

# MAC-ENC-MTP-015

## BLAST MANAGEMENT PLAN

### Document Owner

---

Rebecca Smith, Environmental Coordinator

### Document Approver

---

Julie McNaughton, Environment and Community Manager

Draft

## Contents

1.	Introduction.....	4
1.1.	Objectives .....	4
1.2.	Environmental Management System .....	5
1.3.	Consultation Process .....	5
2.	Blast Mitigation Measures .....	5
2.1.	Best Practice Control Measures.....	5
2.2.	Management of Fly Rock .....	6
2.3.	Protection of Underground Utilities .....	7
2.4.	Management of Road Closures .....	7
2.5.	Management of Aboriginal Heritage.....	7
3.	Consultation .....	8
3.1.	Consultation with Neighbouring Mines.....	8
3.2.	Consultation with Neighbouring Residents .....	8
3.3.	Community Consultation .....	8
3.4.	Consultation with Transgrid .....	8
3.5.	Consultation with Government Agencies .....	9
4.	Response Procedures.....	9
4.1.	Operational Response Process .....	9
4.2.	Complaint Response.....	9
4.3.	Complaints Register.....	10
4.4.	Landholder Notification – Property Inspections and Property Investigations .....	10
5.	Monitoring Program.....	10
6.	Performance Indicators .....	11
7.	Continual Improvement .....	11
8.	Reporting and Review .....	11
8.1.	Reporting .....	11
8.2.	Review .....	12
9.	Responsibilities .....	12
10.	References .....	14
10.1.	External Documents.....	14
10.2.	Mt Arthur Coal Internal EMS Documents .....	14
	Appendix 1: Project Approval and EPL Requirements .....	16
	Appendix 2: Blast Control Area .....	24
	Appendix 3: Mt Arthur Coal - Blasting Technical Note .....	25
	Appendix 4: Government Correspondence .....	33

## Figures

Figure 1: Blast control area .....	24
------------------------------------	----

**Tables**

Table 1: Blast monitoring program responsibilities.....	12
Table 2: Project Approval and EPL Conditions associated with blasting .....	16
Table 3: Vibration data for Windmill North.....	31
Table 4: Orica Report.....	32

Draft

## 1. Introduction

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

Blasting of mine overburden to allow efficient recovery of the underlying coal can have impacts on the surrounding community. These impacts mainly include vibration through the air (overpressure) and earth (ground vibration) along with the generation of dust and fume.

Overpressure and ground vibration limits in place for private residences and heritage structures are prescribed by government based on standards. Blasts are designed and managed to minimise the risk of exceeding these limits, and to minimise impacts they have on the community, surrounding structures and environment.

This Blast Management Plan (BMP) has been prepared to detail the relevant blasting and vibration impact assessment criteria and compliance procedures and controls relating to open cut blasting activities. This Plan has been prepared to fulfil requirements of the Department of Planning and Infrastructure (DoPI) Project Approval (09\_0062) dated 24 September 2010, and the NSW Office of Environment and Heritage (OEH) Environment Protection Licence (EPL) conditions, which are presented in Appendix 1.

The proposed Mt Arthur Underground operation has not commenced. This management plan will be reviewed and updated prior to the commencement of underground operations.

Statutory conditions are listed in Appendix 1. This management plan describes procedures required to ensure compliance with project approval conditions relating to blasting impacts. Details regarding monitoring locations, and frequencies are provided in a separate Blast and Vibration Monitoring Program.

### 1.1. Objectives

The objectives of this BMP are to:

- Ensure all relevant statutory requirements and BHP Billiton Policies and Standards are met;
- Manage and minimise the impact of blasting from mining operations on the environment and nearby residences;
- Maintain an effective response mechanism to deal with issues and complaints; and
- Ensure the results of blast monitoring comply with applicable criteria.

## 1.2. Environmental Management System

Mt Arthur Coal has a firm commitment to minimising the impact of its operations on the local environment and community, and has a comprehensive Environmental Management System (EMS) in place to fulfil this commitment. This BMP is a component of the Mt Arthur Coal EMS.

## 1.3. Consultation Process

This BMP has been prepared in consultation with DoPI and OEH. Consultation has also been undertaken with neighbouring coal mines, including the Drayton and Bengalla Mines and the Mt Pleasant Project in relation to blast scheduling.

# 2. Blast Mitigation Measures

## 2.1. Best Practice Control Measures

Best practice blast management procedures will be implemented at Mt Arthur Coal to minimise air blast overpressure, ground vibration levels, flyrock, fume, dust and odour from blasting activities.

Best practice control of ground vibration, overpressure and flyrock impacts will be achieved by implementing the procedures and safe guards shown below. Particular care will be exercised when blasting is undertaken within the hatched area illustrated in Appendix 2, to ensure that the blast impact assessment criteria are met for public infrastructure, private residences and heritage sites including Edinglassie and Rous Lench. (For further technical information on specific blast procedures relating to minimising impacts within the hatched area illustrated in Appendix 2, refer to the Blasting Technical Note included in Appendix 3).

- Complying with the relevant procedures prior to the initiation of any blast by referring to the *MAC-STE-MTP-008 Mine Safety Management Plan* and the *MAC-PRD-PRO-001 Developing Shotfiring Safe Work Procedures*;
- Conducting a pre-blast environmental assessment with consideration given to wind speed, direction and shear and the strength of temperature inversions prior to each blast. Meteorological conditions will then be compared with internal blasting guidelines before an approval to blast is issued;
- Use of initiation systems that minimise vibration;
- Use of adequate stemming lengths to ensure maximum confinement of explosive charges minimizing flyrock and overpressure;
- Use of suitable quality stemming material - being either drill cuttings, rock sourced from site or imported gravel, when necessary;
- Ensuring adequate burden is present on all faces. In some instances face surveying (laser profiling) techniques may be employed to measure overburden between the blast face and blastholes to ensure sufficient burden is present to prevent blowouts and blast anomalies;
- Adherence to blast loading and initiation designs where practicable;

- Use of monitoring data to establish and refine predictive tools to estimate likely overpressure and vibration levels during the design process of subsequent blasts; and
- Evaluating new technology and alternative blasting methodologies that become available for their potential to lessen environmental impacts from blasting, in the context of safe, efficient mining operations.

Best practice control of blast fume, dust and odour will be achieved by:

- Minimising the potential for delayed firing of shots which have been loaded into wet holes within the constraints of prevailing weather conditions;
- Conducting a pre-blast environmental assessment with consideration given to wind speed, direction and shear and the strength of temperature inversions prior to each blast. Blasts will be fired in suitable weather conditions that minimise the potential for blast generated dust and/or blast fume to be blown towards neighbouring residential areas; and

There may be circumstances where blasts may need to be fired in less than ideal weather conditions. In these circumstances Mt Arthur Coal will take additional controls to minimise impacts, such decisions will be elevated up the organisational structure, demonstrating the seriousness of such decisions.

