# Mt Arthur Coal: Mine Operations Plan FY18 - 20

## Brief description

The Mining Operations Plan (MOP) is a tool used by the Division of Resources and Energy (DRG) to monitor the progress of mining and rehabilitation activities across the life of a mine. The MOP provides a process of measurable criteria that demonstrates rehabilitation objectives are achievable and realistic within a given timeframe. The MOP also satisfies the requirement for the Rehabilitation Management Plan as required by the Department of Planning and Environment (DPE).

| **Mt Arthur Coal Mining Operations Plan** | |
|---|---|
| Name of Mine | Mt Arthur Coal |
| Mining Operations Plan Commencement Date | 1 July 2017 |
| Mining Operations Plan Completion Date | 30 June 2020 |
| Mining Authorisations (Lease/License No.): | CCL 744, CL 396, ML 1358, ML 1487, ML 1548, ML 1593, ML 1655, MPL 263, A 171, A 437, EL 5965, CL 229, CL 335, ML1757, ML1739 |
| Name of Authorisation Holder | Hunter Valley Energy Coal Pty Ltd |
| Name of Authorisation/Title Holder(s): | Hunter Valley Energy Coal Pty Ltd |
| Name of Mine Operator: | Hunter Valley Energy Coal Pty Ltd |
| Name and Contact Details of the Mine Manager (or equivalent): | Dawid Boshoff, General Manager<br>Mt Arthur Coal<br>Thomas Mitchell Drive<br>Muswellbrook NSW 2333<br>Ph: 02 65445566<br>Email: David.Boshoff@bhpbilliton.com |
| Name and Contact Details of Environmental Representative: | Luke Neil, Principal Environment,<br>BHP<br>480 Queen St Level 14 Brisbane 4000<br>Ph: 07 33192193<br>Email: Luke.L.Neil@bhpbilliton.com |
| Name of Representative(s) of the Authorisation Holder(s): | |
| Title: | David Boshoff |
| Signature: | |
| Date: | 24/08/2018 |
| Version – December 2017 | 1.1 FY18 – FY19 (Amendment ) |
| Version – July 2018 | 1.2 FY18 – FY20 (Amendment) |

# MAC-ENC-MTP-052

## Mt Arthur Coal: Mine Operations Plan FY18 - 20

### Key contact

Document Writer – Environment Analysis and Improvement (east)
Document Owner – Manager Production Planning
Document Approver – Head of Health, Safety and Environment
Document authorisation is located in Appendix 5.

# Mt Arthur Coal: Mine Operations Plan FY18 - 20

## Content

## List of Figures



## List of Tables

## Intent

The intent of this Mining Operations Plan (MOP) is to allow continued mining operations at Mt Arthur Coal, following the changes to the development consent associated with the granting of approval for the Mt Arthur Coal Modification Project PA 09_0062 MOD 1. This MOP provides information pertaining to operating philosophy, mining method, rehabilitation management and reporting, water management and environmental management associated with current operations.

## Application

This Plan applies to the following:

- All BHP Billiton employees and contract staff
- All Partnering contractor company representatives
- All Subcontractor company representatives.

## Abbreviations

| | |
|---|---|
| AEMR | Annual Environmental Management Report |
| AHMP | Aboriginal Heritage Management Plan |
| BCM | Bank cubic metres |
| BMP | Biodiversity Management Plan |
| BRMP | Biodiversity and Rehabilitation Management Plan |
| CCC | Community Consultative Committee |
| CCL | Consolidated coal lease |
| CHBI | Central Hunter Box – Ironbark Woodland |
| CHISG | Central Hunter Ironbark – Spotted Gum Grey-Gum Box Forest |
| CHPP | Coal handling preparation plant |
| CL | Coal lease |
| DA | Development approval |
| DoEE | Federal Department of the Environment and Energy |
| DP&E | NSW Department of Planning and Environment |
| DRG | NSW Department of Planning and Environment - Division of Resources and Geoscience |
| EA | Environmental assessment |
| EL | Exploration licence |
| ELA | Exploration Licence Authorisation |
| EPA | NSW Environment Protection Authority |
| EP&A Act | Environmental Planning and Assessment Act 1979 |
| EPBC | Environment Protection and Biodiversity Conservation |
| EPL | Environment Protection Licence |
| EMS | Environmental management system |
| FLDP | Future Landscapes Design Project |
| FY | Financial year |
| HA | Hectares |
| HFRG | Hunter Floodplain Red Gum Woodland Complex |
| HRSTS | Hunter River Salinity Trading Scheme |
| HSE | Health, Safety and Environment |
| HVEC | Hunter valley Energy Coal (MT Arthur Coal) |
| ISO | International Standards Organisation |
| ITP | Inspection and test plan |
| LGA | Local government area |
| MACT | Mt Arthur Coal Terminal |
| ML | Mining lease |
| MOP | Mining Operations Plan |
| MPL | Mining purpose lease |

| | |
|---|---|
| MSC | Muswellbrook Shire Council |
| Mtpa | Million tonnes per annum |
| NFSB | Narrabeen Footslopes Slaty Box Woodland |
| NGER | National Greenhouse and Energy Reporting Act 2007 |
| NGO | Non-government organisation |
| NOW | NSW Office of Water |
| NSW | New South Wales |
| OEH | NSW Office of Environment and Heritage |
| PIRMP | Pollution Incident Response Management Procedure |
| ROM | Run of mine |
| RAP | Remedial Action Plan |
| UHWB | Upper Hunter White Box – Ironbark Grassy Woodland |

## Definitions

- **Hunter Valley Energy Coal Pty Ltd -** operates the Mt Arthur Coal Complex which consists of the approved open cut mining operations, a rail loop and associated rail loading facilities (PA 09_0062) and the Mt Arthur Underground Project (PA 06_0091),
- **Future Landscapes Design Project -** The FLDP was a project undertaken to research a landform approach that would align with community expectations and improvements in landform design techniques. A report by Landloch Pty Ltd (2014) was written to capture the findings of the project which have now been incorporated into the Applied Geofluvial landform.
- **Applied Geofluvial Approach -** The Applied Geofluvial approach uses the characteristics of stable natural alluvial landforms in the local environment as an analogue on which to base the design of overburden landforms. Importantly, the approach does not replicate existing landforms, but rather uses the key characteristics that make these landforms stable in the design.
- **The Project Approval -** Project Approval 09_0062 MOD 1 Mt Arthur Coal Mine – Open Cut Modification Project dated 26 September 2014.
- **Rehabilitation Management Plan (RMP) / Mining Operations Plan (MOP) -** The Rehabilitation Management Plan meets the requirements of Condition 44 of the Mt Arthur Coal Modification Project PA 09_0062 MOD 1 under Section 75W of the Environmental Planning and Assessment Act 1979 (EP&A Act). Condition 44 requires the project proponent to prepare and implement a Rehabilitation Management Plan for the Project. The RMP has been integrated into the MOP which is required by the Department of Resources and Energy.

# 1 Introduction

Hunter Valley Energy Coal Pty Ltd (HVEC) operates Mt Arthur Coal, which consists of an approved open cut and underground mining operation, a rail loop and associated rail loading facilities. The Mt Arthur Coal Mine is located approximately 5 kilometres south west of Muswellbrook within the Muswellbrook Shire Local Government Area (LGA) in the Upper Hunter Valley of NSW. The location of Mt Arthur Coal is shown in Plan 1A.

The Mining Operations Plan (MOP) is established to allow continued mining operations at Mt Arthur Coal, following the changes to the development consent associated with the granting of approval for the Mt Arthur Coal Modification Project PA 09_0062 MOD 1. This MOP fiscal year 2018 - 2020 (1 July 2017 – 30 June 2020) provides information pertaining to operating philosophy, mining method, rehabilitation strategy, water management and environmental management associated with current operations.

The MOP has been prepared in accordance with the NSW Department of Trade and Investment, Regional Infrastructure and Services – Division of Resources and Energy, ESG3: Mining Operations Plan (MOP) Guidelines, September 2013. This MOP also meets all the requirements of Condition 44 of the Mt Arthur Coal Modification Project PA 09_0062 MOD 1 under Section 75W of the Environmental Planning and Assessment Act 1979 (EP&A Act). Condition 44 requires the project proponent to prepare and implement a Rehabilitation Management Plan for the Project.

Primarily the MOP focuses on the new geomorphological design started at MAC. The new design is in its infancy and requires further study to verify where the design can be implemented and still meet requirements for land use, safety, cost and stability. MAC will be ensuring the landforms are constructed in line with the current Approval MOD1 and further information on where and how geomorphological design will be implemented will be provided in 2018. Importantly MAC will measure and analyse the development of the MacLeans landform design to ensure we capture learnings and improvement opportunities that will sustain safety, stability, cost and land use objectives.

MAC is commencing a study into void use optionality and management and will provide results from the study to DRG and DPE in 2018. DPE and DRG will be updated during the scoping and during study progress to ensure the study aligns with expectations.

This MOP covers a three year period 1 July 2017 to 30 June 2020, with indicative information provided on years out to FY 2022. The MOP will be reported on annually to show progress towards the proposed rehabilitation and will be updated every two years or as required by DRG.

## 1.1 History of Operations

Coal mine development at Mt Arthur Coal commenced in the early 1960s in the Bayswater No. 2 Open Cut mining area. Coal production progressively increased and approval to extract coal from the Bayswater No. 3 Open Cut was granted in 1994. To support the expanding development at Bayswater No. 3 and cease coal transport by public road, approval was obtained in November 2000 for the construction and operation of the rail loading facility and spur line. This allows export coal to be transported directly to Newcastle via the Main Northern Railway.

In May 2001, the Mt Arthur North Open Cut operation was approved to extract up to 15 million tonnes of run-of-mine (ROM) coal per annum. The approval also allowed for the construction and use of associated infrastructure and facilities.

Between 2003 and 2006, Saddlers Pit (located in the southern portion of the mine lease area) was maintained on a care and maintenance regime, when mining operations at Bayswater No 3 were effectively suspended. The majority of the work undertaken during the following period involved reshaping and final rehabilitation of several hundred hectares in the vicinity of the Bayswater No 3 open cut operations.

In March 2006, Mt Arthur Coal lodged an application to extend the Mt Arthur North South Pit. The application was approved by the Minister for Planning on 9 January 2008. In September 2006 mining resumed in Saddlers Pit, with overburden removal initially being undertaken by contract miners and coal extraction by Mt Arthur Coal. Mt Arthur Coal assumed responsibility for overburden removal in March 2012.

Also in March 2006, Mt Arthur Coal lodged an application to commence underground mining operations at Mt Arthur Coal Mine. The application was approved by the Minister for Planning on 2 December 2008 (Project Approval 06_0091). The Mt Arthur Underground Project is approved up to 8 million tonnes per annum (Mtpa). Saddlers Pit was utilised for construction of an underground adit associated with that project. The underground project is currently on care and maintenance with no underground mining to occur during this MOP period.

In 2009, Mt Arthur Coal lodged an application under Part 3A of the New South Wales Environment Planning and Assessment Act, 1979 (EP&A Act) to extend open cut operations and consolidate existing approvals for open cut mining operations and surface infrastructure. The application was approved by the Minister for Planning on 24 September 2010 (Project Approval 09_0062). The Project Approval 09_0062 permitted the extraction of up to 32 Mtpa of ROM coal from the open cut.

In accordance with Project Approval 09_0062, a number of project approvals were surrendered by Mt Arthur Coal in 2011 including Mt Arthur North, the Rail Loading Facility and the South Pit Extension and the Bayswater Coal Preparation Plant. The surrender of the Bayswater No. 3 development consent (210/93) was accepted by the Department of Planning & Environment (DP&E) on 20 May 2013.

In 2013, Mt Arthur Coal lodged an application to modify the Project Approval 09_0062 under section 75W of the EP&A Act (the Mt Arthur Coal Open Cut Modification [the Modification]). The application was approved by the Planning Assessment Commission (as delegate of the Minister for Planning) on 26 September 2014 (Project Approval 09_0062 MOD 1). The Modification includes the continuation of open cut mining operations at the Mt Arthur Coal Mine for an additional operational life of four years from 2022 to 2026 at the maximum rate of 32 Mtpa, an increase in open cut disturbance areas, additional overburden emplacement areas, duplication of the existing rail loop and various additional infrastructure changes. The Modification Project Approval can be found at http://www.bhpbilliton.com/environment/regulatory-information.

On 2 December 2016, EPBC approval 2014/7377 was granted for the Modification project, aligning the date with the modification approval life to 2026.

## 1.2 Current Consents, Authorisations and Licences

Details on Mt Arthur Coal's existing statutory approvals as at March 2017 are provided in Table 1.

The Modification Project includes the following key components:

- a four year continuation of the open cut mine life from 2022 to 2026 at the currently approved maximum rate of 32 Mtpa;
- an increase in open cut disturbance areas;
- use of the existing conveyor corridor between Mt Arthur Coal and Drayton for overburden emplacement;
- duplication of the existing rail loop;
- an increase in the maximum number of train movements per day from 24 to 30;
- the relocation of the load point for the overland conveyor which delivers coal to Macquarie Generation's Bayswater Power Station;
- the relocation and upgrade of the explosives storage, magazine and associated facilities; and
- the construction of additional offices, a control room and a small extension to the ROM coal stockpile footprint.

### 1.2.1 Mining Tenements

Mt Arthur Coal currently holds 14 mining and exploration leases and licences including two subleases (Drayton subleases CL 395 and CL 229). ~~In addition to this MLA 533 was lodged in August 2016 and is pending approval. MLA 533 covers approximately 2.51 hectares and is for the purpose of water infrastructure.~~ Mining tenement details are provided in Table 1 and Figure 1. ~~ML1358 renewal was granted on 18 May 2015 for a further period of 21 years.~~

### 1.2.2 Environment Protection Licence

Mt Arthur Coal currently holds one Environment Protection Licence (EPL), EPL No. 11457, for the following scheduled activities:

- Chemical Storage, 5 to 100 tonnes generated or stored;
- Coal Works, > 500,000 tonnes handled; and
- Mining for Coal, > 5,000,000 tonnes produced.

### 1.2.3 Environment Protection and Biodiversity Conservation Approval

On 30 April 2012 Department of Environment (DoE) granted Mt Arthur Coal conditional approval EPBC 2011/5866 to undertake a controlled action (development of five new open cut extension areas) within the designated areas. The controlled action was commenced on 21 May 2012, with approximately one hectare of vegetation cleared for the construction of a dual substation facility. The EPBC referral for the Modification project was lodged in late 2014 and was determined a Controlled Action in 2015. On the 2 December 2016, EPBC approval 2014/7377 was granted for the Modification project.

**Table 1: Mt Arthur Coal's existing statutory approvals as at ~~March 2017~~May 2018**

| Description | Issue date | Expiry date |
|---|---|---|
| Development consents or project approvals issued by the DP&E | | |
| Mt Arthur Coal Mine – Open Cut Modification Project (PA 09_0062 MOD 1)* | 26/09/2014 | 30/06/2026 |
| Mt Arthur Coal Mine – Underground Project | 02/12/2008 | 31/12/2030 |
| Mining leases and exploration licences issued by the DRG | | |
| CCL 744 | 03/07/1989 | 21/01/2028 |
| CL 396 | 23/06/1992 | 03/02/2024 |
| ML 1358 | 21/09/1994 | 21/09/2036 |
| ML 1487 | 13/06/2001 | 12/06/2022 |
| ML 1548 | 31/05/2004 | 30/05/2025 |
| ML 1593 | 30/04/2007 | 29/04/2028 |
| ML 1655 | 03/03/2011 | 03/03/2032 |
| MPL 263 | 17/10/1990 | 17/10/2032 |
| A 171 | 18/10/1979 | 25/11/2020 |
| A 437 | 04/03/1991 | 04/03/2020 |
| EL 5965 | 15/07/2002 | 14/07/2017 (renewal pending) |
| ML1739 ~~(was MLA 476)~~ | 25/07/2016 | 25/07/2037 |
| ML~~A 533~~ 1757 | ~~Applied for August 2016~~7/07/2017 | ~~N/A~~7/07/2038 |
| CL 229 | 03/02/1982 | 02/02/2024 |
| CL 395 | 23/06/1992 | 21/01/2029 |
| EPL issued by the EPA | | |
| EPL 11457 | 09/10/2001 (last updated on 09/04/2015) | Not specified |
| EPBC approval issued by the DoE | | |
| EPBC 2011/5866 | 30/04/2012 | 30/06/2022 |
| EPBC 2014/7377 | 05/12/2016 | 30/06/2026 |

For the purposes of this MOP, the Mt Arthur Coal Mine is considered to be classified as a Level 1 mine (in accordance with the MOP guidelines) due to the project being a large coal mine that was previously approved (PA 09_0062) under Part 3A of the EP&A Act.

bhpbilliton

Mapping Services, Brisbane

Scale 1:50,000 @ A3

0 1 2

Kilometres

Projection: GDA94 MGA Zone 56

# MT ARTHUR MINE

## Statutory Approvals and Key Infrastructure

| | | | |
|---|---|---|---|
| Drawn: B Kleinschmidt | Date: 27/07/2018 | Revision: 0 | Figure: 2 |
| Checked: L. Neil | Filename: 20170201-2 Stat Approvals.mxd | | |

HUNTER RIVER

DENMAN ROAD

THOMAS MITCHELL DRIVE

NEW ENGLAND HIGHWAY

EDDERTON ROAD

MT ARTHUR COAL MINE

Northern Open Cut

CHPP

Belmont Void

McDonalds Void

Southern Open Cut

Tailings Emplacement Area

Drayton Coal Mine

Mount Arthur

ML1757

ML1655

AUTH171

ML1487

ML1548

CCL744

MPL263

CL396

ML1739

SUBLEASE CL395

AUTH437

SUBLEASE CL229

ML1358

ML1593

EL5965

AUTH 437

Saddlers Creek

6420000

300000

280000

LEGEND

- Mt Arthur Mining Leases
- Mt Arthur Exploration Licence
- Environmental Protection Licence (EPL 11457)
- Approved Ancillary Disturbance Boundary
- Environmental Assessment Boundary
- Crown Land
- Underground Maximum Potential Subsidence Area

## 1.3 Land Ownership and Land Use

With the exception of some areas of Crown land, road reserves and private freehold property, Mt Arthur Coal and its subsidiaries own all the land within the Mt Arthur Coal mining tenements. Mt Arthur Coal also owns adjacent properties to the north-east, north and west, which are maintained as buffer land or biodiversity offset areas. With the exception of the Drayton Sub-lease Area in the south east of the mine site, the operational areas at Mt Arthur Coal are located entirely within the land owned or managed by Mt Arthur Coal. A number of Crown and Council road reserves are located within the Lease areas, and these road reserves will be impacted by the proposed mining operations.

Anglo Coal (Drayton Management) Pty Ltd (Anglo) owns the majority of land to the immediate east and south of Mt Arthur Coal mining tenements, including the Drayton Sub-Lease Area, with land further to the south east owned by Macquarie Generation. The majority of the land owned by Anglo Coal is subject to mining tenements. The Bengalla Joint Venture owns the land on which Bengalla Mine operates and to which its mining tenements apply, to the immediate north of the Mt Arthur Coal. Land ownership is shown on Plan 1C.

The topography surrounding the Mt Arthur Coal Mine is gently undulating to hilly, dominated by Mount Arthur (482 m AHD), located within the mine operational area, and Mount Ogilvie (468 m AHD), located to the west of the Mt Arthur Coal Mine. The north of the Mt Arthur Coal Mine gently slopes up from the alluvial flats of the Hunter River at an elevation of approximately 120 m AHD, rising to approximately 230 m AHD at MacLeans Hill and becoming progressively steeper in the vicinity of Mount Arthur and Mount Ogilvie. From Mount Ogilvie, the southern portion of the Mt Arthur Coal Mine slopes down to form part of the Saddlers Creek floodplain. On-site, the Mt Arthur Coal Mine is characterised by mine landforms and infrastructure associated with current and historic mining operations.

The Mt Arthur Coal Mine is situated within the Upper Hunter region which has a long history of rural land use for a variety of agricultural and industrial activities, predominantly livestock grazing and coal mining. Mt Arthur Coal is located within lands that have been largely disturbed by previous agricultural activities, particularly cultivation and grazing. Agriculture has occurred on nearby land since the 1800s.Muswellbrook region was first inhabited by European settlers in 1824, resulting in a landscape largely dominated by grassland and scattered woody vegetation interspersed with small denser stands of remnant woodland vegetation.

The current dominant land uses within and adjacent to the existing mining lease boundaries include open cut coal mining, power generation and industrial activities, agriculture, rural residential and residential areas. Other land uses include equine industries and viticulture. Where possible, rehabilitation planning at Mt Arthur Coal Mine will attempt to maximise opportunities for a diverse post-mining landscape and range of land uses. It is proposed that final land uses will include pastoral, commercial forestry, recreation and/or wildlife habitat opportunities.

## 1.4 Stakeholder Consultation

The following stakeholders are consulted regarding the development of this MOP throughout the development of the Rehabilitation Strategy and the Modification Project Environmental Assessment (which were used to inform this MOP) or through direct engagement on the key aspects of this MOP:

- Department of Planning and Environment (DP&E);
- Office of Environment and Heritage (OEH);
- NSW Office of Water (NOW);
- Muswellbrook Shire Council (MSC);
- Mt Arthur Coal Community Consultative Committee (CCC); and
- Neighbouring mining operations.

The finalised MOP will be uploaded to the BHPBilliton website. Records of consultation will be maintained by Mt Arthur Coal and made available on request.

### 1.4.1 General Consultation

Mt Arthur Coal regularly engages with local stakeholders regarding proposed operations, potential impacts and management, and community engagement programs and opportunities. This engagement includes:

- The operation of a 24-hour free call community response line to allow the community to contact the operation directly (1800 882 044)

- Access to information including approval documents, environmental assessments, management plans, environmental audits and environmental management and monitoring reports on a publicly accessible website, at:
- http://www.bhpbilliton.com/home/aboutus/regulatory/Pages/default.aspx;
- Regular CCC meetings to provide an interface between the community, mine management and the relevant government departments. The community representatives on the CCC are able to share information from CCC meetings with the wider community and to report back on community issues at CCC meetings;
- Regular community contact with local Aboriginal stakeholders and stakeholder groups in relation to Aboriginal archaeology and cultural heritage;
- The Mt Arthur Coal Community Investment Fund which provides financial and in-kind support to local not-for-profit organisations and partners with community development programs;
- Regular attendance at monthly meetings of Muswellbrook Chamber of Commerce and Industry Inc, of which Mt Arthur Coal is an active member, to support local business houses and industry;
- Participation in the Upper Hunter Mining Dialogue (UHMD), coordinated by the NSW Minerals Council to address cumulative impacts from mining in the Upper Hunter and identify opportunities for improved management and innovation; and

#### 1.4.2 Rehabilitation and Post-mining Land Use Consultation

Stakeholder consultation, including via CCC meetings, regarding rehabilitation and post-mining land use was undertaken during the drafting of the Rehabilitation Strategy and the MOP.

Consultation with key stakeholder's, regarding Mt Arthur Coal's existing and proposed mine and rehabilitation program, was undertaken during both the Consolidation Project Environmental Assessment (2009) and the recent Modification Project Environmental Assessment (Feb 2013). As well as meetings with relevant authorities and stakeholder groups, this program included house-to-house consultation visits of neighbouring landholders.

An outcome of consultation was Mt Arthur Coal's commitment to investigate improved rehabilitation and landform design options, resulting in the establishment of the Future Landscapes Design Project (FLDP) (see section 8.2 for further details). The FLDP was an initiative to investigate, develop and deliver an integrated landform that is compatible with the surrounding natural landscape. Phase 1 of this project was concluded in May 2014, satisfying the commitment made within the Mt Arthur Coal Modification Project Environmental Assessment. Phase 1 of the project delivered a final landform design.

As a result of the FLDP investigation and consistent with the requirements of the Mt Arthur Coal Modification Project PA 09_0062 MOD 1, the final landform plan as submitted in this MOP was able to be refined, providing an alternative final landform option that reflects the surrounding natural landscape and maintains stability for selected emplacements. Further study of the Geomorphological design will occur during 2018 to identify where further application of the design will meet stability, land use, safety and cost requirements.

# 2 Proposed Mining Activities

## 2.1 Project Description

Mt Arthur Coal is an open cut coal mine operating with trucks and shovels to extract up to 32Mtpa of ROM coal. The majority of coal is crushed and washed prior to sale on both export and domestic markets. A minor proportion of coal bypasses washing, for domestic contracts. Mt Arthur has development consent approval to operate until 30 June 2026. The general sequence and staging of mining operations over the life of the operation will be consistent with the methods described in Section 2.3.

## 2.2 Asset Register

Definition of the primary domains at Mt Arthur Coal, for the purposes of rehabilitation and mine closure planning, is discussed in Section 5.1. A register of major assets (including buildings, fixed plant and other infrastructure), categorised by primary domain, is presented in Appendix 1. The areas reported for each domain are based on the disturbance areas at the commencement of the MOP. The asset register also outlines the activities required to demolish and remove the assets during decommissioning.

## 2.3 Activities over the MOP term

### 2.3.1 Exploration

During the MOP period, all exploration activities will be undertaken on an as needs basis within Mt Arthur Coal's approved disturbance boundary and will be concentrated in the areas ahead of mining predominately within ML 1548, ML1358 and ML1487.

Exploration activities will include a combination of Envirovibe – seismic surveys and exploration drilling. Envirovibe – seismic surveys are a non-ground disturbing activity unlike traditional seismic exploration. This type of survey does not require vegetation removal and no blasting is required. The vibration levels generated are significantly below Mt Arthur Coal's current vibration approval limits. The Envirovibe - seismic exploration is completed by driving a soft wheeled vibration vehicle across the ground, and hand placed geophones are used on the surface to collect data. Discussion on this process has been made with DRG to ensure understanding of the non-invasive manner of this process This activity does not result in any environmental impact and will only be undertaken on land owned by Mt Arthur Coal.

An exploration drilling program will be undertaken on a campaign basis and subject to operational requirements throughout this reporting period. All boreholes will be drilled on land owned by Mt Arthur Coal, following ecological and cultural heritage (Aboriginal and European) due diligence inspections. A program to monitor and rehabilitate existing boreholes will continue during this MOP period. Boreholes that are yet to be rehabilitated will be capped.

### 2.3.2 Construction

Construction of infrastructure to support the open cut development will continue during this MOP period. The major construction and demolition activities proposed during this MOP period include:

- A new overburden emplacement area (Conveyor Corridor Overburden Emplacement Area) is scheduled to commence construction in FY18 and will progress throughout this MOP period.
- Installation of sediment control structures to the north and south of the Conveyor Corridor Overburden Emplacement Area will be commenced prior to construction of the Conveyor Corridor Overburden Emplacement Area.
- The realignment of powerlines will occur in the MOP period. This includes both powerlines owned by AusGrid and Mt Arthur Coal.
- The relocation of the explosives facility to west of the pit highwall and inclusion of deployment facilities in accordance with existing approvals will occur in the MOP period.
- The Edderton Road construction pad, currently located adjacent to the Windmill/Huon Pit high wall, will be relocated approximately 300m to the south. Construction of the new pad is scheduled for completion by the end of FY16.
- A new overburden emplacement area (Southwest Overburden Emplacement Area) and haul road will be constructed in this MOP period.
- Construction of the Tailings Storage Facility (TSF) Stage 2 infrastructure is scheduled for FY18 & FY19. This involves the construction of additional confining embankments to the north and east of the West Cut Void up to 245 m AHD to form a large tailings storage facility with up to 200 ha surface area.
- Demolition of the disused Bayswater Infrastructure Area will occur towards the end of the MOP period dependent on the need for tailings expansion.
- Decommissioning of the Main Dam will continue during this MOP period.
- Additional water pipelines and associated pumps to support ongoing water management strategies will be installed during this MOP period.
- Additional telecommunications infrastructure will be installed during this MOP period.

- In accordance with Schedule 3, Condition 47 (d) of Planning Approval (PA 09_0062), Mt Arthur Coal is required to realign Edderton Road and its intersection with Denman Road, prior to mining within 200 meters of the road. Mining within 200 meters is proposed to occur in 2019. As set out in the 2009 Environmental Assessment (EA) for the Mt Arthur Consolidation Project (and as subsequently approved under PA 09_0062), Mt Arthur Coal has two approved realignment options. Detailed design work is currently underway to determine the preferred option for the realignment of Edderton Rd. Both realignment options are within Mt Arthur Coal's EA boundary. This project encompasses the extension of the existing alluvial cut off wall, the relocation of powerlines, water infrastructure and the construction of water/sedimentation dams.
- Four new dust monitoring stations are due to be commissioned in FY18 aligned with the EPA requirements for boundary monitoring. Further monitoring consolidation will be made to the air quality monitoring network in conjunction with EPA and DPE.
- Additional mine infrastructure including carparks, store, administration offices, crib room and ablutions, lube bay, fuel facility, tyre maintenance bay, wash bay, workshop and helipad is proposed to be constructed within the existing MOP infrastructure areas during this MOP period as part of ongoing upgrades consistent with existing approvals.
- A temporary deployment facility including carparks, bathhouse and ablutions and office buildings is proposed to be constructed on the north western side of the main pit

### 2.3.3 Mining Operations

During FY 17 mining occurred in the Macleans, Windmill, Huon, Calool, Roxburgh, and Ayredale pits. Overburden was placed on the CD1 trough CD5, VD1 through VD5 and Macleans emplacement areas.

During this FY18 & 22 MOP term approximately 140 million tonnes of ROM coal has been identified for recovery using truck and shovel and/or excavator mining method for an equivalent 110 million tonnes of product coal. This method is consistent with current and previous site open cut operations.

