



# **Millennium Expansion Project**

## **Environmental Impact Statement**

### **CHAPTER 20:**

### **ENVIRONMENTAL MANAGEMENT PLAN**

## TABLE OF CONTENTS

<b>20.0 ENVIRONMENTAL MANAGEMENT PLAN .....</b>	<b>20-1</b>
<b>20.1 INTRODUCTION .....</b>	<b>20-1</b>
20.1.1 Purpose and Structure.....	20-1
20.1.2 The Project .....	20-1
20.1.3 Location .....	20-2
20.1.4 Project Proponent .....	20-2
20.1.5 Land Use and Tenure.....	20-3
20.1.6 Stakeholders .....	20-5
20.1.7 Standard Environmental Conditions.....	20-5
<b>20.2 PROJECT DESCRIPTION .....</b>	<b>20-6</b>
20.2.1 Description of the Project .....	20-6
20.2.2 Mining Sequence .....	20-6
20.2.3 Mine Rehabilitation .....	20-7
20.2.4 Mine Facilities and Infrastructure.....	20-8
20.2.5 Coal Processing and Handling .....	20-8
20.2.6 Rejects and Tailings Management .....	20-9
20.2.7 Water Management.....	20-9
<b>20.3 ENVIRONMENTAL VALUES, IMPACTS, COMMITMENTS, AND DRAFT CONDITIONS.....</b>	<b>20-9</b>
20.3.1 Content of the Section.....	20-9
20.3.2 General Conditions.....	20-11
20.3.2.1 <i>Background</i> .....	20-11
20.3.2.2 <i>Proposed Environmental Authority Conditions: Schedule A-General Conditions</i> .....	20-11
20.3.3 Air Quality.....	20-13
20.3.3.1 <i>Background</i> .....	20-13
20.3.3.2 <i>Environmental Value</i> .....	20-13
20.3.3.3 <i>Potential Impacts on the Environmental Value</i> .....	20-13
20.3.3.4 <i>Environmental Protection Objective</i> .....	20-14
20.3.3.5 <i>Control Strategies</i> .....	20-14
20.3.3.6 <i>Monitoring</i> .....	20-15
20.3.3.7 <i>Proposed Environmental Authority Conditions: Schedule B-Air</i> .....	20-15
20.3.4 Water Resources.....	20-17
20.3.4.1 <i>Background</i> .....	20-17
20.3.4.2 <i>Environmental Values</i> .....	20-18
20.3.4.3 <i>Potential Impacts on the Environmental Values</i> .....	20-18
20.3.4.4 <i>Proposed Environmental Protection Objectives</i> .....	20-18
20.3.4.5 <i>Control Strategies</i> .....	20-18

---

20.3.4.6	Monitoring .....	20-20
20.3.4.7	Proposed Environmental Authority Conditions: Schedule C – Water .....	20-20
20.3.5	Noise and Vibration .....	20-41
20.3.5.1	Background.....	20-41
20.3.5.2	Environmental Value.....	20-41
20.3.5.3	Potential Impacts on the Environmental Value .....	20-41
20.3.5.4	Proposed Environmental Protection Objective.....	20-42
20.3.5.5	Control Strategies.....	20-42
20.3.5.6	Proposed Environmental Authority Conditions: Schedule D–Noise & Vibration .....	20-42
20.3.6	Waste Management .....	20-45
20.3.6.1	Background.....	20-45
20.3.6.2	Environmental Value.....	20-45
20.3.6.3	Potential Impacts on the Environmental Value .....	20-45
20.3.6.4	Proposed Environmental Protection Objective.....	20-45
20.3.6.5	Control Strategies.....	20-45
20.3.6.6	Monitoring .....	20-46
20.3.6.7	Proposed Environmental Authority Conditions: Schedule E–Waste Management .....	20-47
20.3.7	Land Management .....	20-49
20.3.7.1	Background.....	20-49
20.3.7.2	Environmental Values .....	20-50
20.3.7.3	Potential Impacts on Environmental Values.....	20-50
20.3.7.4	Proposed Environmental Protection Objectives .....	20-51
20.3.7.5	Control Strategies.....	20-51
20.3.7.6	Proposed Environmental Authority Conditions: Schedule F–Land .....	20-54
20.3.8	Cultural Heritage .....	20-59
20.3.8.1	Background.....	20-59
20.3.8.2	Environmental Value.....	20-59
20.3.8.3	Potential Impacts on the Environmental Value .....	20-59
20.3.8.4	Proposed Environmental Protection Objective.....	20-59
20.3.8.5	Control Strategies.....	20-60
20.3.8.6	Proposed Environmental Authority Conditions–Schedule G Cultural Heritage.....	20-60
20.3.9	Community .....	20-61
20.3.9.1	Background.....	20-61
20.3.9.2	Environmental Value.....	20-61
20.3.9.3	Potential Impacts on the Environmental Value .....	20-61
20.3.9.4	Proposed Environmental Protection Objective.....	20-61
20.3.9.5	Commitments.....	20-62

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20.3.9.6	<i>Proposed Environmental Authority Conditions: Schedule H–Community</i>	20-62
20.3.10	Environmental Management.....	20-63
20.3.10.1	Monitoring .....	20-63
20.3.10.2	Reporting.....	20-63
20.3.10.3	Environmental Management System .....	20-63
20.3.10.4	Research.....	20-63
20.3.10.5	Staff Training.....	20-64
20.3.10.6	Environmental Auditing and Review .....	20-64
<b>20.4</b>	<b>REFERENCES .....</b>	<b>20-66</b>
<b>20.5</b>	<b>DEFINITIONS.....</b>	<b>20-67</b>

## FIGURES

Figure 20-1	Millennium Coal Mine and Proposed MEP .....	20-4
Figure 20-2	Environmental Monitoring Points .....	20-21

## TABLES

Table 20-1	Millennium Coal Mine and MEP Tenures and Land Owners .....	20-3
Table 20-2	Contaminant Release Points, Sources and Receiving Waters .....	20-20
Table 20-3	Contaminant Release Limits.....	20-22
Table 20-4	Release Contaminant Trigger Investigation Levels.....	20-23
Table 20-5	Contaminant Release during Flow Events.....	20-24
Table 20-6	Water Storage Monitoring .....	20-26
Table 20-7	On-site Water Storage Contaminant Limits.....	20-26
Table 20-8	Receiving Waters Contaminant Trigger Levels.....	20-27
Table 20-9	Receiving Water Upstream and Down Stream Monitoring Points.....	20-27
Table 20-10	Stock Water Release Limits .....	20-30
Table 20-11	Irrigation Water Release Limits .....	20-30
Table 20-12	Groundwater Monitoring Locations and Frequency .....	20-33
Table 20-13	Groundwater Contaminant Trigger Values .....	20-34
Table 20-14	Location of regulated dams .....	20-37
Table 20-15	Basic Specification of Regulated Dams).....	20-37
Table 20-16	Hydraulic Performance of Regulated Dams.....	20-37
Table 20-17	Noise limits.....	20-43
Table 20-18	Airblast Overpressure Level .....	20-44
Table 20-19	Work Areas In Nature Conservation Areas.....	20-55

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## 20.0 ENVIRONMENTAL MANAGEMENT PLAN

### 20.1 INTRODUCTION

#### 20.1.1 Purpose and Structure

Section 202 of the *Environmental Protection Act 1994 (EP Act)* states that the purpose of an Environmental Management Plan (EM Plan) is to propose environmental protection commitments to assist the administering authority prepare the draft environmental authority.

Commitments are expressed so as to be measurable and auditable; they set objectives, standards and measurable indicators; and they include control strategies to ensure achievement of the objectives. In addition, this EM Plan was prepared in the context of the Department of Environment and Resource Management's (DERM) Guideline No. 8.

This EM Plan covers the Millennium Coal Mine, including both the existing Millennium Mine and the Millennium Expansion Project (MEP). The environmental values, impacts, commitments and conditions apply to the whole of Project (i.e. Millennium Coal Mine and MEP).

In accordance with Section 203 of the *EP Act*, this EM Plan describes the following:

- each relevant mining lease (Section 20-1-Introduction);
- all relevant mining activities and the land on which the mining activities are to be carried out (Section 20-2-Project Description);
- the environmental values likely to be affected by the mining activities; and the potential adverse and beneficial impacts of the mining activities on the environmental values, as well as the environmental protection objectives, standards and measurable indicators;
- details of an extensive environmental monitoring program planned for the MEP (Section 20-3.10.1-Monitoring); and
- strategies for continuous improvement, staff training, environmental auditing and reporting, (Sections 20-3.10.2 to 20-3.10.6-Reporting, Environmental Management System, Research, Staff Training and Environmental Auditing and Review respectively).

#### 20.1.2 The Project

The Millennium Coal Mine (including the MEP) involves the following:

- open-cut coal mining—to increase the existing ROM extraction rate from two million tonnes per annum (Mtpa) up to 5.5 Mtpa. Mining involves clearing, salvage of topsoil, excavation of overburden, extraction of the coal, replacement of topsoil and revegetation. The average depth and coal quality varies throughout the MEP area. Coal mining will be performed using open-cut truck and shovel terrace mining methods. Disturbed areas will be progressively rehabilitated;
- coal processing—mined coal will be transported to the processing area on ML 70312 via haul trucks. As part of the coal processing, coal fines and reject material will be produced as by-products. The existing Coal Handling & Preparation Plant (CHPP) on ML 70312 will be used to process the coal,

following suitable infrastructure upgrades to facilitate the proposed increase in production associated with the MEP. The washed coal will be conveyed and stockpiled for off-site transport via the existing rail network;

- disposal of coal fines and coarse rejects–existing facilities will be used. An option to utilise a final void will be investigated as part of the ongoing feasibility assessments;
- Coal Handling and Preparation Plant (CHPP)–the existing CHPP will be utilised along with ROM and product coal stockpile areas. Some upgrades to the CHPP may be incorporated to increase throughput so as to cost effectively utilise the current infrastructure. Any major modification to the CHPP will be the subject of a separate application as the CHPP is owned by the Red Mountain Joint Venture (RMJV);
- other infrastructure–existing mine infrastructure area, workshops, administration facilities etc. will be assessed and may be relocated to more effectively service the expanded mine footprint;
- water infrastructure–new water storage and treatment dams may be required to support increased extraction and processing works associated with the MEP;
- power–a study will be performed to determine if additional powerlines/transmission lines are required along existing power line easements (where possible) to accommodate any increase in electrical demand from new machinery;
- water supply–existing water supply will be utilised;
- coal transport infrastructure–existing rail and product load-out facilities will be utilised;
- main access road–the existing site access road will be utilised;
- mine haulage roads–new roads to the expansion areas will be required as will a crossing over the New Chum Creek; and
- pit and waste rock emplacements–new waste rock areas will be developed to service the new mining areas.

An existing non-standard Environmental Authority (Mining Activities) is held for the MEP (ML 70313, ML 70344, MDL 135, MDL 136, MDL 137, EPC 728)–Environmental Authority No. MIN100344305.

### **20.1.3 Location**

Millennium Coal Mine is located approximately 140 km southwest of the city of Mackay, in Central Queensland. The nearest regional centre is Moranbah, which is located approximately 22 km to the west. There are a number of coal mines operating in the vicinity of Millennium Coal Mine including Carborough Downs approximately 2 km to the north and Poitrel Mine which adjoins Millennium Coal Mine’s leases to the south.

The location of Millennium Coal Mine and the MEP is shown in **Figure 20-1**.

### **20.1.4 Project Proponent**

Millennium Coal Pty Limited (MCPL) is a wholly owned subsidiary of Peabody Energy Australia Pty Limited (Peabody). MCPL is responsible for operating the Millennium Coal Mine. Peabody is the Proponent for the proposed MEP.

Peabody owns substantial coal assets throughout Queensland and New South Wales, comprising a total of eight operations. Peabody is a 100% owned

subsidiary of Peabody Energy Corporation which is listed on the New York Stock Exchange (NYSE-BTU) and is the largest private sector coal company in the world.

### 20.1.5 Land Use and Tenure

The Millennium Coal Mine is comprised of the following tenements:

- ML 70313 'Millennium West';
- ML 70344 'Mountain Pit';
- ML Application 70401 'North Poitrel';
- Mineral Development Licence (MDL) 135 'Morambah';
- Mineral Development Licence (MDL) 136 'Mavis Downs'; and
- Mineral Development Licence (MDL) 137 'Wotonga'.

The MEP is comprised of three of the aforementioned leases namely, ML 70313, MLA 70401 and MDL 136. The leases adjoin a landscape dominated by a mosaic of large scale coal mines, and low density cattle grazing stations. The MEP leases occur on two land tenures (including three easements), as detailed in **Figure 20-1**.

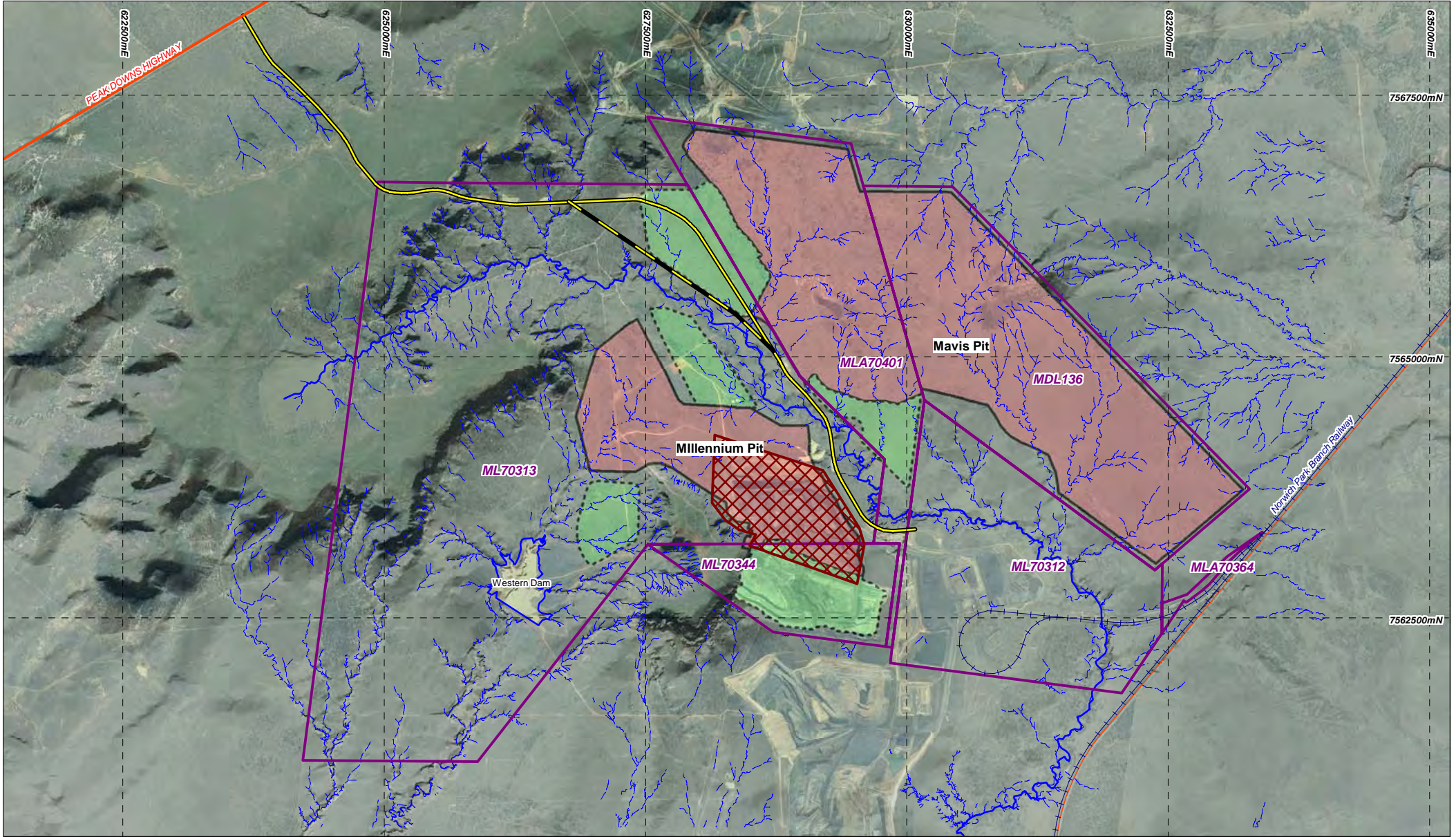
This EM Plan relates to the following mining tenements. Background land tenures and tenure holders are also indicated below in **Table 20-1**.

**Table 20-1 Millennium Coal Mine and MEP Tenures and Land Owners**

Tenement	Real Property Description	Landowner
ML 70313	Lot 2 GV165	Beryl Anne Nielsen
	Easement P SP184913	Millennium Coal Pty Limited
ML 70344	Lot 2 GV165	Beryl Anne Nielsen
MDL 135	Lot 3 on GV252	R Flohr
	Lot 4 on CP 903281	A Atkinson
	Lot 5 on GV132	M Flohr
MDL 137	Lot 2 on GV165	Beryl Anne Nielsen
	Lot 3 on GV 252	R Flohr
	Lot 4 on CP 903281	A Atkinson
	Lot 5 on GV 132	M Flohr
	Lot 7 on GV 195	Commissioner of Main Roads
MLA 70401*	Lot 2 GV165	Beryl Anne Nielsen
	Easement B SP178453	Ergon Energy Corporation MLA 70401 Limited
	Easement E SP1902563	Ergon Energy Corporation Limited
MDL 136	Lot 3 SP190266	Millennium Coal Pty Limited
	Lot 2 GV165	Beryl Anne Nielsen

\* Tenement MLA70401 is 99% owned by Millennium Coal Pty Ltd.





