



# BLAST MANAGEMENT PLAN

Version	Effective Date (Month/YYYY)	Revision Detail (Include the main areas reviewed, trigger / why the change)	Author (Name/s)	Review Team (Name/s)
1	Mar 2010	Original Blast Management Plan	S. Peart	S. Peart
2	June 2013	Updated to include OC2 and OC3	Environment Department	Environment Department
3	Nov 2014	Update to include Open Cut 1 and Open Cut 2 Extension Areas (05_0117 MOD-9)	Environment Department	Environment Department
4	May 2015	To include management and mitigation measures for both Stage 1 and Stage 2 of the Project	MCO, SLR Consulting Australia Pty Ltd	MCO, SLR Consulting Australia Pty Ltd
5	Feb 2020	To incorporate approved modifications to Stage 1 (MOD 14) and Stage 2 (MOD 3) of the Project	MCO	MCO
6	Oct 2020	To incorporate approval of Stage 1 (MOD 15)	MCO	MCO
7	Nov 2023	Annual review considerations, minor grammar and formatting	MCO	MCO

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## 1.0 INTRODUCTION

The Moolarben Coal Complex (MCC) is an open cut and underground coal mining operation located approximately 40 kilometres north of Mudgee in the Western Coalfield of New South Wales (NSW) (**Figure 1**).

Moolarben Coal Operations Pty Ltd (MCO) is the operator of the Moolarben Coal Complex on behalf of the Moolarben Joint Venture (Moolarben Coal Mines Pty Ltd [MCM], Yancoal Moolarben [YM] Pty Ltd and a consortium of Korean power companies). MCO, MCM and YM are wholly owned subsidiaries of Yancoal Australia Limited.

Mining operations at the MCC are currently approved until 31 December 2038 and would continue to be carried out in accordance with NSW Project Approval (05\_0117) (Moolarben Coal Project Stage 1) as modified and NSW Project Approval (08\_0135) (Moolarben Coal Project Stage 2) as modified.

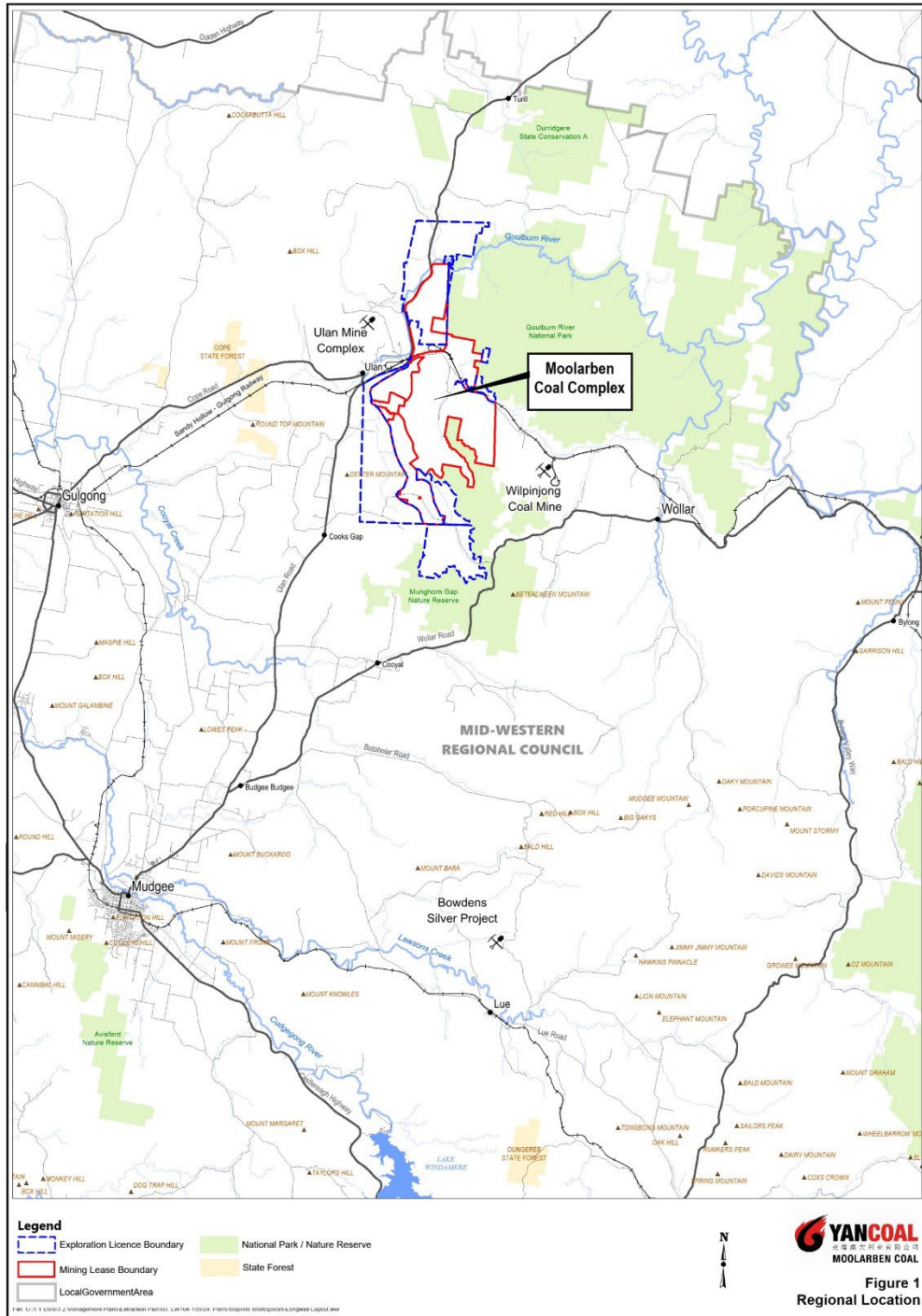
Mining operations at the MCC are undertaken in accordance with the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) approvals EPBC 2007/3297, EPBC 2008/4444, EPBC 2013/6926 and EPBC 2017/7974.

The current mining operations at the MCC are conducted in accordance with the requirements of the conditions of Mining Lease (ML) 1605, ML 1606, ML 1628, ML 1691 and ML 1715 granted under the *Mining Act 1992*.

The general arrangement of the MCC, showing modifications, is provided in **Figure 2**.

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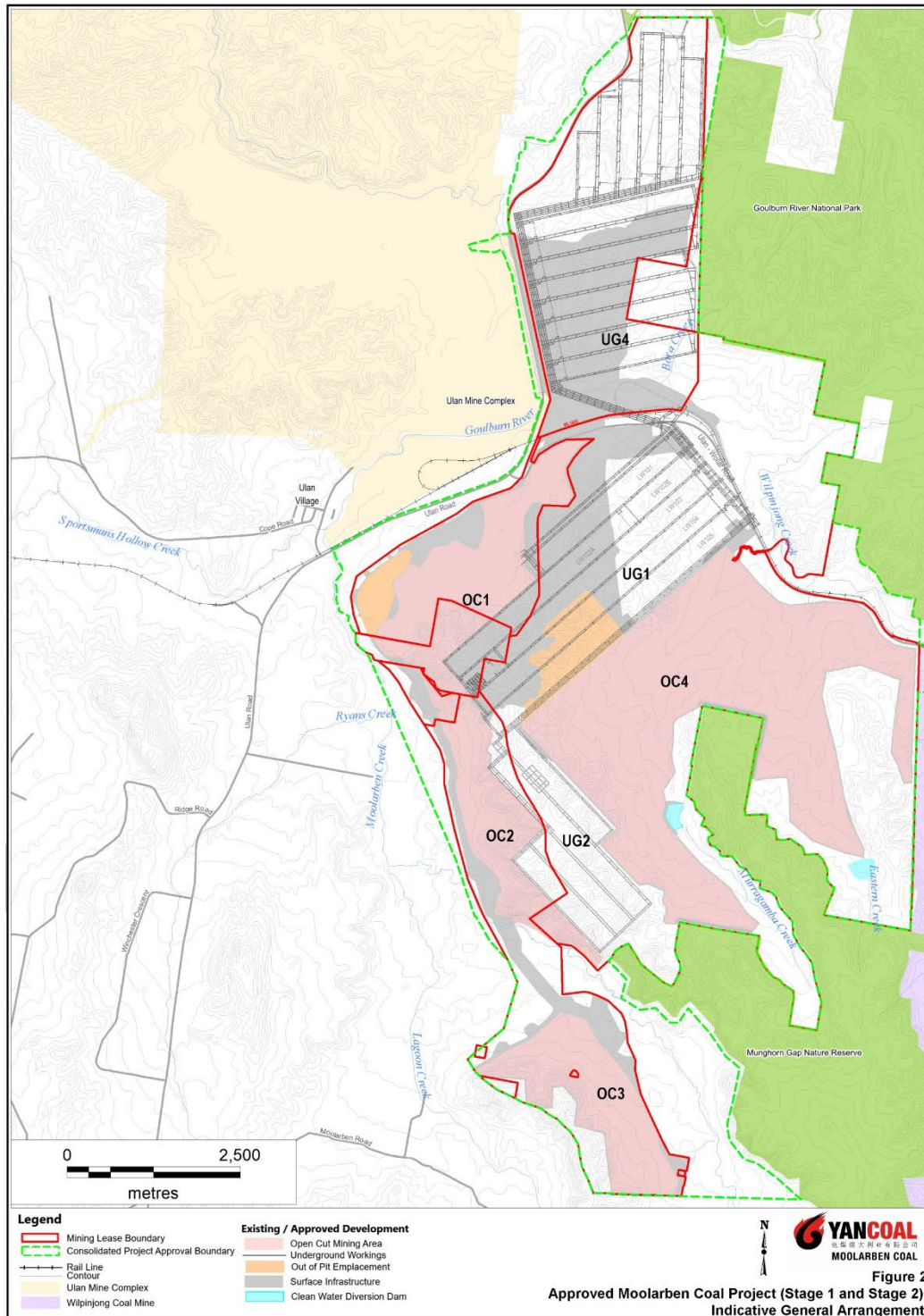
Figure 1: Regional Location



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**Figure 2: Approved Moolarben Coal Project (Stage 1 and 2) General Arrangement**



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## 1.1 OPERATIONAL STATUS

The Moolarben Coal Complex (MCC) comprises four approved open cut mining areas (OC1, OC2, OC3 and OC4), three approved underground mining areas (UG1, UG2 and UG4) and other mining related infrastructure (including coal processing and transport facilities) (**Figure 2**). Since the commencement of coal mining operations in 2010, mining activities have occurred within OC1, OC2, OC3, OC4, UG1 and UG4 with mining to progress to other approved mines in the future.

## 1.2 SCOPE AND PURPOSE

This Blast Management Plan (BMP) has been prepared by MCO (with input from experienced and qualified blast experts [SLR Consulting Australia Pty Ltd]) to satisfy the requirements of NSW Project Approval (05\_0117) (as modified) and the requirements of NSW Project Approval (08\_0135) (as modified).

The BMP describes the management of blasting associated with open cut operations (including management of overpressure, vibration, flyrock, dust and fume) at the MCC in accordance with the above listed Project Approvals.

In accordance with Condition 15(a) of Schedule 3 of the NSW Project Approval (05\_0117) (as modified) and Condition 16(a) of Schedule 3 of the NSW Project Approval (08\_0135) (as modified), this BMP has been prepared in consultation with the Environment Protection Authority.