Blasts are modelled to avoid impacts to heritage and public infrastructure sites. A risk assessment will be conducted in Q3, 2011 to ensure the identification and protection of all Aboriginal sites and publicly owned infrastructure. From that risk assessment, guidelines will be developed to ensure there is no damage from blasting to these sites / infrastructure.

## 2.2. Management of Fly Rock

The generation of fly rock is managed by incorporating appropriate controls in blast designs. These controls include design of stemming lengths and stemming materials to minimise the potential for generating fly rock. Adequate burden, which is the distance from a charge to a free face, is maintained to minimise the risk of generating fly rock due to face bursting. These measures are used to ensure there is no damage to property, equipment or power lines from flyrock.

In certain situations, crushed rock stemming will be used to improve stemming confinement and hence reduce the chance of flyrock and elevated blast overpressure.

An appropriate exclusion zone for people and livestock will be established around each blast site in accordance with relevant mine safety regulations prior to firing a blast. The exclusion zone will be established beyond the expected range of any fly rock with an additional safety margin. The establishment of this zone will minimise the risk of any injuries to people or livestock due to fly rock.

Any unusual level of fly rock generated by blasting, with the potential to cause a safety risk will be noted for each blast. This information will be used to continually re-assess the adequacy of blast design controls in reducing the generation of fly rock. The information will also be used to

re-assess the size of the safety exclusion zone established for people and livestock in the vicinity of a blast.

### 2.3. Protection of Underground Utilities

The level of ground vibration that would result in damage to underground utilities is likely to be greater than 25 mm/s, based on recommendations in AS2187.2-2006 'Explosives—Storage and use Part 2: Use of explosives'. Given the significant distance between Mt Arthur Coal blasting locations and adjacent private land, it is unlikely that any damage to underground utilities will occur.

### 2.4. Management of Road Closures

A Road Closure Management Plan for Denman Road (*MAC-ENC-MTP-024 Denman Road Closure Management Plan*) has been prepared in consultation with Muswellbrook Shire Council (MSC) and the NSW Roads and Traffic Authority (RTA) and is approved by the Director General to address the management of public road closures during any blasting within 500m of Denman Road.

Mt Arthur Coal seeks to minimise the requirement for road closures, and their impacts on the local community. The primary objective of the *MAC-ENC-MTP-024 Denman Road Closure Management Plan* is to provide a framework to coordinate safe and efficient road closures when blasting occurs within 500 metres of Denman Road.

Fundamental to achieving this objective is to:

- Ensure safety and protection of potentially affected persons and property;
- Minimise road closure periods;
- Minimise potential impacts on road users, local residents and businesses, through avoiding peak traffic periods;
- Coordinating blast schedules with neighbouring mines to minimise cumulative impacts of blasting;
- Notify in advance relevant stakeholders, including the public, of blasts that will temporarily close Denman Road; and
- Ensure that emergency service activities are not restricted by road closure events.

No blasting is planned to be undertaken within 500 metres of Edderton Road within the next five years. Should any blasting within 500 metres of Edderton Road be required the management plan and procedure will be reviewed and updated as required.

### 2.5. Management of Aboriginal Heritage

The most significant known Aboriginal heritage feature which has the potential to be impacted by blasting is the axe grooves site at Saddlers Pit. A geotechnical study was done on this particular area and it determined that blasting should not occur within 150m of the centroid of the grooves. Blasting in this area is now moving away from the axe grooves site, and blasting will not occur within 150m of the centroid of the site. Should further artefacts be found, a risk assessment will be conducted and full pre-blasting assessment done to ensure that blasting will not damage those artefacts.

## 3. Consultation

### 3.1. Consultation with Neighbouring Mines

Mt Arthur Coal has undertaken consultation with the operators of neighbouring mines in the past, and provides regular notification to all operators of future blasting schedules to ensure that blast schedules are coordinated and cumulative impacts are minimised.

### 3.2. Consultation with Neighbouring Residents

The public will have access to the blasting schedule which will be posted on the internet via the Mt Arthur Coal web site. As appropriate, the blasting schedule will be further disseminated via mail, e-mail, and fax to appropriate organisations and individuals. It should be noted that the weekly schedule is subject to variation depending on daily factors including variable weather which may ultimately delay a blast until conditions improve.

Further to this, Mt Arthur Coal will make telephone contact with relevant residents as requested prior to blasting in order to avoid surprise and maintain good working relationships.

Blasting events which require road closures activate the notification section of the *MAC-ENC-MTP-024 Denman Road Closure Management Plan* which details the community consultation and notification requirements.

### 3.3. Community Consultation

Mt Arthur Coal has in place a comprehensive community engagement program which includes the establishment of a Community Consultative Committee (CCC). The CCC is operated in accordance with the DoPI's "Guidelines for Establishing and Operating Community Consultative Committees for Mining Projects". Mt Arthur Coals blasting results are reported to the CCC on a regular basis.

The community response line (1800 882 044) enables members of the community to contact environment and community staff directly to discuss concerns with blasting.

Residents within 3km of blasting have been sent letters to inform them that they are entitled to request structural inspections on their property.

### 3.4. Consultation with Transgrid

Mt Arthur Coal will consult with Transgrid to determine the most appropriate damage criteria on a regular basis and prior to any modifications to the existing agreement in relation to the Bayswater to Mt Piper 330/500KV transmission line.



### 3.5. Consultation with Government Agencies

This BMP has been prepared in consultation with OEH and to the satisfaction of the Director General (see correspondence in **Appendix 3**).

## 4. Response Procedures

### 4.1. Operational Response Process

In situations where the blast results are identified as exceeding the impact assessment criteria, the following actions will be undertaken:

- The Drill and Blast Superintendent and/or the Environmental Coordinator will investigate the results of the blast and the potential causes for the exceedence;
- The Director-General, OEH and any other relevant agencies will be contacted as soon as practicable after the exceedence becomes known in accordance with Condition R4.1 of the EPL and Schedule 5, Condition 7 of the Project Approval.
- Mt Arthur Coal will initiate investigations as to the cause of the exceedence and prepare a detailed report of the incident.
- Mt Arthur Coal will prepare a detailed report as a result of the investigation and provide the Director-General, OEH and any other relevant agencies, with the report within 7 days of the incident in accordance with Schedule 5, Condition 7 of the Project Approval.
- If no recognisable causes can be identified further investigations maybe undertaken to identify the cause e.g. specific weather or atmospheric conditions;
- Where the cause is identified, additional controls will be implemented or the blasting method will be altered for future blasts, and, where necessary, procedures will be reviewed;
- Any corrective action will be recorded in the site event management database and reported to the Environmental Coordinator who will keep a record of all significant proactive and reactive actions; and
- The Environmental Coordinator will be informed of any complaint and details must be recorded in the site event management database in addition to response and actions taken (refer to Section 6.3).

### 4.2. Complaint Response

All complaints received in relation to Mt Arthur Coal's blasting activities will be responded to in accordance with *MAC-ENC-PRO-042 Community and Environmental Incident Response and Reporting* and Condition M4.2 of EPL 11457. These provide details on how to receive, handle, respond to, and record and action any community complaints.

