LIDDELL

GLENCORE

Mining Operations Plan

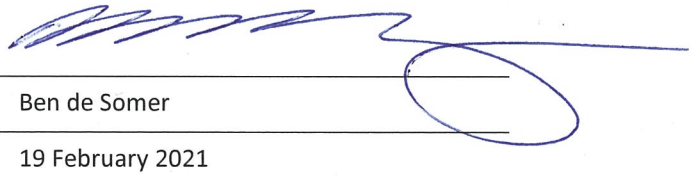
2021 - 2023

Mine Name	Liddell Coal Operations
Company	Liddell Coal Operations Pty Ltd
Operator	Liddell Coal Operations Pty Ltd
Mining Title & Leaseholder	ML 1597, ML1313, CCL 708, Sublease ML1552 Liddell Tenements Pty Ltd.

Status: Approved
Effective: 18 March 2021

Liddell Coal Operations

Mining Operations Plan 2021 to 2023

Name of Mine	Liddell Coal Operations
MOP Commencement Date	18/3/2021
MOP Completion Date	1/12/2023
Mining Authorisations (Lease / Licence No.)	ML1597, ML1313, CCL708, Sublease ML1552
Name of Authorisation / Authorisations Holders (s)	Liddell Tenements Pty Limited
Name of Mine Operator (if different)	N/A
Name & Contact Details of the Mine Manager	Mark Faulkner
Name & Contact Details of the Environmental Representative	Ben de Somer
Name of Representative(s) of the Authorisation Holder(s)	Murray Gregson
Title of Representative(s) of Authorisation Holder(s)	Operations Manager
Signature of Representative(s) of Authorisation Holder(s)	
Reporting Officer	Ben de Somer
Date	19 February 2021
Version	1

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1. Introduction

1.1 Overview

Liddell Coal Operations (LCO) is an established open-cut mine located at Ravensworth, approximately 25 kilometres (km) north-west of Singleton, and 26 kilometres southeast of Muswellbrook, in the Upper Hunter Valley of New South Wales. LCO is operated and managed by Liddell Coal Operations Pty Limited, a wholly owned subsidiary of Glencore Coal Pty Limited (Glencore), on behalf of a joint venture between Glencore (67.5 percent (%)) and Mitsui Matsushima Australia (32.5%). The location of LCO is illustrated on **Plan 1A** (refer to **Appendix A**).

LCO has approval to produce up to 8 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal. Product coal, both semi-soft and thermal, is transported to the Port of Newcastle by rail for sale into the export market. LCO also has approval to truck up to 0.5 Mtpa of reclaimed tailings to local power stations.

1.2 Purpose

This plan has been prepared to satisfy the requirements of a Mining Operations Plan (MOP) in accordance with the NSW Trade and Investment – Division of Resources and Energy (DRE) guideline *ESG3: Mining Operations Plan (MOP) Guidelines, September 2013* (DRE 2013). This MOP also satisfies the requirements for a Rehabilitation Management Plan in accordance with DA 305-11-01 MOD 7 (Schedule 3, Condition 39) (**Appendix B**) and EPBC 2013/6908 Condition 5. This MOP documents the following:

- Proposed mining operations as approved by development consent DA 305-11-01 (MOD 7) issued under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act);
- Long-term mine closure principles and proposed final land use outcomes; and
- Proposed rehabilitation methods and progress during the MOP term.

This MOP documents the rehabilitation and closure related activities during the MOP term. Based on the current Life of Mine Plan coal extraction is planned to occur during this MOP term and cognisant of the subsequent cessation of coal mining, LCO has commenced detailed mine closure planning in consultation with RR; refer to **Section 7.3.6** for details.

1.3 History of Operations

Underground mining commenced at LCO in 1923, and open cut operations in 1946. Mining operations have been continuous at LCO since the 1950s, with operations intermittent prior to this time. Four separate mines once operated at LCO, being the former:

- Liddell, Durham, and Foybrook mines, all of which included both open cut and underground mining operations; and
- Hazeldene, a former underground mine.

The extent of historical underground and open cut workings is illustrated on **Plan 1C**.

In June 1989, the Liddell Joint Venture purchased the Liddell Colliery and lodged an application with Muswellbrook Shire Council to extend operations using both open cut and underground mining methods. This application was approved on 1 May 1990 (DA 24/90).

In 1993, the Liddell Joint Venture acquired the Foybrook leases, excluding the Antiene Void, and lodged a further development application to extend open cut mining operations in the Foybrook lease. Muswellbrook Shire Council granted development consent for this application on 31 March 1994 (DA 101/93).

Development Consent DA 305-11-01 granted in 2002 by the (now) Department of Planning, Industry and Environment (DPIE) consolidated DA 24/90 and DA 101/93 into a single consent, and approved the continuation of open cut operations at LCO until 31 December 2023. DA 305-11-01 remains the current development consent for LCO. The current open cut operation accesses coal reserves not previously recovered by underground mining that utilised partial extraction techniques.

DA 305-11-01 allows for the use of three mining methods at LCO; truck and excavator, dragline, and highwall mining (utilising an auger or continuous miner). Limited highwall mining has been undertaken intermittently to extract coal from areas where open cut mining is not feasible. There have been no dragline operations to date at LCO.

Since approval, DA 305-11-01 has been modified six times: Modifications (MOD) 1 to 4 approved a number of administrative changes, construction of new infrastructure and modifications to existing infrastructure, and an increase in production from 4.5 Mtpa to 8 Mtpa (refer to **Section 1.4.1**).

MOD 5 was approved by the DPIE on 1 December 2015 and approved the extension of mining in the South and Entrance Pits to the south east, and, upon completion of mining in these pits, the mining of coal resources under the Mine Infrastructure Area (MIA) during which the MIA will be relocated to temporary facility. An additional approximate 38 Mt of ROM coal will be recovered from the extended open cut mining areas. MOD 5 also approves a five year extension of the mine life to the end of 2028, as well as the construction of a tailings emplacement within the South Pit void.

MOD 6 was approved by the DPIE on 16 February 2016 and approves construction and operation of a tailings pipeline from the Coal Handling and Preparation Plants (CHPPs) at Ravensworth Operations and Liddell Colliery to the West Pit Void at Ravensworth East Mine.

MOD 7, approved by DPIE on 12 February 2019, comprised of minor amendments to facilitate required remediation works on a portion of the Mountain Block Offset Area. The minor amendments also sought to facilitate improved operational efficiencies at LCO whilst providing the necessary flexibility required for the development of the final landform to the established rehabilitation objectives established for LCO.

Section 2 provides a more detailed description of the proposed activities in the MOP term.

1.3.1 History of MOPs

Table 1 lists the history of MOPs at LCO since the granting of DA 305-11-01 in 2002.

Table 1 History of MOPs

MOP	Status	Issue date	Expiry Date
2021-2023 MOP	This Document	18/3/2021	1/12/2023
2018 - 2020 MOP Amendment B	Current	17/2/2020	31/3/2021
2018 - 2020 MOP Amendment A	Superseded	17/9/2019	1/12/2020
2018 - 2020 MOP Addendum 2	Superseded	24/10/2018	1/12/2020
2018 - 2020 MOP Addendum 1	Superseded	22/06/2018	1/12/2020

MOP	Status	Issue date	Expiry Date
2018 - 2020 MOP	Superseded	29/11/2017	1/12/2020
2015 - 2022 MOP Amendment A	Superseded	20/01/2017	16/03/2022
2015 - 2022 MOP	Superseded	16/03/2015	16/03/2022
2008 – 2015 MOP Amendment C	Superseded	14/04/2014	31/05/2015
2008 – 2015 MOP Amendment B	Superseded	17/10/2011	2015
2008 – 2015 MOP Amendment A	Superseded	25/03/2010	2015
2008 – 2015 MOP	Superseded	11/04/2008	2015
2002 – 2008 Amendment A	Superseded	03/02/2004	2008
2002 – 2008	Superseded	21/05/2002	2008

1.4 Current Consents, Authorisations and Licences

1.4.1 Development Consents

As outlined in **Section 1.3**, the development consent applicable to LCO is DA 305-11-01 MOD 7, approved by the DPIE on 12 February 2019 under Sections 76(A) and 80 of the EP&A Act. Hence, LCO is classified as a Level 1 Mine as defined by *ESG3 Mining Operations Plan (MOP) Guideline* (DRE, 2013). **Table 2** summarises the modification history of DA 305-11-01 and key features of the project approved by each modification.

In addition to the State development consent, on 24th December 2014 LCO was granted EPBC Approval 2013/6908 for a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* to expand the existing Liddell open cut coal mine operations in the Hunter Valley region in New South Wales, under the following Controlling Provisions:

- Listed threatened species and communities (sections 18 & 18A)
- Listed migratory species (sections 20 and 20A)
- Water resources/trigger (sections 24D and 24 E)

Mining activities commenced within the approval area on the 19 May 2015 and the approval expires 31 December 2044.

Table 2 Development Consents

Consent	Details	Issue Date	Expiry Date
DA 305-11-01	Development Consent for the continued operation of the Liddell Colliery including increase of ROM coal production to 4.5 Mtpa with product transferred via the Liddell Coal loading facility and the Main Northern Railway to the Port of Newcastle, using existing infrastructure and extension of open cut mining to two new pits.	20 Nov 2002	31 Dec 2023

Consent	Details	Issue Date	Expiry Date
DA 305-11-01 MOD 1	MOD 2 - a 47 hectare extension to the open cut mining footprint, an increase in ROM coal production from 4.5 up to 8 million tonnes per year, construction and operation of a new coal handling and preparation plant (CHPP), and modifications to coal handling, loading and stockpiling facilities, an increase in rail transportation of product coal from 3.4 up to 6 million tonnes per year, and construction of an access haul road adjacent to the Main Northern Railway Line and an overpass haul road bridge.	1 Aug 2003	31 Dec 2023
DA 305-11-01 MOD 2	Modification of the development consent boundary to incorporate a groundwater monitoring bore.	18 July 2007	31 Dec 2023
DA 305-11-01 MOD 3	MOD 3 – RE-use of treated effluent and storage of in Dam 13, and realignment of the Old New England Highway and the Access Road intersection.	7 May 2008	31 Dec 2023
DA 305-11-01 MOD 4	MOD 4 – Construction of additional offices and workshop facilities.	27 Oct 2009	31 Dec 2023
DA 305-11-01 MOD 5	MOD 5 - Extension of the existing Entrance Pit and South Pit to the south east, mining of coal resources under the MIA upon completion of mining in the South and Entrance Pits, and an associated extension in the mine life at LCO from 2023 to 2028. MOD 5 also allows the construction of a tilings emplacement in the South Pit void.	1 Dec 2014	31 Dec 2028
DA 305-11-01 MOD 6	MOD 6 - construction and operation of a tailings pipeline from the Coal Handling and Preparation Plants (CHPPs) at Ravensworth Operations and Liddell Colliery to the West Pit Void at Ravensworth East Mine	16 Feb 2016	31 Dec 2028
DA 305-11-01 MOD 7	MOD 7 – Minor amendment to permit the required delivery of Mountain Block Offset area and the efficient delivery of the final landform to the established rehabilitation objectives	12 Feb 2019	31 Dec 2028

1.4.2 Mining Titles

The mining titles applicable to LCO are listed below in **Table 3**. During the previous MOP term, LCO applied to modify ML1597 with an Ancillary Mining Activity (AMA) approval for rehabilitation activities associated with Mountain Block discussed in **Section 9.1.2**. Subsequently, ML1597 was varied with AMA1020 on the 21st January 2020.

Table 3 LCO Mining Titles

Mining Title	Title Holder	Issue Date	Expiry Date
ML 1597	Liddell Tenements Pty Ltd	5 Nov 2007 Varied with AMA1020 21 Jan 2020	5 November 2028
CCL. 708	Liddell Tenements Pty Ltd	17 May 1990	30 December 2023
ML 1313	Liddell Tenements Pty Ltd	5 May 1993	13 October 2023
Cumnock Sublease MML 1552	Liddell Tenements Pty Ltd	25 Jan 2006	10 March 2025

1.4.3 Licences

1.4.3.1 Environment Protection Licence

LCO currently operates under Environment Protection Licence (EPL) 2094, which is renewed annually on 30 June. The licence covers the scheduled activities of 'mining for coal' and 'coal works'.

EPL 2094 outlines air quality, surface water quality and blast criteria. EPL 2094 also enables discharges off-site in accordance with the Hunter River Salinity Trading Scheme (HRSTS). Monitoring is reported to the Environment Protection Authority (EPA) as part of the LCO EPL Annual Return.

1.4.3.2 Surface Water Extraction Licences

Table 4 lists the surface water licences currently held by LCO.

Table 4 Surface Water Extraction Licences

Locality	Licence No.	Holder	Use	Water Source/ Management Zone/Type	Annual Use (ML)	Annual Allocation (ML)
Bowmans Creek	**WAL 18320**	Enex Foydell Pty Ltd	Irrigation	Jerrys Water Source/ Jerrys Management Zone/ Unregulated River	Nil	50
Bowmans Creek	**WAL18304**	Enex Foydell Pty Ltd	Irrigation	Jerrys Water Source/ Jerrys Management Zone/ Unregulated River	Nil	32
Bowmans Creek	**WAL18318**	Novacoal Australia Pty Ltd	Irrigation	Jerrys Water Source/ Jerrys Management Zone/ Unregulated River	Nil	55
Bayswater Creek	**WAL 18306**	Mitsushima Australia Pty Ltd	Industrial (coal mining)	Jerrys Water Source/ Jerrys Management	Nil	100

Locality	Licence No.	Holder	Use	Water Source/ Management Zone/Type	Annual Use (ML)	Annual Allocation (ML)
		Enex Liddell Pty Ltd Gabume Pty Ltd		Zone/ Unregulated River		
Hunter River via AGL Macquarie	**WAL7815**	Liddell Tenements Pty Ltd	Industrial	Hunter Regulated River Water Source/ Zone 1B Regulated River	Nil	20
Swamp Creek	**20SL042837**	LCO Pty Ltd	Monitoring		Nil	N/A – Diversion Works

1.4.3.3 Groundwater Licences

LCO currently holds the following groundwater licences as shown in **Table 5**:

Table 5 Groundwater Licences

Locality	Licence No.	Holder	Lot/DP	Purpose	Annual Extraction Allocation (ML)
Haz 6	**20BL168066**	Liddell Tenements Pty Ltd	81/607296	Monitoring	N/A
Dur 3	**20BL168065**	Liddell Tenements Pty Ltd	31/837350	Monitoring	N/A
LC1	**20BL168064**	Liddell Tenements Pty Ltd	353/867083	Monitoring	N/A
Durham 1	**WAL41499**	Liddell Tenements Pty Ltd	33/862516	Industrial	6000
8 South 3 & 4	**WAL41498**	Liddell Tenements Pty Ltd	32/870789	Industrial	6000
Durham 2 & 4	**WAL41497**	Liddell Tenements Pty Ltd	3/237654	Industrial (2 bores)	1000
Haz 1 & 2	**WAL39760**	Liddell Tenements Pty Ltd	81/607296	Industrial (2 bores)	5500
ALV1, ALV2, ALV3, ALV4, ALV7, ALV8, ALV9	**20BL168053**	LCO Pty Ltd	43/654013 201/848078 4/255403 81/607296 6/255403	Test bore/ Monitoring	N/A

Locality	Licence No.	Holder	Lot/DP	Purpose	Annual Extraction Allocation (ML)
			32/545601		
Bowmans Creek Alluvial	**WAL18302**	Liddell Southern Tenements Pty Ltd	32/545601	Irrigation	5
Bowmans Creek Alluvial	**20WA210940**	Enex Foydell Limited	6/1077004	Irrigation	5
M49	**WAL41493**	Liddell Southern Tenements Pty Ltd	32/545601	Dewatering	2500
Mt Owen 1	**WAL41493**	Mt Owen Pty Ltd	353/867083	Stock, domestic, farming and test purposes	2500
Mt Owen 2	**20BL169544**	Mt Owen Pty Ltd	353/867083	Dewatering	2500
Middle Liddell	**WAL41498**	LCO Pty Ltd	1/237766	Dewatering	6000

1.4.3.4 Radiation Density Gauge Licence

LCO holds Radiation Management Licence 5061082 to possess radioactive apparatus and substances. Radiation density gauge locations at the CHPP are recorded and registered by the EPA.

1.5 Land Ownership and Land Use

The area within and surrounding the LCO is dominated by mining and power generating activities, as illustrated on **Plan 1C**. Surrounding mining operations include Ravensworth Operations to the south, Ravensworth Underground Mine and the Ravensworth Central Coal Processing (RCCP) facility to the south west, and the Mount Owen Complex (incorporating Mount Owen, Ravensworth East and Glendell mining operations) to the east. Other mines in the wider surrounding area include Ashton Coal, Integra and Hunter Valley Operations. Bayswater and Liddell Power Stations are located to the west and north-west of LCO respectively.

Lake Liddell lies immediately adjacent to the western boundary of LCO, with the Main Northern Railway line traversing LCO from northwest to southeast. The remaining land within the vicinity of LCO is predominantly used for grazing purposes with a small number of privately owned rural residences located to the north east and north-west of LCO. The nearest private residence to LCO is approximately 1 km from the LCO development consent boundary. Two properties owned by AGL Macquarie are also located to the north west of LCO. Land ownership and land use is illustrated on **Plan 1C** and detailed in **Appendix C**.

1.6 Stakeholder Consultation

Extensive stakeholder consultation specifically related to the activities proposed in this MOP term, including environmental management, proposed rehabilitation strategies, and final land goals for LCO was recently undertaken as part of the preparation of the Environmental Assessment accompanying the development application for MOD7, MOD 6 and MOD 5. These consultation activities are outlined in Modification 7 Environmental Assessment (Hansen Bailey, 2018), *Greater Ravensworth Area Tailings Pipeline Modification Environmental Assessment* (MOD 6 EA) (Hansen Bailey, 2015) and *Liddell Coal Operations Proposed Modification to DA 305E-11-01 Environmental Assessment* (MOD 5 EA) (SLR, 2013).

The Rehabilitation Strategy prepared to support the MOD 5 EA (MOD 5 EA Appendix S) (Umwelt, 2013) was prepared in consultation with community stakeholders and regulators including the RR, DPIE, NSW Office of Water (NOW), NSW Heritage, Biodiversity Conservation Division (BCD), Forests NSW, Singleton Council (SC) and Muswellbrook Shire Council (MSC).

During the 2020-2023 MOP preparation and in accordance with DA305-11-01 Mod 7 Schedule 3 Condition 39 this plan was distributed to DPIE, DPI Water Division (formerly DPI Water), BCD, SC and MSC for comment in August 2020. Accompanying the draft plan, a presentation and letter summarising the key changes/elements of the plan was provided and where possible a meeting was held to discuss. As required by DA305-11-01 Mod 7 Schedule 2 Condition 15, **Table 6** below provides a summary of the consultation required, undertaken, matters raised (by exception) and outcomes. LCO will continue to consult with relevant stakeholders as outline in the LCO Stakeholder Engagement Strategy (LIDOC-90533967-166) and report on environmental performance as per LCO licences and approvals.

Table 6 MOP Consultation Summary

Agency	Summary of matters raised by exception	Outcomes
Resources Regulator	RR requested further information on a number of matters during the MOP assessment regarding primarily completion criteria, mine closure planning, and tailings emplacement rehabilitation methodologies.	Following a meeting with RR, LCO made a number of revisions as required.
Singleton Shire Council	Numerous items raised summarised as a general lack of clarity around the post-closure land uses, adaptive management and relationship between various documents, making it difficult to establish whether the criteria set out in condition 37 of the approval can be met.	Revisions throughout the document to improve clarity around site rehabilitation management.
Muswellbrook Council	Nil	N/A
DPIE – Water (NRAR)	Nil	N/A
DPIE – Biodiversity Conservation Division	A number of recommendations raised regarding the management of high threat weeds, native woodland species revegetation (seed mix and community definition clarity) and ongoing consultation with Resources Regulator regarding completion criteria,	Revisions throughout the document to improve clarity and accuracy.

Agency	Summary of matters raised by exception	Outcomes
	monitoring program and performance indicators.	
DPIE - Planning	Nil	N/A

1.6.1 Community Consultation

The LCO Community Consultative Committee (CCC) meets approximately twice per year to provide a formal forum for interaction between the community and mine management. The CCC is coordinated as per the *NSW Government January 2019 Community Consultative Committee (CCC) Guideline for State Significant Developments.* Environmental performance, rehabilitation progress and upcoming mining activities are discussed at the CCC.

LCO also utilises newsletters and the LCO public website to distributed relevant information to local residents and the broader community, (*http://www.liddellcoal.com.au/EN/Pages/default.aspx*). Specific consultation with the Aboriginal community will be undertaken (if required) in accordance with the *Aboriginal Cultural Heritage Consultation Requirements* (ACHCRs) (DECCW, 2010).

LCO operate Community Response and Blasting Information Hotline (free call 1800 037 317) 24 hours per day, 7 days per week. All enquiries regarding blasting and/or community complaints that are received are responded to by LCO in an efficient manner and reported in the Annual Review (AR) and CCC minutes.

Consultation will continue in the MOP term with neighbouring landholders and utility operators as required.

2. Proposed Mining Activities

2.1 Project Description

In accordance with DA 305-11-01 LCO has approval to undertake open cut mining until 31 December 2028, producing up to 8 Mtpa ROM coal. ROM coal is processed at the LCO CHPP to produce both thermal and semi-soft coking coal products that are transported via rail to the Port of Newcastle for export. LCO also has approval to reclaim and sell up to 0.5 Mtpa of screened tailings directly to AGL Macquarie, via road haulage at up to 114 truck movements per day, 5 days per week.

LCO employs approximately 360 full-time personnel and up to 100 contractors, and operates 24 hours per day 7 days per week.

During this MOP term, mining will continue deeper in the South Pit and Entrance Pit Open cut mining having reached the current planned extraction extents. Mining will utilise truck and shovel mining methods. Overburden will generally be blasted, stripped and emplaced in-pit behind mining. Overburden emplacements will be progressively rehabilitated in areas that have been dumped to the final dump height.