<b>MET SERVE</b>	  0 1 Kilometres Scale: 1:50,000 (A4)	<b>LEGEND</b>	Principal road	New Chum Creek
		Existing Millennium Pit	Road (unsealed)	Watercourse
		Proposed MEP pit	Railway	
		Proposed MEP dump	Existing mine access road	
			Proposed mine access road	

**Peabody Energy Australia Pty Ltd**  
**Millennium Expansion Project**

Millennium Coal Mine and Proposed MEP

25/10/2010

Datum: GDA94  
Projection: MGA54

**FIGURE 20-1**

Data Source: Infrastructure, Tenement, Topography - Minserve.



### 20.1.6 Stakeholders

Government Authorities and community groups that have an interest in environmental issues relating to Millennium Coal Mine include:

#### Commonwealth Government

- Commonwealth Department of Sustainability, Environment, Water, Populations and Communities (SEWPAC)

#### Private Landowners

- Surrounding Landowners (Daunia, Moorevale, Olive Downs, Riverside, Winchester Downs; and Wotonga)

#### Community and NGO Groups

- Mackay Conservation Group
- Fitzroy Basin Association
- Rotary–Moranbah

#### Local Council Groups and Services

- Isaac Plains Economic Group;
- Isaac Regional Council;
- Moranbah Fire and Rescue
- Moranbah State High School
- Moranbah Hospital and General Practitioners
- Moranbah Police
- Moranbah State School
- Nebo Police

#### Queensland Government

- Department of Environment and Natural Resources (DERM)
- Department of Housing
- Department of Main Roads–Mackay (DMR)
- Department of Employment, Economic Development and Innovation (DEEDI)
- Department of Infrastructure and Planning (DIP)
- Queensland Ambulance Service
- Central Queensland TAFE

#### Key Community Suppliers

- BAC Moranbah, Nebo, and Coppabella Business Managers
- Emergency and Long Term Accommodation Moranbah (ELAM)

#### Cultural Heritage Groups

- BBKY Traditional Owners

### 20.1.7 Standard Environmental Conditions

The mining activity will be subject to the conditions of an Environmental Authority (mining activities) and the conditions of a Mining Lease.

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## **20.2 PROJECT DESCRIPTION**

### **20.2.1 Description of the Project**

The Millennium Coal Mine is an existing open-cut coal mine, operated by Millennium Coal Pty Limited (MCPL), a wholly owned subsidiary of Peabody Energy Australia Pty Limited (Peabody). The Mine has been operating since 2005 with approval to produce at a rate of 2.0 Million tonnes per annum (Mtpa).

The Run-of-Mine (ROM) coal is currently extracted from two granted Mining Leases (ML) namely, ML 70313 'Millennium West' and ML 70344 'Mountain Pit'. The ROM coal is washed in a Coal Handling and Preparation Plant (CHPP) on an adjoining infrastructure lease, ML 70312 'Millennium East'.

Peabody proposes to extend the current open-cut mining operation into two new lease areas namely, MDL 136 'Mavis Downs' and MLA 70401 'North Poitrel'. Mining will continue within ML 70313. The proposed expansion areas are collectively referred to as the MEP.

An approval of the MEP will increase the extraction rate up to a maximum of 5.5 Mtpa ROM coal.

### **20.2.2 Mining Sequence**

The MEP involves a multi-seam open-cut mining operation, necessitating the mining of the resource using an excavator and truck mining operation. The maximum pit depth will be approximately 190 m.

The main features of the mining sequence are:

- vegetation will be cleared and stockpiled;
- topsoil will then be stripped from all areas to be disturbed, using scrapers or bulldozers and rear dump trucks, and if not used immediately, will be stockpiled for later use;
- overburden will be drilled and blasted; then excavated in benches using large excavators or rope shovel and excavator combinations and loaded into rear dump trucks. This material will be used to construct waste rock emplacements;
- the exposed coal will then be drilled and blasted (or thin seams ripped by a dozer) and then loaded into rear dump trucks for transport to the Millennium CHPP via the mine haul road;
- coarse rejects are placed in the active waste rock emplacements by trucks. Fine rejects (tailings) are flocculated and settled in special tailings sumps, then trucked to purpose built cells which are encapsulated within the waste rock emplacements;
- in-pit dumping of waste rock will occur from about 2012, when there is sufficient volume created in-pit;
- waste rock emplacements will be progressively shaped to their final landform, topsoiled and seeded with native and pasture grasses, shrubs and tree seeds. The landform design will be based on a maximum overall slope of 3(V):1(H);
- drainage structures such as graded banks will direct run-off to sediment dams constructed at the base of the waste rock emplacements to collect sediment and contain mine water if the pits require water to be pumped

from them. The 'plateau' areas on top of the waste rock emplacements will drain internally within the rehabilitated landform; and

- final voids will remain at the completion of mining. The Millennium final void will cover an area of 65 ha and the Mavis final void will cover an area of 166 ha. The maximum depth will be about 190 m.

The MEP will see a continuation of current open-cut truck and excavator mining methods. However, electric shovels may also be introduced with larger truck sizes to promote mining efficiency. The use of a dragline at a later stage in the mine life may be considered.

### **20.2.3 Mine Rehabilitation**

The proposed post-mine land use for disturbed areas will be a 'self-sustaining vegetation community'. Seeding will use appropriate native tree, shrub and pasture grass species. The criteria for achieving a self-sustaining vegetation community will be developed during the operation as part of the site-specific rehabilitation trials, monitoring and research programs.

The main features of the progressive rehabilitation process are:

- construction of a stable final landform consisting of external and internal waste rock emplacements (EWRE and IWRE) and final voids;
- construction of the waste rock emplacements progressively to final landform design, such that minimal reshaping is required at the end of mining. Angle of repose slopes will be recontoured to a maximum angle of 3(V):1(H);
- use of suitable topsoil, which will either be stockpiled until suitable recontoured areas are available, or respread immediately across available recontoured areas;
- contour ripping as an erosion control measure immediately after topsoil placement;
- seeding with an appropriate seed mix (grass, shrub and tree species) into the ripped seedbed with the objective of maximising the benefits of subsequent rainfall;
- application of appropriate fertiliser for plant establishment if required;
- respraying cleared vegetation on rehabilitated borrow pits, roadsides and laydown areas; and
- the final void will be fenced and/or bunded to prevent access. The final void will then collect water from direct rainfall and run-off from the rehabilitated landform.

The indicative program for the progressive rehabilitation of disturbed areas includes the following:

- mining of the MEP is proposed to commence in 2011-2012. The first activity associated with mining of the MEP will be clearing and topsoil recovery ahead of the excavation of the coal access ramp and initial boxcut in Mavis Pit. EWRE 1 and IWRE will be located to the south-west of this pit with a height up to 60 m;
- expansion of the Millennium Pit will continue, with waste rock placed on the EWRE South-West. Topsoil from this area, and the expanded Millennium Pit will be stripped and stockpiled either side of the waste rock emplacement;

- in 2012, excavation of Mavis Pit will continue to the south-east, with infill of the pit from the north with waste rock. Infill of the Millennium Pit will continue. Rehabilitation will commence on EWRE 1. EWRE 2 will be located on ML70401 to the east of the Millennium Pit;
- by 2015, excavation of the Millennium Pit will be completed. EWRE 3 will be created from the excavated waste rock. Rehabilitation will have commenced on EWRE 2, EWRE 3 and continue on EWRE 1. Rehabilitation of EWRE South-West will be completed. Excavation of Mavis Pit on MDL136 will have commenced by this time;
- by 2020, Millennium Pit will be in-filled and ready for final re-shaping for rehabilitation. Rehabilitation of IWREs within the Millennium Pit will continue and will commence on the northern end of Mavis Pit; and
- by 2027, rehabilitation of Millennium Pit low walls will be completed. The final void of Mavis Pit will also remain with internal waste rock ready for final re-shaping to form the low wall of the void. This low wall will be benched from the top of the internal waste rock emplacement to the pit floor of the final void. Rehabilitation of all other internal and external waste rock emplacements will be completed by this time. All haul roads will be decommissioned and rehabilitated.

Rehabilitation, decommissioning and closure activities will be part of the overall rehabilitation strategy for the Millennium Coal Mine, including the MEP. The objectives outlined in the existing Environmental Management Plan will be complied with for the expansion areas.

#### **20.2.4 Mine Facilities and Infrastructure**

Mine facilities and infrastructure includes roads, dams, administration buildings, potable water treatment plant, heavy-vehicle workshop, change house and warehouse.

The permanent access to the mine site will be via the existing Mine Access Road.

Fuel is stored on-site in properly designed and constructed tanks, with a capacity of approximately 165,000 L. Fuel is replenished from Moranbah or Mackay. Mining equipment is serviced and maintained at the heavy vehicle workshop on-site or in the field.

The use of electrically powered mining equipment such as electric shovels and or a dragline for the MEP may require an upgrade to the current high voltage power supply.

Additional personnel required for construction and ongoing additional mining contractors will be housed at the MAC Camp in Coppabella. Some additional staff may be housed in Moranbah.

The port allocation available to the Millennium Coal Mine is at the Dalrymple Bay Coal Terminal (DBCT). This port will continue to be utilised as required by the MEP operations.

#### **20.2.5 Coal Processing and Handling**

Coal is hauled to the existing CHPP located on ML 70312 for processing. Product coal is stockpiled on this lease and railed to the Dalrymple Bay Coal Terminal (DBCT). The design capacity of the CHPP is currently 1,000 tonnes per hour.



Improvements in CHPP throughput will be investigated on the current plant setup to remove 'bottlenecks'. A step change in capacity may also be considered with the addition of processing modules to accommodate for higher production rates associated with the MEP.

The size of the current ROM and product stockpile area will be increased as required to meet the additional throughput. Any major modification to the CHPP will be the subject of a separate application by the RMJV.

### **20.2.6 Rejects and Tailings Management**

Coarse rejects are removed by the coarse coal circuit (plant reject) processes and are placed in the active waste rock emplacements by trucks. Fine rejects (tailings) are flocculated and settled in special tailings sumps, then trucked to purpose built cells which are encapsulated within the waste rock emplacement.

### **20.2.7 Water Management**

Water is sourced from the West Dam catchment and the Burdekin Pipeline. The potential interconnection of the Peabody operations in the region (i.e. Burton Coal Mine, Millennium Coal Mine and North Goonyella-Eaglefield Coal Mine) will enable adequate supply and re-use options to maximise water security.

The current water management system focuses on separating clean run-off from mine impacted water, and maximising the recirculation of process water for utilisation within the CHPP and for dust suppression.

Due to the location of the MEP pits, changes to the water management infrastructure will be required and may involve the establishment of new water holding structures. All dams, levees and diversions will be designed to appropriate standards and sized in accordance to calculations from water balance models. Whilst no diversions are expected for the MEP, haul roads will cross New Chum Creek.

The consumption of raw water will be kept to a minimum by implementing water efficient work practices and recycling where possible.

The key elements of the water management system for the MEP are:

- the separation of run-off from undisturbed and disturbed areas;
- a series of water dams for the storage of mine pit water (direct rainfall, run-off and groundwater seepage to the pits) should such water have to be pumped from the pits; and also used to contain and settle sediment in the run-off from waste rock emplacements and other disturbed areas;
- the re-use of water in the water dams either for dust suppression at the MEP, or in the via the Process Water Dam; and
- the potential use of the mine pits during extreme wet weather events, to contain disturbed area run-off, so that water can be managed effectively.

## **20.3 ENVIRONMENTAL VALUES, IMPACTS, COMMITMENTS, AND DRAFT CONDITIONS**

### **20.3.1 Content of the Section**

This document has been designed incorporating the framework for drafting an Environmental Management Plan (EM Plan) as outlined in the Queensland DERM guidelines.

This document has been prepared in accordance with the following stages as described below:



The guiding definitions for the terms that are used throughout the EM Plan are:

**Environmental Values:** Environmental values are those qualities or physical characteristics of the environment that are conducive to ecological health, public amenity or safety.

Section 9 of *Environmental Protection Act 1994* describes an Environmental Value as:

- '(a) a quality or physical characteristic of the environment that is conducive to ecological health or public amenity or safety; or
- (b) another quality of the environment identified and declared to be an environmental value under an environmental protection policy or regulation.'

**Environmental Protection Objectives:** Describes the key elements of the environment and the outcomes to be protected in order to minimise impacts on the environmental values.

**Commitments:** Describes the technological and design elements together with management plans and strategies proposed to be taken to meet the environmental protection objectives and achieve the standards.

**Proposed Environmental Authority Conditions:** These are draft conditions containing measurable indicators and standards that are proposed to be included in the Environmental Authority to protect identified environmental values that may be impacted on by the MEP.

**Indicators:** These are the indicators by which the level of achievement of the environmental protection objectives can be determined, in a measurable and auditable way.

**Standards:** These are numerical standards for each of the indicators by which adequate levels of achievement of the environmental protection objectives and protection of the environmental values can be determined.

Words and phrases used throughout this EM Plan are defined except where identified in the *Environmental Protection Act 1994* or subordinate legislation. Where a word or term is not defined, the ordinary English meaning applies, and regard should be given to the Macquarie Dictionary.

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**20.3.2 General Conditions****20.3.2.1 Background**

There are a number of general issues that do not relate to environmental values or control strategies, but are to be included in the environmental authority. Conditions of the Environmental Authority are proposed here for '*Schedule A-General Conditions*'.

**20.3.2.2 Proposed Environmental Authority Conditions: Schedule A-General Conditions****A1 Financial assurance**

Provide financial assurance in the amount and form required by the administering authority prior to the commencement of activities proposed under this environmental authority.

**A2** The financial assurance is to remain in force until the administering authority is satisfied that no claim on the assurance is likely.

**A3 Prevent and /or minimise likelihood of environmental harm**

In carrying out the environmentally relevant activities, you must take all reasonable and practicable measures to prevent and/or to minimise the likelihood of environmental harm being caused. Any environmentally relevant activity, that, if carried out incompetently, or negligently, may cause environmental harm, in a manner that could have been prevented, shall be carried out in a proper manner in accordance with the conditions of this authority.

**A4 Maintenance of measures, plant and equipment**

The environmental authority holder must ensure:

- a) that all measures, plant and equipment necessary to ensure compliance with the conditions of this environmental authority are installed;
- b) that such measures, plant and equipment are maintained in a proper condition; and
- c) that such measures, plant and equipment are operated in a proper manner.

**A5 Monitoring and records**

Record, compile and keep for a minimum of **five (5) years** all monitoring results required by this environmental authority and make available for inspection all or any of these records upon request by the administering authority.

**A6** Where monitoring is a requirement of this environmental authority, ensure that a competent person(s) conducts all monitoring.

**A7 Notification of emergencies, incidents and exceptions**

All reasonable actions are to be taken to minimise environmental harm, or potential environmental harm, resulting from any emergency, incident or circumstances not in accordance with the conditions of this environmental authority.

**A8** As soon as practicable after becoming aware of any emergency, incident or information about circumstances which results or may result in

environmental harm not in accordance with the conditions of this environmental authority, the administering authority must be notified by telephone, facsimile or email.

- A9** Not more than **ten (10) business days** following the initial notification of an emergency, incident or information about circumstances which result or may result in environmental harm, written advice must be provided to the administering authority in relation to:
- a) proposed actions to prevent a recurrence of the emergency or incident;
  - b) the outcomes of actions taken at the time to prevent or minimise environmental harm; and
  - c) proposed actions to respond to the information about circumstances which result or may result in environmental harm.
- A10** As soon as practicable, but not more than **six (6) weeks** following the initial notification of an emergency, incident or information about circumstances which result or may result in environmental harm, environmental monitoring must be performed and written advice must be provided of the results of any such monitoring performed to the administering authority.

**END OF CONDITIONS FOR SCHEDULE A**



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### **20.3.3 Air Quality**

#### *20.3.3.1 Background*

Dust from the MEP is considered the main potential contaminant of air. Gaseous emissions such as SO<sub>2</sub> and NO<sub>x</sub> have been considered but due to the low levels of emission have not been discussed directly.

Contributors to particulate emissions from the surrounding environment include:

- farming activities (in particular dust from cultivated areas);
- smoke; and
- other coal mines in the region.

Background 24-hour average Total Suspended Particulate (TSP) dust levels in the region will be expected to be around 30 µg/m<sup>3</sup>, ranging up to around 80 µg/m<sup>3</sup> during adverse environmental conditions. Monitoring of dust is currently undertaken for the existing Millennium mine, and will continue for the MEP.

Typical daily background PM<sub>10</sub> concentrations in similar areas are of the order of 40 µg/m<sup>3</sup>. Annual average backgrounds will be of the order of 20 µg/m<sup>3</sup>. The ratio of PM<sub>10</sub> to TSP around Australian mines is typically 0.39 and a ratio of around 0.4 is encountered in many areas.

Annual average dust fallout levels will typically vary up to 30 mg/m<sup>2</sup>/month, based on experience in similar regions. Air quality issues are considered to be typical of open-cut mining operations throughout the region.

#### *20.3.3.2 Environmental Value*

The environmental values of the air environment to be enhanced or protected are the qualities of the air environment that are conducive to suitability for the life, health and wellbeing of humans.

