DURALIE COAL MINE
Blast Management Plan

DURALIE COAL MINE
BLAST MANAGEMENT PLAN

REVISION STATUS REGISTER

Section/Page/ Annexure	Revision Number	Amendment/Addition	Distribution	DPIE Approval Date
All	Version A	Original [30 March 2011]	OEH, DP&I	-
All	Version B	Review and Approval [7 June 2011]	DP&I	-
All	Version C	Internal Review [17 June 2011]	-	-
All	Version C1	Review and Approval [17 June 2011]	DP&I	-
All	Version D	Internal Review [1 July 2011]	-	-
All	Version E	Internal Review [9 September 2011]	-	-
All	BLMP-R02-A	Edits made to: • reflect amended Project Approval conditions by Order of The Land and Environment Court of NSW dated 10 November 2011; • consider recommendations (where relevant) of independent environmental audit dated November 2011; • consider any outcomes of the Annual Review for the Duralie Coal Mine (dated September 2011); and • reflect conditions of EPL 11701 varied by Notice 1502222 on 30 December 2011.	OEH, DP&I	6-3-2012
All	BLMP – RO2-B	Annual Review [2013]	DP&I	27-9-2013
All	BLMP – RO2-C	Annual Review (2014)	DP&E	
All	BLMP-R02-D (Sep 2017)	Annual Review (2016) • Reflect DP&E review comments on BLMP and Blast Fume Management Procedure.	DP&E	24-10-2017
All	BLMP-R03-A	Updates to reflect current status of DCM and mine closure planning.	EPA, DPIE	TBC

September 2021
Document No. BLMP-R03-A
ID: 01102300-002

TABLE OF CONTENTS

LIST OF ATTACHMENTS

LIST OF APPENDICES

LIST OF FIGURES

LIST OF TABLES

1 INTRODUCTION

1.1 DURALIE COAL MINE

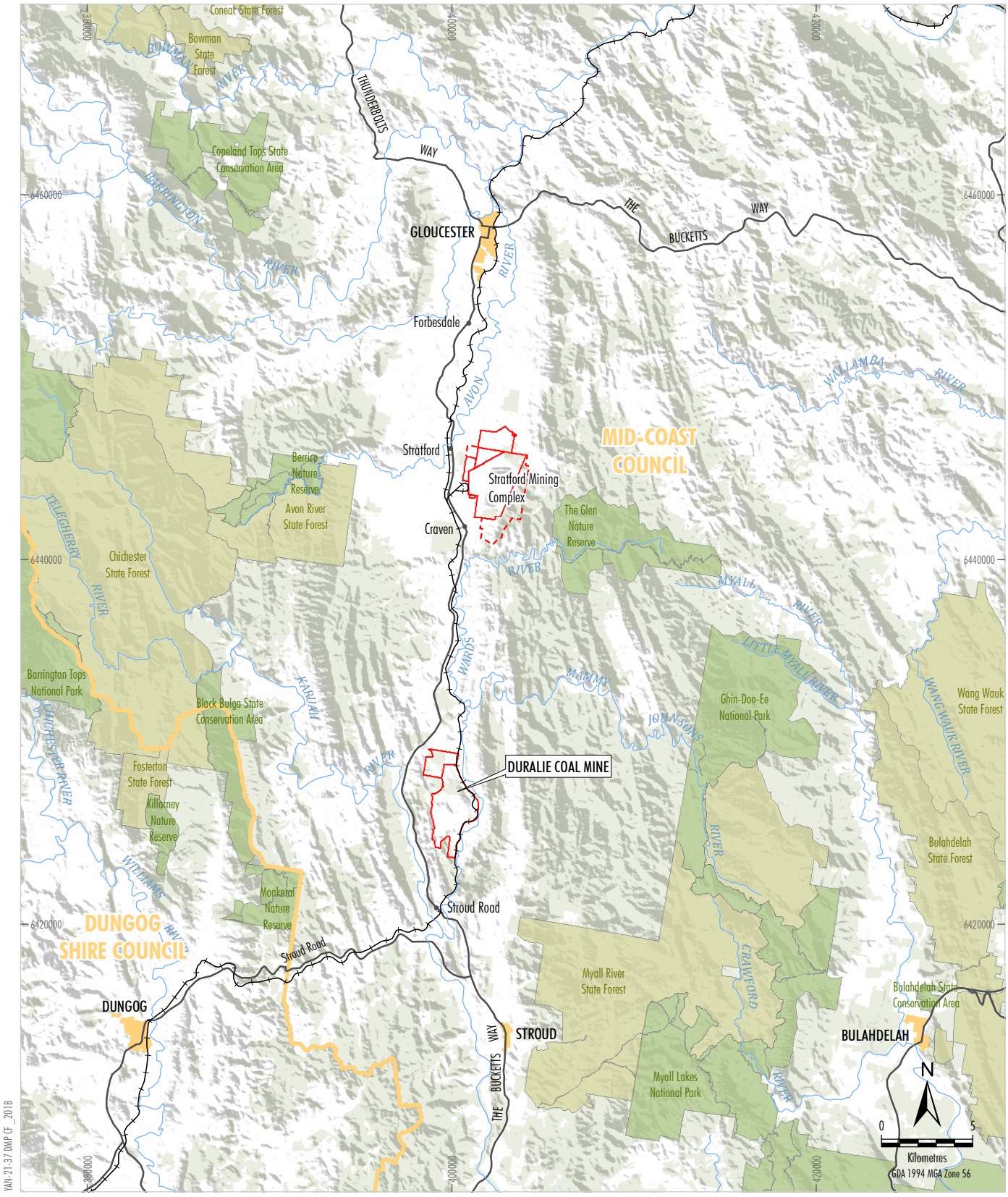
The Duralie Coal Mine (DCM) is situated approximately 35 kilometres (km) south of Gloucester in the Gloucester Valley, New South Wales (NSW) (Figure 1). Duralie Coal Pty Ltd (DCPL), a wholly owned subsidiary of Yancoal Australia Limited (Yancoal), owns and operates the DCM. The NSW Minister for Urban Affairs and Planning granted Development Consent for the DCM in August 1997 and coal production commenced in 2003.

The Duralie Extension Project (DEP) involves the extension and continuation of mine operations at the DCM. DCPL was granted approval for the DEP under section 75J of the NSW *Environmental Planning and Assessment Act, 1979* (EP&A Act) on 26 November 2010 (NSW Project Approval [08_0203]) and under sections 130 and 133 of the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC) on 22 December 2010 (Commonwealth Approval [EPBC 2010/5396]). On 10 November 2011, the NSW Project Approval (08_0203) was amended by order of the Land and Environment Court of NSW. On 1 November 2012, the NSW Project Approval (08_0203) was modified to reflect approval of the Duralie Rail Hours Modification. On 5 December 2014, NSW Project Approval (08_0203) was modified to reflect approval of the Duralie Open Pit Modification. A copy of the consolidated NSW Project Approval (08_0203) and the Commonwealth Approval (EPBC 2010/5396) is available on the Duralie Coal website (http://www.duralie coal.com.au).

The main activities associated with the approved DEP (as modified) include:

- continued development of open cut mining operations at the DCM to facilitate a total run-of-mine (ROM) coal production rate of up to approximately 3 million tonnes per annum (Mtpa), including:
  - extension of the existing approved open pit in the Weismantel Seam to the north-west (i.e. Weismantel open pit) within Mining Lease (ML) 1427 and ML 1646; and
  - open cut mining operations in the Clareval Seam (i.e. Clareval open pit) within ML 1427 and ML 1646;
- ongoing exploration activities within existing exploration tenements;
- progressive backfilling of the open pits with waste rock as mining develops, and continued and expanded placement of waste rock in out-of-pit waste rock emplacements;
- increased ROM coal rail transport movements on the North Coast Railway between the DCM and the Stratford Mining Complex (SMC) in line with increased ROM coal production;
- continued disposal of excess water through irrigation (including development of new irrigation areas within the existing ML 1427 and ML 1646) (refer below regarding status of irrigation at the DCM);
- construction of Auxiliary Dam No. 2 to relative level (RL) 100 metres (m) to provide 2,900 megalitres of on-site storage capacity to manage excess water on-site;
- progressive development of dewatering bores, pumps, dams, irrigation infrastructure and other water management equipment and structures;
- development of new haul roads and internal roads;
- upgrade of existing surface facilities and supporting infrastructure as required in line with increased ROM coal production;
- continued development of soil stockpiles, laydown areas and gravel/borrow pits;
- establishment of the permanent Coal Shaft Creek Diversion alignment adjacent to the existing DCM mining area;
- ongoing surface monitoring and rehabilitation; and
- other associated minor infrastructure, plant, equipment and activities.

An aerial photograph of the DCM general arrangement and surrounds is provided in Figure 2.



YAN-21-37 DMP CF_201B

LEGEND

- Mining Lease Boundary
- NSW State Forest
- National Park, Nature Reserve or State Conservation Area
- Local Government Area Boundary

Source: Geoscience Australia (2006);
NSW Department of Planning & Environment (2017)

DURALIECOAL
Part of the Yancoal Australia Group

DURALIE COAL MINE

Regional Location

Figure 1

YAN-21-37 DMP CF _202A

LEGEND

- Mining Lease Boundary
- Approximate Extent of Existing/Approved Surface Development
- Existing/Approved First Flush Protocol Pump Back System
- Existing/Approved Up-catchment Diversion System

Source: © NSW Spatial Services (2019)
Orthophoto: Google Earth CENS/Airbus (2020)

DURALIECOAL
Part of the Yancoal Australia Group

DURALIE COAL MINE

DCM General Arrangement

Figure 2

The activities associated with the approved Duralie Open Pit Modification include:

- an increase in the maximum depth of the Clareval open pit;
- a minor increase in the extent of surface development of the DCM of approximately 2.5 hectares, resulting from:
  - a reduction in low wall angles of the Clareval open pit and the removal of a pillar between the Clareval and Weismantel open pits to improve geotechnical stability; and
  - associated relocation of the up-catchment diversion to the west of the Clareval open pit;
- revision of mining sequence (i.e. progression of mining in the Clareval and Weismantel open pits); and
- an increase in height of the waste rock emplacement (i.e. the backfilled open pit) from approximately 110 m Australian Height Datum (AHD) to approximately 135 m AHD.

Current Status of the DCM

Condition 5, Schedule 2 of Project Approval (08_0203) authorises mining operations to be carried at the DCM until 31 December 2021. Accordingly, DCPL is planning for the commencement of the mine closure phase (i.e. after the cessation of mining operations on 31 December 2021) and has revised this Blast Management Plan (BLMP) to reflect the current stage of operations and to describe anticipated mine closure activities and blast management at the DCM for the mine closure phase.

Operations at the DCM now reflect the transition towards mine closure:

- **Clareval Open Pit:** mining of the Clareval Open Pit has now been completed, and dewatering of the pit has ceased. Partial backfilling with waste rock mined from the Weismantel Open Pit has commenced, along with shaping of the pit area to its final landform design. Mining of the Clareval Open Pit was finalised to a shallower depth than the maximum approved depth as modelled in 2014 DCM Open Pit Modification.
- **Weismantel Open Pit:** mining of the Weismantel Open Pit will continue until 31 December 2021, however, will also not occur to the maximum approved depth as modelled in 2014 DCM Open Pit Modification. Progressive backfilling of completed areas of the Weismantel Open Pit has been undertaken.
- **DCM Water Management System Changes:**
  - Following the cessation of mining of the Clareval Open Pit (now final void) and the Clareval void becoming available as a water storage, Weismantel Open Pit dewatering is now preferentially transferred to the Clareval void and not stored within the Main Water Dam. As a result, all irrigation activities for the purpose of reducing the total site water inventory at the DCM have now ceased and the DCM's Irrigation Area irrigation system has been decommissioned and removed.
  - Decommissioning of other redundant water management structures has also commenced. Consistent with the approved DCM final landform design, Auxiliary Dam No. 1 has been dewatered, decommissioned and rehabilitated.
- **Vegetation Clearance:** No new disturbance areas (within approved surface disturbance areas) are proposed.
- **Closure Planning:** The DCM's Mine Closure Planning Program (described in the DCM Mining Operations Plan and Rehabilitation Management Plan [1 January 2020 – 31 December 2021]) includes preparation of a detailed final landform design and technical assessments and works that will be undertaken and implemented as the DCM progresses towards and commences the mine closure phase.
  - DCPL is progressively completing components of the Mine Closure Planning Program, with the various technical assessments currently being completed based on the refined final landform design. The outcomes from these reviews and Mine Closure Planning Program technical assessments and works will be incorporated into a DCM Closure Plan.

DCM Activities after Cessation of Mining Operations

Following the completion of mining operations on 31 December 2021, DCPL will undertake bulk rehabilitation earthworks, which may involve some blasting activities to achieve the final landform design and satisfy geotechnical requirements. Bulk rehabilitation earthworks are anticipated to occur during 2022 and 2023 and may involve infrequent blasting. Once bulk rehabilitation earthworks are complete, blasting activities at the DCM will cease. All major fleet will then be removed from site and the mine's workforce reduced to support post-closure activities.

After the cessation of blasting, the requirement to monitor the impact of blasting activities, and blast management measures as described in Section 3, will become redundant as the potential impact no longer exists. Accordingly, following the completion of rehabilitation earthworks, DCPL would seek the NSW Department of Planning, Industry and Environment's (DPIE's) agreement and approval of redundancy of this BLMP and associated conditions in Project Approval (08_0203).

1.2 PURPOSE AND SCOPE

This DCM Blast Management Strategy (BLMP) has been prepared by DCPL in accordance with Condition 16, Schedule 3 of Project Approval (08_0203).

This BLMP outlines procedures and strategies for blasting management to ensure compliance with blast overpressure and ground vibration limits and other conditions of NSW Project Approval (08_0203) administered by the DPIE and EPL 11701 issued by the NSW Environment Protection Authority (EPA) for the DCM. This BLMP also reflects relevant conditions of ML 1646 and ML 1427. This BLMP is relevant to the area of approved surface development (Figure 2) as described in the *Duralie Open Pit Modification Environmental Assessment* (DCPL, 2014) and the area within ML 1646 and ML 1427 (Figure 2).

The overall objectives of the BLMP are to:

- ensure the safety of members of the public during blasting;
- prevent damage to private or public property as a result of blasting;
- minimise any nuisance to the public as a result of blasting; and
- minimise blast fume potential.

This revision of the BLMP has been prepared by DCPL to describe the current status of operations at the DCM and anticipated changes to DCM activities after the cessation of mining on 31 December 2021. Other administrative updates have also been included to contemporise the plan.

