AIR QUALITY MANAGEMENT STRATEGY

For Boggabri – Tarrawonga – Maules Creek Complex

MAY 2017

Idemitsu Australia Resources
Boggabri Coal Operations Pty Ltd

Whitehaven Coal Limited
Tarrawonga Coal Pty Ltd, Maules Creek Coal Pty Ltd

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AEMR	Annual Environmental Management Report
AQGHGMP	Air Quality and Greenhouse Gas Management Plan
AQMS	BTM Complex Air Quality Management Strategy
BCM	Boggabri Coal Mine
BCOPL	Boggabri Coal Operations Pty Limited
BTM Complex	Boggabri-Tarrawonga-Maules Creek Complex (previously known as the Leard Forest Mining Precinct)
CALPUFF	An air quality dispersion model
CCC	Community Consultative Committee
CHPP	Coal Handling and Preparation Plant
CL	Coal Lease
DP&E	NSW Department of Planning and Environment
EA	Environmental Assessment
EPA	Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act, 1979*
EPL	Environment Protection Licence
GHG	Greenhouse Gas
HVAS	High Volume Air Sampler
IAR	Idemitsu Australia Resources Pty Limited
LAN	Local Area Network
MCCM	Maules Creek Coal Project
Mtpa	Million Tonnes Per Annum
PAC	NSW Planning Assessment Commission
PM_{10}	Particulate matter < 10 µm
$PM_{2.5}$	Particulate matter < 2.5 µm
ROM	Run of Mine
TCM	Tarrawonga Coal Mine
TEOM	Tapered Element Oscillating Microbalance
TCPL	Tarrawonga Coal Pty Ltd
TSP	Total Suspended Particulate
WRF	Weather Research and Forecasting

1. Introduction

1.1 Background and purpose

The purpose of this cumulative air quality management strategy (AQMS) is to document the approach that mines within the Boggabri-Tarrawonga-Maules Creek Complex (BTM Complex)[1] will take to monitor and manage cumulative air quality impacts. The AQMS details the relevant cumulative air quality impact assessment criteria for each mine and outlines the cumulative air quality management protocols that will be implemented within the BTM Complex.

The BTM Complex is an existing mining precinct centred within and around the Leard State Forest, approximately 15 km northeast of Boggabri in the Narrabri Shire local government area. The BTM Complex currently includes the existing Tarrawonga Coal Mine (TCM) in the south, the Boggabri Coal Mine (BCM) to the north and the Maules Creek Coal Mine (MCCM) to the northwest. The extents of the EA boundaries for each of the mines that comprise the BTM Complex are presented in Figure 1.1.

BCM is managed by Boggabri Coal Operations Pty Limited (BCOPL), a subsidiary of Idemitsu Australia Resources Pty Limited (IAR). MCCM is a joint venture between Whitehaven Coal Limited (75%), ITOCHU Australia Limited (15%) and J-Power Australia (10%). TCM is also a joint venture operation, with ownership shared between Whitehaven Coal Mining Limited (70%) and Boggabri Coal Pty Ltd (30%). A summary of the ownership details for mines within the BTM Complex is provided below in Table 1.1.

Table 1.1 Management and ownership of BTM Complex mines

Mine	Management	Ownership	Share
Boggabri Coal Mine	Boggabri Coal Operations Pty Limited	Idemitsu Australia Resources l Pty Ltd	80%
		Chugoku Electric Power Australia Resources Pty Ltd	10%
		NS Boggabri Pty Limited	10%
Maules Creek Coal Mine	Maules Creek Coal Joint Venture	Aston Coal 2 Pty Limited (owned 100% by Whitehaven Coal Limited)	75%
		Itochu Coal Resources Australia Maules Creek Pty Ltd (ICRA MC)	15%
		J-Power Australia (J-Power)	10%
Tarrawonga Coal Mine	Tarrawonga Coal Pty Limited (TCPL) - Tarrawonga Joint Venture	Whitehaven Coal Mining Limited	70%
		Boggabri Coal Pty Limited	30%

Project applications for the continued operation of BCM (application number 09_0182) and the development of the MCCM (application number 10_0138) were determined by the NSW Planning Assessment Commission (PAC) in July and October 2012 respectively, under delegation by the NSW Minister for Planning and Infrastructure. Subsequent to this, the (now) Commonwealth Department of the Environment (DoE) granted conditional approval for both the BCM Extension (EPBC 2009/5256) and the MCCM Project (EPBC 2010/5566) on 11 February 2013. Given the level of public interest in these

[1] In previous environmental assessments and approval documents this group of mines has been referred to as the Leard Forest Mining Precinct. For the purposes of this AQMS and all other relevant cumulative impact management documents, all references to the 'Leard Forest Mining Precinct' have been replaced with the term 'BTM Complex'.

projects and the potential for cumulative impacts, approvals were granted subject to stringent conditions related to the management of cumulative impacts.

The TCM application for continuation of mining was approved on 22 January 2013, with similar cumulative impact management conditions to those detailed in the BCM and MCCM approvals. EPBC approval for the Tarrawonga project was granted by the DoE on 11th March 2013.

Approval conditions require the preparation of a suite of regional strategies for environmental management, developed in partnership by all three mines of the BTM Complex. This AQMS has been developed to serve as the Leard Forest Mining Precinct Air Quality Management Strategy, in accordance with each project's approval requirements. Approval conditions relevant to the management of cumulative air quality impacts within the BTM Complex are detailed in Table 1.2.

Table 1.2 Approval requirements for cumulative air quality impact management

Boggabri Coal Mine Project Approval 09-0182	Maules Creek Coal Mine Project Approval 10_0138	Tarrawonga Project Approval PA 11_0047	Details	Section reference in AQMS
Schedule 3, Condition 30 (b)	Schedule 3, Condition 33 (b)	Schedule 3, Condition 28(b)	The proponent shall… "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".	Whole of document, specifically Sections 4.2 and 4.6
Schedule 3, Condition 30 (g)	Schedule 3, Condition 33 (g)	Schedule 3, Condition 28(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 Director-General"	Whole AQMS, including Section 5.3
Schedule 3, Condition 31 (h)	Schedule 3, Condition 34 (g)	Schedule 3, Condition 29(g)	Prepare and implement an Air Quality and Greenhouse Gas Management Plan that… "includes a Leard Forest Mining Precinct Air Quality Management Strategy that has been prepared in consultation with other coal mines in the Complex (formerly Precinct) to minimise the cumulative air quality impacts of all mines within the Complex (formerly 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 from 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 the	Whole of AQMS, specifically Section 4

Boggabri Coal Mine Project Approval 09-0182	Maules Creek Coal Mine Project Approval 10_0138	Tarrawonga Project Approval PA 11_0047	Details	Section reference in AQMS
			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.	Section 5.1
			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 and North West. The Leard Forest Mining Complex (formerly 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.	Section 4.3