#### *20.3.3.3 Potential Impacts on the Environmental Value*

##### **Dust**

The operations that may have the potential to generate particulate emissions are:

- excavators/shovels/ front-end loaders-loading trucks;
- bulldozing;
- trucks dumping;
- drilling;
- blasting;
- wheel generated dust from unpaved roads (e.g. haul roads);
- topsoil stripping;
- scrapers;
- road grading;
- wind erosion from active stockpiles and waste rock emplacements; and
- vehicle exhausts.

Air dispersion modelling of dust for the MEP was conducted using the TAPM model to predict the ground level concentrations of dust.

The predicted levels of suspended and deposited dust are well within guideline levels at the nominated sensitive receptor sites. Predicted levels at nearest

sensitive receptors were well below the annual average guideline level for PM<sub>10</sub> of 50 µg/m<sup>3</sup>; the TSP guideline level of 90 µg/m<sup>3</sup>; and the deposited dust guideline value of 120 mg/m<sup>2</sup>/day as an annual average.

Millennium Coal Mine's nearest homestead is Wotonga, located approximately 8 km from the current workings. Due to the remoteness of the mine and lack of any significant air pollution sources, air pollution from operations is expected to be confined to rising dust.

The potential for spontaneous combustion of stockpiled coal is considered small due to the low levels of sulphur and low inherent moisture. In the event of coal fires developing there will be additional localised impacts on air quality due to the emission of smoke and gases.

The mine is located in a rural setting and prior to mining was only subjected to minor nuisance dust generated from unsealed roads, rural activities or natural events such as dust storms or bushfires.

### **Greenhouse Gases**

The following sources will contribute to direct and indirect greenhouse gas emissions from the MEP:

- fuel (diesel) burning in heavy equipment and light vehicles;
- combustion in explosives used in blasting;
- methane from exposed coal seams; and
- land clearing.

#### *20.3.3.4 Environmental Protection Objective*

The environmental protection objective for air quality is to minimise the impacts of mine-derived dust on sensitive receptors beyond the boundaries of the relevant mining leases, and to minimise the emission of greenhouse gases.

#### *20.3.3.5 Control Strategies*

### **Dust Control**

The following dust control measures will be implemented:

- dust generated by construction and mining activities will be suppressed by regular water spraying;
- provide dust suppression sprays at locations in coal handling facilities that produce excessive dust (e.g. crushers);
- speed limits on unsealed roads will be limited to a maximum speed consistent with the minimisation of dust generation;
- earthworks supervisors will pay particular attention to the management of topsoil stripping such that dust not become a safety hazard or severe nuisance;
- land disturbance will be restricted to that necessary for the works;
- vegetation will not be burned without a permit; and avoid burning cleared vegetation when wind is blowing towards sensitive receptors;
- all complaints about dust will be investigated promptly and appropriate action taken to reduce dust nuisance; and
- a register of dust complaints will be maintained on-site.

Progressive rehabilitation of the available disturbed areas will occur with the aim to reduce exposed areas to wind generated dust. Regular dust abatement methods will be implemented on active areas.

### Greenhouse Gas

The following greenhouse gas emission management control strategies will be implemented:

- improve efficiency and minimise energy use through mine planning, including minimising haul distances;
- consider fuel efficiency of mining equipment and haul trucks during procurement;
- maintain mining equipment and haul trucks in good working order to maximise equipment fuel efficiency;
- use appropriately sized equipment;
- effectively manage coal stockpiles;
- estimate and report annual greenhouse gas emissions to the relevant regulatory authority, as required; and
- review annual energy use to identify potential energy efficiency opportunities on a regular and ongoing basis.

An inventory of greenhouse gas emissions will be maintained, with opportunities to reduce greenhouse gas emissions investigated.

#### 20.3.3.6 Monitoring

### Dust

No indications of a nuisance dust issue beyond areas of active mining operations have arisen from the community. Consequently, dust has not been considered a significant issue, however, if complaints are made, an investigation will be undertaken.

Monitoring will be done in accordance with '*AS/NZS 3580.10.1:2003 Methods for sampling and analysis of ambient air. Method 10.1 Determination of particulate matter-Deposited Matter-Gravimetric method*'.

The nearest landowner to the MEP is located approximately 8 km away from the administration area and predominant wind direction is directed away from this residence. There have been no complaints received regarding air quality.

#### 20.3.3.7 Proposed Environmental Authority Conditions: Schedule B-Air

### B1 Dust Nuisance

The release of dust or particulate matter or both resulting from the mining activity must not cause an environmental nuisance, at any nuisance sensitive or commercial place.

- B2** When requested by the administering authority or as a result of a complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer), dust and particulate monitoring must be undertaken, and the results thereof notified to the administering authority within **fourteen (14) days** following completion of monitoring. Monitoring must be carried out at a place(s) relevant to the potentially affected dust sensitive place. Dust and particulate matter must

not exceed the following levels when measured at any nuisance sensitive or commercial place:

- a) Dust deposition of 120 milligrams per square metre per day, when monitored in accordance with *Australian Standard AS 3580.10.1 of 2003* (or more recent editions); and
- b) A concentration of particulate matter with an aerodynamic diameter of less than 10 micrometre ( $\mu\text{m}$ ) (PM10) suspended in the atmosphere of 50 micrograms per cubic metre over a 24 hour averaging time, at a nuisance sensitive or commercial place downwind of the site, when monitored in accordance with:
  - i) *Australian Standard AS 3580.9.6 of 2003* (or more recent editions) *Ambient air-Particulate matter-Determination of suspended particulate PM10 high-volume sampler with size-selective inlet-Gravimetric method*; or
  - ii) Any alternative method of monitoring PM10 which may be permitted by the current edition of the *Air Quality Sampling Manual* as published from time to time by the administering authority.

**B3** If monitoring indicates exceedence of the relevant limits in condition **B2**, then the environmental authority holder must:

- a) address the complaint including the use of appropriate dispute resolution if required; and
- b) immediately implement dust abatement measures so that emissions of dust from the activity do not result in further environmental nuisance.

**B4 Odour Nuisance**

The release of noxious or offensive odour(s) or any other noxious or offensive airborne contaminant(s) resulting from the mining activity must not cause an environmental nuisance at any nuisance sensitive or commercial place.

**B5** When requested by the administering authority, odour monitoring must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any sensitive or commercial place, and the results must be notified within **fourteen (14) days** to the administering authority following completion of monitoring.

**B6** If administering authority determines the odour released to constitute an environmental nuisance, then the environmental authority holder must:

- a) address the complaint including the use of appropriate dispute resolution if required; and
- b) immediately implement odour abatement measures so that emissions of odour from the activity do not result in further environmental nuisance.

**END OF CONDITIONS FOR SCHEDULE B**



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## 20.3.4 Water Resources

### 20.3.4.1 Background

#### Surface Water

The Millennium Coal Mine (including the MEP) lies in the catchments of the New Chum and West Creeks to the north of the Isaac River. The leases generally drain towards the south. Both creeks are ephemeral and seasonally variable with most flow occurring in the months of November to February.

Surface water reporting to the Millennium open-cut pit has a low electrical conductivity (~500  $\mu\text{S}/\text{cm}$ ) and pH ranging from 5.5-8.5. Total suspended solids (TSS) vary significantly depending on the ground cover of the catchment.

The water in the Isaac River and New Chum Creek is generally suitable for irrigation and stock water use. In summary:

- pH is generally alkaline, with levels up to 8.60;
- electrical conductivity and total dissolved solids (TDS) can exceed guideline values-probably in pools after flow events have ceased;
- the total suspended solids (TSS) and turbidity can be very high at times, reflecting the influence of agriculture in the catchments;
- the concentration of metals in these systems are very low, with occasional elevated concentrations of iron reflecting the high sediment loads (probably) during major flow events; and
- most metals were undetectable in the water of New Chum Creek, except nickel.

Both the Isaac River and New Chum Creek exhibit degraded conditions for the protection of aquatic ecosystems. In addition to the above:

- the pH, electrical conductivity and turbidity can exceed guideline levels at times;
- phosphorus regularly exceeds guideline values; and
- of the metals, copper and iron regularly exceed guideline values.

#### Groundwater

Groundwater is largely associated with the coal seam aquifers and is neutral to alkaline (pH 7.2-8.2), and slightly to highly saline (EC 840-25,500RS/cm). There is no realistic re-use value for this groundwater, either for agricultural, domestic or industrial purposes.

Three main aquifers exist in the Millennium Coal Mine (including the MEP area) though they are not hydrologically connected due to large layers of predominantly impermeable overburden separating the seams, as described below.

- Unconfined fractured rock aquifers of the Triassic and Permian Coal sediments;
- Confined aquifers within Permian Coal Measure sequences; and
- Unconfined aquifers in unconsolidated Quaternary sand and gravel alluvium associated with creeks and rivers.

#### *20.3.4.2 Environmental Values*

With respect to the EPP (Water) the appropriate environmental values to be protected in the Isaac River and New Chum Creek and groundwater are:

- the biological integrity of the surface water aquatic ecosystem; and
- the suitability of surface and groundwater for agricultural use.

#### *20.3.4.3 Potential Impacts on the Environmental Values*

##### **Surface Water**

Project activities that may affect surface water include:

- changes to catchment hydrology due to containment of mine site run-off; and
- operation of dams associated with the site water management system including the sediment dams and Environmental Dam.

The MEP will reduce the effective Isaac River catchment by a small amount (0.15%) and about 35% of the catchment of New Chum Creek during operations.

Flows in the Isaac River will be reduced marginally, but this is unlikely to have any noticeable impacts downstream of the MEP site.

##### **Groundwater**

Mining may cause modifications to the local aquifers and water table drawdown on the pit perimeter. These effects are expected to be local due to the low transmissivity of the Permian Coal Measures and the low groundwater inflow.

Any groundwater impacts associated with the MEP operation are expected to be low as there are no known groundwater users within the affected area.

#### *20.3.4.4 Proposed Environmental Protection Objectives*

The objectives of the surface water and groundwater management system are to:

- separate run-off from disturbed and undisturbed areas;
- minimise the contamination of surface water on-site;
- contain, treat and re-use surface water on-site without having to discharge to the downstream environment-to protect downstream environmental values; and
- provide alternative supplies of water to nearby landholders if bores are adversely affected by water table drawdown.

#### *20.3.4.5 Control Strategies*

##### **Surface Water**

Appropriate sediment control systems will be installed to ensure that the maximum amount of sediment is retained on-site.

Surface water is diverted away from active working areas (including pits, CHPP, stockpiles) to maintain and preserve the water quality values of the creeks. The premise of the water management system is to separate clean and dirty waters, contain mine affected water and maximise recycling and re-use of the resource.

There will be little change to the water quality of the Isaac River downstream of the MEP site. In the event of a water discharge from the MEP site it will be ensured substantial flow is present in the Isaac River.

The MEP will require a number of additional sedimentation dams located near the toe of the waste rock emplacements to remove the bulk of suspended sediment from run-off from disturbed areas prior to discharge from the site.

The sediment dams will be designed to:

- retain the flow from a 10 year ARI (0.1 AEP) critical duration storm for the catchment for sufficient time to settle coarse silt particles; and
- maximise the length of the dam relative to the width of the dam to maximise hydraulic retention time and deposition.

In addition:

- the *Engineering Guidelines for Queensland for Soil Erosion and Sediment Control* (IEAust 1996) or *Best Practice ESC Management 2008*, will be followed as relevant;
- land disturbance will be restricted to that necessary for the works;
- topsoil will be salvaged for use in rehabilitation;
- stormwater and run-off from upstream catchments will be diverted away from active mining and disturbed areas;
- drains will be protected to prevent scouring if necessary;
- sediment dams will be cleaned periodically;
- hazardous materials will be stored in bunded areas or stored such that contaminated run-off is not generated; and
- traffic will be confined to maintained tracks and roads.

The water management system will be adapted to deal with the changes brought by the MEP and to ensure water can be effectively separated. Mine affected waters are either contained on-site or discharged consistent with the conditions of the existing EA.

### **Groundwater**

Seepage will be removed from active and inactive pits through pumping and will be utilised for dust suppression throughout the mine site.

Peabody will seek to reach mutually agreeable arrangements with affected neighbouring groundwater users for the provision of alternative supplies throughout the mine life, and after mine closure if necessary.

Alternative supplies will be put in place before supplies from relevant existing landholder bores are adversely affected.

Options for alternative supplies include:

- installation of new pumps capable of extracting groundwater from greater depth within existing bores;
- deepening of existing bores;
- installation of a new bore at another location on the property; and
- provision of piped water sourced from the mine (surplus water from the mine dewatering program).

The specific arrangements for affected properties will be discussed with each relevant landholder with a view to reaching a mutually acceptable agreement.

A groundwater monitoring program will be implemented to measure groundwater quality in the areas proposed for mining by the MEP.

#### 20.3.4.6 Monitoring

##### Surface Water

The final use for mine surface water in the Millennium Coal Mine area is for stock watering. An environmental monitoring system is currently in place to determine the impacts from the site operation and to establish trends on the downstream water quality values. Surface water quality monitoring will occur upstream and downstream of the MEP on both New Chum Creek and the Isaac River.

##### Groundwater

The groundwater monitoring network will be maintained to monitor the potential impacts of drawdown on the local and regional groundwater regime. After mining has ceased and decommissioning and rehabilitation works are complete, Peabody will seek to relinquish its Millennium mining leases. Prior to relinquishment, Peabody will discuss with the parties with whom it has had alternative water supply arrangements the nature, scope and resourcing of an on-going groundwater monitoring program. Post mining groundwater monitoring will be undertaken within monitoring bores that will be installed during the operational phase of the MEP.

#### 20.3.4.7 Proposed Environmental Authority Conditions: Schedule C – Water

##### Contaminant Release

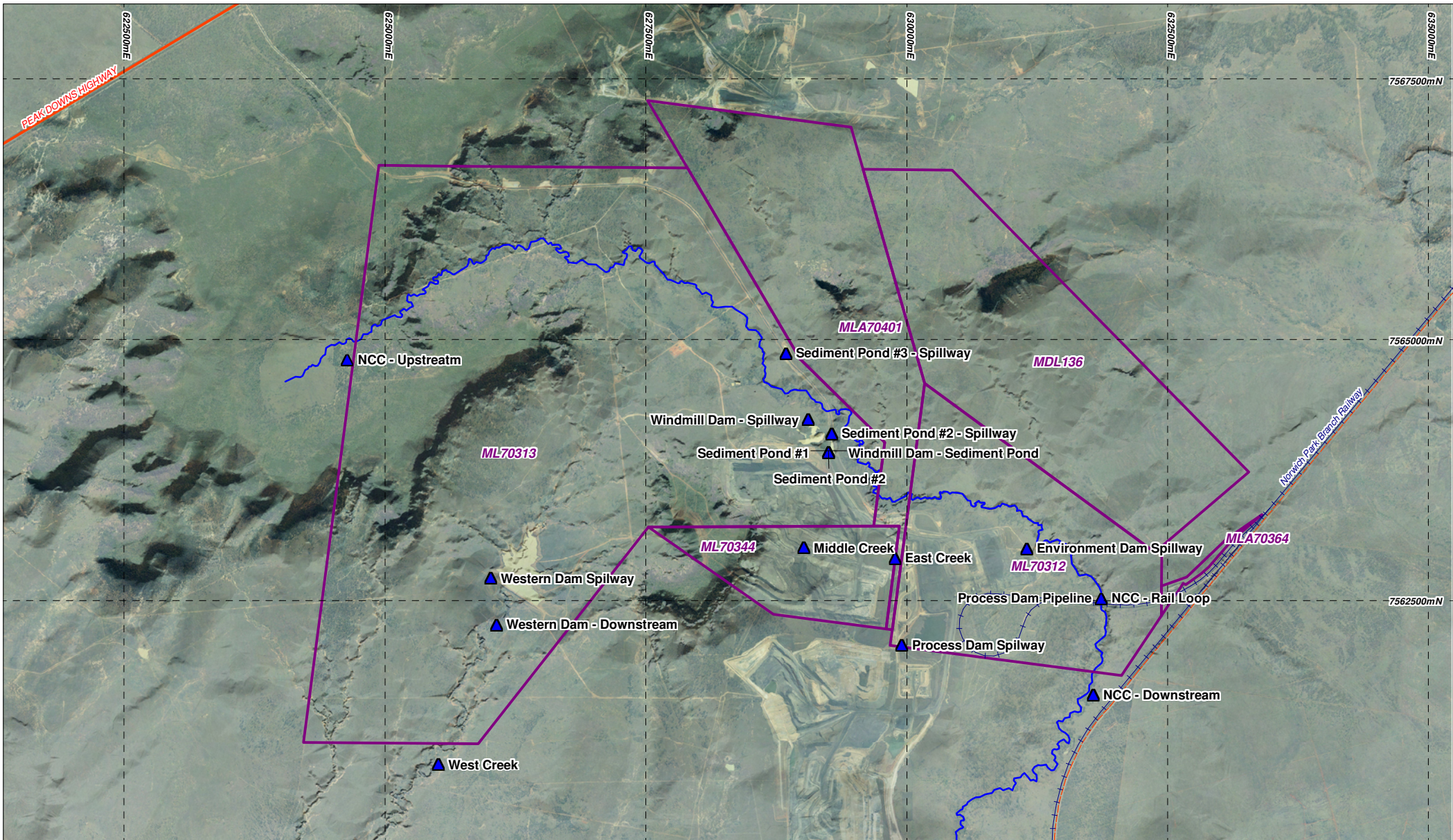
- C1** Contaminants that will, or have the potential to cause environmental harm must not be released directly or indirectly to any waters except as permitted under the conditions of this environmental authority.
- C2** The release of contaminants to waters must only occur from the release points specified in **Table 20-2**.