2 STATUTORY REQUIREMENTS

2.1 NSW PROJECT APPROVAL CONDITIONS

The conditions of NSW Project Approval (08_0203) relevant to blasting and vibration and a description of where they are referenced in this BLMP are provided in Table 1. NSW Project Approval (08_0203) is available on the DCM website (http://www.duraliecoal.com.au/).

Table 1
NSW Project Approval Requirements Relevant to Blasting

<table>
<tr><th>NSW Project Approval Condition</th><th>Requirement</th><th>Section of BLMP</th></tr>
<tr><td>Blasting Criteria:
Schedule 3,
Condition 8</td><td>The Proponent shall ensure that the blasting on the site does not cause exceedances of the criteria in Table 4.
Table 4: Blasting criteria
<table>
<tr><th>Location</th><th>Airblast overpressure level (dB(Lin Peak))</th><th>Ground vibration (mm/s)</th><th>Allowable exceedence</th></tr>
<tr><td>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>Residence on privately owned land</td><td>120</td><td>10</td><td>0%</td></tr>
<tr><td>Mammy Johnson’s Grave</td><td>-</td><td>5</td><td>0%</td></tr>
<tr><td>Former Weismantel’s Inn</td><td>-</td><td>10</td><td>0%</td></tr>
</table>
However, these criteria do not apply if the Proponent has a written agreement with the relevant landowner to exceed the criteria, and the Proponent has advised the Department in writing of the terms of this agreement.</td><td>2.4,
5.1 and 3.4</td></tr>
<tr><td>Blasting Hours:
Schedule 3,
Condition 9</td><td>The Proponent shall only carry out blasting on site between 9am and 5pm Monday to Saturday inclusive. No blasting is allowed on Sundays, public holidays, or at any other time without the written approval of the Secretary.</td><td>3.1</td></tr>
<tr><td>Blasting Frequency:
Schedule 3,
Condition 10</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) 3 blasts a week on site, averaged over any 12 month period.</td><td>3.1</td></tr>
<tr><td>Property Inspections:
Schedule 3,
Condition 11</td><td>If the Proponent receives a written request for the owner of any privately-owned land within 2 kilometres of the approved open cut mining pit on site for a property inspection to establish the baseline condition of any buildings and/or structures on his/her land, or to have a previous property inspection 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 Secretary, to:
• establish the baseline condition of the buildings and/or structures on the land, or update the previous property inspection report;
• identify any measures that should be implemented to minimise the potential blasting impacts of the project on these buildings and/or structures; and
(b) give the landowner a copy of the new or updated property inspection report.</td><td>3.2.3</td></tr>
</table>

Table 1 (Continued)
NSW Project Approval Requirements Relevant to Blasting

NSW Project Approval Condition	Requirement	Section of BLMP
Property Investigations: Schedule 3, Condition 12 (continued)	If the owner of any privately-owned land claims that buildings and/or structures on his/her land have been damaged as a result of blasting on 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 Secretary, 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 damages to the satisfaction of the Secretary. If the Proponent or landowner disagrees with the findings of the independent property investigation, then either party may refer the matter to the Secretary for resolution.	3.2.4
Operating Conditions: Schedule 3, Condition 13	The Proponent shall: (a) implement best blasting practice on site to; • protect the safety of people and livestock in the surrounding area; and • protect public or private property in the surrounding area; and • minimise the dust and fume emissions from blasting on site; and (b) 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 Secretary.	4.1 & 4.2 4.2 3.6 & 3.7 3.2
Operating Conditions: Schedule 3, Condition 14	The Proponent shall not carry out any blasting within 500 metres of: (a) a public road without the approval of Council; and (b) the North Coast Railway without the approval of ARTC.	3.3.2 3.3.1
Operating Conditions: Schedule 3, Condition 15	The Proponent shall not carry out any blasting within 500 metres of any privately-owned land or land not owned by the Proponent unless: (a) 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 Department in writing of the terms of this agreement; or (b) the Proponent has: • demonstrated to the satisfaction of the Secretary that the blasting can be carried out without compromising the safety of the people or livestock on the land, or damaging the buildings and/or structures on the land; and • 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.	3.2.2
Blast Management Plan: Schedule 3, Condition 16	The Proponent shall prepare and implement a Blast Management Plan for the project to the satisfaction of the Secretary. This plan must: (a) be prepared in consultation with EPA, and submitted to the Secretary for approval within 3 months of the date of this approval, unless otherwise agreed by the Secretary; (b) describe the blast mitigation measures that would be implemented to ensure compliance with conditions 8–15 of this Schedule; (c) describe the measures that would be implemented to ensure the public can get up-to-date information on the proposed blasting schedule on site or any road closures; and (d) include a blast monitoring program to evaluate the performance of the project. *Note: The effectiveness of the Blast Management Plan is to be reviewed and audited in accordance with the requirements in Schedule 5. Following this review and audit the plan is to be revised to ensure it remains up to date (see Condition 4 of Schedule 5).*	2.5 3 3.2.1 5 7
Air Quality & Greenhouse Gas – Odour: Schedule 3, Condition 17	The Proponent shall ensure that no offensive odours are emitted from the site, as defined under the POEO Act.	3.6

Condition 2, Schedule 5 of NSW Project Approval (08_0203) outlines the requirements for management plans which are also applicable to this BLMP. Table 2 outlines these requirements and where they are addressed within this BLMP.

Table 2
Management Plan Requirements

NSW Project Approval Condition	Section of BLMP
2. The Proponent shall ensure that the management plans required under this approval are prepared in accordance with any relevant guidelines, and include:	
a) detailed baseline data;	2.6
b) a description of:	
• *the relevant statutory requirements (including any relevant approval, licence or lease conditions);*	2
• *any relevant limits or performance measures/criteria;*	2.4
• *the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures;*	
c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;	3 & 4
d) a program to monitor and report on the:	5 & 9
• *impacts and environmental performance of the project;*	
• *effectiveness of any management measures (see (c) above);*	
e) a contingency plan to manage any unpredicted impacts and their consequences;	6
f) a program to investigate and implement ways to improve the environmental performance of the project over time;	7
g) a protocol for managing and reporting any;	9
• *incidents;*	
• *complaints;*	
• *non-compliances with statutory requirements; and*	
• *exceedences of the impact assessment criteria and/or performance criteria; and*	
h) a protocol for periodic review of the plan.	7.2

2.2 ENVIRONMENT PROTECTION LICENCE CONDITIONS

DCPL is the holder of Environment Protection Licence (EPL) No. 11701, issued under the *Protection of the Environment Operations Act 1997* (POEO Act). The licence authorises the carrying out of activities at ML 1427 (dated 6/4/98) and ML 1646 (dated 4/1/11). Table 3 details the conditions in EPL 11701 relevant to blasting and where they are addressed in this BLMP.

Table 3
EPL Requirements Relevant to Blasting

EPL Condition	Requirement	Section of BLMP
L5 Blasting	*L5.1 The airblast overpressure level from blasting operations in or on the premises must not exceed: 115 dB (Lin Peak) for more than 5% of the total number of blasts during each reporting period; at either monitoring point 38, 39 or 40 in Condition P1.4.*	2.4 & 5.1
	L5.2 The airblast overpressure level from blasting operations in or on the premises must not exceed: 120 dB (Lin Peak) at any time; at either monitoring point 38, 39 or 40 in Condition P1.4.	
	L5.3 The ground vibration peak particle velocity from blasting operations carried out in or on the premises must not exceed: *5 mm/sec for more than 5% of the total number of blasts during each reporting period;* *at either monitoring point 38, 39 or 40 on Condition P1.4.*	

Table 3 (continued)
EPL Requirements Relevant to Blasting

EPL Condition	Requirement	Section of BLMP
L5 Blasting (continued)	*L5.4 The ground vibration peak particle velocity from blasting operations carried out in or on the premises must not exceed:* *10 mm/sec at any time;* *at either monitoring point 38, 39 or 40 in Condition P1.*	2.4 & 5.1
	L5.5 Blasting operations at the premises may only take place between 9:00am to 5:00pm Monday to Saturday. (Where compelling safety reasons exist, the Authority may permit a blast to occur outside the abovementioned hours. Prior written (or facsimile) notification of any such blast must be made to the Authority).	3.1
	L5.6 Offensive blast fume must not be emitted from the premises. *Definition:* *Offensive blast fume means post-blast gases from the detonation of explosives at the premises that by reason of their nature, duration, character or quality, or the time at which they are emitted, or any other circumstances:* *1. are harmful to (or likely to be harmful) a person that is outside the premises from which it is emitted, or* *2. interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted.*	3.6 & 5.3
L6 Potentially offensive odour	*L6.1 The licensee must not cause or permit the emission of offensive odour beyond the boundary of the premises.* *Note: Section 129 of the Protection of the Environment Operations Act 1997, provides that the licensee must not cause or permit the emission of any offensive odour from the premises but provides a defence if the emission is identified in the relevant environment protection licence as a potentially offensive odour and the odour was emitted in accordance with the conditions of a licence directed at minimising odour.*	3.6 & 5.3
M8 Blasting	*M8.1 All blast shots must be recorded on video from a position allowing the collars of the shot, and where possible, any face, and/or toe, to be seen on the video. The licensee must retain a copy of this video for at least 12 months after the blast was initiated.*	5.3
	M8.2 To determine compliance with conditions L5.1, L5.2, L5.3 and L5.4: *a) Airblast overpressure and ground vibration levels must be measured and electronically recorded for monitoring points 38, 39 and 40 for the parameters specified in Column 1 of the table below; and* *b) The licensee must use the units of measure, sampling method, and sample at the frequency specified opposite in the other columns.*	2.4 & 5.1

Parameter	*Units of Measure*	*Frequency*	*Sampling Method*
Airblast Overpressure	*Decibels (Linear Peak)*	*All Blasts*	*Australian Standard AS 2187.2-2006*
Ground Vibration Peak Particle Velocity	*Millimetres/second*	*All Blasts*	*Australian Standard AS 2187.2-2006*

2.3 MINING LEASE CONDITIONS

Condition 10 of ML 1646 issued by the NSW Minister for Primary Industries on 4 January 2011 and Condition 26 of ML 1427 issued by the NSW Minister for Mineral Resources on 6th April 1998 relevant to blasting limits are provided in Table 4 below with reference to the relevant sections of this BLMP.

Table 4
Mining Lease Conditions Relevant to Blasting

Mining Lease Condition	Requirement	Section of BLMP
ML 1646 Condition 10. Blasting	*(a) Ground Vibration* *The lease holder must ensure that the ground peak particle velocity generated by any blasting within the lease area does not exceed 10 mm/second and does not exceed 5 mm/second in more than 5% of the total number of blasts over a period of 12 months at any dwelling or occupied premises as the case may be, unless determined otherwise by the Department of Environment, Climate Change and Water.*	2.4 & 5.1

Table 4 (continued)
Mining Lease Conditions Relevant to Blasting

Mining Lease Condition	Requirement	Section of BLMP
ML 1646 Condition 10. Blasting (continued)	*(b) Blast Overpressure* *The lease holder must ensure that the blast overpressure noise level generated by any blasting within the lease area does not exceed 120 dB (linear) and does not exceed 115 dB (linear) in than 5% of the total number of blasts over a period of 12 months, at any dwelling or occupied premises as the case may be, unless determined otherwise by the Department of Environment, Climate Change and Water.*	2.4 & 5.1
ML 1427 Condition 26 (Blasting)	*26 The lease holder shall monitor noise and vibration and institute controls, generally in accordance with the recommendations of Australian Standard AS-2187-1993 and ANZEC Guidelines.* *(a) Ground Vibration The lease holder shall design all blasts on the basis that the ground vibration peak particle velocity generated by any blasting within the subject area, shall not exceed the levels in or conditions of the EPA Licence for the mine, at any dwelling or occupied premises not owned by the lease holder, the holder of an authority under the Mining Act, or not subject to a valid agreement with the lease holder, with respect to the effects of blasting.* *(b) Blast Overpressure* *The lease holder shall design all blasts on the basis that the blast overpressure noise level generated by any blasting within the subject area, shall not exceed the levels in or conditions of the EPA Licence for the mine, at any dwelling or occupied premises not owned by the lease holder, the holder of an authority under the Mining Act, or not subject to a valid agreement with the lease holder, with respect to the effects of blasting.*	2.4 & 5.1 3 3

2.4 COMPLIANCE WITH BLASTING CRITERIA, STANDARDS AND GUIDELINES

Blasting at DCPL will be conducted in accordance with the following:

- The ground vibration peak particle velocity and Airblast overpressure criteria detailed in NSW Project Approval (08_0203) (Section 2.1), the EPL 11701 conditions relevant to blasting (Section 2.2) and the ML 1646 and ML 1427 conditions relevant to blasting (Section 2.3).
- Australian Standard (AS 2187.2:2006) Explosives: Storage and Use Part 2: Use of Explosives.
- The Australian & New Zealand Environment Conservation Council (ANZECC) Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration (1990).
- Hours of blasting as set out in Condition 9 of NSW Project Approval (08_0203) and Condition L5.5 of EPL 11701.
- DCPL's Explosives Principal Control Plan (DCPL, 2016).
- Duralie Coal Mine Blast Fume Management Procedure (Refer Attachment 1).

2.5 CONSULTATION

In accordance with Condition 16(a), Schedule 3 of NSW Project Approval (08_0203), the BLMP is to be prepared in consultation with the EPA. This revised BLMP will be provided to the EPA for comment, prior to submission to the DPIE for approval. A record of consultation with the EPA will be provided in Appendix A. The revision status of this BLMP is provided on the title page of the plan.

2.6 BASELINE DATA

A detailed description of baseline blasting data is provided in the *Duralie Extension Project Noise and Blasting Impact Assessment* (Heggies Australia, 2010) and *Duralie Open Pit Modification Noise and Blasting Assessment* (SLR, 2014) which are available on the Duralie Coal website (www.duraliecoal.com.au).

3 MANAGEMENT MEASURES

The blast management measures described in this section will continue to be undertaken until blasting activities at the DCM have been permanently ceased after the completion of bulk rehabilitation earthworks.