Upon receipt of a complaint from the Community, preliminary investigations will commence as soon as practicable to determine the likely causes of the complaint using information such as the prevailing climatic conditions, the nature of activities taking place and recent monitoring

results. A response will be provided as soon as practicable, which may include the provision of relevant monitoring data.

Where specific complaints are received in relation to blast overpressure and/or vibration, portable attended monitoring units may be deployed in consultation with the complainant to monitor blast impacts at the relevant location.

Every effort will be made to ensure that concerns are addressed in a manner that facilitates a mutually acceptable outcome for both the complainant and Mt Arthur Coal. If required, the Independent Dispute Resolution Process outlined in PA 09\_0062 will be entered into.

### 4.3. Complaints Register

Mt Arthur Coal will record all community complaints into the site event management database. The database is maintained to include reporting, incident/event notification, close out action tracking, inspections, and audits. Complaints will be recorded in the Annual Environmental Management Report.

### 4.4. Landholder Notification – Property Inspections and Property Investigations

In accordance with conditions 13 of the Project Approval, Mt Arthur Coal has notified all owners of privately-owned land within 3 kilometres of any approved blasting operations that they are entitled to a structural property inspection to establish the baseline condition of building and other structures on their properties.

Property inspections will be undertaken on any privately-owned land within 3 kilometres of any approved blasting operation in accordance with condition 14, when Mt Arthur Coal receives a written request.

Property investigations will be undertaken in accordance with condition 15, if any landholder within 3 kilometres of blasting operations or any other landholder nominated by the Director-General, claims that buildings and / or structures on their land have been damaged as a result of blasting at the project.

## 5. Monitoring Program

The *MAC-ENC-PRO-055 Blast Monitoring Program* has been prepared as a separate document to this management plan and addresses the following:

- Assessment criteria;
- Blasting and vibration monitoring methodology;
- Blast monitoring locations; and
- Data analysis and reporting.

The monitoring program has been designed to ensure that adequate monitoring is undertaken to confirm compliance with schedule 3, conditions 10 to 17 of the Project Approval. The program specifies monitoring requirements, and provides guidelines on data analysis and

reporting. Additional information relating to maintenance and calibration of the monitoring system is also specified.

## 6. Performance Indicators

The extent to which this BMP complies with the Project Approval and EPL requirements will be measured by the following performance indicators:

1. Compliance with relevant blasting impact assessment criteria at monitoring locations, in particular those representative of sensitive receptor locations;
2. Compliance with blast restrictions associated with time and blast numbers;
3. The frequency and extent of complaints reported to the mine in relation to blasting; and
4. Compliance with the *MAC-ENC-PRO-055 Blast Monitoring Program* and this plan, as indicated by internal and statutory reporting.

## 7. Continual Improvement

Mt Arthur Coal strives to continually improve on the mine's environmental performance by applying the principles of best practice to mining operations, including where cost-effective and practicable, the adoption of new best practice technologies and improved blast control measures. Progress will be monitored using the above noted performance indicators.

## 8. Reporting and Review

### 8.1. Reporting

Mt Arthur Coal will report on the performance of the Blast Monitoring Program in the Annual Environmental Management Report (AEMR) and provide regular updates to members of the Community Consultative Committee (CCC). The AEMR will include:

- Blast monitoring results and comparison to performance criteria;
- Blast related complaints and management/mitigation measures undertaken;
- Management/mitigation measures undertaken in the event of any confirmed exceedance of performance criteria; and
- Review of the performance of management/mitigation measures and the monitoring program.

The AEMR will also be submitted to the CCC and made available for public information at the MSC office and Mt Arthur Coal's website.

The Annual Return for EPL11457 will include a blast monitoring report covering the following items relating to blasting on site:

- The date and time of the blast;
- The location of the blast on the premises;
- The blast monitoring results at each blast monitoring station; and
- An explanation for any missing blast monitoring results.

## 8.2. Review

This BMP and associated monitoring plan will be reviewed, and if necessary revised to the satisfaction of the Director-General (in consultation with relevant government agencies) in accordance with Condition 4 of Schedule 5 of the Project Approval:

- within 3 months of the submission of an:
  - annual review under Condition 3, Schedule 5 of the Project Approval;
  - incident report under Condition 7, Schedule 5 of the Project Approval;
  - Independent Environmental Audit report under Condition 9, Schedule 5 of the Project Approval;
  - Modification to the conditions of the Project Approval.
- When there are changes to project approval or licence conditions relating to blast management or monitoring;
- Following significant incidents at Mt Arthur Coal relating to blasting;
- Following the conduct of an independent environmental audit which requires changes to the Blast Management Plan or to the blast monitoring practices; or
- If there is a relevant change in technology or legislation.

## 9. Responsibilities

**Table 1** below summarises responsibilities documented in the Blast and Vibration Management Plan, and should be read in conjunction with this document. Responsibilities may be delegated as required.

**Table 1: Blast monitoring program responsibilities**

No.	Task	Responsibility	Timing
1	Overpressure and vibration limits as specified in project approval to be met.	Drill and Blast Superintendent	For each blast event.
2	Blasting for open cut to be conducted between the hours 9am to 5pm, Monday to Saturday only.	Drill and Blast Superintendent	For each blast event.

No.	Task	Responsibility	Timing
3	Maximum number of blasts averaged over a 12 month period for Mt Arthur Mine complex as specified in Section 2.3.	Drill and Blast Superintendent	For each 12 month period.
4	Written permission to Blast on Sundays or public holidays.	Environment and Community Manager	As required.
5	Transgrid will be consulted prior to any modification to the existing agreement in relation to the Bayswater to Mt Piper 330/500KV transmission line.	Planning and Services Manager & Drill and Blast Superintendent	As required.
6	Where practical, blasting activities will be coordinated with surrounding mines to minimise cumulative impacts.	Drill and Blast Superintendent	As required.
7	Upon receiving a written request from owners of properties listed in Section 4.2, a structural inspection will be undertaken within 14 days and provided to the owner within 14 days of receipt.	Environment and Community Manager	As required.
8	Air blast overpressure and ground vibration will be monitored at the monitoring locations for each blast event.	Environmental Superintendent	For each blast event.
9	Monitoring to be undertaken in accordance with Blast Monitoring Program.	Environmental Superintendent	For each blast event.
10	Any problems associated with multi-storey buildings caused by vibration will be investigated.	Environment and Community Manager	As required.
11	Results of investigations of multi-storey buildings will be reported to DoPI.	Environmental & External Affairs Manager	As required.
12	Blast monitoring report will be included with the Annual Return for EPL11457.	Environmental Superintendent	Annually.
13	Potential exceedances of overpressure and or vibration to be managed in accordance with Section 6.1.	Drill and Blast Superintendent	As required.
14	Blasting complaints to be responded to in accordance with Section 6.2.	Environmental Superintendent	As required.

No.	Task	Responsibility	Timing
15	AEMR to include blast monitoring results, complaints, mitigation measures undertaken and a review of the monitoring undertaken.	Environmental Superintendent	Annually.
16	Review to be undertaken of the Blast and Vibration Management Plan.	Planning and Services Manager; Environmental & External Affairs Manager;	As per EMS requirement and every five years.

