



6 January 2012

Jill Johnson  
Environmental Officer  
Whitehaven Coal Limited  
PO Box 600  
Gunnedah NSW 2380

Dear Jill

**TARRAWONGA COAL MINE MINING OPERATION PLAN 2010-2013  
Variation to Blasting Time**

Reference is made to your request (letter dated 6 January 2012 ) for variation of the "**Mining Operation Plan for Tarrawonga Coal Mine (6<sup>th</sup> July 2010)**" (MOP) approved by the Department on 12 October 2012.

I&I NSW environmental officers have reviewed your request to vary blasting times to be consistent with Development Consent DA 88 4 2005 and EPL12365. The following MOP variation has been accepted by the Director General in accordance with the relevant conditions of the company's mining leases;

***MOP Section 3.4.4.2: Blasting will be carried out at the mine site from 9am to 5pm, Monday to Saturday, inclusive or at such other times as may be permitted by the mine's Environment Protection Licence.***

If you have any queries, please contact the undersigned at I&I NSW Maitland office on (02) 4931 6576.

Yours sincerely

Greg Summerhayes  
Principal Environmental Officer

ESL RECEIVED  
26. AUG 2010

# Mining Operations Plan

## Tarrawonga Coal Pty Ltd

ABN: 73 100 742 185


### Mining Operations Plan

for the

### Tarrawonga Coal Mine

Prepared by Whitehaven Coal Limited

6<sup>th</sup> July 2010

DEPARTMENT OF PRIMARY INDUSTRIES E S B	
APPROVED	
Name .....	MICHAEL WOOD
Position .....	REGIONAL ENV OFFICER
Signature .....	
Date .....	12.10.10

# **Tarrawonga Coal Pty Ltd**

ABN: 73 100 742 185

## **Mining Operations Plan**

**for the**

## **Tarrawonga Coal Mine**

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Prepared by:

Whitehaven Coal Limited

PO Box 600, Gunnedah, NSW 2380


ABN: 68 124 425 396

Telephone: (02) 6741 9316

Facsimile: (02) 6742 3607

Email: [dyoung@whitehavencoal.com.au](mailto:dyoung@whitehavencoal.com.au)

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<b>Name of mine</b>	<i>Tarrawonga Coal Mine</i>		
<b>Mining Titles/Leases</b>	<i>ML 1579</i>		
<b>MOP Commencement Date</b>	<i>1/07/2010</i>	<b>MOP Completion date (nominal)</b>	<i>31/06/2013</i>
<b>Name of leaseholder</b>	<i>Whitehaven Coal Mining Pty Ltd &amp; Idemitsu Boggabri Coal Pty Ltd</i>		
<b>Name of mine operator</b>	<i>Whitehaven Coal Mining Pty Ltd</i>		
<b>Reporting Officer</b>	<i>Danny Young</i>		
<b>Title</b>	<i>Group Environmental Manager</i>		
<b>Signature</b>			
<b>Date</b>	<i>28/1/10</i>		

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Enquiries should be addressed to Whitehaven Coal Limited.

**STATUTORY DECLARATION**

*New South Wales*  
**STATUTORY DECLARATION**  
*OATHS ACT, 1900*  
**EIGHTH SCHEDULE**

I, Casper Dieben of Penegian Beach, in the State of Queensland solemnly and sincerely declare as follows.

1. I am the duly appointed General Manager, Open Cut Operations for the Tarrawonga Open Cut Coal Mine.

2. I am authorised to make this Declaration on behalf of the Lease Holder, Whitehaven Coal Mining Pty Ltd and Idemitsu Boggabri Coal Pty Ltd.

3. All works and activities described in the Mining Operations Plan to which this declaration is attached comply with the conditions of the title of the mining lease (or mining leases) shown in the Mining Operations Plan, and with the conditions of the Project Approval and all other relevant Government Agency approvals and licences granted in respect of them.

4. I confirm that all of the works and activities referred to in the previous paragraph lie wholly within the area shown in the Mining Operations Plan and that the tenements (mining leases, colliery holdings, land ownership) details of those tenements are correct.

**And I make** this solemn Declaration, conscientiously believing the same to be true and by virtue of the provisions of the *Oaths Act, 1900*.

Subscribed and Declared at Gunnedah

in the State of New South Wales this 24<sup>TH</sup> day of August in

the year 2010

(sgd) [Signature]

before me (sgd) [Signature] Justice of the Peace

**STEPHEN K. KING**  
Justice of the Peace  
110274

## GLOSSARY OF ACRONYMS

AEMR	-	Annual Environmental Management Report
AHIMS	-	Aboriginal Heritage Information Management System
CHPP	-	Coal Handling and Preparation Plant
DECCW (EPA)	-	Department of Environment, Climate Change and Water
DII	-	Department of Industry and Investment
DoP	-	Department of Planning
EA	-	Environmental Assessment
EIS	-	Environmental Impact Statement
EL	-	Exploration Licence
IBC	-	Idemitsu Boggabri Coal Pty Ltd
MDG	-	Mine Design Guideline
ML	-	Mining Lease
MOP	-	Mining Operations Plan
MSDS	-	Material Safety Data Sheet
Mt	-	Million tonnes
Mtpa	-	Million tonnes per annum
NMP	-	Noise Monitoring Program
NOW	-	New South Wales Office of Water
PVS	-	Peak Vector Sum
SMU	-	Soil Mapping Unit
SWMP	-	Site Water Management Plan
TCM	-	Tarrawonga Coal Mine
WCL	-	Whitehaven Coal Limited
WCM	-	Whitehaven Coal Mining Pty Ltd

## **PREAMBLE**

Plans 1 to 7 prepared for this Mining Operations Plan (MOP) have been prepared at both A3 size page and A0/A1 size page scales. For reasons of practicality, this document includes the A3 size plans, with the A0/A1 size plans presented within an annexure document entitled "Mining Operations Plan – Plans 1 to 7, A0/A1 size".

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# 1 INTRODUCTION

## 1.1 History of Operations

The Tarrawonga Coal Mine commenced operations in 2006 following the grant of Development Consent DA-88-4-2005 on the 9<sup>th</sup> November 2005 and the grant of Mining Lease (ML) 1579 on the 3<sup>rd</sup> April 2006. At commencement, the project was known as the “East Boggabri Coal Mine”.

Whitehaven Coal Mining Pty Ltd (WCM) obtained Exploration Licence (EL) 5967 over an area of 1,100 ha on 24<sup>th</sup> July 2002 and prepared a conceptual open cut mine plan for the area by the end of 2003. Following the development of this plan, WCM partnered with Idemitsu Boggabri Coal Pty Ltd for further delineation of the coal reserves which ultimately led to the development of an Environmental Impact Statement (EIS) by 2005.

Prior to commencement of operations in 2006, a Mining Operations Plan (MOP) was developed for a period of up to 6 years, until February 2012. In late 2009, following additional exploration works, an extension of the open cut pit limit, and modifications to the northern and southern waste emplacements were identified to enable access to a further 4 million tonnes of coal. Consequently, a modification to the original consent DA-88-4-2005 was applied for under Section 75W of the Environmental Planning and Assessment Act. This modification was approved on 2010. As a consequence of this approval, an amendment to the existing Mining Operations Plan was required, culminating in the development of this document which is effective from the period 1<sup>st</sup> July 2010 – 30th June 2013.

## 1.2 Proposed and Future Operations

This MOP covers the following mining activities/operations:

- Mining by conventional drill and blast and haulback mining methods;
- Placement of overburden and interburden materials from the open cut area to a combination of out-of-pit and in-pit overburden emplacements;
- On-site crushing and stockpiling of mined coal within a defined coal processing area west of the open cut area;
- Transport of coal from the run-of-mine (ROM) pad via overhead bin to road trucks to the Whitehaven CHPP to the north of Gunnedah; and
- Progressive shaping and rehabilitation of the mine area and other areas of disturbance.

As indicated in the original EIS and subsequent MOP documentation exploration activity originally identified a ROM coal quantity of 9.8 million tonnes (Mt). At an average production rate of 1.6 million tonnes per annum (Mtpa), a mine life of approximately 7 years was initially envisaged.

Following investigations associated with the 75W modification, a further 4 million tonnes of coal was identified to the east of the approved open cut limit. Taking into consideration coal extraction rates up to 2010, the additional resource available, and an increase in productivity to 2 Mtpa, it is anticipated that the identified coal resource within the open cut pit limit will be exhausted by mid 2013.

Recent exploration activity has identified that economic quantities of coal extend beyond the current approved mining boundary to the east. Subsequent studies will be undertaken over the life of this MOP to further define resources. If further approvals are obtained, a new MOP will be developed at that time which will provide for a full 7 year MOP term.

A conceptual mine closure plan is included in Section 5 of this MOP document. A Mine Closure Strategy will be submitted within 2 years of the “end of mine life” which will further refine the conceptual information as presented in Section 5. The requirement for closure planning during the term of this MOP is considered necessary, but will be influenced by potential extensions to the mining operation based on ongoing mine planning studies.

### **1.3 Consents, Leases and Licences**

**Table 1.1** identifies the leases, licences and approvals in place for the TCM at the commencement of the MOP period, the issuing / responsible Authority, dates of issue, duration (where limited) and relevant comments. The list is presented chronologically according to the date of issue.

**Table 1.1- Tenements, Licences and Approvals as at 1st July 2010**

Issuing / Responsible Authority	Type of Lease, Licence, Approval	Date of Issue	Expiry	Comments
Department of Primary Industries (DPI)* <sup>1</sup>	Exploration Licence (EL 5967)	24/07/2002	23/07/2012	Renewed 4/10/2007 for a further term until 23 July 2012.
DA originally issued by Minister for Infrastructure and Planning* <sup>2</sup>	Development Application (DA) 88-4-2005 (Appendix 1)	09/11/2005	09/11/2017	No modifications to original consent
Department of Primary Industries - Mineral Resources* <sup>1</sup>	Mining Lease (ML) 1579 (Appendix 2)	03/04/2006	02/04/2027	Expires 21 years from commencement
Department of Primary Industries - Mineral Resources* <sup>1</sup>	Mining Operations Plan (MOP)	09/05/2006	28/02/2012	Current for a term of 6 years.
Department of Environment, Climate Change and Water (DECCW)	Environment Protection Licence (EPL) No. 12365 (Appendix 3)	09/01/2006	Anniversary date: 9 <sup>th</sup> January Next review: 2014	Variations to EPL made in Dec 07, Sep 08 and May 09.
Department of Water and Energy (DWE)* <sup>3</sup>	90BL253276 90BL253278 90BL253279 90BL253280 90BL254253 90BL254254 90BL254255 90BL254221 90BL254214 90BL254692	18/05/2006 18/05/2006 18/05/2006 18/05/2006 18/05/2006 18/05/2006 24/04/2007 05/04/2007 04/04/2007 12/05/2009	Perpetuity Perpetuity Perpetuity Perpetuity Perpetuity Perpetuity Perpetuity Perpetuity Perpetuity 11/05/2014	Monitoring bores          50ML Mining
* <sup>1</sup> Now, Department of Industry and Investment NSW (DII – Mineral Resources)				
* <sup>2</sup> Now, Department of Planning (DoP)				
* <sup>3</sup> Now, NSW Office of Water (NOW)				

Tarrawonga Coal also has in place a number of management plans as required under the development consent issued by the Department of Planning (**Table 1.2**). These management plans form the basis of the site's ongoing environmental management controls as presented in Section 7 of this MOP.

**Table 1.2 - Management Plans, Strategies and Programs**

<b>Title</b>	<b>Comment</b>
Environmental Management Strategy	Prepared in compliance with Condition 6 (1) of DA 88-4-2005
Environmental Monitoring Program	Prepared in compliance with Condition 6 (3) of DA 88-4-2005
Blasting Monitoring Program	Prepared in compliance with Condition 4 (18) of DA 88-4-2005
Watercourse Crossing Management Plan	Prepared in compliance with Condition 4 (25), of DA 88-4-2005
Site Water Management Plan	Prepared in compliance with Conditions 4 (26), 4(28) 4(29) and 4(30) of DA 88-4-2005
Groundwater Contingency Plan	Prepared in compliance with Condition 4(31) of DA 88-4-2005.
Flora and Fauna Management Plan	Prepared in compliance with Condition 4(35) of DA 88-4-2005
Bushfire Management Plan	Prepared in compliance with Condition 4(56) of DA 88-4-2005
Archaeology and Cultural Heritage Management Plan	Prepared in compliance with Condition 4(38) of DA 88-4-2005
Air Quality Monitoring Program	Prepared in compliance with Condition 4(5) of DA 88-4-2005
Noise Monitoring Program	Prepared in compliance with Condition 4(11) of DA 88-4-2005

## 1.4 Mine Contacts

The Tarrawonga Coal Mine is managed and operated by Whitehaven Coal Mining Pty Ltd. Management personnel responsible for operational and environmental performance at the Tarrawonga mine are as follows:

- Mr Casper Dieben – General Manager. Retains overall responsibility for all activities and environmental performance at the mine. Contact: 0407 123 958;
- Mr Jason Conomos – Project Manager. Retains responsibility for day to day operations at the site. Contact: 02 6743 4000;
- Mr Chris Stephens – Manager – Mining Engineering. Contact: 02 6743 4000; and
- Mr Danny Young – Group Environmental Manager. Contact: 0427 497 710.

In addition, support is provided through a range of mining and environmental specialists and consultants.

The Tarrawonga Coal Mine environmental “hot line” telephone number is 0429 497 730 for community feedback or for registering complaints.

## **1.5 Mine Geology**

### **1.5.1 Regional Geology**

Geologically, ML 1579 is located in the Gunnedah Basin which contains sedimentary rocks, including coal measures of the Permo-Triassic age. The Gunnedah Basin forms the central part of the Permo-Triassic Sydney-Gunnedah-Bowen Basin System which extends along the eastern margin of Australia.

### **1.5.2 Local Geology**

The basin, in part, is unconformably overlain by the Jurassic strata of the Surat Basin. A north-south trending ridge of early Permian volcanic rocks, known as the Boggabri ridge, divides the Gunnedah Basin into two sub-basins, namely:

- The Maules Creek Sub-basin to the east; and
- The Mullaley Sub-basin to the west and south.

On its western and southern margins, the Maules Creek sub-basin laps onto the Boggabri Ridge, while to the east, this sub-basin is bounded by the Hunter-Mooki Thrust. To the north the sub-basin continues at depth below overlying basaltic rocks of the Mount Kaputar Volcanic Complex.