The disturbance and extraction boundaries (Plans 3A-E) proposed for this MOP period are located within the EA disturbance boundary, as approved under the Mt Arthur Coal Open Cut Modification Project Approval 09_0062 MOD 1. During this MOP period, mining is proposed to continue within the extended pit shells of Saddlers Pit and the North Pit. North Pit is an amalgam of constituent pits, consisting of:

- Windmill Pit;
- Huon Pit;
- Calool Pit;
- Roxburgh Pit; and
- Ayredale Pit.

During this MOP period, coal will be mined from the Arrowfield, Bowfield, Warkworth, Mount Arthur, Piercefield, Vaux, Broonie, Bayswater, Wynn, Edderton, Clanricard, Bengalla, Edinglassie, Transional, and Ramrod Creek coal seams. Beyond this MOP term, open cut coal reserves still remain at the Saddlers Pit and North Pit area.

The mine design has maximised the recovery of open cut resources from available areas. Future mining potential of underground resources is not adversely affected by activities proposed as part of this MOP. Open cut mining activities proposed under this MOP have been planned in conjunction with the long term engineers to maximise both the net present economic value of both open cut and potential underground resources and the recovery of open cut and underground marketable reserves into the future. An underground exploration adit was mined during previous MOP periods. The adit has been sealed and no coal recovery via underground mining methods will be undertaken during this MOP period.

Prior to excavation of a new open cut strip, pre-stripping operations ensure that natural resources such as vegetation and topsoil are cleared and, where appropriate, recovered for subsequent use in post-mining rehabilitation. Rock strata overlying coal resources (overburden) is drilled and blasted to fracture the rock and facilitate overburden excavation. Hydraulic excavators and electric rope shovels then excavate and load blasted overburden into large haul trucks of nominal 350-tonne and 206-tonne capacities. These trucks transport the overburden material to designated emplacement areas.

After removing the overburden, the exposed coal seam is mined using hydraulic excavators and loaders with the assistance of dozers and front-end-loaders. The ROM coal extracted is delivered by haul trucks of nominal 157-tonne capacity to either the hopper bins that feed into the CHPP or to the ROM coal stockpiles. After crushing to size and processing to remove impurities, coal is stockpiled prior to transport from site by rail and conveyor.

The general sequence of mining used at Mt Arthur Coal is shown in Figure 2.

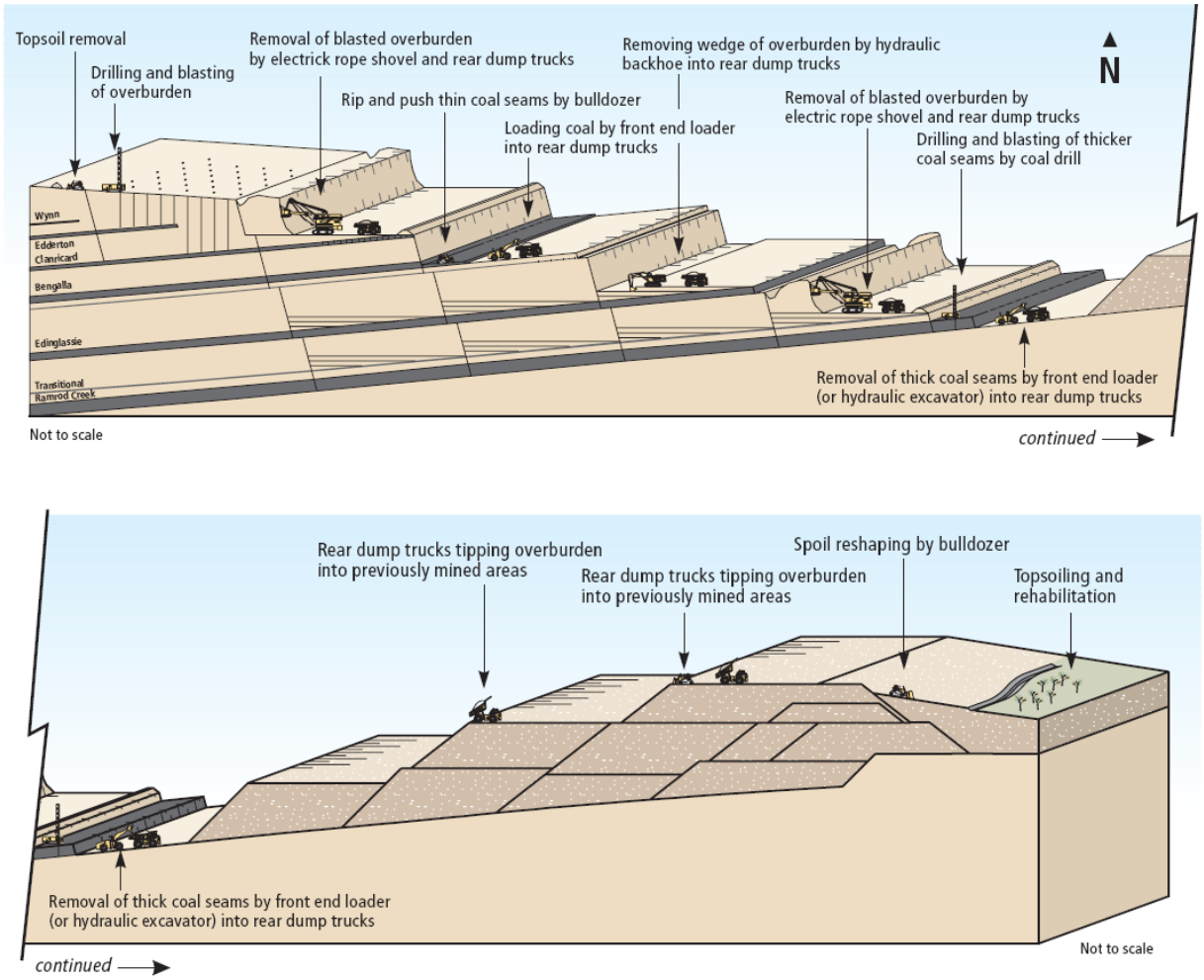


**Figure 2: Mining sequence from topsoil removal to rehabilitation**

### 2.3.4 Overburden Emplacement

During this MOP term approximately 633 million bank cubic metres of overburden has been identified for transportation and placement by rear dump trucks. Emplacement areas are generally located within the open cut pit shell on the low wall side of the active pit. Overburden emplacement areas that will be utilised during this MOP period include:

- MacLeans Emplacement
- Visual Dumps 1 – 5 (VD1-5);
- Contingency Dumps 1 – 5 (CD1-5);
- Saddlers Dump 1-3 (SD1-3);
- Tailings Emplacement Expansion walls;
- Conveyor Corridor Overburden Emplacement Area;
- Drayton Void Overburden Emplacement Area; and
- Southwest Overburden Emplacement Area.

In-pit overburden placement may occur in the Ayredale Pit during this MOP period. This includes an area of overburden emplacement currently being used as infrastructure in Ayredale north.

With the exception of the tailings emplacement expansion walls, these emplacement areas are designed by mine planning engineers. The extended tailings emplacement walls were designed by an external consultant. Survey control during emplacement is undertaken by Mt Arthur surveyors, under the direction of mine planners. Operational management of the emplacements is undertaken by mine Open Cut Examiners (OCE), who supervise overburden placement.

Overburden emplacement design incorporates considerations such as capacity, access, shape and lift height, as well as safety and environmental constraints. Emplacement areas are constructed with positive drainage to ensure emplacements shed water away from the active pit. Emplacements are constrained to an average maximum level of RL 360m, with North Pit emplacements (VD1-5 and CD1-5) allowed emplacement approximate level of RL 375m to create visual relief.

Emplacement design and construction also incorporates hostile material management considerations, as outlined in Section 3.

### 2.3.5 Processing Residues and Tailings

Coal handling and processing is undertaken within the centralised coal handling and preparation plant (CHPP) located within Mining Lease ML1487. ROM coal extracted by the approved open cut operations is delivered by truck to either the ROM coal bins or the CHPP ROM coal stockpile. Following processing at the CHPP, coal is loaded onto trains via the rail loading facility for delivery to the export market or stockpiled and transported by conveyor to the nearby Bayswater power station.

Approximately 20 million tonnes of coarse reject material will be produced from the CHPP during this MOP period. Coarse reject material will continue to be co-disposed within overburden emplacement areas or utilised in the construction of stockpile pads, road or other infrastructure.

Approximately 13 million tonnes of coal fines (tailings) will be produced from the CHPP during this MOP period. Tailings will continue to be pumped from the CHPP to the existing West Cut Tailings Dam (WCTD) for approximately 12 months. Pumping of tailings into a void to the east of the dam, known as East Pit commenced in 2013. Tailings deposition in East Pit and WCTS will continue for this MOP period. These tailings emplacements are shown in Plan 2 and are planned to be expanded in the second half of this MOP period as discussed in Section 2.

In February 2012, Mt Arthur Coal received approval from the DRG for the expansion of the existing tailings storage facility to an elevation of RL 280m AHD for the continued emplacement of tailings. The tailings dam expansion project involves the construction of two cross-valley embankments and a series of rim embankments. Cross-valley embankment design incorporates a compacted weathered layer, backed by an overburden layer, to ensure required levels of permeability as per relevant DRG approval.

Construction commenced in 2012 and will be completed in four stages over a 20-30 year period. Stage 1 (raising dam to RL 235m) involved the placement of 4,000,000 m3 of material and was finalised in 2013. Construction of Stage 2 is planned for FY19 with Stages 3 & 4 being constructed subsequently outside this MOP timeframe.

### 2.3.6 Waste Management

Mt Arthur Coal's waste management system has been designed to minimise the generation of waste, maximise reuse and recycling, and meet regulatory requirements. This system consolidates the disposal, tracking and reporting of all waste generated on site.

Waste generated as part of Mt Arthur Coal's mining activities is sent off site for management. The largest contributors to total waste sent for off site management are:

- waste oil;
- general waste;
- scrap steel; and
- effluent.

With the exception of general waste, the largest four contributors are recycled waste, representing approximately 80 per cent of total waste generated.

Waste tyres from off-road haul trucks are disposed of within active overburden emplacements. Tyre placements are located as deep as possible, but off the pit floor, and placement locations are recorded by the Mt Arthur Coal survey team.

Regular waste inspections and monitoring is conducted by Mt Arthur Coal's waste contractors, who conduct weekly site inspections of all waste generation, handling and storage areas.

Information on the management of hydrocarbon contaminated waste is presented in Section 3.2.

### 2.3.7 Water Management

The aims of the water management system at Mt Arthur Coal are to:

- Minimise the volume of clean water being captured onsite,
- Efficiently manage onsite water resources (mine water and clean water); and

- Minimise adverse impacts on receiving waters.

To achieve these aims during this MOP period, existing structures will be maintained to support the segregation and diversion of clean water, and control sediment-laden run-off prior to release. Existing sediment control structures may also require modification or upgrade as open cut mining progresses within the MOP disturbance boundary. The design of proposed or modified sediment control dams will be undertaken by qualified consultants, and will be consistent with the design requirements as presented in the Managing Urban Stormwater Guidelines (Landcom (2004) [Blue Book]).

Prior to the current MOP period, a risk evaluation was completed for the Main Dam, was the focal point of the Mt Arthur Coal site water network. Following this review it was decided to decommission the dam and re-route mine water to the CHPP Dirty Water dam. The Drayton Void, along with Ayredale, Belmont and MacDonalds and Saddler's pits would also be used as remote or alternate mine water storages (refer to Plan 2) to provide a flexible water network system for maximum practical capacity and water security. The Main Dam decommissioning project will continue during this MOP period.

### 2.3.8 Decommissioning and Demolition Activities

As part of the tailings dam expansion project, the footprint of the expanded dam will extend over the existing tailings dams SP1, SP2 and SP3. Tailings dams SP1, SP2 and SP3 have been decommissioned and capped, and will be further covered by the expanded footprint of the tailings dam expansion project. The North Cut Tailings Dam has been decommissioned and capping of the dam is expected to commence during this MOP period. Capping design is currently being completed by an experienced tailings consultant, and capping project timings will be scheduled following design finalisation.

The new reduced foot print of Stage 2 of the tailings dam will not remove the Bayswater No.2 facilities, however some minor demolition / removal of old dispatch buildings and car parks not associated with the main workshops and plant area will still occur. Removal of the Bayswater No.2 facilities will likely occur at stage 3 of tailings expansion. The footprint of the expanded tailings dam will engulf the complete area of the decommissioned facilities area during stage 3. A remedial action plan (RAP) has been completed and approved by the DP&E as required in PA 09_0062 MOD 1.

Decommissioning of the Main Dam will continue during this MOP period. Following decommissioning, the dam will be capped and rehabilitated.

### 2.3.9 Temporary Stabilisation

Temporary stabilisation activities proposed for this MOP period include the aerial seeding of long-term overburden emplacement areas for dust-suppression purposes.

Emplacement surfaces targeted as part of the aerial seeding program are those most susceptible to prevailing winds, and not available for final rehabilitation in the short to medium term. A pasture seed and fertiliser mix, selected by a consulting agronomist, is aerially applied to the targeted emplacement surfaces. Post-application monitoring of pasture cover development is also undertaken. Approximately 400 ha of aerial seeding is proposed during this MOP period for temporary stabilisation.

### 2.3.10 Progressive Rehabilitation

During this MOP period, Mt Arthur Coal will continue to implement the programs contained in the site Rehabilitation Strategy Rehabilitation and Ecological Monitoring Procedure (REMP) and Biodiversity Management Plan (BMP). This will include the reshaping and revegetation of approximately 284 ha as indicated in Plans 3A to 3E for the MOP period.

Supplementary planting of existing pasture rehabilitated areas with native woodland species will also be undertaken during this MOP period, with the aim of expanding the area of box-gum grassy woodland rehabilitation (see Section 7.1 for more details). Further details on rehabilitation planning, methods and objectives are presented in Section 5.

General rehabilitation, land management and biodiversity enhancement activities will also continue over previously rehabilitated areas during the MOP period, including:

Rehabilitation and ecological monitoring and trials;

Supplementary planting and habitat enhancement;

Slashing, fencing, fertiliser application and access control; and

Weed and feral animal control.

### 2.3.11 Material Production Schedule during MOP Term

The indicative material production schedule during this MOP period is presented in Table 2. Material movement can vary depending on efficiency of mining and production constraints.

**Table 2: Material production schedule during the MOP term**

| Material | | Unit | Year 1 FY18 (July 2017 – June 2018) | Year 2 FY19 (July 2018 – June 2019) | Year 3 FY20 (July 2019 – June 2020) | Year 4 FY21 (July 2020 – June 2021) | Year 5 FY22 (July 2021 – June 2022) |
|---|---|---|---|---|---|---|---|
| Stripped Topsoil | | kBCM | 690 | 699 | 281 | 367 | 168 |
| Prime Rock/ Overburden | | kBCM | 129,345 | 119,900 | 120,772 | 123,938 | 126,653 |
| ROM Coal | | Mt | 24.7 | 27.4 | 27.4 | 29 | 29.8 |
| Reject Material | Course Rejects | Mt | 4.29 | 4.80 | 4.9 | 5.1 | 5.4 |
| | Tailings | Mt | 2.98 | 2.7 | 2.70 | 2.30 | 3.20 |
| Product | | Mt | 19.0 | 19.2 | 20.3 | 22.0 | 22.1 |

Note: years 3-5 are indicative only and will be updated in the following MOP as mine planning evolves.

### 2.3.12 Drayton Sub-lease Area

Mt Arthur Coal and Anglo Coal Australia (Anglo) ~~have~~ executed a sublease agreement in 2006 (registered with DRG in 2013). The Anglo obligations under the sublease agreement transferred over to Malabar Coal following Malabar Coal's acquisition of Anglo's Drayton Mine in February 2018. The sublease agreement~~, which~~ allows Mt Arthur Coal to utilise a disused void on mining tenements owned by ~~Anglo~~Malabar Coal, located adjacent to the Mt Arthur Coal lease. Mt Arthur Coal will primarily use the void within the sublease area for the placement of overburden, and as a short to medium term water storage. ~~The sale of Drayton to another party will require review and potential changes to the sublease agreement. The review process will be undertaken in the MOP period.~~ For this MOP period, the void will be used for both water storage and overburden emplacement purposes.

Under the sublease agreement, Mt Arthur Coal generally assumes land/ rehabilitation management responsibility for the sublease area. Specifically, the agreement obliges Mt Arthur Coal to:

- Ensure works within the sublease area are conducted in accordance with relevant legislation (including permits, licences and other approvals), including safety, environmental planning, pollution and mining (Clause 7);
- Include management of the sublease area in Mt Arthur Coal MOPs and Security Deposit calculation and provision (Clause 8);
- Fill the void with inert material (overburden or tailings) that does not increase the risk of spontaneous combustion or acid generation, to a level that provides the final landform (see Plan 4) (Clause 9 & 10);
- Undertake reshaping and initial revegetation works, including provision of appropriate drainage, consistent with the requirements of the DRG (Clause 10);
- Maintain the rehabilitation for a period of three years, after which Anglo will assume management responsibility (Clause 10); and
- Acquire any other approvals required to undertake the planned activities, or meet agreement obligations, within the sublease area (Clause 13).

Mt Arthur Coal has regularly consulted with Anglo regarding issues as they arise within the sublease area that requires ongoing management. Such issues that have been discussed and are expected to continue to require ongoing consultation throughout this MOP period include final landform design on the sublease area, spontaneous combustion within and adjacent to the sublease area and the variation of the sublease agreement.

Appendix 4 shows the integration of landform contours for the Drayton sub-lease area with adjacent contours associated with the Drayton Mine previously provided by Anglo Coal.

# 3 Environmental Issues Management

## 3.1 Rehabilitation Risk Assessment

An assessment of environmental risks associated with the operation was undertaken as part of the Modification Project Environmental Assessment and has been referenced in the assessment of environmental risks in this MOP. The risk assessment process conducted by the team was aligned with AS/NZS 31000:2009 Risk Management – Principles & Guidelines. A summary of the relevant rehabilitation risks are presented in Table 3. Details of the existing and proposed environmental management controls for the identified risks are provided in Section 3.2.

A detailed assessment of the following key potential environment aspects were addressed in the Modification Project Environmental Assessment and the supporting specialist's reports included as appendices to the Environmental Assessment:

- Agricultural Impact Statement;
- Groundwater Impact Assessment;
- Surface Water Assessment;
- Ecological Assessment;
- Aboriginal and Non-Indigenous Cultural Heritage Assessment;
- Air Quality and Greenhouse Gas Assessment;
- Noise and Blasting Assessment;
- Landscape and Visual Impact Assessment;
- Geochemistry Assessment of Overburden and Interburden;
- Socio-Economic Assessment; and
- Road Transport Assessment.

A risk base approach is used for managing environmental issues at Mt Arthur Coal. Risk assessment prioritises resources and controls to manage the identified risks and to achieve the overarching goals and objectives as shown in Section 6 . Detailed risk assessments are completed for rehabilitation risks at Mt Arthur Coal and are reviewed through the environmental management system process.

**Table 3: Rehabilitation risk assessment summary**

| Issue / Aspect | Exploration | Land clearance | Mining / production | Landform establishment | Growth medium development | Ecosystem establishment | Ecosystem and land use development | Decommissioning |
|---|---|---|---|---|---|---|---|---|
| Erosion and Sedimentation | Mod | Mod | Low | Mod | Low | Mod | Low | Low |
| Water management | Low | Mod | Mod | Mod | Low | Mod | Mod | Low |
| Contaminated Land / Hazardous Substances | Low | Mod | Mod | Low | Mod | Mod | Mod | Low |
| Acid Mine Drainage | Low | Low | Low | Low | Low | Low | Low | Low |
| Flora and Fauna impact | Low | High | Low | Low | Mod | Low | Low | Low |
| Weeds and Pests | Low | Low | Low | Low | Mod | Low | Low | Low |
| Spontaneous Combustion | Low | Low | Low | Low | Low | Low | Low | Low |
| Bushfire | Mod | Mod | Low | Low | Low | Low | Low | Low |
| Mine Subsidence | Low | Low | Low | Low | Low | Low | Low | Low |
| Geotechnical issues (eg landform instability) | Mod | Mod | Low | Low | Low | Low | Low | Low |
| Inadequate or unavailable resources | Mod | Mod | Low | Low | Low | Low | Low | Low |

## 3.2 Rehabilitation Risk Management

Mt Arthur Coal is committed to delivering high standards of environmental performance to meet or exceed legal and other requirements. The following sub-sections present a summary of the management measures implemented at Mt Arthur Coal to address key rehabilitation risks presented in Table 3. Further detail is presented in the site procedures as listed in Appendix 2, most importantly the Rehabilitation and Ecological Monitoring Procedure specifies the required management of rehabilitation from monitoring to maintenance.

General dust management of exposed areas is managed as per the dust management processes shown below with detailed information presented in the Dust Management Procedure:

Deploying water carts across site for haul road dust suppression;

- Using dedicated water carts for contractor operations such as topsoil stripping;
- Using dust suppressants on haul roads;
- Maintaining a short message service alarming system for high winds and elevated dust levels;
- Changing dumping strategies to low areas during strong winds;
- Avoiding tipping into strong headwinds where possible;
- Using stockpile sprays in windy conditions to minimise dust generation;
- Progressively rehabilitating mine surfaces;
- Seeding topsoil stockpiles where applicable;
- Maintaining enclosed coal loading and transfer areas and associated sprays; and
- Aerial seeding exposed overburden where practicable.

### 3.2.1 Geotechnical

A geochemical assessment of overburden material, completed as part of the Mt Arthur North Coal Project Environmental Impact Statement (Coal Operations Australia Limited, April 2000), indicated that the non-coal associated rock strata (95% of the overburden to be removed) represented a low risk of acid generation, that no selective handling was required, and that containment of leachate or runoff was not required (for AMD purposes). The assessment was also completed in the FLDP.

The design method chosen is an adaptation of the Geofluv™ approach and is currently being assessed on the MacLeans emplacement. The Geofluv™ approach uses the characteristics of stable natural alluvial landforms in the local environment as an analogue on which to base the design of overburden landforms. Importantly, the approach does not replicate existing landforms, but rather uses the key characteristics that make these landforms stable in a new design. Natural landforms in alluvial materials are characterised by an integrated network of drainage channel, typically with slopes initially convex close to ridge lines, becoming concave and progressively flattening with increasing catchment area. Not all landforms will have Geofluv™, as there are places where it may not be practical to implement due to safety or stability.

While the site has committed to building these new geomorphologically based landform designs, it is important to emphasise that the design will require the refinement and optimisation of the landforms as construction experience is obtained at Mt Arthur Coal. This will include evaluating the performance of the rocky materials selected for erosion protection in the drainage lines, revegetation strategies in and around the drainage lines and on the general slopes, and evaluation of the performance of the different soil types in varying slope and catchment area configurations. Monitoring will inform continual improvement of the design including limitations on where it can be implemented. Study of the location and suitability of the design will be made in 2018 to inform where further design will occur.

Coal-associated strata includes some material that indicated a potential for acid generation. Therefore, all coal-associated overburden (and coarse rejects) requires selective handling and burying at depths greater than 5m. This is reflected in the emplacement design and construction requirements contained in the Mt Arthur Coal Dump Standard.

The geochemical assessment also analysed overburden material for potential sodicity, and determined a moderate to high potential for sodic spoil to be uncovered during mining. Soil management measures are detailed further in the Soil Types and Suitability section, below.

The construction of the final landform design includes the following:

- on the steeper outer slopes such as MacLeans overburden emplacement area, material will be placed in benches and then dozed into place, while on the upper surface such as for Main overburden emplacement area, the material can be placed and shaped using GPS equipment;
- rock will need to be placed into some of the steeper drainage lines, not as a highly engineered drop structure but rather as an integrated surface in the manner of a typical valley creek; and
- the design approach moves away from specifying maximum slopes, since it is not the steepness of the slope alone that represents an erosion risk, but rather a combination of the catchment area and slope.
- Mt Arthur Coal has implemented a visual assessment procedure to monitor and assess development of overburden emplacements against predictions modelled in the Open Cut Modification Environmental Assessment 2013.
- Results from the visual assessment program are fed back into Mt Arthur Coal's short-term mine plan, which is regularly reviewed by operational supervisors and mine planners to reduce the visibility of the operation. Opportunities for reduction of visual impact include designing overburden emplacements to incorporate visual bunds and barriers. Risk assessments for new or modified mining activities incorporate review or modelling of visual amenity, where applicable.

Management measures designed to reduce the visual impact include:

- The integration of tree corridors on overburden emplacements as part of progressive rehabilitation;
- The retention of the eastern flank of MacLean's Hill to assist in creating landscape diversity at the foot of overburden emplacements;
- Modifying final void high walls and low wall slopes to minimise final disturbance;
- Incorporating micro relief features throughout overburden emplacements to provide an enhanced naturally appearing landform and fauna habitat;
- The practical consideration of 'geofluvial type' designs on emplacements to sustainably manage water and create a natural looking and stable landform;
- The strategic design and rehabilitation of overburden emplacements for increased visual shielding of operations;
- Establishing visual and ecological planting patterns of native trees to achieve landscape patterns that complement the existing spatial distribution of tree and grass cover in a grazing landscape; and
- Minimising exposure of work areas to sensitive receivers where possible, largely through the timely rehabilitation of visible overburden emplacements.

### 3.2.2 Erosion and Sediment Control

As discussed in Section 3.2 (Erosion and Sediment), the primary site-wide management measures for erosion and sediment is the control of initial ground disturbance and timely land rehabilitation following disturbance. With regards to rehabilitation planning, the primary erosion control is rapid establishment of a vegetative cover. To achieve this, rapidly establishing sterile cover crop species are included in both the pasture and native vegetation seed mixes. These species (Shirohie Millet in Summer and Coolibah Oats in Winter) provide initial erosion control via establishment of a surface vegetative cover and subsurface root system, which remains even after the grass has died off, allowing the slower growing but more permanent plant species to emerge.

Reshaped emplacement slopes also incorporate appropriate surface run-off management structures to reduce erosion potential until adequate vegetation cover is established. These structures generally consist of contour drains, mulching and rock placement. Sediment ponds, designed in accordance with the Managing Urban Stormwater Guidelines (Landcom (2004) [Blue Book]), are integrated into landform drainage plans to intercept and reduce sediment load from surface runoff until rehabilitation is established.

### 3.2.3 Soil Types and Suitability

Soil and land capability assessments conducted as part of the Mt Arthur Coal Open Cut Consolidation Project EA (2009) and the Mt Arthur Coal Open Cut Modification Project EA (2013) have identified topsoil resources, suitable for recovery and use as a growth medium in post-mining rehabilitation, across the majority of the highwall areas. Recommended topsoil recovery depths are 100 – 300mm, based on the presence of a moderately to strongly structured sandy to silty loam A horizon. Duplex soils are common, and stripping of heavy clay subsoils is to be avoided. Some soils also displayed sodic subsoil properties and measures have been implemented to ensure these materials do not contaminate topsoil resources.

Prior to topsoil stripping, a pre-stripping assessment is made in accordance with the Land Management Procedure. This assessment will ground-truth the broad scale stripping recommendations presented in the relevant soil stripping plan and delineate local topographical and drainage variations to topsoil depth. The final stripping plan will be modified appropriately to ensure all suitable topsoil material is recovered, without contamination by subsoils. Management measures for ensuring the maintenance of topsoil quality and volume during stripping, handling, stockpiling and placement are also presented in the Land Management Procedure, including:

- disturb the minimum area necessary for mining and associated infrastructure;
- stripping depths and limits (including areas of no recovery) are to be clearly delineated with survey pegs, and adhered to during stripping operations;
- clearing and topsoil removal activities must be checked at regular intervals to ensure continued effectiveness of stripping methods and management of topsoil;
- clearing and topsoil stripping should be limited to daylight hours where possible;
- during topsoil stripping and stockpiling the process avoids structural degradation of soils – taking particular care to avoid excessive compaction (i.e. avoiding re-handling and limit stripping activities in wet conditions);
- direct topsoil placement from stripping onto prepared rehabilitation areas is maximised, and double handling (relocation of stockpiles) minimised through planning;
- Topsoil stockpiles shall be:
    - no greater than 3 metres in height;
    - located away from drainage lines, operational areas, and proposed disturbance areas;
    - managed to minimise run-on and minimise sediment laden run-off;
    - surveyed and recorded on mine plans;
    - ripped and sown with a pasture seed mix (where planned to remain for longer than 6 months); and
    - inspected periodically and, if required, treated for weed infestation.

Due to the proximity of the proposed rehabilitation areas (i.e. VD1 and CD1) to local population centres such as Muswellbrook, dust generation and visual impacts are an important consideration in project planning. The following controls are particularly pertinent to topsoil operations:

- roads (including minor tracks) used to haul topsoil are watered and maintained to suppress dust.
- Stripping operations are not to be undertaken in periods of high wind (>9m/s) unless dust generation is being effectively controlled.
- In order to reduce dust during stripping operations, stripping areas shall be pre-watered using a water cart.
- Vehicles are to follow defined haul roads or haulage routes that are being watered.
- In periods of high wind or dust generation, the –relevant mining supervisor may require operations to be modified or ceased in order to ensure compliance with statutory requirements.

A pre-rehabilitation topsoil stockpile inspection and testing program has also been implemented to characterise stockpiled material, identify suitability for the specific proposed rehabilitation, and identify any requirement for soil ameliorants such as gypsum.

### 3.2.4 Water Management

Water at Mt Arthur Coal is managed in accordance with the following documents:

- Site Water Management Plan;
- Surface Water Monitoring Program;
- Site Water Balance; and
- Surface and Ground Water Response Plan.
- Site Water Management Plan;
- Ground Water Monitoring Program; and
- Surface and Ground Water Response Plan.

The aims of the site water management system are to minimise adverse impacts on downstream receiving waters (comprising Hunter River tributaries such as Saddlers Creek, Quarry Creek, Ramrod Creek, Fairford Creek and Whites Creek), and outline management measures for managing onsite water resources.