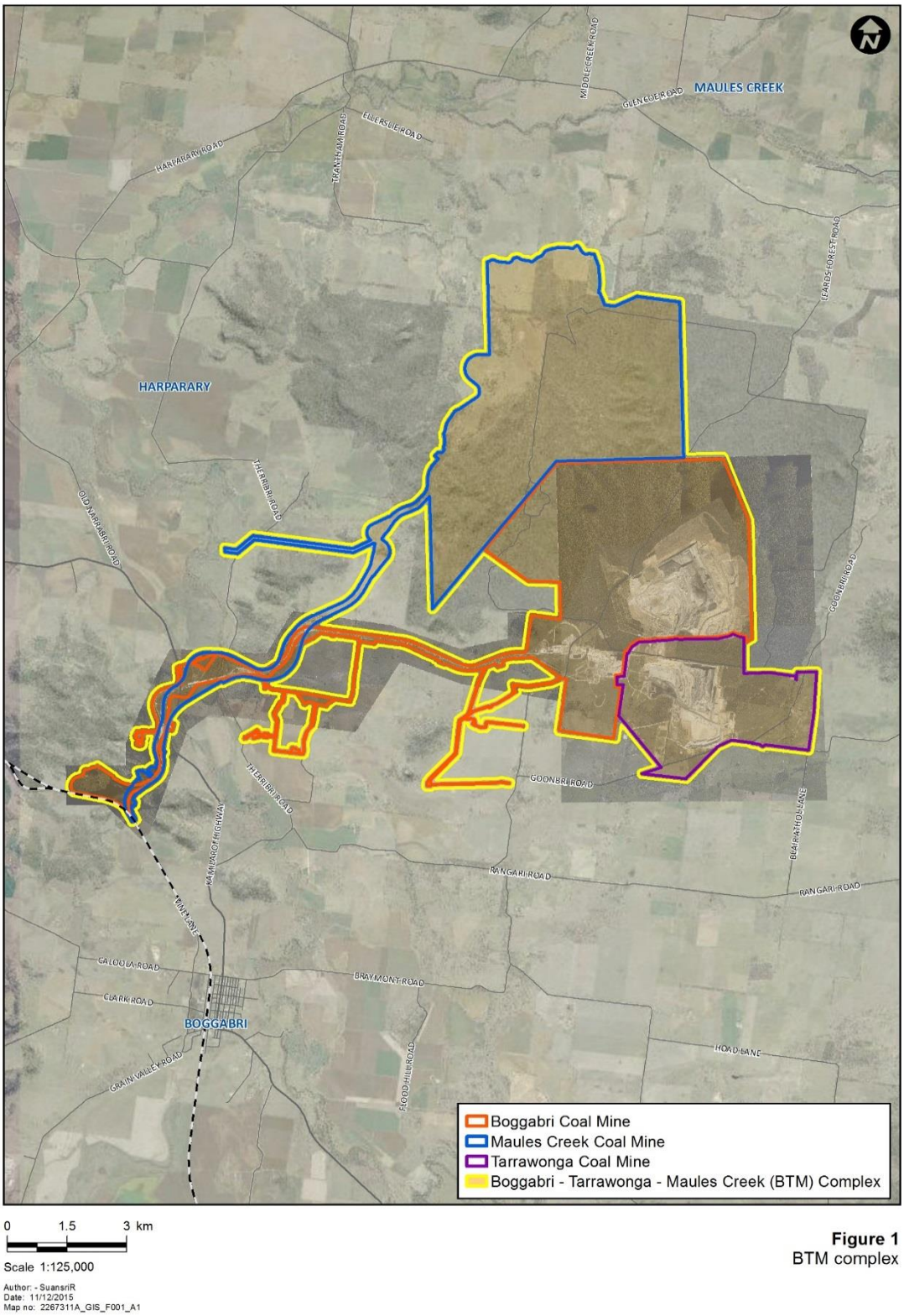

Figure 1-1 Location of the BTM Complex mines

1.2 Document structure

The structure of this report is as follows:

- **Section 1** provides an introduction to the AQMS, including the background to the AQMS, and the scope of the AQMS.
- **Section 2** provides an overview of the BTM Complex mines (BCM, TCM, and MCM).
- **Section 3** describes air quality criteria to be considered in the design and operation of the network and monitoring programs
- **Section 4** describes existing monitoring networks; sets objectives for cumulative monitoring; outlines the cumulative BTM Complex monitoring program;
- **Section 5** discusses corrective and preventative actions.
- **Section 6** summarises the implementation of the AQMS.
- **Section 7** describes document control.
- **Section 8** provides a list of references used in this document.

1.3 Scope

This document is the overarching strategy for management of the BTM Complex and associated zones of air quality affectation.

Individual mines will manage their ongoing operations and associated air quality in accordance with their site specific Air Quality and Greenhouse Gas Management Plans (AQGHGMPs). Statutory requirements relating to air quality will be provided in each individual AQGHGMP and are summarised in this AQMS.

2. BTM Complex

The BTM Complex includes the existing Tarrawonga Coal Mine (TCM) in the south, the Boggabri Coal Mine (BCM) to the north and the Maules Creek Coal Mine (MCCM) to the northwest.

2.1 Boggabri Coal Mine

Boggabri Coal Operations Pty Limited (BCOPL) is majority owned (80%) by Idemitsu Australia Resources Pty Limited (Idemitsu), a subsidiary of Japanese company Idemitsu Kosan Pty Ltd which operate the BCM. The BCM is located 15 kilometres (km) north-east of the township of Boggabri in the north-west Region of NSW.

Full scale mining commenced at BCM in 2006. In 2009, BCOPL lodged an application for the continuation of BCM (the Boggabri Coal Project). This included an increase of production from five to seven million tonnes of product coal per annum. The Boggabri Coal Project was approved under PA 09_0182 on 18 July 2012 and activities have continued at the site since, including:

- construction of a new Coal Handling and Preparation Plant (CHPP)
- construction of a 17 km rail spur line and rail load-out facility
- construction of a high voltage power line (275kV) and associated substations
- upgrade of other ancillary infrastructure.

Four modifications of the Project Approval have subsequently been approved. Modification 2, approved on 17th February 2015 permits the CHPP to process up to 3.5 Mtpa of ROM coal and the transport of up to 3 Mtpa of ROM coal from Tarrawonga Coal Mine to BCM. Modification 3, approved on 17th March 2014, permits the construction of permanent mine access roads from the Kamilaroi Highway and use of other infrastructure. Modification 4, approved on 23rd March 2014 permits project boundary adjustments, alterations to existing infrastructure, realignment of a haul road, extension of the ROM coal stockpile and construction of new hardstand areas & a project boundary security fence. Modification 5, approved on 30th August 2016, permits the use of groundwater production bores for the supply of water to BCM.

BCOPL also operates under an approval granted under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) (EPBC Approval 2009/5256).

Condition 31(h) in schedule 3 of the Boggabri Project Approval (DA 09_0182) requires the preparation of an AQMS for the BTM Complex.

2.2 Tarrawonga Coal Mine

The Tarrawonga Coal Mine is an existing coal mining operation which obtained approval to extract 2 Mtpa of ROM coal in 2005 (DA 88-4-2005). TCPL, a subsidiary of Whitehaven Coal, submitted a Project application in July 2011 for an extension of open cut mining operations with an increased production rate to 3 Mtpa of ROM coal for a further 17 years from 2013 to 2030. This project application was determined by the PAC on 22nd January 2013, and included, under Condition 29 (g) that 'the proponent shall prepare and implement an Air Quality and Greenhouse Gas Management Plan for the Project that must include an AQMS'.

A modification was lodged with the DP&E in May 2013 to allow for the processing of up to 3 Mtpa of ROM coal from Tarrawonga Coal Mine at the Boggabri Infrastructure Facilities in Coal Lease (CL) 368, and the associated transport of up to an additional 3 Mtpa of product coal along the private Boggabri rail spur. This modification was approved 17th February 2015.

A further modification was lodged with the DP&E in February 2014 to allow continued trucking of Tarrawonga coal to the Whitehaven CHPP located west of Gunnedah post commissioning of the Boggabri Coal CHPP and rail spur. This modification was determined on 6 November 2014.