The Maules Creek Sub-basin contains a multi-seam coal resource (the Maules Creek Formation) in a sedimentary section dominated by lithic conglomerate, lithic sandstone, siltstone, minor claystone, coal seams and localised volcanic rocks, mainly of early Permian age. The mine site is located on the western side of the Maules Creek Formation (where the coal seams are noted to be generally thicker and closer together) where it laps onto the Boggabri Ridge (SRK, 2004). Of those coal seams identified within the Maules Creek Formation, those amenable to open cut mining within the mine site are presented below in increasing depth from the surface:

- Braymont (BR);
- Bollol Creek (BC);

- Jeralong (JE);
- Jeralong Lower (JEL);
- Merriown (ME);
- Merriown Lower (MEL);
- Velyama (VE); and
- Nagero (NA).

The coal seams range in thickness up to 4.0m, with an average thickness of 1.5m. Significant conglomerate interburden below the Nagero seam presents a practical divide between those seams mineable by open cut methods and those for which the potential may exist for future underground mining (the Northam, Therribri, Flixton and Tarrawonga seams).

The strike and dip of the coal seams of the Maules Creek Formation are largely controlled by the pre-Permian basement surface. This feature is likened to the edge of the continental shelf, whereby the basement outcrops to the west, dips gently towards the east for a distance, before dipping sharply, almost sub-vertically, resulting in thickening of the Permian formations (Boggabri Volcanics and Maules Creek Formation). Beneath the mine site, the coal seams strike generally in a north-south direction and dip to the east. The strike direction of the coal seams change to almost east-west towards Leard State Forest. Given the change in direction of the coal seam strike, it is likely that small faults will be found accommodating the stresses associated with the tectonic forces required to change the strike direction (Hannah, 2002).

### **1.5.3 Resource Assessment**

#### **1.5.3.1 Coal Reserves**

The total thickness of the coal to be mined is approximately 20m with the depth below the natural surface varying between 20m and 120m. The coal resource remaining within the current approved Tarrawonga deposit is estimated at approximately 6 million tonnes, which at the maximum production rate of 2 million tonnes per year, would be exhausted within the 3 year term of this MOP.

#### **1.5.3.2 Coal Quality**

Based on the results of coal quality analyses, the coal at the Tarrawonga Coal Mine typically has:

- An air dried moisture of between 2.6% to 4.4%;
- Low total sulphur content (0.30% to 0.44%); and

- An ash content ranging from 5.4% to 10.0%.

Higher ash coal was identified in the MEL and JEL seams (20.8% and 22.8% respectively), however these seams represent a minor component of the total resource at approximately 8% of total recoverable coal.

The coal from the Tarrawonga Coal Mine can be described as a high volatility (volatile matter 30.6% - 39.8% adb) coal which will produce a very low sulphur semi soft coking/thermal coal with typically <10% ash and a specific energy of approximately 7,400kcal/kg.

### **1.5.3.3 Constraints Affecting Mine Design**

#### Economic

The economic cut-off of the Tarrawonga Coal Mine will ultimately be determined by the stripping ratio and the prevailing coal prices. Both coal price and mining costs will determine the economic stripping ratio, which in turn, will be determined by coal seam thickness and the depth of the overburden and interburden layers. The average overburden/interburden to coal stripping ratio is expected to average approximately 9:1 over the term of this MOP period. This represents a slight increase in ratio as a consequence of the 2010 modification which will allow moving through the hill on the eastern side of the current open cut. This will be offset through future mine development, if approved, as the open cut extends east of the current hill.

#### Geological

Constraints posed by the geology of the mine comprise the following:

- The depth of weathering of the coal seams which influences the volume of overburden requiring removal to access the coal;
- The potential presence of faulting within the seam structure which may influence the sequence and possibly method of mining; and
- The potential for an uneven coal seam floor which could potentially complicate vehicular access to the coal.

#### Environmental

Although initial limits for the coal mine were previously based predominantly on economic and geological considerations, the following environmental considerations continue to influence the overall mine planning process:

- **Agricultural Land** - The final landform originally conceived for the site included retention of agricultural (Class III) capability land at the plateau of the northern waste emplacement, with the remaining area returned to native

vegetation. As a consequence of the modification, and the raising of the height of the Northern Emplacement to 370m, the area previously identified for Class III capability is now to be re-established as native woodland. This has been done on the basis of providing a more connected vegetated landscape with the adjoining Leard State Forest and on the expectation that the small area at the top of the plateau was unlikely to be economically viable for future farming activity in any case. Whilst the plateau area will be established to woodland, it will still retain a land capability of Class III by virtue of the retained slope class and capacity for occasional cultivation.

- **Ecological Considerations** - Parts of the area have been identified to contain significant vegetation communities, in particular the threatened ecological community (White Box Yellow Box Blakely's Red Gum Woodland) and an area of Belah. The mine disturbance area will avoid these communities with the majority of future development occurring in the White Cypress Pine – Narrow leaved Ironbark open forest to the east of the current pit. The new soil stockpiling area will impact on an area of White Box grassy woodland, however this area is predominantly a derived grassland with no mature overstorey species present. On this basis, and in view of the biobanking credit calculation for offset requirements, appropriate mitigation measures for this disturbance are in place.
- **Aboriginal Heritage** – Several Aboriginal heritage sites comprising mainly scatters of stone artefacts have been identified within the mine site. Two sites have already been subject to salvage prior to the development of the Northern Emplacement, for which permit (No. 2312) to destroy was obtained under the *National Parks and Wildlife Act 1974*.

An additional site, NASO2 will require salvage in advance of the extension to the southern emplacement. This salvage will be undertaken in accordance with the provisions of the *National Parks and Wildlife Act 1974*, and the Tarrawonga Coal Mine Aboriginal Cultural Heritage Management Plan.

## 1.6 Land Ownership

WCL and its joint venture partner IBC own all freehold land within the mine site, which comprises:

- “Thuin”;
- “Nagero”; and
- “Forest View”.

In addition, WCL has acquired the adjoining properties of “Bollol Creek”, “Templemore”, “Green Hills”, “Blair Athol School House”, and “Matong” as a buffer to its operations. Whitehaven Coal has also entered into binding agreements with the landholders of the “Ambardo”, “Kyalla” and “Pine Grove” properties in relation to noise levels from coal haulage at those properties. **Plan 1** presents the ownership details for land on and surrounding the mine site and identifies nearby project-related and private residences.

## **1.7 Consultation**

### **1.7.1 Neighbours**

Prior to the advertising and public submission phase of the modification application, WCM produced a community newsletter which was distributed to surrounding residents and the Narrabri and Gunnedah Shire Council’s to inform them of the proposed modification. On completion of the Environmental Assessment for the project, copies were distributed to surrounding residents for review and comment. The modification was also publicly advertised through the Department of Planning.

### **1.7.2 Community Consultative Committee (CCC)**

Consultation with the local community was also undertaken via the Tarrawonga Community Consultative Committee (CCC). Meetings are held on a quarterly basis thereby providing opportunity for any issues of concern in the local community to be raised in an appropriate forum. Membership of the CCC is made up of local representatives residing in the neighbouring community, a local government representative and chaired by an independent community member who is also a Narrabri Shire Councillor.

The Tarrawonga site operates an environmental “hot line” telephone number 0429 497 730 for community feedback or for registering complaints with a procedure for responding.

### **1.7.3 Government Departments**

The Annual Environmental Management Reporting (AEMR) process provides the means of measuring progress towards the attainment of site environmental and rehabilitation outcomes as required by conditions of consent, leases and licences.

To date four AEMR’s have been submitted and have been followed by site inspections by the government departments including I&I – Mineral Resources, DoP, Narrabri and Gunnedah Shire Council, DECCW, and NOW.

WHC will continue to promote open discussion and consultation with all government departments.

## **1.8 Context of Operations**

The operating company for the Tarrawonga Coal Mine is Tarrawonga Coal Pty Ltd (TCPL), which is a joint venture between Whitehaven Coal Mining Pty Ltd (WCM) and Idemitsu Boggabri Coal Pty Ltd (IBC).

Whitehaven Coal Limited (WCL) is a listed public company and the parent company to Whitehaven Coal Mining Pty Ltd which has been at the forefront of the re-invigoration of the coal industry in the Gunnedah Basin. WCL currently operates, or co-operates, the following mines:

- Canyon Coal Mine, currently in the closure phase (100%)
- Rocglen Coal Mine (100%);
- Narrabri Coal Mine (70%);
- Sunnyside Coal Mine (100%);
- Whitehaven CHPP (100%); and
- Werris Creek Coal Mine (100%)

## **2 PRE MOP ENVIRONMENT**

### **2.1 Landscape**

#### **2.1.1 Topography**

The Tarrawonga Coal Mine is situated in the foothills of the Willowtree Range, 12km east of the Namoi River. The topography of ML 1579 comprises a series of rolling hills which vary in elevation from about 300 to 360m AHD. The fringing floodplains of Bollol Creek to the south of ML 1579 vary from approximately 260 to 280m AHD. ML 1579 is bounded to north by Leard State Forest and is surrounded by low-lying floodplains of Bollol Creek. Nagero Creek drains the southern slopes of the Willowtree range including the north-western portions of the lease area. Both Bollol and Nagero Creeks are poorly defined channels that become wide, shallow and slow moving waterways during and following significant rainfall and runoff events.

The existing landforms of the Tarrawonga Coal Mine comprise a Northern Emplacement which currently rises to a height of approximately 340m AHD, with an approved final height of 370m AHD. The southern emplacement rises to a current height of approximately 320m AHD, with a final approved height of 340m AHD. The height of the final landform on the Tarrawonga mine site will replicate the immediate adjoining topography.

#### **2.1.2 Surface Water**

The main local drainages in the vicinity of ML 1579 are Nagero Creek, Bollol Creek and Goonbri Creek. These creeks drain west to the Namoi River. Surface water quality and flow regimes in the vicinity of ML 1579 are influenced by existing mining activities and historical clearing for grazing on native and improved pastures and cultivation.

A small portion of the Nagero Creek catchment originates in the north western corner of ML 1579 and has been diverted from its original flow path to be captured within site water storages and sediment dams for on-site usage and to prevent sediment laden runoff from entering the creek. Nagero Creek in the vicinity of the mine is ephemeral and only flows during or after prolonged rainfall events.

The headwaters of Bollol Creek rise in the timbered hilly terrain approximately 20km east of the Tarrawonga Mine. More than half of the southern portion of ML 1579 is within the Bollol Creek Catchment. Bollol Creek is also ephemeral, flowing only during or after prolonged rainfall events.

Goonbri Creek, a tributary of Bollol Creek, rises in the eastern slopes of the Willowtree Range and drains a minor portion of the eastern part of ML 1579. Goonbri Creek is ephemeral and flows only during or after prolonged rainfall events.

The Tarrawonga Coal Mine surface water management system has been developed on the basis of providing adequate sediment storage capacity to meet the five day 90<sup>th</sup> percentile rainfall event as specified in the publication, "Managing Urban Stormwater: Soils and Construction, Vol 1, 2004". This capacity has been written into the conditions applicable to surface water discharge under the Tarrawonga Coal EPL.

Based on historical information in the area and ongoing surface water sampling, surface water is of a quality generally suitable for stock watering and irrigation purposes, with no consistent or obvious difference in water quality at sites upstream or downstream of the mine site.

### **2.1.3 Groundwater**

Groundwater investigations undertaken by RCA Australia (2005) identified three main aquifers in and around ML 1579, being:

1. Permian Coal Measures of the Maules Creek Formation, with water storage in the coal seams and interburden rocks;
2. Early Permian Boggabri Volcanics, where flows occur in fractures in the bedrock; and
3. Quaternary alluvial sediments, approximately 1 to 1.5km to the south of ML 1579, particularly within and adjacent to Bollol Creek and to the northwest along Nagero Creek, with groundwater typically ranging from 5m to 10m below ground level.

#### Permian Coal Measures of the Maules Creek Formation

The Permian Coal Measures have a low hydraulic conductivity and porosity due to their compacted nature, with groundwater occurring in fractures, joints, cleats and bedding. The fractures are usually a result of faulting or tensional folding. Flow rates in these storages are low, with flow direction to the south-west and at a depth of approximately 38m below surface.

#### Early Permian Boggabri Volcanics

Groundwater flow in the Boggabri Volcanics is also in a south-westerly direction, but generally at a slower rate than in the coal measures. Flows occur along fractures in bedrock, and there may be some groundwater flow between the coal measures and volcanics particularly where fractures within the volcanics adjoin the coal measures strata.

### Quaternary Alluvial Sediments

Large areas of the Maules Creek Sub-basin are covered by alluvial deposits of the Quaternary period. These deposits are generally 1 to 1.5km south of ML 1579 and particularly identifiable within and adjacent to Bollol Creek and to the northwest along Nagero Creek. These alluvial deposits have a high hydraulic conductivity with groundwater flows through the pore spaces between the grains.

Depth of groundwater ranges from 5 to 10m below ground level, with flows generally to the southwest. Limited flow interaction would occur between the coal measures and the alluvial sediments in the vicinity of the mine site.

The groundwater of the mine site is generally suitable for livestock watering, although not generally suited to human consumption due to elevated salt levels.

#### **2.1.4 Water Use and Availability**

A search of the NOW records identified some 36 registered bores within a 5km radius of ML 1579. These bores have yields generally <1L/sec with the majority used for stock and domestic supply.

#### **2.1.5 Land Capability**

GCNRC (2005a) identified that Land Capability of the mine site varied between Class III land on the lower slope areas, Class IV land on the mid slopes and parts of the upper slopes and Class VI land on the upper slopes and ridges, as presented on **Plan 2. Table 2.1** identifies the land capability classes.

**Table 2.1 - Land Capability Class Descriptions**

<b>Land Capability Class</b>	<b>Description</b>
Class III	"Land suitable for regular cultivation provided soil conservation works and adequate crop rotations are used".
Class IV	"Land suitable for grazing with occasional cultivation and requiring soil conservation practices such as stock control, application of fertiliser and minimal cultivation for the establishment or re-establishment of permanent pasture".
Class VI	"Land not capable of being cultivated but suitable for grazing; and application of soil conservation practices including limitation of stock, broadcasting of seed and fertiliser, prevention of fire and destruction of vermin."
Source: GCNRC (2004a) - Section 9, Specialist Consultant Studies Compendium accompanying the EIS	

## 2.2 Flora and Fauna

### 2.2.1 Flora

A large proportion of ML 1579 has been cleared for grazing and cropping although some areas of remnant native vegetation remain. Originally, the site comprised eight vegetation communities as shown on **Plan 2**, and as follows:

- Community 1 – Narrow Leaf Ironbark – White Cypress Pine Community
- Community 2 – White Box-Blakely's Red Gum White Cypress Pine Community
- Community 3 – Belah Community
- Community 4 – Cleared Lands
- Community 5 – Box – White Cypress Pine-Bull Oak Community
- Community 6 – Regenerating White Cypress Pine-Narrow-leaf Ironbark-Wattle Community
- Community 7- White Box-Pilliga Grey Box-Narrow-leaf Ironbark Community
- Community 8 – Shrubby White Box Woodland Community

The extension to the open cut and associated areas of disturbance as approved via the modification application in 2010 will impact on two vegetation communities as mapped by EcoLogical Australia Pty Ltd in 2010 and are as follows:

- White Cypress Pine – Narrow-leaved Ironbark Shrub/Grass open forest of the Western Nandewar Bioregion which aligns with Community 6 above; and
- White Box Grassy Woodland of the Nandewar and Brigalow Belt South Bioregions. This community was previously mapped as Community 4 and has now been captured as White Box grassy woodland by virtue of the biometric assessment methodology as completed for the biobanking assessment for the Tarrawonga modification.