**Table 20-2 Contaminant Release Points, Sources and Receiving Waters**

Release Point (RP)	Easting (GDA94)	Northing (GDA94)	Contaminant Source and Location	Monitoring Point	Receiving Waters Description
RP 1	629393	7564295	Sediment Pond 2 Outlet	Spillway	New Chum Creek
RP 2	626127	7562911	Western Dam Spillway	Spillway	West Creek
RP 3	629117	7564490	Windmill Dam Spillway	Spillway	New Chum Creek

- C3** The release of contaminants to waters must not exceed the release limits stated in **Table 20-3** when measured at the monitoring points specified in **Table 20-2** for each quality characteristic.





<b>MET SERVE</b>	  0 1 Metres Scale: 1:50,000 (A4)	<b>LEGEND</b>	Proposed monitoring point	<b>Peabody Energy Australia Pty Ltd Millennium Expansion Project</b>	30/11/2010
		Principal road Road (unsealed) Railway New Chum Creek			Datum: GDA94 Projection: MGA54
		Data Source: Infrastructure, Tenement, Topography - Minserve. Surfacewater - WRM Water & Environment.			<b>Environmental Monitoring Points</b>  <b>FIGURE 20-2</b>



**Table 20-3 Contaminant Release Limits**

Quality Characteristic	Interim Release Limits for all Mines	Future Release Limits from 31 December 2011.	Monitoring Frequency
Electrical conductivity ( $\mu\text{S}/\text{cm}$ )	1,400	Aquatic ecosystem protection (no drinking water value: An end-of-pipe limit to achieve in the range 0 to 1,000 EC in the receiving waters-for mines in the upper catchments must have natural flow i.e. the 20 <sup>th</sup> percentile flow trigger	Daily during release (the first sample must be taken within two hours of commencement of release)
pH (pH Unit)	6.5 (minimum)  9.0 (maximum)	6.5 (minimum)  9.0 (maximum)	Daily during release (the first sample must be taken within two hours of commencement of release)
Turbidity (NTU)	NA*	Limit to be determined based on receiving water reference data	Daily during release* (first sample within two hours of commencement of release)
Suspended Solids (mg/L)	N/A*	Limit to be determined based on receiving water reference data and achievable best practice sedimentation control and treatment	Daily during release* (first sample within two hours of commencement of release)
Sulphate ( $\text{SO}_4^{2-}$ ) (mg/L)	1,000	1,000	Daily during release* (first sample within two hours of commencement of release)

Note: NA – not available, \* local trigger values need to be developed

- C4** The release of contaminants to waters from the release points must be monitored at the locations specified in **Table 20-2** for each quality characteristic and at the frequency specified in **Table 20-4** and **Table 20-3** respectively.

Table 20-4 Release Contaminant Trigger Investigation Levels

Quality Characteristic	Trigger Levels (µg/L)	Comment on Trigger Level	Monitoring Frequency
Aluminium	55	<i>For aquatic ecosystem protection, based on LOR for ICPMS</i>	Commencement of release and thereafter weekly during release
Arsenic	13	<i>For aquatic ecosystem protection, based on SMD guideline</i>	
Cadmium	0.2	<i>For aquatic ecosystem protection, based on SMD guideline</i>	
Chromium	1.0	<i>For aquatic ecosystem protection, based on SMD guideline</i>	
Copper	2.0	<i>For aquatic ecosystem protection, based on LOR for ICPMS</i>	
Iron	300	<i>For aquatic ecosystem protection, based on low reliability guideline</i>	
Lead	10	<i>For aquatic ecosystem protection, based on LOR for ICPMS</i>	
Mercury	0.2	<i>For aquatic ecosystem protection, based on LOR for CV FIMS</i>	
Nickel	11	<i>For aquatic ecosystem protection, based on SMD guideline</i>	
Zinc	8.0	<i>For aquatic ecosystem protection, based on SMD guideline</i>	
Boron	370	<i>For aquatic ecosystem protection, based on SMD guideline</i>	
Cobalt	90	<i>For aquatic ecosystem protection, based on low reliability guideline</i>	
Manganese	1900	<i>For aquatic ecosystem protection, based on SMD guideline</i>	
Molybdenum	34	<i>For aquatic ecosystem protection, based on low reliability guideline</i>	
Selenium	10	<i>For aquatic ecosystem protection, based on LOR for ICPMS</i>	
Silver	1.0	<i>For aquatic ecosystem protection, based on LOR for ICPMS</i>	
Uranium	1.0	<i>For aquatic ecosystem protection, based on LOR for ICPMS</i>	
Vanadium	10	<i>For aquatic ecosystem protection, based on LOR for ICPMS</i>	
Ammonia	900	<i>For aquatic ecosystem protection, based on SMD guideline</i>	
Nitrate	1100	<i>For aquatic ecosystem protection, based on ambient Qld WQ Guidelines (Department of Environment and Resource Management, 2009) for TN</i>	
Petroleum hydrocarbons (C6-C9)	20		
Petroleum hydrocarbons (C10-C36)	100		
Fluoride (total)	2000	<i>Protection of livestock and short term irrigation guideline</i>	

Note:

1. All metals and metalloids must be measured as total (unfiltered) and dissolved (filtered). Trigger levels for metal/metalloids apply if dissolved results exceed trigger.
2. The list of quality characteristics required to be monitored as per will be reviewed once the results of the monitoring data is gathered for the interim period until 31 December 2011 or an earlier date if the data is, or becomes, available and if it is determined that there is no need to monitor for certain individual quality characteristics these can be removed.
3. SMD – slightly moderately disturbed level of protection, guideline refers *ANZECC & ARM CANZ (2000)*.
4. LOR – typical reporting for method stated. ICPMS/CV FIMS – analytical method required to achieve LOR.

- C5** If quality characteristics of the release exceed any of the trigger levels specified in and during a release event, the environmental authority holder must compare the downstream results in the receiving waters to the trigger values specified in and:
- 1) where the trigger values are not exceeded then no action is to be taken; or
  - 2) where the downstream results exceed the trigger values specified
  - 3) for any quality characteristic, compare the results of the downstream site to the data from background monitoring sites and;
    - a) if the result is less than the background monitoring site data, then no action is to be taken; or
    - b) if the result is greater than the background monitoring site data, complete an investigation in accordance with the ANZECC & ARMCANZ (2000) methodology, into the potential for environmental harm and provide a written report to the administering authority in the next annual return, outlining:
      - i) details of the investigations carried out; and
      - ii) actions taken to prevent environmental harm.

Note: Where an exceedence of a trigger level has occurred and is being investigated, in accordance with W5 (2)(b)(ii) of this condition, no further reporting is required for subsequent trigger events for that quality characteristic.

- C6** If an exceedence in accordance with condition **C5(3)(b)** is identified, the holder of the authority must notify the administering authority within **fourteen (14) days** of receiving the result.

#### Contaminant Release Events

- C7** The holder must install, operate and maintain a stream flow gauging station to determine and record stream flows at the locations upstream of each Release Point as specified in **Table 20-5** for any receiving water into which a release occurs.
- C8** Notwithstanding any other condition of this environmental authority, the release of contaminants to waters must only take place during periods of natural flow events specified as minimum flow in **Table 20-5** for the contaminant release point(s) specified in **Table 20-2**.

**Table 20-5 Contaminant Release during Flow Events**

Receiving Water	Release Point	Gauging Station Description	Latitude (GDA94)	Longitude (GDA94)	Min Flow (Receiving Water)	Percentage for Maximum Release	Flow Recording Frequency
Isaac River	West Dam (RP 2)	Goonyella Station #130414A (DERM)	21° 51' 24" S (GDA 84)	147° 58' 18" E (GDA 84)	= > 2.0 m <sup>3</sup> /sec	1% of flow in receiving waters	Continuous (minimum daily)
New Chum Creek	Sediment Dam (RP1) & Windmill Dam (RP3)	Railway Culvert (GS 1)	22° 02' 08" S	148° 169' 43" E	= > 0.05 m <sup>3</sup> /sec	20% of flow in receiving waters	Continuous (minimum daily)

- C9** The volume released through the release point(s) must not exceed the maximum allowable flow at any time determined by multiplying the recorded receiving water flow at the corresponding gauging station in **Table 20-5** with the corresponding percentages for maximum release in **Table 20-5**.
- C10** The daily quantity of contaminants released from each release point must be measured and recorded at the release points in **Table 20-5**.
- C11** Releases to waters must be undertaken so as not to cause erosion of the bed and banks of the receiving waters, or cause a material build up of sediment in such waters.

#### **Notification of Release Event**

- C12** The authority holder must notify the administering authority as soon as practicable (no later than **six (6) hours** of having commenced releasing mine affected water to the receiving environment). Notification must include the submission of written verification to the administering authority of the following information:
- a) release commencement date/time;
  - b) expected release cessation date/time;
  - c) release point(s);
  - d) release volume (estimated);
  - e) receiving water(s) including the natural flow rate; and
  - f) any details (including available data) regarding likely impacts on the receiving water(s).
- C13** The authority holder must notify the administering authority as soon as practicable, (nominally within **twenty-four (24) hours** after cessation of a release) of the cessation of a release notified under condition **C12** and within **twenty-eight (28) days** provide the following information in writing:
- a) release cessation date/time;
  - b) natural flow volume in receiving water;
  - c) volume of water released;
  - d) details regarding the compliance of the release with the conditions of Department Interest: Water of this environmental authority (i.e. contamination limits, natural flow, discharge volume);
  - e) all in-situ water quality monitoring results; and
  - f) any other matters pertinent to the water release event.

#### **Notification of Release Event Exceedence**

- C14** If the release limits defined in **Table 20-3** are exceeded, the holder of the environmental authority must notify the administering authority within **twenty-four (24) hours** of receiving the results.
- C15** The authority holder must, within **twenty-eight (28) days** of a release that exceeds the conditions of this authority, provide a report to the administering authority detailing:
- a) the reason for the release;
  - b) the location of the release;
  - c) all water quality monitoring results;

- d) any general observations;
- e) all calculations; and
- f) any other matters pertinent to the water release event.

### Monitoring of Water Storage Quality

**C16** Water storages stated in **Table 20-6** which are associated with the release points must be monitored for the water quality characteristics specified in **Table 20-7** at the monitoring locations and at the monitoring frequency specified in **Table 20-6**.

**Table 20-6 Water Storage Monitoring**

Water Storage Description	Easting (GDA94)	Northing (GDA94)	Monitoring Location	Frequency of Monitoring
Windmill Dam	629117	7564490	Spillway	Quarterly
Western Dam	626127	7562911	Spillway	Quarterly

**C17** In the event that waters storages defined in **Table 20-6** exceed the contaminant limits defined in **Table 20-7**, the holder of the environmental authority must implement measures, where practicable, to prevent access to waters by all livestock.

**Table 20-7 On-site Water Storage Contaminant Limits**

Quality Characteristic	Test Value	Contaminant Limit
pH (pH unit)	Range	Greater than 4, less than 9 <sup>2</sup>
EC (µS/cm)	Maximum	5,970 <sup>1</sup>
Sulphate (mg/L)	Maximum	1,000 <sup>1</sup>
Fluoride (mg/L)	Maximum	2.0 <sup>1</sup>
Aluminium (mg/L)	Maximum	5.0 <sup>1</sup>
Arsenic (mg/L)	Maximum	0.5 <sup>1</sup>
Cadmium (mg/L)	Maximum	0.01 <sup>1</sup>
Cobalt (mg/L)	Maximum	1.0 <sup>1</sup>
Copper (mg/L)	Maximum	1.0 <sup>1</sup>
Lead (mg/L)	Maximum	0.1 <sup>1</sup>
Nickel (mg/L)	Maximum	1.0 <sup>1</sup>
Zinc (mg/L)	Maximum	20 <sup>1</sup>

Note: <sup>1</sup> Contaminant limit based on ANZECC & ARMCANZ (2000) stock water quality guidelines.

<sup>2</sup> Page 4.2-15 of ANZECC & ARMCANZ (2000) 'Soil and animal health will not generally be affected by water with pH in the range of 4-9'.

Note: Total measurements (unfiltered) must be taken and analysed.



## Receiving Environment Monitoring and Contaminant Trigger Levels

**C18** The quality of the receiving waters must be monitored at the locations specified in **Table 20-9** for each quality characteristic and at the monitoring frequency stated in **Table 20-8**.

**Table 20-8 Receiving Waters Contaminant Trigger Levels**

Quality Characteristic	Trigger Level	Monitoring Frequency
pH	6.5 – 8.0	Daily during the release
Electrical Conductivity (µS/cm)	1,000	
Suspended solids (mg/L)	To Be Determined. Turbidity may be required to assess ecosystems impacts and can provide instantaneous results	
Sulphate (SO <sub>4</sub> <sup>2-</sup> ) (mg/L)	1,000	

**Table 20-9 Receiving Water Upstream and Down Stream Monitoring Points**

Monitoring Points	Receiving Waters Location Description	Easting (GDA94)	Northing (GDA94)
Upstream Background Monitoring Points			
Monitoring Point 1	New Chum Creek 3,250 metres upstream of RP 1 and 3	626644	7566139
Downstream Monitoring Points			
Monitoring Point 2	New Chum Creek 3,200 metres downstream of RP 1 and 3	631977	7562721
Monitoring Point 3	West Creek 700 metres downstream of RP 2	626080	7562157

Notes:

The data from background monitoring points must not be used where they are affected by releases from other mines.

**C19** If quality characteristics of the receiving water at the downstream monitoring points exceed any of the trigger levels specified in **Table 20-8** during a release event the environmental authority holder must compare the downstream results to the upstream results in the receiving waters and:

- where the downstream result is the same or a lower value than the upstream value for the quality characteristic then no action is to be taken; or
- where the downstream results exceed the upstream results complete an investigation in accordance with the ANZECC & ARMCANZ (2000) methodology, into the potential for environmental harm and provide a

written report to the administering authority in the next annual return, outlining:

- i) details of the investigations carried out; and
- ii) actions taken to prevent environmental harm.

### **Receiving Environment Monitoring Program (REMP)**

**C20** A REMP has been developed and implemented since **1 March 2010** to monitor and record the effects of the release of contaminants on the receiving environment periodically and whilst contaminants are being discharged from the site. The REMP is identifying and describing the extent of any adverse impacts to local environmental values, and monitoring any changes in the receiving water. A copy of the REMP has been provided to the administering authority.

For the purposes of the REMP, the receiving environment is the waters of New Chum Creek, West Creeks and connected waterways within Isaac River 10km downstream of the release.

**C21** The REMP addresses the following:

- a) description of potentially affected receiving waters including key communities and background water quality characteristics based on accurate and reliable monitoring data that takes into consideration any temporal variation (e.g. seasonality);
- b) description of applicable environmental values and water quality objectives to be achieved (i.e. as scheduled pursuant to the *Environmental Protection (Water) Policy 2009*);
- c) any relevant reports prepared by other governmental or professional research organisations that relate to the receiving environment within which the REMP is proposed;
- d) water quality targets within the receiving environment to be achieved, and clarification of contaminant concentrations or levels indicating adverse environmental impacts during the REMP;
- e) monitoring for any potential adverse environmental impacts caused by the release;
- f) monitoring of stream flow and hydrology;
- g) monitoring of toxicants should consider the trigger levels specified in **Table 20-4** to assess the extent of the compliance of concentrations with water quality objectives and/or the ANZECC & ARMCANZ (2000) guidelines for slightly to moderately disturbed ecosystems;
- h) monitoring of physical chemical characteristics as a minimum those specified in **Table 20-3** (in addition to dissolved oxygen saturation and temperature);
- i) monitoring biological indicators (for macroinvertebrates in accordance with the AusRivas methodology) and metals/metalloids in sediments (in accordance with ANZECC & ARMCANZ (2000), BATLEY and/or the most recent version of *AS5667.1 Guidance on Sampling of Bottom Sediments*) for permanent, semi-permanent water holes and water storages;

- j) the locations of monitoring points (including the locations specified in **Table 20-9** which are background and downstream impacted sites for each release point);
- k) the frequency or scheduling of sampling and analysis sufficient to determine water quality objectives and to derive site specific reference values within **two (2) years** (depending on wet season flows) in accordance with the *Queensland Water Quality Guidelines* 2009. For ephemeral streams, this should include periods of flow irrespective of mine or other discharges;
- l) specify sampling and analysis methods and quality assurance and control;
- m) any historical datasets to be relied upon;
- n) description of the statistical basis on which conclusions are drawn; and
- o) any spatial and temporal controls to exclude potential confounding factors.

The REMP is being kept up to date with any changes in legislation or regulation as well as with variations in monitoring methodologies, as required.

The provisions of the existing REMP shall include requirements relating to the MEP.

**C22** A report outlining the findings of the REMP, including all monitoring results and interpretations in accordance with condition **C20** must be prepared and submitted in writing to the administering authority by **1 October 2011**. This should include an assessment of background water quality, any assimilative capacity for those contaminants monitored and the suitability of current discharge limits to protect downstream environment values.

#### **Water Re-use**

**C23** Water contaminated by mining activity may be piped or trucked or transferred by some other means that does not contravene the conditions of this authority during periods of dry weather for the purpose of supplying stock water to properties directly adjoining properties owned by the environmental authority holder or a third party and subject to compliance with the quality release limits specified in **Table 20-10**.

