

MAC-ENC-PRO-057

AIR QUALITY MONITORING PROGRAM

Document Owner

Donna McLaughlin, Environment Superintendent

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Revision History

Version No.	Date Published	Details
1.2	30/3/2012	Draft provided to DP&I incorporating DP&I comments.
1.3	10/5/2012	Purpose of monitors DD01, DD12, DD22, DF01 & DF02 changed from statutory to internal use. These monitors are located on Mt Arthur Coal land and are not representative of nearby receivers
Final	6/6/2012	Approved by the Department of Planning & Infrastructure on 6/6/2012
2.1	21/5/2013	Minor monitoring location changes
Final	27/5/2013	Approved by the Department of Planning & Infrastructure on 27/5/2013

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1.0 Introduction

Hunter Valley Energy Coal Pty Ltd operates the Mt Arthur Coal mine complex which consists of approved open cut and underground mining operations, a rail loop and associated rail loading facilities. The operations are located in the Upper Hunter Valley, NSW approximately 5 kilometres south west of Muswellbrook.

This Air Quality Monitoring Program has been prepared for ongoing operations at the Mt Arthur Coal mine complex and should be read in conjunction with *MAC-ENC-MTP-040 Air Quality Management Plan*.

Data from this monitoring program will be used to determine the impact of Mt Arthur Coal's operations on the surrounding air environment, and the compliance status of the mining operations in relation to relevant statutory requirements.

This monitoring program details the following:

- Assessment criteria;
- Monitoring methodology;
- Monitoring locations; and
- Data analysis and reporting.

2.0 Assessment Criteria

The impact assessment criteria applicable to the Mt Arthur Coal mine complex are defined by the Project Approval (09_0062) and apply at privately owned residences and at privately owned vacant land. Privately owned land is considered dust-affected when dust levels exceed the criteria at any residence on privately owned land or on more than 25 per cent of any privately owned land.

In accordance with the Project Approval, Mt Arthur Coal must not cause any additional exceedances of the air quality impact assessment criteria, except where predicted in the Mt Arthur Coal Consolidation Project Environmental Assessment (EA) (Hansen Bailey, 2009).

The term "particulate matter" refers to a category of airborne particles that range from 0.1 micrometres (μm) to 50 μm in aerodynamic diameter. Total suspended particulate (TSP) relates to all suspended particles usually in the size range of 0.1 μm to 50 μm , while PM_{10} refers to particulate matter with a diameter less than 10 μm .

Deposited dust is assessed as insoluble solids as defined by Standards Australia in *AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method*.

2.1 Particulate Matter

The Mt Arthur Coal Mine Open Cut Consolidation Project Approval criteria for particulate matter are defined for TSP and PM₁₀ and are referred to as long-term (annual average) and short-term (24-hour maximum) criteria. The TSP and PM₁₀ criteria that apply to Mt Arthur Coal are summarised in Tables 1 and 2.

The prescribed long-term land acquisition criteria are the same as the prescribed long-term impact assessment criteria. However, additional details have been provided for the assessment of short-term land acquisition criteria. These are presented in Table 3.

Table 1: Long-term impact assessment criteria for particulate matter

Pollutant	Averaging period	Criterion	Basis
Total suspended particulate (TSP) matter	Annual	90 µg/m ³	Total ¹
Particulate matter <10µm (PM ₁₀)	Annual	30 µg/m ³	Total ¹

¹ Background concentrations due to all other sources plus the incremental increase in concentration due to the mine complex alone.

Table 2: Short-term impact assessment criteria for particulate matter

Pollutant	Averaging period	Criterion	Basis
Particulate matter <10µm (PM ₁₀)	24-hour	50 µg/m ³	Total ¹

¹ Background concentrations due to all other sources plus the incremental increase in concentration due to the mine complex alone.

Table 3: Short-term land acquisition criteria for particulate matter

Pollutant	Averaging Period	Criterion	Percentile ³	Basis
Particulate matter <10µm (PM ₁₀)	24-hour	150 µg/m ³	99 ⁴	Total ¹
Particulate matter <10µm (PM ₁₀)	24-hour	50 µg/m ³	98.6	Increment ²

¹ Background concentrations due to all other sources plus the incremental increase in concentration due to the mine complex alone.

