BLAST MANAGEMENT PLAN

Edition	Rev.	Comments	Author	Authorised By	Date
1	1	Draft for DoP Approval	WCC	Andrew Wright	27th April 2012
1	2	Draft for DoP Approval	Andrew Wright	Lloyd Hain	5th September 2013
1	3	Final	Andrew Wright	Danny Young	19th December 2013

EXECUTIVE SUMMARY and QUICK KEY

This document has been prepared by Werris Creek Coal (WCC) for the NSW Department of Planning and Infrastructure (DoP).

WCC was granted Project Approval (PA 10_0059) on 25th October 2011 from DoP for the Life of Mine (LOM) project. The Project involves a northerly extension of the current mine footprint, increasing the projected mine life by approximately 15 to 20 years.

To satisfy Condition 13, Schedule 3 of PA 10_0059, WCC are required to prepare and implement a Blast Management Plan (BMP) for the project. The plan has also been prepared to meet the management plan requirements specified in Condition 2, Schedule 5 of the PA 10_0059.

The BMP outlines the control measures to be implemented as a part of the continued operations at WCC to minimise the potential for blasting impacts on the local community and the environment. The BMP also contains an updated Blast Monitoring Program, developed to quantify the blast impacts of the operation and to assess compliance against the blast criteria.

For ready reference to the required Section of the BMP, use the following quick key:

Responsibilities	Section 2
Approval Conditions	Section 3
Previous Monitoring Results	Section 4
Predicted Environmental Impacts	Section 5
Risk Assessment	Section 6
Blasting Criteria	Section 7
Management Strategies, Measures & Controls	Section 8
Blast Monitoring	Section 9
Blast Reporting	Section 12

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ACRONYMS USED THROUGHOUT THIS DOCUMENT

AEMR	-	Annual Environmental Management Report
BMP	-	Blast Management Plan
NIA	-	Noise (and Blasting) Impact Assessment
AS	-	Australian Standard
CCC	-	Community Consultative Committee
DoPI	-	Department of Planning and Infrastructure
EA	-	Environmental Assessment
EPL	-	Environment Protection Licence
LOM	-	Life of Mine
ML	-	Mining Lease
EPA	-	Environmental Protection Authority
PA	-	Project Approval
WCC	-	Werris Creek Coal
ARTC	-	Australian Rail Track Corporation
LPSC	-	Liverpool Plains Shire Council
MIC	-	Maximum instantaneous charge
ACARP	-	Australian Coal Association Research Program
OCE	-	Open Cut Examiner

1 INTRODUCTION

The existing Werris Creek Coal No.2 Coal Mine (WCCM) is operated by Werris Creek Coal (WCC) and is located within the North West Slopes and Plains of New South Wales approximately 45km south west from Tamworth (**Figure 1**). The mine is currently located approximately 4km south of Werris Creek and 11km north-northwest of Quirindi (**Figure 2**).

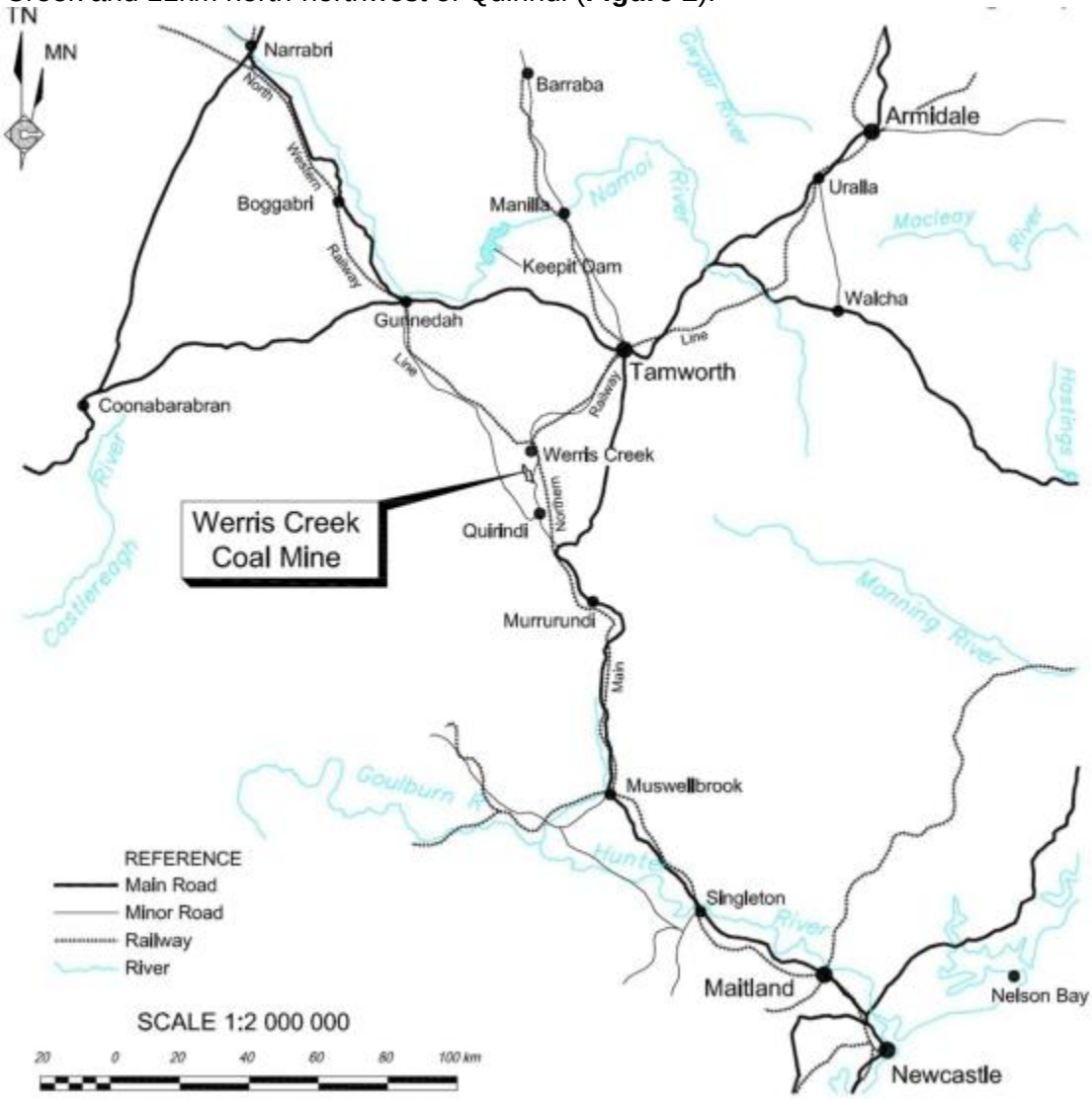


Figure 1: Regional Location (modified from Figure 1.1 R.W. Corkery & Co, 2010)

1.1 History of Operations

Underground mining at the former Werris Creek Colliery commenced commercially in 1925, closing in 1963 due to the cancellation of railway contracts for coal. The operation, owned by Preston Coal Company was small, employing a total of 13 people in 1928 (Pratt, 1996). The former Colliery was predominantly a board and pillar underground operation in which very few of the pillars have been removed (Pratt, 1996). The operation mined the lower 2.5m of what was referred to as the “Tunnel Seam” which corresponds to the E Seam in the current operations.

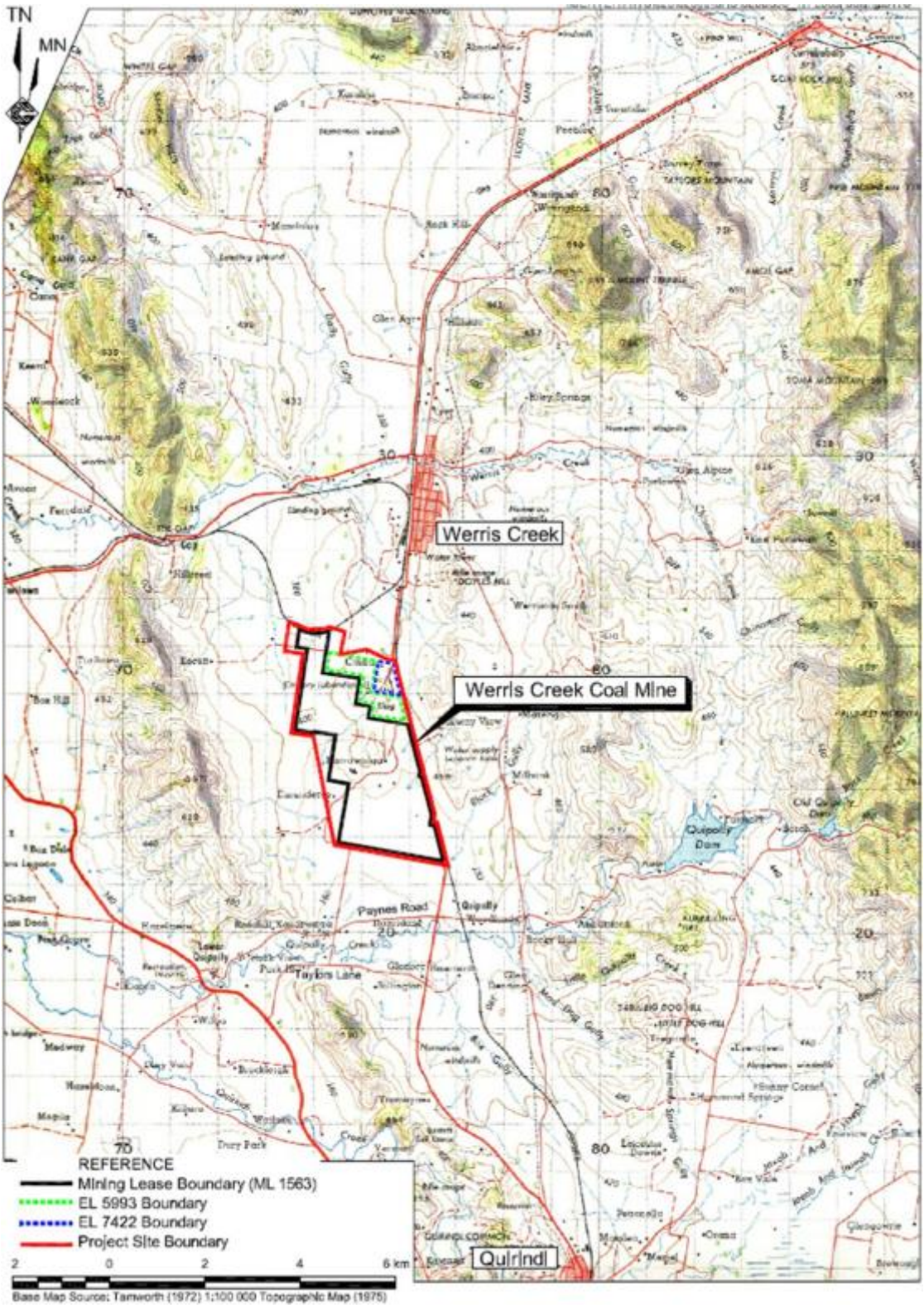


Figure 2: WCC Local Area (modified from Figure 1.1 R.W. Corkery & Co, 2011)

In 2002, Exploration License (EL) 5993 was granted to Creek Resources Pty Ltd and Betalpha Pty Ltd to undertake further exploration of the coal basin. Development Consent DA 172-7-2004 was approved on the 18th February 2005 and the Mining Lease (ML) 1563 was granted on 23rd March 2005. Construction for open cut operations commenced in April 2005. Whitehaven Coal Mining Pty

Ltd purchased Creek Resources Pty Ltd in 2005 which owned 40% of WCC. Whitehaven Coal purchased the remaining 60% interest in WCC in late 2007 taking management control for the operation. The operating company is Werris Creek Coal Pty. Ltd, which is a wholly owned subsidiary of Whitehaven Coal Mining Pty Ltd.

1.2 Life Of Mine Project

The WCC Life Of Mine (LOM) Project covers an area of 910ha including ML1563, ML1672 (covering EL5993 and EL7422) and ML1671 for mining related purposes which covers the remaining areas within the project boundary not cover by a mining title (**Figure 2**). The LOM Project involves the following component activities and operations (**Figure 3**):

- Increase Void Water Dam 1 (VWD1) storage capacity to 250ML and modify the Biodiversity Offset Strategy to include "Greenslopes/Banool" property compensating for the increased disturbance for VWD1 and alternate LOM Explosive Magazine location in accordance with PA 10_0059(MOD1);
- Northerly continuation of the existing open cut mine to extract the entire Werris Creek outlier of the Greta Coal Measures;
- Extension of the out-of-pit overburden emplacement area to the west over the current footprint of the Coal Processing Area and Site Administration and Facilities Area (out-of-pit emplacement) and construct a "Acoustic and Visual Amenity Bund" that extends around the eastern and north eastern perimeter of the open cut, and extend northwards over the completed sections of the open cut (in-pit emplacement);
- Relocation of coal processing infrastructure (Coal Processing Area) and increase ROM coal stockpile (ROM Coal Pad) capacity to 200000t;
- Maintaining road transportation of coal to domestic markets at 50000tpa to meet the needs of local customers for low ash coal (R.W. Corkery & Co, 2011). Road transport must not go through local government areas of Muswellbrook, Singleton, Mid-Western Regional, Cessnock and Newcastle;
- Production of up to 2.5Mtpa of thermal and Pulverised Coal Injection (PCI) coal for the domestic and international markets;
- Increased storage capacity of the Product Coal Storage Area at the Rail Load-out Facility and extend the pad to the east to increase the capacity of the stockpile area to approximately 250000t;
- Increase in the approved hours of operation to 24 hours, 7 day per week for all activities excluding Blast and road transport of coal from the WCC;
- Relocation of the administration and workshop areas (Site Administration and Facilities Area);
- Construction of a new entrance to WCC off Escott Road for direct access to the relocated coal processing infrastructure, offices and facilities. The use of Escott Road as the primary access point to the WCC would require the existing Escott Road and the intersection of Escott Road with Werris Creek Road to be upgraded;
- Construction of a second feed point to the Rail Load-out Facility to allow for product separation and reduced inter-product contamination;
- Construction of a 'turn-around' rail loop which would take off from the Werris Creek Rail Siding to the immediate west of the Rail Load-out Facility;
- Continued dewatering the underground workings of the former Werris Creek Colliery (approved under DA 172-7-2004) to enable open cut mining through all of these workings;
- Construction of a Northern Void Water Dam for the storage of water which accumulates in the open cut;
- Rehabilitation and new Biodiversity Offset Strategy (BOS) focusing on restoring Grassy White Box Woodland; and

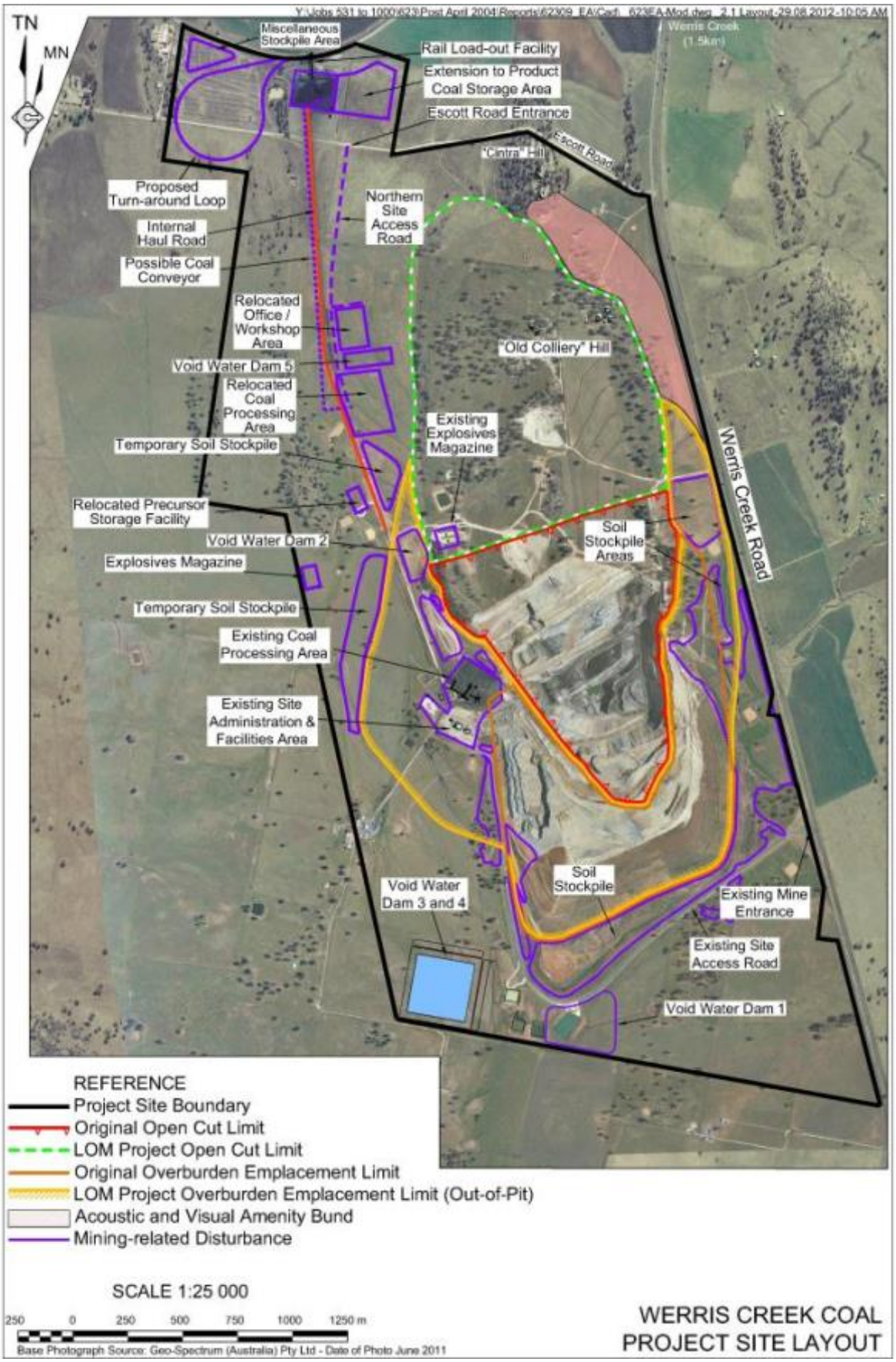


Figure 3: WCCM Layout (modified from Appendix 2 PA10_0059MOD1)

- Depending on economics, allows for the construction of a conveyor to transport coal from the Coal Processing Area to the Product Coal Storage Area potentially replacing internal coal haulage.

1.3 Purpose

The purpose of the BMP is to:

- Address and comply with the relevant conditions of the Project Approval (PA 10_0059) and Environmental Protection Licence (EPL 12290);
- Provide employees with a clear outline of their responsibilities in relation to blast management;
- Consolidate information relating to baseline conditions, and potential impacts associated with operations associated with the LOM project;
- Address all relevant commitments made by in the Werris Creek Coal Mine LOM Project: Environmental Assessment;
- Outline measures to minimise the blast impacts from the WCC on the surrounding community and environment;
- Establish a blast monitoring programs to assess and report the impact on blast as required by statutory approvals; and
- To keep the local community and relevant agencies informed and to provide a mechanism to respond to blast issues and complaints effectively.

The BMP has been prepared by WCC with reference to relevant legislation and guidelines and is consistent with the commitments in the following documentation:

- the Life of Mine (LOM) Project Approval 10_0059 which was approved by the Department of Planning and Infrastructure (DoPI) on 25th October 2011 under delegation from the Minister for Planning and Infrastructure;
- the Project Modification (PA 10_0059 MOD1) which was approved by DoPI on 30th August 2012 under delegation from the Minister for Planning and Infrastructure;
- Environment Protection License (EPL 12290) issued by the NSW Environment Protection Authority (EPA);
- the final "Environmental Assessment for Werris Creek Coal Mine Life of Mine Project" (R.W Corkery & Co, 2010);
- "Response to Submissions for the Environmental Assessment for Werris Creek Coal Mine Life of Mine Project" (R.W. Corkery & Co, 2011);
- Spectrum Acoustics Pty Ltd, Noise (and Blasting) Impact Assessment for Werris Creek Coal Mine Life of Mine Project 2010;
- Werris Creek Coal Pty Ltd, Annual Environmental Management Report 2010-2011, May 2011; and
- Werris Creek Coal Pty Ltd, Life of Mine Mining Operations Plan for the Werris Creek, November 2011.