**Table 20-10 Stock Water Release Limits**

Quality Characteristic	Units	Minimum	Maximum
pH	pH units	6.5	8.5
Electrical Conductivity	µS/cm	N/A	5000

**C24** Water contaminated by mining activity may be piped or trucked or transferred by some other means that does not contravene the conditions of this authority during periods of dry weather for the purpose of supplying irrigation water to properties directly adjoining properties owned by the environmental authority holder or a third party and subject to compliance with quality release limits in **Table 20-11**.

**Table 20-11 Irrigation Water Release Limits**

Quality characteristic	Units	Minimum	Maximum
pH	pH units	6.5	8.5
Electrical Conductivity	µS/cm	N/A	Site specific value to be determined in accordance with ANZECC & ARMCANZ (2000) Irrigation Guidelines and provided through an amendment process.

**C25** Water contaminated by mining activity may be piped or trucked off the mining lease for the purpose of supplying water to a third party for purpose of construction and/or road maintenance in accordance with the conditions of this environmental authority.

**C26** Water contaminated by mining activity may be piped or trucked for the purpose of supplying water to Red Mountain CHPP Joint Venture and Poitrel Coal Mine in accordance with the conditions of this environmental authority. The volume, pH and electrical conductivity of water transferred to Red Mountain CHPP Joint Venture and Poitrel Coal Mine must be monitored and recorded.

**C27** If the responsibility of water contaminated by mining activities (the water) is given or transferred to another person in accordance with conditions **C23, C24, C25 or C26**:

- the responsibility of the water must only be given or transferred in accordance with a written agreement (the third party agreement); and
- include in the third party agreement a commitment from the person utilising the water to use water in such a way as to prevent environmental harm or public health incidences and specifically make the persons aware of the General Environmental Duty (GED) under section 319 of the *Environmental Protection Act 1994*, environmental sustainability of the water disposal and protection of environmental values of waters.

## Water General

**C28** All determinations of water quality must be:

- a) performed by a person or body possessing appropriate experience and qualifications to perform the required measurements;
- b) made in accordance with methods prescribed in the latest edition of the administering authority's Water Quality Sampling Manual;
- c) collected from the monitoring locations identified within this environmental authority, within **ten hours** of each other where possible;
- d) carried out on representative samples; and
- e) laboratory testing must be undertaken using a laboratory accredited (e.g. NATA) for the method of analysis being used.

**C29** The release of contaminants directly or indirectly to waters:

- a) must not produce any visible discolouration of receiving waters; and
- b) must not produce any slick or other visible or odorous evidence of oil, grease or petrochemicals nor contain visible floating oil, grease, scum, litter or other objectionable matter.

### **Annual Water Monitoring Reporting**

**C30** The following information must be recorded in relation to all water monitoring required under the conditions of this environmental authority and submitted to the administering authority in the specified format with each annual return:

- a) the date on which the sample was taken;
- b) the time at which the sample was taken;
- c) the monitoring point at which the sample was taken;
- d) the measured or estimated daily quantity of the contaminants released from all release points;
- e) the release flow rate at the time of sampling for each release point;
- f) the results of all monitoring and details of any exceedence with the conditions of this environmental authority; and
- g) water quality monitoring data must be provided to the administering authority in the specified electronic format upon request.

### **Temporary Interference with Waterways**

**C31** Temporarily destroying native vegetation, excavating, or placing fill in a watercourse, lake or spring necessary for and associated with mining operations must be undertaken in accordance with Department of Environment and Resource Management *Guideline-Activities in a Watercourse, Lake or Spring associated with Mining Activities*.

### **Water Management Plan**

**C32** A Water Management Plan has been developed and implemented since **1 March 2010** that provides for the proper and effective management of the actual and potential environmental impacts resulting from the mining activity and to ensure compliance with the conditions of the current EA. The Water Management Plan shall include and address impacts resulting from the MEP.

**C33** The Water Management Plan was developed in accordance with the department *Guideline for Preparing a Water Management Plan 2009* and includes the following components:

- i. Contaminant Source Study;
- ii. Site Water Balance and Model;
- iii. Water Management System;
- iv. Saline Drainage Prevention and Management Measures;
- v. Acid Rock Drainage Prevention and Management Measures (if applicable);
- vi. Emergency and Contingency Planning; and
- vii. Monitoring and Review.

**C34** The Water Management Plan is reviewed annually prior to the wet season (i.e. by **1 November**) and a further review following the wet season (i.e. by **1 May** the following year) to ensure that proper and effective *measures, practices or procedures are in place so that the mine is operated in accordance with the conditions of this environmental authority and that environmental harm is prevented or minimised.*

**C35** A copy of the Water Management Plan and/or a review of the Water Management Plan can be provided to the administering authority on request.

#### **Saline Drainage**

**C36** The holder of this environmental authority must ensure proper and effective measures are taken to avoid or otherwise minimise the generation and/or release of saline drainage.

#### **Acid Rock Drainage**

**C37** The holder of this environmental authority must ensure proper and effective measures are taken to avoid or otherwise minimise the generation and/or release of acid rock drainage.

#### **Stormwater and Water Sediment Controls**

**C38** An Erosion and Sediment Control Plan must be developed by an appropriately qualified person and implemented for all stages of the mining activities on the site to minimise erosion and the release of sediment to receiving waters and contamination of storm water.

**C39** The maintenance and cleaning of any vehicles, plant or equipment must not be carried out in areas from which contaminants can be released into any receiving waters.

**C40** Any spillage of wastes, contaminants or other materials must be cleaned up as quickly as practicable to minimise the release of wastes, contaminants or materials to any stormwater drainage system or receiving waters.

#### **Fitzroy River Basin study**

**C41** The administering authority and the holder of this environmental authority both acknowledge that the conditions for release of contaminants to the Isaac River in this environmental authority have been calculated without the benefit of the findings of projects proposed to be undertaken as per recommendations 2 and 3 of the *Study of cumulative impacts on water quality of mining activities in the Fitzroy River Basin* (April 2009). The administering authority may, based on the information provided in the study report when it becomes available, all relevant information available



at the time and the regulatory framework applicable at that time, consult with the holder of this environmental authority about the conditions in the environmental authority concerning the treatment and disposal of waste water.

The aim of the consultation shall be the meaningful review of the contaminant release limits imposed in this authority having regard to:

- a) the study results;
- b) near field monitoring results;
- c) QLD Water Quality Guidelines; and
- d) best practice environmental management.

If this review leads to a change in the requirements on this environmental authority holder, this shall be advanced by way of an authority amendment or a Transitional Environmental Program and as is necessary or desirable.

#### **C42 Sewage Effluent**

Treated effluent must be removed off-site by a regulated waste transporter and be disposed of at an authorised waste disposal facility.

**C43** Treated effluent must not be released from the site to any waters, the bed and banks of any waters or to land.

**C44** Water or stormwater contaminated by sewage treatment activities must not be released to any waters or the bed and banks of any waters.

#### **C45 Groundwater**

A groundwater monitoring program has been developed and implemented since 1 October 2009. The program aims to detect a significant change to groundwater quality values (consistent with the current suitability of the groundwater for domestic and agricultural use) due to activities that are part of this existing Millennium Mine. The program shall include monitoring aimed at detecting potential impacts resulting from the MEP.

**C46** The results and analysis of groundwater monitoring are available to the administering authority on request.

**C47** Subject to condition **C48** groundwater levels are monitored and groundwater draw down fluctuations in excess of two (2) meters per year, not resulting from the pumping of licenced bores, must be notified as per conditions **A7–A10**.

**C48** Groundwater affected by the mining activities are monitored at the locations and frequencies defined in **Table 20-12** (Groundwater monitoring locations and frequency).

**Table 20-12 Groundwater Monitoring Locations and Frequency**

Monitoring Point	Easting (GDA 94)	Northing (GDA 94)	Monitoring Frequency
Observation Bore (X)	To be provided as per condition W50	To be provided as per condition W50	3 Monthly

**C49** If the groundwater contaminant trigger levels defined in **Table 20-13** (Groundwater contaminant trigger values) are exceeded then the environmental authority holder must complete an investigation into the potential for environmental harm and notify the administering authority within **twenty-eight (28) days** of receiving the analysis results.

**C50 Background Groundwater Monitoring Program**

A background groundwater monitoring program must be developed to include bore(s) that are located an appropriate distance from potential sources of impact from mining activities to provide the following:

- a) representative groundwater samples from the aquifers potentially affected by mining activities;
- b) at least **twelve (12) sampling events** (quarterly sampling) to determine background groundwater quality as far as practicable;
- c) background groundwater quality in hydraulically isolated background bore(s) that have not been affected by any mining activities; and
- d) final groundwater contaminant trigger levels and limits required in condition **C52**.

**Table 20-13 Groundwater Contaminant Trigger Values**

Water Quality Indicator	Unit	Trigger Values	Limit Type
Aluminium	µg/L	To be provided as per condition C52	To be provided as per condition C52
Antimony	µg/L	To be provided as per condition C52	To be provided as per condition C52
Arsenic	µg/L	To be provided as per condition C52	To be provided as per condition C52
Calcium	µg/L	To be provided as per condition C52	To be provided as per condition C52
Chlorine	µg/L	To be provided as per condition C52	To be provided as per condition C52
CO <sub>3</sub>	µg/L	To be provided as per condition C52	To be provided as per condition C52
Dissolved Solids (Total)	µg/L	To be provided as per condition C52	To be provided as per condition C52
Electrical Conductivity	µS/cm	To be provided as per condition C52	To be provided as per condition C52
HCO <sub>3</sub>	µg/L	To be provided as per condition C52	To be provided as per condition C52
Iron	µg/L	To be provided as per condition C52	To be provided as per condition C52
Magnesium	µg/L	To be provided as per condition C52	To be provided as per condition C52
Mercury	µg/L	To be provided as per condition C52	To be provided as per condition C52
Molybdenum	µg/L	To be provided as per condition C52	To be provided as per condition C52
Petroleum Hydrocarbons (Total)	µg/L	To be provided as per condition C52	To be provided as per condition C52

Water Quality Indicator	Unit	Trigger Values	Limit Type
pH	pH Units	To be provided as per condition C52	To be provided as per condition C52
Potassium	µg/L	To be provided as per condition C52	To be provided as per condition C52
Selenium	µg/L	To be provided as per condition C52	To be provided as per condition C52
Silver	µg/L	To be provided as per condition C52	To be provided as per condition C52
SO <sub>4</sub>	µg/L	To be provided as per condition C52	To be provided as per condition C52
Sodium	µg/L	To be provided as per condition C52	To be provided as per condition C52
Suspended Solids (Total)	µg/L	To be provided as per condition C52	To be provided as per condition C52

**C51** The groundwater monitoring data must be reviewed on an annual basis. The review must include the assessment of groundwater levels and quality data, and the suitability of the monitoring network. The assessment will be made available to the administering authority within **twenty-eight (28) days** from request. Monitoring results from each sampling event must be reviewed, with any deviation from condition **C9** considered as an incident and shall be reported to the administering authority as per conditions **A7–A10**.

**C52** Groundwater contaminant trigger levels as per **Table 20-13** (Groundwater contaminant trigger values) must be finalised based on a background groundwater monitoring program defined in condition **C50** and submitted to the administering authority by **1 January 2013**.

**C53** Upon finalisation of groundwater contaminant trigger levels as per condition **C52**, the environmental authority holder may apply for the frequency of the groundwater monitoring to be reduced.

#### **C54 Associated Water**

Associated water delivered via the pipeline from the Arrow Energy Project (ML191) must be stored in regulated dams and be managed in accordance with regulated dams and authorised release conditions authorised under this environmental authority.

**C55** The holder of this environmental authority is responsible for the water pipeline from Arrow Energy storage area as far as limiting any environmental harm as a result of a pipeline or transfer failure.

**C56** Associated water may be used for the purpose of civil construction and dust suppression on haul roads and ROM areas only. The water cannot be used if contaminant or water quality concentrations are capable of causing environmental harm. The water is not authorised to be directly released into or near watercourses.

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**Department Interest: Dams****C57 All Dams**

The holder of this environmental authority must ensure that each dam is designed, constructed, operated and maintained in accordance with accepted engineering standards and is fit for the purpose for which it is intended.

**C58** The hazard category of each dam must be assessed by a suitably qualified and experienced person at least once per year, based on documented evidence sufficient to define or confirm the current nature and extent of environmental consequences for potential failure of that dam. Hazard category is to be determined in accordance with the Department of Economic Development, Employment and Innovation's *Site Water Management Technical Guideline for Environmental Management of Exploration and Mining in Queensland (DME, 1995)*.

**C59** Where the hazard category of a dam is assessed as significant or high, the holder of the environmental authority must act immediately to ensure:

- a) the administering authority is advised of the current details of that dam, including:
  - i) the assessed hazard category of that dam;
  - ii) sufficient points of latitude and longitude in the current Geocentric Datum of Australia to form a perimeter around that dam and its associated works;
  - iii) the maximum surface area, maximum volume, maximum depth of that dam; and
- b) that dam meets the hydraulic performance required of the assessed hazard category within **twelve (12) months** of that assessment.

**C60** The condition of dams must be monitored for early signs of loss of structural or hydraulic integrity, based on the advice of a suitably qualified and experienced person. The methods of monitoring and frequency of monitoring shall be as assessed by that suitably qualified and experienced person, based on the hazard category and particular circumstances of each dam.

**C61** In the event of early signs of loss of structural or hydraulic integrity, the holder of this environmental authority must immediately take action to prevent or minimise any actual or potential environmental harm, and report in writing any findings and actions taken to the administering authority within **twenty-eight (28) days** of that event.

**C62** The holder of this environmental authority must not abandon any dam but must decommission each dam such that ongoing environmental harm is prevented.

**C63** As a minimum, decommissioning must be conducted such that each dam, either:

- a) has become a stable landform, that no longer contains flowable substances; or
- b) has been approved or authorised under relevant legislation for a beneficial use and is subject to legally enforceable conditions of management; or

- c) is a void authorised by the administering authority to remain after decommissioning subject to legally enforceable conditions of management; and
- d) complies with the rehabilitation requirements of this environmental authority.

#### C64 Location and Basic Specifications

The following are the only regulated dams authorised under this environmental authority, and those dams are to be located within the control points defined in **Table 20-14** (Location of regulated dams).

**Table 20-14 Location of regulated dams**

Name of regulated dam	Easting (GDA 94)	Northing (GDA 94)
Western Dam	626227	7563194
	626095	7562948
	626597	7562599
	626615	7563108

**C65** The following are the only regulated dams authorised under this environmental authority, and those dams are to accord with the basic specifications in **Table 20-15** (Basic specification of regulated dams).

**Table 20-15 Basic Specification of Regulated Dams)**

Name of Regulated Dam	Maximum Surface Area Of Dam (ha)	Maximum Volume Of Dam (ML)	Maximum Depth of Dam (m)	Purpose of Dam
Western Dam	22	540	6.75	Water storage for transfer to process water dam. Storage of associated water and run-off.

**C66** The following are the only regulated dams authorised under this environmental authority, and those dams are to accord with the hydraulic specifications in **Table 20-16** (Hydraulic performance of regulated dams) below.

**Table 20-16 Hydraulic Performance of Regulated Dams**

Regulated Dam	Design Storage Allowance	Spillway Critical Design Storm	Mandatory Reporting Level
Western Dam	1 in 100 ARI Event	1 in 100 ARI Event	1 in 100 ARI

**C67 Certification and Operation**

Documentation required by the conditions in this schedule must be kept available for inspection by the administering authority for a period of **five (5) years** after the conclusion of the environmentally relevant activity in respect of which this environmental authority has been granted.

**C68** The holder of this environmental authority must not commence construction of a regulated dam unless:

- i) the holder has submitted to the administering authority two copies of a design plan, together with the certification of a suitably qualified and experienced person that the design of the regulated dam is fit for the purpose for that dam stated in that plan, and compliant in all respects with this environmental authority; and
- ii) at least twenty-eight (28) days has passed since the submission of the design plan, or the administering authority has advised the holder that the design plan is compliant with this condition.

**C69** When construction or modification of any regulated dam is complete, or within **twelve (12) months** of a dam becoming a regulated dam by virtue of a hazard assessment, the holder of this environmental authority must submit to the administering authority two copies of a set of 'as constructed' drawings, together with the certification by a suitably qualified and experienced person that the dam 'as constructed' is fit for the purpose stated in the hazard assessment and the design plan if the latter exists, and compliant in all respects with this environmental authority.

**C70** The holder of this environmental authority must ensure that there is always a current operational plan for each regulated dam, which may form part of other plans required by legislation.

**C71** The operational plan shall at least cover all matters relevant to the operation and maintenance of the regulated dam so that it is compliant in all respects with this environmental authority.

**C72** The holder of this environmental authority must ensure that, where a current operational plan covers decommissioning and rehabilitation, those operations are consistent with the objectives in any design plan for the dam.

**C73** The holder of this environmental authority must notify the administering authority immediately of the level in any regulated dam reaching the mandatory reporting level (MRL), and confirm in writing within **seven (7) days**.

**C74 Annual Inspection and Report**

The holder of this environmental authority must arrange for each regulated dam to be inspected annually by a suitably qualified and experienced person, in accordance with the following conditions.

**C75** At each annual inspection, the condition of each regulated dam must be assessed, including the structural, geotechnical and hydraulic adequacy of the dam and the adequacy of the works with respect to dam safety, and any recommended actions conveyed immediately to the holder of this environmental authority.