2.3 Maules Creek Coal Mine

The Maules Creek Coal Mine is located directly to the northwest of Boggabri Coal Mine. There is an existing development consent covering coal mining within an area delineated as Coal Lease 375 (CL 375). Aston Resources Pty Limited, which has subsequently been acquired by Whitehaven Coal, submitted a project application under Part 3A of the EP&A Act seeking a contemporary Project Approval for coal mining and ancillary activities within this area.

The application sought approval for extraction of up to 13 Mtpa ROM coal for 21 years. Other key features of this Project include transportation of coal by rail to Newcastle; and development of site infrastructure including the CHPP and associated facilities; train loading facility; rail spur and loop; a mine access road; communications and power reticulation; explosives storage; and a water pipeline from the Namoi River.

The Maules Creek Coal Project (MCCM) application (number 10-0138) under the now-repealed Part 3A of the EP&A Act was granted approval by the DP&E in October 2012. Condition 34 (g) of the Project Approval also requires the preparation of an AQMS for the BTM Complex.

Three modifications have subsequently been lodged. Modification 1, lodged in April 2013, was lodged to gain approval for construction and operation of high voltage transmission lines and an associated switching station, following detailed design; a minor extension to existing 11 kV transmission line; and realignment of the CHPP area and associated facilities. Approval for this modification was received in July 2013. Modification 2 was lodged in February 2014 seeking approval for an optimised design for key water related infrastructure components (raw water pipeline and pump station). This modification was determined on 10 March 2014. Modification 3 was submitted in 2016 and approved in January 2017 approving a modification to employee transport and the percentage of shuttle bus use.

3. Air quality strategy criteria

3.1 Air quality assessment criteria

Relevant air quality impact assessment criteria have been extracted from the most recent BCOPL Project Approval, the MCCM Project Approval and the TCM Project Approval. These criteria are provided in Table 3.1, Table 3.2 and Table 3.3.

The conditions require that BCOPL, MCCM and TCM must ensure particulate emissions generated by BTM Complex operational activities do not exceed the criteria listed in Tables 3.1 to 3.3 at any residence on privately-owned land or on more than 25 per cent of any privately owned-land.

Table 3.1 Long term criteria for particulate matter

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

Table 3.2 Short term criteria for particulate matter

Pollutant	Averaging Period	[d] Criterion
Particulate matter < 10 um (PM_{10})	24 hour	[a] 50 ug/m^3

Table 3.3 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 3.1, Table 3.2 and Table 3.3
[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 Air – Determination of Particulate Matter – Deposited Matter – Gravimetric Method.
[d] Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents, or any other activity as agreed by the Director General.

3.2 Air quality acquisition criteria

The acquisition criteria for operations is detailed and addressed in each mine site's individual AQGHGMPs.

4. Monitoring

The mines of the BTM Complex already have comprehensive air quality monitoring systems in place. It is proposed that the existing air quality monitoring network will be upgraded to reflect the implementation of the BTM Complex cumulative air quality monitoring network.

4.1 Existing monitoring network

A review of the individual mines' existing air quality monitoring networks has considered High Volume Air Samplers (HVAS) and real-time (TEOM) PM_{10} and $PM_{2.5}$ monitors. The locations of monitors within the existing air quality monitoring network proposed for use in the BTM Strategy are shown on Figure 4-1. Proposed modifications to the existing monitoring network are described in the following section and specific BTM complex monitoring locations are shown on Figure 4-1.

4.2 Proposed cumulative monitoring network

The requirements of the cumulative monitoring network at the BTM Complex are to:

- facilitate compliance with existing and likely future consent conditions
- allow proactive management and real-time dust monitoring to assist in day to day operations of each mine site
- develop an integrated and coordinated approach to air quality management of the BTM Complex
- consolidate existing monitoring
- allow for predictive meteorological forecasting
- include procedures for identifying and apportioning the source(s) and contribution(s) to cumulative air impacts for mines and other sources, using the air quality and meteorological monitoring network
- include appropriate investigative tools such as modelling of post incident plume dispersion.

The mines of the BTM Complex implement comprehensive air quality management systems. These air management systems utilise a combination of dust deposition and HVAS monitoring for compliance with project approval's and EPL's for the individual mines, and TEOMs for use as management tools as part of the day to day operations.

Four TEOMs, one capable of measuring $PM_{2.5}$, and current HVAS from the existing air monitoring network will be used to monitor and manage cumulative impacts associated with the operation of mines in the BTM Complex.

In addition, the BTM Complex monitoring network will include:

- Installation of up to four portable real-time PM_{10} monitors for day to day operational dust management (e.g. e-samplers or equivalent).
- Implementation of a web based system to manage real-time monitoring data (as well as weather, emissions and modelled predictions for air quality).