² Incremental increase in concentrations due to the mine complex alone.

³ Based on the number of block 24-hour averages in an annual period.

⁴ Excludes extraordinary events such as bushfires, dust storms or any other activity agreed by the Director-General in consultation with the Office of Environment and Heritage.

2.2 Dust Deposition

Particle sizes larger than 50 µm are measured as deposited dust. The Office of Environment and Heritage (OEH) expresses dust deposition criteria in terms of an acceptable increase in dust deposition over the existing background deposition levels. The long-term (annual average) OEH criteria for depositional dust that apply to Mt Arthur Coal are provided in Table 4. The prescribed long-term land acquisition criteria are the same as the prescribed long-term impact assessment criteria.

Table 4: Long-term impact assessment criteria for deposited dust

Pollutant	Averaging period	Maximum increase ¹ in deposited dust level	Maximum total ² deposited dust level
Deposited dust	Annual	2 g/m ² /month	4 g/m ² /month

¹ Incremental increase of concentrations due to the mine complex alone.

² Background concentrations due to all other sources plus the incremental increase in concentrations due to the mine complex alone.

3.0 Monitoring Methodology

The Air Quality Monitoring Program will monitor PM₁₀, dust deposition and meteorological conditions, while TSP will be calculated from monitored PM₁₀ levels.

All monitoring will be conducted in accordance with the OEH's *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (2005).

3.1 Real-Time Particulate Monitoring (PM₁₀)

Real-time particulate monitoring is conducted using real-time, continuous air quality monitors to facilitate air quality management and provide early identification of increased dust levels at the monitoring site.

Seven tapered element oscillating microbalance analysers (TEOMs) are installed to measure PM₁₀ concentrations to the north, south, east and west of the mine site (refer to Table 5 and Appendix 1 for monitoring locations). Monitoring locations generally represent the closest privately owned residential areas to the site and provide background concentrations to determine compliance with air quality criteria.

PM₁₀ monitoring data from the real-time monitors is used to calculate annual average TSP levels. PM₁₀ can account for between 24 and 52 per cent of TSP depending on the source of the particulate, as detailed within the *National Pollutant Inventory Emission Estimation Techniques Manual for Mining, Version 2.3* (Commonwealth of Australia, 2001). Based on the relative contribution of dust sources at a surface mine (Pacific Environment) the PM₁₀ contribution to TSP is conservatively estimated to be 40 per cent at Mt Arthur Coal. Therefore, TSP results can be inferred by multiplying the annual average PM₁₀ results by 2.5.

Monitoring for particulate matter using a TEOM must comply with *AS 3580.9.8-2001 Determination of suspended particulate matter – PM₁₀ continuous direct mass method using a tapered element oscillating microbalance analyser*.

3.1.1 SMS and Email Alarm Function for Operational Control

The real time air quality monitors are linked to the site via a telemetry system that relays data to a central server for use primarily by the Advisor Environment and Open Cut Examiners (OCE).

A short message service (SMS) alarm function has been implemented and is designed to alert the OCE of an Episodic dust event that could potentially lead to an exceedance of the 24-hour PM₁₀ impact assessment criteria. An SMS alert is configured to alert the OCE and an email alert sent to the Advisor Environment when any two consecutive 15 minute readings greater than 70 µg/m³ are recorded per shift. This alarm is a trigger to the OCE to increase surveillance of the operation and modify or suspend operations as required.

A notification of exceedance email will be triggered to the Advisor Environment when the 24-hour average has exceeded 50 µg/m³. This email will trigger the exceedance protocol for investigation and reporting if required in accordance with *MAC-ENC-MTP- 040 Air Quality Management Plan*.

3.2 High Volume Air Sampler Monitoring (PM₁₀)

High volume air sampler (HVAS) monitoring is conducted over a 24-hour period every six days. Three HVAS are installed to measure PM₁₀ concentrations around the mine site (refer to Table 5 and Appendix 1 for monitoring locations).