Key components that are proposed to be undertaken in this MOP term, as approved under DA 305-11-01, include:

- Open cut mining in the South Pit and Entrance Pit; at a combined rate up the 8 Mtpa ROM coal;
- ROM coal processing at the LCO CHPP to produce thermal and semi-soft coal products;
- Co-emplacement of coarse rejects within overburden emplacements;
- Continued tailings emplacement at the existing tailings emplacement facilities including Mount Owen West Pit as approved by DA305-11-01 Mod 6;
- Construction of minor additional surface infrastructure to facilitate mining activities such as water management infrastructure;
- Continued operation of Train Load Out facilities situated on the shared rail loop;
- Progressive rehabilitation of the site;

DA 305-11-01 also approves the construction of a new conveyor and connection to the existing overland conveyor to convey up to 1.5 Mtpa ROM coal to the RCCP for processing, and up to 2Mtpa ROM coal from Mount Owen Complex. Further, DA305-11-01 approves emplacement of tailings in the South Cut Pit. Construction of this infrastructure is unlikely to be required in the MOP term. If it is determined that the new conveyor is required LCO will consult with the NSW Resources Regulator and if required prepare a MOP Amendment to address these activities

Proposed activities in the MOP term are outlined further in **Section 2.3**.

2.2 Asset Register

The asset register (**Table 7**) provides a summary of the key features/primary domain activities within each Rehabilitation Planning Domain area (refer to **Section 5.1**), as well as the principal activities required for rehabilitation. This asset register is intended to provide a high level of context for the Rehabilitation Cost Estimate (RCE).

Divided by Rehabilitation Planning Domain, the areas for each primary domain represent the total disturbed footprint for each domain at the commencement of the MOP term, as depicted on **Plan 2** (refer to **Appendix A**).

Table 7 Asset Register

Primary Domain Activities	Approx. Area/ Length	Description	Decommissioning/ Rehabilitation Activities
Domain 1: CHPP			
Infrastructure	22ha	CHPP incl, small buildings, industrial buildings, workshops, coal stockpile areas, car-parks, train loading facilities. CHPP conveyors and gantries Fuel farms and hydrocarbon remediation area	Contamination assessment/s Develop demolition and waste management plan Demolish and remove infrastructure including concrete footings Undertake revegetation
Infrastructure	5km 63km	Whole of site services including 11kV and 33kV power lines and communications infrastructure Water management system including pipelines and underground bores	Decommission. Relocate or demolish built infrastructure
Water Management	0.5ha	CHPP South Dam & CHPP Settling Pond	Decommission, remove sediments and rehabilitate
Domain 2: Open Cut Facilities			
Infrastructure	18ha	Open cut facilities including administration buildings, heavy vehicle workshop, car parks and ancillary buildings	Decommission. Relocate or demolish built infrastructure Undertake revegetation
Water Management	0.5ha	Workshop Sedimentation Dam	Decommission, remove sediments and rehabilitate
Domain 3: South Pit			
Overburden Emplacement	575ha	Overburden and coarse rejects emplacement area	Largely in ecosystem establishment phase. Landform shaping and establishment of vegetation ongoing.
Active Mine & Voids		Progressively being backfilled with overburden.	Landform shaping and high wall treatment
Domain 4: Durham			
Tailings Storage	67ha	Open cut void backfilled with coal washery tailings (14ha tailings surface).	Establish initial cap and final landform revegetation

Primary Domain Activities	Approx. Area/ Length	Description	Decommissioning/ Rehabilitation Activities
Domain 5: Reservoir Block			
Overburden Emplacement	162ha	Overburden and coarse rejects emplacement area	Largely in ecosystem establishment phase.
Tailings Storage	20ha	Open cut void backfilled with coal washery tailings.	Establish initial cap and final landform. High wall treatment. Revegetation.
Water Management	19ha	Reservoir North Void mine water dam	Landform shaping, vegetation establishment and maintain as water body.
Infrastructure	0.5ha	11kv power, pontoon pumps and associated sheds.	Decommission, minor shaping and vegetation establishment.
Domain 6: Entrance Pit			
Overburden Emplacement	237ha	Progressively backfill open cut pit with overburden	Landform shaping, vegetation establishment.
Active Mine & Voids	45ha	Active extraction areas.	Landform shaping, high wall treatment and vegetation establishment.
Domain 7: Antiene			
Overburden Emplacement	80ha	Overburden and coarse rejects emplacement area	Largely in ecosystem establishment phase.
Tailings Storage	31ha	Legacy open cut void backfilled with coal washery tailings	Establish initial cap and final landform. Revegetation
Water Management	13ha	Legacy Dam 4 and Dam 17 (mine water dams)	Landform shaping, vegetation establishment and maintain as water body.
Domain 8: Final Voids			
Active Mine & Voids	185ha	Active extraction areas	Landform shaping, vegetation establishment and stabilisation ahead of inundation for final void water body.
Domain 9: Mountain Block			
Overburden Emplacement	67ha	No active mining activities.	Rehabilitation management
Domain 10: Biodiversity Offset Area			

Primary Domain Activities	Approx. Area/ Length	Description	Decommissioning/ Rehabilitation Activities
Not applicable	364ha	Biodiversity conservation areas within the mine leases – Bowman's Creek Riparian Corridor and Mountain Block Offset Area.	Refer to Biodiversity Offset Management Plan.
Buffer Land - Undisturbed Area			
Not applicable			

2.2.1 Rehabilitation Cost Estimate

The Rehabilitation Cost Estimate (RCE) prepared for this MOP submission has been calculated to undertake the necessary works to achieve the desired final land use (refer to **Section 4** and **Plan 4**). The RCE provides for:

- Decommissioning and demolition of all surface infrastructure;
- Rehabilitation of all areas disturbed by mining as depicted in **Plan 2**, with the exception of dams to be retained for post mining use; and
- Mobilisation costs, project management and contingencies.
- Elements subject to further detailed design (such as final voids) have uncertain costs and have therefore been costed based on industry and NSW Resources Regulator accepted practices, and the current approved final landform.

2.3 Activities over the MOP Term

2.3.1 Exploration

LCO's primary purpose for exploration is to achieve measured status remaining mineable coal reserves in accordance with the "Australasian code for Reporting of Exploration Results, Minerals Resources and Ore Reserves – the JORC Code 2012 Edition".

Due to the extensive historical mining within the reserve pit shells and the associated challenges of drilling through overburden spoil dumps and underground workings, it will not be possible for the entire mineable reserves to achieve measured status. However the existences of historical mine workings can benefit the structural validity of the modelled coal seams and the identification of geological structures within the LOM pit shells.

As a minimum LCO's reserve status must be indicated for all coal seams. Future exploration programs will be designed to achieve measured status in the resource model down to the Barrett coal seam where possible. Achieving measured status requires compilation and validation of both structural and quality properties of coal seams. In addition to achieving measured status, exploration may also be required to further examine and understand geological anomalies encountered during the mining process.

LCO will continue to undertake exploration and prospecting activities across the approved lease areas for the purposes of geotechnical, geological, hydrogeological and gas investigations. These leases include ML 1597, ML 1313, CCL 708, and ML 1552. More specifically, exploration work will involve core

and/or open holes for structural definition, coal quality sampling, geotechnical assessment, groundwater monitoring and greenhouse gas assessment.

The techniques used for exploration and prospecting may include, but are not limited to:

- Aerial photograph interpretation;
- Field assessments (soil, vegetation, etc.);
- Drilling allowing for lithological and geophysical logging and/or coal quality sampling;
- Drilling associated with collecting gas concentration samples;
- Geophysical investigations;
- Magnetic surveys;
- Seismic surveys; and
- Excavation and bulk samples.

Any plans for exploration are dependent upon mine planning and economic conditions and appropriate notice of future exploration programs will be provided in accordance with relevant tenement conditions. Annual reporting of exploration activities will continue to be undertaken in accordance with the relevant tenement conditions.

2.3.2 Construction

There are no major construction activities planned during the MOP term.

2.3.3 Mining Operations

Open Cut Mining

The open cut mining sequence at LCO includes:

- Land preparation including vegetation removal and pre-stripping topsoil;
- Removal of overburden;
- Coal extraction, predominantly using excavators and tucks;
- Coal processing and transport.

Mining will continue in the MOP term targeting the Lemington, Pikes Gully, Arties, Liddell, Barrett and Hebden seams. These seams range from 0.7 metres (m) to 9.5 m in thickness, and include semi-soft and thermal coal types. Mining will generally utilise hydraulic excavators and trucks which are suitable for working in the relatively small South Pit and Entrance Pit to recover coal from multiple seams.

Highwall Mining

Highwall mining, undertaken using an auger or continuous miner to extract coal at the base of the highwall, may continue to be undertaken in the MOP term where open cut mining methods are not feasible. The auger or continuous miner is driven into the coal seam, removed, and then re-established adjacent to the previous excavation. Highwall mining operations will be managed to cause negligible subsidence and allow for the safe removal of equipment. LCO is approved to undertake highwall mining following detailed design however none is planned to occur during the MOP term.

Recovery of Tailings

Since the 1960's, tailings have been placed in various emplacements at LCO, including old open cut pits and underground workings. Due to the age of these tailings emplacements, sampling has shown

that some contain residual energy, which is of value to AGL Macquarie. LCO are approved for the reprocessing and recovery of tailings following detailed design however none is planned to occur during the MOP term.

Mining Equipment

Table 8 lists the typical mining equipment currently in operation at LCO.

Table 8 Typical Mining Equipment Fleet

TYPE	MODEL	CAPACITY	No Units	FUNCTION
Hydraulic Excavator	Hitachi EX8000	43m³	1	Overburden
Hydraulic Excavator	Liebherr R996	36m³	2	Overburden
Hydraulic Excavator	Liebherr R9400	22m³	2	Coal and Partings
Rear Dump Truck	Hitachi EH5000	300t	18	Overburden
Rear Dump Truck	Caterpillar 789C	180t	15	Coal and Partings
Loader	Caterpillar 988H	12m³	1	Coal Handling and Prep
Track Dozer	Caterpillar D11T	N/A	1	Ancillary
Track Dozer	Caterpillar D11R	N/A	3	Coal Handling and Prep
Track Dozer	Caterpillar D11N	N/A	1	Ancillary
Track Dozer	Caterpillar D11R	N/A	1	Rehabilitation
Track Dozer	Caterpillar D10T	N/A	8	Ancillary
Rubber Tyred Dozer	Caterpillar 854K	N/A	1	Ancillary
Drill	Terex Reedrill	229mm	3	Overburden and
Grader	Caterpillar 24M	N/A	1	Ancillary
Grader	Caterpillar 16M	N/A	2	Ancillary
Grader	Caterpillar 16G	N/A	1	Ancillary
Water Truck	Caterpillar 777F	70kL	4	Ancillary
Service Truck	Caterpillar 775F	25kL	2	Ancillary
Service Truck	Volvo FM	24kL	1	Ancillary

LCO will continue to review the mining fleet in the MOP term to ensure that efficient, productive and commercially viable mining activities are undertaken. Changes to the mining fleet may be undertaken where appropriate to ensure efficient and viable operations continue, in compliance with approved environmental outcomes.

2.3.4 Land Preparation

Land preparation describes the activities undertaken prior to mining comprising vegetation, habitat material and topsoil resource salvage. At the commencement of the MOP term, LCO has undertaken all of the land preparation activities currently planned to occur on the mine lease with no new disturbance for coal extraction schedule.

Impact mitigation

The risks to flora and fauna as well as impact mitigation controls during the land preparation stage of operations have been developed in consultation with DPIE, ecologists and industry guidelines. The

LCO Water Management Plan, LCO Biodiversity Management Plan and supporting procedures detail the processes LCO implement, see to **Table 31** for references.

Soil resource salvage

Suitable topsoil and subsoils are salvaged in accordance with the LCO Land Clearing and Stripping Procedure. At the commencement of this MOP term, soil resources within the planned extraction footprint have been either reused on rehabilitation areas or stockpiled for reuse with ongoing stockpile management to maintain the soil condition.

A register of soil resources is maintained and stockpiles retained longer than three months are shaped, ripped and seeded with a suitable cover crop to minimise dust generation, supress weed growth and preserve the soil seed bank. Stockpiles are signposted and regularly inspected to monitor erosion and weed growth to provide for suitable resource maintenance.

2.3.5 Waste Rock Removal

Following land preparation overburden is generally blasted and removed using excavators and overburden haul trucks. A Blast Management Plan is implemented in accordance with DA 305-11-01 Mod 7. Blast management is discussed in **Section 3.2.7**.

The blasted overburden is loaded into rear dump trucks and transported via internal haul roads to in-pit emplacement areas. Some waste overburden is crushed using a mobile crushing unit to produce road base materials for use on-site. Active overburden dumping areas are shown on **Plan 3A** to **Plan 3C**. Forecast volumes of waste rock for each year of the MOP are provided in

Table 9.

2.3.6 Coal Stockpiling and Processing

Coal is hauled from the open cut areas via internal haul roads to an (approximate) 200,000 tonne ROM stockpile prior to processing in the CHPP. Coal with a low propensity to spontaneously heat may also be stockpiled in a 450,000 tonne supplementary stockpile adjacent to the ROM stockpile.

Loaders or dozers load coal from the stockpiles into the adjacent ROM dump bin that gravity feeds the coal onto a feed conveyor, through a primary sizer, and then onto the transfer conveyor to transfer the ROM coal to the CHPP for processing. At the CHPP ROM coal is crushed, sized, washed, screened, rinsed and dewatered. The ROM coal yields approximately 70% product. Rejects comprise approximately 21% coarse rejects and 9% fines (tailings).

Semi-soft and thermal coal products are stockpiled separately in product stockpiles that have an approximate combined capacity of 400,000 tonnes. The product coal stockpiles are formed by dumping coal off an overhead conveyor belt and coal is recovered by an underground reclaim tunnel through valves.

2.3.7 Coal Transport

ROM Coal

ROM coal is trucked from the open cut to the ROM stockpile.

Development consents for LCO, the RCCP and Mount Owen Complex approve transport of ROM coal between the operations for processing to optimise efficiency. In accordance with DA 305-11-01 LCO may:

- Transport up to 1.5 Mtpa ROM coal to RCCP by road, using the approved route along Liddell Station Road to the RCCP facility; and

- Receive up to 2 Mtpa of ROM coal from the Mount Owen Complex for processing and despatch.

As outlined in **Section 2.1** LCO has approval to construct an additional transfer point and conveyor connecting to the existing Mount Owen/Glendell/AGL Macquarie conveyor. Construction of the new ROM conveyor, and movement of ROM coal between LCO and Mount Owen Complex, is not anticipated to occur in the MOP term. LCO will consult with the NSW Resources Regulator and prepare a MOP amendment if the new ROM coal conveyor is required.

Product Coal

All product coal is transported from LCO to Newcastle by rail, via the Hunter Valley Rail Loop and the Main Northern Railway Line. The Hunter Valley Rail Loop operates 24 hours a day, seven days a week and has a daily capacity of 65,000 tonnes. From the Port of Newcastle, the coal is currently exported to Japanese, Korean and other Asian markets. Product coal transported from LCO is in the order of 6 Mtpa.

LCO monitors coal haulage movements as part of standard operations. Train loading is scheduled by the Hunter Valley Coal Chain (HVCC) Coordinator, and is scheduled to occur concurrently with other producers on the rail loop to maximise the capacity of the system. DA 305-11-01 MOD 7 allows LCO to load trains on all days of the year.

Reclaimed Tailings

LCO has approval to transport 0.5 Mtpa of the reclaimed tailings, which are sold on the domestic market to AGL Macquarie. DA 305-11-01 allows up to 114 truck movements per day, 5 days per week, to either the Liddell or Bayswater power stations along the New England Highway.

2.3.8 Coarse Rejects and Tailings

The processing of ROM coal in the CHPP produces both tailings and coarse reject by-products. Forecast volumes of tailings and coarse rejects for each year of the MOP term are provided in

Table 9.

Coarse Rejects

Coarse rejects generated from the LCO CHPP are in the order of 26% of ROM coal processed, and consist of carbonaceous shale, mudstone and claystone, with minor coarser rocks such as siltstone and sandstone. During this MOP term coarse rejects will be co-dispersed throughout the overburden dumps in varying levels during dump construction with a final placement to be a minimum of 5m below the final landform. Capping of coarse reject will be undertaken using inert overburden to minimise the risk of spontaneous combustion. Carbonaceous shale in the coarse rejects has a very low spontaneous combustion potential.

Over the life of the mine, LCO has undertaken Annual Rehabilitation Monitoring as per **Section 8** of this MOP. Both historic and recent monitoring results have shown no indication that co-disposal of coarse reject is having a negative impact on rehabilitation progress.

Tailings

LCO has approval to dispose of tailings in the four onsite tailings facilities Antiene, Reservoir West and Reservoir South (RTEA), the Durham emplacement areas as well as offsite facility West Pit Void at Mount Owen Complex (refer **Plan 2**). Tailings emplacement during the MOP term will primarily be the West Pit Void at Mount Owen Complex and Durham with only minor emplacement in RTEA to reach final fill levels. Tailings rehabilitation activities during the MOP term are outlined in **Section 7.2.3**. Cycling of minor emplacement in RTEA to utilise the entire capacity and is expected to have the following benefits:

- to improve evaporation rates above solely pumping into the RTEA by intermittingly topping up each dam and allowing thinner layers of tailings to be deposited with a larger surface area.
- More efficient water extraction will also allow a thicker/stronger crust to form on the RTEA than would otherwise be the case. It is expected that this will then aid timely capping and rehabilitation of RTEA;
- Improve capping outcomes for RTEA by reducing the volume of capping material required to account for settlement areas and allow for free draining final rehabilitation; and
- Maximise the utilisation of existing tailings storage facilities.

2.3.9 Waste Management

Wastes streams that will be generated in the MOP term include general wastes, hydrocarbon wastes and sewage. Waste will be managed in accordance with the LCO Waste Management Procedure that adopts the following principles:

- Waste avoidance;
- Waste re-use;
- Waste recycling; and
- Waste removal and disposal.

Management of specific waste streams anticipated to be generated during the MOP term have been outlined below.

General Waste

LCO disposes of general waste as follows:

- All fuel and oil filters are removed by a licensed contractor for recycling;
- Batteries are stockpiled in covered areas and removed periodically by a licensed contractor;
- Small tyres are disposed off-site by a licensed contractor;
- Scrap metal is collected and stored in workshop areas until periodic recycling by a licensed contractor;
- Paper and cardboard is regularly collected from workshop and office areas for recycling by a licensed contractor; and
- All domestic waste is disposed of to an approved Council landfill site by a licensed contractor.

Sewage

Sewage generated at the MIA is treated by a waste water treatment system to a quality suitable for human contact. The treated effluent is pumped to the South Cut for re-use in the mine water system, as approved under DA 305-11-01 Modification 3 in 2008.

Sewage generated by the CHPP and associated infrastructure is collected in the CHPP sewage treatment tanks, and pumped to the aerated sewage treatment plant prior to disposal at the designated effluent irrigation area. Deactivated sludge from the treatment plant is periodically removed by a licensed contractor for disposal.

Both waste water treatment plants are regularly maintained and sampled by a licensed contractor.

Hydrocarbon and Chemical Wastes

Fuel, lubricants and waste oils are stored in a bulk fuel area at the office and workshop complex, which consists of five tanks with capacities up to 110kL. The bulk fuel storage area is bunded and linked to an oil water separator located nearby.

The fuel, lubricants and waste oil for the CHPP are stored within two tank farms located adjacent to the CHPP workshop. Both tank farms are contained within a concrete bund. All waste oil tanks located on site will be inspected weekly and emptied as required by licensed contractor.

Minor storages of chemicals and fuels in the workshop area may be temporarily stored on bunded pallets for accessibility and short term storage purposes. These self bunded pallets are inspected weekly by a licensed waste contractor and maintained as required. All storage of fuels and chemicals is conducted in accordance with LCO's Hazardous Chemicals Standard LIDOC-90533967-159.

Waste oils (including oils collected in oil water separators) and waste chemicals are removed by licenced waste disposal contractors.

Hydrocarbon contaminated material, including overburden and wash down bay silt, can be treated in the onsite Bioremediation Area which was established in 2014. Once treated to threshold limits the material may be disposed of onsite into overburden emplacements. All material will be handled in accordance with the internal Bioremediation Area Management Plan. Threshold limits have been determined in consultation with the Environmental Protection Agency. The operation of the bioremediation area is not a scheduled activity under the Protection of the Environment Operations Act 1997.

Heavy Plant Tyres

Large tyres are disposed of in pit in accordance with and as permitted by EPL2094. The disposal locations of large tyres is selected to provide for the long term adequate inert material encapsulation.

2.3.10 Decommissioning and Demolition Activities

During the MOP term, mining activities will be undertaken with decommissioning activities undertaken in overburden emplacement areas and tailings facilities. During this MOP term, LCO will undertake detailed planning for the eventual decommissioning and demolition activities of infrastructure areas planned to be undertaken in the subsequent MOP term (post 2023) following coal extraction cessation.

Refer to **Section 7.2** for summary of rehabilitation activities during the MOP term, **Section 7.2.3** for a summary of tailings storage decommissioning.

2.3.11 Progressive Rehabilitation and Completion

Rehabilitation at LCO is undertaken progressively over the life of the mine, with overburden emplacements and backfilled pits shaped and rehabilitated as areas become available. Refer to **Section 7.1** for an outline of the current site rehabilitation status at commencement of the MOP term. **Section 7.4** summarises the rehabilitation status at commencement and planned status at the end of the MOP term.

Rehabilitation progress in the MOP term is depicted on **Plans 3A to 3C**. It is not anticipated that any rehabilitation areas will be relinquished in the MOP term.

Whilst mining cessation will not occur during this MOP term, LCO is undertaking detailed mine closure planning to provide for future decommissioning and rehabilitation activities, refer to **Section 7.3.6** for further details on mine closure planning.

2.3.12 Material Production Schedule

The material production schedule during the MOP term is provided in

Table 9. Any proposed changes to this schedule will be outlined in the AR.