In addition to the DCPL's blast design and implementation methodologies, the following activities shall be undertaken to minimise any potential impacts of blasting at the DCM:

- Blast design addressing aspects including total charge size, instantaneous charge size, delay between blast hole explosive initiation, direction of initiation (taking into account potentially affected receivers), type and quantity of stemming material, geology, use of decking, provision for burden relief, etc.
- Evaluation of the potential for faceburst due to insufficient face burden.
- Evaluation of the overpressure enhancing potential offered by adverse prevailing weather conditions, particularly low, dense cloud cover, strong winds and temperature inversions. Blasting will not be undertaken if unacceptable environmental outcomes are anticipated.
- Evaluation of the potential for the generation of dust and/or fume (Sections 3.6 & 3.7).
- Evaluation of the potential for dust and/or fume to be carried to a nearby receiver as a consequence of receiver proximity, wind direction and wind strength.
- Evaluation of the potential for flyrock generation.
- Adequate preparation of bench surface to drain water away from blast holes.
- Adequate preparation of the blast surface (e.g. dozing/grading) to provide an even surface for drilling.
- Inspection of the blast surface to ensure that there is no significant geological weakness (e.g. fracturing from a previous blast) that may contribute to inadequate containment of explosive energy during blasting.
- Completion of a Blasting Checklist (Attachment 2) to evaluate the potential impacts of the blast.
- Quality control for supplied stemming gravel to ensure the material is acceptable in terms of size, rock type and angularity.
- Monitoring of the quantity of stemming gravel within each blast hole to ensure compliance with design.
- Maintaining the integrity of the stemming material such that it is not contaminated with foreign matter such as clay which may result in the explosive materials being insufficiently stemmed.
- Personnel involved in designing and undertaking blasting operations will be appropriately qualified and experienced to undertake their assigned tasks.
- External blasting expertise and specialised service providers will be utilised as required.

3.1 BLAST TIMING AND FREQUENCY

As per Condition L5.5 of EPL 11701, and Condition 9, Schedule 3 of NSW Project Approval (08_0203), blasting operations at the premises will only take place between 9:00am to 5:00pm Monday to Saturday. Where compelling safety reasons exist, the EPA may permit a blast to occur outside the abovementioned hours. Prior written (or electronic correspondence) notification of any such blast must be made to the EPA. No blasting will occur on Sundays, public holidays or any other time without the written approval of the Secretary of the DPIE, in accordance with NSW Project Approval (08_0203).

As per Condition 10, Schedule 3 of NSW Project Approval Condition (08_0203), there will be no more than three (3) blasts per week on site, averaged over any 12 month period. Only one (1) blast is to occur each day on site, unless an additional blast is required following a blast misfire.

As described in Section 1, after the cessation of mining operations on 31 December 2021, some blasting may occur at the DCM to achieve the final landform design and satisfy geotechnical requirements. These blasts would be infrequent and would continue to be conducted in accordance with the timing requirements as prescribed under EPL 11701 and Project Approval (08_0203) described above. Once bulk rehabilitation earthworks are complete, blasting would no longer occur at the DCM.

3.2 BLASTING AND LOCAL RESIDENCES

3.2.1 Notification of Blasting and/or Road Closure

A "Blasting Hotline" (**02 6538 4213**) has been established to provide the public with up-to-date information on the blasting schedule and road closures at the mine.

The existence of the "Hotline" is promoted on the DCM's website and by advertising within the Dungog Chronicle and the Gloucester Advocate on two occasions each year. The "Hotline" is also featured within the "Pink Pages" local telephone directory issued by each local newspaper as well as in the Sensis White Pages Directory (Newcastle and Kempsey Directory areas).

DCPL has provided an initial blast notification, by post, to each landowner whose property lies within the 500 m Blast Zone (Figure 3) of current operations.

Where doubt exists as to whether the blast notification has been received and a written agreement for blasting cannot be established, DCPL will also attempt to contact the landholder by any listed or known phone contact. In the event that this phone contact is unsuccessful, an inspection of this property will take place (Section 3.2.3).

Where there are known user(s) of an infrequently used road subject to road closure such as Duralie Road – for example a local landowner – such a road user would be informed by notice at the property gate or a telephone call of the proposed blast/road closure if they wished to be so advised.

The procedure for closing a public road for blasting is described in Section 3.3.2.

3.2.2 Interaction with Private Landholders

A 500 m Blasting Zone for all persons (with the exception of those persons permitted by the shot firer to be within the 500 m Blast Zone for the purposes of blast management) will be established for all blasts.

The outer limits of the 500 m Blast Zone for approved operations is shown on Figure 3. The 500 m Blast Zone includes one privately owned property (Figure 3), which is a vacant landholding without a private residence.

The following process will be followed for all blasts fired where any vacant landholding is within the 500 m blast zone:

- Inspection of the vacant property within the 500 m Blast Zone (Figure 3) will be conducted in accordance with the inspection measures described below.
- Inspections will occur twice, once in the morning of the day of the scheduled blast and one just prior to the blast (within an hour).

YAN-21-37 DMP BlastMP_203B

LEGEND

- Mining Lease Boundary
- Approximate Extent of Existing/Approved Surface Development
- Privately Owned Land
- Council Owned Land

Source: © NSW Spatial Services (2019)
Orthophoto: Google Earth CENS/Airbus (2020)

DURALIECOAL
Part of the Yancoal Australia Group

DURALIE COAL MINE

500 m Blast Zone

Figure 3

General Inspection – Morning of the Scheduled Blast

DCM personnel will drive Duralie Road viewing the property frontage and access points for signs of recent visitation to private lands. DCM personnel will:

- inspect access points including gates for recent tyre marks;
- check for signs of disturbance of any accumulated vegetation across areas of access;
- check for recent disturbance of gates; and
- inspect the property for activity.

Detailed Inspection of Unattended Lands – One Hour prior to Blasting

1. Closure of Duralie Road (by NSW Roads and Maritime Services' qualified personnel) at least 1 hour prior to the blast. This prevents access to private lands, after closure is confirmed a detailed inspection shall commence.
2. DCM personnel will drive or walk, as appropriate, the actual boundaries of the lands subject to blasting and inspect the lands with binoculars if required. Visual inspection will take place where clear lines of sight are available for the relevant property.
3. DCM personnel will conduct a thorough visual inspection of the property to check for livestock and persons, in addition DCM personnel will stop and listen for activity. The current vacant private land within the 500 m blast zone (Figure 3) has clear lines of sight such that a comprehensive inspection of all aspects of the property is possible from various viewpoints along the property boundary.
4. DCM personnel will attempt to identify any changes on the property and any evidence of occupation or recent activity such as mowing, slashing, maintenance, new vehicles, burning off or mail build-up.
5. Once the boundaries have been checked, mine personnel will relocate to sentry viewing areas which overlook private lands

In the event that DCM personnel determine that someone is/may be present on the non-DCPL owned land, the following measures will be undertaken:

1. Should livestock or persons be detected on private lands within the 500m Blast Zone then the DCM personnel shall report to the shot-firer and the blast shall be postponed.
2. The DCM personnel shall not make contact with any persons on private lands.
3. The shot-firer shall report to the DCM Manager of Mining Engineering of the presence of persons or livestock on the private lands.
4. Blasting will be postponed until such a time that it is confirmed that the persons are notified and a suitable determined blast time can be agreed. If this is not possible, blasting measures will be implemented which will ensure the safety of people and livestock on the land are not compromised.

   The measures could include reduction of maximum instantaneous charge size, increased charge delay and flushing prepared blast holes to neutralize primers and boosters. The type of measure will be determined by DCM Management and the DCM Manager of Mining Engineering and will account for location of the proposed blast within the pit and distance to the relevant private landholding.

3.2.3 Property Inspections

If DCPL receives a written request from the owner of any privately-owned land within 2 kilometres of the approved open cut mining pit for a property inspection to establish the baseline condition of any buildings and/or structures on his/her land, or have a previous property inspection report updated, then within 2 months of receiving this request, DCPL will:

(a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Secretary of the DPIE, to:
- establish the baseline condition of the buildings and/or structures on the land, or update the previous property inspection report; and
- identify any measures that should be implemented to minimise the potential blasting impacts of the project on these buildings and/or structures; and

(b) give the landowner a copy of the new or updated property inspection report.

In addition, DCPL facilitates routine property inspections of privately-owned dwellings with selection taking into account location relative to current or future operations, history of past inspection and concern regarding building damage (e.g. observed cracking) expressed by the owner amongst other factors.

3.2.4 Property Investigations

If the owner of any privately-owned land claims that buildings and/or structures on his/her land have been damaged as a result of blasting on site, then within 2 months of receiving this claim, DCPL will:

(a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Secretary of the DPIE, 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 DCPL will repair the damages to the satisfaction of the Secretary of the DPIE.

If DCPL or the landowner disagrees with the findings of the independent property investigation, then either party may refer the matter to the Secretary of the DPIE for resolution.

3.2.5 Property Purchase

DCPL will conduct annual checks of the ownership of properties within two kilometres of the mine using current land tenure records. In the event that non-company owned land is under new ownership, the notification and inspection procedures described in Section 3.2.2 will be enacted with the new owner and fresh attempts to develop a written agreement for blasting will be undertaken.

3.3 BLASTING WITHIN 500 M OF PUBLIC INFRASTRUCTURE

3.3.1 Blasting within 500 m of the North Coast Railway Line

Permission has been obtained from the Australian Rail Track Corporation (ARTC) for blasting within 500 m of the North Coast Railway Line (Figure 3). A protocol for blasting within 500 m of the North Coast Railway Line with concurrence of ARTC was previously established by the mining contractor, Henry Walker Elton Contacting (HWE), prior to blasting occurring within that area.

The current protocol is for ARTC to be notified with a minimum of twenty-four (24) hours advanced warning of the intention to fire a blast within 400 m of the North Coast Railway Line. A sentry is placed to observe the railway line for rail traffic and communications made with the shot-firer. In the event that rail traffic is observed on the rail line the blast is delayed and then detonated when the rail line is clear of traffic.

3.3.2 Blasting within 500 m of a Public Road

Sentries will be employed in the event of road closure and for the inspection of non-company owned land (Section 3.2.2). The location of these sentries will be determined by the Drill and Blast Engineer, with the agreement of the shot firer and the Mining Supervisor (Open Cut Examiner [OCE]), and will ensure adequate visibility of all non-company owned lands and roadways within the 500 m Blast Zone.

Sentries will also be employed at the DCM to ensure that the 500 m Blast Zone is maintained until the shot firer deems it is safe to re-enter the 500 m Blast Zone. The location of sentries will be determined by the Drill and Blast Engineer, the shot firer and the Mining Supervisor (OCE) before each blast.

Duralie Road is the only public road that is subject to road closure when blasting occurs. Permission has been obtained from the Great Lakes Council (GLC) (now the MidCoast Council [MCC]) for blasting within 500 m of the Duralie Road. When closure of this road is necessary a dedicated road closure process is employed. This road closure process addresses:

- MCC notification;
- notification to potentially impacted private property owners;
- traffic control in accordance with NSW Roads and Maritime Services' requirements; and
- blast sentry locations.

3.4 BLASTING AT SITES OF SIGNIFICANCE

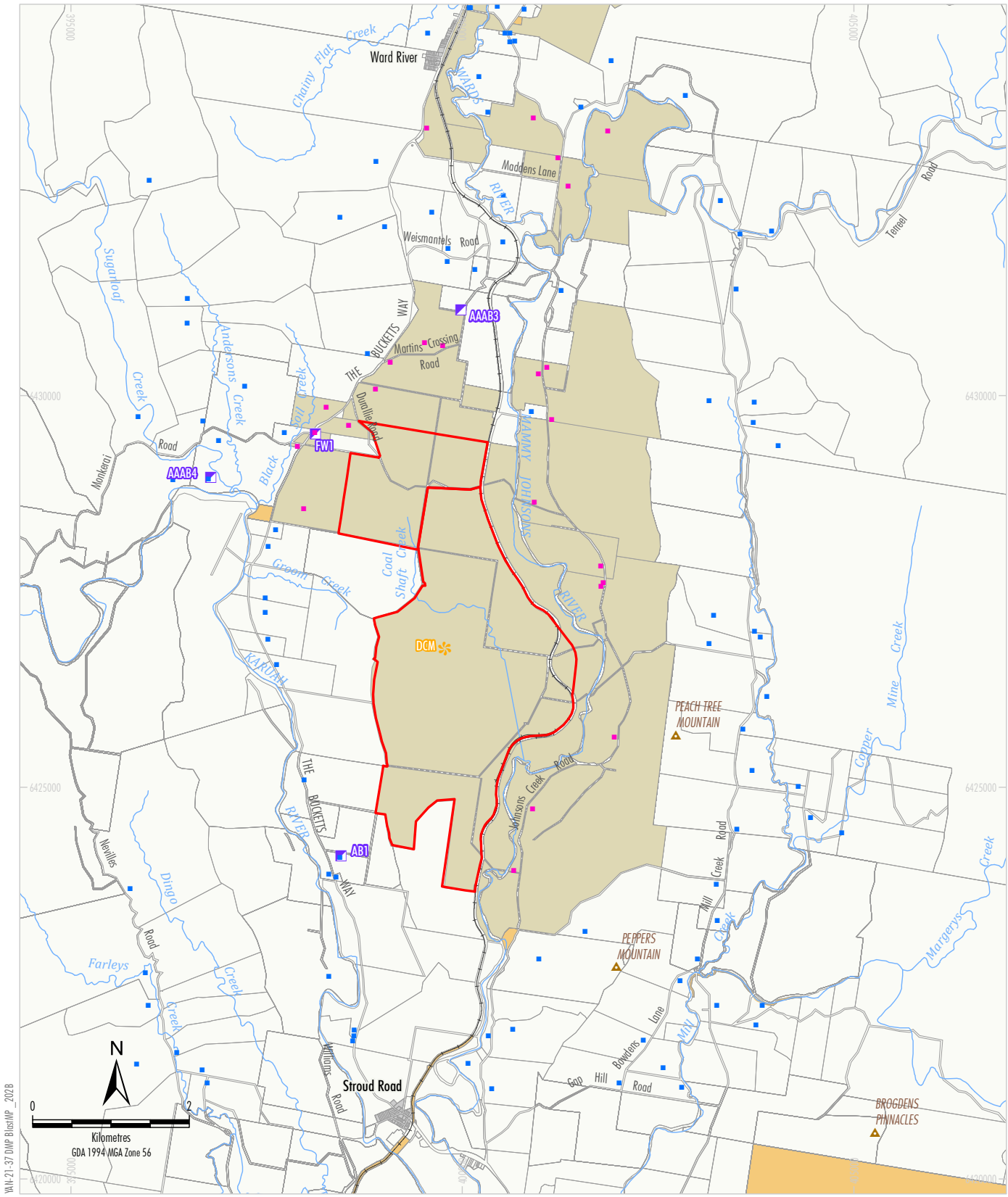
3.4.1 Mammy Johnsons Grave

No blasting under this BLMP will occur within 3,000 m of Mammy Johnsons Grave. Blast design utilised at the DCM provides for a Maximum Instantaneous Charge (MIC) within the range 400 – 1,500 kilograms. At this charge range there is negligible potential for blasting to exceed the NSW Project Approval limit of five (5) millimetres per second (mm/s) ground vibration at this location (Section 2.1).