Monitoring for particulate matter using a HVAS must comply with *AS/NZS 3580.9.6:2003 Methods for sampling and analysis of ambient air - Determination of suspended particulate matter – PM₁₀ high volume sampler with size-selective inlet - Gravimetric method*.

3.3 Dust Deposition Monitoring

Dust deposition gauges record dust fallout which can be derived from mining or non-mining activities, and provide a useful measure of changing air quality.

A total network of 13 dust deposition gauges are installed around the mine site and in residential locations (refer to Table 5 and Appendix 1 for monitoring locations). Seven of these gauges are positioned on Mt Arthur Coal owned land which is not representative of nearby privately owned residences and the information provided is for management purposes only. The compliance monitoring locations are representative of privately owned property in the vicinity of the site and have been determined in consultation with OEH. Data from these gauges enable determination of the compliance status of the mining operations at private properties in the vicinity of the mine site.

Dust deposition gauges are exposed for 30 days (+/- 2 days) and analysed for insoluble solids and ash residue. Monitoring for depositional dust must comply with *AS 3580.10.1-2003 Determination of particulates – Deposited Matter – Gravimetric Method*.

3.4 Meteorological Monitoring

One on-site automatic weather station (AWS) currently located within the Mt Arthur Coal Industrial Area (WS09) and another monitor located off-site at the Wellbrook site (WS10), both comply with *AS2923-1987 Ambient Air – Guide for measurement of horizontal wind for air quality applications* and the *NSW Industrial Noise Policy*. These AWS provide representative weather data for the mine site including wind speed and direction, solar radiation, humidity, rainfall and temperature. The on-site AWS location was sited by an accredited and independent consultant.

Real-time data from the on-site station is made available to the Advisor Environment, Drill and Blast Superintendent and OCE to assist in operational monitoring and real-time response.

Three additional AWS are situated around the mining operations area. These AWS provide representative weather data for the surrounding privately owned residential areas and the data is used for internal management purposes only.

3.4.1 SMS Alarm Function for Operational Control

An SMS alert is configured to alert the OCE and an email alert sent to the Advisor Environment when two consecutive 15 minute wind speeds readings are greater than 9 m/s per shift. This alarm is to alert the OCE that wind conditions are conducive to dust generation and that operations on exposed dump faces should be modified or suspended. Alarms will not be generated during periods of rainfall, as dust is unlikely to be generated during rainfall events.

4.0 Monitoring Locations

The Air Quality Monitoring Program consists of the following:

- Seven TEOMs;
- Three HVAS;
- 21 13 dust deposition gauges;
- Two AS2923-1987 compliant AWS (Industrial Area and Wellbrook); and
- Three AWS representative of conditions in surrounding privately owned areas.

All statutory monitoring locations must conform to the requirements of *AS 3580.1.1:2007 Methods for sampling and analysis of ambient Air - Guide to siting air monitoring equipment*, subject to local site constraints. Monitoring will be conducted in accordance with OEH standards as outlined in *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (2005)*.

Appendix 1 shows the Mt Arthur Coal mine site with surrounding receptors and established monitoring locations (refer to Table 5 for approximate geographic coordinates for each monitoring location).



