NEWCREST
MINING LIMITED

11 August 2022

Attn: Katrina O'Reilly

Department of Planning and Environment
Locked Bag 5022
Parramatta NSW 2124

Via upload to Major Projects External Portal

Dear Ms O'Reilly,

RE: Submission of Independent Air Quality Audit

Schedule 2 of the Cadia East Project Approval (PA06_0295), provides the following two conditions which limit the maximum quantity of ore authorised to be processed:

> *LIMITS ON APPROVAL*
>
> *6. The Proponent shall not process more than 32 million tonnes of ore from the project in a calendar year, or the alternative maximum of 35 million tonnes of ore is approved as varied by condition 6A.*
>
> *6A. A maximum of 35 million tonnes of ore from the project in a calendar year may be processed on-site, subject to the Proponent commissioning an independent air quality audit report to the satisfaction of the Secretary. The independent audit report must:*
>
> *a) be prepared in accordance with the Independent Environmental Audit requirements in Schedule 5 of this approval; and*
> *b) describe details and scheduling of all reasonable and feasible best practice measures that are being implemented for managing and minimising off-site air quality impacts of the project, particularly from NTSF, STSF, and ventilations shafts.*

In compliance with Schedule 2, Condition 6A, Cadia nominated Zephyr Environmental as a suitably qualified persons to undertake the required Independent Air Quality Audit. This nomination was approved by the Department of Planning and Environment on 10 January 2022.

Zephyr Environmental were notified of this appointment on 11 January 2022, which is the date of commissioning of the Independent Air Quality Audit.

An audit inspection was undertaken by Zephyr Environmental between 11 – 12 April 2022. The final audit report prepared by Zephyr Environmental accords with the Independent Environmental Audit requirements in Schedule 5 of PA06_0295, and is included with this letter as Appendix A.

The final audit report describes details and scheduling of all reasonable and feasible best practice measures that are being implemented for managing and minimising off-site air quality impacts of the project, particularly from NTSF, STSF, and ventilations shafts.

Cadia's response to the audit report is included with this letter as Appendix B.

Should you have any further queries regarding this matter, please do not hesitate to contact Lyndsay Potts on 0417 104 889 or lyndsay.potts@newcrest.com.au.

Yours sincerely,

Aaron Brannigan
General Manager – Cadia Valley Operations

Email: aaron.brannigan@newcrest.com.au

NEWCREST

Appendix A – Independent Air Quality Audit

Cadia Valley Operations

Independent Air Quality Audit

Project Number.: 0030

Date: 11 August 2022

Document details	
Document title	Cadia Valley Operations
Document subtitle	Independent Air Quality Audit
Project No.	0030
Date	11 August 2022
Version	Final
Author	Jane Barnett
Client Name	Newcrest Mining Limited

Document history

Version	Date	Author	Reviewed by	Comments
D01	22.07.2022	Jane Barnett	Damon Roddis	Draft for review
F01	11.08.2022	Jane Barnett	Damon Roddis	Final

Damon Roddis
Principal

Jane Barnett
Principal

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1 INTRODUCTION

Zephyr Environmental Pty Ltd (Zephyr) has completed an air quality audit for the Cadia Valley Operations (CVO) mine to evaluate dust mitigation practices with the view to identifying the potential to improve the current controls and implement additional mitigation strategies.

As prescribed under the Cadia East Project Approval (PA 06_0295) Schedule 2 Condition 6A (DPE, 2021), CVO is required to commission an independent audit of the dust generating aspects of the operations, with particular regard to the Tailings Storage Facilities (TSFs) and ventilation shafts.

1.1 Audit scope

Zephyr has been approved by the Planning Secretary of the NSW Department of Planning and Environment (DPE) to perform the audit of Condition 6A, which is replicated below:

> *A maximum of 35 million tonnes of ore from the project in a calendar year may be processed on-site, subject to the Proponent commissioning an independent air quality audit report to the satisfaction of the Secretary. The independent audit report must:*
>
> *(a) be prepared in accordance with the Independent Environmental Audit requirements in Schedule 5 of this approval; and*
>
> *(b) describe details and scheduling of all reasonable and feasible best practice measures that are being implemented for managing and minimising off-site air quality impacts of the project, particularly from NTSF, STSF, and ventilations shafts.*

The communication from DPE approving Zephyr for this work is provided in Appendix A. Zephyr requested a meeting with DPE to discuss the scope and proposed methodology for the audit and seek guidance as to any other stakeholders that DPE would like to be included in the consultation process. This meeting was held on Monday 21 February 2022 and was attended by CVO, Zephyr and DPE personnel. The email communication from Zephyr requesting this meeting and outlining our methodology is included in Appendix B.

The outcomes of this meeting were as follows:

- The audit is concerned with particulate matter (PM). Odour and other gaseous emissions are out of scope.
- The dewatering facility at Blayney is out of scope.
- The audit is to address all particulate emission sources but the focus is to be on the northern tailings storage facility (NTSF), southern tailings storage facility (STSF) and ventilation outlets.
- The NSW Environment Protection Authority (EPA) and the Community Consultation Committee (CCC) should be consulted, but no other stakeholders are required.
- The audit should investigate the current monitoring network and evaluate its capacity to ensure compliance but also aid in operational dust management.
- This is not considered a typical compliance audit against approval requirements, but rather the audit will focus on evaluating the onsite activities against the draft Air Quality and Greenhouse Gas Management Plan (AQGHGMP).

1.2 Audit period

This audit covers a six-month period from commissioning to completion, as per the following timeline:

- Zephyr commissioned by CVO: 11 January 2022
- Zephyr conducted the site inspection: 11 – 12 April 2022
- Draft audit report completed: 22 July 2022

1.3 Audit personnel

The audit was performed by Damon Roddis (Principal, Zephyr Environmental) and Jane Barnett (Principal, Zephyr Environmental), as approved by DPE. A copy of the independent audit declaration form is provided in Appendix C.

The audit was informed by a site inspection of the CVO mine, undertaken by Damon Roddis and Jane Barnett, with facilitation by Nicolas Bourgeot of CVO, on 11 and 12 April 2022. Discussions were held with various site personnel, all of whom are listed in Table 1-1. There were also some preliminary discussions held with CVO personnel who were unable to attend on site at the time of the visit and these are also listed at the bottom of the table.

Table 1-1: All participants in the air quality audit

Name	Role
Damon Roddis	Lead auditor (Zephyr)
Jane Barnett	Senior auditor (Zephyr)
Nicolas Bourgeot	Senior Environmental Advisor (CVO)
Teiya Thornberry	Environmental Advisor (CVO)
John Ford	Senior Environmental Scientist (CVO)
Chloe Hartnig	Ore Processing (CVO)
Rob Thomas	Surface Operations (CVO)
Russ Atkins	Ore Processing (CVO)
Harry L'Strange	Ore Processing (CVO)
Campbell Haines	Metallurgy (CVO)
Cole Fanning	TSF Construction (CVO)
Involved but not available during site inspection	
Christine Jones	Senior Environmental Advisor (CVO)
Evan Kay	Ventilation (CVO)

2 AUDIT PROCESS AND PROCEDURE

2.1 Audit process

The audit process involved the following:

- Preparation and preliminary interviews
- Review of AQGHGMP and other documents
- Opening meeting
- Site inspection and interviews with relevant personnel
- Review of other documents against site inspection
- Reporting
- Close-out meeting

2.2 Audit procedure

The procedure followed during the audit was adapted from NSW Department of Planning and Environment Independent Audit – Post Approval Requirements (PAR) (DPE 2020). The requirements for the presentation of audit findings are prescribed in Section 4.2.3 of the PAR. As noted above, in Section 1.1, this is not a standard Independent Environmental Audit but rather an Air Quality Audit, and so not everything in the DPE (2020) document will be relevant, confirmed by DPE in the meeting on 21 February 2022. The following information is included in the report:

- A summary of the pollution reduction programs (PRPs) issued in relation to the consent during the audit period;
- Discussion on whether the AQGHGMP is adequate, implemented and whether there are any opportunities for improvement;
- Evidence collected through site inspections undertaken during the audit;
- Evidence to support compliance assessment provided by the personnel interviewed during the audit;
- Discussion of any improvement opportunities identified as part of the audit; and
- Recommended actions to address any incidents or issues identified by the auditor.

2.3 Evaluation

An evaluation of compliance against the requirements for the AQGHGMP, Approval Conditions and Environmental Protection Licence (EPL) is provided in Section 6 and uses the relevant descriptors in the table below.

Table 2-1: Status descriptors

Status	Description
Compliant	The auditor has collected sufficient verifiable evidence to demonstrate that all elements of the requirement have been complied with within the scope of the audit
Non-compliant	The auditor has determined that one or more specific elements of the conditions or requirements have not been complied with within the scope of the audit.
Not-triggered	A requirement has an activation or timing trigger that has not been met during the temporal scope of the audit being undertaken (may be a retrospective or future requirement), therefore an assessment of compliance is not relevant

The compliance assessment aspect of the audit is summarised in Table 6-1 at the conclusion of this report.

2.4 Document review and site inspection

2.4.1 Document list

To achieve the outcomes of the audit, the following documents have been reviewed:

- Environmental Protection Licence (EPL) 5590, version date 1 October 2021 (EPA, 2021)
- Cadia East Project Consolidated Consent Conditions (Approval Conditions) (DPE, 2021)
- Air Quality and Greenhouse Gas Management Plan (AQGHGMP) Draft for Consultation, 11 March 2022 (CVO, 2022)
- Air Quality and Greenhouse Gas Assessment – Cadia Valley Operations Processing Rate Modification (MOD14). Prepared by Todoroski Air Sciences on 1 December 2021 (TAS, 2020a)
- Newcrest Mining Limited – Environmental Policy (Newcrest, 2017)
- Report addressing the requirements of EPL Condition U1.1 and U1.2, prepared 1 August 2021 (CVO, 2021a)
- Quarterly report addressing the requirements of EPL Condition U1.1 and U1.2, prepared 1 December 2021 (CVO, 2021b)
- Quarterly report addressing the requirements of EPL Condition U1.1 and U1.2, prepared 1 March 2022 (CVO, 2022b)
- Report addressing the requirements of EPL Condition U1.3 – Air Dispersion Modelling Cadia Valley Operations Tailings Storage Facilities. Prepared by Todoroski Air Sciences, issued 8 October 2021 (TAS, 2021b)

- Trigger Action Response Plan (TARP) developed for EPL Condition U1.4 (CVO, 2022c)
- Cadia Valley Operations Mining Operations Plan 2020 – 2022 (CVO, 2020)
- Mine Vent Emission Study Report Number R012219 (Ektimo, 2022)
- Proposal for a Proactive Dust and Noise Management Solution (EnviroSuite, 2022)

The Air Quality Impact Validation Report required in Schedule 3, Condition 19A of the Approval Conditions and noted in Section 12.3 of the draft AQGHGMP, was not provided and could not be reviewed.

2.4.2 Site inspection

The following areas were visually inspected during the site visit on 11 – 12 April 2022:

- Surface stockpiles
- Ore processing plant (conveyors, crusher and transfer points)
- Site Access Operation Control (SAOC)
- Northern and southern TSFs
- Rehabilitation areas
- Mine ventilation shaft outlet (VR81)
- Meribah air quality monitoring station
- Southern Lease Boundary (SLB) meteorological monitoring station
- Open pit
- Molybdenum plant

These sites are shown in Figure 2-1. A copy of the itinerary for the site visit is also provided in Appendix D.

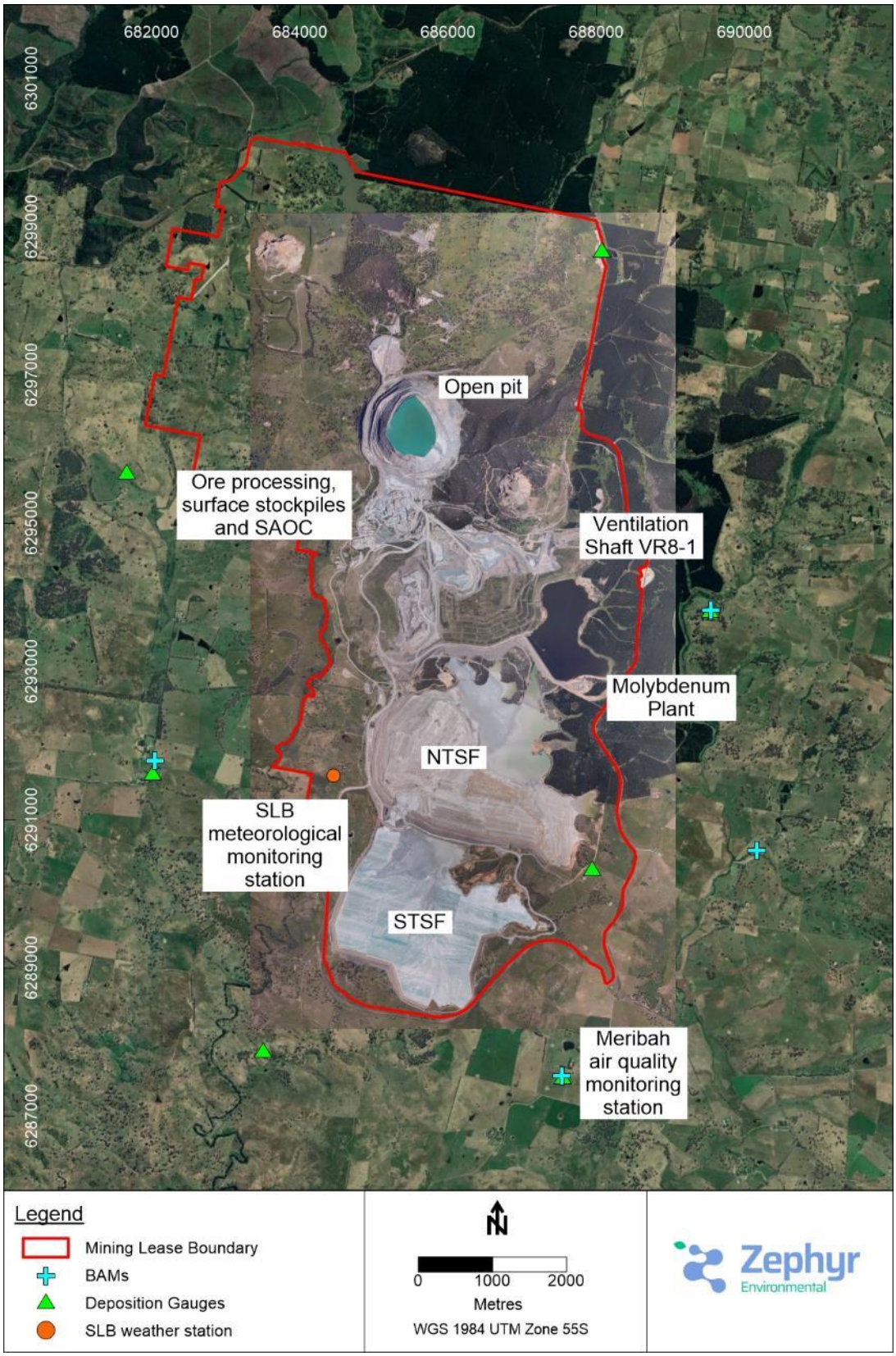


Figure 2-1: Sites inspected during site visit on 11 and 12 April 2022

3 POLLUTION REDUCTION PROGRAMS

After the partial slump of the NTSF embankment in March 2018, and subsequent dust generation events, Cadia's EPL was updated to include a Pollution Reduction Program (PRP) Condition U1. This was divided into four parts:

- Condition U1.1 and U1.2:
    - the covering of both TSFs with dust suppressants, engaging a 3rd party to supply and maintain this cover
    - respond to any dust events as required
    - provide reports to the EPA detailing the ongoing management of the TSFs until operations re-commence
- Condition U1.3
    - the provision of air dispersion modelling to quantify dust lift-off and determine conditions under which impacts may occur off-site
- Condition U1.4
    - the development of a Trigger Action Response Plan (TARP) based on the information provided in U1.3

The programs Cadia has undertaken to meet these conditions are detailed in Section 5.8.

4 AIR QUALITY AND GHG MANAGEMENT PLAN

Schedule 3, Condition 20 of the Approval Conditions, requires CVO to prepare an Air Quality and Greenhouse Gas Management Plan (AQGHGMP) for the project within three months of approval. The draft AQGHGMP was submitted to the DPE for review on 11 March 2022 and at the time of this audit had not yet been finalised. Table 4-1 presents the individual parts of Condition 20 indicating where, in this report, each part has been addressed. As per the scope of this audit, these only refer to the elements of Condition 20 which are relevant to air quality.

Table 4-1: Requirements for the AQGHGMP

Condition	Section in audit report where this is discussed
The Condition states this Plan must:	
(a) be prepared by a suitably qualified and experienced person and in consultation with EPA and the CCC, and be submitted to the Secretary within 3 months of approval of Modification 14, unless otherwise agreed by the Secretary	Section 4
(b) describe proactive and reactive measures of all significant, and potentially significant emissions sources and construction activities, that would be implemented to ensure compliance with conditions 17-19C of this schedule	Section 5
(c) include key performance indicators	Section 4.1
(d) include a program for the implementation of the measures referred to in (b) above	Section 5.8
(e) include an air quality monitoring program that:	
- uses a combination of real-time monitoring measures, high volume samplers and dust deposition gauges to monitor and evaluate the dust emissions of the project;	Section 5.3
- describes the proposed installation, ongoing operation and maintenance of a suitable number of real-time particle monitoring sites around the NTSF and STSF to allow responsive dust management;	Section 5.8
- includes a suitable air quality monitoring program for the project's ventilation shafts discharge points including PM_{10} and $PM_{2.5}$ emissions and ventilation flow rates;	Section 5.9
- includes the ongoing operation and maintenance of a meteorological weather station;	Section 5.4
- includes a protocol for determining exceedances of the relevant conditions of this approval	Section 4.3
(f) establish a trigger response/reactive management protocol (Trigger Action Response Plan) to be used in combination with the particle monitoring sites and meteorological weather station	Section 4.2
(g) include the location, frequency and duration of monitoring, record keeping, system and performance review for continuous improvement and compliance reporting	Section 5.3
(h) include procedures for the reasonable use of interim stabilisation and temporary vegetation strategies to minimise the area exposed for dust generation	Section 5.8

4.1 Key Performance Indicators

The purpose of the management plan is to ensure all requirements of the Approval Conditions and EPL (in this case, relevant to air quality) are defined with suitable targets and have management roles and expectations assigned to the appropriate people in the team. The draft Cadia AQGHGMP takes these targets and links them to Key Performance Indicators (KPIs) to evaluate the performance and effectiveness of the management system. The performance is then reported in the Annual Review (CVO, 2021c) where further actions can be recommended for improvement, as required.

The targets with respect to air quality relate to compliance with ambient air quality criteria in the Approval Conditions. It is noted that one of the KPIs refers to "*no exceedances of air quality criteria reported on a 12 month basis*". The analysis of data over a number of years (TAS, 2020a) has shown that from time to time there have been exceedances which are the result of regional events and not the Project. This is particularly true for short-term (24-hour) averaging periods, but can occur for the annual average too, such as the severe bushfires in 2019 / 2020.

It is therefore recommended that this KPI be updated to include reference to the exceedance being due to the Project. For example, *"no exceedances of air quality criteria reported on a 12 month basis, as a result of emissions from the Project"*. This makes the KPI more appropriate and the target within CVO's control.

It is also recommended that a monitoring KPI be added to incorporate the in-stack concentration limits at the ventilation shafts of 20 mg/m^3. The first round of these measurements shows an exceedance of this limit at VR8-1 and VR3-1 and is discussed further in Section 5.9.

4.2 Trigger Action Response Plan (TARP)

As part of the AQGHGMP, and as noted above in Condition 20(f), CVO is required to develop a TARP to be used in combination with the particulate and meteorological monitoring stations. This is also required under EPL Condition U1.4. At the time of writing, these plans are still in draft format but have been reviewed by Zephyr.

The Dust TARP covers four areas:

- WeatherZone dust forecast
- Alarm from Southern Lease Boundary (SLB) weather station
- Visible dust
- Real-time operational air quality monitors

This TARP represents best practice as it enables early detection of potential air quality impacts via an alarm system and management responsibilities for rapid deployment of control measures to mitigate, ideally, prior to dust leaving the site. The real-time dust management system being installed by EnviroSuite (see Section 5.8) will integrate with the TARP.

It is recommended that this TARP be reviewed again once it is finalised and the EnviroSuite system is installed and operational to ensure the triggers are appropriate for this specific application.

4.3 Pollution Incident Response Management Plan (PIRMP)

The AQGHGMP also includes a PIRMP outlining the steps that need to be taken in the event of an air quality exceedance. As with the TARP, this is still in draft form but indicates best practice in terms of the process and the actions required as a result of the outcomes of each step.

5 OBSERVATIONS FROM SITE INSPECTION

The following sections provide an overview of the observations made in and around each potentially dust generating area during the site inspection on 11 and 12 April 2022. The discussion also summarises the information gained from interviews with the relevant site personnel responsible for the management of these specific operational areas, as it relates to dust.

5.1 Surface stockpiles

ROM is mined by panel caving and the material is transported from underground via conveyor and delivered directly to the main stockpile at the surface. This stockpile is maintained as high as possible to minimise the drop height from the conveyor and also to maintain sufficient weight to effectively draw it down. It is reclaimed via three feeders underneath the stockpile and conveyed to the processing plant.

If this main stockpile reaches capacity, material is removed via truck and transported to a smaller ROM stockpile. This material then re-feeds the main stockpile as required. Figure 5-1 shows the conveyor loading the main stockpile.

There are no water sprays on the external surfaces of the main stockpile. However, water sprays on the conveyor provide moisture to the raw material and the stockpile is constantly loaded to the top so little dust was observed to be generated by this source. Water carts are used to aid dust suppression on the unsealed roads between the main stockpile and the smaller ROM stockpile when required.

Conveyor transfer chutes are sealed and water mist spray installations have been designed for some transfer chutes, significantly reducing dust escaping from these locations. Dust is currently well managed from surface stockpiles and associated activities.

