AIR QUALITY AND GREENHOUSE GAS MANAGEMENT PLAN

Edition	Rev.	Comments	Author	Authorised By	Date
1	0	Initial document	R.W. Corkery & CO Pty Ltd	Keith Ross	December 2005
	1	Document review	Jill Scealy	Danny Young	June 2009
2	0	2010 Modification review	Jill Scealy	Danny Young	March 2011
	1	Inclusion of greenhouse gas management information	Jill Johnson	Danny Young	January 2012
	2	PA11_0047 review	Lachy Johnson	Jill Johnson	June 2014
	3	PA11_0047 review	Lachy Johnson	Jill Johnson	September 2014
	4	PA11_0047 review	Lachy Johnson	Jill Johnson	January 2015
	5	PA11_0047 review	Lachy Johnson	Anthony Margetts	June 2017
	6	PA11_0047 review	Todoroski Air Sciences	Environmental Superintendent	August 2018
	7	PA11_0047 review	Todoroski Air Sciences	Environmental Superintendent	October 2019
	8	Response to RFI from DPIE	Todoroski Air Sciences	Environmental Superintendent	February 2021
	9	PA11_0047 review (MOD7)	TCM	TCM	May 2021

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ACRONYMS USED THROUGHOUT THIS DOCUMENT

AQGGMP	-	Air Quality & Greenhouse Gas Management Plan
AR	-	Annual Review
AS	-	Australian Standard
BTM	-	Boggabri – Tarrawonga - Maules Creek
CCC	-	Community Consultative Committee
DPIE	-	Department of Planning Infrastructure and Environment
EA	-	Environmental Assessment
EPA	-	Environment Protection Authority
EPL	-	Environment Protection Licence
HVAS	-	High Volume Air Sampler
ML	-	Mining Lease
NATA	-	National Association of Testing Authorities
$PM_{2.5}$		Particulate Matter with aerodynamic diameter less than 2.5µg
PM_{10}	-	Particulate Matter with aerodynamic diameter less than 10µg
TCM	-	Tarrawonga Coal Mine
TCPL	-	Tarrawonga Coal Pty Ltd
TSP	-	Total Suspended Particulate Matter

1 INTRODUCTION

The Tarrawonga Coal Mine (TCM) is located approximately 15 km northeast of Boggabri, 10km north of the Canyon Coal Mine (formerly Whitehaven, in closure) and south of, and adjacent to, the Boggabri Coal Mine (BCM) (Figure 1). The mine site is contained within Mining Lease (ML) 1579, ML 1693, ML 1685 and ML 1749 as shown in Figure 1. The mine site is being developed by Tarrawonga Coal Ltd (TCPL), which is owned by Whitehaven Coal Mining Pty Ltd.

The mine site operates under Project Approval (PA) 11_0047 (granted 22 January 2013), and have made 8 Modifications since this date. TCPL also operates under Environment Protection Licence (EPL) 12365.

The operation of a mine has potential to impact on the air quality within and beyond the boundaries of the mine site. This Air Quality & Greenhouse Gas Management Plan (AQGGMP) has been developed to manage the potential impacts of TCM on local air quality, and to maintain compliance with Condition 3(29) of PA 11_0047.

The AQGGMP has been prepared with reference to relevant legislation, approvals and guidelines, follows the management plan requirements specified in Schedule 3 Condition 3 of PA 11_0047 and is consistent with the following documents:

- Tarrawonga Coal Project Environmental Assessment January 2012 – specifically Section 4.7; and
- Tarrawonga Coal Project – Appendix D Air Quality Impact Assessment.

As required by PA 11_0047, the EPA has been consulted during preparation of this plan.

The Tarrawonga Coal Mine Project Environmental Assessment and previous Annual Environmental Management Reports/Annual Reviews (AEMR/Annual Review) for the site should be referred to for comprehensive baseline data.