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### 1.3 STRUCTURE OF THIS BLAST MANAGEMENT PLAN

The remainder of the BMP is structured as follows:

- Section 2.0** Outlines the statutory requirements applicable to the BMP.
- Section 3.0** Outlines the relevant blast criteria applicable to MCC operations.
- Section 4.0** Outlines the existing environment.
- Section 5.0** Outlines potential impacts of blasting.
- Section 6.0** Outlines blast management and control measures.
- Section 7.0** Outlines the blast monitoring program components.
- Section 8.0** Provides the response protocols for an exceedance of criteria.
- Section 9.0** Provides details for the review and improvement of environmental performance process.
- Section 10.0** Describes the management and reporting of incidents, complaints and non-compliances.
- Section 11.0** Key roles and responsibilities.
- Section 12.0** Provides the references cited in the BMP.

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## 2.0 STATUTORY AND PROJECT APPROVAL REQUIREMENTS

MCO's statutory obligations are contained in:

- the conditions of the NSW Project Approval (05\_0117) (as modified) and NSW Project Approval (08\_0135) (as modified);
- relevant licences and permits, including conditions attached to the Environment Protection Licence (EPL) 12932 and mining leases; and
- other relevant legislation.

Obligations relevant to this BMP are described in **Sections 2.1, 2.2, and 2.3** below.

### 2.1 PROJECT APPROVALS

#### 2.1.1 Blast Management Plan

Condition 15, Schedule 3 of Project Approval (05\_0117) and Condition 16, Schedule 3 of NSW Project Approval (08\_0135) require the preparation of a BMP. The conditions of the Project Approvals (05\_0117 and 08\_0135) relevant to this BMP are described **Appendix A**.

#### 2.1.2 Blast Fume Management Strategy

In 2014, the former Department of Planning and Environment (DP&E), now Department of Planning and Environment (DPE) required all open cut coal mines across NSW to develop a Blast Fume Management Strategy to minimise and manage blast-related fume emissions. MCO's initial BFMS was prepared in December 2014 and approved by DP&E on 25 February 2015. This strategy is now incorporated into this plan.

#### 2.1.3 Other Management Plan Requirements

Condition 3, Schedule 5 of Project Approval (05\_0117) and Condition 3, Schedule 6 of NSW Project Approval (08\_0135) outline the general management plan requirements that are also applicable to the preparation of the BMP. These requirements are also addressed in **Appendix A**.

## 2.2 LICENCES, PERMITS AND LEASES

In addition to the Project Approvals (05\_0117 and 08\_0135) and Commonwealth Approvals (EPBC 2007/3297, 2013/6926, 2017/7974 and 2008/4444), all activities at the MCC are conducted in accordance with a number of licences, permits and leases, including:

- Mining Leases issued under Part 5 of the NSW *Mining Act 1992* including ML1605, ML1606, ML1628, ML1691 and ML1715.
- EPL 12932 issued under Part 3 of the NSW *Protection of the Environment Operations Act 1997* by the NSW Environment Protection Authority (EPA).

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- Mining Operations Plan approved by the Resources Regulator (as amended from time to time).

### 2.3 OTHER LEGISLATION

The NSW Acts that may be applicable to blasting at the MCC include, but are not limited to, the:

- *Explosives Act 2003*;
- *Work Health and Safety Act 2011*; and
- *Work Health and Safety (Mines) Act 2013*.

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### 3.0 BLAST CRITERIA AND PERFORMANCE INDICATORS

#### 3.1 PROJECT APPROVAL CONDITIONS

Blasting criteria, blasting hours, blasting frequency, property inspection requirements and operating conditions are provided in Conditions 8 to 14, Schedule 3 and Conditions 7 to 15, Schedule 3 of the Project Approvals (05\_0117 and 08\_0135, respectively) (**Appendix A**). The prescribed blasting criteria are set out in **Table 1**.

**Table 1: Blasting Criteria**

Location	Airblast Overpressure (dB(Lin Peak))	Ground Vibration (mm/s)	Allowable Exceedance
Residence on privately owned land, churches and schools	120	10	0%
	115	5	5% of the total number of blasts over a period of 12 months
All public infrastructure	-	50 (or a limit determined by the structural design methodology in AS 2187.2-2006, or its latest version, or other alternative limit for public infrastructure, to the satisfaction of the Secretary)	0%

Note These criteria do not apply where MCO has a written agreement with the private landowner or public infrastructure authority and has advised the terms of this agreement to DPE.

mm/s = millimetres per second

Blasting for open cut operations can be carried out at the MCC between 9.00 am and 5.00 pm Monday to Saturday inclusive. MCO can undertake up to 2 blasts per day and 9 blasts per week (averaged over a calendar year). No blasting is allowed on Sundays, public holidays, or at any other time, without the written approval of the Secretary of the DPE.

Further, MCO cannot blast within 500 metres of a road, rail, transmission line or private land unless it has implemented specific measures to avoid impacts to people, livestock, structures and infrastructure, or it has an agreement in place with the relevant owner.

#### 3.2 MINING LEASE CONDITIONS

Mining lease conditions relating to blasting are consistent with the NSW Project Approvals (05\_0117 and 08\_0135).

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### 3.3 EPL CONDITIONS

EPL 12932 contains blasting conditions consistent with NSW Project Approvals (05\_0117 and 08\_0135) with respect to blasting times (Condition L6.1), number of blasts per day and per week (Condition L6.2) and overpressure and ground vibration criteria (Conditions L6.3 to L6.6).

In addition to this, EPL 12932 contains specific requirements around monitoring locations and includes an additional obligation around blast fume emissions. Condition M8.1 requires monitoring of overpressure and ground vibration at Ulan Public School (EPL Identification No. 49, BM1). Blast monitoring at this site and others is further discussed in **Section 7.1**.

Condition L6.7 of EPL 12932 requires that *offensive blast fume must not be emitted from the premises*, and defines an offensive blast fume as follows:

*Offensive blast fume means post-blast gases from the detonation of explosives at the premises that by reason of their nature, duration, character of quality, or the time at which they are emitted, or any other circumstances:*

- 1. are harmful to (or likely harmful to) a person that is outside the premises from which it is emitted; or*
- 2. interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted.*

### 3.4 PERFORMANCE INDICATORS

The extent of compliance with the above criteria and requirements will be measured by the following performance indicators:

- compliance with the relevant criteria at monitoring locations;
- number of blast fume events leaving the site<sup>1</sup> at Level 3 or above in **Section 5.3**, annually at the MCC; and
- compliance with this plan, as indicated through annual reporting.

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<sup>1</sup> Site is as per the “premises” definition for EPL 12932 for the Moolarben Coal Complex.

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## 4.0 EXISTING ENVIRONMENT

### 4.1 BASELINE DATA

MCO blasts overburden, interburden and coal to assist with extraction. The nature of blast shots varies with the terrain, material and bench height (among other factors). Previous environmental assessments for the MCC includes Wells (2006), Global Acoustics (2012), EMM (2013) and SLR (2017).

A summary of the environmental monitoring results collected by MCO is presented on the [Moolarben Coal website](#) every month in accordance with Condition 11(a), Schedule 5 and Condition 11(a), Schedule 6 of the Project Approvals (05\_0117 and 08\_0135, respectively). This summary includes the results of blast monitoring.

### 4.2 SENSITIVE RECEPTORS

Potentially sensitive receptors to blasting impacts from operational activities associated with the MCC are shown on **Figure 3**. These include:

- privately owned residences;
- infrastructure, including Ulan Road bridge, Ulan-Wollar Road bridges, Sandy Hollow Gulgong railway line (and associated culverts), Wollar-Wellington 330 kilovolt (kV) transmission line, and the Essential Energy 66 kV transmission line;
- public roads (including Ulan-Wollar Road and Ulan Road); and
- heritage sites, including Aboriginal rock shelter sites.

Potential blasting impacts at these receptors/features have been modelled as a component of the environmental assessments for the Moolarben Coal Project Stage 1 and Moolarben Coal Project Stage 2 and are shown in **Section 4.1**.

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## 5.0 BLAST IMPACTS

Blasting has the potential to result in the following hazards which may present a risk to public safety or property damage, if inappropriately managed:

- overpressure (i.e. airblast) and ground vibration exceedances;
- flyrock;
- dust and fume; and
- misfires.

### 5.1 OVERPRESSURE AND VIBRATION

Blasting generates a transient air pressure greater than the surrounding atmospheric pressure, known as an overpressure. An overpressure has the potential to damage buildings and infrastructure.

Some of the energy released as a result of blasting can result in vibration of the ground which has the potential to damage buildings and infrastructure.

Blast-related overpressure and vibrations also have the potential to impact human amenity. Buildings and infrastructure can generally sustain higher levels of overpressure and vibrations. The criteria for private residences set out in **Section 3.1** are based on human comfort thresholds.

### 5.2 FLYROCK

Flyrock is any material ejected from the blast site by the force of the blast. Flyrock has the potential to damage buildings and infrastructure and poses a safety hazard.

### 5.3 DUST AND FUME

Blasting has the potential to generate dust emissions which can impact human health and amenity.

Blasting has the potential to generate fume as a result of the use of ammonium nitrate-based explosives.

Post-blast fume is largely a product of (incomplete) combustion from a blast. The products of combustion from a blast may include oxides of nitrogen (NO<sub>x</sub>), ammonia, nitric acid, carbon monoxide and carbon dioxide. These gases are often referred to as “fume”. NO<sub>x</sub> is visible and the colour ranges from yellow to a reddish-brown depending on the concentration and size of the gas cloud. The other combustion products are not visible.

Exposure to these gases at certain concentrations can pose health risks. Fume generation is rated in accordance with the Australian Explosives Industry Safety Group (AEISG) (2011) *Code of Practice and Management of Blast Generated NO<sub>x</sub> Gases in Surface Blasting* shown in **Appendix B**.

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## 6.0 BLAST MANAGEMENT AND CONTROL MEASURES

### 6.1 PUBLIC SAFETY

MCO has developed a blasting protocol to protect the safety of people, property, and livestock. Specific actions to protect public safety include:

- A blast exclusion zone for production blasts (i.e. overburden, interburden and coal shots) of a minimum of 500 metres (m) for personnel is established in accordance with the MCO internal procedures.
- Pre-blast inspections are undertaken.
- Sentries are posted to restrict access to a blast exclusion zone.
- Registered residences are notified of blasting times and potentially impacted nearby residents/landholders are directly contacted.
- The general public being informed of blasts via road signage or by checking [Moolarben Coal's website](#).
- Emergency services and government agencies are notified, including the following:
  - Mudgee Police;
  - Mudgee Ambulance;
  - Mid-Western Regional Council;
  - Roads and Maritime Services (RMS) (Parkes Office); and
  - Rural Fire Service.

#### 6.1.1 Public Notice

Any private landholder within 2km of open cut operations at the MCC, or any other private landowner that registers an interest in being informed of the blasting schedule, is notified via SMS or as otherwise agreed between the parties. MCO maintains these contacts in a pre-blast notification register. Those listed on the register are contacted prior to blasting and will be re-notified if a blast is delayed by more than two hours.

MCO operates and maintains a 24 hour free-call Community Response Hotline (1800 556 484) and a public website [www.moolarbencoal.com.au](http://www.moolarbencoal.com.au) where the local community is informed of blasting activities and provides up-to-date information on the blasting schedule.

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### 6.1.2 Road Closures

A Road Closure Procedure has also been developed to the satisfaction of Mid-Western Regional Council. It includes the following actions for when blasts are planned to occur within 500 metres of Ulan Road or Ulan Wollar Road:

- public notification of the date and time of blast related road closures in a local newspaper, via road signage and on [Moolarben Coal's website](#);
- implementation of road closure and traffic controls (including RMS traffic control training for relevant personnel); and
- post-blast road inspections and road clearance (where required) prior to road re-opening.