1.4 Scope

The BMP applies to all blasting activities represented by Scenario 1 activities in the LOM Project Environmental Assessment (2011 to 2015) undertaken by WCC as part of the LOM Project, within the areas defined as the Project Site Boundary (**Figure 3**).

The BMP is planned to be revised after three years in 2015. However, WCC will revise the BMP following any of the triggering events listed in **Section 13**.

2 RESPONSIBILITIES

Specific responsibilities in relation to blast management for key management positions are outlined in ***Table 1***.

Table 1: Roles and Responsibilities

Role	Responsibilities
General Manager	▪ To authorise this plan. ▪ To provide the final sign off/authorised distribution of this management plan and all environmental reports.
Operations Manager	▪ Ensure that operations are undertaken in accordance with relevant regulations, licenses and approvals. ▪ Monitor the effectiveness of blast management strategies and provide ongoing guidance as needed. ▪ Maintain overall responsibility for activities undertaken on the WCC site.
Group Environment Manager	▪ Ensure the blast management controls are implemented in accordance with this plan. ▪ Ensure sufficient resources are allocated for the implementation of this plan. ▪ Ensure all site personal have received the appropriate training for their responsibilities. ▪ Monitor the effectiveness of blast management strategies and provide ongoing guidance as needed. ▪ Ensure all internal and external reporting requirements are met, including incident reporting in accordance with relevant internal protocols.
Site Environment Officer	▪ Implementing the procedures contained in this management plan. ▪ Post induction education and contact with all employees and contractors on blast issues. ▪ Analysis of monitoring results and inclusion in the AEMR. ▪ Timely reporting of environmental monitoring data on the Whitehaven website. ▪ Regularly revise the performance of blast management strategies. ▪ Regularly report environmental performance to Group Environmental Manager. ▪ Develop strategies to prevent or reduce environmental impacts. ▪ Attend Community Consultation Committee meetings.

Role	Responsibilities
	▪ Receive and respond to community complaints in relation to blast.
Blast Engineer Open Cut Examiner (OCE) Shotfirers	▪ Ensure that all operations on site are undertaken in compliance with this management plan. ▪ Ensure all site personal have received the appropriate training for their responsibilities and are aware of the blast obligations. ▪ Conduct regular inspections of the work area to monitor compliance with this plan. ▪ Implement blast controls. ▪ Report any incidences or complaints immediately to the Site Environmental Officer. ▪ Provide feedback on the adequacy and effectiveness of this plan.
Employees and Contractors	▪ Ensure the implementation of this plan with respect to their specific work practices. ▪ Act in accordance with the blast management procedures or protocols outlined in this plan. ▪ Ensure any potential or actual blast issues, including environmental incidents, are reported to the immediate supervisor.

3 REQUIREMENTS

The BMP for the WCC LOM Project has been prepared in accordance with the requirements established under various legislative and best practice instruments. The requirements established under these instruments are outlined in the following sections.

3.1 Project Approval

Specific conditions relating to the implementation of the WCC LOM Project were issued by the NSW DoPI in Project Approval 10_0059 approved on 25th October 2011 and as modified in PA 10_0059(MOD1) approved on 30th August 2012. ***Table 2*** summarises the requirements relating to blasting from the Project Approval, and identifies where these requirements are addressed within this management plan.

Table 2: Conditions established in Project Approval 10_0059

<table>
<tr><th>Schedule (Condition)</th><th>Requirement</th><th>Response Detailed in Section</th></tr>
<tr><td></td><td>BLASTING
Blasting Criteria</td><td></td></tr>
<tr><td>6</td><td>The Proponent shall ensure that on the blasting on site does not cause exceedances of the criteria in Table 5.
Table 5: Blasting Criteria
<table>
<tr><th>Location</th><th>Airblast Overpressure (dB(Lin Peak))</th><th>Ground Vibration (ppv(mm/s))</th><th>Allowable Exceedance</th></tr>
<tr><td rowspan="2">Any residence on privately-owned land</td><td>115</td><td>5</td><td>5% of the total number of blasts over a period of 12 months</td></tr>
<tr><td>120</td><td>10</td><td>0%</td></tr>
<tr><td>All public infrastructure</td><td>-</td><td>50</td><td>0%</td></tr>
</table>
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.</td><td>7.1</td></tr>
<tr><td></td><td>Blasting Hours</td><td></td></tr>
<tr><td>7</td><td>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 Director-General.</td><td>7.1
8.13</td></tr>
<tr><td></td><td>Blasting Frequency</td><td></td></tr>
<tr><td>8</td><td>The Proponent shall not carry out more than:
(a) 1 blast a day on site, unless an additional blast is required following a blast misfire; and
(b) 15 blasts a month on site.
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, or blasts required to ensure the safety of the mine or its workers.
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.</td><td>8.13</td></tr>
<tr><td></td><td>Property Inspections</td><td></td></tr>
<tr><td>9</td><td>If the Proponent receives a written request from the owner of any privately-owned land within 2 kilometres of the approved open cut pit on site for a property inspection to establish the baseline condition of any buildings and/or structures on their land, or to have a previous property inspection report updated, then within 2 months of receiving this request the Proponent shall:
(a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Director-General to:
• establish the baseline condition of the buildings and/or structures on the land</td><td>8.18
10.3</td></tr>
</table>

Schedule (Condition)	Requirement	Response Detailed in Section
	or update the previous property inspection report; and • identify any measures that should be implemented to minimise the potential blasting impacts of the projects on these buildings and/or structures; and (b) give the landowner a copy of the new or updated property inspection report.	
	Property Investigations	
10	If the owner of any privately-owned land claims that the buildings and/or structures on their land have been damaged as a result of blasting on site, then within 2 months of receiving this claim the Proponent shall: (a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Director-General, to investigate the claim; and (b) give the landowner a copy of the property investigation report. 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. 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.	8.18 10.3
	Operating Conditions	
11	The Proponent shall: (a) implement best practice blasting management on site to: • protect the safety of people and livestock in the surrounding area; • protect private or public property in the surrounding area; • minimise the dust and fume emissions of the blasting; and (b) minimise the duration and frequency of any road closures for blasting; (c) operate a suitable system to enable the public to get up-to-date information on the proposed blasting schedule on site, to the satisfaction of the Director-General.	8.2 8.15, 8.18 4.3, 8.7 8.9, 8.12, 8.16 8.15 8.14
12	The Proponent shall not carry out blasting on site that is within 500 metres of: (a) Werris Creek Road without the approval of RTA; (b) the Main Northern Railway without the approval of ARTC; and (c) any land outside the site that is not owned by the Proponent unless: • the Proponent has a written agreement with the relevant landowner to allow blasting to be carried out closer to the land, and the Proponent has advised the Director-General in writing of the terms of this agreement; or • the Proponent has: o demonstrated to the satisfaction of the Director-General that the blasting can be carried out closer to the land without compromising the safety of people or livestock on the land, or damaging the buildings and/or structures on the land; and o 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 land.	8.15 8.15 8.2
	Blast Management Plan	
13	The Proponent shall prepare and implement a Blast Management Plan for the project to the satisfaction of the Director-General. This plan must: (a) be prepared in consultation with OEH, RTA and ARTC; (b) be submitted to the Director-General for approval by the end of April 2012; (c) describe the mitigation measures that would be implemented to ensure compliance with the relevant conditions of this approval; (d) describe the measures that would be implemented to ensure that the public can get up-to-date information on the proposed blasting schedule on site; and (e) include a blast monitoring program for evaluating the performance of the project, including: • compliance with the applicable criteria; and • minimising the fume emissions from the site.	8.15, Appx 5 8 8.14 8.14 7 4.3, 8.9, 8.12

3.2 Statement of Commitments

The requirements for blast management outlined in the Final Statement of Commitments in the "Response to Submissions for the Environmental Assessment for Werris Creek Coal Mine Life of Mine Project" (R.W. Corkery & Co, 2011) are summarised in ***Table 3*** and identifies where these requirements are addressed within the BMP.

Table 3: Statement of Commitments

Commitment	Action	Response Detailed in Section
7.1	Maintain the Deed of Agreement that has been established with ARTC.	8.15
7.2	Continue to implement the road closure management procedure when blasting occurs within the 500m of Werris Creek Road.	8.15
7.3	Minimise the number of blasts by maximising blast size without compromising compliance with the environmental criteria.	8.4
7.4	Implement refinements to blast design components on the basis of monitoring results and the achievement of specific blasting objectives.	8.4, 8.5
7.5	Blast design and implementation is undertaken by a suitably qualified blasting engineer and/or experienced and appropriately certified shot-firer.	8.4
7.6	Ensure that the minimum practicable weight of explosive detonates at an instant for each blast.	8.4, 8.11
7.7	Maintain a blast exclusion zone of 500m around each blast.	8.2, 8.15
7.8	Continue to monitor blasting impacts at the current monitoring locations.	9

3.3 Environmental Protection Licence

Table 4 summarises the monitoring and reporting requirements established in the Environment Protection Licence (EPL12990) for scheduled activities undertaken as part of the WCC LOM project.

Table 4: Conditions established in EPL 12290

Condition	Action	Response Detailed in Section
L5	**Blasting**	
L5.1	The overpressure level from blasting operations at the premises must not exceed 120dB (Lin Peak) at any time. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.	7.1
L5.2	The airblast overpressure level from blasting operations at the premises must not exceed 115dB (Lin Peak) at any noise sensitive locations for more than five per cent of the total number of blasts over each reporting period. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.	7.1
L5.3	Ground vibration peak particle velocity from the blasting operations at the premises must not exceed 10mm/sec at any time at any noise sensitive locations. Error margins associated with any monitoring equipment used to	7.1

Condition	Action	Response Detailed in Section
	measure this are not to be taken into account in determining whether or not the limit has been exceeded.	
L5.4	Ground vibration peak particle velocity from the blasting operations at the premises must not exceed 5mm/sec at any noise sensitive locations for more than five per cent of the total number of blasts over each reporting period. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.	7.1
L5.5	Blasting operations at the premises may only take place between 9:00am-5:00pm Monday to Saturday. Blasting is not permitted on public holidays. Blasting outside the hours specified above can only take place with the written approval of the EPA.	7.1 8.13
L5.6	The hours of operation for blasting operations specified in this licence may be varied by the EPA, having regard to the effect that the proposed variation would have on the amenity of the residents in the locality, gives written consent to the variation.	7.1 8.13
L5.7	Blasting at the premises is limited to 1 blast on each day on which blasting is permitted. Note: Additional blasts are permitted where the EPA and neighbours have been notified of the intended blast prior to the additional blast being fired; and - it is demonstrated to be necessary for safety reasons; or - the previous blast generated ground vibration levels of less than 0.5 mm per second at all non-project related residences.	7.1 8.13
L5.8	To determine compliance with condition(s) L5.1, L5.2, L5.3 and L5.4 a) Airblast overpressure and ground vibration levels must be measured and electronically recorded at any point within 30 metres of any non-project related residential building or other sensitive locations such as a school or hospital for all blasts carried out in or on the premises; and b) Instrumentation used to measure the airblast overpressure and ground vibration must meet the requirements of Australian Standard AS 2187.2-2006. Note: A breach of the licence will still occur where airblast overpressure or ground vibration levels from the blasting operations at the premises exceeds the limit specified in this licence at any “noise sensitive locations” other than the locations identified in the above condition.	9 Appx 5
M7	**Blasting**	
M7.1	POINTS: Within 30 metres of the residences on the properties R20 (“Tonsley Park”), R96 (“Talavera” listed as “Millbank”), R11 (“Glenara”) and R62 (Kurrara Street) as marked on Appendix 3 of Project Approval 10_0059.	9

Parameter	Units of Measure	Frequency	Sampling Method
Blast Noise	dB (Lin Peak)	Every Blast	Type 1 Noise/Blast Logger
Blast Vibration	mm/s	Every Blast	Geophone Logger or similar

3.4 Relevant Guidelines and Standards

In addition to the regulatory requirements outlined in **Sections 3.1** to **3.3**, blast management at WCCM will be undertaken with regard to the following standards and guideline documents. The Whitehaven Coal Health, Safety and Environment Policy (WHC_POL_OHSE) is in **Appendix B**.

3.4.1 Standards

- Australian Standard AS 2187.2-2006 Explosives - Storage and use - Use of explosives.
- AS 2923 -1987: Guide for measurement of horizontal wind for air quality applications.
- WHC_STD_OC_ Explosives Whitehaven Coal Standard Explosives
- WHC-PLN-WC-Explosive Management Plan
- WHC-PRO-Explosive Blasting and Misfires
- WHC-PRO-Explosive Charging Blast Holes
- WHC-PRO-Hot Hole Blasting Procedure
- WHC-PRO-Hot Hole Identification Procedure
- WHC-PRO-WC-Safe Operation of a Drill
- WHC-PRO-WC-Blast Sentry Duty Card
- WHC-PRO-WC-Collapse Blasting of Underground Roadways
- WHC-PRO-WC-Design and drilling of patterns adjacent to underground workings
- WHC-PRO-WC-Road and Rail Closure Procedure

3.4.2 Guidelines

- ANZECC, The Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration,1990
- DEC, Assessing Vibration: A Technical Guideline, 2006
- Australian Coal Association Research Program (ACARP), Final Report Structure Response to Blast Vibration C9040 November 2002;
- ACARP, Final Report Effect of Blasting on Infrastructure C14057 October 2008;

4 BASELINE CONDITION

This section includes a summary of the historical blast monitoring data and a summary of blast complaints recorded since 2005.

4.1 Blast Monitoring Results

WCC has been undertaking blast monitoring since 2005 when the mine commenced and ***Figure 4*** presents the recent and previous blast monitoring locations since 2008.

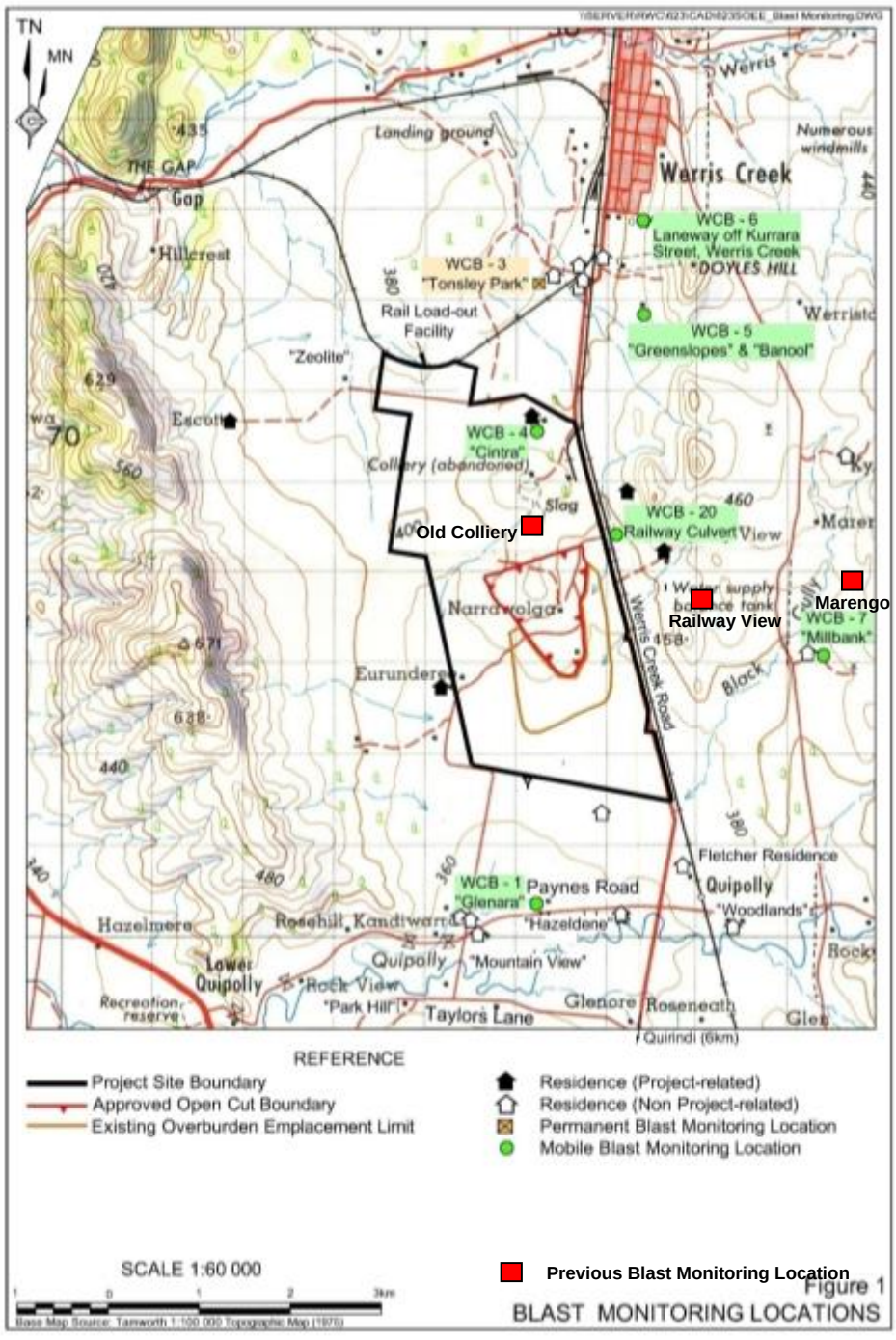


Figure 4 Current and Previous Blast Monitoring Locations

Table 5 summarises the blast monitoring results for WCC since 2008 with the individual blast results in **Appendix C**. Since that time, very few blasts have recorded overpressure results greater than 115dB(L) and those that have; were at WCC owned properties adjacent to the mining operation. Monitoring locations further a field representative of Quipolly or Werris Creek communities have not had any blast results that have exceeded blasting criteria. No blast has recorded vibration levels greater than 5mm/s.

Table 5: Summary of WCC Blasting Monitoring Results 2008 to 2013

			Glenala		Railway View		Old Colliery*		Escott Road			
2008 - 2009	75		mm/s	dB(L)	mm/s	dB(L)	mm/s	dB(L)	mm/s	dB(L)		
		Ave	0.42	102.4	1.49	110.0	1.13	106.4	0.56	100.9		
		Max	1.07	113.5	3.6	**118.4**	3.21	113.9	1.7	109.8		
			Glenala		Railway View*		Tonsley Park		Cintra		Marengo*	
2009 - 2010	109		mm/s	dB(L)	mm/s	dB(L)	mm/s	dB(L)	mm/s	dB(L)	mm/s	dB(L)
		Ave	0.42	107.5	1.11	105.0	0.61	104.3	0.77	107.6	0.58	105.0
		Max	1.82	113.0	3.31	**122.1**	0.89	113.0	1.47	114.5	1.10	113.4
			Glenala		Greenslopes		Tonsley Park		Cintra		Werris Creek	
2010 - 2011	102		mm/s	dB(L)	mm/s	dB(L)	mm/s	dB(L)	mm/s	dB(L)	mm/s	dB(L)
		Ave	0.10	114.7	0.59	106.7	0.68	102.2	0.87	108.0	0.48	95.6
		Max	0.10	114.7	1.07	110.1	1.32	113.3	2.39	**118.0**	0.51	99.8
			Glenala		Greenslopes*		Tonsley Park		Cintra*		Werris Creek	
2011 - 2012	84		mm/s	dB(L)	mm/s	dB(L)	mm/s	dB(L)	mm/s	dB(L)	mm/s	dB(L)
		Ave	<0.37	<109.9	0.69	102.9	0.81	101.6	1.19	106.7	0.44	101.5
		Max	<0.37	<109.9	2.19	**115.8**	1.98	113.1	3.75	**117.4**	1.45	113.2
			Glenala		Tonsley Park*		Werris Creek		Talavera			
2012 - 2013	82		mm/s	dB(L)	mm/s	dB(L)	mm/s	dB(L)	mm/s	dB(L)		
		Ave	0.21	104.5	0.91	102.2	0.42	99.8	0.31	105.3		
		Max	0.48	111.0	2.14	114.9	0.87	111.0	0.67	113.4		

* Indicates project related properties not subject to blasting criteria; NM – Not monitored.