A number of weed species listed as “noxious” under the *Noxious Weeds Act 1993* occur on ML 1579. The weeds, which occur both in cropped areas and areas of remnant native vegetation, along with their current noxious weed category are as follows:

- African Boxthorn [*Lycium ferocissimum*] – W3
- Bathurst Burr [*Xanthium spinosum*] – W1
- Noogoora Burr [*Xanthium pungens*] – W1
- Paterson's Curse [*Echium plantagineum*] – W3

- Prickly Pear [*Opuntia stricta*] - W4

No threatened flora species occur within ML 1579, although Box-Gum Woodland EEC and Box-Gum Grassy Woodlands and Derived Native Grasslands CEEC which are threatened ecological communities listed under the TSC Act and EPBC Act, have been identified by EcoLogical Australia as part of their assessment in 2010.

No areas of world heritage significance, wetlands of international significance or critical habitat occur in ML 1579.

### 2.2.2 Fauna

A large part of ML 1579 has been highly altered by previous and current agricultural land uses, however, it still provides habitat for a number of native and introduced species. Threatened fauna species previously recorded within ML 1579 comprise the species listed in **Table 2.2**.

**Table 2.2 - Threatened Fauna Species**

Scientific Name	Common Name
<b>Birds</b>	
<i>Calyptorhynchus lathami</i>	Glossy Black Cockatoo
<i>Neophema pulchella</i>	Turquoise Parrot
<i>Climacteris picmnus victoria</i>	Brown Treecreeper (Eastern sub-species)
<i>Pyrrholaemus saggitatus</i>	Speckled Warbler
<i>Melanodryas cucullata</i>	Hooded Robin
<i>Pomatstomus temporalis</i>	Grey Crowned Babbler (Eastern sub-species)
<b>Mammals</b>	
<i>Chalinolobus picatus</i>	Little Pied Bat
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail Bat

In addition to the above species, a further five threatened fauna species have been recorded in the adjoining Leard State Forest, or nearby and are as follows:

- Black-chinned Honeyeater (*Melithreptus gularis gularis*);
- Diamond Firetail (*Stagonopleura guttata*);
- Masked Owl (*Tyto novaehollandiae*);
- Greater Long-eared Bat (*Nyctophilus timoriensis*); and
- Grey Falcon (*Falco hypoleucos*)

These species could potentially use habitat within the Tarrawonga extension area.

## 2.3 Archaeological

### 2.3.1 Aboriginal

The search of Aboriginal Sites Register (Aboriginal Heritage Information Management System – AHIMS) identified three recorded sites within a 11km x 10km area centred on ML 1579. None of the known sites would be impacted by the Tarrawonga mine development.

Subsequent field survey identified four Aboriginal Heritage sites within ML 1579, with a further four sites identified along the access route to the mine site. These sites are identified in **Table 2.3**.

**Table 2.3 - Known Aboriginal Heritage Sites within ML 1579**

Site Type	Site
Isolated Artefact	NASO1, NISO1, NASO2
Tree	NST1
Artefact scatters along haul route	GGOS1, GGOS2, GGOS3 and GGOS4

Of the above sites, NASO1 and NISO1 have been salvaged under permit number 2312 from DECCW. NST1, GGOS1, GGOS2, GGOS3 and GGOS4 have all been fenced and will not be affected by ongoing mine development. NASO2 will be directly impacted by the extension to the southern emplacement and will be subject to salvage in accordance with a Section 87 permit under the *National Parks and Wildlife Act, 1974*. Upon salvage the artefacts will be stored at the Red Chief Local Aboriginal Land Council Keeping Place.

### 2.3.2 European

No areas of European heritage have been identified on the mine site with no impact expected on European heritage as a result of the ongoing operation of the Tarrawonga Coal Mine.

### **3 PROPOSED MINING ACTIVITIES**

#### **3.1 Exploration**

Additional exploration drilling is proposed within ML 1579 over the term of this MOP period. This will generally focus on the exploration licence area (EL 5967) east of the existing Mining Lease area and will form the basis of further development of the Tarrawonga Coal Mine.

#### **3.2 Land Preparation**

##### **3.2.1 Introduction**

The ongoing development of the Tarrawonga Coal Mine will involve the sequential clearing of vegetation and removal of soil (land preparation) prior to the removal of overburden and interburden, mining of the identified coal seams and progressive backfilling and rehabilitation of mined-out areas. **Plan 3** presents the extent of land preparation for the term of this MOP.

##### **3.2.2 Vegetation Clearing**

Vegetation clearing to be undertaken during the term of this MOP will be on the basis of a progressive campaign approach, with the extent of clearing undertaken in each campaign sufficient for the subsequent year of mine development. Vegetation to be cleared during the term of this MOP for active mining will comprise a mixture of cleared lands (approximately 40ha) and remnant native vegetation (approximately 45ha) which is predominantly White Cypress Pine, Narrow-leaved Ironbark shrub/grass open forest. A further 21ha of open grassland will be utilised for soil stockpiling purposes. Clearing activities would be undertaken preferentially over the autumn period each year to ensure completion of activities prior to the winter hibernation period. All clearing campaigns will be subject to preliminary inspections to ensure minimal impact on fauna during clearing campaigns.

###### **3.2.2.1 Clearing Procedures**

Vegetation removed during the term of this MOP will generally be cleared in the following manner:

1. The area of vegetation to be cleared will be clearly defined (using marking/tagging of individual trees if necessary);
2. All personnel involved in the clearing will be made aware of the boundaries of the clearing;

3. Prior to any surface disturbance during any given clearing campaign, upslope temporary diversion banks and/or down slope silt fencing will be erected across all identified drainage lines (where necessary). Diverted water will be directed to natural/undisturbed drainage lines or to water storages within the site;
4. Prior to each clearing campaign, an inspection of trees will be undertaken to ensure impacts on resident fauna will be minimised;
5. Chainsaw felling and/or bulldozer with the blade positioned just above the ground to minimise soil disturbance, will be used to clear the larger vegetation (>0.3m in height). Groundcover (<0.3m in height) will be retained and subsequently collected with topsoil during the soil removal operation;
6. When appropriate, and where weeds are sufficiently dense in areas to be cleared, weed spraying will be conducted prior to soil stripping activities and
7. Once felled, logs and branches <300mm in diameter or exhibiting hollows will be cut or broken into manageable lengths and placed on areas designated for the re-establishment of native woodland vegetation, or in stockpiles for subsequent replacement as part of WCM's ongoing rehabilitation program.

The cleared vegetation will be stockpiled within the areas shown on **Plan 3**.

### 3.2.3 Drainage Installation

In accordance with measures to be prescribed in an amended Site Water Management Plan (SWMP) for the site, the additional activities prescribed during the term of this MOP will include the requirement for additional drainage measures as follows:

- SD 20 will need to be drained prior to mining through. A new diversion drain and new sediment basin to be constructed east of the open cut (SB22);
- Realignment of dirty water collection drains and clean water diversions around the southern emplacement;
- Additional dirty water collection and clean water diversion drains, and a new sediment basin (SB21) will be required to capture and direct runoff from and around the north-eastern portion of the expanded southern emplacement.;
- Expansion of the northern emplacement eastwards as the open cut progresses will require the construction of additional contour banks and the extension of the existing dirty water drain along the northern edge of ML 1579;
- A new dirty water collection drain and sediment basin (SB23) will be required at the new soil stockpile area west of the main access road;
- An additional sediment basin (SB24) will be constructed to capture overflow from SB21 to enhance storage capacity and solids settling capacity prior to off-site licensed discharge;

- Construction of storage dam SD18 north of SB24 to capture clean water from the clean water diversion drain;
- A new mine water dam will be required south of the existing mine facilities area. Spillway would be directed via the existing dirty water collection system. Provision will be available for additional mine water dams as required;
- Three new licensed discharge points will be required. The first to be located downstream of SB22 to the east of the open cut for discharge into the Nagero Creek Catchment. The second to be located downstream of SB23 at the southwest margin of the soil stockpile area, which drains to the Bollol Creek catchment. The third to be located downstream of SB24 for any release off site into the Bollol Creek catchment. The existing licensed discharge point north of SD20 will be made redundant upon mining through of SD20.

All other drainage measures will remain as per existing arrangements.

### **3.2.4 Soil Removal**

#### **3.2.4.1 Introduction**

The soils within the proposed areas of disturbance have been described based on:

- Their suitability for use as a final cover material on the post-mining landform; and
- The requirement for specific stripping and stockpiling or erosion control measures.

The description was based on field and laboratory examinations of key physical and chemical attributes.

#### **3.2.4.2 Soil Categorisation**

Two main Soil Mapping Units (SMUs) are present within the area of ML 1579 and are subject to disturbance under this MOP period. A basic description of each SMU, together with comments on stripping suitabilities and stripping procedures, is summarised in **Table 3.1**.

**Table 3.1 - Soil Stripping Procedures**

Layer (Thickness)	Material	Stripping Suitability	Soil Stripping Procedures
<b>SMU 1</b>			
1 - Topsoil (0-15cm)	Sandy 10cm, sandy clay 10cm, clay 10cm, clay sand, fine sandy clay 10cm, light to medium clay, silty clay.	Suitable for topsoiling though sandier than ideal and containing considerable amounts of gravel. Also contains valuable seed, organic matter, nutrient reserves and other favourable attributes.	Strip to a depth of 15cm in all areas disturbed by mining and associated infrastructure development.
2 - Subsoil (15-65cm)	Sandy 10cm, sandy clay 10cm or light to medium clay, some sands, silty clay 10cm, heavy clay	Suitable for use as subsoil.	Strip to depth 50cm below layer 1 (total depth 65cm) in areas of deeper disturbance such as mining or waste rock emplacements.
3 - (65cm-115cm)		Some limitations including pH, presence of mottles and amount of gravel.	Strip to a depth 50cm below layer 2 (total depth of 115cm) where weathered rock is not present. Cease stripping as rock is encountered.
<b>SMU 2</b>			
1 - Topsoil (0-10cm)	Light to medium clay, sometimes heavy clay.	Suitable for topsoiling provided suitable stripping and storage methods are used.	Strip to a depth of 10cm.
2 - Remainder of Profile		Not suitable for stripping and stockpiling	Strip material below 10cm and mix with overburden material. This material should be targeted for priority burial in the pit once backfilling of mined out areas commences.
Source: Modified after Geoff Cunningham Natural Resource Consultants Pty Ltd (2005a) – Sections 7 & 8			

As identified on **Plan 2**, the majority of mining activity over the term of the MOP Period will be occurring on soils categorised as Land Capability Class 3, 4 and 6 and within Soil Mapping Unit 1.

### **3.2.4.3 Soil Erodibility and Erosion Potential**

Visual observations of the mine site indicate that in its current state, the site is generally stable except for some minor areas of sheet erosion on the slopes and some gully erosion in the main drainage lines.

Using the SOILOSS computer program, both SMU's illustrate a moderate erodibility and will require careful management during the stripping and rehabilitation stages to ensure that the soil structure damage is minimised, and that they are suitably protected by vegetation at all times.

#### **3.2.4.4 Soil Stripping**

Soil stripping will generally follow vegetation clearing activities. Due to the generally good structure of both the topsoils and subsoils, bulldozers and/or scrapers will be used for soil stripping. Topsoil and subsoil will be stripped to the depths noted in **Table 3.1** for each SMU. In order to minimise handling, scrapers will dump their loads neatly to form a uniform stockpile that requires little further forming prior to establishment of a vegetation cover. Stripping of topsoil and subsoil during periods of excessive soil moisture content (ie. following heavy rain) will also be avoided to reduce the likelihood of damage to soil structure.

Soil stripping will generally be undertaken in the following manner:

1. Areas of disturbance requiring soil stripping will be clearly defined following vegetation clearing (using marker pegs/posts if necessary);
2. Topsoil will be stripped to the depths nominated in **Table 3.1**, being 15cm (SMU1) and 10cm (SMU2) with subsoil stripped to a maximum depth of 50cm (SMU1). SMU 2 is not suitable for subsoil retention;
3. Topsoil and subsoil stockpiles would be retained at 3m height, with slopes no greater than 1:2 (V:H) and a slightly roughened surface to minimise erosion;
4. All topsoil and subsoil stockpiles will be seeded with a non-persistent cover crop to reduce erosion potential as soon as possible after completion of stockpiling. Where seasonal conditions preclude adequate development of a cover crop, stockpiles will be treated with a straw/vegetative mulch to improve stability;
5. Wherever possible, no soil will be removed in wet conditions to avoid breakdown in soil structure;
6. There will be no vehicle access on soil stockpiles;
7. Soil stockpiles will be located in positions to avoid surface water flows. Silt stop fencing will be placed immediately down-slope of stockpiles until stable vegetation cover is established;
8. In the event that unacceptable weed generation is observed on soil stockpiles, a weed eradication program will be implemented; and
9. An inventory of soil resources on the mine site will be maintained and regularly reconciled with rehabilitation requirements.

During the MOP term, it is anticipated that an area of approximately 85ha will be cleared for active mining, with a further 21ha disturbed for topsoil stockpiling. During this time, an existing 335,000m<sup>3</sup> of topsoil will be relocated to the new soil stockpiling area to allow extension to the southern waste emplacement. A further 127,500m<sup>3</sup> of topsoil will be stripped within the pit extension, and previously approved areas of mine development and 255,000m<sup>3</sup> of subsoil will be stripped from the active mining and emplacement areas. Soil will not be stripped from the soil stockpiling area. Areas to be mined over the life of this MOP period generally comprise shallower topsoils to that encountered during the initial development of the mine. This is due to the progression of the mine footprint to the top of the ridgeline and generally over poorer quality soil.