In order to validate the above anticipated blasting impacts at Mammy Johnsons Grave, a series of ten consecutive blasting events was monitored at the grave site. A report evaluating results from this monitoring sequence was prepared and provided to the former Department of Planning and Industry (DP&I) on 8 March 2012. In consultation with former DP&I it was determined this report provided sufficient evidence that there is negligible potential to exceed the NSW Project Approval blasting criteria at Mammy Johnson's Grave and no further blast monitoring is required to be conducted at Mammy Johnson's Grave.

3.4.2 The Former Weismantel's Inn

A blast monitor has been situated at the former Weismantel's Inn to measure ground vibration and all blasts are monitored at this location (blast monitor FWI) (Figure 4). Project Approval (08_0203) requires that ground vibration peak particle velocity from blasting must not exceed 10 mm/s at the former Weismantel's Inn (Section 2.1). Blast monitoring results to date indicate that ground vibration from blasting activities at the DCM have not exceeded 5 mm/s.



LEGEND

- Mining Lease Boundary
- Yancoal - Owned Land
- Private Landholders
- Crown Land
- Urban Development
- Dwelling - Yancoal Owned
- Dwelling - Privately Owned
- Meterological Station
- Blast Monitoring
- Blast Monitoring Site

Source: © NSW Spatial Services (2020)

DURALIECOAL
Part of the Yancoal Australia Group

DURALIE COAL MINE

Blast Montoring Sites

Note: The Duralie Coal Mine blast monitoring program will become redundant following the completion of bulk rehabilitation earthworks (anticipated by end 2023).

Figure 4

3.5 BLASTING AND RISK OF INDUCED GEOLOGICAL FRACTURING

Blasting management practices (including the use of pre-split shots) will be utilised to minimise the risk of induced geological fracturing which could increase the potential for local ground waters to migrate to Mammy Johnsons River, particularly upon cessation of mining. Such practices would also serve to minimise the risk of water resources associated with the Mammy Johnsons River reporting directly to the mine workings.

3.6 FUME MANAGEMENT

The management of blast fume is described in detail in the DCM Blast Fume Management Procedure (Attachment 1). The most effective way to manage fume is to eliminate the possibility of fume being generated. The elimination of fume requires the concerted action by all entities involved in the blasting activity. This requires an understanding of the factors known to affect the generation of post blast (NOx) fume within any blast process.

A risk assessment for the potential of fume generation from blasting is conducted for each blast based on historical and current observations. The risk assessment will involve the likelihood of fume generation as a result of the following parameters:

- historic fume location;
- presence of clay;
- presence of loose/broken ground;
- heavily rain affected;
- product selection;
- rain ingress; and
- groundwater/dynamic water.

Each of the parameters outlined above is assigned a score which corresponds to the likelihood of fume generation (1=rare to 5=almost certain). The score assigned to each of the parameters is then multiplied by the full time weighting of each parameter. The sum of the resulting scores then determines the overall likelihood of fume generation.

The outcome of the risk assessment determines the guidelines for blast design, product selection and other pre-blast considerations, further detail is provided in Attachment 1. An example risk assessment matrix is shown in Table 5.

Table 5
Example Fume Likelihood Risk Assessment Matrix

Fume Likelihood	Score	Likelihood	Weight (%)
Historic fume location	1	Rare	30
Presence of clay	1	Rare	5
Presence of broken ground	3	Possible	5
Heavily rain affected	3	Possible	15
Product selection	2	Unlikely	30
Rain ingress	2	Unlikely	5
Dynamic ground water	1	Rare	10
Fume Likelihood	2	Unlikely	

5	Almost certain	Use AquaMax 270 or ThrowMax 240 & reduce sleep time to < 3days, load to allow firing at short notice
4	Likely	Use AquaMax 270 or ThrowMax 240 & reduce sleep time to < 3days, load to allow firing at short notice
3	Possible	Use AquaMax 270 or ThrowMax 240 & if major slumping occurs use AquaMax 270 & fire within 5 days
2	Unlikely	Use AquaMax 270 or ThrowMax 240 & if major slumping occurs use AquaMax 270 & fire within 8 days
1	Rare	Use AquaMax 270 or ThrowMax 240 & if major slumping occurs use AquaMax 270 & fire within 8 days

Where particular circumstances are known to increase the likelihood of a blast producing unacceptable fumes and/or odours (e.g.: prevailing wind direction indicating that any potentially generated fume will be carried to a potential receiver), control measures will be implemented to avoid those operational circumstances where practicable.

In the interest of the minimisation of fume generation to the greatest extent possible, the type of explosive used at the DCM has been limited to heavy ammonium nitrate fuel oil (HANFO), which contains an increased amount of water resistant emulsion.

3.7 MANAGEMENT OF DUST FROM BLASTING

Where particular circumstances are known to increase the likelihood of a blast producing unacceptable amounts of dust (e.g. prevailing wind direction indicating that any potentially generated dust will be carried to a potential receiver), control measures will be implemented to avoid those operational circumstances where practicable. As described in Section 6.1.1 of the DCM Air Quality and Greenhouse Gas Management Plan, proactive management measures may include:

- Fine material collected during drilling will not be used for blast stemming.
- Adequate stemming will be used at all times.
- When practicable DCPL will consider options for benches to be watered prior to loading a blast if unacceptable levels of dust are being generated.
- Blasting will only occur following an assessment of weather conditions by the Environment and Community Superintendent to ensure that wind speed and direction will not result in excess dust emissions from the site towards adjacent residences. No blasting will occur in the open cut when wind speeds exceed an average of 10 m/s over a 15 minute period.

3.8 MAINTENANCE OF BLAST ZONE POST BLASTING

The 500 m Blast Zone (Figure 3) will be maintained following the completion of the blast until a thorough inspection of the blast site can be completed by the shot firer. Once this inspection of the blast site has been completed and the shot firer is satisfied that the site is safe (i.e. no misfires have occurred), the shot firer will allow the re-establishment of access to the 500 m Blast Zone and normal operations to resume.

4 SAFETY

The blasting safety procedures described in this section will continue to be undertaken until blasting activities at the DCM have been permanently ceased after the completion of bulk rehabilitation earthworks.

4.1 PROTECTION OF LIVESTOCK

Consistent with the procedures described in Section 3.2.2, livestock agisted on mine owned land will be removed from areas which may be affected by flyrock, dust or blast fume. The owners of livestock grazing on land not owned by the mine will be advised of any impending blast that has the potential to injure their livestock in order that they may relocate their animals beyond the area of blast affectation.

4.2 PROTECTION OF PERSONS DURING BLASTING

The DCM Explosives Principal Control Plan (DCPL, 2016) addresses personal safety requirements during blasting.

A 500 m Blast Zone for all persons (with the exception of those persons permitted by the shot firer to be within the 500 m Blast Zone for the purposes of blast management) will be established for all blasts (Figure 3). The 500 m Blast Zone can also be varied at the discretion of the shot firer, Mining Supervisor or Mine Manager when considered appropriate. The 500 m Blast Zone will be maintained by placing sentries at points of entry to the blast affected area.

In cases where a portion of the 500 m Blast Zone lies within privately owned land refer Section 3.2.2.

4.3 SAFETY OF AIRCRAFT

A visual inspection of air space in the vicinity of blast area will be undertaken by the shot firer prior to initiating the blast. If there is any perceived risk to aircraft in the area of the mine as a result of blasting, the blast will be delayed until the aircraft has left the blast area.

5 BLAST MONITORING PROGRAM

The blast monitoring program described in this section will continue to be undertaken until blasting activities at the DCM have been permanently ceased after the completion of bulk rehabilitation earthworks.

5.1 MONITORING METHODS AND PROGRAM

Blast monitoring will be conducted to confirm compliance with the blasting limits/criteria defined in Sections 2.1 to 2.3 and will use a blasting seismograph which meets the standards specified in the Australian Standard Explosive Code (AS2187.2 – 2006).

Measurements of airblast overpressure and ground vibration for all blasts are measured at the monitoring locations indicated in Figure 4:

a) Land owned by E and V Shultz shown as blast monitoring site AB1, Bucketts Way;

b) Land owned by A Fisher-Webster shown as blast monitoring site AAAB3, Martins Crossing Road;

c) Land owned by P Moylan shown as blast monitoring site AAAB4, Monkerai Road; and

d) Former Weismantel's Inn shown as blast monitoring site FWI (Ground vibration only).

Note that all EPL licensed monitoring locations:

- are subject to permission to monitor being given by the property owner; and
- may be altered or supplemented on the basis of blasting results over time and/or community feedback. Any alteration to an EPL designated monitoring location would first require a relevant EPL variation.

Instrumentation used to measure the airblast overpressure and ground vibration levels are inspected and calibrated routinely to ensure the requirements of Australian Standard AS 2187.2 – 2006.

Blast monitoring program results are included within the Annual Review which is available on the DCM website (http://www.duraliecoal.com.au/). Monitoring results will be kept for a minimum of four (4) years.

5.2 VIDEO MONITORING OF BLASTS

In accordance with EPL 11701 Condition M8.1, all blast shots at the DCM are recorded on video, from a position which allows the collars of the shot, and where possible, any face, and/or toe, to be seen on the video. All videos will be a minimum duration of 1 minute following the blast and will capture any post blast fume until the fume dissipates, leaves the site or leaves the view of the camera. As required by Condition M8.1, DCPL retains a copy of each video for at least 12 months after the blast was initiated.

5.3 MONITORING OF FUME

The level and rating of blast fume generation will be monitored for each blast by the shot firer as described in the DCM Blast Fume Management Procedure (Attachment 1). The fume characteristics for all blasts will be recorded, rated and reported using the rating system in Appendices 2 and 3 of the Australian Explosives Industry and Safety Group Inc. Code of Practice titled "Prevention and Management of NOx Gases in Surface Blasting, Edition 2, August 2011". In situations where fume has been generated, an assessment will be made of the extent to which the fume has travelled as well as its dispersion time. Both will be recorded along with the level of fume generated.

5.4 MONITORING PROGRAM FOR FLYROCK DISTRIBUTION

As outlined in Section 3.8, following each blast, the shot firer will inspect the blast site to determine whether all explosive has satisfactorily detonated and whether it is safe for work to resume in the area. During this inspection a visual assessment will be made of flyrock distribution in the immediate area.

When blasting occurs in a location where there is a potential for flyrock to reach the North Coast Railway Line, an inspection of the railway line will be conducted following the blast to determine whether flyrock has reached the railway line. If the railway line has been affected by flyrock, the rock will be removed in order to make the railway line safe.

Where blasting occurs in a location where there is a potential for flyrock to reach a public road, an inspection of the road will be undertaken immediately after the blast to ascertain whether flyrock has reached the road. If flyrock is on the road it will be removed before the road is re-opened.

Similarly, where blasting occurs in a location where there is a potential for flyrock to reach a private property, an inspection of the private property, with the land owners consent, will be undertaken immediately after the blast to ascertain whether flyrock has reached the private property. If flyrock is on the private property it will be removed, with the land owners consent.

6 BLASTING PROTOCOLS & CONTINGENCY PLAN

The requirements for implementation of the protocols, investigation and notification procedures described in this section will cease once blasting activities cease at the DCM. Blasting activities at the DCM will cease following the completion of bulk rehabilitation earthworks, which are anticipated to be completed in 2023.

An Incident Investigation will be required when any one of the following incidents arises following blasting:

- Monitoring indicates an exceedance of the blasting limits/criteria stated within the conditions of NSW Project Approval (08_0203), ML 1646 or ML 1427 or EPL 11701 (Sections 2.1 to 2.3);
- Breach of any other Licence, Lease or Project Approval condition relating to blasting;
- Generation of blast fume;
- Receipt of a complaint from a member of the public or a public authority following blasting; and
- Evidence of structural damage to nearby privately or publicly owned structures attributable to blasting.

6.1 CONTINGENCY PLAN

In the event of any of the above incidents, DCPL will implement the following Contingency Plan:

- report any non-compliant blast (in terms of monitored results) to EPA, DPIE and NSW Resources Regulator as per the notification procedures outlined in Section 6.2;
- record the blasting related complaint on the DCM Complaint Register and conduct appropriate follow up as per DCM complaint management procedures; and/or
- commission a dilapidation survey utilising a DPIE approved structural engineer where structural damage of privately or publicly-owned structures potentially attributable to blasting has been reported to DCPL. This survey is to ascertain the cause of the damage and to evaluate possible remedial works should the damage be deemed due to blasting; and/or
- review and assess the blast design and implementation procedures to determine the likely cause of the incident and to identify appropriate mitigation measures:
  - review of the blast design to identify possible explanations for the non-compliance (i.e. whether suitable blast controls were implemented in the blast design and were implemented correctly); and
  - review of the blast monitoring results and meteorological data to identify whether meteorological conditions may have contributed to the problem.

6.2 NOTIFICATION PROCEDURES

In the event that monitoring indicates an exceedance of NSW Project Approval (08_0203), EPL or ML blasting limits/criteria detailed in Sections 2.1 to 2.3, the following notification procedures will be implemented:

- The exceedance of the blasting criteria will be reported to the Operations Manager and Environment & Community Superintendent (or delegate) within 24 hours of assessment completion.
- DCPL will report the exceedance of the blasting criteria to the EPA and the DPIE as soon as practicable (i.e. within 24 hours of assessment completion).

DCPL will provide written details of the incident to the EPA and the DPIE within 7 days of the date on which the incident occurred as required by Condition R2.2 of EPL 11701 and Condition 6 of NSW Project Approval (08_0203).

6.2.1 Blast Fume

In accordance with the DCM's Pollution Incident Response Management Plan (PIRMP) and DCM Blast Fume Management Procedure (Attachment 1), DCPL is required to notify the relevant regulatory authorities including the EPA and DPIE of any blast producing post-blast fume that rates 3 at its highest extent and leaves the site, or any blast that rates 4 and 5.

In this event, an investigation process will be undertaken to identify any possible mitigation measures which may be implemented to minimise the potential for ongoing fume generation as a result of blasting. The investigation process will be undertaken in accordance with Sections 5 and 6 of the Australian Explosives Industry Safety Group (AEISG) Code of Practice; "Prevention And Management Of Blast Generated NOx Gases In Surface Blasting" and is summarised in Section 3.7 of the DCM Blast Fume Management Procedure. As required by Condition R2.2 of EPL 11701, DCPL will provide written details of the incident to the EPA with 7 days of the date on which the incident occurred.

Any reasonable and feasible control measure which may prevent the ongoing generation of fume at the DCM which arises as a result of the investigation process will be implemented.

7 ANNUAL REVIEW AND IMPROVEMENT OF BLMP

7.1 ANNUAL REVIEW

In accordance with Condition 3, Schedule 5 of NSW Project Approval (08_0203), DCPL will prepare an Annual Review of the environmental performance of the DCM by the end of December each year. Annual Reviews are made publicly available on the DCPL website, in accordance with Condition 10, Schedule 5 of NSW Project Approval (08_0203).