Table 9 Material Production Schedule during the MOP Term

Material	Unit	2020	2021	2022	2023
Stripped Topsoil	m^3	5500	0	0	0
Rock/ Overburden	kt	35,945	31,661	25,820	8,356
ROM Coal	kt	6,310	5,305	4,173	2,357
Reject Material (Coarse)	kt	2,391	1,841	1,360	930
Product Coal	kt	3,949	3,465	2,814	1,427

3. Environmental Management

LCO maintains an Environmental Management Strategy (EMS) to provide a framework for environmental management and facilitate compliance with regulatory requirements. LCO's EMS is consistent with the requirements of ISO 14001. The EMS includes a suite of environmental management plans, procedures and standards. The following management plans have been developed and approved to satisfy development consent requirements:

- Environmental Management Strategy
- Air Quality Management and Monitoring Plan
- Water Management Plan
- Noise Monitoring Program
- Biodiversity Management Plan
- Biodiversity Offset Management Plan
- Blast Management Plan
- Chain of Ponds Inn Blast Management Strategy
- Newdell Zone Substation Blast Management Strategy
- Aboriginal Cultural Heritage Management Plan
- Spontaneous Combustion Management Plan
- Pollution Incident Response Management Plan

Monitoring requirements documented in the above Environmental Management Plans are consolidated in the LIDOC-90533967-797 Environmental Management Strategy. Copies of the most current approved versions of these plans are available on the LCO website (*www.liddellcoal.com.au*). DA 305-11-01 MOD 7 requires LCO to review and maintain management plans.

Operations at LCO are undertaken in accordance with a number of complementary environmental and safety risk assessments. Risk management and mitigation measures are reviewed annually. **Section 3.1** comprises a summary of the Annual Environment and Community Risk Assessment and the MOP Risk Assessment; **Section 3.2** provides an outline of environmental risk management measures by aspect including risks to rehabilitation establishment.

To minimise the risk of rehabilitation not meeting the required objective and in acknowledgement that risks and management measures change with time; LCO reviews the risks to rehabilitation at the commencement of each MOP term considering the rehabilitation performance & activities proposed. Monitoring, maintenance and risk management measures as described in the various sections of this plan are implemented for the given MOP term with the aim to reduce any risks to as low as reasonably practicable. For instance, during this MOP term LCO is proposing to undertake rehabilitation activities on tailings emplacement facilities, refer to **Section 7.2.3**. Accordingly, LCO has undertaken technical assessments to identify the risks associated with establishing rehabilitation on these areas. LCO has developed a strategy/methodology, detailed in **Section 7.3.7**, for action during this MOP term identifying the measures being undertaken to mitigate the risks of failure.

Similarly, in preparation for mining cessation during the next MOP term, LCO is currently undertaking Detailed Mine Closure Planning, detailed in **Section 7.3.6**, in line with Glencore Protocol and Industry guidelines (ICMM, 2019). This process involves the systematic analysis of long term risks to

rehabilitation, verification & mitigation measures as appropriate including rehabilitation maintenance.

3.1 Environmental Risk Assessment

The LCO Environment and Community risk register was reviewed and updated in June 2020 to identify and evaluate environment and community risks associated with the project. A Risk Assessment (BBRA) was undertaken in accordance with the GCCA Risk Management Standard (CAA FIN STD 0001), which establishes a qualitative risk assessment methodology in accordance with the Risk Management Handbook for the Mining Industry (MDG1010) and the requirements of the Joint Australian & New Zealand Standard AS/NZS 31000:2018 Risk Management - Principles and Guidelines. The workshop assessed 38 key environment and community risks. During the risk assessment, 11 elements were identified as having medium risk rankings and none of the elements were categorised as being a high risk.

In accordance with the current MOP Guidelines, LCO undertook an additional risk assessment in August 2020 with a key focus on mine closure and rehabilitation based issues during the MOP Term. The risk assessment addressed a number of key aspects and how they relate to rehabilitation. 22 key risks to rehabilitation and closure of the mine were identified. Of these risks, 14 were ranked as low or negligible and 8 were ranked as medium; none were ranked as being high risk. During the workshop, all risks were identified as having current controls that are managing the risk at a satisfactory level.

A copy of the Risk Register developed at the MOP risks to rehabilitation workshop is also included in **Appendix D**. Further details of the existing environmental management controls are provided in **Section 3.2**.

3.2 Environmental & Rehabilitation Specific Risk Management

The following subsections provide a summary of the operational environmental risk management and rehabilitation risk treatment activities during the MOP Term; a summary of the EMS described in Section 3.

3.2.1 Air Quality

Air quality at LCO is managed in accordance with the Air Quality Management and Monitoring Plan (AQMMP) which includes the following measures:

- Engineering controls (e.g. enclosure of conveyors);
- Operational control measures routinely implemented (e.g. road dust suppression); and
- Contingency measures implemented during periods of high particulate matter concentrations or adverse meteorological conditions, such as modification or ceasing of operations.

Best practice management measures and controls to be implemented during the MOP term include:

- Undertaking regular dust inspections. Mining activities may be ceased or modified if excessive dust is observed;
- Planning land clearing and progressive rehabilitation to minimise the total disturbance area necessary for mining operations;
- Employing effective dust suppression on the active haul road network, hardstand areas, ROM hopper and transfer conveyor points;

- Prompt, progressive rehabilitation of disturbed areas following completion of mining, including temporary rehabilitation of long term overburden dumps and mine infrastructure areas where practical;
- Regular maintenance of equipment to ensure efficient operation, reducing emissions; and
- Real time dust monitoring is undertaken to assist with the proactive management of dust on-site.

Three types of air quality monitoring are undertaken at LCO to comprise the whole monitoring network, namely:

- Compliance Monitoring: Air Quality and Meteorological Monitoring undertaken at privately owned residence, in accordance with development consent conditions (Appendix A). This comprises of High Volume (Hi-Vol) Air Samplers which take a 24hr samples of Total Suspended Particulate Matter (TSP) and Particulate Matter <10µm (PM10) on a 6 day cycle. Samples are collected and examined by a NATA accredited laboratory.
- Management Monitoring: This primarily refers to real-time Air Quality and Meteorological Monitoring for reactive dust management, as provided for in the Dust Management Trigger Action Response Plan. This monitoring is not intended for use in assessing compliance with ambient air quality criteria to meet regulatory requirements. This comprises of a number of continuous Tapered Element Oscillating Microbalance (TEOM) which monitor the level of PM10 at locations surrounding the site on dominant wind directions.
- Supplementary Boundary Monitoring: This refers to four relocatable E-Bam units located close to the operational boundaries on dominant wind axis up and downstream. The supplementary real-time boundary monitoring serves two purposes: 1) aid determination of LCO's contribution to local dust concentrations when investigating exceedances of air quality criterion and 2) to supplement the reactive dust management system.

All air quality monitoring and equipment for LCO is undertaken by qualified consultants in accordance with:

- AS 2724.3 – 1984 Ambient Air – Particulate Matter – Determination of Total Suspended Particulates (TSP) – High Volume Sampler Gravimetric Method; and
- AS 3580.10.1 – 2003 Methods for Sampling and Analysis of Ambient Air – Determination of Particulate Matter – Deposited Matter – Gravimetric Method.

Air quality compliance monitoring results are documented in the AR, EPL Annual Return, as well as on the LCO public website and to the Community Consultative Committee (CCC). Refer to the LCO AQMMP for full details.

LCO implements progressive rehabilitation in accordance with an Annual Rehabilitation and Closure Management Plan (ARCMP) that is developed to optimise progressive rehabilitation and minimise the total disturbance footprint.

3.2.2 Surface Water

Surface water is managed in accordance with the approved Water Management Plan (WMP) which provides for efficient use of water resources, identification of risk management systems and an impact/performance monitoring program.

Surface water quality monitoring is undertaken monthly at locations onsite and in the surrounding catchment area including locations at Bayswater Creek, Bowmans Creek and onsite dams. Water quality parameters including pH, electrical conductivity (EC), total suspended solids (TSS) and Total

Dissolved Solids (TDS) are evaluated by a NATA accredited laboratory. Additional monitoring is undertaken biannually and analysed for a range of inorganics. Results of surface water monitoring undertaken are reported annually and monthly as per development consent and environmental protection licence requirements.

Surface water management involves but is not limited to the following:

- monitoring of onsite dams and sensitive receptors such as Bowman's Creeks;
- maintaining and monitoring condition of erosion and sediment control structures such as sediment dams;
- construction and operation of erosion and sediment controls as per the requirements of Managing Urban Stormwater: Soils and Construction, Volume 1, 4th Edition, 2004 (Landcom, 2004), or its latest version;
- Revegetation progress of disturbed areas and the installation of appropriate erosion and sedimentation control structure in rehabilitation areas;
- maintaining mine water containment system controls such as diversion drains;
- site water balance monitoring including tracking of stored water volumes, consumption and reuse (e.g. haul road dust suppression and tailings reclaim);

Refer to the WMP for details of surface water management activities undertaken at LCO.

3.2.3 Groundwater

Groundwater is managed in accordance with the approved WMP which provides for efficient use of water resources, identification of risk management systems and an impact/performance monitoring program.

LCO maintains a groundwater monitoring network of 19 piezometers installed in 2002 situated in around the site and in the surrounding groundwater systems (e.g. Bowman's Creek Alluvium, shallow bedrock underlying the alluvium and deep hard rock aquifers associated with historic underground mining operations. Historic underground workings situated in the mined hard rock aquifer throughout the mine lease are accessed through groundwater extraction bores and provide a key storage function for operational mine water.

Key monitoring and mitigation measures that will be undertaken in the MOP term include:

- Review the groundwater model to incorporate the additional site and monitoring data as mining progresses. The frequency of review and updates to the model will be determined based on the results of monitoring programs and other studies.
- Monitoring the Bowmans Creek alluvium and shallow bedrock groundwater systems and when triggered by the monitoring data, undertake investigation to determine if monitored levels are the result of mining activities and any further mitigation action if required;
- If necessary, alternative mitigation strategies including investigating options for adjustments to mining and/or dewatering plans, will be undertaken to mitigate actual or predicted impacts on the alluvial system.

Refer to the WMP for details of groundwater management activities undertaken at LCO.

3.2.4 Hazardous Materials and Land Contamination

LCO store and use hazardous materials including:

- Hydrocarbons (e.g. diesel, oil, greases) for equipment;
- Explosives for overburden blasting, refer to SafeWork NSW Licence to Store No.XSTR100214 (expiring 1 April 2025);
- Devices containing radiation sources at the CHPP refer to Radiation Management Licence (RML5061082)
- PCB's contained in electrical transformers

To comply with relevant legislation and internal for the use of hazardous materials, LCO maintain the following;

- Inventories of hazardous materials;
- Databases (ChemAlert) for data management;
- Containment systems such as concrete bund storage areas and oil-water separators to prevent contamination;
- Management and performance monitoring systems such as housekeeping, maintenance, inspection, training and incident reporting.

There is no bulk underground storage of hydrocarbons at LCO. Refer to LCO Hazardous Chemicals Standard for full details.

3.2.5 Flora and Fauna

In accordance with DA 305-11-01 LCO has an approved Biodiversity Management Plan (BMP) that details the management of flora and fauna, in particular threatened species. The BMP describes short, medium and long term measures to mitigate impacts as well as integrate management of offset areas with remnant vegetation and rehabilitation areas at the site. These measures include:

- Implement revegetation and regeneration with disturbance areas and offset areas;
- Protect remnant vegetation and soils outside the disturbance areas;
- Rehabilitate creeks and drainage lines within the project boundary (where required);
- Manage salinity;
- Conserve and reuse topsoil;
- Undertake pre-clearance surveys;
- Manage impacts on fauna;
- Collect and propagate native seed;
- Salvaging and reuse material from the site for habitat enhancement;
- Salvage, transplant and/or propagate threatened flora in accordance with the *Guidelines for the Translocation of Threatened Plants in Australia* (Vallee et at., 2004);
- Undertake land management including managing grazing on LCO lands, manage bushfire risks and control weeds and feral pests, including investigating available technologies to reduce impacts to non-target species; and
- Undertake seasonal monitoring of in-stream and riparian ecological condition.

As detailed in the BMP, LCO currently manages impacts to biodiversity using the following management plans and programs:

- Annual Rehabilitation and Closure Management Plan;
- Weed and pest control programs;
- Annual Rehabilitation and Biodiversity Monitoring Programs;
- Biodiversity Offset Remediation Strategy; and
- The Ground Disturbance Permit system that includes identification and demarcation of potential Spotted-tail Quoll habitat.

As outlined in **Section 4**, habitat corridors and connectivity across LCO has been developed with consideration of the surrounding environments and the final landform plans of neighbouring open cut operations. If there are changes proposed with LCO or adjacent sites including Ravensworth and Mount Owen Complex to final landform habitat corridors, LCO will liaise to optimise the compatibility of the proposed final landform, and maximise linkages between proposed habitat corridors.

Biodiversity Related Risks to Rehabilitation

There were four biodiversity related risks to rehabilitation identified in the LCO MOP Risk Assessment. The identified risks are:

- Rehabilitation lacks adequate habitat corridors and connectivity resulting in delay to reach rehabilitation objectives
- Failure to establish key target communities in rehab and offset areas that are consistent with Central Hunter Box lronbark Woodland within budget and desired timeframe resulting in delay to reach rehabilitation objectives
- Failure to achieve nominated agricultural final land use within budget and desired timeframe resulting in delay to reach rehabilitation objectives
- Failure to establish suitable habitat for the spotted tailed quoll e.g. log/boulder piles resulting in delay to reach rehabilitation objectives

LCO will continue two complementary monitoring programs to inform biodiversity management and rehabilitation. These programs provide for adaptive management of rehabilitation being the regular assessment of rehabilitation performance, the identification and subsequent implementation of appropriate maintenance measures to minimise the biodiversity related risks to rehabilitation. Rehabilitation implementation is detailed in **Section 7** and monitoring programs detailed in **Section 8**.

3.2.6 Weed and Pest Control

Weed and pest control measures are implemented on LCO managed lands to mitigate invasive species impacts on rehabilitation and native fauna. The BMP Plan details activities undertaken which include:

- Regular site inspections to identify areas of weed infestation and weed species;
- Rehabilitation and biodiversity monitoring programs
- Development and implementation of an annual weed and pest management plan;
- Liaising with neighbouring property owners to coordinate weed control in the surrounding area;
- Minimising vegetation disturbance by:
  - Reducing the number of access tracks;
  - Minimisation of clearing associated with civil works;

  - Progressive rehabilitation focussed on rapid establishment of groundcover at rehabilitation areas; and

- Conducting control activities in a manner appropriate for the weed type, location in the landscape. This includes using selective herbicides, herbicides safe for aquatic environments and various techniques from foliar spraying through to cut and paint control in sensitive areas;
- A vehicle hygiene process to mitigate the vehicle spread of highly invasive weed species;

Native herbivores, specifically the eastern grey kangaroo, is known to have observable impact to establishing rehabilitation at LCO occurring at pest level populations within the region. LCO monitor rehabilitation areas understand native herbivore impacts. To mitigate the impact of this species on establishing rehabilitation areas, where appropriate LCO estimate the populations and conduct active management to control in consultation with National Parks and Wildlife as per the Biodiversity Conservation Act 2016.

3.2.7 Blasting

LCO has developed a Blast Management Plan in accordance with DA 305-11-01. Current blast management procedures include:

- Training all relevant personnel on environmental obligations and the safe handling of explosives, in accordance with the LCO procedure for environmental awareness and training;
- Designing blasts to achieve compliance with vibration and airblast limits, and to minimise the potential of flyrock that may injure people or damage property;
- Operation of a blasting hotline or an alternate system as agreed with the DPIE to enable the public to get up-to-date information on the blasting schedule at LCO;
- Use of adequate stemming, a delay detonation system, and careful drilling and hole loading to achieve required blast design;
- Monitoring blasts at sensitive locations to verify compliance with vibration and airblast limits;
- Review monitoring results and modification of the blast design, if necessary;
- Documentation of the date, location of blasts and quantity of explosive used; and
- Periodic review of blast management practices to evaluate performance and identify potential improvement if required.

A specific Blast Management Strategy for the heritage listed Chain of Ponds Inn and a Blast Management Strategy for the Newdell Zone Substation has also been developed. The scope of the Chain of Ponds Inn Strategy is discussed further in **Section 3.2.10**.

DA 305-11-01 and the LCO EPL specify the frequency (number of times per day and week) as well as times when blasting is permissible.

Impacts relating to post blast fume will be minimised through the ongoing implementation of LCO's Post Blast Fume Procedure, which was developed in accordance with the *Code of Good Practice: Prevention and Management of Blast Generated NO_x Gases in Surface Blasting* (Australian Explosives Industry and Safety Group Inc., 2011).

This code outlines the industry best practices to manage blasting and minimise impacts, including:

- Selection of appropriate explosive products in consideration of local aspects surrounding the blast location;
- Reviewing geological conditions in the formulation of blast designs;

- Reviewing ground conditions (e.g. presence of clay or loose/broken ground);
- Minimising the time between drilling and loading, and loading and shooting of the blast; and
- Consideration of meteorological conditions in blast scheduling.

Blast events are monitored and results are reported publically as per the LCO Blast Management Plan.

3.2.8 Noise

Noise management at LCO is undertaken in accordance with the approved Noise Monitoring Program (NMP). The main sources of noise at LCO are associated with blasting events, coal and overburden excavation, dump truck movements, coal handling and processing, and rail movements.

Noise management strategies currently employed at LCO include:

- A program of regular sound power screening testing to monitor equipment sound power levels and identify plant items requiring maintenance;
- A continued program of attended monitoring as outlined in the NMP to monitor compliance with approved noise criteria.

Real time noise monitoring will be undertaken in the MOP term in proximity to the nearest receptors, providing alerts if mining noise levels are close to the Project Specific Noise Criteria (PSNC). These alerts will prompt adaptive management techniques to allow mining operations to be altered as necessary for noise levels to remain within PSNC. Mitigation measures to address potential exceedances include;

- The review of digging and dumping activities likely to have resulted in any noise exceedance, taking into consideration wind direction and height / proximity of active operations to the continuous noise monitor;
- The relocation of equipment closest to receivers to lower risk areas;
- The temporary reduction in height of operations; and
- The shutting down of mining equipment, as deemed necessary to meet criteria.

Attended night time noise monitoring at LCO is currently conducted once per month, measuring $LAeq_{(15\ minute)}$ and $LA_{(1minute)}$. Noise monitoring results are reported publically as per the Noise Monitoring Program.

3.2.9 Visual and Lighting

Lighting is managed at LCO in accordance with the Lighting Management Procedure. Visual impacts have been considered in design elements for the project including:

- Design of the overburden emplacement to effectively shield operations from views to the north and northeast, reducing the impact of light on surrounding residences and road users;
- Progressive rehabilitation of disturbance areas as soon as possible following completion of mining activities;
- Installing recommended lighting treatments for specific plant and equipment to reduce light spill to non-operational areas, especially with regard to mobile lighting plants; and
- Incorporating mine infrastructure treatments (such as choice of materials and painted surface colours) to reduce the impact of lighting from fixed light sources.

Throughout the MOP term LCO will continue to employ measures minimise visual related impacts on nearest receptors by:

- Rehabilitating disturbed areas as soon as practical after mining;
- Prioritising rehabilitation works in areas that are most visually prominent at private residences; and
- Orientating lights on site away from sensitive receptors where practical.
- Establishing a mix of grazing and native vegetation land uses that are compatible with the surrounding environment; and
- Constructing emplacements with profiles and maximum heights that are consistent with the local topography.

The visual impact of the final landform were assessed in the preparation of the MOD 5 EA and discussed in **Section 4 and 5**.

3.2.10 Heritage (Aboriginal and European)

Aboriginal Heritage

Aboriginal cultural heritage is managed in accordance with the Aboriginal Cultural Heritage Management Plan (ACHMP).

A number of archaeological items of Aboriginal heritage, including artefact scatters and isolated finds have been identified across the LCO development consent area over the course of the mine life. The majority of the sites have been salvaged in accordance with Section 87 and Section 90 permits.

Previously known artefacts still remaining in-situ in the MOD 5 extension areas, and the newly identified sites, were salvaged prior to disturbance in the extension areas 2015 in accordance with an Aboriginal Heritage Impact Permit (AHIP) granted by the Heritage NSW (AHIP number C0000623) and approved ACHMP. All known sites at LCO that are not located in disturbance areas will be managed in-situ in accordance with the ACHMP.

Measures to minimise the potential for impacts to known Aboriginal heritage sites are:

- Demarcating all known Aboriginal heritage sites in the field (fencing and signage) and on Ground Disturbance Permits to minimise the potential for unauthorised access or disturbance;
- Implementation of appropriate erosion and sediment controls for all disturbance areas to minimise impacts by sedimentation; and
- Land management including weed and feral animal control and bushfire mitigation will be carried out in a manner that does not impact Aboriginal heritage sites.

LCO will continue to manage risks of disturbing known sites with the controls outlined above. Potential impacts to previously undiscovered Aboriginal heritage items and sites will be minimised by providing cultural heritage awareness training to all personnel and contractors engaged at LCO. In the event that any previously unknown artefact is discovered in the MOP term LCO will advise the Aboriginal Stakeholder Reference Group and works in the vicinity will cease take steps to protect the artefact and follow the ACHMP.

European Heritage

European heritage was assessed for the MOD 5 EA (OzArk, 2013). There is one heritage site in the vicinity of LCO; being the Chain of Ponds Inn and associated outbuildings. The site is adjacent to LCO (**Plan 1C**), and is listed on both the Register of the National Estate (#001400) and the State Heritage

Register (#00242) and assessed as having State Significance. The Chain of Ponds Inn is also noted within the Singleton LEP as being of State Significance.

The buildings and associated structures such as fencing are considered to be in a poor condition and are considered to be vulnerable to impacts associated with blasting in the South Pit extension areas. Long term restoration of the buildings is the responsibility of the landowner (not LCO) however LCO has committed to undertaking stabilisation works as required in accordance with the approved Chain of Ponds Inn Blast Management Strategy.

In accordance with DA 305-11-01, LCO will repair any project related damage to the Chain of Ponds (should any damage occur) within 6 months of the damage occurring and provide an annual report on the condition of the Chain of Ponds Inn to the Heritage Council.

3.2.11 Bushfire

LCO employs a Bushfire Management Plan, associated with the BMP, to provide for the prevention and impact mitigation.