Table 5: Mt Arthur Coal air quality monitoring locations

Site no.	Location	Instrument	Frequency	Approximate coordinates (MGA)	Reason for location	Purpose
DC02	Sheppard Avenue	TEOM	Continuous	E. 299169 N. 6426451	Determine PM ₁₀ levels to north-north-east of operation	Statutory
DC04	South Muswellbrook	TEOM	Continuous	E. 301618 N. 6425732	Determine PM ₁₀ levels to north east of the operation	Statutory
DC05	Roxburgh Road	TEOM	Continuous	E. 290210 N. 6424790	Determine PM ₁₀ levels to north-west of operation	Statutory
DC06	Edderton Homestead	TEOM	Continuous	E. 295900 N. 6413100	Determine PM ₁₀ levels to south of operation	Statutory
DC07^	Antiene	TEOM	Continuous	E. 304233 N. 6422344	Determine PM ₁₀ levels to east of operation	Statutory
DC08	Edinglassie – Located on Mt Arthur Coal land	TEOM	Continuous	E. 296010 N. 6424160	Determine PM ₁₀ levels to north of operation	Internal use*
DC09^	Wellbrook	TEOM	Continous	E. 290285 N. 6422256	Determine PM10 levels to north west of operation	Statutory
DF05	Roxburgh Road	HVAS	6 days	E. 290210 N. 6424800	Determine PM ₁₀ levels to north-west of operation	Statutory
DF06	Sheppard Avenue	HVAS	6 days	E. 299169 N. 6426451	Determine PM ₁₀ levels to north-north-east of operation	Statutory
DF07	South Muswellbrook	HVAS	6 days	E. 301592 N. 6425956	Determine PM ₁₀ levels to north east of the operation	Statutory
DD01	Antiene – Located on Mt Arthur Coal land	Dust Gauge	30 days (+/- 2 days)	E. 301892 N. 6442209	Monitoring levels generated from rail loading activities. Located on Mt Arthur Coal owned land with no private landholders located close by.	Internal use*
DD03	Antiene	Dust Gauge	30 days (+/- 2 days)	E. 303208 N. 6421307	Background monitoring for predominant east south easterly winds and representative of sensitive receptors to east of mine	Internal use*



Site no.	Location	Instrument	Frequency	Approximate coordinates (MGA)	Reason for location	Purpose
DD04	Antiene	Dust Gauge	30 days (+/- 2 days)	E. 305744 N. 6442204	Representative of sensitive receptors to east of mine	Statutory
DD05	Edderton	Dust Gauge	30 days (+/- 2 days)	E. 300422 N. 6414734	Monitor levels to the south of the operation. Located on Mt Arthur Coal owned land with no private landholders located close by.	Internal use*
DD08	Edderton Homestead	Dust Gauge	30 days (+/- 2 days)	E. 295733 N. 6413104	Background monitoring southwest of the mine	Statutory
DD10	Edderton Road	Dust Gauge	30 days (+/- 2 days)	E. 294948 N. 6420057	Monitor levels to the west of the operation. Located on Mt Arthur Coal owned land with no private landholders located close by.	Internal use*
DD12	Roxburgh Vineyard	Dust Gauge	30 days (+/- 2 days)	E. 292401 N. 6420371	Monitor levels to the west of the operation. Located on Mt Arthur Coal owned land with no private landholders located close by.	Internal use*
DD14	Roxburgh Road	Dust Gauge	30 days (+/- 2 days)	E. 290962 N. 6424585	Representative of sensitive receptors north-west of mine on Roxburgh Road	Statutory
DD15	Denman Road West	Dust Gauge	30 days (+/- 2 days)	E. 293346 N. 6422434	Representative of sensitive receptor to west of mine	Statutory
DD16	Onsite – Located on Mt Arthur Coal land	Dust Gauge	30 days (+/- 2 days)	E. 296010 N. 6424160	Monitoring levels to north of the mine. Located on Mt Arthur Coal owned land as no private landholders are located in this area.	Internal use*
DD19	Sheppard Avenue	Dust Gauge	30 days (+/- 2 days)	E. 299169 N. 6426451	Representative of sensitive receptors north-north-east of mine on Racecourse Road	Statutory
DD21	South Muswellbrook	Dust Gauge	30 days (+/- 2 days)	E. 301592 N. 6425956	Representative of sensitive receptors to north east of mine	Statutory
DD22	Yammanie	Dust Gauge	30 days (+/- 2 days)	E. 299406 N. 6425140	Monitor levels to the north east of the operation. Located on Mt Arthur Coal owned land with no private landholders located close by	Internal use*