A soil balance for the site over the term of this MOP is presented in **Table 3.2**.

**Table 3.2 - Soil Balance (Years 2010 to 2013)**

Item	Unit	2010 (1/7/2010 – 31/12/2010)	2011 (1/1/2011 – 31/12/2011)	2012 (1/1/2012 – 31/12/2012)	2013 (1/1/2013- 30/06/2013)	Total
Clearing Area – Open Cut	ha	14	12	14	8	48
Clearing Area – Overburden emplacement	ha	12	12	11	0	35
Topsoil Open Cut	m <sup>3</sup>	21,000	18,000	21,000	12,000	72,000
Subsoil Open Cut	m <sup>3</sup>	42,000	36,000	42,000	24,000	144,000
Topsoil – Overburden emplacement	m <sup>3</sup>	21,000	18,000	16,500	0	55,500
Subsoil – Overburden emplacement	m <sup>3</sup>	42,000	36,000	42,000	0	120,000
Direct Placement	m <sup>3</sup>	25,000	30,000	30,000	22,500	107,500
Stockpiled	m <sup>3</sup>	101,000	78,000	91,500	13,500	284,000

#### **3.2.4.5 Soil Management**

In order to effectively manage the topsoil and subsoil stripped and ultimately respread, Tarrawonga Coal maintains an inventory of the various soils stripped, replaced and stockpiled to reconcile against required volumes for ongoing rehabilitation. Estimates of recoverable topsoil and subsoil volumes within those areas to be disturbed by mining and

associated activities over the life of the mine have been determined based on the stripping depths presented in **Table 3.1**.

### 3.2.5 Soil Stockpiling Methods/Location

In preference to stockpiling, wherever possible, stripped topsoil and subsoil will be directly replaced on completed sections of the final landform. This will become common practice over the term of this MOP as the final landform is developed behind the advancing footprint of the mine. The locations of existing soil stockpile areas and new stockpile areas during the term of this MOP are displayed on **Plan 4**. These locations minimise the haul distance for subsequent respreading and are sufficient for stockpiling requirements over the term of this MOP period.

## 3.3 Construction

Over the term of this MOP period, additional construction activity on site will comprise:

- Storage dam and sediment basin development, together with diversion bank establishment in accordance with site water management requirements;
- Construction of additional hardstand areas for park up of dump trucks and laydown of spare parts and equipment; and
- Establishment of new soil stockpiling location.

Construction of all these components will be undertaken in accordance with the 75W approval granted by the Department of Planning.

All infrastructure developed over the previous MOP term will remain and comprises:

- Tarrawonga Coal office and administration area, including:
- Offices;
- Toilet and ablution facilities;
- Crib room;
- Stores building;
- First Aid building;
- Maintenance workshop;
- Hardstand/laydown area;
- Fuel farm;
- Service bay and wash bay; and
- Parking facilities area.

- Mine entrance and access roads; and
- ROM coal pad and processing area.

### 3.4 Mining

#### 3.4.1 Introduction

The ongoing method and sequence of mining at the Tarrawonga Coal Mine will be largely as undertaken over the previous MOP term, and as described in the EIS prepared as part of the initial development application for the mine and subsequent 75W modification. This subsection serves to expand on the description contained within these documents. Details of the proposed mining activities are presented on **Plan 4**.

#### 3.4.2 Overburden Removal / Coal Extraction

The Tarrawonga Coal mine will continue to be developed using conventional drill and blast, and haulback mining methods as follows:

1. Holes will be drilled into the overburden rock, packed with explosive and blasted to fracture the rock such that it can be removed from the open cut area to expose the coal seams. **Table 3.3** presents the blasting parameters to be adopted at the mine;

**Table 3.3 - Typical Blast Design Parameters**

Parameter	Unit	Detail		
		Minimum	Average	Maximum
Bench Height	m	2	25	45
Blast hole diameter	mm	125	229	300
Blast hole inclination	deg	60	75	90
Blast hole spacing	m	4.0	6.5	9.5
Burden	m	4.0	6.5	7.5
Stemming Length	m	0.5	3.0	5.5
Explosive type		90% Heavy ANFO, 10% emulsion		
Maximum Instantaneous Charge	kg	50	960	1 952
Initiation System		Nonel or electronic delay		

2. Following blasting, the bulk overburden will be loaded by excavator into haul trucks and transported to the closest overburden emplacement or mined out section of the void;
3. Interburden layers greater than 2m thick will be blasted and removed in a similar fashion. Interburden layers between 0.3m and 2m thick will be ripped by bulldozer before being loaded to haul trucks. 0.3m generally represents the practical limit to the separate mining of these layers; and
4. To remove the coal, benches will be developed along and perpendicular to the length of coal seam exposed through blasting and overburden/interburden removal. As sufficient coal is exposed, it will be ripped, excavated and loaded to haul trucks for transportation to the ROM pad within the coal processing area.

### **3.4.3 Mining Sequence**

Mining will continue in an easterly direction into the extension area approved via the 75W modification. The open cut mine will continue to be developed with benches oriented in a north-south direction.

Annual ROM coal production is projected to approximate 2 Mtpa over the life of the MOP.

### **3.4.4 Blasting**

#### **3.4.4.1 Introduction**

The number of blasts will be minimised by maximising blast size whilst complying with the environmental criteria. It is projected that an average of four blasts will be initiated per month.

Blast design will be undertaken by a blasting engineer with loading and firing undertaken by a suitably qualified and experienced contractor holding a shotfirer's certificate issued by the DII (Mineral Resources). Each blast will be designed to provide an adequate level of fragmentation with acceptable environmental impact.

#### **3.4.4.2 Blasting Criteria**

##### Annoyance Criteria

Tarrowonga Coal will ensure the airblast overpressure and ground vibration impacts remain within the following ANZECC "annoyance" criteria and DECCW licensing and DoP Development Consent requirements, as follows:

- The maximum overpressure level for blasting is 115dB (linear);
- The level of 115dB (linear) may be exceeded for up to 5% of the total number of blasts over a 12 month period, but should not exceed 120dB (linear) at any time;
- The recommended maximum vibration velocity for blasting is 5mm/s Peak Vector Sum (PVS); and
- The PVS level of 5mm/s may be exceeded for up to 5% of the total number of blasts over a 12 month period, but should not exceed 10mm/s at any time.

Blasting will be limited to the hours of 9:00am to 5:00pm Monday to Friday, and will not take place on Saturdays, Sundays and Public Holidays. Blasting will occur no more than once per day, unless safety concerns require the initiation of a second smaller blast which is approved by the DECCW.

#### Safety Criteria

Blasting by its very nature requires rocks to be broken and propelled away from the blast site. The area in which blasted rock should normally fall is referred to as the blast envelope and any rock propelled beyond the blast envelope is referred to as fly rock. From a safety perspective, a distance of 500m from a blast in a coal mine is typically identified as a safe distance. This distance is not site-specific and consequently is recognised to be conservative.

#### **3.4.4.3 Blast Controls and Safeguards**

The following operational controls and safeguards will be implemented by Tarrawonga Coal:

- Where practicable, the orientation of the blast face will be away from, or at an oblique angle to nearby residences;
- Blasthole spacing will be implemented in accordance with blast design;
- Burden distance and stemming length will be carefully selected and implemented precisely;
- Appropriate materials, eg. <20mm aggregate, will be used for stemming;
- Blast design will ensure that charges detonate in the correct sequence and with inter-row delays that provide good progressive release of burden;
- The maximum weight of explosive detonated in a given delay period (the maximum instantaneous charge) will be limited to conservative and proven levels;
- Tarrawonga Coal will follow the blast notification procedure nominated in the Blast Monitoring Program; and

- A blast notice board at the entrance to site will be updated prior to each blast to provide adequate notification.

#### **3.4.4.4 Blast Monitoring and Inspections**

Airblast overpressure and ground vibration will continue to be monitored at a selection of surrounding residence as provided in the Tarrawonga Coal Blast Monitoring Program and in accordance with the specifications presented in **Table 3.4**.

**Table 3.4 - Blast Monitoring Schedule**

<b>Parameter</b>	<b>Units of Measure</b>	<b>Frequency</b>	<b>Sampling Method</b>	<b>Measurement Location</b>
Air-blast overpressure	dB(Lin Peak)	Every blast	AS2187.2-2006	Not less than 3.5m from a building or structure
Peak particle velocity	mm/s	Every blast	AS2187.2-2006	Not more than 30m from a building or structure

Source: DA 88-4-2005

In the event a landowner or resident claims property or infrastructure has been damaged as a result of blasting, Tarrawonga Coal will, within 3 months of receiving a written request, commission an investigation into the claim by a suitably qualified person whose appointment is approved by the Director-General of the Department of Planning. A copy of the investigation report will be provided to the landowner or resident and any damages caused by blasting repaired at the cost of Tarrawonga Coal.

#### **3.4.5 Coal Transportation**

The location of the Tarrawonga Coal Mine necessitates the requirement to haul the ROM coal to the Gunnedah CHPP for washing that component requiring additional beneficiation, or direct loading to trains as bypass product. All coal haulage is undertaken via an approved transport route and within the approved hours of transport being 7am to 10pm Monday to Friday, and 7am to 6pm on Saturdays. The approved transport hours necessitates final loading during the week to cease from 9:15pm and by 5:15pm on Saturdays.

#### **3.4.6 Mine Dewatering**

Dewatering from the active mine will continue on the basis of pumping pit water to designated pit water storages on site. An existing pit water storage below the ROM pad is now obsolete due to its distance from the active pit. New storages will be constructed on an as needs basis in accordance with the approval granted under the 75W modification.

A 1m freeboard will be maintained in pit water dams at all times and in the event that capacity is reached, pumping from the void will cease.

### 3.4.7 Equipment

**Table 3.5** lists the types and number of items of earthmoving and mining equipment to be used at the Tarrawonga Coal Mine together with their principal function and likely duration of use, e.g. campaign, full-time. The majority of the identified equipment is owned by WCM.

**Table 3.5 - Typical Mining Equipment**

Item	No.	Function	Duration of Use	
			Day*	Evening**
O & K RH170 Excavator	3	Overburden Excavation/Loading	Full Time	Full Time
Hitachi EX1900 Excavator	1	Overburden/Coal Excavation/Loading	Full Time	Full Time
Terex Dump Truck	7	Overburden/Interburden	Full Time	Full Time
CAT Dump Truck 777F	3	Overburden/Interburden/Coal haulage	Full Time	Full Time
CAT Dump Truck 785C	4	Overburden/Interburden/Coal haulage	Full Time	Full Time
Terex SKF Drill	1	Blasthole drilling	Full Time	Full Time
Cubex QXR1320 Gen V Drill	1	Blasthole drilling	Full Time	Full Time
CAT D10R Dozer	1	Clearing, Interburden/Coal Ripping/Pushing, Dump Maintenance	Full Time	Full Time
CAT D11R Dozer	4	Clearing, Interburden/Coal Ripping/Pushing, Dump Maintenance	Full Time	Full Time
Water Cart (road registered)	2	Dust Suppression	Full Time	Full Time
CAT 773 Water Truck	1	Dust Suppression	Full Time	Full Time
CAT 16M Grader	2	Road Maintenance	Full Time	Full Time
CAT 637-2 Scraper	4	Soil removal and stockpiling	Full Time	Part Time
Service Truck	1	Machinery servicing	Full Time	Full Time
Cummins Genset	2	Power for site offices, workshop and crusher	Full Time	Full Time
Crusher/Screening Plant	1	Coal Size Reduction and Screening	Full Time	Full Time
Mobile Crusher	1	Coal Size Reduction / domestic product	Full Time	Part Time
Lighting Plant	11	Lighting for Work After Nightfall	-	Full Time
IT38G Loader	2	Loading	Part Time	Part Time
CAT 988H Loader	2	ROM Pad	Part Time	Part Time
* Day Shift = 7:00am to 4:30pm		** Evening Shift =4:30pm to 3:30am		

Additional equipment used on ML 1579 may include generators (either freestanding or integrated with various items of equipment) and miscellaneous maintenance equipment (eg. welders).

### 3.4.8 Hours of Operation

Hours of operation at the Tarrawonga Coal Mine are as follows:

- Open cut mining activities and coal processing activities between 7am and midnight Monday to Friday, between midnight and 3:30am Tuesday to Saturday, and 7am and 6pm Saturdays;
- General maintenance activities at any time Monday to Sunday; and
- Coal transport between 7am and 10pm (last load off site by 9:15pm) Monday to Friday and 7am and 6pm (last load off site by 5:15pm) on Saturdays.

## 3.5 Coal Processing

The component areas and parts of the coal processing area include:

- ROM pad;
- Coal loading hopper;
- Primary and secondary crushers;
- Portable crusher;
- Product bin;
- Conveyors;
- Product coal stockpile area;
- Weigh bridge;
- Diesel generator and fuel storage;
- Crib hut; and
- Access road for truck access to loading bin.

**Plan 4** presents the location of the coal processing area beyond the western perimeter of the open cut mine.

A front-end loader will be used to place coal from the ROM pad into the 40t capacity coal loading hopper. The ROM coal will pass over a feeder and into the primary crusher where it will be reduced to 150mm diameter. The crushed coal to be despatched for further beneficiation at the Whitehaven CHPP will then pass via a conveyor to the 300t product bin

for truck loading. Coal that does not require further beneficiation (by-pass coal) will progress along the same circuit but will pass through a secondary crusher where it will be crushed to a maximum size of 50mm diameter. From the secondary crusher the coal will travel via conveyor to the product bin for loading.

The product bin incorporates a tripper to enable coal to be stockpiled adjacent to the bin if necessary in the event of a bin malfunction to ensure continuing supply to the Whitehaven CHPP.

### 3.6 ROM Coal and Product Stockpiles

The mined coal will be placed in various stockpiles on the ROM pad, including:

- Clean bypass coal – coal requiring only primary and secondary crushing prior to despatch and sale;
- Dirty coal – coal requiring primary crushing and further beneficiation through the Whitehaven CHPP; and
- Dirty-dirty coal – generally obtained from the roof or floor of the coal seams and diluted by overburden layers and requiring primary crushing and further beneficiation through the Whitehaven CHPP.

The ROM pad retains a capacity of approximately 150,000t.

Under normal circumstances, up to 50,000t ROM coal and 35,000t screened and broken coal will be retained within the coal processing area in stockpiles. Any processing waste produced through the crushing/screening process will be stockpiled temporarily within the processing area before being disposed of in pit. **Table 3.6** presents the projected volumes for topsoil stripped, overburden and ROM coal removed, and product coal produced.