The Annual Review will specifically address the following aspects of Condition 3, Schedule 5 of Project Approval (08_0203), which are directly relevant to blast management:

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

This BLMP will be reviewed within three months of the submission of an Annual Review, and revised where appropriate, as described in Section 7.2 below.

7.2 BLAST MANAGEMENT PLAN REVIEW

In accordance with Condition 4, Schedule 5 of NSW Project Approval (08_0203), this BLMP will be reviewed, and if necessary revised to the satisfaction of the Director-General of the DPIE within three months of the submission of:

- an Annual Review, in accordance with Condition 3, Schedule 5 of NSW Project Approval (08_0203);
- an incident report, in accordance with Condition 6, Schedule 5 of NSW Project Approval (08_0203);
- an audit, in accordance with Condition 8, Schedule 5 of NSW Project Approval (08_0203); or
- any modification to the conditions of NSW Project Approval (08_0203).

In addition, the BLMP will be revised to the satisfaction of the Director-General of the DPIE if necessary, to ensure the plan is updated on a regular basis and to incorporate any recommended measures to improve environmental performance.

This BLMP is publicly available on DCM's website, in accordance with Condition 10, Schedule 5 of NSW Project Approval (08_0203). A hard copy is also kept at the DCM.

8 ROLES AND RESPONSIBILITIES

Table 6 details the DCM staff responsibilities relevant to implementation of this BLMP.

Table 6
BLMP Implementation Responsibilities

Role	Responsibility
Operations Manager	Provide adequate resources to implement the requirements of the BLMP.
	Notify Yancoal corporate of blast and blast fume incidents (as defined in Section 6).
Technical Services Manager	Provide adequate resources so this BLMP is communicated to all personnel involved in the blasting process.
	Approves blast designs and signs off all blasts.
Mining Supervisor (Open Cut Examiner)	Ensure all employees fully comply with this BLMP and the Blast Fume Management Procedure.
	Ensure adequate training and assessment of employees undertaking blast activities.
	Ensure any person exposed to NOx gases seeks medical attention immediately as per the Blast Fume Management Procedure .
Drill and Blast Engineer	Assist in relevant reviews of this BLMP.
	Design blasts to comply with relevant blast limits/criteria and to minimise blast fume.
	Provide geological information for blast design and management of blast fume.
	Assess all post blast fume according to AEISG Rating Scale, and record results according to Blast Fume Management Procedure (Attachment 1).
Environment and Community Superintendent	Notify relevant authorities and potentially affected external stakeholders of pollution incidents.
	Coordinate the response to blast and blast fume incidents and initiate the Pollution Incident Response protocol where required.
	Prepare reports relating to blast and blast fume incidents.
	Provide all employees and contractors adequate training in environmental awareness, legal responsibilities, and pollution incident response.
	Coordinate relevant reviews of the BLMP.
Environment and Community Advisor	Assist with the response to blast and blast fume incidents.
	Assist with the reporting of blast and blast fume incidents.

8.1 TRAINING

The DCM site induction informs all employees, contractors and visitors about general blast procedures and restrictions at the DCM and on blast fume generation and the potential impacts of blast fumes. DCM blast crew are trained on blast product selection, blast design, industry standards and guidelines and blast fume management. Blast fume management training includes:

- Health impacts of NOx gases.
- Potential causes of blast fume.
- Fume mitigation and management measures.
- Blast fume rating and post blast assessment procedures.
- Incident investigation and contingency plan procedures.
- Notification procedures associated with post-blast fume events.

9 REPORTING PROTOCOLS

In accordance with Condition 2 (g), Schedule 5 of NSW Project Approval (08_0203), DCPL has developed protocols for managing and reporting the following:

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

The management of incidents is described in the DCM Pollution Incident Response Management Plan (PIRMP). The management of complaints and non-compliances is described in detail in the DCM Environmental Management Strategy. The management of exceedances of performance criteria relevant to blasting is detailed in Section 6 of this BLMP. The DCM PIRMP and Environmental Management Strategy are available on the DCM's website.

10 REFERENCES

ANZECC (1990) *Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration*. Australian and New Zealand Environment Council, Canberra.

DCPL (2014) *Duralie Open Pit Modification Environmental Assessment.*

DCPL (2016) *Duralie Coal Mine Explosives Principal Control Plan*.

Heggies Australia (2010) *Duralie Extension Project Noise and Blasting Impact Assessment.*

SLR (2014) *Duralie Open Pit Modification Noise and Blasting Assessment.*

11 DEFINITIONS

ANFO	A mixture of ammonium nitrate and fuel oil with or without a dye colouring agent (Definition from AS2187.0).
Dry Holes	Blast hole with no greater than 0.5 metres of water, which can be bagged off using a gas bag.
BEZ	Blast Exclusion Zone.
Dust	Airborne particulate matter ranging in diameter from 10 to 50 microns.
Dynamic Water	Water that is in motion (i.e. flowing water)
NOx (Oxides of Nitrogen)	A multiple combinations of oxides of nitrogen (N_2O_2, NO, NO_2, N_2O_3, N_2O_4, N_2O_5) with nitrogen dioxide (NO_2) being the principle hazardous nitrous fume.
Post Blast Fume	Gases generated by the detonation of explosives during blasting.
OCE	Open Cut Examiner
Precursor	A material resulting from a chemical or physical change when two or more substances consisting of fuels and oxidisers are mixed is intended to be used exclusively in the production of an explosive. (Definition from AEMSC Code of Good Practice Precursors for Explosives.)
Sleep Time	The time between explosives being loaded into a blast hole and their initiation (Definition from AS2187.0)
Wet holes	Blast holes containing dynamic or static water.

ATTACHMENT 1

DURALIE COAL MINE BLAST FUME MANAGEMENT PROCEDURE

YANCOAL
兖煤澳大利亚有限公司

DURALIECOAL
Part of the Yancoal Australia Group

STRATFORDCOAL
Part of the Yancoal Australia Group

STRATFORD AND DURALIE COAL MINES
Blast Fume Management Procedure

Document Control

Description

Title	Blast Fume Management Procedure
General Description	To provide a documented process for managing post blast NOx fume at the Stratford and Duralie Coal Mines in order to achieve an acceptable level of risk.
Key Support Documents	• Stratford-Duralie Coal Explosives Control Plan • NSW Work Health and Safety Act 2011 • NSW Work Health and Safety Regulation 2017 • NSW Work Health and Safety (Mines and Petroleum Sites) Act 2013 • NSW Work Health and Safety (Mines and Petroleum Sites) Regulation 2014 – Section 26 (6), 31 and Schedule 2 (4) • NSW Explosives Act 2003 • NSW Explosives Regulation 2013 • Australian Explosives Industry Safety Group (AEISG) - Prevention and Management of Blast Generated NOx Gases in Surface Blasting (August 2011) • Queensland Government - Queensland Guidance Note - Management of Oxides of Nitrogen (Nox) in Open Cut Blasting (QGN 19, 31 May 2011)

Approvals

ORIGINATOR	Kylie Hannigan	**POSITION**	Health and Safety Consultant
REVIEWED	Leonnie Taylor	**POSITION**	Safety and Training Superintendent
APPROVED	Nathan Vaughan	**POSITION**	Mine Planning Superintendent

Revision Status Register					Approved
Version #	**Date**	**Description**	**By**	**Checked**	**Name**
1	5.11.15	New document drafted from Explosives Risk Assessment outcomes and considering existing Blasting Contractor (i.e. Downer Blasting Services), Mining Contractor (i.e. Leighton's) explosives management systems and the requirements of the Work Health and Safety (Mines) Legislation.	STAC Consulting (Kylie Hannigan	CC	OG
2	12.9.17	Document revised to incorporate relevant components of the former Duralie Coal Mine Blast Fume Management Strategy and to address and incorporate DP&E review comments on the former Blast Fume Management Strategy.	Resource Strategies	MP	OG
3	21.9.21	Updates to reflect current status of DCM and mine closure planning.	DCPL/ Resource Strategies	MP	NV

The nominated Coordinator for this document is	Technical Services Superintendent

TABLE OF CONTENTS

1. PURPOSE

The purpose of this procedure is to provide a documented process for managing post blast NOx fume in order to achieve an acceptable level of risk.

2. AIM

This aim of this procedure is to minimise the likelihood of a fume event, or the impacts of a fume event if it were to occur.

3. SCOPE

This procedure applies to the Stratford-Duralie Coal Mine sites within the relevant Mining Leases for the sites and is relevant to all employees, contractors and subcontractors at the Stratford-Duralie Coal Mines.

Following the cessation of blasting activities at the Duralie Coal Mine (anticipated by end 2023), this Blast Fume Management Procedure will no longer be applicable to the Duralie Coal Mine.

4. BACKGROUND

Post-blast fume is a product of (incomplete) combustion from a blast. The products of combustion from a blast may include oxides of nitrogen, ammonia, nitric acid, carbon monoxide and carbon dioxide. These gases are often referred to as "fume". Nitrogen oxide is visible as a reddish brown colour, the other products are not visible.

Post-blast fume is composed of toxic gases (including NOx) which can be released into the atmosphere in significant quantities from blasting operations. Exposure to even quite low concentrations can pose a serious health risk. Fume can enter the body through inhalation or contact with eyes and skin. Exposure to nitrogen dioxide can result in delayed health effects that may be potentially life threatening, even though the exposed person may at first appear relatively unaffected. For this reason, anyone who has been exposed to NOx should undergo an immediate medical assessment and a continued period of observation at the advice of the treating doctor (refer Section 5.8)

The Australian Explosives Industry and Safety Group (AEISG) (2011) Code of Practice - *Prevention and Management of Blast Generated NOx Gases in Surface Blasting* has been considered in the development of the Blast Fume Management Procedure detailed in Section 5.

5. BLAST FUME MANAGEMENT PROCEDURE

5.1 FUME PREVENTION

The most effective way to manage fume is to eliminate the possibility of fume being generated. The elimination of fume requires the concerted action by all entities involved in the blasting activity. This requires an understanding of the factors known to affect the generation of post blast (NOx) fume within any blast process.

Stratford-Duralie Coal has identified the following, as the key factors involved in the generation of post blast fume within any blast process:

- Poor diesel absorption by ammonium nitrate (prill);
- Water ingress in products as the product exceeds sleep time limits;
- Presence of dynamic water within the blast holes;
- Poor loading practices;
- Emulsion formulation deficient in oil content or rich in ammonium nitrate content (oxygen rich / oxygen positive);
- Critical density;
- Critical diameter;
- Product de-sensitisation by pressure;
- Ground conditions such as presence of cavities, cracked ground, weak / soft rock areas;
- Lack of proper confinement (stemming of blast holes); or
- Direct contact of incompatible chemical compounds (e.g. DAMs 1 and DAMs 2).

Should NOx be produced in a surface blast the fault tree shown in Section 4.4 can be used to identify which of the fundamental causes was the significant contributor to the generation of NOx.

5.2 MANAGEMENT OF FUME

Management measures are required at each stage of the blasting process from product manufacture, to post blast, to minimise the likelihood of a fume event, or the impacts of an event if it were to occur. The stages of management throughout the blasting process include:

- Explosive formulation and quality assurance
- Geological conditions
- Blast design

- Explosive product selection
- On-bench practices
- Pre-Blast Considerations

These stages reflect the 6 key causes of NOx-generating conditions outlined in the AEISG (2011) *Code of Practice - Prevention and Management of Blast Generated NOx Gases in Surface Blasting*.

5.2.1 Explosive Formulation and Quality Assurance

The management measures for explosive formulation and quality assurance are:

Contributing Causes	▪ Explosive product incorrectly formulated ▪ Explosives product change ▪ Inadequate mixing of raw materials ▪ Delivery system metering incorrectly ▪ Explosive precursors not manufactured to specification ▪ Precursor degradation during transport and storage ▪ Raw material changes
Performance Objective(s)	To ensure that the explosive product and raw materials meet quality assurance requirements and therefore do not contribute to causing post blast NOx fume.
Management Strategies	▪ Quality assurance and quality control processes applied to the manufacture of explosive and precursor products. ▪ In the event of any changes to product specifications, a Change Management Procedure is applied and updated Technical Data Sheets. ▪ A visual check of materials whilst loading into holes to check for mixing is undertaken. ▪ Metering and measuring systems are calibrated within required calibration dates. ▪ Precursors are transported in accordance with Australian Standards. ▪ Precursor storage location and stock rotation management in accordance with AS4326-2008. ▪ Explosives are formulated to an appropriate oxygen balance to minimise the likelihood of post-blast gases. ▪ Explosives products are authorised. ▪ In the event of any changes to product specifications, tests are undertaken for adverse impacts. ▪ Density checks undertaken once per load or as specified in the Load Sheet. ▪ Precursors are inspected and/or tested prior to use. ▪ Raw material tests are carried out to assess the

	suitability of raw materials. ▪ Risk assessments are undertaken for all changes to product and raw materials. ▪ Density of emulsion and other final products is tested. ▪ Trigger Action Response Plan applied (Attachment B).
Performance Criteria	▪ Nil fume events due to a root cause of explosive product and raw material deficiencies. ▪ Blast performs to plan.
Monitoring Frequency	▪ QA/QC checks – quality, density, viscosity, mixing equipment calibration.
Corrective Actions	▪ All incidents shall be recorded in CMO. ▪ All corrective actions will be managed through CMO.

5.2.2 Geological Conditions

The management measures for geological conditions are:

Contributing Causes	▪ Lack of relief in weak/soft strata ▪ Inadequate confinement in soft ground ▪ Explosive product seeping into cracks ▪ Dynamic water in holes ▪ Mud and/or sediment in base of blast hole. ▪ Blast hole wall deterioration between drilling and loading e.g. cracks, voids, hole contraction ▪ Chemistry and moisture of rock type e.g. limestone ▪
Performance Objective(s)	To ensure that the geology of the blast area is understood and blast design, product selection and loading procedures take those conditions into consideration and therefore do not contribute to causing post blast NOx fume.
Management Strategies	▪ The geology of each shot is considered and blasts designed to ensure adequate relief in weak/soft strata. ▪ Explosives product selection takes into account the specific geological conditions. ▪ Blast design takes into account the specific geological conditions. ▪ Blast size is minimised where practicable. ▪ Blast hole liners utilised where appropriate. ▪ Blast holes that are slumped or require excessive explosive product to reach stemming height are recorded and monitored. ▪ Sleep time of shot is minimised or eliminated whenever possible. ▪ When dewatering holes, recharge rates are

	measured and appropriate explosives products selected. ▪ The hydrology of pit and plan blasting is assessed to avoid interaction between explosives and dynamic water (either natural or from other pit operations). ▪ The time between drilling and loading is minimised. ▪ Blast hole savers utilised where appropriate. ▪ Drilling foam used to stabilise hole (confirm chemical compatibility with explosives first). ▪ When blasting in the weathered zone pattern sizes should be reduced along with the sleep time. To minimize the potential for fume generation a water resistant or fume minimizing product should be selected. ▪ Trigger Action Response Plan applied (Attachment B). ▪ Prior to the firing of any blast, an assessment must be conducted to determine if there are likely to be adverse fume effects as a result of deviations from the blast plan and other issues encountered during the preparation and loading of the shot. ▪ The Shotfirer in charge of the loading needs to record any problems encountered in relation to those issues so that a reasonable deduction can be made on the likelihood of post blast fume occurring. These factors must be considered and recorded and mitigations planned where appropriate prior to a blast being undertaken. ▪ Maintain accurate drill records. ▪ Bag off holes above known cracking to avoid/minimise seepage of product. ▪ Daily inspections of sleeping shots by Shotfirers.
Performance Criteria	▪ Nil fume events due to a root cause of geological conditions. ▪ Blast performs to plan.
Monitoring Frequency	▪ QA/QC checks – quality, density, viscosity, mixing.
Corrective Actions	▪ All incidents shall be recorded in CMO. ▪ All corrective actions will be managed through CMO.

