



# EAST ARM ROAD QUARRY

## DUST MANAGEMENT PLAN

Version 3.0

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DRAFT FOR PUBLIC CONSULTATION

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ACRONYMS	
<b>BMP</b>	Blast Management Plan
<b>DD</b>	Dust Deposition Gauge
<b>EAR</b>	East Arm Resources Pty Ltd
<b>EMPCA</b>	<i>Environmental Management and Pollution Control Act 1994</i>
<b>EPA</b>	Environment Protection Authority
<b>HVAS</b>	High Volume Air Sampler
<b>LVAS</b>	Low Volume Air Sampler
<b>ML</b>	Mining Lease
<b>MRT</b>	Mineral Resources Tasmania
<b>QCP</b>	<i>Tasmanian Quarry Code of Practice 2017</i>
<b>TE</b>	means Tarkarri Engineering Pty Ltd

TERMS	
<b>Mining Lease</b>	Mining Lease 2135P/M
<b>Record</b>	means to write an observation. All records will be handed to the Quarry Manager and will be kept on file. All records are to be clearly legible.
<b>Quarry</b>	means East Arm Road Quarry

## SECTION 1 - INTRODUCTION

### 1.1 EAST ARM ROAD QUARRY

The East Arm Road Quarry is located at East Arm Road, north of Hillwood in the George Town municipality.

The resource being extracted occurs in low-relief terrain southwards of Fourteen Mile Creek. The activity is located within Consolidated Mining Lease 2135P/M.

Up to 2,500,000 cubic metres per annum (approximately 4,000,000 tonnes of product at a conversion factor of 1.6) is extracted per annum.

The Quarry includes the following activities:

- surface site preparation by tree-felling and stockpiling/mulching,
- soil and overburden removal and stockpiling,
- excavation and ripping of material,
- drilling and blasting by a licensed contractor,
- crushing and/or screening of material,
- stockpiling of material (processed and unprocessed),
- the loading of trucks with processed material from the stockpile area,
- rehabilitation of worked out areas,
- management of stormwater in and external to the Quarry, and
- installation and maintenance of drainage systems.

Drilling and blasting are carried out by qualified contractors in consultation with the Proponent to ensure the following:

- drilling is carried out to the specified design pattern;
- noise and vibration standards are met (both drilling and blasting activities);
- blasting activities are safe and meet workplace health and safety requirements; and
- blasting is adequate to achieve rock fracturing/fragmentation for both extraction by excavator and crushing.

### 1.2 SCOPE AND OBJECTIVES

The DMP applies to all activities undertaken at the Quarry including for example drilling and blasting, crushing, screening, stockpiling and transportation of quarry products, maintenance activities; and associated service and support functions.

The DMP provides the framework and guidance for the Quarry activities to be conducted in a manner whereby appropriate control measures are implemented to minimise the potential for adverse impacts on air quality and meet compliance requirements.

Objectives of the DMP are to:

1. Detail the controls to minimise dust generation from the Quarry;
2. Establish an air quality monitoring system to assess the air quality performance against the specific air quality impact assessment criteria;
3. Provide a mechanism to assess monitoring results against air quality impact assessment criteria;
4. Identify triggers for the implementation of additional management response measures as required, using an adaptive management approach;
5. To detail the requirements for reporting air quality criteria exceedance to the relevant stakeholders; and
6. Manage air quality related community complaints in a timely and effective manner.

The DMP provides the framework and guidance for the Quarry activities to be conducted in a manner whereby appropriate control measures are implemented to minimise the potential for adverse impacts on environment and to meet compliance requirements.

### 1.3 COMMENCEMENT OF DUST MONITORING

The Quarry will formally<sup>1</sup> monitor dust deposition and particulate matter (TSP, PM<sub>2.5</sub>, PM<sub>10</sub>) concentrations within and in the vicinity of the Quarry when tonnage transported from the Quarry reaches 350,000 tonnes per annum; the Quarry has approval to extract 208,000 tonnes per annum now without any formal air monitoring requirement imposed by conditions. Once enacted, the formal monitoring program will continue even if annual production levels drop below 350,000 tonnes per annum.

Prior to attaining extraction levels of 350,000 tonnes per annum, visual monitoring will be adopted as it is now to manage and respond to dust emissions. DDG may be installed and monitored prior to the attainment of 350,000 tonnes per annum, and other monitoring conducted, at the discretion of the proponent.

### 1.4 PLAN STRUCTURE

The structure of the Management Plan is outlined in **Table 1**.

**Table 1. Structure of the Management Plan**

Section	Content
1	Provides an overview of the project, and objectives of the plan

<sup>1</sup> A summary of the formal air monitoring requirements is provided in **Table 6**.

2	Details of the statutory requirements as outlined in the conditions of permit conditions
3	Describes the existing environment of the site and dust risks and sources
4	Describes the air quality management (dust) controls to be implemented
5	Dust monitoring protocols and compliance assessment criteria
6	Outlines dust incident responses
7	Outlines the reporting and review requirements

## 1.5 PLAN MANAGEMENT TEAM

The DMP is to be implemented by a team comprised of management, operational staff, and consultants.

### 1.5.1 EAST ARM RESOURCES PTY LTD

The East Arm Road Quarry is owned and operated by East Arm Resources Pty Ltd which is a company in the VSA Roads Group which includes Inroads, Centre State Asphalt, Western Quarries, Topcoat Asphalt and Primal Surfacing – see **Table 2**.

The Quarry employs a team of machinery/equipment operators, HSEQ officers, and administration staff.

**Table 2. Details for East Arm Resources Pty Ltd and the Quarry**

Item	Details
<b>Legal entity Name</b>	East Arm Resources Pty Ltd
<b>Trading Name</b>	East Arm Resources Pty Ltd
<b>ACN</b>	636 993 783
<b>ABN</b>	41 636 993 783
<b>Registered Address</b>	Unit 2, 3-5 Gibbon Road, Winston Hills NSW 2153
<b>Postal Address</b>	9 Weddel Court, Laverton North VIC 3026
<b>Contact Persons</b>	Name – John Bell Andrews, General Manager, East Arm Road Quarry Email – <a href="mailto:jba@eastarmresources.com">jba@eastarmresources.com</a> Mobile – 0427 709 762
	Name – Rachel Andrews, Site Supervisor, East Arm Road Quarry

	Email – <a href="mailto:andrewsr@eastarmresources.com">andrewsr@eastarmresources.com</a> Mobile – 0460 309 720
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### 1.5.2 ENVIRONMENTAL ASSISTANCE AND ADVICE

Van Diemen Consulting Pty Ltd has been engaged to provide on-site assistance and advice with the implementation of the DMP.