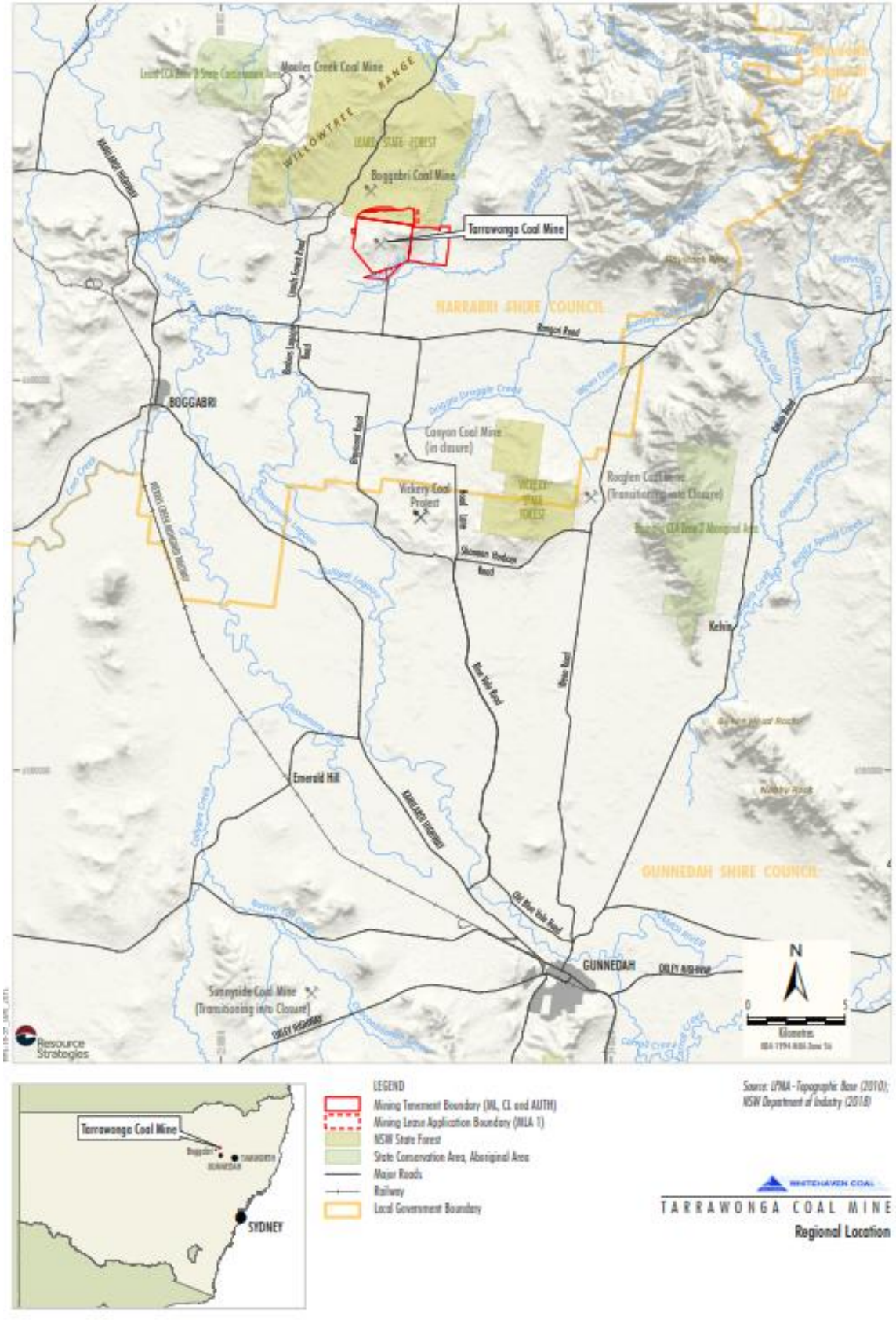

Figure 1 Tarrawonga Coal Mine Location

2 AIR QUALITY STATUTORY REQUIREMENTS

The air quality statutory criteria for the project have been incorporated in PA 11_0047 Conditions 3(22) – 3(30) as reproduced below. These conditions set out the applicable air pollutant concentration criteria and management/ operational requirements to mitigate air quality impacts, not only in relation to dust, but also relating to odour and greenhouse gas emissions.

Odour

22. Unless otherwise authorised by an EPL, the Proponent shall ensure that no offensive odours are emitted from the site, as defined under the POEO Act.

Greenhouse Gas Emissions

23. . The Proponent shall implement all reasonable and feasible measures to minimise the release of greenhouse gas emissions from the site to the satisfaction of the Secretary.

Air Quality Criteria

24. The Proponent shall ensure that all reasonable and feasible avoidance and mitigation measures are implemented so that the particulate emissions generated by the project do not exceed the criteria listed in Table 6, Table 7 and Table 8 at any residence on privately-owned land or on more than 25 per cent of any privately owned-land.

The assessment acknowledges that it may not be reasonable and feasible to prevent exceedance of the PM_{10} criteria in Table 6 at property [e]45 and exceedance of the criteria in Table 7 in year 16 at property [f]49. (To interpret the property locations referred to see the applicable figure(s) in Appendix 5.)

Table 6: Long term criteria for particulate matter

Pollutant	Averaging period	[d]Criterion
Total suspended particulate (TSP) matter	Annual	[a]90 µg/m^3
Particulate matter <10 µm (PM_{10})	Annual	[a]30 µg/m^3

Table 7: Short term criterion for particulate matter

Pollutant	Averaging period	[d]Criterion
Particulate matter <10 µm (PM_{10})	24 hour	[a]50 µg/m^3

Table 8: Long term criteria for deposited dust

Pollutant	Averaging period	Maximum increase in deposited dust level	Maximum total deposited dust level
Deposited dust	Annual	[b]2 g/m^2/month	[a]4 g/m^2/month

Notes to Table 6, Table 7 and Table 8:

- *[a] Total impact (i.e. incremental increase in concentrations due to the project plus background concentrations due to other sources);*
- *[b] Incremental impact (i.e. incremental increase in concentrations due to the project on its own)*
- *[c] Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1-2003: Methods for Sampling and Analysis of Ambient A – Determination of Particulates – Deposited Matter – Gravimetric Method.*
- *[d] Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents, or any other activity agree to by the Secretary.*
- *"Reasonable and feasible avoidance measures" includes, but is not limited to, the operational*

requirements in conditions 28 and 29 to develop and implement a real-time air quality management system that ensures operational responses to the risk of exceedance of the criteria.

- [e] *Property 45 has been acquired (joint ownership between Boggabri Coal and Tarrawonga Coal) and is now project owned land.*
- [f] *Property 49 is a vacant landholding with no residence*

Mine Specific Air Quality Criteria

25. The Proponent shall ensure that particulate matter emissions generated by the project do not exceed the criteria listed in Table 9 at any residence on privately- owned land or on more than 25 percent of privately-owned land, except on property 49 in year 16.

Table 9: Long term land acquisition criteria for particulate matter

Pollutant	Averaging period	Criterion
Particulate matter < 10 µm (PM_{10})	24 hour	50 µg/m^3

Note:
As provided by the EP&A Act, the criterion in Table 9 may be amended to a more stringent criterion in an EPL, after the first review of the EPL under section 78 of the POEP Act.

Air Quality Acquisition Criteria

26. If particulate matter emissions generated by the project exceed the criteria, or contribute to an exceedance of the relevant cumulative criteria, in Table 10, Table 11 or Table 12, at any residence on privately-owned land or on more than 25 percent of any privately-owned land, then upon receiving a written request for acquisition from the landowner the Proponent shall acquire the land in accordance with the procedures in conditions 8 and 9 of schedule 4.

Table 10: Long term land acquisition criteria for particulate matter

Pollutant	Averaging period	[d] Criterion
Total suspended particulate (TSP) matter	Annual	[a]90 µg/m^3
Particulate matter < 10 µm (PM_{10})	Annual	[a] 30 µg/m^3

Table 11: Short term land acquisition criteria for particulate matter

Pollutant	Averaging period	[d] Criterion
Particulate matter < 10 µm (PM_{10})	24 hour	[a] 150 µg/m^3
Particulate matter < 10 µm (PM_{10})	24 hour	[b] 50 µg/m^3

Table 12: Long term land acquisition criteria for deposited dust

Pollutant	Averaging period	Maximum increase in deposited dust level	Maximum total deposited dust level
[c] Deposited dust	Annual	[b] 2 g/m^2/month	[a] 4 g/m^2/month

Notes to Table 10, Table 11 and Table 12:

[a] Total impact (i.e. incremental increase in concentrations due to the project plus background concentrations due to all other sources);

[b] Incremental impact (i.e. incremental increase in concentrations due to the project on its own);

[c] Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method;

[d] Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents, or any other activity agreed by the Secretary.