The surface water monitoring program consists of scheduled sampling of downstream waters and rain event sampling. The monitoring program also includes impact assessment criteria, which if exceeded, trigger a management response, generally consisting of an investigation, reporting, and if required, remedial action.

The site water management plan aims to minimise any adverse impacts on groundwater resources in proximity to Mt Arthur Coal operations, including aquifers associated with hard rock coal measures and the Hunter River shallow alluvial deposits.

The groundwater monitoring program consists of the scheduled sampling of a network of groundwater piezometers. Permeability testing is also undertaken during installation of new monitoring bores to determine local groundwater flow conditions. The monitoring program also includes impact assessment criteria, which if exceeded, trigger a management response, generally consisting of an investigation, reporting, and if required, remedial action.

### 3.2.5 Contaminated Land and Hazardous Substances

Contaminated land at Mt Arthur Coal is managed in accordance with the following documents:

- Storage of Fuels and Chemicals Procedure;
- Ground Disturbance Permit (GDP);
- Spill Response Procedure;
- Environmental Emergency Response;
- Contaminated Land Management Procedure; and
- Hazardous Materials Management Procedure.

These documents outline the requirements for the handling, transport, storage, use and disposal of hydrocarbons and other hazardous substances at Mt Arthur Coal. These materials are kept in designated storage facilities, designed and managed in accordance with relevant standards and procedures.

All hydrocarbon handling and storage areas (i.e. diesel storage areas and fill points) are appropriately designed and constructed, incorporating sealed concrete surfaces, bunding and oily water separators, where required.

The Contaminated Land Management procedure also outlines the requirements for investigating, reporting, handling and treating contaminated land. Small volumes of hydrocarbon contaminated material are recovered and disposed of via the regulated waste management system or remediated at the onsite bioremediation facility.

Monitoring and inspection programs are maintained for these facilities, to ensure hazardous materials and substances are being adequately stored and disposed and that any spills or leaks are promptly reported and managed. These documents also detail the protocols to be observed in the event of an environmental incident, to ensure incidents are managed in a manner that reduces the potential for pollution impacts, and meets regulatory reporting obligations.

### 3.2.6 Flora and Fauna

Flora and fauna at Mt Arthur Coal is managed in accordance with the following documents:

- Biodiversity Management Plan;
- Rehabilitation and Ecological Monitoring Procedure; and
- Land Management Procedure.

Mt Arthur Coal has a management strategy in place to manage or mitigate mining impacts on native flora, fauna and habitat in the vicinity of operational mining areas. These management and mitigation measures are currently outlined in the above documents, and include a:

- ground disturbance permit system to minimise and control ground and vegetation disturbance;
- pre-disturbance ecological inspection to identify threatened/listed species and habitat in the proposed clearance zone;
- vegetation clearing protocol to minimise impacts on wildlife, and ensure the preservation and recovery of valuable habitat features;
- program to increase biodiversity values within remnant and rehabilitated woodland vegetation communities through the placement of recovered habitat features such as logs, stags, tree hollows and rocks;
- biodiversity offset program to protect designated vegetation/habitat communities, by way of compensation for mining related impacts; and
- flora and fauna monitoring program to assess the impacts of mining disturbance, and monitor the effectiveness of management and offset measures.

Pre-project ecological assessments and control of disturbance during vegetation clearing are the main protection measures. From a rehabilitation planning perspective, the major strategies are to ensure that, in accordance with the Mt Arthur Coal EPBC Approval (EPBC 2011/5866) and Project Approval 09_0062 MOD 1, rehabilitation planning incorporates the return of:

- 500 ha of box-gum grassy woodland/ winter bird habitat; and
- An additional 2142 ha of woody native vegetation community.

To meet the requirements of the Project Approval 09_0062 MOD 1, rehabilitated woody vegetation communities are also to focus on the re-establishment of:

- significant and/or threatened plant communities, including:
    - Upper Hunter White Box – Ironbark Grassy Woodland;
    - Central Hunter Box – Ironbark Woodland;
    - Central Hunter Ironbark – Spotted Grey-Gum Box Forest;
    - Narrabeen Footslopes Slaty Box Woodland;
    - Hunter Floodplain Red Gum Woodland Complex
    - White Box Yellow Box Blakely's Red Gum Forest
    - Hunter Lowlands Red Gum Forest; and
- habitat for significant and/or threatened animal species.

The rehabilitation strategy incorporates measures to ensure these requirements are met. Native vegetation seed mixes have been adopted that target the re-establishment of the required ironbark-box-gum communities. Tubestock planting programs also target the establishment of box-gum woodland and fauna habitat.

Biodiversity and habitat values within woody rehabilitation areas are also enhanced by the incorporation of nesting/roosting boxes, and hollow bearing trees recovered during vegetation clearing. Where practical, large surface rocks raked clear during preparation for pasture rehabilitation are placed in piles amongst, or adjacent to, remnant or rehabilitated vegetation as habitat features. The diversity of structure improves the potential biodiversity capability.

Mt Arthur Coal has an integrated ecological and rehabilitation monitoring program which, as well as assessing mining impact on nearby remnant native vegetation, also assesses the ecological development of rehabilitation areas against the remnant communities and rehabilitation progress criteria. This program is discussed further in Section 8.1.

The weed, pest and bushfire management measures outlined in this Section 3.2 also apply to site rehabilitation areas, thereby enhancing biodiversity value and fauna/flora protection within those areas.

Annual ecological monitoring surveys have been completed as part of this program first established in 2003 and designed to meet the following objectives:

- assess the condition and development of rehabilitated/regenerated vegetation;
- assess the stability of land surface, landforms and related engineering structures;
- allow for comparison of rehabilitated/regenerated areas with relevant baseline information, reference sites, progress indicators and completion criteria as listed in the MOP;
- identify requirements for maintenance or remedial treatment; and
- meet statutory and corporate requirements relating to rehabilitation and ecological monitoring.

Specifically, the Ecological Development Monitoring Program objectives are to collect sufficient information to:

- prove that areas designated as providing biodiversity value in the post-mining landscape are trending towards the selected vegetation community composition and structure as described in completion criteria in the MOP; and,
- identify requirement for maintenance activities, remedial action, or modification to rehabilitation, regeneration or land management programs.
    - Drought affected areas have impacted progress for some woodland rehabilitation over the life of MAC. Pasture has been planted on an interim basis to prevent wind and water erosion. Recently, in agreement with DPE, tube stock have been planted on the VD1 drought affected area. This remedial process is captured be measurements following the Rehabilitation and Ecological Monitoring Procedure and implementation activities as per the TARP in Section 9.2.

Flora diversity, structural complexity and fauna diversity recorded are compared to reference vegetation by suitably qualified personnel with progress over time reviewed against criteria. The process and location of reference sites is documented in the Rehabilitation and Ecological Monitoring Procedure. An assessment of current status is provided against reference sites as well as recommendations for remedial and/or maintenance actions. A summary of the monitoring is provided in the Annual Environmental Management Report.

### 3.2.7 Heritage (Aboriginal)

Aboriginal cultural heritage at Mt Arthur Coal is managed in accordance with the DP&E approved Aboriginal Heritage Management Plan (AHMP). The AHMP assists to mitigate the impacts of operations on Aboriginal cultural heritage, comply with the requirements of the National Parks and Wildlife Act 1974, EP&A Act and the Project Approval, and continue its active partnership with the Aboriginal community.

The AHMP provides the framework to identify, assess, monitor, conserve and manage Aboriginal cultural heritage identified on land owned by Mt Arthur Coal. Under the AHMP, the following activities are undertaken at Mt Arthur Coal:

- Recording, protection and monitoring of significant cultural features identified;
- A salvage program to record, recover and temporarily store surface artefactual material;
- Maintenance of a temporary keeping place for salvaged items;
- Due diligence inspections for areas of proposed disturbance not already subject to salvage operations;
- Implementation of a response protocol upon discovery of previously unknown cultural heritage sites and human skeletal remains; and
- Procedures for consultation with the Aboriginal community, access to site for members of the Aboriginal community, and incident or complaint response.

### 3.2.8 Spontaneous Combustion

Spontaneous combustion at Mt Arthur Coal is managed in accordance with the following documents:

- Spontaneous Combustion Control Program; and
- Overburden Handling and Coal Extraction Procedure.

Spontaneous combustion at Mt Arthur Coal is predominantly confined to old mining areas in the Bayswater No. 2 and the Drayton sublease area. This is a result of the higher levels of sulphuric material in the coal seams mined from the Greta measures, compared to those mined in the former Bayswater No. 3 and Mt Arthur North mining areas (Wittingham measures).

The Spontaneous Combustion Control Program contains details on measures implemented to identify, assess, handle, treat and monitor spontaneous combustion, and materials with potential to cause spontaneous combustion. Such measures include:

Guidelines for overburden emplacement and coal stockpile design to minimise Spontaneous combustion potential;

Guidelines for handling of high Spontaneous combustion potential material, such as "…potential spontaneous combustion material should be placed in thin layers, only in the designated active emplacements, and to be rapidly buried with inert cover to a minimum depth of 10 metres";

Monthly inspections of the Bayswater No. 2 and Drayton sublease area, and other reported outbreak areas, to identify and monitor indicators of spontaneous combustion, including surface cracking, visible smoke, and carbonaceous combustion odour;

Weekly inspections of product coal stockpile areas to identify indicators of spontaneous combustion;

Corrective actions, should significant Spontaneous combustion be identified; and

Reporting of area of active spontaneous combustion to the NSW EPA, and in the AEMR.

### 3.2.9 Bushfire

Bushfire at Mt Arthur Coal is managed in accordance with the:

- Bushfire Prevention Procedure; and
- Emergency Procedure – Bushfires.

The above procedures document fire prevention and control measures to reduce the risk of bushfire ignition on Mt Arthur Coal owned land, and to protect the operations from bushfire. Specific prevention and fire suppression control measures are implemented in order to protect remnant vegetation communities as well as Mt Arthur Coal fixed and mobile infrastructure.

Preventative measures include fuel load assessment and reduction programs, the establishment and maintenance of fire breaks and the prevention of ignition sources. Fire suppression and control is achieved through on-site firefighting equipment, including a rescue truck and water carts, facilitated by a network of roads and vehicle access trails, which provide access to all areas of Mt Arthur Coal owned land. Mt Arthur Coal also maintains a trained emergency response team on each shift, and fire extinguishers are fitted in all vehicles and buildings.

### 3.2.10 Weed and Pest Management

Weed management at Mt Arthur Coal is managed in accordance with the:

- Biodiversity Management Plan; and
- Land Management Procedure.

Weed management at Mt Arthur Coal (including offset areas) consists of two major programs: the weed assessment program and weed treatment program. The assessment program consists of the periodic inspection of all Mt Arthur Coal owned land (except operational areas such as open cut pits) by experienced weed contractors, to delineate, assess and record weed distribution, and recommend weed treatment priorities. This is supported by regular inspections conducted by Mt Arthur Coal staff and feedback from mining personnel, contractors and lessees to identify areas of weed infestation. The treatment program involves the seasonal treatment, mainly through chemical spraying, of the highest priority weed infestations.

The aim of the vertebrate pest management program is to target wild dogs and foxes that represent a threat to biodiversity values on site (including offset areas) and to adjacent grazing operations. A minimum of one feral animal control program is conducted across Mt Arthur Coal owned land each year, targeting those areas where dogs and foxes have been reported by employees, contractors and landowners. Pest management programs are conducted in accordance with the with Pesticide Control (1080 Liquid Concentrate and Bait Products) Order 2010 and, where possible, in conjunction with wider regional control programs.

The BMP details the measures Mt Arthur Coal has implemented to protect and enhance biodiversity values on site and within offset and conservation areas.

### 3.2.11 Mine Subsidence

Although Mt Arthur Coal is located within the Muswellbrook Mine Subsidence district, there is no recent history of mine subsidence within Mt Arthur Coal mine leases. As a result, subsidence is not predicted to impact on mining or rehabilitation activities within this MOP period.

### 3.2.12 Other Considerations

Visual: A visual impact of mining operations was undertaken as part of the Mt Arthur Coal Open Cut Modification Project EA, and overburden emplacement design incorporates measures to minimise visual impact. As discussed in Section 1.4.2– agreement has also been reached with the Mt Arthur CCC regarding modifications to the rehabilitation strategy to minimise visual impact, by revegetating the north facing bund with woody vegetation.

Public safety: Mt Arthur Coal has completed the installation of a security fence around the perimeter of its site to ensure no unauthorised access to mining areas. The fence has been installed on land owned by Mt Arthur Coal along the general alignment of the existing fence line.

# 4 Post Mining Land use

## 4.1 Regulatory Requirements

Conditions relating to rehabilitation and progress towards the post-mining land use are contained in:

- Project Approval (09_0062 MOD 1)[1];
- EPBC Approval 2014/7377; and
- Key Mining Tenements

1. Note: MAC in consultation with DP&E have agreed that for the purposes of PA 09_0062 MOD 1 S44(a-j), the MOP content is aligned with and accepted as discharging the requirement for a separate Rehabilitation Management Plan.

Those conditions that specifically affect the post mining land use, landscape and rehabilitation outcomes management are contained in Table 4.

**Table 4: Regulatory Requirements related to rehabilitation**

| Section/Condition | Requirement | Summary of Status |
|---|---|---|
| Project Approval (09_0062 MOD 1) Schedule 2, Condition 5 | Mining operations for the project may take place until 30 June 2026. | Mining operations continuing. |
| Project Approval (09_0062 MOD 1) Schedule 3, Condition 36 | The Proponent shall implement the biodiversity offset strategy as outlined in Table 13 and as generally described in the EA (and shown in Appendix 7), to the satisfaction of the Secretary. | The current approved Rehabilitation Strategy incorporates rehabilitation for 1915ha of woody vegetation (including 500ha of Box Gum woodland). This was revised in September 2015 to incorporate 2642ha of woody vegetation as outlined in PA 09_0062 MOD 1. |
| Project Approval (09_0062 MOD 1) Schedule 3, Condition 38 | The Proponent shall ensure that the offset strategy and/or rehabilitation strategy is focused on the re-establishment of:<br>(a) significant and/or threatened plant communities, including:<br>Upper Hunter White Box – Ironbark Grassy Woodland;<br>Central Hunter Box – Ironbark Woodland;<br>Central Hunter Ironbark – Spotted Gum - Grey Box Forest;<br>Narrabeen Footslopes Slaty Box Woodland;<br>Hunter Floodplain Red Gum Woodland Complex;<br>White Box Yellow Box Blakely's Red Gum Woodland;<br>Hunter Lowlands Red Gum Forest; and<br>(b) significant and/or threatened plant species, including:<br>River Red Gum (*Eucalyptus camaldulensis*);<br>Pine Donkey Orchid (*Diuris tricolor*);<br>Tiger Orchid (*Cymbidium canaliculatum*);<br>Weeping Myall (*Acacia pendula*); and<br>(c) habitat for significant and/or threatened animal species. | Native vegetation seed mixes and tubestock planting species composition reflects the communities mentioned in Condition 38(a).<br>Relocation of habitat trees, have been incorporated into rehabilitation design to enhance habitat value. |
| Project Approval (09_0062 MOD 1) Schedule 3, Condition 41A | The Proponent shall rehabilitate the site to the satisfaction of the DRE. The rehabilitation must comply with the objectives in Table 14, and be consistent with the rehabilitation plan shown in Appendix 7 and the final landform plan shown in Appendix 8. | Rehabilitation objectives are outlined in Section 4.3 of this MOP.<br>The current approved Rehabilitation Strategy was revised and submitted to DP&E for approval in April 2017. |

| Section/Condition | Requirement | Summary of Status |
|---|---|---|
| Project Approval (09_0062 MOD 1) Schedule 3, Condition 42 | The Proponent shall prepare a revised Rehabilitation Strategy for the Mt Arthur mine complex to the satisfaction of the Secretary. This strategy must: be prepared in consultation with the DRE and Council, and be submitted to the Secretary for approval by the end of September 2015, unless otherwise agreed with the Secretary;<br>(b) investigate options for:<br>increasing the area to be rehabilitated to woodland on the site;<br>reducing the size of final voids on site; and<br>beneficial future land use of disturbed areas, including voids;<br>(c) describe and justify the proposed rehabilitation plan for the site, including the final landform and land use; and<br>(d) include detailed rehabilitation objectives for the site that comply with and build on the objectives in Table 14.<br>Note: The strategy should build on the rehabilitation plan in Appendix 7. | Extension to December 2015 by agreement in accordance with (a) to allow for consultation with Council.<br>The current approved Rehabilitation Strategy was revised and submitted to DP&E for approval in April 2017. |
| Project Approval (09_0062 MOD 1) Schedule 3, Condition 43 | The Proponent shall carry out rehabilitation progressively, that is, as soon as reasonably practicable following disturbance (particularly on the face of emplacements that are visible off-site). Interim stabilisation measures must be implemented where reasonable and feasible to control dust emissions in disturbed areas that are not active and which are not ready for final rehabilitation.<br>Note: It is accepted that parts of the site that are progressively rehabilitated may be subject to further disturbance in future. | Rehabilitation is being carried out progressively, as detailed in Section 7.27 of this MOP.<br>Completion of the rehabilitation and temporary stabilisation activities proposed in the approved MOP is understood to demonstrate compliance with Condition 43(b). |
| Project Approval (09_0062 MOD 1) Schedule 3, Condition 44 | The Proponent shall prepare and implement a Rehabilitation Management Plan for the Mt Arthur mine complex to the satisfaction of the DRE. This plan must:<br>be submitted to NSW Trade & Investment for approval by 30 September 2015;<br>be prepared in consultation with the Department, NOW, OEH and Council;<br>be prepared in accordance with relevant NSW Trade & Investment guidelines;<br>describe how the rehabilitation of the site would be integrated with the implementation of the biodiversity offset strategy; | DRE confirmed in a letter dated 15 September 2015 that the Mining Operations Plan, developed in accordance with the Department's MOP Guidelines, was acceptable to satisfy the requirements for a Rehabilitation Management Plan under Schedule 3 Condition 44 of the Mt Arthur Coal Modification Project Approval (PA 09_0062 MOD 1). |

| Section/Condition | Requirement | Summary of Status |
|---|---|---|
| | include detailed performance and completion criteria for evaluating the performance of the rehabilitation of the site, and triggering remedial action (if necessary);<br>describe the measures that would be implemented to ensure compliance with the relevant conditions of this approval, and address all aspects of rehabilitation including mine closure, final landform including final voids, and final land use;<br>include interim rehabilitation where necessary to minimise the area exposed for dust generation;<br>include a research program that seeks to improve the understanding and application of rehabilitation techniques and methods in the Hunter Valley;<br>include a program to monitor, independently audit and report on the effectiveness of the measures, and progress against the detailed performance and completion criteria; and<br>build to the maximum extent practicable on other management plans required under this approval. | |
| EPBC Approval 2011/5688, Condition 4 | The person taking the action must commence progressive regeneration of 1915 ha of woodland and forest communities, including 299.20 ha of Box Gum Woodland identified in Table 1, as described in the Preliminary Documentation within 1 year of commencement of construction. (Table 1 indicates 500 ha of Box Gum Woodland, and 1415 ha Rehabilitation Corridors). | Progressive regeneration of woodland and forest communities at Mt Arthur Coal commenced in the mid-1990s.<br>As of June 2014, Mt Arthur Coal had completed 47 ha and June 2017 439 ha of seeding and tubestock planting aimed at establishing Box Gum Woodland. |
| Mining Tenement ML1358 | 6 The lease holder shall comply with any direction, given or which may be given by the Inspector regarding the stabilisation and revegetation of any coal, minerals, mine residues, tailings or overburden situated on the subject area.<br>16 Subject to any specific condition of this authority providing for rehabilitation of any particular part of the subject area affected by mining or activities associated therewith, the lease holder shall;<br>a) shape and revegetate to the satisfaction of the Minister, any part of the subject area that<br>may, in the opinion of the Minister have been damaged or deleteriously affected by mining operations and ensure such areas are permanently stabilised, and, | No directives consistent with Conditions 6 or 19 are currently in force. Any such future directives will be incorporated into future MOP versions.<br>Planned activities to meet conditions 16 (a), 16(b), 27, 30 and 33 are incorporated into Section 7 of this MOP.<br>Conditions 20 and 34 are met in the proposed final rehabilitation/ closure plan, as shown in MOP Plan 4.<br>Conditions 32 and 35 are addressed by the measures presented in the site Erosion and Sediment Control Plan and Land Management procedure, which are summarised in Section 3.2 of this MOP. |

| Section/Condition | Requirement | Summary of Status |
|---|---|---|
| | b) reinstate and make safe, including sealing and/or fencing, any excavation within the<br>subject area.<br>19 If so directed by the Minister the lease holder shall rehabilitate to the satisfaction of the Minister and within such time as may be allowed by the Minister any lands within the subject area which may have been disturbed by the lease holder.<br>20 Upon completion of operations on the surface of the subject area or upon the expiry or sooner determination of this authority or any renewal thereof, the lease holder shall remove from such surface such buildings, machinery, plant, equipment, constructions and works as may be directed by the Minister and such surface shall be rehabilitated and left in a clean, tidy and safe condition to the satisfaction of the Minister.<br>27 The lease holder shall plant such grasses, trees or shrubs or such other vegetation as may be required by the Minister and care for same during the currency of this authority or any renewal thereof, to the satisfaction of the Minister.<br>30 The lease holder shall cover with top dressing material, to the Minister's satisfaction, such parts of the subject area as may be stipulated by the Minister and shall plant and maintain, to the Minister's satisfaction, such grasses, trees or shrubs or such other vegetation as may be required by the Minister.<br>32 The lease holder shall conduct operations in such a manner as not to cause or aggravate soil erosion and the lease holder shall observe and perform any instructions given or which may be given by the Minister with a view to minimising or preventing soil erosion. | |
| Mining Tenement ML1358 continued | 33 The lease holder shall ensure that any topsoil or other material suitable for topdressing purposes which may be disturbed during operations shall be removed separately for replacement as far as may be practicable and the lease holder shall plant or sow such grasses, shrubs or trees in the replaced surface material as may be considered necessary by the Minister to control or prevent soil erosion.<br>34 In the event of any excavations being made the lease holder shall ensure that such are refilled and the topsoil previously removed is replaced and | Topsoil stockpiles are shown in figures 3A – E. |

| Section/Condition | Requirement | Summary of Status |
|---|---|---|
| | levelled. All such refilling and levelling shall be done to the satisfaction of the Minister.<br>35 The lease holder shall ensure that the run off from any disturbed area including the overflow from any depression or ponded area is discharged in such a manner that it will not cause erosion. | |
| Mining Tenement ML1487 | 15 The lease holder shall comply with any direction, given or which may be given by the Inspector regarding the dumping, depositing or removal of material extracted as well as the stabilisation and revegetation of any emplacements of coal, minerals, mine residues, tailings or overburden situated on the subject area or the associated colliery holding. If so directed by the Minister the lease holder shall rehabilitate to the satisfaction of the Minister any lands within the subject area which may have been disturbed by the lease holder.<br>22 Upon completion of operations on the surface of the subject area or upon the expiry or sooner determination of this authority or any renewal thereof, the lease holder shall remove<br>from such surface such buildings, machinery, plant, equipment, constructions and works as may be directed by the Minister and such surface shall be rehabilitated and left in a clean, tidy and safe condition to the satisfaction of the Minister.<br>23 If so directed by the Minister the lease holder shall rehabilitate to the satisfaction of the Minister and within such time as may be allowed by the Minister any lands within the<br>subject area which may have been disturbed by mining or prospecting operations whether such operations were or were not carried out by the lease holder.<br>25 The lease holder shall provide and maintain to the satisfaction of the Minister efficient<br>means to prevent contamination, pollution, erosion or siltation of any river, stream, creek,<br>tributary, lake, dam, reservoir, watercourse, groundwater or catchment area or any undue | No directives consistent with Condition 15 are currently in force. Any such future directives will be incorporated into future MOP versions.<br>Planned activities to meet conditions 21, 23 are incorporated into Section 7 of this MOP.<br>Condition 22 is met in the proposed final rehabilitation/ closure plan, as shown in MOP Plan 4.<br>Conditions 25 and 30 are addressed by the measures presented in the site Water Management Plan, Erosion and Sediment Control Plan and Land Management procedure, which are summarised in Section 3.2of this MOP. |

| Section/Condition | Requirement | Summary of Status |
|---|---|---|
| | interference to fish or their environment and shall observe any instruction given or which<br>may be given by the Minister with a view to preventing or minimising the contamination,<br>pollution, erosion or siltation of any river, stream, creek, tributary, lake, dam, reservoir,<br>watercourse, groundwater, or catchment area or any undue interference to fish or their environment.<br>30 The lease holder shall conduct operations in such a manner as not to cause or aggravate<br>soil erosion and the lease holder shall observe and perform any instructions given or which<br>may be given by the Minister with a view to minimising or preventing soil erosion. | |
| Mining Tenement ML 1548 | 13 (a) Land disturbed must be rehabilitated to a stable and permanent form suitable for a subsequent land use acceptable to the Director-General and in accordance with the Mining Operations Plan so that;-<br>there is no adverse environmental effect outside the disturbed area and that the land is properly drained and protected from soil erosion.<br>the state of the land is compatible with the surrounding land and land use requirements.<br>the landforms, soils, hydrology and flora require no greater maintenance than that in the surrounding land.<br>in cases where vegetation is required and native vegetation is removed or damaged, the original species must be re-established with close reference to the flora survey included in the Mining Operations Plan. If the appropriate vegetation was not native, ant re-established vegetation must be appropriate to the area and at an acceptable density.<br>The land does not pose a threat to public safety.<br>(b) Any topsoil that is removed must be stored and maintained in a manner acceptable to the Director-General.<br>16 Operations must be carried out in a manner that does not cause or aggravate air pollution, water pollution (including sedimentation), or soil contamination or erosion, unless otherwise authorised by a relevant approval, | Planned activities to meet condition 13(a) are incorporated into Section 7 of this MOP.<br>Planned activities to meet condition 13(b) are incorporated into Land Management procedure, and summarised in Section 3.2of this MOP.<br>The requirements of Condition 16 are addressed by the measures presented in the site Air Quality and Greenhouse Gas Management Plan, Water Management Plan, Erosion and Sediment Control Plan and Land Management procedure, which are summarised in Section 3.2of this MOP. |

| Section/Condition | Requirement | Summary of Status |
|---|---|---|
| | and in accordance with an accepted Mining Operations Plan. For the purpose of this condition, water shall be taken to include any watercourse, waterbody or groundwaters. The lease holder must observe and perform any instructions given by the Director-General in this regard. | |
| Mining Tenement CCL 744 | 7 Disturbed land must be rehabilitated to a sustainable/agreed end use to the satisfaction of the Director-General.<br>18 Operations must be carried out in a manner that does not cause or aggravate air pollution, water pollution (including sedimentation) or soil contamination or erosion, unless otherwise authorised by a relevant approval, and in accordance with an accepted Mining Operations Plan. For the purpose of this condition, water shall be taken to include any watercourse, waterbody or groundwaters. The lease holder must observe and perform any instructions given by the Director-General in this regard. | Planned activities to meet condition 7 are incorporated into Section 7 of this MOP.<br>The requirements of Condition 18 are addressed by the measures presented in the site Air Quality and Greenhouse Gas Management Plan, Water Management Plan, Erosion and Sediment Control Plan and Land Management procedure, which are summarised in Section 3.2of this MOP. |

## 4.2 Post Mining Land Use Goal

Mt Arthur Coal will rehabilitate mining generated landforms to establish a non-polluting, structurally stable landscape to maximise opportunities for a diverse post-mining landscape and range of land uses. It is proposed that final land uses should remain flexible and could include pastoral, commercial forestry, recreation, wildlife habitat corridors and/or opportunities.

Mt Arthur Coal has developed a "Goal" to meet the long term expectations of regulators and stakeholders so that through the review and feedback process the final landform will provide sustainable benefit to the region. The Goal aligns with the requirements of the Project Approval and elaborates the intent of these requirements rather than disparaging their purpose. The goal is considered to be permanent for the life of mine and will not change significantly over the life of mine. The goal cannot easily be directly measured, but rather, requires the components of the rehabilitation process to show progress to the goal. When the rehabilitation objectives are achieved the goal is shown to have been achieved.

The Goal is:

"Create a safe, stable, non-polluting and sustainable landscape that achieves the intended final land uses and is consistent with key stakeholder agreed social and environmental values."

This post-mining land use goal is reflected in the proposed post-mining landscape, land use and vegetation distribution shown in Plan 4.

## 4.3 Rehabilitation Objectives

In achieving rehabilitation objectives presented in Table 6 the Mt Arthur Coal post-mining land use goal (Section 4.2), will be met. These objectives from the Project approval have also been expanded to clearly describe the rehabilitation process required to achieve the project approval compliance.

The rehabilitation process uses metrics that can quantitatively demonstrate the progress towards completion criteria and therefore achievement of the rehabilitation objectives. The development of suitable criteria is an iterative process and acceptable values or levels may change over time aligned with monitoring results, research and technology. Rehabilitation objectives, completion criteria and performance indicators are presented in Table 6 to provide a quantitative evaluation point of rehabilitation at Mt Arthur Coal. Furthermore criteria are nominated for each phase of rehabilitation in the MOP so that rehabilitation success can be tracked throughout the life of the mine.

Table 6 shows the link between the rehabilitation objectives from table 14 of the Mt Arthur Coal Mine – Open Cut Modification Project (PA 09_0062 MOD 1). The link enables a pathway to relinquishment of rehabilitated lands.

# 5 Rehabilitation Planning and Management

## 5.1 Domain Selection

Primary domains are post-mining land management units characterised by similar or land use. Secondary domains are defined as operational or functional land management units within the mine site, usually with unique purpose and therefore similar geophysical characteristics and rehabilitation treatment requirements.