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- C76** The holder of this environmental authority must immediately act upon recommendations arising from an annual inspection on condition and adequacy of a dam.
- C77** At each annual inspection, the adequacy of the available storage against the design storage allowance specified must be assessed and, if a mandatory reporting level is required, it must be determined and marked on each regulated dam.
- C78** A final assessment of adequacy of available storage in each regulated dam must be based on a dam level observed within the month of October, accepted as valid by the suitably qualified and experienced person, and resulting in an estimate of the level in that dam as at **1 November**.
- C79** For each annual inspection, **two (2) copies** of a report certified by the suitably qualified and experienced person, including any recommended actions to be taken to ensure the integrity of each regulated dam, must be provided to the administering authority by **1 December**.

**C80 Design Storage Allowance**

The holder of the environmental authority must develop, calibrate, and maintain a complete mine water balance model with a coupled salt balance model that adequately represents all sources of mine water contributing hazardous mine water dams, mine pits, and operations of the mine water management system. All key assumptions and input parameters of the mine water balance model must be documented and be available for auditing.

- C81** All key assumptions for mine water operations in the mine water balance model must be documented in Standard Operating Procedures and the mine water management system must be operated in accordance with the procedures.
- C82** Assessments utilising the mine water balance model to evaluate water management system capacity and operations in response to rainfall must be undertaken by competent personnel.
- C83** The holder of the environmental authority must implement and maintain monitoring of actual mine water quantity and quality within the mine water management system to demonstrate, and continually improve the mine water balance model calibration.
- C84** On **1 November** each year, the holder of the environmental authority must review the mine catchments, storage capacity, current storage volumes, system transfer capacity, and Standard Operating Procedures of all key infrastructure elements of the mine water management system and update the mine water balance model. An assessment of the mine water balance model must be undertaken to ensure that the mine water management system has sufficient storage capacity, transfer capacity, and transfer operations to ensure that there will be no unauthorised discharges of mine water for wet season rainfall events up to a **1 in 10 year ARI** wet season. The assessment must be undertaken with an appropriate period of climate data that includes representation of **1 in 10 year ARI** wet season rainfall. The assessment results must be documented and be available for auditing.

- C85** The holder of the environmental authority must notify the administering authority if the assessment of the mine water management system shows that unauthorised discharges may occur for rainfall events up to the **1 in 10 year ARI** wet season.
- C86** In the event of failure of any component of the mine water management system, the holder of the environmental authority must utilise the mine water balance model to reassess the performance of the mine water management system in its current state, and notify the administering authority if the assessment of the mine water management system shows that unauthorised discharges may occur for rainfall events up to the **1 in 10 ARI** year wet season.

**END OF CONDITIONS FOR SCHEDULE C**

## 20.3.5 Noise and Vibration

### 20.3.5.1 Background

The nearest sensitive receptor for noise is at the Wotonga Homestead, located approximately 8 km from active mine workings.

Noise measurements were taken at the Wotonga (the nearest sensitive receptor, shown below), Winchester Downs and Moorvale Homesteads. The ambient noise environment is considered representative of the noise environment in the area of the MEP.

**Wotonga Noise Measurements**

Period	Leq	L10	L90
Day 7am-6pm	46	47	36
Evening 6pm-10pm	46	50	25
Night 10pm-7am	42	46	24

The mine is in a rural setting and therefore is generally not subjected to noise other than that associated with rural transport and use of machinery.

### 20.3.5.2 Environmental Value

The environmental values to be enhanced or protected are the acoustic qualities suitable for the wellbeing of a community, including its social and economic amenity; and for the wellbeing of the individual, including the individual's opportunities to sleep, relax and converse without unreasonable interference from intrusive noise or vibration.

### 20.3.5.3 Potential Impacts on the Environmental Value

Mining creates noise and vibration through use of heavy equipment, the plant processing the coal, and blasting of the overburden material.

The local area with potential to be impacted from noise or vibration is very sparsely settled. Main noise and vibration sources from the MEP include:

- rail traffic;
- coal haulage, preparation and load-out to trains;
- overburden blasting and removal;
- coal preparation plant operations; and
- light traffic flow in and around the mine-site vicinity.

The results of computer noise modelling of the MEP using PEN3D show that noise levels experienced at various residences vary according to the terrain between the noise source and the receiver, the distance from the source to the receiver and the meteorological conditions.

The potential for noise at a residence is greatest when out of pit dumping occurs. The operation of the MEP is expected to produce noise levels of up to 22 dB(A) during calm conditions and 26 dB(A) during worst-case conditions at the Wotonga residence.

Under the typically adverse conditions modelled, no residence was exposed to noise levels in excess of 30 dB(A).

With respect to the potential for sleep disturbance at night, the predicted level is within the 22 -26 dB(A) range for outdoor noise which is consistent with the 30 dB(A) indoor noise recommended by the World Health Organisation to minimise sleep disturbance.

The *Environmental Protection Regulation* airblast overpressure limit of less than 115 dBL for four out of five blasts can be achieved by varying blast specifications depending on the type of blast (box-cut and stripping blast) and distance to the nearest residence.

Peak ground vibration from blasts with the standard blasting specification loading are predicted to be less than or equal to 4.6 mm/s at the nearest residence, well below the *Environmental Protection Regulation* limit of 10 mm/s.

#### 20.3.5.4 *Proposed Environmental Protection Objective*

The *Environmental Protection Policy (Noise) 2008* (EPP Noise) specifies that the acoustic quality objective of the legislation is to achieve an ambient level of 55 dB(A) or less for most of Queensland's population living in residential areas.

The Millennium Coal Mine will operate 24 hours a day, seven days a week. An overall noise criterion of 35 dB(A) at the nearest sensitive receptors is to be achieved.

#### 20.3.5.5 *Control Strategies*

Millennium Coal Mine has no identified environmental noise issues associated with the operation due to its remoteness from townships and homesteads.

Proper equipment maintenance and operation procedures will continue to be implemented to minimise nuisance noise emissions from equipment.

Blasting will only occur during daylight hours, and when background noise levels are higher than at other times of the day.

A site contact number will be provided to neighbours to allow a timely response to any complaint about nuisance noise. Complaints will be investigated to determine the source of the nuisance noise and, where appropriate, noise monitoring will be conducted at the affected residence. Should monitoring indicate that the noise level is persistently causing a nuisance, the holder of the Environmental Authority will seek to reach an agreement with the occupier of the residence to provide noise reduction treatment of the dwelling to minimise the nuisance.

There have been no complaints received regarding noise emissions from the existing mine.

Impacts from noise generated by the MEP are expected to be minimal.

#### 20.3.5.6 *Proposed Environmental Authority Conditions: Schedule D–Noise & Vibration*

##### **D1 Noise Nuisance**

Noise from mining activities must not cause an environmental nuisance at any noise sensitive or commercial place.

##### **D2 All noise from mining activities must not exceed the levels specified in Table 20-17 (Noise limits) at any noise affected place.**

##### **D3 Noise Monitoring**

When requested by the administering authority, noise monitoring must be undertaken to investigate any complaint of noise nuisance, and the results notified within **fourteen (14) days** to the administering authority. Monitoring must include:

- a) LA 10, adj, 10 mins;
- b) LA 1, adj, 10 mins;
- c) the level and frequency of occurrence of impulsive or tonal noise;
- d) atmospheric conditions including wind speed and direction;
- e) effects due to extraneous factors such as traffic noise; and
- f) location date and time of recording.

**D4** Noise is not considered to be a nuisance under condition **D1** if monitoring shows that noise does not exceed the following levels in the time periods specified in **Table 20-17** (Noise limits).

**Table 20-17 Noise limits**

Noise Level dB(A)	Monday-Saturday			Sundays and Public Holidays		
	7am-6pm	6pm-10pm	10pm-7am	9am-6pm	6pm-10pm	10pm-9am
	Noise measured at a 'Noise Sensitive Place'					
LA10, adj, 10 mins	B/g + 5	B/g + 5	B/g + 0	B/g + 5	B/g + 5	B/g + 0
LA1, adj, 10 mins	B/g + 10	B/g + 10	B/g + 5	B/g + 10	B/g + 10	B/g + 5
	Noise measured at a 'Commercial Place'					
LA10, adj, 10 mins	B/g + 10	B/g + 10	B/g + 5	B/g + 10	B/g + 10	B/g + 5
LA1, adj, 10 mins	B/g + 15	B/g + 15	B/g + 10	B/g + 15	B/g + 15	B/g + 10

**D5** The method of measurement and reporting of noise monitoring must comply with the current edition of the administering authority's Noise Measurement Manual.

**D6** If monitoring indicates exceedence of the relevant limits in condition **D4**, then the environmental authority holder must:

- a) address the complaint including the use of appropriate dispute resolution if required; and
- b) immediately implement noise abatement measures so that emissions of noise from the activity do not result in further environmental nuisance.

**D7 Vibration Nuisance**

Vibration from the licenced activities must not cause an environmental nuisance, at any sensitive or commercial place.

**D8** When requested by the administering authority, vibration monitoring must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any sensitive or commercial place, and the results must be notified within

**fourteen (14) days** to the administering authority following completion of monitoring.

**D9 Airblast Overpressure Nuisance**

The airblast overpressure level from blasting operations on the premises must not exceed the limits defined in **Table 20-18** (Airblast overpressure level) at any nuisance sensitive or commercial place.

**Table 20-18 Airblast Overpressure Level**

Location	Airblast Overpressure Measured
Sensitive or commercial place	Air blast overpressure level of 115 db (Linear peak) for nine (9) out of ten (10) consecutive blasts initiated and not greater than 120 db (Linear peak) at any time.

**D10** When requested by the administering authority, airblast overpressure monitoring must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any sensitive or commercial place, and the results must be notified within **fourteen (14) days** to the administering authority following completion of monitoring.

**D11** Airblast overpressure monitoring must include the following descriptors, characteristics and conditions:

- a) location of the blast(s) within the mining area (including which bench level);
- b) atmospheric conditions including temperature, relative humidity and wind speed and direction; and
- c) location, date and time of recording.

**D12** If monitoring indicates exceedence of the relevant limits in **Table 20-18** (Airblast overpressure level), then the environmental authority holder must:

- a) address the complaint including the use of appropriate dispute resolution if required; and
- b) immediately implement airblast overpressure abatement measures so that airblast overpressure from the activity does not result in further environmental nuisance.

**D13** The method of measurement and reporting of airblast overpressure levels must comply with the current edition of the administering authority's Noise Measurement Manual.

**END OF CONDITIONS FOR SCHEDULE D**



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## 20.3.6 Waste Management

### 20.3.6.1 Background

The major sources of waste with the potential to cause impacts are:

- mine wastes, including waste rock, rejects and tailings;
- regulated waste (hydrocarbon waste, batteries, tyres, detergents, solvents) from workshop activities;
- general waste (benign waste, wood, food scraps, wrapping paper and rags);
- recyclable general waste (paper, cans and glass);
- recyclable scrap metal; and
- sewage effluent and dried sewage sludge.

### 20.3.6.2 Environmental Value

In accordance with the *Environmental Protection (Waste Management) Policy 2000*, the environmental values to be protected or enhanced throughout the MEP are:

- The life, health and wellbeing of people;
- The diversity of ecological processes and associated ecosystems; and
- The land use capability.

### 20.3.6.3 Potential Impacts on the Environmental Value

Inappropriate disposal of waste may lead to the contamination of land and water, adverse effects on ecosystem health.

### 20.3.6.4 Proposed Environmental Protection Objective

Minimise the impacts of waste on the environment by managing the following aspects of the operation effectively:

- mine wastes;
- coal processing waste (tailings and rejects);
- regulated waste (eg batteries, tyres, hydrocarbon wastes, miscellaneous chemicals); and
- general construction and operational wastes.

### 20.3.6.5 Control Strategies

The Millennium Coal Mine operates a waste management plan that details requirements for employee and contractor responsibility, training and disposal of all materials used on the mine site. The adoption of the principles of the waste management hierarchy minimises the inappropriate loss of resources and ensures appropriate disposal of wastes.

On-site waste management practices will expand as required to cater for any increases in waste products generated from the MEP. Currently, all wastes (with the exception of tyres and some conveyor belts) are disposed of off-site either as general waste to landfill, regulated waste for disposal as appropriate and as recyclable materials.

The MEP will manage wastes in accordance with the Waste Management Hierarchy listed in the *Environmental Protection (Waste Management) Policy 2000*, which involves:

- waste avoidance;
- waste re-use;
- waste recycling; and
- waste disposal.

**General and Regulated Waste**

General wastes will be collected and segregated on-site for re-use, recycling or disposal if necessary. Transportation of wastes off-site will be by a licenced waste contractor.

**Hazardous Materials**

Any hazardous materials used on-site will be recorded in a Hazardous Materials Register. This register will include details on storage location; storage requirements; proper usage; handling information; and disposal procedures. This information will be available in Material Safety Data Sheets (MSDS) which will be kept for all materials and chemicals maintained within the Hazardous Materials Register.

In addition:

- Section 5.8 of *AS 1940-2004 for the Storage and Handling of Flammable and Combustible Liquids* will be implemented on-site;
- contractors will provide a list of hazardous chemicals and MSDS prior to bringing chemicals on-site;
- no chemical will be allowed on-site without an MSDS;
- a chemical register will be continued on-site;
- corrosive materials will be stored and handled in accordance with AS 3780.8 (Class 8 substances–corrosives);
- fuels, oils and chemicals will be stored in a bunded area with capacity of at least 110% of the largest container;
- all fuels, oils and chemicals will be clearly labelled;
- transfer of bulk fuel and handling of hazardous chemicals will be undertaken only by trained personnel;
- spill cleanup kits including absorbent materials will be kept at each fuel and chemical storage facility; and
- an area will be designated for the temporary storage or bioremediation of hydrocarbon contaminated soils.

**20.3.6.6 Monitoring**

Waste monitoring and auditing will be undertaken at the MEP. The purpose of monitoring waste management activities and outcomes on-site include:

- assessing actual waste results and comparing with predicted impacts and mitigation measures;
- monitoring for potential environmental impacts; and
- providing baseline data to enable continuous improvement of waste avoidance, reduction and management measures throughout the MEP.

Wastes and emissions generated from the MEP are also reported annually, as required, through the National Pollutant Inventory process.

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20.3.6.7      *Proposed Environmental Authority Conditions: Schedule E-Waste Management*

**E1    Storage of Tyres**

Scrap tyres stored awaiting disposal or transport for take-back and recycling, or waste-to-energy options must be stored in stable stacks and at least ten (10) metres from any other scrap tyre storage area, or combustible or flammable material, including vegetation.

**E2**    All reasonable and practicable fire prevention measures must be implemented, including removal of grass and other materials within a **ten (10) metre** radius of the scrap tyre storage area.

**E3**    Disposing of scrap tyres resulting from the authorised activities in waste rock emplacements is acceptable, provided tyres are placed as deep in the waste rock as reasonably practicable. A record must be kept of the number and location for tyres disposed.

**E4**    Scrap tyres resulting from the mining activities disposed within the operational land must not impede saturated aquifers or compromise the stability of the consolidated landform.

**E5    Waste Management**

A Waste Management Plan, in accordance with the *Environmental Protection (Waste Management) Policy 2000*, must be implemented by **1 April 2012** and must:

- a) describe how the Millennium Coal Mine Project recognise and apply the waste management hierarchy;
- b) identify characteristics of wastes generated from the MEP and general volume trends over the past **five (5) years**;
- c) cover a program for safe recycling or disposal of all wastes-reusing and recycling where possible;
- d) identify waste commitments with auditable targets to reduce, re-use and recycle;
- e) describe waste management control strategies, including:
  - i) the type of wastes;
  - ii) segregation of the wastes;
  - iii) storage of the wastes;
  - iv) transport of the wastes;
  - v) monitoring and reporting matters concerning the waste;
  - vi) emergency response planning;
  - vii) disposal, reused and recycling options;
- f) identify the potential adverse and beneficial impacts of the wastes generated; and
- g) detail the hazardous characteristics of the waste generated (if any);
  - i) detail the disposal procedure for hazardous wastes;
  - ii) outline the process to be implemented to allow for continuous improvement of the waste management systems;

- 
- iii) identify responsible staff (positions) for implementing, managing and reporting the Waste Management Plan; and
  - iv) detail a staff awareness and induction program that encourages re-use and recycling.
- E6** Waste must not be burned or allowed to be burned on the licenced site unless by approval of the administering authority.
- E7** A designated area must be set aside for the segregation of economically viable, recyclable solid and liquid waste.
- E8** Records must be kept for **five (5) years**, and must include the following information:
- a) date of pickup of waste;
  - b) description of waste;
  - c) cross reference to relevant waste transport documentation;
  - d) quantity of waste;
  - e) origin of the waste;
  - f) destination of the waste; and
  - g) intended fate of the waste, for example, type of waste treatment, reprocessing or disposal.
- E9** Records of trade and regulated wastes or material leaving the mining lease for recycling or disposal, including the final destination and method of treatment, must be in accordance with the *Environmental Protection (Waste Management) Policy 2000*.
- E10** All regulated waste received at and removed from the site must be transported by a person who holds a current authority to transport such waste under the provisions of the *Environmental Protection Act 1994*.
- E11** Except as otherwise provided by the conditions of this authority, all waste removed from the site must be taken to a facility that is lawfully allowed to accept such waste under the provisions of the *Environmental Protection Act 1994*.

**END OF CONDITIONS FOR SCHEDULE E**

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## **20.3.7 Land Management**

### *20.3.7.1 Background*

#### **Land Use**

Land use on the Millennium Coal Mine area is grazing. Surrounding land uses include grazing and coal mining. According to the Strategic Cropping Land – Draft Trigger Map C4 (Mackay area) provided under the (draft) *Protecting Queensland's Strategic Cropping Land: A Policy Framework*, the area of the MEP does not include any identified Strategic Cropping Land.