4.2 Compliance History

There were two blast exceedances from one blast in 2005 at the "Railway View" and "Hill View" properties. On the 21st September 2005 the maximum overpressure criteria was exceeded at "Railway View" (120.9dB(L)) and "Hillview" (122.0 dB(L)).

There were three blast exceedances from two blasts in 2006 at the "Railway View" and "Hill View" properties. The "Hill View" property was purchased in July 2006, while "Railway View" was purchased in 2008. On the 4th July 2006 the maximum overpressure criteria was exceeded at "Railway View" (121.9dB(L)) and "Hillview" (123.3 dB(L)). Another blast on 23rd January 2007 at "Railway View" (122.2dB(L)) also exceeded the maximum overpressure criteria.

There were two blast exceedances in 2007, both at the "Railway View" property which was subsequently acquired by WCC. The first exceedance was on 15th May 2007 with an overpressure result of 121.4dB(L) and second exceedance was on 3rd July 2007 with an overpressure result of 121.9dB(L) exceeding the 120dB(L) maximum overpressure criteria and resulting in the EPA issuing WCC a Penalty Infringement Notice.

There has been no further overpressure blasting exceedances since 2007. The only other blasting non-compliance was a fume event from a blast on 4th November 2011 that resulted in a community complaint. The blast area was into part of the former underground workings resulting in the ground being extensively cracked and a lack of confinement of the blast detonation resulting in significant nitrous oxide (fume) being generated. The EPA issued WCC a Penalty Infringement Notice.

4.3 Summary of Blasting Investigations

Following a significant increase in blasting complaints (**Section 4.5**) since 2011, WCC and the blasting contractor instigated a number of investigations into overpressure, vibration and fume impacts experienced by the complainants.

Two reports by the blasting contractor into air blast (overpressure) impacts found that these blast complaints were due to excessive energy causing cratering around the margins of the blast, poor quality of stemming and wind reinforcement. The recommendations included reduced density of holes and partial loading of explosives every second hole, specify stemming product and cleaner stemming handling procedures and also increasing the stemming height for blasts above RL385m and establishing a wind rose blasting protocol.

An independent blasting investigation by an external consultant was undertaken into community complaints due to vibration impacts. The report found that while blasts levels were well within the compliance criteria, the Werris Creek community represented a hyper sensitive community to blasting impacts. The maximum instantaneous charges (MIC) of blasts being fired would generate vibration levels that could be felt by humans (>1mm/s) and this was enough to result in complaints. Recommendations included that blasts should have a pre-slipt fired before the main blast and that the blasting contractor should develop a site law to allow predictions of blast vibrations during the design process.

The third blasting assessment was into fume generation following a blast on 4th November 2011 added to the knowledge gained from an earlier fume report by the blasting contractor in 2009. The 2009 report recommended using water tolerant explosive products such as emulsion and reducing the sleeping time of the shot to minimise the deterioration of the ammonium nitrate in the explosive. The 2011 review identified that fume was being generated at WCC by a different mechanism other than water/clay reactions, but instead that broken ground (such as cracks, cavities, voids) was not be adequately identified in shots, resulting in a lack of confinement at detonation and generating fume. The blasting contractor has recommended in addition to using drill records, a video camera will be used down holes to accurately log broken ground so that those areas with cracks and cavities can be segregated with gas bags preventing the explosion of product in those areas and thus no fume being generated.

If WCC receives a blasting complaint alleging damage, a Property Investigation (Structural Inspection) must be undertaken. Since 2010, 28 assessments have been completed with none finding any damage caused as a result of WCCM blasting. Only one Property Investigation report has been disputed, with DoPI engaging a consultant to peer review the previous report; finding that it was scientifically valid and agreed that the damage was not due to WCCM blasting.

Further investigations were undertaken by both the blasting contractor and an independent consultant into G Coal Interburden blasts in 2013 following vibration related complaints. The analyse found given the hard, thick strata to be fired leads to these blasts being larger resulting in enough vibration energy being reinforced and at the right frequency that amplifies the perception of shaking of houses leading to the increased complaints. Another blast on the 8th July 2013 resulted in an elevated airblast with overpressure results recording 119.0dB(L) at Werris Creek. The air blast was caused by the ejection of energy from the old underground bore and general rifling as the material being blasted was quiet weathered. While not an exceedance, the Werris Creek community was concerned about future blasting impacts. To prevent the continued escalation of blasting complaints, WCC coordinated a meeting with the blasting contractor to improve the cross communication and signoff process during design, loading and firing stages of each shot. In addition, WCC developed blast design protocols to establish maximum parameters to minimize the potential for complaints from either overpressure or vibration generated by larger blasts.

4.4 Meteorological Conditions

A meteorological station was installed at WCC in 2005 to assess local meteorological conditions including wind speed and direction, among other parameters. In late 2010 the meteorological station was relocated to the top of the rehabilitation area on top of the overburden emplacement. Analysis of meteorological monitoring data from the WCC Project Site was undertaken as part of the Noise (and Blasting) Impact Assessment for the LOM EA. ***Figure 5*** displays annual wind roses from 2006 until 2010 recorded at the WCC meteorological station. The windroses demonstrate that the prevailing wind directions are from the south-east and north-west.

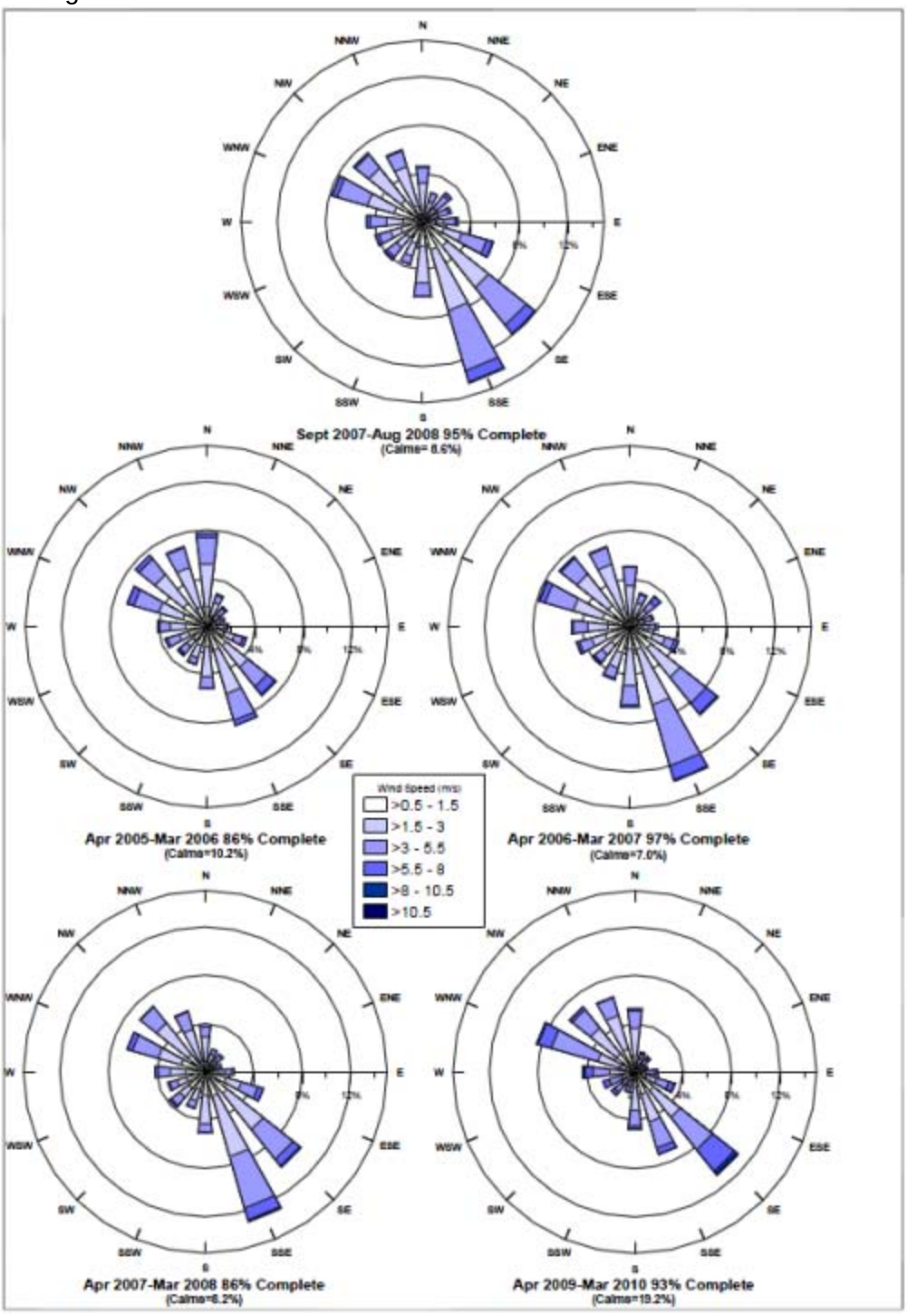


Figure 5 Annual Wind Roses from 2006 to 2010

4.5 Blast Complaints

Blasting related complaints have been the most common community complaint resulting from WCC operations since the mine commenced in 2005. A summary of blasting and all types of complaints received from 2005 to 2013 are provided in **Table 6**.

Table 6: WCC Complaint Issues from 2005 to 2013

Complaint Issue	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013
Blast – Vibration & Overpressure	3	4	1	2	7	22	68	9
Blast – Fume & Dust	0	0	0	0	2	3	2	1
Blast – Other including Damage	0	0	0	0	0	0	1	4
All Complaints (incl. blast)	**8**	**10**	**7**	**16**	**12**	**52**	**117**	**56**

Historically, blasting complaints have accounted for just under half of all complaints received by WCC, however that increased in 2011-2012 to 61% of all complaints. Of the 68 blasting complaints due to overpressure or vibration (categorised together because complainants unable to differentiate the difference), 46 complaints were generated from four individual blasts (3rd & 16th June and 3rd and 17th August 2011). Until 2010, the majority of complaints relating to the mine (including blasting) were from Quipolly residents and a single receiver located to the east of the mine; however since 2010, complaints have been dominated by Werris Creek residents with over 80% of complaints. The likely reason for the increase in the number of complaints and complainants is because WCC is moving closer to Werris Creek, which has a larger and denser residential population of 1600 people than compared to the rural Quipolly area. Since 2010, over a quarter of the blast complaints (25 out of 98) are from a single complainant located on the southern limits of Werris Creek. While one complainant has dominated the complaint data, WCC does recognise that overall blast complaints have increased, the number of complainants has increased and that there is a shift towards Werris Creek residents making blast complaints that requires further management by WCC.

A review of multiple blasting complaints and blast locations identified in **Table 7** found that there was a trend for blasting complaints in particular locations in pit but also the likely cause of the complaint. For example, blasts in the upper horizons of the pit (above RL350m and including the A Seam) are resulting in overpressure complaints. Blasts deeper in pit (RL350m and below including the basal G Seam) have resulted in vibration complaints. **Section 4.3** summarises the investigation into the causes of blasting complaints at WCC.

Table 7: WCC Blasting Complaints by location since 2011

Period	Blast Location	Blast Type	# Complaints	Likely Blast Impact
January 2011	Strip 11_385	Overburden	2	Overpressure
January 2011	Strip 9_300	Interburden	2	Vibration
February 2011	Strip 9_GCoal	Interburden	2	Vibration
May-June 2011	Strip 9_300	Interburden	2	Vibration
June 2011	Strip 11/12_385	Overburden	31	Overpressure
August-September 2011	Strip 10_GCoal	Interburden	23	Vibration
September 2011	Strip 11_385	Overburden	3	Overpressure
January 2011	Strip 11_350	Interburden	2	Vibration
Dec 2011, Jan&Feb 2012	Strip 12_Aseam	Overburden	4	Overpressure
April 2012	BlackSeam4	Overburden	1	Overpressure
July 2012	Strip 14_385	Overburden	1	Overpressure
October 2012	Strip 15_385	Overburden	1	Overpressure
February 2013	Strip 16_385	Overburden	6	Vibration

5 ENVIRONMENTAL IMPACTS

Spectrum Acoustics (2010) undertook the Noise (and Blasting) Impact Assessment as part of the LOM EA and calculated air blast overpressure (OP) and vibration (PPV) levels for various typical MIC values which are summarised in **Table 8**. The predictions of impacts are based on modelling blasting results over the previous five years from WCC blasting activities. The results indicate that the ground vibration criterion of 5mm/s would not be exceeded at any receiver for the range of likely blast sizes.

Table 8: Predicted Blast Overpressure and Vibration Levels

Receiver*		Distance (m)	MIC (kg)					
			400		800		1200	
			OP	PPV	OP	PPV	OP	PPV
R20	"Tonsley Park"	1740	111	1.4	113	1.7	115	1.9
R55	Kurrara St	2680	107	0.9	109	1.1	110	1.2
R14	"Greenslopes"	1315	114	1.8	116	2.3	118	2.6
R96	"Talavera"	2580	107	0.9	109	1.1	111	1.3
R15	"Plain View"	2525	107	0.9	109	1.1	111	1.3

* These residences reflect the most exposed residences within the residential area of Werris Creek. Compliance at these residences will imply compliance at all other residences within Werris Creek

Overpressure levels may exceed the 5% exceedance level of 115dB at R14 ("Greenslopes") for blasts greater than 520kg MIC when 1315m from the LOM Project open cut area. Spectrum Acoustics (2010) undertook further calculations and identified that the airblast overpressure criteria would likely be met for 1 200kg MIC blasts when 1690m from "Greenslopes". "Greenslopes" property has subsequently been purchased by WCC and the proposed MIC limitations now do not apply.

6 RISK ASSESSMENT

The BMP has thus far discussed the proposed LOM Project operations, the relevant approval conditions relating to blast management; the blast performance of WCC and community complaints received and the predicted blasting impacts from the LOM Project. The next step is to determine the risks of blast hazards from WCC LOM Project operations. Two risk assessments were conducted for WCC which covered the identification of blast hazard, risk (consequence and likelihood) and management controls to mitigate blast risks. The completed risk assessments are located in **Appendix D** for:

- Environmental Risk Assessment from LOM Project (R.W. Corkery & Co., 2010); and
- Whitehaven Coal Broadbrush Environmental Risk Assessment for WCC (SMS, 2012).

A summary of the risk assessments for blasting are outlined in **Table** *9:* **9** with the key blast hazards identified, risk ranking (existing controls), and the existing controls and proposed additional management actions to be implemented further mitigate potential blast impacts.

Table 9: WCC LOM Project Blast Management Risk Summary

Hazard	Cause	Current Management Control	Risk	Additional Management Action
Overpressure Exceedance	1. Underground workings 2. Burden 3. Stemming 4. MIC 5. Broken/ Soft Ground 6. Explosives 7. Weather	▪ Property Acquisition and Private Agreement ▪ Blast Design ▪ Face Profiling ▪ Shotfirer Inspections ▪ Loading Explosives and Detonators ▪ Blast Time and Frequency	M	▪ Pre-Blast Design Assessment ▪ Stemming Height and Quality ▪ Blast Notification ▪ Pre-Blast Weather Check ▪ Pre-Blast Planning
Overpressure Complaint			H	
Vibration Exceedance	1. Underground workings 2. MIC 3. Timing 4. Direction 5. Broken/ Soft Ground 6. Explosives	▪ Property Acquisition and Private Agreement ▪ Blast Design ▪ Shotfirer Inspections ▪ Loading Explosives and Detonators ▪ Blast Time and Frequency ▪ Structural Inspections	L	▪ Pre-Blast Design Assessment ▪ Predictive Vibration Site Law ▪ Initiation Sequence ▪ Blast Notification
Vibration Complaint			H	
Fume Exceedance	8. Underground workings 9. Water 10. Clay 11. Broken/ Soft Ground	▪ Property Acquisition and Private Agreement ▪ Blast Design ▪ Shotfirer Inspections ▪ Loading Explosives and Detonators ▪ Sleeping Shots ▪ Blast Time and Frequency	M	▪ Pre-Blast Design Assessment ▪ Blast Notification ▪ Pre-Blast Weather Check ▪ Pre-Blast Planning
Fume Complaint			M	

7 OBJECTIVES AND TARGETS

WCC will outline the revised blast criteria for the LOM Project and develop blast management objectives and targets as part of the Environmental Management System (EMS) for WCC.

7.1 Blast Criteria

The blast criteria for the LOM project (**Table 10**) was established in accordance with the conditions for the Project Approval 10_0059 and EPL 12290 outlined in **Section 3**.

Table 10: Blast Criteria

Location	*Airblast Overpressure (dB(Lin Peak))*	*Ground Vibration (ppv(mm/s))*	*Allowable Exceedance*
Any residence on privately-owned land	115	5	5% of the total number of blasts over a period of 12 months
	120	10	0%
All public infrastructure	-	50	0%

In addition to the above blasting criteria based upon the physical limits on blasting impacts, there are other administrative compliance criteria that WCC must adhere to:

- Blasts can only be fired between 9am to 5pm Monday to Saturday*;
- No blasting on Sundays or Public Holidays*;
- Limited to one blast per day*; and
- Limited to 15 blasts per month*.

* Both PA 10_0059 and EPL 12290 contain exemptions, **Section 8.13** outlines how to implement exemptions if required.

The methods for evaluating compliance with these blast criteria are presented in **Section 9** and **Appendix 5**.

7.2 Blast Objectives and Targets

As part of the planning process in the EMS, objectives and targets are set to drive organisations towards continuous improvement in environmental performance. WCC will establish specific objectives and targets for the blast hazards that were assigned the highest risks in **Section 6**. These risks include exceedance of the blast criteria and receipt of community complaints. The blast objectives and targets will be incorporated into the WCC Environmental Management Strategy which is the overarching document describing the EMS. The objectives and targets (**Table 11**) will be reviewed monthly and revised annually based on the overall years performance. The objectives and targets proposed for the future years are only indicative and will be subject to the results of the BMP Performance Annual Review (**Section 13**).

Table 11: EMS Blast Objectives and Targets

Objective		Performance Indicator	Performance		Target		
Activity	**Environmental Hazard**		**2011-2012**	**2012-2013**	**2013-2014**	**2014-2015**	**Reason**
Blasting	Blast related Community Complaint	Number of Blast Complaints	71	14	13	12	10% reduction year on year
		Number of Blast Complainants	35	11	10	9	10% reduction year on year
	Overpressure	Number of Blasts >115dBL at privately	2*	0	0	0	Target 0 to minimise complaints
	Vibration	Number of blasts at Werris Creek Monitor >1mm/s	1	1	0	0	Target 0 to minimise complaints
	Blast Criteria Exceedance	Number of exceedances from Blast Monitoring	1	1	0	0	Exceedance of blast criteria is not acceptable

* Two blasts >115dB(L) recorded at “Greenslopes” prior to WCC acquiring the property

8 MANAGEMENT STRATEGIES AND MEASURES

This section describes the drill and blast process at WCC and the range of management strategies and measures implemented by WCC to mitigate impacts from blasting on the environment and community and the related risks to compliance.