Domains will require a different rehabilitation methodology to achieve the intended post-mining land use. Domains for Mt Arthur Coal have been determined in consideration of the specific requirements of the mining location and local environment. The key domains for Mt Arthur Coal, as shown in Plan 2, are outlined in Table 5.

**Table 5: Mt Arthur Coal Primary and Secondary Domains**

| Secondary Domain | Code | Primary Domain | Code |
|---|---|---|---|
| Open Cut Void | 1 | Final Void | A |
| Water Management Area | 2 | Water Management Area | B |
| Infrastructure Area | 3 | Rehabilitation Area - Pasture | C |
| Existing Rehabilitation | 4 | Rehabilitation Area – Native Woodland | D |
| Tailings Storage Facility | 5 | Rehabilitation Area – Box Gum Woodland | E |
| Overburden Emplacements | 6 | Onsite Conservation and Offset areas | F |
| Onsite Conservation and Offset areas | 7 | | |

## 5.2 Domain Rehabilitation Objectives

The overall rehabilitation objectives for Mt Arthur Coal are discussed in Section 4.3 of this MOP. These site rehabilitation objectives have been further developed into the specific objectives for the primary and secondary domains identified in Section 5.1, and are presented in Table 6.

Table 6 shows the link between the rehabilitation objectives from table 14 of the Mt Arthur Coal Mine – Open Cut Modification Project (PA 09_0062 MOD 1) and the detailed objectives and criteria developed to compliment the Project approval objectives. The link enables a pathway to relinquishment of rehabilitated lands. Where objectives shown in the Approval do not need expanding they are left as presented in the approval however the criteria and indicators expand and align with the approval objectives. Furthermore the detailed objectives align with the Rehabilitation Tables in appendix 3 for the relinquishment phase.

**Table 6: Domain Specific Rehabilitation Objectives**

| Approval Feature | Approval Objective | Closure Domain (Primary) | Detailed Objective | Completion Criteria | Performance / Leading Indicator |
|---|---|---|---|---|---|
| Mine site (as a whole) | Safe, stable and non-polluting final landforms designed to incorporate natural micro-relief and natural drainage lines to integrate with surrounding natural landforms | All Domains<br>Water management area;<br>Final Void Rehabilitated Areas – Pasture;<br>Rehabilitated Areas – Native Woodland;<br>Rehabilitated Areas – Box Gum Woodland;<br>Offset Areas; and<br>Non-operational lands | Safe, stable and non-polluting final landforms designed to incorporate natural micro-relief and natural drainage lines to integrate with surrounding natural landforms | Closure criteria and proposed final land use developed through stakeholder consultation<br>Landforms are independently assessed as safe and stable compatible with surrounding natural landscape<br>Restoration of mined land achieves visual amenity<br>Ecologically sustainable land management practices aligned with approved domain<br>TSF capped to ensure long-term containment of emplaced material and sustains proposed land use<br>Removal, treatment and/or containment of hazardous or contaminated material<br>The rehabilitated post-mining landscape will not cause environmental impacts greater than surrounding non-mined land | Independent Geotechnical inspections landforms completed<br>Emplacement areas progressively rehabilitated<br>Comparison to analogue sites<br>Stakeholder consultation documentation<br>Reporting progress in the AEMR<br>“Annual Rapid Assessment” of indicators including:<br>• Vegetation ground cover<br>• Landform stability and erosion control<br>• Drainage<br>Independently reviewed plan and design for TSF capping |
| Agricultural land | Rehabilitate at least 33 hectares of Class II agricultural capability land in the area identified in the rehabilitation plan (see Appendix 7)<br>Rehabilitate other areas identified for agricultural use in the rehabilitation plan to sufficient agricultural capability to support grazing | Rehabilitated Areas - Pasture | Rehabilitated pasture landscapes support environmentally sustainable livestock grazing<br>Post-mining landuses will be consistent with surrounding landuses, and not impact on biodiversity values of adjacent woodland and conservation areas. | Land is compatible with proposed land use<br>Return appropriate areas of land to sustainable grazing use<br>Post mining land use does not negatively impact on the biodiversity or environmental values<br>Encourage sustainability and diversity of land use through stakeholder consultation | Pasture species mix identified for preferred land capability<br>Pasture productivity assessment<br>Soil assessment<br>Grazing trial assessment<br>Post-mining land ownership is consistent with post-mining land use<br>Land use is aligned to current and foreseable future usage of adjoining and regional land<br>Participate in local and regional forums to assess land use options |
| Revegetation areas | Restore at least 2,642 hectares of self-sustaining woodland ecosystems in accordance with the rehabilitation plan, including at least 500 hectares of White Box Yellow Box Blakely's Red Gum Woodland. | Rehabilitated Areas – Native Woodland;<br>Rehabilitated Areas – Box Gum Woodland;<br>- Onsite Conservation and Offset areas | Rehabilitation will establish at least 2142ha of native woodland vegetation community (excluding 500 ha Box Gum Woodland).<br>The rehabilitated post-mining landscape will be compliant with relevant regulatory and corporate requirements.<br>Rehabilitation areas will include at least 500 ha of re-established Box Gum Woodland.<br>All onsite biodiversity offset and conservation areas will be managed to increase their biodiversity and habitat value, and meet regulatory requirements. | Suitable vegetation for re-establishment aligned to proposed plant communities<br>Revegetation has facilitated fauna recolonisation and landscape function<br>Plant communities are creating effective habitat linkages and are aligned to surrounding native vegetated lands<br>Biodiversity Offset Management Plan, as conditioned in the Project Approval, is implemented | Native vegetation selection incorporates local species and sourcing seed of local provenance (where possible)<br>Management plan in place for threatening issues such as overgrazing, fire, weeds, drought and pests<br>Evidence to demonstrate that the ecosystem will progress towards self-sustaining recruitment<br>Annual rapid assessment, monitoring and reporting Minimum rehabilitation of 2142ha of native woodland vegetation community<br>Minimum rehabilitation of 500 ha of re-established Box Gum Woodland |

| Approval Feature | Approval Objective | Closure Domain (Primary) | Detailed Objective | Completion Criteria | Performance / Leading Indicator |
|---|---|---|---|---|---|
| Final Voids | Designed as long term groundwater sinks and to maximise groundwater flows across back-filled pits to the final void<br>Minimise to the greatest extent practicable:<br>the size and depth of final voids<br>the drainage catchment of final voids<br>any high wall instability risk<br>risk of flood interaction. | Final Voids | Mining voids remaining in the rehabilitated post-mining landscape will be safe, stable and non-polluting | Final voids assessed by a qualified geotechnical engineer for stability and do not pose a safety risk<br>Void use is compatible with long-term void relinquishment options<br>No long term groundwater impact to downstream users<br>Final voids are consistent with achievable key stakeholder agreed social and environmental values | Void opportunity assessment and recommendations developed in consultation with stakeholders<br>Independent assessment of void design and stability<br>Hydrological modelling<br>Measurement of water quality<br>Defined final use |
| Creek diversions and realignments | Flows to mimic pre-development flows for all flood events up to and<br>including the 1 in 100 year ARI<br>Incorporate erosion control measures based on vegetation and engineering revetments<br>Incorporate structures for aquatic habitat<br>Revegetate with suitable native species | Water management. | Rehabilitated water management features will be re-instated and managed as stable, non-eroding and non-polluting landform features that either hold water (i.e. dams) or allow the unimpeded flow of water (i.e. drainage lines and watercourses) as designed. | Decommissioned mine water management facilities rehabilitated to stable and non-eroding landforms and/ or watercourses.<br>Rehabilitated water management features will be re-instated and managed as stable, and non-polluting landform features that either hold water (i.e. dams) or allow the unimpeded flow of water (i.e. drainage lines and watercourses) as designed | Independent hydrological assessment showing the diversions will function as designed<br>Evidence to demonstrate that the ecosystem will progress towards self-sustaining |
| Surface infrastructure | To be decommissioned and removed, unless agrees otherwise DRE | All Domains | To be decommissioned and removed, unless agrees otherwise DRE | Unless required for post-mining use, infrastructure areas decommissioned and demolished, resulting in safe, stable and non-polluting landscape | Hazardous materials assessment of infrastructure completed to identify the potential health and environmental risks associated with demolition<br>Infrastructure removed and demolished<br>Independent contaminated site assessment after infrastructure removal<br>No visual contamination |
| Community | Ensure public safety<br>Minimise the adverse socio-economic effects associated with mine closure. | Final voids, Rehabilitated Areas Pasture;<br>Rehabilitated Areas Native Woodland;<br>Rehabilitated Areas Box Gum Woodland;<br>Offset Areas | Ensure public safety<br>Minimise the adverse socio-economic effects associated with mine closure.<br>Land use provides social and economic value to the local and wider community | Sustainability and diversity demonstrated by assessment of vegetation type, land use type and suitability to final landform<br>Ongoing management requirements no greater than adjacent non-mined land<br>Post-mining land use is compatible with surrounding land use in terms of optimal social and economic benefit (local and wider community) | Construction of emplacements as per design<br>Progressive rehabilitation<br>Assessment of land use opportunities in conjunction with stakeholders<br>Evidence to demonstrate that the ecosystem will progress towards self-sustaining recruitment (woodlands)<br>Pasture areas are independently shown to support stock |

## 5.3 Rehabilitation Phases

As management domains progress from active or operational domains through to rehabilitated final or post-mining domains, they will progress through a series of Rehabilitation Phases. As well as the Operational phase, which precedes rehabilitation and accounts for all of the domains during this MOP, the phases nominated for the Mt Arthur Coal closure planning process consist of:

(Operational – those areas still actively used for mining, or mining related operations)

1. Decommissioning – removal of hard stand areas, buildings, contaminated materials, hazardous materials;
2. Landform Establishment – incorporates gradient, slope, aspect, drainage, substrate material characterisation and capping of hostile materials;
3. Growing Media Development – incorporates physical, chemical and biological components of the growing media and ameliorants that are used to optimise the potential of the media in terms of the preferred vegetative cover;
4. Ecosystem and Land use Establishment – incorporates revegetated lands and habitat augmentation; species selection, species presence and growth together with weed and pest animal control / management and establishment of flora;
5. Ecosystem and Land use Sustainability – incorporates components of floristic structure, nutrient cycling recruitment and recovery, community structure and function which are the key elements of a sustainable landscape; and
6. Relinquishment – land use and landscape is deemed as suitable to be relinquished from the Mining Lease.

By dividing the temporal progression of rehabilitation into these phases, and allocating progress indicators and relinquishment criteria (as discussed in Section 6), Mt Arthur Coal is able to track the development of rehabilitation to final completion and relinquishment. Not all rehabilitation phases are relevant to each management domain. Table 7 presents the relationship between the management domains adopted for the Mt Arthur Coal closure and rehabilitation planning process, and the applicable rehabilitation phase for that domain (as proposed for end of this MOP). Furthermore the information is also shown in Plans 3A to 3E.

**Table 7: Rehabilitation Phases for Mt Arthur Coal Management Domains proposed for completion at the end of the MOP**

| Rehabilitation Phase | Management Domain | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Voids (1A) | Voids Pasture (1C) | Voids Native Woodl | Voids Box Gum | Water Manag ement | Water Manag ement | Infrastr ucture Voids | Infrastr ucture Pastur | Infrastr ucture Native | Tailing s Pastur | Tailing s Native | Overbu rden Voids | Overbu rden Pastur | Overbu rden Native | Overbu rden Box | Conser vation Areas |
| Operational (Active Mining) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 1. Decommissioning | ✓ | X | X | ✓ | X | ✓ | X | ✓ | ✓ | ✓ | ✓ | ✓ | - | - | - | - |
| 2. Landform Establishment | X | X | X | ✓ | X | ✓ | X | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | - |
| 3. Growing Media Development | X | X | X | ✓ | X | ✓ | X | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | - |
| 4. Ecosystem and Landuse Establishment | X | X | X | X | X | X | X | ✓ | ✓ | ✓ | X | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 5. Ecosystem and Landuse Sustainability | X | X | X | X | X | X | X | X | X | X | X | X | ✓ | ✓ | X | ✓ |
| 6. Relinquishment | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |

# 6 Performance Indicators and Completion Criteria

To measure the development of rehabilitation towards completion, performance indicators, have been developed for each domain (as presented in Section 6), by Rehabilitation Phase (as presented in section 5.3).

The progress benchmarks for the final rehabilitation phase (7. Relinquishment), are known as Relinquishment or closure Criteria. Rehabilitation meeting the Relinquishment Criteria is not necessarily the final or climax community. The communities will continue to develop for many decades. However, achieving these criteria will indicate that the community is on the correct development trajectory to eventually achieve the mature targeted community.

Completion criteria and performance Indicators are directly related to the rehabilitation objectives defined for each Domain in Section 5.1 of this MOP.

Each progress benchmark is selected from, or supported by, relevant and authoritative sources, which may include:

- Technical guidelines and industry standards;
- Scientific literature and industry research;
- Site rehabilitation trials and observations from suitable reference sites; or
- Regulatory guidelines, approval conditions and relevant regulator-approved management plans.

As further trials and research lead to an improved rehabilitation knowledge base, or the drivers for rehabilitation (i.e. technological ability, community and regulatory expectations or the surrounding environment) evolve and change, the modification or refinement of Rehabilitation Objectives, Performance Indicators or Completion Criteria may be warranted.

As well as assessing progress toward Rehabilitation Objectives, non-achievement of these progress benchmarks can also be used to identify the requirement for remedial management actions or the modification of rehabilitation processes. A Trigger Action Response Plan (TARP) has been developed to provide clear guidance on the implementation of responsive or corrective actions. The TARP is presented in Section 9.2.

The Rehabilitation Objectives, Performance Indicators and Relinquishment Criteria for each domain (along with key supporting information) are presented, by Rehabilitation Phase, in the Rehabilitation Tables. The Rehabilitation Tables are included in Appendix 3 to this MOP.

MAC-ENC-PRO-080 Rehabilitation and Ecological Monitoring Procedure, defines the Ecological Development Monitoring Program method, comprising vegetation community assessment (VCA) as well as fauna survey. The VCA component of the program includes permanent monitoring plots, meander transects and photo monitoring; while the fauna survey component includes diurnal avifauna surveys, diurnal herpetological surveys, spotlighting surveys, micro-bat detection surveys and nest box monitoring.

# 7 Rehabilitation Implementation

## 7.1 Status at MOP Commencement

Progressive rehabilitation of mined land has been occurring within the Mt Arthur Coal (and Bayswater) mining areas for nearly two decades. Plan 2 identifies the areas of rehabilitation completed prior to commencement of this MOP period.

Rehabilitation history for each mining domain at Mt Arthur Coal is outlined in Sections 7.1.

### 7.1.1 Domain 1 – Open Cut Voids (Active)

The existing Open Cut Voids at Mt Arthur Coal (as shown on Plan 4) are:

- North Pit;
- Belmont Pit;
- MacDonalds Pit; and
- Saddlers Pit

All four open cut pits are currently used for mining purposes. North Pit is the main active pit for coal extraction, and Saddlers Pit is primarily used for overburden emplacement. Belmont and MacDonalds pits are used as active water storages for mine and process water. Belmont and MacDonalds pits have been partially rehabilitated.

### 7.1.2 Domain 2 – Water Management Structures (Active)

The major water management features (not including open cut voids) at Mt Arthur Coal are the Environmental Dam, CHPP Dam and Main Dam. A disused void within the Drayton sublease is also currently used for water storage. The Environmental Dam and CHPP Dam are currently active and will continue to be used as long-term water storages.

### 7.1.3 Domain 3 – Infrastructure Area (Active)

The Infrastructure Area is situated in the north-east part of Mt Arthur Coal and includes major infrastructure that has an inherent risk in terms of decommissioning or potential contamination. Such facilities include:

Haul roads, park up areas and other surfaces used for the movement of mobile plant;

Main workshops, hardstands, vehicle washdown and tank-farm;

CHPP, stockpile pads, conveyors and associated buildings;

Water treatment plant;

Rail loop, rail load-out and associated rail infrastructure;

Administration building, projects offices, other permanent and temporary administrative buildings, bath-houses, sealed roads and car parks; and

Disused Bayswater facilities, including CPP and workshops.

A list of buildings and structures is presented in the Asset Register, in Appendix 1.

### 7.1.4 Domain 4 – Existing Rehabilitation (Active)

Progressive rehabilitation has been implemented at Mt Arthur Coal for the past two decades. Monitoring and management is driven by the Ecological and Biodiversity management procedure. The existing rehabilitation domain consists of a total of 1169 ha of rehabilitated land as at the end of Fy17, the majority of which consists of overburden emplacements rehabilitated to pasture and native woodland.

### 7.1.5 Domain 5 – Tailings Storage Facilities (Active)

Tailings Storage facilities at Mt Arthur Coal currently consist of the West Cut Tailings Dam, East Pit and North Cut Tailings Dam, with tailings dams SP1, SP2 and SP3 having been decommissioned and capped in 2012.

Tailings dams SP1, SP2 and SP3 are located within the footprint of the dam wall for the Tailings Expansion Project Stage 2. The objective of the capping these dams was to ensure stability of the proposed overlying dam wall. The voids above the tailings surfaces were backfilled up to the crest level of the perimeter embankments with sedimentary mine overburden material. To ensure safe and stable capping, filling of SP1 and SP2 voids was completed in two discrete layers. SP3 was backfilled in six layers, with placement restrictions observed for the first two layers. The final surface was graded to form a free draining surface.

### 7.1.6 Domain 6 – Overburden Emplacements (Active)

Rehabilitation of overburden emplacements represents the majority of rehabilitation completed to date. Rehabilitation of the Bayswater open cut emplacement areas commenced in 1996, with the reshaping and rehabilitation of overburden in the vicinity of MacDonalds Pit to a mix of exotic pasture and native tree belts.

Rehabilitation has continued over the subsequent years, with approximately 1165 ha of pasture and native woodland rehabilitation having been completed across the site at the start of this MOP period FY18. Of the old Bayswater overburden emplacements, only Saddlers Pit emplacements are still active, with the majority of emplacement area in the vicinity of MacDonalds and Belmont Pits having been rehabilitated. Emplacements in North Pit that have been rehabilitated to a mix of pasture and native woodland vegetation include CD1 and VD1.

Although areas of rehabilitation on VD1 have historically been established as pasture rehabilitation, the northern slopes of this emplacement have been committed as native woodland. A program of tubestock planting has been implemented to establish native tree and shrub species across the existing pasture rehabilitation with the modified native tree, shrub and grass mix discussed in Section 7.1

### 7.1.7 Domain 7 – Conservation Areas (Active)

Four conservation or biodiversity offset areas have been established on land covered by Mt Arthur Coal mining leases. These are referred to as the On-site Offset and Conservation Areas, and include:

Saddlers Creek Conservation Area;

Mount Arthur Conservation Area;

Edderton Road Revegetation Area; and

Thomas Mitchell Drive On-site Offset Area.

Middle Deep Creek, Roxburgh Road, Additional Off-site Offset and Thomas Mitchell Drive Off-site Offset Areas are not situated on Mt Arthur Coal mining leases, and are not discussed in this MOP.

The Conservation Areas have not been not been disturbed by mining and; therefore, no rehabilitation has occurred on these lands. However, active native vegetation regeneration programs have been implemented in the Thomas Mitchell Drive On-site Offset Area and Saddlers Creek Conservation Area. Land management programs such as weed control, exclusion fencing and feral animal control have also been implemented across all these areas.

## 7.2 Proposed Rehabilitation Activities this MOP Term

During this MOP period, Mt Arthur Coal will continue to implement the rehabilitation programs contained in the site Rehabilitation Strategy. This will include the reshaping and revegetation of 243 ha. As the majority of the mine areas and facilities are still operational, the proposed activities will be discussed by Primary Domain. The areas proposed for rehabilitation during this MOP period are shown on Plans 3A to 3E, with rehabilitation areas presented in Table 12.

Disturbance and rehabilitation progression during the MOP areas is presented in Table 10. Proposed rehabilitation activities for each primary domain at Mt Arthur Coal is outlined in Section 7.

**Table 8: Disturbance and Rehabilitation Progression during the MOP**

| Year | Annual Disturbance Area (ha) | Cumulative Disturbance (ha) | Annual Rehabilitation Area (ha) | Cumulative Rehabilitation Area (ha) | Comments |
|---|---|---|---|---|---|
| End FY 17 (30 Jun 2017) | 31 | 3,297 | 57 | 1,171 | Actual reported in AEMR |
| End FY 18 (30 Jun 2018) | 226 | 3,491 | 32 | 1,160 | New quarry started within mine disturbance area |
| End FY 19 (30 Jun 2019) | 309 | 3,710 | 90 | 1,158 | - |
| End FY 20 (30 Jun 2020) | 137 | 3,706 | 141 | 1,281 | Dependant on the completion of the Ayredale dump. |
| End FY21 (30 Jun 2021) | 51 | 3,705 | 53 | 1,334 | - |
| End MOP (30 Jun 2022) | 260 | 3,884 | 81 | 1,254 | South west emplacement construction |
| **Total FY18 -22** | 984 | 3,884 | 397 | 1,254 | |

Note: years FY20 – 22 are indicative only and will be updated in the next MOP period as the mine plan evolves. Disturbance cumulative total takes into account rehabilitated area.

### 7.2.1 Site wide programs

The major modification to rehabilitation method across all domains is the change in vegetation establishment to encourage the development of specific box gum woodland communities.

In the past, pasture rehabilitation has largely been established by broadcast seeding of a pasture seed mix, based heavily on exotic grass species such as rhodes grass (Chloris gayana), kikuyu (Pennisetum clandestinum) and green panic (Panicum maximum). The actual composition of the pasture seed mix has varied substantially, with the most significant change being the reduction and eventual removal of rhodes grass due to its observed dominance in pasture rehabilitation. Native grass species have also been used to a greater extent in recent years, as discussed below.

The native woodland vegetation seeded before July 2012 was a generic native tree and shrub mix based on species common to native vegetation communities of the Upper Hunter Valley floor. Following consultation with ecological consultants, the seed mix used to establish woodland rehabilitation at Mt Arthur Coal was modified during 2013 to better reflect the species composition of Upper Hunter White Box – Ironbark Grassy Woodland. This seed mix was also modified to include mainly native grass species, along with a sterile exotic cover crop, for groundcover.

Mt Arthur Coal will continue a program of native seed harvesting from remnant native vegetation located on Mt Arthur Coal owned land. This seed will be used in rehabilitation direct-seeding, or to develop tubestock for planting in rehabilitation and regeneration activities.

Re-establishing, or increasing, the habitat value of rehabilitated woodland vegetation communities, by the placement of recovered habitat features such as hollow-bearing logs, large wooden debris and rocks will be a key rehabilitation initiative. Large surface rocks raked clear during overburden emplacement rehabilitation will be placed in piles as habitat features amongst or adjacent to remnant vegetation where possible.

Exploration drill site rehabilitation will continue during this MOP period and consist of backfilling sumps and allowing for backfill settlement. Following adequate settlement, disturbed sections of exploration sites (approximately 50 by 50 metres) will be given a final trim, with any protective bunds or recovered topsoil reinstated. For pasture areas the disturbed areas will be hand-seeded with a pasture rehabilitation mix.

General rehabilitation maintenance, land management and biodiversity enhancement activities will continue over previously rehabilitated areas during this MOP period, including:

- Rehabilitation and ecological monitoring and trials (see Section 8)
- Supplementary tubestock planting for visual amenity and habitat enhancement where deemed required;
- Slashing, fencing, fertiliser application and access control;
- Weed and feral animal control; and
- Minor remedial earthworks repairs.

### 7.2.2 Domain 1 – Open Cut Voids

No rehabilitation activities are proposed in this domain during this MOP period.

### 7.2.3 Domain 2 – Water Management Structures

Decommissioning of the Main Dam will continue during this MOP period. Following decommissioning, the dam will be capped with spoil and rehabilitated.

### 7.2.4 Domain 3 – Infrastructure Area

Decommissioning of the disused Bayswater infrastructure area (including workshops, hardstands, buildings disused CHPP, and related structures) will continue during this MOP period. A contamination assessment and remedial action plan has been approved by the DP&E with project planning underway for dismantling and removal of surface structures. The majority of the decommissioned area will be covered by the dam wall of the extended tailings storage facility expected to be constructed in the second half of this MOP period.

All other facilities within the Infrastructure Area will remain operational during this MOP period.

### 7.2.5 Domain 4 – Existing Rehabilitation

Monitoring and maintenance/remedial activities will continue within existing rehabilitation areas over the period of this MOP. Annual monitoring as per the ecological and rehabilitation procedure will be reported in the AEMR.

### 7.2.6 Domain 5 – Tailings Storage Facilities

North Cut Tailings Dam will be decommissioned and capping design commenced during this MOP period. The capping design is being completed by an experienced tailings consultant and capping is likely to start in FY20.

No other rehabilitation works on Tailings Storage Facilities are scheduled during this MOP period.

### 7.2.7 Domain 6 – Overburden Emplacements

The majority of rehabilitation scheduled during this MOP period will consist of overburden emplacement rehabilitation as shown in Table 12.

The rehabilitation of emplacement areas consists of four broad phases – bulk reshaping, ground preparation, top soiling, and revegetation. Emplacement progression depends on the active mining area, however the intent is to complete lifts so that visual edges can be rehabilitated as the emplacement is built.

As discussed in Section 2.3.4, overburden emplacements are constructed in lifts by rear dump mine trucks. The overburden generally consists of Permian materials including laminated siltstones, fine-grained sandstones and claystone bands. Bulk reshaping of overburden emplacements is the initial stage of rehabilitation, using large bulldozers (i.e. Caterpillar D11 or similar), to generally have an overall slope of approximately 10 degrees.

As a result of the FLDP investigation and consistent with the requirements of the Mt Arthur Coal Modification Project PA 09_0062 MOD 1, the final landform plan as submitted in this MOP was able to be refined, providing an alternative final landform option that better reflects the surrounding natural landscape. The main changes to the final landform plan include variation in slope angle on the outer face of the VD1 emplacement (visible to the Muswellbrook community), with mid-slope designed to ~14 degrees and the upper-slope at ~5 degrees in places to achieve an overall slope of 10 degrees.

The next stage of rehabilitation, ground preparation, includes:

deep ripping the reshaped overburden along the surface contour to disrupt any hard pans left during dumping, aid water infiltration and create a key between the overburden and overlying topsoil;

rock-raking the surface clear of large boulders that may impede subsequent rehabilitation works or grazing operations (for pasture rehabilitation areas);

final trim to ensure the final landform surface is trafficable, free of anomalous features and integrates seamlessly with adjacent landforms; and

constructing and integrating water management infrastructure, to minimise the potential for erosion.

Water management infrastructure consists of contour diversion drains constructed at regular intervals down rehabilitated slopes to capture and divert surface water run-off into protective drop structures. These drains and drop structures report to sediment dams, which allow for the settling of suspended solids. Design and construction of the sediment dams is consistent with the Blue Book (Managing Urban Stormwater: Soils & Construction, Volume 1, 4th Edition, 2004 and Volume 2E Mines and Quarries, 2008).

Topsoil is sourced from nearby stockpiles, or directly placed from stripping operations. Due to the age and variable quality of stockpiled soil, it is tested before placement to determine suitability and identify amelioration requirements. The material is then placed and spread to an approximate depth of 150 - 300 millimetres. Ameliorants (i.e. gypsum), if required, are applied and integrated, and the topsoil surface is contour cultivated prior to seeding to provide suitable micro-environments that shelters seed and encourages water infiltration. The landscape being constructed will also include extensive use of trees and rock scarp for visual relief.

Pasture rehabilitation areas are cultivated and broadcast sown with the pasture seed mix in a single pass. The pasture seed mix generally used by Mt Arthur Coal is shown in Table 9. This mix is subject to change depending on results, landscape and expert advice and may change within the MOP period.

**Table 9: Mt Arthur Coal pasture seed mix**

| Common name | Species name | Seed mix kg/ha |
|---|---|---|
| Couch | *Cynodon dactylon* | 10 |
| Lucerne | *Medicago Sativa* | 3 |
| Green Panic | *Panicum Coloratum* | 3 |
| Seaton Park Sub-clover | *Trifolium Subterranean* | 3 |
| Haifa White Clover | *Trifolium Repens* | 3 |
| Kikuyu | *Pennisetum Clandestinum* | 3 |
| Wimmera Rye | *Lolium Rigidum* | 7 |
| Perennial Rye | *Lolium Perenne* | 7 |
| Phalaris | *Phalaris Aquatica* | 5 |
| Shirohie Millet (summer) | *Echinochloa Esculenta* | 10 |
| Oats (winter) | *Avena Sativa* | 10 |

Areas of Box Gum Woodland (and Native Woodland) rehabilitation will be seeded with a tree, shrub and grass seed mix targeting the establishment of Upper Hunter Box-Ironbark Woodland vegetation community (which is the same community as Central Hunter Box-Ironbark Woodland). The seed mix also includes an exotic sterile cover crop to assist with initial slope stabilisation, weed and dust control, while native vegetation establishes. Due to the wide range of seed size and weight, the woodland seed mix is broadcast sown in two passes. The Box Gum Woodland seed mix generally used by Mt Arthur Coal is shown in Table 10.

This seed mix has been introduced to achieve the targeted community structure and species composition for Central Hunter Box-Ironbark Woodland, as presented in Table 10. The woodland mix is a guide and subject to change within the MOP period due to analysis of results, landscape type and expert advice.