The post-mine land use for areas disturbed by mining at the MEP will be a self-sustaining vegetation community using appropriate native tree, shrub and pasture grass species.

#### **Pre and Post Mine Land Suitability**

The Mining leases are generally classified as Agricultural Land Class C (Pasture Land-suitable only for improved or native pastures, due to limitations which preclude continuous cultivation for crop production). The majority of the land is categorised as Suitability Class 5 (Unsuitable) for dryland cropping, and Classes 3 to 4 (Moderate to Marginal) for grazing.

#### **Good Quality Agricultural Land**

*State Planning Policy 1/92* provides a framework for development to be assessed that considers the value of GQAL. The policy acknowledges that there will be developments that can legitimately alienate GQAL because they represent an overriding benefit to the community.

The MEP will remove some areas of Good Quality Agricultural Land (GQAL) suitable for improved pasture grazing—with approximately 283 ha of Class C1 land will be removed for the MEP.

#### **Waste Characterisation**

Total sulphur analysis was used to screen samples that may contain potentially acid-forming (PAF) material principally in the form of pyrite sulphur. Generally, where the sulphur concentration (as S) is less than 300 mg/kg, there is considered to be negligible risk of acid formation.

Analysis of waste rock samples from the existing Millennium Mine (Millennium Coal, 2008) found the majority of the waste rock has negligible sulphur content and a net acid neutralising capacity due to a high content of calcium carbonate.

This view is supported by anecdotal evidence at Millennium Mine, with no visible indications of pyritic oxidation in rehabilitated waste rock to date and no expression of such occurrences in water sampling results. Metal and elemental levels in the existing waste rock are at expected background levels, and has low to moderate salinity and sodicity. Overall the results indicate that the waste rock has sufficient acid neutralising capacity to ensure acid drainage is not generated. This was also confirmed with new testing undertaken for the new areas affected by the MEP.

Analysis shows that coal reject material has a slightly increased acid forming potential. This material should not be exposed at the surface of final landforms nor should it be placed in the waste rock profile in such a manner to allow contact with locally developed groundwater tables.

## Land Contamination

The mine workshop and fuel storage areas are recognised as having the potential to generate contaminated land through hydrocarbon spills. All fuel and chemical storage areas within the industrial area will be bunded, and contaminants from the workshop and truck wash-down areas will be directed to a sump or drain where they can be contained for subsequent treatment or proper disposal.

Potential for land contamination from the spilling of hydrocarbons will be minimised through the development and implementation of standard operating procedures for transport, handling and storage of hydrocarbons. Other measures such as bunding around storage areas, emergency spill response planning and employee training will be employed. Correct handling procedures will be followed at all times. Any land contamination that occurs will be recorded on a register and remediated.

## Terrestrial Ecology

The Millennium Coal Mine and MEP area contains 19 discrete vegetation communities. Of these vegetation communities, 15 are remnant as defined under the provisions of the *VM Act*, and equate to 11 different RE types. The dominant vegetation community within the MEP area is pasture grasses on sands. This community is non-remnant under the *VM Act* and is not analogous to any threatened (endangered) ecological community as defined under the provisions of the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*.

This vegetation community does however contain some areas where Brigalow and/or Poplar Box is regrowing within the pasture. Given sufficient canopy development, such areas may eventually be classified remnant vegetation. However, these regrowth areas are at an early stage of development, featuring generally low and sparse woody vegetation. Patches are not easily separated out from the surrounding pasture matrix.

### 20.3.7.2 Environmental Values

The environmental values of the land that are to be protected or enhanced are:

- a beneficial post mining land use—a self sustaining vegetation community using appropriate native tree, shrub and grass species;
- a stable, non-polluting landform (including the prevention of contaminated land);
- to control the introduction and spread of declared plants; and
- to minimise the disturbance of remnant vegetation.

### 20.3.7.3 Potential Impacts on Environmental Values

Activities with potential to impact on the land are:

- clearing of vegetation;
- stripping and stockpiling of topsoil;
- construction of access tracks and haul roads;
- construction of elevated waste rock emplacements;
- storage of coal wastes (rejects and tailings);
- changes in land use;



- creation of final voids; and
- potential land contamination from the spillage of hazardous materials (e.g. hydrocarbons).

#### 20.3.7.4 *Proposed Environmental Protection Objectives*

The objectives to protect the environmental values of the mined land are:

##### **Objective 1: A Beneficial Post Mining Land Use**

The post-mine land use for areas disturbed by mining will be a self-sustaining vegetation community using appropriate native tree, shrub and pasture grass species based on-site-specific trials.

##### **Objective 2: A Stable, Non-Polluting Landform.**

Land disturbed by mining activities will be made stable (geotechnically and erosionally) to ensure that the post-mine land use is not compromised by instability of the site. In particular, the production of acid rock drainage (ARD) will be controlled by appropriate management of potentially acid forming (PAF) materials. Land contamination prevention will focus on good management practices for the storage, handling and use of fuels, oil and chemicals.

##### **Objective 3: Weed Management**

Develop and implement a Weed Management Plan which includes management methods for declared plants on the MEP Site in accordance with local management practice and or DNRW Pest Fact sheets. Monitor treated areas to assess the success of declared plant eradication, and identify any new declared plant infestations. Use vehicle wash-down facilities for vehicles entering and leaving the MEP Site.

##### **Objective 4: Remnant Vegetation**

A Permit to Disturb System (formal checks and approvals before clearing can start) will be implemented, and the mining footprint will be designed to avoid endangered regional ecosystems where possible.

#### 20.3.7.5 *Control Strategies*

##### **Rehabilitation**

The rehabilitation strategy at the MEP consists of the following integrated measures:

- appropriate pre-disturbance preparation such as topsoil salvage and management plans;
- implementation of practical landform designs, to prevent erosion and establish final landform stability;
- identification of an appropriate post-mine land use consistent with local environmental constraints;
- revegetation trials, for selection of appropriate revegetation species and methodologies;
- progressive rehabilitation of disturbed areas, using rehabilitation procedures for appropriate to the type of disturbance;
- implementation of erosion control measures;
- a rehabilitation monitoring program to assess the success of rehabilitation;
- ongoing weed management;

- a corrective action program to address areas of failed rehabilitation; and
- preparation of Final Rehabilitation Report (FRR) prior to surrender of the Mining Lease.

### **Post-Mine Landform**

Stable landforms will be established following mining, using soils capable of supporting vegetation communities adapted to the local environment. The disturbed land will be rehabilitated to a condition that is self-sustaining, or to a condition where the maintenance requirements are consistent with the post mining land use.

The proposed final landform consists of external and internal waste rock emplacements. Final voids will be left at the cessation of mining, with the remainder of the pit backfilled.

Final voids will be left in a geotechnically stable condition at the final batter angle. Bunds will be constructed along the crest of the pit to prevent vehicular access.

### **Topsoil Management**

Suitable topsoil will be stripped for use in the rehabilitation program. The topsoil will either be stockpiled until suitable re-contoured areas are available, or respread immediately across the area to be rehabilitated. The topsoil resources present are more than adequate for the rehabilitation of the waste rock emplacements and other disturbed areas.

In addition:

- the Engineering Guidelines for Queensland for Soil Erosion and Sediment Control (IEAust, 1996) or the *Best Practice ESC Management 2008* will be followed, where appropriate;
- areas to be cleared will be clearly marked with tape, pegs or other means and will conform with the limits on design drawings. Particular attention will be paid to defining the boundaries of clearing where significant vegetation is present;
- clearing will not commence until drainage control works are in place;
- cleared vegetation will be windrowed along the contour to assist with erosion control;
- vegetation clearing will be restricted to that necessary for the works;
- vegetation will not be burned without a permit;
- topsoil will be salvaged from all disturbed areas, unless specific directions have been given that certain soils are unsuitable; and
- topsoil stockpiles will be located away from drainage lines and the final surface will be ripped to promote natural revegetation.

### **Progressive Rehabilitation**

A progressive rehabilitation program will be implemented throughout the mine life.

### **Revegetation**

The revegetation methods for all types of disturbed land at the MEP will normally consist of the following:

- resspreading stockpiled or freshly stripped topsoil;

- contour ripping;
- seeding with an appropriate seed mix; and
- application of appropriate fertiliser for plant establishment if required.

### **Rehabilitation Success Criteria**

The site-specific criteria for achieving a self-sustaining vegetation community will be developed during the operation based on rehabilitation trials and the monitoring of progressive rehabilitation.

Criteria for successful rehabilitation may include the following parameters:

- percentage ground cover;
- tree and shrub density;
- tree and shrub species diversity;
- indicators for rill and gully erosion; and
- downstream water quality.

### **Rehabilitation Monitoring**

Rehabilitated areas will be monitored using the selected parameters and trends tracked to demonstrate progress towards a self-sustaining ecosystem. The MEP will be monitored for the following rehabilitation success criteria:

- percentage ground cover in pasture/grazing areas;
- canopy cover in native bushland areas – this success criterion will be researched to determine an appropriate benchmark value and quantify its robustness as an indicator of post-mining sustainability of rehabilitated areas;
- the number of stems/ha of native trees and shrubs in rehabilitated areas;
- run-off water quality; and
- occurrence of active erosion gullies.

### **Decommissioning**

The decommissioning and final rehabilitation of the MEP will occur on a staged basis over several years. A contaminated site assessment will be carried out as part of the Final Rehabilitation Report.

On the completion of mining, infrastructure will be treated as follows:

- mine roads will be left behind for use as farm roads (or rehabilitated);
- water dams will remain if required by the subsequent landowner and approved by regulators; otherwise, the dam walls will be breached;
- buildings, plant and equipment will be removed and the surface rehabilitated. This will include the CHPP, workshop, offices, storage tanks and coal handling facilities; and
- concrete pads will be covered with benign waste rock, topsoiled and revegetated.

The final voids remaining at the end of the mine life will cover approximately 231 ha and will be on average 150 m deep. A bund and fence will be constructed around the crest of the pit to prevent access to the final void.

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*20.3.7.6 Proposed Environmental Authority Conditions: Schedule F-Land***F1 Topsoil**

Topsoil must be strategically stripped ahead of mining in accordance with a topsoil management plan.

- F2** A topsoil inventory which identifies the topsoil requirements for mining leases 70313 and 70344, MLA 70401 and MDL 136 including availability of suitable topsoil on-site must be detailed in the topsoil management plan.

**F3 Rehabilitation Landform Criteria**

All areas significantly disturbed by mining activities must be rehabilitated to a stable landform with a self-sustaining vegetation cover.

- F4** Progressive rehabilitation must commence within **twelve (12) months** when areas become available within the operational land.

- F5** Complete an investigation into rehabilitation of disturbed areas and submit a report to the administering authority proposing acceptance criteria by **1 April 2012** for review and comment. On acceptance of the criteria proposed in the rehabilitation management plan, the criteria must be specified in this environmental authority. The rehabilitation management plan must, at a minimum:

- a) map existing areas of rehabilitation;
- b) develop design objectives for rehabilitation of disturbed areas and post mining land uses across the mine;
- c) specify waste rock characteristics, soil analysis, soil separation for use on rehabilitation;
- d) detail rehabilitation methods applied to areas;
- e) contain landform design criteria including end of mine design;
- f) detail how landform design will be consistent with the surrounding topography;
- g) identify success criteria for areas and itemise revegetation criteria;
- h) explain planned native vegetation rehabilitation areas and corridors;
- i) identify at least a minimum of three (3) reference and three (3) rehabilitation sites to be used to develop rehabilitation success criteria;
- j) describe rehabilitation indicators and the monitoring program to be used;
- k) develop a contingency plan for rehabilitation maintenance or redesign;
- l) describe end of mine landform design plan and post mining land uses across the mine;
- m) include a cost benefit analysis / triple bottom line assessment (or an alternative assessment method) of the proposed final landform design criteria and alternatives;
- n) propose Endangered Regional Ecosystem (ERE) management and offset protection; and
- o) identify and consider the potential for cumulative impacts on rehabilitation outcomes as a result of applying mine affected water with high electrical conductivity for dust suppression.

## F6 Residual Void Outcome

Residual voids must not cause any serious environmental harm to land, surface waters or any recognised groundwater aquifer, other than the environmental harm constituted by the existence of the residual void itself and subject to any other condition within this environmental authority.

**F7** Complete an investigation into residual voids and submit a report to the administering authority proposing acceptance criteria to meet the outcomes in condition **F6** and landform design criteria by **1 April 2012** for review and comment. On acceptance of the criteria proposed in the residual void management plan, the criteria must be specified in the environmental authority. The investigation must at a minimum include the following:

- a) a study of options available for minimising final void area and volume;
- b) develop design criteria for rehabilitation of final voids;
- c) a void hydrology study, addressing the long-term water balance in the voids, connections to groundwater resources and water quality parameters in the long-term;
- d) a pit wall stability study, considering the effects of long-term erosion and weathering of the pit wall and the effects of significant hydrological events;
- e) a study of void capability to support native flora and fauna; and
- f) a proposal/s for end of mine void rehabilitation success criteria and final void areas and volumes.

These studies will be undertaken during the life of the mine, and will include detailed research and modelling.

## Nature Conservation

**F8** A buffer distance of not less than **one hundred (100) metres** must be retained on either side of the vegetation along New Chum Creek within mining lease 70313, to minimise environmental impacts to regional ecosystems except as indicated in **Table 20-19**.

**Table 20-19 Work Areas In Nature Conservation Areas**

Description	Easting (GDA 94)	Northing (GDA 94)
Water Storage – West Creek	626227	7563194
	626095	7562948
	626597	7562599
	626615	7563108
Haul Road Crossings	Exact co-ordinates to be determined in consultation with site environmental personnel prior to construction.	

**F9** The Plan of Operations must include strategies to manage the impact of mining on Endangered Regional Ecosystems. The strategies must be developed and implemented prior to the commencement of construction activities.

**F10 Preventing Contaminant Release to Land**

Contaminants must not be released to land in a manner which constitutes nuisance, material or serious environmental harm.

**F11 Storage and Handling Of Flammable and Combustible Liquids**

All flammable and combustible liquids must be contained within an on-site containment system and controlled in a manner that prevents environmental harm and maintained in accordance with the current version of *AS 1940 – Storage and Handling of Flammable and Combustible Liquids*.

**F12** Spillage of all flammable and combustible liquids must be controlled in a manner that prevents environmental harm.

**F13 Storage and Handling of Chemicals**

All chemicals must be contained within an on-site containment system and controlled in a manner that prevents environmental harm and maintained in accordance with the current version of the relevant Australian Standard.

**F14** Spillage of all chemicals must be controlled in a manner that prevents environmental harm.

**F15 Infrastructure**

All infrastructure, constructed by or for the environmental authority holder during the licenced activities including water storage structures, must be removed from the site prior to surrender, except where agreed in writing by the post mining landowner / holder.

**F16 Exploration Activities**

The environmental authority holder must comply with each of the Standard Environmental Conditions contained in the *Code of Environmental Compliance for Exploration and Mineral Development Projects*, except Condition 13 of the Code, which is replaced by the conditions in this environmental authority.

**F17 Exploration Within ERE Buffer**

This environmental authority authorises exploration activities within the five hundred metre (500m) buffer of ERE on the following tenements only:

MDL 136;

ML 70313; and

EPC 728.

Exploration activities are not permitted within ERE.

**F18** This environmental authority authorises the construction of Line of Oxidation (LOX) drilling activities within the ERE buffer on MDL 136 and ML 70313 as shown in Attachment 1-Figure 2: Mapped ERE, 500m buffer and proposed LOX lines.

**F19** This environmental authority authorises the construction of two (2) drill holes within the ERE buffer of MDL 136 as shown in Attachment 1-Figure 3: Mapped ERE, 500m buffer and proposed geotechnical core holes on MDL 136 (Mavis Downs), and six (6) drill holes within ERE buffer of EPC 728 as



shown in Attachment 1-Figure 4: EPC 728 mapped ERE and proposed drill holes.

**F20 Land Disturbance on ERE Buffer**

The operational area of drill sites must not exceed one thousand square metres (1,000 m<sup>2</sup>).

**F21** Drill holes are limited to no more than two hundred millimetres (200 mm) in diameter.

**F22** The construction of sumps must not exceed ten square metres (10 m<sup>2</sup>).

**F23** Topsoil stripping must be limited to the sump area.

**F24** Exploration activities within the ERE buffer must not involve costeaning or bulk sampling activities.

**F25** Exploration camps are not permitted to be established within ERE or ERE buffer.

**F26 Tracks on ERE Buffer**

Existing access and fence line tracks must be used where possible. New tracks must be in accordance with the *Code of Environmental Compliance for Exploration and Mineral Development Projects*.

**F27** Constructed tracks must be less than five metres (5 m) in width.

**F28** Authorised track construction involving blade clearing of established ground cover vegetation and/or clearing of mature trees is to be minimised.

**F29** All new tracks are to be recorded with GPS coordinates and records kept of their location and made available to the administering authority on request.

**F30** The environmental authority holder must consult with the landowner prior to establishing any new roads or tracks.

**F31** All tracks, including water course crossings, must be commissioned and operated in accordance with the *Code of Environmental Compliance for Exploration and Mineral Development Projects*.

**F32 Rehabilitation and Reporting for Exploration on ERE Buffer**

Rehabilitation of drill sites and sumps will be in accordance with the *Code of Environmental Compliance for Exploration and Mineral Development Projects*.

**F33** Rehabilitation of areas disturbed within the ERE buffer must be completed as soon as practicable, but no longer than three (3) months after completion of the disturbance activity.