## 10. References

### 10.1. External Documents

Australian Standard AS 2187.2-2006 'Explosives—Storage and use Part 2: Use of explosives'  
 Department of Environment, Climate Change and Water (12 November 2009) Environmental Protection Licence 11457

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

Department of Planning (December 2008) Minister of Planning's Development Consent (dated 2 December 2008) Application 06\_0091 Mt Arthur Underground.

Environment Protection Authority (January 2000) NSW Industrial Noise Policy  
 Hansen Bailey (2009), Mt Arthur Coal Consolidation Project Environmental Assessment. Prepared for Hunter Valley Energy Coal Pty Ltd.

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

### 10.2. Mt Arthur Coal Internal EMS Documents

*MAC-ENC-PRO-008 Communication and Reporting*  
*MAC-ENC-PRO-041 Real Time Monitoring Response*  
*MAC-ENC-PRO-042 Environmental Incident Response and Reporting*  
*MAC-ENC-PRO-055 Blast Monitoring Program*  
*MAC-ENC-MTP-018 European Heritage Management Plan*

*MAC-ENC-MTP-024 Road Closure Management Plan*  
*MAC-PRD-PRO-001 Developing Shotfiring Safe Work Procedures*  
*MAC-STE-MTP-008 Mine Safety Management Plan*

Draft

## Appendix 1: Project Approval and EPL Requirements

**Table 2: Project Approval and EPL Conditions associated with blasting**

Consent/Licence	Schedule : Condition	Condition / Requirement	Management Plan Section															
Open Cut Consolidation Project Approval	3:10	<p><b>Blast Impact Assessment Criteria</b>                      10. The Proponent shall ensure that blasts on site do not cause exceedances of the criteria in Table 8.                      Table 8: Blasting impact assessment criteria</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #333; color: white;"> <th style="width: 30%;">Location</th> <th style="width: 20%;">Airblast overpressure (dB(Lin Peak))</th> <th style="width: 20%;">Ground vibration (mm/s)</th> <th style="width: 30%;">Allowable exceedence</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Residence on privately owned land</td> <td style="text-align: center;">120</td> <td style="text-align: center;">10</td> <td style="text-align: center;">0%</td> </tr> <tr> <td style="text-align: center;">115</td> <td style="text-align: center;">5</td> <td style="text-align: center;">5% of the total number of blasts over a period of 12 months</td> </tr> <tr> <td>Heritage sites, including Edinglassie and Rous Lench</td> <td style="text-align: center;">133</td> <td style="text-align: center;">10</td> <td style="text-align: center;">0%</td> </tr> </tbody> </table>	Location	Airblast overpressure (dB(Lin Peak))	Ground vibration (mm/s)	Allowable exceedence	Residence on privately owned land	120	10	0%	115	5	5% of the total number of blasts over a period of 12 months	Heritage sites, including Edinglassie and Rous Lench	133	10	0%	Refer to Blast Monitoring Program
		Location	Airblast overpressure (dB(Lin Peak))	Ground vibration (mm/s)	Allowable exceedence													
		Residence on privately owned land	120	10	0%													
			115	5	5% of the total number of blasts over a period of 12 months													
Heritage sites, including Edinglassie and Rous Lench	133	10	0%															
Open Cut Consolidation Project Approval	3:11	<p><b>Blasting Hours</b>                      11. The Proponent shall only carry out blasting on 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 Director-General.</p>	5.0 8.0															
Open Cut Consolidation Project Approval	3:12	<p><b>Blasting Frequency</b>                      12. The Proponent may carry out a maximum of:                      (a) 2 blasts a day;                      (b) 12 blasts a week; and</p>	5.0 8.0															



Consent/Licence	Schedule : Condition	Condition / Requirement	Management Plan Section
		(c) 4 blasts a week with a maximum instantaneous charge of greater than 1,500 kilograms, averaged over a 12 month period, for all open cut operations at the Mt Arthur mine complex. 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.	
Open Cut Consolidation Project Approval	3:13	<b>Property Inspections</b> 13. By the end of November 2010, the Proponent shall advise the owners of privately-owned land within 3 kilometres of any approved blasting operations that they are entitled to a structural property inspection to establish the baseline condition of buildings and other structures on the property.	4.4
Open Cut Consolidation Project Approval	3:14	<b>Property Inspections Cont.</b> 14. If the Proponent receives a written request for a property inspection from any such landowner, the Proponent shall: <ul style="list-style-type: none"> <li>(a) within 2 months of receiving this request commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Director-General, to:               <ul style="list-style-type: none"> <li>• establish the baseline condition of any buildings and other structures on the land; and</li> <li>• identify measures that should be implemented to minimise the potential blasting impacts of the project on these buildings or structures; and</li> </ul> </li> <li>(b) give the landowner a copy of the property inspection report.</li> </ul>	4.4
Open Cut Consolidation Project Approval	3:15	<b>Property Investigations</b> 15. If any landowner of privately-owned land within 3 kilometres (including the whole of the Racecourse Road area and the area southwest of Skellatar Stock Route) of blasting operations, or any other landowner nominated by the Director-General claims that buildings and/or structures on his/her land have been damaged as a result of blasting at the project, the Proponent shall within 3 months of receiving this request: <ul style="list-style-type: none"> <li>(a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Director-General, 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 Director-General.</p>	4.4

Consent/Licence	Schedule : Condition	Condition / Requirement	Management Plan Section
		If the Proponent or landowner disagrees with the findings of the independent property investigation, then either party may refer the matter to the Director-General for resolution.	
Open Cut Consolidation Project Approval	3:16	<p><b>Operating Conditions</b></p> <p>16. During mining operations on site, the Proponent shall:</p> <p>(a) implement best blasting practice to:</p> <ul style="list-style-type: none"> <li>• protect the safety of people and livestock in the area surrounding blasting operations;</li> <li>• protect public or private infrastructure/property in the area surrounding blasting operations from blasting damage; and</li> <li>• minimise the dust and fume emissions from blasting at the project;</li> </ul> <p>(b) co-ordinate the timing of blasting on site with the timing of blasting at the Drayton and Bengalla coal mines to minimise the potential cumulative blasting impacts of the three mines; and</p> <p>(c) operate a suitable system to enable the general public and surrounding landowners and tenants to get up-to-date information on the proposed blasting schedule on site, to the satisfaction of the Director-General.</p>	<p>2.1</p> <p>3.1</p> <p>3.2</p> <p>3.3</p>
Open Cut Consolidation Project Approval	3:17	<p><b>Blast Management Plan</b></p> <p>17. The Proponent shall prepare and implement a Blast Management Plan for the project to the satisfaction of the Director-General. This plan must:</p> <p>(a) be prepared in consultation with OEH, and be submitted to the Director-General for approval by the end of March 2011; and</p> <p>(b) describe the blast mitigation measures that would be implemented to ensure compliance with the relevant conditions of this approval, including detailed demonstration that blasting within the hatched area shown on the figure in Appendix 6 can be undertaken in a manner that will meet the blast impact assessment criteria in Table 8 at all times;</p> <p>(c) describe the measures that would be implemented to ensure that the general public and surrounding landowners and tenants to get up-to-date information on the blasting schedule;</p> <p>(d) include a road closure management plan, prepared in consultation with the applicable roads authority, that includes provisions for:</p> <ul style="list-style-type: none"> <li>• minimising the duration of closures, both on a per event basis and weekly basis;</li> <li>• avoiding peak traffic periods as far as practicable; and</li> <li>• coordinating with neighbouring mines to minimise the cumulative effect of road closures;</li> </ul> <p>and</p>	<p>1.3 &amp; 3.5</p> <p>2.1, 2.2 &amp; 2.3</p> <p>3.2 &amp; 3.3</p> <p>2.4</p> <p>Refer to Road Closure Mgt Plan</p>