**Table 3.6 - Production Schedule**

Item	Unit	Provisional Production during MOP Term			
		2010 1/07/2010 – 31/12/2010	2011 1/01/2011 – 31/12/2011	2012 1/01/2012 – 31/12/2012	2013 1/01/2013- 30/6/2013
Stripped Topsoil & Subsoil	m <sup>3</sup>	126,000	108,000	121,500	36,000
Overburden	bcm	9,000,000	18,000,000	18,000,000	9,000,000
ROM Coal	t	1,000,000	2,000,000	2,000,000	1,000,000

## 3.7 Waste Management

### 3.7.1 Introduction

The waste materials produced by the mine can be categorised as either production or non-production wastes.

Production wastes comprise:

- Overburden and interburden from the development of the open cut mine;
- Potentially contaminated water from the maintenance workshop, washdown pad and fuel storage areas;
- Rejects produced from washing of coal at the Whitehaven CHPP which will be periodically backloaded to the open cut for placement in the specified reject emplacement area as approved under Section 100 of the CMHSA.

Non-production wastes include:

- General domestic-type wastes from the on-site buildings and routine maintenance consumables;
- Oils and grease; and
- Sewage.

Management of production wastes is described in Section 3.7.2 and 3.7.3. The management of domestic type wastes, waste oil and sewage is described in Sections 3.7.4, 3.7.5 and 3.7.6 respectively.

### 3.7.2 Overburden and Interburden

#### 3.7.2.1 *Material Characteristics*

An assessment of the chemical and physical characteristics of the overburden and interburden material was undertaken on composite samples from the core of a representative drill hole established to the immediate east of the open cut mine area.

The results of an independent assessment established that there is a low potential for both acid formation and soluble salt generation from the overburden and interburden material (Geo-Environmental Management, 2010). Analysis was undertaken in March 2010 by ALS which confirmed this determination to be consistent with previous studies. As such, there are no specific handling and emplacement requirements for these materials apart from the inclusion of testing Arsenic, Antimony, Selenium and Molybdenum in the site water

monitoring program to confirm minimal leaching of these elements from the overburden waste emplacements.

### **3.7.2.2 Overburden and Interburden Placement**

Virtually all of the overburden and interburden materials will be blasted and removed by conventional haulback methods, i.e. the overburden and interburden is to be transported by haul truck to the overburden emplacement area in-pit and out-of-pit. The overburden out-of-pit emplacements are located to the west and south of the active pit. During this MOP period overburden and interburden emplacement will take place on the northern emplacement, increasing in height to 370m AHD, in pit, extending on the northern emplacement area, and at the southern emplacement to a maximum height of 340m AHD.

During the term of this MOP, approximately 54 million bank cubic metres (Mbcm) of overburden and interburden material will be mined. Out-of-pit placement of overburden will account for approximately 54% or 29.2 Mbcm of total placement, with the remaining 46% or 24.8 Mbcm to be placed within the mined out sections of the open cut. The batters of the out of pit overburden emplacements will be progressively rehabilitated to native vegetation, as will the plateau of the in pit emplacement area. This will allow the final rehabilitation of the site to blend with existing vegetation areas retained both on the mining lease and within the adjoining Leard State Forest. The emplacement areas will blend with the surrounding topography (with slopes at or less than 10°) and a maximum height of 370m.

### **3.7.3 Whitehaven CHPP Reject**

The beneficiation (washing) of the coal at the Whitehaven CHPP produces both coarse and fine reject. The coarse reject particles range between 1.4mm and 50mm diameter, and represent between 4% and 12% of coal delivered for washing. The Tarrawonga site has an approved Reject Emplacement Area designated within the open cut and approved under Section 100 of the CMHSA on the 6<sup>th</sup> January 2010. It is estimated that up to 2,000 tonnes/day of coarse reject may be transported to the Tarrawonga reject emplacement up to 5 days/week. As the emplacement area is within the pit void, the reject material will be covered by up to 20m of overburden material within the in pit dump and will be subsequently rehabilitated consistent with the remainder of the in-pit dump area.

### **3.7.4 Domestic Type Wastes**

All paper and general wastes originating from the site office, amenities and ablutions buildings, together with routine maintenance consumables from the daily servicing of equipment (such as grease cartridges), is to be disposed of in 240L or similar mobile garbage bins located adjacent to the various buildings. These bins will generally be collected

daily and the contents placed in large waste storage receptacles or dumpsters positioned adjacent to the heavy vehicle maintenance building to await removal by a licenced industrial waste collection contractor. Industrial waste collection will be undertaken as required.

A separate collection system is in place for paper, cans and cardboard to enable these to be recycled. These, and other recyclables such as ferrous and non-ferrous metals, will be despatched off site at appropriate intervals.

### **3.7.5 Oil Containment and Disposal**

Routine maintenance of mining and earthmoving equipment will generally be undertaken in the workshop building within the administration and facilities area, or at equipment maintenance facilities away from the mine. Within the workshop building, waste oils will be collected and pumped to bulk storage tanks by oil evacuation pumps. Emergency or breakdown maintenance of equipment may also be necessary within the mine area or on the overburden emplacement. Under these circumstances, oils will be pumped from this equipment to a tank on the service vehicle using an evacuation pump and then transferred to the bulk storage tank at the workshop building. All parts and packaging are to be collected and transferred to the workshop building for disposal or recycling. Waste oils will be stored in a bunded area at the workshop building, which will be collected by a licensed waste contractor for recycling.

Waste materials collected from the sump of the wash down bay is collected and analysed on an as needs basis to determine concentration thresholds for hydrocarbons. In the event that the material sampled is below concentration thresholds as specified by DECCW, the material will be disposed of in the open pit and covered with overburden material. The GPS location of disposed materials will be recorded by WHC. Where materials do not meet concentration threshold criteria for classification as general waste, they will be stored on site for bio-remediation.

### **3.7.6 Sewage Treatment and Disposal**

Tarrowonga Coal has installed adequate toilet and hand-washing facilities within the mine facilities and amenities area for the site workforce and visitors. These facilities incorporate a biocycle sewage treatment system approved by Narrabri Shire Council. The system is serviced by licensed waste collection and disposal contractors as required. Treated effluent disposal will be pumped to a small waste water utilisation area located close to the administration facilities on the southern side of the administration area.

## 3.8 Water Management

### 3.8.1 Introduction

The Tarrawonga Coal Mine lies within the catchment of Nagero and Bollol Creeks, with any runoff originating from the lease area flowing directly or indirectly towards these creeks and ultimately, the Namoi River.

Water is required on the mine site primarily for dust suppression, with minor quantities required for potable and toilet/ablutions purposes. Water for dust suppression will be sourced from a combination of on-site water harvesting, extraction of accumulated groundwater from within the open cut pit, and limited volumes from groundwater extraction. Water for potable, toilet and ablutions purposes will be trucked to the site from Gunnedah or Boggabri.

The principal objectives of site water management are as follows:

1. To ensure sufficient quantities of water can be obtained through the capture of “dirty” water, harvesting of “clean” water, and extraction/harvesting of groundwater to meet the requirements for dust suppression on the mine site;
2. To ensure the segregation of “dirty” water from “clean” water;
3. To maximise the use of “dirty” water for dust suppression purposes and minimise the necessity to harvest “clean” water;
4. To minimise the volume of water discharged from the mine site, but should discharge of water prove necessary, ensure sufficient settling time is provided prior to discharge such that suspended sediment within the water meets the discharge criteria;
5. To minimise erosion and sedimentation from all active and rehabilitated areas of the mine site;
6. To monitor the effectiveness of surface water controls and ensure all relevant surface and groundwater quality criteria are met;
7. To monitor the impact on groundwater level, quality and availability;
8. To minimise any impacts on the availability of surface water or groundwater to surrounding landholders and residents.

Tarrawonga Coal has an operational Site Water Management Plan (SWMP) which addresses the objectives outlined above and forms the basis for site water management on the mine site.

The design, sizing and construction of the water management controls currently in place and proposed over the life of this MOP are to meet the 90%ile 5 day event criteria as specified in the publication, “Managing Urban Stormwater: Soils and Construction, Vol 1, 2004”. **Plan 4**

presents the water management controls including sediment basins, storage dams, as applicable to the Tarrawonga site.

The nature and design of identified water management and control structures as described in the SWMP will be subject to ongoing review by Tarrawonga Coal with any modifications over time to be reflected in amendments to the SWMP.

### 3.8.2 Potential Sources of Water Pollution

The potential sources of water pollution from the various areas of disturbance and activities at the mine undertaken during the term of this MOP are as follows:

1. Runoff from areas disturbed in advance of and during mining;
2. Runoff from topsoil, subsoil and overburden stockpiles/emplacment;
3. Surface runoff from the processing, and product stockpile areas;
4. Surface runoff from rehabilitated areas prior to full stabilisation;
5. Discharge of mine water;
6. Surface runoff from roads; and
7. Leakage or spillage of fuel, oil or lubricants.

The principal contaminant in all but item (vii) above is suspended solids.

For management purposes, the water within ML 1579 has been divided into four classes, as detailed below:

- **“Clean”** – surface runoff from rehabilitated catchments and catchments undisturbed or relatively undisturbed by mining or related activities.
- **“Dirty”** – surface runoff from disturbed catchments such as the active mine area and overburden dumps, ROM and product coal stockpiles, soil and subsoil stockpiles and rehabilitated areas (until stabilised), all of which could contain sediments.
- **“Contaminated”** – surface runoff which could potentially contain hydrocarbons.
- **“Pit Water”** – Water pumped from the open cut void to specially designed mine water storage dams.

### 3.8.3 Clean Water Management Structures

Clean water will be diverted away from areas of disturbance via constructed diversion banks and held in storage dams for use in dust suppression activities. **Plan 4** presents the location of these structures constructed in accordance with the site water management plan.

The dimensions for each diversion bank have been based on the upslope catchment area and slope. Generally, each bank exhibits the following features:

- The channel of the bank is to be trapezoidal;
- Bank batters between 1:3 to 1:6 (vertical : horizontal);
- Channel batters are to be 1:6 (v:h);
- Channel grade 1: 400 (5cm/20m) if channel is bare;
- Channel grade 1:200 (10cm/20m) if channel is to be kept well grassed;
- Level sill outlet to each channel;
- Stable grass cover to be maintained below sill outlets; and
- Sill width approximately 1.5 x channel base width.

Each storage dam exhibits the following features:

- Excavation and dam bank batters to be at least 1:3 (V:H);
- Crest width to be a minimum 3m wide;
- Freeboard to be a minimum 1m above top water level up to a wall height of 3m. Above 3m there will be an allowance made of 0.1m/m increase in wall height;
- Inlet and outlet channel batters are to be 1:6 (V:H);
- Outlet channel grade 1:200 (10cm/20m) if channel is to be kept well grassed;
- Level sill to each outlet channel;
- Stable grass cover to be maintained below sill outlets; and
- Sill width approximately 1.5 x channel base width.

Tarrawonga Coal will routinely liaise with specialist consultants with respect to the water management system performance and the achievement of its objectives, with modifications or additional structures installed as necessary, subject to relevant approval processes. All water management structures will be inspected and ongoing maintenance, such as channel slope stabilisation, sediment removal and erosion protection carried out as required.

### **3.8.4 Dirty Water Management Structures**

A number of catch banks have been constructed to direct dirty water to sediment basins, the locations of which are presented in **Plan 4**. The sediment basins have been designed to allow for settling and storage volume for the more dispersive Type D soils identified on ML 1579. As for the clean water management structures, the catch banks and sediment basins will exhibit the features identified in Section 3.8.3.

Groundcover will be retained wherever possible on ML 1579 which will assist in reducing the sediment load of surface water flows.

### **3.8.5 Contaminated Water Management**

The potential for contamination of water will be restricted to the administration and facilities area. Tarrawonga Coal will implement the following measures to ensure that hydrocarbons do not contaminate surface water or groundwater:

1. Fuel tanks with a combined storage capacity of 124,000L and various containers of oils, lubricants and grease on-site will be fully bunded to ensure that in the event of a leak or rupture, no hydrocarbons escapes from the bunded area. The fuel tanks are double-skinned self-bunded tanks that allow containment of any spills. The bunded area for other hydrocarbons has the capacity to contain at least 110% of total capacity. Pipes with lockable valves will be installed to allow for the removal of any minor spills or rainfall. Any water or hydrocarbons removed will be placed in a tank for collection and off-site disposal;
2. Similarly, in the event of a tank rupture, the contaminated fuel will either be pumped from the second 'skin' into another tank for use onsite (if the fuel is not contaminated) or collection by a licenced oil recycling contractor (if the fuel is contaminated);
3. All fuel and oil is securely stored on site;
4. Runoff from the wash-down bay is directed to an oil separator and containment system for subsequent pump-out and disposal; and
5. Any spills of fuel or oil external to the bunded areas will be immediately cleaned up with the affected material transported to an approved waste depot for disposal or treated/remediated in a manner on-site approved by the DECCW.

### **3.8.6 Pit Water**

Pit water will be managed by pumping from the void sump to the designated pit water dam. Water from this storage will be utilised by the Tarrawonga Coal water carts for dust

suppression elsewhere on the mine lease. Each pit water dam will have a 1m freeboard marker to determine the cut-off point for pumping from the void.

### **3.8.7 Storage and Use**

Potable water (i.e. water for drinking purposes) will be transported from Boggabri or Gunnedah and stored in tanks. Based on the water requirements over the previous 3 years, it is expected that between 60kL and 100kL will be required each year.

Tarrawonga Coal has determined that, over the life of operations to date, the annual operational water requirements, predominantly for dust suppression on haul roads, crushing operations and stockpiling areas equates to approximately 110ML/yr.

Operational water requirements will be preferentially sourced from “dirty” run-off collected on site, together with any surface water and groundwater which accumulates in the open cut with any shortfall supplemented by harvested “clean” water and the available groundwater allocation from the sites registered bore. Annual water usage will be reported in AEMRs produced for the Tarrawonga Coal Mine.

## **3.9 Hazardous Materials**

ANFO-based bulk explosives will be used at the mine with NONEL delay or electronic detonators used for blast initiation. The components of the bulk explosives, ammonium nitrate prill, emulsion and diesel will be stored within the blasting contractor’s compound which is located off-site adjacent to the coal haul route.

Materials Safety Data Sheets (MSDS) will be retained on-site for all hazardous materials brought to site, independent of the quantity held.