**Table 10: Mt Arthur Coal Box Gum Woodland seed mix**

| Common Name | Species name | Seed mix (kg/ha) |
|---|---|---|
| Narrow-leaved Ironbark | *Eucalyptus crebra* | 0.2 |
| White Box | *Eucalyptus albens* | 0.3 |
| Grey Box | *Eucalyptus moluccana* | 0.3 |
| Blakely's Red Gum | *Eucalyptus blakelyi* | 0.3 |
| Kurrajong | *Brachychiton populensis* | 0.2 |
| Showy Wattle | *Acacia decora* | 0.3 |
| Kangaroo Thorn | Acacia paradoxa | 0.3 |
| Lightwood | *Acacia falcata* | 0.2 |
| Hickory Wattle/Silver-leaved Wattle | *Acacia implexa* | 0.2 |
| Sticky hop-bush | *Dodonaea viscosa spatulata* | 0.3 |
| Black she-oak | *Allocasuarina littoralis* | 0.2 |
| Native blackthorn | *Bursaria spinosa* | 0.1 |
| Mixed endemic grass seed | *Cymbopogon refractus, Bothriochloa decipiens, Bothriochloa macra, Dichanthium sericeum, Chloris truncata, Aristida sp., Sporobolus creber* | 2.0 |
| Couch | *Cynodon dactylon* | 1.0 |
| Slender spear grass | *Austrostipa verticilata* | 0.05 |
| Coolabah Oats (winter) | *Avena Sativa* | 5.0 |

Establishment of key canopy and understorey species of the Central Hunter Box – Ironbark Woodland community (Table 11) on areas of VD1 previously rehabilitated as pasture will continue during this MOP period. Vegetation establishment works will include intensive weed treatment, pasture slashing, ripping of planting line, tubestock planting of target species, and follow up guarding and watering, if required.

Temporary stabilisation works, such as the aerial seeding of exposed overburden surfaces not ready for final rehabilitation, will continue throughout this MOP period. The aerial seeding of these overburden surfaces with a pasture mix of hardy, fast-growing grass, form and legume species has produced promising results and assisted with reducing wind-blown dust generation. The seed mix used in the aerial seeding program was selected based on advice provided by a Hunter Valley based agronomist. The species included are grass and legume species commonly used across the Hunter Valley and that are hardy and quick to establish.

**Table 11: Species composition and community structure criteria for targeted vegetation communities.**

| Proposed Rehabilitation Vegetation | | | |
|---|---|---|---|
| Planned Vegetation Community | Target Condition | | |
| | Canopy | Understorey | Ground Cover |
| Central Hunter Box - Ironbark Woodland | 10-40% cover dominated by either grey/white box hybrids (Eucalyptus albens x moluccana), or narrow-leaved ironbark (Eucalyptus crebra). | 1-10% cover comprising regrowth of canopy species as well as Cassinia quinquefaria, western golden wattle (Acacia decora), kangaroo thorn (Acacia paradoxa), native blackthorn (Bursaria spinosa), western boobialla (Myoporum montanum), and native olive (Notelaea microcarpa var. microcarpa). | Up to 85% cover and between 0.1 to 1m in height and containing target species as described in Section 4.3.1 of the Baseline Ecological Study of Mt Arthur Coal Biodiversity Offset and Conservation Areas (Umwelt, 2013). |
| Hunter Floodplain Red Gum Woodland Complex (Saddlers Creek Conservation Area only) | Up to 20% cover. Dominated by yellow box (Eucalyptus melliodora), grey/white box hybrids (Eucalyptus albens x moluccana), red gum hybrids (Eucalyptus blakelyi x tereticornis), Blakely's red gum (Eucalyptus blakelyi) and forest red gum (Eucalyptus tereticornis). In some areas swamp oak (Casuarina glauca) and rough-barked apple (Angophora floribunda) | Up to 20% cover comprising regrowth of canopy species as well as cooba (Acacia salicina) and native olive (Notelaea microcarpa var. microcarpa). | Up to 95% cover between 0.1 to 1m in height and containing target species as described in Section 4.3.2 of the Baseline Ecological Study of Mt Arthur Coal Biodiversity Offset and Conservation Areas (Umwelt 2013). |
| Central Hunter Ironbark - Spotted Gum – Grey Box Forest | Up to 30% cover dominated by spotted gum (Corymbia maculata). | 1-10% cover comprising cooba (Acacia salicina), native olive (Notelaea microcarpa var. microcarpa), native blackthorn (Bursaria spinosa), shiny-leaved canthium (Psydrax odorata) and western boobialla (Myoporum montanum). | Up to 70% cover between 0.1 to 1m in height and containing target species as described in Section 4.3.9 of the Baseline Ecological Study of Mt Arthur Coal Biodiversity Offset and Conservation Areas (Umwelt, 2013). |

#### 7.2.8 Domain 7 – Conservation Areas

The Conservation Areas have not been disturbed by mining and; therefore, no rehabilitation is scheduled during this MOP period on these lands.

Land Management programs such as regeneration, weed control, exclusion fencing and feral animal control will continue across all the onsite Conservation Areas.

## 7.3 Summary of rehabilitation areas during the MOP

A summary of rehabilitation progress towards relinquishment, by domain and rehabilitation phase, is presented in Table 12.

**Table 12: Mt Arthur Coal rehabilitation summary by domain**

| Secondary Domain | | | | |
|---|---|---|---|---|
| **Domain** | | **Rehabilitation Phase** | **Start (ha)** | **End (ha)** |
| Open Cut Void | 1 | N/A | 1558 | 1634 |
| Water Management | 2 | | 93 | 81 |
| Infrastructure | 3 | | 637 | 524 |
| Existing Rehabilitation | 4 | | 1171 | 1309 |
| Tailings Storage | 5 | | 137 | 120 |
| Overburden Emplacement | 6 | | 1279 | 1369 |
| Conservation Areas | 7 | | 726 | 726 |
| ~~Total~~ | | | 5601 | 5708 |
| **Primary Domain** | | | | |
| **Domain** | | **Rehabilitation Phase** | **Start (ha)** | **End (ha)** |
| Final Voids | A | Active | 187.9 | 193.8 |
| | | Decommissioning | 0 | 0 |
| | | Landform Establishment | 0 | 0 |
| | | Growth Medium Development | 0 | 0 |
| | | Ecosystem and Landuse Establishment | 0 | 0 |
| | | Ecosystem and Landuse Sustainability | 0 | 0 |
| | | Relinquishment | 0 | 0 |
| | | **Sub-total** | 187.9 | 193.8 |
| Water Management | B | Active | 9.5 | 9.5 |
| | | Decommissioning | 0 | 0 |
| | | Landform Establishment | 0 | 0 |
| | | Growth Medium Development | 0 | 0 |
| | | Ecosystem and Landuse Establishment | 0 | 0 |
| | | Ecosystem and Landuse Sustainability | 0 | 0 |
| | | Relinquishment | 0 | 0 |
| | | **Sub-total** | 9.5 | 9.5 |
| Rehabilitation – Pasture | C | Active | 2668 | 2718 |
| | | Decommissioning | 0 | 0 |
| | | Landform Establishment | 0 | 0 |
| | | Growth Medium Development | 0 | 0 |
| | | Ecosystem and Landuse Establishment | 0 | 0 |
| | | Ecosystem and Landuse Sustainability | 499 | 767 |
| | | Relinquishment | 0 | 20 |
| | | **Sub-total** | 3168 | 3506 |
| Rehabilitation – Native Woodland | D | Active | 624 | 792 |
| | | Decommissioning | 0 | 0 |
| | | Landform Establishment | 0 | 0 |
| | | Growth Medium Development | 0 | 0 |
| | | Ecosystem and Landuse Establishment | 0 | 0 |
| | | Ecosystem and Landuse Sustainability | 513 | 566 |
| | | Relinquishment | 0 | 0 |
| | | **Sub-total** | 1138 | 1358 |
| Rehabilitation – Box Gum Woodland | E | Active | 292 | 134 |
| | | Decommissioning | 0 | 0 |
| | | Landform Establishment | 0 | 0 |
| | | Growth Medium Development | 0 | 0 |
| | | Ecosystem and Landuse Establishment | 0 | 0 |
| | | Ecosystem and Landuse Sustainability | 146 | 304 |
| | | Relinquishment | 0 | 0 |
| | | **Sub-total** | 439 | 439 |
| Conservation Areas | F | Active | 0 | 0 |
| | | Decommissioning | 0 | 0 |
| | | Landform Establishment | 0 | 0 |
| | | Growth Medium Development | 0 | 0 |
| | | Ecosystem and Landuse Establishment | 726 | 626 |
| | | Ecosystem and Landuse Sustainability | 0 | 100 |
| | | Relinquishment | 0 | 0 |
| | | **Sub-total** | 726 | 726 |

## 7.4 Relinquishment phase achieved during MOP period

Assessment of the monitoring results will be made during this MOP period. The relinquishment of rehabilitated areas will be discussed further with DRG with the intent that rehabilitation that has met relinquishment criteria as defined in Appendix 3 and aligns with the objectives in Table 6 is able to be progressively relinquished. Mt Arthur Coal intends to relinquish rehabilitated areas in-line with progressive rehabilitation for areas that will not be disturbed by future mining, however further monitoring is required to verify relinquishment areas success before relinquishment process can be made with DRG.

# 8 Rehabilitation Monitoring, Research and Reporting

## 8.1 Rehabilitation Monitoring

These programs have been implemented to achieve the following objectives:

- assess the condition and development of rehabilitated/regenerated vegetation;
- assess the stability of land surface, landforms and related engineering structures;
- allow for the comparison of rehabilitated/regenerated areas with relevant baseline information, reference sites;
- progress indicators and completion criteria as listed in the Mt Arthur Coal Mining Operations Plan (MOP);
- identify requirements for maintenance or remedial treatment; and
- meet statutory and corporate requirements relating to rehabilitation and ecological monitoring.

The following monitoring programs have been implemented, at Mt Arthur Coal as part of the Rehabilitation and Ecological Monitoring Procedure:

Rehabilitation Completion

Landform Stability

Ecological Development

Grazing Potential

### 8.1.1 Rehabilitation completion monitoring

Rehabilitation completion monitoring is undertaken during rehabilitation projects to ensure the rehabilitation method used to complete the rehabilitation is recorded, and meets the standards adopted by Mt Arthur Coal. The monitoring requires the rehabilitation contractor and Mt Arthur Coal representative to inspect the works after each key phase and sign-off that the completed work meets the specifications for rehabilitation included in the contract. An inspection checklist is completed and signed by both contractor and site representative to show compliance.

### 8.1.2 Landform stability monitoring

Landform stability monitoring program consists of an inspection regime for all rehabilitated areas, buffer land, final voids and offset and conservation areas to monitor long-term stability of rehabilitated and modified natural lands. The inspections consist of post-rehabilitation and annual rapid assessments, plus a five year inspection by a suitably qualified specialist. The aim of this program is to:

- prove that all post-mining landforms are vegetated, relatively stable and represent minimal risk of failure;
- identify areas of significant active erosion across Mt Arthur Coal owned land (except operational and infrastructure areas), and evaluate potential for environmental impact; and
- determine the requirement for maintenance, remedial treatment or modification of rehabilitation measures.

### 8.1.3 Ecological development monitoring

Ecological development monitoring program consists of flora and fauna assessments (including reference sites), post-regeneration inspections and weed assessments for woodland rehabilitation areas and conservation areas, in order to:

- prove that areas designated as providing biodiversity value in the post-mining landscape are trending towards the selected vegetation community composition and structure (as described in relinquishment criteria, presented in the MOP or BMP); and
- identify requirement for maintenance activities, remedial action, or modification to rehabilitation, regeneration or land management programs.

The Mt Arthur Coal ecological monitoring program uses an Annual Rapid Assessment (ARA). Monitoring locations have been chosen by a consultant and provide suitable assessment of rehabilitation against analogue sites where possible. The ARA will consist of:

1. A desktop review of latest aerial photography and previous ARA's to identify potential areas of concern that require a field walkover, including significant active erosion, evidence of soil degradation, vegetation failure and infrastructure failure; and
2. A field walkover of all subject areas to identify, photograph and determine corrective actions for all identified areas of concern. For visible active erosion or other evidence of instability:

- Record GPS coordinates;
- Photograph from upslope and downslope; and
- If appropriate, take notes and measurements, such as size, depth, width, active/nonactive, erosive or depositional and record on the ARA form.

In addition to the above, an inspection will occur post rainfall events (within 7 days) of newly established rehab with less than 70% ground cover. Within this inspection the following criteria will be assessed:

- Effectiveness of contours (if present);
- Identification and evaluation of any area of active/potential erosion; and,
- Rapid assessment of newly established rehab for level of groundcover percentage to
- determine if future monitoring is required under this program.

The ARA is undertaken:

- Within three to six months of rehabilitation establishment, and then annually;
- For at least five years; and
- Until the area/structure is determined to be relatively stable by an independent expert.

The Grazing Potential monitoring program consists of periodic ground and pasture assessments and grazing trials on those areas of pasture rehabilitation and buffer land that are designated as potential post-mining grazing areas. The aims of the program are to show that proposed grazing pasture displays the landscape, soil and pasture characteristics suitable for supporting sustainable beef cattle grazing, and identify maintenance and remedial requirements.

Fenced pasture rehabilitation adjacent to the Belmont and MacDonald's Void will be used during the MOP period for small scale cattle grazing to assess grazing and rehabilitation performance and maintain long term sustainable pastures.

Stocking rates will be in the approximate range 7 – 9.5 dry sheep equivalent per hectare depending on the mix of breeding (>500kg) and growing cattle (300-500kg). Rotational grazing (for stocking rates in range mentioned above) or continuous grazing (for lower stocking rates) will be employed dependent on stocking densities. Monitoring will enable responsive changes to stocking rate and grazing regime as seasonal conditions vary.

Trigger points defining target conditions to achieve sustainable livestock production with best practice land management are listed below in Table 13.

**Table 13: Trigger points to achieve sustainable livestock production**

| | Low (less than) | Ideal | Comment | Action Required |
|---|---|---|---|---|
| Ground cover | 70% | 90-100% | Ground cover includes higher slopes 80% cover | Reduce grazing pressure, encourage pasture regeneration |
| Perennial grass component of pasture | Minimum 40% | 60-80% | Provides stable grassland base, must maintain some diversity | Increase perennial pasture component with strategic grazing |
| Dominant grass (% of total pasture cover) | > 40% of total cover | <40% | Lack of diversity, often the least palatable grass dominates | - |
| Herbage mass (kg DM/ha) cattle | 1000kg (4-5 cm) | 2000kg (10cm) | Low herbage mass limits animal production /health, reduces groundcover and litter formation | Monitor herbage mass and remove stock as required |

Grazing infrastructure will include stock proof fencing and existing farm dams for water with back up reticulated water supply. Cattle will be excluded from riparian and woodland rehabilitation. Full scale drought feeding will not be conducted on these pastures, as damage to the pastures while feeding could be irreversible. Early destocking will be the preferred management if drought conditions are severe.

Further detail on these programs is currently being documented in the Rehabilitation and Ecological Monitoring procedure.

## 8.2 Research and Rehabilitation Trials and Use of Analogue Sites

Methods to re-establish the targeted vegetation communities required under regulatory approvals have been the focus of recent research and field trial projects. The research and trials have been based on selecting the best methods of establishing the targeted vegetation species in existing pasture rehabilitation, including seed mix refinement and planting/ seeding methods. The outcomes of this program, where appropriate, have been incorporated into the rehabilitation and regeneration programs in VD1 and Saddlers Creek Conservation Area, respectively.

Targeted seed mixes have been refined for two of the targeted communities - Upper/Central Hunter Box-Ironbark Woodland (BIW) and Central Hunter Ironbark – Spotted Grey-Gum Box Forest (ISG). The BIW seed mix is currently being utilised in rehabilitation programs, and the ISG will be utilised, once the level overburden emplacement surfaces require rehabilitation. Species composition of tubestock planting programs (rehabilitation and regeneration) has been modified to reflect the Hunter Floodplain Red Gum Woodland (HFR), ISG and BIW vegetation communities. The regeneration program targeting HFR will be restricted to the Saddlers Creek Conservation area, which will be the only onsite post-mining landscape that provides suitable landform and drainage conditions.

Further field trials into the establishment of box gum grassy woodlands (especially groundcover and understoreys) in existing pasture rehabilitation will be developed over this, and subsequent, MOP periods. This research will specifically investigate methods to reduce the dominance of exotic grass species, increase the proportion of native grass species, and control weed proliferation, when modifying existing pasture rehabilitation. Where possible Mt Arthur Coal will also look to utilise the results of other research initiatives completed in the Hunter Valley to help develop and inform establishment of box gum woodland.

During this MOP period a grazing trial on rehabilitated land south of MacDonalds Pit will continue, with a reference

site established on adjacent non-mined grazing land. This trial area forms part of an industry-wide rehabilitation grazing trial being coordinated by NSW Mining, as part of the Upper Hunter Mining Dialogue. A supplementary broad-brush grazing suitability assessment of pasture rehabilitation across the Mt Arthur Coal mine has commenced and will be finalised during this MOP period. This assessment is investigating the existing pasture rehabilitation areas at the mine and providing general recommendations for landscape, soils and pasture selection and development for future areas.

The ecological and rehabilitation monitoring undertaken at Mt Arthur Coal includes flora and fauna monitoring on rehabilitated sites, and remnant native woodland sites (analogue sites) located at various distances from open cut operations. The monitored remnant vegetation sites are used as reference locations, for comparison between years, and with the rehabilitated sites. These sites will be used to show progress towards relinquishment of rehabilitated areas.

A void investigation will be developed and completed in this MOP period. The intent is to better understand the options available to void relinquishment and the benefits that could be available to communities or the environment. The void investigation will be communicated to DRG and DPE on a regular basis to ensure progress aligns with expectations. This work will complement the NSWMC void work that is currently underway.

The implementation of the Applied Geofluv™ design on the MacLeans emplacement will be monitored to understand its benefits and limitations during the MOP period. From the review a plan for life of mine will be developed. Depending on the review results, other design methods will be included to ensure safety, stability, cost and land use are acceptable for emplacements.

Investigation and trial into using sterile cover grass crops for land that is in preparation for rehabilitation but not necessarily ready for seeding. This will include further development of the planning process that links rehabilitation preparation to appropriate seeding timing. The intent is to ensure rehabilitation does not get setbacks or rework associated with weed infestation.

# 9 Intervention and Adaptive Management

## 9.1 Threats to Rehabilitation

Section 3.2 discusses operational management of environmental risks specifically relating to rehabilitation. Building on the risks and issues discussed in Section 3.1, the major threats to the achievement of rehabilitation performance indicators and/or successful post-mining land use are summarised below. As discussed in Section 8, monitoring programs have been implemented to assess rehabilitation progress towards post-mining land use and identify potential threats that may impede that progress. The earlier these threats are identified, the greater the opportunity to introduce effective management actions to negate those threats. Such actions may include the implementation of remedial strategies to address realised impacts, or the modification of existing management processes to prevent impacts developing or worsening (i.e. adaptive management). A TARP has been developed to provide guidance on appropriate and timely response, if these threats should be identified or predicted.

### 9.1.1 Soils, Geology & Erosion

- Poor quality or insufficient topsoil due to natural deficiency or poor management, leading to inability to establish vegetation desired for ecological communities or grazing;
- Surface (wind or water) erosion leading to degradation of growth medium and rehabilitation quality;
- Major geotechnical failure of overburden emplacement, such as slumping or subsidence;
- Geotechnical failure of final void residual walls, leading to an unstable and potentially polluting landscape;
- Spontaneous combustion of near-surface waste material generating pollution, destabilising land surface and impeding vegetation establishment;
- Sodicity and/or salinity of spoils/soils leading to accelerated erosion and preventing successful vegetation establishment;
- Failure of water management structures (or natural drainage lines), leading to erosion, unstable landform and potential pollution; and
- Targeted land capability class not met by rehabilitated landform and soils.

### 9.1.2 Biological factors

- Insufficient, poor quality or incorrect species seed/seedlings leading to poor vegetation establishment;
- Inadequate weed control, leading to extreme weed competition preventing establishment of desired species;
- Continued dominance of exotic tropical grass species, preventing successful establishment of native grass groundcover;
- Inadequate vertebrate pest animal control leading to predation of juvenile vegetation and poor biodiversity (habitat) outcomes;
- Ecosystem processes (i.e. reproduction, nitrogen fixing and nutrient recycling) not re-established, leading to sterile unsustainable ecosystem;
- Insect attack, disease infestation causing premature vegetation die-back; and
- Poor vegetation development leading to simplified, non-stratified community structure of poor habitat value.

9.1.3 Environmental Factors

- Severe and/or prolonged drought leading to widespread failure of revegetation;
- Uncontrolled bush fire events leading to widespread failure of revegetation areas;
- Major Storm event resulting in flooding, geotechnical instability, major erosion and/or widespread damage to rehabilitation areas; and
- Unintended seasonal landform inundation or waterlogging preventing vegetation establishment or causing die-back of established vegetation.

9.1.4 Pollution Issues

- Soil/ overburden geochemistry leading to continuous offsite release of contaminants from mined materials/ waste material requiring long-term management or treatment;
- Unsatisfactory water quality of final void waters leading to environmental impacts, and failed post-mining void use; and
- Unexpected contaminated land (i.e. undisclosed asbestos or hazardous waste disposal areas), leading to costly treatment and disposal, and delayed relinquishment.

9.1.5 Management/ Organisational

- Poor systems implementation, leading to inadequate rehabilitation monitoring and maintenance;
- Inadequate resources lodged/ provisioned to successfully rehabilitate mine areas at closure;
- Evolving regulatory requirements, conflicting community expectations and district land uses leading to difficulties negotiating or attaining relinquishment criteria for older rehabilitation; and
- Pasture areas subjected to prolonged/ uncontrolled overgrazing by livestock, leading to loss of vegetative cover, erosion and land degradation.

## 9.2 Trigger Action Response Plan

A TARP (Table 14) has been developed that identifies potential post-rehabilitation trigger events or indicators, and the appropriate response strategies to be implemented should those triggers be realised. Accurate identification of trigger events provides for early responses to emerging rehabilitation risks. As well as identifying the initial trigger for response, Mt Arthur Coal's rehabilitation and ecological monitoring program shall be the primary means to monitor the effectiveness of the response actions.

As conditions on a mine change, new major hazards may be identified and added to the TARP. Mt Arthur Coal will regularly review its risks and update the TARP as required.

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**Table 14: Trigger Action Response Plan for Rehabilitation Establishment**

| Risk and Level for Response | Monitoring & Measurement Process | Trigger | Proposed Response Action and Mitigation Measures | Responsible Person |
|---|---|---|---|---|
| Soils, Geology & Erosion | | | | |
| Poor quality/ insufficient topsoil impeding vegetation establishment for ecological communities or grazing. | Monitoring programs: Landform Stability; Grazing Potential, Topsoil Monitoring. | Trigger: Progress indicators: Growth Medium Development, Ecosystem/Land use Establishment; Ecosystem/Land use Sustainability. | Utilisation of subsoils/ spoil materials, with appropriate soil supplements and ameliorants, as alternates to topsoil.<br>Appropriate delineation and recovery of all suitable topsoil resources and topsoil management in accordance with Land Management Procedure to ensure maximum available resource.<br>Review post-mining land use selection to reduce topsoil intensive uses. | Superintendent HSE |
| Surface (wind or water) erosion leading to degradation of growth medium and rehabilitation/offset quality. | Monitoring programs: Landform Stability. | Trigger: Progress indicators: Growth Medium Development, Ecosystem/Land use Establishment; Ecosystem/Land use Sustainability. | Ensure up-catchment reshaping minimises slopes >10° or incorporates appropriate drainage management.<br>Review rehabilitation methods and monitoring/maintenance regime to identify root cause of erosion.<br>Remediation of concentrated erosion impacts (if possible).<br>Rapidly stabilise up-catchment substrate and increase organic matter using sterile cover crops and sow with appropriate ground cover species. | Superintendent HSE<br>Superintendent Short Term Planning |
| Major geotechnical failure of overburden emplacement, | Monitoring programs: Landform Stability. | Trigger: Progress indicators: Landform Establishment. | Ensure emplacement reshaping minimises slopes >10° or incorporates appropriate drainage management. | Manager Production |

| Risk and Level for Response | Monitoring & Measurement Process | Trigger | Proposed Response Action and Mitigation Measures | Responsible Person |
|---|---|---|---|---|
| such as slumping or subsidence. | | | Review emplacement design, dumping methods and monitoring/maintenance regime to identify root cause of failure.<br>Review impacts on proposed post-mine land use in affected area.<br>Remedial earthworks and/or rehabilitation, as required. | Superintendent HSE<br>Superintendent Short Term Planning<br>Principal Geotechnical Engineer |
| Targeted land capability class not met by rehabilitated landform and soils. | Monitoring programs: Landform Stability; Grazing Potential. | Trigger: Progress indicators: Landform Establishment; Growth Medium Development. | Review landform design, rehabilitation planning and reshaping operational controls to identify root cause of incorrect land capability class establishment.<br>Identify future rehabilitation for potential increase of land capability class area to compensate for current loss of area.<br>Investigate impact on proposed post-mining land use, to identify appropriate remedial strategies, or modification of post-mining land use options. | Superintendent HSE<br>Superintendent Short Term Planning |
| Failure of water management structures (or natural drainage lines), leading to erosion, unstable landform and potential pollution. | Monitoring programs: Landform Stability. | Trigger: Progress indicators: Landform Establishment; Growth Medium Development; Ecosystem/ land use Establishment. | Review landform design and reshaping operational controls to identify root cause of poor drainage performance.<br>Identify remedial strategy that repairs immediate failure and downstream impacts, improves up-catchment infiltration or drainage diversion. | Superintendent HSE<br>Superintendent Short Term Planning |
| Sodicity and/or salinity of spoils/soils leading to accelerated erosion and | Monitoring processes/ programs: Materials geochemical assessment | Trigger: Progress indicators: Landform Establishment; | Conduct soil characterisation sampling and review current rehabilitation practices to identify root cause of erosion/dispersion. | Superintendent HSE |

| Risk and Level for Response | Monitoring & Measurement Process | Trigger | Proposed Response Action and Mitigation Measures | Responsible Person |
|---|---|---|---|---|
| preventing successful vegetation establishment. | during project planning. Landform Stability. | Growth Medium Development. | Identify remedial strategy that modifies existing process of soil characterisation and selection and rehabilitation to prevent recurrence, and treats and repairs immediate failure and downstream impacts (i.e. topdressing, gypsum application).<br>Revise proposed post-mining land use to ensure still appropriate for soil type, and identify long-term management requirements. | |
| Spontaneous combustion of near-surface waste material generating pollution, destabilising land surface and impeding vegetation establishment. | Monitoring processes/ programs: Materials geochemical assessment during project planning; Spontaneous combustion; Landform Stability. | Trigger: Significant or continued spontaneous combustion surface impacts. | Characterisation of spontaneous combustion risk and adoption of standard combustion prevention measures.<br>Targeted monitoring program in vicinity of impacts.<br>Remedial treatment (i.e. capping) as per Spontaneous Combustion Procedure. Remedial surface rehabilitation, if required. | Superintendent HSE |
| Geotechnical failure of final void residual walls, leading to an unstable and potentially polluting landscape. | Monitoring processes/ programs: Geotechnical assessment of void walls during void treatment design; Landform Stability. | Trigger: Actual or predicted significant void wall failure. | Conduct geotechnical assessment of failed area, and review void treatment design to identify root cause of failure. Identify remedial strategy that mitigates and makes safe the immediate failed area, addresses all associated impacts (i.e. reduced void storage capacity, water quality impacts).<br>Review proposed post-mining void use to determine whether still achievable, and identify long-term management measures. | Superintendent HSE<br>Principal Geotechnical Engineer |

| Risk and Level for Response | Monitoring & Measurement Process | Trigger | Proposed Response Action and Mitigation Measures | Responsible Person |
|---|---|---|---|---|
| Biological Factors | | | | |
| Insufficient, poor quality or incorrect species seed/seedlings leading to poor vegetation establishment. | Monitoring programs: Ecological Development; Grazing Potential. | Trigger: Progress indicators: Ecosystem/Land use Establishment; Ecosystem/Land use Sustainability. | Review ecological monitoring results and, if required, seed viability testing to determine if seed/seedling quality is contributing to poor vegetation establishment.<br>Identify required modifications to rehabilitation design or seed sourcing, and complete remedial planting works for areas of poor vegetation establishment.<br>Establish a broad supply base of seed to mitigate supply limitations, and a broad species base to mitigate undersupply and climatic variation. | Superintendent HSE |
| Poor vegetation development leading to simplified, non-stratified community structure of poor habitat value. | Monitoring programs: Ecological Development. | Trigger: Progress indicators: Ecosystem/Land use Sustainability. | Review ecological monitoring results to determine likely causes of non-development of vegetation stratum (i.e. species selection, seed/seedling quality, vegetation establishment practices or site conditions) and identify remedial treatment options (i.e. remedial planting, modification of species selection and establishment method or additional ground treatment)<br>Conduct remedial treatment, as selected, and review rehabilitation practices to incorporate new measures.<br>Ensure species mix used in rehabilitation programs are aligned to the floristic structure of the targeted plant community/ reference sites. | Superintendent HSE |

| Risk and Level for Response | Monitoring & Measurement Process | Trigger | Proposed Response Action and Mitigation Measures | Responsible Person |
|---|---|---|---|---|
| Inadequate weed control, leading to extreme weed competition preventing establishment of desired species. | Monitoring programs: Landform Stability; Ecological Development; Grazing Potential. | Trigger: Progress indicators: Growth Medium Development, Ecosystem/Land use Establishment; Ecosystem/Land use Sustainability. | Implement remedial treatment program to control weeds (i.e. chemical weed control, encourage rapid establishment of ground cover, scalping of surface layer, topdressing).<br>Weed control undertaken in accordance with the requirements of the Noxious Weeds Act 1993 by competent operators.<br>Weed species density and distribution monitored.<br>Topsoil supply treated for weeds prior to stripping, if required. | Superintendent HSE |
| Continued dominance of exotic tropical grass species, preventing successful establishment of native grass groundcover. | Monitoring programs: Ecological Development. | Trigger: Progress indicators: Ecosystem/Land use Establishment; Ecosystem/Land use Sustainability. | Review of ecological monitoring results to identify species of concern, and most appropriate treatment (including cost/benefit analysis on starting rehabilitation again).<br>Identify best treatment options, which may include chemical spraying, slashing, cultivating, burning or grazing existing groundcover, and vegetation establishment, which may include tubestock planting or direct drilling seed.<br>Ensure intensified monitoring during re-establishment of remedially treated rehabilitation, and review ongoing monitoring/ maintenance regime to ensure adequate. | Superintendent HSE |