## 6.2 INFRASTRUCTURE

### 6.2.1 Public Infrastructure

The closest non-mine owned infrastructure potentially sensitive to blasting activities at the MCC includes the Ulan Road bridge over the Sandy Hollow Gulgong railway line (east of the Ulan Coal Mine rail loop), the Sandy Hollow Gulgong railway line (and associated culverts), Ulan-Wollar Road bridges, Ulan Road, Ulan-Wollar Road (and other minor public roads), the Essential Energy 66 kV transmission line and the Wollar-Wellington 330 kV transmission line.

MCO has written agreements with TransGrid and Australian Rail Track Corporation (ARTC) to undertake blasting within 500 m of the Wollar-Wellington 330 kV transmission line and within 500 m of Sandy Hollow Gulgong railway line, respectively. These agreements include specific procedures to manage blasting within 500 m of these infrastructure assets, including:

- communication protocols to inform TransGrid and ARTC of proposed blasting activities within 500 m of the applicable infrastructure;
- implementation of agreed controls, including but not limited to vibration limits;
- monitoring and provision of monitoring results, post blasting;
- notifications regarding criteria exceedances or infrastructure damage;
- investigation or inspection regimes required post blasting; and
- responsibility for repair of any MCO related blasting impacts.

As discussed in **Section 6.1**, MCO has in place a Road Closure Procedure to protect road users from fly rock and to avoid structural damage to the road infrastructure from blast events. Based on work undertaken by Terrock Consulting Engineers, TransGrid and MCO have agreed that peak particle velocity

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(i.e. ground vibration limits) for the Wollar-Wellington 330kV transmission line should not exceed 50 mm/s for tension towers and 100 mm/s for suspension towers.

Blasting limits for ARTC infrastructure (i.e. rail line, culverts, bridges) are managed according to a risk management approach agreed to between MCO and ARTC. Notwithstanding, by managing blasting such that vibration at the 330 kV suspension towers does not exceed 50 mm/s, a vibration limit of 50 mm/s at ARTC infrastructure is also maintained.

Detailed monitoring of all blasts will be undertaken throughout the life of the MCC at relevant locations to enable modification and refinement of blast designs as necessary.

### 6.2.2 Private Residence Inspections and Investigations

All private residences within a 2 km radius of MCC open cut mining operations have been notified in writing that they are entitled to a structural property inspection prior to the start of mining operations in the respective open cuts. Written notification was also sent to Ulan Public School.

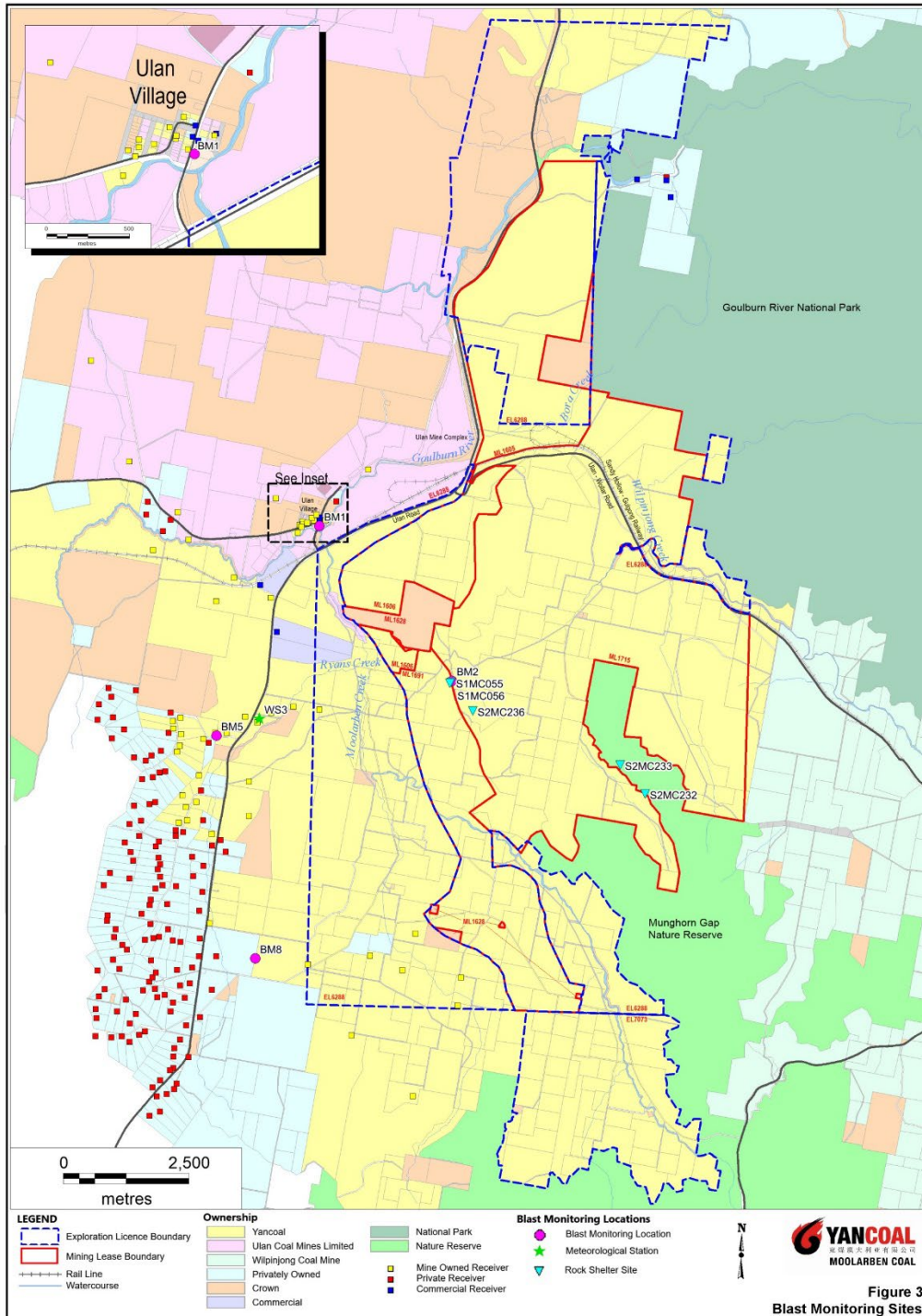
In accordance with Condition 11, Schedule 3 and Condition 12, Schedule 3 of the NSW Project Approvals (05\_0117 and 08\_0135, respectively), the inspections will be performed by a qualified, experienced, and independent person, whose appointment is acceptable to both parties. The inspection includes an assessment of the condition of the building or structure and recommended measures to mitigate any potential blasting impacts. A copy of the report is to be provided to the resident.

In accordance with Condition 12, Schedule 3 and Condition 13, Schedule 3 of the Project Approvals (05\_0117 and 08\_0135, respectively), should any private landholder within a 2 km radius of open cut operations at the MCC claim that buildings and/or structures on their land have been damaged as a result of blasting activities at the MCC, an investigation will be performed by a suitably qualified, experienced, and independent person, whose appointment is acceptable to both parties. This investigation will be undertaken within three months of the claim. A copy of the report is to be provided to the resident.

If this investigation confirms the landholder's claim, and both parties agree with these findings, MCO will repair the damages to the satisfaction of DPE. However, if the landholder or MCO disagree with the findings of the report, either party may refer the matter to the Secretary of DPE for resolution as outlined in the Environmental Management Strategy.

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Figure 3: Moolarben Coal Complex Blast Monitoring Sites



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### 6.3 ABORIGINAL ROCK SHELTER SITES

Previous Aboriginal cultural heritage impact assessments identified several rock formations within the MCC that are likely to be Aboriginal rock shelters. Aboriginal rock shelters within the approved surface disturbance footprint have/will be salvaged prior to disturbance. Rock shelters outside the approved surface disturbance footprint, including S1MC055, S1MC056, S2MC232 and S2MC233 (Figure 5), will be managed to protect from damage. MCO has committed to engage a suitably qualified expert (e.g. geotechnical engineer) to determine the appropriate vibration limits to ensure that damage is avoided for these sites.

Engineering studies have now been conducted for the MCC to determine appropriate vibration levels to protect nearby Aboriginal rock shelters (Terrock Consulting Engineers, 2014 & 2015, SLR 2018). The most recent SLR study references observational research undertaken by the United States (US) Army Corps of Engineers into the effects of large surface blasts on the dynamic stability of nearby unlined tunnels of various diameters in sandstone and granite. The US Army Corps research indicated that intermittent rock fall or observable damage was not observed until vibration levels exceeded 460 mm/s. Based on these findings and SLR's recommendation, a rock shelter vibration damage criterion of 250 mm/s (safe design 5% exceedance level) will be adopted. MCO will adjust its blast designs, as necessary, to comply with this criterion.

MCO will use mobile monitors to monitor ground vibration levels when blasts occur near these rock shelters. As recommended by SLR, blast vibration monitoring will be undertaken when blasting is within 230 m of rock shelters S1MC055, S1MC056, S2MC232 and S2MC233.

Where salvage has been implemented no further vibration monitoring or blast management will be required for the feature.

All other heritage sites will be managed in accordance with the Heritage Management Plan.

### 6.4 ADVERSE WEATHER AND BLASTING

The primary factor affecting air quality impacts offsite (and hence at sensitive receptors) is poor air dispersion<sup>2</sup>. Air dispersion (and hence dust dispersion) is affected by the complex interaction of meteorological parameters such as temperature, relative humidity, wind speed and direction and

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<sup>2</sup> Note that there may be up to about a 10-fold difference in the level of dust emitted between best case controlled (e.g. 90% control for haul roads) and worst case dust generating activity. However this is a small factor relative to the approx. >100-fold differences that can arise due to poor air dispersion conditions (e.g. maximum downwind dust levels due to a mine are typically >100-fold greater than the lower downwind dust levels due to the mine that occur up to 20% of the time for the same prevailing wind conditions). Hence poor air dispersion (not wind condition, and not dust emission) is the primary factor affecting off-site air quality impacts.

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atmospheric mixing conditions (amongst many others). This dynamic interaction makes it impractical to reasonably or accurately define specific measurable weather conditions that are associated with increased impacts. For example, high wind conditions (e.g. one-hour average wind speeds > 8m/s) can increase visible dust emissions at the source, but these conditions will predominantly also increase air dispersion and will generally result in lower off-site dust levels (even if there is an increased release of dust at the source). Hence there is no definable wind speed threshold or set of conditions that can be measured that will correlate with increased dust levels.

On a practical level, the only definable weather situation where the operation of the MCC may affect impacts at sensitive receptors is the presence of winds towards receptors (i.e. wind direction NE to SE [45 to 135 degrees]) along with poor air dispersion conditions prevailing at the time of blasting at the operation.

Hence, adverse weather conditions are defined as:

- any weather condition which results in a difference between the monitored upwind and downwind ambient dust level being greater than  $25\mu\text{g}/\text{m}^3$  when the wind blows across the MCC towards a sensitive receptor location; or
- NE to SE [45 to 135 degrees]) winds at speeds at or greater than 10m/s over a 20-minute averaging period.

MCO will consider delaying blasts during adverse weather conditions, when there is potential to increase impacts to sensitive receptors outside of the project approval boundary.

There may be circumstances where blasts may need to be fired during adverse weather, particularly if explosives have already been loaded. The Open Cut Mine Manager (or delegate) will review the assessment where it is identified that adverse weather conditions are present. If blasting in adverse weather, the following process will be implemented:

- Review of the blast design, environmental forecasting model, dust risk and fume prediction.
- Review of 7-day weather forecast including rain and thunderstorm forecasts.
- Identification of further controls to minimise impacts, such as increased exclusion zones (as required).
- Consideration of the safety, operational and community risks of delaying the blast.
- Determination whether to alter the blast time.
- Notification of the Environment and Community Manager and the Underground Mine Manager (as required).