## **4 PROPOSED REHABILITATION DURING THE MOP TERM**

### **4.1 Stakeholder Consultation**

Stakeholders in the rehabilitation of ML 1579 include:

1. Tarrawonga Coal Pty Ltd, Idemitsu Boggabri Coal and Whitehaven Coal Limited;
2. Surrounding / future landowners;
3. Narrabri and Gunnedah Shire Councils;

4. Relevant State government agencies (DII (Mineral Resources), DoP, DII (Agriculture), DECCW etc); and
5. Local Aboriginal Community Groups.

Consultation regarding the rehabilitation of the Tarrawonga Coal Mine was undertaken throughout the preparation of the original EIS and the recent modification Environmental Assessment. The more recent EA has placed more emphasis on the re-establishment of native vegetation across the site on the basis that it will provide more amenable links to retained vegetation on site and to the north in Leard State Forest.

The proposed revegetation strategy was generally agreed to and confirmed both by DECCW and DoP in their general terms of approvals and conditions of consent respectively for the rehabilitation of the site.

Since the granting of the original consent, Tarrawonga Coal has undertaken additional consultation with both DECCW and DoP in relation to the Biodiversity Offset Strategy. Tarrawonga Coal has now identified an offset strategy which incorporates the retiring of credits in its Regional Biodiversity Offset area on the Kelvin Range, as well as retaining areas on and adjacent to the mining lease has identified in the original Tarrawonga approval. The Biodiversity Offset area will be managed in accordance with the Regional Biodiversity Offset Management Plan, to be approved through the DECCW Biobanking requirements.

## 4.2 Rehabilitation Status at MOP Commencement

Initially, Tarrawonga Coal began rehabilitation of the site on the western edge of the northern emplacement. The western batter has been regraded to a maximum 10 degrees, subsoiled, topsoiled and water management structures put in place. A rock-lined waterway has also been constructed down the western emplacement which drains surface flows to a sediment basin and storage dam prior to discharge off site. The entire western edge of the northern emplacement has been seeded to cover crop and planted out to native tubestock. Future planting in this area will comprise infill planting of understorey species and replacement planting of eucalypts on an as needs basis as part of the maintenance program. In total, 32.4ha of the western emplacement has been rehabilitated as identified in **Plan 5**.

Reshaping of the southern emplacement has occurred on the lowest lift, including water management structures together with construction of a rock-lined waterway draining surface flows to an adjacent sediment basin. Rehabilitation works on the southern emplacement totals 5.39 ha. Other rehabilitation works on site have included strategic tubestock planting adjacent to the site entrance road. Selected logs from timber stockpiles have been reinstated on the batters of the rehabilitation area, providing necessary habitat for a variety of fauna.

### 4.3 Proposed Rehabilitation Status at MOP Finish

**Plan 5** presents the status of rehabilitation at the end of the MOP term and includes:

- Areas of active mining and overburden emplacement;
- Infrastructure;
- Land under rehabilitation including areas classified as either “shaped and covered” or “rehabilitated and under maintenance”;
- Water management and control structures; and
- Slope identification of land under rehabilitation. It is noted there is no land to be rehabilitated with a slope of  $>10^\circ$  apart from those inside faces of the final void.

The major rehabilitation activities undertaken during this MOP period will include the following:

- The continuation of rehabilitation on the northern overburden emplacement as it extends to its maximum height of 370m AHD. Rehabilitation works will include reshaping, contouring, cover crop development and planting to native vegetation to blend with the existing rehabilitation on the western face.
- Commencement of the rehabilitation works on the top height of the northern emplacement and in pit emplacement. This will include the reapplication of stockpiled subsoil and topsoil, as well as the reseeding of pasture species and eucalypts, and appropriate drainage features.
- Extension to the rehabilitation completed on the southern waste emplacement on the outer batter, to blend with existing rehabilitation and establishment of woodland communities.
- The continued management of the biodiversity offset areas, with stock exclusion and general management in accordance with the biodiversity offset management plan.
- Additional tube-stock planting and seeding plots to enhance rehabilitated landscape.

Rehabilitation activities will continue beyond the term of this MOP to produce the final landform conceptually presented in **Plan 6**. A more definitive plan will be provided in a MOP and/or Mine Closure Plan to be prepared closer to the cessation of mining. **Plan 5** presents the progressive rehabilitation of ML 1579 over the 2 year period of this MOP. It should be noted that the conceptual final rehabilitation plan is based on cessation of mining at the end

of the MOP term, however, studies have already commenced in relation to further extensions to the east of the Tarrawonga mine, and if approved, would result in modifications to the final landform design. Any such activity would be covered in a new MOP.

## **4.4 Buildings**

No additional buildings are required during the term of this MOP.

## **4.5 Rehabilitation of Disturbed Land**

### **4.5.1 Introduction**

Land disturbance within ML 1579 during the term of this MOP approximates 70ha. Progressive rehabilitation will ensure that some form of rehabilitation is undertaken over the majority of the areas disturbed during the term of this MOP. Progressive rehabilitation will comprise landform creation and stabilisation, spreading of soils and revegetation.

This sub-section identifies the rehabilitation procedures to be adopted and rehabilitation maintenance activities, as well as outlining more general objectives for the final landform.

### **4.5.2 Rehabilitation Procedures**

#### ***4.5.2.1 Open Cut Mine and Overburden Emplacement***

Approximately 25% of the open cut area to be mined over the life of the mine will be backfilled with overburden and interburden during the term of the MOP. Rehabilitation of the overburden emplacement, including backfilled areas within the open cut, will involve three basic steps, as described below.

##### Step 1: Overburden Placement and Shaping

Placement and shaping of the overburden to create slopes with gradients approximately 10° or less will be undertaken in a manner which, wherever practicable, ensures that any friable or weathered materials are placed below the subsoil and topsoil layers as a cover over the more competent overburden and interburden materials, thereby avoiding the exposure of large rocks on the final surface. The haulback method will be employed to place the overburden and interburden material and a D11 bulldozer or equivalent will be used to push the overburden to its designed slope. The site surveyor will confirm final grade of the reshaped emplacement is at 10° or less. During the term of this MOP additional contour banks will be designed and built to control surface water runoff on the overburden emplacement.

##### Step 2: Subsoil and Topsoil Replacement

Subsoil and topsoil will be placed on the shaped landform in the reverse order to stripping, i.e. subsoil then topsoil, with the materials being preferentially sourced from areas being stripped in advance of mining or, if no such materials are available, from previously established stockpiles.

Prior to the spreading of soil, the surface of the overburden emplacement will be ripped along the line of the contour to break any compacted and/or smooth surfaces. Scrapers will be used to spread subsoil and then topsoil. Ripping prior to the spreading of soil will assist the keying of the subsoil materials, in order to maximise infiltration of water and minimise erosion. Subsoil will generally be placed at a maximum thickness of 50cm, with topsoil replaced at a maximum thickness of 15cm.

During the term of this MOP, subsoil and topsoil replacement will be primarily over the northern, in-pit and southern overburden emplacements.

Cleared trees and branches of <300mm diameter and other vegetative debris will be spread over those areas designated for native woodland re-establishment.

### Step 3: Drainage Installation

Contour banks will be progressively installed on the rehabilitated landform. The heights and cross-sectional areas of the individual banks will be determined on the basis of the individual sub-catchment areas but will typically be less than 0.7m<sup>2</sup> and 3.0m<sup>2</sup> respectively.

The contour banks will direct water flows back to natural surface or to flumes to be constructed on the final landform to assist in controlling the flow of water off the slopes of the rehabilitated waste emplacements. Conceptual drainage design is shown on **Plan 5**.

### Step 4: Cover Crop Establishment

Following placement of topsoil onto the rehabilitated surface, the area will be seeded to a cover crop and pasture mix appropriate to the season. The seed mix will include fast growing, short lived species and perennial grasses and legumes generally in accordance with the species listed in **Table 4.1**, depending upon availability. The mix will generally incorporate a cover of Japanese Millet during the spring/summer months and Rye Corn during the autumn/winter months.

**Table 4.1 - Pasture Species Seed Mix**

Pasture Species	Rate (kg/ha)	Fertiliser
<b>Warm Season Grasses</b>		
Bombatsi Panic	1-2	150kg/ha

Green Panic *2	2-4	Di-ammonium Phosphate (DAP)
Rhodes Grass *2	1-2	
Purple Pigeon Grass	1-2	
<b>Annual Legumes</b>		
Subterranean Clover	4-5	
<b>Cool Season Legumes *1</b>		
Barrel (Sephi) medic	2-4	
Snail (sava) medic *2	3-5	
Woolly Pod Vetch	4-6	
Serradella (Elgara)	1-2	
Lucerne	0.5	
<b>Cool Season Grasses</b>		
Phalaris (Sirolan or Holdfast)	1-2	
Wallaby Grass	0.3-1	
*1 Inoculated with appropriate rhizobia		
*2 Specific Soil Conservation Application		
Source: Department of Lands		

In order to maximise seed germination and establishment, where practicable, sowing will employ scratch or direct seeding techniques in lieu of broadcast seeding, with specialised techniques such as straw mulching, bitumen mulching and hydromulching used where rapid soil stabilisation and erosion protection are required. Fertiliser will be applied at the same time as seed application to promote germination.

#### Step 5: Native Vegetation Establishment

Once the established cover crop dies off, the area will be deep ripped, or mounded in preparation for tubestock planting with the tree/shrub species presented in **Table 4.2**. Tubestock will be propagated from locally sourced seed, where available, to promote the use of endemic seed stock to enhance survival rates as much as practicable. Tubestock will be planted during appropriate conditions (ie. following suitable rainfall) and will be deep watered immediately after planting, with follow up watering as required. Tubestock will be mulched and fertilised appropriately. In some circumstances, tubestock may also be protected by bags to remove grazing threat. Tubestock will generally be planted at a rate of 400 trees/ha and at 4-5m spacings for areas being re-established to native woodland.

Consideration will also be given to direct seeding of eucalypt and understorey species, with trial plots allocated to this purpose to determine effectiveness. If proven effective, larger scale direct seeding may occur across areas designated to native woodland establishment.

Planted out rip-lines, or mounded areas, will be regularly inspected for weed/grass invasion and treated with appropriate herbicide to reduce competition with the planted tubestock.

**Table 4.2 - Tree/Shrub Species**

<b>Common Name</b>	<b>Scientific Name</b>
<b>Trees</b>	
White Box	<i>Eucalyptus albens</i>
Blakely's Red Gum	<i>Eucalyptus balelyi</i>
Yellow Box	<i>Eucalyptus melliodora</i>
Narrow-leaf Ironbark	<i>Eucalyptus crebra</i>
Bimble Box	<i>Eucalyptus populnea</i>
Tumbledown Gum	<i>Eucalyptus dealbata</i>
Pilliga Grey Box	<i>Eucalyptus pilligaensis</i>
Wilga	<i>Geijera parviflora</i>
Belah	<i>Casuarina cristata</i>
Rosewood	<i>Alectryon oleifolius</i>
<b>Shrubs</b>	
Western Golden Wattle	<i>Acacia decora</i>
Amulla	<i>Myoporum debile</i>
Sandalwood	<i>Santalum lanceolatum</i>
Eastern Cottonbush	<i>Maireana microphylla</i>
Native Jasmine	<i>Jasminum lineare</i>
Gargaloo	<i>Pasonsia eucalyptophylla</i>
Yellow Berry Bush	<i>Maytenus cunninghamii</i>
Wild Lemon	<i>Canthium oleifolium</i>
Wild Orange	<i>Capparis mitchellii</i>
Hopbush	<i>Dodonea spp.</i>
Emubush	<i>Eremophila longifolia</i>
Native Olive	<i>Notelea microcarpa</i>
Butterbush	<i>Pittosporum angustifolium</i>
Cough Bush	<i>Cassinia laevis</i>

#### **4.5.2.2 Soil Stockpiles**

Although the soil stockpiles will gradually be used in the rehabilitation of disturbed areas, some stockpiles will be retained for periods greater than 3 months. As a consequence, a

non-persistent cover crop will be sown on all stockpiles not intended for immediate use in rehabilitation. Where soil stockpiles have been utilised, the area where the stockpile was located will be ripped and seeded with a cover crop.

#### **4.5.2.3 Fencing**

Rehabilitated areas, together with those areas identified for the long-term exclusion of stock to enable the natural regeneration of the native vegetation communities, will be protected by the progressive installation or modification of existing fencing within ML 1579.

#### **4.5.3 Monitoring and Maintenance**

Tarrowonga Coal will monitor the effectiveness of vegetation establishment on rehabilitated land during the MOP term, with particular attention paid to vegetation cover establishment. If adequate vegetation establishment is not attained on rehabilitated surfaces, activities such as re-topsoiling, re-seeding or re-planting will be undertaken. In the event of high erosion levels, jute mesh or rock lining may be used until a sufficient pasture cover is established.

The stock exclusion areas will be regularly inspected and any breaches in fencing repaired immediately. Tree guards will be placed around planted seedlings should unplanned grazing by native animals be excessive.

Noxious weed species on ML 1579 will be identified through regular weed monitoring, and targeted via weed spraying or other appropriate weed control methods in consultation with the Department of Industry and Investment (Agriculture) and/or the local Noxious Weeds Inspector. This program of inspection, control and/or eradication will continue as part of the ongoing post-mine maintenance program.

**Table 4.3** presents a summary of the total area of disturbance at the start and end of this MOP term.

Table 4.3 - Summary of Proposed Rehabilitation

		Area Affected (hectares)		
		Total Area, start of MOP	Total Area, end of MOP	At mine closure <sup>*1</sup> (anticipated)
<b>A: MINE LEASE AREA</b>				
<b>A1</b>	<b>Mine lease(s) Area</b>	661		
<b>B: DISTURBED AREAS</b>				
<b>B1:</b>	<b>Infrastructure area</b> (other disturbed areas to be rehabilitated at closure including facilities, roads)	16.7	18.6	-
<b>B2:</b>	<b>Active Mining Area</b> (excluding items B3 - B5 below)	49.06	60.0	-
<b>B3:</b>	<b>Waste emplacements</b> (active/unshaped/in or out-of-pit )	131.8	100.0	-
<b>B4:</b>	<b>Tailings emplacements</b> (active/unshaped /uncapped)	Nil	Nil	Nil
<b>B5:</b>	<b>Shaped waste emplacement</b> (awaits final vegetation)	3.09	30.0	-
<b>TOTAL ALL DISTURBED AREAS</b>		200.65	208.6	-
<b>C: REHABILITATION</b>				
<b>C1:</b>	<b>Total Rehabilitated area</b> <sup>*2</sup> (except for maintenance)	32.4	74.92	327
<b>D: REHABILITATION ON SLOPES</b> <sup>*4</sup>				
D1	10 to 18 degrees	Nil	Nil	25
D2	Greater than 18 degrees	Nil	Nil	Nil
D3	Less than 10 degrees	32.4	74.92	252.08
<b>E: SURFACE OF REHABILITATED LAND</b>				
E1	Pasture and grasses	Nil	Nil	32
E2	Native forest/ecosystems	32.4	74.92	327
E3	Plantations and crops	Nil	Nil	Nil
E4	Other (include non-vegetative outcomes)	Nil	Nil	Nil
<sup>*1</sup> Assumes mine closure equates to lease relinquishment				
<sup>*2</sup> Assumes no maintenance requirement 3 years after establishment				

## 4.6 Water Management – Rehabilitated Land

During the term of this MOP, contour banks will continue to be progressively installed along newly constructed areas of overburden emplacement on the out of pit dumps and on slopes of the rehabilitated landform. The contour banks on the western and southern slopes of the northern and southern emplacements were established during the first MOP period. Additional banks will be constructed with channel back slopes of 10° and channel foreslopes of 40°. The heights (effective depths) and cross-sectional areas of the individual banks will be less than 0.7m and 3.0m<sup>2</sup> respectively. Additional rock-lined flumes have been identified conceptually on **Plan 5** and will be incorporated into the final landform. All surface waters captured on the batters of the final landform will be directed to this structure via the 1° fall provided by the contour banks. As previously mentioned, this design is a conceptual plan and will be reviewed as final designs for water management are produced.