The bushfire hazard pertaining to a particular area is assessed by rating two main land based factors of fire, these being vegetation (fuel) and terrain (slope), and their relative contributions to a potential fire. Two land units occur at the Colliery: woodland on slopes ranging from 4 to 13 per cent and native and improved grassland on slopes ranging from 5 to 18 per cent. Fire burning uphill poses the most significant hazard. Rehabilitated lands are vulnerable to fire, with uphill slope lengths of 170 to 730 metres.

Bushfire ignition sources at LCO include natural occurrences such as lightning strikes, while other occurrences include sparks from power lines and human ignition sources. Traffic on Antiene Road, Hebden Road, New England Highway and the Main Northern Railway can be considered a fire hazard. Possible on-site ignition sources also include sparks and fire from machinery and fuel storage areas.

Controls in place to minimise the risk and impacts of bushfire on site include:

- Bushfire Management Procedure;
- Fire bans, as determined by the Rural Fire Service, are adhered to with hot works (e.g. welding, grinding) undertaken subject to risk assessment.
- Providing emergency preparedness training for mine site personnel;
- Regularly inspecting and maintaining established asset protection zones and firebreaks around LCO to prevent the spread of bushfires onto or from adjacent properties;
- Maintaining fire management resources including access roads, water carts equipped with firefighting equipment, dams and water fill points and earthmoving equipment; and
- Undertaking fuel reduction works as required to maintain reasonable fuel levels on site;

3.2.12 Mine Subsidence

Mine subsidence associated with historic underground workings at LCO is considered a low risk due to the period of time since active underground mining occurred. There has been an isolated incidence of a sink-hole forming over shallow historic mine workings in the Liddell Seam within the project boundary. An investigation concluded that the sink-hole was the result of inadequate drainage works constructed above the shallow workings. The sink-hole has since been remediated by backfilling and grouting the hole and restoring the function of the diversion drain.

Due to the depth of remaining historic underground workings and their remoteness to any proposed construction or infrastructure further instances of sink-hole development is considered a low risk for rehabilitation (refer to **Appendix D**).

3.2.13 Geology and Geochemistry

The potential for the geology or geochemistry of the site to affect rehabilitation was considered a low risk in the LCO MOP Risks to Rehabilitation Risk Assessment (2017) (**Appendix D**). Currently LCO undertake geochemical testing as part of rehabilitation works, which identifies any potential issues that could affect the success of rehabilitation. LCO will continue to undertake this testing during the MOP term.

3.2.14 Spontaneous Combustion

The risk of Spontaneous Combustion impeding rehabilitation was ranked as a low risk element in the LCO MOP Risks to Rehabilitation Risk Assessment (2017) (refer **Appendix D**), based in part on the long history of mining operations at LCO over a number of years resulting in a good understanding of the materials on site.

LCO recognises however that spontaneous combustion presents a potential threat to rehabilitation and long term public safety unless appropriate controls are maintained and spontaneous combustion is considered in the final landform design.

Spontaneous combustion management is undertaken in accordance with the approved Spontaneous Combustion Management Plan. The LCO Spontaneous Combustion Management Plan identifies responsible prevention, control and reporting measures for spontaneous combustion. The plan aims to minimise the occurrence of, and manage any instance of heating or spontaneous combustion in mining and coal stockpile areas at LCO.

Additional controls that are currently in place and assisting in effectively controlling the risk of spontaneous combustion include:

- Annual Rehabilitation Inspections; and
- Mine Design Control Inspections.
- Spontaneous combustion of coal at LCO is predominately confined to the Liddell Seam. Previously mined underground workings provide an oxygen source to the Liddell Coal seam which has a propensity to heat and spontaneously combust when exposed to oxygen for an extended period.

The hierarchy of controls applied to spontaneous combustion at LCO are:

- Elimination
  - Managing water levels in underground workings (where possible) to minimise the exposure time of the Liddell Coal seam.
  - Sealing exposed old workings in interim highwalls utilising clay and overburden material to minimise oxygen ingress into underground workings; and
  - Modify mining and spoil stockpiling design to prevent outbreaks of spontaneous combustion.
- Separation
  - Where material has or is showing signs of spontaneous combustion it is stockpiled separate to other inert coals to avoid spreading the heating.
- Engineering controls

  - For example, minimise contact with hot materials / equipment or establishing sprinklers/bench flooding to cool material prior to mining.

- Procedures
  - LCO has procedures for identification of spontaneous combustion; managing heated materials; provision of protective or first response capacity; and preparing for / cleaning up after spontaneous combustion events;
- Personnel skills and training
  - LCO provides training and education on the effects of spontaneous combustion and how to prevent incidents to all personnel and contractors who work in affected areas.
- PPE
  - Including gas monitors, masks, respirators and eye protection are required when potentially exposed to spontaneous combustion.

Controls to minimise the risk of spontaneous combustion affecting rehabilitation areas include:

- Emplacing carbonaceous material (including coarse rejects) within dumps so that it is not exposed to wind or air passages (e.g. at the base of rocky dumps) where spontaneous combustion may occur. Carbonaceous material is placed at least 5m below the final rehabilitated landform.
- Disposing of any hot material that has produced spontaneous material by block dumping the material in-pit at least 20 m from the rehabilitated surface.

3.2.15 Soils

LCO recovers all suitable soil resources as per the MOD 5 EIS Soil and Land Resource Assessment and the LCO Land Clearing and Topsoil Stripping Procedure. The results of the materials balance presented in the EIS identifies that LCO has a deficit of topsoil for completing rehabilitation and therefore substitute materials will be used when feasible. LCO will continue to utilise suitable soil substitutes such as recycled organics or other suitable products for use for as top-dress/incorporation within overburden as seed bed preparation where topsoil is not placed as appropriate to establish the target vegetation. In instances where an alternative growth medium or waste product is selected to be utilised in the rehabilitation, LCO will ensure that the waste product selected is in accordance with EPL 2094 and meets the requirements of the relevant conditions and exemptions.

Where topsoil can be used, it is respread nominally at 100 mm on the rehabilitation areas. Topsoil resources is tracked and recorded in a topsoil register, as a system to assist rehabilitation planning and for performance review. The register includes GIS mapping of uniquely identified topsoil resources and will be used to ensure suitable topsoil or substitute is placed in pasture or woodland rehabilitation areas.

LCO will continue to monitor rehabilitation performance of topsoil and alternatives to identify opportunities and ensure the most efficient use of topsoil resources and that rehabilitation is progressing towards the required outcomes.

3.2.16 Geotechnical Stability

Adaptive rehabilitation management is employed to ensure that vegetation and landform shape and landform drainage provides for adequate geotechnical stability. LCO designs and constructs to the approved final landform design which provides for geotechnical stability through minimum standards such as maximum slope grades and provisions for water management. LCO operate in accordance with a Ground or Strata Failure Management Plan (LIDOC-90533967-2849) that details the strata

monitoring and designs employed to provide for geotechnical stability. Below outlines particular geotechnical stability risks and management measures at LCO.

Mountain Block Slope Stability

The Mountain Block area is situated to the north of the site and when mining ceased in 2003 a remnant highwall remained that was approximately 120 m high and 450 m long with slopes between 35 and 45 degrees. Two major slips occurred shortly following cessation of mining. LCO undertook a stability assessment and rehabilitation works between 2004 and 2006 to push material over the top of the highwall to buttress the sections that had failed with soils.

Further failures occurred in May 2006 due to a slide failure of material with moist to wet silty clays with high shrink/swell potential located on the upper western slope of the highwall. Stabilisation works included excavating this material and constructing contour banks on the slope. In 2009 additional shaping works and tree plantings were completed in the western slip section. Since 2009 monitoring has identified significant gullying and tunnel erosion and downward movement of debris.

A geotechnical monitoring program was established in 2015 to inform a remediation strategy to address the slip areas. During the previous MOP term, LCO undertook a strategy for rehabilitation remediation works at the Mountain Block area to address landform stability issues and ongoing erosion impacts. The strategy began with detailed design including the following components:

- Obtaining bulk soil samples for flume testing in the laboratory, in order to quantify the materials erosion risk of the material to be used in the outer slopes;
- Analysis of the materials, using the Water Erosion Prediction Project (WEPP) analysis software to determine sustainable flow lengths and slopes;
- Updating the conceptual designs of the final landform by incorporating "Applied Geofluv™" and Geographic Information Systems (GIS) erosion risk analysis, to optimise the conceptual design. It will include a constructability analysis in 3D for consultation and initial costing;
- Final design for the final landform, incorporating issues raised from the conceptual landform reviews;
- Analysis of the proposed final landform, using the SIBERIA erosion model to quantify the short and long term erosion risk (with and without vegetation);

During the previous MOP term, works in the Mountain Block area were completed and included:

- Bulk Shaping – commenced shaping to developed final landform based on principles of Geofluv, intended to be a less erodible landform and to provide drainage lines and structures to carry concentrated flows.
- Soil Amelioration – Incorporation of gypsum and lime to improve the condition of the soil to as close to optimum conditions for the desired vegetation outcome. The ability to establish and sustain vegetation growth is essential for effective stabilisation of the Mountain Block.
- Rock Drains – the construction of rock drains for surface run-off is concentrated to prevent erosion.
- Revegetation - revegetation as per design recommendations from modelled erosion risk & areas nominated in MOP as woodland or pasture/grazing
- Surface Erosion Protection - to provide protection to all or part of the sown surface as required to maintain erosion protection until vegetation can provide adequate protection from erosion

During this MOP term, LCO will continue to monitor the rehabilitation performance and undertake maintenance as required till adequate erosion protection is achieved in all rehabilitated areas.

Railway Pillar Stability

The Main Northern Railway infrastructure corridor dissects the open cut excavation into two areas resulting in highwalls forming a 'railway pillar' that will be retained in the final landform where the open cut void is not backfilled. To provide for the long term safety and stability of this landform feature LCO manages the geotechnical instability risks as detailed in the LCO Ground or Strata Failure Management Plan (LIDOC-90533967-2849) and Geotechnical Monitoring Procedure LIDOC-90533967-37. All highwall designs have geotechnical assessment by suitably qualified engineers and subject to regular geotechnical monitoring and assessment.

4. Post Mining Land Use

4.1 Regulatory Requirements

Regulatory requirements related to post mining land use are listed below in **Table 10**.

Table 10 Regulatory Requirements Relating to Post Mining Land Use and Rehabilitation

Condition	Requirement	Timing
DA 305-11-01		
Schedule 2 Condition 1	In addition to meeting the specific performance criteria established under this consent, the Applicant must implement all reasonable and feasible measures to prevent and/or minimise any harm to the environment that may result from the construction, operation, or rehabilitation of the development.	Life of mine
Schedule 3 Condition 23	Water Management Plan The Applicant must prepare and implement a Water Management Plan for the development to the satisfaction of the Secretary. This Plan must: (c) this plan must include a: (iii) Surface Water Management Plan, that includes: • … • Design objectives and performance criteria, for the: – design and management of final voids – design and management for sodic and dispersible soils and acid or sulphate generating materials; – reinstatement of drainage lines on the rehabilitated areas of the site; and – control of any potential water pollution from the rehabilitated areas of the site; • … (iv) Groundwater Management Plan • … • design objectives and performance criteria, for the: – … – final voids; • a program to monitor and report on: – … – the seepage/leachate from water storages, emplacements and final voids; – … – impacts of the development on: ○ … ○ the seepage/leachate from water storages, emplacements, backfilled voids and final voids; ○ … – … • …	Life of mine
Schedule 3 Condition 25	The Applicant must ensure that the offset strategy and/or rehabilitation strategy is focused on the re-establishment of: (a) significant and/or threatened plant communities, including: • Central Hunter Box – Ironbark Woodland EEC; • Narrow-Leaved Ironbark – Spotted Gum Woodland EEC; • Narrow-Leaved Ironbark – Bulloak Open Forest EEC; (b) significant and/or threatened plant species; and	Life of Mine

Condition	Requirement	Timing
	(c) habitat for significant and/or threatened animal species including the Spotted-tailed Quoll	
Schedule 3 Condition 28A	The Applicant shall plant and maintain, until established, 10 River Oak trees for every established River Oak tree removed during construction of the tailings pipeline under MOD 6. *Note: an established River Oak tree is considered to be two meters or greater in height.*	
Schedule 3 Condition 29	Biodiversity Management Plan The Applicant must prepare and implement a detailed Biodiversity Management Plan for the site to the satisfaction of the Secretary. This plan must: (a) be prepared in consultation with OEH and be submitted to the Secretary for approval by the end of May 2015, unless otherwise agreed by the Secretary; (b) describe how the implementation of the offset strategy would be integrated with the overall rehabilitation of the site (see below); (c) include: (i) a description of the short, medium and long term measures that would be implemented to: • implement the offset strategy; and • manage the remnant vegetation and habitat on the site in the offset areas; (ii) detailed performance and completion criteria for the implementation of the offset strategy; (iii) a detailed description of the measures that would be implemented over the next 3 years, including the procedures to be implemented for: • implementing revegetation and regeneration with the disturbance areas and offset areas, including establishment of canopy, sub-canopy (if relevant), understorey and ground strata; • protecting vegetation and soil outside the disturbance areas; • rehabilitating creeks and drainage lines that occur on the site; • managing salinity; • conserving and reusing topsoil; • undertaking pre-clearance surveys; • managing impacts on fauna; • collecting and propagating seed; • salvaging and reusing material from the site for habitat enhancement; • salvaging, transplanting and/or propagating threatened flora in accordance with the Guidelines for the Translocation of Threatened Plants in Australia (Vallee et at., 2004); • controlling weeds and feral pests including investigating alternate technologies to reduce poisoning of non-target species; • managing grazing and agriculture; • controlling access; • bushfire management; • habitat enhancement works; • seasonal monitoring of in-stream and riparian ecological condition; • survey of stygofauna in Bowmans Creek alluvial aquifer (prior to predicted drawdown); and • monitoring of stygofauna populations every 6 months following the occurrence of the predicted drawdown. (iv) a seasonally-based program to monitor the effectiveness of these measures, and progress against the performance and completion criteria;	Life of mine

<table>
<tr><th>Condition</th><th>Requirement</th><th>Timing</th></tr>
<tr><td></td><td>(v) a description of the potential risks to successful revegetation, and a description of the contingency measures that would be implemented to mitigate these risks; and
(vi) details of who would be responsible for monitoring, reviewing and implementing the plan.
The applicant must implement the management plan as approved by the Secretary.</td><td></td></tr>
<tr><td>Schedule 3 Condition 37</td><td>The Applicant must rehabilitate the site to the satisfaction of Resources Regulator. The rehabilitation must comply with the objectives in Table 8, and be generally consistent with the proposed rehabilitation strategy in the EIS and as shown conceptually in Appendix 3.
<table>
<tr><th>Feature</th><th>Objective</th></tr>
<tr><td>Mine site (as a whole)</td><td>• Safe, stable and non-polluting
• Final landforms designed to incorporate micro-relief and integrate with surrounding natural landforms
• Constructed landforms drain to the natural environment (excluding the final voids)
• Minimise visual impact of final landforms as far as reasonable and feasible
• Ensure there are no adverse flood impacts to privately owned properties.</td></tr>
<tr><td>Final voids</td><td>• Minimise to the greatest extent practicable:
- the size and depth of final voids
- the drainage catchment of final voids</td></tr>
<tr><td>Surface infrastructure</td><td>• To be decommissioned and removed, unless the Secretary agrees otherwise</td></tr>
<tr><td>Revegetation</td><td>• Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprising of:
- At least 731 hectares of Central Hunter Box-Ironbark Woodland
- habitat for threatened flora and fauna species including habitat connectivity for the Spotted-tailed Quoll
• Maintain, establish and/or restore grassland areas with pockets of native vegetation to support sustainable agricultural activities, as shown conceptually in Appendix 3.</td></tr>
<tr><td>Community</td><td>• Ensure public safety
• Minimise the adverse socio-economic effects associated with mine closure</td></tr>
<tr><td>Final land use</td><td>• Restore or maintain land capability generally as described in the EA and as shown conceptually in Appendix 3.</td></tr>
</table></td><td>Prior to relinquishment</td></tr>
<tr><td>Schedule 3 Condition 38</td><td>Progressive Rehabilitation</td><td>Life of Mine</td></tr>
</table>

Condition	Requirement	Timing
	The Applicant must carry out rehabilitation progressively, that is, as soon as reasonably, practicable following disturbance. All reasonable and feasible measures must be taken to minimise the total area exposed for dust generation at any time. Interim rehabilitation strategies must be employed when areas prone to dust generation cannot yet be permanently rehabilitated. *Note: It is accepted that parts of the site that are progressively rehabilitated may be subject to further disturbance in the future.*	
Schedule 3 Condition 39	Rehabilitation Management Plan The Applicant must prepare and implement a Rehabilitation Management Plan for the development to the satisfaction of DRG, This plan must: (a) be submitted to DRE for approval by the end of June 2015; (b) be prepared in consultation with the Department, DoI, OEH, MSC and SSC; (c) be prepared in accordance with relevant DRE guidelines; (d) describe how the rehabilitation of the site would be integrated with the implementation of the biodiversity offset strategy; (e) include a detailed performance and completion criteria for evaluating the performance of the rehabilitation of the site, and triggering remedial action (if necessary); (f) describe the measures that would be implemented to ensure compliance with the relevant conditions of this consent, and address all aspects of rehabilitation including mine closure, final landform including final voids and final land use; (g) include interim rehabilitation where necessary to minimise the area exposed for dust generation; (h) include a program to monitor and report on the effectiveness of the measures, and progress against the detailed performance and completion criteria; and (i) build to the maximum extent practicable on other management plans required under this consent. The applicant shall implement the approved management plan as approved from time to time by the Secretary. The Applicant must implement the management plan as approved by the Secretary. Note: The Rehabilitation Management Plan may be combined with a Mining Operations Plan, or similar plan, required under a mining lease granted under the Mining Act 1992 for the development.	To be developed for each MOP term
MOD 5 EA Statement of Commitments		
27	Soil and Land Resources Native woodland vegetation will be rehabilitated where possible on the land that will be rendered unsuitable for agricultural enterprises.	Life of mine
30	Visual Amenity Rehabilitation of disturbed areas will take place as soon as practical after mining	Life of mine
31	Planting/seeding of native vegetation (canopy, mid-canopy and groundcover) will be undertaken on the highwall benches to improve long term visual amenity of the void.	Prior to relinquishment
34	Within five years of closure, LCO will prepare a detailed Mine Closure Plan, which will include confirmation of post-mining land uses and final rehabilitation success criteria.	Five years

Condition	Requirement	Timing
		from closure

4.2 Post Mining Land Use Goal

LCO is committed to establishing sustainable post mining land uses that meet the expectations of stakeholders, and support the objectives of key regional strategic land use policies, particularly the:

- Singleton Local Environment Plan 2013 (Singleton LEP);
- Muswellbrook Local Environmental Plan 2009 (Muswellbrook LEP);
- Muswellbrook Shire Council Draft Local Strategic Planning Statement 2020 – 2040;
- Singleton Council Local Strategic Planning Statement 2041;
- Hunter Regional Plan 2036
- Synoptic Plan: Integrated landscapes for Coal Mine Rehabilitation in the Hunter Valley of NSW (Synoptic Plan) (DMR, 1999): and
- Strategic Regional Land Use Plan for the Upper Hunter (DP&I, 2012).

Post mining land use goal for LCO were developed in consultation with regulatory authorities, reviewed and assessed during the preparation of the DA 305-11-01 MOD 5 Rehabilitation Strategy (included in the MOD 5 EA (Umwelt, 2013)). Due to the nature of MOD 6 and MOD 7 the post mining land use goal did not require modification to the strategy. DA 305-11-01 Appendix 3 provides a plan of the approved conceptual final landform prepared during MOD 5 to satisfy DA 305-11-01 Schedule 3 Condition 37. Incorporation of the intent of local government LEP provisions has been included within the rehabilitation strategy to maintain the rural landscape by establishing native vegetation corridors to promote regional fauna movements across the greater Ravensworth area and to re-establish land for sustainable agricultural purposes.

The primary post mining land use goal for LCO is to establish a mix of grasslands capable of supporting sustainable grazing, and native vegetation corridors to enhance habitat connectivity. Rehabilitation of post mining areas aims to establish a landform, natural resources and vegetation suitable for the post mining land uses and to achieve the requirements of the development consent; specifically 731ha of Central Hunter Box-Ironbark Woodland and grassland for sustainable agriculture. Progressive rehabilitation activities occur throughout the life of mine to allow minimisation of environmental impacts (dust emissions, habitat disruption) and maximisation of opportunities for the development of vegetation prior to mine closure.

Final Landform Development during Previous MOP Term

Maintaining a flexible plan is key for any mine approaching the closure phase to enable a cost effective and practical outcome whilst maintaining compliance with approval conditions. Since 2013, changes in economic conditions have prompted a strategic review of the mine plan resulting in a revised mining sequence, particularly affecting the Entrance Pit mining area. Consequently, LCO has determined in consultation with NSW Resources Regulator, that the conceptual landform currently approved requires amendment with the changes are summarised below.

The strategic review of the mine plan review completed during 2017 has resulted in the decision to not extract the coal below the Pikes Gully Seam in the southern portions of the Entrance Pit. It was identified that leaving the coal and associated overburden in-situ whilst continuing to extract coal in the mining sequence presented in DA 305-11-01 would result in a larger final void than current

approved. Additionally, investigation into the calculation of the EA proposed final landform vegetation hectare commitments revealed errors in the quantities of woodland (731ha) and grassland (1247ha) proposed, these errors feature specifically in Schedule 3 Condition 37 Table 8.

Deeming the void increase to be an undesirable final landform outcome, LCO completed further design work to refine the Life of Mine Plan, revising both mining sequence and final landform to meet the objectives of DA 305-11-01 Schedule 3 Condition 37 and 38. Key features of the planned final landform included differences in the location, size and dimensions of the voids as well as minor changes to the proposed revegetation distribution. Whilst both woodland and grassland hectare commitments could not be achieved, the requirement to establish self-sustaining Central Hunter Box Ironbark Woodland was prioritised due to its ecological benefits and is maintained in the revised landform design.

Due to the nature of the changes proposed and the inflexibility of DA 305-11-01 Mod 6 Schedule 2 Condition 2 requiring strict compliance with the consent, specifically Appendix 3 Conceptual Final Landform and Condition 37 Table 8; LCO required to obtain a Development Consent Modification to revise the final landform design. An application was made and subsequently approved 12 February 2019, Modification 7.