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## 6.5 BLASTING CONTROLS

MCO is committed to designing and managing its blasting operations to meet all relevant statutory requirements and to minimise the risk of impacts to residential receivers, sensitive infrastructure and heritage sites S1MC055, S1MC056, S2MC232 and S2MC233.

To meet all blasting related requirements, MCO implements procedures to minimise blast overpressure, vibration levels, flyrock and dust/fume from its blasting operations. Blast management procedures include:

- Training all relevant personnel on environmental obligations and explosives management;
- Use of appropriate initiation and detonation systems and adherence to blast loading and initiation designs;
- Use of adequate burden, stemming lengths and stemming material to confine explosives;
- Designing all blasts to comply with vibration and airblast limits;
- Pre- Blast Assessments including the use of weather forecasting software;
- Implementation of procedures to mitigate fume generation for all blasts (**Section 6.5.1**);
- Monitoring of all blasts at locations (**Section 7.0**);
- Calibration of site models, using monitored data from previous blasting, to enable refinement and assessment of ongoing impacts;
- Development of a blast record system which captures sufficient information to allow appropriate categorisation and comparison of blasts (**Section 7.4**);
- Periodic review of blasting procedures to evaluate performance; and
- Evaluation of new technology and alternative blasting methodologies as they become available.

### 6.5.1 Fume Management

Blast fume management is based on the AEISG Code of Practice (2011). This includes consideration of the following factors and practices to mitigate fume:

- Explosive formulation and quality assurance.
- Geological conditions (material properties).
- Presence of water.
- Blast design including hole depth.
- Explosive product selection.

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- On-bench practices.
- Contamination of explosives in the blast hole.
- Proximity to sensitive receptors.
- Meteorological conditions.

Further detail is provided in the Blast Fume Cause and Control Matrix in **Appendix C** and the Blast Fume TARP detailed in **Appendix D**.

### 6.5.2 Environmental Forecasting Software

MCO operates an environmental forecasting model as part of the blast management system at the MCC which allows MCO to simulate potential dust and fume impacts from a blast, up to 48 hours in advance and reschedule as required.

### 6.5.3 Pre-Blast Assessment

Prior to blasting at MCO a preliminary assessment of the meteorological conditions is undertaken using an environmental forecasting model, this allows MCO to simulate potential dust and fume impacts from a blast in advance of initiation, and reassess blasting as required based on green, orange red rating.

A review of the blast design, controls and potential impacts on public infrastructure, sensitive receptors and interactions with neighbouring operations is completed by the Drill and Blast Engineer. On the day of the blast, a pre-blast meteorological assessment is coordinated by the Environment and Community Coordinator or delegate. The pre-blast meteorological assessment includes:

- Notification checks.
- Real time meteorological conditions assessed in the lead up to the blast.

If required, this pre-blast assessment will be reviewed and revised to reflect changes to the mine design, stakeholder and blast locations, community, and regional land ownership.

## 6.6 CUMULATIVE IMPACTS

A communications protocol has been developed with Ulan Coal Mine and Wilpinjong Coal Mine so that cumulative impacts from simultaneous blasting are avoided. This protocol outlines that blast times are rescheduled where there is potential for blasts to occur concurrently. The protocol requires communication to be made prior to each blast with both Ulan Coal Mine and Wilpinjong Coal Mine.

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## 7.0 BLAST MONITORING PROGRAM

### 7.1 BLAST OVERPRESSURE AND VIBRATION MONITORING

Monitoring frequency and parameters are outlined in **Table 2**. Monitoring sites have been selected in consultation with the EPA and are representative of the nearest privately owned residences, and other sensitive infrastructure located within 2 km of blasting activities.

**Table 2: Monitoring Parameters**

Parameter	Units of Measure	Frequency	Sampling Method
Overpressure	dB (Lin Peak)	Every Blast	Type 1 noise blast logger
Ground vibration	mm/s	Every Blast	Geophone logger or similar
Fume	AEISG Code of Practice Fume Rating System	Every Blast	Observation and video recording

Blast monitoring locations relative to open cut operations at the MCC are illustrated in **Figure 3** and described in Table 3. Blast monitoring locations will be reviewed and modified where necessary as a result of changes to the geographical location of blasting or changes to land ownership (where relevant).

Blast overpressure and ground vibration monitoring locations for OC3, will be established prior to blasting operations in OC3. These locations will be dependent on access and land ownership.

All blast monitoring instrumentation will be installed, calibrated, and maintained in accordance with AS2187.2-2006 and the manufacturer's specifications.

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**Table 3: Location of Monitoring Equipment**

Locations	Site ID	Parameters	Frequency	Justification
Ulan Public School (EPA Identification No. 49 from EPL 12932)	BM1	Blast overpressure and vibration	Every blast	Permanent blast monitor located adjacent to Ulan Public School for the purposes of airblast overpressure and ground vibration monitoring. Representative of nearest privately owned residences to the north-west of OC1.
Ridge Road	BM5	Blast overpressure and vibration	Every blast	Permanent blast monitor located at, or adjacent to the nearest privately owned residence to the south-west of OC1 and west of OC2 for the purposes of blasting.
Moolarben Road <sup>1</sup>	BM8	Blast overpressure and vibration	Every blast following commencement of blasting in OC3	Permanent blast monitor located at, or adjacent to the nearest privately owned residence to the west and south-west of OC3.
Aboriginal rock shelter sites <sup>2</sup> : <ul style="list-style-type: none"> <li>• S1MC55; and</li> <li>• S1MC56.</li> </ul>	BM2	Blast vibration	Every blast within 230 m of the Aboriginal rock shelter sites, and as required, to validate compliance with criteria in Section 6.3. <sup>3</sup>	Portable blast monitor located at the Aboriginal rock shelter site or representative site for the purposes of structural integrity monitoring.
Aboriginal rock shelter sites <sup>2</sup> : <ul style="list-style-type: none"> <li>• S1MC232; and</li> <li>• S1MC233.</li> </ul>	Various	Blast vibration	Every blast within 230 m of the Aboriginal rock shelter sites, and as required, to validate compliance with criteria in Section 6.3.	Portable blast monitor located at the Aboriginal rock shelter site or representative site for the purposes of structural integrity monitoring.
Other Infrastructure <sup>4</sup> <ul style="list-style-type: none"> <li>• Ulan-Wollar Road;</li> <li>• Ulan Road;</li> <li>• Sandy Hollow Gulgong Railway;</li> <li>• Wollar-Wellington 330 kV transmission line</li> </ul>	Various	Blast vibration	Blast monitoring will be undertaken when blasting is proposed within 500 m of the relevant structure.	Portable blast monitor located at, or adjacent to infrastructure for the purposes of structural integrity monitoring.
Ulan Road	Weather Station (WS3) <sup>4</sup>	Full Meteorological Complement*	Continuous.	Permanent meteorological station representative of conditions near non-mine owned residences to the south-west of the operation.
<p>* Full Meteorological complement consists of sensors and calculations that provide the following:</p> <ul style="list-style-type: none"> <li>• wind speed at 10 m;</li> <li>• wind direction at 10 m;</li> <li>• standard deviation of wind direction (sigma-theta) at 10 m;</li> <li>• temperature at 2 m and 10 m;</li> <li>• relative humidity at 2 m;</li> <li>• temperature difference between 2 m and 10 m; and</li> <li>• rainfall (gauge at ground-level).</li> </ul>				
<p><sup>1</sup> Monitoring location will be established prior to commencement of blasting operations in OC3.</p> <p><sup>2</sup> Where access to the site is unsafe, an alternative, representative monitoring site may be used.</p> <p><sup>3</sup> Monitoring will be undertaken if it is determined that these sites may be subject to impacts associated with blasting. Monitoring has ceased as all blasting is greater than 230 m away from the sites and/or the sites have been excavated and/or salvaged as necessary.</p> <p><sup>4</sup> Additional weather stations may be used to supplement weather data as required. No blasting is permitted to occur within 500 m of non-mine owned lands or infrastructure unless suitable arrangements have been made with the landowners/infrastructure owners and tenants to minimise risk of flyrock related impact.</p>				

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## 7.2 BLAST FUME MONITORING

The amount of NO<sub>x</sub> gases and extent of fume generated from a blast are assessed against the AEISG (2011) Blast Fume Classification Table (**Section 5.3** and **Appendix B**). In addition to visual monitoring of fume, a video of each blast is also recorded.

## 7.3 BLAST MONITORING EVALUATION

The blast monitoring results, including vibration, overpressure and fume rating will be reviewed after each blast to evaluate compliance. Any exceedance of the criteria in **Section 3.1** will be managed in accordance with the Response Protocols outlined in **Section 8.0** and reported in accordance with **Section 10.0**.

## 7.4 RECORDS

Results of monitoring will be kept in a legible form for at least four years after each blasting event has been undertaken. These records are available to any authorised officer of the EPA or DPE when requested.

The following is recorded for each blast:

- Date and time of blasting event.
- Location of blasting event.
- Location where monitoring was conducted.
- Fume rating.
- Meteorological information.
- Overpressure and vibration at each location.

A video of each blast is also recorded and kept for at least 12 months.

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## 8.0 RESPONSE PROTOCOLS

Response protocols have been developed for blasting and are provided in Table 4 below:

**Table 4: Blast Trigger Action Response Plan**

Performance Criteria	Trigger	Action – Trigger Exceedance	Response
Vibration and Overpressure results within criteria at sensitive receptors.	Vibration or Overpressure readings exceed criteria.	<ol style="list-style-type: none"> <li>1. Check and validate data.</li> <li>2. Notify the Environment and Community Manager (ECM) or delegate.</li> <li>3. Undertake investigation to confirm if investigation trigger exceedance is mining-related:               <ol style="list-style-type: none"> <li>a. If necessary, engage a suitably qualified person.</li> <li>b. Review environmental factors e.g. wind effects on overpressure readings.</li> <li>c. If investigation confirms trigger exceedance is not mining-related, record data and cease investigation.</li> </ol> </li> <li>4. If trigger exceedance is mining related,               <ol style="list-style-type: none"> <li>a. Notify DPE, EPA and other relevant agencies as soon as practicable.</li> </ol> </li> <li>5. Complete Preliminary investigation report and provide to DPE and relevant agencies within 7 days of identifying the incident.</li> </ol>	<p>Where mining-related activities have resulted in trigger exceedances, implement contingency and remedial measures based on investigation.</p> <p>Measures may include:</p> <ul style="list-style-type: none"> <li>• Review, and if necessary, revise blast practices.</li> <li>• Review and revise if necessary Blast MP and re-submit to DPE.</li> <li>• Training of personnel.</li> </ul> <p>MCO will also notify affected landholders as soon as practicable and provide them with regular blast monitoring results, until the results show that the MCO is complying with the blasting criteria.</p>
Vibration results within criteria at rock shelters.	Vibration readings exceed criteria.	<ol style="list-style-type: none"> <li>1. Check and validate data.</li> <li>2. Notify the Environment and Community Manager (ECM) or delegate.</li> <li>3. Undertake investigation to confirm if investigation trigger exceedance is mining-related:               <ol style="list-style-type: none"> <li>a. If necessary, engage a suitably qualified person.</li> <li>b. If investigation confirms trigger exceedance is not mining-related, record data and cease investigation.</li> </ol> </li> <li>4. If trigger exceedance is mining related,               <ol style="list-style-type: none"> <li>a. Notify DPE, EPA and other relevant agencies as soon as practicable.</li> </ol> </li> <li>5. Complete Preliminary investigation report and provide to DPE and relevant agencies within 7 days of identifying the incident.</li> </ol>	<p>Where mining-related activities have resulted in trigger exceedances, implement contingency and remedial measures based on investigation.</p> <p>Measures may include:</p> <ul style="list-style-type: none"> <li>• Review and if necessary, revise blast designs.</li> <li>• Assess potential impacts on shelters.</li> <li>• Consider salvage of shelter (where safe to do so).</li> <li>• Review and revise if necessary Blast MP and re-submit to DPE.</li> </ul>