8.1 Drill and Blast Process

The description of the drill and blast activities is as follows:

1. WCC produces an indicative blast schedule weekly based on WCC production priorities so that resources can be allocated to meet the required production objectives. WCC will prepare a Pre-Blast Assessment between relevant personnel;
2. The Blast Engineer will commence the blast design to achieve the required objectives and produce a drill plan of hole locations, depths and size;
3. The Open Cut Examiner (OCE) will organise the preparation and clean up (drill prep) of the site prior to drilling. The OCE will get the surveyor to mark up the drill pad and coordinate the required drill to commence drilling in accordance with the drill plan;
4. Security sensitive dangerous goods and blasting accessories will be stored at the Precursor Facility and Explosives Magazine until required. A current Acknowledgement of Notification of Dangerous Goods (35/037161 **Appendix A**) will be maintained;
5. The Shotfiring team will inspect each hole using a combination of techniques from visual surface inspection, dipping hole depth, presence of water, temperature and gamma logging for heating and rock density and if required using a video camera to log broken ground in holes. Based on the information collected by the Shotfirers and drill logs, the Blast Engineer will prepare load sheets for each individual hole. The Shotfirers will supervise the loading of the desired explosives to the required height and the installation of other products (i.e. detonators, detonator cord, gas bags) at the required depth. The Shotfirers will dip each hole at the conclusion to confirm that column heights are at the design height;
6. The OCE will coordinate the delivery of the required stemming product size to site and out to the shot site. The WCC stemming operators will then load each individual hole with the required stemming based on the load sheets;
7. The Shotfirers will supervise stemming operations and inspect all holes to confirm that column heights are at the design height. The Shotfirers will commence tie up of the detonator cord down lines and commence programming the initiation sequence provided by the Blast Engineer. The Shotfirers will check weather conditions and if OK to blast, will detonate the shot; and
8. Prior to the blast, blast monitors will be set out at the required community and infrastructure monitoring locations and post blast will retrieve the monitors from the field for analysis of the blast results.

In order to mitigate the risks associated with the blast hazards identified in **Section 6** for the LOM Project, **Table 12** summarises the blast management controls implemented by WCC throughout the life of the operation. A description of each management measure in **Table 12** is outlined below in the relevant section.

Table 12: Blast Management Strategies and Controls

Section	Measure	Responsibility	Timing
8.2	Property Acquisition and Private Agreement	CLO	As required
8.3	Pre-Blast Design Risk Assessment	OCE	Prior to Design
8.4	Blast Design	BE	Prior to Drilling
8.5	Predictive Vibration Site Law	BE	Prior to Loading
8.6	Burden Profiling	Surveyor	Prior to Loading
8.7	Drilling	OCE/PS	Prior to Drilling
8.8	Shotfirer Inspections	Shotfirer	Prior to Loading
8.9	Loading Explosives and Detonators	Shotfirer	Prior to Loading
8.10	Stemming Height and Quality	OCE/Shotfirer	Prior to Loading
8.11	Initiation Sequence	OCE/Shotfirer	Prior to Firing
8.12	Sleeping Shots	OCE/Shotfirer	Prior to Firing
8.13	Blast Times and Frequency	BE/EO	At Firing
8.14	Blast Notification	BE/PS	Post Firing
8.15	Road and Rail Closure	BE/PS	Prior to Firing
8.16	Pre-Blast Weather Check	EO/BE/PS	Prior to Firing
8.17	Daily Mine Blast Planning	EO	Day of Firing
8.18	Structural Inspections	EO	After Complaint

CLO – Community Liaison Officer; EO – Environmental Officer; OCE – Open Cut Examiner; BE – Blast Engineer; PS - Production Superintendent.

8.2 Property Acquisition and Private Agreement

While efforts to mitigate blast impacts at receivers are preferred, WCC has acquired a number of adjacent properties since commencement of mining. These acquisitions occurred thorough private negotiation to alleviate any current or future environmental impacts on these residents; allowing mining to continue in the most productive and efficient method possible and avoiding the need to restrict operations impacting on production. **Table 13** presents the properties that have been acquired by WCC since 2004.

Table 13: Adjacent Properties Purchased by WCC

Property Name		Purchase Date
R1	"Narrawolga"	1st July 2004*
R1	"Eurunderee"	1st March 2005*
R1	"Hillview"	28th July 2006*
R1	"The Colliery"	14th February 2008
R1	"Railway View"	5th June 2008
R1	"Preston Park"	20th October 2008
R1	"Branga"	20th October 2008
R1	"Escott"	7th November 2009**
R19	"W C Railway Cottage"	23rd September 2009
R2	"Cintra"	31st March 2010
R1	"Marengo"	17th May 2010
R4	O'Donnells Quarry	27th October 2010
R15	"Plain View"	7th February 2011
R18	"W C Railway Cottage"	3rd November 2011
R14	"Greenslopes"	20th December 2011
R100	"Banool"	20th December 2011
R65	"Banool" (Subdivision)	20th December 2011
R20	"Tonsley Park"	2nd November 2012

* Whitehaven Coal acquired 100% ownership on 7th July 2010; ** Zeolight Australia property also become a project related property through the purchase of "Escott".

PA 10_0059 Schedule 3 Condition 6 and EPL 12290 Condition L5.8 allow for WCC to negotiate private agreements with any surrounding landowners of privately owned land. WCC has not currently negotiated a private agreement with any landowners. However if a landowner was to agree to a blasting related private agreement, and WCC subsequently advises DoP and EPA, then the property would be classed as project related and would not be subject to the blast criteria in **Table 10**.

As WCC owns all the land adjacent to the areas to be blasted for the LOM Project, only mine personnel or agistees and their cattle that are controlled by WCC could be within 500m of a blast area. The 500m blast exclusion zones and sentry clearance process (WHC_PRO_Sentry Duty) clears the blasting area of any potential safety hazards for people or livestock prior to the blast.

8.3 Pre-Blast Assessment

The Blast Engineer will coordinate a Pre-Blast Assessment between the relevant personnel. The purpose of the assessment is to identify at the start of the blast process any hazards associated with the blast in addition to those normally managed in the blasting process and generate

additional actions to address those risks either through the blast design process or other methods. For example:

- Safety:
  - highwalls;
  - underground workings and potential hazardous gas emissions;
  - equipment and personnel working in the area or below the blast site;
  - equipment and personnel working in the blast radius;
- Infrastructure:
  - Werris Creek Road;
  - Great Northern Rail Line;
  - Powerlines;
  - Optic Fibre;
  - Ancillary Equipment or Infrastructure – Quarry, Bore Pump;
- Environmental
  - Higher overpressure in weathered material in upper horizons of the pit or bore holes;
  - Higher vibration in lower horizons in pit;
  - High fume emissions due to broken/soft ground from weathered material, adjacent to previous shots or adjacent to former underground workings.

8.4 Blast Design

The Blast Engineer will design a blast to meet the production objectives discussed with WCC and actions generated from the Pre-Blast Assessment. Blast design will try to minimise the number of blasts by maximising the blast size and minimising the maximum instantaneous charge (MIC) of each shot. Using specialist blast software, the blast design process includes defining:

- Hole spacing intervals and hole size;
- Hole depths based on designed horizon RL or coal seam roof level from the geological model;
- Drill Plan;
- Explosive product selection;
- Load sheets for individual holes identify the quantity of explosives and stemming required; and
- Initiation sequence outlining the initiating hole, inter row and echelon holes timing in microseconds and the direction of firing.

Blast design can be an iterative process depending on changes in production objectives/priorities or additional ground information. Blast designs will be updated based on the findings of shotfirer inspections and drill logs (**Section 8.7** and **8.8**).

8.5 Pre-Blast Vibration Prediction

Based on the blast design (and updated for each design iteration), a predicted vibration will be calculated for Werris Creek township (**Figure 8**). WCC goal is not to exceed a predicted blast vibration of 1mm/s to minimise the potential for generating community complaints (**Table 11**). If a blast design is predicted to generate a vibration level over 1mm/s, the Blast Engineer will modify other design parameters to lower the predicted vibration however if this will affect production objectives then the Operations Manager or delegate will have the final decision.

8.6 Burden Profiling

Burden is the minimum width of material between the section of a hole loaded with explosives on a face row and the nearest free face of the blast. Stemming height is also considered a component of burden on a shot but is discussed later in **Section 8.10**. The amount of burden (distance) to contain the energy of blast is dependent on the amount of explosives, type of explosives and competency of the ground. The amount of burden can be less than that required or designed due to over digging through the mining process or the blasting of an adjacent shot can crack the edge of the shot or cause more overburden than expected to fall away from the shot. Therefore the amount of burden is a key control in preventing face bursts which can lead to high overpressure levels and potentially exceedances. Adequate burden can also ensure confinement of a blast preventing fume. To control burden particularly along the free faces of a shot, the surveyor uses a laser scanner to profile the shot and together with the drill holes locations determine burden thickness. If burden is insufficient, more overburden can be brought in or the particular drill holes not be loaded in that area to increase burden.

8.7 Drilling

The Blast Engineer will provide a drill plan for each shot. Prior to commencing drilling, the OCE will coordinate drill prep (preparation of the drill pad and site cleanup) to make the site trafficable. By the time the shot has been fired, the top of the blast has been run over numerous times. As part of the pre-strip process, the soil and vegetation will have already been removed and requires a dozer to clean out remaining material so that the drill pad is on competent material and push up a perimeter wind row for safety. A grader will make the drill pad level and trafficable, and a water cart will wet down the drill pad to create a thick crust on the surface to minimise dust generation later during the loading and blasting of the shot. Once the shot is drilled, a water cart cannot come back onto the shot at any stage.

Upon completion of drill prep, the OCE will schedule for a drill to commencing drilling on the shot area in accordance with drill plan. The surveyor will mark out with clay targets the drill hole locations as per the drill plan, and the drill will commence drilling to the depth, hole size and hole angle required by the plan. An important task of the driller is to log detail of each hole as they drill such as location of coal seams, broken ground (voids and cavities do not generate cuttings) and location of underground workings if intersected. This information is provided back to the blasting contractor to confirm their blast design.

8.8 Shotfirer Inspections

At the completion of drilling, the OCE hands over the drill pad to the Shotfirers for the next stage of the blasting process and the Shotfirers become statutorily responsible for the location under the Coal Mines Health and Safety Act 2002. Shotfirer's must be trained and hold a current unrestricted Blasting Explosive User Licence provided by Workcover Authority. The first step by the Shotfirers is to visually assess the surface of the shot and hole collars looking at the ground for cracks, slumping, missing holes and the drill cuttings (no cuttings indicates voids in the ground). The next step by the Shotfirers is to confirm that holes have been drilled to the design, whether re-drill is required or whether changes to the blast design is needed. Each hole is dipped to check depth (a change in depth of a hole after drilling can be as a result of slumping inside the hole) and the presence of water (triggering a change in explosives used). On occasions, holes need to be backfilled because coal seams were intersected during drill and backfilling prevents the coal from being blasted and sterilising the resource.

Other checks undertaken by Shotfirers include temperature, gamma and camera logging (as required). Temperature logging is only undertaken in areas such as the underground that could self heat and risk an unintended explosion. Gamma logging is used mainly in thru-seam shots to more accurately measure the location of coal seams and the standoff distance required to prevent the coal being blasted. In areas where there is a risk of broken ground, the blasting contractor will use a video camera down the hole to accurately measure the location of voids, cavities and cracks. This check undertaken by the Shotfirers provides information on locations within the hole not to load explosives preventing a lack of confinement when blasted and minimising the fume generated. This information is provided back to the blasting contractor to confirm their blast design.

8.9 Loading Explosives and Detonators

The explosive supplier manufactures and supplies WCC with a variety of explosive products. The base explosive is known as ANFO (Ammonium Nitrate Fuel Oil = 1.0g/cm^3). The next product type is known as heavy ANFO (density >1.0g/cm^3) which is more resistant to deterioration from water, air and clay but also contains more explosive energy. The final product available for WCC is emulsion which is water, air and clay resistant (dependent on sleep time – **Section 8.12**). In broken ground, emulsion will migrate from the blast hole into the cracks and voids in the ground due to its low viscosity. While emulsion products are recognised as mitigating fume generation in blasts with wet or reactive holes, however emulsion products cannot mitigate fume generation in broken ground because of the lack of confinement of the blast unless plastic sleeves are used.

The explosive supplier operates explosive loading trucks (called MMU – Mobile Manufacturing Unit). The MMUs are loaded with the raw ingredients for explosives from the Precursor Explosives Facility and diesel from the Fuel Farm at WCC. The materials are not recognised as explosives until the products are mixed together and sensitised when loaded down the hole.

Prior to loading the holes on the shot, the shotfirers re-dip each hole to confirm that depth and presence of water is in accordance with the load sheets produced by the Blast Engineer. If the hole is deeper or shorter due to slumping or water ingress has subsequently occurred, the hole is not loaded and the Blast Engineer advised so that to the load sheet can be appropriately modified. The load sheets will have already been modified based on the information provided by shotfirers inspection and checks undertaken in **Section 8.8**. The shotfirers then supervise the MMU loading each hole with the required column (height) of explosives and re-dip after loading to confirm the hole is at the correct column height as per the load sheet. This step is important to check that the correct volume and weight of explosives are in each hole, as under loading will result in poor fragmentation of the ground which affects dig ability, production efficiency and lowers excavation rates due to oversized overburden. Overloading of holes with explosives can cause excessive overpressure or vibration issues when blasted because more energy (increased MIC) is released into the atmosphere/ground than designed and can result in exceedances or community complaints. In areas where no column rise is observed during loading, shotfirers stop loading and move onto the next hole to prevent further explosives migrating out of the hole. In areas where the ground is known to be reactive or to prevent explosives from migrating out of the hole, sleeves can be used in holes, however in broken ground fume will still be generated due to lack of confinement.

The shotfirers collect the detonators and down line detonator cord from the explosives magazines and store in specially designed explosive cabinets on their shotfiring utes. The detonators and down line detonator cord are added to the hole as per the load sheet prior to loading explosives.

8.10 Stemming Height and Quality

As discussed in **Section 8.6**, stemming is an integral control for managing explosives energy in the ground to fracture the rock rather than resulting in an air blast rifling out of a blast hole and excessive overpressure leading community complaints and potential exceedance. Rifling is when stemming is ejected from the hole (**Figure 6**) because either the hole was under stemmed or the stemming material has failed to lock together and hold in the explosive energy. Shotfirers will dip the holes prior to stemming to confirm that the column height is as per the load sheet for that hole. Under supervision from the shotfirers, WCC stemming operators using bobcats and loaders with modified buckets; pick up the stemming and load each hole. The stemming operators will count the number buckets required to fill the hole with stemming as well as the shotfirers confirm that the hole is filled to the surface or is re-dipped to confirm the post stemming height with the load sheet.

Figure 6 Example of rifling from a blast

Stemming quality is important to minimise the amount of fines or foreign material (i.e. clay) that will reduce the friction required to lock in place at the time of explosion. Depending on the drill hole size, a particular gravel product size is specified to stem holes. To improve the quality of the stemming product supplied from local quarries, stemming supply contractors that will specify quality specifications to minimise the amount fines potentially affecting stemming. In wet weather situations, handling of stemming onsite can incorporate clay material into the stemming and therefore loaded down the hole. In the interim, stemming operators will ensure that stemming stockpiles will have an adequate gravel base to prevent contamination and both stemming operators and shotfirers will visually inspect stemming as it loaded to avoid clay contamination. Longer term strategy is for WCC to purchase a stemming truck (depending on budget availability) that is capable of supplying straight from the truck down the hole to the required stemming height and reducing handling of stemming onsite.

8.11 Initiation Sequence

Blasting will use a mixture of non-electric and electronic detonation as the method for initiating blasts at WCC. The capability of electronic detonation increases the range of initiation sequences possible to achieve the desired production objectives. Electronic detonation can allow decking of

blasts such as thru-seam shots used to blast the overburden underneath and above the coal seam, by firing detonating the lower level first and a couple of milliseconds later detonating the upper level. Such methods can also be used to lower MIC in larger blasts where vibration related impacts can mitigated by (in concept) halving the shot but be fired at the same time.

The objective of the initiation sequence is that each hole is fired sequentially and not all at exactly the same time. Blasting every hole at the same time would release all the energy together reinforcing the energy wave generated. By firing each hole milliseconds apart, this evens out the energy produced and mitigates the potential for a large pulse of energy resulting in overpressure or vibration impacts. **Figure 7** provides a schematic of timing for an initiation sequence showing when each hole in milliseconds is detonated. This type of analysis can review and prevent any holes in 2D from detonating together.

Figure 7 Example of blast initiation sequence in milliseconds

The orientation of blast initiation provides the firing direction of the blast. In **Figure 7**, the blast is fired from the bottom left to the top right. Depending on ground conditions and energy wave transmission through the earth (similar to earthquake theory), the firing direction controls the direction of energy waves generated by the blast. WCC and the blasting contractor aim is to avoid the firing direction aligning with north east which is towards the town of Werris Creek. This is not always possible due to the mining sequence so other controls will be identified during the Pre-Blast Assessment process.

The blast initiation sequence can also control other potential impacts that lead to complaints that are perceived as vibration, but are not measured by standard blast monitoring geophones (**Figure 12**). Similar to earthquakes, blasts generate seismic waves which impart low-frequency acoustic energy through the ground. When different types of waves overlap, this is call wave-front reinforcement and can be felt as a sudden but short increase in vibration. **Figure 8** shows the type of analysis that can be completed to review the arrival times of the energy waves to reveal if wave-front reinforcement was an issue with a particular blast. Another initiation sequence issue can be the wavelength generated by a blast. At detonation, the energy wave wavelength is short and high frequency but through distance and attenuation in the ground, the wavelengths increase and become low frequency. When the wavelength approaches 10-20 hertz (Hz) frequency, this is recognised as being in the vicinity of the natural resonance of a structure (buildings) and can extenuate the perceived vibration experienced by a person in the residence. Where required, post blast analysis of the wavelength frequency can be undertaken and revised initiation sequences developed to avoid natural resonance frequencies for future blasts.

Misfires can occur when only part of the shot is blasted due to detonator or detonator cord failure. How WCC treats misfires is addressed in **Section 8.13**.

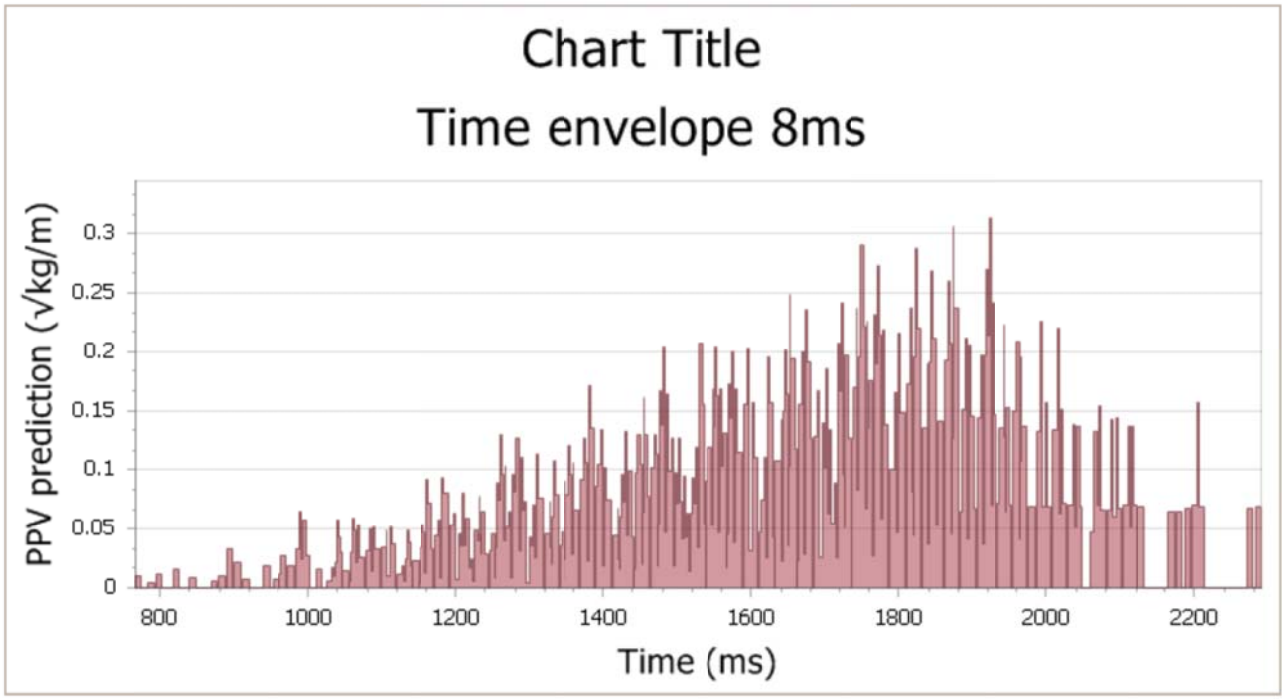


Figure 8 Assessment of blast vibration prediction and wave-front reinforcement impacts

8.12 Sleeping Shots

Explosives will be slept in ground for the minimum practicable time up to the maximum permitted by the explosives supplier depending on the type of explosives. It is well known that the longer explosives sit in the ground, the more deterioration can occur from contact with the air, water and ground. The Pre-Blast Assessment (**Section 8.3**) process is to identify the increased risk of fume, in particular areas of the pit where fume is known to be a problem and minimise the sleeping time of the shot. An example of an action identified through the risk assessment would be to get holes at higher risk of fume to be loaded the day before or on the day of the blast and select the best explosive product to minimise fume based on what is the likely cause of the fume (i.e. broken ground, water).