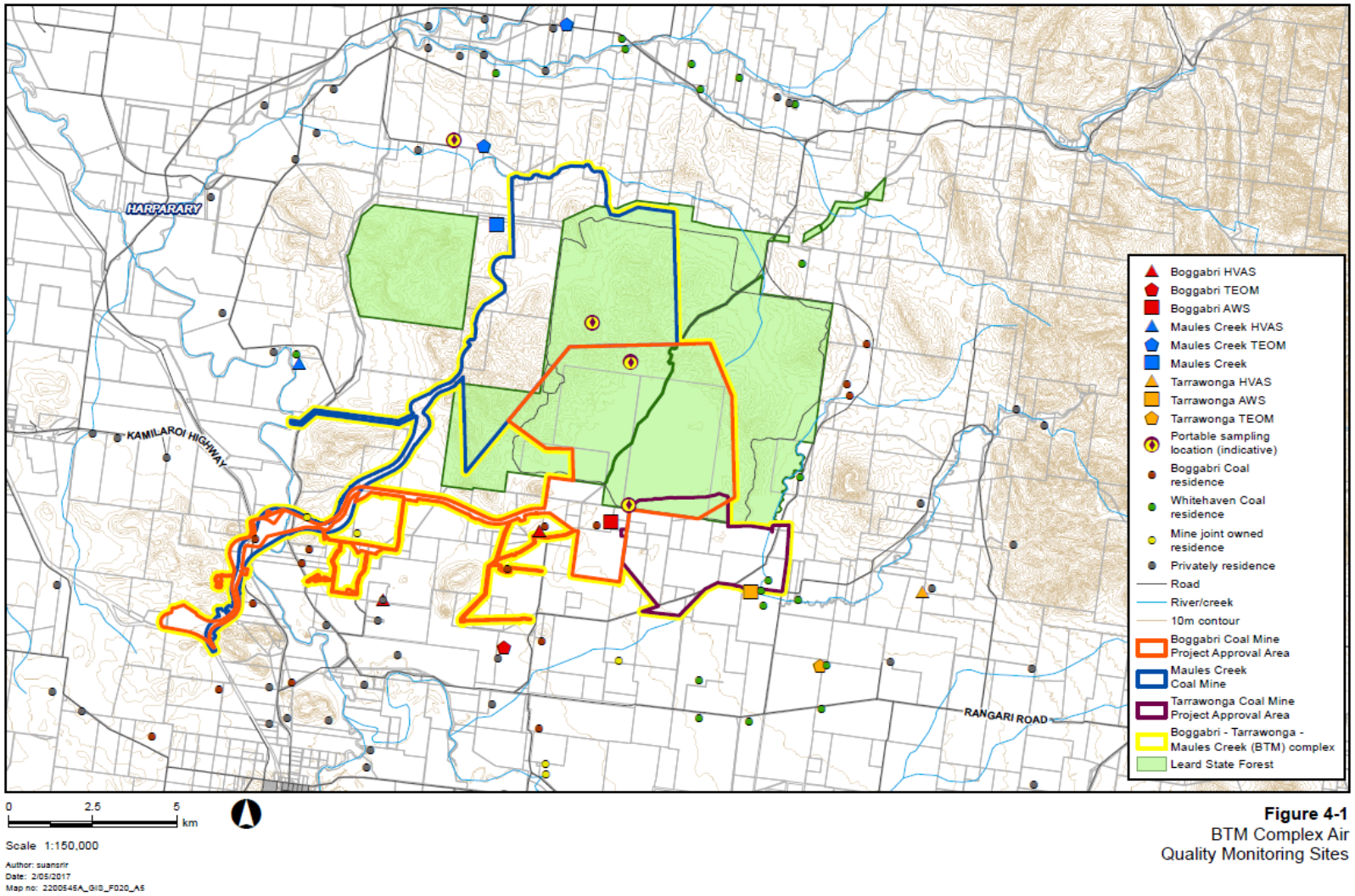

Figure 4-1 BTM Complex air quality monitoring locations

4.2.1 Real-time monitors

Critical to the AQMS are the locations of the real-time monitors, which will guide the implementation of reactive dust management measures by respective mines.

It is important to understand the different roles of monitors in the cumulative network. The four real-time monitors proposed for use in the BTM system (e.g. TEOMs) are for management purposes and will be placed at the locations as described in each mines AQGHGMPs, as amended over time. The TEOM units are positioned at locations to monitoring air quality at receivers including the Maules Creek public school, The units may also be relocated for operational purposes. The units will be capable of measuring $PM_{10,}$ and for at least one monitor $PM_{2.5}$. These monitors will be used to determine (in real time) if pre-defined trigger levels have been reached and when additional dust control is required. Other real-time monitors may be used by individual sites for performance evaluation at non-fixed sites.

The real-time air quality monitoring allows relevant personnel to react when short term trigger levels are reached, which are set at a level that allows reactive dust management (to control 24-hour and ultimately annual average impacts).

The TEOM's located on privately owned land to the South-West of BCM and North MCCM will be used by individual mines to assess compliance with their respective air quality criteria. These monitors and the air quality criteria are further discussed in each mines AQGHGMP's.

The locations of the TEOM units will be reviewed by individual mines (following an annual review, audits, complaints, modifications) and where required relocated to provide representative coverage to assess air quality from mining operations.

4.2.2 Portable real-time PM_{10} monitors

The BTM Complex has installed four portable real-time PM_{10} monitors (e-samplers or equivalent) for the day to day dust management of mining operations. Prior to operating, a period of commissioning of portable real-time PM_{10} monitors will be undertaken to allow calibration of the instruments, verification of the monitoring results, and determination of the number of samplers actually required to achieve the required monitoring outcome.

Following this commissioning period it is intended that these portable monitors will be placed at appropriate locations close to mining operations. The portable monitoring locations will move periodically as BTM Complex mining operations progress. As the monitors will not be located in fixed locations, they will not be used to assess compliance against each sites project approval. Their locations will take account of a number of factors, such as:

- seasonally predominant daily wind patterns (e.g. upwind and downwind of operations given predominant SE/NW wind directions)
- the relative locations of each mines' highest controllable dust generating sources
- practicality of locating monitoring equipment close to the mining operations, and
- suitability of immediate location where sited eg not immediately next to unsealed roads.

An indicative array of monitoring locations is shown in Figure 4-1. These are positioned according to an operational mine plan scenario for concurrent mining at all three mine sites.

The suggested monitoring locations will allow for the analysis of upwind PM_{10} concentrations along the north/south and southeast/northwest axis that correspond to the prevailing wind directions; and areas that are predicted to be impacted by BTM Complex operations. The portable monitors should also capture any impacts during less frequent wind directions.

This combined network of portable monitors and TEOMs will allow for the identification of which mining may be contributing to any elevated measurements, so that appropriate mitigation measures can be employed.

4.2.3 High volume air samplers

Each of the BTM Complex mines operate HVAS for the purpose of compliance monitoring. The HVAS located on private land will be used to assess compliance with the air quality criteria detailed in each mines AQGHGMP. The HVAS sample PM_{10} by passing an air stream through a filter paper for a period of 24 hours every 6 days. The location and operation of each HVAS is illustrated in Figure 4.1 and detailed in each mines AQGHGMP.

4.3 Regional monitoring (control site)

Approval conditions require control monitoring sites to provide real time data on background air quality levels (i.e. not influenced by mining from the BTM Complex).

Approval conditions also note that the requirement for regionally based control sites can be 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 need for commissioning a control air quality monitoring site will be reviewed, in consultation with DP&E and EPA, pending EPA's decision on implementing the regional air quality monitoring network. This Strategy will be reviewed, and if required revised, pending the outcomes of this review.

As an interim control site, reference will be made to EPA monitoring data collected at Tamworth, which will provide an indication of regional air quality not influenced by mining from the BTM Complex.

4.4 Responsibility of the individual mines

Each mine shares responsibility for the maintenance, calibration, repair, operating costs and site access agreements for the operation of the monitoring network. Arrangements have been confirmed between the mines regarding the ongoing logistics of operating the monitoring network.

4.5 Data management and interpretation

It is proposed that real time air quality monitoring data from the three mine sites will be stored in a central data repository. The data will be available for use by each mine site and will be able to be viewed in various formats on a secure website to display the data in real-time.

Air quality data will be summarised, validated and available for the public and agencies on a monthly basis, via each mine site's website. The BTM Complex will also investigate systems for web based real-

time data publishing. The availability of this data will be staged, as detailed in Section 6.1, as the air quality monitoring system is installed, commissioned and proven.

4.6 Predictive and real-time air quality management

4.6.1 Overview of requirements

A key method to ensure that air quality management systems maintain standards of best available technology is to incorporate predictive and real-time reactive capability.

It is proposed that a predictive and reactive air quality management system will be implemented for the BTM Complex that personnel will use to:

- assess potential offsite impacts and evaluate community risk in advance and in real-time
- perform scenario modelling under predicted adverse or other operating conditions
- evaluate community complaints and determine if BTM Complex activities may have caused an impact
- accept information and data inputs from various instruments and data sources (e.g. web services, real-time monitoring)
- provide alerts with respect to abatement or avoidance of potential issues and operational requirements based on outputs of the system and site specific management measures.

4.6.2 Components

It is proposed that the predictive and reactive air quality management system will include:

- a predictive component: using forecast weather data and dispersion modelling
- a reactive component: using real-time meteorology, air quality monitoring and dispersion modelling
- a non-steady state air quality dispersion model (that is capable of processing data at a sub-hourly time interval)
- short term tiered trigger levels and notifications for managing potential impacts
- a daily forecast report: providing information on temperature inversions, wind conditions at various heights, dust risk.

The system requires reliable and frequent data communications from monitoring equipment and weather stations and will be maintained and supported to ensure that the information it provides is reliable and as accurate as possible.

It is extremely important to maintain periodic review of any forecast and real-time air quality system to ensure that the system is operating using:

- validated meteorological forecasts
- data from calibrated monitoring equipment

- accurate varying emission rates, informed by campaign monitoring where necessary
- accurate emission source parameters, i.e. updated as the mine plan evolves.

4.6.3 Predictive forecast meteorology

It is proposed that a predictive forecast meteorology system be implemented based on the *Weather Research & Forecasting* (WRF) model and CALMET, specifically for the BTM Complex, and data be made available for each of the mine sites, with half hourly forecasts up to 48 hours in advance. This system will download meteorological data and forecasts on a daily basis and process and run the WRF model to produce the information required for input to a real-time 3D dispersion model.