| Risk and Level for Response | Monitoring & Measurement Process | Trigger | Proposed Response Action and Mitigation Measures | Responsible Person |
|---|---|---|---|---|
| Inadequate vertebrate pest animal control leading to predation of juvenile vegetation and poor biodiversity (habitat) outcomes. | Monitoring programs: Ecological development; feral animal register; community consultation. | Trigger: Progress indicators: Ecosystem/Land use Sustainability.<br><br>Increasing presence of feral animals. | Review of ecological monitoring results and feral animal register to identify species of concern (rabbit, deer, wild dog fox, pig, goat, etc), damage from pest animal species, and most appropriate treatment regime. Implement control program and intensified monitoring program to determine program success. Pest animal control undertaken by competent/ licenced operators.<br><br>Consult with neighbouring/ district landowners to coordinate control programs. | Superintendent HSE |
| Ecosystem processes (i.e. reproduction, nitrogen fixing and nutrient recycling) not re-established, leading to sterile unsustainable ecosystem. | Monitoring programs: Landform Stability; Ecological Development; Grazing Potential. | Trigger: Progress indicators: Growth Medium Development, Ecosystem/Land use Establishment; Ecosystem/Land use Sustainability. | Review ecological monitoring results and, if required, conduct targeted sampling to determine likely causes of non-development of processes (i.e. oversupply or undersupply of nutrients, species selection, soil properties or climatic contributors) and identify remedial treatment options (i.e. mulches, composts, biosolids, inoculants, remedial planting, species selection, etc).<br><br>Conduct remedial treatment and/or review rehabilitation planning and practice to incorporate new treatment measures.<br><br>Review monitoring program to more accurately detect the presence/ absence of process indicators. | Superintendent HSE |
| Insect attack, disease infestation causing premature vegetation die-back. | Monitoring programs: Ecological Development. | Trigger: Progress indicators: Ecosystem/Land use Establishment; | Review ecological monitoring results and, if required, conduct targeted sampling to determine likely causes of infection/ infestation) and identify remedial treatment options. | Superintendent HSE |

| Risk and Level for Response | Monitoring & Measurement Process | Trigger | Proposed Response Action and Mitigation Measures | Responsible Person |
|---|---|---|---|---|
| | | Ecosystem/Land use Sustainability. | Conduct remedial treatment, if required, and review rehabilitation maintenance practices to incorporate new treatment measures.<br><br>Review monitoring program to more accurately detect the presence/ absence of disease indicators. Aim to encourage diversity within the vegetation (i.e. colonisation by spiders, insects, frogs, lizards and insectivorous birds) by providing suitable habitat features and vegetation complexity. | |
| Environmental Factors | | | | |
| Unintended seasonal landform inundation or waterlogging preventing vegetation establishment or causing die-back. | Monitoring programs: Landform Stability; Ecological Development; Grazing Potential. | Trigger: Progress indicators: Landform Establishment; Growth Medium Development, Ecosystem/Land use Establishment; Ecosystem/Land use Sustainability. | Conduct geotechnical/ hydrological assessment of impacted area, to identify root cause of seasonal inundation (i.e. landform settlement, poor drainage design/ construction) and identify remedial strategy that may involve remedial drainage works, remedial planting, or modification of species selection.<br><br>Review proposed post-mining land use for the area to determine whether still achievable, or whether area might be best suited to new purpose (i.e. seasonal wetland/ habitat) and identify long-term management/ mitigation measures. | Superintendent HSE |
| Major storm event resulting in flooding, geotechnical instability, major erosion | Monitoring programs: Landform Stability; Ecological Development. | Trigger: Progress indicators: Growth Medium | Review landform planning and design, and rehabilitation practices, to identify root cause of poor drainage/ rehabilitation performance. | Superintendent HSE |

| Risk and Level for Response | Monitoring & Measurement Process | Trigger | Proposed Response Action and Mitigation Measures | Responsible Person |
|---|---|---|---|---|
| and/or widespread damage to rehabilitation areas. | | Development, Ecosystem/Land use Establishment; Ecosystem/Land use Sustainability. | Implement remedial strategy that repairs or reinstates the immediate area of rehabilitation and water management structure failure, and all associated downstream impacts, improves catchment infiltration, and drainage design (i.e. improves vegetative cover). All final landforms should be designed in accordance with Blue Book Volume 2E, to cope with major storm events (1 in 20 year ARI). Adopting more stringent design criteria may be warranted, if failure is common or widespread, or storms are frequent. | Superintendent Short Term Planning |
| Severe and/or prolonged drought leading to widespread failure of revegetation. | Monitoring programs: Landform Stability; Ecological Development; Grazing Potential. | Trigger: Progress indicators: Ecosystem/Land use Establishment; Ecosystem/Land use Sustainability. | Review rehabilitation practices, to identify any opportunities for drought-proofing rehabilitated areas (i.e. provide internally draining areas, temporary survival irrigation until establishment, or appropriate species selection).<br>Ensure intensified monitoring is undertaken during and after drought to observe rehabilitation performance and resilience.<br>All assessment should be relative to monitored performance of reference sites, to determine whether impacts are rehabilitation specific.<br>Plans should be prepared for post-drought remedial revegetation, if required. Include updates to government during annual reporting on remedial measures. Remedial tree planting and | Superintendent HSE |

| Risk and Level for Response | Monitoring & Measurement Process | Trigger | Proposed Response Action and Mitigation Measures | Responsible Person |
|---|---|---|---|---|
| Uncontrolled bush fire events leading to widespread failure of revegetation areas. | Monitoring programs: Landform Stability; Ecological Development; Grazing Potential. | Trigger: Progress indicators: Ecosystem/Land use Establishment; Ecosystem/Land use Sustainability. | Attempts should be made, within the capabilities of site resources and the RFS, to prevent uncontrolled fires reaching newly rehabilitated areas.<br><br>Review fire control and incident response practices, including consultation with local RFS, to identify the root cause for fire initiation and spread into rehabilitated areas, and modify site procedures to reduce the potential for recurrence.<br><br>Ensure intensified monitoring is undertaken after fire to record fire impact, and observe rehabilitation resilience during recovery.<br><br>Plans should be prepared for post-fire remedial revegetation, if required. | Superintendent HSE |
| Pollution Issues | | | | |
| Release of leachate/ contaminants from mined materials/ waste material requiring long-term management or treatment. | Monitoring programs: Landform Stability<br><br>Monitoring programs: Water monitoring/ modelling. | Trigger: Progress indicators: Decommissioning; Landform Establishment.<br><br>Trigger: discharge/ seepage from emplacements exceeds EPL/ Water Management Plan water quality criteria. | Response will be in accordance with the Groundwater and Surface Water Response Plan, and will involve the confirmation of laboratory results, investigation of cause, proposal of remedial options, then implementation of remedial strategy.<br><br>Water monitoring will be ongoing to determine impact of remedial strategy. Overall monitoring program should be reviewed to ensure continued suitability, in light of investigation findings. | Superintendent HSE |

| Risk and Level for Response | Monitoring & Measurement Process | Trigger | Proposed Response Action and Mitigation Measures | Responsible Person |
|---|---|---|---|---|
| Unsatisfactory water quality of final void waters leading to environmental impacts, and failed post-mining void use. | Monitoring programs: Landform Stability | Trigger: Progress indicators: Decommissioning; Landform Establishment; Growth Medium Development. | Response will be in accordance with the Groundwater and Surface Water Response Plan, and will involve the clarification of monitoring data, investigation of cause, proposal of remedial options, then implementation of remedial strategy. | Superintendent HSE |
| | Monitoring programs: Water monitoring/ modelling. | Trigger: void water quality exceeds EPL/ Water Management Plan water quality criteria. | Water monitoring will be ongoing to determine impact of remedial strategy. Overall monitoring program should be reviewed to ensure continued suitability, in light of investigation findings. If required, the decommissioning, rehabilitation and final-use strategies for final voids should also be reviewed to determine ongoing suitability. | |
| Unexpected contaminated land, leading to costly treatment and disposal, and delayed relinquishment. | Monitoring programs: Waste disposal management contract. Asbestos register. Contaminated Site Register. | Trigger: Progress indicators: Decommissioning; Landform Establishment.<br><br>Trigger: project specific contamination investigation criteria exceeded, or asbestos in path of proposed disturbance. | Works to be halted or relocated, and site appropriately isolated until declared safe for human access.<br><br>Site contamination assessment, remediation and clean-up by qualified consultant, as required.<br><br>Appropriate notifications made to EPA and other regulators.<br>Maintain the asbestos and contaminated land registers via regular reviews. | Superintendent HSE<br><br>Superintendent Health & Hygiene |

| Risk and Level for Response | Monitoring & Measurement Process | Trigger | Proposed Response Action and Mitigation Measures | Responsible Person |
|---|---|---|---|---|
| Management and Organisational Factors | | | | |
| Inadequate resources lodged/ provisioned to successfully rehabilitate mine areas a closure. | Monitoring processes:<br><br>MOP cost calculations and progress indicators<br><br>Rehabilitation provisioning | Trigger: Internal rehabilitation provisioning does not cover liability at start of final MOP period. | Use qualified personnel to review rehabilitation liability calculations and address any shortfalls identified.<br>Investigate opportunities for accelerated decommissioning and rehabilitation while mine still operating.<br>Review Mine Closure Plan to identify opportunities for streamlining the closure process, while still meeting Relinquishment criteria | Principal Environment Analysis & Improvement<br><br>Manager Long Term Planning |
| Poor systems implementation, leading to inadequate rehabilitation monitoring and maintenance. | Monitoring; completion of all Ecological and Rehabilitation monitoring programs. | Trigger; non-achievement of actions and measures committed to in MOP and OMPs | Appropriate resourcing to ensure all monitoring and management actions are completed as required in MOP or OMPs. | Superintendent HSE |
| Evolving regulatory requirements, community expectations and district landuses leading to difficulties attaining rehabilitation completion | Monitoring Process: Project Approvals and stakeholder consultation processes. | Trigger: DA lodgement for non-mining/ non-rural landuses adjacent to mine/ mine rehab. | Monitor trends and developments in legislation and changes to community expectations.<br>Make submissions to incompatible development applications in proximity of site rehabilitated areas.<br>Continue to regularly consult with stakeholders to gain acceptance of completion criteria. | Superintendent HSE<br><br>Manager Environment Analysis and Improvement |
| Pasture areas subjected to prolonged/ uncontrolled overgrazing by livestock, leading to loss of vegetative cover, erosion and land degradation. | Monitoring Program: Grazing Potential | Trigger; Progress Indicators for Growth Medium Development; Landuse Establishment; | Destock degraded paddocks until adequately recovered. | Superintendent HSE |

| Risk and Level for Response | Monitoring & Measurement Process | Trigger | Proposed Response Action and Mitigation Measures | Responsible Person |
|---|---|---|---|---|
| | | Landuse Sustainability | Increase frequency of Ground and Pasture Assessments, and closely monitor recovery trends.<br><br>Review contractual arrangements with grazier to include mechanism for preventing de-stocking, and review monitoring frequency. | |

# 10 Reporting

Mt Arthur Coal will report on the performance of MOP programs and commitments in the Annual Environmental Management Report (AEMR). The AEMR will report on the following aspects for the reporting period:

- Mining activities, major construction projects and related ground disturbance;
- Closure, decommissioning and rehabilitation activities completed;
- Ecological and rehabilitation monitoring activities an results, including performance against rehabilitation objectives and progress indicators;
- Results of other environmental monitoring programs and audits;
- Environmental incidents, events and complaints;
- Stakeholder consultation activities; and
- Non-compliance with regulatory requirements.

The AEMR will be submitted to DRG and other required authorities within three months of the end of the reporting year (July to June each year). The AEMR will also be submitted to the CCC and made available to the public on the BHP Billiton website. The AEMR will also meet the requirements of the Annual Review, required for submission to DP&E under Schedule 5, Condition 3 of Project approval 09_0062 MOD 1.

Progress of BMP implementation (including vegetation and habitat disturbance, progress of rehabilitation and regeneration programs, and monitoring programs) will be reported to the DoE in the EPBC Annual Report, as required under Condition 14 of EPBC Approval 2011/5866.

Mt Arthur Coal is also required to maintain records and report on community complaints and environmental incidents. Community complaints received by Mt Arthur Coal are managed in accordance with the Community Complaints Handling, Response and Reporting Procedure. Environmental incidents are reported in accordance with the Event Management Standard.

# 11 Plans

Plans attached to this MOP were prepared generally in accordance with Section 11 of ESG3: Mining Operations Plan (MOP) Guidelines, September 2013 (DTIRIS – DRE). Plans include:

Plan 1A – Pre-mining environment – Project Locality

Plan 1B – Pre-mining environment – Natural environment

Plan 1C – Pre-mining environment – Built environment

Plan 2 – Mine Domains at commencement of MOP

Plan 3A – Mining and Rehabilitation year one of MOP

Plan 3B - Mining and Rehabilitation year two of MOP

Plan 3C – Mining and Rehabilitation year three of MOP (indicative only)

Plan 3D – Mining and Rehabilitation year four of MOP (indicative only)

Plan 3E - Mining and Rehabilitation year five of MOP (indicative only)

Plan 4 – Final Rehabilitation and Post Mining Land Use

Plan 5 A-5B – Final Rehabilitation and Post Mining Land Use Cross Sections

# 12 Review and Implementation of the MOP

## 12.1 Review of the MOP

Review of this MOP will be conducted annually during production of the AEMR.

Review of this MOP may also be triggered by:

Deficiencies being identified in the MOP (via audit, risk assessment or regulatory/ community comment);

Results from the ecological and rehabilitation monitoring program;

Changing environmental and legislative requirements;

Improvements in rehabilitation/closure knowledge or technology become available;

Significant change in the activities or operations associated with Mt Arthur Coal; or

Modification to the Mt Arthur Coal Project Approval or EPBC Approval that results in amendment to mine planning, rehabilitation and closure planning.

Where a MOP review results in amendments being required, such amendments will be undertaken in accordance with MOP Guidelines (DRG, September 2013) and consultation with the DRG and other appropriate stakeholders.

## 12.2 Implementation

Table 15 shows personnel who are responsible for the monitoring, review and implementation of this MOP.

**Table 15: Responsibilities for implementation of this MOP**

| Title | Responsibility |
|---|---|
| Statutory Mine Manager | Provide resources required to undertake mine and rehabilitation planning, and implement MOP commitments.<br>Internally approve MOP |
| Manager Production Planning/ Manager Closure planning | Assist, where relevant, to implement the strategies and commitments presented in this MOP.<br>Oversee and facilitate the mine planning required for the MOP.<br>Provide mine planning, mining progression and disturbance information for reporting in the AEMR. |
| Head of Health Safety and Environment | Supervise the preparation of the MOP.<br>Implement, monitor and review the programs and commitments contained in this MOP and supporting procedures.<br>Consult with regulatory authorities as required.<br>Provide for the engagement of external assistance as required.<br>Report the progress of mine disturbance, rehabilitation and monitoring in the AEMR. |
| Superintendent HSE Business Partnership | Provide support for the implementation Health Safety and Environment responsibilities.<br>Assist in MOP preparation |
| Chief Mine Surveyor | Assist with preparation of MOP Plans.<br>Verification of MOP Plans for submission to DRG. |
| Principal Corporate Affairs | Ensure MOP is communicated to community via CCC. |

# Appendix 1: Asset Register

| Domain | Assets | Decommissioning/ rehabilitation requirements |
|---|---|---|
| Primary Domains | | |
| Open Cut Voids (active mining) | Crib rooms and remote sewerage tanks;<br>Truck fill points;<br>Sediment dams and open drains;<br>Mobile fuel storage containers;<br>Noise testing facility;<br>Magazine facility;<br>Coal stockpiles;<br>Water management pumps and polylines. | Infrastructure demolition and/or removal.<br>Flushing and removal of water pipelines.<br>Management of contaminated materials.<br>Dams reinstated or decontaminated and converted to clean water dams.<br>Open drains reinstated.<br>Rehabilitation works (hardstands/roads/tracks, high-wall and low-wall treatment, topsoiling and revegetation). |
| Water Management Areas | Whites Creek diversion;<br>Environmental Dam;<br>CHPP Dam;<br>Main Dam;<br>Dam walls;<br>Pumps and pump housings;<br>Polylines;<br>Open drains and spillways;<br>Access tracks;<br>Powerlines; | Whites Creek diversion partially retained and integrated into post-mine landscape. Redundant section reinstated and rehabilitated.<br>All three dams will be removed.<br>Pumps and pump housing structures removed;<br>Powerlines isolated and removed;<br>Polylines will be flushed and removed;<br>Dam walls, spillways and other water management earthworks will be dozed and reshaped;<br>The dam floor will be assessed for contamination; final trimmed, rock raked and deep ripped; and<br>Topsoil and revegetation works will be completed. |

| Domain | Assets | Decommissioning/ rehabilitation requirements |
|---|---|---|
| Infrastructure Areas | Main workshop;<br>Wash-down bay and mobile plant park-up areas;<br>CHPP (including structure, equipment and associated buildings);<br>Coal stockpile areas, including export stockpile;<br>Electricity sub stations;<br>Powerlines and light towers;<br>Fuel farm;<br>Truck fill Points;<br>Water treatment plant and potable tanks;<br>Water pipelines;<br>Septic tanks;<br>Conveyor to Bayswater Power station;<br>Conveyor from CHPP to export stockpile;<br>Rail loading bin and infrastructure;<br>Rail loop;<br>Visual and noise barriers (fencing) along the rail line; and<br>Overpass bridges (2 over Thomas Mitchell Drive and 1 over The New England Highway).<br>Main administration building and bath house;<br>Projects Offices and portable buildings;<br>Powerlines and light towers;<br>Sealed roads and car parks; | All services, including power, water and communications, would be disconnected and terminated and removed or sealed underground.<br>All buildings, sheds, tanks and fixed plant would be demolished and removed from the site.<br>Reclaim tunnels would be exposed, the conveyors removed and then collapsed.<br>All fixed plant that contains oil would be de-oiled, and oil would be disposed of by an approved waste oil collection contractor.<br>Substations would also be decommissioned, demolished and removed from the site.<br>All concrete footings, pads/slabs and vehicle parking areas would be demolished and removed to at least 1.5 m below the ground.<br>Tank farms and fill points will be decontaminated prior to demolition and disposal.<br>Where hydrocarbon contamination is identified above regulatory limits, bioremediation would be conducted on site or the material would be transported to an approved and engineered landfill site for disposal.<br>Residual surface material would be scalped from hardstand areas and unsealed access roads and disposed of in a suitable location to remove the heavily compacted or contaminated material.<br>Access tracks may be left in place as required for maintenance of the rehabilitation works.<br>Coal stockpile areas would have approximately 0.5 m of material scalped from the surface to ensure all carbonaceous material is removed.<br>The Rail load-out facility will be decommissioned and rehabilitated at the cessation of operations in 2081. Due to the planned duration of operations at Mt Arthur Coal, BHP Billiton has assumed responsibility for the infrastructure.<br>The road overpass structures will be removed and the rail alignment will be dozer pushed to an angle of approximately 10 degrees.<br>Disturbed areas final trimmed, top soiled and revegetated. |
| Existing Rehabilitation | Rehabilitated pasture and woodland | Ongoing monitoring, maintenance and (where required) remedial activities. |
| Tailings Storage Facility | Tailings Storage Facility (walls and tailings);<br>Pumps and pump housing;<br>Access tracks;<br>Powerlines;<br>Tailings pipelines under the tailings storage facility | A detailed tailings dam dewatering and capping methodology will be developed by suitable specialists and technical experts as part of the tailings management strategy.<br>Infrastructure such as pumps and powerlines removed.<br>The tailings dam will be required to be capped and rehabilitated at closure. The average thickness of the proposed cap will be a minimum of 3m.<br>The area will be reshaped to integrate with adjacent landforms, unnecessary access tracks removed, and the area top soiled and revegetated. |

| Domain | Assets | Decommissioning/ rehabilitation requirements |
|---|---|---|
| Overburden Emplacements | Access tracks;<br>Ramps and haul roads;<br>Powerlines;<br>Open drains, sediment dams and polylines. | Powerlines and access tracks removed, except as required for post-mining land use.<br>Ramps and haul roads backfilled or reshaped with adjacent emplacements.<br>Polylines flushed back to open cut and removed from site.<br>Remaining sediment dams integrated into surrounding catchment and drainage lines.<br>Other open drains and sediment dams reinstated to surface level, final trimmed, top soiled and revegetated. |
| Conservation Areas | Access tracks;<br>Powerlines;<br>Perimeter and internal fencing;<br>Cattle yards; and<br>Subsidiary dams. | Access tracks may be required for post closure management, however where possible all roads and tracks will be rehabilitated.<br>Remaining dams will be decontaminated and converted to clean water structures.<br>The requirements for maintaining powerlines, cattle yards, internal or perimeter fencing will be determined during detailed closure planning.<br>Redundant infrastructure will be removed. |

# Appendix 2: Environmental Management Documents

The following existing documents from the Mt Arthur Coal Environmental Management System (EMS) are referenced in the MOP.

- Air Quality and Greenhouse Gas Management Plan
- Air Quality Monitoring Program
- Dust Management Procedure
- Erosion and Sediment Control Plan
- Site Water Management Plan
- Surface Water Monitoring Program
- Site Water Balance
- Surface and Ground Water Response Plan
- Ground Water Monitoring Program
- Storage of Fuels and Chemicals Procedure
- Ground Disturbance Permit
- Spill Response Procedure
- Environmental Emergency Response
- Contaminated Land Management Procedure
- Hazardous Materials Management Procedure
- Land Management Procedure
- Biodiversity Management Plan (Formerly Biodiversity and Rehabilitation Management Plan)
- Rehabilitation and Ecological Monitoring Procedure
- Blast Management Plan (including Blast Fume Management Plan)
- Blast Monitoring Program
- Pre-Blasting Approval Procedure
- Blasting Permit
- Road Closure Management Plan
- Noise Management Plan
- Noise Monitoring Program
- Mobile Plant Noise Specification
- Visual Assessment Procedure
- Procedure for Lighting Plant Movement and Setup
- Light Management Procedure
- Aboriginal Heritage Management Plan
- Spontaneous Combustion Control Program
- Overburden Handling and Coal Extraction Procedure
- Bushfire Prevention Procedure
- Emergency Procedure – Bushfires
- Event Management Standard
- Dump Standard – Design, Construction and Maintenance of Dump Areas
- Waste Handling & Disposal Procedure
- Environmental Emergency Response
- Storage of Fuels and Chemicals

# Appendix 3: Rehabilitation Tables

| Objective | Performance Indicator | Performance Measure | Relinquishment Criteria | Justification / Source | Complete Yes/No | Link to TARP | Progress at Start of MOP |
|---|---|---|---|---|---|---|---|
| Phase – 1. Decommissioning | | | | | | | |
| Domain – 1. Open Cut Voids | | | | | | | |
| Mining voids that remain in the rehabilitated post-mining landscape will be safe, stable and non-polluting. | Final voids designs assessed against hydrological modelling. | Hydrologist Report | Actual final void dimensions align with hydrological modelling requirements. | 2009 EA<br>2013 EA | No | N/A | Initial modelling undertaken as part of 2009 EA and further developed in 2013 EA. |
| | Hazardous material assessment undertaken and contamination at acceptable level | Hazardous Material Assessment | Hostile geological strata (i.e. carbonaceous, acid generating or spontaneously combustible) covered/sealed before closure. Contaminants less than the assessment criteria. | 2009 EA<br>2013 EA | No | yes | Not commenced |
| | Risk assessment conducted to document security controls to minimise risk of unauthorised access and implementation of risk controls. | Risk Assessment<br>Inspection report | Safety risks associated with remaining voids identified and appropriately managed | Closure Plan | No | yes | |
| Domain – 2. Water Management Structures | | | | | | | |
| Existing water storage facilities decommissioned and remediated | Major dams (CHPP Dam, Main Dam and Environmental Dam) decommissioned | Inspection Report | Infrastructure removed. | Closure Plan | No | N/A | Decommissioning of the main dam is expected to be completed during this MOP period.<br>Others not commenced. |

| Objective | Performance Indicator | Performance Measure | Relinquishment Criteria | Justification / Source | Complete Yes/No | Link to TARP | Progress at Start of MOP |
|---|---|---|---|---|---|---|---|
| | | Inspection Report | Dams de-watered and ground surface areas remediated (scalped or capped). | Closure Plan | No | N/A | Decommissioning of the main dam is expected to be completed during this MOP period.<br>Others not |
| | Sediment dams decommissioned subject to individual risk assessment to determine post-mining status. | Risk Assessment<br>Inspection Report | Sediment dams which assist in the water flow from the final rehabilitation surface will be retained following mine closure. Other dams will be removed and drainage paths re-established. | Closure Plan | No | N/A | Not commenced |
| | Drainage paths re-instated where not part of wider landform reshaping program. | Inspection Report | Minor, or remote, dams and open drains back-filled to ensure unimpeded landform drainage and seamless integration with surrounding topography. | Closure Plan | No | Yes | Not commenced |
| | Risk assessment and implementation of risk controls. | Inspection Report | Safety risks associated with remaining infrastructure identified and appropriately managed. | Closure Plan | No | Yes | |
| Domain – 3. Infrastructure Areas | | | | | | | |
| Infrastructure areas decommissioned and demolished, resulting in safe, stable and non-polluting landscape.<br><br>(Ex-Infrastructure areas will be rehabilitated as per Rehabilitation – Pasture or | Status of retained infrastructure legally confirmed. | Legal instruments | Legal instruments established to prove transfer of ownership to another entity, or agreement to acquire, operate and manage retained infrastructure at mine closure. | Closure Plan | No | N/A | Not commenced |
| | Mine infrastructure areas decommissioned and cleared of surface infrastructure. | Inspection Report | Surface structures, buildings, roads and rail infrastructure not required for post mining land use have services disconnected and terminated and are demolished and removed. | Closure Plan | No | Yes | Commenced for Bayswater No. 2 Infrastructure Area. |

| Objective | Performance Indicator | Performance Measure | Relinquishment Criteria | Justification / Source | Complete Yes/No | Link to TARP | Progress at Start of MOP |
|---|---|---|---|---|---|---|---|
| Rehabilitation – Native Woodland for subsequent rehabilitation phases). | Hazardous material assessment undertaken and contamination at acceptable level Secure and safe containment, remediation and/or removal of waste substances to meet criteria for the proposed final land use in accordance with the relevant contaminated land guidelines under the Contaminated Land Management Act 1997. These include:<br>Guidelines for the NSW Auditor Scheme (EPA, 2006)<br>Guidelines for Consultants Reporting on Contaminated Sites (EPA, 2011)<br>Investigation of Service Station Sites (EPA, 2014) | Hazardous Material Assessment Report | Contaminated materials removed from site, treated or capped. | EPL | No | Yes | Not commenced |
| | | | | EPL<br>PA 09_0062 MOD 1 | No | Yes | A remedial action plan has been completed for the Bayswater No. 2 Infrastructure Area.<br>PCB and asbestos register maintained by H&S staff. |
| | Risk assessment conducted to document security controls to minimise risk of unauthorised access and implementation of risk controls. | Risk Assessment<br>Inspection Report | Safety risks associated with remaining infrastructure identified and appropriately managed. | Closure Plan | No | Yes | |
| Domain – 4. Existing Rehabilitation | | | | | | | |

| Objective | Performance Indicator | Performance Measure | Relinquishment Criteria | Justification / Source | Complete Yes/No | Link to TARP | Progress at Start of MOP |
|---|---|---|---|---|---|---|---|
| As per relevant Secondary Domain | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Domain – 5. Tailings Storage Facility (TSF) | | | | | | | |
| TSF capped to ensure long-term containment of emplaced material, with minimal potential for external impact.<br>(Ex-TSF areas will be reshaped and rehabilitated as per Overburden Emplacements for subsequent rehabilitation phases). | Assessment for potential acid generation, and incorporation of findings into capping design | As constructed reports | Capping of tailings. | 2009 EA<br>EPL<br>2013 EA | Yes | Yes | Geochemical assessment completed (2000) |
| | Capping/ treatment of facilities will be appropriately designed and constructed so as to ensure geotechnical. stability and successful containment of tailings material and hazardous leachate drainage or seepage. | As constructed reports | Construction of capping layer as per independent consultant's design, or minimum of 3m capping layer of inert material. | 2009 EA<br>Closure Plan<br>2013 EA | No | Yes | Completed for SP1, SP2 & SP3. |
| | | Monitoring Reports | Monitoring regime established for downstream waters. | EPL<br>2009 EA<br>2013 EA | Yes | N/A | Monitoring regime established. SWMP approved by DP&E. |
| | | Monitoring Reports | Monitoring indicates no evidence of capping instability or environmental harm. | DSC | No | Yes | SP1, SP2 and SP3 capped. No other dams have been capped.<br>North Cut Tailings Dam will be capped during this MOP period. |
| | | Dam Safety Report | Sign off from the Dam Safety Committee that TSF wall integrity is satisfactory based on assessment by a suitably qualified geotechnical engineer. | Closure Plan | No | Yes | |