Figure 5-1: Conveyor loading main surface stockpile (photograph taken 12 April 2022)

5.2 Ore processing plant

The site inspection involved a tour of the current plant and a description of recent improvement programs which have either been completed or are being planned to reduce dust. These improvement works include:

- Mini tunnel skirting upgrade (see Figure 5-2)
  - Increased belt life
  - Decreased spillage
  - Reduction in dust in the immediate and surrounding areas of the mini tunnel

Figure 5-2: Before and after skirting upgrade (provided by CVO)

- CV2013 to CV2006 transfer chute dust mitigation
  - Reduction in dust from this transfer point by placing a cover over the top of the chute
  - Work order currently in the system to install sprays for dust at discharge. Installation to be completed in July 2022.
- BN2007 dust containment
  - Cover to be installed at the top of Bin 2007. To be completed in 2022.
- CV2013 scraper improvement project
  - Project currently in design phase and part of the ongoing specialist improvement Program FY2022. Figure 5-3 shows the design drawings with the equipment nominally positioned in place.

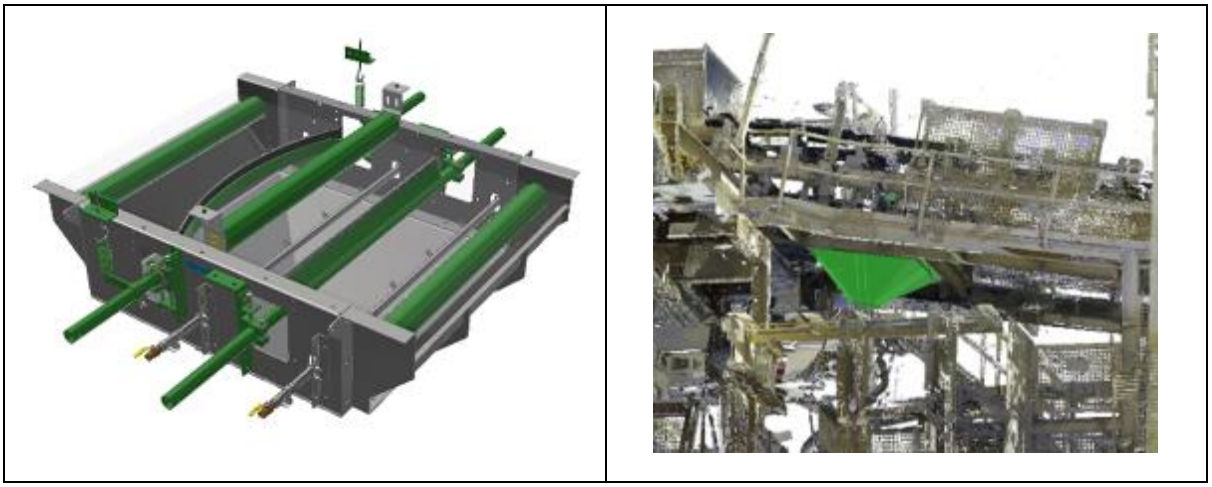


Figure 5-3: Typical washbox with support rollers (left) and design drawing of washbox in place (right)

- DE2005 (dust collector) ducting upgrade
    - Work order submitted
    - Access to inspect and clean some of the existing dust extraction pipework is difficult, the project is to cut hatches into the existing duct work for inspection and cleaning, this will improve the effectiveness of the DE2005 unit.
    - Dust collects in the horizontal lines creating a blockage and reducing dust recovery

Much has already been done, or is being done, to reduce dust at the source for the processing plant, but there are also a number of notifications and work orders for additional improvements, investigative and corrective work. They are summarised as follows:

- NOTIFICATION 12358687 Approved – involves trialling a second set of sprays closer to the discharge of CR2001 (atomising sprays to be installed)
- CV2006 Work order 14998325 – installing sprays for the dust at the discharge.
- W/O 15044805 – Flush the dust suppression spray bar and improve functionality.
- W/O 14977328 – Move the spray bar at the discharge to where it can be more effective –still to be wired in by electricians, but the spray bar has been installed

5.3 Air quality monitoring

5.3.1 Ambient monitoring

There are a number of active air quality monitoring stations across the CVO site, in line with EPL Condition P1 and Schedule 3, Condition 17 and 20(e) of the Approval Conditions. The monitoring network fulfils the requirements for both compliance and operational monitoring. The real-time

The site inspected (Meribah) on 12 April was a significant site as it contained one of each type of monitor used throughout the CVO network (Figure 5-4). These instruments included:

- Two Beta Attenuation Monitors (BAMs) – continuous 1-hour average measurements of PM_{10} and $PM_{2.5}$
- A High Volume Air Sampler (HVAS) – one 24-hour average TSP measurement every six days
- A Low Volume Air Sampler (LVAS) – one 24-hour average PM_{10} measurement every six-days
- A Tapered Element Oscillating Microbalance (TEOM) – continuous 1-hour average measurements of PM_{10} and $PM_{2.5}$ and currently being replaced by BAMs
- A DustTrak measuring – continuous measurements of PM_{10} and $PM_{2.5}$ (the use of the DustTrak is permitted under EPL Condition E1 in the event the TEOM is not in operation)
- A dust deposition gauge – one measurement of insoluble solids per month

All monitors were installed in accordance with their relevant Australian Standard.

Monitors were installed and are operated in accordance with relevant Australian Standards, legislation and the Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (EPA, 2007).

5.3.2 Emissions monitoring

Condition M3 in the EPL refers to monitoring concentrations of pollutants emitted to air in accordance with testing methods under the *Protection of the Environment Operations (Clean Air) Regulation 2021* (the Clean Air Regulation) Condition 20(e) of the Approval Conditions also requires an "*air quality monitoring program for the project's ventilation shafts discharge points, including PM_{10} and $PM_{2.5}$ emissions and ventilation flow rates*".

Stack testing carried out by Ektimo between 28 February – 3 March 2022 and these results are discussed in Section 5.9.

TEOM

BAM

HVAS

LVAS

DustTrak

Dust deposition gauge

Figure 5-4: Particulate monitoring at Meribah

5.4 Meteorological monitoring station

There are two active meteorological stations operated by CVO, as required in Condition P1 of the EPL and Schedule 3, Condition 21 of the Consolidated Consent Conditions. Zephyr inspected the Southern Lease Boundary site on 12 April 2022, shown in Figure 5-5. The station was installed in accordance with Australian Standards (AS 2922-1987, AS 2923-1987) and complies with the requirements in the EPL and Consent Conditions.

Figure 5-5: Southern Lease Boundary meteorological station

5.5 Site Asset Operations Centre (SAOC)

The SAOC is the control centre for the site, monitoring all operations underground and at the surface. With respect to dust management, the SAOC will be critical for managing the real-time air quality TARP.

The SAOC Supervisor and Surface Operations Supervisor check the WeatherZone detailed forecast for alerts at the start of each shift and advise the relevant parties as to any actions required. Real-time weather from the Southern Lease Boundary meteorological station is monitored for any changes to these meteorological conditions.

Zephyr visited the SAOC and noted a dedicated desk being made ready for the new real-time dust management solution once installed this year for management at the TSFs. An example of a similar monitoring area at the SAOC is shown in Figure 5-6.

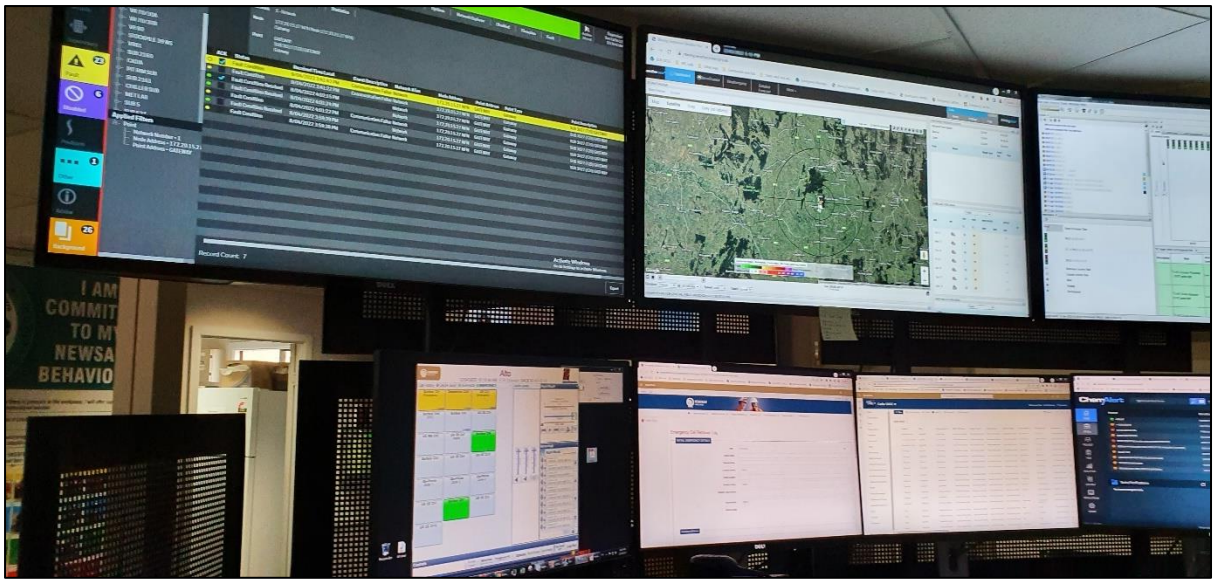


Figure 5-6: Example of a SAOC monitoring area

5.6 Open pit

The open pit is currently being used as a temporary TSF, while reconstruction of the NTSF and STSF is being completed. This has filled significantly since being used for temporary storage (Figure 5-7) and is not a significant source of dust.

Figure 5-7: Previous open pit currently storing tailings

5.7 Molybdenum plant

Inspection of the molybdenum plant (Figure 5-8) confirmed this is not a significant dust source. However, the odour was noticeable off-site on Cadia Road, east of the plant. While not within the scope of this audit, there is potential for this to cause off-site nuisance impacts and it is recommended that this should be evaluated further.

Figure 5-8: Molybdenum plant

5.8 Northern and Southern TSFs

Prior to March 2018, it is understood that Cadia's air quality emissions were primarily associated with seasonal or operational related dust emissions from either the NTSF or the STSF. Wind-blown dust was generally as a result of drying in hot and dry conditions combined with interruption to tailings deposition caused by planned maintenance or TSF construction activities.

After the partial slump of the embankment of the NTSF in March 2018, the deposition of tailings to the NTSF was stopped and there was only intermittent tailings deposition to the STSF until July 2021. The combination of no active deposition of tailings to either TSF and extreme drought conditions until early 2020 led to a significant increase of windblown dust emissions and an increase in community complaints and non-compliance with EPL and Approval Conditions.

Cadia has undertaken a number of activities on the TSFs, in line with EPL Condition U1. These are three-fold in nature, as follows:

- Conditions U1.1 and U1.2 – The development of a dust suppression program involving the trial of both aerial and ground-based application of commercial suppression products, including regular three-monthly progress reporting (CVO, 2021a; CVO, 2021b; CVO, 2022b)
- Condition U1.3 – Dispersion modelling quantifying dust lift-off, identifying the general wind conditions experienced at the TSFs and those which generate dust lift-off, and to estimate the distances this material may travel off-site (TAS, 2021b)
- Condition U1.4 – The development of a Trigger Action Response Plan (TARP) based on the information the dispersion modelling (CVO, 2022c)

Significant work has been undertaken and is continuing, to reduce and manage wind blown dust emissions since the NTSF slump. In August 2021, CVO produced a report which details some of this work, including different trials of a range of dust suppressant options. There have been numerous challenges including;

- The large area affected (approximately 800 hectares)
- Accessibility after rainfall
- Surface damage after rainfall, compromising the effectiveness of the suppressants
- Problems with growth medium for vegetative covers

A number of methods have been trialled including polymers (ground and aerial application) and hydromulch (grass seed and fertiliser). CVO have developed a low ground pressure trailer (Panther) to apply these across the interior NTSF surface. Figure 5-9 and Figure 5-10 show the Panther on-site, with polymer and hydromulch stored and ready to be applied when required.

A grid-based monitoring system is used to perform visual inspections (ground and aerial) to identify areas where performance has been compromised by either weather or wildlife. A GPS tracking system is used to monitor the applications. Aerial application of polymer products has also been trialled, firstly in April 2018 and again in February 2019 following the breakdown of the first application. Forecasting using *WeatherZone* enables predictions for the upcoming few days ensuring dust suppression can be applied in advance of adverse weather conditions. These predictions also allow neighbouring properties to be alerted of any potential dust impacts. An example of the type of information available through this system is provided in Figure 5-11.

Inspections on the TSFs are undertaken daily by site personnel and these are reported weekly. Each inspection takes 3 – 4 hours to complete. Figure 5-12 shows an example of an inspection form.

Figure 5-9: Panther and polymer ready for application

Figure 5-10: Hydromulch stored and ready for application

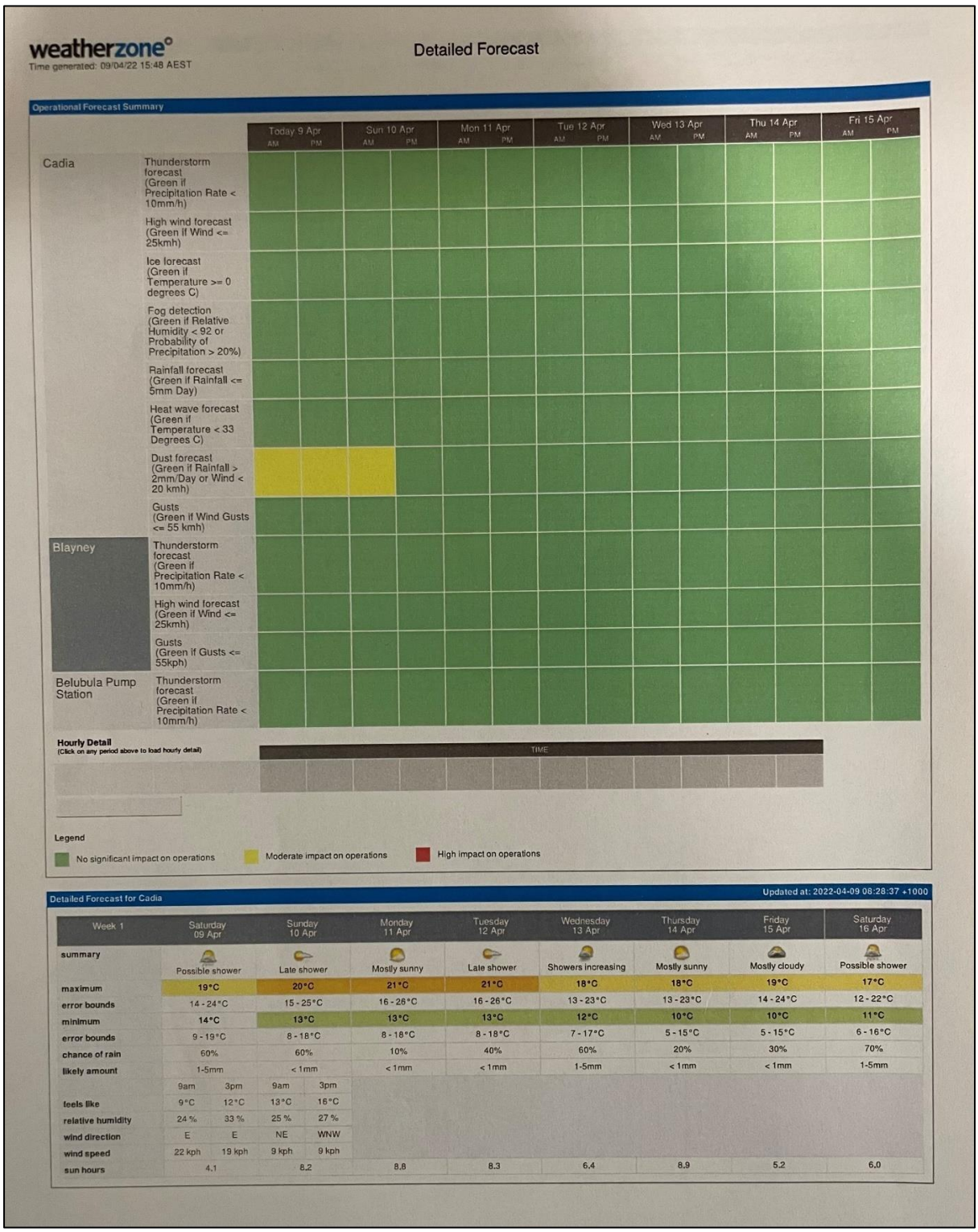
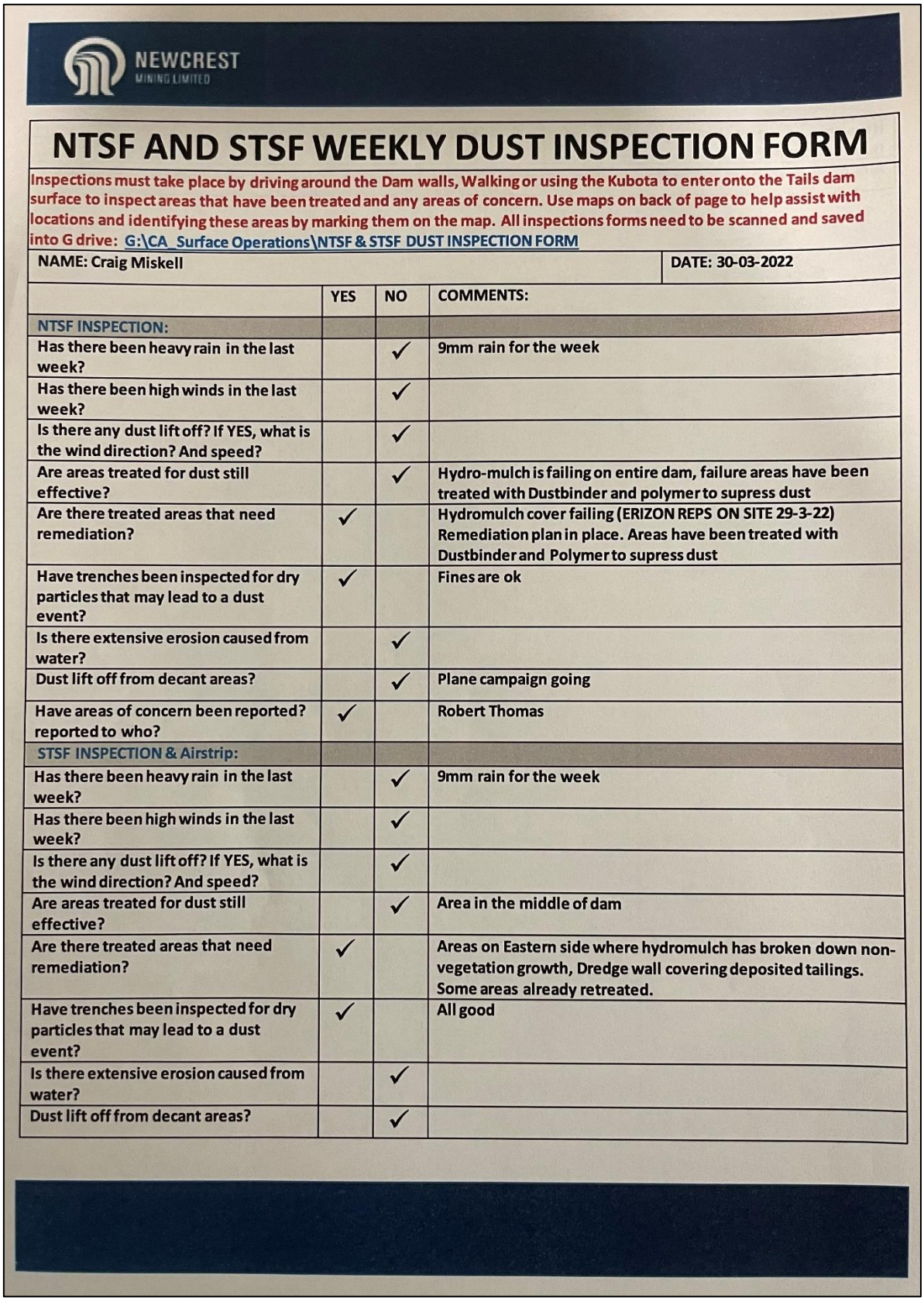


Figure 5-11: Example of a *WeatherZone* forecast currently adopted by CVO



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NTSF AND STSF WEEKLY DUST INSPECTION FORM

Inspections must take place by driving around the Dam walls, Walking or using the Kubota to enter onto the Tails dam surface to inspect areas that have been treated and any areas of concern. Use maps on back of page to help assist with locations and identifying these areas by marking them on the map. All inspections forms need to be scanned and saved into G drive: G:\CA_Surface Operations\NTSF & STSF DUST INSPECTION FORM

NAME: Craig Miskell | DATE: 30-03-2022

	YES	NO	COMMENTS:
NTSF INSPECTION:			
Has there been heavy rain in the last week?		✓	9mm rain for the week
Has there been high winds in the last week?		✓	
Is there any dust lift off? If YES, what is the wind direction? And speed?		✓	
Are areas treated for dust still effective?		✓	Hydro-mulch is failing on entire dam, failure areas have been treated with Dustbinder and polymer to supress dust
Are there treated areas that need remediation?	✓		Hydromulch cover failing (ERIZON REPS ON SITE 29-3-22) Remediation plan in place. Areas have been treated with Dustbinder and Polymer to supress dust
Have trenches been inspected for dry particles that may lead to a dust event?	✓		Fines are ok
Is there extensive erosion caused from water?		✓	
Dust lift off from decant areas?		✓	Plane campaign going
Have areas of concern been reported? reported to who?	✓		Robert Thomas
STSF INSPECTION & Airstrip:			
Has there been heavy rain in the last week?		✓	9mm rain for the week
Has there been high winds in the last week?		✓	
Is there any dust lift off? If YES, what is the wind direction? And speed?		✓	
Are areas treated for dust still effective?		✓	Area in the middle of dam
Are there treated areas that need remediation?	✓		Areas on Eastern side where hydromulch has broken down non-vegetation growth, Dredge wall covering deposited tailings. Some areas already retreated.
Have trenches been inspected for dry particles that may lead to a dust event?	✓		All good
Is there extensive erosion caused from water?		✓	
Dust lift off from decant areas?		✓	

Figure 5-12: Example of a TSF inspection form

CVO has produced regular quarterly reports (December 2021 and March 2022 so far), providing progress updates to regulators on the dust suppressant program for the TSFs. It is considered that the work undertaken and measures in place to date satisfy the requirements of EPL Condition U1.1 and U1.2.