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### 1.5.3 CONTRACTORS

Additional contractors or specific service providers may be engaged to provide on-site assistance with the implementation of the DMP including dust sampling.

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## SECTION 2 – LEGISLATIVE AND RELEVANT MANAGEMENT PLAN CONTEXT

### 2.1 CONTEXT OF ENVIRONMENTAL DUST MANAGEMENT

#### 2.1.1 CODES AND ENVIRONMENTAL PROTECTION POLICY

##### **Quarry Code of Practice**

Key considerations include: -

- Dust should not normally be visible crossing the boundary of the premises;
- Environmental factors, such as wind conditions, may on occasion, make the retention of all visible dust on the site impossible. In such cases, the operator must take all reasonable actions to ensure that the emission of dust from the premises is minimised;
- Roads within the boundary of the premises must be watered or sealed when necessary or when directed by the approval authority, to minimise environmental nuisance;
- Trucks must utilise effective dust control measures such as tarpaulins, load dampening when travelling by public roads and carrying loads containing a significant quantity of material that passes a 4-millimetre sieve; and
- Dust produced by the operation of the quarry or by transport, crushing and screening plant must be effectively controlled to the satisfaction of the approval authority.

##### **Environment Protection Policy (Air Quality) 2004**

Airborne particles are characterised as fumes, smokes, mists, or dusts depending on the nature of the particle and its size. Particles are commonly classified by size expressed as equivalent aerodynamic diameter (EAD) in micrometres ( $\mu\text{m}$ ) as follows: -

- total suspended particles (TSP) – diameter  $\leq 50 \mu\text{m}$ ;
- PM10 – diameter  $\leq 10 \mu\text{m}$ ; and
- PM2.5 – diameter  $\leq 2.5 \mu\text{m}$ .

Under the *Environment Protection Policy (Air Quality) 2004* the following is stated with to the management of diffuse air emission sources (the sources of dust from the Quarry are fugitive and therefore considered diffuse in nature): -

## Part 5 - MANAGING DIFFUSE SOURCES OF AIR CONTAMINANTS

### Management of diffuse sources of air pollution

16. (1) Regulatory authorities should manage and regulate diffuse sources of air pollution that have the potential to cause material or serious environmental harm or an environmental nuisance in such a manner as will protect the environmental values identified in this Policy.
- (2) Diffuse sources of air pollution should be managed using best practice environmental management so as to:
- (a) minimise emissions; and
  - (b) manage those emissions that are unavoidable in a manner that minimises impacts on health, safety or amenity.
- (3) Diffuse sources of air pollution should be managed in accordance with any relevant guidelines published, adopted or endorsed by the Board for the purposes of this clause.
- (4) Diffuse sources of air pollution must be managed in accordance with any regulations made under the Act.

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### 2.1.2 EMISSION STANDARDS

Criteria for air constituent for the assessment of potential environmental harm / nuisance are taken from the *Environment Protection Policy (Air Quality) 2004*<sup>2</sup> and subsequent EPA Board Statement from January 2022, *Update to Air Pollutant Design Criteria used in the Environmental Impact Assessment Process*.

Concentrations are reported for gas volumes at 25°C and 1 atmosphere. For TSP and dust deposition criteria are taken from the NSW Environment Protection Authority (EPA).

The following criteria apply to the DMP, noting the *EPP (Air Quality) 2004* requires emissions that are unavoidable to be managed in a manner that minimises impacts to health, safety or amenity.

#### PM<sub>10</sub>

Averaging period	Maximum concentration
1 day	50 µg/m <sup>3</sup>
1 year	25 µg/m <sup>3</sup>

#### PM<sub>2.5</sub>

Averaging period	Maximum concentration
1 day	25 µg/m <sup>3</sup>
1 year	8 µg/m <sup>3</sup>

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<sup>2</sup> Department of Primary Industries, Water and Environment (2005) ENVIRONMENT PROTECTION POLICY (AIR QUALITY) 2004.

**TSP**

Total Suspended Particulate Matter (TSP), NSW EPA criteria.

Averaging period	Maximum concentration
1 year	90 µg/m <sup>3</sup>

**Deposition**

Deposition of insoluble solids, NSW EPA criteria

Maximum rate	Maximum increase
2 g/m <sup>2</sup> /month	2 g/m <sup>2</sup> /month

The monitoring of particulate matter against the criteria excludes samples where the impact of extraordinary events listed below are likely to have influenced the monitoring results:

- Bushfires;
- Prescribed burning;
- Dust storms;
- Sea fog;
- Fire incidents;
- Illegal activities; and/or
- Any other activity agreed to with the EPA.

**2.2 PERMIT REQUIREMENTS**

The permit requirements are below.

Permit Conditions	
TBC	

**2.3 OTHER RELEVANT PLANS**

The following relevant plans and documents have been considered in the development of the DMP.

Other Relevant Plans and Reports

**East Arm Road Quarry. Stormwater Management and Sediment Control Report. February 2025.**

Prepared by Van Diemen Consulting Pty Ltd.

**East Arm Road Quarry. Air Quality Assessment. February 2025.**

Prepared by Tarkarri Engineering Pty Ltd.

**East Arm Road Quarry. Environmental noise, ground vibration and air blast overpressure assessment. November 2024.**

Prepared by Tarkarri Engineering Pty Ltd.

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## SECTION 3 – AIR QUALITY (DUST) OVERVIEW

The primary air emission associated generally with any quarry operation is dust. It is this pollutant specifically considered in the assessment as odour, fumes, smokes, and mists are not to be generated beyond fuel-combustion waste emissions from machinery and equipment.

Dust can be a nuisance to neighbours and may be a safety hazard to quarry employees. Generally, the emission of visible dust should be confined within the boundary of the premises, except in remote areas where the effects beyond the site may not cause an environmental nuisance or harm.

### 3.1 EXISTING AMBIENT AIR QUALITY

The main sources of air emissions in the wider area of the Quarry include extractive industries, commercial and industrial operations, agricultural activities, emissions from local anthropogenic activities (such as motor vehicle exhaust, dust from dirt roads, and domestic wood heaters) and various other rural activities.

Information relating to the background constituent concentrations at the north-western end of the Tamar Valley are limited. Background concentrations for  $PM_{10}$  of  $9.9 \mu\text{g}/\text{m}^3$  and for  $PM_{2.5}$   $6.8 \mu\text{g}/\text{m}^3$  were assumed by Tarkarri Engineering (TE) in the modelling of dust dispersion rates and extent. This figure is based on the analysis of validated background concentration data at George Town Air Monitoring Station for the 2011 year as part of multiple assessments for emergency power generation in 2016.