5.2.3 Blast Design

The management measures for blast design are:

Contributing Causes	▪ Explosive desensitisation due to the blast hole depth. ▪ Inappropriate priming and/or placement. ▪ Mismatch of explosives and rock type. ▪ Inter-hole explosive desensitisation. ▪ Intra-hole explosive desensitisation in decked blast holes. ▪ Initiation of significant explosive quantities in a single blast event.
Performance Objective(s)	To ensure that the blast design does not contribute to causing post blast NOx fume.
Management Strategies	▪ Bench height reduced where appropriate. ▪ Adequate relief provided in deep holes. ▪ Blasts will be designed with consideration for : – depth of holes – product initiation – product suitability – geology – timing – product selection – initiation selection – blast size ▪ The site approved blast design is reviewed to improve priming. ▪ Blast design / approval process including completion of Blasting Checklist (Attachment C). ▪ Authorisation of all blast events by the Operations Manager. ▪ Powder factor is reduced where appropriate. ▪ Trigger Action Response Plan applied (Attachment B).
Performance Criteria	▪ Nil fume events due to a root cause of blast design. Blast performs to plan.
Monitoring Frequency	▪ Video every blast using two cameras at 90 degrees.
Corrective Actions	▪ All incidents shall be recorded in CMO. ▪ All corrective actions will be managed through CMO.

5.2.4 Explosive Product Selection

The management measures for explosive product selection are:

Contributing Causes	▪ Non water-resistant explosive products loaded into wet or dewatered holes. ▪ Excessive energy in weak/soft strata desensitising adjacent explosive product columns. ▪ Primer of insufficient strength to initiate explosive column. ▪ Desensitisation of explosive column from in-hole cord initiation. ▪ Inappropriate explosive product for application.
Performance Objective(s)	To ensure that product selection does not contribute to causing post blast NOx fume.
Management Strategies	▪ Technical Data Sheet stating recommendations and procedure for variations to manufacturer's recommendations for explosive product selection and initiating systems are followed. ▪ Weather forecasts are considered prior to product selection. ▪ Bench is designed for effective surface water run-off. ▪ Detonating cord for down the hole initiation is minimised wherever possible. ▪ Blast design / approval process including completion of Blasting Checklist (Attachment C). ▪ Trigger Action Response Plan (Attachment B) ▪ Training of blast crew on product selection and designs.
Performance Criteria	▪ Nil fume events due to a root cause of product selection. Blast performs to plan
Monitoring Frequency	▪ Video every blast using two cameras at 90 degrees.
Corrective Actions	▪ All incidents shall be recorded in CMO. ▪ All corrective actions will be managed through CMO.

5.2.5 On-Bench Practices

The management measures for explosive formulation and quality assurance are:

Contributing Causes	▪ Hole condition incorrectly identified. ▪ Blast not drilled outside of acceptable variation from plan (more than 0.5 metre from design location.) ▪ Dewatering of holes diverts water into holes previously loaded with dry hole explosive products. Blast not loaded as per blast plan.
Performance Objective(s)	To ensure that bench practices do not contribute to causing post blast NOx fume.
Management Strategies	▪ All holes are dipped prior to loading. ▪ Bench is free draining as practicable. ▪ Wet, dewatered and dry holes are recorded on blast plans and this information is used as a basis for explosive product selection. ▪ Water from wet holes is to be diverted away from any dry product holes. ▪ Recharge rate of dewatered holes is used as a basis for explosive product selection. ▪ Actual load sheets recorded for each hole. ▪ Time between dipping and loading is minimised, especially in soft and clay strata. ▪ Sleep time of shot is minimised or eliminated whenever possible. ▪ If sleep time is exceeded a risk assessment must be completed by the MME and Explosives Inspectorate. ▪ Accurate drilling records are maintained and reviewed if required. ▪ Wet holes are loaded first and remaining holes are dipped prior to loading. The explosive product selection is adjusted accordingly. ▪ Gas bags are used in dewatered blast holes where required. ▪ Shotfirer records variations to blast design or changes to bench conditions during loading. ▪ Drill and Blast Engineer to be notified of any changes to load plan. ▪ Trigger Action Response Plan applied (Attachment B). ▪ Prior to the firing of any blast, an assessment must be conducted to determine if there are likely to be adverse fume effects as a result of deviations from the blast plan and other issues encountered during the preparation and loading of the shot. ▪ The Shotfirer in charge of the loading needs to record any problems encountered in relation to those issues so that a reasonable deduction can be made on the likelihood of post blast fume occurring. These factors

	must be considered and recorded and mitigations planned where appropriate prior to a blast been undertaken.
Performance Criteria	▪ Nil fume events due to a root cause of bench practices. ▪ Blast performs to plan.
Monitoring Frequency	▪ Video every blast using two cameras at 90 degrees. ▪ Explosives loading area bench acceptance inspection.
Corrective Actions	▪ All incidents shall be recorded in CMO. ▪ All corrective actions will be managed through CMO.

5.2.6 Pre-Blast Considerations

The management measures for explosive formulation and quality assurance are:

Contributing Causes	▪ Explosive product mixes with mud / sediment at bottom of hole. ▪ Interaction of explosive product with drilling muds. ▪ Penetration of stemming material into top of explosive column (fluid / pumpable explosive products only). ▪ Water entrainment in explosive product. ▪ Moisture in ground attacking explosive product. ▪ Contamination of explosives column by drill cuttings during loading. ▪ Rainfall on a sleeping shot.
Performance Objective(s)	To ensure that the risk of contamination of explosives in blast holes is minimised and does not contribute to causing post blast NOx fume.
Management Strategies	▪ Loading procedure followed during charging. ▪ Primer is positioned in undiluted explosive product. ▪ Gas bags used to separate mud / sediment from explosive product where required. ▪ Blast hole savers utilised where required. ▪ End of loading hose dispersers utilised where required to minimise contamination. ▪ Appropriate stemming material is sourced and used. ▪ Explosive product is gassed to required specifications before stemming. ▪ Gas bags used to seal the top of explosives columns prior to stemming where required. ▪ All primers are positioned in undiluted explosive product. ▪ Gas bags used in dewatered blast holes where required. ▪ Hole liners used where required. ▪ Hose lubrication minimised during charging.

	▪ Water recharge rate measured after dewatering and explosive product selection adjusted accordingly. ▪ Low blast holes loaded last where practical. ▪ Sleep time minimised or eliminated. ▪ Wet holes loaded first where practical and remaining holes dipped prior to loading and explosive product selection adjusted accordingly. ▪ Vehicle contact minimised near blast holes. ▪ Hole savers utilised where required. ▪ Early firing of scheduled blast considered if wet weather is predicted. ▪ Trigger Action Response Plan applied (Attachment B). ▪ Prior to firing any blast, an assessment must be conducted by the Operations Manager to determine if there are likely to be adverse fume effects as a result of deviations from the blast plan and other issues (including adverse weather conditions) encountered during the preparation and loading of the shot. ▪ The Operations Manager is to authorise adverse weather blast events. ▪ The Shotfirer in charge of the loading needs to record any problems encountered in relation to those issues so that a reasonable deduction can be made on the likelihood of post blast fume occurring. These factors must be considered and recorded and mitigations planned where appropriate prior to a blast being undertaken.
Performance Criteria	▪ Nil fume events due to a root cause of contaminated explosives in blast holes. Blast performs to plan.
Monitoring Frequency	▪ Video every blast using two cameras at 90 degrees.
Corrective Actions	▪ All incidents shall be recorded in CMO. ▪ All corrective actions will be managed through CMO.

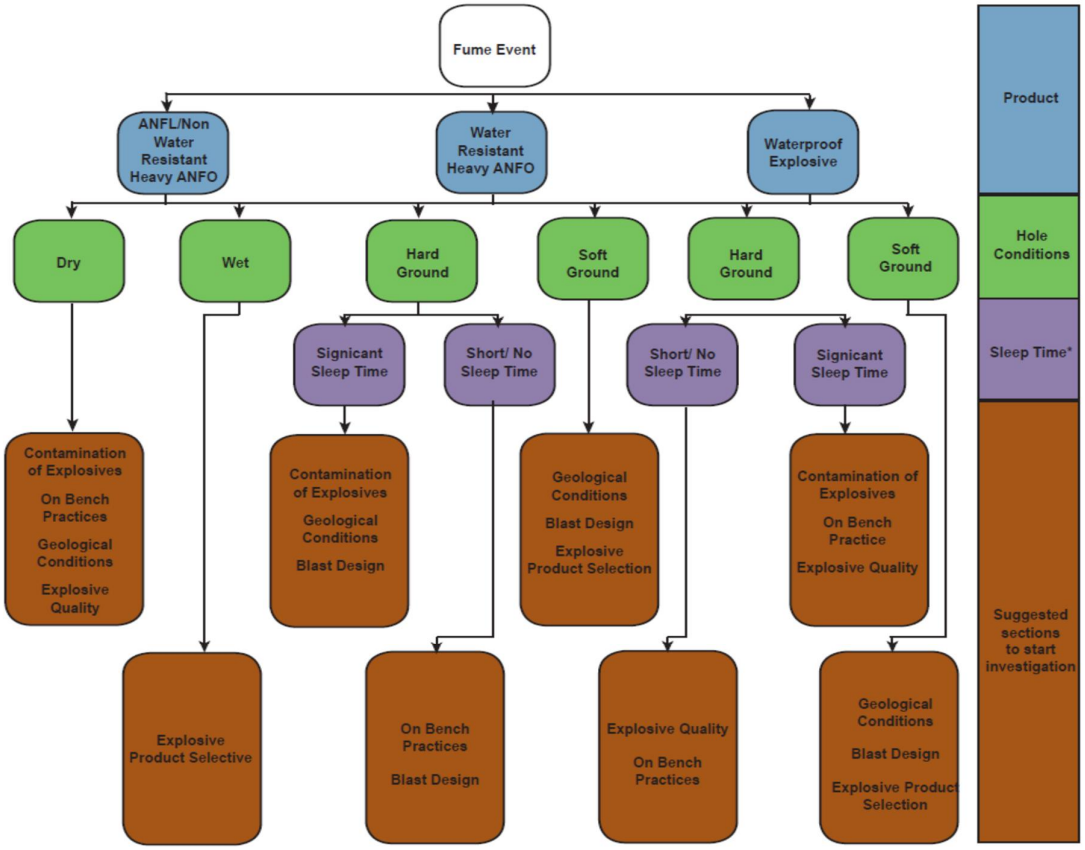
5.3 PRE-BLAST ASSESSMENT

Prior to the firing of any blast, a review must be conducted to determine if there are likely to be adverse fume effects as a result of deviations from the blast plan and other issues encountered during the preparation and loading of the shot. This review is conducted just prior to the firing of the blast.

The Shotfirer in charge of the loading needs to record any problems encountered in relation to those issues, so that a reasonable deduction can be made on the likelihood of post blast fume occurring. These factors must be considered and recorded and mitigations planned where appropriate prior to a blast being undertaken.

5.4 POST BLAST FUME MANAGEMENT

Should NOx be produced in a surface blast the following fault tree can be used to identify which of the fundamental causes was the significant contributor to the generation of NOx. Once the likely causes have been identified appropriate action plans can then be put in place to mitigate and reduce the generation of NOx from future surface blasts. These actions plans are to be internally reported and distributed to all relevant personnel. The fault tree can also be used to educate those responsible for surface blasts as to their responsibilities in ensuring appropriate steps are taken in the design, loading and firing of the blast to minimise the likelihood of generating NOx from the blast.



*Reference to short sleep or significant sleep in this Fault Tree does not refer to the explosives manufacturer's recommneded sleep time, but rather is a subjective term aimed at differentiating between a load and shoot blast and one which is designed to sleep for a period of time. It recognises that there is a correlation between increased sleep time and the generation of NOx gases from blasting. As a guide for this Fault Tree Analysis only, a time of less than 3 days is considered a short sleep time, however conditions vary from site to site and consideration should be given to the adverse impacts longer sleep times can have on loaded blast holes.

5.5 VISUAL ESTIMATION OF FUME CATEGORY

Post blast fume categories are required to be estimated based on colour by the blast sentries and / or video records of the blast.

The width and depth of a fume cloud should be kept in mind when assessing fume; as the depth and width of a fume cloud increases so does the apparent colour of the fume.

To accurately assess a fume cloud's colour (and therefore category) it should be done from a vantage point that looks through the thinnest part of the shot (i.e. observe the shot front or back on, not from the side). Fume categories are typically identified visually using the following colour coding:

Level	Colour	Pantone Number
Level 0 No NOx gas		Warm Grey 1C (RGB 244, 222, 217)
Level 1 Slight NOx gas		Pantone 155C (RGB 244, 219, 170)
Level 2 Minor yellow/orange gas		Pantone 157C (RGB 237, 160, 79)
Level 3 Orange gas		Pantone 158C (RGB 232, 117, 17)
Level 4 Orange/red gas		Pantone 1525C (RGB 181, 84, 0)
Level 5 Red/purple gases		Pantone 161C (RGB 99, 58, 17)

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

Assessing the amount of NOx gases produced from a blast will depend on the distance the observer is from the blast and the prevailing weather conditions. The intensity of the NOx gases produced in a blast should be measured on a simple scale from 0 to 5 based on the table above. The extent of the NOx gases also needs to be assessed and this should be done on a simple scale from A to C where:

- A = Localised (i.e. NOx Gases localised across only a few blast holes)
- B = Medium (i.e. NOx Gases from up to 50% of blast holes in the shot)
- C = Extensive (i.e. Extensive generation of NOx Gases across the whole blast)

5.6 RECORDING AND REPORTING BLAST FUME

All blasts will be recorded, rated and reported as followed:

- Rate and record the fume characteristics of all shots using the rating system in Appendices 2 and 3 of the Australian Explosives Industry and Safety Group (AEISG) Code of Practice titled "Prevention and Management of NOx Gases in Surface Blasting". This includes all blasts even if there is no visible post blast fume.
- Records of fume ratings are to be kept on the mine site. NSW Department of Planning, Industry and Environment (DPIE) may take up the option of reviewing and discussing these results with the mine from time to time. Written records are to be kept for a minimum of 2 years.
- Video record of each blast using two cameras at 90 degrees.
- All video footage is to be stored for at least 1 year. All videos should be a minimum duration of 1 minute following the blast and should capture any post blast fume until the fume dissipates, leave the site or leaves the view of the camera.
- The rating and recording of post blast fume is to be kept from 1 April 2014.