CVO is continuing to look for innovative approaches through the development of a Cadia specific solution given the unique challenges. These include a specific type of suppressant and also the development of their own application equipment that may enable access to large areas of the TSFs after rainfall periods. The hydromulch was successfully applied across the entire NSTF by November 2020 and the STSF by July 2021. Polymers are used to target specific areas as needed. Figure 5-13 (taken on 11 April 2022) shows an example of good coverage on the NSTF using both the hydromulch (foreground) and polymers (green coloured areas).

Figure 5-13: Hydromulch and polymer cover over the NTSF

In addition to the proactive mitigation through ongoing dust suppression as described above, CVO is procuring a real-time dust monitoring system as required in Schedule 3, Condition 20(e) of the Approval Conditions, from EnviroSuite. Zephyr has reviewed the EnviroSuite proposal and is satisfied that it provides best-practice in terms of operational dust management. The EnviroSuite solution will assist CVO with the following:

- Maintaining constant awareness of fugitive dust emissions, informing the deployment of mitigation measures, and optimising their application, whenever possible
- Enabling targeted dust controls and adaptive plans by identifying the areas onsite that are generating emissions that may be causing offsite impacts
- Improving coordination and confidence in operational planning to mitigate dust risks
- Forecasting the potential impact of weather and receiving advanced notice of any high-risk periods due to environmental conditions so that preventive action may be taken
- Validating any nuisance reports received from neighbours or investigating high ambient monitoring readings, quickly and with the support of accepted scientific analysis methods, and
- Improving transparency and engagement with authorities and community stakeholders, when required

The system will include an additional six real-time particulate monitors, placed around the boundary of the TSFs. These will be permanent, although mobile in nature to allow flexibility in location. They will be linked with the meteorological monitoring data to inform the TARP described in Section 4.1. It is anticipated that this system will be commissioned later this year and the monitors positioned as shown as Operational Monitors B1 – B6 in Figure 5-14.

CVO has also undertaken the modelling required in Condition U1.3, to quantify dust emissions from the TSFs, identify the wind conditions which generate these emissions and to understand how far this dust travels away from the source and potentially off-site (TAS, 2021). Modelling was evaluated using data collected at the four TEOM sites over a four year period. The modelled and measured concentrations correlated reasonably well indicating satisfactory model performance. The model was then used to predict the dispersion characteristics of these emissions.

The report showed both general dispersion patterns as well as predicted concentrations on specific complaint days. The modelling of the complaint days indicated that over a 24-hour average period the background contributions were much larger than the predicted contribution from TSF emissions. However, the report did acknowledge that PM_{10} concentrations could peak during high wind speeds, potentially leading to complaints, without causing an exceedance of the 24-hour air quality criterion.

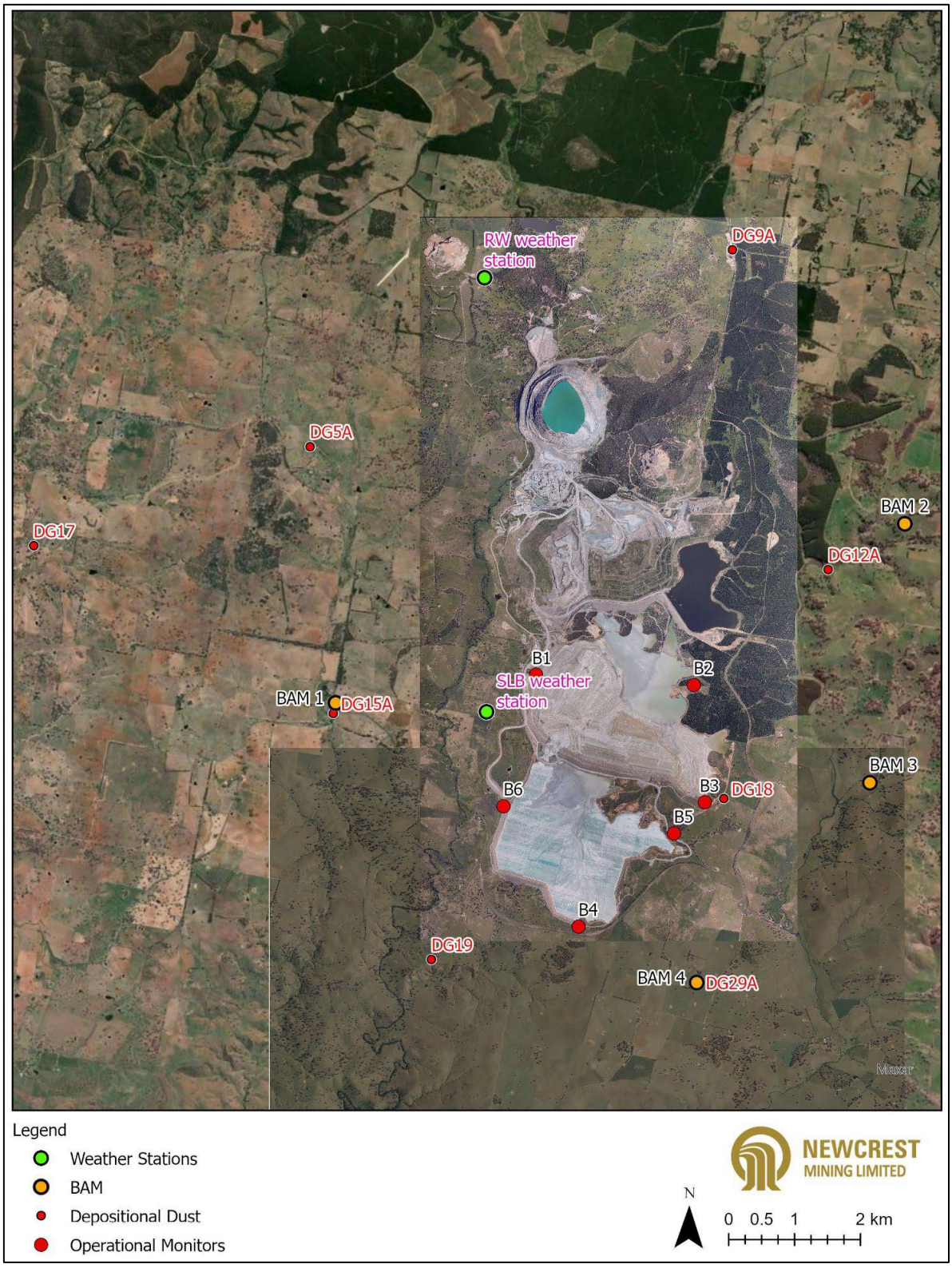


Figure 5-14: Proposed locations of real-time particulate monitors as part of CVO's EnviroSuite solution

5.8.1 TSF construction

At the time of this audit, the Air Quality Impact Validation Report, required under Schedule 3, Condition 19b of the Approval Conditions had not been provided. This study was intended to be completed within three months of approval of Modification 14 and prior to the construction of the NTSF and STSF. It is understood that this study has been commissioned but is not yet finalised. It is recommended this work be reviewed when complete.

TSF construction activities to remediate the slump will involve bulk earthworks and reclaiming of material from the Blue Dump. Dredged spoils from the NTSF will be spread over the STSF, south of the containment bund, and the void backfilled with material from the Blue Dump. This material will be hauled from the dump to the construction zone and water carts will be employed to mitigate wheel generated dust. CVO is also investigating the option of static water sprinklers along the eastern haul road in lieu of water carts. Other heavy machinery will include dump trucks, dozers and rollers, all with dust generating potential. The real-time management solution including the TARP will be used to monitor dust during construction.

In summary, it is our opinion that the programs of works CVO has completed, and continues to undertake, with regard to the TSFs, represents best practice. This work has included both mitigating emissions at the source, understanding the dispersion characteristics of residual emissions, informing the community of potential impacts and putting proactive solutions in place to further manage these emissions.

5.9 Mine ventilation shaft outlets

A site inspection of ventilation outlet VR8-1 indicated there were significant visible particulate emissions from this vent shaft. These emissions could be seen clearly from the molybdenum plant approximately 2 km to the south across the dam lake (Figure 5-15).

The reason for the observed high particulate loading from this ventilation outlet is understood to be as a result of underground crushing and screening activities being located immediately prior to the vertical riser for this ventilation outlet.

Figure 5-15: View of emissions from VR8-1 from the molybdenum plant

Closer inspection in the immediate vicinity of VR8-1 showed significant deposits of particulate matter on the ground and surrounding structures (Figure 5-16). This material was fine and clay-like, indicating that the emission is likely to have a high moisture content.

Figure 5-16: Fine clay material covering the ground and equipment at VR8-1

Condition M3 in the EPL refers to monitoring concentrations of pollutants emitted to air in accordance with testing methods under the *Protection of the Environment Operations (Clean Air) Regulation 2021* (the Clean Air Regulation) Condition 20(e) of the Approval Conditions also requires an "*air quality monitoring program for the project's ventilation shafts discharge points, including PM_{10} and $PM_{2.5}$ emissions and ventilation flow rates*".

Under Part 7, Schedule 4 of the Clean Air Regulation (*Standards of concentration for scheduled premises: general activities and plant*), the maximum in-stack concentration for the ventilation shafts would be 20 mg/m^3, for total solid particulates[1]. (EPA, 2021).

Stack testing carried out by Ektimo between 28 February – 3 March 2022 indicated that total solid particulate concentrations at VR8-1 are 360 mg/m^3, significantly above this limit. This Ektimo report is provided in Appendix E, and also shows that levels at ventilation outlet VR3-1 also exceed the limit of 20 mg/m^3. The report notes that due to the design of the shaft outlets, the sampling locations were non-conforming with the Australian Standard (AS 4323.1 (2021): Stationary source emissions selection of sampling positions).

Significant flow disturbance was reported due to the bend immediately downstream from the sampling plane. The report also notes that "*where testing at non-conforming sampling planes is unavoidable, all efforts were made to collect a representative sample. To achieve this, the number of sampling points was increased in accordance with the procedures described in AS 4323.1 (2021)*". This alternative procedure can be utilised to classify a "non-confirming" location as a "non-ideal location". Regardless, the measured concentrations are more than an order of magnitude above the regulatory limit and are not likely to be due to the non-conformity of the testing.

It is noted that the dispersion modelling for the Modification 14 Air Quality and Greenhouse Gas Assessment (TAS, 2020a) applied an in-stack concentration of 2.96 mg/m^3. Previous modelling by TAS in May 2021 included a marginally higher concentration of 4.715 mg/m^3 (TAS 2020b) which was then reduced to 3.84 mg/m^3 in September 2021 (TAS, 2021). Regardless of which value was used, they are all significantly lower than the actual measured concentration of 360 mg/m^3. In other words, the predicted ground level concentrations noted in each of these reports will be considerably underestimated. The contours presented in TAS (2020b) indicate the main areas of impact are to the northeast of the site. However, as these contours do not show any concentration levels it is not possible to know what these levels are (see Figure 5-17), only the pattern of dispersion. The contours in the air quality assessment (TAS, 2020a) do not provide this information either as the ventilation shaft emissions are included with all other dust emissions from the site.

[1] For 'any crushing, grinding, separating or materials handling activity' for Group 6, which applies to this operation as specified in EPL 5590.

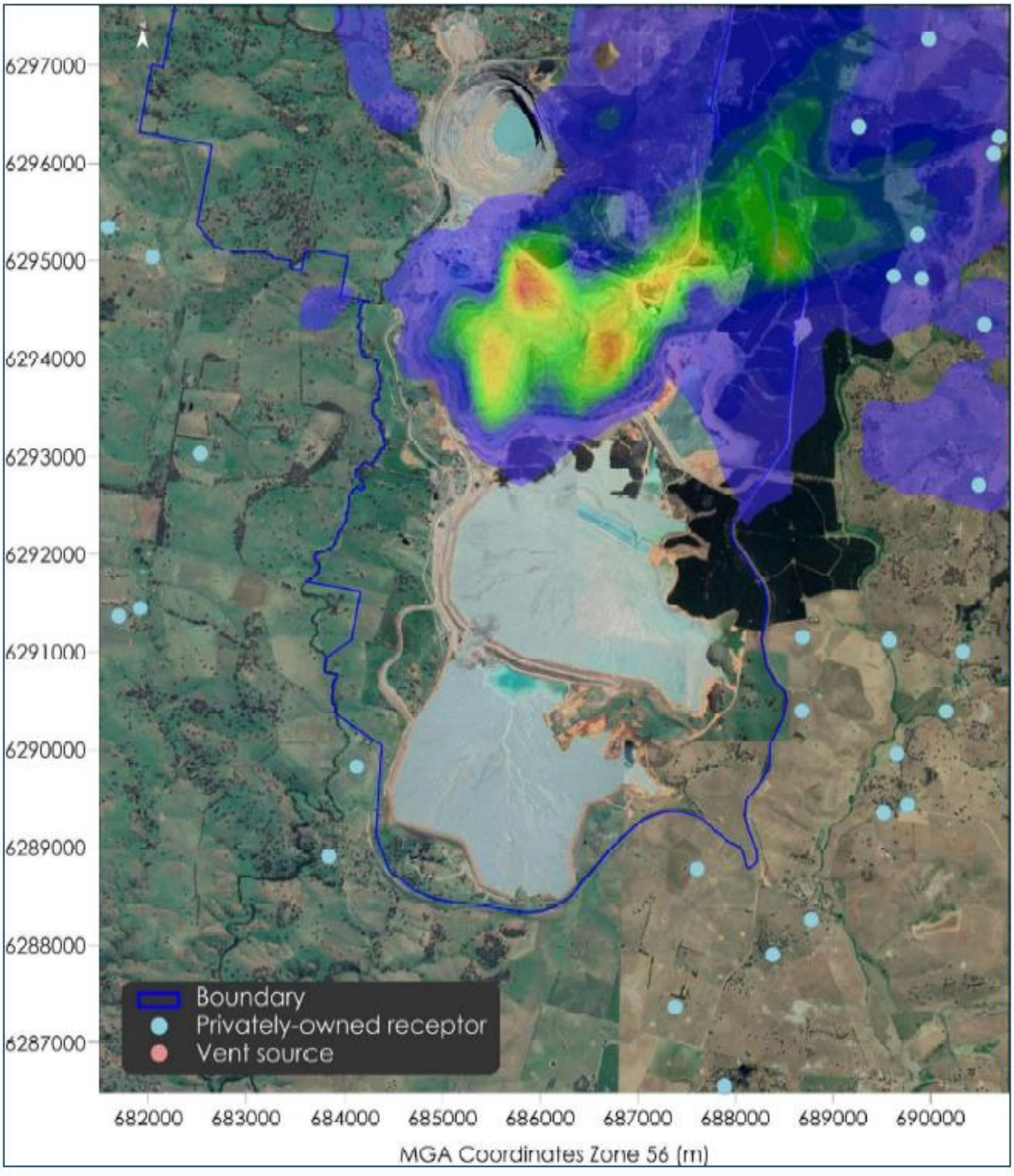


Figure 2: Predicted maximum 24-hour average levels

Source: Figure 2 from TAS 2020b

Figure 5-17: Predicted 24-hour average dispersion pattern from CVO ventilation shafts

Regardless, CVO do not currently meet the requirements of the EPL and Clean Air Regulation and work is needed to reduce these in-stack concentrations to below in-stack criteria. The most effective way to reduce these concentrations is likely to be controlling dust at the source, that is, on the underground conveyors and crushers. A number of options are currently being considered and these works include:

- Misting sprays at tail end of CV2006
- Sprays at the tipple where the vent air draws from
- Investigation into a scrubber system for VR8-1
- Dust collectors and hoods on the incline conveyor chutes
- Mist curtain at the bottom of the west collector chute
- Tail end sprays on incline conveyors
- Installation of sprays at the discharge of CV3038

Much of the documentation around best practice dust control (NIOSH, 2010) for underground mines is in relation to the health and safety of workers and is therefore focussed on reducing concentrations underground. Mine ventilation is obviously the most effective way of doing this as fresh air is drawn in and contaminated air is removed from the underground working areas through the ventilation shafts. The focus of this audit, however, is the emissions to atmosphere at the surface. Regardless, controlling dust at the source will both reduce underground concentrations and reduce ventilation emissions and so these best practice options are discussed here.

Application of water spray systems and scrubbers provide the best means of dust control at the source. This involves the use of watering at all points of material transfer (loading to hoppers and transfer to conveyors) as well as the crusher itself. Water powered scrubbers mounted on crushers can be very effective and require less maintenance than other types with more moving parts. Dust laden air is drawn through a series of tubes with sprays attached to each tube. An example of such a setup is shown in the schematic in Figure 5-18 (NIOSH, 2010).

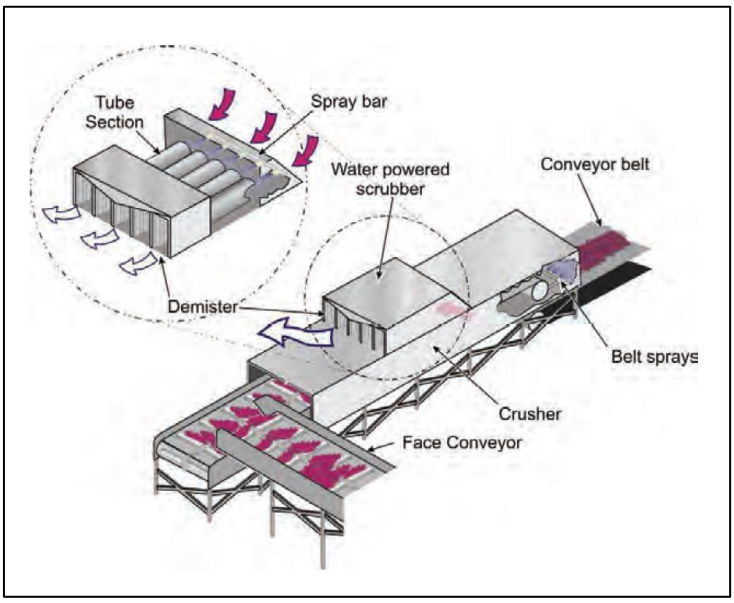


Figure 5-18: Schematic example of a wet scrubber installed on an underground crusher

6 AUDIT SUMMARY

The compliance assessment aspect of the audit is summarised in Table 6-1. In addition to compliance and non-compliance, the following recommendations are made:

- Update the KPIs in the AQGHGMP to account for the fact that exceedances of the air quality criteria may occur due to regional dust events. This may include a reference to an exceedance being due to the Project, for example, *"no exceedances of air quality criteria reported on a 12 month basis, as a result of emissions from the Project"*
- Update the KPIs in the AQGHGMP to reference the in-stack concentration limit for total particulates that should apply to the ventilation shaft outlets. The limit for this Project should be 20 mg/m^3, as noted in the Clean Air Regulation.
- Further review of the TARP once it is finalised and the EnviroSuite solution is operational.
- Further review of the AQGHGMP once finalised.
- Investigate potential nuisance impacts due to odour emissions from the Molybdenum Plant.
- Complete a review of the Air Quality Impact Validation Report (Schedule 3, Condition 19b of the Approval Conditions), once completed.
- Prioritise trials of dust mitigation applicable to underground unloading, crushing and conveying activities that report to ventilation outlets VR3-1 and VR8-1 (i.e. control of particulate at the source).
- Demonstrate the effectiveness of underground dust control measures through subsequent stack testing once a satisfactory solution has been implemented. Stack testing should demonstrate compliance with the in-stack concentration limits within the Clean Air Regulation.