TSP data are not available, however an assumed ratio for TSP to  $PM_{10}$  of 0.5 was assumed resulting in a background TSP concentration of  $19.8 \mu\text{g}/\text{m}^3$ .

There is no historical air quality monitoring data available from the Quarry.

### 3.2 DUST TYPES AND SOURCES

Dust emissions are made up of a combination of different particle size fractions. The size of the particle determines the selected management measures:

- **$PM_{2.5}$ :** Particulate of an aerodynamic diameter of less than 2.5 micrometers ( $PM_{2.5}$ ) is typically associated with human health effects. These particles are small enough to deposit in the lower respiratory tract where they can then enter the bloodstream. There is sufficient evidence to suggest that acute and chronic exposure to  $PM_{2.5}$  over long periods (years) can cause adverse health effects. Air emissions from the Quarry are likely to be dominated by particle sizes typically larger than  $PM_{2.5}$ .
- **$PM_{10}$ :** Particulate of an aerodynamic diameter of less than 10 micron ( $PM_{10}$ ) is typically associated with human health effects. These smaller particles are termed thoracic particles and tend to remain suspended in the air for longer periods. These particles are inhaled into the upper part of the airways and can penetrate down to the lungs. Further, if contaminated, these fine particles may pose a further health risk through absorption of the chemicals on the particles into the blood stream. Information obtained from the World Health Organisation (WHO) and United States Environmental Protection Agency (USEPA) indicates that numerous scientific studies have linked particle pollution exposure to a

variety of health effects depending on chemical and physical properties. Particulate matter smaller than 10 micrometers in aerodynamic diameter includes PM<sub>2.5</sub> as well as respirable particulate that can deposit in the nose, throat and upper respiratory tract. Since air emissions from Sellicks Quarry are dominated by mineral dust, measurements of PM<sub>10</sub> are used to assess potential human health effects related to particulate matter.

- **Total suspended particulates (TSP):** is defined as particulate matter with aerodynamic diameters less than 50 µm and includes PM<sub>2.5</sub> and PM<sub>10</sub>. 'Dust' is typically defined as the difference between PM<sub>2.5</sub> and TSP, with particles larger than PM<sub>10</sub> constituting nuisance dust that contributes to reduced visibility and the soiling of exposed surfaces.

### 3.4 POTENTIAL DUST SOURCES

Potential sources of dust from the Quarry are: -

- The stripping of topsoil (extremely limited as the amount of topsoil is low);
- The harvesting and clearing of trees and other vegetation;
- The drilling and blasting, and ripping of rock during dry windy conditions (especially in the summer months);
- The movement of rock and gravel by machinery;
- Crushing and/or vibratory screening of rock material;
- Access road (gravel) use in and out of the quarry; and
- Stockpiled gravel and fines.

The most likely source of dust is from Quarry internal (haul) road use and the act of crushing and screening material. Winds tend to be northerly to westerly with southern breezes in the afternoon (especially in summer) which may push dust emissions to the south and southeast of the Quarry.

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#### 3.4.1 DUST FROM DRILLING AND BLASTING

The drilling process is used to fragment the rock for subsequent blasting operations. Drilling and blasting activities are episodic in nature (i.e. once a week) and dust impacts are generally short term (i.e. for less than 30 minutes after a blasting event). Blasting can be considered a major potential source of dust and may occur every week.

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#### 3.4.2 WHEEL GENERATED DUST

Haul and access roads are used extensively in quarrying operations by mobile equipment to move material in and out of the quarry. The road network at a Quarry will become more extensive as the extraction area grows, and the potential for dust generation is dependent upon the traffic patterns and use.

The rate of the emission is dependent on several factors including:

- Vehicle kilometres travelled (VKT) – the amount of dust emitted is directly proportional to the distance a vehicle travels on unpaved surfaces. VKT refers to each type of vehicle.
- Vehicle weight – heavier vehicles generally have a greater potential to mechanically disturb particulate in the unpaved surface releasing it into the air. In general, they have more contact with the unpaved surface (larger and more numerous wheels).
- Vehicle speed – increased speed generally increases the potential to mechanically disturb particulate in the unpaved surface releasing it into the air.
- Surface physical properties (e.g. silt and moisture content) – the potential for dust generating is increased for greater silt content and lower moisture content.
- Meteorological conditions – the moisture content of an unpaved surface can be affected by ambient temperature, humidity, wind, incident solar radiation and rainfall.

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#### 3.4.3 DUST FROM LOADING AND MOVEMENT

Aggregate loaded into on-site haul trucks and that which is moved by loaders to the stockpile area from the pit has the potential to release dust into the air. The rate of emission is related to:

- Aggregate physical properties – the potential for dust generation is increased for finer materials with greater silt content and lower moisture content.
- Meteorological conditions – the moisture content of the aggregate can be affected by ambient temperature, humidity, wind, incident solar radiation and rainfall.

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#### 3.4.4 MATERIAL EXCAVATION

The mechanical disturbance of material associated with excavation is a source of dust on-site, the rate of which is dependent on:

- Rate of excavation and loading – the amount of material excavated (related to the size of the excavator and the intensity at which it is utilised).
- Material physical properties – the potential for dust generation is increased for finer materials with greater silt content and lower moisture content. Coarser materials, such as larger particle size aggregates, do not present a risk.
- Meteorological conditions – the moisture content of the material especially in the surface layers, can be affected by ambient temperature, humidity, wind, incident solar radiation and rainfall.

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#### 3.4.5 CRUSHING AND SCREENING

Crushing and screening has the potential to be a major source of dust. Crushing has the potential to produce fines while the agitation of the crushing and screening tends to release fines from the surface of rock and aggregate, all of which can be entrained into the air. Agitated fines can also fall to the ground and collect around the crusher and be entrained by the wind or wheel traffic.

The rate of emission is related to:

- Feed rate of the crusher.

- Levels of crushing and screening – e.g. primary, primary and secondary, primary, secondary and tertiary.
- Material physical properties – the potential for dust generation is increased for crushing material with lower moisture content.
- Meteorological conditions – the moisture content of the material, can be affected by ambient temperature, humidity, wind, incident solar radiation and rainfall.