As with any predictive forecast, confidence reduces with longer predictions, however the half hourly 48-hour forecasts will provide useful planning information for operations. The forecasts for the next 24-hour and 12-hour periods will provide more confidence in predictions for the day ahead and how weather may affect operations.

Within 12 months of this meteorological system being configured and operating and every 3 years after commencing, the outcomes will be subject to an evaluation by a competent meteorologist or atmospheric science professional against actual meteorological and dust measurements and the meteorological system and refinements to the predictive system made where appropriate. The scope of the evaluation will include a review of predictive forecast models and analysis of data outputs to assess the accuracy of the dispersion modelling compared against measured meteorological and air quality levels.

This system's performance will be reviewed, including operating, reporting and accuracy performance every three months and validation reports will be produced.

Data from local automatic weather stations will be used to validate weather forecasting model performance over time.

Meteorological instrumentation or data communications equipment will be reviewed to confirm that the right quality of data is available to the system.

4.6.4 Integrated real-time monitoring data

To enable real-time reactive feedback from the system, a connection has been established to receive a data feed from weather stations and air quality monitoring equipment in the BTM Complex network.

These data feeds have been connected to the system from a central data repository and via a connection to loggers on infield monitors and weather stations using Wi-Fi and/or mobile networks to transfer data.

Real-time dust management capability builds on the information gained from predictive systems to proactively manage dust. The system will be improved further by incorporating real-time modelling and analysing modelled source contributions in real-time to identify the instantaneous main source of high emissions at specific locations around the operations. Protocols will be put in place to react to rising dust levels, e.g. automated notices sent to Open Cut Examiners to alert the need to respond with control/mitigation, and focus can be given to the most significant identified dust source in accordance with site specific management measures.

Real-time air quality monitoring data gathered from monitors will be used in the first instance to determine level of emissions and to manage dust generating activities from the operations. However, this data can

also be used to validate the air quality dispersion model predictions. Other monitoring data such as HVAS data may also be used for periodic validation.

4.6.5 Air quality dispersion model

The air quality dispersion model proposed for the BTM Complex will:

- be a 3 dimensional non-steady state model
- accommodate reliable, rapid-update data feed
- assimilate multiple data sources
- be accessible – for integration to a system
- be validated.

It is proposed that the BTM Complex system will use the WRF/CALMET/CALPUFF modelling system. CALMET is a meteorological pre-processor that provides the meteorological inputs required to run the CALPUFF dispersion model. It creates a fine resolution, three-dimensional meteorological field and includes a wind field generator that takes into account slope flows, terrain effects and terrain blocking effects. CALMET produces fields of wind components, air temperature, relative humidity, mixing height and other micro-meteorological variables for each time average step of the modelling.

CALPUFF is a multi-layer, multi-species non-steady state puff dispersion model that can simulate the effects of time and space varying meteorological conditions on pollutant transport, transformation and removal. The model contains algorithms for near-source effects such as building downwash, partial plume penetration, sub-grid scale interactions as well as longer-range effects such as pollutant removal, chemical transformation, vertical wind shear and coastal interaction effects. The model uses dispersion equations based on a Gaussian distribution of pollutants across the puff and takes account of complex arrangements of emissions from point, area, volume, and line sources.

Upper air data will be provided by the WRF system that automatically downloads global meteorological conditions and processes these to provide local information. This information is required to generate upper air meteorological data as well as a forecast meteorology prediction. CALMET will then be configured to use these weather data.

The CALPUFF model will be configured specifically for the BTM Complex operations and will use forecast meteorological data and real-time data from the ambient weather station network. Source emissions data will be configured and modelled in CALPUFF. Source emissions data will involve constant emission factors initially, and if considered appropriate, later improvements could include emission factors that are derived from ambient or campaign monitoring for significant sources.

4.7 Predictive and reactive triggers

Predictive and ‘near real-time’ reactive triggers will be configured in the system. These triggers will be initially set based on analysis of the available monitoring data, a review of the existing triggers at each site and experience from other similar operations where these systems are operating.

Predictive triggers will be set for typical meteorological conditions that are known to have adverse impacts on air quality due to dust generated during mining operations. Over time predictive triggers can be updated for conditions resulting in observed increases in dust impacts. The predictive triggers are incorporated into the daily dust risk forecast report. Reactive triggers will be set to alert operations when monitoring data for short term average periods indicate that the 24-hour air quality criteria may be reached at areas of relevant exposure. Short term triggers allow for proactive dust management to control 24-hour and ultimately annual average impacts based on measured shorter term average concentrations.

The monitoring data from the real-time monitors in the BTM Complex air quality monitoring network (i.e. e-samplers and TEOMs) will be assessed to determine if pre-defined trigger levels have been reached and when action is required.

Associated with each trigger level is a response which will inform the course of action taken by the relevant personnel. Two trigger levels are defined that require a response from the relevant personnel, as follows:

- investigation level
- action level.

An example of Investigation and Action trigger levels are shown in Table 4-1.These trigger levels have been set based on real-time monitoring data recorded at the Fairfax Public School. The relationship between peak 1-hour PM_{10} concentrations and mean 24-hour PM_{10} concentrations are analysed to determine the level of 1-hour PM_{10} concentrations that may result in elevated 24-hour PM_{10} concentrations.

Table 4.1 Investigation and trigger levels

Action level	Trigger level	Description/action required
Investigation	1-hour average PM_{10} concentration above 100 µg/m^3	Relevant personnel are required to identify what activities are occurring and notify plant/equipment operators that dust emissions may be elevated and additional dust controls may need to be implemented. Preparatory measures will be implemented or ready to be implemented.
Action	Consecutive 1-hour average PM_{10} concentration above 150 µg/m^3	Relevant personnel are required to implement controls such as additional water spraying or modifying work practices.

It is important to note that once the real-time air quality management system is operational, trigger levels will be reviewed, updated and refined following a review of the data and calibration of the system.

If the trigger levels are determined not appropriate to site operations, for example, there are too many or too few investigation or action responses, they will be reviewed and updated. Different trigger levels may be set for each monitoring location within the cumulative network. For example, they may be set higher for monitoring locations closer to dust sources. Trigger levels will also be regularly assessed as part of the ongoing review of this plan.

Actual predictive and reactive triggers will be reviewed regularly, and be based on the initial air quality data collected during commissioning of air quality monitoring equipment as well as ongoing monitoring results.

SMS and email alerts will be sent to relevant personnel and monitoring data will be displayed in near real-time on a customised web based reporting system.

Real-time dust management alerts are sent if the trigger conditions outlined above are met. The notification will also identify which criteria have triggered the alert.

Alerts will be sent when a new level is triggered, i.e. subsequent time periods that result in the same dust level will not generate multiple warnings. When the conditions increase to a higher alert level or when conditions return to a lower alert level, the system will send a new notification alerting all relevant personnel to the new dust management alert level.

All alerts are recorded by the system in an alert log that can be analysed at any time to identify trends or patterns in alerts that may lead to improvements in operational planning and/or dust control that is focussed on certain areas of operations or times of the day.

4.7.1 System outputs

Once the predictive and reactive system is implemented and configured as described above, a range of user interface, templates and reports will be able to be generated and used as part of standard operating procedures.

Some system outputs that will be required include:

- Daily forecast reports providing information on temperature inversions, wind conditions, dust risk, and recommended control actions.
- Graphical representation of the forecasted meteorology and real-time monitoring data via the system's web interface.
- Capability to analyse and confirm the likely source(s) of dust and path(s) that the dust has travelled. This functionality is critical in apportioning responsibility to operations for mitigating emissions.