8.13 Blast Times and Frequency

WCC aims to fire all blasts in the middle of the day generally between 12pm and 2pm, which is during the crib (lunch) break of production operators and minimises the delays to mining operations. However circumstances will arise due to production, scheduling or weather conditions that blasts will need to be fired outside that time period. In accordance with the blast criteria in **Section 7.1**, WCC can:

- Blast between 9am to 5pm Monday to Saturday[1];
- No blasting on Sundays or Public Holidays[1];
- Limited to one blast per day[2]; and
- Limited to 15 blasts per month[3].

Both PA 10_0059 and EPL 12290 contain exemptions to the above limits based on safety or community amenity impacts and actions required are outlined in **Table 14**. The superscript

references are linked to the numbered conditions in **Table 14**. WCC defines a second blast as being triggered more than one minute after the first blast regardless whether it is in the same or different area/location in pit. Two shots from different areas of the pit can be fired together as one blast as long as they are initiated together within 60 seconds of start to finish.

Table 14: Exemptions to Blast Times and Frequency Limits that may be Allowed

	Specific Condition	Action Required
1	Blast required to be fired before 9am or after 5pm or on a Sunday or Public Holidays because of: • Misfire and safety hazard to operations; • Potential for lightning to trigger blast; • Underground fire potential to trigger blast; • Other justified safety concern for a blast.	1. Notify Environmental Officer/Mine Manager/Operations Manager and describe the safety hazard or issue 2. Environmental Officer/Mine Manager/Operations Manager to obtain written approval from DoP and EPA prior to firing (EPL 12290 Condition L5.5 and PA 10_0059 Schedule 3 Condition 7) 3. Implement any further conditions imposed by DoP and EPA
2	Second blast required to be fired between 9am and 5pm Monday to Saturday because of: • First blast did not exceed 0.5mm/s at any community monitoring location; • Misfire and safety hazard to operations; • Potential for lightning to trigger blast; • Underground fire potential to trigger blast; • Other justified safety concern for a blast.	1. Notify Environmental Officer/Mine Manager/ Operations Manager and describe the safety hazard or issue 2. Check blast monitoring results if vibration <0.5mm/s 3. Environmental Officer/Mine Manager/Operations Manager to notify the EPA and community prior to firing (EPL 12290 Condition L5.7)
3	More than 15 blasts required for any calendar month because of: • Blasts during the month were less than 0.5mm/s at any community monitoring location; • Misfires; • Other justified safety concern for a blast.	None

8.14 Blast Notification

A requirement of PA 10_0059 (Schedule 3 Condition 12c and 13d) is for the public to received up to date information on the proposed blasting schedule. The Production Superintendent (or delegate) is required to update the Blast Notification Webpage of the new blast date and time as early as possible (if the date/time changes, not an issue to make repeated changes). The process for how to update the website is included in “Blasting Requirements & Community Notification Toolbox” training available on the Whitehaven Intranet. If the blast is delayed by more than an hour, the Blast Notification Webpage will be amended with the updated time. The Blast Notification Webpage address on the external Whitehaven Coal website (**Figure 9**) is:

http://www.whitehavencoal.com.au/community/blastnotification/werriscreek/wcbn.cfm

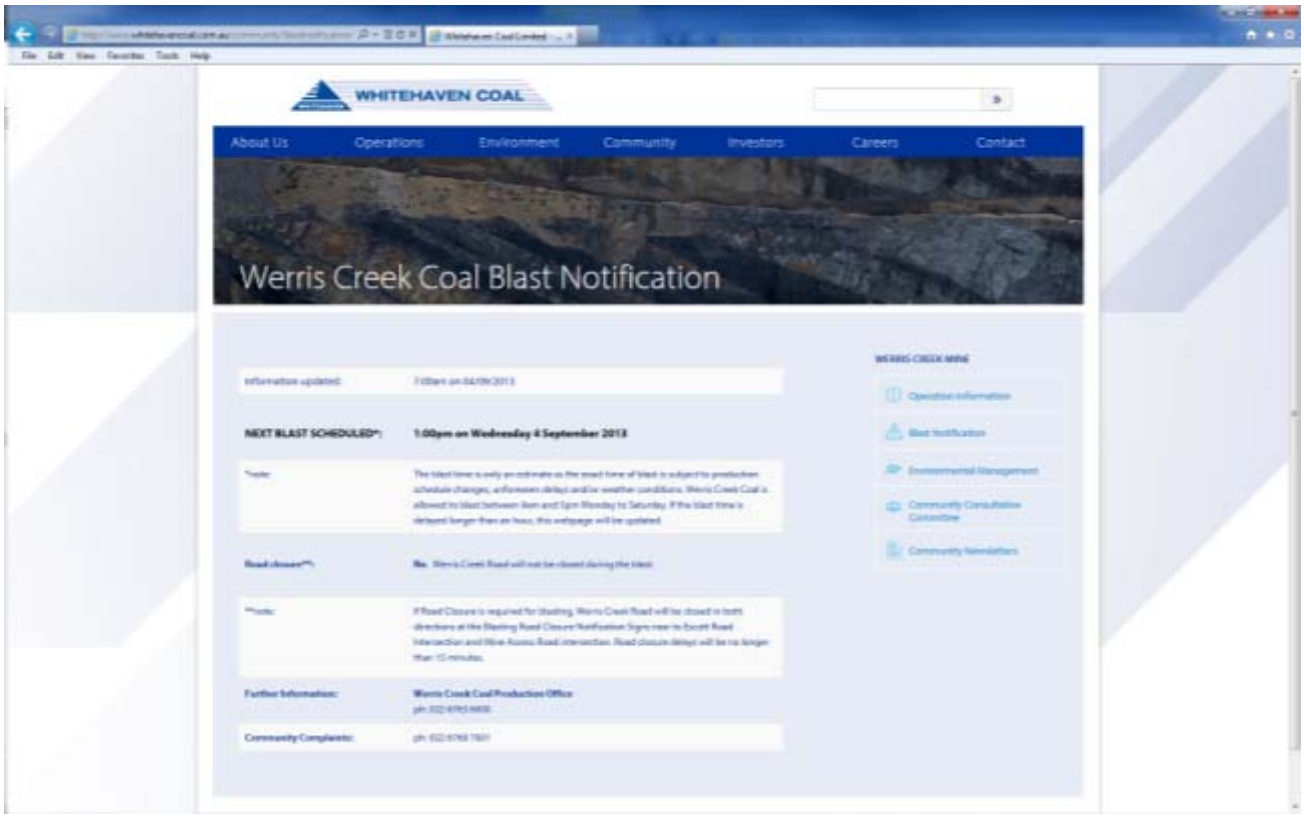


Figure 9 Werris Creek Coal Blast Notification Webpage

8.15 Road and Rail Closures

WCC has a road and rail closure procedure (WHC_PRO_WC_Road Closure Procedure) for blasting within 500m of Werris Creek Road and Great Northern Rail Line (**Appendix 5**). No privately owned land will be within 500m of any blast undertaken for the LOM Project. As discussed in **Section 8.13**, most blasts will be between 12pm and 2pm; therefore any blasts that are road and rail closures will be at a similar time and between 9:30am and 2:30pm to avoid peak traffic and school bus services. A summary of the process involved for road and rail closures is as follows:

Blasts Within 500m:

- Blasts will be designed to fire away from the road and rail line. A plan is produced by the surveyor (**Figure 10**) outlining the blast location and triggers for road and rail closure;
- Road and rail line do not need to be closed within 500m. Sentries will be placed on Werris Creek Road to inspect for flyrock, dust or fume and ensure that there is no trains within 2km at the time of the blast;

Blasts Within 350m:

- Werris Creek Road will need to be closed however the Rail Line can remain open as above;
- WCC will notify 7 days ahead of a required road closure via signage on Werris Creek Road; a notice in the Quirindi Advocate; fax to Liverpool Plains Shire Council (LPSC) and local emergency services. LPSC and the emergency services will also be contracted by phone on the morning of the blast;
- Sentries will be placed on Werris Creek Road who will close the road when advised to by the Shotfirer. Once the blast is completed the sentries will inspect the road and be re-opened no longer than 15 minutes after it was closed;

Blasts Within 200m:

- Werris Creek Road (as per the above process) and the Great Northern Rail Line will need to be closed;
- WCC will organise to undertake a short-notice possession of the rail line with the Australian Rail Track Corporation (ARTC) who will reschedule rail pathways around the blast; and
- ARTC recognised Protection Officers will escort WCC personnel to inspect the rail line.

If clean up or repairs are required to the road or rail line, WCC will implement the process outlined in WHC_PRO_WC_Road Closure Procedure.

WHC_PRO_WC_Road Closure Procedure has been approved by LPSC and Roads and Maritime Service (**Appendix A**) who are the gazetted road authority for the regional road MR130 Werris Creek Road and is in accordance with the executed "Blasting Deed 22nd April 2010 between Australian Rail Track Corporation Limited and Whitehaven Coal Limited".

In the advent that a road closure blast needs to be fired earlier or later than 9:30am or 2:30pm due to potential safety risks (i.e. underground collapse blast temperature trending indicates that blast holes will be >35°C and risks uncontrolled detonation); LPSC will be available to undertake an emergency road closure of Werris Creek Road (see also **Section 8.13**).

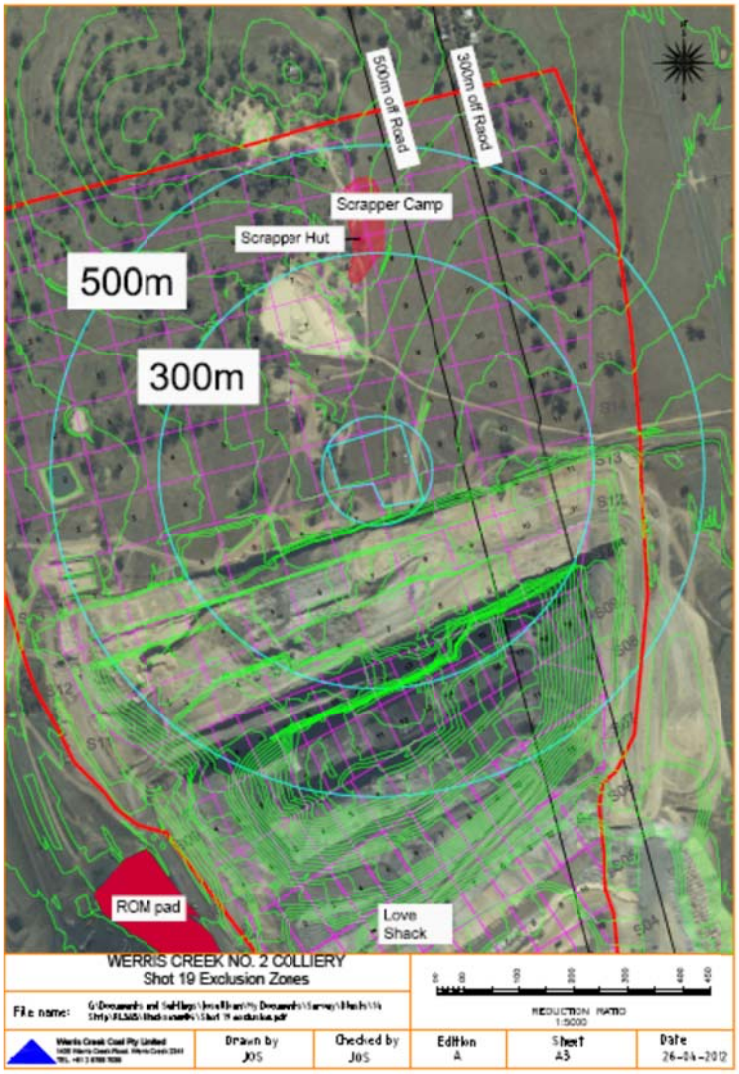


Figure 10 WCC Blasting Exclusion Zones

8.16 Pre-Blast Weather Assessment

WCC will not fire blasts when the 5 minute average wind direction is between 182^{o} and 204^{o} towards Werris Creek township (**Figure 11**) or greater than 6m/s unless with Operations Manager or delegate approval. WCC has developed a process for the Pre-Blast Weather Assessment (**Appendix 5**) which outlines how using the real time weather data to make the assessment "OK to Blast" or "DO NOT BLAST". Blasting in the middle of the day has the benefit of when the circulation of the lower atmosphere has reached its maximum mixing depth and improves dispersion of any potential overpressure, dust or fume that could be generated by the blast. If blasts were required to be fired early or later in the day; temperature inversions will be reviewed and if present no blast will be fired unless with Operations Manager or delegate approval. No Pre-Blast Weather Assessment will be undertaken for warm and hot shots given the safety risk of an unplanned detonation, if a blast was delayed due to unfavourable weather conditions when blast hole temperatures are greater than 35^{o}C.

8.17 Daily Blast Planning

At the morning production meeting, the Environmental Officer reports to the WCC management including Mine Engineers, OCE, Production Superintendent and Operations Manager on the previous days blast performance as well as the forecast weather conditions and the risk of blast impacts based on today's proposed blast (if blasting). A "traffic light" code is used in the powerpoint presentation to visually present high (red), moderate (yellow) and green (low) risk of blast impacts. If moderate or high risks are identified then discussions are immediately held on what additional control measures will need to be implemented to mitigate potential blast impacts.

8.18 Structural Inspections

In the event that a community member from Werris Creek or Quipolly claims that their property has been impacted by a blast, WCC will organise a Property Investigation to the complainant's property and infrastructure in accordance with PA 10_0059, Schedule 3 Condition 10. Two privately owned properties are within 2km of the final LOM open cut pit position, and in accordance with PA 10_0059, Schedule 4 Condition 1(a), these properties were offered Property Inspections (PA 10_0059, Schedule 3 Condition 9) in letters dated 20th December 2011. While none of these properties took up the Property Inspection offer, WCC coordinated structural inspections of R21 ("Alco Park") and Zeolitte Australia Plant to establish a baseline condition. Zeolitte Australia purchased the land from Whitehaven Coal with clauses in the sale contract limiting WCC liability. The third property R20 ("Tonsley Park"), was privately owned but has been subsequently purchased by Whitehaven Coal.

Property Investigation will be undertaken by a suitably qualified, experienced and independent person approved by DoP. On 17th February 2012, DoP approved a structural engineer - Anthony Fowler from Acumen Engineers to undertake Property Investigations. Both Property Inspections and Investigations will review the structural condition of infrastructure including the resident's home and detail all defects (cosmetic and structural) identified including a description of the size and location as well as a photograph as a record for comparison in case of additional structural inspections being required. A copy of structural reports will be provided to the landowner within 2 months of the initial claim being made (pending landowner's availability).

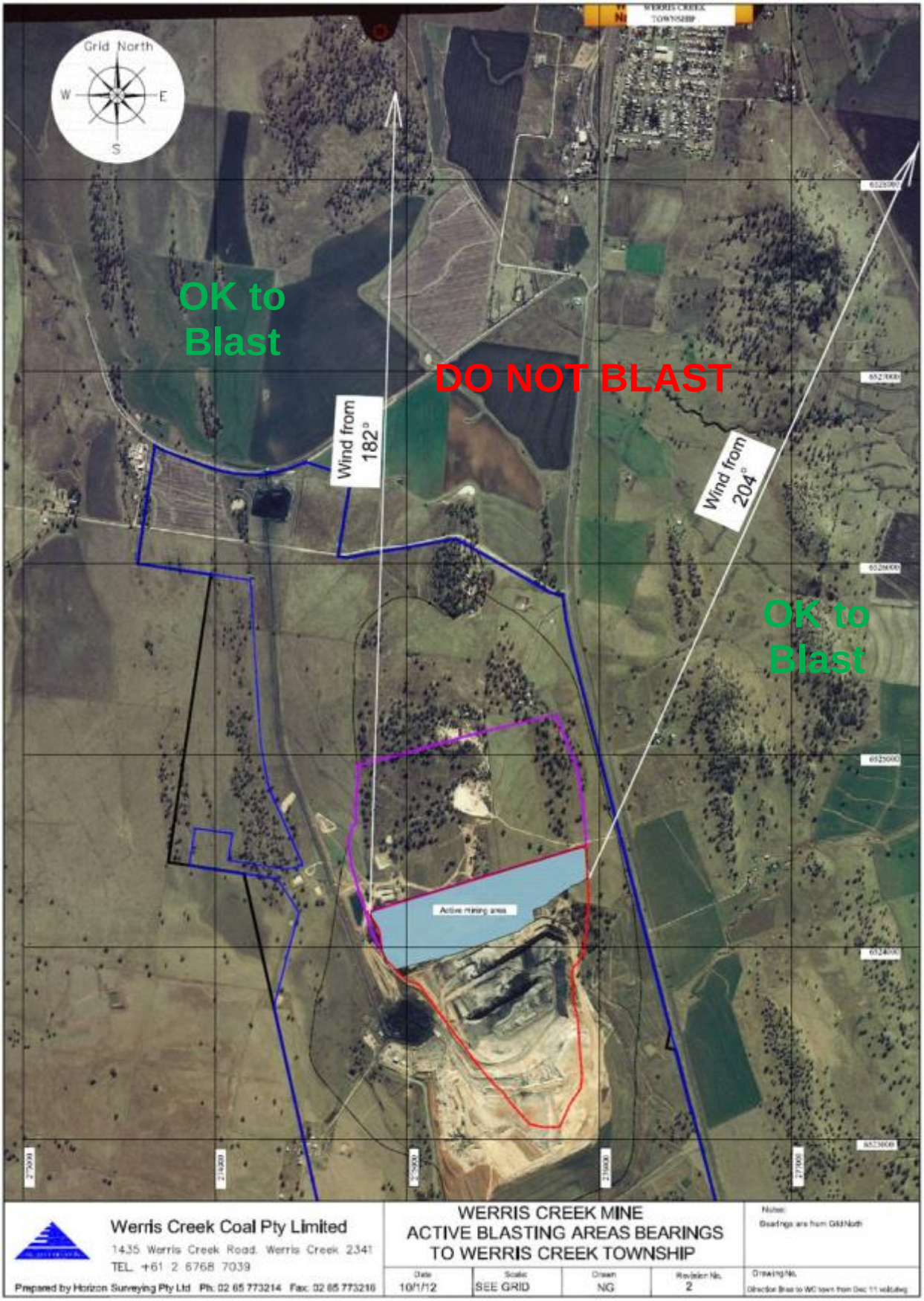


Figure 11 WCC Blast Wind Rose

If the independent Property Investigation confirms the complainant's claim and both WCC and the landowner agree that blasting activities caused the identify defect/damage, then WCC will repair the damage to the satisfaction of DoP. However if WCC or the landowner disagrees with the findings of the independent Property Investigation, then either party may refer the matter to the DoP for resolution.

In accordance with a risk assessment completed as part of the executed "Blasting Deed 22nd April 2010 between Australian Rail Track Corporation Limited and Whitehaven Coal Limited", WCC coordinates structural inspections of the ARTC Railway Culvert (**Figure 12**) every 6 months.

9 MONITORING

With the increased exposure due to the LOM Project extending WCC mine life, increase production rates and moving closer to Werris Creek township; the local community will be sensitive to the perceived blasting impacts of higher overpressure and vibration levels. WCC's blast monitoring methodology aims to be representative of the most affected community residences or sensitive locations to the north, east and south of the mine site that are not owned by WCC or subject to a private agreement with the property owner.