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Performance Criteria	Trigger	Action – Trigger Exceedance	Response
		<ol style="list-style-type: none"> <li>6. Engage a qualified archaeologist to inspect the condition of the shelter.</li> <li>7. Provide RAPs with a copy of the final condition report</li> </ol>	
No emission of offensive Blast fumes that are harmful to (or likely harmful to) a person that is outside the premises or interferes unreasonably with a person outside the premises	Blast fume rated at Level 3 (appendix B) or higher (i.e. an offensive blast fume [Section 3.2]) leaves site.	<ol style="list-style-type: none"> <li>1. The Blast Controller will notify the Mine Manager and ECM (or delegate) immediately advising of the nature of the event and direction of travel of the fume.</li> <li>2. The ECM (or delegate) will initiate the Pollution Incident Response Management Plan, including notification of the DPE, EPA and other relevant agencies.</li> <li>3. The ECM or delegates will notify affected landholders of a potential blast fume event advise resident to avoid potential exposure to the blast fume. Communications with the stakeholders will be based on a risk based approach identifying those that may be affected by the event.</li> <li>4. Complete Preliminary investigation report and provide to DPE and relevant agencies within 7 days of identifying the incident.</li> </ol>	<p>Where mining-related activities have resulted in trigger exceedances, implement contingency and remedial measures based on investigation.</p> <p>Measures may include:</p> <ul style="list-style-type: none"> <li>• Providing blast fume related information to stakeholders.</li> <li>• Review and if necessary, revise blast management practices.</li> <li>• Review and revise if necessary Blast MP and re-submit to DPE.</li> </ul>

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## 9.0 ANNUAL REVIEW AND IMPROVEMENT

### 9.1 ANNUAL REVIEW

MCO will conduct an annual review of MCO operations prior to 31 March for the preceding calendar year in accordance with Condition 4, Schedule 5 and Condition 4, Schedule 6 of the Project Approvals (05\_0117 and 08\_0135, respectively).

This annual review will specifically address the following aspects of Condition 4, which directly relate to blasting:

- include a comprehensive review of the monitoring results and complaints records of MCO operations over the previous calendar year, which includes a comparison of these results against the:
  - relevant statutory requirements, limits, or performance measures/criteria
  - monitoring results of previous years
  - relevant predictions in the EA
- identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance.
- identify any trends in the monitoring data over the life of the project.
- identify any discrepancies between the predicted and actual impacts of MCO operations and analyse the potential cause of any significant discrepancies.
- describe what measures will be implemented over the next year to improve the environmental performance of the project.

The annual review will be made publicly available on the [Moolarben Coal website](#) in accordance with Condition 11, Schedule 5 and Condition 11, Schedule 6 of the Project Approvals (05\_0117 and 08\_0135, respectively).

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## 9.2 BLAST MANAGEMENT PLAN REVIEW

In accordance with Condition 5, Schedule 5 and Condition 5, Schedule 6 of the Project Approvals (05\_0117 and 08\_0135, respectively) this BMP will be reviewed, and if necessary revised to the satisfaction of the Secretary of the DPE, within 3 months of the submission of:

- (a) an Annual Review in accordance with Condition 4, Schedule 5 and Condition 4, Schedule 6 of the Project Approvals (05\_0117 and 08\_0135, respectively);
- (b) an incident report in accordance with Condition 7, Schedule 5 and Condition 7, Schedule 6 of the Project Approvals (05\_0117 and 08\_0135, respectively);
- (c) an audit in accordance with Condition 9, Schedule 5 and Condition 9, Schedule 6 of the Project Approvals (05\_0117 and 08\_0135, respectively); and
- (d) any modification to the conditions of the Project Approvals.

Once approved by DPE, this BMP will be made publicly available on the [Moolarben Coal website](#), in accordance with Condition 11, Schedule 5 and Condition 11, Schedule 6 of the Project Approvals (05\_0117 and 08\_0135, respectively).

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## 10.0 REPORTING SYSTEMS

In accordance with Condition 3, Schedule 5 and Condition 3, Schedule 6 of the Project Approvals (05\_0117 and 08\_0135, respectively), MCO has developed protocols for managing and reporting the following:

- incidents
- complaints
- non-compliances with statutory requirements
- exceedances of the impact assessment criteria and/or performance criteria

These protocols are described in detail in the Environmental Management Strategy (EMS).

### 10.1 INCIDENT REPORTING

In accordance with Condition 7, Schedule 5 and Condition 7, Schedule 6 of the Project Approvals (05\_0117 and 08\_0135, respectively), MCO will immediately notify DPE and any other relevant agencies of any incident that has caused, or threatens to cause, material harm to the environment. For any other incident associated with the project, MCO will notify DPE and any other relevant agencies as soon as practicable after it becomes aware of the incident. Within 7 days of the date of the incident, MCO will provide DPE and any other relevant agencies with a detailed report on the incident, and such further reports as may be requested.

In the event of a pollution incident, a notification will also be conducted as per the processes outlined in the PIRMP (prepared as part of MCO's holding EPL 12932), in accordance with the protocol for industry notification of pollution incidents under Part 5.7 of the *Protection of the Environment Operations Act 1997*.

MCO will also provide regular monitoring results to DPE, EPA, other relevant agencies and affected landowners until the results show that the project is complying with relevant criteria.

### 10.2 COMPLAINTS HANDLING

MCO maintains a Community Response (Complaints) Line (Phone Number 1800 556 484) that is dedicated to the receipt of community complaints. The Community Response (Complaints) Line is publicly advertised and operates 24 hours per day, seven days a week, to receive any complaints from neighbouring residents or other stakeholders. The Community Response (Complaints) Line is advertised in the local media and is also available on the [Moolarben Coal website](#) and in the community newsletters.

MCO has developed an internal Community Complaints Procedure which details the process to be followed when receiving, responding to and recording community complaints. Further information on complaints management can be found in the EMS.

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### 10.3 NON-COMPLIANCES

MCO will notify the Secretary of the DPE, and any other relevant agencies of any blast-related non-compliance associated with the MCC immediately after MCO becomes aware of the non-compliance. All non-compliances will be reported in the Annual Review (**Section 9.1**).

If required, MCO will also provide the Secretary of the DPE and any relevant agencies with a detailed report on the non-compliance.

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## 11.0 KEY ROLES AND RESPONSIBILITIES

Specific roles and responsibilities in relation to this BMP are outlined below:

Role	Responsibility
General Manager (GM)	<ul style="list-style-type: none"> <li>Ensure resources are available to MCO personnel to facilitate the completion of responsibilities under this BMP.</li> </ul>
Environment and Community Manager (or delegate)	<ul style="list-style-type: none"> <li>Liaise with relevant stakeholders regarding blasting impacts.</li> <li>Ensure BMP reviews are undertaken.</li> <li>Ensure monitoring and reporting are carried out consistent with the BMP.</li> <li>Ensure that all blast related complaints are responded to in accordance with the Complaints Response Procedure.</li> </ul>
Environment and Community Superintendent	<ul style="list-style-type: none"> <li>Communication of the BMP to relevant personnel and contractors</li> <li>Oversee monitoring and reporting are carried out consistent with the BMP</li> </ul>
Environment and Community Advisor	<ul style="list-style-type: none"> <li>Coordinate pre-blast meteorological assessments: pre-blast meteorological checks.</li> <li>Assist in the incident investigation processes.</li> <li>Review blast monitoring data to ensure compliance with relevant blast criteria.</li> </ul>
Open Cut Technical Services Manager	<ul style="list-style-type: none"> <li>Ensure blasts are designed to comply with blast criteria and the BMP.</li> </ul>
Open Cut Mine Manager	<ul style="list-style-type: none"> <li>Ensure blasting is conducted in accordance with approved designs and this BMP.</li> <li>Assess Fume Rating</li> <li>Complete incident reports required under this BMP</li> </ul>
Drill and Blast Superintendent	<ul style="list-style-type: none"> <li>Coordinate blasting with neighbouring mines and infrastructure owners (where required).</li> <li>Coordinate blasting activities in accordance with the BMP.</li> <li>Coordinate blast exclusion zones</li> <li>Ensure relevant personnel are trained in the BMP</li> </ul>
Blast Controller	<ul style="list-style-type: none"> <li>Control blasting activities for each blast</li> <li>Control Blast exclusion zones</li> <li>Monitor fume and escalate to Mine Manager and E&amp;C Manager if required</li> </ul>
Drill and Blast Engineer	<ul style="list-style-type: none"> <li>Coordinate pre-blast meteorological assessments: blast details and design checks.</li> <li>Ensure blasts are designed to comply with blast criteria and the BMP.</li> </ul>
All Employees and Contractors	<ul style="list-style-type: none"> <li>Ensure the effective implementation of this BMP with respect to their work activities and areas.</li> <li>Ensure any potential or actual issues, including environmental incidents, are reported to the Supervisor (or relevant equivalent) immediately.</li> </ul>

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## 12.0 REFERENCES

ANZECC (1990) *Technical Basis for Guidelines to Minimise Annoyance due to Blasting and Ground Vibration.*

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Southeast Archaeology Pty Ltd (2015) *Wilpinjong Coal Mine, Central Tablelands of New South Wales – Extension Project: Aboriginal Cultural Heritage Assessment.*

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**APPENDIX A - RELEVANT NSW PROJECT APPROVAL CONDITIONS (05\_0117  
AND 08\_0135)**

**Table A-1: Blast Management Plan Requirements**

Stage 1 - NSW Project Approval (05_0117)	BMP Section
<b>Blast Management Plan</b>	
15. The Proponent shall prepare and implement a Blast Management Plan for the project prior to undertaking any blasting on site 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 31 March 2015;	1.2
(b) describe the measures that would be implemented to ensure compliance with the blast criteria and operating conditions in this approval;	6.0
(c) propose and justify any alternative ground vibration limits for public infrastructure in the vicinity of the site (if relevant); and	6.2
(d) include a monitoring program for evaluating compliance with the blasting criteria and operating conditions of this approval.	7.0

**Table A-2: Blast Management Plan Requirements**

Stage 2 - NSW Project Approval (08_0135)	BMP Section
<b>Blast Management Plan</b>	
16. The Proponent shall prepare and implement a Blast Management Plan for the project to the satisfaction of the Secretary. This plan must:	
(a) be prepared in consultation with the EPA, and submitted to the Secretary for approval prior to the conducting any blasting on site;	1.2
(b) describe the measures that would be implemented to ensure compliance with the blast criteria and operating conditions of this approval;	6.0
(c) propose and justify any alternative ground vibration limits for public infrastructure in the vicinity of the site (if relevant); and	6.2
(d) include a monitoring program for evaluating and reporting on compliance with the blasting criteria and operating conditions of this approval.	7.0