Tarrawonga Coal is committed to providing functional rehabilitated water management structures post mining at the Tarrawonga site. As required throughout the rehabilitation phase of the site, advice from specialist consultants will be sought to provide the relevant departments with details of any possible enhancement to original design.

## 4.7 Other Infrastructure

No other infrastructure is required over the term of this MOP apart from additional hardstand areas building on the existing dump truck park up area, and a spare parts lay down pad opposite the current workshop area. Additional pit water, sediment basins and storage dams will be constructed as required in accordance with the Site Water Management Plan.

## 4.8 Rehabilitation Trials and Research

Tarrawonga Coal will trial a range of options for rehabilitation over the term of the MOP period. Such trials will include:

- Utilising tube-stock sourced from different areas (trailing with Idemitsu Boggabri) to verify if stock from different sources produce better growth;
- Mounding prior to planting or ripping prior to planting to determine best moisture retention within rehabilitation;
- Direct seeding of small areas to determine if effectiveness;
- Seed mix variations to determine best cover crop establishment; and
- Real time noise monitoring to enable reactive management to elevated noise levels.

The results of trials will be reported in each subsequent AEMR.

## 5 FINAL REHABILITATION

### 5.1 Rehabilitated Areas and Features

The rehabilitation of the final landform features beyond the term of this MOP will represent an extension of the rehabilitation procedures and philosophy outlined in Section 4, as refined by monitoring. Longer-term objectives, i.e. those to be achieved prior to lease relinquishment include:

- Blending of the final landform with the surrounding topography such that the visual impact of the post-mining landform is minimised;
- Establishment of a sustainable woodland environment across the rehabilitated waste emplacements that provide habitat and connectivity to retained remnant vegetation on site and the broader landscape (ie. Leard State Forest); and
- Revegetation of up to 327ha of disturbed areas with native woodland for long term conservation. This area will be managed in conjunction with the sites retained biodiversity offset areas as identified on **Plan 6**.

**Plan 6** presents the conceptual plan for rehabilitation at lease relinquishment.

The information contained in **Plan 6** and Section 5 of this MOP is largely conceptual, with greater detail to be provided in subsequent MOPs and the Closure Plan. The rehabilitation concept may also be altered on the basis of extensions to the mine to the east which is currently under investigation.

### 5.2 Remaining Features

On relinquishment of ML 1579, the principal use of the land will be for nature conservation on the basis of the area returned to native woodland. Only minor areas within the lease would be suitable to agriculture/grazing.

The areas assigned for each post-mining land use identified on **Plan 6** have been proposed following the consultation outlined in Section 4.1 but may be refined based on subsequent consultation with neighbouring landowners, and local and State government agencies or as a result of rehabilitation monitoring on the lease.

**Plan 6** presents the conceptual final landform and completed rehabilitation activity at relinquishment of the lease. The only infrastructure retained at the end of the mine life would be the sealed access road and the “Thuin” residence and associated buildings.

### 5.3 Rehabilitation Planning Criteria

Rehabilitation planning criteria for ML 1579 as presented in **Table 5.1** have been taken from “Strategic Framework for Mine Closure” (ANZMEC, 2000) to ensure the most appropriate and efficient rehabilitation techniques are applied. Advice will also be sought from representatives of the DII, DoP, DECCW and specialist consultants employed by Tarrawonga Coal regarding any additional actions that need to be adopted at the site.

An integral part of Tarrawonga Coal’s rehabilitation planning and management is the application of the recommendations and procedures set out in the various Management Plans outlined in **Table 1.2**. These Management Plans will, where applicable, be used to establish the criteria for the final rehabilitation of the site. The criteria will be presented in greater detail in subsequent MOPs and the Closure Plan.

**Table 5.1** also presents how each of the rehabilitation planning criteria will be met during the period of this MOP.

**Table 5.1 - Rehabilitation Planning Criteria**

Criteria	Summary of Intended Action
Rehabilitation and rehabilitation outcomes consistent with the EIS and subsequent EA's which formed the basis of approval.	As documented in the EIS, 75W mod EA and management plans as identified in DA 172-7-2004
Based on mine closure criteria and rehabilitation outcomes developed through stakeholder consultation.	A Mine Closure Plan will be developed, based on the final landform and land use objectives identified in the EIS and subsequent 75W mod EA, continued consultation with the local community and government agencies, and the most up-to-date mine closure criteria produced by DII (Mineral Resources) or other State or Federal government agencies.
Integrates rehabilitated native vegetation with undisturbed native vegetation to provide larger areas and wildlife corridors	Areas of the northern and southern overburden emplacements will be linked with retained vegetation on the lease and the Leard State Forest to the north. These areas, and the final void will be revegetated with native species predominant in the locality.
Suitable for an agreed subsequent land use as far as possible compatible with the surrounding land fabric and land use requirements.	Areas of the final landform have been designated for re-establishment of native vegetation consistent with existing vegetation in Leard State Forest which adjoins the site to the north.
Addresses limitations on the use of rehabilitated land.	The land capability class of the final landform will be comparable to the current classification, albeit will retain less Class III land. Final land uses proposed for ML 1579 have been determined on the basis of most appropriate future land use having regard to the adjacent State Forest. Whilst the plateau at top height could have been returned to Class III capability, its practical value as land suited to cultivation was considered low on the basis of its small size and therefore likely to be uneconomic for farming purposes

	into the future.
Sustainable in terms of that land use.	The proposed final land use is an extension of existing land uses, with specific attention paid to creating habitat and building on wildlife corridors through the re-establishment of native woodland communities.
Stable and permanent landforms, with soils, hydrology, and ecosystems with maintenance needs no greater than those of surrounding land. (may include waste emplacements, voids, pits and water-bodies providing that they are part of the accepted final outcome).	The overburden emplacement has been designed with outer batter slopes of no greater than 10° and is comparable to the topography of the surrounding environment. These re-established areas will be integrated with similar areas in the local area to prevent isolation and decreased viability. Groundwater and surface water will gradually fill the retained void to approximately 270m AHD. Whilst the retained water in the void may be mildly brackish, it will be suitable for stock watering purposes and as a water source to native fauna. Ongoing monitoring will be undertaken with mitigation measures developed in the event of increased salinity within the final void.
Securely and safely contain waste substances that have the potential to affect land use or result in pollution.	No such materials have been identified on ML 1579. However, should ongoing analysis of overburden/interburden identify such material, it will be managed appropriately.
Not present a hazard to persons, stock or native fauna.	The final landform will be created with moderate and stable slopes and as such will not present a greater than normal risk to persons, stock or native fauna when compared to elements of the existing landform.
Addresses Threatened species issues.	A Flora and Fauna Management Plan has been prepared to ensure threatened and endangered species are not significantly impacted. The re-establishment of a native woodland community and its linkage to existing remnants of native woodland will greatly assist in off-setting any impact associated with disturbance during the mine development.
Addresses heritage issues.	Items of Aboriginal heritage significance identified on ML 1579 have been appropriately managed to minimise impact. At the cessation of mining those areas currently protected by fencing and signage will be retained and signage and fencing removed in consultation with the relevant Aboriginal stakeholders. As mining progresses on ML 1579, Tarrawonga Coal will continue to monitor the Mining Lease and apply protocols as noted in the current management plan.
Clean and tidy, and free of rubbish, metal and derelict equipment/structures, except for heritage and other agreed features.	All non-production waste materials generated by the mine and associated activities will be disposed off-site by waste contractors licensed in this function.
Free from unacceptable air and water pollution, and other environmental effect outside the disturbed area.	The mine is operated in accordance with conditions imposed by the development consent and Environment Protection Licence.

## 6 ENVIRONMENTAL AND REHABILITATION RISK IDENTIFICATION

### 6.1 Environmental Risk Identification Matrix

**Table 6.1** presents an Environmental Risk Identification Matrix which identifies the potential for environmental impacts from the various activities to be undertaken during the term of this MOP, an assessment of the severity of risk from these activities in the absence of controls and consequently, the extent of control strategy required to prevent or mitigate those impacts.

In determining the level of risk and the potential impact of an event, consideration was given to the guidelines for the preparation of a MOP. The level of impact from each of these has, in turn, been assigned a level of severity based on a scale of 1 to 3, with a grade of 1 corresponding to a low level of impact in the event of undue circumstances, up to a grade of 3 for a severe to catastrophic impact.

The assessed severity levels are by their nature arbitrary. However, in their determination, consideration has been given to factors such as the duration or extent of the activity (area), the proximity to neighbours, sensitivity of the surrounding landscape, current and final landform, geological stability of the environs and the extent and reliance upon regional groundwater by other users. Consideration has also been given to the likely type of contaminants and potential pollutants that may arise from an emergency or accidental situation, as well as the potential quantity involved and the likely duration of the incident.

Some elements of the matrix have been denoted “na” to indicate they are not applicable for this particular site or for the process carried out. This has also been extended to incorporate issues that relate to precedence. For example, the impact of mine development has been assessed as “na” to threatened flora protection given the surface footprint will be stripped of vegetation, topsoil and subsoil prior to mining commencing. Consequently, the higher risk assessment has been assigned to the preceding land preparation activity.

Table 6.1 - Environmental Risk Identification Matrix

	Exploration activities	Land preparation, vegetation & topsoil stripping	All construction activities including earth moving	Well development, stimulation and workovers	Pipelines and gathering system development and management	Use/maintenance of roads, tracks and equipment	Topsoil and excavated material management	Processing facilities and infrastructure	Storage and handling of products	Waste water and production water management	Water management including storm event contingencies	Hazardous materials & fuel, handling/spills management	Sewerage	Rubbish disposal	Rehabilitation activities	Rehabilitated land and remaining features
Air pollution, dust/odour other	1	2	2	1	1	2	2	2	2	1	1	2	2	2	2	2
Erosion/sediment minimisation	1	2	2	1	1	2	2	2	1	2	2	1	1	1	2	2
Surface water pollution	2	2	2	2	1	1	2	2	2	2	2	2	2	2	1	1
Groundwater pollution	1	1	2	2	1	1	1	1	1	1	2	2	1	1	2	2
Contaminated or polluted land	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2
Threatened flora protection	1	2	na	1	1	1	na	1	1	1	1	1	1	1	na	na
Threatened fauna protection	1	2	na	1	1	1	na	1	1	1	1	1	1	1	na	na
Weed Control & Management	1	2	2	1	1	2	2	1	1	1	1	1	1	1	2	2
Operational noise	1	2	2	1	1	2	2	2	1	1	1	1	1	1	2	2
Vibration and air blast	1	1	2	na	na	na	na	1	na	na	na	na	na	na	na	na
Visual amenity, stray light	1	1	2	1	1	1	1	2	1	1	1	1	1	1	1	1
Aboriginal heritage	2	2	2	1	1	2	1	1	1	1	1	1	1	1	2	2
Natural heritage conservation	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1
Fires & Spon. Com.	1	1	2	1	1	1	1	2	2	1	1	1	1	1	1	1
Bushfire	2	2	2	1	1	2	1	2	1	1	1	2	1	1	2	2
Mine subsidence	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
Hydrocarbon contamination	2	2	2	1	1	1	1	2	2	1	1	2	1	1	1	1
Methane drainage/venting	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
Public safety	2	2	3	2	2	2	2	3	3	2	2	2	2	1	2	2

It can be seen from **Table 6.1** that, in the absence of appropriate management procedures, the potential highest risks include the following:

- Construction and land preparation activities as this may impact on the identified item of Aboriginal heritage; and
- Construction, processing and storage activities as this may impact on public safety.

With the implementation of the nominated management procedures, the risk will be reduced.

## 7 ENVIRONMENTAL MANAGEMENT CONTROLS

The environmental management controls for the mine site have been drawn from the Development Consent and accepted industry/operating standards. This section addresses each of the potential environmental impacts listed in **Table 6.1** to the extent necessary to reduce the risk of each to an acceptable level. Where an environmental management plan or monitoring program has been prepared for a particular environmental risk, reference is made to the relevant plan or program. Unless specifically listed as an appendix, all management plans and monitoring programs can be found on the Whitehaven Coal website ([www.whitehavencoal.com.au](http://www.whitehavencoal.com.au)).

### 7.1 Air Pollution

#### 7.1.1 Environmental Management Controls

Management controls will include the following, categorised by activity:

##### General

- The principal dust generating activities will be temporarily ceased when protracted dry periods and/or high winds lead to significant dust generation and dispersal towards the surrounding residences; and
- All earthmoving equipment onsite will be fitted with exhaust controls which satisfy NSW DECCW emission requirements.

##### Vegetation Clearing and Soil Stripping

- Cleared trees and branches will be retained for use in stabilising slopes identified for rehabilitation with native woodland communities;
- Where practicable, soil stripping will be undertaken at a time when there is sufficient soil moisture to prevent significant lift-off of dust;
- Tarrawonga Coal will avoid stripping soil in periods of high winds; and
- Dust suppression by water application will be used to increase soil moisture should stripping occur during periods of low soil moisture.

##### Drilling and Blasting Activities

- The drill rigs will utilise water injection or alternatively, be fitted with dust collectors;
- Blast hole stemming will be used to prevent venting of explosion gases;
- Blasting will be conducted both before the establishment, and after the break-up of low-level atmospheric temperature inversions;

- The following factors contributing to non-ideal detonation behaviour and higher emission (principally NO<sub>2</sub>) concentrations, will be avoided whenever possible;
- Weak overburden which reduces the necessary explosive confinement, this will be ripped in preference to blasting;
- Water infiltration;
- Long explosive columns; and
- Explosive pre-compression, caused by hole-to-hole shock propagation due to wet overburden and clay veins.