The period in which mining operations at LCO trigger the parameters of the revised final void in Entrance mining area is Q4 2020 (in-pit dumping commences on LPG floor of Bayswater Pit area).

Planned Final Landform

Following the long-term planning activities and approval of DA 305-11-01 MOD 7, LCO has prepared a Planned Final Landform in consultation with regulatory authorities to satisfy the specific rehabilitation approval conditions listed in **Table 10**, specifically the objectives of DA305-11-01 Schedule 3 Condition 37 and 38**.** The current proposed final landform and final land uses are depicted on **Plan 4** with the following notes:

- The EIS rehabilitation strategy, objectives and post mining land uses have been retained.
- Woodland areas meet the required 731ha as specifically required by Schedule 3 Condition 37.
- Distribution of woodland areas aligns with the EIS rehabilitation strategy providing connectivity with remnant woodland areas, adjacent operations woodland areas and Biodiversity Offset Areas.
- Final voids are of equivalent size (surface area and volume) to the approved final voids.
- The final landform visual impacts are consistent with the approved landform.

Final Landuse Integration with Adjacent Operations

LCO are committed to a rehabilitation strategy that complements the proposed rehabilitation at the adjacent Glencore operations Ravensworth Operations and Mount Owen Complex, and meets the final landuse goals for the project including enhancing regional habitat connectivity (refer **to Section 4.2**). Land use and habitat corridors as described in the Singleton Local Strategic Planning Statement 2041 and the Muswellbrook Shire Council Statement 2020-2040 have been reviewed in the development of LCO's rehabilitation strategy for Development Consent Modification 5.

The proposed final landform and landuse for LCO (Plan 4) provides woodland habitat corridors that complement the future landuse and immediate setting of LCO. That is, riparian areas of the Bayswater and Bowmans Creek; proposed native vegetation rehabilitation at adjacent mining operations (Ravensworth Operations, Mount Owen Complex) and the adjacent biodiversity conservation offset area (Ravensworth Operations Hillcrest Offset Area). Connectivity east-west across the lease between the two bounding creeks and north south from remnant native vegetation to biodiversity conservation areas to the north. Additionally, habitat enhancement will be undertaken along Bowmans Creek to

enhance habitat specifically for the Spotted-tailed Quoll. Regeneration works associated with Bowmans Creek will be documented in the Biodiversity Management Plan.

LCO will continue through the MOP term to liaise with Ravensworth Operations and Mount Owen Complex to ensure native vegetation rehabilitation objectives at the operations are compatible and achieve the desired outcome of habitat connectivity.

4.2.1 Alternative Final Land Uses

Alternative post-mining land use options include potential industrial uses, particularly in consideration of the availability of the rail line and proximity to the New England Highway. Appropriate future use for built infrastructure including the workshop, office complex and ancillary facilities such as lay down storage areas may be explored further by LCO and stakeholders in the detailed mine closure planning phase of the project. Any alternative final land use option considered would be developed in consultation with stakeholders and would be subject to future project approvals.

4.3 Rehabilitation Objectives

Rehabilitation is undertaken to achieve a final landform capable to support the required post mining landuse. The principal rehabilitation objectives at LCO adhere to the fundamental principles below:

a) **Create a stable and non-polluting post-disturbance area** - Disturbed land will be rehabilitated to a condition that is self-sustaining or a condition where maintenance requirements are consistent with an agreed post-mining land use. The quality of surface water and groundwater that leave the mining lease areas will be adequate to maintain environmental values and beneficial uses downstream of the Project Application Area.

b) **Achieve an acceptable post-disturbance land use** - Rehabilitation of disturbed areas will aim to create a land use capability and/or suitability compatible with the pre-mining land use, unless other beneficial land uses are pre-determined and agreed.

The principal rehabilitation objectives for LCO are to:

- Rehabilitate all disturbance areas to be safe, stable and non-polluting;
- Ensure public safety;
- Minimise the adverse socio-economic effects associated with mine closure;
- Decommission and remove all surface infrastructure, unless the NSW Resources Regulator agrees otherwise;
- Design final landforms to incorporate micro-relief and integrate with surrounding natural landforms. Micro-relief by definition relates to only slight/small irregularities in the final land surface causing minor variations in elevation.
- Restore or maintain land capability generally as described in the EA;
- Construct landforms that drain to the natural environment (excluding final voids);
- Minimise visual impact of the final landforms as far as reasonable and feasible;
- Minimise to the greatest extent practicable:
    - The size and depth of the final voids;
    - The drainage catchment of the final voids;

Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems that is comprised of at least:

- 731 hectares of Central Hunter Box-Ironbark Woodland (Plant Community Type 1691);
- Grassland areas with pockets of native vegetation to support sustainable agricultural activities;
- Establish areas of self-sustaining habitat for threatened flora and fauna species including corridor habitat for the Spotted-tailed Quoll.

Specific rehabilitation objectives for each proposed final land use domain are provided in **Section 5.2**.

5. Rehabilitation Planning and Management

The following sections outline the rehabilitation planning processes and objectives/criteria for LCO, in accordance with the requirements of DA 305-11-01 and the *ESG3: Mining Operations Plan (MOP) Guidelines, September 2013* (DRE 2013).

5.1 Domain Selection

Land Use Domains

Consistent with the ESG: 3 MOP Guidelines, LCO has been categorised into a series of primary (operational) domains and secondary (post mining land use) domains based on the land use as listed as in **Table 11**. Primary domains at the commencement of the MOP term are depicted on **Plan 2**.

Primary domains have been defined on the basis of land management units within the mine site which have similar operational purposes and therefore similar geophysical characteristics. Secondary domains have been defined as land management units characterised by similar post mining land use objectives.

Table 11 Primary and Secondary Domains

Code	Description
Primary Domains	
1	**Active Mining -** The footprint of the LCO active excavation areas.
2	**Water Management -** Dams and surface water management structures.
3	**Infrastructure -** Existing infrastructure during the MOP term including the LCO CHPP and associated stockpiles and conveyors, administration and amenity facilities, workshops, haul roads and access roads, rail loader and rail loop.
4	**Overburden Emplacement -** The footprint for the LCO out of pit and in-pit emplacement areas.
5	**Tailings Storage Area -** Includes all current tailings emplacement areas.
Secondary Domains	
A	**Final Void –** Two voids (South Pit and Entrance Pit) will be retained in the final landform. The voids will hold permanent water bodies (to approximately 67 m AHD) and be vegetated with woodland species on the battered highwalls and lowwalls above the permanent water levels.
B	**Water Management -** Various dams and surface water management structures to be retained in the final landform.
C	**Rehabilitation Area – Grassland -** Areas to be rehabilitated with selected grasses and pasture species. Grassland will generally be established on rehabilitated tailings emplacements and flatted areas on overburden dumps. Grassland rehabilitation areas will be capable of supporting sustainable grazing, and may include pockets of trees for stock shelter.
D	**Rehabilitation Area – Woodland -** Areas to be rehabilitated with woodland corridors that will integrate with adjacent remnant vegetation and proposed native vegetation corridors at adjacent mining operations (including Ravensworth Operations and Mount Owen Complex). Woodland rehabilitation areas will establish self-sustaining ecosystems commensurate with Central Hunter

Code	Description
	Box - Ironbark Woodland (Peake 2006) and include habitat features suitable for native fauna including the Spotted Quoll.
E	**Conservation and Biodiversity Offset Area –** Areas within the mining lease being Bowman's Creek Riparian Corridor and Mountain Block Offset area that have a Conservation Agreement established with the National Parks and Wildlife Act 1974(NSW). These areas are to provide long-term ecological habitat to support threatened flora and fauna species. Refer to the Biodiversity Offset Management Plan for details.

Site Rehabilitation Planning Domains

To facilitate rehabilitation management and development of the Rehabilitation Cost Estimate, LCO has been divided into a number of Rehabilitation Planning Domains. These domains are defined with consideration of spatial location, development undertaken (e.g. age and mining methods), specific risks associated with the area (e.g. tailings emplacements) and rehabilitation activities required (e.g. infrastructure areas such as at the CHPP). The Rehabilitation Planning Domains are described in **Table 7.**

5.2 Domain Rehabilitation Objectives

There are distinct geophysical features associated with the current operational use (Primary Domains) areas and post-mining land use (Secondary Domains) land function. Hence specific rehabilitation management objectives are used to describe the outcomes required to achieve the post mining land use goals for each phase and land use. For each of the land use domains applicable at LCO, refer **Table 11**, the rehabilitation management objectives are identified in **Table 12**.

Table 12 Domain Rehabilitation Objectives

Domain	Rehabilitation Management Objectives
Primary Domains	
1 – Active Mining	• All appropriate rehabilitation resources including topsoils, subsoils and habitat resources will be identified and salvaged ahead of mining; • Vegetation and soils will be progressively disturbed ahead of mining to minimise total disturbance areas and period for soil stockpiling; • Open cut pit areas will be progressively backfilled, hence transitioning to Primary Domain 4, and rehabilitated as soon as practical following the completion of mining;
2 – Water Management	• Clean water will be diverted around operational areas prior to disturbance where practical; • Dirty water and mine water will be captured and diverted to mine water and dirty water dams; • Mine water and dirty water will preferentially be used for operational uses including coal processing and dust suppression; • Dirty water dams and mine water dams will be managed to maintain design capacity in accordance with the EPL and WMP; • Operational water management structures will be retained and maintained until the associated catchment is considered rehabilitated and discharge water quality meets the relevant rehabilitation completion criteria.

Domain	Rehabilitation Management Objectives
3 – Infrastructure	• Infrastructure areas will be maintained and operated to mitigate any potential land contamination during operational use. • All built surface infrastructure will be decommissioned and removed from site (unless agreed otherwise with regulators and stakeholders); • All hazardous materials and contaminated materials will be identified and removed from site or remediated in accordance with legislation; • All open bore holes (including underground dewatering bores and monitoring wells) and rehabilitated in accordance with regulatory guidelines; • Infrastructure areas will generally be rehabilitated to a mixture of grassland and woodland final land uses.
4 – Overburden Emplacement	• Overburden emplacement areas will be predominantly rehabilitated to Domain C grassland (Rural Land Capability Classes IV, V and VI), and Domain D woodland habitat corridors established on slopes; • Overburden emplacement shaping will produce a generally free draining land form with slopes generally 10 degrees or less and not exceeding 18 degrees unless agreed by regulators; • Overburden emplacements will be shaped with generally informal profiles and maximum heights that complement the local topography; • Overburden emplacements will include swales and berms and be graded to direct runoff away from the two final voids; • Co-disposed coarse rejects are covered with at least 5 m inert cover to minimise the risk of spontaneous combustion;
5 – Tailings Emplacement Area	• All tailings pumping infrastructure will be decommissioned and removed; • Tailings emplacement areas will be capped and rehabilitated in accordance with an approved capping design and Section 101 approval; • Rehabilitated tailings emplacements will be capped and shaped to produce free draining landforms;
Secondary Domains	
Domain A - Final Void	• Two final voids retained in the final landform; • The South Pit and Entrance Pit final voids will be designed and constructed to produce non-spilling permanent water storage bodies; • The depth, surface area, and total catchment of the final voids will be constructed to produce an equilibrium water level of approximately 67 m AHD; • Final voids will be made safe by: - Constructing high walls and low walls to be geotechnically stable; and - Constructing perimeter fencing and safety bunds to restrict public access; • High wall benches and low walls (above the predicted permanent water body level) will be vegetated where appropriate with woodland species to enhance visual amenity.
Domain B – Water Management	• Final landform drainage will integrate with the surrounding catchments; • Surface water management structures will be designed and constructed in accordance with the Blue Book to minimise erosion and enhance stability; • Surface water runoff from the final landform will be non-polluting; • Clean water dams will be preserved in the final landform to provide water resources for native fauna and grazing stock.

Domain	Rehabilitation Management Objectives
Domain C – Grassland	• Grassland will be established that can be demonstrated to be capable of supporting sustainable agricultural activities by: - Having a pasture species mix representative of the district - Providing a mix of land capability suitable for agriculture (Rural Land Capability Class IV, V and VI); - having a carrying capacity comparable to suitable analogue sites; - Requiring management inputs comparable to suitable analogue sites; • Soils (or soil substitutes) will be reinstated on rehabilitation areas with characteristics that are appropriate for the final landuse. Alternatively, suitable amelioration of overburden will be undertaken to provide for the development of required vegetation
Domain D - Woodland	• At least 731 ha of woodland will be established primarily comprising the slopes of overburden emplacement areas; • Woodland rehabilitation corridors will connect with remnant vegetation and rehabilitation at adjacent operations (Ravensworth Operations and Mount Owen Complex) to enhance habitat connectivity for the Spotted-tailed Quoll; • Will provide habitat augmentation features (such as rock piles and felled logs and woody debris) for threatened native flora and fauna species, including the Spotted-tailed Quoll; • Vegetation compositions in woodland rehabilitation areas will be comparable with analogue vegetation communities, including areas representative of Central Hunter Box – Ironbark Woodland, specifically adjacent to rehabilitation areas at Ravensworth Operations and Mount Owen Complex; • Soils (or soil substitutes) will be reinstated on rehabilitation areas with characteristics that are appropriate for the final landuse. Alternatively, suitable amelioration of overburden will be undertaken to provide for the development of required vegetation • Woodland rehabilitation areas will be self-sustaining and require ongoing management that are appropriate for the final land use.
Domain E – Conservation & Biodiversity Offset Area	• Refer to the Biodiversity Offset Management Plan

5.3 Rehabilitation Phases

The ultimate rehabilitation objective for LCO is to create safe, stable, non-polluting post mining landforms that are cognisant of site constraints and allow the achievement of the agreed post mining land uses. This will be achieved by demonstrating completion of a series of conceptual phases of rehabilitation which are described as:

1. **Decommissioning –** decommissioning of all on-site infrastructure, including the CHPP, administration buildings and train loading facilities; removal of haul road, rail crossings and hard stand areas, the completion of contamination studies for relevant areas and subsequent decontamination where required, removal of hazardous materials;
2. **Landform Establishment –** incorporates slope, aspect, drainage, substrate material characterisation and morphology;

3. **Growth Medium 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. **Land Relinquishment –** completion criteria for rehabilitation are met and the land is determined to be suitable to be relinquished from the mining tenement.

The following **Table 13** provides a summary of planned rehabilitation phase status for each domain at the end of the MOP period. The progressive rehabilitation undertaken at LCO is demonstrated in **Table 13** where more than one phase is expected to be applicable in that domain; hence some of the domain may be active and other areas undergoing active rehabilitation. Refer to **Section 7.4.6** for further details on rehabilitation status changes during the MOP term. Note the current LCO Life of Mine Plan indicates that coal extraction will continue until the approximately the end of this MOP period, refer to **Section 7.3.6** for details on mine closure planning activities occurring during the MOP term.

Table 13 Summary of Rehabilitation Phases Proposed at the end of the MOP

Rehabilitation Domain	Primary Domain / Secondary Domain	Rehabilitation Phase						
		Active	Decommissioning	Landform Establishment	Growth Medium Development	Ecosystem and Land Use Establishment	Ecosystem and Land Use Sustainability	Relinquished Lands
Domain 1: CHPP	Infrastructure/Grassland (3C)	✓	x	x	x	x	x	x
	Water Management/Water (2B)	✓	x	x	x	x	x	x
Domain 2: Open Cut Facilities	Infrastructure/Grassland (3C)	✓	x	x	x	x	x	x
	Water Management/Water (2B)	✓	x	x	x	x	x	x
Domain 3: South Pit	Overburden Emplacement/Grassland (4C)	x	x	x	x	✓	✓	x
	Overburden Emplacement/Woodland (4D)	✓	✓	✓	✓	✓	x	x
Domain 4: Durham	Tailings Storage/Grassland (5C)	x	✓	✓	x	x	x	x
Domain 5: Reservoir Block	Tailings Storage/Grassland (5C)	x	✓	✓	✓	✓	x	x
	Water Management/Water (2B)	✓	x	x	x	x	x	x
	Infrastructure/Grassland (3C)	✓	x	x	x	x	x	x
Domain 6: Entrance Pit	Overburden Emplacement/Grassland (4C)	x	x	x	x	✓	✓	x
	Overburden Emplacement/Woodland (4D)	✓	✓	✓	✓	✓	x	x
Domain 7: Antiene	Tailings Storage/Grassland (5C)	x	x	x	x	✓	x	x
	Water Management/Water (2B)	✓	x	x	✓	x	x	x
Domain 8: Final Voids	Active Mine/Final Void (1A)	✓	x	x	x	x	x	x
Domain 9: Mountain Block	Overburden Emplacement (4C)	x	x	x	x	✓	x	x
Domain 10: Biodiversity Offset Area	Overburden Emplacement or unmined land / Conservation & Biodiversity Offset Area (4E)	x	x	x	x	✓	✓	x

6. Performance Indicators, and Completion Criteria

The completion criteria are objective target levels or values assigned to a variety of indicators (i.e. slope, species diversity, groundcover etc.), which can be measured to demonstrate progress and ultimate success of rehabilitation. As such, they provide a defined end point, at which point in time rehabilitation can be deemed successful and the lease relinquishment process can proceed.

Completion criteria have been developed considering site specific issues and objectives, Glencore's standards and the preliminary outcomes of a current ACARP study entitled 'Establishing Self-sustaining and Recognisable Ecological Mine Rehabilitation' (Umwelt, in prep).

During the previous MOP period, consultation with NSW Resources Regulator and relevant stakeholders occurred to refine the completion criteria with the aim to improve overall clarity (measurability) and appropriateness to the post-mining land use. The performance measures and associated indicators have been designed based on the template provided by the NSW Resources Regulator with amendments to suit Liddell's specific approval requirements, see **Tables 14-18** for the performance criteria by secondary domain. The criteria and indicators listed in **Tables 14-18** are based on the Biodiversity Assessment Methodology (BAM).It is noted that these completion criteria primarily provide for the standardisation of rehabilitation implementation. When rehabilitation relinquishment is planned to occur during a MOP term, these criteria may be subject to refinement in consultation with the relevant stakeholders.

The achievement (or otherwise) of the completion criteria will be monitored and reported within the annual reports to be submitted to relevant government agencies.

Table 14 Completion Criteria Infrastructure to remove

POST MINING Land Use	MINING DOMAIN	REHABILITATION OBJECTIVES	COMPLETION CRITERIA	PERFORMANCE INDICES	EXAMPLE OF JUSTIFICATION / VALIDATION METHODS
All Post Mining Land Uses	Infrastructure Area;	Infrastructure to Remove All infrastructure that is not to be used as part of the final land use is removed to ensure the site is safe and free of hazardous materials.	Removal of all services (power, water, communications) that have been connected on the site as part of the operation.	Infrastructure removed.	Statement provided, independent field verification
			Heritage obligations (e.g. development consent under the Environmental Planning and Assessment Act 1979, approvals under the Heritage Act 1977, etc.) have been met (e.g. archival recording, building retention or building demolition with footings preserved).	Permits and approval documents issued; archival reports (where required) complete and submitted.	Copy of any relevant approval documentation.
			All plant, equipment and associated infrastructure including processing facilities, stockpile areas, rail infrastructure and loading facilities, underground hydrocarbon storage tanks, office complex, portable offices, exploration core samples, camp facilities, storage racks, samples are disposed of in accordance with Waste Management Regulations.	Infrastructure removed.	As-constructed final landform plan, photos, independent field verification, etc.
			Removal of all footings or encapsulation of footings compatible with final landform/land use objectives.	Infrastructure removed.	Statement provided, independent field verification. Surveyed and marked on the as-constructed final landform plan.
			Removal of all water management infrastructure (including pumps, pipes and power).	Infrastructure removed.	Statement provided, independent field verification and before/after photos.
			All drill cores have been removed from site and either taken to authorised storage or disposal location with due consideration to Mining Regulation S65 requirements.	Cores removed.	Statement provided, independent field verification, disposal/transfer receipts
			Surveying and sealing of all drill holes, boreholes and gas wells in accordance with departmental guidelines and relevant standards.	Sealing complete.	Engineering report/statement, survey records, photos etc.