WCC has identified four privately owned properties to monitor potential blasting impacts representative of the most affected community locations to WCC. The four community monitoring locations have been established to record the overpressure and vibration for each blast event at WCC. Two monitoring locations to the north of WCC within Werris Creek township recognises the exposure to blasting will increase as mining moves closer to an urban population of 1700. Monitoring of residences to the east and south (Quipolly) are representative of community receptors in those locations. The blast monitoring network has been updated to reflect recent changes in land ownership in the local area; as outlined in **Figure 12** and **Table 15**.

Table 15: Blast Monitoring Locations

Monitor Type	Purpose	Property/Location Description	Frequency	Direction from WCC	Distance (km)
Permanent	Community	R11 "Glenara"	Every Blast	South	3.2
Permanent	Community	R98 "Kyooma"	Every Blast	East	2.9
Permanent	Community	R62 Werris Creek South	Every Blast	North East	3.7
Permanent	Community	R92 Werris Creek Middle	Every Blast	North East	4.4
Portable	Infrastructure	Railway Culvert #406-099	Every Blast with 500m of Rail Line	East	0.3

Note: Grey shading indicates blast monitoring will be undertaken infrequently

An independent environmental monitoring contractor will manage and maintain the blast monitoring network for WCC. The permanent blast monitors are fixed units installed at each community locations consisting of a computer/communication cabinet, solar panel, antenna and microphone attached to a pole with a standalone geophone **(Figure 13)**. The permanent blast monitors are installed in compliance with Australian Standard AS2187.2-2006 with the microphone and geophone facing in the direction of blasting, microphone >1m off the ground and a 2.5Hz geophone fixed horizontally to a concrete block in complete contact with ground. The permanent blast monitors through a website interface are able to report blast results in near real time including SMS with the complete waveform/trace available via the website for detailed analysis. The maintenance regime for the permanent blast monitors will include pre-blast checks confirming functionality and communication; quarterly service and maintenance works by the contractor and annual calibration of the microphone and geophone with copies of the certificates made available to WCC.

WCC will use a portable blast monitor for every blast within 500m of the Great Northern Railway Line in accordance with the executed "Blasting Deed 22nd April 2010 between Australian Rail Track Corporation Limited and Whitehaven Coal Limited". The portable blast monitor will be set up at the agreed culvert under the rail line at chainage #406-099 with the results shared with ARTC within 1 week of the blast. The portable blast monitor will undergo pre-blast checks confirming functionality and communication and annual calibration of the microphone and geophone with copies of the certificates made available to WCC.

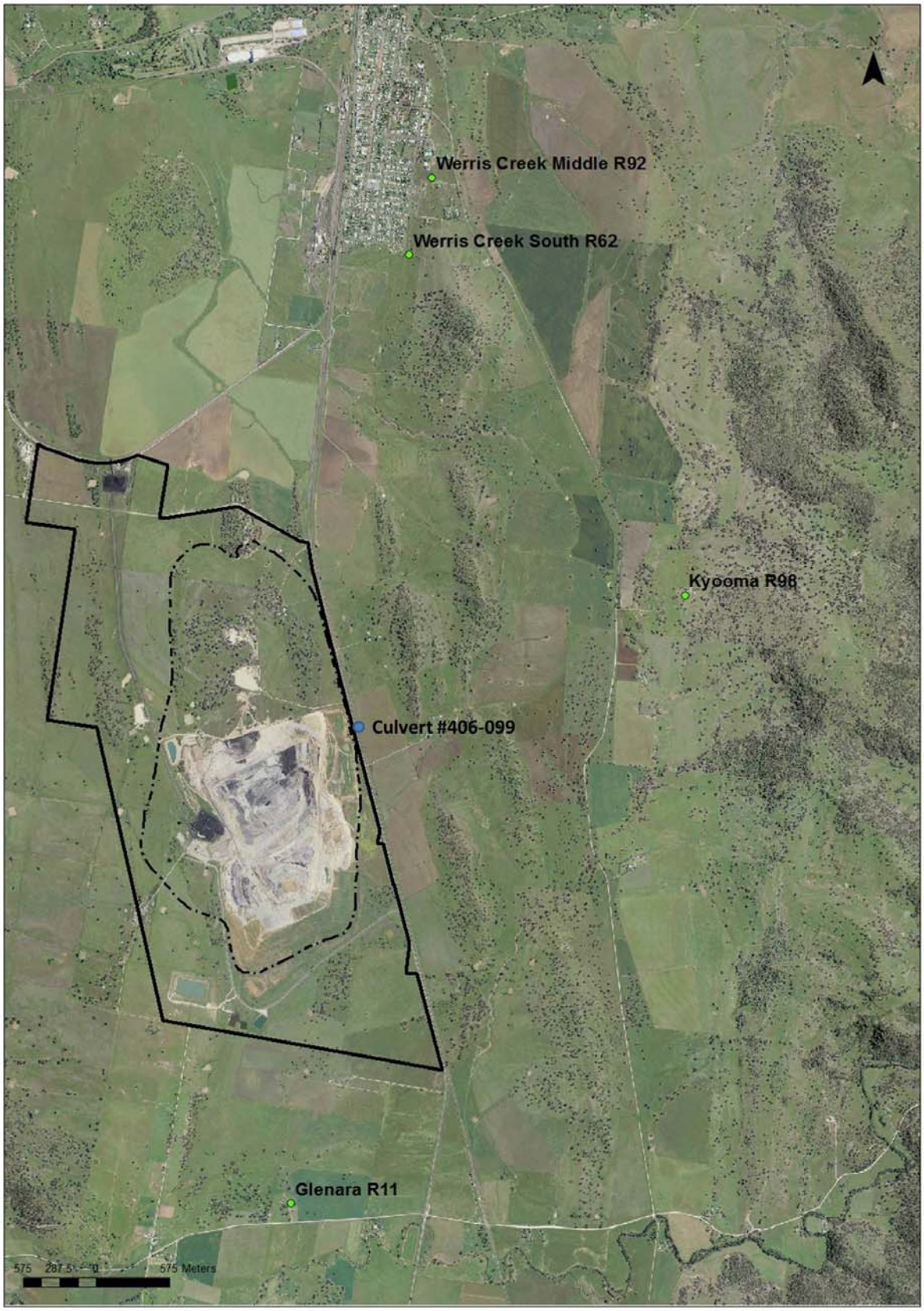


Figure 12 WCC Blasting Monitoring Network

Figure 13 Permanent Blast Monitor set up at "Kyooma" property

10 INSPECTIONS

As part of the EMS, inspection systems are integral to environmental management by identifying issues and observing the effectiveness of control measures. WCC have inspection systems to identify and manage blast impacts.

10.1 OCE Inspections

The Open Cut Examiner (OCE) is required by coal mine health and safety legislation to undertake inspections of mining operations during every shift. As part of these inspections, the OCE undertakes informal observations of drill and blast operations during the shift, with only notable issues documented on the shift inspection proforma. Any notable issues for drill and blast operations observed during the shift, the OCE will immediately implement the required control measures during drill prep (**Section 8.7**) or activities not in accordance with the pre-blast risk assessment (**Section 8.3**).

10.2 Shotfirer Inspections

As discussed with **Section 8.8**, Shotfirer's undertake numerous inspections of any given blast area from the drilling to the time the shot is fired. The outcomes of the inspections are used by the Blast Engineer to refine the blast design to take into account changes in ground or weather conditions.

10.3 Structural Inspections

Following any complaints of damage to private property, WCC will undertake structural inspection of the residence or other infrastructure in accordance with **Section 8.18**. Cosmetic and structural defects are identified by the independent structural engineer and documented with an interpretation as to the cause of the defect. **Figure 14** presents a common cosmetic defect of diagonal cracking at square set opening of a door way as a result of small dimension changes from thermal and moisture effects acting on the timber frame.

Figure 14 Example of Common Cosmetic Defect not from Blasting Impacts

11 TRAINING

Effective implementation and maintenance of this plan requires communication and training to all levels of operational and management staff at WCC. In addition, all persons conducting work at Whitehaven Coal should be authorised as competent to perform their work or job. The open cut operations training requirements require specialist skills and experience to operate safely and productively while mitigating potential environmental impacts. Where possible, environmental training required by this BMP will be incorporated as part of the WCC training and competency management system approved by the Department of Resources and Energy.

Employees and contractors engaged in blasting activities and those responsible for implementing blast management controls would be required to undertake additional training. This training will be targeted to provide the appropriate level of skills and knowledge to employees and contractors enabling them to manage blast issues in accordance with the BMP. **Table 16** outlines the WCC training requirements for blast management:

Table 16: WCC BMP Training Program

Training	Who	Relevant Procedure	Frequency/When	Reference
Induction – Whitehaven Coal Generic and WCC Site Specific	All Employees All Contractors	Not Applicable	Biennial	Not Applicable
Blasting Requirements & Community Notification	WCC Staff	Not Applicable	Annual	Not Applicable
Blasting Explosive User Licence	Shotfirers	Not Applicable (Workcover Authority)	5 years	Not Applicable
Unsupervised Handlers Licence	Stemming Operators	Not Applicable (Workcover Authority)	5 years	Not Applicable
Blast Monitoring	Environmental Officer	Blast Monitoring Procedure	Annual	Section 9 Appendix 5
Pre-Blast Weather Assessment	WCC Staff	Pre-Blast Weather Check Process	Annual	Section 8.16 Appendix 5
Road and Rail Closure	Blast Engineer OCE	WHC_PRO_WC_Road Closure Procedure	Biennial	Section 8.15 Appendix 5
Loading Explosives	Blast Contractor Stemming Operators OCE	WHC_PRO_Explosive Charging Blast Holes WHC_PRO_Hot Hole Blasting	Biennial	Section 8.9
Blast Initiation	Blast Engineer OCE	WHC_ PRO_ Explosive Blasting and Misfires	Biennial	Section 8.11
Blast Design	Blast Engineer	WHC_PRO_WC_Collapse Blasting of Underground Roadways	Biennial	Section 8.4
Sentries	OCE	WHC_PRO_WC_Blast Sentry Duty Card	Biennial	Section 8.15
Stemming	Stemming Operators OCE	WHC_PRO_Stemming	Biennial	Section 8.10
Drill Operations	Drill Operators	WHC_PRO_Safe Operation of a Drill WHC_PRO_WC_Design and drilling of patterns adjacent to underground workings	Biennial	Section 8.7

12 REPORTING

Reporting of monitoring and management information is an integral component of an EMS. This BMP outlines the internal and external blast monitoring and management reporting processes implemented at WCC. **Table 17** outlines the types of reports that include blast information; the reporting frequency, requirements, distribution and timing. Any reporting processes that are linked to approval conditions are *italicised*.

Table 17: Reporting schedules for Blast Monitoring and Management

Report	Frequency	Requirements	Distribution	Timing
Blast Non-Compliance (Serious Incident)	As required	Complete Whitehaven Coal Incident Report Form. Notification of Blast non-compliance or incident. *Meet PA 10_0059 Schedule 4 Conditions 2 and Schedule 5 Condition 6*.	Whitehaven	Immediate
			EPA DoP Landowner	Earliest opportunity (Material Harm) otherwise as soon as practicable*
		Blast Engineer undertake incident investigation	Whitehaven	Within 7 days of incident*
		Detailed report of Blast non-compliance including cause/nature, date, time, duration and location of event; contact details of WCC representatives or witnesses; action taken and measures to prevent recurrence. *Meet PA 10_0059 Schedule 5 Condition 6 and EPL 12290 Conditions R2 & R3.*	EPA DoP Landowner	Within 7 working days of incident*
Blast Complaints	As required	Complete Whitehaven Coal/WCC Complaints Form including complainant, complaint reported date & time, date & time of compliant event, complaint method, complainant details, complaint nature, actions taken and follow up contact. *Meet Condition M5 of EPL 12290.*	WCC Complainant	As soon as practicable
			DoP, EPA (if requested)	Within 7 days of complaint
		Blast Engineer undertake incident investigation	Whitehaven	Within 7 days of complaint
	Monthly	Update Complaints Register with a summary of complaints received. *Meet PA 10_0059 Schedule 5 Condition 10 Dot Point 5.*	Website	Within 14 days of month end
End Of Month Report	Monthly	Summary of blast monitoring results and complaints received collated into site report for Whitehaven Coal management.	WCC	7 working days following month end
Blast Monitoring Database	Monthly	Update database spreadsheet with blast monitoring data.	WCC	7 working days following month end
Environmental Monitoring Report	Quarterly	Summary of blast monitoring results for inclusion in environmental monitoring report for discussion at CCC meetings. *Meet PA 10_0059 Schedule 5 Condition 10 Dot Point 4.*	CCC WCC Website	2 weeks prior to CCC meeting

Report	Frequency	Requirements	Distribution	Timing
AEMR	Annually	Summarise operational and environmental activities for the previous year including annual review requirements, review of compliance with MOP, PA and other approvals and description of non-compliance/exceedances, rehabilitation progress, comprehensive monitoring results and complaints information. *Meet PA 10_0059 Schedule 5 Condition 3 and ML 1563/1671/1672 Condition 4.*	DoP DRE WCC Website	Due by 31st May (unless extension approved)

* Given that blast non-compliance/exceedance do not cause or threatened material harm to the environment, "immediate"/"at the earliest opportunity" reporting timeframes in the EPL 12290 and PA 10_0059 do not apply. PA 10_0059 Schedule 5 Condition 6 specifies that other incidents be notified to DoP as soon as practicable which WCC is interpreting as 7 days.

Further details on WCC incident and community complaint processes is provided in the WCC Environmental Management Strategy in accordance with Whitehaven Coal incident reporting standard and relevant procedure. WCC maintains a designated community complaints line (0267687001) which is regularly published through community newsletters, in the Werris Creek Flyer and signposted on the front entrance to the mine site. The complaints line is a PABX based system, which gives callers the option to be directly transferred to the Site Environmental Officer, transferred to the Open Cut Examiner on shift or leave a message for the Site Environmental Officer to return their call. This system facilitates an instantaneous operational response.

13 REVIEW

A key component of this BMP (as part of WCC EMS) is that WCC is able to review the effectiveness and performance of blast management onsite. WCC will implement a number of review processes to ensure that there is continuous improvement of blast management including:

- Periodic Drill and Blast Process Audit;
- Blast Management Plan Review;
- Blast Performance Annual Review; and
- Independent Environmental Audits.

Any of these review mechanisms may trigger a revision of the BMP in **Section 13.4** below.

13.1 Periodic Drill and Blast Process Audit

Whitehaven Coal will periodically organise an independent person with drill and blast industry experience to review the drill and blast practices and procedures to identify areas for improvements and standardise operations across Whitehaven Coal group.

13.2 Blast Management Plan Review

A protocol for the BMP Review is provided in **Appendix G**. WCC will annually complete the BMP Review Protocol prior to writing the Annual Review section of the AEMR. BMP Review Protocol will outline the management measures implemented for the previous year, track progress against the objectives and targets, changes to risks associated with blast hazards, demonstrate whether accountabilities been followed, and that inspections and reporting process have been completed. The outcomes from the BMP Review will be incorporated into the Annual Review section of the AEMR.

13.3 Blast Performance Annual Review

WCC will annually review its blast performance and management as a part of writing the AEMR in accordance with PA 10_0059 (Schedule 5 Condition 3). The Blast Performance Annual Review will include a comprehensive review of the blast monitoring results and blast complaints over the period 1st April to 31st March and make comparison of these results against the:

- Revised Blast Criteria (**Table 18**) and Blast Objectives and Targets (**Table 19**);
- Blast monitoring results from previous years;
- Blast modelling predictions from the EA (**Table 10** to **15** and **17**);
- Discuss any blast non-compliances and what actions were taken;
- Identify any trends in blast monitoring data;
- Identify any discrepancies between predicted and actual blast levels and discuss potential causes;
- Outline management measures to be implemented over the next year to continual improve blast performance; and
- Outline whether a revision to the BMP is required.

13.4 Independent Environmental Audit

WCC is required to undertake an Independent Environmental Audit (IEA) every three years in accordance with the PA 10_0059 (Schedule 5 Condition 8). The first IEA will be undertaken prior to June 2014 and every three years after. The IEA will:

- Be conducted by a suitably qualified, experienced and independent team of experts whose appointment will be endorsed by DoP;
- Include consultation with the relevant agencies;
- Assess the environmental performance of the project;
- Assess whether WCC is complying with the requirements of PA 10_0059, EPL 12290, ML 1563, ML 1671, ML 1672 and including any assessment, plan or program required under these approvals; and
- Recommend appropriate measures or actions to improve environmental performance and rehabilitation at WCC.

13.5 Revision of Blast Management Plan

The BMP is planned to be revised after three years in 2015. However, in accordance with PA 10_0059 (Schedule 5 Condition 4), WCC will revise the BMP following:

- The AEMR Blast Performance Annual Review (including the BMP Review), where this review recommends a revision of the BMP;
- A blast non-compliance incident report recommending a revision of the BMP;
- IEA recommending a revision of the BMP;
- Modification of PA 10_0059 or Variation to EPL 12290 recommending a revision of the BMP.

WCC would be required to submit the revised BMP in consultation with the EPA for DoP's approval within 3 months of any triggering event listed above.

14 CONTINGENCY PLAN

WCC is required to implement a contingency plans to manage any unpredicted impacts and their consequences. In regards to contingency plans for blast management, WCC have a number of management strategies that would identify unpredicted blast impacts and management measures to mitigate or ameliorate those impacts.

The need to implement blast contingency plans will be identified by WCC using the reporting processes in **Table 18**.

Table 18: Identification of Blast Contingency Plan Triggers

Reporting Process	BMP Section	Frequency	Method
Community Complaint	12	As required	Complaint investigation identifies blast impact outside predicted impact or exceeds Blast criteria
Blast Non-compliance (Serious Incident)	12	As required	Incident investigation identifies blast impact outside predicted impact, non-compliance or exceeds blast criteria
Environmental End Of Month Report	12	Monthly	Blast monitoring results identifies blast impact outside predicted impact or exceedances blast criteria
Environmental Monitoring Report	12	Quarterly	Blast monitoring results trend outside predicted impact
Annual Environmental Management Report	12	Annual	Blast monitoring results trend outside predicted impact or blast management measures not effective at mitigating blast impacts

A number of management measures and actions already discussed in the BMP can be implemented as blast contingency plans are outlined in **Table 19**.

Table 19: Blast Management Contingency Plans

Contingency Plan	Method	BMP Section
Community Complaint	Response to community complaint outlining contingency plan actions to be implemented to the satisfaction of the complainant and DoP/EPA if involved	13
Blast Non-compliance (Incident)	Response to relevant government departments regarding non-compliance outlining contingency plan actions to be implemented to the satisfaction of the relevant government departments	13
Property Acquisition or Private Agreement	Negotiate either private acquisition process or private agreement with Landowner	8.2
Blast Design	Modify future blast designs to prevent further blast impacts	8.4
Predictive Vibration Site Law	Develop specific predictive vibration site law for complainant to prevent further blast impacts	8.5
Pre-Blast Weather Check	Modify pre-blast adverse weather wind rose to prevent further blast impacts	8.16
Blast Notification	Modify blast notification process to prevent further blast impacts	8.14
Structural Inspections	Engage independent structural engineer to undertake Property Investigation to determine blast impact. If blast impact has damaged structural, WCC undertake repairs	8.18

15 REFERENCES

AS 2187.2-2006 Explosives - Storage and use - Use of explosives.

AS 2923 -1987: Guide for measurement of horizontal wind for air quality applications.