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#### 3.4.6 WIND EROSION FROM STOCKPILES AND EXPOSED AREAS

Dust from the surface of stockpiles and exposed areas can potentially be entrained by the air (wind) passing over it. This source of dust is notable as it can occur at any time there is wind, whether there is site activity or not (including out of operational hours and shut-down periods). Entrainment can be accentuated by dust already in suspension which can aid the dislodgement of particulates on the surface.

The rate of wind erosion related emission is related to factors including for example the:

- Extent of the area of wind erodible surface exposed;
- Wind speed and direction – wind erosion is increased at higher wind speeds and can also be dependent on wind direction if, for example, the site and surrounding terrain is not flat and creates natural wind breaks and or increases turbulence;
- Surface physical properties – the potential for dust generation is higher for finer materials with greater silt content and lower moisture content; and
- Other meteorological conditions – the moisture content of the surface can be affected by ambient temperature, humidity, wind, incident solar radiation and rainfall.

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#### 3.4.7 TRACK-OUT

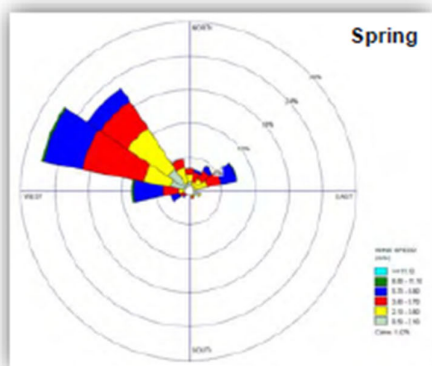
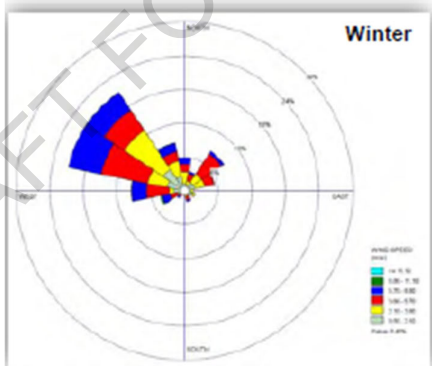
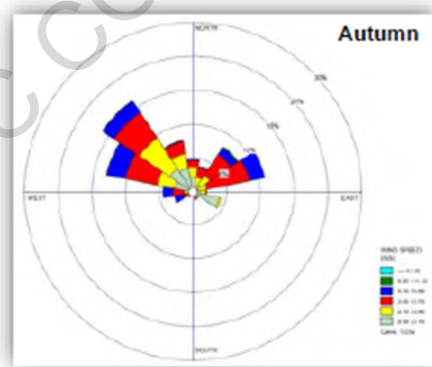
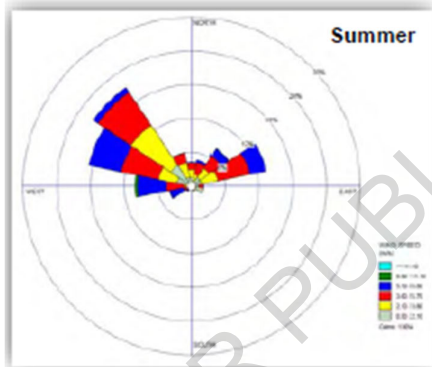
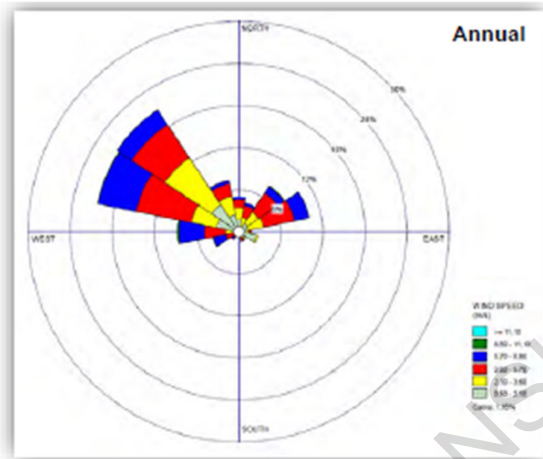
Highway trucks used to take product off-site have the potential to take material onto public paved roadways. Material can drop from tailgates, vehicle surfaces where material may have collected during loading, and from wheels. Similarly, materials from third-party sites might also be deposited. Light vehicles leaving site may contribute to track-out, although to a lesser degree, by dropping and spreading material from wheels. Fines from this material have the potential to be entrained in the air from the paved surface by the wind or vehicular traffic (including public vehicular traffic).

### 3.5 WIND RISK PROFILE

CALMET is an advanced non-steady-state diagnostic three-dimensional meteorological model with micrometeorological modules for overwater and overland boundary layers. The model is the meteorological preprocessor for the CALPUFF modelling system. Tarkarri Engineering generated a wind rose for each season, and for an annual wind cycle for the Quarry location. The wind roses are reproduced below.

High wind speeds are generally absent from the site and consistent NW and NE wind components are present indicative of the local topographic influence on winds at the site. The absence of high wind speeds would

suggest a reduced severity of wind induced dust entrainment on exposed areas. Winds are slightly stronger in the Spring and Summer. Overall winds from the south are largely absent, or weak.



## SECTION 4 – DUST MANAGEMENT CONTROLS

The primary objective of the DMP is to provide guidance and direction for Quarry activities to be conducted in a manner whereby appropriate control measures are implemented to minimise the potential for adverse impacts on air quality and offsite disturbances and to meet compliance requirements.

A control hierarchy approach is followed to specify controls to reduce the likelihood and/or the consequence of dust from the Quarry impacting nearby receptors – see **Table 3**. In considering controls for each risk, preference is given to elimination of the activity or equipment producing the risk, but where this is not practicable, substitution of that activity is considered, and so on. Most management measures are of an engineering application, with these applied during day-to-day operations.

**Table 3. Control Hierarchy**

Control	Description
<b>Elimination</b>	Remove the activity or equipment producing the risk.
<b>Engineering</b>	Engineer a change in the activity or equipment producing the risk such that the risk is reduced or removed, e.g. enclose and isolate the activity or equipment.
<b>Administration</b>	Use procedures, training and rules to reduce the risk.

### 4.1 ADMINISTRATIVE CONTROLS

There is a suite of administrative based controls that are applied at the Quarry.

#### 4.1.1 INDUCTIONS AND TRAINING

All full-time staff and contractors are required to attend an induction session prior to commencing work at the Quarry. The inductions are recorded. Staff induction documentation will include potential environmental impacts related to the DMP and their respective control measures will be discussed, explained, and communicated to attendees. An electronic sign-on system is in place at the Quarry which records the attendance at the Quarry by staff, contractors (excluding truck drivers collecting aggregate for delivery) and other people working in the Quarry. The online sign-in system will include information about the dust management requirements required by the DMP.