Consent/Licence	Schedule : Condition	Condition / Requirement	Management Plan Section
		(e) include a blast monitoring program for evaluating blast-related impacts (including blast-induced seismic activity) on, and demonstrating compliance with the blasting criteria in this approval for: <ul style="list-style-type: none"> <li>• privately-owned residences and structures;</li> <li>• items of Aboriginal (including scarred trees and axe grinding grooves) and nonindigenous cultural heritage significance (including Edinglassie, Rous Lench and Balmoral); and</li> <li>• publicly-owned infrastructure;</li> </ul>	5.0 Refer to Blast Monitoring Program & European Heritage Management Plan
Open Cut Consolidation Project Approval	5:2	<p><b>Management Plan Requirements</b></p> <p>2. 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>	- Appendix 1 5.0 Refer to Blast Monitoring Program 6.0 2.0, 3.0, 4.0, 5.0 & 8.0 4.1 & 7.0 7.0 4.0 & 8.1 8.2

Consent/Licence	Schedule : Condition	Condition / Requirement	Management Plan Section
Open Cut Consolidation Project Approval	5:4	<p><b>Revision of Strategies, Plans and Programs</b></p> <p>4. Within 3 months of the submission of an:</p> <p>(a) annual review under condition 3 above;</p> <p>(b) incident report under condition 7 below;</p> <p>(c) audit under condition 9 below; and</p> <p>(d) any modification to the conditions of this approval, the Proponent shall review, and if necessary revise, the strategies, plans, and programs required under this approval to the satisfaction of the Director-General.</p> <p><i>Note: This is to ensure the strategies, plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the project.</i></p>	8.2
Open Cut Consolidation Project Approval	5:7	<p><b>REPORTING</b></p> <p><b>Incident Reporting</b></p> <p>7. The Proponent shall notify the Director-General and any other relevant agencies of any incident associated with the project as soon as practicable after the Proponent becomes aware of the incident.</p> <p>Within 7 days of becoming aware of the incident, the Proponent shall provide the Director-General and any relevant agencies with a detailed report on the incident.</p>	4.0
Open Cut Consolidation Project Approval	5:8	<p><b>Regular Reporting</b></p> <p>8. The Proponent shall provide regular reporting on the environmental performance of the project on its website, in accordance with the reporting arrangements in any plans or programs approved under the conditions of this approval, and to the satisfaction of the Director-General.</p>	8.1
Open Cut Consolidation Project Approval	5:11	<p><b>ACCESS TO INFORMATION</b></p> <p>11. From the end of December 2010, the Proponent shall:</p> <p>(a) make the following information publicly available on its website:</p> <ul style="list-style-type: none"> <li>• a copy of all current statutory approvals for the project;</li> <li>• a copy of the current environmental management strategy and associated plans and programs;</li> </ul>	Refer to Mt Arthur Coal Website

Consent/Licence	Schedule : Condition	Condition / Requirement	Management Plan Section
		<ul style="list-style-type: none"> <li>• a summary of the monitoring results of the project, which have been reported in accordance with the various plans and programs approved under the conditions of this approval;</li> <li>• a complaints register, which is to be updated on a monthly basis;</li> <li>• a copy of the minutes of CCC meetings;</li> <li>• a copy of any Annual Reviews (over the last 5 years);</li> <li>• a copy of any Independent Environmental Audit, and the Proponent's response to the recommendations in any audit;</li> <li>• any other matter required by the Director-General; and</li> </ul> (b) keep this information up to date, to the satisfaction of the Director-General.	
Open Cut Consolidation Project Approval – Appendix 3 Statement of Commitments	2	<i>Mt Arthur Coal's Environmental Monitoring Programs for air quality, water quality, noise and blasting will be reviewed and updated as required, in consultation with relevant regulators for approval by the Department.</i>	5.0 Refer to Blast Monitoring Program
Open Cut Consolidation Project Approval – Appendix 3 Statement of Commitments	7	<i>Mt Arthur Coal shall undertake blast monitoring and associated reporting at the Woodlands property in accordance with protocols approved by the Department of Planning and for a time frame to be agreed with Woodlands.</i>	5.0 Refer to Blast Monitoring Program
Open Cut Consolidation Project Approval – Appendix 3 Statement of Commitments	13	<i>Transgrid will be consulted consistent with current practice when blasting in close proximity to the high voltage transmission line located near to the southern boundary of the mining area (as per South Pit Extension EA Statement of Commitment No. 6.4.3)</i>	3.4
EPL 11457	M4.2	<b>Recording of Pollution Complaints</b> M4.2 The record must include details of the following: <ul style="list-style-type: none"> <li>(a) the date and time of the complaint;</li> <li>(b) the method by which the complaint was made;</li> <li>(c) any personal details of the complainant which were provided by the complainant or, if no</li> </ul>	4.2 & 4.3

Consent/Licence	Schedule : Condition	Condition / Requirement	Management Plan Section
		(d) such details were provided, a note to that effect; (e) the nature of the complaint; (f) the action taken by the licensee in relation to the complaint, including any follow-up contact (g) with the complainant; and (h) if no action was taken by the licensee, the reasons why no action was taken.	
EPL 11457	L7.1	<b>L7 Blasting limits</b> L7.1 Blasting in or on the premises must only be carried out between 0900 hours and 1700 hours, Monday to Saturday. Blasting in or on the premises must not take place on Sundays or Public Holidays without the prior approval of the EPA.	5.0 Refer to Blast Monitoring Program
EPL 11457	L7.2	<b>L7 Blasting limits</b> L7.2 The airblast overpressure level from blasting operations in or on the premises must not exceed: (a) 115 dB (Lin Peak) for more than 5% of the total number of blasts during each reporting period; and (b) 120 dB (Lin Peak) at any time. At any residence or noise sensitive location (such as school or hospital) that is not owned by the licensee or subject of a private agreement between the owner of the residence or noise sensitive location and the licensee as to an alternative overpressure level.	5.0 Refer to Blast Monitoring Program
EPL 11457	L7.3	<b>L7 Blasting limits</b> L7.3 The ground vibration peak particle velocity from blasting operations carried out in or on the premises must not exceed: (a) 5mm/s for more than 5% of the total number of blasts carried out on the premises during each reporting period; and (b) 10 mm/s at any time. At any residence or noise sensitive location (such as school or hospital) that is not owned by the licensee or subject of a private agreement between the owner of the residence or noise sensitive location and the licensee as to an alternative ground vibration level.	5.0 Refer to Blast Monitoring Program
EPL 11457	M8.1	<b>M8 Blasting monitoring</b> M8.1 To determine compliance with condition(s) L7.2 and L7.3: a) Airblast overpressure and ground vibration levels must be measured and electronically recorded at locations representative of impacts likely to be experienced at residential	5.0 Refer to Blast Monitoring