Mine-owned Land

27. *The Proponent shall ensure that all reasonable and feasible avoidance and mitigation measures are implemented so that particulate matter emissions generated by the project do not exceed the criteria in Table 6, Table 7 and Table 8 at any occupied residence on any mine-owned land (including land owned by adjacent mines), unless:*
    - *(a) the tenant and/or landowner has been notified of any health risks in accordance with the notification requirements under schedule 4 of this approval;*
    - *(b) the tenant on project-related land can terminate the tenancy agreement without penalty, subject to giving reasonable notice, and the Proponent uses its best endeavours to provide assistance with relocation and sourcing of alternative accommodation;*
    - *(c) air mitigation measures such as air filters, a first flush roof water drainage system and/or air conditioning) are installed at the residence, if requested by the tenant and landowner (where owned by another mine other than the Proponent);*
    - *(d) particulate matter air quality monitoring is undertaken to inform the tenant and landowner of potential health risks; and*
    - *(e) monitoring data is presented to the tenant in an appropriate format, for a medical practitioner to assist the tenant in making an informed decision on the health risks associated with occupying the property,*

    to the satisfaction of the Secretary.

Operating Conditions

28. *The Proponent shall:*
    - *(a) implement best practice air quality management practices on site, including all reasonable and feasible measures to minimise odour, fume and dust emissions of the project;*
    - *(b) operate a comprehensive air quality management system on site that uses a combination of predictive meteorological forecasting, predictive and real time air dispersion modelling and real-time air quality monitoring data to guide the day-to-day planning of mining operations and implementation of both proactive and reactive air quality mitigation measures to ensure compliance with the relevant conditions of this approval;*
    - *(c) manage $PM_{2.5}$ levels in accordance with any requirements of an EPL;*
    - *(d) minimise the air quality impacts of the project during adverse meteorological conditions and extraordinary events (see noted under Table 8);*
    - *(e) minimise any visible air pollution generated by the project;*
    - *(f) minimise the surface disturbance of the site generated by the project; and*
    - *(g) co-ordinate the air quality management on site with the air quality management at other mines within the Leard Forest Mining Precinct to minimise the cumulative air quality impacts of the mines,*

    to the satisfaction of the Secretary.

Air Quality and Greenhouse Gas Management Plan

29. *The Proponent shall prepare and implement an Air Quality and Greenhouse Gas Management Plan for the project to the satisfaction of the Secretary. This plan must:*
    - *(a) be prepared in consultation with the EPA and be submitted to the Secretary for approval by the end of May 2013;*
    - *(b) describe the measures that would be implemented to ensure:*
        - *best practice management is being employed;*
        - *the air quality impacts of the project are minimised during adverse meteorological conditions and extraordinary events; and*
        - *compliance with the relevant conditions of this approval;*
    - *(c) describe the proposed air quality management system;*

(d) include a risk/response matrix to codify mine operational responses to varying levels of risk resulting from weather conditions and specific mining activities;

(e) include commitments to provide summary reports and specific briefings at CCC meetings on issues arising from air quality monitoring;

(f) include an air quality monitoring program that:

- *uses a combination of real-time monitors and supplementary monitors to evaluate the performance of the project;*
- *adequately supports the proactive and reactive air quality management system;*
- *includes $PM_{2.5}$ monitoring;*
- *includes monitoring of occupied mine-owned residences and residences on the air quality affected land in Table 1, subject to the agreement of the tenant and/or landowner;*
- *evaluates and reports on the effectiveness of the air quality management system;*
- *includes sufficient random audits of operating responses to real time air quality management systems to determine the ongoing effectiveness of these responses in maintaining the project within the relevant criteria in this schedule and the requirements of conditions 24 and 25, above;*
- *includes a protocol for determining any exceedances of the relevant conditions in this approval; and*

(g) includes a Leard Forest Mining Precinct Air Quality Management Strategy that has been prepared in consultation with other coal mines in the Precinct to minimise the cumulative air quality impacts of all mines within the Precinct, that includes:

- *systems and processes to ensure that all mines are managed to achieve their air quality criteria;*
- *a shared environmental monitoring network and data sharing protocol;*
- *control monitoring site(s) to provide real time data on background air quality levels (i.e. not influenced by mining in the Leard Forest Mining Precinct and representative of regional air quality);*
- *a shared predictive and real time air dispersion model covering the Leard Forest Mining Precinct to be used for assessment of cumulative impacts, optimising location of the shared real time monitoring network, validation of air predictions and optimising mitigation measures; and*
- *procedures for identifying and apportioning the source/s and contribution/s to cumulative air impacts for both mines and other sources, using the air quality and meteorological monitoring network and appropriate investigative tools such as modelling of post incident plume dispersion, dual synchronised monitors and chemical methods of source apportionment (where possible).*

Notes:

- *The requirement for regionally based control sites can be further reviewed if a regional air monitoring network is implemented and operated by the EPA as recommended in the draft Strategic Regional Land Use Plan for New England North West.*
- *The Leard Forest Mining Precinct Air Quality Management Strategy can be developed in stages and will need to be subject to ongoing review dependent upon the determination of and commencement of other mining projects in the area.*
- *The management plan should be consistent with the EPA's guidance on Best Management Practice reporting and Reactive Particulate Management Strategies.*

Meteorological Monitoring

30. For the life of the project, the Proponent shall ensure that there is a meteorological station in the vicinity of the site that:

(a) complies with the requirements in the Approved Methods for Sampling of Air Pollutants

in New South Wales guideline; and

(b) is capable of continuous real-time measurement of temperature lapse rate in accordance with the NSW Industrial Noise Policy, unless a suitable alternative is approved by the Secretary following consultation with the EPA.

3 AIR QUALITY CONTROLS AND MANAGEMENT PROCEDURES

TCM adopts a range of design and operational safeguards and operational procedures for the mine to ensure that the effectiveness of the air quality controls are optimised throughout all stages of the mine's development and operation.

The controls have been selected largely based on their proven effectiveness at both TCM and other similar mines.

The controls reflect the possible range of air quality mitigation measures that are feasible and can be applied to achieve a standard of mine operation consistent with current best practice for the control of dust emissions from coal mines in NSW.

3.1 Daily activity planning

TCM uses a predictive meteorological forecasting and predictive air dispersion modelling, together with real time monitoring data to inform operational practices. This aids in the day to day planning of mining activities giving due consideration to prevailing weather conditions and potential for dust generation and dispersion.

Operators, maintenance staff and contractors are advised of real time 24 hour average PM_{10} levels at the commencement of both shifts. All employees and contractors undertake toolbox talks to identify, report, and minimise dust levels originating from mining operations.

3.2 Continuous operational management

Continuous surveillance of visible dust plumes from all activities is carried by operators, maintenance staff and contractors. Visible dust plumes are controlled to not extend beyond twice the size (e.g. length) of the source. A Trigger Action Response Plan (TARP) for visual surveillance of dust is included in Section 4.6.1. Activity is modified or ceased where excessive visible plumes of dust cannot be abated.