Site no.	Location	Instrument	Frequency	Approximate coordinates (MGA)	Reason for location	Purpose
WS05	South Muswellbrook	AWS	Continuous	E. 301592 N. 6425956	Prevailing wind	Internal use*
WS08	Sheppard Ave	AWS	Continuous	E. 299169 N. 6426451	Prevailing wind	Internal use*
WS09	Mt Arthur Coal Industrial Area	On-site AWS	Continuous	E.301202 N.6420154	On-site location, calculation of lapse rate	Statutory
WS10^	Wellbrook	AWS	Continuous	E. 290285 N. 6422256	Prevailing wind, calculation of lapse rate	Statutory
WS12^	Antiene	AWS	Continuous	E. 304233 N. 6422344	Prevailing winds	Internal use*

* Monitoring sites designated for internal use provide indicative measures of meteorological and air quality conditions to enhance air quality management at Mt Arthur Coal. Data from these monitoring locations may not be included in statutory reporting.

^ New monitoring locations to be installed and operational by 30 September 2013.

5.0 Data Analysis and Reporting

5.1 Data Quality Assurance Procedure

5.1.1 Real-Time Particulate Monitoring (PM₁₀)

- Visual analysis of the raw data is undertaken to reveal any anomalous readings.
- Negative values recorded by the TEOM are not removed unless the data is considered anomalous. As the values are to be averaged over 24-hours the negative value will compensate for the over read in the preceding values and should therefore be left in to avoid positive bias in the measurements.
- Zero readings occur when there is a power failure and when a filter is changed and the data recording is stopped. These readings are removed from the analysis.

5.1.2 Dust Deposition Monitoring

- Depositional dust samples are analysed by a National Association of Testing Authorities accredited laboratory and an independent consultant to determine contamination. Typically, contamination may be caused by the presence of bird droppings, vegetation or insects. These samples are excluded from results.

5.1.3 Calibration of Equipment

- Monitoring equipment is maintained and calibrated in accordance with manufacturer's specifications and relevant standards.
- A calibration register and records are to be maintained to ensure calibration of equipment is undertaken as per schedule.

5.2 Reporting

Relevant air quality monitoring results will be published in the AEMR as required by the relevant project approval conditions. The AEMR will be submitted to the relevant government authorities, the Community Consultative Committee and it will be made available for public information on Mt Arthur Coal's website.

The Annual Return for EPL 11457 requires annual environmental reporting in accordance with R1 Annual return document conditions. The Annual Return for EPL11457 will include an air quality monitoring and complaints summary in accordance with condition R1.1.

Air quality monitoring results will also be published regularly on the Mt Arthur Coal website.

6.0 References

6.1 External Documents

Commonwealth of Australia (2001), National Pollutant Inventory Emission Estimation Techniques Manual for Mining, Version 2.3

Department of Environment and Conservation (2005), Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales

Department of Environment, Climate Change and Water (12 November 2009) Environmental Protection Licence 11457

Department of Planning, Minister of Planning's Project Approval document (dated 29 September 2010, Application Number 09-0062, Mt Arthur Coal Mine – Open Cut Consolidation Project.

Environmental Protection Authority (2000) NSW Industrial Noise Policy

Hansen Bailey (2009), Mt Arthur Coal Consolidation Project Environmental Assessment. Prepared for Hunter Valley Energy Coal Pty Ltd.

Katestone Environmental Pty Ltd (2010), NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining.

Standards Australia (2008) AS 3580.9.8-2008: Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM₁₀ continuous direct mass method using a tapered element oscillating microbalance analyser

Standards Australia (2007) AS 3580.1.1:2007: Methods for sampling and analysis of ambient air - Guide to siting air monitoring equipment

Standards Australia (1987) AS 2923-1987: Ambient air - Guide for measurement of horizontal wind for air quality applications

URS Australia Pty Limited (2000) The Mount Arthur North Coal Project, Environmental Impact Statement. Prepared for Coal Operations Australia Limited.