Table 6-1: Audit compliance table

Condition	Requirement	Evidence collected	Findings and recommendations	Compliance status	Unique non-compliance reference number
Condition of Approval					
Approval Conditions Schedule 3, Condition 19A	The Proponent must prepare an Air Quality Impact Validation Report to the satisfaction of the Secretary based on detailed construction methodology and equipment for the construction of the NTSF and STSF embankments and associated infrastructure including haulage roads and transfer of waste rock material. The Air Quality Impact Validation Report must be prepared by a suitably qualified and experienced person, whose appointment has been approved by the Secretary and be submitted to the Secretary within 3 months of approval of Modification 14	None	This report has not been completed in the required timeframe Recommend this is reviewed when available	Non-compliant	AQNC-01
Approval Conditions Schedule 3, Condition 20	The Proponent must prepare an Air Quality and Greenhouse Gas Management Plan for the project to the satisfaction of the Secretary. This plan must: (a) be prepared by a suitably qualified and experienced person and in consultation with EPA and the CCC, and be submitted to the Secretary within 3 months of approval of Modification 14, unless otherwise agreed by the Secretary;	Draft AQGHGMP Although in draft format the Plan is thorough and addresses each of the components of this requirement	Recommend the final version is reviewed once complete	Compliant	-
	(b) describe proactive and reactive measures of all significant, and potentially significant emissions sources and construction activities, that would be implemented to ensure compliance with conditions 17-19C of this schedule;	Section 10 of the AQGHMP and site inspections	No further recommendation	Compliant	-
	(c) include key performance indicators;	Section 9 of the AQGHMP	Recommend the inclusion of a KPI for in-stack concentrations in ventilation shafts	Compliant	-
	(d) include a program for the implementation of the measures referred to in (b) above;	Section 10 of the AQGHMP	No further recommendation	Compliant	-

	(e) include an air quality monitoring program that: - uses a combination of real-time monitoring measures, high volume samplers and dust deposition gauges to monitor and evaluate the dust emissions of the project;	Section 13 of the AQGHMP and site inspection	No further recommendation	Compliant	-
	- describes the proposed installation, ongoing operation and maintenance of a suitable number of real-time particle monitoring sites around the NTSF and STSF to allow responsive dust management;	Section 13.3 of the AQGHMP	No further recommendation	Compliant	-
	- includes a suitable air quality monitoring program for the project's ventilation shafts discharge points, including PM_{10} and $PM_{2.5}$ emissions and ventilation flow rates;	Section 13.2.3 and Ektimo testing report	Method and timing are described appropriately, but suggest the required limit is noted	Compliant	-
	- includes the ongoing operation and maintenance of a meteorological weather station;	Section 13.4 of the AQGHMP and site inspection	No further recommendation	Compliant	-
	- includes a protocol for determining exceedances of the relevant conditions of this approval	Section 15 of the AQGHGMP	No further recommendation	Compliant	-
	(f) establish a trigger response/reactive management protocol (Trigger Action Response Plan) to be used in combination with the particle monitoring sites and meteorological weather station;	Section 7 of the AQGHMP and the TARP document 710-283-EN-STR-0001	Recommend this TARP be reviewed once EnviroSuite is operational	Compliant	-
	(g) include the location, frequency and duration of monitoring, record keeping, system and performance review for continuous improvement and compliance reporting;	Section 13 of the AQGHMP	No further recommendation	Compliant	-
	(h) include procedures for the reasonable use of interim stabilisation and temporary vegetation strategies to minimise the area exposed for dust generation	Section 10 of the AQGHMP and MOP document 710-005-EN-PLA-0008_V3	No further recommendation	Compliant	-
Approval Conditions Schedule 3, Condition 20A	The Proponent must implement the Air Quality and Greenhouse Gas Management Plan as approved by the Secretary.	Still in draft. Will be implemented once complete.	Not yet finalised	Not-triggered	-

EPL 5590 Condition M3.1	Monitoring for the concentration of a pollutant emitted to the air required to be conducted by this licence must be done in accordance with: a) Any methodology which is required by or under the Act to be used for the testing of the concentration of the pollutant; or b) If no such requirement is imposed by or under the Act, any methodology which is a condition of this licence requires to be used for that testing; or c) If no such requirement is imposed by or under the Act or by a condition of this licence, any methodology approved in writing by the EPA for the purpose of that testing prior to the testing taking place. Note: The Protection of the Environment Operations (Clean Air) Regulation 2021 requires testing for certain purposes to be conducted in accordance with test methods contained in the publication "Approved Methods for the Sampling and Analysis of Air Pollutants in NSW".	Monitoring is carried out in accordance with the correct methods – due to the physical design of the shaft the method was modified in accordance with the standard	No further recommendations	Compliant	-
Clean Air Regulation Part 7, Schedule 4	In-stack concentration limit of 20 mg/m^3	Ektimo stack testing report	Testing results for the ventilation shaft indicate that concentrations for VR3-1 and VR8-1 are above regulatory limits so recommend further mitigation required	Non-compliant	AQNC-02
EPL 5590 Condition U1.1	The Licensee will complete the following works under the PRP: • Cover the entire surface of the Northern Tailings Storage Facility (NTSF) and Southern Tailings Storage Facility (STSF) with a dust suppressant product • While the TSF's aren't in operation, engage an independent 3rd party provider to supply or operate a fleet of appropriate equipment to apply the suppression product on an ongoing basis, including any ongoing maintenance required • While TSF's aren't in operation maintain coverage of the entire surface at all times • Promptly respond to all dust events which includes the maintenance and reapplication of any disturbed cover and communication with potentially impacted downwind receptors • Provide progress reports to the EPA detailing the dust suppressant program for the Tailings Storage Facilities. The written report must be submitted until operations of the Tailings Storage Facilities has commenced. The first report must be submitted to the EPA on 1 December 2021 and an update submitted every three months thereafter.	Reports submitted in August 2021, December 2021 and March 2022	No further recommendations	Compliant	-

EPL 5590 Condition U1.2	The Licensee will complete the works by the following dates: **PRP Activity** / **Date/Deadline** Achieve full coverage of the NTSF and STSF with a dust suppressant — 31 July 2021 Maintain dust suppressant covering both STFs — Ongoing until STFs return to normal operations. Continue contractual arrangements with a 3rd party provider to ensure cover is adequately maintained — Ongoing until STFs return to normal operations. Monitor STFs and apply suppressant material to those areas identified as potential dust lift areas across the STFs and/or at areas where dust generation is occurring — Ongoing as required	Reports submitted in August 2021, December 2021 and March 2022	No further recommendations	Compliant	-
EPL 5590 Condition U1.3	The Licensee will be required to engage a suitably qualified independent consultant to develop and undertake an Air Quality Dispersion Model which includes but is not limited to the following: 1. Identify the approximate quantity of dust which is lifting from the TSF's on an annual basis. 2. Model the wind speed and direction whi9ch is typically experienced at each of the TSF's 3. Identify the conditions under which dust is lifted from the TSF's and potentially deposited offsite 4. Identify the distance dust travels away from the TSF, the concentration of dust and the sedimentation/deposition of dust as it moves further from the point source. Condition U1.3 must be completed and a report supplied to the EPA by no later than 5pm Friday 8 October 2021	Report submitted in October 2021	No further recommendations	Compliant	-
EPL 5590 Condition U1.4	The Licensee will be required to develop a Trigger Action Response Plan (TARP) based on the information obtained from the dust modelling program. Condition U1.4 must be completed and adopted by no later than 5pm Friday 29 October 2021	TARP submitted in draft	Recommend the final version is reviewed once complete and when EnviroSuite is operational	Compliant	-

7 REFERENCES

CVO (2020), Cadia Valley Operations Mining Operations Plan 2020 – 2022 710-005-EN-PLA-0008, Revision K, approved 3 January 2020

CVO (2021a), Cadia Dust Management Update, report prepared for NSW Department of Environment and Planning, August 2021

CVO (2021b), Quarterly Report addressing the requirements of EPL Condition U1.1 and U1.2, prepared 1 December 2021

CVO (2021c), Cadia Valley Operations Annual Environmental Management Report 2020/2021, submitted to DPE on 29 October 2021

CVO (2022a), Draft Cadia Air Quality and Greenhouse Gas Management Plan, 710-005-EN-PLA-0024. Released for consultation on 11 March 2022.

CVO (2022b), Quarterly Report addressing the requirements of EPL Condition U1.1 and U1.2, prepared 1 March 2022

CVO (2022c) Draft Trigger Action Response Plan (TARP) 710-005-EN-PLA-008, developed for EPL Condition U1.4

DPE (2020), Independent Audit Post Approval Requirements, published May 2020

DPE (2021), Project Approval Consolidated Consent for Application 06_0295, NSW Department of Planning. Most recent release in December 2021 for MOD 14

Ektimo (2022), Mine Vent Emission Study Report Number R012219. Prepared by Ektimo Pty Ltd, issued 24 May 2022

Envirosuite (2022), Proposal for Newcrest Mining for Envirosuite – Proactive Dust and Noise Management Solution, 20 January 2022

EPA (2021), Protection of the Environment Operations (Clean Air) Regulation 2021 under the Protection of the Environment Operations Act 1997 (https://legislation.nsw.gov.au/view/html/inforce/current/sl-2021-0485#sch.4)

EPA (2021), Environmental Protection Licence 5590, updated by NSW EPA on 1 October 2021.

Newcrest (2017), Environmental Policy for Newcrest Mining Limited.

NIOSH (2012), Dust Control Handbook for Industrial Minerals Mining and Processing, Report of Investigations 9689

NIOSH (2010), Best Practices for Dust Control in Coal Mining, Information Circular 9517

Serinus (2021), Tailings dust environmental health assessment and monitoring study review. Prepared by Serinus for Newcrest Mining Limited Cadia Valley Operations – 2 July 2021.

TAS (2020a), Air Quality and Greenhouse Gas Assessment – Cadia Valley Operations Processing Rate Modification, prepared by Todoroski Air Sciences, 1 December 2020

TAS (2020b), Cadia Valley Operations – Ventilation shaft air modelling. Letter from Todoroski Air Sciences to Cadia Valley Operations Environmental Specialist dated 26 May 2020 (Appendix C of Serinus, 2021)

TAS (2020c), Air Quality Monitoring Plan Cadia Valley Operations – Tailings Storage Facility. Report prepared by Todoroski Air Sciences on 9 June 2020 (Appendix C of Serinus, 2021)

TAS (2021a), Cadia Valley Operations Processing Rate Modification – Additional Information for Ventilation Emissions. Letter from Todoroski Air Sciences to Cadia Valley Operations Approvals Superintendent, dated 9 September 2021

TAS (2021b), Air Dispersion Modelling Cadia Valley Operations Tailings Storage Facilities. Prepared by Todoroski Air Sciences, issued 8 October 2021 to address EPL Condition U1.3

Appendix A:
DPE approval of auditors

Mrs Jane Chung
Approvals Superintendent
Newcrest Mining Limited
1460 Cadia Road
Orange New South Wales 2800
10/01/2022

Dear Mrs Chung

Cadia Valley Operations Mine – MP06_0295
Independent Air Quality Audit expert approval

I refer to your request (MP06_0295-PA-44) submitted to the Department of Planning and Environment (the Department) on 7 January 2022 for the Secretary's approval of suitably qualified persons to undertake the Independent Air Quality Audit and prepare the report, for Cadia Valley Operations Mine (the project) in accordance with Schedule 2, Condition 6A of MP06_0295 (the approval).

The Department has reviewed the nominations and information you have provided and is satisfied that these experts are suitably qualified and experienced. Consequently, I can advise that in accordance with Schedule 2, Condition 6A of the approval, the Secretary approves the appointment of Mr Damon Rodds (Lead Auditor) and Ms Jane Barnett of Zephyr Environmental to undertake the Independent Air Quality Audit and prepare the report. This is conditional on Mr Rodds and Ms Barnett being independent of the project.

Please ensure this correspondence is appended to the Independent Audit Report.

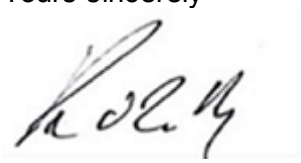
The Independent Audit must be prepared, undertaken and finalised in accordance with the Independent Audit Post Approval Requirements and comply with the condition of approval. Failure to meet these requirements will require revision and resubmission.

The Department reserves the right to request an alternate auditor or audit team for future audits.

Notwithstanding the agreement for the above listed audit team for this Project, each respective project approval or consent requires a request for the agreement to the auditor or audit team be submitted to the Department, for consideration of the Secretary. Each request is reviewed and depending on the complexity of future projects, the suitability of a proposed auditor or audit team will be considered.

If you wish to discuss the matter further, please contact me on 0429400261 or at katrina.oreilly@planning.nsw.gov.au

Yours sincerely



Katrina O'Reilly
Team Leader - Compliance
Compliance
As nominee of the Planning Secretary

Appendix B:
Zephyr communication to DPE

jane.barnett@zephyrenviro.com

From: jane.barnett@zephyrenviro.com
Sent: Friday, 4 February 2022 4:32 PM
To: stephen.odonoghue@planning.nsw.gov.au
Cc: 'Damon Roddis'
Subject: Independent Air Quality Audit - Cadia Valley Operations

Hi Stephen

Zephyr Environmental has been engaged by Newcrest to carry out the Independent Air Quality Audit (IAQA) for their Cadia Valley Operations. This audit is required in Schedule 2 Condition 6A of the Project Approval (PA 06_0295). Under this Condition, the audit must be carried out in accordance with the Independent Environmental Audit Post Approval Requirements (2020).
We are writing to you to begin this process and to ask for some input from the Department.

Could you please let us know which stakeholders we will need to engage with, if any, to achieve the appropriate outcomes of the AQ audit? Can we assume DPE will contact these departments on our behalf? If not, can you please provide the contact details for all relevant people.

We would also like to discuss with you the relevant scope of the audit. Given this is not a typical Independent Environmental Audit (IEA), but rather a specific audit focused on Air Quality, there will be some differences to a standard IEA scope.

Condition 6A makes specific reference to the NTSF, STSF and ventilation shafts. In October 2021, the EPA updated the EPL for the site (EPL 5590) and introduced a further PRP for dust suppression on the NTSF and STSF. The audit should therefore focus on these areas and ensure the requirements of the PRP have been met or are being progressed. However, there are many other dust generating activities across the site and these should also be addressed to ensure all reasonable and feasible best practice measures are being implemented. Many of these were listed in the most recent air quality assessment for MOD14, submitted in December 2020, and are noted in the following table.

We plan to interview the relevant people responsible for the different areas, inspect the systems currently in place and compare them to best practice. The majority of what constitutes best practice would be sourced from the work commissioned and published by NSW EPA '*NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining*', in 2011. While this work was done with specific reference to coal mines, clearly there are synergies with the open cut and underground operations at Cadia.

The air quality assessment also notes H2S emissions from the sodium hydrosulfide (NaHS) solutionising plant and molybdenum plant. Emissions from both these plants will be emitted via a stack. We are seeking advice as to whether these should form part of the AQ audit.

We are planning to conduct our site visit in March this year. Our discussions with you will help us coordinate our itinerary for the days on site and also determine who we will need to interview while we are there.

We would like to have a video conference with you to discuss this methodology and refine the scope. Could you let us know when you are available over the next few weeks so we can set up a time. I am away next week, so any time after 14 February would work for us.

Activity	**Current commitment as noted in AQIA (completed in December 2020)**
General	Activities to be assessed during adverse weather conditions and modified as required (e.g. cease activity where reasonable levels of dust cannot be maintained using the available means).
	Weather forecast to be checked prior to undertaking material handling or processing.

	Engines of on-site vehicles and plant to be switched off when not in use.
	Vehicles and plant are to be fitted with pollution reduction devices where practicable.
	Vehicles are to be maintained and serviced according to manufacturer's specifications.
Exposed areas / stockpiles	Minimise pre-strip and disturbed areas by clearly marking areas for stripping.
	Vegetative cover on stockpiles in place for longer than 3 months.
	No topsoil stripping during high winds.
	Vegetative ground cover on overburden dumps.
	Water sprays on stockpiles.
Material handling	Reduce drop heights from loading and handling equipment where practical.
	Modify activities in windy conditions.
Haulage activities	Haul roads should be watered using water carts such that the road surface has sufficient moisture to minimise on-road dust generation.
	Regularly inspect haul roads and maintain surfaces to remove potholes or depressions.
	Driveways and hardstand areas to be swept/cleaned regularly as required.
	Vehicle traffic is to be restricted to designated routes.
	Speed limits are to be enforced.
	Vehicle loads are to be covered when travelling off-site.
Ore processing mill	Enclosure at transfers.
	Wind shielding on conveyors.
	Belt cleaning and spillage minimisation for conveyors and transfers.
Specific focus areas	
Tailings Storage Facilities	Pollution Reduction Program requirements under U1 the EPL
Ventilation shafts	There is no guidance provided in the Best Practice Report to reduce PM from ventilation shafts. Propose to ensure the correct emission parameters are being measured (via stack testing), and best practice in terms of stack parameters are in place (if required). These may include alignment (vertical / horizontal), shaft heights, flow rates etc..

Look forward to catching up with you soon.

Kind regards
Jane

Jane Barnett

Principal – Air Quality

Zeph Environmental

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Appendix C:
Audit declaration form

Attachment B: Declaration of Independence

Declaration of Independence - Auditors	
Project Name	Independent Air Quality Audit – Cadia Valley Operations
Consent Number	PA 06_0295
Description of Project	An independent audit of air quality management activities at Cadia Valley Operations
Project Address	1460 Cadia Road, Orange, NSW 2800
Proponent	Cadia Holdings Pty Ltd
Date	10 December 2021

We declare that:

i. We are not related to any proponent, owner, operator or other entity involved in the delivery of the project. Such a relationship includes that of employer/employee, a business partnership, sharing a common employer, a contractual arrangement outside an Independent Audit, or that of a spouse, partner, sibling, parent, or child;

ii. We do not have any pecuniary interest in the project, proponent or related entities. Such an interest includes where there is a reasonable likelihood or expectation of financial gain (other than being reimbursed for performing the audit) or loss to the auditor, or their spouse, partner, sibling, parent, or child;

iii. We have not provided services (not including independent reviews or auditing) to the project with the result that the audit work performed by themselves or their company, except as otherwise declared to the Department prior to the audit;

iv. We are not Environmental Representatives for the project; and

v. We will not accept any inducement, commission, gift or any other benefit from auditee organisations, their employees or any interested party, or knowingly allow colleagues to do so.

Damon Roddis

Jane Barnett

Appendix D:
Site visit itinerary

INDEPENDENT AIR QUALITY AUDIT AGENDA

Day 1 Monday 11 April 2022

Time	Activity	Participants	Location
9:00am – 09:30am	Kick Off Meeting	JB, DR, NB, LP, TT	Meeting Room 3
09:30am – 12:00pm	Site Inspection 1 1. NTSF & STSF 2. Molybdenum Plant (from outside) 3. Meteorological Stations	JB, DR, NB, TT, RT, SG	LV429
12:00pm – 1:00pm	Lunch (Kate Jones Catering)	JB, DR, NB, SG, TT, RT	Moly Plant
1:00pm – 2:30pm	Site Inspection 2 4. Mine Vent VR81 5. Progressive Rehabilitation	JB, DR, NB, TT	LV429
2:30pm – 4:00pm	Interviews 2:30pm – Ore Processing (Chloe Hartnig) 3:00pm – Surface Operations (Rob Thomas) 3:30pm – Progressive Rehabilitation (John Ford)	JB, DR, TT, NB (opt.)	Meeting Room 3
4:00pm	Day 1 Complete		

Day 2 Tuesday 12 April 2022

Time	Activity	Participants	Location / Vehicle
8:00am – 9:00am	Interviews 8:00am – TSF Construction (Cole Fanning) 8:30pm – Metallurgy (Campbell Haines)	JB, DR, TT, NB (opt.)	Meeting Room 3
9:00am – 11:00am	Site Inspection 3 6. Ore Processing 7. Site Access Operation Control	JB, DR, NB, TT	LV429
11:00-11:30am	Interviews 11:00am – SAOC (Rob Thomas)	JB, DR, TT, NB (opt.)	Meeting Room 3
11:30am – 12:00pm	Summary of Outstanding Investigations	JB, DR, NB, LP, TT, NB (opt.)	Meeting Room 3
12:00pm – 1:30pm	Lunch (Kate Jones Catering)	JB, DR, All Environment Team	Environment Shed
1:30pm – 3:00pm	Site Inspection 4 8. Air Quality Monitoring Location (Compliance)	JB, DR, ME, NB (opt.)	LV429
3:00pm – 3:30pm	Interviews 3:00pm – Environment Management (Nic Bourgeot)	JB, DR, TT, NB (opt.)	Meeting Room 3
3:30pm – 4:00pm	Close Out Meeting, General Feedback from Auditors	JB, DR, NB, LP, TT, NB (opt.)	Meeting Room 3
4:00pm	Day 2 Complete		

Appendix E:
Ektimo stack testing report

Ektimo

Newcrest Mining Limited, Cadia Mine

Mine Vent Emissions Study

Report Number R012219[DRAFT2]

DRAFT

Document Information

Template Version 211117

Client Name:	Newcrest Mining Limited
Report Number:	R012219[DRAFT2]
Date of Issue:	24 May 2022
Attention:	Christine Jones
Address:	1460 Cadia Road Orange NSW 2800
Testing Laboratory:	Ektimo Pty Ltd, ABN 86 600 381 413

Report Authorisation

Graham Edwards
Ektimo Signatory

NATA Accredited Laboratory
No. 14601

Accredited for compliance with ISO/IEC 17025 - Testing. NATA is a signatory to the ILAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports.

Please note that only numerical results pertaining to measurements conducted directly by Ektimo are covered by Ektimo's terms of NATA accreditation. This does not include comments, conclusions or recommendations based upon the results. Refer to 'Test Methods' for full details of testing covered by NATA accreditation.

Table of Contents

1 Executive Summary

1.1 Background

Ektimo was engaged by Newcrest Mining Limited to perform emission testing from four return (exhaust) air systems within the Cadia Mine site. Results from this sampling project will assist with providing data on the parameters within and exhausted from the return air systems. All method deviations have been outlined in section 1.3.

1.2 Project Objective

The objective of the project was to quantify representative emissions from four discharge points, data will be utilised for modelling and regulatory compliance purposes.

Monitoring was performed as follows:

Location	Test Date	Test Parameters*
VR 3 Exhaust	March 2nd, 2022	Solid particles Fine particulates <10µm (PM_{10}), Fine particulates <2.5µm ($PM_{2.5}$) Type 1 and 2 Substances (metal and metallic compounds) Diesel Particulate Matter (DPM) Crystalline Silica
VR 5 Exhaust	February 28th, 2022	
VR 7 Exhaust	March 3rd, 2022	
VR 8 Exhaust	March 1st, 2022	

* Flow rate, velocity, temperature, and moisture were also determined.

All results are reported on a dry basis at STP.

PM_{10} and $PM_{2.5}$ results determined as sample fractions from particle size analysis (PSA), are calculated based on the assumption that the density of the sample material is 1 g/cm^3, i.e., no corrections have been made for sample density.

Plant operating conditions have been noted in the report.

1.3 Project Limitations

Sampling Plane Conformance - 4323.1 (2021) ***Selection of sampling positions and measurement of velocity in stacks***

As per Australian Standard 4323.1 (2021) "The sampling plane shall be located in a straight, preferably vertical section of stack, away from any flow obstructions which may cause a disturbance or other instability to the gas flow". All tested locations within this report have been classified as **non-conforming** per section 4.2.1 (c) (ii) i.e., "A sampling plane that is located less than one duct diameter upstream of a flow disturbance or less than two duct diameters downstream of a flow disturbance."

Regarding the test locations, VR 3, VR 5 and VR 7, the flow disturbance observed was an expansion of the duct (i.e., a change in diameter) which tapers outwards as the duct rises vertically. For the test location VR 8, the most significant flow disturbance is a bend immediately downstream from the sampling plane. Images of all test locations are found in the Appendix of this report.

Please note, where testing at non-conforming sampling planes is unavoidable, all efforts were made to collect a representative sample. To achieve this, the number of sampling points was increased in accordance with the procedures described in AS 4323.1 (2021).

Please note, if demonstrated successfully, an alternative procedure outlined in Appendix C of AS4323.1 (2021) can be utilized to classify a "non-conforming" location as a "non-ideal location".

Particle Size Distribution (PM_{10} and $PM_{2.5}$)

Determination of fine particulate matter (which incorporates PM_{10} and $PM_{2.5}$) was conducted using AS4323.2 (NSW TM-15) Solid Particles (Total). Particle size analysis was performed on the solid particles sample using a Malvern Mastersizer 2000 (HRL in-house method). Please note that PSA analysis determines the geometric diameter of particles and is not covered by NATA accreditation. Ektimo generally utilises USEPA 201A (NSW OM-5) to determine the concentration of PM_{10} and $PM_{2.5}$ particulate from stationary sources. However, this was not possible since USEPA 201A cannot be used where water droplets are present with the sample gas (as per section 1.5 of the test method).

Respirable Crystalline Silica

Crystalline silica (total) sampling and analysis was substituted for respirable crystalline silica (RCS). RCS is crystalline silica that is also part of the $PM_{2.5}$ dust fraction. As noted above, USEPA 201A could not be utilised to separate the particles, due to the interference of free moisture within the sample gas. Crystalline silica (total) was therefore collected as part of the particulate matter collected using AS4323.2 (NSW TM-15) Solid Particles (Total).