**Table A-3: NSW Project Approval Conditions Relating to Blasting**

NSW Project Approval (05_0117)				NSW Project Approval (08_0135)				BMP Section																														
<b>Schedule 3</b>				<b>Schedule 3</b>																																		
<b>BLASTING</b>				<b>BLASTING</b>																																		
<p><b>Blasting Criteria</b></p> <p>8. The Proponent shall ensure that the blasting on the Moolarben mine complex does not cause exceedances of the criteria in Table 4.</p> <p>Table 4: Blasting Criteria</p> <table border="1"> <thead> <tr> <th>Location</th> <th>Airblast overpressure (dB(Lin Peak))</th> <th>Ground vibration (mm/s)</th> <th>Allowable exceedance</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Residence on privately owned land</td> <td align="center">120</td> <td align="center">10</td> <td align="center">0%</td> </tr> <tr> <td align="center">115</td> <td align="center">5</td> <td align="center">5% of the total number of blasts over a period of 12 months</td> </tr> <tr> <td>All public infrastructure</td> <td align="center">-</td> <td align="center">50 (or a limit determined by the structural design methodology in AS 2187.2-2006, or its latest version, or other alternative limit for public infrastructure, to the satisfaction of the Secretary)</td> <td align="center">0%</td> </tr> </tbody> </table> <p>However, these criteria do not apply if the Proponent has a written agreement with the relevant owner, and has advised the Department in writing of the terms of this agreement.</p>				Location	Airblast overpressure (dB(Lin Peak))	Ground vibration (mm/s)	Allowable exceedance	Residence on privately owned land	120	10	0%	115	5	5% of the total number of blasts over a period of 12 months	All public infrastructure	-	50 (or a limit determined by the structural design methodology in AS 2187.2-2006, or its latest version, or other alternative limit for public infrastructure, to the satisfaction of the Secretary)	0%	<p><b>Blasting Criteria</b></p> <p>7. The Proponent shall ensure that blasting on the Moolarben mine complex does not cause exceedances of the criteria in Table 7.</p> <p>Table 4: Blasting Criteria</p> <table border="1"> <thead> <tr> <th>Location</th> <th>Airblast overpressure (dB(Lin Peak))</th> <th>Ground vibration (mm/s)</th> <th>Allowable exceedance</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Residence on privately owned land</td> <td align="center">120</td> <td align="center">10</td> <td align="center">0%</td> </tr> <tr> <td align="center">115</td> <td align="center">5</td> <td align="center">5% of the total number of blasts over a period of 12 months</td> </tr> <tr> <td>All public infrastructure</td> <td align="center">-</td> <td align="center">50 (or a limit determined by the structural design methodology in AS 2187.2-2006, or its latest version, or other alternative limit for public infrastructure, to the satisfaction of the Secretary)</td> <td align="center">0%</td> </tr> </tbody> </table> <p>However, these criteria do not apply if the Proponent has a written agreement with the relevant owner to exceed these criteria, and has advised the Department in writing of the terms of this agreement.</p>				Location	Airblast overpressure (dB(Lin Peak))	Ground vibration (mm/s)	Allowable exceedance	Residence on privately owned land	120	10	0%	115	5	5% of the total number of blasts over a period of 12 months	All public infrastructure	-	50 (or a limit determined by the structural design methodology in AS 2187.2-2006, or its latest version, or other alternative limit for public infrastructure, to the satisfaction of the Secretary)	0%	3.0
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<p><b>Blasting Hours</b></p> <p>9. The Proponent shall only carry out blasting on the site between 9am and 5pm Monday to Saturday inclusive. No blasting is allowed on Sundays, public holidays, or at any other time without the written approval of the Secretary.</p>				<p><b>Blasting Hours</b></p> <p>8. The Proponent shall only carry out blasting on site between 9 am and 5 pm Monday to Saturday inclusive. No blasting is allowed on Sundays, public holidays, or at any other time without the written approval of the Secretary.</p>				3.0																														

<p><b>Blasting Frequency</b></p> <p>10. The Proponent may carry out a maximum of:</p> <ul style="list-style-type: none"> <li>(a) 2 blasts a day; and</li> <li>(b) 9 blasts a week, averaged over a calendar year, at the Moolarben mine complex.</li> </ul> <p>This condition does not apply to blasts that generate ground vibration of 0.5 mm/s or less at any residence on privately-owned land, blasts misfires or blasts required to ensure the safety of the mine or its workers.</p> <p><i>Note: For the purposes of this condition, a blast refers to a single blast event, which may involve a number of individual blasts fired in quick succession in a discrete area of the mine.</i></p>	<p><b>Blasting Frequency</b></p> <p>9. The Proponent may carry out a maximum of:</p> <ul style="list-style-type: none"> <li>(a) 2 blasts a day; and</li> <li>(b) 9 blasts a week, averaged over a calendar year, at the Moolarben mine complex.</li> </ul> <p>This condition does not apply to blasts that generate ground vibration of 0.5 mm/s or less at any residence on privately-owned land, blast misfires or blasts required to ensure the safety of the mine or its workers.</p> <p><i>Note: For the purposes of this condition, a blast refers to a single blast event, which may involve a number of individual blasts fired in quick succession in a discrete area of the mine.</i></p>	3.0
<p><b>Property Inspections</b></p> <p>11. If the Proponent receives a written request from the owner of any privately-owned land within 2 kilometres of any approved open cut mining pit on site for a property inspection to establish the baseline condition of any buildings and/or structures on his/her land, or to have a previous property inspection updated, then within 2 months of receiving this request the Proponent shall:</p> <ul style="list-style-type: none"> <li>(a) commission a suitably qualified, experienced and independent person, whose appointment is acceptable to both parties to: <ul style="list-style-type: none"> <li>• establish the baseline condition of any buildings and other structures on the land, or update the previous property inspection report; and</li> <li>• identify measures that should be implemented to minimise the potential blasting impacts of the project on these buildings and/or structures; and</li> </ul> </li> <li>(b) give the landowner a copy of the new or updated property inspection report.</li> </ul> <p>If there is a dispute over the selection of the suitably qualified, experienced and independent person, or the Proponent or the landowner disagrees with the findings of the property inspection report, either party may refer the matter to the Secretary for resolution.</p>	<p><b>Property Inspections</b></p> <p>12. If the Proponent receives a written request from the owner of any privately-owned land within 2 kilometres of any approved open cut mining pit on site for a property inspection to establish the baseline condition of any buildings and/or structures on his/her land, or to have a previous property inspection updated, then within 2 months of receiving this request the Proponent shall:</p> <ul style="list-style-type: none"> <li>(a) commission a suitably qualified, experienced and independent person, whose appointment is acceptable to both parties to: <ul style="list-style-type: none"> <li>• establish the baseline condition of any buildings and other structures on the land, or update the previous property inspection report; and</li> <li>• identify measures that should be implemented to minimise the potential blasting impacts of the project on these buildings and/or structures; and</li> </ul> </li> <li>(b) give the landowner a copy of the new or updated property inspection report.</li> </ul> <p>If there is a dispute over the selection of the suitably qualified, experienced and independent person, or the Proponent or the landowner disagrees with the findings of the property inspection report, either party may refer the matter to the Secretary for resolution.</p>	6.2
<p><b>Property Investigations</b></p> <p>12. If the owner of any privately-owned land claims that buildings and/or structures on his/her land have been damaged as a result of blasting on the site, then within 2 months of receiving this claim the Proponent shall:</p> <ul style="list-style-type: none"> <li>(a) commission a suitably qualified, experienced and independent person, whose appointment is acceptable to both parties to investigate the claim; and</li> <li>(b) give the landowner a copy of the property investigation report.</li> </ul> <p>If this independent property investigation confirms the landowner's claim, and both parties agree with these findings, then the Proponent shall repair the damage to the satisfaction of the Secretary.</p> <p>If there is a dispute over the selection of the suitably qualified, experienced and independent</p>	<p><b>Property Investigations</b></p> <p>13. If the owner of any privately-owned land claims that buildings and/or structures on his/her land have been damaged as a result of blasting on the site, then within 2 months of receiving this claim the Proponent shall:</p> <ul style="list-style-type: none"> <li>(a) commission a suitably qualified, experienced and independent person, whose appointment is acceptable to both parties to investigate the claim; and</li> <li>(b) give the landowner a copy of the property investigation report.</li> </ul> <p>If this independent property investigation confirms the landowner's claim, and both parties agree with these findings, then the Proponent shall repair the damage to the satisfaction of the Secretary.</p>	6.2

<p>person, or the Proponent or the landowner disagrees with the findings of the independent property investigation, then either party may refer the matter to the Secretary for resolution.</p> <p><b>Operating Conditions</b></p> <p>13. The Proponent shall:</p> <p>(a) implement best practice blasting management to:</p> <ul style="list-style-type: none"> <li>• protect the safety of people and livestock in the surrounding area;</li> <li>• protect public or private infrastructure/property in the surrounding area from any damage; and</li> <li>• minimise the dust and fume emissions of any blasting;</li> </ul>	<p>If there is a dispute over the selection of the suitably qualified, experienced and independent person, or the Proponent or the landowner disagrees with the findings of the independent property investigation, then either party may refer the matter to the Secretary for resolution.</p> <p><b>Operating Conditions</b></p> <p>14. The Proponent shall:</p> <p>(a) implement best management practice to:</p> <ul style="list-style-type: none"> <li>• protect the safety of people and livestock in the surrounding area;</li> <li>• protect public or private infrastructure/property in the surrounding area from any damage; and</li> <li>• minimise the dust and fume emissions of any blasting;</li> </ul> <p>(b) ensure that blasting on the site does not damage Aboriginal rock shelter sites S2MC229 (AHIMS No. 36-3-1376), S2MC232 (AHIMS No. 36-3-1379) or S2MC233 (AHIMS No. 36-3-1380);</p>	<p>6.1</p> <p>6.2</p> <p>6.4, 6.5</p> <p>6.3</p>
<p>(b) operate a suitable system to enable the public to get up-to-date information on the proposed blasting Schedule on site; and</p>	<p>(c) operate a suitable system to enable the public to get up-to-date information on the proposed blasting Schedule on site; and</p>	<p>6.1</p>
<p>(c) co-ordinate the timing of blasting on site with the timing of blasting at the Ulan and Wilpinjong mines to minimise cumulative blasting impacts, to the satisfaction of the Secretary.</p>	<p>(d) co-ordinate the timing of blasting on site with the timing of blasting at the Ulan and Wilpinjong mines to minimise cumulative blasting impacts, to the satisfaction of the Secretary.</p> <p><i>Note: To identify the Aboriginal rock shelter sites, see the applicable figure in Appendix 8.</i></p>	<p>6.6</p>
<p>14. The Proponent shall not undertake blasting on site within 500 metres of:</p> <p>(a) any public road;</p> <p>(b) the Gulgong to Sandy Hollow Railway Line;</p> <p>(c) the Wollar-Wellington 330kV Transmission Line; or</p> <p>(d) any land outside the site not owned by the Proponent, unless the Proponent has:</p> <ul style="list-style-type: none"> <li>• demonstrated to the satisfaction of the Secretary that the blasting can be carried out closer to the infrastructure or land without compromising the safety of people or livestock or damaging the infrastructure and/or other buildings and structures; and</li> <li>• updated the Blast Management Plan to include the specific measures that would be implemented while blasting is being carried out within 500 metres of the infrastructure or land; or</li> <li>• a written agreement with the relevant infrastructure owner or landowner to allow blasting to be carried out closer to the infrastructure or land, and the Proponent has advised the Department in writing of the terms of this agreement.</li> </ul>	<p>15. The Proponent shall not undertake blasting on site within 500 metres of:</p> <p>(a) any public road;</p> <p>(b) the Gulgong to Sandy Hollow Railway Line;</p> <p>(c) the Wollar-Wellington 330kV Transmission Line; or</p> <p>(d) any land outside the site not owned by the Proponent, unless the Proponent has:</p> <ul style="list-style-type: none"> <li>• demonstrated to the satisfaction of the Secretary that the blasting can be carried out closer to the infrastructure or land without compromising the safety of people or livestock or damaging the infrastructure and/or other buildings and structures; and</li> <li>• updated the Blast Management Plan to include the specific measures that would be implemented while blasting is being carried out within 500 metres of the infrastructure or land; or</li> <li>• a written agreement with the relevant infrastructure owner or landowner to allow blasting to be carried out closer to the infrastructure or land, and the Proponent has advised the Department in writing of the terms of this agreement.</li> </ul>	<p>6.2</p>