Surveillance of visual dust is formalised and documented when meteorological condition thresholds for wind speed are reached, as set out in the TARP in Section 4.6.2. The TARP also triggers direct response actions up to temporary cessation of activity, when any second level meteorological (wind) condition thresholds are reached.

3.3 Activity specific mitigation and management measures

In addition to the daily planning and continuous operational management measures, measures that are specific to various activities are implemented, as set out in the following sections.

3.3.1 Vegetation Clearing and Soil Stripping

- Cleared trees and branches are retained where possible for the use in stabilising slopes identified for rehabilitation with native woodland communities.

- Where practicable, soil stripping is undertaken at a time when there is sufficient soil moisture to prevent significant dust lift-off.
- Dust suppression by water application is used to increase soil moisture if stripping occurs during periods of high wind or low soil moisture.
- During adverse weather conditions soil stripping activities will be suspended if the dust mitigation controls are not considered to be effective.
- Vegetation clearance and soil stripping will be confined to an area sufficient for the following 12 months mining activities. This will minimise the areas exposed to dust lift off as much as practically possible.

3.3.2 Drilling and Blasting Activities

- Drill rigs utilise water injection and/or fitted with dust collectors. Drill areas are moistened. Blast hole stemming is used to prevent venting of explosion gases.
- Blasting is conducted both before the establishment, and after the break-up of, low-level atmospheric temperature inversions (category F-G).
- Blasting will be subject to an assessment (Pre Blast Environmental Checklist) of weather conditions prior to and on the day of a blast, to ensure that wind speed and direction will not result in significant dust emissions or blast fume impacts on neighbouring residences.
- Review of geological conditions to inform blast design.
- Minimise the time between drilling, loading and shooting the blast.
- Coordinate blasting schedule with other BTM Complex mines.

3.3.3 Overburden Ripping and Coal Mining

- Ripping of softer overburden material is avoided during adverse weather conditions.
- In-situ coal moisture has been sampled to be >5.5%; no further moisture sampling required. Visual inspections utilised to assess air quality.
- Drop heights are minimised.
- Operations are modified during adverse weather conditions when excessive visible dust cannot be controlled.

3.3.4 Internal Road and Hardstand Area Construction

- Clearing ahead of construction activities is minimised.

- Cleared areas are watered regularly during any construction activities, where appropriate.
- Unsealed roads associated with construction activities will be watered utilising site water carts to minimise dust generation. Where necessary additional water applications will be made, and/or chemical dust suppressants will be used to minimise dust lift off from unsealed roads.
- Construction equipment and trucks will be subject to speed limits in place at the site.

3.3.5 Coal Processing Area

- Water is applied to the coal at the feed hopper, crusher and at all conveyor transfer and discharge points.
- All conveyors are fitted with appropriate cleaning and collection devices to minimise the amount of material falling from the return of conveyor belts.
- Some flexibility exists to temporarily cease or modify operation during adverse weather conditions, or significant dust generation and dispersal towards the surrounding private residences.
- Trucks transporting coal offsite from the Coal Processing Area must be covered immediately after loading to prevent windblown emissions and spillage. The covering must be maintained until immediately before unloading the trucks (as per Condition O3.2 of EPL 12365).
- In dry windy conditions, trucks on the loading bin loop will reduce their speed to 10km/hr to minimise risk of potential dust lift off.
- Conveyors and transfer points are shielded from wind or enclosed where practical.
- Aim to dump ROM directly to hopper and use ROM stockpiles for overflow.

3.3.6 Wind Erosion Management

- The extent of clearing/site preparation in advance of mining will be confined to an area sufficient for the following 12 months mining activities Progressive rehabilitation of areas of disturbance, including topsoil and subsoil stockpiles is undertaken in accordance with the approved MOP.
- Usage of additional sprayers or similar will be implemented during adverse wind conditions.
- Spillage from loading/unloading is cleaned up as soon as practical.
- Progressive reshaping of topsoil and overburden emplacement areas is undertaken. Stockpile height is limited.

3.3.7 Internal Transport

- The road for the transportation of coal product between the mine facilities area and mine entrance is sealed.
- Unsealed roads regularly used on the mine site will be watered utilising site water carts to minimise dust generation.
- Dust suppressants will be used from time to time to reduce dust and particulate generation, especially during excessive dry weather periods or when site water levels are low or restricted.
- Where necessary additional water applications will be made, and/or chemical dust suppressants will be used to minimise dust lift off from unsealed roads to achieve a 90% dust control level for haul road emissions.
- Haul roads are regularly maintained.
- All roads are speed limited to ensure that dust generation is at acceptable levels. Speed limits will be further reduced under adverse conditions where appropriate.
- Earthmoving equipment and on-site vehicles:
    - are fitted with exhaust controls which satisfy NSW EPA emission requirements;
    - are properly maintained and any mobile equipment which does not comply with NSW EPA guidelines is removed; and,
    - have the exhausts directed upward or to the side (where applicable) so as not to cause dust lift-off.

3.4 Ongoing improvement

The controls and management procedures will be reviewed in response to the results of air quality monitoring, complaints or comments identified through TCPL's consultation effort.

The management of cumulative air quality impacts with nearby mines in the Leard Forest Mining Precinct is addressed in the BTM Complex Air Quality Management Strategy (Appendix 1).

4 AIR QUALITY MONITORING NETWORK

This section outlines the monitoring and reporting requirements to measure the impacts and environmental performance of the mine and the effectiveness of air quality management measures.

Data obtained from the real-time air quality monitoring network provide continuous and real-time dust level information as well as daily reports and alarm notifications to key personnel (i.e. OCE, Operations Manager, Environmental Officer or representative). In addition to daily reports, the monitoring data can be downloaded via the web interface as required.

The BTM Complex management procedures incorporate a forecasting tool that utilises a central web based repository for access to data from additional e-sampler monitoring equipment.

Continuous visual inspection of dust levels (refer to Section 4.6.1) by all staff and TARP's are the primary means used to minimise emissions from activities at the site, and the monitoring network provides additional information and alerts to further assist the operators to maintain air quality levels within acceptable bounds.

4.1 Monitoring Methods and Sampling Instruments

Monitoring is undertaken according to the DEC (2006) document Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales 2006, as applicable. Note that for some monitoring equipment, DEC (2006) does not list any applicable monitoring methods, and in all cases, it is the responsibility of the Environmental Team to ensure monitoring is carried out in the appropriate manner.

Note that direct monitoring of TSP is not conducted as the TSP values are determined by multiplying measured PM_{10} values by a factor of 2. This approach was accepted by DP&E for all Whitehaven sites in a letter dated 5th August 2011.