The methodology for estimating RCS results was:

1. Determine the mass of the total particulate sample via AS4323.2 (NSW TM-15).
2. Determine the proportion of the particulate sample that is crystalline silica. Analysis results are expressed as a percentage weight-for-weight.
3. Estimate the respirable component of the particulate sample using PSA. These results are also expressed as a percentage.
4. Multiply the results from steps 1, 2 & 3 to obtain an estimate of RCS mass to determine the RCS concentration emitted from a source.

Particulate matter samples were submitted to Pickford & Rhyder for analysis. Analysis was performed according to Pickford & Rhyder in-house test methods AQ/2 and BQ/2.

Please note, NATA accreditation does not apply to the sampling of crystalline silica from stationary sources.

Diesel Particulate Matter

Diesel particulate patter (DPM) was collected as part of the particulate matter that was collected using AS4323.2 (NSW TM-15) Solid Particles (Total).

The methodology for estimating DPM results was:

1. Determine the mass of DPM. Results were provided in units of $\mu g/cm^2$.
2. Determine the collection area of the filters. (This area excludes parts of the filters that are covered by o-rings etc.). This result is in units of cm^2.
3. Multiply the results of Steps 1 & 2 to get determine a total mass of DPM collected per sample. This mass is then used to determine the concentration of DPM emitted from a source.

Filters were submitted to Coal Mines Technical Services (CMTS) for analysis. Analysis was performed according to CMTS test method "Thermal Optical Organic Carbon/Elemental Carbon using the principles of NIOSH Method 5040 and TMDPM01".

Please note, NATA accreditation does not apply to the sampling of diesel particulate matter from stationary sources.

1.4 Results Summary

Monitoring was conducted successfully. Details of measurement results and plant operating conditions can be found in their respective sections later in the report.

Location		VR 3	VR 5	VR 7	VR 8
Sampling Date		2/03/2022	28/02/2022	3/02/2022	1/03/2022
Total Type 1 & 2 Metals	Concentration [mg/m^3]	≤0.14	≤0.16	≤0.038	≤0.52
	Mass Rate [g/min]	≤1.8	≤2.9	≤0.72	≤16
Diesel Particulate Matter as Total Carbon	Concentration [mg/m^3]	0.98	0.08	0.2	7.4
	Mass Rate [g/min]	13	1.4	3.8	230
Diesel Particulate Matter as Elemental Carbon	Concentration [mg/m^3]	<0.03	0.02	0.055	0.068
	Mass Rate [g/min]	<0.4	0.36	1.1	2.1
Solid Particles	Concentration [mg/m^3]	62	1.3	13	360
	Mass Rate [g/min]	770	23	220	11,000
Fine Particles (PM_{10})	Concentration [mg/m^3]	49	0.69	9.3	220
	Mass Rate [g/min]	620	12	160	6,900
Fine Particles ($PM_{2.5}$)	Concentration [mg/m^3]	19	0.24	2.7	74
	Mass Rate [g/min]	240	4.4	46	2,300
Fine Particles ($PM_{1.0}$)	Concentration [mg/m^3]	4.9	0.034	0.67	19
	Mass Rate [g/min]	61	0.61	11	600
Crystalline Silica	Concentration [mg/m^3]	<0.005	<0.004	<0.004	22
	Mass Rate [g/min]	<0.06	<0.07	<0.07	680
Respirable Crystalline Silica (PM_{10})	Concentration [mg/m^3]	-	-	-	14
	Mass Rate [g/min]	-	-	-	420
Respirable Crystalline Silica ($PM_{2.5}$)	Concentration [mg/m^3]	-	-	-	4.5
	Mass Rate [g/min]	-	-	-	140

2 Results

2.1 VR 3 exhaust

Date	2/03/2022	**Client**	Newcrest Mining Limited
Report	R012219	**Stack ID**	VR 3
Licence No.	-	**Location**	Cadia
Ektimo Staff	Graham Edwards, Scott Woods	**State**	NSW
Process Conditions	Please refer to client records.		*220218*

Sampling Plane Details		
Sampling plane dimensions	5000 mm	
Sampling plane area	19.6 m²	
Sampling port size, number & depth	4" BSP (x6), 30 mm	
Access & height of ports	Ground level 1.5 m	
Duct orientation & shape	Vertical Circular	
Downstream disturbance	Change in diameter 0 D	
Upstream disturbance	Change in diameter 0 D	
No. traverses & points sampled	3 42	
Sample plane conformance to AS4323.1 (2021)	Non-conforming	

Comments
The discharge is assumed to be composed of dry air and moisture

The sampling plane is deemed to be non-conforming due to the following reasons:
The highest to lowest gas velocity ratio exceeds 1.6:1
The downstream disturbance is <1D from the sampling plane
The upstream disturbance is <2D from the sampling plane

Stack Parameters		
Moisture content, %v/v	2.1	
Gas molecular weight, g/g mole	28.7 (wet)	29.0 (dry)
Gas density at STP, kg/m³	1.28 (wet)	1.29 (dry)
Gas density at discharge conditions, kg/m³	1.07	
Gas Flow Parameters		
Temperature, °C	23	
Temperature, K	296	
Velocity at sampling plane, m/s	13	
Volumetric flow rate, actual, m³/s	260	
Volumetric flow rate (wet STP), m³/s	220	
Volumetric flow rate (dry STP), m³/s	210	
Mass flow rate (wet basis), kg/hour	1000000	

Date	2/03/2022	**Client**	Newcrest Mining Limited
Report	R012219	**Stack ID**	VR 3
Licence No.	-	**Location**	Cadia
Ektimo Staff	Graham Edwards, Scott Woods	**State**	NSW
Process Conditions	Please refer to client records.		220218

Isokinetic Results	Results	
Sampling time	0820-1223	
	Concentration mg/m³	Mass Rate g/min
Aluminium	**3.7**	**47**
Antimony	<0.002	<0.03
Arsenic	**0.0012**	**0.016**
Barium	**0.014**	**0.18**
Beryllium	<0.0003	<0.004
Bismuth	<0.002	<0.03
Boron	<0.008	<0.1
Cadmium	**0.00057**	**0.0073**
Calcium	**6.6**	**85**
Chromium	**0.0084**	**0.11**
Cobalt	**0.0026**	**0.034**
Iron	**4.3**	**55**
Lead	**0.0056**	**0.072**
Magnesium	**3.2**	**41**
Manganese	**0.089**	**1.1**
Mercury	<0.0003	<0.004
Nickel	**0.0072**	**0.093**
Phosphorus	**0.14**	**1.7**
Potassium	**0.96**	**12**
Selenium	<0.002	<0.03
Sodium	**0.41**	**5.3**
Tin	<0.001	<0.01
Vanadium	**0.023**	**0.29**
Type 1 & 2 Substances		
Upper Bound		
Total Type 1 Substances	≤0.0099	≤0.13
Total Type 2 Substances	≤0.13	≤1.7
Total Type 1 & 2 Substances	≤0.14	≤1.8
Isokinetic Sampling Parameters		
Sampling time, min	210	
Isokinetic rate, %	99	

Date	2/03/2022	**Client**	Newcrest Mining Limited
Report	R012219	**Stack ID**	VR 3
Licence No.	-	**Location**	Cadia
Ektimo Staff	Graham Edwards, Scott Woods	**State**	NSW
Process Conditions	Please refer to client records.		220218

Sampling Plane Details		
Sampling plane dimensions	5000 mm	
Sampling plane area	19.6 m²	
Sampling port size, number & depth	4" BSP (x6), 30 mm	
Access & height of ports	Ground level 1.5 m	
Duct orientation & shape	Vertical Circular	
Downstream disturbance	Change in diameter 0 D	
Upstream disturbance	Change in diameter 0 D	
No. traverses & points sampled	3 42	
Sample plane conformance to AS4323.1 (2021)	Non-conforming	

Comments

The discharge is assumed to be composed of dry air and moisture

The sampling plane is deemed to be non-conforming due to the following reasons:

The downstream disturbance is <1D from the sampling plane

The upstream disturbance is <2D from the sampling plane

Stack Parameters		
Moisture content, %v/v	2.4	
Gas molecular weight, g/g mole	28.7 (wet)	29.0 (dry)
Gas density at STP, kg/m³	1.28 (wet)	1.29 (dry)
Gas density at discharge conditions, kg/m³	1.07	
Gas Flow Parameters		
Temperature, °C	23	
Temperature, K	296	
Velocity at sampling plane, m/s	14	
Volumetric flow rate, actual, m³/s	270	
Volumetric flow rate (wet STP), m³/s	220	
Volumetric flow rate (dry STP), m³/s	220	
Mass flow rate (wet basis), kg/hour	1000000	

Isokinetic Results	Results	
Sampling time	1310-1645	
	Concentration mg/m³	Mass Rate g/min
Diesel Particulate Matter as Elemental Carbon	<0.03	<0.4
Isokinetic Sampling Parameters		
Sampling time, min	210	
Isokinetic rate, %	100	

Date	2/03/2022	**Client**	Newcrest Mining Limited
Report	R012219	**Stack ID**	VR 3
Licence No.	-	**Location**	Cadia
Ektimo Staff	Graham Edwards, Scott Woods	**State**	NSW
Process Conditions	Please refer to client records.		220218

Sampling Plane Details	
Sampling plane dimensions	5000 mm
Sampling plane area	19.6 m²
Sampling port size, number & depth	4" BSP (x6), 60 mm
Access & height of ports	Ground level 1.5 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Change in diameter 0 D
Upstream disturbance	Change in diameter 0 D
No. traverses & points sampled	3 42
Sample plane conformance to AS4323.1 (2021)	Non-conforming

Comments
The discharge is assumed to be composed of dry air and moisture

The sampling plane is deemed to be non-conforming due to the following reasons:
The downstream disturbance is <1D from the sampling plane
The upstream disturbance is <2D from the sampling plane

Stack Parameters		
Moisture content, %v/v	2.2	
Gas molecular weight, g/g mole	28.7 (wet)	29.0 (dry)
Gas density at STP, kg/m³	1.28 (wet)	1.29 (dry)
Gas density at discharge conditions, kg/m³	1.07	
Gas Flow Parameters		
Temperature, °C	24	
Temperature, K	297	
Velocity at sampling plane, m/s	13	
Volumetric flow rate, actual, m³/s	260	
Volumetric flow rate (wet STP), m³/s	210	
Volumetric flow rate (dry STP), m³/s	210	
Mass flow rate (wet basis), kg/hour	980000	

Isokinetic Results		Results	
Sampling time		1310-1645	
		Concentration mg/m³	Mass Rate g/min
Solid Particles		62	770
Fine particulates (PM10)	(PSA)	49	620
Fine particulates (PM2.5)	(PSA)	19	240
Fine particulates (PM1.0)	(PSA)	4.9	61
Isokinetic Sampling Parameters			
Sampling time, min		210	
Isokinetic rate, %		101	
Gravimetric analysis date (total particulate)		10-03-2022	

Date	2/03/2022	**Client**	Newcrest Mining Limited
Report	R012219	**Stack ID**	VR 3
Licence No.	-	**Location**	Cadia
Ektimo Staff	Graham Edwards, Scott Woods	**State**	NSW
Process Conditions	Please refer to client records.		220218

Sampling Plane Details		
Sampling plane dimensions	5000 mm	
Sampling plane area	19.6 m²	
Sampling port size, number & depth	4" BSP (x6), 30 mm	
Access & height of ports	Ground level 1.5 m	
Duct orientation & shape	Vertical Circular	
Downstream disturbance	Change in diameter 0 D	
Upstream disturbance	Change in diameter 0 D	
No. traverses & points sampled	3 42	
Sample plane conformance to AS4323.1 (2021)	Non-conforming	

Comments

The discharge is assumed to be composed of dry air and moisture

The sampling plane is deemed to be non-conforming due to the following reasons:

The downstream disturbance is <1D from the sampling plane
The upstream disturbance is <2D from the sampling plane

Stack Parameters		
Moisture content, %v/v	2.3	
Gas molecular weight, g/g mole	28.7 (wet)	29.0 (dry)
Gas density at STP, kg/m³	1.28 (wet)	1.29 (dry)
Gas density at discharge conditions, kg/m³	1.07	
Gas Flow Parameters		
Temperature, °C	23	
Temperature, K	296	
Velocity at sampling plane, m/s	13	
Volumetric flow rate, actual, m³/s	260	
Volumetric flow rate (wet STP), m³/s	210	
Volumetric flow rate (dry STP), m³/s	210	
Mass flow rate (wet basis), kg/hour	990000	

Isokinetic Results	Results	
Sampling time	0820-1223	
	Concentration mg/m³	Mass Rate g/min
Crystalline Silica	<0.005	<0.06
Isokinetic Sampling Parameters		
Sampling time, min	210	
Isokinetic rate, %	101	

2.2 VR 5 exhaust

Date	28/02/2022	**Client**	Newcrest Mining Limited
Report	R012219	**Stack ID**	VR 5
Licence No.	-	**Location**	Cadia
Ektimo Staff	Graham Edwards, Scott Woods	**State**	NSW
Process Conditions	Please refer to client records.		220218

Sampling Plane Details		
Sampling plane dimensions	5410 mm	
Sampling plane area	23 m²	
Sampling port size, number & depth	4" BSP (x4), 90 mm	
Access & height of ports	Ground level 2 m	
Duct orientation & shape	Vertical Circular	
Downstream disturbance	Change in diameter 0 D	
Upstream disturbance	Change in diameter 0 D	
No. traverses & points sampled	3 42	
Sample plane conformance to AS4323.1 (2021)	Non-conforming	

Comments

The discharge is assumed to be composed of dry air and moisture

The sampling plane is deemed to be non-conforming due to the following reasons:

The highest to lowest gas velocity ratio exceeds 1.6:1
The downstream disturbance is <1D from the sampling plane
The upstream disturbance is <2D from the sampling plane

Stack Parameters		
Moisture content, %v/v	2	
Gas molecular weight, g/g mole	28.7 (wet)	29.0 (dry)
Gas density at STP, kg/m³	1.28 (wet)	1.29 (dry)
Gas density at discharge conditions, kg/m³	1.08	
Gas Flow Parameters		
Temperature, °C	24	
Temperature, K	298	
Velocity at sampling plane, m/s	16	
Volumetric flow rate, actual, m³/s	370	
Volumetric flow rate (wet STP), m³/s	310	
Volumetric flow rate (dry STP), m³/s	300	
Mass flow rate (wet basis), kg/hour	1400000	

Date	28/02/2022	**Client**	Newcrest Mining Limited
Report	R012219	**Stack ID**	VR 5
Licence No.	-	**Location**	Cadia
Ektimo Staff	Graham Edwards, Scott Woods	**State**	NSW
Process Conditions	Please refer to client records.		*220218*

Isokinetic Results	Results	
Sampling time	0818-1320	
	Concentration mg/m³	Mass Rate g/min
Aluminium	**0.053**	**0.97**
Antimony	<0.002	<0.03
Arsenic	<0.0008	<0.02
Barium	**0.0045**	**0.081**
Beryllium	<0.0003	<0.005
Bismuth	<0.002	<0.03
Boron	<0.01	<0.2
Cadmium	**0.00032**	**0.0057**
Calcium	**0.77**	**14**
Chromium	**0.0022**	**0.039**
Cobalt	<0.0003	<0.006
Iron	**0.12**	**2.3**
Lead	**0.036**	**0.65**
Magnesium	**0.35**	**6.4**
Manganese	**0.0049**	**0.089**
Mercury	<0.0003	<0.006
Nickel	**0.11**	**2**
Phosphorus	<0.009	<0.2
Potassium	<0.1	<2
Selenium	<0.002	<0.03
Sodium	**0.51**	**9.4**
Tin	<0.0008	<0.02
Vanadium	<0.0005	<0.009
Type 1 & 2 Substances		
Upper Bound		
Total Type 1 Substances	≤0.039	≤0.71
Total Type 2 Substances	≤0.12	≤2.2
Total Type 1 & 2 Substances	≤0.16	≤2.9
Isokinetic Sampling Parameters		
Sampling time, min	210	
Isokinetic rate, %	98	

Date	28/02/2022	**Client**	Newcrest Mining Limited
Report	R012219	**Stack ID**	VR 5
Licence No.	-	**Location**	Cadia
Ektimo Staff	Graham Edwards, Scott Woods	**State**	NSW
Process Conditions	Please refer to client records.		220218

Sampling Plane Details	
Sampling plane dimensions	5410 mm
Sampling plane area	23 m²
Sampling port size, number & depth	4" BSP (x4), 90 mm
Access & height of ports	Ground level 2 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Change in diameter 0 D
Upstream disturbance	Change in diameter 0 D
No. traverses & points sampled	3 42
Sample plane conformance to AS4323.1 (2021)	Non-conforming

Comments

The discharge is assumed to be composed of dry air and moisture

The sampling plane is deemed to be non-conforming due to the following reasons:

The downstream disturbance is <1D from the sampling plane

The upstream disturbance is <2D from the sampling plane

Stack Parameters		
Moisture content, %v/v	1.9	
Gas molecular weight, g/g mole	28.8 (wet)	29.0 (dry)
Gas density at STP, kg/m³	1.28 (wet)	1.29 (dry)
Gas density at discharge conditions, kg/m³	1.08	
Gas Flow Parameters		
Temperature, °C	24	
Temperature, K	297	
Velocity at sampling plane, m/s	16	
Volumetric flow rate, actual, m³/s	360	
Volumetric flow rate (wet STP), m³/s	310	
Volumetric flow rate (dry STP), m³/s	300	
Mass flow rate (wet basis), kg/hour	1400000	

Isokinetic Results	Results	
Sampling time	1400-1750	
	Concentration mg/m³	Mass Rate g/min
Diesel Particulate Matter as Elemental Carbon	0.02	0.36
Isokinetic Sampling Parameters		
Sampling time, min	210	
Isokinetic rate, %	97	

Date	28/02/2022	**Client**	Newcrest Mining Limited
Report	R012219	**Stack ID**	VR 5
Licence No.	-	**Location**	Cadia
Ektimo Staff	Graham Edwards, Scott Woods	**State**	NSW
Process Conditions	Please refer to client records.		220218

Sampling Plane Details	
Sampling plane dimensions	5410 mm
Sampling plane area	23 m²
Sampling port size, number & depth	4" BSP (x4), 90 mm
Access & height of ports	Ground level 2 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Change in diameter 0 D
Upstream disturbance	Change in diameter 0 D
No. traverses & points sampled	3 42
Sample plane conformance to AS4323.1 (2021)	Non-conforming

Comments
The discharge is assumed to be composed of dry air and moisture

The sampling plane is deemed to be non-conforming due to the following reasons:
The downstream disturbance is <1D from the sampling plane
The upstream disturbance is <2D from the sampling plane

Stack Parameters		
Moisture content, %v/v	2.1	
Gas molecular weight, g/g mole	28.7 (wet)	29.0 (dry)
Gas density at STP, kg/m³	1.28 (wet)	1.29 (dry)
Gas density at discharge conditions, kg/m³	1.08	
Gas Flow Parameters		
Temperature, °C	24	
Temperature, K	298	
Velocity at sampling plane, m/s	16	
Volumetric flow rate, actual, m³/s	370	
Volumetric flow rate (wet STP), m³/s	310	
Volumetric flow rate (dry STP), m³/s	300	
Mass flow rate (wet basis), kg/hour	1400000	

Isokinetic Results		Results	
	Sampling time	0954-1325	
		Concentration mg/m³	Mass Rate g/min
Solid Particles		1.3	23
Fine particulates (PM10)	(PSA)	0.69	12
Fine particulates (PM2.5)	(PSA)	0.24	4.4
Fine particulates (PM1.0)	(PSA)	0.034	0.61
Isokinetic Sampling Parameters			
Sampling time, min		210	
Isokinetic rate, %		97	
Gravimetric analysis date (total particulate)		10-03-2022	

Date	28/02/2022	**Client**	Newcrest Mining Limited
Report	R012219	**Stack ID**	VR 5
Licence No.	-	**Location**	Cadia
Ektimo Staff	Graham Edwards, Scott Woods	**State**	NSW
Process Conditions	Please refer to client records.		220218

Sampling Plane Details	
Sampling plane dimensions	5410 mm
Sampling plane area	23 m²
Sampling port size, number & depth	4" BSP (x4), 90 mm
Access & height of ports	Ground level 2 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Change in diameter 0 D
Upstream disturbance	Change in diameter 0 D
No. traverses & points sampled	3 42
Sample plane conformance to AS4323.1 (2021)	Non-conforming

Comments

The discharge is assumed to be composed of dry air and moisture

The sampling plane is deemed to be non-conforming due to the following reasons:

The downstream disturbance is <1D from the sampling plane
The upstream disturbance is <2D from the sampling plane

Stack Parameters		
Moisture content, %v/v	2.1	
Gas molecular weight, g/g mole	28.7 (wet)	29.0 (dry)
Gas density at STP, kg/m³	1.28 (wet)	1.29 (dry)
Gas density at discharge conditions, kg/m³	1.08	
Gas Flow Parameters		
Temperature, °C	24	
Temperature, K	297	
Velocity at sampling plane, m/s	16	
Volumetric flow rate, actual, m³/s	360	
Volumetric flow rate (wet STP), m³/s	300	
Volumetric flow rate (dry STP), m³/s	300	
Mass flow rate (wet basis), kg/hour	1400000	

Isokinetic Results	Results	
Sampling time	1400-1749	
	Concentration mg/m³	Mass Rate g/min
Crystalline Silica	<0.004	<0.07
Isokinetic Sampling Parameters		
Sampling time, min	210	
Isokinetic rate, %	101	

2.3 VR 7 exhaust

Date	3/03/2022	**Client**	Newcrest Mining Limited
Report	R012219	**Stack ID**	VR 7
Licence No.	-	**Location**	Cadia
Ektimo Staff	Graham Edwards, Scott Woods	**State**	NSW
Process Conditions	Please refer to client records.		220218

Sampling Plane Details		
Sampling plane dimensions	6200 mm	
Sampling plane area	30.2 m²	
Sampling port size, number & depth	4" BSP (x6), 55 mm	
Access & height of ports	Ground level 1 m	
Duct orientation & shape	Vertical Circular	
Downstream disturbance	Flow straightener 0 D	
Upstream disturbance	Inlet 0 D	
No. traverses & points sampled	3 54	
Sample plane conformance to AS4323.1 (2021)	Non-conforming	