Staff and contractors who are implementing the DMP or are responsible for its implementation will receive specific training to ensure that dust monitoring equipment is used, stored and calibrated correctly.

#### 4.1.2 SITE DEVELOPMENT AND EXTRACTION PLANNING

The environmental aspects of the Quarry have benefited by procurement of modern equipment and controls and ability to plan site layout design to minimise potential for adverse incremental and total impacts associated with quarry activities.

Some examples of these benefits are:

- The ability to progressively relocate the mobile crusher units into the working pit which significantly reduces the haulage of materials from extraction areas. This results in a reduction of fuel usage and air emissions (i.e. noise, dust, and exhaust) due to the reduction in truck movements;
- Planning the initial extraction works northwards, away from sensitive receptors, and then westwards to retain for as long as possible the hill system between the extraction zone and sensitive receptors more likely to receive dust (based on the wind rose risk profile); and
- The scheduled installation of modern technology in monitoring meteorological conditions for proactive management of operations.

#### 4.2 ENGINEERED CONTROLS

A range of engineering controls have been incorporated into the design and operation of the Quarry to minimise the potential for dust generation resulting in offsite disturbances and include:

- Dust suppression sprays on crushing units;
- Haul roads and processing areas to be compacted and suitably constructed;
- Location of crushers within the pit rather than the stockpile area;
- Controlling stockpiles of fine material with water sprays;
- Progressive removal of vegetative cover to keep the disturbed area as small as possible;
- Reduction in disturbed areas by progressive rehabilitation even with temporary short-term coverage of quick growing pasture grasses; and
- Application of dust suppressants in the screening and crushing operations, on bunds, and non-trafficable areas to minimise the risk of wind generated dust emissions.

#### 4.3 OPERATIONAL CONTROLS

The Quarry implements a range of site-specific operational management protocols with allocated responsibilities for the 'day-to-day' control of air emissions (refer to **Table 4**). The control of air emissions through this range of protocols will minimise disturbances offsite.

Further activity specific controls are to be applied, as presented in **Table 5**.

**Table 4. Site-Specific Dust Mitigation Controls**

Control Measure	Implementation	Responsibility
Implementation of the requirements of this DMP	Throughout Operations	Site Manager
Ongoing monitoring and reporting as described in this DMP	Throughout Operations	Environmental Officer
Reviewing meteorological conditions regularly to guide quarry operations	Daily	Site Supervisor
Overburden haulage and placement will be guided by ambient weather conditions	Daily	Site Supervisor
Reviewing of meteorological conditions prior to blasting and amendment of plans if excessive dust generation is anticipated	Prior blasting	Site Supervisor
Topsoil stripping when it is moist either naturally or through the application of water	Overburden Stripping	Site Supervisor
Traffic limited to pre-determined haul routes and laydown areas	Throughout Operations	Site Manager
Progressive rehabilitation of bunds, non-trafficable areas, and spoil dumps	Throughout Operations	Environmental Officer
Use of suppressants on haul roads or unsealed areas where watering or rehabilitation is not effective or possible	As required	Site Supervisor
Restrictions on speed of vehicles on site (20km/hr limit)	Ongoing	Site supervisor
Cleaning up of areas which could become sources of wind erosion dust due to build-up of settled fine material	As required	Site Supervisor
Education of staff to dust mitigation measures through the induction process	As required	Site Supervisor
Routine audits of pollution control equipment	As per manufacturer's specifications	Site Supervisor
Water cannon	As required	Site Supervisor
Onsite water cart to wet roads and other dust generating surfaces - Level 2 watering (>2 l/m <sup>2</sup> /hr) of the processing and stockpile area.	As required	Site Supervisor

<ul style="list-style-type: none"> <li>- Level 1 watering (&lt;2 l/m<sup>2</sup>/hr) of unsealed haul roads when dust is visible.</li> </ul>		
<p>Irrigation/sprinkler system to be installed for the stockpile area and directly associated internal unsealed road network</p>	<p>To be installed and then maintained/operated as required</p>	<p>Site Supervisor</p>

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**Table 5. Specific controls to be implemented relative to the activity type at the East Arm Road Quarry**

Potential Impact	Controls
<b>Drilling and Blasting</b>	
<p>Preparatory drilling causing localised dust that can be seen off-site</p>	<ul style="list-style-type: none"> <li>• Deliver training and inductions to all new employees and relevant site personnel to highlight the importance of dust control;</li> <li>• Forecast weather conditions are checked prior to drilling and deemed appropriate with respect to wind direction and speed;</li> <li>• Drilling undertaken by trained contractors and in accordance with Australian Standards;</li> <li>• Blasting will be performed by trained contractors and in accordance with Australian Standards AS2187.2-2006;</li> <li>• All drills to have dust collectors installed; and</li> <li>• Water cart used in the drill area prior to drilling during dry and/or windy periods of drilling.</li> </ul>
<p>Blasting causing episodic TSP, PM<sub>2.5</sub> and PM<sub>10</sub> causing off-site nuisance</p> <p>Off-site health consequences from blasting</p> <p>Visible dust from blasting causing community concern</p>	<ul style="list-style-type: none"> <li>• Blasting will preferentially occur when weather conditions are favourable (e.g. early afternoons);</li> <li>• Plan blasting activities for weekdays only;</li> <li>• Water cart to prewet as many surfaces as possible 30 minutes prior to firing events and as soon as possible after firing events in dry conditions; and</li> <li>• Community notifications issued for both visible and non-visible blast events.</li> </ul>
<b>Material Excavation</b>	
<p>Finer aggregates during excavation and loading causing dust that moves off-site</p>	<ul style="list-style-type: none"> <li>• Forecast weather conditions are checked and appropriate controls are planned with respect to wind direction and speed;</li> <li>• Excavators will preferentially work shielded from prevailing winds. Where this is not possible, the water cannon will be used; and</li> <li>• Water cart and cannon will wet down areas prior to and post excavation if required.</li> </ul>