| Objective | Performance Indicator | Performance Measure | Relinquishment Criteria | Justification / Source | Complete Yes/No | Link to TARP | Progress at Start of MOP |
|---|---|---|---|---|---|---|---|
| | Risk assessment conducted to document security controls to minimise risk of unauthorised access and implementation of risk controls. | Risk Assessment | Safety risks associated with remaining infrastructure identified and appropriately managed. | Closure Plan | No | Yes | |
| Domain – 7. Onsite Conservation and Offset areas | | | | | | | |
| All onsite biodiversity offset and conservation areas will be managed to increase their biodiversity and habitat value, in accordance with the requirements of PA 09_0062 MOD 1, EPBC Approval 2011/5688, and the site Biodiversity Management Plan. | Long-term protection of biodiversity conservation areas. | Legal Instruments | Appropriate legal instruments in place to provide long-term protection to onsite biodiversity offset and conservation areas. | PA 09_0062 MOD 1<br>EPBC | No | N/A | Mt Arthur Coal required to establish long term security mechanism by 31 December 2016. |
| | Conservation areas free of unnecessary infrastructure that may pose risk to biodiversity values. | Inspection Report | No unnecessary infrastructure in place. | BMP/OMP | No | Yes | In progress. |
| | | Inspection Report | Infrastructure have services disconnected and terminated and are demolished and removed. | BMP/OMP | No | N/A | In progress. |
| Phase – 2. Landform Establishment | | | | | | | |
| Domain – 1. Open Cut Voids | | | | | | | |
| Mining voids that remain in the rehabilitated post-mining landscape will be safe, stable and non-polluting. | Final void walls will be treated to ensure human and animal safety and geotechnical stability. | As constructed designs | Void low walls are to be reshaped with slopes of approximately 18 degrees. | 2009 EA, 2013 EA, MOP | No | Yes | Not commenced |
| | | As constructed designs | Void high walls reshaped to approximately 37 degrees and, if required, protected with berm and trench, or fencing and signage, depending on risk. | 2009 EA, MOP | No | Yes | Not commenced |

| Objective | Performance Indicator | Performance Measure | Relinquishment Criteria | Justification / Source | Complete Yes/No | Link to TARP | Progress at Start of MOP |
|---|---|---|---|---|---|---|---|
| | | Geotechnical report | Final voids have been inspected by a qualified geotechnical engineer to validate that it is stable and does not pose a safety risk. | 2009 EA, MOP | No | Yes | Not commenced |
| | Final void does not cause harmful impact on downstream waters (surface or groundwater). | Hydrological report<br>Inspection report | Implementation of management measures from hydrological report. | 2009 EA | No | N/A | Initial modelling undertaken as part of 2009 EA. |
| | | Monitoring reports | Monitoring regime established for downstream waters. | EPL, SWMP | Yes | N/A | Monitoring regime established |
| | | Monitoring reports | Monitoring indicates no evidence of harmful impact on downstream waters. | EPL, SWMP | Yes | Yes | Monitoring in progress |
| Domain – 2. Water Management Structures | | | | | | | |
| Decommissioned mine water management facilities re-habilitated to stable and non-eroding landforms and/ or watercourses. | Drainage paths re-established to achieve stable and non-polluting landscape. | As constructed report | Drainage lines re-instated. | 2009 EA<br>Closure plan<br>2013 EA | No | Yes | Not commenced |
| | | As constructed report | Adjacent disturbed area reshaped, to maximise sheet flow. | 2009 EA<br>Closure plan<br>2013 EA | No | Yes | Not commenced |
| Long-term stability of remaining water management structures. | External engineer's assessment report, indicating that the flood levy is stable and flood-proof, with no evidence of slumping, and continued function and stability of sub-surface cut off wall. | External engineer's assessment report | Demonstrated long-term stability and function of Hunter River alluvials cut-off wall and flood levy. | Controlled Activity Approval | No | Yes | Alluvial wall & flood levy completed. Regular inspections of area completed by Civil Engineer to ensure stability. |
| Domain – 6. Overburden Emplacements | | | | | | | |

| Objective | Performance Indicator | Performance Measure | Relinquishment Criteria | Justification / Source | Complete Yes/No | Link to TARP | Progress at Start of MOP |
|---|---|---|---|---|---|---|---|
| Overburden emplacements will be reshaped to stable, free draining, non-polluting landforms, compatible with surrounding landforms and selected post-mining landuses.<br><br>(Reshaped Overburden Emplacements will be rehabilitated as per Rehabilitation – Pasture, Rehabilitation – Native Woodland or Rehabilitation – Box Gum Woodland for subsequent rehabilitation phases). | Reshaped overburden emplacements will be geotechnically stable. | Field monitoring and Survey Data Analysis | Field monitoring and/or survey data analysis indicates reshaped landforms will continue to shed water, with evidence of unplanned pooling, slumping or accelerated erosion comparable to surrounding non-mined landforms of similar topography. | 2009 EA<br>2013 EA | No | Yes | Completed for established rehabilitated areas. |
| | | Inspection report | Field monitoring of surface drainage infrastructure demonstrates that constructed drainage features are functioning as designed with no significant failures. | 2009 EA<br>2013 EA | No | Yes | In progress. |
| | | As constructed report | Emplacement outer slopes will generally have an overall slope angle of 10 degrees, and up to a maximum slope of 18 degrees, with DRG approval and appropriate management. | 2009 EA<br>2013 EA | No | Yes | Completed for established rehabilitated areas. |
| | Reshaped overburden emplacements will be non-polluting. | As constructed report | Potentially high risk materials (coarse rejects, potentially acid-generating or spontaneously combustible) placed in overburden emplacements will be capped by a minimum of 5m of benign material. | 2009 EA<br>Dump Standard<br>2013 EA | No | Yes | Geochemical assessment completed (2000).<br>In progress. |
| | | Inspection report | Absence of hazardous carbonaceous material on the surface of the rehabilitation. | 2009 EA<br>Dump Standard<br>2013 EA | No | Yes | In progress. |
| | | Inspection/Monitoring report | No active spontaneous combustion areas, as evidenced through established monitoring program. | 2009 EA<br>Dump Standard<br>2013 EA | No | Yes | In progress. |

| Objective | Performance Indicator | Performance Measure | Relinquishment Criteria | Justification / Source | Complete Yes/No | Link to TARP | Progress at Start of MOP |
|---|---|---|---|---|---|---|---|
| | Reshaped overburden emplacements will be compatible with surrounding landforms (mined and non-mined) and selected post-mining landuses. | Survey report | Emplacements will have a maximum average height of RL 360m, with limited features allowed to RL375m to provide positive visual relief. | 2009 EA<br>2013 EA | No | N/A | In progress. No emplacements exceeding 360m to date. |
| | | Visual Assessment Reports | Condition 4 of the Visual Assessment Procedure is achieved | 2009 EA<br>2013 EA | No | N/A | In progress |
| | | Agricultural Impact Statement<br>Analysis Reports | Rehabilitated landscapes will be of the land capability class comparable to that of pre-mining as outlined in the Agricultural Impact Statement. | 2009 EA<br>2013 EA | No | Yes | In progress |
| Phase – 3. Growing Media Development | | | | | | | |
| Domain – B. Water Management Areas | | | | | | | |
| Decommissioned mine water management facilities re-habilitated to stable and non-eroding landforms and/ or watercourses.<br>(Re-instated drainage lines will be rehabilitated as per Rehabilitation – Native Woodland or Rehabilitation – Box Gum Woodland for subsequent rehabilitation phases). | Reshaped or re-instated drainage will be topsoiled and rehabilitated to promote stable and non-polluting landscape. | As constructed report | Topsoil will be placed to a minimum depth of 100mm across all disturbed ground and drainage lines. Topsoil substitutes (i.e. protective matting or hydromulching) may be used to reduce sediment potential. | 2009 EA<br>2013 EA<br>Grigg et al<br>Blue Book Vol2E | No | Yes | In progress |
| Domain – C. Rehabilitation - Pasture | | | | | | | |
| Rehabilitated pasture landscapes will | Pasture rehabilitation land will demonstrate | Inspection report | Topsoil placed at a minimum depth of 100 mm. | Agronomist | No | Yes | In progress. |

| Objective | Performance Indicator | Performance Measure | Relinquishment Criteria | Justification / Source | Complete Yes/No | Link to TARP | Progress at Start of MOP |
|---|---|---|---|---|---|---|---|
| support a financially viable and environmentally sustainable livestock grazing operation. | appropriate soil properties so as to support sustainable livestock grazing. | Sampling results | Topsoil will have the following properties, as demonstrated through field survey and analytical testing (including re-rehabilitation stockpile testing).<br>Physical<br>Texture typically: Silty clay loam to sandy loam, with clay content < 30%<br>Structured soils - not massive (heavy clay) or single grained (sand)<br>Sub-optimal soils treated with gypsum at rate of ~10 tonnes/ha | Elliot & Veness | No | Yes | In progress. |
| | | Sampling Results | Chemical<br>pH:4.5-9<br>EC (1:5 ratio) of <0.15 uS/cm<br>Cation exchange capacity (CEC) >14 Cmol+/kg | Agronomist, Grigg et al, Blue Book Vol 2E | No | Yes | In progress. |
| | | Sampling Results | Erosion Potential<br>Emerson Aggregate Test Class of 3 (1), 3(2), 4, 5 or 6.<br>Or exchangeable sodium capacity (ESP) <5% | Blue Book Vol 2E, Hazelton & Murphy | No | Yes | In progress. |
| | | Sampling Results | Nutrients<br>Organic carbon levels (>4.0%)<br>Soil Phosphorous (Colwell P) levels 14-20 mg/kg<br>Fertiliser requirement comparable to similar non-mined grazing land | Agronomist, Blue Book Vol 2E, Hazelton & Murphy | No | Yes | In progress. |

| Objective | Performance Indicator | Performance Measure | Relinquishment Criteria | Justification / Source | Complete Yes/No | Link to TARP | Progress at Start of MOP |
|---|---|---|---|---|---|---|---|
| Domain – D. Rehabilitation – Native Woodland & Domain – E. Rehabilitation – Box Gum Woodland | | | | | | | |
| Rehabilitated areas will be able to support an open native woodland vegetation community to enhance biodiversity and habitat values. | Soils/ growth medium demonstrates physical and chemical properties suited to native woodland vegetation. | Inspection report | Topsoil placed at a minimum depth of 100 mm.<br>Other growth media materials (i.e. biosolids or organic mulch) integrated with subsoil/spoil material as per relevant guidelines. | Grigg et al, Blue Book Vol 2E | No | Yes | In progress. |
| | | Sampling Results | Topsoil will have the following properties, as indicated through field monitoring.<br>Clay content < 30% and not massive (heavy clay) or single grained (sand)<br>pH:4.5-9<br>EC (1:5 ratio) of <0.15 uS/cm<br>Soil Carbon, Nitrogen and Phosphorous levels to be comparable with reference sites. | Hazelton & Murphy, Elliot & Veness, Rawlings et al | No | Yes | In progress. |
| Phase – 4. Ecosystem and Landuse Establishment | | | | | | | |
| Domain – A. Final Voids | | | | | | | |
| Mining voids remaining in the rehabilitated post-mining landscape will be safe, stable and non-polluting. | Vegetative cover promotes landform stability and assists with water quality maintenance. | Inspection Report | Reshaped low wall rehabilitated as pasture or woodland vegetation (see relevant domain for detailed performance indicators). | See relevant domain C, D or E | - | - | - |
| | Landforms and water storages safe for humans, livestock and native wildlife, and non-polluting. | Inspection Report & Risk Assessments | Steep void walls and water storages isolated by berm and bench, or fencing and signage (depending on risk profile) to prevent unintentional vehicle, pedestrian and livestock access. | 2009 EA<br>2013 EA | No | Yes | Not commenced |

| Objective | Performance Indicator | Performance Measure | Relinquishment Criteria | Justification / Source | Complete Yes/No | Link to TARP | Progress at Start of MOP |
|---|---|---|---|---|---|---|---|
| | | Water Monitoring Results | Water monitoring indicates no harmful impact on surrounding surface and groundwater and is consistent with hydrological modelling predictions. | EPL<br>2009 EA<br>2013 EA | No | Yes | Sitewide surface water and groundwater monitoring in progress. |
| Domain – C. Rehabilitation - Pasture | | | | | | | |
| Rehabilitated pasture landscapes will support a financially viable and environmentally sustainable livestock grazing operation. | Establish landscape and land-surface suitable for grazing operations. | Inspection report | 70 percent of vegetation established and maintained. | Blue Book Vol2E, Grigg et al | No | Yes | In progress. |
| | | Inspection Report | Land surfaces within grazing areas are free of obstacles or hazardous terrain. | MOP | No | N/A | In progress. |
| | | Inspection report | Appropriate infrastructure such access roads, fencing, and a water supply plan completed. | Agronomist , MOP | No | N/A | Not commenced. |
| Post-mining landuses will be consistent with surrounding landuses, and not impact on biodiversity values of adjacent woodland and conservation areas. | Land management measures implemented to control grazing related risks to onsite grazing, neighbouring land and adjacent biodiversity areas. | Weed assessment reports | Weed distribution comparable to local remnant vegetation. | 2009 EA<br>2013 EA<br>Agronomist | No | Yes | In progress. |
| | | Fire Management Plan | Program implemented for fuel load assessment and reduction, with advice from NSW Rural Fire Service. | Bushfire Prevention Procedure | No | Yes | In progress. |
| | | Assessment reports | Pest animal infestation comparable to local remnant vegetation. | 2009 EA<br>2013 EA | No | Yes | In progress |
| | | Inspection report | No gullies greater than 20cm depth over transects. | 2009 EA<br>2013 EA | No | Yes | In progress. |
| | | Inspection report | Major rehabilitated watercourses and adjacent conservation areas fenced off to prevent livestock access. | 2009 EA<br>BMP<br>2013 EA | No | N/A | In progress. |

| Objective | Performance Indicator | Performance Measure | Relinquishment Criteria | Justification / Source | Complete Yes/No | Link to TARP | Progress at Start of MOP |
|---|---|---|---|---|---|---|---|
| Domain – D. Rehabilitation – Native Woodland | | | | | | | |
| Rehabilitation will establish at least 2142ha of native woodland vegetation community (excluding 500 ha Box Gum Woodland). | An area equivalent to 2142 ha will be established as native woodland. | Rehabilitation assessment report | All areas shown as Native Woodland vegetation community in Plan 4, planted with a native species mix (seed or tubestock) targeted at establishing an open grassy woodland vegetation community. | PA 09_0062 MOD 1, EPBC Approval | No | Yes | In progress. |
| | Rehabilitated native woodland will be focussed on establishing the vegetation communities as required in of the Project Approval. | Rehabilitation Assessment Report | Rehabilitation species composition (seed mix or tubestock) drawn from the species list in Section 7.2 for Central Hunter Box - Ironbark Woodland or Central Hunter Ironbark - Spotted Gum – Grey Box Forest. | PA 09_0062 MOD 1 BMP | No | Yes | In progress. |
| | | Rehabilitation Assessment Report | All structural dominant species represented compared with analogue site. | PA 09_0062 MOD 1 EPBC Approval | No | Yes | In progress. |
| | | Rehabilitation Assessment Report | The diversity, percentage and density of shrubs and juvenile trees with a stem diameter <5cm is comparable to that of the local remnant vegetation. | PA 09_0062 MOD 1 EPBC Approval | No | Yes | In progress. |
| | | Rehabilitation Assessment Report | The total number of native plant species is comparable to the local remnant vegetation. | PA 09_0062 MOD 1 EPBC Approval | No | Yes | In progress. |

| Objective | Performance Indicator | Performance Measure | Relinquishment Criteria | Justification / Source | Complete Yes/No | Link to TARP | Progress at Start of MOP |
|---|---|---|---|---|---|---|---|
| | | Rehabilitation Assessment Report | The number of tree, shrub and sub-shrub species is comparable to that of the local remnant vegetation. | PA 09_0062 MOD 1<br>EPBC Approval | No | Yes | In progress. |
| | Rehabilitated native woodland will enhance habitat and biodiversity values. | Rehabilitation Assessment Report | Species composition for revegetation will be aimed at establishing a complex community structure consisting of groundcover, understory and canopy according to Table 13. | PA 09_0062 MOD 1<br>BMP | No | Yes | In progress. |
| | | Biodiversity Plan | Nesting boxes (various bird, squirrel glider, possum and bat) and natural habitat features (including large rocks, logs/coarse woody debris, hollow bearing timber) are placed in established native woodland rehabilitation. | PA 09_0062 MOD 1<br>BMP/OMP | No | Yes | In progress. |
| | | Rehabilitation Assessment Report | Number of weed species and surface area comparable to local remnant vegetation. | 2009 EA<br>2013 EA | No | Yes | In progress. |
| | | Fire Management Plan | Program implemented for fuel load assessment and reduction, with advice from NSW Rural Fire Service. | Bushfire Prevention Procedure | No | Yes | In progress. |
| | | Rehabilitation assessment reports | Pest animal infestation comparable to reference sites. | 2009 EA<br>2013 EA | No | Yes | In progress |

| Objective | Performance Indicator | Performance Measure | Relinquishment Criteria | Justification / Source | Complete Yes/No | Link to TARP | Progress at Start of MOP |
|---|---|---|---|---|---|---|---|
| | | Inspection Report | Where adjacent to selected grazing or operational mining land, adequate fencing and signage is installed and maintained to prevent unintentional vehicle and livestock access. | 2009 EA<br>BMP<br>2013 EA | No | N/A | In progress. |
| | Rehabilitated native woodland vegetation will provide faunal habitat and movement corridors by linking existing vegetation communities within and surrounding the mine boundary. | Rehabilitation assessment reports | Rehabilitated native vegetation distribution will link areas of onsite and near-site native vegetation, and be consistent with the biodiversity corridors consistent with the latest version of the DRG Synoptic Plan. | 2009 EA<br>BMP<br>2013 EA<br>DRG Synoptic Plan | No | N/A | In progress – corridors planned. |
| | Domain – E. Rehabilitation – Box Gum Woodland | | | | | | |
| Rehabilitation areas will include at least 500 ha of re-established Box Gum Woodland. | A minimum area of 500 ha rehabilitation will be established as Box Gum Woodland. | Rehabilitation assessment reports | The Box-Gum re-establishment area based on the north-eastern slope of Visual Dump 1, and shown on Plan 4, will be established with a species mix (seed or tubestock) drawn from the species list presented in Section 7.2 for Central Hunter Box - Ironbark Woodland or Central Hunter Ironbark - Spotted Gum – Grey Box Forest. | PA 09_0062 MOD 1<br>EPBC Approval | No | Yes<br>Yes | In progress. |
| | | Rehabilitation Assessment Report | All structural dominant species represented compared with analogue site | PA 09_0062 MOD 1<br>EPBC Approval | No | Yes | In progress. |

| Objective | Performance Indicator | Performance Measure | Relinquishment Criteria | Justification / Source | Complete Yes/No | Link to TARP | Progress at Start of MOP |
|---|---|---|---|---|---|---|---|
| | | Rehabilitation Assessment Report | The diversity, percentage and density of shrubs and juvenile trees with a stem diameter <5cm is comparable to that of the local remnant vegetation | PA 09_0062 MOD 1<br>EPBC Approval | No | Yes | In progress. |
| | | Rehabilitation Assessment Report | The total number of live native plant species is comparable to the local remnant vegetation | PA 09_0062 MOD 1<br>EPBC Approval | No | Yes | In progress. |
| | | Rehabilitation Assessment Report | The number of tree, shrub and sub-shrub species is comparable to that of the local remnant vegetation | PA 09_0062 MOD 1<br>EPBC Approval | No | Yes | In progress. |
| | Rehabilitated Box Gum Woodland will enhance habitat and biodiversity values. | Rehabilitation Assessment Report | Establishment of groundcover, understory and canopy according to Table 13. | PA 09_0062 MOD 1<br>BMP/OMP | No | Yes | In progress. |
| | | Rehabilitation Assessment Report | Fauna monitoring of natural and introduced habitat indicates colonisation by native species. | PA 09_0062 MOD 1<br>BMP/OMP | No | Yes | In progress. |
| | | Rehabilitation Assessment Report | Number of weed species and surface area comparable to reference sites. | 2009 EA<br>2013 EA | No | Yes | In progress. |
| | | Fire Management Plan | Program implemented for fuel load assessment and reduction, with advice from NSW Rural Fire Service. | Bushfire Prevention Procedure | No | Yes | In progress. |

| Objective | Performance Indicator | Performance Measure | Relinquishment Criteria | Justification / Source | Complete Yes/No | Link to TARP | Progress at Start of MOP |
|---|---|---|---|---|---|---|---|
| | | Rehabilitation Assessment Report | Pest animal infestation comparable to reference sites. | 2009 EA<br>2013 EA | No | Yes | In progress |
| Domain – F. Onsite Conservation and Offset areas | | | | | | | |
| All onsite biodiversity offset and conservation areas will be managed to increase their biodiversity and habitat value, and meet regulatory requirements. | Rehabilitation operations are completed in accordance with the biodiversity and rehabilitation management requirements of PA 09_0062 MOD 1 and EPBC Approval 2011/5688, and the site Biodiversity Management Plan. | Biodiversity Management Plan | Compliance with management actions presented in the site Biodiversity Management Plan, as evidenced through the most recent Independent Environmental Audit and/or Biodiversity Audit. | PA 09_0062 MOD 1<br>EPBC Approval<br>BMP | No | N/A | Independent audits completed. |
| Phase – 5. Ecosystem and Landuse Sustainability | | | | | | | |
| Domain – A. Final Voids | | | | | | | |
| Mining voids remaining in the rehabilitated post-mining landscape will be safe, stable and non-polluting. | Vegetative cover promotes landform stability and assists with water quality maintenance. | Rehabilitation Assessment Report | Established pasture or woodland vegetation (see relevant domain for detailed performance indicators). | See relevant domain | - | - | - |
| | Landforms and water storages safe for humans, livestock and native wildlife, and non-polluting | Inspection Report and Risk Assessment | Steep void walls and water storages isolated by berm and bench, or fencing and signage (depending on risk profile) to prevent unintentional vehicle, pedestrian and livestock access. | 2009 EA<br>2013 EA | No | Yes | Not commenced. |
| | | Rehabilitation Assessment Report | Water monitoring indicates contaminants within acceptable limits. | EPL<br>2009 EA<br>2013 EA | No | Yes | Site wide surface water and groundwater monitoring in progress. |
| Domain – C. Rehabilitation - Pasture | | | | | | | |

| Objective | Performance Indicator | Performance Measure | Relinquishment Criteria | Justification / Source | Complete Yes/No | Link to TARP | Progress at Start of MOP |
|---|---|---|---|---|---|---|---|
| Rehabilitated pasture landscapes will support a financially viable and environmentally sustainable livestock grazing operation. | Landscape and land-surface suitable for grazing operations. | Grazing Potential Assessment Report | Established vegetation cover of at least 70 percent. | Blue Book Vol2E, Grigg et al | No | Yes | In progress. |
| | | Inspection Report | Land surfaces within grazing areas free of obstacles or hazardous terrain. | MOP | No | N/A | In progress. |
| | | Agricultural Impact Statement<br>Analysis Report | Rehabilitated landscapes will be of the land capability class comparable to that of pre-mining as outlined in the Agricultural Impact Statement. | 2009 EA<br>2013 EA | No | Yes | In progress. |
| | | Inspection Report | Appropriate infrastructure such access roads and fencing, including fencing along drainage lines and adjacent woodland areas, maintained and functional. | BMP | No | N/A | In progress. |
| | Soil substrate and pasture cover that will support grazing. | Grazing Potential Assessment Report | Pasture grass cover established. | Agronomist | No | Yes | In progress. |
| | | Grazing Potential Assessment Report | Carrying capacity (DSE/ha), crude protein (%), digestibility (%), green dry matter content (kg green DMA/ha) comparable to reference sites. | Agronomist | No | Yes | In progress. |
| | | Grazing Potential Assessment Report | Number of weed species and surface area comparable to reference sites. | 2009 EA<br>2013 EA<br>Agronomist | No | Yes | In progress. |
| | | Fire Management Plan | Program implemented for fuel load assessment and reduction, with advice from NSW Rural Fire Service. | Bushfire Prevention Procedure | No | Yes | In progress. |

| Objective | Performance Indicator | Performance Measure | Relinquishment Criteria | Justification / Source | Complete Yes/No | Link to TARP | Progress at Start of MOP |
|---|---|---|---|---|---|---|---|
| | | Monitoring Report | Pest animal infestation comparable to reference sites. | 2009 EA<br>2013 EA | No | Yes | In progress |
| | | Inspection Report | No gullies greater than 20 cm depth over transects. | 2009 EA<br>2013 EA | No | Yes | In progress. |
| | | Inspection Report | Major rehabilitated watercourses and adjacent conservation areas fenced off to prevent livestock access. | 2009 EA<br>BMP<br>2013 EA | No | N/A | In progress. |
| | | Sample Results | Soil assessment as part of site monitoring program indicates:<br>Minimum topsoil depth 100 mm, with further development of A horizon.<br>minimal land degradation;<br>no accelerated or concentrated erosion;<br>pH:4.5-9<br>EC (1:5 ratio) of <0.15 uS/cm<br>cation exchange capacity (CEC) >14 Cmol+/kg<br>Emerson Aggregate Test Class of 3 (1), 3(2), 4, 5 or 6, or exchangeable sodium capacity (ESP) <5%<br>Organic carbon levels (>4.0%)<br>Soil Phosphorous (Colwell P) levels 14-20 mg/kg | Blue Book Vol 2E, Hazelton & Murphy, Elliot & Veness, Grigg et al | No | Yes | In progress. |
| Post-mining landuses will be consistent with surrounding landuses, and not impact on | Land management measures implemented to control grazing related risks to onsite grazing, | Rehabilitation Assessment Report | Weed distribution comparable to reference sites. | 2009 EA<br>2013 EA<br>Agronomist | No | Yes | In progress. |

| Objective | Performance Indicator | Performance Measure | Relinquishment Criteria | Justification / Source | Complete Yes/No | Link to TARP | Progress at Start of MOP |
|---|---|---|---|---|---|---|---|
| biodiversity values of adjacent woodland and conservation areas. | neighbouring land and adjacent biodiversity areas. | Fire Management Plan | Program implemented for fuel load assessment and reduction, with advice from NSW Rural Fire Service. | Bushfire Prevention Procedure | No | Yes | In progress. |
| | | Rehabilitation Assessment Report | Pest animal infestation comparable to reference sites, with ongoing control. | 2009 EA<br>2013 EA | No | Yes | In progress |
| | | Inspection Report | No gullies greater than 20 cm depth over transects. | 2009 EA<br>2013 EA | No | Yes | In progress. |
| | | Monitoring Results | Monitoring of drainage lines indicates no significant concentrated/ accelerated erosion, and no downstream sedimentation or other degradation impacts. | 2009 EA<br>BMP<br>2013 EA | No | Yes | In progress. |
| Domain – D. Rehabilitation – Native Woodland | | | | | | | |
| Rehabilitation will establish at least 2142ha of native woodland vegetation community (excluding 500 ha Box Gum Woodland). | An area equivalent to 2142 ha will be maintained as native woodland. | Rehabilitation Assessment Report | All areas shown as Native Woodland vegetation community in Plan 4, planted with a native species mix (seed or tubestock) targeted at establishing an open grassy woodland vegetation community have been established. | PA 09_0062 MOD 1<br>EPBC | No | Yes | In progress. |
| | Rehabilitated native woodland will be focussed on establishing the vegetation communities as required in Project Approval. | Rehabilitation Assessment Report | The developing vegetation community will include key species listed in Section 7.2 for Central Hunter Box - Ironbark Woodland or Central Hunter Ironbark - Spotted Gum – Grey Box Forest. | PA 09_0062 MOD 1<br>EPBC<br>BMP | No | Yes | In progress. |

| Objective | Performance Indicator | Performance Measure | Relinquishment Criteria | Justification / Source | Complete Yes/No | Link to TARP | Progress at Start of MOP |
|---|---|---|---|---|---|---|---|
| | Rehabilitated native woodland will enhance habitat and biodiversity values. | Rehabilitation Assessment Report | The development of a multi-layered community structure is evident, and (for communities > 10 years) consists of canopy, understory and groundcover comparable with reference sites. | PA 09_0062 MOD 1<br>BMP | No | Yes | In progress. |
| | | Rehabilitation Assessment Report | Density and diversity of developing tree and shrub species within rehabilitated community is comparable to that of reference sites. | BMP/OMP | No | Yes | In progress. |
| | | Rehabilitation Assessment Report | Vegetation health:<br>Age < 10 years - survival of 75% of key species and no evidence of significant vegetation stress (i.e. weed dominance, disease, water stress, premature die-back);<br>Age > 10 years – vegetation health indicators comparable to that of reference sites. | BMP/OMP | No | Yes | In progress. |
| | | Rehabilitation Assessment Report | Observations indicating reproduction (seeding, flowering or second generation plants) recorded at multiple locations within rehabilitated vegetation area. | BMP/OMP | No | Yes | In progress. |
| | | Rehabilitation Assessment Report | Observations indicating nutrient recycling (development of consistent litter layer, litter layer decomposition and cryptogam presence) recorded at multiple locations within rehabilitated vegetation area. | BMP/OMP | No | Yes | In progress. |