Comments

The discharge is assumed to be composed of dry air and moisture
The gas temperature of the sampling plane is below the dew point

The sampling plane is deemed to be non-conforming due to the following reasons:

The highest to lowest gas velocity ratio exceeds 1.6:1
The downstream disturbance is <1D from the sampling plane
The upstream disturbance is <2D from the sampling plane

Stack Parameters		
Moisture content, %v/v	2.7	
Gas molecular weight, g/g mole	28.7 (wet)	29.0 (dry)
Gas density at STP, kg/m³	1.28 (wet)	1.29 (dry)
Gas density at discharge conditions, kg/m³	1.07	
Gas Flow Parameters		
Temperature, °C	23	
Temperature, K	296	
Velocity at sampling plane, m/s	13	
Volumetric flow rate, actual, m³/s	380	
Volumetric flow rate (wet STP), m³/s	320	
Volumetric flow rate (dry STP), m³/s	310	
Mass flow rate (wet basis), kg/hour	1500000	

Date	3/03/2022	**Client**	Newcrest Mining Limited
Report	R012219	**Stack ID**	VR 7
Licence No.	-	**Location**	Cadia
Ektimo Staff	Graham Edwards, Scott Woods	**State**	NSW
Process Conditions	Please refer to client records.		220218

Isokinetic Results	Results	
Sampling time	0830-1335	
	Concentration mg/m³	Mass Rate g/min
Aluminium	**0.68**	**13**
Antimony	<0.002	<0.03
Arsenic	<0.0008	<0.02
Barium	**0.0058**	**0.11**
Beryllium	<0.0002	<0.005
Bismuth	<0.002	<0.03
Boron	<0.006	<0.1
Cadmium	<0.0002	<0.004
Calcium	**2**	**37**
Chromium	**0.0042**	**0.08**
Cobalt	**0.00036**	**0.0068**
Iron	**0.93**	**18**
Lead	**0.0034**	**0.064**
Magnesium	**0.67**	**13**
Manganese	**0.016**	**0.31**
Mercury	<0.0002	<0.004
Nickel	**0.0048**	**0.09**
Phosphorus	**0.017**	**0.31**
Potassium	**0.24**	**4.5**
Selenium	<0.002	<0.03
Sodium	**0.56**	**11**
Tin	<0.0008	<0.02
Vanadium	**0.0033**	**0.063**
Type 1 & 2 Substances		
Upper Bound		
Total Type 1 Substances	≤0.0065	≤0.12
Total Type 2 Substances	≤0.032	≤0.6
Total Type 1 & 2 Substances	≤0.038	≤0.72
Isokinetic Sampling Parameters		
Sampling time, min	270	
Isokinetic rate, %	100	

Date	3/03/2022	**Client**	Newcrest Mining Limited
Report	R012219	**Stack ID**	VR 7
Licence No.	-	**Location**	Cadia
Ektimo Staff	Graham Edwards, Scott Woods	**State**	NSW
Process Conditions	Please refer to client records.		220218

Sampling Plane Details	
Sampling plane dimensions	6200 mm
Sampling plane area	30.2 m²
Sampling port size, number & depth	4" BSP (x6), 55 mm
Access & height of ports	Ground level 1 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Flow straightener 0 D
Upstream disturbance	Inlet 0 D
No. traverses & points sampled	3 54
Sample plane conformance to AS4323.1 (2021)	Non-conforming

Comments
The discharge is assumed to be composed of dry air and moisture

The sampling plane is deemed to be non-conforming due to the following reasons:
The downstream disturbance is <1D from the sampling plane
The upstream disturbance is <2D from the sampling plane

Stack Parameters		
Moisture content, %v/v	1.9	
Gas molecular weight, g/g mole	28.8 (wet)	29.0 (dry)
Gas density at STP, kg/m³	1.28 (wet)	1.29 (dry)
Gas density at discharge conditions, kg/m³	1.07	
Gas Flow Parameters		
Temperature, °C	24	
Temperature, K	297	
Velocity at sampling plane, m/s	13	
Volumetric flow rate, actual, m³/s	390	
Volumetric flow rate (wet STP), m³/s	330	
Volumetric flow rate (dry STP), m³/s	320	
Mass flow rate (wet basis), kg/hour	1500000	

Isokinetic Results	Results	
Sampling time	1400-1845	
	Concentration mg/m³	Mass Rate g/min
Diesel Particulate Matter as Elemental Carbon	0.055	1.1
Isokinetic Sampling Parameters		
Sampling time, min	270	
Isokinetic rate, %	94	

Date	3/03/2022	**Client**	Newcrest Mining Limited
Report	R012219	**Stack ID**	VR 7
Licence No.	-	**Location**	Cadia
Ektimo Staff	Graham Edwards, Scott Woods	**State**	NSW
Process Conditions	Please refer to client records.		220218

Sampling Plane Details		
Sampling plane dimensions	6200 mm	
Sampling plane area	30.2 m²	
Sampling port size, number & depth	4" BSP (x6), 55 mm	
Access & height of ports	Ground level	1 m
Duct orientation & shape	Vertical	Circular
Downstream disturbance	Flow straightener	0 D
Upstream disturbance	Inlet	0 D
No. traverses & points sampled	3	54
Sample plane conformance to AS4323.1 (2021)	Non-conforming	
The discharge is assumed to be composed of dry air and moisture		
The downstream disturbance is <1D from the sampling plane		
The upstream disturbance is <2D from the sampling plane		

Stack Parameters		
Moisture content, %v/v	1.9	
Gas molecular weight, g/g mole	28.8 (wet)	29.0 (dry)
Gas density at STP, kg/m³	1.28 (wet)	1.29 (dry)
Gas density at discharge conditions, kg/m³	1.07	
Gas Flow Parameters		
Temperature, °C	24	
Temperature, K	297	
Velocity at sampling plane, m/s	11	
Volumetric flow rate, actual, m³/s	340	
Volumetric flow rate (wet STP), m³/s	290	
Volumetric flow rate (dry STP), m³/s	280	
Mass flow rate (wet basis), kg/hour	1300000	

Isokinetic Results		Results	
Sampling time		1400-1845	
		Concentration mg/m³	Mass Rate g/min
Solid Particles		13	220
Fine particulates (PM10)	(PSA)	9.3	160
Fine particulates (PM2.5)	(PSA)	2.7	46
Fine particulates (PM1.0)	(PSA)	0.67	11
Isokinetic Sampling Parameters			
Sampling time, min		270	
Isokinetic rate, %		96	
Gravimetric analysis date (total particulate)		10-03-2022	

Date	3/03/2022	**Client**	Newcrest Mining Limited
Report	R012219	**Stack ID**	VR 7
Licence No.	-	**Location**	Cadia
Ektimo Staff	Graham Edwards, Scott Woods	**State**	NSW
Process Conditions	Please refer to client records.		220218

Sampling Plane Details	
Sampling plane dimensions	6200 mm
Sampling plane area	30.2 m²
Sampling port size, number & depth	4" BSP (x6), 55 mm
Access & height of ports	Ground level 1 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Flow straightener 0 D
Upstream disturbance	Inlet 0 D
No. traverses & points sampled	3 54
Sample plane conformance to AS4323.1 (2021)	Non-conforming

Comments

The discharge is assumed to be composed of dry air and moisture

The sampling plane is deemed to be non-conforming due to the following reasons:

The downstream disturbance is <1D from the sampling plane
The upstream disturbance is <2D from the sampling plane

Stack Parameters		
Moisture content, %v/v	2.3	
Gas molecular weight, g/g mole	28.7 (wet)	29.0 (dry)
Gas density at STP, kg/m³	1.28 (wet)	1.29 (dry)
Gas density at discharge conditions, kg/m³	1.07	
Gas Flow Parameters		
Temperature, °C	23	
Temperature, K	296	
Velocity at sampling plane, m/s	13	
Volumetric flow rate, actual, m³/s	380	
Volumetric flow rate (wet STP), m³/s	320	
Volumetric flow rate (dry STP), m³/s	310	
Mass flow rate (wet basis), kg/hour	1500000	

Isokinetic Results	Results	
Sampling time	0830-1335	
	Concentration mg/m³	Mass Rate g/min
Crystalline Silica	<0.004	<0.07
Isokinetic Sampling Parameters		
Sampling time, min	270	
Isokinetic rate, %	99	

2.4 VR 8 exhaust

Date	1/03/2022	**Client**	Newcrest Mining Limited
Report	R012219	**Stack ID**	VR 8
Licence No.	-	**Location**	Cadia
Ektimo Staff	Graham Edwards, Scott Woods	**State**	NSW
Process Conditions	3 extraction fans in operation		*220218*

Sampling Plane Details		
Sampling plane dimensions	5908 mm	
Sampling plane area	27.4 m²	
Sampling port size, number & depth	3" BSP (x6), 55 mm	
Access & height of ports	Ground level 1 m	
Duct orientation & shape	Vertical Circular	
Downstream disturbance	Bend 0.1 D	
Upstream disturbance	Inlet 0 D	
No. traverses & points sampled	3 42	
Sample plane conformance to AS4323.1 (2021)	Non-conforming	

Comments
The discharge is assumed to be composed of dry air and moisture
The gas temperature of the sampling plane is below the dew point

The sampling plane is deemed to be non-conforming due to the following reasons:
The highest to lowest gas velocity ratio exceeds 1.6:1
The downstream disturbance is <1D from the sampling plane
The upstream disturbance is <2D from the sampling plane

Stack Parameters		
Moisture content, %v/v	2.6	
Gas molecular weight, g/g mole	28.7 (wet)	29.0 (dry)
Gas density at STP, kg/m³	1.28 (wet)	1.29 (dry)
Gas density at discharge conditions, kg/m³	1.03	
Gas Flow Parameters		
Temperature, °C	22	
Temperature, K	296	
Velocity at sampling plane, m/s	24	
Volumetric flow rate, actual, m³/s	670	
Volumetric flow rate (wet STP), m³/s	540	
Volumetric flow rate (dry STP), m³/s	520	
Mass flow rate (wet basis), kg/hour	2500000	

Date	1/03/2022	**Client**	Newcrest Mining Limited
Report	R012219	**Stack ID**	VR 8
Licence No.	-	**Location**	Cadia
Ektimo Staff	Graham Edwards, Scott Woods	**State**	NSW
Process Conditions	3 extraction fans in operation		220218

Isokinetic Results	Results	
Sampling time	0900-1230	
	Concentration mg/m³	Mass Rate g/min
Aluminium	**13**	**410**
Antimony	<0.003	<0.1
Arsenic	**0.004**	**0.13**
Barium	**0.049**	**1.5**
Beryllium	<0.0005	<0.02
Bismuth	<0.003	<0.1
Boron	<0.01	<0.3
Cadmium	**0.00054**	**0.017**
Calcium	**39**	**1200**
Chromium	**0.023**	**0.71**
Cobalt	**0.009**	**0.28**
Iron	**20**	**630**
Lead	**0.041**	**1.3**
Magnesium	**12**	**370**
Manganese	**0.35**	**11**
Mercury	<0.0004	<0.01
Nickel	**0.017**	**0.52**
Phosphorus	**1.1**	**34**
Potassium	**2.2**	**68**
Selenium	<0.003	<0.1
Sodium	**0.69**	**22**
Tin	<0.001	<0.04
Vanadium	**0.065**	**2**
Type 1 & 2 Substances		
Upper Bound		
Total Type 1 Substances	≤0.049	≤1.5
Total Type 2 Substances	≤0.47	≤15
Total Type 1 & 2 Substances	≤0.52	≤16
Isokinetic Sampling Parameters		
Sampling time, min	210	
Isokinetic rate, %	99	

Date	1/03/2022	**Client**	Newcrest Mining Limited
Report	R012219	**Stack ID**	VR 8
Licence No.	-	**Location**	Cadia
Ektimo Staff	Graham Edwards, Scott Woods	**State**	NSW
Process Conditions	3 extraction fans in operation		220218

Sampling Plane Details	
Sampling plane dimensions	5908 mm
Sampling plane area	27.4 m²
Sampling port size, number & depth	3" BSP (x6), 55 mm
Access & height of ports	Ground level 1 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Bend 0.1 D
Upstream disturbance	Inlet 0 D
No. traverses & points sampled	3 42
Sample plane conformance to AS4323.1 (2021)	Non-conforming

Comments
The discharge is assumed to be composed of dry air and moisture
The gas temperature of the sampling plane is below the dew point

The sampling plane is deemed to be non-conforming due to the following reasons:
The downstream disturbance is <1D from the sampling plane
The upstream disturbance is <2D from the sampling plane

Stack Parameters		
Moisture content, %v/v	2.6	
Gas molecular weight, g/g mole	28.7 (wet)	29.0 (dry)
Gas density at STP, kg/m³	1.28 (wet)	1.29 (dry)
Gas density at discharge conditions, kg/m³	1.04	
Gas Flow Parameters		
Temperature, °C	22	
Temperature, K	295	
Velocity at sampling plane, m/s	23	
Volumetric flow rate, actual, m³/s	640	
Volumetric flow rate (wet STP), m³/s	520	
Volumetric flow rate (dry STP), m³/s	510	
Mass flow rate (wet basis), kg/hour	2400000	

Isokinetic Results	Results	
Sampling time	1355-1730	
	Concentration mg/m³	Mass Rate g/min
Diesel Particulate Matter as Elemental Carbon	0.068	2.1
Isokinetic Sampling Parameters		
Sampling time, min	210	
Isokinetic rate, %	99	

Date	1/03/2022	**Client**	Newcrest Mining Limited
Report	R012219	**Stack ID**	VR 8
Licence No.	-	**Location**	Cadia
Ektimo Staff	Graham Edwards, Scott Woods	**State**	NSW
Process Conditions	3 extraction fans in operation		220218

Sampling Plane Details	
Sampling plane dimensions	5908 mm
Sampling plane area	27.4 m²
Sampling port size, number & depth	3" BSP (x6), 55 mm
Access & height of ports	Ground level 1 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Bend 0.1 D
Upstream disturbance	Inlet 0 D
No. traverses & points sampled	3 42
Sample plane conformance to AS4323.1 (2021)	Non-conforming

Comments
The discharge is assumed to be composed of dry air and moisture
The gas temperature of the sampling plane is below the dew point

The sampling plane is deemed to be non-conforming due to the following reasons:
The downstream disturbance is <1D from the sampling plane
The upstream disturbance is <2D from the sampling plane

Stack Parameters		
Moisture content, %v/v	2.9	
Gas molecular weight, g/g mole	28.6 (wet)	29.0 (dry)
Gas density at STP, kg/m³	1.28 (wet)	1.29 (dry)
Gas density at discharge conditions, kg/m³	1.03	
Gas Flow Parameters		
Temperature, °C	23	
Temperature, K	296	
Velocity at sampling plane, m/s	24	
Volumetric flow rate, actual, m³/s	660	
Volumetric flow rate (wet STP), m³/s	530	
Volumetric flow rate (dry STP), m³/s	520	
Mass flow rate (wet basis), kg/hour	2400000	

Isokinetic Results		Results	
Sampling time		0905-1315	
		Concentration mg/m³	Mass Rate g/min
Solid Particles		360	11000
Fine particulates (PM10)	(PSA)	220	6900
Fine particulates (PM2.5)	(PSA)	74	2300
Fine particulates (PM1.0)	(PSA)	19	600
Isokinetic Sampling Parameters			
Sampling time, min		210	
Isokinetic rate, %		100	
Gravimetric analysis date (total particulate)		10-03-2022	

Date	1/03/2022	**Client**	Newcrest Mining Limited
Report	R012219	**Stack ID**	VR 8
Licence No.	-	**Location**	Cadia
Ektimo Staff	Graham Edwards, Scott Woods	**State**	NSW
Process Conditions	3 extraction fans in operation		*220218*

Sampling Plane Details	
Sampling plane dimensions	5908 mm
Sampling plane area	27.4 m²
Sampling port size, number & depth	3" BSP (x6), 55 mm
Access & height of ports	Ground level 1 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Bend 0.1 D
Upstream disturbance	Inlet 0 D
No. traverses & points sampled	3 42
Sample plane conformance to AS4323.1 (2021)	Non-conforming

Comments
The discharge is assumed to be composed of dry air and moisture
The gas temperature of the sampling plane is below the dew point

The sampling plane is deemed to be non-conforming due to the following reasons:
The downstream disturbance is <1D from the sampling plane
The upstream disturbance is <2D from the sampling plane

Stack Parameters		
Moisture content, %v/v	3	
Gas molecular weight, g/g mole	28.6 (wet)	29.0 (dry)
Gas density at STP, kg/m³	1.28 (wet)	1.29 (dry)
Gas density at discharge conditions, kg/m³	1.03	
Gas Flow Parameters		
Temperature, °C	22	
Temperature, K	295	
Velocity at sampling plane, m/s	24	
Volumetric flow rate, actual, m³/s	650	
Volumetric flow rate (wet STP), m³/s	520	
Volumetric flow rate (dry STP), m³/s	510	
Mass flow rate (wet basis), kg/hour	2400000	

Isokinetic Results	Results	
Sampling time	1355-1727	
	Concentration mg/m³	Mass Rate g/min
Crystalline Silica*	22	680
Respirable Crystalline Silica (PM10)*	14	420
Respirable Crystalline Silica (PM2.5)*	4.5	140
Isokinetic Sampling Parameters		
Sampling time, min	210	
Isokinetic rate, %	101	

**** Crystalline Silica was determined based on a fraction of the concentration of Solid Particles. Respirable Crystalline Silica was determined based on the Crystalline Silica result and the fractions determined via particle size analysis (PSA). Further details are found in section 1.3 "project limitations".***

3 Plant Operating Conditions

During the sampling of VR 8, all 3 exhaust fans were in operation. Detailed operating conditions from the sampling dates presented in Appendix 2, have been supplied by Newcrest Mining Limited.

See Newcrest Mining Limited records for complete process conditions.

4 Test Methods

All sampling and analysis performed by Ektimo unless otherwise specified. Specific details of the methods are available upon request.

Parameter	Sampling method	Analysis method	Uncertainty*	NATA accredited Sampling	NATA accredited Analysis
Sampling points - Selection	NSW EPA TM-1 (AS 4323.1)	NA	NA	✓	NA
Flow rate, temperature and velocity	NSW EPA TM-2 (USEPA Method 2)	NSW EPA TM-2 (USEPA Method 2)	8%, 2%, 7%	NA	✓
Moisture content	NSW EPA TM-22 (USEPA Method 4)	NSW EPA TM-22 (USEPA Method 4)	8%	✓	✓
Molecular weight	NA	NSW EPA TM-23 (USEPA Method 3)	not specified	NA	✓
Dry gas density	NA	NSW EPA TM-23 (USEPA Method 3)	not specified	NA	✓
Carbon dioxide	NSW EPA TM-24 (USEPA Method 3A)	NSW EPA TM-24 (USEPA Method 3A)	13%	✓	✓
Carbon monoxide	NSW EPA TM-32 (USEPA Method 10)	NSW EPA TM-32 (USEPA Method 10)	12%	✓	✓
Diesel particulate matter	NSW EPA TM-15 (AS 4323.2)	Coal Mines Technical Services in-house method	6%	×	✓§
Particulate matter (PM_{10} and $PM_{2.5}$) by particle size analysis	NSW EPA TM-15 (AS 4323.2)	HRL in-house method using Malvern Mastersizer 2000	not specified	×	×**
Solid particles (total)	NSW EPA TM-15 (AS 4323.2)	NSW EPA TM-15 (AS 4323.2)	3%	✓	✓††
Total (gaseous and particulate) metals and metallic compounds	NSW EPA TM-12, NSW EPA TM-13, NSW EPA TM-14 (USEPA Method 29)	Envirolab in-house methods Metals-006, Metals-022 & Metals-021	15%	✓	✓‡
Type 1 substances (As, Cd, Hg, Pb, Sb)	NSW EPA TM-12 (USEPA Method 29)	Envirolab in-house methods Metals-006, Metals-022 & Metals-021	15%	✓	✓‡
Type 2 substances (Be, Cr, Co, Mn, Ni, Se, Sn, V)	NSW EPA TM-13 (USEPA Method 29)	Envirolab in-house methods Metals-006, Metals-022 & Metals-021	15%	✓	✓‡
Crystalline silica	NSW EPA TM-15 (AS 4323.2)	Pickford & Rhyder in-house methods AQ/2 & BQ/2	not specified	×	✓***

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* Uncertainties cited in this table are estimated using typical values and are calculated at the 95% confidence level (coverage factor = 2).

†† Gravimetric analysis conducted at the Ektimo Unanderra, NSW laboratory, NATA accreditation number 14601.

‡ Analysis performed by Envirolab, NATA accreditation number 2901. Results were reported to Ektimo on 17 March 2022 in report 290700.

§ Analysis performed by Coal Mines Technical Services, NATA accreditation number 1757. Results were reported to Ektimo on 28 March 2022 in report DP22/021.

** Analysis performed by HRL Technology using a laser-diffraction particle size analyser. NATA accreditation does not cover the performance of this service. Results were reported to Ektimo on 22 March 2022 in report 220343.

*** Analysis performed by Pickford & Rhyder, NATA Accreditation 2515. Results reported to Ektimo on:
23 March 2022 in report 107966/69-BQ.
23 March 2022 in report 107967-AQ.

5 Quality Assurance/Quality Control Information

Ektimo is accredited by the National Association of Testing Authorities (NATA) for the sampling and analysis of air pollutants from industrial sources. Unless otherwise stated test methods used are accredited with the National Association of Testing Authorities. For full details, search for Ektimo at NATA's website www.nata.com.au.

Ektimo is accredited by NATA (National Association of Testing Authorities) to ISO/IEC 17025 - Testing. ISO/IEC 17025 - Testing requires that a laboratory have adequate equipment to perform the testing, as well as laboratory personnel with the competence to perform the testing. This quality assurance system is administered and maintained by the Quality Director.

NATA is a member of APAC (Asia Pacific Accreditation Co-operation) and of ILAC (International Laboratory Accreditation Co-operation). Through mutual recognition arrangements with these organisations, NATA accreditation is recognised worldwide.