In accordance with the site's Pollution Incident Response Management Plan (PIRMP) Stratford-Duralie Coal is required to notify, as soon as practicable, the relevant regulatory authorities including the NSW EPA and NSW DPIE of any blast producing post blast fume that rates 3 at its highest extent and leaves the site, and any blast that rates 4 and 5. A written report will be submitted within 7 days of the incident (refer Section 4.7 below).

Internal reporting actions following all blasts will include:

- completion of a Blasting Checklist to evaluate the potential impacts of the blast; and
- completion of an action plan that identifies which fundamental cause was the significant contributor to the generation of NOx from a blast fume event and the success of the mitigation measures used.

In addition, a summary of any blast fume event that rates 3 at its highest extent and leaves the site, and any blast that rates 4 and 5 will be provided within the Stratford-Duralie Annual Reviews.

5.7 BLAST FUME INCIDENTS

Following a blast fume incident (Category Rating 3 - offsite, 4 or 5) at Stratford-Duralie Coal the following actions will occur:

- Notification to relevant authorities
- Debriefing with personnel directly involved in the incident within 24 hours of the cessation of the blast fume incident;
- Internal analysis of the blast fume incident;
- Submission of a report within 7 days of the incident to DPIE and EPA on the pollution incident outlining the following;
    - Date, time and nature of the pollution incident;
    - Identifying the cause (or likely cause) of the pollution incident;
    - Describing what action has been taken to date; and
    - Describing proposed measure to address the pollution incident
- Participate in any external investigation of the pollution incident.

Communications with the community will be based on a risk based approach identifying those that may be affected. For fume related incidents the stakeholders that are predicted to be impacted by each event will be notified prior to blasting. Contact registers for Stratford-Duralie Coal stakeholders are maintained on site. The method and content of communication will depend on the incident and the actions required to protect human health.

An investigation shall also be required in the event that a person is affected by the effects of NOx gasses.

5.8 BLAST FUME EXPOSURE

If a person has been exposed to NOx gases medical attention must be sought as soon as possible.

The possibility of delayed and life threatening pulmonary oedema dictates that any person exposed to a visible plume of NOx, and/or any person experiencing sudden acute effects of coughing, shortness of breath or irritation of the mucous membranes of the eyes, nose or throat following post-blast NOx events must be examined by a medial practitioner without delay, even if no NOx smell was noticed or symptoms are mild.

The treating medical practitioner shall be informed of the potential NOx exposure (Refer to Attachment A – Letter to Doctor Re: Potential Exposure to NOx Gas Fumes).

6. TRAINING

The following personnel will be provided relevant training in the BCM blast management and procedures:

- general staff;
- Blast Crew;
- Shot firers;
- Drill and Blast Engineer;
- Explosives Inspectorate; and
- any other key DCM personnel associated with implementation of blast fume management procedure.

7. ACCOUNTABILITIES

Role	Accountability
Stratford-Duralie Coal Management	▪ Ensure a safe work environment is provided and maintained for all employees in accordance with the requirements outlined in this Procedure. ▪ Ensure they are fully familiar with and comply with the requirements of this Procedure. ▪ Ensure all work undertaken within their area of responsibility is conducted in accordance with the requirements of this Procedure. ▪ Ensure training and assessment of employees who may be affected by the requirements of this Procedure is provided. ▪ Ensure the requirements of this procedure are implemented and reviewed.
Mining Engineering Manager (MEM)	▪ Report any Notifiable Incidents (category 3 [offsite], 4 and 5 blasts) regarding blast fume to the relevant Statutory (Government) Department (refer Section 4.7).
Explosives Inspectorate	▪ External explosives and blasting regulation.
Drill and Blast Engineer	▪ Design blasts to minimise fume. ▪ Assess all post blast fume according to AEISG Rating

Role	Accountability
	Scale, and record results according to site procedures.
Environment and Community Superintendent	▪ Notify relevant authorities and potentially affected external stakeholders of notifiable blast fume incidents (category 3 [offsite], 4 and 5 blasts). ▪ Coordinate the response to blast fume incidents and initiation of site Pollution Incident Response protocol where required. ▪ Prepare reports relating to blast fume incidents.
Open Cut Examiner (OCE)	▪ Ensure a safe work environment is maintained for all employees in accordance with the requirements outlined in this Procedure. ▪ Ensure they are fully familiar with and comply with the requirements of this Procedure. ▪ Ensure all work undertaken within their area of responsibility is conducted in accordance with the requirements of this Procedure. ▪ Ensure training and assessment of coal mine workers who may be affected by the requirements of this Procedure and how it is to be applied is provided. ▪ Ensure any person who may have been exposed to NOx gasses seeks medical attention immediately and a Letter to the Doctor (Attachment A) is provided.
All Workers	▪ Act promptly to rectify or report hazards once identified. ▪ Comply with the requirements of this Procedure.

8. DEFINITIONS

Word	Definition
ANFO	A mixture of ammonium nitrate and fuel oil with or without a dye colouring agent.
BEZ	Blast Exclusion Zone
Dry Holes	Blast hole with no greater than 0.5 metres of water, which can be bagged off using a gas bag.
Dust	Airborne particulate matter ranging in diameter from 10 to 50 microns.
Dynamic Water	Water that is in motion (i.e. flowing water).
MME	Manager of Mining Engineering
NOx (Oxides of Nitrogen)	A multiple combinations of oxides of nitrogen (N2O2, NO, NO2, N2O3, N2O4, N2O5) with nitrogen dioxide (NO2) being the principle hazardous nitrous fume.
OCE	Open Cut Examiner
Post Blast Fume	Gases generated by the detonation of explosives during blasting.
Precursor	A material resulting from a chemical or physical change when two or more substances consisting of fuels and oxidisers are mixed is intended to be used exclusively in the production of an explosive.
Sleep Time	The time between explosives being loaded into a blast hole and their initiation.
Wet Holes	Blast holes containing dynamic or static water. Mud at base of blast hole is also indicative of a wet hole.

9. REFERENCES

Australian Explosives Industry Safety Group (AEISG) (2011) *Code of Practice Prevention and Management of Blast Generated NOx Gases in Surface Blasting* (Edition 2, August 2011).

DCPL (2016) *Duralie Coal Mine Blast Management Plan*.

DCPL (2016 *Duralie Coal Mine Explosives Principal Control Plan*.

DCPL (2015) *Duralie Coal Mine Pollution Incident Response Management Plan*.

Attachment A: Letter to Doctor Re: Potential exposure to NOx Gas Fumes

Advice to Medical Staff

This patient may have been exposed to NOx. This is a gas usually produced in mines after the use of explosives. NOx consists of multiple combinations of nitrogen and oxygen (N2O, NO, NO2, N2O4, N2O3, N2O5). Nitrogen dioxide (NO2) is the principle hazardous nitrous fume. NOx irritates the eyes and mucous membranes primarily by dissolving on contact with moisture and forming a mixture of nitric and nitrous acids. But this is not the only mechanism by which injury may occur. Inhalation results in both respiratory tract irritation and pulmonary oedema. High level exposure can cause methemoglobinemia. Some people, particularly asthmatics, can experience significant bronchospasm at very low concentrations.

The following effects are commonly encountered after NOx exposure:

ACUTE

- Cough
- Shortness of breath
- Irritations of the mucous membranes of the eyes, nose and throat

SHORT TERM

- Pulmonary oedema which may be delayed for up to 4 – 12 hours

MEDIUM TERM

- R.A.D.S. (Reactive Airways Dysfunction Syndrome)
- In rare cases bronchiolitis obliterans which may take from 2-6 weeks to appear

LONG TERM

- Chronic Respiratory insufficiency

High level exposure particularly associated with methemoglobinemia can cause chest pain, cyanosis, and shortness of breath, tachypnea, and tachycardia. Deaths have been reported after exposure and are usually delayed. Even non-irritant concentrations of NOx may cause pulmonary oedema. Symptoms of pulmonary oedema often don't become manifest until a few hours after exposure and are aggravated by physical effort. Prior to transport to you the patient should have been advised to rest and if any respiratory symptoms were present should have been administered oxygen.

The patient will need to be treated symptomatically but as a base line it is suggested that the following investigations are required:

- **Spirometry**
- **Chest X-ray**
- **Methheamoglobin estimation**

Because of the risk of delayed onset pulmonary oedema it is recommended that as a precaution the patient be **observed for up to 12 hours**. As no specific antidote for NOx exists, symptoms will have to be treated on their merits.

Attachment B: TARP – Fume Management

	Normal Operating Conditions	Abnormal Conditions	Cessation of Mining Conditions (Withdrawal Conditions Level 3 - 5)
Trigger Condition			
Condition	▪ **No abnormal/ unpredicted inclement weather conditions** ▪ **No Identified product discrepancies / deterioration** ▪ **Wind speed not faster than a breeze (i.e. approximately 3 m/s)** ▪ **Shot fired successfully – no post blast fume**	▪ **Unpredicted rainfall during loading operations** ▪ **Minor product discrepancies identified (Density Checks/Water affected/Deterioration)** ▪ **Reasonable wind speed (i.e. between approximately 5 m/s and 10 m/s)** ▪ **Shot fired successfully - Minor Fume Event (Level 1-3)** ▪ **Fume Event Occurs – Remains within the Blast Exclusion Zone (BEZ)**	▪ **Significant (or repeated) unpredicted rainfall/ weather event during loading operations** ▪ **Sleep time extended beyond product maximum specifications (with or without weather interference)** ▪ **Significant product degradation** ▪ **Strong to gale force winds (i.e. above approximately 10 m/s)** ▪ **Shot fired successfully – Major Fume Event (Level 4-5)** ▪ **Fume Event Breaches the Blast Exclusion Zone (BEZ)** ▪ **Single or multiple persons (on-site or off-site) exposed to fume**
Response Requirements			
Action & Reporting	**Shotfirer:** ▪ Proceed with normal post blast activities, declare the shot as clear for normal mining operations to resume ▪ Complete post blast documentation **Blast Guard:** ▪ No intervention required **Open Cut Examiner (OCE)** ▪ No intervention required **Worker/Visitor** ▪ No intervention required – remain out of the BEZ **Mining Engineering**	**Shotfirer:** ▪ Incident Notification, Investigating and Reporting – report any fume event to relevant stakeholders ▪ Monitor fume strength and record on fume rating sheet ▪ Monitor wind speed and direction of fume. Determine if blast guards will be required to push back to a safe position ▪ Notify mine personnel if fume is likely to breach the BEZ – provide a clear instruction if action is required	**Shotfirer:** ▪ Immediately determine action for the safety of personnel potentially affected outside of the BEZ based on the activity of the fume /strength/ direction/ speed ▪ Immediately communicate to mine personnel of current circumstances ▪ Identify the circumstances as an emergency (if required) and follow emergency response plan ▪ Provide immediate First Aid Treatment to exposed or potentially exposed mine personnel (requires medical attention – send Letter to Dr) ▪ Proceed to notify In accordance with Stratford-Duralie Coal Coal Incident Reporting Procedure – report any fume event to relevant stakeholders ▪ Complete post blast

	Normal Operating Conditions	Abnormal Conditions	Cessation of Mining Conditions (Withdrawal Conditions Level 3 - 5)
	Manager (MEM) ▪ No intervention required	▪ Complete post blast documentation **Blast Guard:** ▪ Notify Shotfirer if fume is approaching their allocated position ▪ Respond immediately to instructions received from the Shotfirer ▪ Ensure allocated blast guard position is not breached by any personnel or vehicle, notify Shotfirer if it occurs ▪ Notify Shotfirer of any visible fume/dust/ wind changes once the shot has been fired **Open Cut Examiner (OCE)** ▪ Ensure everyone remains out of the BEZ ▪ Follow any evacuation instructions received **Mining Engineering Manager (MEM)** ▪ No intervention required	documentation **Blast Guard:** ▪ Notify Shotfirer if fume is approaching their allocated position ▪ Report any identified changes to fume behaviour as visible from the blast guard location if safe (change of direction, increase in wind speed) ▪ Report any actual or potential exposure to fume ▪ Respond immediately to specific instructions received ▪ Close vehicles and put on reverse cycle air conditioning **Open Cut Examiner (OCE)** ▪ Report any actual or potential exposure to fume ▪ Gather exposed personnel and assist with providing immediate medical attention ▪ ▪ Gather incident data and commence **Worker/Visitor** ▪ Follow instructions received ▪ Remain inside a vehicle with airconditioning on recycle ▪ Do not return to areas unless cleared by the Shotfirer **Mining Engineering Manager (MEM)** ▪ Immediately notify the appropriate authorities of the fume event and its rating ▪ Communicate with inspectorate
Monitoring	**Shotfirer:** ▪ Continue to observe weather conditions for resumed loading ▪ Ensure video in position prior to firing	**Shotfirer:** ▪ Continue to observe weather conditions for resumed loading activities ▪ Ensure video in position prior to firing	**Shotfirer:** ▪ Continue to observe weather conditions for resumed loading ▪ Ensure video in position prior to firing and are not damaged **Blast Guard:** ▪ No intervention required

	Normal Operating Conditions	Abnormal Conditions	Cessation of Mining Conditions (Withdrawal Conditions Level 3 - 5)
	Blast Guard: ▪ No intervention required **Mining Superintendent** ▪ Review geological conditions as required with D&B Engineer **Worker/Visitor** ▪ No intervention **Mining Engineering Manager (MEM)** ▪ No intervention required	**Blast Guard:** ▪ No intervention required **Mining Superintendent** ▪ Review fume events in the specific geology to determine if product selection is appropriate for the strata **Worker/Visitor** ▪ No intervention required **Mining Engineering Manager (MEM)** ▪ Review fume events at the mine and determine if response measures remain accurate or corrective actions are required	**D&B Engineer** ▪ Implement corrective actions as highlighted in the investigation ▪ Communicate and advise investigation findings **Worker/Visitor** ▪ No intervention required **Mining Engineering Manager (MEM)** ▪ Review investigation outcomes and determine appropriate action to prevent a recurrence/ improve management

ATTACHMENT C – DCM BLASTING CHECKLIST

STRATFORDCOAL
Part of the Yancoal Australia Group

PRE FIRING CHECKLIST FOR POST BLAST FUME MANAGEMENT

Date:	Location:	Blast ID:
D&B Engineer who designed the shot:	Shotfirer in Charge:	Date Blast Fired:

Prior to the firing of any blast, a review must be conducted to determine if there are likely to be adverse fume effects as a result of deviations from the blast plan and other issues encountered during the preparation and loading of the shot. A Shotfirer has to consider a number of blast hazards such as flyrock, overpressure, ground shock and post blast fumes. This review is conducted just prior to the firing of the blast.