6.2 Mt Arthur Coal Internal EMS Documents

Mt Arthur Coal EMS Documents

MAC-ENC-MTP- 040 Air Quality Management Plan

Appendix 1: Monitoring location map

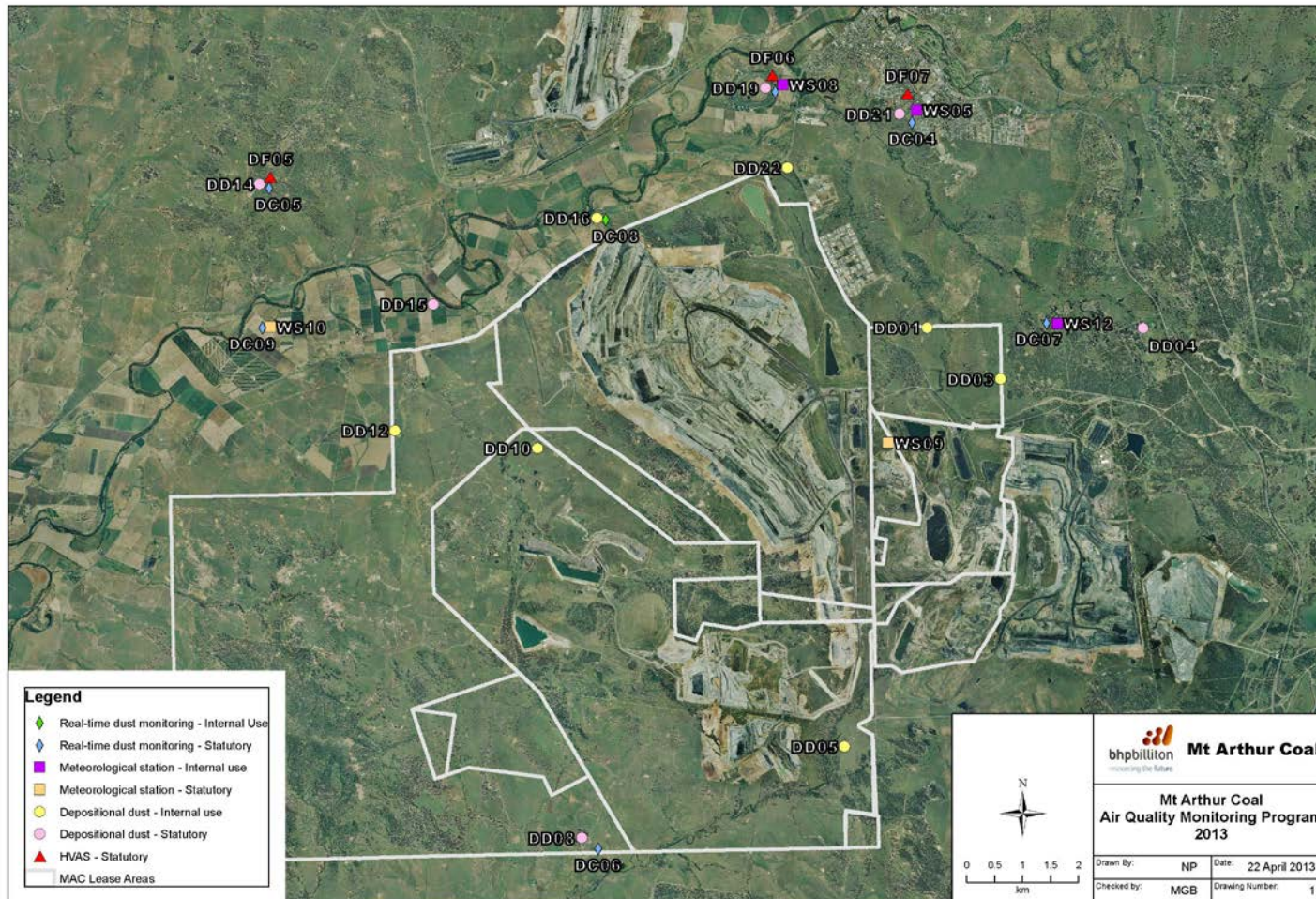


Figure 1: Air Quality Monitoring Locations

Appendix 2: Correspondence Records

Telephone correspondence on 16 March 2011, 3.38pm

Steve Perkins from Mt Arthur Coal contacted Steve Clair from the Department of Environment, Climate Change and Water (now Office of Environment and Heritage) on 16 March 2011 and asked if Mt Arthur Coal could meet with him to review Management Plans. Steve Clair advised that the Department of Environment, Climate Change and Water does not provide comment on Management Plans. Steve Clair informed Steve Perkins that he could send the Management Plans to him for review, but that he would not submit any comments on the Management Plans.