6 Definitions

The following symbols and abbreviations may be used in this test report:

% v/v	Volume to volume ratio, dry or wet basis
~	Approximately
<	Less than
>	Greater than
≥	Greater than or equal to
AS	Australian Standard
BSP	British standard pipe
CARB	Californian Air Resources Board
CTM	Conditional test method
D	Duct diameter or equivalent duct diameter for rectangular ducts
D_{50}	'Cut size' of a cyclone is defined as the particle diameter at which the cyclone achieves a 50% collection efficiency i.e. half of the particles are retained by the cyclone and half pass through it. The D_{50} method simplifies the capture efficiency distribution by assuming that a given cyclone stage captures all of the particles with a diameter equal to or greater than the D_{50} of that cyclone and less than the D_{50} of the preceding cyclone.
DECC	Department of Environment & Climate Change (NSW)
Disturbance	A flow obstruction or instability in the direction of the flow which may impede accurate flow determination. This includes centrifugal fans, axial fans, partially closed or closed dampers, louvres, bends, connections, junctions, direction changes or changes in pipe diameter.
EPA	Environment Protection Authority
FTIR	Fourier Transform Infra-red
ISC	Intersociety Committee, Methods of Air Sampling and Analysis
ISO	International Organisation for Standardisation
ITE	Individual threshold estimate
Lower bound	When an analyte is not present above the detection limit, the result is assumed to be equal to zero.
Medium bound	When an analyte is not present above the detection limit, the result is assumed to be equal to half of the detection limit.
NA	Not applicable
NATA	National Association of Testing Authorities
NT	Not tested or results not required
OM	Other approved method
PM_{10}	Atmospheric suspended particulate matter having an equivalent aerodynamic diameter of less than approximately 10 microns (µm).
$PM_{2.5}$	Atmospheric suspended particulate matter having an equivalent aerodynamic diameter of less than approximately 2.5 microns (µm).
PSA	Particle size analysis. PSA provides a distribution of geometric diameters, for a given sample, determined using laser diffraction.
RATA	Relative accuracy test audit
STP	Standard temperature and pressure. Gas volumes and concentrations are expressed on a dry basis at 0°C, at discharge oxygen concentration and an absolute pressure of 101.325 kPa, unless otherwise specified.
TM	Test method
TOC	The sum of all compounds of carbon which contain at least one carbon-to-carbon bond, plus methane and its derivatives.
USEPA	United States Environmental Protection Agency
VDI	Verein Deutscher Ingenieure (Association of German Engineers)
Velocity difference	The percentage difference between the average of initial flows and after flows.
XRD	X-ray diffractometry
Upper bound	When an analyte is not present above the detection limit, the result is assumed to be equal to the detection limit.
95% confidence interval	Range of values that contains the true result with 95% certainty. This means there is a 5% risk that the true result is outside this range.

7 Appendix 1: Site Photos

Figure 1. *VR3 exhaust*

Figure 2. *VR5 exhaust*

Figure 3. *VR7 exhaust*

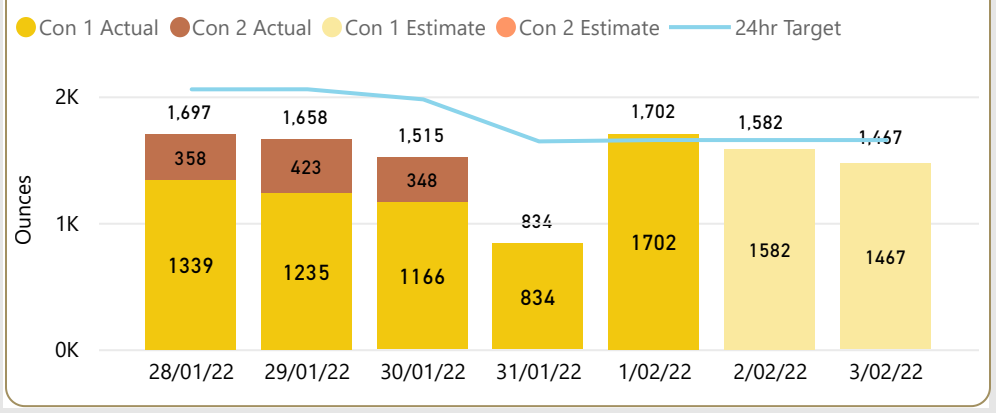
Figure 4. *VR8 exhaust*

8 Appendix 2: Operating Conditions

CVO03005F Cadia Daily Production Report

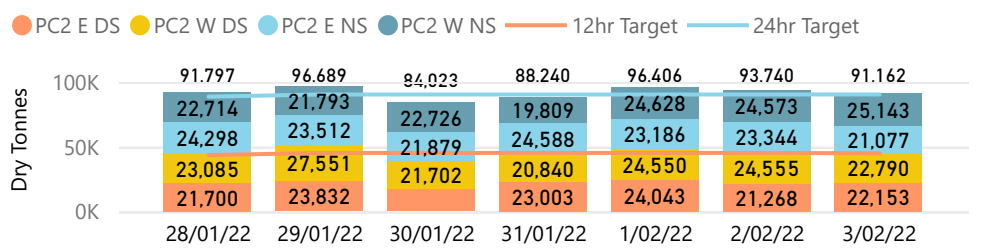
NEWCREST MINING LIMITED

GOLD Ounce Recovered



Oz	Target	Estimate	Variation
CON1 (Oz)	1,654	1,467	-187 !
CON2 (Oz)	0	0	0✓
24hr (Oz)	1,654	1,467	-187 !
24hr Variance to Target			-11% !
Production Week to date Total (Oz)			1,467
Production Week Variance to Target			-187 !

PC2



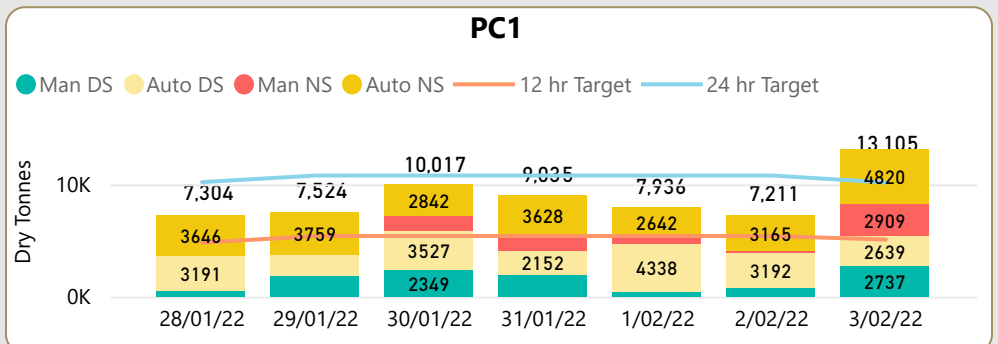
PC2	Target	Actual	Variation
DS	44,933	44,942	9✓
NS	45,497	46,220	723✓
24hr	90,430	91,162	732✓
Production Week Variance to Target			732✓

Day Shift Comments

T9 Blocked Chute activated, re-entries delayed start - 88 mins.

Night Shift Comments

PC1

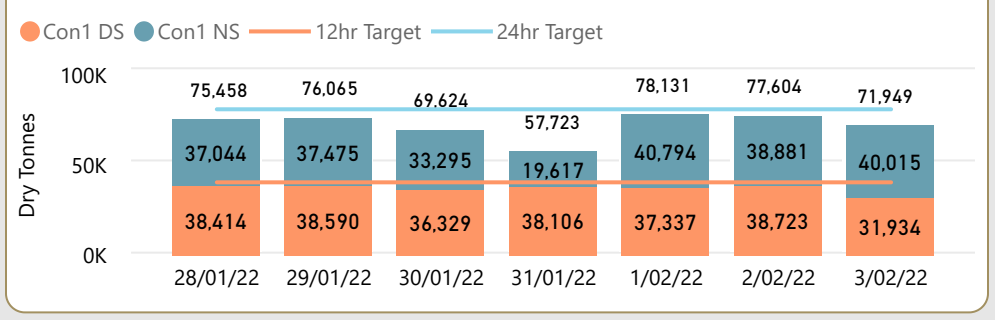


PC1	Target	Manual	Auto	Actual	Variation
DS	5,080	2,737	2,639	5,376	295✓
NS	5,080	2,909	4,820	7,729	2,649✓
24hr	10,161	5,761	7,459	13,105	2,944✓
Production Week Variance to Target					2,944✓

Day Shift Comments

Night Shift Comments

Concentrator 1



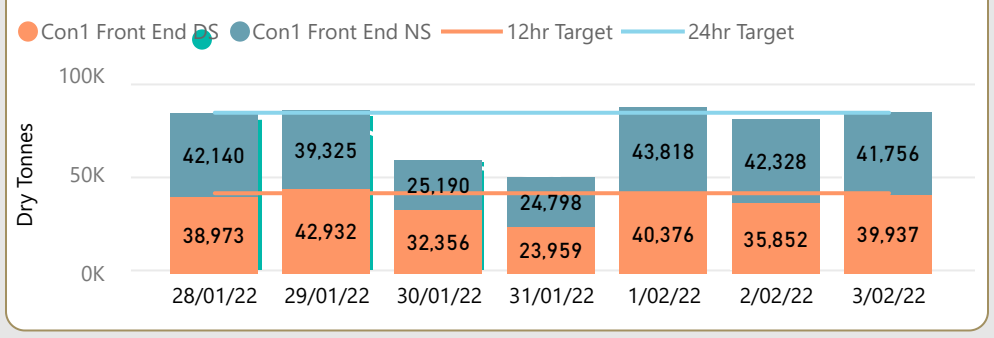
CON1	Target	Actual	Variation
DS	40,572	31,934	-8,638 !
NS	40,572	40,015	-557 !
24hr	81,144	71,949	-9,195 !
Production Week Variance to Target			-9,195 !

Day Shift Comments

SAG tripped on lube low flow.

Night Shift Comments

C1 Front End

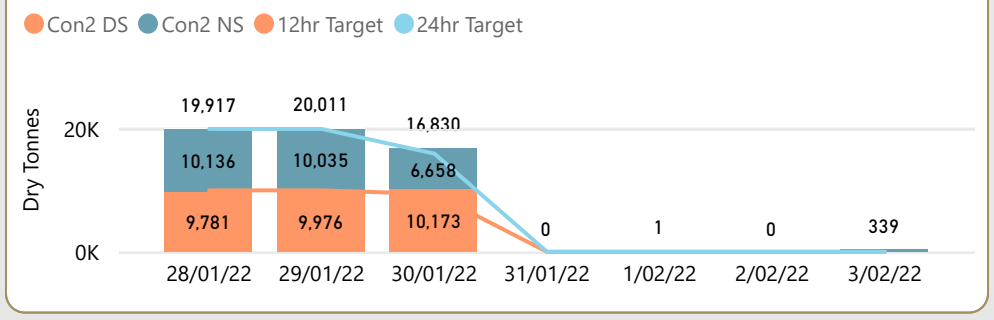


C1 Front End	Target	Actual	Variation
DS	40,572	39,937	-635 !
NS	40,572	41,756	1,184✓
24hr	81,144	81,693	549✓
Production Week Variance to Target			549✓

Day Shift Comments

Night Shift Comments

Concentrator 2



CON2	Target	Actual	Variation
DS	0	0	0✓
NS	0	339	339✓
24hr	0	339	339✓
Production Week Variance to Target			339✓

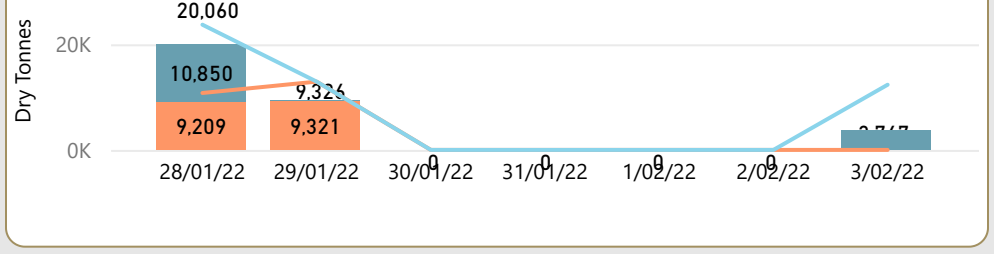
Day Shift Comments

Planned Shut

Night Shift Comments

Planned Shut

C2 Front End



C2 Front End	Target	Actual	Variation
DS	0	0	0✓
NS	12,348	3,747	-8,601 !
24hr	12,348	3,747	-8,601 !
Production Week Variance to Target			-8,601 !

Day Shift Comments

Planned Shut

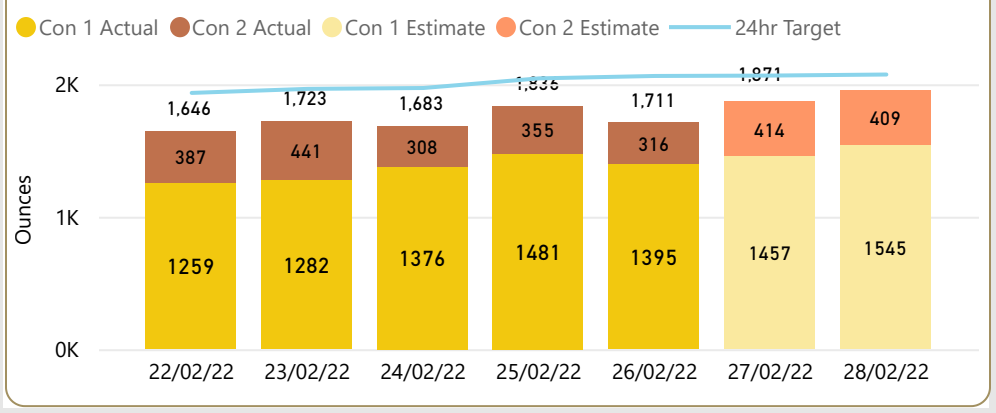
Night Shift Comments

Planned Shut

CVO03005F Cadia Daily Production Report

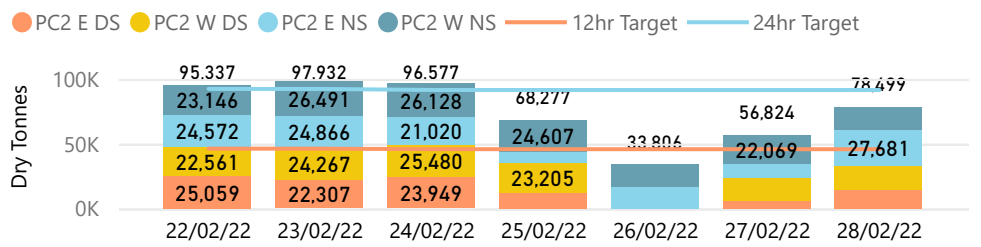
NEWCREST MINING LIMITED

GOLD Ounce Recovered



Oz	Target	Estimate	Variation
CON1 (Oz)	1,647	1,545	-102 !
CON2 (Oz)	427	409	-18 !
24hr (Oz)	2,074	1,954	-120 !
24hr Variance to Target			-6% !
Production Week to date Total (Oz)			9,055
Production Week Variance to Target			-1,164 !

PC2



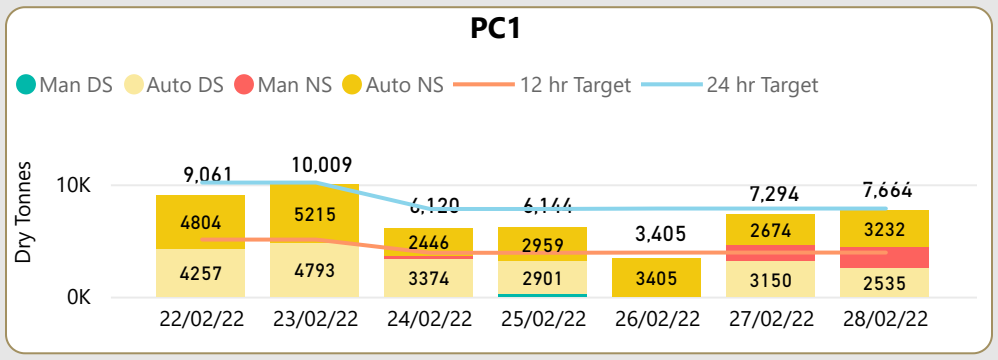
PC2	Target	Actual	Variation
DS	45,755	33,083	-12,673 !
NS	45,755	45,416	-339 !
24hr	91,510	78,499	-13,012 !
Production Week Variance to Target			-123,639 !

Day Shift Comments

CV3026 Blocked chutes & waiting on re-entries

Night Shift Comments

PC1



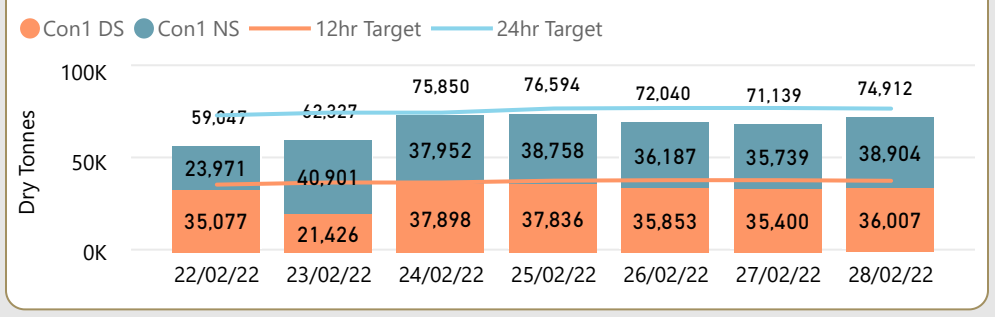
PC1	Target	Manual	Auto	Actual	Variation
DS	3,920	0	2,535	2,535	-1,385 !
NS	3,920	1,897	3,232	5,129	1,209 ✓
24hr	7,840	1,935	5,767	7,664	-176 !
Production Week Variance to Target					-8,495 !

Day Shift Comments

Loader availability

Night Shift Comments

Concentrator 1



CON1	Target	Actual	Variation
DS	39,759	36,007	-3,751 !
NS	40,102	38,904	-1,197 !
24hr	79,860	74,912	-4,949 !
Production Week Variance to Target			-27,276 !

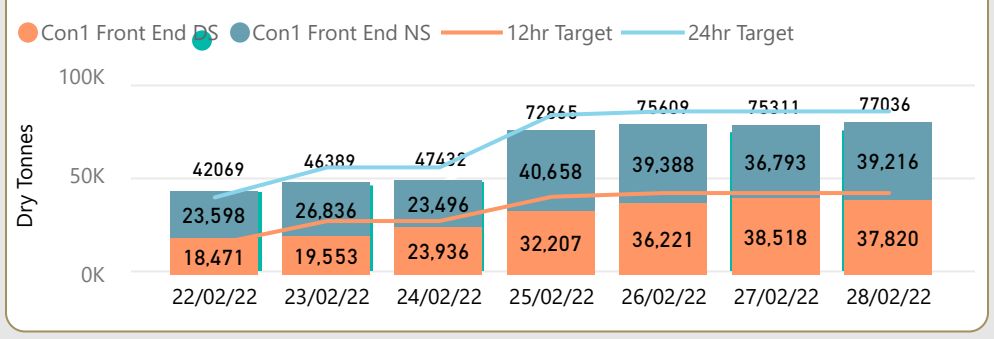
Day Shift Comments

Sag surge events

Night Shift Comments

Sag surge events

C1 Front End

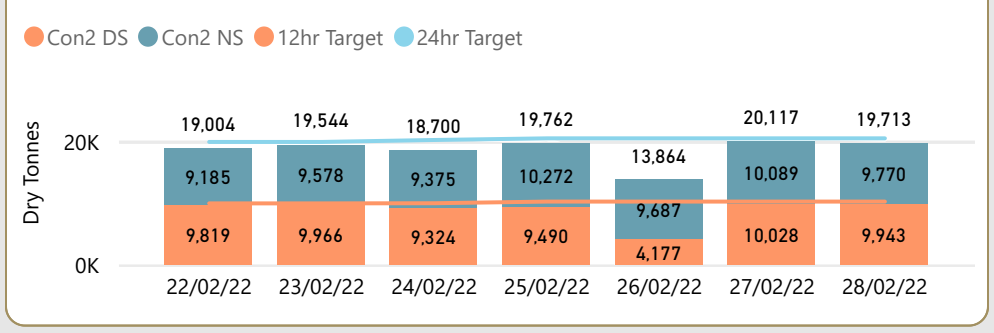


C1 Front End	Target	Actual	Variation
DS	41,160	37,820	-3,340 !
NS	41,160	39,216	-1,944 !
24hr	82,320	77,036	-5,284 !
Production Week Variance to Target			-33,261 !

Day Shift Comments

Night Shift Comments

Concentrator 2



CON2	Target	Actual	Variation
DS	10,290	9,943	-347 !
NS	10,290	9,770	-520 !
24hr	20,580	19,713	-867 !
Production Week Variance to Target			-10,475 !

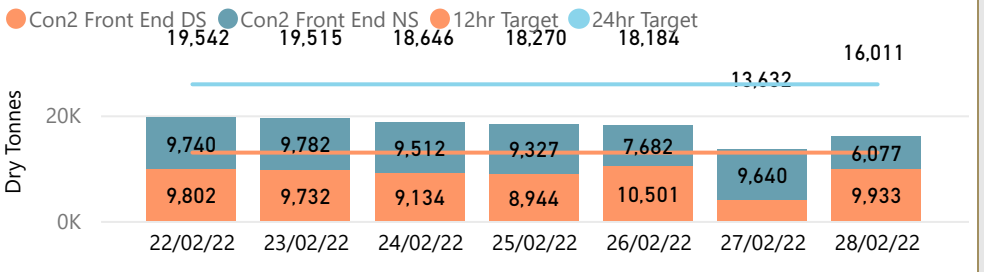
Day Shift Comments

Low cos, High F80.

Night Shift Comments

Low cos, High F80.

C2 Front End



C2 Front End	Target	Actual	Variation
DS	12,936	9,933	-3,003 !
NS	12,936	6,077	-6,859 !
24hr	25,872	16,011	-9,861 !
Production Week Variance to Target			-44,617 !

Day Shift Comments

Screen cleans, CR603 running in bowl level control.