Consent/Licence	Schedule : Condition	Condition / Requirement	Management Plan Section
		<p>properties, or other sensitive receivers, resulting from the operation of the mine, - for all blasts carried out in or on the premises; and</p> <p>b) Instrumentation used to measure the airblast overpressure and ground vibration levels must meet the requirements of Australian Standard AS 2187.2-2006.</p>	Program
EPL 11457	R4.1	<p><b>R4 Reporting of Blast Monitoring</b></p> <p>R4.1 The licensee must report any exceedence of the licence blasting limits to the regional office of the EPA as soon as practicable after the exceedence becomes known to the licensee or to one of the licensee's employees or agents.</p>	8.1

Draft

## Appendix 2: Blast Control Area

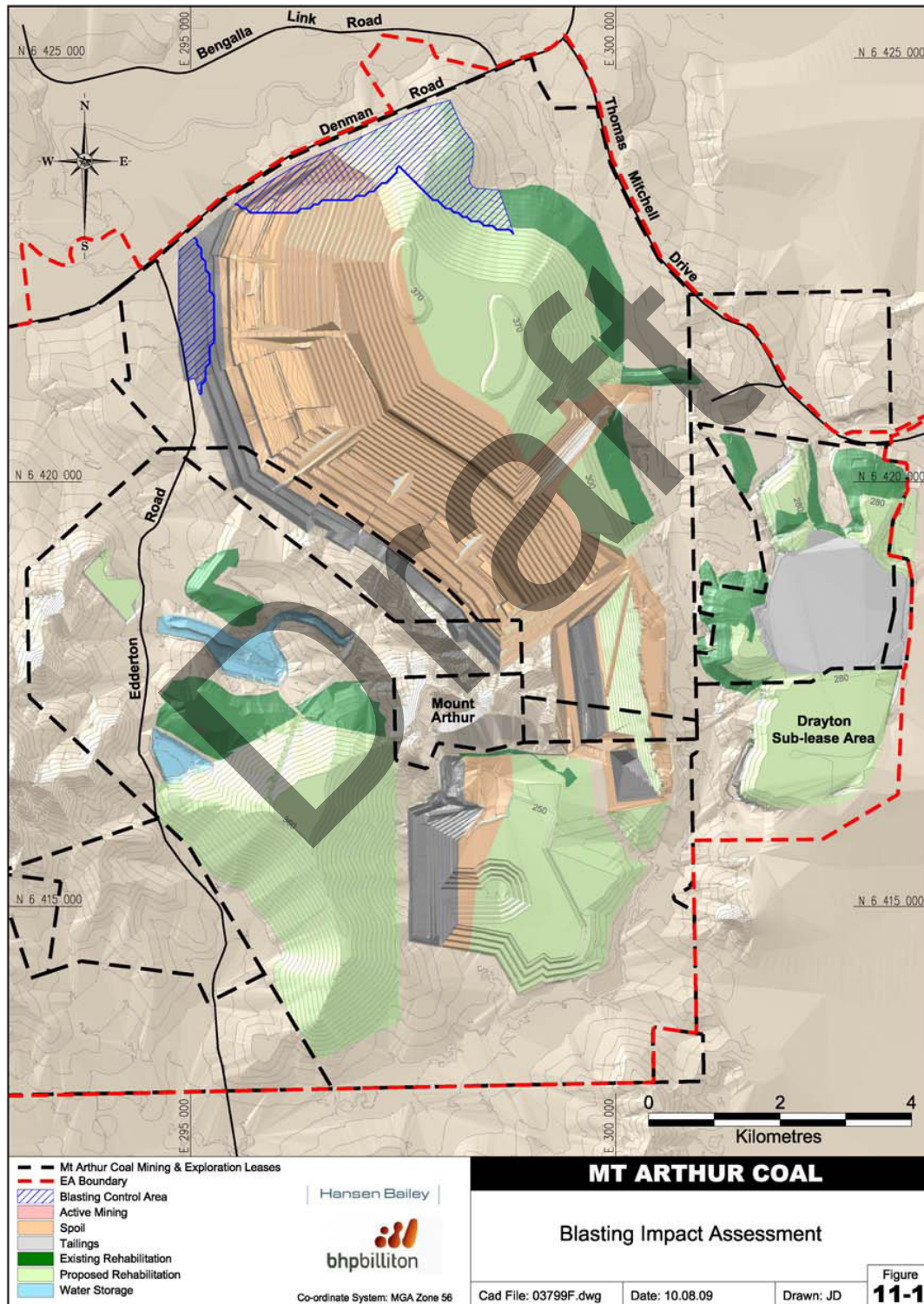


Figure 1: Blast control area



## Appendix 3: Mt Arthur Coal - Blasting Technical Note

### Mt Arthur Coal

### Technical Note

**Date:** 29 April 2010  
**By:** Jeff Hanlon  
**Subject:** **Blasting Simplification**

---

### Blasting – Vibration and Overpressure Discussion

Blasting is effectively the conversion of explosives into an energy form that is used to break rock. Like most processes, blasting is not totally efficient. Some of the energy created is transmitted into either the atmosphere above the blast or the ground adjacent to the blast. The energy lost to the atmosphere is referred to as overpressure, while the energy lost to the adjacent ground is referred to as vibration. To a neighbour, vibration would be perceived as a shake of the ground or building while overpressure is registered as noise or a rattle of the windows.

As a generalisation, distance is the most important issue for both these items where an increase in distance away from a blast will result in a reduction of both overpressure and vibration at a point of interest.

#### Vibration

Vibration is the movement of the ground adjacent to the blast due to some of the energy not being used in the rock breakage process. It travels as a set of three waves through the rock, one wave in each dimension (simple view).

Good predictive models exist for vibration as the ground is relatively constant. The models do simplify some geological impacts such as faulting and bedding, but they do enable reasonable predictions of vibration at points of interest, once a model has been developed. Models for vibration contain two variables, distance and maximum instantaneous charge (MIC), and two constants which are unique for each point of interest.

---

The mathematical expression relating distance and MIC has constants of 784.7 and -1.7 for vibration estimates at Edinglassie. Thus it is possible to predict the vibration at Edinglassie from any blast in the mine. Some simplified examples are shown in Table 1.