WHC_STD_OC_ Explosives Whitehaven Coal Standard Explosives

WHC-PLN-WC-Explosive Management Plan

WHC-PRO-Explosive Blasting and Misfires

WHC-PRO-Explosive Charging Blast Holes

WHC-PRO-Hot Hole Blasting Procedure

WHC-PRO-Hot Hole Identification Procedure

WHC-PRO-WC-Safe Operation of a Drill

WHC-PRO-WC-Blast Sentry Duty Card

WHC-PRO-WC-Collapse Blasting of Underground Roadways

WHC-PRO-WC-Design and drilling of patterns adjacent to underground workings

WHC-PRO-WC-Road and Rail Closure Procedure

Spectrum Acoustics Pty Ltd, Noise (and Blast) Impact Assessment for Werris Creek Coal Mine Life of Mine Project 2010

R.W. Corkery & Co. Pty. Limited, Werris Creek Coal Mine LOM Project: Environmental Assessment, Dec 2010

Werris Creek Coal Pty Ltd, Annual Environmental Management Report 2010-2011, May 2011

Werris Creek Coal Pty Ltd, Blast Monitoring Program, July 2010

Werris Creek Coal Pty Ltd, Life of Mine Mining Operations Plan for the Werris Creek, November 2011

APPENDIX A - Related correspondence with Government Agencies

Subject: FW: Air Quality MP Consultation and Rehabilitation Management Plan

From: Andrew Wright
Sent: Thursday, 19 April 2012 1:45 PM
To: 'Simon Lund'
Subject: RE: Air Quality MP Consultation and Rehabilitation Management Plan

Thanks Simon.

To confirm that the EPA has been given the opportunity to be consulted regarding Werris Creek Coal:

- Rehabilitation Management Plan;
- Air Quality and Greenhouse Gas Management Plan;
- Noise Management Plan;
- Water Management Plan; and
- Blast Management Plan

When DoP (DRE for Rehab MP) has approved the relevant management plans, WCC will provide hardcopy and electronic copies of these plans to the EPA.

Cheers, Andrew

Andrew Wright
Environmental Officer
Werris Creek Coal
0488497701

From: Simon Lund [mailto:Simon.Lund@epa.nsw.gov.au]
Sent: Thursday, 19 April 2012 1:36 PM
To: Andrew Wright
Subject: RE: Air Quality MP Consultation and Rehabilitation Management Plan

Andrew

Sorry its taken a while to respond.

The Environment Protection Authority encourages the development of such plans to ensure that proponents have determined how they will meet their statutory obligations and designated environmental objectives. However, we do not approve or endorse these documents as our role is to set environmental objectives for environmental/ conservation management, not to be directly involved in the development of strategies to achieve those objectives.

Should you have any further enquiries please do not hesitate to contact me.

Regards

Simon Lund Regional Operations Officer| **NSW Environment Protection Authority** |
☎: (02) 6773 7000 | Mobile ☎: 0407 209 283 | 🖷: (02) 6773 2336| 🖱:simon.lund@epa.nsw.gov.au

Andrew Wright

From: HEYMAN Todd A <Todd.HEYMAN@rms.nsw.gov.au>
Sent: Monday, 21 May 2012 2:02 PM
To: Andrew Wright
Cc: ORVAD Terry P; ADAMS Matthew G
Subject: RE: Werris Creek Road Blasting Closure Documents
Attachments: WCC LOM BMPv1.pdf; WHC_PRO_WC_Road Closure Procedure.pdf; 100210 Ltr from LPSC - Road Cosure Agreement.pdf

Andrew

As discussed, thank you for providing Roads and Maritime Services (RMS) Northern Region with an opportunity to comment on this blast management plan. Please be aware that based on the information provided, your blast impacts mainly on Werris Creek Rd (RR130), which is a regional road under the control of Liverpool Plains Shire Council. The road environment upon which the blast could impact is considered a high speed, low volume environment, accompanied with Long Distance Coaches and Large Heavy Vehicles (B-Double) and Overmass-Overdimension vehicle movements. As such, RNS is concerned that the safety of road users is not compromised.

There are potential dangers in all events of this nature and it is the proponent's responsibility to minimise and prevent them. This notwithstanding, RMS offers no objection to the content of the blast management plan relevant to traffic management or safety.

Best regards

Todd

Todd Heyman
Traffic Operations Manager Northern
RCS Northern RSTM & D | Northern Region
T 02 6640 1384 F 02 6640 1304
www.rmservices.nsw.gov.au

Roads and Maritime Services
31 Victoria St Grafton NSW 2460 | PO BOX 576 Grafton NSW 2460

From: Andrew Wright [mailto:AWright@whitehavencoal.com.au]
Sent: Monday, 30 April 2012 12:01 PM
To: HEYMAN Todd A
Subject: Werris Creek Road Blasting Closure Documents

Todd

I was given your name as the contact regarding consulting with the RTA over Werris Creek Coal Blast Management Plan.

Werris Creek Coal currently closes WerrisCreek Road for blasting on ~5 occasions (out of 100 blasts) per year which we have an existing arrangement in place with Liverpool Plains Shire Council.

Our Project Approval 10_0059 requires us to consult with the RTA on our Blast Management Plan and Werris Creek Road closures before the Department of Planning and Infrastructure (DoP) will approve that

document. Find attached a copy of our Blast Management Plan, our Procedure for Road and Rail Closures and a copy of a letter and agreement with Liverpool Plains Shire Council.

To demonstrate consultation to DoP, I need evidence such a reply to this email and whether you have any comments on the above information?

Andrew Wright
Environmental Officer - Werris Creek Coal

Whitehaven Coal Limited
1435 Werris Creek Road/PO Box 125, Werris Creek NSW 2341
Tel: +61 2 67687071 **Mobile:** +61 488497701
Email: awright@whitehavencoal.com.au www.whitehavencoal.com.au

WHITEHAVEN COAL

Andrew Wright

From: Nicole Spear <NSpear@ARTC.com.au>
Sent: Monday, 18 June 2012 12:02 PM
To: Andrew Wright
Subject: RE: can you reply to this email with Management Plan

Andrew,

Management Plan received. I will forward to internal stakeholders for comment and respond in writing as soon as possible.

Kind regards,

Nicole Spear
Property Officer

ARTC

P – 02 4941 9620
F – 02 4941 9738
M – 0428 469 981
E – nspear@artc.com.au

Australian Rail Track Corporation Ltd.
Locked Bag 1, Broadmeadow NSW 2292

5/33 Newton Street, Broadmeadow NSW 2292

From: Andrew Wright [mailto:AWright@whitehavencoal.com.au]
Sent: Monday, 18 June 2012 7:17 AM
To: Nicole Spear
Subject: RE: can you reply to this email with Management Plan

Nicole

WCC's Project Approval 10_0059 requires us to consult with ARTC on our Blast Management Plan. The blast management plan has been prepared in accordance with the existing Blasting Deed Agreement between Whitehaven Coal and ARTC. Refer to Section 8.15 for Blasting related Road/Rail Closures.

To show evidence of consultation, is able ARTC to respond in writing (letter or email) that ARTC has been consulted with and whether ARTC has any other comments would be appreciated.

Andrew Wright
Environmental Officer - Werris Creek Coal

Whitehaven Coal Limited
1435 Werris Creek Road/PO Box 125, Werris Creek NSW 2341
Tel: +61 2 67687071 **Mobile:** +61 488497701
Email: awright@whitehavencoal.com.au www.whitehavencoal.com.au

WHITEHAVEN COAL

WorkCover NSW
92-100 Donnison Street, Gosford, NSW 2250
Locked Bag 2906, Lisarow, NSW 2252
T 02 4325 4145 F 02 4321 5000
WorkCover Assistance Service 13 10 50
DX 731 Sydney workcover.nsw.gov.au

Dangerous Goods Notification Team
ph (02) 4321 5500 fax (02) 9287 5500

Occupier **ORICA AUSTRALIA PTY LIMITED**
Attn: PAUL HARRISON
Licensee: ACN 004 117 828
P O BOX 196
KURRI KURRI NSW 2327

ACKNOWLEDGEMENT OF NOTIFICATION OF DANGEROUS GOODS ON PREMISES

ISSUED UNDER AND SUBJECT TO THE PROVISIONS OF
THE OCCUPATIONAL HEALTH & SAFETY ACT 2000 AND REGULATIONS THEREUNDER

Acknowledgement Number 35/037161 **Expiry Date** 27/11/2013

Occupier Contact PAUL HARRISON Ph. 02 4439 5212 Fax. 02 4439 5299

Premises where notified Dangerous Goods are stored / handled
ORICA AUSTRALIA PTY LIMITED
1435 WERRIS CREEK- QUIRINDI RD WERRIS CREEK 2341

Nature of Site COAL MINING

Emergency Contact for this Site EMERGENCY Ph. 1800 033 111

Site staffing 12 HRS 6 DAYS

Details of Storage Locations

Identifier.	Type	Goods Stored in Storage Location	Qty
AN01	**ABOVE-GROUND TANK**	**Class 5.1**	**35000 KG**
	UN 1942 AMMONIUM NITRATE		35000 KG
ANE01	**ABOVE-GROUND TANK**	**Class 5.1**	**80000 KG**
	UN 3139 OXIDIZING LIQUID, N.O.S.		80000 KG
MAG 1	**EXTERNAL MAGAZINE**	**Class 1.1B**	**130000 NO.**
	UN 0360 DETONATOR ASSEMBLIES, NON-ELECTRIC		100000 NO.
MAG 2	**EXTERNAL MAGAZINE**	**Class 1.1D**	**10000 KG**
	UN 0042 BOOSTERS		9500 KG
	UN 0065 CORD, DETONATING		500 KG

This acknowledgment must be retained as PROOF OF NOTIFICATION.
You must notify WorkCover annually of the Dangerous Goods stored on these premises

WC03116 0611

WORK SAFE HOME SAFE

NSW GOVERNMENT | WorkCover NEW SOUTH WALES

WorkCover NSW
92-100 Donnison Street, Gosford, NSW 2250
Locked Bag 2906, Lisarow, NSW 2252
T 02 4325 4145 F 02 4321 5000
WorkCover Assistance Service 13 10 50
DX 731 Sydney workcover.nsw.gov.au

Dangerous Goods Notification Team
ph (02) 4321 5500 fax (02) 9287 5500

Occupier **ORICA AUSTRALIA PTY LIMITED**
Attn: PAUL HARRISON
Licensee: ACN 004 117 828
P O BOX 196
KURRI KURRI NSW 2327

ACKNOWLEDGEMENT OF NOTIFICATION OF DANGEROUS GOODS ON PREMISES

ISSUED UNDER AND SUBJECT TO THE PROVISIONS OF
THE OCCUPATIONAL HEALTH & SAFETY ACT 2000 AND REGULATIONS THEREUNDER

Acknowledgement Number 35/037161 **Expiry Date** 27/11/2013

Occupier Contact PAUL HARRISON Ph. 02 4439 5212 Fax. 02 4439 5299

Premises where notified Dangerous Goods are stored / handled
ORICA AUSTRALIA PTY LIMITED
1435 WERRIS CREEK- QUIRINDI RD WERRIS CREEK 2341

Nature of Site COAL MINING

Emergency Contact for this Site EMERGENCY Ph. 1800 033 111

Site staffing 12 HRS 6 DAYS

Details of Storage Locations

Identifier.	Type	Goods Stored in Storage Location	Qty
AN01	ABOVE-GROUND TANK	Class 5.1	35000 KG
	UN 1942 AMMONIUM NITRATE		35000 KG
ANE01	ABOVE-GROUND TANK	Class 5.1	80000 KG
	UN 3139 OXIDIZING LIQUID, N.O.S.		80000 KG
MAG 1	EXTERNAL MAGAZINE	Class 1.1B	130000 NO.
	UN 0360 DETONATOR ASSEMBLIES, NON-ELECTRIC		100000 NO.
MAG 2	EXTERNAL MAGAZINE	Class 1.1D	10000 KG
	UN 0042 BOOSTERS		9500 KG
	UN 0065 CORD, DETONATING		500 KG

This acknowledgment must be retained as PROOF OF NOTIFICATION.
You must notify WorkCover annually of the Dangerous Goods stored on these premises

WC03116 0611

WORK SAFE HOME SAFE

WorkCover NEW SOUTH WALES

Licence Number: 07-100181-002
Certificate Number: 000004-000019179

Licence to Store

Issued under and subject to the provisions of the Explosives Act 2003
And the Explosives regulation 2005

Issued to:	Orica Australia Pty Ltd
Trading As:	Orica Mining Services
Business Address:	P.O Box 196 KURRI KURRI NSW 2327
Date of Expiry:	28 Nov 2013

Authorisations The licence holder is authorised to: Possess; Store
Authorisations subject to the Licence Conditions and Class of Explosives listed below.

Class of Explosives:	**Maximum Quantity**
11B 1.1B - EXPLOSIVES	130000 Units
11D 1.1D - EXPLOSIVES	10000 Kilos
002 5.1 - OXIDIZING SUBSTANCE	115000 Kilos

Licence Conditions:
6/12/13/14/15/19/20/31/32/34/37/39/40/41/42/52/53/54/63

Please refer to the WorkCover General Licensing Conditions for condition details

Nominated Person:
NOM:Adrian Grant Mason:01-100652

Signature Block

WorkCover. **Watching out for you.**

3

WorkCover NSW ABN 77 682 742 966 92-100 Donnison Street Gosford NSW 2250 Locked Bag 2906 Lisarow NSW 2252
Telephone 02 4321 5000 Facsimile 02 4325 4145 WorkCover Assistance Service **13 10 50**
DX 731 Website **www.workcover.nsw.gov.au**

WC1216LH

NSW GOVERNMENT | Industry & Investment

27 January 2010

DEPARTMENT OF MINERAL RESOURCES
Level 1, 1 Civic Avenue (PO Box 51)
Singleton NSW 2330 Australia
INSPECTORATE: Phone (02) 6571 8788
Fax (02) 6572 1201
www.minerals.nsw.gov.au
DX 7071
ABN 72 189 919 072 - 002

The Mine Operator
Whitehaven Coal Limited
Werris Creek No 2 Colliery
PO Box 600 Gunnedah
NSW 2380
Attention: Des George, MME

File Number: 07/4889
Comet ID: 317578745001

Dear Sir,

Proposed Road Closure Procedure for Blasting Activities – Werris Creek No 2 Colliery

Following our inspection of the area yesterday and consideration of your submission WHC_PROC_ROAD CLOSURE PROCEDURE for Werris Creek No2 Colliery and dated 27/11/2009 I am satisfied the procedure has considered all the risks associated with blasting in close proximity to the Werris Creek Road provided that:

1. Where the distance between the roadway and blast area is 500 metres or less, and it is determined by risk assessment that the road does not need to be closed, at least two observers with blast warning signs will be placed at appropriate locations along the roadway to inform approaching traffic of an impending blast, and to monitor the blast for flyrock and dust. Should any flyrock be observed, or there be dust movement towards the roadway, the observers are to take immediate action to stop traffic entering the affected area. All other provisions of the road closure procedure will continue to apply in the 500 metres zone, including blasting times.
2. In any case the road closure procedures will be implemented in full when the distance between the blast area and the roadway is 350 metres or less.
3. Prior to blasting activities taking place in any zone within 500 metres of the roadway, an earth bund, of minimum 6 metres height will be erected along the edge of the void between the blast area and the roadway.
4. The Manager of Mining Engineering will develop a safe work procedure in consultation with the ARTC to ensure safety along the adjacent rail system, provided that the road closure procedures will apply as a minimum requirement for the rail system. A copy of the rail procedure will be forwarded to the District Inspector.

Yours faithfully,

Ray Leggett

Ray Leggett
Inspector of Coal Mining Engineering

Copies: Project Manager Werris Creek No2 Colliery
Werris Creek Site Check Inspector
Inspector Ron Findley

File Number	Comet ID	Prepared By	Date	Page Number
07/4889	DPI Letter	ray leggett	28 January 2010	1 of 1

LIVERPOOL PLAINS SHIRE COUNCIL

Reference: **47611.53**

Contact: **Barry Maher**

10 February 2010

Mr. Des George
Manager of Mining Engineering
Werris Creek No 2 Colliery
PO Box 125
WERRIS CREEK NSW 2341

Agreement to supply Traffic Control during blasting operations

Dear Des

As requested in your email of 2 February 2010 to the Works and Assets Manager, the change to Section 4 – Definitions – Designated Blast Zones – from 300m to 350m is noted. Your attention is also drawn to Section 3 .1.i. Signage on the Werris Creek Road must display the intended road closure for a minimum period of seven days in accordance with ROADS (GENERAL) REG 5;

a) By means of a notice published in a local newspaper and
b) By means of a conspicuous notice erected along the roadway.

Attached to this letter is two copies of an agreement to supply traffic control and the latest version of Whitehaven Coals road closure procedure. If Whitehaven is happy to proceed with the agreement please sign and return the original document.

If you wish to discuss this matter further please do not hesitate to contact Council's Works and Assets Manager, Barry Maher on 67461755.

Yours faithfully

Greg Tory
DIRECTOR – WORKS

LIVERPOOL PLAINS SHIRE COUNCIL
60 Station Street PO Box 152 QUIRINDI NSW 2343 TEL 02 6746 1755 FAX 02 6746 3255
EMAIL lpsc@lpsc.nsw.gov.au WEBSITE www.lpsc.nsw.gov.au ABN 97 810 717 370

APPENDIX B - Environmental Policy

INTEGRATED MANAGEMENT SYSTEM	Document Owner:	Managing Director
	Revision Period:	3 Yearly
	Issue:	2
	Last Revision Date:	17/06/2009
	Date Printed:	18/06/2009

WHC_POLICY_HEALTH, SAFETY & ENVIRONMENT

Whitehaven intends to conduct business in a way that maintains a safe and healthy workplace for its employees, contractors, visitors and the surrounding community and will protect the environment in all stages of exploration, mining, processing and train loading.

Whitehaven aims to:

- Achieve zero injuries and occupational illnesses.
- Achieve zero equipment damage.
- Achieve zero environmental incidents.

Whitehaven will strive to achieve these goals by:

- Ensuring health, safety and environment is considered in all planning and work activities.
- Involve employees through regular communication, consultation and training.
- Identifying and controlling all potential hazards in the workplace through hazard identification and risk analysis.
- Ensuring all incidents are reported, controlled and learning's applied and shared.
- Providing effective injury management and rehabilitation for all employees.
- Seeking continuous improvement in performance by taking into account employee & community concerns and advances in health, safety and environment.
- Complying with legislative and other requirements and providing necessary training and resources.

Whitehaven will ensure the availability of human, financial and physical resources to maintain and implement the Health and Safety Management System.

Responsibilities of people employed at Whitehaven Coal:

All persons employed by Whitehaven have a personal responsibility to comply with this policy and associated Health, Safety & Environment systems. No work is to be undertaken without a clear understanding of a safe method that minimizes the risk of injury, equipment damage and environmental harm.

Whitehaven employees shall:

- Work in a healthy, safe and environmentally responsible manner.
- Encourage others to work in a healthy, safe and environmentally responsible manner.
- Promptly report incidents, unsafe practices or conditions and environmental concerns as they become apparent.
- Co-operate with Management in the support of promotion of health and safety responsible environmental management in the work place.

This policy applies to all mines operated by Whitehaven Coal Limited and its subsidiaries.

.....

Tony Haggarty
Managing Director
17th June 2009

APPENDIX C - Data Tables

APPENDIX D - MP Risk Assessment

A) Environmental Risk Assessment from LOM Project (R.W. Corkery & Co., 2010)

Blasting specific risk assessment extracted and modified from **Table 3.6** and **Table 6.1**

Identified Risk	Level / Scale of Potential Impact (if applicable)	Unmitigated			Mitigated		
		Consequence	Likelihood	Risk Rating	Consequence	Likelihood	Risk Rating
Structural damage to buildings or structures from airblast overpressure	Minor damage to buildings or structures	2	C	M	2	D	L
	Significant damage to buildings or structures	3	D	M	3	E	M
Damage to buildings and structures	Minor damage to buildings or structures	2	C	M	2	D	L
	Significant damage to buildings or structures	3	D	M	3	E	M
Nuisance/ amenity impacts to surrounding landowners		2	B	H	2	D	L
Minor health impacts associated with emissions of sulphur dioxide and nitrogen oxide		2	C	M			

Blasting specific risks and impacts extracted from **Table 3.2**

Environmental Issue	Risk Source/ Potential Incident(s)	Potential Consequences	Receptor/ Surrounding Environment	Potential Environmental Impacts
Noise	• Elevated overpressure (noise) from blasting operations as mining operations move closer to the town of Werris Creek	• Community complaints • Reduced reputation within the local community	• Surrounding residences, buildings and other structures	• Structural damage to buildings and structures • Nuisance/amenity impacts on surrounding landowners/residents
Vibration	• Elevated vibration from blasting operations as mining operations move closer to the town of Werris Creek	• Community complaints • Reduced reputation within the local community • Reduced agricultural production	• Surrounding residences, buildings and other structures • Local livestock	• Structural damage to buildings and structures • Nuisance/amenity impacts on surrounding landowners/residents
NOx	• The production of a large amount of nitrogen oxide from blasting operations	• Community complaints • Increased contribution to the greenhouse effect	• Residents, landowners and leaseholders of properties on and surrounding the Mine Site • Local air-shed • Global air-shed	• Minor health impacts • Increased greenhouse emissions • Reduced local amenity

B) Whitehaven Coal Broadbrush Environmental Risk Assessment for WCC (SMS, 2012)

Blasting specific risk assessment extracted and modified from WCC Broadbrush Risk Assessment. See Whitehaven Coal Risk Management Standard for risk matrix definitions.