4.1.1 Deposited Dust

Deposited dust is assessed as insoluble solids as defined by Standards Australia AS/NZS 3580.10.1:2016: "Methods for sampling and analysis of ambient air – Determination of particulate matter – Deposited matter – Gravimetric Method". The sampling period for a dust gauge is approximately a month (30 days ±2). A NATA accredited analytical laboratory then conducts gravimetric analysis of the material collected in the gauge to determine the total insoluble matter in g/m^2/month.

4.1.2 HVAS

A High Volume Air Sampler (HVAS) is used to measure PM_{10} concentrations in the ambient air. HVAS monitoring is conducted approximately every 6 days for a 24-hour monitoring period. A NATA accredited analytical laboratory then conducts gravimetric analysis of the filter papers to determine the PM_{10} level.

4.1.3 TEOM

A Tapered Element Oscillating Microbalance (TEOM) is used to continuously measure concentrations of particulates (either PM_{10} or $PM_{2.5}$), recorded at approximately 5 minute intervals.

4.1.4 E-sampler

An e-sampler is a light scattering aerosol monitor that can be used to continuously measure concentrations of particulates. The samplers operate on solar power and can be relocated as required.

4.2 Monitoring Locations

Table 1 presents a summary of the air quality monitoring sites. Figure 1 presents the locations of the air quality monitors.

The e-samplers are portable units that provide flexibility to adapt to mine planning and progress and as such can be relocated to a more suitable location as required. One E-sampler is installed on the southwest side of the pit (part of the BTM complex network) and a second sampler is installed at the southeast side of the pit. One E- sampler is installed on the south of Goobri Road on one of the mine related properties.

Table 1 Air Quality Monitoring Locations

Monitor*	Easting	Northing	Residence/Property	Parameter
Dust gauge EB-4	230897	6605869	*"Templemore"*	Deposited dust
Dust gauge EB-5	231117	6606212	*"Bollol Creek Station"*	Deposited dust
Dust gauge EB-6	229044	6603178	*"Ambardo"*	Deposited dust
Dust gauge EB-7	226672	6603754	*"Tarrawonga"*	Deposited dust
Dust gauge EB-9	230504	6601914	*"Pine Grove"*	Deposited dust
Dust gauge EB-10	226420	6605376	*"Tarrawonga Mine"*	Deposited dust
Dust gauge EB-11	227176	6606259	*SW of boundary of ML 1579*	Deposited dust
Dust gauge EB-14	226926	6607770	*Tarrawonga Coal Mine*	Deposited dust
Dust gauge EB-15	226872	6606994	*Tarrawonga Coal Mine*	Deposited dust
Dust gauge EB-16	225440	6603310	*"Taylor Vale"*	Deposited dust
TEOM	231803	6596402	*"Will-gai"*	$PM_{2.5}$
TEOM	232784	6603658	*"Flixton"*	PM_{10}
HVAS	235883	6605901	*"Coomalgah"*	PM_{10}
E-sampler ES04	227288	6606720	Mine Site**	PM_{10}
E-sampler ES05	230910	6606695	Mine site**	PM_{10}
E-sampler ES06	230867	6605784	*"Templemore"*	PM_{10}

* See Figure 2

**E-samplers are mobile units and location may change as required.

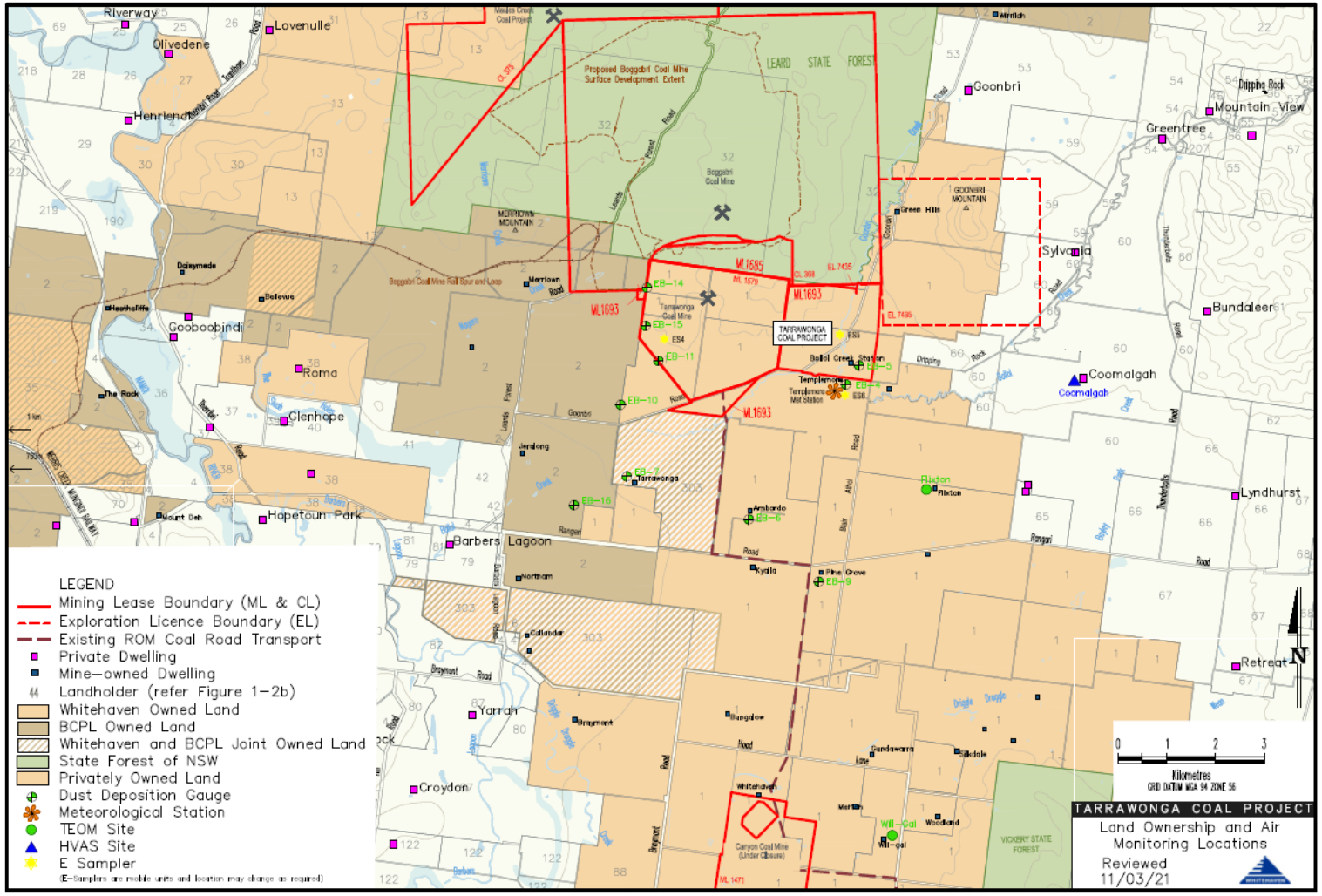

Figure 2 Air Quality Monitoring Locations

4.3 Compliance and Management Monitoring

Table 2 provides a summary of the air quality monitoring sites. The PM_{10} TEOM is used to determine (in real time) if pre-defined trigger levels have been reached and potentially whether additional dust control is required.