#### Overburden Ripping and Placement

- Ripping of softer overburden material will be avoided during periods of high wind; and
- Temporarily directing the placement of overburden into In-pit Emplacement during periods of high wind.

#### Coal Mining

- Low moisture coal will be sprayed with water prior to excavation to raise moisture content to >6%.

#### Coal Processing and Coal Processing Area Maintenance

- Water will be applied to the coal at the feed hopper, crusher and at all conveyor transfer and discharge points. Water will be applied at a rate of 0.75L/t of coal;
- All conveyors will be fitted with appropriate cleaning and collection devices to minimise the amount of material falling from the return conveyor belts;
- Clear definition of any access or haul roads and the restriction of vehicles and equipment to those roads;
- Routine application of water with or without chemical dust suppressants;
- Progressive rehabilitation of areas of disturbance including topsoil and subsoil stockpiles;
- Installation of bund walls and windbreaks, as required; and
- Limit vehicle speeds during hot and windy weather.

#### Internal Transport

- The road for the transportation of coal product between the site facilities area and mine entrance are sealed;

- Internal haul roads will be regularly watered. The frequency of water application to the various internal haul roads and exposed surfaces will be dependent on climatic factors;
- Earthmoving equipment and on-site vehicles will:
  - be fitted with exhaust controls which satisfy NSW DECCW emission requirements;
  - be properly maintained and any mobile equipment which does not comply with NSW DECCW guidelines will be removed; and
  - have the exhausts of all equipment directed upwards or to the side so as not to impinge on the ground and cause dust lift-off.

### External Transport

- All trucks carrying product coal from the mine will be covered with approved covers and the tailgates securely fixed to prevent windblown dust emission or spillages.

### **7.1.2 Monitoring**

Refer to the Air Quality Monitoring Program prepared for the Tarrawonga Coal Mine.

## **7.2 Erosion and Sediment**

### **7.2.1 Environmental Management Controls**

Refer to Section 5.0 of the Site Water Management Plan (SWMP) prepared for the Tarrawonga Coal Mine.

### **7.2.2 Monitoring**

Refer to Section 6.0 of the SWMP prepared for the Tarrawonga Coal Mine.

## **7.3 Surface Water Pollution**

### **7.3.1 Environmental Management Controls**

For management purposes, the surface water catchments within the proposed areas of disturbance have been divided into four categories, namely:

- **‘Void’** water. The ‘Void’ water catchment area is comprised of the active mine void area.

- **‘Dirty’** water. The ‘Dirty’ water catchment area is comprised of the offices, workshops, coal processing operations and the overburden emplacements, soil and subsoil stockpiles and areas undergoing rehabilitation.
- **‘Clean’** water. The ‘Clean’ water catchment area is comprised of areas of completed rehabilitation or undisturbed or relatively undisturbed areas.
- **‘Contaminated’** water. Surface runoff which could potentially contain hydrocarbons.

The key principles in managing surface water within and around the site would be to:

- Divert clean water away from disturbed areas;
- Capture dirty water and treat it so that it could be discharged in accordance with relevant DECCW and ANZECC guidelines;
- Capture and treat contaminated water prior to discharge from and/or re-use on the site; and
- Maintain as much vegetation cover (particularly grass) as possible.

The Site Water Management Plan presents the general and specific environmental controls as they relate to surface water pollution. These controls firstly consider management of water quantity followed by the water quality aspects, contingency plans, monitoring and long term management of the landforms within the site.

### **7.3.2 Monitoring**

Refer to Section 6.0 of the SWMP prepared for the Tarrawonga Coal Mine.

## **7.4 Groundwater Pollution**

### **7.4.1 Environmental Management Controls**

Refer to Section 7.0 of the SWMP prepared for the Tarrawonga Coal Mine.

### **7.4.2 Monitoring**

Refer to Section 7.2 of the SWMP prepared for the Tarrawonga Coal Mine.

## **7.5 Contaminated Polluted Land**

No contaminated or polluted land has been identified and as such no specific management controls or monitoring procedures are required. The greatest risk for the contamination or

pollution of land as a result of the mine is associated with the potential for fuel or oil spills/leaks. Section 7.16 documents the management controls to be implemented by Tarrawonga Coal in the event of a hydrocarbon spill or leak.

## **7.6 Threatened Flora**

Tarrawonga Coal will continue to manage all aspects of flora management as per the site's current Flora and Fauna Management Plan.

## **7.7 Threatened Fauna**

Tarrawonga Coal will continue to manage all aspects of fauna management as per the site's current Flora and Fauna Management Plan.

## **7.8 Weeds**

### **7.8.1 Environmental Management Controls**

If required, appropriate noxious weed control methods and programs will be undertaken as per Section 4.12 of the Flora and Fauna Management Plan.

### **7.8.2 Monitoring**

The mine site will be regularly inspected for weeds, particularly areas being revegetated, as part of a monitoring program aimed at assessing the success of rehabilitation (see Section 5.0 of the Flora and Fauna Management Plan). Additional monitoring will be undertaken at the request of local weeds inspectors. The results of all monitoring and eradication works will be included in the relevant AEMR.

## **7.9 Blasting**

### **7.9.1 Environmental Management Controls**

Management controls will include the following:

- Blast design and implementation will be undertaken by a suitably qualified blasting engineer and/or experienced and appropriately certified shot-firer;
- The blast face, where practical, will be oriented away from or at an oblique angle to nearby residences;
- Blasthole spacing will be implemented in accordance with blast design;

- Appropriate burden distance and stemming length will be selected and then implemented precisely;
- Appropriate materials for stemming will be used, e.g. <20mm aggregates;
- A notification procedure for impacted residents and staff is implemented prior to every blast;
- A blast notice board is installed at the entrance to the Tarrawonga Mine notifying of the next blast and is updated within 24 hours of the next blast; and
- Environmental conditions are monitored on site through a meteorological station.

### **7.9.2 Monitoring**

Refer to the Blasting Monitoring Program for the Tarrawonga Coal Mine.

## **7.10 Operational Noise**

### **7.10.1 Environmental Management Controls**

Management of operational noise has been outlined in the Noise Management Plan for Tarrawonga Coal Mine. Hours of operation influencing operational noise have also been outlined in Section 3.4.8 of this document.

Additional measures implemented at Tarrawonga Coal Mine includes the use of real time noise monitoring at the most affected residential receivers which provides active management of noise levels in advance on non-compliance occurring.

### **7.10.2 Monitoring**

Refer to the Noise Monitoring Program for the Tarrawonga Coal Mine.

## **7.11 Visual, Stray Light**

### **7.11.1 Environmental Management Controls**

The following controls will be implemented by Tarrawonga Coal:

- The mine site will be progressively rehabilitated such that cleared or non-vegetated areas will be minimised. Non-persistent cover crops will be sown immediately over areas to be rehabilitated prior to the establishment of the designated vegetation type;

- Rehabilitation of the western waste emplacement has included the planting of over 8,000 individual eucalypt trees endemic to the area to provide visual screening from the western side of the mine. The southern emplacement will be reshaped, rehabilitated and replanted as soon as practically possible to reduce visual impacts;
- Additional screen planting has also occurred along the site entrance road to minimise visual impact;
- Overburden emplacements themselves have been designed to replicate existing topographic features;
- The extent of land disturbance / clearing in advance of mining will continue to be minimised;
- Progressive rehabilitation of all disturbed areas within the mine site will continue to be undertaken;
- The mine and associated areas of disturbance will be maintained in a clean and tidy condition at all times;
- A maximum of eleven lighting plants will be used for night time activities;
- Floodlights will be positioned and directed to minimise emissions and used only when required. Where the use of floodlights are required in the open cut, on the overburden emplacements or at the processing plant, they will be directed away from the adjacent residences; and
- The Open Cut Examiners are responsible for the set up of lighting plants and are aware of the locations of surrounding residents.

### **7.11.2 Monitoring**

Site management regularly review the locations of the lighting plants to ensure that none are directed towards surrounding residences.

## **7.12 Aboriginal Heritage**

Refer to the Archaeology and Cultural Heritage Management Plan for the Tarrawonga Coal Mine.

## **7.13 Spontaneous Combustion**

### **7.13.1 Environmental Management Controls**

Tarrawonga Coal has implemented the following control techniques for the management of spontaneous combustion on site:

- Minimising the length of time coal is held in stockpiles.
- Monitoring coal stockpiles for signs of spontaneous combustion.
- Immediately reporting incidents.
- Extinguishment by excavation, spreading and saturation with water.

### **7.13.2 Monitoring**

None is proposed other than visual inspections of the ROM stockpiles by the Mine Manager and Open Cut Examiner during routine shift inspections.

## **7.14 Bushfire**

Refer to the Bushfire Management Plan for Tarrawonga Coal Mine.

## **7.15 Mine Subsidence**

As an open cut operation, no mine subsidence is expected at the Tarrawonga site.

## **7.16 Hydrocarbon Contamination**

### **7.16.1 Environmental Management Controls**

The following controls have been implemented by Tarrawonga Coal:

- All water from wash-down areas and workshops will be directed to an oil separator and containment system;
- All storage tanks will either be self bunded or partitioned within an impermeable bund with a capacity to contain a minimum 110% of the largest storage tank capacity;
- All hydrocarbon products will be securely stored; and
- With the exception of less mobile mining equipment which will be refueled within the open cut area, designated areas will be allocated for refueling and minor maintenance work. The use of these areas will be enforced by mine management.

### **7.16.2 Monitoring**

In the event of a hydrocarbon spill, the affected area will be regularly inspected to ensure there is no on-going affect on the land that will prevent it from being successfully rehabilitated.

## 7.17 Public Safety

### 7.17.1 Environmental Management Controls

The following controls have been implemented by Tarrawonga Coal:

- Trucks carrying product coal are required to stop or give way to traffic on public roads;
- Stock fencing around the areas of activity within ML 1579. Internal fencing will also be established and/or maintained to enable the continuance of agricultural activities in areas unaffected by mining and related activities;
- Maintain lockable gates at the junctions of the private sections of haul road and public roads. Private sections of haul road are also signposted for mine vehicle access only;
- Position security/warning signs at strategic locations around or within the mine site indicating the presence of earthmoving and mining equipment, deep excavations and steep slopes. The positioning of signs will depend on the location of the mining activities at any one time. Signs identifying blasting procedures and times have also been installed adjacent to the mine access road at the mine entrance. The signs are positioned to alert employees/visitors entering the mine site and passing motorists of the proposed time of the blast on or before that day, if one is to be initiated;
- Employee induction in safe working practices and regular follow-up safety meetings and reviews;
- Installation of bunds along the margins of internal haul roads created on slopes to a height of half the height of the largest wheel on site;
- Implement appropriate controls with respect to the use of explosives to ensure compliance with statutory requirements at all times;
- Ensure that Tarrawonga's blasting contractor utilises correct blasting procedures to contain the fragmented rock and to minimise the generation of ground and air vibrations;
- Ensure all earthmoving equipment complies with the Standards and Electrical and Mechanical Engineering Practice and are fitted with appropriate safety equipment, e.g. rollover protection structures and seatbelts, an operating reversing alarm (or other approved warning device) and an approved location and method of operation for the fire suppression system, all of which will be maintained in a good condition and operated safely at all times;
- Ensure all size reduction and screening equipment at all times complies with all relevant requirements and standards;

- Strictly complying with all mining lease, project approval and licence conditions; and
- Edge lines and centre lines will be marked on the sealed road surface of the public road sections of the proposed transport route.

### **7.17.2 Monitoring**

No monitoring is required at this stage, or has been proposed.

## 8 REFERENCES

**ANZMEC, 2000.** Strategic Framework for Mine Closure. Australian and New Zealand Minerals and Energy Council and the Minerals Council of Australia.

Department of Planning, 2005. Development Consent (DA 88-4-2005) for the East Boggabri Joint Venture.

**Department of Mineral Resources, 2002.** Guidelines to the Mining, Rehabilitation and Environmental Management Process.

**Geoff Cunningham Natural Resource Consultants Pty Ltd (2005a),** Soils and Land Capability Study of Proposed Mine Site. Prepared on behalf of East Boggabri Coal Pty Ltd – Part 3a Specialist Consultant Studies Compendium.

**Geoff Cunningham Natural Resource Consultants Pty Ltd (2005b),** Flora Assessment of the proposed Mine Site. Prepared on behalf of East Boggabri Coal Pty Ltd – Part 4a Specialist Consultant Studies Compendium.

**RCA Australia (2005),** Groundwater Assessment for the Proposed East Boggabri Coal Mine. Prepared on behalf of East Boggabri Coal Pty Ltd – Part 2 of the Specialist Consultant Studies Compendium.

**R.W. Corkery & Co. Pty. Limited (2005b),** Environmental Impact Statement for the Proposed East Boggabri Coal Mine. Prepared on behalf of East Boggabri Coal Pty Ltd.

**Resource Strategies Pty Ltd (2010),** Tarrawonga Coal Mine Modification Environmental Assessment. Prepared on behalf of Whitehaven Coal Limited

**Geo-Environmental Management (2010),** Environmental Geochemistry Assessment of the Tarrawonga Coal Mine Modification. Prepared for Tarrawonga Coal Pty Ltd.

**Wilkinson Murray (2010),** Tarrawonga Coal Mine Modification – Noise and Blasting Impact Assessment. Prepared for Tarrawonga Coal Pty. Ltd.

**Heggies(2010),** Tarrawonga Coal Mine Section 75W Modification – Air Quality Impact Assessment. Prepared for Tarrawonga Coal Pty Ltd.

**Gilbert & Associates (2010)**, Tarrawonga Coal Mine Modification – Surface Water Assessment. Prepared for Tarrawonga Coal Pty Ltd.

**Landskape Natural and Cultural Heritage Management (2010)**, Tarrawonga Coal Mine Modification - Cultural Heritage Assessment. Prepared for Tarrawonga Coal Pty Ltd.

**EcoLogical Australia (2010)**, Tarrawonga Coal Mine Modification – Biobanking and Threatened Species Assessment Report. Prepared for Tarrawonga Coal Pty Ltd.

## **9 PLANS**

Plan 1 – Mine and Context

Plan 2 – Pre MOP Environment

Plan 3 – Land Preparation

Plan 4 – Mining Activities

Plan 5 – Rehabilitation

Plan 6 – Final Rehabilitation

Plan 7 – Vertical Sections