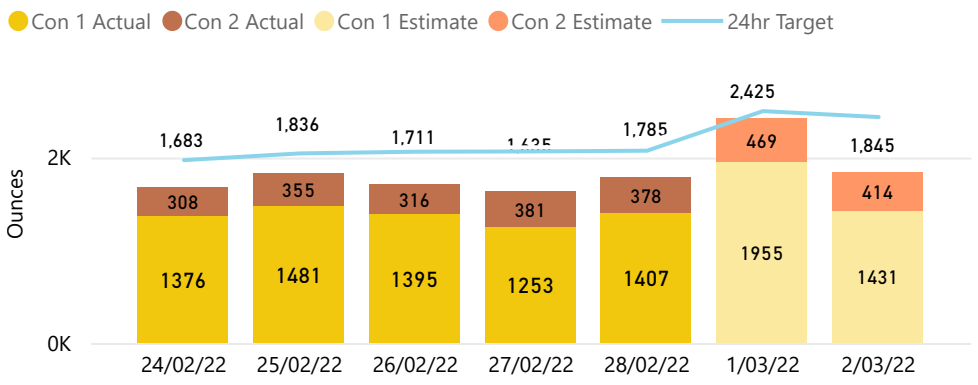
Night Shift Comments

Screen cleans, CR603 running in bowl level control, CV2021 bogged.

CVO03005F Cadia Daily Production Report

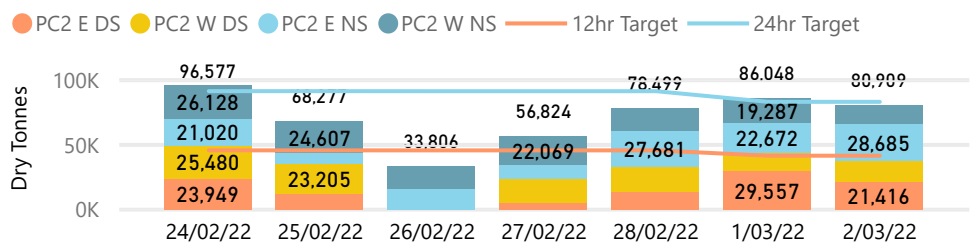
NEWCREST MINING LIMITED

GOLD Ounce Recovered



Oz	Target	Estimate	Variation
CON1 (Oz)	1,925	1,431	-495 !
CON2 (Oz)	511	414	-97 !
24hr (Oz)	2,436	1,845	-591 !
24hr Variance to Target			-24% !
Production Week to date Total (Oz)			12,920
Production Week Variance to Target			-2,235 !

PC2



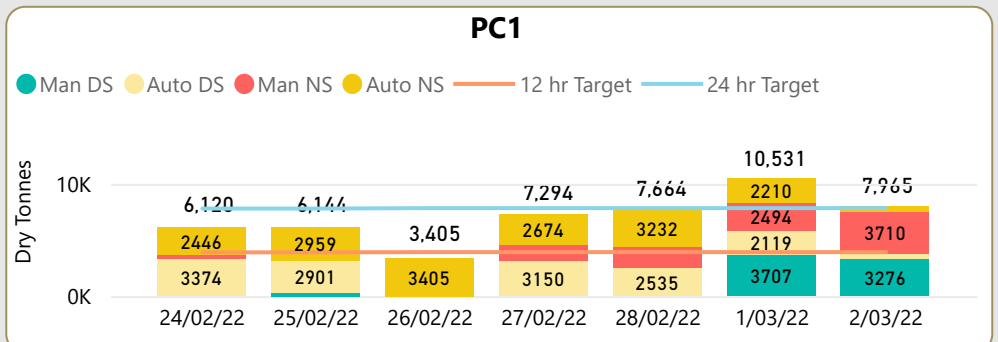
PC2	Target	Actual	Variation
DS	41,641	37,769	-3,872 !
NS	41,641	43,140	1,499✓
24hr	83,282	80,909	-2,373 !
Production Week Variance to Target			-123,246 !

Day Shift Comments

FD3022 speed sensor replacement.

Night Shift Comments

PC1

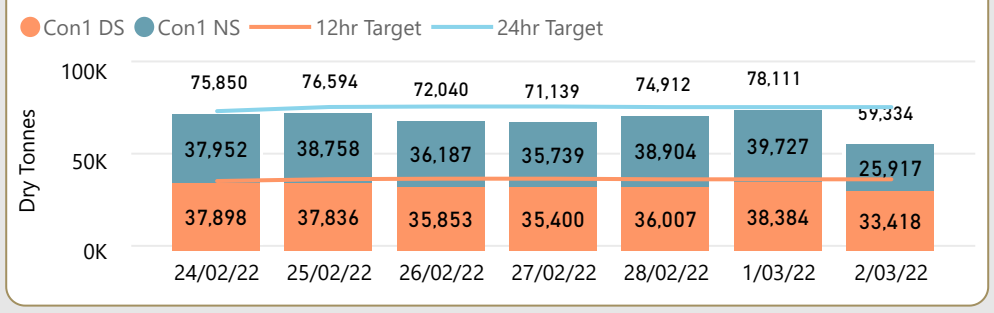


PC1	Target	Manual	Auto	Actual	Variation
DS	3,920	3,276	531	3,807	-113 !
NS	3,920	3,710	448	4,158	238✓
24hr	7,840	7,128	980	7,965	125✓
Production Week Variance to Target					-5,679 !

Day Shift Comments

Night Shift Comments

Concentrator 1



CON1	Target	Actual	Variation
DS	39,759	33,418	-6,341 !
NS	40,102	25,917	-14,185 !
24hr	79,860	59,334	-20,526 !
Production Week Variance to Target			-49,552 !

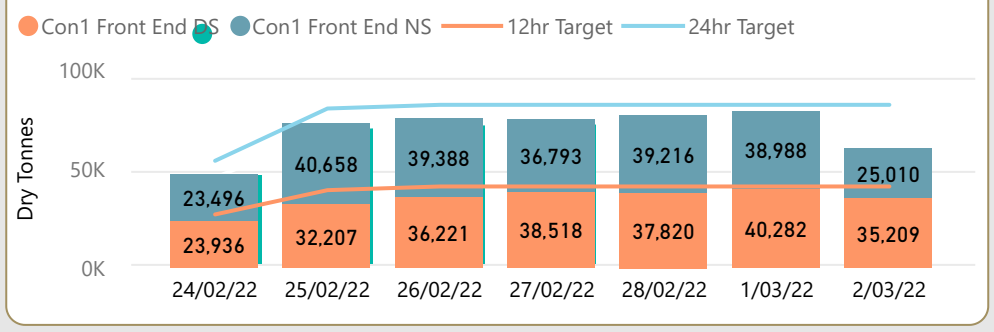
Day Shift Comments

SAG surge events. HPGR issues.

Night Shift Comments

HPGR issues.

C1 Front End

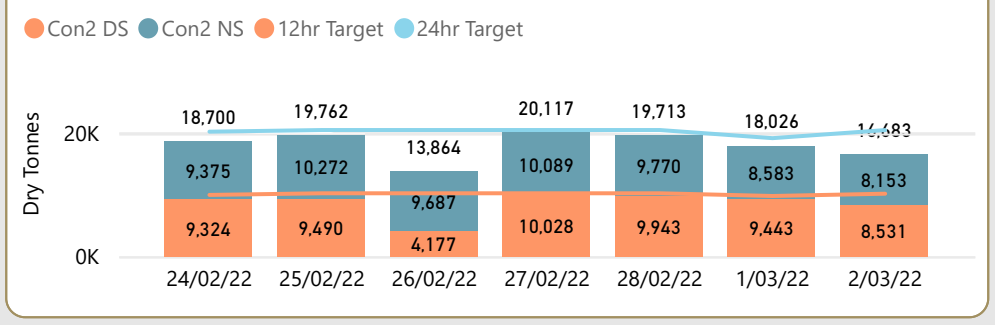


C1 Front End	Target	Actual	Variation
DS	41,160	35,209	-5,951 !
NS	41,160	25,010	-16,150 !
24hr	82,320	60,219	-22,101 !
Production Week Variance to Target			-58,412 !

Day Shift Comments

Night Shift Comments

Concentrator 2



CON2	Target	Actual	Variation
DS	10,221	8,531	-1,691 !
NS	10,349	8,153	-2,196 !
24hr	20,570	16,683	-3,887 !
Production Week Variance to Target			-15,593 !

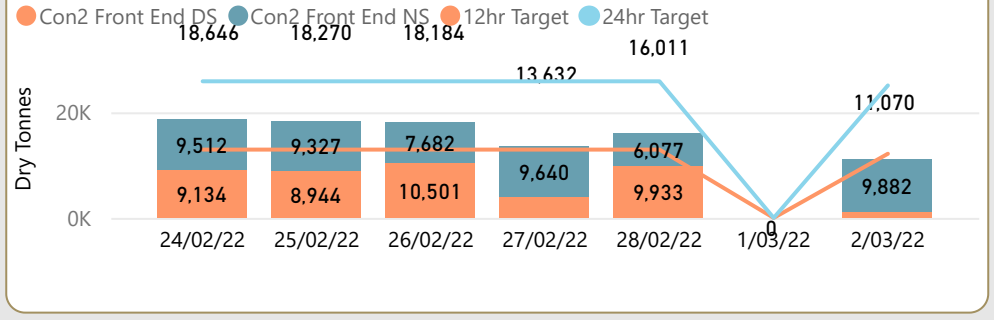
Day Shift Comments

High F80.

Night Shift Comments

High F80.

C2 Front End



C2 Front End	Target	Actual	Variation
DS	12,152	1,188	-10,964 !
NS	12,936	9,882	-3,054 !
24hr	25,088	11,070	-14,018 !
Production Week Variance to Target			-58,635 !

Day Shift Comments

Planned shutdown.

Night Shift Comments

Shut overrun.

Ektimo

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WA 6164
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BRISBANE
3/109 Riverside Place
Morningside
QLD 4170
AUSTRALIA

Appendix B – Cadia's Response to the Independent Air Quality Audit

Zephyr Environmental assessed Cadia's compliance with 20 compliance requirements related to air quality impacts. Zephyr Environmental assessed Cadia as compliant with 90% of the compliance requirements assessed as part of the audit (17 compliant, two non-compliant, and one not triggered). Refer to Table 6-1 of the Independent Air Quality Report for further details.

Non-Compliance 1 (AQNC-01) concerns Schedule 3, Condition 19A of the Cadia East Environmental Assessment, which requires an Air Quality Validation Report to be submitted to the Secretary within 3 months of approval of Modification 14.

Non-Compliance 2 (AQNC-02) concerns Part 7, Schedule 4 of the Protection of the Environment Operations (Clean Air) Regulation 2021 (NSW), which sets the limit for Group 6 emissions of solid particles (total).

Further detail of the non-compliances is provided below.

Non-Compliance 1 (AQNC-01) – Air Quality Validation Report

Schedule 3, Condition 19A of the Cadia East Environmental Assessment requires that:

> *The Proponent must prepare an Air Quality Impact Validation Report to the satisfaction of the Secretary based on detailed construction methodology and equipment for the construction of the NTSF and STSF embankments and associated infrastructure including haulage roads and transfer of waste rock material. The Air Quality Impact Validation Report must be prepared by a suitably qualified and experienced person, whose appointment has been approved by the Secretary and be submitted to the Secretary within 3 months of approval of Modification 14.*

Modification 14 was determined on 16 December 2021, thus the Air Quality Impact Validation Report was due to be submitted to DPE on 16 March 2022. Cadia submitted a request to DPE for an extension to the submission deadline, prior to the due date. The extension request was declined as there was no mechanism for DPE to grant the extension. As identified by Zephyr Environmental, the Air Quality Impact Validation Report has not yet been submitted to DPE, and is therefore non-compliant with this condition.

The delay in submission of the Air Quality Impact Validation Report has been caused by a delay in the Tailings Construction Project. As a result of the delay, details of the total material movement required to develop the Air Quality Impact Validation Report have not been finalised and therefore the details required to assess air quality impacts associated with the Tailings Construction Project are not yet available.

In consideration of the cause of the delay, Cadia considers that the failure to submit the Air Quality Impact Validation Report within three months of approval of Modification 14 of the Cadia East Project Approval is an administrative non-compliance only. The Air Quality Impact Validation Report is designed to assess the potential or likely impact from the Tailings Construction Project in support of the existing Air Quality Monitoring Program, which is designed to assess compliance with offsite air quality impacts (required by Schedule 3, Condition 20 of PA06_0295).

Air quality monitoring is conducted using a combination of the following monitoring equipment:

- Tapered Element Oscillating Microbalance (TEOM) analysers (continuous);
- Beta Attenuation Monitors (BAM) (continuous); and
- Dust Deposition Gauges (DDG).

An assessment of the air quality monitoring data for the period of non-compliance (March – July 2022) is provided below:

Continuous Air Quality Monitoring

For the period March 2022 to June 2022, continuous air quality monitoring was undertaken at the following locations (Figure 1 below):

- BAM 1 – Bundarra;
- TEOM 2 – Flyers Creek;
- BAM 2 – Woodville (June 2022 only);
- BAM 3 – Triangle Flat; and
- BAM 4 and TEOM 4 – Meribah.

In accordance with the Cadia Air Quality Management Plan, monthly continuous air quality data has been independently reviewed by Advitech Pty Ltd against the air quality impact assessment criteria in PA 06_0295. During the period March – June 2022, monitoring data at all locations was compliant with the air quality impact criteria set in PA06_0295. A copy of each monthly report is made available on the Cadia website (www.cadiavalley.com.au).

Figure 1: Cadia Air Quality Monitoring Network

Depositional Dust Monitoring

Depositional dust monitoring is undertaken monthly at eight locations surrounding Cadia (Figure 1 above). In accordance with the Cadia Air Quality Management Plan, monthly depositional dust data has been independently reviewed by Todoroski Air Sciences to assess compliance against Schedule 3, Condition 17 and Condition 18 of the Cadia East Project Approval PA 06_0295.

A summary of the depositional dust monitoring data is provided below in Table 1. During the period March – June 2022, the valid monitoring data at all locations was compliant with the air quality impact criteria set in PA06_0295.

Table 1: Depositional dust gauge summary (insoluble solids g/m^2/month)

Month	DG5A	DG9A	DG12A	DG15A	DG17	DG18	DG19	DG29A
Mar-22	1.6	0.7	3.4	2.5	1.8	1.1	0.9	1.5
Apr-22	0.9	8.3[a]	1.4	1.5	0.5	1.2	0.9	0.8
May-22	0.8	1.5	1.0	0.9	0.9	0.9	0.5	0.6
Jun-22	0.5	1.2	1.0	0.5	0.5	1.4	0.4	0.4

Notes:

[a] Sample has been assessed as invalid. Organic matter in the sample is 56%. Field notes indicate bird droppings, vegetation, insects and algae in the sample. Photos indicate a high level of algae compared to other samples. High organic content indicates contamination and level not representative of mining activity. Monitor downwind of CVO for 12% of time and unlikely to that the elevated levels are due to the mining activity alone.

In consideration of the air quality monitoring data described above, it is reasonable to conclude that the likelihood of environmental harm associated with the non-compliance in submission of the Air Quality Impact Validation Report is very low.

Nevertheless, Cadia is working towards finalising the design and implementation plan for the Tailings Construction Project. This plan will provide the required total material movement and allow Cadia to commission the development the Air Quality Impact Validation Report. The expected date for submission of the Air Quality Impact Validation Report to DPE is 30 October 2022.

During the period where preliminary construction preparation works are occurring, prior to finalisation of the Air Quality Impact Validation Report, Cadia will continue to monitor and control dust emissions from the construction work, and assess the potential for environmental harm using the existing air

quality monitoring network. Where elevated dust emissions are identified and an assessment indicates that the likely source is the Tailings Construction Project, additional dust mitigation measures will be implemented.

Non-Compliance 2 (AQNC-02) – Mine Vent Emissions

The Protection of the Environment Operations (Clean Air) Regulation 2021 (NSW) sets standards of concentration of emissions for scheduled premises. Part 7, Schedule 4 of the Regulation provides general standards of concentration for general activities and plant. The applicable category is solid particles (total), for any crushing, grinding, separating or materials handling activity, which sets a concentration limit of 20 mg/m3 for Group 6 emissions.

As identified by Zephyr Environmental, emissions testing undertaken by Ektimo between 28 February 2022 and 3 March 2022 indicated that particulate emissions from VR3 and VR8 exceeded the concentration limit of 20 mg/m3 for Group 6 emissions.

Cadia became aware of this non-compliance on receipt the draft report from Ektimo on 5 April 2022. Since this time, Cadia has commissioned several investigations into the source of the dust emissions, efficient operation of the mine vents, and operational improvements which could be implemented to reduce dust emissions from the mine vents. These investigations are outlined below:

1. ANSTO Monitoring

In consultation with the Cadia Community Air Quality Working Group, Cadia have engaged the Australian Nuclear Science Technology Organisation (ANSTO) to undertake a Particulate Characterisation Study at Cadia.

The ANSTO Study will utilise elemental concentration data to statistically fingerprint and quantify the particulate matter source components contributing to the measured particulate mass from three locations surrounding Cadia (Millthorpe, Mandurama and Panuara), in addition to one reference site (Orange). The study is required to be undertaken over a 12 month period for adequate data to be collected for interpretation.

The ANSTO Study will provide Cadia with accurate information regarding the source of particulate matter, and quantify Cadia's contribution to total particulate matter in the regional air shed. This information will allow Cadia to target emissions reduction program based on the highest contributing source of emissions from mine related sources.

The 12 month monitoring period will be completed in February 2023, with the final report expected to be provided to Cadia in March 2023.

2. Todoroski Air Sciences Peer Review of MV Emissions Monitoring Methodology

Following the receipt of the Ektimo Mine Vent Emissions Monitoring Report, Cadia identified that monitoring portals on the mine vents were non-conforming with Australian Standard 4323.1 (2021). AS4323.1 requires that "The sampling plane shall be located in a straight, preferably vertical section of stack, away from any flow obstructions which may cause a disturbance or other instability to the gas flow". For the test locations on VR3, VR5 and VR7, the flow disturbance observed was an expansion of the duct (i.e. a change in diameter) which tapers outwards as the duct rises vertically. For the test location VR8, the most significant flow disturbance is a bend immediately downstream from the sampling plane. Due to the design of the mine vents, undertaking emissions monitoring at non-conforming sampling planes is unavoidable; however all efforts were made to collect a representative sample. As described in Appendix C of AS4323.1, if demonstrated successfully, an alternative monitoring procedure can be utilized to classify a "non-conforming" location as a "non-ideal location".

To ensure that the monitoring methodology used by Ektimo was the best possible methodology to accurately represent the emissions from the mine vents, Cadia engaged Todoroski Air Sciences (TAS) to undertake a peer review of the Ektimo Mine Vent Emissions Monitoring Report. The TAS Peer Review confirmed the following in relation to the methodology and results of the Ektimo Mine Vent Emissions Monitoring at Cadia:

1. The actual emissions of particles from the vents are not as high as measured or reported, and do not at this time appear to be a major environmental issue in terms of air emissions or any potential for significant off-site air quality impacts;
2. The mine vent emissions monitoring that has been done cannot reliably determine the actual concentration or amount of particulate matter emitted, and we conclude the testing does not provide a correct measurement of the actual particulate emissions released from the mine vents;
3. The test methods in this situation inherently cannot sample the actual suspended particles, and instead are heavily affected by collecting droplets of mud or slurry in the air stream. The

sampled mud droplets thus do not represent any actual environmentally suspended particulate;

4. Whilst the correct sampling procedure has been carried out (and there is no immediately obvious alternative method), for the reasons above, the results produced do not correctly reflect the actual concentration of suspended particulate in the air; and
5. As the mine vent emissions monitoring results cannot reliably quantify the actual concentration of the particulate matter being discharged, they should not be used to assess compliance or non-compliance.

TAS then concluded that “at this time, it is not possible to determine the actual concentration of discharged suspended particulate matter, other than to note there will be a significant amount of suspended matter discharged, but it would be significantly less than quantified per the available stack testing data”.

3. Assessment of Primary Dust Scrubber System and Mechanical Filtration for Tipple Extraction Fans

Cadia will conduct a market investigation into the available dust control technologies (such as Primary Dust Scrubber System) and assess suitable systems which may be installed at Cadia to effectively mitigate particulate matter from being discharged through the mine vents. The scope of the investigation will include technology that can be used to filter or scrub out dust in the horizontal airways leading to each extraction fan location. This assessment will follow the initial investigations and market engagement into both wet scrubbing and dry filtration systems previously completed by Cadia.

Following completion of the technology selection process, Cadia will carry out a pre-feasibility study to locate the dust reduction equipment in the mine ventilation system. Additional assessment will then be undertaken to size the plant and integrate the solution into the existing mine ventilation system by considering mining development impacts, electrical and controls and materials handling.

Following completion of this assessment, the proposed dust reduction project will be assessed by Cadia to ensure that the system will result in an overall reduction particulate matter from being discharged through the mine vents.

As noted in the description of the emission reduction investigations above, Cadia's investigations into the source of the dust emissions, efficient operation of the mine vents, and operational improvements which could be implemented to reduce dust emissions from the mine vents is continuing as at the date of this letter. To ensure that a wholistic approach to emissions reduction projects is taken, each of the emission reduction investigations is to be completed to ensure that the most effective solution is implemented. The final ANSTO report will be available to Cadia in March 2023, it is expected that Cadia will have a robust emissions reduction program plan available in May 2023. This plan will be submitted to the Department of Planning and Environment (DPE) when it becomes available.

It is acknowledged that the implementation of the emissions reduction program plan will not be immediate; however, the following short-term emissions controls and emissions monitoring is being implemented by Cadia:

- Water sprays have been installed on the MHS system conveyor transfer points and crusher points to minimised particulates becoming airborne, and thus become mobilised and discharged out of the mine vents;
- A project is being implemented to optimise the draw point spray system on the mine vents; and
- Cadia is working with TAS to design an alternative monitoring methodology to accurately assess the dust emissions from the mine vents. It is likely that this alternative methodology will be implemented in conjunction with the methodology used by Ektimo and refined over a series of monitoring events. Cadia will engage with DPE and the Environmental Protection Agency (EPA) regarding the proposed alternative monitoring methodology.

As noted by TAS, emissions of particles from the mine vents are not as high as measured or reported, and do not at this time appear to be a major environmental issue in terms of air emissions or any potential for significant off-site air quality impacts. Nevertheless, Cadia continues to monitor offsite dust impacts using a combination of the following monitoring equipment:

- Tapered Element Oscillating Microbalance (TEOM) analysers (continuous);
- Beta Attenuation Monitors (BAM) (continuous); and
- Dust Deposition Gauges (DDG).

Reporting of these monitoring programs is available on the Cadia website (www.cadiavalley.com.au) and all non-compliances with air quality impact assessment criteria is reported to DPE and EPA. Further, non-compliances are reported in Cadia's Annual Return, and Annual Review.