**Table 1 – Simplistic Model for Edinglassie**

Distance	500	1000	250	500	500
MIC	1000	1000	1000	2000	500
Vibration	7.2	2.2	23.3	13.0	4.0

From the table, it can be seen that distance has an inverse function in the order of 150%. That is, if the distance is halved, the resultant vibration is 3 times as high. In the case of charge, the function is of the order of 100%. That is, a doubling of the charge, doubles the resultant vibration. It should be noted that this relationship is different at every point of interest.

With respect to vibration impacts on other heritage homesteads in the area, blasting will be designed to ensure the stipulated licence conditions are met. In the case of Windmill Pit blasts, they will be designed to manage the vibration to the limits stated for Edinglassie as both Rous Lench and Balmoral are further away from the influence of blasting and thus, based on the distance component of the vibration equation, will experience a lower vibration than Edinglassie (considerably lower in the case of Balmoral). In the case of blasting in Macleans Hill, Rous Lench is the closest heritage property. It will be managed to the 10mm/s stated in the licence conditions. Achievement of this outcome will ensure vibration is less than 10 mm/s at both Balmoral and Edinglassie as they are further from blasting than Rous Lench. Additionally, the blast monitor at Yammanie is representative of Balmoral and will be used in conjunction with the Edinglassie monitor to verify compliance with the private residence criteria outlined in the Project Approval.

## Overpressure

Overpressure relates to the movement of the air adjacent to the blast and how that movement is transmitted through the atmosphere. Unlike the ground, the atmosphere is not even remotely homogeneous. Thus there are a significant number of impacts on the amount of overpressure created from a blast that cannot be controlled. Overpressure cannot be as successfully modelled as vibration. The most successful model is achieved through the development of a database of actual results and the use of historical data to estimate blast outcomes.

The two main influences on overpressure are the atmospheric conditions and the pathways from a blast that reach the atmosphere. Atmospheric conditions include weather, humidity, wind speed and direction, inversions, cloud cover and fog. The pathways that are available for energy release include lack of confinement of the blast hole, holes too close to the edge of a blast, faulting and cracking.

As with vibration, distance and charge weight influence the overpressure result: i.e. the further from a blast and the less explosive involved, the lower the overpressure will be. This point can

be erroneous on rare occasions when the overpressure “bounces” off an inversion layer and is transmitted a large distance away from a blast.

A good discussion of this information can be found at

<http://terrock.com.au/vibration/blasting.html>

## Actual Data

In Appendix 1, a set of actual blast results have been provided. All of these shots have been fired since the end of 2008 in the Windmill Pit which is the closest to Edinglassie and Rous-Lench.

As can be seen from the data, all but one MIC provides results <10mm/s at Edinglassie. In fact, the data suggests that other variables have an important role in determining a vibration outcome. The main issue would probably be the delay scatter. The value supplied for MIC assumes that there are 3 holes initiating at the one time. The lower than expected vibration is probably related to the actual quantity of explosive rather than the predicted volume. This supports a view that engineering a solution that takes out the potential for hole initiation overlap would give a positive outcome at the relevant point of interest.

In the case of the one result over 10mm/s, detailed investigation found that a small number of holes had been marginally over-drilled, the shot was tied as a box cut and the worst case scenario of multiple holes initiating together all compounded to give 10.99mm/s at the Edinglassie blast monitor. Edinglassie blast monitor is used for management purposes only.

## Reduction Strategies

The major influences on both overpressure and vibration are geography and blast issues. As the geography is fixed, all reduction processes will predominantly focus on the blasting issues.

Vibration management relates to how a point of interest “sees” a blast. Simplistic changes to the blasting process are reductions in explosives being fired at any one time. However, the same explosives quantity per blast hole can give widely different vibration results.

The current method of blasting at MAC uses pyrotechnics. Thus any quoted MIC will encompass an assumption that 3 holes are firing at the same time. This is due to the inherent inaccuracies with this method of initiation (delay scatter). Current blasting practices in the Windmill Pit have been changed so that slower delay times are used between holes. This gives rise to a longer gap between holes firing, which in turn, negates the compounding effect of timing overlap because there are longer time gaps between individual holes initiating.

Appendix 2 shows Table 3 from the Orica report *Affects of Expansion on Blasting Operations – October 2009*, previously provided as part of the adequacy assessment of the Mt Arthur Coal Consolidation Environmental Assessment. Table 3 shows a matrix of drill holes sizes and the use of electronic detonation of blasts to demonstrate how vibration levels at Edinglassie and

Rous Lench are able to be met, and how blasting practices can vary close to receivers to achieve acceptable results.

The first column shows the criteria to be met through the application of site laws and principles of electronics (either 5mm/s or 10mm/s depending on the location).

Columns two to five compare drill bit thickness, ie the width of the drill hole (Mt Arthur Coal currently utilises 200mm, 251mm and 270mm drill bits), and the depth of the hole. Essentially, the depth and width of the hole will govern the amount of explosive that can be used in each hole. For example, a 200mm hole drilled to 15 metres can use the same amount of explosive as an 11.2m hole drilled to 270mm.

The remaining columns represent metres from the monitor (listed in column 1) that a shot can be fired, using the relevant drill hole width to achieve the result of five or ten mm/s at the receiver.

Columns six and seven assume single and double holes firing at the same time – this would be achieved as described below using electronic initiation rather than traditional pyrotechnic methods.

The final column illustrates triple hole firing, which is achieved using pyrotechnics currently used onsite.

For example, a 15m deep hole drilled using a 200mm diameter drill bit and standard pyrotechnic initiation (as currently employed onsite) may potentially exceed vibration limits at Edinglassie / Rous Lench if the blast is within 470m of the homesteads. (as read from Row 12 of Table 3). This distance could be varied through the use of electronic initiation (to double shot precision) to 385 metres. The same results could be achieved through using a 270mm drill bit and a drilling depth of 11.2m.

As MAC moves closer to receivers, further adjustments may have to be made. The MIC can be adjusted a number of ways. They include:

- Decking
  - Decking effectively splits a hole up into a number of smaller explosions. Each deck of explosives is fired at a different time and separated from another by a layer of stemming. This system is commonly used in industry today and reduces the MIC in a reasonably simple way.
- Hole diameter
  - Reduction of hole diameter reduces the quantity of explosive in a hole thus reducing the MIC.
- Hole length
  - Reduction of hole length reduces the quantity of explosive in a hole thus reducing the MIC.

- Electronics
  - Electronic initiation systems allow two features to reduce vibration:
    - Firstly, their accuracy is significantly enhanced over the standard pyrotechnic initiation systems. This allows for less scatter and thus, single hole firing. Effectively, depending on the tie up method being used, the MIC will be reduced by half to two thirds, due to one hole initiating at once rather than two or three.
    - Secondly, as the system is extremely accurate, different timing arrangements can be used which will dictate the order in which holes go off. This allows for less confinement of the blast, resulting in the transmission of less energy in the form of vibration.
- Tie Up
  - The tie up dictates the order in which holes fire.
  - Different tie ups will produce different results for the post blast profile. Typically, the post blast profile is designed to move material to final profile and assist with digging operations.
  - A fairly simple change in tie up can sometimes reduce the vibration output from a shot.
  - By firing a shot away from points of interest, the resultant vibration is reduced as the compounding nature of the vibration waves travels away from those points.
- Shielding
  - It is possible to fire a shot in a specific way to establish a zone of broken rock first between the main body of the shot and the point of interest. Effectively a “curtain” of broken rock is created which inhibits vibration transmission towards the point of interest.