The High Volume Air sampler (HVAS) installed at the privately owned 'Coomalgah" property is used for compliance purposes. It is located at approximately 6 kms to the Southeast of the mine.

Details of the site TARP and Risk Response Matrix are discussed in Section 4.6.1.

E-samplers operate at non-fixed locations for performance evaluation, and are relocated as appropriate. The real-time air quality monitoring allows relevant personnel to react when short term trigger levels are reached, which are set to optimise reactive dust management

The monitoring sites are considered to be conservatively representative of the nearest privately-owned receptors.

The e-samplers are not used for compliance purposes as they are situated within close proximity of the mine pit. They are used for upwind/ downwind calculations to evaluate the likely dust contributions of the operations in the BTM Complex.

Table 2 Air Quality Monitoring

Location	Parameter to be Analysed	Criteria	Frequency/Timing of Monitoring
HVAS Monitor (PM_{10}) – "Coomalgah"	PM_{10}	50 µg/m^3 24 hour 30 µg/m^3 rolling annual average	Every 6 days
Real Time Monitor (TEOM) – "Will-gai"	$PM_{2.5}$	Whilst no criteria apply, levels of 8µg/m^3 for annual average and 25µg/m^3 for 24 hour maximum would be referred to when evaluating regional events such as dust storms or major bushfires	Continuous
Real Time Monitor (TEOM) – "Flixton"	PM_{10}	A rolling 24hr average PM_{10} trigger level of 40 µg/m^3 applies each 30 minutes to alert for potential to reach the 24-hour criteria of 50 µg/m^3.	Continuous
Dust Gauges EB	Dust Deposition (g/m^2/month)	Monitoring at mine owned properties is conducted for indicative purposes, to infer compliance, against a level of 4 g/m^2/month	Continuous (monthly)
E-samplers	PM_{10}	Assist with analysis of upwind/ downwind PM_{10} concentrations and down-wind mine contribution calculations	Continuous

4.4 Meteorological Monitoring

The weather station at Templemore is sited in accordance with AM-2, Guide for measurement of horizontal wind for air quality applications (AS 2923-1987 or AS/NZS 3580.14-2014), and AM-4, Meteorological monitoring guidance for regulatory modelling applications EPA 454/R-99-005 (USEPA (2000)).

Table 3 Weather Station Parameters

Parameter	Unit	Frequency	Averaging Period	Method
Wind speed at 10m	m/s	Continuous	15 minutes	AM-2 & AM-4
Wind direction at 10m	degrees	Continuous	15 minutes	AM-2 & AM-4
Sigma Theta at 10m	Degrees	Continuous	15 minutes	AM-2 & AM-4
Temperature at 2m	Celsius	Continuous	15 minutes	AM-4
Temperature at 10m	Celsius	Continuous	15 minutes	AM-4
Solar radiation	W/m²	Continuous	15 minutes	AM-4
Rainfall	mm	Continuous	1 hour	AM-4

4.5 Data Reporting

With respect to Project Approval Condition 27(d) - particulate matter air quality monitoring, the data collected via the TCM monitoring network is used to inform tenants of properties on mine owned land of any potential health risks.

A summary of air quality monitoring results is reported to the Community Consultative Committee (CCC), and is also made available on the Whitehaven website.

Each year, the results of the air quality monitoring program are summarised and presented in the Annual Review together with reference to the prevailing meteorological data and site activities during the measurement period(s). The Reporting compares the monitoring results with the criteria, the previous monitoring results and also predictions made in the EA.

Reporting requirements for complaints and non-compliances are specified in Section 5.

Real time air quality monitoring data, in the form of the 24hr average PM_{10} concentration for the preceding period, daily weather forecasts for the week ahead, and operational responses to forecasts and monitoring data for the preceding period are made available on the Whitehaven Coal website on a daily basis, in accordance with Project Approval requirements. It is important to note that the 24hr average PM_{10} concentration result reported in this way is for the dust from all sources and is not related to only mining activities, therefore this data is not suitable to use to directly confirm any mine related contributions.

4.6 Reactive Management

Tarrawonga Coal use visual dust monitoring and meteorological monitoring as the primary

means for reactive air quality management.

4.6.1 Visual Dust Trigger Action Response Plan

Visual inspection of dust will be conducted at all times by personnel at TCM to determine whether visible dust levels are within appropriate levels, or if further mitigation is required. A TARP has been developed for the site which provides visual dust trigger indicators, (normal, level 1 and level 2), and sets out the corresponding response/actions if the trigger is reached, see Appendix 2.

4.6.2 Meteorological Risk Response Matrix

Tarrawonga Coal commissioned an assessment to assess the wind speed and direction at which Total Suspended Particulate dust emissions become excessive. The air quality model that was used found that dust levels start to increase after 7m/s and increase exponentially after 10m/s.

A meteorological risk response matrix has been developed for the site to identify operational practices or weather conditions that require specific action to mitigate potential impacts (Appendix 2). The intent behind the risk response matrix is to understand the prevailing conditions and implement management practices accordingly to avoid subsequent air quality impacts. Meteorological data is obtained from the Templemore weather station.

The real time monitors provides for site alerts in the event that air quality measurements approach compliance thresholds (refer to Section 4.3)

Under extraordinary weather events, such as those identified in Project Approval Condition 26(d) i.e. bushfires, prescribed burning and dust storms, the operations will review their activities, and mitigate wherever practicable, material contribution to poor ambient air quality.

5 MANAGEMENT PROTOCOLS FOR COMPLAINTS AND NON-COMPLIANCE

It is the responsibility of the Environmental Team to manage complaints and non-compliances.

5.1 Non-Compliance

5.1.1 Protocol for Determining Exceedances

This protocol outlines how compliance per the impact assessment criteria (set out in Section 2) is evaluated. Flexibility is required for using methods that are most "appropriate to the situation". Not all the options presented will be relevant for every exceedance investigation.