Table 15 Completion Criteria Infrastructure to remain

POST MINING LAND USE	MINING DOMAIN	REHABILITATION OBJECTIVES	COMPLETION CRITERIA	PERFORMANCE INDICES	EXAMPLE OF JUSTIFICATION / VALIDATION METHODS
All Post Mining Land Uses	All Domains	Infrastructure to Remain Any infrastructure that is to remain as part of the final land use is safe.	Where applicable, necessary approvals are in place (e.g. development consent under the Environmental Planning and Assessment Act 1979) where buildings and infrastructure are to be retained as part of final land use	Permits and approval documents issued	Copy of any relevant approvals or evidence if approvals not required e.g. fencing
			Potential hazards (e.g. electrical, mechanical) have been effectively isolated.	Hazards isolated.	Statement provided.
			Water management infrastructure (dams, drains, embankments, etc.) and access tracks are suitable in size and condition for the post mining land use and practically minimised. .	Any required Repairs or Upgrades complete.	Copy of any relevant plans, photos etc.
			Heritage obligations as required under the *Environmental Planning and Assessment Act 1979*, *Heritage Act 1977,* etc. have been met (e.g. archival recording, building retention and restoration).	Permits and approval documents issued; archival reports (where required) complete and submitted.	Copy of any relevant approval documentation.
			The structural integrity of the infrastructure is suitable and safe for use as part of the intended final land use.	The structural integrity of the infrastructure has been inspected by a suitably qualified engineer and determined to be safe for the intended final land use (to an engineering standard).	Engineering report/statement, photos etc.
			If any underground pipelines or other infrastructure (e.g. building footings) are to remain in situ, they do not pose a hazard for the intended final land use. Note: If any underground pipelines or other infrastructure are to remain in situ in areas to be returned for Agriculture – cropping they are at a depth >0.5m and don't constrain the final land use.	The location of the infrastructure has been marked on a plan and registered with the relevant local authority (e.g. local Council)	Surveyed and marked on the as-constructed final landform plan. Copy of notification to or correspondence with relevant authority

Table 16 Completion Criteria land contamination, landform stability, bushfire, water quality, groundwater regime, water approvals

POST MINING Land Use	MINING DOMAIN	REHABILITATION OBJECTIVES	COMPLETION CRITERIA	PERFORMANCE INDICES	EXAMPLE OF JUSTIFICATION / VALIDATION METHODS
All Post Mining Land Uses	All Domains	Land Contamination There is no residual soil contamination on site that is incompatible with the final land use or that poses a threat of environmental harm.	Contamination will be appropriately remediated to a condition that does not pose a threat of environmental harm or constrain the final land use	Contamination will be appropriately remediated so that appropriate guidelines for land use are met, e.g. Health Investigation Level of the National Environment Protection (Assessment of Site Contamination) Measure (1999).	Contamination Remediation Report prepared by Land Contamination Consultant Site Contamination Audit Report and Site Audit Statement prepared by EPA Accredited Auditor (where required)
			Residual waste materials stored on site (e.g. tailings dams) will be appropriately contained / encapsulated so it doesn't pose any threat of environmental harm or constrain the intended final land use.	The structural integrity of the any infrastructure has been inspected by a suitably qualified engineer and the landform determined to be suitable and safe as part of the intended final land use and does not pose threat of environmental harm.	Engineered capping design with specifications, land contamination assessment

POST MINING Land Use	MINING DOMAIN	REHABILITATION OBJECTIVES	COMPLETION CRITERIA	PERFORMANCE INDICES	EXAMPLE OF JUSTIFICATION / VALIDATION METHODS
		Landform Stability The final landform is stable and does not present a risk of environmental harm downstream/ downslope of the site or a safety risk to the public/ stock/ native fauna.	Any areas of active erosion are within the parameters for safe and stable landform. Discharge points from rehabilitated landform to natural channels are stable. Landform provides that there are no adverse flood impacts to privately owned properties. Any water management structures are stable and suitable for the post mining land use.	The final landform has been constructed in general accordance with the approved Final Landform & Rehabilitation Plan. Signs of erosion and or land instability are recorded, measured and assessed with remedial action taken when necessary. Erosion surveys to demonstrate that the average annual soil loss from the final landform at completion is to be equal or less than that predicted by the Revised Universal Sediment Loss Equation (or equivalent) for the approved land use. Water management structures such as dams, embankments, spillways for any remaining dams have been constructed in accordance with engineered hydrological design.	Before and after photos, rehabilitation monitoring reports, as-constructed surveys, erosion surveys, hydrological assessments, independent reports that demonstrate long term stability of rehabilitated landform. Depending on the nature, scale and risks associated with a specific site, stability will need to be evaluated over a number of years (e.g. 5 years).
		Bushfire The risk of bushfire and impacts to the community, environment and infrastructure has been addressed as part of rehabilitation.	Appropriate bushfire hazard controls (where required) have been implemented on the advice from the NSW Rural Fire Service.	Bushfire controls implemented appropriate to the final land use.	Independent verification report.

POST MINING Land Use	MINING DOMAIN	REHABILITATION OBJECTIVES	COMPLETION CRITERIA	PERFORMANCE INDICES	EXAMPLE OF JUSTIFICATION / VALIDATION METHODS
		Final Voids Final voids size, depth and catchments are minimised to the greatest extent practicable.	Final voids size, depth and catchments are minimised to the greatest extent practicable.	Cumulative surface area of final voids. Final void catchment.	Survey of as constructed final voids and drainage catchments.
		Surface Water Quality Runoff water quality does not adversely impact aquatic ecosystems.	Runoff water quality from rehabilitation areas represent an acceptable level of change from a background condition (baseline study).	Assessment of runoff water quality against local background water quality including: - EC - TSS - pH - Metals - Biological health in accordance with Australian River Assessment System (AUSRIVAS) or equivalent	Water quality monitoring reports Independent biological health assessment report. Depending on the nature, scale and risks associated with a specific site, achievement of criteria may need to be evaluated over a number of years
			Water quality in all storages left on site (other than final voids) is suitable (with reference to the ANZECC guidelines) for the approved final land use	Assessment of water quality against guidelines (ANZECC) for the final land use (e.g. agricultural, industrial, recreational)	Independent report, water quality monitoring reports. Depending on the nature, scale and risks associated with a specific site, achievement of criteria may need to be evaluated over a number of years
			Water quality in any approved final voids does not pose a risk to the final land use.	Final void study completed, which includes predicted water quality and assessment of toxicity.	Independent report, water quality monitoring reports. Depending on the nature, scale and risks associated with a specific site, achievement of criteria may need to be evaluated over a number of years

POST MINING Land Use	MINING DOMAIN	REHABILITATION OBJECTIVES	COMPLETION CRITERIA	PERFORMANCE INDICES	EXAMPLE OF JUSTIFICATION / VALIDATION METHODS
		Groundwater Quality & Regime The risk to important groundwater assets (GDE's, Alluvial Aquifers, Landholder bores) has been addressed by the rehabilitation.	Groundwater quality and groundwater regime are within range as predicted in environmental assessments and in accordance with water sharing plans and water allocations held by the site.	The measured water quality at important groundwater assets meets predictions. Modelled drawdown and water take is consistent with approval predictions. Biological monitoring to demonstrate the health and conditions of GDE's present (aquifer ecosystem of the Bowmans Creek Alluvial Aquifer and river base flow)	Independent hydro-geological assessment report, monitoring reports, independent ecological assessment. Depending on the nature, scale and risks associated with a specific site, achievement of criteria may need to be evaluated over a number of years
		Water Approvals Structures that take water are appropriately licensed.	Adequate water allocations and associated licenses are held for all applicable structures.	Hydrological and hydro-geological assessments are undertaken to determine water take at completion from the relevant water sources to confirm that sufficient allocations are held.	Copy of any relevant approvals or evidence if approvals not required. Confirmation from relevant Government Agency (e.g. NRAR) that licences are held. Independent water harvesting compliance assessment.

Table 17 Completion Criteria Ecological rehabilitation objective 1-3

POST MINING Land Use	MINING DOMAIN	REHABILITATION OBJECTIVES	COMPLETION CRITERIA	PERFORMANCE INDICES	EXAMPLE OF JUSTIFICATION / VALIDATION METHODS
Native Ecosystem (Central Hunter Box-Ironbark Woodland)	All domains	At least 731ha of the target native woodland vegetation (Central Hunter Box-Ironbark Woodland) is established providing habitat connectivity for the Spotted-tailed Quoll.	Survey confirms 731ha of Central Hunter Box-Ironbark Woodland is established across the landform providing connectivity (native woodland corridors) between adjoining native vegetation/habitat.	Distribution of Central Hunter Box-Ironbark Woodland provides for habitat connectivity across the landform.	Independent ecological reports and vegetation distribution mapping.
		Ecological Rehabilitation Objective 1 The vegetation composition of the rehabilitation is recognisable as the target plant community (Central Hunter Box-Ironbark Woodland) as described by the NSW Scientific Final Committee Determination. Note: Recognisable is defined as "Diagnostic species present for each Growth form for PCT/TEC using the scientific description of the plant community type available on Bionet.	A minimum of 10 of the 38 characteristic flora species contained in the *Central Hunter Grey Box – Ironbark Woodland* Final Determination (NSW Scientific Committee 2010) is present in a standard 20 m x 20 m floristic sampling plot.	The number of characteristic species for Central Hunter Box-Ironbark Woodland present is assessed against the NSW Scientific Committee Final Determination.	Before and after photos, statistically robust rehabilitation monitoring reports, independent ecological reports. Depending on the nature, scale and risks associated with a specific site, achievement of criteria may need to be evaluated over a number of years All native vascular plant species are recorded to species level from fixed monitoring plots. Monitoring undertaken in accordance with BAM.

POST MINING Land Use	MINING DOMAIN	REHABILITATION OBJECTIVES	COMPLETION CRITERIA	PERFORMANCE INDICES	EXAMPLE OF JUSTIFICATION / VALIDATION METHODS
		Ecological Rehabilitation Objective 2 The vegetation structure of the rehabilitation is recognisable as, or is trending towards the target plant community (Central Hunter Box-Ironbark Woodland)as described by the NSW Scientific Committee Final Determination. Note: "Trending Towards the target plant community" requires use of time series data to show development for each Growth Form against benchmark value range (or successional benchmarks)	Cover of all native growth forms are comparable to, or trending towards, values observed at reference sites.	Cover of each native growth form; and of all native vascular plant species, including: -Overstorey cover -Midstorey cover - Native groundcover (grasses, shrubs, other)	Before and after photos, rehabilitation monitoring reports, independent ecological reports (where required). Depending on the nature, scale and risks associated with a specific site, achievement of criteria may need to be evaluated over a number of years Monitoring undertaken in accordance with BAM.
		Ecological Rehabilitation Objective 3 Levels of ecosystem function have been established that demonstrate the rehabilitation is self-sustainable	Litter cover is within the range[1] observed at reference sites [1] The range equates to the minimum and maximum litter cover values observed during the same temporal monitoring event.	Litter cover is recorded at fixed monitoring plots in accordance with the BAM.	Rehabilitation monitoring reports, independent soil reports (where required) that demonstrate long term function of rehabilitated landform. Depending on the nature, scale and risks associated with a specific site, achievement of criteria may need to be evaluated over a number of years Monitoring undertaken in accordance with BAM.

POST MINING Land Use	MINING DOMAIN	REHABILITATION OBJECTIVES	COMPLETION CRITERIA	PERFORMANCE INDICES	EXAMPLE OF JUSTIFICATION / VALIDATION METHODS
			Plant recruitment is "suitable"[1,2] for sustaining the target plant community [1] Suitable means that second generation trees and shrubs are present.	Trees and shrubs are monitored for establishment and survival of second generation individuals.	Before and after photos, rehabilitation monitoring reports, independent ecological reports (where required) that demonstrate long term stability of rehabilitated landform. Depending on the nature, scale and risks associated with a specific site, achievement of criteria may need to be evaluated over a number of years Monitoring undertaken in accordance with BAM and walkover inspections undertaken to identify presence of recruitment.
			Plant competition is "suitable"[1] for sustaining the target plant community [1] Suitable means at least 70 % of understorey vegetative cover* within a standard 20 m x 20 m floristic sampling plot is native; and 'High Threat Weeds' (as defined by the BAM) account for no more than 10% of understorey vegetative cover. * Understorey vegetative cover includes the foliage cover of all flora species present below the tree canopy.	The total cover of exotic plant species is recorded at fixed monitoring plots as per BAM. The cover and abundance of each high threat weed is separately recorded.	Before and after photos, rehabilitation monitoring reports, independent ecological reports (where required) that demonstrate long term stability of rehabilitated landform. Depending on the nature, scale and risks associated with a specific site, achievement of criteria may need to be evaluated over a number of years Monitoring undertaken in accordance with BAM.

Table 18 Completion Criteria Agricultural rehabilitation

POST MINING Land Use	MINING DOMAIN	REHABILITATION OBJECTIVES	COMPLETION CRITERIA	PERFORMANCE INDICES	EXAMPLE OF JUSTIFICATION / VALIDATION METHODS
Grassland for Sustainable Agriculture	All domains	Revegetation consists of grassland areas with pockets of native vegetation to support sustainable agricultural activities (grazing) and only requires maintenance that is consistent with the intended final land use. Land capability of revegetation is generally as described in the Environmental Assessment.	Land and Soil Capability classification or Agricultural Land Classification criteria met. Land capability of revegetation is generally as described in the Environmental Assessment. >70% of pasture species are perennial, palatable, and productive Ground cover (vegetation, leaf litter, mulch) is greater than 70% Biomass (Dry Matter (kg DM)/ha) of pasture vegetation is >1500 Pasture or Priority weed presence cover is <20% Notes: Priority Weed = Weed listed on the Priority Weed list for the Council Area(s) relevant to GCAA operation. The priority weed list can be accessed via the NSW Department of Primary Industries Weedwise Website (or its latest version). Pasture Weeds = those other weeds that are not listed on the Priority Weed list for the Council Area(s) relevant to GCAA operation, however are unpalatable or otherwise pose a risk to the establishment of the desired pasture composition.	Land and Soil Capability classification or Agricultural Land Classification assessed against Approval requirements The re-established growth medium substrate (e.g. topsoil / subsoil) is capable of supporting the targeted agricultural regime (grazing) on a sustained basis. Pasture composition assessed, including pasture weeds	Results from Industry research, studies or trials, rehabilitation monitoring reports, independent soil reports, environmental monitoring records, independent agronomist reports. Depending on the nature, scale and risks associated with a specific site, achievement of criteria may need to be evaluated over a number of years (e.g. 5 years to 15 years).

7. Rehabilitation Implementation

7.1 Status at MOP Commencement

The progressive rehabilitation undertaken at LCO and the site has been decomposed into Rehabilitation Planning Domains, refer to **Section 5.1**. The following provides a summary of each Rehabilitation Planning Domain (discrete area of site) identifying the primary and secondary domains relevant and activities that have occurred prior to the commencement of the MOP, refer to **Plan 2**.

Rehabilitation Planning Domain 1: CHPP

This domain encompasses the coal stockpiling, handling and railing infrastructure including associate dirty water dams all currently active and subject to ongoing operations. No rehabilitation activities have been undertaken in this domain or planned within this MOP term.

Rehabilitation Planning Domain 2: Open Cut Facilities

This domain includes the open cut facilities including administration buildings, heavy vehicle workshop, car parks, ancillary administration buildings and associated dirty water dams all currently active and subject to ongoing operations. No rehabilitation activities have been undertaken or planned within this MOP term.

Rehabilitation Planning Domain 3: South Pit

This domain covers the open cut operation west of the main northern railway that is being progressively backfilled with overburden. Progressive rehabilitation has occurred as the overburden emplacement reached capacity with both grassland and woodland revegetation occurring. Active emplacement is ongoing in the southern extents only noting that current active extraction west of the railway is occurring in Rehabilitation Domain 8: Final Voids.

Rehabilitation Planning Domain 4: Durham

This domain comprises active tailings emplacement situated within the overburden backfilled open cut void. Overburden emplacement surrounding the tailings emplacement is undergoing rehabilitation to the intended post mining land use (grassland).

Rehabilitation Planning Domain 5: Reservoir Block

This domain situated to the north of the operation wherein open cut mining has occurred; the resultant mine voids and overburden emplacement now two active tailings emplacements, the main surface mine water storage and associated infrastructure for electric pumps. Rehabilitation activities have been undertaken on overburden emplacements with a grassland post mining land use. The two tailings emplacements have reached final fill levels and are undergoing consolidation prior to bulk rehabilitation activities commencing.

Rehabilitation Planning Domain 6: Entrance Pit

This domain is located on the eastern side of the main northern railway comprising active overburden backfilled open cut voids and an active extraction area in the southern extents that will be backfilled during the MOP term. Rehabilitation activities have been undertaken progressively as the overburden emplacements reached capacity to either grassland or woodland post mining land uses.

Rehabilitation Planning Domain 7: Antiene

This domain is positioned to the north east of the site adjacent Bowman's creek where historic open cut operations have occurred by small dragline to varying extraction depths with overburden

emplacements and mine voids constructed. The Antiene mine void has been filled with tailings and initial capping activities commenced; three small voids are currently utilised for water management purposes and overburden emplacements surrounding these rehabilitated to the grassland post mining land use.

Rehabilitation Planning Domain 8: Final Voids

This domain provides for the planned final voids in the South Pit and Entrance Pit. These areas are continuing active mine extraction areas with no rehabilitation activities commenced.

Rehabilitation Planning Domain 9: Mountain Block

This domain is located at the northern most extents of the mining lease and encompasses historic open cut operations. Rehabilitation activities have occurred across the whole domain and subsequent slope stability issues in some areas the subject of ongoing remediation. During 2020, significant slope stabilisation and rehabilitation activities following several years on planning and consultation with NSW Resources Regulator. Refer to **Section 3.2.16** for an outline of the slope stability works.

Rehabilitation Planning Domain 10: Biodiversity Offset Area

This domain covers biodiversity offset conservation areas within the mining lease being Bowman's Creek Riparian Corridor and Mountain Block Offset area. These areas have a Conservation Agreement established with the National Parks and Wildlife Act 1974(NSW) and are to provide long-term ecological habitat to support threatened flora and fauna species. Bowman's Creek Riparian Corridor is located adjacent Bowman's creek and provides connectivity across historically mined Mountain Block area to the Mountain Block Offset Area (and other Glencore offset areas) on unmined land. Active regeneration activities and management is ongoing in these areas, refer to the Biodiversity Offset Management Plan for full details.

7.2 Proposed Rehabilitation Activities during the MOP Term

LCO develop an Annual Rehabilitation and Closure Plan to succinctly outline activities required each year to ensure progress towards rehabilitation objectives. The annual plan is developed with consideration of the annual monitoring programs findings (refer to **Section 8**) and risk assessments (refer to **Section 3**).

Proposed rehabilitation activities during the MOP term are divided into the following sections;

- **Section 7.2.1** lists activities planned to be completed across the site by rehabilitation planning domain area
- **Section 7.2.2** identifies the primary open cut rehabilitation schedule
- **Section 7.2.3** summarises rehabilitation activities for tailings emplacements

Subsequent **Section 7.3** outlines the methodologies of the proposed rehabilitation activities including Detailed Mine Closure Planning activities and Tailings Emplacement facility rehabilitation.

7.2.1 Rehabilitation activities

Rehabilitation activities across all rehabilitation domains of LCO are outlined in **Table 19 below**.

Table 19 Proposed rehabilitation activities for the MOP term

Rehabilitation Domain	Primary Domain / Secondary Domain	Proposed Rehabilitation Activities
Domain 1: CHPP	Infrastructure/Grassland (3C)	Detailed mine closure planning only.
	Water Management/Water (2B)	Detailed mine closure planning only.
Domain 2: Open Cut Facilities	Infrastructure/Grassland (3C)	Detailed mine closure planning only.
	Water Management/Water (2B)	Detailed mine closure planning only.
Domain 3: South Pit	Overburden Emplacement/Grassland (4C)	Monitoring and maintenance of establishing areas.
	Overburden Emplacement/Woodland (4D)	Monitoring and maintenance of establishing areas. Overburden emplacement above natural ground level will occur in 2020. Continued emplacement will occur throughout the remainder of MOP term to backfill the mine void to final shape. Establishment of rehabilitation areas leading into the final void will occur late 2023
Domain 4: Durham	Tailings Storage/Grassland (5C)	Detailed mine closure planning and commencement of rehabilitation activities
Domain 5: Reservoir Block	Tailings Storage/Grassland (5C)	Detailed mine closure planning and commencement of rehabilitation activities
	Water Management/Water (2B)	Detailed mine closure planning only.
	Infrastructure/Grassland (3C)	Detailed mine closure planning only.
Domain 6: Entrance Pit	Overburden Emplacement/Grassland (4C)	Monitoring and maintenance of establishing areas.
	Overburden Emplacement/Woodland (4D)	Monitoring and maintenance of establishing areas. Overburden emplacement in the southern extents of the mine void to occur until 2022 to final capacity. Establishment of rehabilitation areas leading into the final void will occur late 2022
Domain 7: Antiene	Tailings Storage/Grassland (5C)	Continued initial capping and landform establishment
	Water Management/Water (2B)	Maintain water management areas essential to operation and commence rehabilitation activities on water storages not required for operation.

Rehabilitation Domain	Primary Domain / Secondary Domain	Proposed Rehabilitation Activities
Domain 8: Final Voids	Active Mine/Final Void (1A)	Detailed mine closure planning only.
Domain 9: Mountain Block	Overburden Emplacement (4C)	Monitoring and maintenance of establishing areas.
Domain 10: Biodiversity Offset Area	Overburden Emplacement or unmined land / Conservation & Biodiversity Offset Area (4E)	Refer to Biodiversity Offset Management Plan

7.2.2 Primary open cut rehabilitation schedule

Short to medium term mining and rehabilitation progression for the MOP term are shown on **Plans 3A – 3C**. **Table 20** summarises the forecast total disturbance and rehabilitation areas at LCO for each year of the MOP term.

Table 20 Rehabilitation and Disturbance schedule during the MOP Term

Year	Disturbance (ha)	Rehabilitation (ha)	Cumulative Rehabilitation (ha)	Comments/Explanation
2020	9.4	50	972	Disturbance of Entrance (Pit 9.4ha). Rehabilitation of Entrance Pit and South Pit overburden emplacement areas.
2021	0	17	989	South cut overburden emplacements (17ha)
2022	0	45	1034	Southern extent of Entrance Pit (45ha)
2023	0	45	1079	South cut overburden emplacements (45ha)

7.2.3 Tailings emplacements and rehabilitation schedule

Rehabilitation activities are proposed to be undertaken on each tailings emplacement area during the MOP term. **Section 7.3.7** provides a summary of the tailings emplacement rehabilitation methodology, outlining the technical assessment and landform design considerations proposed to be undertaken to mitigate the unique risks to tailings area rehabilitation success. **Table 21** identifies the tailings rehabilitation works scheduled with reference to the tailings emplacement rehabilitation methodology phases and activities detailed in **Section 7.3.7.**

Capping and rehabilitation of the Antiene Tailings Dam commenced in 2016 as shown on Plan 3A. Prior to decommissioning, LCO developed a detailed capping design. The Antiene Tailings Dam is listed as a Prescribed Dam in Schedule 1 of the Dams Safety Act 1978. Accordingly, LCO developed the capping design and management plan in consultation with the Dams Safety Committee (DSC). LCO has submitted an application to the NSW Resources Regulator to discontinue the use of the Antiene tailings dam in accordance with Section 101 of the Coal Mines Health and Safety Act (2002). Following decommissioning, LCO will apply to the NSW Dam Safety to have the dam de-listed as a prescribed dam.

Where the tailings crust material has adequate shear strength to bear equipment and capping layer construction of the capping layer is completed in accordance with the High Risk Works Activity. As per the capping strategy and following initial capping of the Antiene Tailings Dam southern half, capping activities halted to allow for further consolidation at the northern end. LCO aims to recommence capping operations once confirmation of sufficient surface strength. At this stage approximately 23ha of the 33ha dam have had an initial capping layer of 1.5m created. The final landform to be developed is a broad valley with a gentle slope to the northern end. Runoff from the northern end will be directed to a series of sedimentation ponds in the remnant Pikes Gully Void prior to discharge to the natural stream system.