NSW Project Approval (05_0117)	NSW Project Approval (08_0135)	BMP Section
Schedule 4	Schedule 5	
<p><b>NOTIFICATION OF LANDOWNERS/TENANTS</b></p> <p>1. By the end of March 2015, the Proponent shall:</p> <p>(a) notify in writing the owners of:</p> <ul style="list-style-type: none"> <li>(a) any land in Table 1A and any land or residence exceeding the criteria in Tables 2A and 2 (respectively) of Schedule 3 that they have the right to require the Proponent to acquire their land at any stage during the project;</li> <li>(b) any residence on the land listed in Table 3 and any residence exceeding the criteria in Table 3A of Schedule 3 that they have the right to request the Proponent for additional noise mitigation measures to be installed at their residence at any stage during the project; and</li> </ul> <ul style="list-style-type: none"> <li>• any privately-owned land within 2 kilometres of the approved open cut mining pit/s that they are entitled to ask for an inspection to establish the baseline condition of any buildings or structures on their land, or to have a previous property inspection report updated;</li> </ul> <p>(b) notify the tenants of any mine-owned land of their rights under this approval; and</p> <p>(c) send a copy of the NSW Health fact sheet entitled “Mine Dust and You” (as may be updated from time to time) to the owners and/or existing tenants of any land (including mine-owned land) where the predictions in the EA identify that dust emissions generated by the project are likely to be greater than the relevant air quality criteria in Schedule 3 at any time during the life of the project.</p>	<p><b>NOTIFICATION OF LANDOWNERS/TENANTS</b></p> <p>1. Within 1 month of the date of this approval, the Proponent shall:</p> <p>(a) notify in writing the owners of:</p> <ul style="list-style-type: none"> <li>• any land listed in Table 1 and any residence or land exceeding the criteria in Tables 4 or 5 (respectively) of Schedule 3 that they have the right to require the Proponent to acquire their land at any stage during the project;</li> <li>• any residence on the land listed in Table 2 and any residence exceeding the criteria in Table 6 of Schedule 3 that they have the right to request the Proponent for additional noise mitigation measures to be installed at their residence at any stage during the project; and</li> <li>• any privately-owned land within 2 kilometres of the approved open cut mining pit/s that they are entitled to ask for an inspection to establish the baseline condition of any buildings or structures on their land, or to have a previous property inspection report updated;</li> </ul> <p>(b) notify the tenants of any mine-owned land of their rights under this approval; and</p> <p>(c) send a copy of the NSW Health fact sheet entitled “Mine Dust and You” (as may be updated from time to time) to the owners and/or existing tenants of any land (including mine-owned land) where the predictions in the EA identify that dust emissions generated by the project are likely to be greater than the relevant air quality criteria in Schedule 3 at any time during the life of the project.</p>	6.2
<p>3. As soon as practicable after obtaining monitoring results showing:</p> <p>(a) (a) an exceedance of any relevant criteria in Schedule 3, the Proponent shall notify affected landowners in writing of the exceedance, and provide regular monitoring results to each affected landowner until the project is again complying with the relevant criteria; and</p> <p>(b) (b) an exceedance of the relevant air quality criteria in Schedule 3, the Proponent shall send a copy of the NSW Health fact sheet entitled “Mine Dust and You” (as may be updated from time to time) to the affected landowners and/or existing tenants of the land (including the tenants of any mine-owned land).</p>	<p>3. As soon as practicable after obtaining monitoring results showing:</p> <p>(a) an exceedance of any relevant criteria in Schedule 3, the Proponent shall notify affected landowners in writing of the exceedance, and provide regular monitoring results to each affected landowner until the project is again complying with the relevant criteria; and</p> <p>(b) an exceedance of the relevant air quality criteria in Schedule 3, the Proponent shall send a copy of the NSW Health fact sheet entitled “Mine Dust and You” (as may be updated from time to time) to the affected landowners and/or existing tenants of the land (including the tenants of any mine-owned land).</p>	8.0, 10.0

**Table A-4 Management Plan Requirements**

NSW Project Approval Condition	BMP Section
<p>3. The Proponent shall ensure that the management plans required under this approval are prepared in accordance with any relevant guidelines, and include:</p> <p>(a) detailed baseline data;</p> <p>(b) a description of:</p> <ul style="list-style-type: none"> <li>• the relevant statutory requirements (including any relevant approval, licence or lease conditions);</li> <li>• any relevant limits or performance measures/criteria;</li> <li>• the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures;</li> </ul> <p>(c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;</p> <p>(d) a program to monitor and report on the:</p> <ul style="list-style-type: none"> <li>• impacts and environmental performance of the project;</li> <li>• effectiveness of any management measures (see c above);</li> </ul> <p>(e) a contingency plan to manage any unpredicted impacts and their consequences;</p> <p>(f) a program to investigate and implement ways to improve the environmental performance of the project over time;</p> <p>(g) a protocol for managing and reporting any:</p> <ul style="list-style-type: none"> <li>• incidents;</li> <li>• complaints;</li> <li>• non-compliances with statutory requirements; and</li> <li>• exceedances of the impact assessment criteria and/or performance criteria; and</li> </ul> <p>(h) a protocol for periodic review of the plan.</p>	<p>4.1</p> <p>2.0</p> <p>3.0</p> <p>3.4</p> <p>6.0</p> <p>7.0</p> <p>7.0</p> <p>8.0</p> <p>8.0, 9.0</p> <p>10.0</p> <p>9.0</p>

**Table A-5: Relevant Commitments Relating to Blasting  
in Appendix 3 of Stage 1 NSW Project Approval Conditions**

Stage 1 - NSW Project Approval (05_0117)	BMP Section
<b>Appendix 3: Statement of Commitments</b>	
<p>(18) Additional Management and Mitigation – Modification of Stage 1</p> <ul style="list-style-type: none"> <li>• The Aboriginal Cultural Heritage Management Plan will be updated to include: <ul style="list-style-type: none"> <li>- ...</li> <li>- Sub-surface testing and potential salvage of S1MC343-345 and S1MC352 where blasting is assessed to adversely impact these sites.</li> </ul> </li> </ul>	<p>Complete</p>







**Table A-6: Relevant Commitments Relating to Blasting in Appendix 3 of Stage 3 NSW Project Approval Conditions**

Stage 2 - NSW Project Approval (08_0135)		BMP Section
<b>Appendix 3: Statement of Commitments</b>		
<p>(4) MCM will revise the Stage 1 Environmental Management System to incorporate the MCC Stage 2 project in consultation with relevant regulators and stakeholders (where appropriate). This may require revision or preparation of monitoring and management plans as prescribed by the Project Approval, such as (where relevant):</p> <ul style="list-style-type: none"> <li>• Environmental Monitoring Program;</li> <li>• Air Quality and Greenhouse Gas Management Plan (including energy savings actions);</li> <li>• Spontaneous Combustion Management Plan;</li> <li>• Noise Management Plan;</li> <li>• Blast Management Plan;</li> <li>• Water Management Plan (including groundwater and surface water);</li> <li>• Creek and Aquatic Rehabilitation Plan;</li> <li>• Rehabilitation Management Plan;</li> <li>• Biodiversity Management Plan;</li> <li>• Subsidence Management Plan;</li> <li>• Aboriginal Cultural Heritage Management Plan;</li> <li>• Non Aboriginal Heritage Management Plan;</li> <li>• Erosion and Sediment Control Plan;</li> <li>• Social Engagement and Issue Response Strategy;</li> <li>• Bushfire Management Plan; and</li> <li>• Waste Management Plan.</li> </ul> <p>(Note where applicable or appropriate some of these plans may be combined).</p>	<p>This BMP</p>	
<p>(8) MCM will develop and implement meteorological criteria to help ensure that blasting is not undertaken under unfavourable wind and/or atmospheric conditions which would result in an exceedance of relevant criteria.</p>	<p>6.4, 6.5</p>	
<p>(14) MCM will work cooperatively with neighbouring mines to develop a blast monitoring system which is representative of the closest sensitive receivers to ensure compliance with the relevant blast criteria.</p>	<p>6.6</p>	
<p>(16) MCM will continue to advise neighbours of blasting schedules upon request so that any concerns regarding blasting and impacts to pets and livestock can be managed by neighbours.</p>	<p>6.1</p>	

**APPENDIX B – AEISG (2011) FUME RATING**

In accordance with the AEISG (2011) *Code of Practice Prevention and Management of Blast Generated NOx Gases in Surface Blasting*, MCO uses a fume rating system for all blasts (below). Fume is measured on a simple scale from 0 to 5 and the extent of the fume is assessed on a simple scale from A to C where:

- A = localised (i.e. fume localised across only a few blast holes)
- B = medium (i.e. fume from up to 50% of blast holes in the shot)
- C = extensive (i.e. extensive generation of fume across the whole blast)

Level	Typical Appearance
<b>Level 0</b> No NOx gas	
<b>Level 1</b> Slight NOx gas	
1A Localised	
1B Medium	
1C Extensive	
<b>Level 2</b> Minor yellow/orange gas	
2A Localised	
2B Medium	
2C Extensive	
<b>Level 3</b> Orange gas	
3A Localised	
3B Medium	
3C Extensive	
<b>Level 4</b> Orange/red gas	
4A Localised	
4B Medium	
4C Extensive	
<b>Level 5</b> Red/purple gas	
5A Localised	
5B Medium	
5C Extensive	

Source: Australian Explosives Industry and Safety Group Inc. 2011



## APPENDIX C – BLAST FUME CAUSE AND CONTROL MATRIX

Potential Cause	Likely Indicators	Possible Control Measures
<b>Primary Cause 1: Explosive Formulation and Quality Assurance</b>		
Explosive product incorrectly formulated	<ul style="list-style-type: none"> <li>Frequent NOx generation in all blasts in all locations utilising a specific product</li> </ul>	<ul style="list-style-type: none"> <li>Explosive formulated by supplier to an appropriate oxygen balance</li> <li>On bench QA checks</li> </ul>
Inadequate mixing of raw materials	<ul style="list-style-type: none"> <li>Product appearance abnormal</li> <li>All blasts in a specific location utilising a specific delivery system creating fume</li> </ul>	<ul style="list-style-type: none"> <li>On bench QA checks</li> <li>Frequent MMU calibration</li> </ul>
Delivery system metering incorrectly	<ul style="list-style-type: none"> <li>All blasts in a specific location utilising a specific explosive product creating fume</li> <li>Not achieving designed collar height during loading process</li> </ul>	<ul style="list-style-type: none"> <li>Frequent MMU calibration</li> <li>Quality control of explosive products conducted in accordance with manufacturers recommendations</li> </ul>
Product degradation	<ul style="list-style-type: none"> <li>Slumping of blast hole</li> </ul>	<ul style="list-style-type: none"> <li>Shotfirers perform daily inspection of all sleeping shots</li> <li>Expected sleep time considered when selecting bulk product</li> </ul>
<b>Primary Cause 2: Geological Conditions</b>		
Blasting in weak / soft strata	<ul style="list-style-type: none"> <li>Frequent NOx generation in specific areas known to contain weak/soft strata</li> </ul>	<ul style="list-style-type: none"> <li>Understand geology of each shot and design blast (timing and explosive product) to ensure adequate relief in weak/soft strata</li> </ul>
Inadequate confinement in soft ground	<ul style="list-style-type: none"> <li>Frequent NOx generation in specific areas known to contain weak/soft strata</li> </ul>	<ul style="list-style-type: none"> <li>Appropriate explosives product selection</li> <li>Blast design to consider strata</li> </ul>
Explosive product seeping into cracks	<ul style="list-style-type: none"> <li>Intermittent NOx gases in specific areas known to contain a high incidence of faulted/ fractured ground</li> </ul>	<ul style="list-style-type: none"> <li>Consider manufactures recommendations on explosive product selection</li> <li>Maintenance of accurate drill records e.g. loss of cuttings / air</li> <li>Monitor charging on areas where product loss occurs in dry holes to identify cracked areas.</li> </ul>
Dynamic water in holes	<ul style="list-style-type: none"> <li>Slumping of blast hole</li> <li>Not achieving designed collar height during loading process</li> </ul>	<ul style="list-style-type: none"> <li>Minimise sleep time of shot</li> <li>Follow manufacturer's recommendations on explosive product selection</li> </ul>
Moisture in clay	<ul style="list-style-type: none"> <li>Frequent NOx when blasting clay or clay rich strata</li> </ul>	<ul style="list-style-type: none"> <li>Consider manufactures recommendations on explosive product selection</li> </ul>
Blast hole deterioration between drilling and loading	<ul style="list-style-type: none"> <li>Traceable to specific geological areas</li> </ul>	<ul style="list-style-type: none"> <li>Minimise time between drilling and loading</li> <li>Impact of surrounding shots on drilled holes to be considered prior to loading</li> </ul>
<b>Primary Cause 3: Blast Design</b>		