Potential Impact	Controls
<b>Wheel generated dust</b>	
<p>Excavators, front end loaders and truck movements creating dust that moves off-site</p> <p>Front end loaders and machinery movements between pit and stockpile area creating dust that moves off-site</p> <p>Use of light vehicles generating dust that moves off-site</p>	<ul style="list-style-type: none"> <li>• Ensure speeds are safe and are minimised to suppress dust emissions;</li> <li>• Use of haul road dust suppressants. Magnesium chloride used as a haul road dust suppression additive over the summer months and in response to environmental conditions, allowing for more efficient water cart utilisation and decreased water consumption;</li> <li>• Daily visual assessment of vehicle routes. Re-route vehicles from problem areas;</li> <li>• Sprinklers and water cart/s deployed in summer and/or windy and dry conditions;</li> <li>• Water cart deployment prior to plant start-up procedures in summer and/or windy and dry conditions;</li> <li>• Use a skid steer (or grader) to remove accumulating material on roads as required; and</li> <li>• Asphalt laid around weighbridge and visitor car park to decrease the surface extent of unsealed surfaces.</li> </ul>
<b>Dust from loading and movement</b>	
<p>Finer aggregates during loading and unloading causing dust that moves off-site</p>	<ul style="list-style-type: none"> <li>• Material loads are sufficiently wetted (visual assessment) to minimise dust;</li> <li>• Adhere to site speed limits;</li> <li>• Tipping of product at the stockpile area to occur slowly and in stages;</li> <li>• Height of tipping activity is reduced with a loader used to spread the material;</li> <li>• Sprinklers and water carts deployed in summer and/or windy and dry conditions; and</li> <li>• Water reticulation on stockpile area to provide dust suppression when required.</li> </ul>
<p>Aggregate from the site is expected to be transported by haul trucks that may deposit dust off- site</p>	<ul style="list-style-type: none"> <li>• Trucks will not be overloaded; and</li> <li>• Trucks will be covered prior to leaving site or load dampened.</li> </ul>
<b>Crushing and Screening</b>	

Potential Impact	Controls
Finer aggregates during excavation and loading causing dust that moves off-site	<ul style="list-style-type: none"> <li>• Crushing generating dust that is airborne and/or accumulates on the ground before becoming entrained in wind and leaving the site boundary;</li> <li>• Water sprays used at the outputs of units;</li> <li>• Water cart deployed/water sprays used prior to plant start-up procedures in summer and/or windy and dry conditions;</li> <li>• Adjust the rate of crushing to respond to the meteorological conditions.</li> </ul>
<b>Wind erosion from stockpiles and exposed areas</b>	
Dust from the surface of stockpiles and other exposed areas leaving the Mining Lease through wind	<ul style="list-style-type: none"> <li>• Minimise stockpile drop heights;</li> <li>• Timed switched sprinklers used at regular intervals in summer, and/or dry and windy conditions;</li> <li>• Use of dust suppressants / sealants;</li> <li>• Vegetative cover established as soon as practicable;</li> <li>• Water cart and cannon used to suppress dust;</li> <li>• Consider daily forecasts to inform construction activities to limit dust generating activities;</li> <li>• Use water line to assist with revegetation and moisture for dust suppression along the exposed area of the stockpile.</li> </ul>
<b>Track-out</b>	
Materials dropping through tailgates or collecting on the wheels of vehicles depositing on internal or external roads that may then cause nuisance	<ul style="list-style-type: none"> <li>• Tailgates to be locked;</li> <li>• Spillage from side trails, tail gates and drawbars are cleared;</li> <li>• Check that loads are covered or load dampened;</li> <li>• Entrance road cleaned with street sweeper at regular intervals; and</li> <li>• Additional asphalt surface at the quarry entrance up to and around the weighbridge.</li> </ul>

## SECTION 5 – DUST MONITORING

This section details the air quality sampling program, including the monitoring sites, equipment and frequency of monitoring.

### 5.1 DUST DEPOSITION

#### 5.1.1 INTRODUCTION

Airborne dust has the potential to cause nuisance impacts by deposition on surfaces.

Dust deposition monitoring will occur at a minimum of 6 locations providing, total solids, insoluble solids and soluble solids (utilising dust deposition gauges) at locations along the southern and western boundary of the Mining Lease. Dust deposition gauges are co-located with High Volume Air Samplers to the east and south of the Quarry.

#### 5.1.2 MONITORING EQUIPMENT

Dust deposition gauges measure the rate at which dust settles onto a surface. A dust deposition gauge consists of a  $150 \pm 10$  mm diameter glass funnel supported by a rubber or plastic stopper in the neck of a glass jar which has a minimum volume of four litres. The stopper has a groove or outlet pipe which allows water to overflow in the event of excessive rain. The gauge is set up on a stand, in such a way that the top of the funnel is horizontal and positioned approximately  $2 \pm 0.2$  m above ground level.

Over the sampling period (usually  $30 \pm 2$  days) dust particles that settle out from the ambient air collect in the jar, together with any rainwater.

The deposition gauges established will be operated and maintained in accordance with AS/NZS 3580.10.1:2003 Methods for sampling and analysis of ambient air: Determination of particulate matter—Deposited matter—Gravimetric method.

The sampling inlet should be positioned giving consideration to AS/NZS 3580.1.1:2007, including:

- height above ground level:  $2\text{m} \pm 0.2$ ;
- distance from source:  $\geq 5$  m;
- clear sky angle above sampling inlet:  $120^\circ$ ;
- unrestricted airflow around sampling inlet:  $360^\circ$ ;
- distance from drip line of trees: 10 m; and
- no extraneous sources nearby.

#### 5.1.3 ANALYSES AND CRITERIA

On completion of the sampling period (usually  $30 \pm 2$  days), the jar is removed, sealed, labelled, and sent to a NATA accredited laboratory as soon as possible, and within 30 days of collection, for analysis in accordance with AS/NZS 3580.10.1:2003. It must be kept in a cool, dark environment prior to analysis.

The mass deposition rate of insoluble deposited matter is determined at the laboratory, considering the mass of insoluble solids collected, the funnel cross-sectional area and the exposure period. The results are reported in g/m<sup>2</sup>/month or mg/m<sup>2</sup>/day.

Dust deposition monitoring results are assessed by comparison against the air quality criteria below.

#### Deposition of insoluble solids, NSW EPA criteria

Maximum rate	Maximum increase
4 g/m <sup>2</sup> /month	2 g/m <sup>2</sup> /month

To assist in determining compliance with the impact assessment criteria, assessment of the 'ash' component of the dust sample will also be undertaken. Due to the nature and composition of the hard rock resource, and the many pollutants that can make up 'insoluble solids', ash will be used as an indicator of quarry dust contribution. This will ensure that organic pollutants such as bird dropping, pollen, wind-blown vegetation and the like will not be confused with the inorganic dust contribution.