Where monitoring results are below the relevant criteria, no further action is needed, and results are reported with no additional analysis.

Where monitoring results are above the impact assessment criteria levels indicated in Tables 6-12 in Section 2, further analysis will be used to determine if the project contributed to the exceedance. The analysis may include the following evaluation methods, but may use other means appropriate to the situation.

Sample/ data integrity check:

For PM_{10} (HVAS) or dust deposition results, the analysing laboratory will be contacted to ensure no error has been made in storing, analysing or recording the sample or result and if any potential contamination of the sample appears to have occurred.

Data from real-time monitors will be analysed to determine if the monitors were functioning and operating correctly.

Interceding data review:

Any monitoring data recorded at location approximately between TCM and the monitoring site will be reviewed. Where this data is found to be below the criteria, it can be inferred that dust from TCM could not have contributed significantly to the recorded elevated level further away.

Operations review:

Operations logs will be reviewed for the relevant period to identify what activities were occurring in proximity to monitoring locations.

Meteorological and monitoring data analysis:

An investigation of the meteorological data and monitoring data for the relevant period will be conducted to determine the likelihood of the project causing or contributing to the elevated levels above the impact assessment criteria.

Natural and anthropogenic factors review:

A review of natural factors such as dust storms and bushfires, along with human and agricultural activity factors such as hazard reduction burns, livestock or cropping activity, will be made to determine if these factors affected the reading.

Specialist review:

Where TCM is unable to reasonably determine the cause of the elevated level, a specialist air quality consultant would be engaged to investigate the potential cause of the elevated level, and to recommend any actions if appropriate to do so.

Other:

Other non-compliances that relate to issues with the monitoring, for example monitor interference or malfunction are set out in the Annual Review. Monitors are to be maintained appropriately to minimise such occurrences.

5.1.2 Incident Reporting

This section details the reporting and corrective actions where a non-compliance is determined to have occurred as per the protocol for determining exceedances.

In accordance with Schedule 5 Condition 8 of PA 11_0047, immediately after becoming aware of an incident that has caused, or threatens to cause, material harm to the environment, TCM will inform the Secretary and all relevant agencies . Within 7 days of the date of the incident or after becoming aware of a non-compliance, TCM shall provide the Secretary with a written notification via the Major Projects website. Within 30 days of the date on which the incident occurred or as otherwise agreed by the Secretary, the Proponent must provide a detailed report on the incident in accordance with Appendix 9 of PA11_0047

Condition 3 of Schedule 4 requires TCPL to notify affected landowners of air quality criteria as soon as practical following receipt of results. The NSW Health fact sheet “Mine Dust and You” must be provided, and monitoring results update must also be provided until the site returns to compliance.

The recorded exceedance, corrective actions and reassessment will be reported to the CCC and included in each relevant Annual Review.

5.1.3 Corrective Action Plan and Re-Assessment

If review of monitoring data indicates compliance related problems, a corrective action plan will be initiated.

Where it is determined that a corrective action plan is necessary, TCPL will prepare the plan to reduce dust generation and thereby reduce PM10 (HVAS) concentrations around the mine site and return the operation to compliance. Preparation of the plan would include a schedule for re- assessment. Depending on the situation, the plan can be prepared by TCM, or by TCM with assistance from a specialist air quality consultant.

5.1.4 Independent Review and Land Acquisition

If an owner of privately-owned land considers the mine to be exceeding air quality criteria, they may ask the Secretary in writing for an independent review of the impacts on their land. Conditions 4, 5 and 6 of Schedule 4 of PA 11_0047 specify the independent review process.

Within 3 months of receiving a written request from a landholder with acquisition rights, TCPL shall make a binding written offer as detailed in Condition 4(8) of PA 11_0047. Air quality acquisition criteria are specified in Condition (26) of Schedule 3 while Condition 8 of Schedule 4 requires TCPL to pay all reasonable costs associated with the land acquisition process.

It should be noted that under PA 11_0047, property ID 49 retains existing acquisition rights on the basis of air quality impacts, and can, on making a written request as per Condition (1) of Schedule 3, seek acquisition under the terms of Conditions (8) and (9) of Schedule 4 4. Property ID's 44 and 45, listed in PA 11_0047, have been acquired and are now project related properties.

5.2 Contingency Plan for Unpredicted Impacts

In the event that unpredicted or unforeseen air quality impacts are identified, the following contingency plan will be adopted.

Table 5 Unpredicted Impact Contingency Plan

Step	Procedure
1a	Review the unpredicted impact including consideration of: • Any relevant monitoring data; and • Current mine activities as well as activities in the vicinity of the affected location.
1b	Where Step 1a does not identify the cause, commission an investigation by an appropriate specialist into the unpredicted impact, if considered appropriate.
2	Develop appropriate ameliorative measures based on the results of Step 1a or Step 1b (or both), in consultation with relevant government departments.
3	Implement additional monitoring, where relevant, to measure the effectiveness of the improvement measures.

5.3 Complaints Protocol

Whilst all endeavours will be made by TCPL to avoid adverse air quality impacts on local landowners / residents, it is acknowledged that from time to time such impacts may occur. In order to ensure an appropriate and consistent level of reporting, response and follow-up to any complaints is adopted by TCPL, the following complaints management protocol will be followed:

- A publicly advertised telephone complaints line will be in place to receive complaints during operating hours and record complaints at other times.

- Each complaint received will be recorded on a Complaints Register, which will include the following details:
    - The date and time of complaint.
    - Any personal details the complainant wishes to provide or if no such details are provided a note to that effect.
    - The nature of the incident that led to the complaint, including the time of the dispersal and its duration.
    - The action taken by TCPL in relation to the complaint, including any follow-up contact with the complainant.
    - If no action was taken by TCPL, the reason why no action was taken.
- The Environmental Team will be responsible for ensuring that an initial response is provided in general within 24 hours of receipt of a complaint (except in the event of complaints recorded when the mine is not operational).
- Data from the site weather station will be obtained for the time applicable to the complaint for use in determination of cause and identification of future remedial actions.
- Additional measures will be undertaken as required to address the complaint. This may include visiting the complainant, or inviting the complainant to the mine site.
- Once the identified measures are undertaken, the Environmental Team will update the Complaints Register.
- If necessary, follow-up monitoring will take place to confirm the source of the complaint is adequately mitigated.
- A copy of the Complaints Register will be kept by TCPL and made available to the CCC and the complainant (on request). A summary of complaints received every 12 months will be included in the Annual Review.

Based on the nature of individual complaints, specific contingency measures may be implemented to the (reasonable) satisfaction of the complainant. The Environment Team retains responsibility to ensure that complaints received are properly recorded and addressed appropriately.