This analysis provides the modelled path of a parcel of air and alternative paths accounting for uncertainty. It provides an indication of the time that the plume will have travelled over a certain area, which may assist operations in pinpointing activities that were occurring at that time in the locations highlighted for investigation.

A source apportionment chart can also be generated from modelled predictions and monitoring data at a selected location.

5. Corrective and preventative actions

5.1 Process to identify main source of dust impacts

It is proposed that the reactive component of the dust management system will be designed to process real-time data from PM_{10} monitors and weather stations. It will generate outputs (such as those outlined in Section 4.7.1) that are used with predetermined triggers to assess the potential for dust impacts from operations. The system will notify operators when triggers are activated. The system will be used to analyse and provide information on potential dust sources that are responsible for the increase in monitored dust.

For the BTM Complex, real-time monitors will be used to measure PM_{10} concentrations at a number of locations around the operations (for example as shown in Figure 4-1 and AQGHGMPs). The dust monitoring data will be sent in short time steps to a web server where it will be processed by the air quality management system. Trigger levels will be set for the real-time monitors (i.e. TEOMs and portable samplers). As the system operates over time the trigger levels will be refined through consideration of historical data and any other relevant observations.

If a real-time monitor triggers an alert, the system will query the monitoring data to determine if mining operations are upwind of the triggered monitor. If so, it will be used to assess whether activities occurring between upwind and downwind monitors are creating an increased level of dust that has set off an alert. The system will use available weather data to determine the likely area of the operations that contains the dust generating source. This can be done by activating a reverse trajectory analysis of the plume that has triggered an alert.

Figure 5-1 shows a logic diagram for responding to an alert that has been triggered.

5.2 Mitigation

Processes to mitigate air quality outcomes associated with operations are addressed in each mine sites individual AQGHGMPs.

Operational activities will be ranked based on dust generation potential. Recent studies performed as part of responses to the Coal Mine Particulate Matter Control Best Practice Pollution Reduction Program have confirmed that the main dust source at coal mines is hauling on unsealed roads, followed by wind erosion from exposed areas, trucks loading and unloading and bulldozer operations, blasting and graders.

Each mines' rankings will be used as the basis for scheduling operational activities or increasing dust control measures to mitigate risks when dust generation is predicted to reach trigger levels.

Dust generation assessment will be undertaken by experienced site personnel (e.g. OCE), with the assistance of various specialists (e.g. operations, environment and air quality specialists) as required.

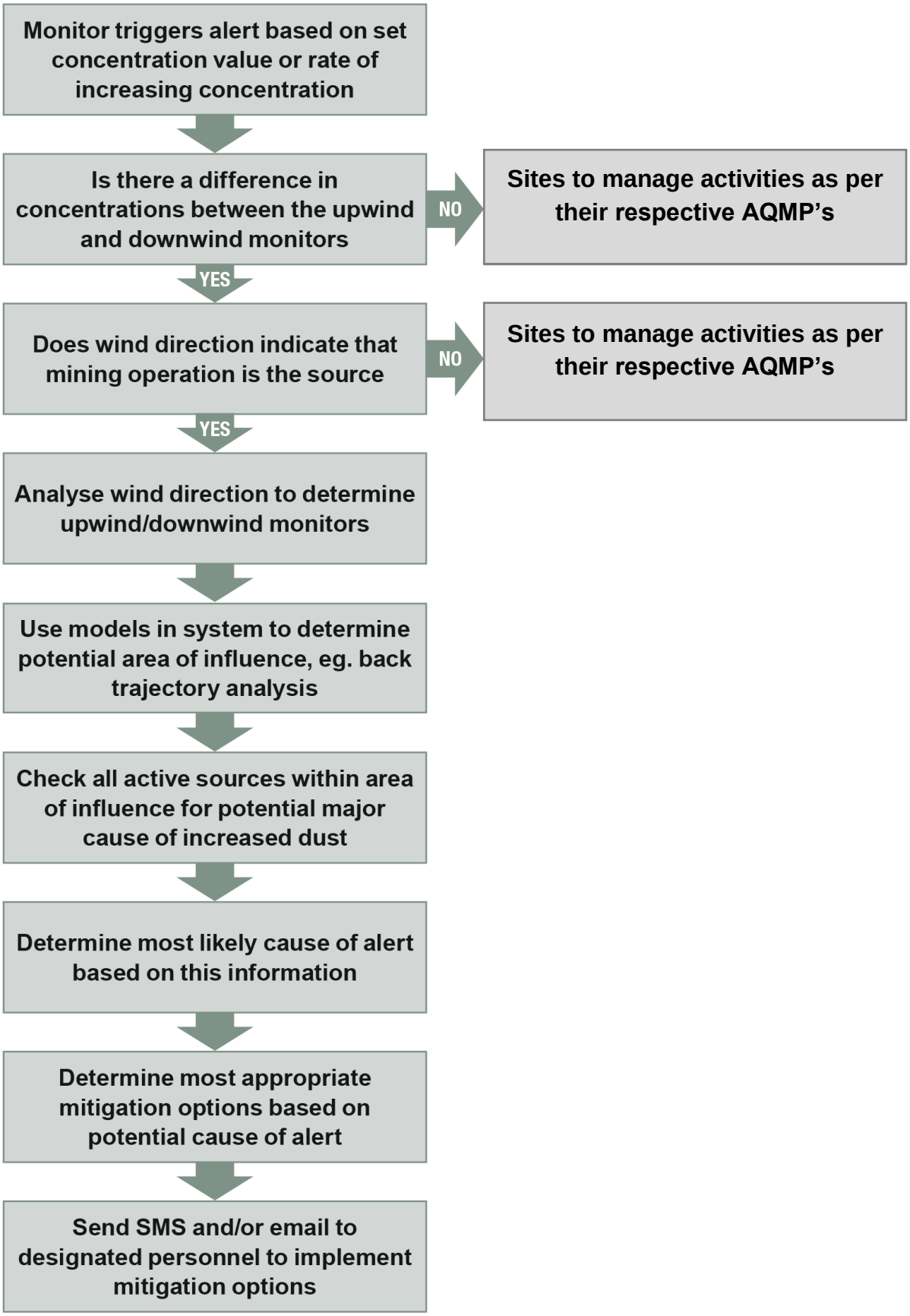

Figure 5-1 Logic diagram for system response to triggered levels

5.3 Communication

Regular meetings will be held by nominated personnel representing each of the mines in the BTM Complex (at least quarterly) to discuss predictive model outcomes, monitoring results and future operational events. Meeting minutes will be documented and retained at each mine site.

The trigger levels will initiate automated system alerts to relevant personnel within the BTM Complex to allow the complex to implement management measures in order to reduce dust generation.

When air quality criteria are exceeded, discussions will be held within the BTM Complex, regulatory agencies and affected landholders (where an exceedance occurs on privately-owned land).

Reporting of air quality exceedances will also be made in accordance with relevant project approval conditions.

5.4 Reporting

External reporting will include:

- updates on individual company websites
- presentations to Community Consultative Committees (CCCs)
- reporting as required under each mines approvals.

5.5 Unpredicted contingency

Unpredicted events such as dust storms, bushfires, agricultural activities, hazard reduction burning or similar activities that influence dust levels will be identified and reported as impacting on air quality trigger levels on a case by case basis.

Where air quality triggers occur and are outside forecast predictions or unexpected from model inputs, and can't be identified from specific source information from the BTM Complex operations, an air quality specialist will be consulted to investigate the cause of the impact. The specialist will refine the predictive model, and recommend appropriate action to address the outcomes of the unpredicted event.