Monitoring results will be assessed against previous monitoring results to identify changes or trends to dust deposition over time.

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#### 5.1.4 TIMING AND FREQUENCY

Each dust deposition gauge is to be replaced on the first day of each month (or as near as possible to the first day of each month) i.e. on a 30 ± 2 days cycle.

Sampling should occur for a minimum of 24 months from the commencement of the activity and then be reviewed based on the results (including the frequency, if any, of exceedances and complaints raised from the public). The frequency of sampling should be adjusted accordingly, and any new regime only implemented once approved by the EPA.

## 5.2 PARTICULATE MATTER CONCENTRATIONS

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### 5.2.1 INTRODUCTION

Particulate matter has the potential to have nuisance impacts, and small particles can affect visibility and human health.

Real-time multi-channel particulate monitoring of PM<sub>10</sub> and PM<sub>2.5</sub> levels will be conducted on the southern boundary, directly south of the stockpile and loading area, using a DRX DustTrack instrument (optical particle counter).

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### 5.2.2 MONITORING LOCATIONS AND EQUIPMENT

PM<sub>10</sub> monitoring is to be conducted to the east and south of the Quarry, preferably on the land at 44 East Arm Rd, Hillwood and 285 East Arm Rd, Mount Direction (at or at locations equivalent to the existing dwellings). Agreement would need to be sought from the land owners for this to occur. If this is not possible then alternative locations would need to be considered.

A High-Volume Air Sampler with PM<sub>10</sub> sampling head and filters exchanged at intervals of no greater than 1-week. In addition to PM<sub>10</sub> monitoring dust deposition is to be monitored at the two locations. The sampler is to be operated and maintained in accordance with AS/NZS 3580.9.6 - 2003 Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – PM<sub>10</sub> high volume sampler with size selective inlet – Gravimetric method and the instrument operating manual.

The Quarry will also retain a Low Volume Air Sampler with PM<sub>2.5</sub> and PM<sub>10</sub> sampling heads for spot 24 hr sampling around high dust generating periods at the quarry (i.e. on days when blasting occurs and/or high wind speed conditions) with the location of deployment based on wind direction (i.e. downwind of operations).

All monitoring should be conducted with the minimum wind speed and direction be measured at each High-Volume Air Sampler at a minimum height above ground of 3.5 m.

### 5.2.3 ANALYSES AND CRITERIA

At the conclusion of the sampling period (24 ± 1 hours), the filters in the samplers are replaced. The removed filters will be individually folded so that only surfaces with collected particulate matter are in contact. They will then be placed in separate, suitably labelled, dustproof containers and sent to a NATA accredited laboratory for preparation and weighing.

The TSP, PM<sub>2.5</sub>, and PM<sub>10</sub> concentrations will be determined at the laboratory by dividing the mass of collected particulate matter by the total volume of air drawn in the sampling period. The results are reported in µg/m<sup>3</sup>.

Monitoring results are to be assessed by comparison against the air quality criteria below.

#### PM<sub>10</sub>

Averaging period	Maximum concentration
1 day	50 µg/m <sup>3</sup>
1 year	25 µg/m <sup>3</sup>

#### PM<sub>2.5</sub>

Averaging period	Maximum concentration
1 day	25 µg/m <sup>3</sup>
1 year	8 µg/m <sup>3</sup>

#### TSP

Total Suspended Particulate Matter (TSP), NSW EPA criteria.

Averaging period	Maximum concentration
1 year	90 µg/m <sup>3</sup>

Monitoring results will be assessed against previous monitoring results to identify changes or trends to dust deposition over time.

### 5.2.4 TIMING AND FREQUENCY

High-Volume Air Samplers can be programmed to operate concurrently and continuously for  $24 \pm 1$  hours on a cycle or manually. As soon as practical after the completion of a sampling period, the filter will be collected. The used filter will be sent to a NATA accredited laboratory for analysis as soon as possible.

Sampling should occur for a minimum of 24 months from the commencement of the activity and then be reviewed based on the results (including the frequency, if any, of exceedances and complaints raised from the public). The frequency of sampling should be adjusted accordingly, and any new regime only implemented once approved by the EPA.

Low Volume Air Sampler collected samples should be done on an ad hoc basis, generally in support of the HVAS collected samples and to identify any specific problem areas where dust emissions are encountered.

### 5.3 SPOT MONITORING

The Quarry will 'spot' monitor dust deposition and particulate matter (TSP,  $PM_{2.5}$ ,  $PM_{10}$ ) concentrations within and in the vicinity of the Quarry based on the summary provided in **Table 6**. The 'spot' monitoring methods are **in addition to the monitoring described in Sections 5.1 and 5.2**. The additional monitoring may for example be conducted to further identify problem areas of dust emissions, and to investigate complaints about emissions (which may for example require more intensive monitoring around or near a dwelling).

Siting and operation of air quality monitoring equipment is to be in accordance with Australian Standard methodology.

**Table 6. Summary of 'Spot' Monitoring Program**

Parameter	Averaging Period	Sampling Period <sup>3</sup>	Sample Collection	Equipment
Deposited Dust	1 Month	Continuous	Every 30 days ( $\pm 2$ days) for 24 months	Dust Deposition Gauge
TSP	24 hours	$24 \pm 1$ hours	At least once per month at each site for a minimum of 24 months	High Volume Air Sampler Low Volume Air Sampler
$PM_{10}$	24 hours	$24 \pm 1$ hours	At least once per month at each site for a minimum of 24 months	High Volume Air Sampler fitted with size selective inlet Low Volume Air Sampler fitted with size selective inlet

<sup>3</sup> Continuous monitoring excludes periods for instrument calibrations/ maintenance and extended periods of data downloads.

PM <sub>2.5</sub>	24 hours	24± 1 hours	At least once per month at each site for a minimum of 24 months	Low Volume Air Sampler fitted with size selective inlet
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## 5.4 VISUAL ASSESSMENTS

Opportunistic visual inspections are conducted for evidence of site dust moving beyond the site boundary and is used to formulate reactive management strategies for quarry operations.

Formal analysis of visual monitoring will not be required. However, visual observations of excessive dust generation will feed into site management responses to minimise air quality impacts on privately owned land. Instances of dust observed moving off-site will be documented as set out in **Section 7**.

## 5.5 METEOROLOGICAL CONDITIONS

### 5.5.1 INTRODUCTION

Real-time measurements of meteorological conditions are taken to support dust monitoring and to identify weather conditions which may trigger the need to modify operations. For instance, conditions that may be conducive to excessive dust generation and/ or movement of dust onto neighbouring properties, e.g. strong north-easterly winds, may trigger overburden dumping to cease temporarily.