Subprocess	Hazard	Causes	Existing Controls	Consequence	Likelihood	Risk Level	Additional Actions	Consequence	Likelihood	Risk Level
Airblast over pressure	Criteria is exceeded	1. LTA blast design (Incorrect loading of shot, Incorrect timing of firing, LTA stemming, etc.) 2. Weather conditions 3. Blast size	1. Use of a qualified, experienced blast contractor 2. Blast MP, which includes monitoring requirements 3. Pre design drilling and provision of information to blast contractor 4. Experience from previous blasts 5. Selection of suitable blast times to avoid unfavourable weather conditions 6. Pre blast design risk assessments involving blast contractor	3	D	M	1. Whitehaven personnel to liaise with Orica re. Improved modelling and blast design 2. Engage an industry expert to audit Orica's operational procedures and provide recommendations 3. Formalise a procedure for the monitoring of stemming material (delivery to site and re-handling) 4. Consider alternative blast contractor 5. Ensure follow-up on investigation recommendations are implemented 6. Orica to provide evidence that their monitoring equipment are calibrated as per the manufacturers recommendations 7. Require Orica to provide an independent investigation for selected exceedances and to ensure recommendations are implemented and the results are provided to Whitehaven 8. Require Orica to have an Overpressure Management Plan, including predicting overpressure	3	E	M
Airblast overpressure	Neighbours complaint	1. LTA blast design (Incorrect loading of shot, Incorrect timing of firing, LTA stemming, etc.) 2. Weather conditions 3. Individuals perception of blast	1. Use of a qualified, experienced blast contractor 2. Blast MP, which includes monitoring requirements 3. Pre design drilling and provision of information to blast contractor 4. Experience from previous blasts 5. Selection of suitable blast times to avoid unfavourable weather conditions 6. Complaints procedure 7. Whitehaven Community Liaison Officer 8. Site Community Consultative Committee 9. Notifications of Blast times 10. Pre blast structural engineering inspection of private properties 11. Post blast structural engineering inspection of private properties if required 12. Pre blast design risk assessments involving blast contractor	3	B	H	1. Whitehaven personnel to liaise with Orica re. Improved modelling and blast design 2. Engage an industry expert to audit Orica's operational procedures and provide recommendations 3. Formalise a procedure for the monitoring of stemming material (delivery to site and re-handling) 4. Consider alternative blast contractor 5. Ensure follow-up on investigation recommendations are implemented 6. Orica to provide evidence that their monitoring equipment are calibrated as per the manufacturers recommendations 7. Require Orica to provide an independent investigation for selected exceedances and to ensure recommendations are implemented and the results are provided to Whitehaven 8. Require Orica to have an Overpressure Management Plan, including predicting overpressure	3	D	M

Ground vibration	Criteria is exceeded	1. LTA blast design (Incorrect loading of shot, Incorrect timing of firing, etc.)	1. Use of a qualified, experienced blast contractor 2. Blast MP, which includes monitoring requirements 3. Pre design drilling and provision of information to blast contractor 4. Experience from previous blasts 5. Selection of suitable blast times to avoid unfavourable weather conditions 6. Pre blast design risk assessments involving blast contractor	3	E	M	1. Whitehaven personnel to liaise with Orica re. Improved modelling and blast design 2. Engage an industry expert to audit Orica's operational procedures and provide recommendations 3. Formalise a procedure for the monitoring of stemming material (delivery to site and re-handling) 4. Consider alternative blast contractor 5. Ensure follow-up on investigation recommendations are implemented 6. Orica to provide evidence that their monitoring equipment are calibrated as per the manufacturers recommendations 7. Require Orica to provide an independent investigation for selected exceedances and to ensure recommendations are implemented and the results are provided to Whitehaven 8. Require Orica to have an Overpressure Management Plan, including predicting overpressure			
Ground vibration	Neighbours complaint	1. LTA blast design (Incorrect loading of shot, Incorrect timing of firing, etc.) 2. Individuals perception of blast	1. Use of a qualified, experienced blast contractor 2. Blast MP, which includes monitoring requirements 3. Pre design drilling and provision of information to blast contractor 4. Experience from previous blasts 5. Selection of suitable blast times to avoid unfavourable weather conditions 6. Complaints procedure 7. Whitehaven Community Liaison Officer 8. Site Community Consultative Committee 9. Notifications of Blast times 10. Pre blast structural engineering inspection of private properties 11. Post blast structural engineering inspection of private properties if required 12. Pre blast design risk assessments involving blast contractor	3	B	H	1. Whitehaven personnel to liaise with Orica re. Improved modelling and blast design 2. Engage an industry expert to audit Orica's operational procedures and provide recommendations 3. Formalise a procedure for the monitoring of stemming material (delivery to site and re-handling) 4. Consider alternative blast contractor 5. Ensure follow-up on investigation recommendations are implemented 6. Orica to provide evidence that their monitoring equipment are calibrated as per the manufacturers recommendations 7. Require Orica to provide an independent investigation for selected exceedances and to ensure recommendations are implemented and the results are provided to Whitehaven 8. Require Orica to have an Overpressure Management Plan, including predicting overpressure	3	D	M
Flyrock	Personal injury to member of public	1. LTA exclusion zone 2. LTA blast design (Incorrect loading of shot, Incorrect timing of firing, etc.)	1. Exclusion zones (250 - 500m) 2. Road and rail closure procedure 3. Blast Management Plan including evacuation and use of sentries	5	E	H				
Flyrock	Damage to infrastructure or equipment	1. LTA exclusion zone 2. LTA blast design (Incorrect loading of shot, Incorrect timing of firing, etc.)	1. Exclusion zones (250 - 500m) 2. Road and rail closure procedure 3. Blast Management Plan including evacuation and use of sentries 4. Structural inspections of railway infrastructure (every 6 months)	2	D	L				
Dust	Generation of airborne dust leading to non compliance	1. Detonation	1. Blast Management Plan 2. Air Quality and Greenhouse Gas Management Plan 3. Consideration of weather prior to blasting	3	D	M				

Dust	Generation of airborne dust leading to complaint	1. Detonation	1. Blast Management Plan 2. Air Quality and Greenhouse Gas Management Plan 3. Consideration of weather prior to blasting 4. Notifications of blast times 5. Community liaison officer 6. Complaints procedure	3	C	H	1. Develop a blasting weather check based on wind direction and speed and improvements to website	3	D	M
Gas plume	Generation of visible plume resulting in non-compliance	1. LTA explosive product 2. Damp material 3. Incorrect ratio of explosives mixture 4. Cracks and fissures in hole	1. Use of a reputable blast contractor 2. Blast MP, which includes monitoring requirements 3. Pre design drilling and provision of information to blast contractor 4. Experience from previous blasts 5. Consideration of weather conditions 6. Pre blast design risk assessments involving blast contractor	3	C	H	1. Whitehaven personnel to liaise with Orica re. Improved modelling and blast design 2. Engage an industry expert to audit Orica's operational procedures and provide recommendations 3. Formalise a procedure for the monitoring of stemming material (delivery to site and re-handling) 4. Consider alternative blast contractor 5. Ensure follow-up on investigation recommendations are implemented 6. Orica to provide evidence that their monitoring equipment are calibrated as per the manufacturers recommendations 7. Require Orica to provide an independent investigation for selected exceedances and to ensure recommendations are implemented and the results are provided to Whitehaven 8. Require Orica to have an Overpressure Management Plan, including predicting overpressure	2	D	L
Gas plume	Generation of visible plume resulting in neighbour complaint	1. LTA explosive product 2. Damp material 3. Incorrect ratio of explosives mixture 4. Cracks and fissures in hole	1. Use of a reputable blast contractor 2. Blast MP, which includes monitoring requirements 3. Pre design drilling and provision of information to blast contractor 4. Experience from previous blasts 5. Consideration of weather conditions 6. Pre blast design risk assessments involving blast contractor	3	C	H	1. Whitehaven personnel to liaise with Orica re. Improved modelling and blast design 2. Engage an industry expert to audit Orica's operational procedures and provide recommendations 3. Formalise a procedure for the monitoring of stemming material (delivery to site and re-handling) 4. Consider alternative blast contractor 5. Ensure follow-up on investigation recommendations are implemented 6. Orica to provide evidence that their monitoring equipment are calibrated as per the manufacturers recommendations 7. Require Orica to provide an independent investigation for selected exceedances and to ensure recommendations are implemented and the results are provided to Whitehaven 8. Require Orica to have an Overpressure Management Plan, including predicting overpressure	2	D	L
Blast scheduling	Blasting carried out in breach of agreed schedule	1. Blasting carried out outside of agreed blasting times (9am - 5pm Mon-Sat) 2. More than blast per day	1. Blast Management Plan 2. Management and blast contractor awareness of conditions placed upon Werris Creek	2	D	L	1. Modify EPL to change wording from approval to advised to firing a misfire			

APPENDIX E - Procedures

A) **Pre-Blast Weather Check Process**

Version 1.1 27th April 2012

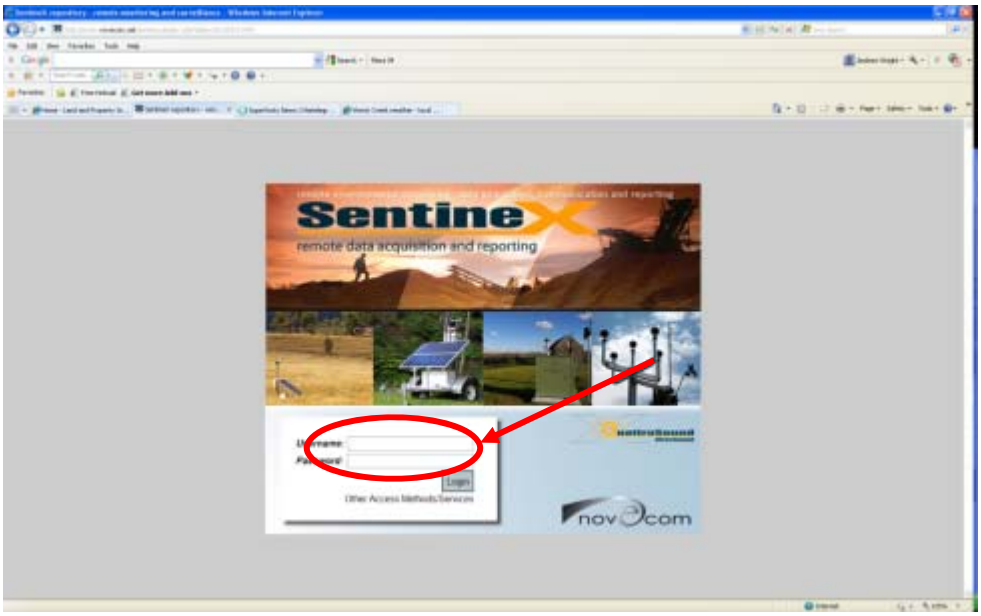
1. WEATHER STATION ACCESS

1. Double click on the desktop shortcut called “Weather”; otherwise open Internet Explorer web browser page and enter the following web address:

www.novecom.com.au/sentinex

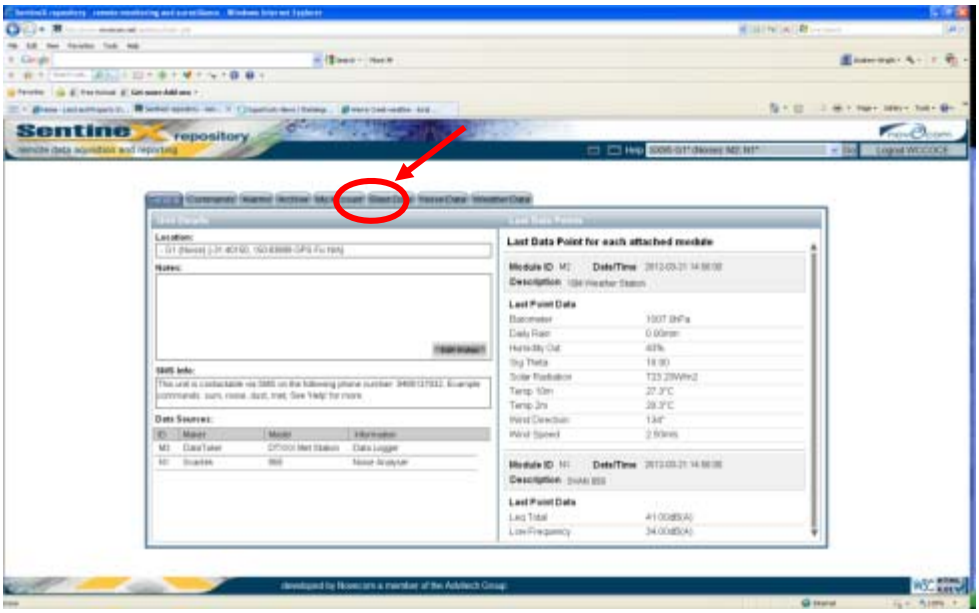
2. At the website login page, enter the following Username and Password:

USERNAME: XXXXXX
PASSWORD: XXXXXX



2. WEATHER STATION

a) The “General” page will appear, click on the “Blast Data” tab



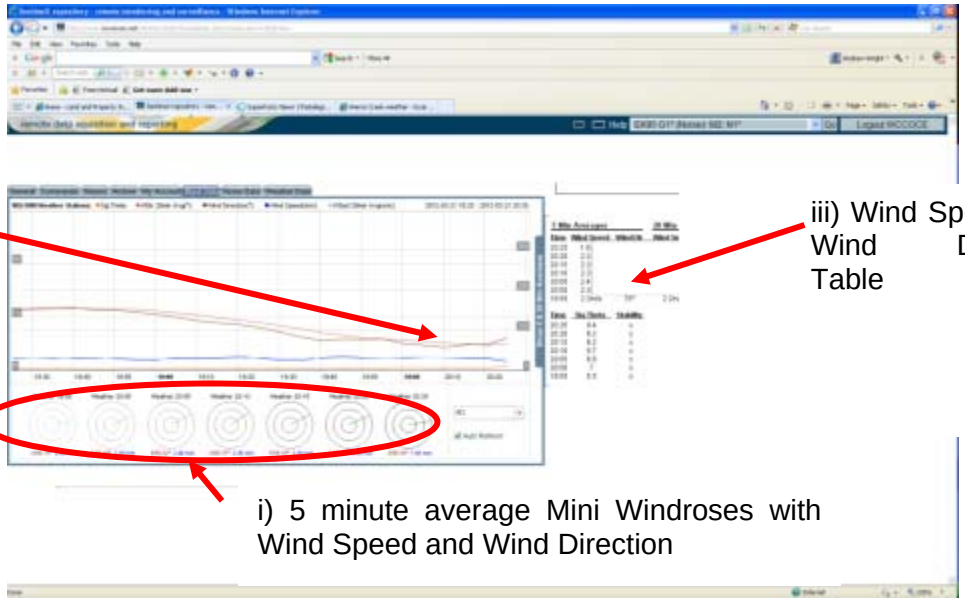
b) The Blast Data page will appear. This page has three components:

i. Mini Wind Roses with Wind Direction and Wind Speed along the bottom of the box. The right hand Mini Wind Rose represents the latest 5 minute average, with the previous 5 minute average period sequentially going back in time moving the left

ii. Strip Graph of weather conditions including Sigma Theta (ignore), 20 minute average Wind Speed and Wind Direction and 5 minute average Wind Speed and Wind Direction.

Move the mouse cursor over the lines in the strip chart. If the cursor is over the right edge of the line, this is the most recent 5 minute weather data average. The actual weather data is given immediately above the bottom strip chart to the left. Here you will find the 5 minute noise level average for "Leq Total (dB(A)):" and "Low Frequency (dB(A)):" for a specific date and time that is on the right above the strip chart

iii. Table of 5 minute average and 20 minute average Wind Speed and Wind Direction



c) Easiest feature to use is i) Mini Wind Roses to quickly read off the wind direction and wind speed when asked for by Orica or WCC Production

3. BLASTING WEATHER REVIEW

a) OCE completes first Sentry Check to confirm Sentries are in position and secure. Once each Sentry has confirmed they are in position and secure, the OCE hands over control to Orica Shot Firers

b) Orica Shot Firers will confirm they have commenced programming (can take up to 15 minutes) and communicate over 2WAY asking for a "Blasting Weather Check"

c) WCC Staff will confirm that the next "Weather Update is in X minutes" where X is less than 5 minutes

d) When the next 5 minute Weather Update is reported on the "Blast Data" page as per Step 2, the WCC Staff will check the latest 5 minute weather data against the Blasting Wind Rose criteria and plan outlined below:

DO NOT BLAST unless approved by the Operations Manager	**Wind Direction from 182^{o} to 204^{o}** towards Werris Creek
	Wind Speed >6m/s in any direction
OK TO BLAST	Any other Wind Direction (i.e. 0^{o} to 181^{o} and 205^{o} to 359^{o})

e) WCC Staff will over the 2WAY either "OK to Blast" or "**DO NOT BLAST**" to Orica Shot Firers

f) When the Programming of Shot is completed, the Orica Shotfirers will request another "Blasting Weather Check" and the WCC Staff will confirm that the next "Weather Update is in X minutes" where X is less than 5 minutes

g) When the next 5 minute Weather Update is reported on the "Blast Data" page as per Step 2, the WCC Staff will communicate whether the latest 5 minute weather data is "OK to Blast" or "**DO NOT BLAST**" against the Blasting Wind Rose criteria

h) If "OK to Blast", Orica Shot Firers will complete fire the blast within the next 5 minute period

i) If "**DO NOT BLAST**", Orica Shot Firers will ask for another "Blasting Weather Check" at the next 5 minute Weather update. If the second 5 minute Weather Update is communicated by the Production Site Clerk as "**DO NOT BLAST**", Orica Shot Firers will ask the OCE whether to continue or de-program the blast

j) If Orica Shot Firers are asked to continue, then recommence to Step 3b otherwise blast is deferred pending Operations Managers approval

B) **Road and Rail Closure Procedure**

APPENDIX F - Inspection Proforma

No inspection proformas for the blast management plan

APPENDIX G - Review Proforma

Period of Review: **Date:** **Name:** **Signed:**

BMP Section	Clause	Compliant	Evidence/Comment	Recommendation
2.0	Responsibilities			
3.1	PA 10_0059			
3.2	Statement of Commitments			
3.3	EPL 12290			
6.0	Risk Assessment			
7.1	Blast Criteria			
7.2	Blast Objectives and Targets			
8.2	Property Acquisition and Private Agreement			
8.3	Pre-Blast Design Risk Assessment			
8.4	Blast Design			
8.5	Predictive Vibration Site Law			
8.6	Burden Profiling			
8.7	Drilling			
8.8	Shotfirer Inspections			
8.9	Loading Explosives and Detonators			
8.10	Stemming Height and Quality			
8.11	Initiation Sequence			
8.12	Sleeping Shots			
8.13	Blast Times and Frequency			

BMP Section	Clause	Compliant	Evidence/Comment	Recommendation
8.14	Blast Notification			
8.15	Road and Rail Closure			
8.16	Pre-Blast Weather Check			
8.17	Pre-Blast Planning			
8.18	Structural Inspections			
9	Blast Monitoring			
10	Inspections			
11	Training			
12	Reporting			
13	Reviews			