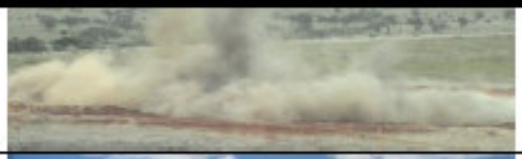
The Shotfirer in charge of the loading will record any problems encountered, so that a reasonable deduction can be made on the likelihood of post blast fume occurring. These factors must be considered and recorded and mitigations planned where appropriate prior to a blast being undertaken.

ISSUES LIKELY TO CAUSE POST-BLAST FUME:	POTENTIAL POST-BLAST FUME TRIGGERS (TICK AS APPROPRIATE)	COMMENTS
FIRING TIME AND WEATHER CONDITIONS	☐ FIRING IMMEDIATELY AFTER 09:00AM ☐ FIRING AFTER 4:00PM AND BEFORE 5:00PM ☐ CURRENTLY RAINING ☐ RECENT RAIN FALL ☐ CLOUDY	
BLAST HOLE DIPPING AND LOGGING	**Were the blast holes dipped and logged prior to loading?** ☐ YES ☐ IF YES, < 1 DAY PRIOR TO LOADING ☐ IF YES, > 1 DAY PRIOR TO LOADING ☐ NO ☐ MUDDY BOTTOM RECOREDED / BAGGED ☐ MOIEST / WET SIDES RECORDED	
GROND WATER	**Was ground water identified in holes prior to loading?** ☐ NO ☐ YES- DYNAMIC WATER ☐ YES - STATIC WATER ☐ WERE THE BLASTHO9LES DEWATERED ☐ WAS THE RECHARGE RATE MEASURED	
SLEEP TIME	**Was sleep time excessive for the Product concerned (refer to the Product Technical Data Sheet)?** ☐ NO ☐ YES	

ISSUES LIKELY TO CAUSE POST-BLAST FUME:	POTENTIAL POST-BLAST FUME TRIGGERS (TICK AS APPROPRIATE)	COMMENTS
ROCK AND GROUND TYPE	☐ SOFT CLAYS ☐ WET CLAYS / SURFACE SOILS ☐ BROKEN / FRAGMENTED GROUND ☐ KNOWN CAVITIES ☐ BLASTHOLE INSTABLILITY DURING DRILLING ☐ POTENTIAL LOSS OF CRITICAL DIAMETER **Note: These will give the explosives poor confinement**	
PRODUCT DAMAGE BY WATER (POTENTIAL)	☐ INCORRECT PORDUCT LOADED (WET HOLES) ☐ LOADING TOOK PLACE IN WET CONDITIONS ☐ POOR DRAINAGE ON THE BENCH EXPOSING PRODUCT TO WATER ☐ SUBSTITUTED PORDUCT UNABLE TO MANAGE WATER CONDITIONS OR HOLE CONDITIONS	
BLAST DESIGN	☐ INADVERTENT DYNAMIC DESENSITIZATION OF SURROUNDING HOLES ☐ UNAUTHORISED PORDUCT CHANGES ☐ UNAUTHORISED PLAN CHANGES ☐ INADEQUATE TIMING FACTORS ☐ BLAST DESIGN NOT FOLLOWED ☐ INSUFFICIENT USE OF GAS BAGS ☐ INSUFFICIENT USE OF PRIMERS ☐ INADEQUATE STEMMING	
MPU GROSS INGREDIENT USEAGE	☐ PRODUCT QUALITY CHECKS COMPLETED (PODUCT EXCEEDS CRITICAL DENSITY) ☐ VEHICLES CALIBRATED WITHIN LAST 30 DAYS ☐ PRODUCT TOTALS REVERSE CALCULATED TO ENSURE ACCURATE DELIVERY ☐ PRODUCT OVER FUELLED ☐ PRODUCT UNDER FUELLED ☐ PRODUCT SPECIFICATION / FORMULATION INCORRECT (INCLUDES RAW MATERIALS) ☐ PRODUCT TOP LOADED FROM AUGER INTO WET HOLE	
PRE- FIRING	☐ BLAST CONTROLLER HAS CLEARED THE BLAST ZONE ☐ WINDSPEED AND DIRECTION HAS BEEN CHECKED TO ENSURE DUST OR FUME DON'T LEAVE SITE AND ONSITE PERSONNEL ARE NOT IN THE DIRECT PATH OF POTENTIAL DUST OR FUME ☐ AIRSPACE OF EXCUZION ZONE CHECKED AND CLEAR OF AIRCRAFT	

STRATFORDCOAL
Part of the Yancoal Australia Group

IDENTIFY POTENTIAL AND ACTUAL LEVEL OF FUME:

LEVEL	COLOUR	VISUAL GUIDE	SELECT POTENTIAL	SELECT ACTUAL
Level 0 No NOx Gas / No Fume Expected			☐	☐
Level 1 Slight NOx Gas / Fume Expected			☐	☐
Level 2 Minor Yellow/Orange Gas / Fume Expected			☐	☐
Level 3 Orange Gas / Fume Expected			☐	☐
Level 4 Orange/Red Gas / Fume Expected			☐	☐
Level 5 Red/Purple Gases / Fume Expected			☐	☐
OTHER FACTORS:				

SIGN OFF:		
POSITION	NAME	SIGNATURE

ATTACHMENT 2

DCM BLASTING CHECKLISTS

STRATFORDCOAL
Part of the Yancoal Australia Group

PRE FIRING CHECKLIST FOR POST BLAST FUME MANAGEMENT

Date:	Location:	Blast ID:
D&B Engineer who designed the shot:	Shotfirer in Charge:	Date Blast Fired:

Prior to the firing of any blast, a review must be conducted to determine if there are likely to be adverse fume effects as a result of deviations from the blast plan and other issues encountered during the preparation and loading of the shot. A Shotfirer has to consider a number of blast hazards such as flyrock, overpressure, ground shock and post blast fumes. This review is conducted just prior to the firing of the blast.

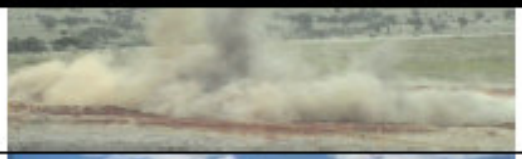
The Shotfirer in charge of the loading will record any problems encountered, so that a reasonable deduction can be made on the likelihood of post blast fume occurring. These factors must be considered and recorded and mitigations planned where appropriate prior to a blast being undertaken.

ISSUES LIKELY TO CAUSE POST-BLAST FUME:	POTENTIAL POST-BLAST FUME TRIGGERS (TICK AS APPROPRIATE)	COMMENTS
FIRING TIME AND WEATHER CONDITIONS	☐ FIRING IMMEDIATELY AFTER 09:00AM ☐ FIRING AFTER 4:00PM AND BEFORE 5:00PM ☐ CURRENTLY RAINING ☐ RECENT RAIN FALL ☐ CLOUDY	
BLAST HOLE DIPPING AND LOGGING	**Were the blast holes dipped and logged prior to loading?** ☐ YES ☐ IF YES, < 1 DAY PRIOR TO LOADING ☐ IF YES, > 1 DAY PRIOR TO LOADING ☐ NO ☐ MUDDY BOTTOM RECOREDED / BAGGED ☐ MOIEST / WET SIDES RECORDED	
GROND WATER	**Was ground water identified in holes prior to loading?** ☐ NO ☐ YES- DYNAMIC WATER ☐ YES - STATIC WATER ☐ WERE THE BLASTHO9LES DEWATERED ☐ WAS THE RECHARGE RATE MEASURED	
SLEEP TIME	**Was sleep time excessive for the Product concerned (refer to the Product Technical Data Sheet)?** ☐ NO ☐ YES	

ISSUES LIKELY TO CAUSE POST-BLAST FUME:	POTENTIAL POST-BLAST FUME TRIGGERS (TICK AS APPROPRIATE)	COMMENTS
ROCK AND GROUND TYPE	☐ SOFT CLAYS ☐ WET CLAYS / SURFACE SOILS ☐ BROKEN / FRAGMENTED GROUND ☐ KNOWN CAVITIES ☐ BLASTHOLE INSTABLILITY DURING DRILLING ☐ POTENTIAL LOSS OF CRITICAL DIAMETER **Note: These will give the explosives poor confinement**	
PRODUCT DAMAGE BY WATER (POTENTIAL)	☐ INCORRECT PORDUCT LOADED (WET HOLES) ☐ LOADING TOOK PLACE IN WET CONDITIONS ☐ POOR DRAINAGE ON THE BENCH EXPOSING PRODUCT TO WATER ☐ SUBSTITUTED PORDUCT UNABLE TO MANAGE WATER CONDITIONS OR HOLE CONDITIONS	
BLAST DESIGN	☐ INADVERTENT DYNAMIC DESENSITIZATION OF SURROUNDING HOLES ☐ UNAUTHORISED PORDUCT CHANGES ☐ UNAUTHORISED PLAN CHANGES ☐ INADEQUATE TIMING FACTORS ☐ BLAST DESIGN NOT FOLLOWED ☐ INSUFFICIENT USE OF GAS BAGS ☐ INSUFFICIENT USE OF PRIMERS ☐ INADEQUATE STEMMING	
MPU GROSS INGREDIENT USEAGE	☐ PRODUCT QUALITY CHECKS COMPLETED (PODUCT EXCEEDS CRITICAL DENSITY) ☐ VEHICLES CALIBRATED WITHIN LAST 30 DAYS ☐ PRODUCT TOTALS REVERSE CALCULATED TO ENSURE ACCURATE DELIVERY ☐ PRODUCT OVER FUELLED ☐ PRODUCT UNDER FUELLED ☐ PRODUCT SPECIFICATION / FORMULATION INCORRECT (INCLUDES RAW MATERIALS) ☐ PRODUCT TOP LOADED FROM AUGER INTO WET HOLE	
PRE- FIRING	☐ BLAST CONTROLLER HAS CLEARED THE BLAST ZONE ☐ WINDSPEED AND DIRECTION HAS BEEN CHECKED TO ENSURE DUST OR FUME DON'T LEAVE SITE AND ONSITE PERSONNEL ARE NOT IN THE DIRECT PATH OF POTENTIAL DUST OR FUME ☐ AIRSPACE OF EXCUZION ZONE CHECKED AND CLEAR OF AIRCRAFT	

STRATFORDCOAL
Part of the Yancoal Australia Group

IDENTIFY POTENTIAL AND ACTUAL LEVEL OF FUME:

LEVEL	COLOUR	VISUAL GUIDE	SELECT POTENTIAL	SELECT ACTUAL
Level 0 No NOx Gas / No Fume Expected			☐	☐
Level 1 Slight NOx Gas / Fume Expected			☐	☐
Level 2 Minor Yellow/Orange Gas / Fume Expected			☐	☐
Level 3 Orange Gas / Fume Expected			☐	☐
Level 4 Orange/Red Gas / Fume Expected			☐	☐
Level 5 Red/Purple Gases / Fume Expected			☐	☐
OTHER FACTORS:				

SIGN OFF:		
POSITION	NAME	SIGNATURE

APPENDIX A

RECORD OF CONSULTATION WITH EPA

DOC21/831611-3; EF13/2892

Planning and Assessment Division
Department of Planning, Industry and Environment
Locked Bag 5022
PARRAMATTA NSW 2124

Attention: The Planning Officer

23 September 2021

EPA Submission on Post Approval Planning Advice Request PAE-28527236

Dear Sir/Madam,

Thank you for the request for advice for Post Approval Consultation (PAE-28527236), requesting a review by the NSW Environment Protection Authority (EPA) of the Updated Blast Management Plan and supporting Appendices. The document has been updated in accordance with Condition 16, Schedule 3 of the Duralie Coal Mine (DCM) Project Approval (MP08_0203).

The EPA understands that operations at the DCM now reflect the transition towards mine closure. The Blast Management Plan (BMP) has been amended to reflect the current stage of operations and to describe anticipated mine closure activities and blast management at the DCM for the mine closure and rehabilitation phase.

Key changes as a result of mine closure include:

- Weismantel Open Pit - mining of the Weismantel Open Pit will continue until 31 December 2021, however, will not occur to the maximum approved depth as modelled in the 2014 DCM Open Pit Modification. Progressive backfilling of the Weismantel Open Pit has been undertaken.
- Water Management System Changes - following the cessation of mining of the Clareval Open Pit (now final void) and the Clareval void becoming available as a water storage, Weismantel Open Pit dewatering is now preferentially transferred to the Clareval void and not stored within the Main Water Dam. As a result, all irrigation activities for the purpose of reducing the total site water inventory at the DCM have now ceased and the DCM's Irrigation Area irrigation system has been decommissioned and removed.
- Decommissioning of other redundant water management structures has also commenced. Consistent with the approved DCM Mining Operations Plan and Rehabilitation Management Plan, Auxiliary Dam No. 1 has been dewatered, decommissioned and rehabilitated.
- No new disturbance areas are proposed.
- Following the completion of mining operations on 31 December 2021, bulk rehabilitation earthworks will be undertaken during 2022 and 2023. This may involve some infrequent blasting activities to achieve the final landform design and satisfy geotechnical requirements.
- Once bulk rehabilitation earthworks are complete, blasting activities at the DCM will cease.

The EPA has reviewed the documentation and has the following comments and recommendations:

1. Matters to be addressed post approval

a. Licence Variation May Be Required

The EPA notes that the Updated Blast Management Plan and appendices do not propose any amendments that will impact on the blast monitoring undertaken in accordance with EPL 11701.

However, EPL 11701 should still be reviewed upon finalisation of the post approval consultation to confirm that no amendments are necessary.

Recommendation: The EPA recommends that upon determination of PAE-28527236, DCM review the current licence and, if necessary, submit a licence variation application that clearly outlines each of the amendments required.

This concludes the EPA's submission on the proposal.

If you have any questions about this request, please contact Emma Coombs on (02) 4908 6831 or via email at EPA.Northopsregional@epa.nsw.gov.au.

Yours sincerely

ROB HUGHES
Unit Head – Regulatory Operations Regional North
Environment Protection Authority