### 5.5.2 MONITORING EQUIPMENT

A solar-powered weather station is to be installed and maintained at a yet to be determined location in the Quarry. This station will consist of solar panels, a weatherproof enclosure which contains a data logger (which reads the sensors) and power supply, and sensors which continuously measure:

- rainfall;
- wind speed and direction (measured at three metres above ground level);
- relative humidity;
- temperature; and
- solar radiation.

The station will be equipped with a digital cell phone kit which retrieves data from the logger and transmits it directly to a computer at the site office. Software is to be used for automatically downloading the data and to create monitoring programs e.g. for calculations of evaporation and temperature inversion. The equipment facilitates real-time monitoring of weather conditions.

## 5.6 CALIBRATION AND MAINTENANCE

Inspection, calibration, cleaning, and maintenance of air monitoring equipment is scheduled and performed to NATA requirements and in accordance with AS/NZS 3580.9.3 - 2003 and AS/NZS 3580.9.6 – 2003 and the manufacturer’s specifications as applicable.

Dust deposition gauges are to be checked monthly with any ongoing maintenance of gauge equipment and parts to be undertaken at this time. The air samplers and weather station are to be calibrated and maintained according the manufacturer’s specifications.

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## SECTION 6 – DUST RESPONSE PLAN

### 6.1 INTRODUCTION

The objective of this section is to provide procedures for responding to impacts identified by the monitoring program and by routine monitoring of air quality management systems.

It is also designed to act as a response plan for taking action in the unlikely event that an unforeseen incident occurs at the site; e.g. Failure of dust suppression equipment, visual wind-borne dust etc.

Responding to identified impacts will be the responsibility of the Quarry Supervisor.

### 6.2 DUST EXCEEDANCE/NON-COMPLIANCE RESPONSE

Air quality monitoring exceedances may result due to activities at the quarry or due to the surrounding environmental conditions and other activities. Exceedances are notified once the samples have been analysed and supplied by the NATA accredited laboratory.

Should an exceedance / non-compliance be identified the following actions will be taken:

- the EPA will be notified of the exceedance / non-compliance within seven days of its identification;
- an investigation will be undertaken to establish the root cause. This will include checking weather conditions at the time of the exceedance/non-compliance, Quarry operations and other possible impacts. Other associated data should be considered in the investigation;
- subject to the findings of the investigation actions will be taken to minimise any reoccurrence of the exceedance/ non-compliance where possible; and
- the identified cause of the impact and the selected response will be formally documented in an incident response report and electronically recorded in the incident management system.

### 6.3 DUST INCIDENCE RESPONSE

Adverse air quality impacts due to dust emissions are likely to be associated with the malfunction or inadequate application of operational procedures, resulting from an incident. This would potentially include:

- wind borne dust from stockpiles; and
- failure of operating equipment or infrastructure.

Once it is identified that air quality may be impacted by the operations and result in an offsite disturbance or cause an incident<sup>4</sup> the actions presented in **Table 7** are to be temporarily applied by the reduced or altered intensity of the activity, and/or additional temporary control(s) implemented.

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<sup>4</sup> An incident as defined to be “an occurrence or set of circumstances that causes or threatens to cause material harm and which may or may not be or cause a non-compliance.”

**Table 7. Temporary measures to respond to an increased risk of dust emissions**

Activity	Temporary Intensity Reduction	Temporary Control
<b>Drilling</b>	Cease drilling until more favourable conditions return	Cease drilling until more favourable conditions return Deploy water cannon to area
<b>Vehicle movements (wheel generated dust)</b>	Reduce vehicle movements	Re-route vehicles from problem areas (e.g. near site boundaries; route not serviced by sprinkler etc.) Concentrate water cart and cannon on one route and limit vehicles to this route
<b>Loading and moving material</b>	Reduce vehicle movements Cease transfer of material from pit to stockpile area until more favourable conditions return	Deploy water cannon to area Increase sprinkler watering rate
<b>Crushing and screening</b>	Cease crushing and screening until more favourable conditions return	Increase sprinkler watering rate Provide additional water cannon misting Cease crushing and stockpiling material
<b>Wind erosion of unconsolidated stockpiles or exposed areas</b>	N/A	Increase sprinkler and/or water cart rate Deploy water cannon

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## SECTION 7 – REPORTING AND REVIEW

### 7.1 REPORTING

Compliance with relevant air quality criteria will be managed by appropriate operational management, which includes:

#### 7.1.2 ANNUAL REVIEW (AR)

The Environmental Officer is responsible for managing the environmental reporting program and arranging specialist consultants to prepare reports, as required.

The activities and performance outcomes of the DMP will be presented in the Annual Review (AR) and include detailed assessment of monitoring results collected over the course of the DMP, an evaluation of any trends occurring across the site, any community/stakeholder complaints or non-conformances with licences/criteria and recommendations for management actions.

By 30 June in each year starting after the commencement of Quarry, or other timeframe agreed by the EPA, a report must be submitted to the EPA reviewing the environmental performance of the DMP, to the satisfaction of the EPA.

The AR must:

- include a comprehensive review of the monitoring results and complaints records of the project over the previous calendar year, which includes a comparison of these results against the:
  - relevant statutory requirements, limits or performance measures/criteria;
  - requirements of any plan or program required under this approval; and
  - monitoring results of previous years; and
- identify any non-compliance over the past calendar year, and describe what actions were (or are being) taken to rectify the non-compliance and avoid reoccurrence;
- evaluate and report on:
  - the effectiveness of the noise and air quality management systems; and
  - compliance with the performance measures, criteria and operating conditions in this approval;
- identify any trends in the monitoring data over the life of the project;
- identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and
- describe what measures will be implemented over the next calendar year to improve the environmental performance of the project.

### 7.2 REVIEW

The DMP is to be reviewed within 3 months of:

- the submission of an incident report;

- the submission of an Annual Review;
- the approval of any modification of the conditions of this approval (unless the conditions require otherwise); or
- the issue of a direction of the EPA which requires a review.

A review may be of short duration and not result in any change to the DMP, especially if there are no exceedances, non-compliances, or incidents to report.

If necessary, to either improve the environmental performance of the project, cater for a modification, or comply with a direction, this plan must be revised, to the satisfaction of the EPA and submitted to the Director for approval within six weeks of the review.

The proponent will continue to apply existing management plans, strategies, or monitoring programs prior to the determination of a modification until the approval of a similar plan, strategy, or program.

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