6. Implementation

6.1 Staged approach

It is proposed that a staged approach will be taken to install the equipment and systems which are additional to individual mine's existing air quality monitoring systems.

This proposed staged approach of implementation is detailed in Figure 6-1 below and in the following sections.

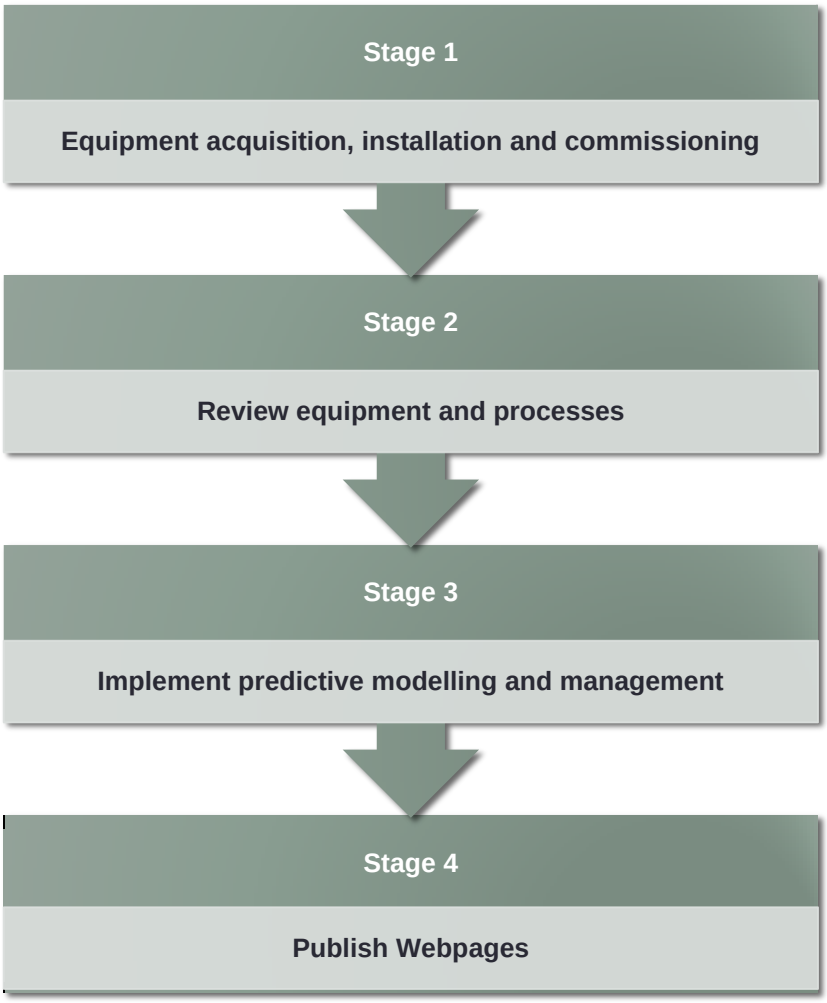

Figure 6-1 Staged approach to implementation

6.1.1 Stage 1 - Equipment acquisition, installation and commissioning

As detailed in Section 4.2, the real time monitoring network will include: 4 x real time PM_{10} (TEOM) monitors, one with real time $PM_{2.5}$ (TEOM) capability (Fairfax School) and 4 x portable (e-sampler) PM_{10} monitors.

The 4 x real-time portable PM_{10} monitors will be acquired and commissioned at locations relevant to current mining operations, as part of the day to day management of real-time dust. An indicative layout of these monitors is also shown in Figure 4-1. The installation of these portable PM_{10} monitors will be reviewed as part of Stage 2, to ensure they allow sufficient coverage to achieve the required monitoring goals. The configuration may change over time as each mining pit develops.

The central data repository will be created and the real time PM_{10} monitors will be linked into the repository.

BCM, MCCM and TCM have all acquired, installed and commissioned meteorological stations.

Stage 1 equipment was installed and commissioned in April 2016.

6.1.2 Stage 2 - Review equipment and processes

Within three months of the installation, approval of the strategy and commissioning of Stage 1 equipment the following will be reviewed:

- performance and reliability of the cumulative air quality monitoring equipment
- triggers proposed in this protocol
- central data repository and data interface.

6.1.3 Stage 3 - Implement predictive modelling and management

The predictive modelling system is scheduled to have been acquired, installed and commissioned by the end July 2017.

This system's performance will be reviewed every three months and validation reports will be produced.

6.1.4 Stage 4 - Publish webpages

Each mine site will maintain a Company webpage.

Continuous data collected by the real-time monitors will undergo preliminary data validity checks (for example, to identify outliers, negatives etc.). Each mines webpage will present summarised and validated real-time air quality results in respective Annual Reviews as the results from the staged implementation of the real-time air monitoring system are made available.

The Project Approval requirements to provide data from real-time monitors as described in each mines AQGHGMP, which include the publication of validated real-time monitoring data in a clearly understandable form, identification of mine operational responses to real-time monitoring data and weather forecasts and provision for on-line input by members of the community and regionally-based government regulators.

7. Document control

This cumulative air quality management strategy has been developed with the input of representatives of BCM, TCM and MCCM.

7.1 Review and revision

In accordance with the project approvals, the AQMS will also be reviewed within three months of:

- an annual review
- incident threatening material harm, requiring notification of the Secretary / relevant agencies
- statutory audit, and
- modification of project approval.

In addition this Strategy will be reviewed, and if required revised, pending the outcomes of the EPA regional network decision, refer section 4.3.

8. References

Boggabri Coal Mine, 2013. Draft Air Quality and Greenhouse Gas Management Plan. Prepared by Parsons Brinckerhoff.

Maules Creek Coal Project, 2014. Air Quality and Greenhouse Gas Management Plan. Prepared by PAE Holmes.

PAEHolmes, 2011. Report: Review and Recommendations for Boggabri/Tarrawonga/Maules Creek Cumulative Air Quality Monitoring, Prepared for Boggabri Coal Pty Ltd, Tarrawonga Coal Pty Ltd and Maules Creek Project by PAEHolmes, August 2011.

PAE Holmes, 2012. Report: Tarrawonga Coal Mine – Particulate Matte Control Best Practice Pollution Reduction Program, June 2012.

Project Approval (PA 09_0182) for Boggabri Coal Mine.

Project Approval (PA 10_0138) for Maules Creek Coal Mine.

Project Approval (PA 11_0047) for Tarrawonga Coal Mine.

Tarrawonga Coal Mine, 2015. Air Quality and Greenhouse Gas Management Plan

Appendix A

Requirements of Project Approvals

Boggabri Coal Mine

Table A.1 Project Conditions from Project Approval for Boggabri Coal Mine (Application No. 09-0182), July 2012.