Rehabilitation of the other tailings dams are planned to commence following final rehabilitation of the Antiene Tailings Dam and adequate consolidation of tailings to provide for the safest possible tailings surface to cap and rehabilitate. LCO will gain experience rehabilitating the Antiene Tailings Dam and then apply the learnings to the Durham, Reservoir South and Reservoir West Tailings Dams projects to provide for adaptive management principles in line with the tailings rehabilitation strategy. As such, the timeframes stated in **Table 21** below are indicative at the time of writing.

Table 21 Tailings Emplacement Rehabilitation Schedule

Year	Tailings Facility	Rehabilitation Phase	Rehabilitation Activities
2020	Antiene	Landform Design & Rehabilitation Execution	Materials characterisation and detailed landform design specification. Landform construction including capping and shaping to establish landform drainage and adequate tailings cover.
	Reservoir West / South	TSF Operation	Dewatering management and consolidation monitoring.
	Durham	TSF Operation	Dewatering management and consolidation monitoring.
2021	Antiene	Rehabilitation Execution	Complete landform construction and commence vegetation establishment.
	Reservoir West / South	TSF Operation & Landform Design	Dewatering management and consolidation monitoring. Commence materials characterisation and detailed landform design specification.
	Durham	TSF Operation & Landform Design	Dewatering management and consolidation monitoring. Commence materials characterisation and detailed landform design specification.
2022	Antiene	Rehabilitation Monitoring	Post rehabilitation maintenance and performance monitoring.
	Reservoir West/ South	Landform Design & Rehabilitation Execution	Dewatering management and consolidation monitoring. Ongoing materials characterisation and detailed landform design specification. Commence initial landform construction including capping and shaping to establish landform drainage and adequate tailings cover.
	Durham	TSF Operation, Landform Design	Dewatering management and consolidation monitoring. Commence materials characterisation and detailed landform design specification. Commence initial landform construction

Year	Tailings Facility	Rehabilitation Phase	Rehabilitation Activities
		& Rehabilitation Execution	including capping and shaping to establish landform drainage and adequate tailings cover.
2023	Durham	Rehabilitation Execution	Complete landform construction and commence vegetation establishment.
	Antiene	Rehabilitation Monitoring	Post rehabilitation maintenance and performance monitoring.
	Reservoir West/ South	Rehabilitation Execution & Rehabilitation Monitoring	Ongoing landform construction and vegetation establishment as well as post rehabilitation maintenance and performance monitoring in complete areas.

During the MOP term LCO will manage risks associated with rehabilitating tailings emplacements by:

- Implementing the Tailings Emplacement Rehabilitation Strategy (refer to **Section 7.3.7**);
- Undertaking inspections and monitoring as per the applicable TSF Operation Manual;
- Implement the Operational Manual for each tailings dams; and

7.3 Rehabilitation Methodologies for Activities in the MOP Term

This section provides a summary of rehabilitation methodologies proposed for the MOP term. **Section 7.3.1-7.3.5** outline the activities undertaken during each rehabilitation phase based on the primary domain activity. During the initial rehabilitation phases, activities are distinguished based on the Primary Domain active mine use. Once rehabilitation activities reach the Ecosystem Establishment phase standard methodologies are employed based on the intended Secondary Domain rather than primary land use. The following **Section 7.3.6-7.3.7** outline activities that pertain to mine closure, tailings emplacements.

7.3.1 Decommissioning Phase

Primary Domains 1 – 3

There not be any decommissioning activities of Primary Domains 1-3 during the MOP term.

Primary Domain 4 – Overburden emplacement

Decommissioning activities of overburden emplacement involve removal of portable mining plant (mobile amenities); there is no fixed infrastructure.

Primary Domain 5 – Tailings storage areas

Decommissioning activities of tailings emplacements involve removal of portable mining plant (pipelines); there is no fixed infrastructure.

7.3.2 Landform Establishment Phase

Primary Domains 1 – 3

There will be no landform establishment activities in Primary Domains 1 – 3 during the MOP term.

Primary Domain 4 – Overburden emplacement

Landform establishment activities in Primary Domain 4 comprise ongoing progressive landform shaping comprising slope and drainage construction (characteristics, grade and density), substrate material characterisation, geomorphology. Overburden emplacements will generally be graded to produce free draining landforms. The final landform will be constructed to achieve the design catchments and generally direct flows away from the direction of the final void locations. The final landform will also be constructed to include informal, minor undulations to enhance the visual amenity of the constructed landform.

Shaping works to be completed at in-pit overburden dumps include re-grading and trimming dump slopes using dozers. Slopes will generally be graded to 10 degrees or less.

Erosion and sediment control strategies (temporary stabilisation, drainage structures, etc.) are employed during this stage since the lack of vegetation significantly increases landform erosion risk. Drainage structures (contour banks, drains and rock armoured 'drop structures') will be constructed on shaped overburden dumps to provide for erosion and sediment control prior to vegetation establishment. Drainage structures are built to align with the conceptual final landform drainage design is shown on **Plan 4**. The WMP details the principle and standards adopted at LCO.

Primary Domain 5 – Tailings storage areas

Landform establishment activities in tailings emplacement in summary require a detailed design, robust characterisation of tailings material load bearing capacity and a High Risk Works Activity Approval. Initial capping works can occur where the tailings crust material has adequate shear strength to bear equipment and capping layer. Subsequently, a final landform surface is constructed consistent with the detailed tailings landform design; refer to **Section 7.3.7** for further details.

7.3.3 Growth Media Development Phase

The growth media development phase incorporates surface preparation activities to produce the initial growth media to establish the desired vegetation communities for the intended final landuse. Once the landform is established, standard methodologies throughout the following rehabilitation phases are employed based on the intended Secondary Domain rather than Primary Domain land use. LCO Rehabilitation Procedure details the methodologies and activities; the following provides a summary of the process that is utilised across each Primary Domain once the landform is established.

Substrate Preparation

Surface preparation activities for rehabilitated areas are commenced as soon as possible following the completion of landform establishment activities. A general overview of surface preparation activities undertaken at LCO is as follows. Prior to revegetation activities, spoils and topsoils will be characterised to determine the type and application rate of any ameliorants required such as gypsum, fertiliser, biosolids and organic composts. Spoil samples will be analysed for pH, electrical conductivity (EC) and exchangeable sodium percent (ESP).

Following material characterisation, substrates will be treated by:

- Incorporating appropriate soil ameliorants at the recommended rate per hectare;
- Deep ripping shaped surfaces parallel with the contour prior (where direct tree seeding is planned) or shallow ripping/tilling across the contour (where grasslands are to be established) to provide for an adequate seed bed;
- Rock raking to remove large rocks in Grassland rehabilitation areas.
- Suitable erosion control measures will be installed as required.

Soil Spreading

Topsoil and/or subsoil will generally be spread over the prepared substrate to a depth of 100 mm. The results of the materials balance presented in the EIS identified that LCO has a deficit of topsoil for completing rehabilitation and therefore substitute materials will be used when feasible. Where appropriate, LCO will substitute topsoils and subsoils with alternatives such as recycled organics or other suitable products for use for as top-dress/incorporation within overburden as seed bed preparation. Application of ameliorants and direct seeding into overburden may also occur. In instances where an alternative growth medium or waste product is selected to be utilised in the rehabilitation, LCO will ensure that the waste product selected is in accordance with EPL 2094 and meets the requirements of the relevant NSW EPA Resource Recovery Order and Exemption conditions.

Soils will be spread when slightly moist whenever possible to minimise structural damage. Soils and ameliorants will be spread evenly along the contour, commencing at the top of slopes and working downwards.

Following application of soils and required ameliorants, the rehabilitation area is re-ripped along the contour. This allows for the partial mixing of topsoil, ameliorants and overburden, and provides surface roughness to improve infiltration and seed/soil contact.

Soil Amelioration

Prior to respreading soils, sampling will be undertaken (either from stockpiles or in-situ soils) to determine appropriate ameliorant application. Soils will be ameliorated in accordance with recommendations from the soil assessment immediately following soil spreading. Repeat applications of ameliorants may be required to maintain nutrient levels to rapidly establish an effective ground cover and sustain plant growth prior to evidence of nutrient recycling. Grazing rehabilitation areas may require ongoing repeat application of ameliorants until the land capability completion criteria are met.

Habitat Augmentation

Prior to revegetation, habitat features are installed in Domain D – Woodland rehabilitation areas. Where appropriate and practical, salvaged tree hollows and logs will be incorporated into the final landform to augment the habitat value of proposed habitat corridors or riparian habitat. Large competent (hard) rocks will be placed into habitat piles where appropriate. All habitat incorporation will be situated with consideration of potential erosion.

In addition to installation of habitat features on rehabilitation areas nest boxes will be established adjacent to rehabilitation areas in nearby remnant vegetation to compensate for the loss of hollows in habitat trees. The number and designs of nest boxes required will be determined following assessment of the number and type of tree hollows removed during clearing.

7.3.4 Ecosystem Establishment

Standard methodologies are employed based on the intended Secondary Domain rather than primary land use.

Species Selection and Native Seed Collection

Due low native seed resource onsite, rehabilitation seed will be sourced from commercial suppliers, targeting 90% native seed being sourced from local provenance. The seed mixes for Domain C – Grassland (**Table 22**) and Domain D – Woodland (**Table 23**) rehabilitation incorporate species represented in appropriate control (analogue) sites that are representative of the desired final land use. Seed mixes may be subject to variation due to seasonal seed availability. Where suitable local resource is identified from monitoring programs, local native seed will be collected and utilised to maintain the genetic integrity of rehabilitation areas if possible.

After surface soil amelioration and tillage is completed for any given area, revegetation will commence as soon as practicable. LCO plans rehabilitation campaigns to time seeding in spring and autumn when possible. Opportunistic sowing may occur in summer and winter if areas become available and weather conditions are predicted to be favourable for germination. In the event of prolonged adverse weather conditions, severe drought, LCO will consider potential impacts to revegetation and take mitigation action (delay seeding) if appropriate.

Secondary Domain C – Grassland

Areas to be rehabilitated to grasslands will generally include, but not necessarily limited to, the species in **Table 22.** The seed mix and sowing rates may vary dependent upon the conditions and availability.

Table 22 Species and Sowing Rates for Grassland Rehabilitation

Species	Rate (kg/ha)	
	Spring / Summer	**Autumn / Winter**
Japanese Millet	15	0
Oats	0	25
Green Panic	3	2
Premier Digit Grass	5	3
Setaria	2	1
Kikuyu	5	3
Couch Grass	5	3
Tall Fescue	2	5
Cocksfoot	0	2
Wimmera Ryegrass	2	6
Lucerne (Aurora)	6	8
White Clover (Haifa)	2	2
Medic (Sephi)	0	5
Chicory	2	2
Plantain (Tonic)	1	3
Woolly Pod Vetch (Namoi)	0	5
TOTAL	50	75

Secondary Domain D – Woodland

Woodland rehabilitation areas will focus on establishing flora species assemblage's characteristic of Central Hunter Box – Ironbark Woodland with the species selected from the recommended species list appended to the BMP. Woodland will be established to contribute to habitat corridors as depicted on **Plan 4** and integrate with adjacent remnant native vegetation and woodland rehabilitation at neighbouring mining operations. **Table 23** summarises a typical species mix used.

Table 23 Typical Species for Woodland Rehabilitation

Scientific Name	Common Name
Upper Storey	
Angophora floribunda	Rough-barked apple

Scientific Name	Common Name
Eucalyptus crebra	Narrow-leaved ironbark
Eucalyptus molucanna	Grey box
E. tereticornis	Forest red gum
E blakelyi	Blake's red gum
Corymbia maculata	Spotted gum
Mid Storey	
Allocasuarina luehmannii	Bulloak
Brachychiton populneum	Kurrajong
Notelaea macrocarpa var. macrocarpa	Velvet mock olive
Acacia salicina	River cooba
Acacia implexa	Hickory
Acacia decora	Western silver wattle
Acacia amblygona	Fan wattle
Acacia paradoxa	Kangaroo thorn
Acacia falcata	Falcate wattle
Acacia decurrens	Green wattle
Dodonaea viscosa	Hop bush
Allocasuarina distyla	Scrub she oak
Ground Cover	
Aristida mix (A. ramosa, A. vagans)	Purple wiregrass
Atriplex semibaccata	Creeping saltbush
Austrodanthonia mix (A. setacea, A. fulva, A. caespitosa)	
Austrostipa mix (A. scabra, A.verticillata)	Speargrass
Bothriochloa macra and B. decipiens	
Bursaria spinosa	Blackthorn
Cymbopogon refractus	Barbed wire grass
Chrysocephalum apiculatum (herb)	
Chloris truncata	
Dichelachne micrantha	
Dicanthium sericeum	
Digitaria sp.	
Einadia mix (E. trigonos, E.hastata)	Climbing saltbush
Eragrostis sp.	
Elymus scaber	
Enchylaena tomentosa	Ruby saltbush
Lomandra multiflora subsp. Multiflora	Many-flowered mat-rush
Microleana stipoides	

Scientific Name	Common Name
Sporobolus creber	
Themeda triandra	
Couch	
Cover crop. Oats (winter) Jap millet (summer)	

Tree and shrub seed will be applied at a rate determined appropriate to site conditions this will generally be a total of approximately 7kg/ha. Where required, seed will be appropriately pre-treated to provide for germination and will be evenly mixed and spread.

The majority of revegetation will involve sowing of pasture species and direct seeding of native tree species. A range of other techniques may also be utilised where appropriate over isolated areas associated with steep slopes.

7.3.5 Ecosystem Sustainability Phase

Standard methodologies are employed based on the intended Secondary Domain rather than primary land use. Activities associated with the ecosystem sustainability phase of rehabilitation are generally ongoing maintenance and land management activities and rehabilitation monitoring. Maintenance at rehabilitated areas will include, but not be limited to:

- Weeds and pest animal control;
- Managing bushfire risks;
- Minor earthworks to remediate any significant erosion features;
- Infill planting and/or seeding to meet vegetation community requirements; and
- Maintaining erosion and sediment controls.

LCO have developed a formal rehabilitation monitoring program to assess the progress of rehabilitation areas toward the nominated completion criterial. Rehabilitation monitoring will be undertaken throughout the ecosystem sustainability phase until it can be demonstrated that rehabilitation areas have met all conditions for relinquishment. Rehabilitation monitoring for the MOP term is discussed in **Section 8**.

Rhodes Grass Management

Rhodes grass was historically used in the pasture seed mix at LCO and has since been removed from the standard pasture seed mixes. Rhodes grass by virtue of its establishment and structure is effective for the stabilisation and erosion protection of steep slopes; LCO may use Rhodes Grass at the direction of relevant revegetation experts. Rhodes grass at LCO is an historic management practice and where rehabilitation areas are developing to a monoculture of Rhodes grass it is managed through grazing and slashing where appropriate, spraying with appropriate herbicides and complimented by reseeding to supplement other pasture species present.

7.3.6 Detailed Mine Closure Planning

Detailed Mine Closure Planning (DMCP) refers to the planning of rehabilitation activities outstanding once coal extraction has been completed (e.g. decommission and rehabilitation of CHPP areas) to achieve the rehabilitation objectives. Further, consideration of the socio-economic impacts and particular stakeholder consultation is also provided for. LCO aims to have proactive approach to mine closure planning and progressive implementation of decommissioning and rehabilitation works concurrently with mining to provide for efficient delivery of the required rehabilitated landform.

Glencore Coal Assets Australia Mine Closure Planning Protocol provides for a framework for clear, well planned and executable process that will provide for a sustainable post-mining land use and ultimately allow mining tenements to be relinquished. This Mine Closure Planning Protocol has been recently reviewed to meet the requirements of Integrated Mine Closure: Good Practice Guide (ICMM 2019) which is considered as international best practice for mine closure planning. As LCO approaches closure, mine closure planning will increase in detail to ensure that an executable plans can be readily implemented when required to rehabilitate the site.

During the previous MOP term, LCO commenced mine closure preparedness summarised in the following:

- An Initial Closure Broad Brush Risk Assessment with risks individually assigned to a closure domain or where deemed appropriate, applied to the whole site.
- Legal and Other Obligations Register with consideration of the State/Commonwealth legislation, guidelines, standards, permits, agreements and planning requirements that are applicable to the site that require consideration when preparing the DMCP
- A Constrains and Opportunities analysis commensurate to the risks and opportunities relating to closure of the site.
- A Mine Closure Stakeholder Engagement Strategy has been prepared to ensure that all relevant internal and external stakeholders who have an interest or role in the preparation of the DMCP are consulted at the appropriate times throughout the process. It is intended that this be a "live" document that will be revised and updated at regular milestones.
- A Knowledge Base Report to define the Environmental and Socio-Economic Baseline and to provide for a systematic ‘gap analysis’ of information required to prepare the detailed mine closure plan. Outcomes of this gap analysis were then used to further detail the Closure Risk Assessment and scope the technical studies required.

During the MOP term, LCO will be continuing to develop the DMCP as per schedule in **Table 24** and by;

- Continuing progressive rehabilitation as mining activities complete in areas including tailings emplacements, refer to **Section 7.3.7**.
- Undertaking Stakeholder Engagement as per the aforementioned strategy including scheduled briefing of RR regarding progress/timing.
- Undertaking review of the risks to rehabilitation and actioning of appropriate treatment plans and/or controls.

Table 24 Detailed Mine Closure Planning Schedule during MOP Term

Detailed Mine Closure Planning Activity	Description	Indicative Completion Timing
Social and Environmental Baseline. Establish 'knowledge gaps' and undertake detailed closure risk assessment	The Knowledge Base Report involved undertaking a thorough review of the adequacy existing data and processes as well as the identification of potential risks to successfully rehabilitating the site and executing the project. A number of independent technical assessments was completed to inform the works targeting the following aspects: • Tailings emplacement decommissioning and rehabilitation • Geochemistry and spontaneous combustion • Groundwater • Surface water and water balance • Land quality/contamination • Rehabilitation, biodiversity and offset management • Archaeology • Demolition waste and hazardous materials disposal The review outcomes were compiled to detail the Closure Risk Assessment and specify relevant treatment plans (technical studies) required.	Q4 2020
Technical Studies. Assessments/ studies / designs to addresses knowledge gaps are developed as appropriate to minimise risks identified in the closure risk assessment. Review of project risks and rehabilitation residual risks. Technical studies are summarised as;	<u>Final landform water management detailed designs</u> This involves the development of the final landform water balance for dams and hydraulic design of water management structures planned to remain in the landform. The outcomes will facilitate construction of stable water management structures; inform the accuracy of predicted surface water quality; confirm the long term surface water take to be licenced.	Q2 2022
	<u>Hydrogeological assessments</u> <u>Technical studies to confirm the predicted draw down and recovery of Bowmans Creek Alluvium and characterise tailings emplacement seepage.</u>	
	<u>Rehabilitation and erosion and sediment control plans</u> This works involves the ongoing design and optimisation of rehabilitation surface water runoff management.	
	<u>Final voids water balance assessment and optimisation</u> Project to confirm the long term final void water balance predictions.	
	<u>Demolition plans for major infrastructure areas including waste management plan</u> Development waste material inventory, salvage and disposal strategy.	

Detailed Mine Closure Planning Activity	Description	Indicative Completion Timing
	Social Impact Assessment Analysis of the mine closure social impacts.	
	Biodiversity and Rehabilitation Completion Criteria As described in Section 6, rehabilitation monitoring results will be reviewed and ongoing consultation with RR to further develop/refine site specific completion criteria.	
	Tailings Emplacement Rehabilitation Refer to Section 7.3.7, detailed landform design and technical assessments for each tailings emplacement.	
	Project risks and rehabilitation residual risks review Following completion of technical studies, project and rehabilitation risks are reviewed; long term rehabilitation residual risks can be characterised.	
Scope Closure Rehabilitation Works. Closure activities for each domain are defined for engineering assessment and costing.	This phase provides for the consolidation and incorporation of technical assessment outcomes in the development of a detailed internal rehabilitation scope of works. This scope of works is subject to ongoing refinement, engineering assessment, costing and scheduling.	Q3 2022
Preparation of Rehabilitation Plan. Rehabilitation and Closure activities for each closure domain are detailed in the Rehabilitation Management Plan.	This phase provides for the preparation of a Rehabilitation Management Plan to detail activities occurring post mining extraction cessation.	Q4 2022

7.3.7 Tailings Emplacement Rehabilitation Strategy

There are four in pit tailings emplacement facilities (TSF) at LCO being Antiene, Reservoir South and West (RTEA) and Durham. All four TSFs are inactive mining areas, bounded by reshaped mine spoil and natural ground surfaces which have not been previously mined. To provide for the timely rehabilitation of these areas with the least long term residual risk, LCO has developed a Tailings Emplacement Rehabilitation Strategy. The strategy provides a process for the specific consideration and management of risks to rehabilitation during each stage of the TSF lifecycle and recognises the inherent differences of each TSF due to age/setting/etc. For clarity, the strategy separates the rehabilitation process into distinct phases wherein particular 'controls' are implemented to manage specific risks. The strategy has been developed in consultation with suitably qualified experts, is specific for the tailings emplacements at LCO and is supported by a risk assessment. **Table 25** provides a summary of the tailings emplacement rehabilitation strategy with key risks to the rehabilitation performance identified during each phase of the TSF life cycle and controls specified.

Table 25 Tailings Rehabilitation Risk & Controls

Phase	Purpose	Aspect	Risk	Control
TSF Operation	Provide for dewatering and beach management Provide for consolidation monitoring	Dewatering management	Less than adequate dewatering during operational phase resulting in extended consolidation timelines and/or more expensive capping regime required to complete the final landform and/ or longer required timeframe for completion of the final landform.	Maintain pumping of free surface water. Routine inspections to provide for maintenance of surface pumping activities. Routine survey monitoring of tailings surface and calculated density.
		Consolidation monitoring	Delay in commencing detailed rehabilitation planning due to less than adequate monitoring of dewatering performance and material consolidation	Routine survey monitoring of tailings surface and calculated density.
Landform design	Provide for specification of a landform design performance requirements, and construction options assessment to achieve the rehabilitation objectives (safe, stable, non-polluting). Landform design to be developed with suitably qualified engineer involvement and consider: - tailings chemical properties (phyto-toxicity potential, reactivity, spontaneous combustion, etc.)	Tailings properties	Less than adequate geotechnical analysis to characterise the in-situ tailings strength necessary for detailed landform design, rehabilitation planning and options analysis	Landform design to be designed by suitably qualified engineer and with consideration of tailings strength. When reasonably safe to access and in consultation with suitably qualified engineer, carry out a Stage 1 (shear vane) geotechnical investigation for each TSF. The Stage 1 investigation would also include a program of tailings laboratory testing on samples extracted from each TSF, to assist in the derivation of shear strength profiles to facilitate predictions of TSF drying.
		Tailings properties	Interaction of tailings material with land, ground or surface water resulting in surface runoff and/or seepage that may impact local water quality or vegetation.	Landform design to be designed by suitably qualified engineer with consideration of tailings material properties. Detailed material properties testing and analysis to inform the rehabilitation plan / landform design. This should include an evaluation of the tailings composition (chemical and physical) for phyto-toxicity potential, in-situ density for long term settlement, spontaneous combustion propensity and reactivity; with consideration of the final landform vegetation and land use.