**F34** The environmental authority holder must revegetate disturbed areas of ERE buffer with native plant species endemic to the area that will promote the same vegetation type and density of cover to that of the surrounding undisturbed areas in the ERE buffer.

**F35** Annual return reporting must include details of the exploration activities undertaken and details of progressive rehabilitation works completed to demonstrate compliance with rehabilitation requirements of the environmental authority.

- F36** The environmental authority holder must complete rehabilitation of disturbed areas to the satisfaction of the administering authority.

**END OF CONDITIONS FOR SCHEDULE F**

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### **20.3.8 Cultural Heritage**

#### *20.3.8.1 Background*

The area surrounding the mine has a history of both Aboriginal and European activity. The Mine and surrounding areas have been subjected to extensive land clearing for agricultural and mining developments.

Both Indigenous and non-Indigenous cultural heritage places and values have been recorded as part of cultural heritage investigations that have been undertaken throughout the MEP area. Archaeological surveys have been conducted for both the existing Millennium Mine and the MEP.

#### **Indigenous Cultural Heritage**

The first indigenous cultural heritage assessment was carried out in October 2003 for the existing Millennium Mine (ML 70312 and ML 70313). The survey was conducted in collaboration with the native title claimants.

An archaeological survey of the MEP area was conducted in 2006 with sites identified as being significant with regards to indigenous cultural heritage.

#### **Non-Indigenous Cultural Heritage**

There were no sites of European cultural heritage within the MEP area identified on the Register of the National Estate, nor the Queensland Heritage Register.

Unidentified European cultural heritage sites are likely to be remnants relating to pastoral and settlement activities, such as historic survey trees, roads and stock routes, remnant boundary fence lines and station dumps. Elements associated with early roads, such as mile markers and historic camp remnants, may also exist.

A non-indigenous cultural heritage assessment was undertaken in June 2009 (Everick Heritage Consultants, 2009) for the MEP area in collaboration with landowners. Based on the literature review and site survey undertaken, no known non-Indigenous cultural heritage items or places were identified or are expected to be impacted as a result of the MEP.

#### *20.3.8.2 Environmental Value*

The environmental values of the cultural environment to be enhanced or protected are those qualities that are of particular aesthetic, archaeological, historical, social or scientific significant with respect to:

- Aboriginal occupation of the mining tenement; and
- Non-aboriginal occupation of the mining tenement.

#### *20.3.8.3 Potential Impacts on the Environmental Value*

Potential impacts on cultural heritage values include loss of and/or damage to artefacts of European and Aboriginal significance.

#### *20.3.8.4 Proposed Environmental Protection Objective*

The environmental protection objective is to preserve the cultural heritage values (Indigenous and Non-Indigenous) of the MEP area.

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*20.3.8.5 Control Strategies***Indigenous Cultural Heritage Management Plan**

Peabody will continue to implement the Cultural Heritage Management Plan (CHMP) and meet duty of care standards set by the *Aboriginal Cultural Heritage Act 2003* for the MEP. Peabody also commits to engaging with the endorsed Aboriginal parties to compile a comprehensive schedule of the cultural heritage places and values of the study area. A strategy will then be negotiated a strategy to manage those places and values in a culturally appropriate fashion in the context of the proposed development.

**Non-Indigenous Cultural Heritage**

In order to minimise the risk of accidental damage to identified and unidentified non-Indigenous features, the following strategies will be implemented:

- incorporate cultural heritage awareness into worker induction sessions and training. This will include identifying non indigenous cultural heritage features and explaining site history. This will institute awareness of the heritage features; and
- a procedure will be implemented whereby a permit must be obtained from the relevant site person(s) prior to undertaking any clearing or excavations. Clearing and excavation that potentially impacts the identified cultural heritage features will not be permitted.

**Fossils**

If fossils are located during the development and operation phases of the MEP, Peabody will advise the Queensland Museum.

*20.3.8.6 Proposed Environmental Authority Conditions–Schedule G Cultural Heritage*

No environmental authority conditions proposed.

**END OF CONDITIONS FOR SCHEDULE G**

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### **20.3.9 Community**

#### *20.3.9.1 Background*

The MEP is located in a rural area with neighbours involved in grazing activities. The MEP is in the Isaac Regional Council area, 22 km from Moranbah. The nearby towns of Nebo and Moranbah have a long history of involvement with the mining industry.

The majority of employees at the mine are living in the Mackay region with camp facilities provided at the MAC Camp in Coppabella. Some Peabody personnel are housed in Moranbah. Transport to and from the mine site and camp is provided by the company.

The MEP will require an increase in staffing of approximately 160 employees to the existing employees of the Millennium Coal Mine.

#### *20.3.9.2 Environmental Value*

The lifestyle, including the wealth, health, safety, and wellbeing of the community surrounding the MEP.

#### *20.3.9.3 Potential Impacts on the Environmental Value*

Mining activities have the potential for the following impacts that may affect community values:

- dust;
- noise;
- ground vibration;
- water level impacts;
- airblast overpressure;
- traffic; and
- lighting.

Continued operation of the mine will assist in the ongoing provision of the range of town facilities and services. It will also maintain the relative prosperity of the community. The mine does displace some land from grazing use. The relative economic returns from the mining use of the land are estimated to be about 10,000 times those of grazing over the life of the mine. Landholders affected by mining have been compensated by various agreements and no significant issues in this area have arisen.

The mining and transport of coal from the mine contributes a significant flow-on or multiplier to the economy locally, regionally, for the State and the nation. This is by way of wealth and employment generated in other sectors of the economy. The greatest potential for social impact will occur if local mines reduce operations.

The MEP will benefit local and regional areas with increased security of employment and the ongoing requirement for services and support. This will have an impact on the region and state in relation to water supply, electricity supply, labour supply, infrastructure, accommodation and road traffic.

#### *20.3.9.4 Proposed Environmental Protection Objective*

The environmental protection objective is to minimise environmental nuisance to neighbours from mining and associated activities and to respond to concerns expeditiously.

*20.3.9.5 Commitments*

Peabody will maintain a complaints procedure that includes:

- maintenance of a register of complaints held on-site;
- a process for receiving, handling and investigating complaints;
- investigation expeditiously by and a response as soon as practicable; and
- a non-compliance notification will be given to any party whose actions have caused a complaint as a result of non-compliance with site environmental requirements.

*20.3.9.6 Proposed Environmental Authority Conditions: Schedule H-Community***H1 Complaint Response**

All complaints received must be recorded including investigations undertaken, conclusions formed and action taken. This information must be made available to the administering authority on request.

**H2** The holder of this environmental authority must record the following details for all complaints received and provide this information to the administering authority on request:

- a) time, date, name and contact details of the complainant;
- b) reasons for the complaint;
- c) conclusions formed; and
- d) any actions taken.

**H3** In consultation with the administering authority, cooperate with and participate in any community environmental liaison committee established in respect of either the licenced place specifically or the industrial estate where the licenced place is located.**END OF CONDITIONS FOR SCHEDULE H**



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**20.3.10 Environmental Management***20.3.10.1 Monitoring***Background**

Environmental monitoring will be performed to provide data to measure the impact of the MEP on the environment.

**Proposed Environmental Protection Objective**

To demonstrate that the MEP is operated in accordance with the Environmental Authority Conditions, and that environmental control structures and programs are operating within the conditions.

**Commitments**

Environmental monitoring will occur in accordance with the requirements of the Environmental Authority.

The environmental monitoring will include rehabilitation success, surface water quality, groundwater quality and level, dust deposition and noise (if required). Commitments and proposed environmental authority conditions have been included in the relevant sections of this EM Plan.

An Environmental Monitoring Manual (EMM) will be developed as part of the Project Environmental Management System. The EMM will outline the MEP's environmental monitoring program (including monitoring sites, parameters and their frequency of measurement and make reference to monitoring procedures and records). The EMM will be made available to the administering authority on request.

*20.3.10.2 Reporting***Objective**

To provide timely, relevant and appropriately presented information to government authorities, the local community and the general public on the environmental performance of the mine and plant.

**Commitments**

Annual Returns will be prepared as required under the *Environmental Protection Act 1994* and the mine will submit National Pollutant Inventory (NPI) reports as prepared as necessary.

A Register of Environmental Incidents will be maintained. Incidents that may potentially compromise compliance with the conditions of the Environmental Authority will be reported immediately to operations management.

*20.3.10.3 Environmental Management System*

Project operations will take place under an environmental management system.

*20.3.10.4 Research*

Peabody is a major contributor to mining environmental research through its own internal projects and also through contributions to the Australian Coal Association Research Program (ACARP) and the research conducted by the Australian Centre for Mining Environmental Research (ACMER) and the University of Queensland Centre for Mined Land Rehabilitation (CMLR).

Peabody is making proportional contributions to the \$1 billion COAL21 Fund established by the Australian coal industry to support the research and demonstration of low emissions coal utilisation technologies.

#### *20.3.10.5 Staff Training*

Peabody will ensure that employees, contractors and visitors receive appropriate environmental awareness training. This will be achieved through a variety of methods including induction training, formal presentations, and impromptu meetings.

Specifically, Peabody requires that employees, contractors and visitors are aware of:

- their roles and responsibilities (including environmental incident reporting);
- the environmental impacts, potential or actual, of their activities on-site;
- the potential consequences of poor environmental performance; and
- site emergency procedures.

Environmental awareness training will occur at induction, and will be a regular feature of site-wide training. Records of training content and attendance will also be maintained.

Employees and contractors required to undertake work at the site must undergo an environment, health and safety induction. Relevant environmental topics include:

- Environmental Policy;
- Duty of Care and Duty to Notify;
- Hazard/Incident Reporting;
- Basic Environmental Management;
- Risk Management; and
- Chemicals and Hazardous Substances.

#### *20.3.10.6 Environmental Auditing and Review*

##### **Background**

The MEP will conduct environmental audits to assess compliance with regulatory requirements and the performance of the site EMS. Energy audits will also be conducted throughout the life of the operation.

##### **Objective**

The objectives of the Environmental Auditing and Review programs are to:

- monitor and report on compliance with statutes, EM Plan commitments and Plan of Operations, environmental policy, company standards, leading practice guidelines and signatory codes; and
- ensure a senior management review of performance via consideration of the audit reports.

##### **Commitments**

An environmental auditing program will be implemented at the MEP. The program will include:

- Internal Environmental Audits–bi-annually;
- Environmental Management System Review–as required within the EMS;

- Plan of Operations Audits – with each Plan of Operations; and
- Administering Authority Audits-at a frequency determined by the authority.

## 20.4 REFERENCES

Australian and New Zealand Environment and Conservation Council & Agriculture and Resource Management Council of Australia and New Zealand 2000, Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

Department of Environment and Resource Management 2009, Version 3, Queensland Water Quality Guidelines 2009, State of Queensland.

Department of Mines and Energy 1995, Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland, Queensland Government, Brisbane.

Everick Heritage Consultants 2009, Historic Non-Indigenous Cultural Heritage Assessment.

Institution of Engineers Australia 1996, Soil Erosion and Sediment Control – Engineering Guidelines for Queensland Construction Sites, Institution of Engineers Australia Queensland Division, Brisbane.

Millennium Coal 2008, Millennium Coal Mine Environmental Management Plan, August 2008.

## 20.5 DEFINITIONS

Words and phrases used throughout this Environmental Management Plan are defined below except where identified in the *Environmental Protection Act 1994* or subordinate legislation. Where a word or term is not defined, the ordinary English meaning applies, and regard should be given to the Macquarie Dictionary.

**'Act'** means the *Environmental Protection Act 1994*.

**'administering authority'** means the Environmental Protection Agency or its successor.

**'The holder'** means the holder of this environmental authority.

**'acceptance criteria'** means the measures by which the actions implemented to rehabilitate the land are deemed to be complete (same as completion criteria).

**'annual exceedence probability'** means the probability that the given event will be exceeded within a one year period.

**'appropriately qualified person'** means a person or body possessing appropriate experience and qualifications to perform these tasks.

**'ARD'** means acid rock drainage and refers to the low pH, high heavy metal pollutant typical of sulphidic mine wastes, and most commonly associated with the production of ferrous iron and sulphuric acid through the oxidation of sulphide minerals.

**'authority'** means environmental authority under the *Environmental Protection Act 1994*.

**'design storage allowance'** as defined in the DME 1995 Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland.

**'land'** in the 'land schedule' of this document means land excluding waters and the atmosphere.

**'land use'** term to describe the selected post mining use of the land, which is planned to occur after the cessation of mining operations.

**'leachate'** means a liquid that has passed through or emerged from, or is likely to have passed through or emerged from, a material stored, processed or disposed of at the operational land which contains soluble, suspended or miscible contaminants likely to have been derived from the said material.

**'noxious'** means harmful or injurious to health or physical well being.

**'offensive'** means causing unreasonable offence or displeasure; is unreasonably disagreeable to the sense; disgusting, nauseous or repulsive.

**'percent slope'** = 
$$\frac{\text{height difference (metres)}}{\text{horizontal difference (metres)}} \times 100$$

**‘protected area’** means

- a protected area under the Nature Conservation Act 1992; or
- a marine park under the Marine Parks Act 1992; or
- a World Heritage Area.

**‘progressive rehabilitation’** means rehabilitation (defined below) undertaken progressively OR a staged approach to rehabilitation as mining operations are ongoing.

**‘rehabilitation’** means the process of reshaping and revegetating land to restore it to a stable landform and in accordance with the acceptance criteria set out in this environmental authority and, where relevant, includes remediation of contaminated land.

**‘representative’** means a sample set which covers the variance in monitoring or other data either due to natural changes or operational phases of the mining activities.

**‘sediment dam’** means a structure for the capture and treatment of stormwater run-off contaminated only by sediments from disturbed areas and which discharge off-site once full.

**‘self sustaining’** means an area of land which has been rehabilitated and has maintained the required acceptance criteria without human intervention for a period nominated by the administering authority.

**‘sensitive place’**[e.g. odour and dust] has the same meaning as and includes a noise sensitive place and a commercial place.

**‘stable’** means geotechnical stability of the rehabilitated landform where instability related to the bearing capacity, excessive settlement and subsidence caused by consolidation / settlement of the wastes deposited, and sliding / slumping instability has ceased.

**‘waters’** includes river, stream, lake, lagoon, pond, swamp, wetland, unconfined surface water, unconfined water natural, bed and bank of any waters, dams, non-tidal or tidal waters (including the sea), and any under groundwater, any part-thereof.

**‘mg/kg’** means milligrams per kilogram.

**‘mg/L’** means milligrams per litre.

**‘µg/L’** means micrograms per litre.

**‘ng/L’** means nanograms per litre.

**‘80th percentile’** means that the measured values of the quality characteristic must not be greater than the release limit for any more than one out of five consecutive samples where the time interval between the taking of each consecutive sample is not less than three days.

**‘50th percentile’** means that the measured values of the quality characteristic must not be greater than the release limit for any more than three out of six



consecutive samples where the time interval between the taking of each consecutive sample is not less than three days.

**'median'** means the middle value, where half the data are smaller, and half the data are larger. If the number of samples is even, the median is the arithmetic average of the two middle values.

**'maximum'** means that the measured value of the quality characteristic or contaminant must not be greater than the release limit stated.

**'minimum'** means that the measured value of the quality characteristic or contaminant must not be less than the release limit stated.

**'range'** means that the measured value of the quality characteristic or contaminant must not be greater than the higher release limit stated nor lower than the lower release limit stated.

**'Total Organic Carbon' ('TOC')** means the sum of all compounds of carbon which contain at least one carbon to carbon bond plus methane and its derivatives. For the purpose of measurement 1 gram of TOC is deemed to have the same flame ionisation response as 1 gram of Hexane.

#### Noise Definitions

**' $L_{Amax,adj,T}$ '** means the average maximum A-weighted sound pressure level, adjusted for noise character and measured over a time period of not less than 15 minutes, using Fast response.

**'Background noise level'** means noise, measured in the absence of the noise under investigation, as either:

**L A90,T** being the A-weighted sound pressure level exceeded for 90 percent of the time period of not less than 15 minutes, using Fast response, or

**L LAbg,T** being the arithmetic average of the minimum readings during a representative time period of not less than 15 minutes, using Fast response.

**' $MaxLpA,T$ '** means the maximum A-weighted sound pressure level measured over a time period of not less than 15 minutes, using Fast response.

**'noise sensitive place'** means –

- a legal dwelling, caravan park, residential marina or other residential premises; or
- a motel, hotel or hostel; or
- a kindergarten, school, university or other educational institution; or
- a medical centre or hospital; or
- a protected area; or
- a public park or gardens.
- and includes the curtilage of any such place.

**'commercial place'** means a place used as an office or for business or commercial purposes, other than a place within the boundaries of the operational land.

**'Airblast overpressure'** is the energy transmitted from the blast site within the atmosphere in the form of pressure waves, consisting of both audible (noise) and inaudible (concussion) energy. The maximum excess pressure in this wave is the peak airblast overpressure.

**'dB (Linear) Peak'** is the maximum reading in decibels (dB) obtained using the 'P' time – weighting characteristic as specified in AS 1259.1 – 1990 with all frequency – weighted networks inoperative.

**'Maximum Instantaneous Charge (MIC)'** is the maximum amount of explosive on any one specific delay detonator in any one blast hole.

**'Peak particle velocity (ppv)'**, is a measure of ground vibration magnitude and is the maximum instantaneous particle velocity at a point during a given time interval in mms-1. (Peak particle velocity can be taken as the vector sum of the three component particle velocities in mutually perpendicular directions).