| Objective | Performance Indicator | Performance Measure | Relinquishment Criteria | Justification / Source | Complete Yes/No | Link to TARP | Progress at Start of MOP |
|---|---|---|---|---|---|---|---|
| | | Rehabilitation Assessment Report | Fauna monitoring of natural and introduced habitat features (i.e. nesting boxes large rocks, logs/coarse woody debris, hollow bearing timber) indicates colonisation by native species. | PA, BMP/OMP | No | Yes | In progress. |
| | | Rehabilitation Assessment Report | Weed trends comparable to reference sites. | 2013 EA<br>2009 EA<br>BMP/OMP | No | Yes | In progress. |
| | | Inspection Report | Where adjacent to selected grazing or operational mining land, adequate fencing and signage is installed and maintained to prevent unintentional vehicle and livestock access. | 2013 EA<br>2009 EA<br>BMP/OMP | No | N/A | In progress. |
| | Rehabilitated native woodland vegetation will provide faunal habitat and movement corridors by linking existing vegetation communities within and surrounding the mine boundary. | Rehabilitation Assessment Report | Rehabilitated native vegetation distribution will link areas of onsite and near-site native vegetation, and be consistent with the biodiversity corridors consistent with the latest version of the DRG Synoptic Plan. | 2009 EA<br>2013 EA<br>DRG Synoptic Plan | No | N/A | In progress. |

| Objective | Performance Indicator | Performance Measure | Relinquishment Criteria | Justification / Source | Complete Yes/No | Link to TARP | Progress at Start of MOP |
|---|---|---|---|---|---|---|---|
| | Soils/ growth medium displays physical and chemical properties suited to native woodland vegetation. | Sampling Results | Field monitoring indicates:<br>Topsoil minimum depth of 100 mm, with further development of A horizon evident;<br>no accelerated or concentrated erosion<br>pH:4.5-9<br>EC (1:5 ratio) of <0.15 uS/cm<br>Soil Carbon, Nitrogen and Phosphorous levels comparable with reference sites. | Blue Book Vol 2E, Hazelton & Murphy, Elliot & Veness, Rawling et al | No | Yes | In progress. |
| Domain – E. Rehabilitation – Box Gum Woodland | | | | | | | |
| Rehabilitation areas will include at least 500 ha of re-established Box Gum Woodland. | A minimum area of 500 ha rehabilitation will be maintained as Box Gum Woodland. | Rehabilitation Assessment Report | The Box-Gum re-establishment area as shown on Plan 4, has been established with species presented in Section 7.2 for Central Hunter Box - Ironbark Woodland or Central Hunter Ironbark - Spotted Gum – Grey Box Forest. | PA 09_0062 MOD 1<br>EPBC | No | Yes | In progress. |
| | Rehabilitated Box Gum Woodland will enhance habitat and biodiversity values. | Rehabilitation Assessment Report | The development of a multi-layered community structure is evident, and (for communities > 10 years) consists of canopy, understory and groundcover comparable with reference sites. | PA 09_0062 MOD 1<br>BMP | No | Yes | In progress. |
| | | Rehabilitation Assessment Report | Density and diversity of developing tree and shrub species within rehabilitated community is comparable to that of reference sites. | BMP | No | Yes | In progress. |

| Objective | Performance Indicator | Performance Measure | Relinquishment Criteria | Justification / Source | Complete Yes/No | Link to TARP | Progress at Start of MOP |
|---|---|---|---|---|---|---|---|
| | | Rehabilitation Assessment Report | Vegetation health:<br>Age < 10 years - survival of 75% of key species and no evidence of significant vegetation stress (i.e. weed dominance, disease, water stress, premature die-back);<br>Age > 10 years – vegetation health indicators comparable to that of reference sites. | BMP | No | Yes | In progress. |
| | | Rehabilitation Assessment Report | Observations indicating reproduction (seeding, flowering or second generation plants) recorded at multiple locations within rehabilitated vegetation area. | BMP | No | Yes | In progress. |
| | | Rehabilitation Assessment Report | Observations indicating nutrient recycling (development of consistent litter layer, litter layer decomposition and cryptogam presence) recorded at multiple locations within rehabilitated vegetation area. | BMP | No | Yes | In progress. |
| | | Rehabilitation Assessment Report | Colonisation by native species comparable with local remnant vegetation. | PA 09_0062 MOD 1<br>BMP | No | Yes | In progress. |
| | | Rehabilitation Assessment Report | Weed presence is comparable to remnant vegetation. | 2009 EA<br>2013 EA<br>BMP | No | Yes | In progress. |

| Objective | Performance Indicator | Performance Measure | Relinquishment Criteria | Justification / Source | Complete Yes/No | Link to TARP | Progress at Start of MOP |
|---|---|---|---|---|---|---|---|
| | | Inspection Report | Where adjacent to selected grazing or operational mining land, adequate fencing and signage is installed and maintained to prevent unintentional vehicle and livestock access. | 2009 EA<br>2013 EA<br>BMP | No | N/A | In progress. |
| | Soils/ growth medium displays physical and chemical properties suited to native woodland vegetation. | Inspection Report & Monitoring Results | Field monitoring indicates:<br>Topsoil minimum depth of 100 mm, with further development of A horizon evident;<br>no accelerated or concentrated erosion<br>pH:4.5-9<br>EC (1:5 ratio) of <0.15 uS/cm<br>Soil Carbon, Nitrogen and Phosphorous levels comparable with reference sites. | Blue Book Vol 2E, Hazelton & Murphy, Elliot & Veness, Rawling et al | No | Yes | In progress. |
| | Domain – F. Onsite Conservation and Offset areas | | | | | | |
| All onsite biodiversity offset and conservation areas will be managed to increase their biodiversity and habitat value, and meet regulatory requirements. | Rehabilitation operations are completed in accordance with the biodiversity and rehabilitation management requirements of PA 09_0062 MOD 1 and EPBC Approval 2011/5688, and the site Biodiversity Management Plan. | Biodiversity Management Plan | Compliance with management actions presented in the site Biodiversity Management Plan, as evidenced through the most recent Independent Environmental Audit and/or Biodiversity Audit. | PA 09_0062 MOD 1<br>EPBC<br>Approval<br>BMP | No | N/A | Independent audits completed. |
| Phase – 6. Relinquishment | | | | | | | |
| Domain – A. Final Voids | | | | | | | |

| Objective | Performance Indicator | Performance Measure | Relinquishment Criteria | Justification / Source | Complete Yes/No | Link to TARP | Progress at Start of MOP |
|---|---|---|---|---|---|---|---|
| Mining voids remaining in the rehabilitated post-mining landscape will be safe, stable and non-polluting. | Vegetative cover promotes landform stability and assists with water quality maintenance. | Rehabilitation Assessment Report | Reshaped low wall areas rehabilitated as pasture or woodland vegetation meet relevant completion criteria for the relevant secondary domain. | See relevant Domain | - | - | - |
| | Landforms and water storages safe for humans, livestock and native wildlife, and non-polluting | Risk assessment & Inspection Report | Steep void walls and water storages isolated by berm and bench, or fencing and signage (depending on risk profile) to prevent unintentional vehicle, pedestrian and livestock access. | 2009 EA<br>2013 EA | No | Yes | Not commenced. |
| | | Inspection Report | Geotechnical inspections of residual steep landforms completed by independent engineer identifying:<br>no areas of existing or immanent landform failure; and<br>no potential long-term and/or high risk landform stability issues. | 2009 EA<br>2013 EA | No | N/A | Not commenced. |
| | | Water Monitoring report | Water monitoring indicates contaminants within acceptable limits. | EPL | No | Yes | Sitewide ground & surface water monitoring in progress and approved by DP&E. |
| Domain – B. Water Management | | | | | | | |
| Rehabilitated water management features will be re-instated and managed as stable, non-eroding and non-polluting landform features that either hold water (i.e. dams) | Water management features will be stable and non-polluting | Water Monitoring Report | Water leaving site is monitored in accordance with the relevant EPL (until EPL is surrendered). | EPL | Yes | Yes | Monitoring in progress. |
| | | Water Monitoring Report | Discharged water quality is in the range of receiving watercourse background water quality. | EPL | Yes | Yes | Monitoring in progress. |

| Objective | Performance Indicator | Performance Measure | Relinquishment Criteria | Justification / Source | Complete Yes/No | Link to TARP | Progress at Start of MOP |
|---|---|---|---|---|---|---|---|
| or allow the unimpeded flow of water (i.e. drainage lines and watercourses) as designed. | | Rehabilitation Assessment Report | No concentrated or accelerated erosion in drainage lines compared to nearby non-mining disturbed drainage lines. | 2009 EA<br>2013 EA | No | Yes | In progress. |
| | | Rehabilitation Assessment Report | Rehabilitated drainage lines revegetated | See relevant Domain | - | - | - |
| | | Inspection report | Appropriately fenced and signed to prevent unintended livestock and vehicle access. | 2009 EA<br>2013 EA<br>BMP | No | N/A | In progress. |
| Domain – C. Rehabilitation - Pasture | | | | | | | |
| Rehabilitated pasture landscapes will support a financially viable and environmentally sustainable livestock grazing operation. | Landscape and land-surface suitable for grazing operations. | Grazing Potential Assessment Report | At least 70 percent established and maintained. | Blue Book Vol2E, Grigg et al | No | Yes | In progress. |
| | | Inspection Report | Land surfaces within grazing areas free of obstacles or hazardous terrain. | MOP | No | N/A | In progress. |
| | | Grazing Potential Assessment Report | Rehabilitate at least 33 ha of Class II agricultural capability land in the area identified in the Project Approval. | 2009 EA<br>2013 EA<br>PA 09_0062 MOD 1 | No | Yes | In progress. |
| | | Inspection report | Appropriate infrastructure such access roads and fencing, including fencing along drainage lines and adjacent woodland areas, maintained and functional. | 2009 EA<br>2013 EA<br><br><br><br>Agronomist | No<br><br><br><br>No | N/A<br><br><br><br>N/A | In progress.<br><br><br><br>Not commenced. |

| Objective | Performance Indicator | Performance Measure | Relinquishment Criteria | Justification / Source | Complete Yes/No | Link to TARP | Progress at Start of MOP |
|---|---|---|---|---|---|---|---|
| | Soil substrate and pasture cover is able to support grazing. | Grazing Potential Assessment Report | Pasture cover species composition suited to beef cattle grazing, with trends in pasture health and composition comparable with non-mined grazing reference sites. | Agronomist | No | Yes | In progress. |
| | | Monitoring Results | Soil assessment as part of site monitoring program indicates:<br>Minimum topsoil depth 100 mm, with well-developed A horizon present.<br>minimal evidence of active land degradation processes;<br>no evidence of accelerated or concentrated erosion;<br>Rootzone soil pH:4.5-9<br>Rootzone soil EC (1:5 ratio) of <0.15 uS/cm<br>Rootzone soil cation exchange capacity (CEC) >14 Cmol+/kg<br>Exchangeable sodium capacity (ESP) <5%<br>Rootzone organic carbon levels (>4.0%)<br>Rootzone soil phosphorous (Colwell P) levels 14-20 mg/kg | Blue Book Vol 2E, Hazelton & Murphy, Elliot & Veness, Grigg et al | No | Yes | In progress. |
| Post-mining landuses will be consistent with surrounding landuses, and not impact on biodiversity values of adjacent woodland and conservation areas. | Land management measures implemented to control grazing related risks to onsite grazing, neighbouring land and adjacent biodiversity areas. | Grazing Potential Assessment Report | Weed distribution comparable to reference sites. | 2009 EA<br>2013 EA<br>Agronomist | No | Yes | In progress. |
| | | Fire Management Plan | Program implemented for fuel load assessment and reduction, with advice from NSW Rural Fire Service. | Bushfire Prevention Procedure | No | Yes | In progress. |

| Objective | Performance Indicator | Performance Measure | Relinquishment Criteria | Justification / Source | Complete Yes/No | Link to TARP | Progress at Start of MOP |
|---|---|---|---|---|---|---|---|
| | | Monitoring Report | Pest animal infestation comparable to reference sites, with ongoing control program in place. | 2009 EA<br>2013 EA | No | Yes | In progress |
| | | Inspection Report | No gullies greater than 20cm depth over transects. | 2009 EA<br>2013 EA | No | Yes | In progress. |
| | | Monitoring Results | Monitoring of drainage lines indicates no significant concentrated/ accelerated erosion, and no downstream sedimentation or other degradation impacts. | 2009 EA<br>BMP<br>2013 EA | No | Yes | In progress. |
| Domain – D. Rehabilitation – Native Woodland | | | | | | | |
| Rehabilitation will establish at least 2142ha of native woodland vegetation community (excluding 500 ha Box Gum Woodland). | An area equivalent to 2142 ha will be maintained as established native woodland. | Rehabilitation Assessment Report<br>Independent Report | All areas shown as Native Woodland vegetation community in Plan 4 have been established as open grassy woodland vegetation community. Verified by independent audit. | PA 09_0062 MOD 1 | No | Yes | In progress. |
| | Rehabilitated native woodland will be focussed on establishing the vegetation communities as required in Project Approval. | Rehabilitation Assessment Report | Rehabilitated native woodland vegetation communities will include key species listed in Section 7.2 for Central Hunter Box - Ironbark Woodland or Central Hunter Ironbark - Spotted Gum – Grey Box Forest. | PA 09_0062 MOD 1<br>BMP/OMP | No | Yes | In progress. |
| | Rehabilitated native woodland will enhance habitat and biodiversity values. | Rehabilitation Assessment Report | The development of a multi-layered community structure is evident, and (for communities > 10 years) consists of canopy, understory and groundcover comparable with reference sites. | PA 09_0062 MOD 1<br>BMP/OMP | No | Yes | In progress. |

| Objective | Performance Indicator | Performance Measure | Relinquishment Criteria | Justification / Source | Complete Yes/No | Link to TARP | Progress at Start of MOP |
|---|---|---|---|---|---|---|---|
| | | Rehabilitation Assessment Report | Density and diversity of developing tree and shrub species within rehabilitated community is comparable to that of reference sites. | BMP/OMP | No | Yes | In progress. |
| | | Rehabilitation Assessment Report | Vegetation health indicators i.e. weed dominance, disease, water stress, premature die-back) comparable to that of reference sites. | BMP/OMP | No | Yes | In progress. |
| | | Rehabilitation Assessment Report | Observations indicating reproduction (seeding and flowering in second generation plants) recorded at multiple locations within rehabilitated vegetation area. | BMP/OMP | No | Yes | In progress. |
| | | Rehabilitation Assessment Report | Observations indicating nutrient recycling (development of consistent litter layer, litter layer decomposition and cryptogam presence) recorded at multiple locations within rehabilitated vegetation area. | BMP/OMP | No | Yes | In progress. |
| | | Rehabilitation Assessment Report | Fauna monitoring indicates patterns of native fauna colonisation and distribution comparable with non-mined native woodland reference sites. | PA 09_0062 MOD 1<br>BMP/OMP | No | Yes | In progress. |
| | | Rehabilitation Assessment Report | Overall weed trends comparable to reference sites. | 2009 EA, MOP, BMP/OMP | No | Yes | In progress. |

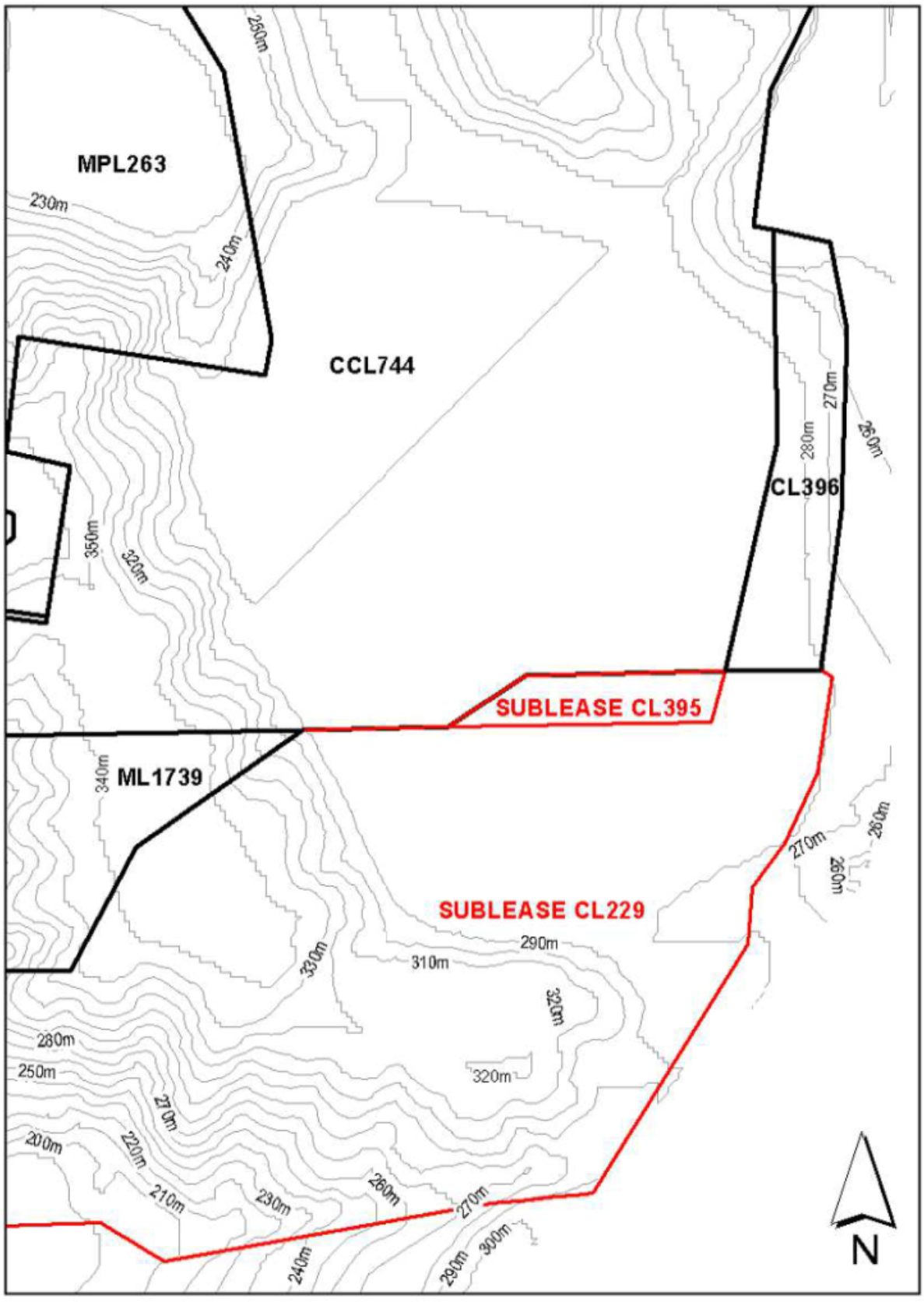
| Objective | Performance Indicator | Performance Measure | Relinquishment Criteria | Justification / Source | Complete Yes/No | Link to TARP | Progress at Start of MOP |
|---|---|---|---|---|---|---|---|
| | | Inspection Report | Where adjacent to proposed grazing land, adequate fencing and signage is installed and maintained to prevent unintentional vehicle and livestock access. | 2009 EA, MOP, BMP/OMP | No | N/A | In progress. |
| | Rehabilitated native woodland vegetation will provide faunal habitat and movement corridors by linking existing vegetation communities within and surrounding the mine boundary. | Rehabilitation Assessment Report | Rehabilitated native vegetation distribution will link areas of onsite and near-site native vegetation, and be consistent with the biodiversity corridors presented in the latest version of the DRG Synoptic Plan (or equivalent). | 2009 EA, DRG Synoptic Plan | No | N/A | In progress. |
| | Soils/ growth medium displays physical and chemical properties suited to native woodland vegetation. | Field Monitoring | Field monitoring indicates:<br>Topsoil minimum depth of 100 mm, with well-developed A horizon evident;<br>no accelerated or concentrated erosion<br>pH:4.5-9<br>EC (1:5 ratio) of <0.15 uS/cm<br>Soil Carbon, Nitrogen and Phosphorous levels comparable with reference sites. | Blue Book Vol 2E, Hazelton & Murphy, Elliot & Veness, Rawling et al | No | Yes | In progress. |
| The rehabilitated post-mining landscape will be compliant with relevant regulatory and corporate requirements. | The rehabilitated native woodland areas will be established and managed in accordance with the biodiversity and rehabilitation requirements of the EPBC approval, Project Approval and site Biodiversity Management Plan. | Audit Report | An independent audit of compliance with the biodiversity and rehabilitation requirements of the EPBC approval, Project Approval and site Biodiversity Management Plan will be undertaken within three years of planned mine closure, with all non-compliances addressed before final closure. | PA 09_0062 MOD 1<br>EPBC Approval | No | N/A | Not commenced. |

| Objective | Performance Indicator | Performance Measure | Relinquishment Criteria | Justification / Source | Complete Yes/No | Link to TARP | Progress at Start of MOP |
|---|---|---|---|---|---|---|---|
| Domain – E. Rehabilitation – Box Gum Woodland | | | | | | | |
| Rehabilitation areas will include at least 500 ha of re-established Box Gum Woodland. | A minimum area of 500 ha rehabilitation will be maintained as established Box Gum Woodland. | Rehabilitation Assessment Report | The 500 ha Box-Gum woodland area consists of the key species in the strata listed in Section 7.2 for Central Hunter Box - Ironbark Woodland or Central Hunter Ironbark - Spotted Gum – Grey Box Forest. | PA 09_0062 MOD 1<br>EPBC Approval | No | Yes | In progress. |
| | Rehabilitated Box Gum Woodland will enhance habitat and biodiversity values. | Rehabilitation Assessment Report | The development of a multi-layered community structure is evident, and (for communities > 10 years) consists of canopy, understory and groundcover comparable with reference sites. | PA 09_0062 MOD 1<br>EPBC Approval<br>BMP | No | Yes | In progress. |
| | | Rehabilitation Assessment Report | Density and diversity of developing tree and shrub species within rehabilitated community is comparable to that of reference sites. | BMP | No | Yes | In progress. |
| | | Rehabilitation Assessment Report | Vegetation health indicators (i.e. weed dominance, disease, water stress, premature die-back) comparable to that of reference sites. | BMP | No | Yes | In progress. |
| | | Rehabilitation Assessment Report | Observations indicating reproduction (seeding and flowering in second generation plants) recorded at multiple locations within rehabilitated vegetation area. | BMP | No | Yes | In progress. |

| Objective | Performance Indicator | Performance Measure | Relinquishment Criteria | Justification / Source | Complete Yes/No | Link to TARP | Progress at Start of MOP |
|---|---|---|---|---|---|---|---|
| | | Rehabilitation Assessment Report | Observations indicating nutrient recycling (development of consistent litter layer, litter layer decomposition and cryptogam presence) recorded at multiple locations within rehabilitated vegetation area. | BMP | No | Yes | In progress. |
| | | Rehabilitation Assessment Report | Fauna monitoring indicates patterns of native fauna colonisation and distribution comparable with non-mined native woodland reference sites. | PA 09_0062 MOD 1<br>BMP | No | Yes | In progress. |
| | | Rehabilitation Assessment Report | Overall weed trends comparable to reference sites. | 2009 EA,<br>BMP/OMP<br>2013 EA | No | Yes | In progress. |
| | | Rehabilitation Assessment Report | Weed density within Box Gum Woodland rehabilitation area is similar to that of State 1 areas as described in the Baseline Ecological Study of Mt Arthur Coal Biodiversity Offset and Conservation Areas (Umwelt, 2013). | BMP/OMP, Rawling et al | No | Yes | In progress. |
| | | Inspection Report | Where adjacent to proposed grazing land, adequate fencing and signage is installed and maintained to prevent unintentional vehicle and livestock access. | 2009 EA, MOP, BMP/OMP | No | N/A | In progress. |

| Objective | Performance Indicator | Performance Measure | Relinquishment Criteria | Justification / Source | Complete Yes/No | Link to TARP | Progress at Start of MOP |
|---|---|---|---|---|---|---|---|
| | Soils/ growth medium displays physical and chemical properties suited to native woodland vegetation. | Independent Field Monitoring Report | Field monitoring indicates:<br>Topsoil minimum depth of 100 mm, with well-developed A horizon;<br>no accelerated or concentrated erosion<br>pH:4.5-9<br>EC (1:5 ratio) of <0.15 uS/cm<br>Soil Carbon, Nitrogen and Phosphorous levels comparable with reference sites. | Blue Book Vol 2E, Hazelton & Murphy, Elliot & Veness, Rawling et al | No | Yes | In progress. |
| The rehabilitated post-mining landscape will be compliant with relevant regulatory and corporate requirements. | The rehabilitated native woodland areas will be established and managed in accordance with the biodiversity and rehabilitation requirements of the EPBC approval, Project Approval and site Biodiversity Management Plan. | Audit Report | An independent audit of compliance with the biodiversity and rehabilitation requirements of the EPBC approval, Project Approval and site Biodiversity Management Plan will be undertaken within three years of planned mine closure, with all non-compliances addressed before final closure. | PA 09_0062 MOD 1<br>EPBC | No | N/A | Not commenced |
| Domain – F. Onsite Conservation and Offset areas | | | | | | | |
| All onsite biodiversity offset and conservation areas will be managed to increase their biodiversity and habitat value, and meet regulatory requirements. | Rehabilitation operations are completed in accordance with the biodiversity and rehabilitation management requirements of PA 09_0062 and EPBC Approval 2011/5688, and the site Biodiversity Management Plan. | Audit Report | Compliance with management actions presented in the site Biodiversity Management Plan, as evidenced through the most recent Independent Environmental Audit and/or Biodiversity Audit. | PA 09_0062 MOD 1<br>EPBC<br>BMP | No | N/A | Independent audits completed, but future audits required. |

## Appendix 4: Drayton sub-lease area landform contours



# Appendix 5: Document Control Authorisation

| Amendment History | | | |
|---|---|---|---|
| **Date** | **Version** | **Page** | **Details** |
| May 2017 | 1.0 | All | New two year MOP for FY18 and FY19 |
| November 2017 | 1.1 | 13, 17, 43, 49, 108 | Amendment to include Conveyor corridor dump, Saddlers Mining and Ayredale infrastructure. MOP Plans 3A – E and Plan 4 have been updated. |
| August 2018 | 1.2 | 1, 8, 9, 10, 18, 44, 46, 50,108,109 | Amendment to include dump area at Saddlers, conveyor corridor and sublease. also to include mining in Saddlers, Ayredale and Roxburgh |
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# Appendix 5: Document Control Authorisation

| Business Process Owner Endorser Authorisation | | | |
|---|---|---|---|
| **Position** | **Name** | **Date** | **Signature** |
| Superintendent HSE Business Partnership | Kris Sheehan | | |
| Superintendent Tactical Planning | Ian McKechnie | | |

| Approver Authorisation | | | |
|---|---|---|---|
| **Position** | **Name** | **Date** | **Signature** |
| Manager Production Planning | Damien Perkins | 23/08/2018 | |
| Head HSE Business Partnership | Sarah Withell | 24/08/2018 | |
| General Manager | Dawid Boshoff | 24/08/2018 | |

| Amendment History | | | |
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# Appendix 5: Document Control Authorisation

| Business Process Owner Endorser Authorisation | | | |
|---|---|---|---|
| **Position** | **Name** | **Date** | **Signature** |
| Superintendent HSE Business Partnership | Kris Sheehan | 22 Aug 2018 | |
| Superintendent Tactical Planning | Ian McKechnie | 20 Aug 2018 | |

| Approver Authorisation | | | |
|---|---|---|---|
| **Position** | **Name** | **Date** | **Signature** |
| Manager Production Planning | Damien Perkins | | |
| Head HSE Business Partnership | Sarah Withell | | |
| General Manager | Dawid Boshoff | | |

| Amendment History | | | |
|---|---|---|---|
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| | | | |
| | | | |
| | | | |

# Appendix 6: References


| Rehabilitation Table Reference | Publication |
|---|---|
| Grigg et al | Grigg, A., Emmerton, B.R. and McCallum, N.J. ACARP Project C8038: Completion Criteria for Pasture Based Rehabilitation in the Bowen Basin. CMLR, University of Queensland. August 2001. |
| Rawlings et al | Rawlings, K.; Freudenberger, D.; and Carr, D.; A Guide to Managing Box Gum Grassy Woodlands. Department of the Environment, Water, Heritage and the Arts, 2010. |
| 2009 EA | Hansen Bailey (2009) Mt Arthur Coal Consolidation Project Environmental Assessment |
| 2013 EA | Resource Strategies (2013) Mt Arthur Coal Open Cut Modification Environmental Assessment |
| Blue Book Vol 2E | Managing Urban Stormwater Guidelines: Volume 2E Mines and Quarries. NSW EPA, 2008. |
| PA 09_0062 MOD 1 | Project Approval 09_0062 MOD 1. Mt Arthur Coal Mine – Open Cut Modification Project, NSW Department of Planning and Environment, September 2014. |
| EPBC | Environmental Protection and Biodiversity Conservation Act Approval 2011/5866. Department of Sustainability, Environment, Water, Population and Communities, April 2012. |
| BMP/OMP | Biodiversity Management Plan and Offset Management Program for Onsite and Near site Offset Areas. In prep. Umwelt, 2013. |
| Closure Plan | Mt Arthur Coal Mine, Hunter Valley, NSW. Development of a Conceptual Mine Closure Plan and Outline of the Methodology behind the Closure Cost Provision and Valuation. GSSE, July 2011. |
| EMS | Mt Arthur Coal Environmental Management System |
| EPL | Environment Protection Licence No. 11457 |
| DSC | NSW Dam Safety Committee approval conditions |
| SWMP | Site Water Management Plan |
| Dump Standard | Standard for Design, Construction and Maintenance of Dump Areas |
| Agronomist | Report prepared by consulting agronomist on grazing potential on Mt Arthur Coal pasture rehabilitation. In preparation. |
| Elliot & Veness | After Elliot, G.L. and Veness, R.A. Selection of Topdressing Material for Rehabilitation of Disturbed Areas in the Hunter Valley. J.Soil Cons, NSW 37 37-40, 1981. |
| Hazelton & Murphy | Hazelton, P.A. & Murphy, B.W. Interpreting Soil Test Results: What do all the numbers mean? (2nd ed.). CSIRO, 2007. |