Blasting results are continually assessed to ensure all vibration criteria are met. All of these options will be applied to the review of blasting to ensure the best technique is applied to future blasting. The achievement of stipulated targets is paramount and as such the appropriate resources and techniques will be applied.

The best way to manage overpressure from a blast is to develop effective guidelines as to when the environmental conditions permit blasting and to ensure good blast practices exist on site.

The environmental guidelines currently in place at Mt Arthur Coal ensure that the prevailing weather conditions are taken into account when blasting. Information is provided to the Drill and Blast team related to inversions, wind direction and speed. This information, together with general weather advice, is utilised to formally gain approval for a blast. Once approval is gained, the team will prepare the blast. At any time between being given approval and the firing of the shot, the shot can be called off if conditions change to a point where there will be poor outcomes offsite from a blast. As with all models, the environmental inputs are continually reviewed to ensure they stay effective and relevant.

In the case of blasting practices, the systems for blasting need to account for the geology of an area, the geography of a blast and good practice. At the design stage, blast hole location takes account of any geological anomalies such as faults. In the field, hole location is adjusted based on any ground cracking observed and the location of the blast free face. During the design of the charging, stemming lengths are set based on conservative overpressure outcomes. During the actual charging process, the shot crew are able to manage any unforeseen circumstances (such as cracked ground) which could impact overpressure. Stemming lengths are regularly increased and holes occasionally undercharged to reduce overpressure results. Also, the shot is typically tied up so that any energy releases are orientated away from the mine boundaries.

## Summary

Overpressure and vibration are effectively managed at MAC. Experts have confirmed that with careful blast specific design, overpressure and vibration will stay below target levels at sensitive receptors for all blasts. As mining moves closer to the boundaries and the distance to neighbours shrinks, blasting practices will be adjusted to ensure conditions are met.

Draft

**Table 3: Vibration data for Windmill North**

Blast Name	Date Fired	MIC (kg)	Vibration	Distance
WMn1916/EG1	15/12/2008	2,787	8.62	1201
WMn1918/EG1	30/12/2008	2,087	3.87	1317
WMn1920/EG1	5/01/2009	2,102	5.71	1467
WMn2014/BA	18/02/2009	1,808	5.00	1009
WMn2515/BOW	24/02/2009	663	2.64	644
WMn2213/Ramp	4/03/2009	713	2.94	664
WMn2316/BOW	4/03/2009	1,635	5.00	818
WMn2020/CB	4/03/2009	970	0.25	1345
WMn2416/BOW	13/03/2009	1,269	3.44	741
WMn2017/CT	13/03/2009	999	3.55	1086
WMn2516/BOW	20/03/2009	1,254	2.15	666
WMn2317/BOW	26/03/2009	1,082	5.13	923
WMn2517/BOW	9/04/2009	951	2.32	820
WMn1919/T	18/05/2009	527	1.22	1209
WMn2215/BL	3/07/2009	742	4.23	871
WMn2315_RL150	13/07/2009	1,574	6.01	770
WMn2020/BA	14/07/2009	1,306	1.13	1321
WMn2320/VU	14/07/2009	1,898	5.90	1069
WMn2317/VU	22/07/2009	1,727	7.17	2588
WMn2016/BA	22/07/2009	1,021	4.36	1097
WMN2415_RL150	30/07/2009	1,775	7.11	681
WMn2419_RL150	6/08/2009	888	5.38	894
WMn2515_RL150	21/08/2009	708	6.42	572
WMn2517_RL150	2/09/2009	900	9.38	701
WMn2519_RL150	19/09/2009	737	3.66	940
WMn1920/R1	7/10/2009	2,082	2.86	1504
WMn1918/R1	15/10/2009	3,403	3.48	1360
WMn1916/R1	21/10/2009	693	5.47	1245
WMn1821/R1	21/10/2009	1,752	1.64	1726
WMn2520_RL130	30/10/2009	477	6.98	1094
WMn2117/BL	10/12/2009	956	6.16	1017
WMn2418_RL130	10/12/2009	1,338	10.99	1503
WMn2517_RL130	10/12/2009	1,845	10.99	1503
WMn2217/BL	17/12/2009	1,097	2.70	950
WMn2518_RL130	17/12/2009	1,593	6.44	969
WMn2219/BL	23/12/2009	1,489	2.48	1164
WMn2119/BL	6/01/2010	2,022	1.93	1218

**Table 4: Orica Report**

Summary of PPV Distance Contours*							
POI	200mm Horizon Thickness (m)	229mm Horizon Thickness (m)	251mm Horizon Thickness (m)	270mm Horizon Thickness (m)	Single Hole Minimum Distance (m)	Double Hole Minimum Distance (m)	Triple Hole Minimum Distance (m)
Denman Road West 5 mm/s	5	5	5	5			
	10	9.0	8.6	8.5			
	15	12.9	11.8	11.2			
	20	16.7	15.0	13.9			
	25	20.5	18.2	16.7			
	30	24.3	21.3	19.4			
	35	28.1	24.5	22.2			
	40	31.9	27.7	24.9			1150
Edinglassie / Rous-lench 10 mm/s	5	5	5	5			
	10	9.0	8.6	8.5			350
	15	12.9	11.8	11.2		385	470
	20	16.7	15.0	13.9	325	460	565
	25	20.5	18.2	16.7	370	525	645
	30	24.3	21.3	19.4	415	585	715
	35	28.1	24.5	22.2	450	635	780
	40	31.9	27.7	24.9	485	685	840
Racecourse Road 5 mm/s	5	5	5	5			
	10	9.0	8.6	8.5			
	15	12.9	11.8	11.2			
	20	16.7	15.0	13.9			
	25	20.5	18.2	16.7			
	30	24.3	21.3	19.4			
	35	28.1	24.5	22.2			
	40	31.9	27.7	24.9			
Scriven 5 mm/s	5	5	5	5			
	10	9.0	8.6	8.5			
	15	12.9	11.8	11.2			
	20	16.7	15.0	13.9			
	25	20.5	18.2	16.7			
	30	24.3	21.3	19.4			
	35	28.1	24.5	22.2			
	40	31.9	27.7	24.9			
Sheppard Avenue 5 mm/s	5	5	5	5			
	10	9.0	8.6	8.5			
	15	12.9	11.8	11.2			
	20	16.7	15.0	13.9			
	25	20.5	18.2	16.7			
	30	24.3	21.3	19.4			
	35	28.1	24.5	22.2			
	40	31.9	27.7	24.9			

\* This table is based on the current Site law information and should be used for feasibility purposes only (not for daily production blasting requirements)  
 Existing blasting methods acceptable

Table 3 – PPV Distance Contours



## Appendix 4: Government Correspondence

Draft