Email correspondence on 31 March 2011, 4.07PM

From: Perkins, Steven R (NSWEC)
Sent: Thursday, 31 March 2011 4:07 PM
To: 'steve.clair@environment.nsw.gov.au'
Subject: Air Quality Management Plan
Attachments: MAC-ENC-MTP-040 Air Quality Mgt Plan 110331.doc; MAC-ENC-PRO-057 AQ MonitoringProgram 110331.doc

Good afternoon Steve,

Please find attached the Mt Arthur Coal Air Quality Management Plan and Air Quality Monitoring Program for your review.

Regards,
Steve



Steven Perkins
Environmental Superintendent
Mt Arthur Coal
NSW Energy Coal

BHP Billiton
Thomas Mitchell Drive, Muswellbrook, 2333, NSW, Australia
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Michael White
General Manager Operations
Mt Arthur Coal
PMB 8
MUSWELLBROOK NSW 2333

Contact: Ben Harrison
Phone: 02 6575 3402
Fax: 02 6575 3515
Email: benjamin.harrison@planning.nsw.gov.au
Our ref: 10/20755

Dear Mr White,

**Mt Arthur Coal Mine – PA 09_0062
Environmental Monitoring and Management Plans**

Thank you for forwarding the following management plans required under project approval 09_0062 for the Department's consideration:

- Noise Management Plan (Condition 9 of Schedule 3);
- Noise Monitoring Program (Condition 9(c) of Schedule 3);
- Road Closure Management Plan (Condition 17(d) of Schedule 3)
- Air Quality Management Plan (Condition 24 of Schedule 3);
- Air Quality Monitoring Program (Condition 24(c) of Schedule 3);
- Visual Impact Report (Condition 49 of Schedule 3)

The Department has reviewed these plans (as amended following previous correspondence) and is satisfied that they generally address the requirements set out in the relevant conditions of the project approval. Consequently, I would like to advise you that the Director-General has approved the plans.

Could you please forward finalised copies of the above plans for the Department's records at your earliest convenience.

Should you have any enquiries on this matter please contact Ben Harrison on (02) 65753402.

Yours sincerely



David Kitto 6/6/12

David Kitto
Director
Mining and Industry Projects
As delegate for the Director-General



Contact: Ben Harrison
Phone: 02 6575 3402
Fax: 02 6575 3515
Email: benjamin.harrison@planning.nsw.gov.au
Our ref: 10/20755

Michael White
General Manager Operations
Mt Arthur Coal
PMB 8
MUSWELLBROOK NSW 2333

Dear Mr White,

**Mt Arthur Coal Mine – PA 09_0062
Environmental Monitoring and Management Plans**

Thank you for forwarding the following modified management plans required under project approval 09_0062 for the Department's consideration:

- Blast Management Plan, inclusive of monitoring program (Condition 17, Schedule 3);
- Air Quality Management Plan inclusive of monitoring program (Condition 24, Schedule 3)
- Noise Management Plan, inclusive of monitoring program (Condition 9, Schedule 3)
- Environmental Management Strategy (Condition 1, Schedule 5)

The Department has reviewed these plans and is satisfied that they generally address the requirements set out in the relevant conditions of the project approval. Consequently, I would like to advise you that the Director-General has approved the plans.

Could you please forward finalised copies of the above plans for the Department's records at your earliest convenience.

Should you have any enquiries on this matter please contact Ben Harrison on (02) 6575 3402.



Scott Brooks
Team Leader Compliance

As Nominee for the Director-General

27-5-2013