6 GREENHOUSE GAS MANAGEMENT

TCM forms part of the Whitehaven Group's National Greenhouse and Energy Reporting Scheme (NGERS) reporting requirements. The Scheme's legislated objectives are to:

- Inform policy-making and the Australian public,
- Meet Australia's international reporting obligations,
- Provide a single national reporting framework for energy and emissions reporting.

Under NGERS requirements, relevant sources of greenhouse gas emissions and energy consumption are measured and reported on an annual basis.

7 DOCUMENT REVIEW AND CONTINUOUS IMPROVEMENT

This document will be reviewed in accordance with the requirements of Conditions 4 and 5 o f Schedule 5 of PA 11_0047.

The environmental performance of the project is reviewed annually. This review includes:

- A description of the development (including rehabilitation) that was carried out in the past calendar year;
- A comprehensive review of the monitoring results and complaints records of the project over the past year;
- Identification of any non-compliances and actions taken to ensure compliance;
- Identification of any trends in the monitoring data over the life of the project;
- Identification of any discrepancies between predicted and actual impacts of the project and analyse the potential cause of any significant discrepancies; and
- A description of measures to be implemented over the next year to improve the environmental performance of the project.

From 2014 and every three years thereafter an Independent Environmental Audit of the project is to be carried out.

TCPL will investigate and implement ways to improve the environmental performance of the project over time. This will be achieved by undertaking internal audits and keeping abreast of best practice in the industry for air quality controls and reporting on outcomes of air quality monitoring annually in the AEMR/Annual Review.

In accordance with Project Approval Condition 29(f) in Schedule 3, random audits of operating responses to real time air quality management systems will be undertaken including but not limited to review of alarm action log, and assessment of site dust generation and required management actions.

Appendix 1 Most recent BTM Complex Air Quality Management Strategy

Appendix 2 Most recent Visual Dust Trigger Action Response Plan and Meteorological Risk Response Matrix

	Normal State		Level 2 Triggers		Level 3 Triggers	
Work Area/ Equipment	**Trigger**	**Action/Response**	**Trigger**	**Action/Response**	**Trigger**	**Action/Response**
Haul Trucks/ Haul Roads	Dust below wheel height. 	• Continue work/ tasks as normal. • Maintain dust suppression activities. • Continue to monitor operation. Water carts: • to be manned as required. Services to be planned for night shifts. • Zone watering techniques to be applied where possible.	Dust above wheel height, but below tray height. 	• Truck Operator to reduce speed & notify water cart operators for additional dust suppression requirements. • Limit Grading activities. • Consolidate haul roads and dumps in use and reduce haul distance if possible • Shut non-essential roads. IF Water Carts have Minor Breakdown/s (duration of less than 10% of the shift): • They should be hot-seated during crib breaks. • limit grading activities. • Consolidate haul roads and dumps in use. Reduce haul distance if possible. • Shut non-essential roads. This is Weather dependent.	Dust above tray height. 	• Truck Operator to notify Mining Supervisor and STOP work. • Mining Supervisor to call for additional dust suppression. • Work to resume once water cart operator has advised roadway is adequately watered. IF Water Carts have Major Breakdown/s (50% or more of carts unavailable over shift): • Water cart operators to inform supervisor if they cannot control dust. • Work to resume once water cart operator has advised roadway is adequately watered. This is Weather dependent.
Dozers/ Dumps		• Continue work/tasks as normal • Continue to monitor operation.		• Dozer Operator/ Supervisor to limit activity to leeward side of area. • Reduce drop height of materials. • Cease non-essential activities and operations in wind exposed areas. • Limit travel speeds. • Water work areas.		• Consider limiting dumping to paddock dumping only. • Dozer operators to notify Mining Supervisor and STOP where paddock dump unavailable. • Work to resume only when controls are sufficient or weather conditions permit.
Loaders/ Excavators		• Continue work/ tasks as normal. • Continue to monitor operation.		• Limit tramming or pushing distances. • Limit number of operations being conducted. • Increase watering of area. • Change material type.		• Loader/ Excavator operator to notify Mining Supervisor and STOP work. • Only recommence work with supervisor approval or if weather conditions permit. • Change material type.
Drills	No visible dust below deck height. 	• Continue work/ tasks as normal. • Monitor dust suppression activities. • Continue to monitor operations	Dust visible at deck height. Sporadic event. 	• Drill Operators to ensure dust suppression system functioning correctly. • Mining Supervisor monitor conditions. • Assess impact of weather conditions and modify operations as required.	Persistent emissions of dust above deck height. 	• Drill operator STOP operations. • Dust suppression system checked for operational and maintenance requirements. • Only recommence work if the dust suppression system is operable, site preparation is adequate and weather conditions permit.

Meteorological Risk Response Matrix

Location/ Activity	Wind Speed <7m/s (Normal – Low Risk Conditions)	Wind Speed from 7-10m/s (Medium Risk Conditions)	Wind Speed >10m/s (Medium and High Risk Conditions)[1,2]			
Wind Direction	All	All	North	South	East	West
Highest dumping area close to Southern Boundary	No specific action required. Visible Dust TARP operates at all times.	Formal visible dust check performed, visible dust observations and actions taken, if any, are recorded. Activity is suspended if emissions cannot be controlled	STOP	STOP	STOP	STOP
Elevated dumping area close to Southern Boundary			STOP	CHECK Activity and STOP if emissions cannot be controlled	STOP	STOP
Elevated dumping area close to Northern Boundary			STOP	STOP	STOP	STOP
Highest dumping area close to Western and Northern Boundaries			STOP	STOP	STOP	STOP
Elevated Central dumping area			CHECK Activity and STOP if emissions cannot be controlled	CHECK Activity and STOP if emissions cannot be controlled	CHECK Activity and STOP if emissions cannot be controlled	CHECK Activity and STOP if emissions cannot be controlled
Soil Stripping and Vegetation Clearing			STOP	STOP	STOP	STOP
Crusher and Loader			CHECK Activity and STOP if emissions cannot be controlled	CHECK Activity and STOP if emissions cannot be controlled	CHECK Activity and STOP if emissions cannot be controlled	CHECK Activity and STOP if emissions cannot be controlled
Excavators and Dozers			CHECK Activity and STOP if emissions cannot be controlled	CHECK Activity and STOP if emissions cannot be controlled	CHECK Activity and STOP if emissions cannot be controlled	CHECK Activity and STOP if emissions cannot be controlled

[1]May result in assessment and implementation of additional mitigation measures or suspension of activity.
[2]SMS and Email messages sent to OCE and Environmental Officer.