Applicable Condition	Requirement	BCM Plan/BTM Complex Strategy	Section
Schedule 3 Condition 23	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	AQGHGMP	5.1 to 5.6
Schedule 3 Condition 24	The Proponent shall implement all reasonable and feasible measures to minimise the release of greenhouse gas emissions from the site	AQGHGMP	5.1 to 5.6
Schedule 3 Condition 25	Upon receiving a written request for acquisition from an owner of the land listed in Table 7, Boggabri Coal shall acquire the land in accordance with the procedures in the Project Approval Schedule 4 Condition 8 and 9.	AQGHGMP	5.7
Schedule 3 Condition 26	Upon receiving a written request from the owner of any residence on the land listed in Table 7 or the land listed in Table 8, the Proponent shall implement additional air quality mitigation measures (such as air filters, a first flush roof water drainage system and/or air conditioning) at the residence in consultation with the owner. These measures must be reasonable and feasible and directed towards reducing the air quality impacts of the project on the residence. If within 3 months of receiving this request from the owner, the Proponent and the owner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Director-General for resolution.	AQGHGMP	5.6
Schedule 3 Condition 26	The Proponent shall ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate matter emissions generated by the development do not exceed the criteria listed in Tables 6, 7 or 8 at any residence on privately-owned land or on more than 25 percent of any privately-owned land.	AQGHGMP	4.2, 5.1-5.6, 6.1-6.3
Schedule 3 Condition 27	Except for the air quality affected land in Table 7, the Proponent shall ensure that particulate matter emissions generated by the project do not exceed the criteria listed in Table 9, Table 10 and Table 11 at any residence on privately owned land or on more than 25 percent of any privately-owned land.	AQGHGMP	4.2
Schedule 3 Condition 28	Boggabri Coal shall ensure that particulate matter emissions generated by the project do not exceed the criteria listed in Tables 4-1, 4-2 and 4-3, at any occupied residence on any mine owned land (including land owned by adjacent mines) unless: (a) all reasonable and feasible avoidance and mitigation measures have been employed to prevent exceedance of the criteria (b) the tenant, and landowner (where owned by a mine other than Boggabri Coal), has been notified of health risks in accordance with the notification requirements under Schedule 4 of the Project Approval (c) the tenant on project owned land can terminate their tenancy agreement without penalty, subject to giving reasonable notice, and Boggabri Coal uses its best endeavours to provide assistance with relocation and	AQGHGMP	4.2

Applicable Condition	Requirement	BCM Plan/BTM Complex Strategy	Section
	sourcing of alternative accommodation (d) 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 a mine other than Boggabri Coal) (e) particulate matter air quality monitoring is undertaken to inform the tenant and landowner (where owned by a mine other than Boggabri Coal) of potential health risks (f) the monitoring data are provided 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 Director-General.		
Schedule 3 Condition 29	If particulate matter emissions generated by Boggabri Coal exceed, or contribute to an exceedance of the relevant cumulative criteria, in Table 12, 13 or 14 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 Applicant shall acquire the land in accordance with the procedures in Project Approval Conditions 8 and 9 of Schedule 4.	AQGHGMP	4.2 and 5.7
Schedule 3 Condition 30	The Proponent shall: (a) implement best management practice to minimise the odour, fume and dust emissions of the project, including best practice coal loading and profiling and other measures to minimise dust emissions from coal transportation by rail (b) operate a comprehensive air quality management system onsite 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 the project approval (c) manage PM2.5 levels in accordance with the requirements of the EPL (d) minimise the air quality impacts of the project during adverse meteorological conditions and extraordinary events (e) minimise any visible air pollution (f) minimise the surface disturbance of the site generated by the project (g) co-ordinate the air quality management onsite with the air quality management at other mines within the Leard Forest Mining Precinct (Tarrawonga and Maules Creek) to minimise the cumulative air quality impacts of the mines, to the satisfaction of the Director-General.	AQGHGMP	5.1 to 5.6
Schedule 3 Condition 31	The Proponent shall prepare and implement an Air Quality and Greenhouse Gas Management Plan for the project to the satisfaction of the Director-General. This plan must: (a) be prepared in consultation with the EPA and CCC, and be submitted to the Director-General for approval within 6 months from the date of project approval (b) integrate the recommendations of a Site Specific Best Management Determination and Reactive Dust	AQGHGMP	Whole AQGHGMP Document

Applicable Condition	Requirement	BCM Plan/BTM Complex Strategy	Section
	Management Strategy prepared to the satisfaction of the EPA (c) describe the measures that would be implemented to ensure: ▸ best management practice is being employed, consistent with the development of the site specific best management determination and reactive dust management strategy ▸ the air quality impacts of the project are minimised during adverse meteorological conditions and extraordinary events ▸ compliance with the relevant conditions of this consent. (d) describe the proposed air quality management system (e) include a risk/response matrix to codify mine operational responses to varying levels of risk resulting from weather conditions and specific mining activities (f) include commitments to provide summary reports and specific briefings at CCC meetings on issues arising from air quality monitoring (g) include an air quality monitoring program that: ▸ uses a combinations 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 project-related residences and residences of air-affected land listed in Table 7 and Table 8, subject to the agreement of the tenant or landowner ▸ evaluates and reports on the effectiveness of the air quality management system ▸ includes a protocol for determining any exceedances of the relevant conditions in this approval		
Schedule 3 Condition 31	(h) 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:	AQMS	Whole AQMS Document
	▪ systems and processes to ensure that all mines are managed to achieve their air quality criteria	AQMS	Whole AQMS Document
	▪ a shared environmental monitoring network and data sharing protocol	AQMS	Section 4.2
	▪ control monitoring site(s) to provide real time data on background air quality levels (i.e. not influenced by mining from the Leard Forest Mining Precinct and representative of regional air quality)	AQMS	Section 4.1 and 4.2
	▪ 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	AQMS	Section 4.6
	▪ procedures for identifying and apportioning the source/s	AQMS	Section 5.1

Applicable Condition	Requirement	BCM Plan/BTM Complex Strategy	Section
	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 the modelling of post incident plume dispersion, dual synchronised monitors and chemical methods of source apportionment.		

Maules Creek Mine

Table A.2 Project Conditions from Project Approval for Maules Creek Coal Project (Application No. 10_0138), July 2012.

Applicable Condition	Requirement	BTM Complex Strategy	Section
Schedule 3 Condition 34 (g)	(The Proponent shall prepare and implement an Air Quality and Greenhouse Gas Management Plan for the project to the satisfaction of the Director-General. This plan) 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:	AQMS	Whole AQMS Document
	▪ systems and processes to ensure that all mines are managed to achieve their air quality criteria	AQMS	Whole AQMS Document
	▪ a shared environmental monitoring network and data sharing protocol	AQMS	Section 4.2
	▪ control monitoring site(s) to provide real time data on background air quality levels (i.e. not influenced by mining from the Leard Forest Mining Precinct and representative of regional air quality)	AQMS	Section 4.1 and 4.2
	▪ 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	AQMS	Section 4.6
	▪ 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 the modelling of post incident plume dispersion, dual synchronised monitors and chemical methods of source apportionment (where possible).	AQMS	Section 5.1

Tarrawonga Coal Mine

Table A.3 Project Conditions from Project Approval for Tarrawonga Coal Project (Application No. 11_0047), January 2013.

Applicable Condition	Requirement	BTM Complex Strategy	Section
Schedule 3	The Proponent shall prepare and implement an Air Quality and Greenhouse Gas Management Plan for the project to the	AQMS	Whole AQMS

Applicable Condition	Requirement	BTM Complex Strategy	Section
Condition 29 (g)	satisfaction of the Director-General. This plan must: (g) include 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:		Document
	▪ systems and processes to ensure that all mines are managed to achieve their air quality criteria	AQMS	Whole AQMS Document
	▪ a shared environmental monitoring network and data sharing protocol	AQMS	Section 4.2
	▪ control monitoring site(s) to provide real time data on background air quality levels (i.e. not influenced by mining from the Leard Forest Mining Precinct and representative of regional air quality)	AQMS	Section 4.1 and 4.2
	▪ 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	AQMS	Section 4.6
	▪ 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 the modelling of post incident plume dispersion, dual synchronised monitors and chemical methods of source apportionment (where possible).	AQMS	Section 5.1