Potential Cause	Likely Indicators	Possible Control Measures
Explosive desensitisation due to the blast hole depth	<ul style="list-style-type: none"> <li>In deep holes only</li> </ul>	<ul style="list-style-type: none"> <li>Follow manufacturer's recommendations on explosive product selection and blast design for deep holes</li> </ul>
Inter-hole explosive desensitisation	<ul style="list-style-type: none"> <li>Blast holes drilled closer together than planned</li> <li>Blast hole deviations differ greatly from planned</li> </ul>	<ul style="list-style-type: none"> <li>Drill design on GPS</li> <li>Loading design to consider hole location</li> </ul>
Intra-hole explosive desensitisation in decked blast holes	<ul style="list-style-type: none"> <li>When using decks only</li> </ul>	<ul style="list-style-type: none"> <li>Appropriate separation of explosive decks</li> </ul>
Initiation of significant explosive quantities in a single blast event	<ul style="list-style-type: none"> <li>Intensity of post-blast gases proportional to explosives quantity used</li> </ul>	<ul style="list-style-type: none"> <li>Design blast to have correct explosive energy match to material type to ensure adequate confinement of explosives</li> </ul>
<b>Primary Cause 4: Explosives Product Selection</b>		
Non-water-resistant explosive products loaded into wet or dewatered holes	<ul style="list-style-type: none"> <li>Blasts containing wet / dewatered blast holes only</li> <li></li> </ul>	<ul style="list-style-type: none"> <li>Follow manufacturer's recommendations on explosive product selection</li> <li>Provision of load sheets detailing explosive type</li> </ul>
Excessive energy in weak/ soft strata desensitising adjacent explosive product columns	<ul style="list-style-type: none"> <li>In specific areas known to contain weak/soft strata only</li> <li></li> </ul>	<ul style="list-style-type: none"> <li>Blast design to consider the geology of each shot and design blast (timing and explosive product) to match</li> <li>Follow manufacturer's recommendations on explosive product selection</li> </ul>
Desensitisation of explosive column from in-hole cord initiation	<ul style="list-style-type: none"> <li>Only in areas where in-hole cord initiation is used</li> </ul>	<ul style="list-style-type: none"> <li>Follow manufacturer's recommendations on compatibility of initiating systems with explosives</li> </ul>
<b>Primary Cause 5: On-bench Practices</b>		
Hole condition incorrectly identified	<ul style="list-style-type: none"> <li>Only when using non-water-resistant explosive products</li> </ul>	<ul style="list-style-type: none"> <li>Measure all holes in shots that have holes greater than 12m and conduct a sample measurement of shots with holes less than 12m to understand the hole conditions throughout the pattern</li> <li>Record wet, dewatered and dry holes on dip sheets and use this information as a basis for explosive product selection</li> <li>Capture hole by hole charging data</li> <li>Minimise time between dipping and loading, especially in soft and clay strata</li> <li>Minimise sleep time of shot</li> <li>Training/competence of blast crew</li> </ul>
Blast not drilled to plan	<ul style="list-style-type: none"> <li>Inaccurately drilled patterns</li> </ul>	<ul style="list-style-type: none"> <li>Drill design on GPS</li> <li>Loading design to consider hole location</li> </ul>

Potential Cause	Likely Indicators	Possible Control Measures
Dewatering of holes diverts water into holes previously loaded with dry hole explosive products	<ul style="list-style-type: none"> <li>Only when using non-water-resistant explosive products</li> <li>Cross grade of bench</li> </ul>	<ul style="list-style-type: none"> <li>Load wet holes first and dip remaining holes prior to loading</li> <li>Adjust explosive product selection according to manufacturer's recommendations</li> <li>Training/competence of blast crew</li> </ul>
Blast not loaded as per blast plan	<ul style="list-style-type: none"> <li>Incorrect tonnages / types of explosives used on shot</li> </ul>	<ul style="list-style-type: none"> <li>Training/competence of blast crew</li> <li>Effective supervision</li> <li>Communication of loading requirements</li> <li>Record actual loadings e.g. product, quantity, height</li> </ul>
<b>Primary Causes 6: Contamination of Explosives in the Blast hole</b>		
Explosive product mixes with mud/ sediment at bottom of hole.	<ul style="list-style-type: none"> <li>Blasts containing wet/dewatered blast holes</li> </ul>	<ul style="list-style-type: none"> <li>When mud or sediment is identified a gas bag is to be used to separate mud/ sediment from explosive product</li> <li>Ensure appropriate loading practices are followed during charging</li> <li>Ensure primer is positioned in undiluted explosive product</li> <li>Training/competence of blast crew</li> </ul>
Penetration of stemming material into top of explosive column (fluid/ pumpable explosive products only)	<ul style="list-style-type: none"> <li>Blasts charged with pumpable explosive products only</li> </ul>	<ul style="list-style-type: none"> <li>Use appropriate stemming material</li> <li>Ensure explosive product is gassed to manufacturer's specifications before stemming</li> </ul>
Water entrainment in explosive product	<ul style="list-style-type: none"> <li>Blasts containing wet/dewatered blast holes only</li> </ul>	<ul style="list-style-type: none"> <li>Load wet holes first and dip remaining holes prior to loading</li> <li>Ensure correct loading practices are followed during charging</li> <li>Adjust explosive product selection according to manufacturer's recommendations</li> <li>Training/competence of blast crew</li> <li>Loaded dry holes are stemmed prior to predicted wet weather</li> <li>Load holes identified as wet with wet product only</li> <li>Load low lying areas last where practical.</li> <li>Minimise sleep time</li> </ul>
Moisture in ground damaging explosive product	<ul style="list-style-type: none"> <li>Frequent fume events in blasting horizon</li> <li>Wet ground</li> </ul>	<ul style="list-style-type: none"> <li>Explosives product selection</li> <li>Minimise sleep time</li> <li>Load wet holes first and dip remaining holes prior to loading</li> </ul>

Potential Cause	Likely Indicators	Possible Control Measures
Contamination of explosives column by drill cuttings during loading	<ul style="list-style-type: none"> <li>Poor loading practices</li> </ul>	<ul style="list-style-type: none"> <li>Verify correct hose handling practices are in place e.g. operator competence, procedures, use explosives supplier's personnel</li> <li>Training/competence of blast crew</li> </ul>
<b>Primary Cause 7: Weather</b>		
Rainfall on a sleeping shot.	<ul style="list-style-type: none"> <li>Excessive Rainfall</li> <li>Ponding of water on the shot</li> <li>Slumping of holes</li> </ul>	<ul style="list-style-type: none"> <li>Minimise sleep time</li> <li>In cases when wet weather is predicted load low lying holes with wet product prior to the arrival of the rainfall.</li> <li>Ensure all loaded dry holes are stemmed prior to predicted wet weather</li> <li>Bench design for water runoff with appropriate bunding and drainage.</li> </ul>

## APPENDIX D – BLAST FUME TARP

	Level	Green	Yellow	Red
<b>Prior to Blast</b>	<b>Trigger</b>	<ul style="list-style-type: none"> <li>• Low or Medium fume rating and,</li> <li>• Wind away from sensitive receptors</li> </ul>	<ul style="list-style-type: none"> <li>• High Fume risk and wind away from private residences; or</li> <li>• Wind towards sensitive receptors</li> </ul>	<ul style="list-style-type: none"> <li>• High fume risk, and,</li> <li>• Wind towards sensitive receptors</li> </ul>
	<b>Actions - Blast Controller</b>	<ul style="list-style-type: none"> <li>• Establish a blast exclusion zone of a minimum of 500m for personnel and consider extending for personnel working downwind of shot</li> </ul>	<ul style="list-style-type: none"> <li>• Establish a blast exclusion zone of a minimum of 500m for personnel and consider extending for personnel working downwind of shot</li> <li>• Conditions to be discussed with Mine Manager prior to firing</li> </ul>	<ul style="list-style-type: none"> <li>• Establish a blast exclusion zone of a minimum of 500m for personnel and consider extending for personnel working downwind of shot</li> <li>• Conditions to be discussed with Mine Manager and ECM (or delegate) prior to firing</li> </ul>
<b>Post Blast</b>	<b>Trigger</b>	<ul style="list-style-type: none"> <li>• No visible fume generated</li> </ul>	<ul style="list-style-type: none"> <li>• Blast generates a level two or less fume event or,</li> <li>• Blast generates a level three fume event or above but it is not travelling toward sensitive receptors</li> </ul>	<ul style="list-style-type: none"> <li>• Blast generates a level three or higher fume event and fume travelling towards sensitive receptors</li> </ul>
	<b>Actions - Blast Controller</b>	<ul style="list-style-type: none"> <li>• No additional action is required</li> </ul>	<ul style="list-style-type: none"> <li>• Monitor fume and increase personnel exclusion zones if blast fumes travel towards people</li> </ul>	<ul style="list-style-type: none"> <li>• Monitor fume and increase personnel exclusion zones if blast fumes travel towards people</li> <li>• Notify the Mine Manager and ECM (or delegate) immediately advising of the nature of the event and direction of fume travel</li> </ul>
	<b>Actions – Blast Guard</b>	<ul style="list-style-type: none"> <li>• No action required</li> </ul>	<ul style="list-style-type: none"> <li>• Monitor blast fumes and advise blast controller if travelling sensitive receptors.</li> </ul>	<ul style="list-style-type: none"> <li>• Monitor blast fumes and advise blast controller if travelling sensitive receptors.</li> </ul>
	<b>Action – ECM (or delegate)</b>	<ul style="list-style-type: none"> <li>• No action required</li> </ul>	<ul style="list-style-type: none"> <li>• No action required</li> </ul>	<ul style="list-style-type: none"> <li>• Initiate the Pollution Incident Response Management Plan (PIRMP), including notification of the DPE, EPA and other relevant agencies.</li> <li>• Notify affected landholders of a potential blast fume event advise resident to avoid potential exposure to the blast fume. Communications with the stakeholders will be a risk-based approach identifying those that may be affected by the event.</li> </ul>

*Note: Actions additional to normal blasting practices*