Phase	Purpose	Aspect	Risk	Control
	- tailings physical properties (density, shear strength) - cover material physical & chemical properties - cover material source - long term settlement - rehabilitation timing - construction staging	Cover material properties	Tailings cover material characteristics does not adequately support vegetation or provide for long term stability of cover.	Landform design to be designed by suitably qualified p with consideration of cover material properties. Detailed material properties testing and analysis to inform the rehabilitation plan. Characterisation of cover material will provide for the identification of appropriate amelioration to achieve the vegetation and qualification of phyto-toxicity risk. Further it will provide input information to determine long term stability.
		Long term stability	Stability of engineered structures is compromised by tailings settlement, seismic events and/or natural weathering resulting in a landform that doesn't meet the rehabilitation objectives requiring excessive maintenance	Landform design to be geotechnically stable and designed by suitably qualified engineer. Further landform design considerations include; 1) natural weathering of cover material. This should be done using landform erosion modelling to inform surface water drainage design, 2) long term tailings settlement.
		Construction options	Landform design not considerate of the construction methodology options resulting in increased costs or delayed rehabilitation.	Undertake a capping and rehabilitation options analysis that uses preliminary material characterisation to iteratively refine the landform design. Further, evaluation of rehabilitation options to meets LCO closure timing and rehabilitation commitments.
		Spontaneous combustion	Spontaneous combustion of tailings impacting final landform vegetation, air quality or safety	Final landform to be developed by suitably qualified engineer with consideration of tailings material properties. Geochemical testing of tailings material during detailed rehabilitation planning phase to include spontaneous combustion propensity. Tailings have a low propensity for self-heating and retain significant moisture which generally prevents spontaneous combustion during operations.
		Free draining	Failure to construct a free draining landform	Final landform to be developed by suitably qualified engineer with consideration of long term settlement and surface water drainage requirements

Phase	Purpose	Aspect	Risk	Control
Rehabilitation Execution	Provide for the detailed capping and rehabilitation methodology to achieve the landform design. Rehabilitation plan and scope of works to be developed with suitably qualified engineer involvement and detail: - equipment - timing - source of cover materials - geotechnical monitoring requirements for immediate safety and landform design refinement - High Risk Activities relevant information	Ongoing geotechnical monitoring	Less than adequate geotechnical data to further refine design and develop capping action plan resulting in sub optimal rehabilitation action plan	Following detailed design, ongoing geotechnical investigation (stage 2) should be undertaken during capping execution to provide for increased accuracy in strength testing, identify changes in strength and further refine the landform design.
		Detailed capping and rehabilitation plan	Increased costs or delays to capping due to less than adequate capping action planning (incorrect machines, sub optimal staging, etc.)	Once the detailed landform design has been developed, the execution of rehabilitation activities requires detailing in a capping action plan. This will including equipment, safety aspects, timing, source of cover materials, and details and design of instrumentation and requirements for monitoring etc.) and a TARP to ensure regulatory compliance with the requirements for notified High Risk Activities.
		Rehabilitation Quality Control	Less than adequate construction/rehabilitation activities resulting in rehabilitation outcome that doesn't meet requirements	Implement a Quality Control Plan developed by suitably qualified specialist.
Post Rehabilitation	Provide for post rehabilitation monitoring considering geotechnical, settlement and vegetation aspects	Design risk assessment Ongoing rehabilitation monitoring	Rehabilitated landform is or becomes unstable post rehabilitation, failure to adequately identify failure modes and control	Landform design to be developed by suitably qualified engineers with consideration of failure modes - a risk assessment with specialist engagement. Adaptive management - Rehabilitation monitoring program to measure the rehabilitation performance and trigger action as required.

7.4 Summary of Rehabilitation Progress during the MOP Term

Table 26 details the rehabilitation status in each domain planned during the MOP term.

Table 26 Summary of Proposed Rehabilitation

Primary Domain	Secondary Domain	Code	Rehabilitation Phase	MOP start (ha)	MOP end (ha)
Active Mining (1)	Water Management (B)	1B	Active	151	151
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem and Land Use Establishment	0	0
			Ecosystem and Land Use Sustainability	0	0
			Relinquished Lands	0	0
			Total	151	151
Active Mining (1)	Rehabilitation Area – Grassland (C)	1C	Active	13	9
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem and Land Use Establishment	0	4
			Ecosystem and Land Use Sustainability	0	0
			Relinquished Lands	0	0
			Total	13	13
Active Mining (1)	Rehabilitation Area – Woodland (D)	1D	Active	63	26
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem and Land Use Establishment	0	37
			Ecosystem and Land Use Sustainability	0	0
			Relinquished Lands	0	0
			Total	63	63
Active Mining Total				227	227
Water Management (2)	Water Management (B)	2B	Active	34	34
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem and Land Use Establishment	0	0
			Ecosystem and Land Use Sustainability	0	0
			Relinquished Lands	0	0
			Total	34	34
Water Management (2)	Rehabilitation Area – Grassland (C)	2C	Active	10	10
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem and Land Use Establishment	1	1
			Ecosystem and Land Use Sustainability	0	0
			Relinquished Lands	0	0

			Total	11	11
Water Management Total				45	45
Infrastructure (3)	Rehabilitation Area – Grassland (C)	3C	Active	39	39
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem and Land Use Establishment	1	1
			Ecosystem and Land Use Sustainability	0	0
			Relinquished Lands	0	0
			Total	40	40
Infrastructure Total				40	40
Overburden Emplacement (4)	Rehabilitation Area – Grassland (C)	4C	Active	72	20
			Decommissioning	0	0
			Landform Establishment	0	29
			Growth Medium Development	0	0
			Ecosystem and Land Use Establishment	612	635
			Ecosystem and Land Use Sustainability	0	0
			Relinquished Lands	0	0
			Total	684	684
Overburden Emplacement (4)	Rehabilitation Area – Woodland (D)	4D	Active	219	146
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem and Land Use Establishment	360	433
			Ecosystem and Land Use Sustainability	0	0
			Relinquished Lands	0	0
			Total	579	579
Overburden Total				1264	1264
Tailings Storage Area (5)	Rehabilitation Area – Grassland (C)	5C	Active	40	0
			Decommissioning	31	0
			Landform Establishment	0	40
			Growth Medium Development	0	0
			Ecosystem and Land Use Establishment	0	31
			Ecosystem and Land Use Sustainability	0	0
			Relinquished Lands	0	0
			Total	71	71
Tailings Storage Area Total				71	71

7.4.1 Relinquishment Phase achieved during MOP Period

Rehabilitation performance is assessed as per the rehabilitation monitoring program detailed in **Section 8**. During the MOP term, LCO will review the status of rehabilitation areas and if the performance criteria detailed in **Section 6** are met, LCO intends to seek relinquishment.

8. Rehabilitation Monitoring and Research

LCO will continue two complementary monitoring programs to inform biodiversity management and rehabilitation. Firstly, an Annual Rehabilitation Monitoring Program is undertaken to identify if key characteristics of rehabilitation areas are trending toward desired outcomes. This monitoring program is focussed on flora rehabilitation performance. Key characteristics (indicators) and outcomes (completion criteria) as discussed in **Section 5** and **Section 6**. Risks of failing to meet desired biodiversity outcomes in rehabilitation areas will be managed by assessing rehabilitation monitoring results to identify if key completion criteria are at risk of not being achieved, and implementing appropriate corrective actions in accordance with a Rehabilitation Trigger Action Response Plan (TARP) (refer to **Section 9.2**). LCO will also review, and where appropriate, refine the nominated completion criteria for biodiversity outcomes based on the results of rehabilitation trials being undertaken by LCO. Secondly, a Biodiversity Monitoring Program is undertaken focuses on fauna and flora, onsite and surrounding the operation. The program is intended to inform on the performance of impact mitigation measures as well as the rehabilitation establishment. Refer to the BMP for full details.

The following sections detail the monitoring programs undertaken.

8.1 Rehabilitation Monitoring Program

In accordance with the GCAA Standard for Closure Criteria Development and Rehabilitation Monitoring, LCO have developed a rehabilitation monitoring program. The program assesses progress toward completion criteria and the need for any intervention.

The objectives of the program are to:

- Assess the long term stability and functioning of rehabilitation areas;
- Assess rehabilitation performance against the closure criteria; and
- Facilitate continuous improvement in rehabilitation practices.

The rehabilitation monitoring program has been revised during 2020 subsequent to review by the Centre for Mine Land Rehabilitation (University of Queensland) to align NSW GCAA sites rehabilitation monitoring programs for the development of Rehabilitation Report Cards. An updated monitoring program is being implemented to improve the transparency and accuracy of rehabilitation monitoring; ensure the program is informative; improved robustness of adaptive improvement management and progress rehabilitated areas from early stages towards relinquishment. The aim of this process is to ensure that rehabilitation areas are being monitored for the right parameters at the appropriate lifecycle stage of the rehabilitation and has been designed in a way that if a critical failure is identified that the rehabilitation area will not process onto the next stage of monitoring until it has been addressed. Further, in this manner each rehabilitation area will demonstrate with monitoring results achievement of each rehabilitation phase's completion criteria before progressing. In addition to measuring the performance and trajectory of rehabilitation, the monitoring program includes the collection analogue reference site quality to inform completion criteria and benchmark rehabilitation.

The approach taken is generally quantitative and focuses on a range of indicators that reflect compositional, structural and functional aspects of ecological communities. The monitoring be completed in a manner consistent with Biodiversity Assessment Methodology (BAM) (OEH 2017) and will consist of a 50 metre transect, 50 metre by 20 metre plot, with a 20 metre by 20 metre sub-plot and five 1 metre by 1 metre sub-plots.

The rehabilitation monitoring program combines walk over inspection and floristic plot analysis. Walkover area inspections are conducted with reference to the GCAA Annual Rehabilitation Inspection Form. The LCO Rehabilitation Procedure lists the monitoring program attributes, data collection methods, timing and records. The key objectives of the annual walkover area inspections are:

- Assess the long-term stability and functioning of rehabilitation areas, particular relation to:
  - Erosion (rill, gully and tunnel).
  - Stability and functioning of erosion and sediment control and water management structures.
  - Visual assessment of vegetation cover, species diversity, vegetation health and growth rates.
  - Presence of weeds and pests.
- Assess rehabilitation performance against closure criteria.
- Facilitate continuous improvements in rehabilitation practices.
- Identify rehabilitation failures or maintenance issues likely to hinder success of rehabilitation and result in expensive and/or extensive remediation.

Plot based floristic monitoring is decomposed into two distinct monitoring methods to target parameters appropriate to the age of vegetation and summarised as:

- Initial Establishment Monitoring (IEM) - monitoring in years 1 – 3 with focus on the initial emergence and establishment of seedlings, including the range of key species that have established. Early signs of erosion can be captured at this time. It is also important during this phase to examine the sites for the presence of weed species that may hinder further development of the site.
- Long Term Monitoring (LTM) - monitoring of the full range of pasture or ecological attributes/floristic aspects of native vegetation rehabilitation should commence when the vegetation is at least 4 years age. LTM uses plot locations drawn from IEM so the locations are consistent over time, however a broader suite of data is collected as part of LTM.

To ensure monitoring adequately captures rehabilitation performance, the sites spatial distribution are reviewed annually.

The monitoring results are summarised in a Rehabilitation Report Card to track rehabilitation trajectory performance as well as remediation/maintenance required and facilitate the annual rehabilitation planning process. **Table 27** identifies the rehabilitation status results summary that LCO will use to inform the annual rehabilitation planning process. Additionally, intervention and adaptive management strategies are triggered, refer to **Section 9.2**.

Table 27 Rehabilitation Report Card Result Summary

Rehabilitation Status	Criteria
Rework	Does not meet completion criteria. Extensive rework required that would not typically form part of a rehabilitation maintenance program (e.g. slopes do not comply with approval requirements, bare areas >0.1ha, large erosion gullies).
Maintenance	Does not meet completion criteria. Routine rehabilitation maintenance works required (e.g. weed control, infill seeding/plantings, repair of minor erosion, fertiliser application).

Rehabilitation Status	Criteria
Monitor	Trajecting towards completion criteria but does not meet all criteria. No intervention required but continue to monitor (e.g. ecologically young areas, variable results).
Acceptable	Meets all completion criteria and ready for sign off by stakeholders. Continue to manage and monitor to maintain status until relinquishment off is sought.

8.2 Annual Ecological Monitoring Program

Suitably qualified and experienced ecologists undertake flora and fauna monitoring annually for all rehabilitation areas, offset areas and remnant vegetation areas. This monitoring program is detailed in the LCO BMP and LCO BOMP.

The ecological monitoring program includes monitoring for rehabilitation monitoring plots and control sites (analogue sites) for woodland and grazing rehabilitation areas. As rehabilitation progresses, additional monitoring plots will be added to the program.

Current elements of the ecological monitoring program include:

- Flora Monitoring
- Habitat Assessment
- Photo Monitoring
- Fauna Monitoring including diurnal woodland birds, targeted bird surveys, micro bat, spot lighting, baited camera traps (spotted tail quolls), waterbird monitoring and nest box monitoring
- Stygofauna monitoring
- Instream riparian ecological condition monitoring
- Tiger orchid monitoring

8.3 Research, Trials and Use of Analogue Sites

Rehabilitation implementation practices at LCO have been developed considering the outcomes of research/trials undertaken onsite, throughout GCAA and across the industry. The rehabilitation monitoring program provides for the ongoing capture and characterisation of analogue reference site information to inform the refinement of completion criteria as stated in **Section 6**. The following describes trials occurring during the reporting period.

Cattle Grazing Trial

The LCO grazing trial commenced in late 2012 and aimed to investigate the ability of rehabilitated mine land to support cattle grazing on a sustainable basis. The project aimed to assist Glencore to identify gaps in knowledge and identify opportunities for further trials or research.

The specific objectives of the trial are to:

- Assess and compare performance of a rehabilitation grazing site against an adjoining un-mined grazing site across a range of soil, vegetation and livestock parameters;
- Develop guidance material for Glencore sites relating to completion criteria for grazing rehabilitation areas and management of grazing on rehabilitation areas; and

- Demonstrate viability of cattle grazing as a sustainable post-mining land use option to stakeholders.

The trial utilised beef cattle of similar breed and age to reduce variation between cattle and the cattle are placed randomly in rehabilitation paddocks and natural (un-mined) paddocks. The trail involved monitoring of soils, water, pastures and livestock performance across both the rehabilitation and natural pastures. The trial was completed in 2018 with the following key outcomes/findings informing rehabilitation practices and outlined below;

- Growth rates of cattle grazing pastures sown on land rehabilitated after mining have been above (trials 1, 3 & 4) or equal (Trial 2) cattle grazing adjacent natural pastures on undisturbed land.
- The stocking rates have been maintained at the high end of district average to ensure pastures are subject to the kind of grazing pressure common in the area.
- Trace element levels were satisfactory in both rehabilitated and undisturbed soils and blood test of the cattle showed no contamination of cattle with heavy metals or excess minerals.
- Feed quality was a major factor in the increased performance of the cattle grazing rehabilitated pastures compared to unmined pastures
- Groundcover levels has been maintained above 70% across the sits during the studies.
- The pasture species sown on rehabilitated land comprises mostly tropical grasses (dominated by Rhodes Grass). The unmined pastures area a diverse mix of native and exotic species.

The grazing trial assessed both vegetation characteristics as well as land management matters. The completion criteria detailed in **Section 6** has been developed with consideration of the grazing trial and ongoing rehabilitation monitoring. In the previous MOP term, LCO commenced rotational grazing practices on suitable areas of pasture rehabilitation in the South Cut. These areas were monitored to inform maintenance activities to support the pasture development. This process will continue into the current MOP term with additional suitable areas of pasture rehabilitation in the South Cut included in the rotational grazing program.

9. Intervention and Adaptive Management

9.1 Threats to Rehabilitation

A rehabilitation risk assessment was undertaken during preparation of this MOP to assess the key issues that may affect successful mine closure (**Appendix D**). The objectives of the risk assessment were to:

- Identify issues and assess risk of preventing or delaying timely and cost effective relinquishment of mining tenements;
- Identify key controls and management actions to manage and reduce risks; and
- Determine knowledge gaps.

Operational issues with the potential to impact rehabilitation are discussed in **Section 3.2**.

Key threats to rehabilitation, and threat reduction actions that will be implemented and/or developed at LCO during the MOP term, and the relevant MOP section, are summarised in **Table 28**.

Table 28 Key Threats to Rehabilitation

Aspect	Mitigation Measures in MOP Term	Section in the MOP
Topsoil Resource (quantity and quality)	Ongoing implementation of soil substitute and substrate amelioration	Section 3.2.15 Section 7.3.3
Revegetation failure due to drought	Appropriate timing of seeding campaigns	Section 7.3.4
Revegetation failure due to bushfire	Maintenance of bushfire mitigation controls	Section 3.2.11

Following completion of the works LCO will undertake monitoring to verify the effectiveness of the rehabilitation strategy. In the event that monitoring indicates there are potential instability issues LCO will undertake additional investigations and remedial works in accordance with the Rehabilitation Trigger Action Response Plan (TARP) (**Section 9.2**).

9.2 Trigger Action Response Plan

To achieve the final land use outcomes and rehabilitation objectives detailed in **Section 4** in a timely manner, LCO acknowledge that ongoing rehabilitation and maintenance activities will be required as each discrete area develops. To inform rehabilitation establishment progress and identify appropriate maintenance activities, monitoring is completed annually as per **Section 8**. The following TARP for rehabilitation has been developed to detail the typical required management actions in the event of impacts to rehabilitation have occurred (such as damage or excessive erosion), or where rehabilitation development progress is not being achieved or likely to be achieved in an acceptable timeframe. The intent of the TARP is to document standard rehabilitation maintenance activities required to be implemented from time to time. Each rehabilitation domain/area is assessed individually and where monitoring results identify TARP activation (status requiring intervention); it is noted in the Annual Rehabilitation Monitoring Report for the relevant domain and reported in the AR.

Where necessary, rehabilitation procedures will be amended as required with the aim of continually improving rehabilitation standards. LCO will notify the NSW Resources Regulator and other relevant stakeholders of any incident resulting in major impacts to rehabilitation.

The responses specified within the TARP have been based upon the rehabilitation completion criteria developed during the preparation of the EIS (Umwelt 2013a) and the current rehabilitation monitoring program.

The TARP is provided as **Table 29** below, and will be reviewed and may be revised as conditions at LCO change or new threats to rehabilitation are identified. The following **Table 29** should be read with reference to **Table 17** regarding species composition development.

Table 29 Trigger Action Response Plan

Aspect/ Category	Key Element	Element Number	Trigger Response	Condition Green	Condition Amber	Condition Red
Landform stability	Slope gradient	1	Trigger	Rehabilitated overburden areas have slopes that are generally <10˚.	Rehabilitated overburden areas have slopes >10° but <14˚.	Rehabilitated overburden areas have slopes >15°.
			Response	No response required. Continue monitoring program.	Undertake regrading and revegetation of the area, if it is not designed to be >10° <14˚.	Undertake a review of the landform design, including survey if required. Undertake regrading and revegetation of the area, if required.
		2	Trigger	Rehabilitation areas have no signs of slumping or movement.	Rehabilitation areas exhibit some minor slumping or movement.	Rehabilitation areas exhibit significant slumping or mass movement.
			Response	No response required. Continue monitoring program.	Monitor and assess stability of area. Undertake regrading and revegetation of the area, if required.	Undertake a review of the landform design, including survey if required. Undertake regrading and revegetation of the area, if required.
	Erosion control	3	Trigger	No gully or tunnel erosion. No active rilling present >200mm deep	Minor gully or tunnel erosion present and/or active rilling >200 mm deep.	Significant gully or tunnel erosion present and/or rilling >600 mm deep.
			Response	No response required. Continue monitoring program.	A suitably trained person to inspect the site. Investigate opportunities to install water management infrastructure to address erosion. Remediate as appropriate.	Undertake a review of the drainage of the area and provide recommendations to appropriately remediate the erosion. Remediate as soon as practicable.
	Drainage Condition	4	Trigger	Drainage condition is in accordance with the design criteria established within this document.	Landforms exhibiting minor drainage issues but does not threaten to cause rehabilitation failure.	Landforms exhibiting significant drainage issues, threatening or causing rehabilitation failure.
			Response	No response required. Continue monitoring program.	A suitably trained person to inspect the site. Investigate opportunities to address issues. Remediate as appropriate.	Undertake a review of the drainage design and provide recommendations to appropriately remediate the area. Remediate as soon as practicable.
Water Quality	Monitoring parameters	5	Trigger	Surface water quality of runoff from rehabilitation areas is within EPL criteria and rehabilitation performance criteria established within this document.	Water quality exceeds EPL or performance criteria but does not indicate a long-term rehabilitation issue.	Water quality exceeds criteria, indicating a long term rehabilitation liability.
			Response	No response required. Continue monitoring program.	Review and investigation of water quality monitoring and management where appropriate. Implement relevant remedial measures where required.	Reporting as per PIRMP and all statutory reporting requirements. Implement relevant responses and undertake immediate review to determine source of issues and implement remediation measures identified as soon as practicable.
Spontaneous Combustion	Evidence of Spontaneous Combustion	6	Trigger	No evidence of spontaneous combustion in rehabilitation areas.	Isolated incidence of heating in rehabilitation areas.	Widespread or repeated incidences of ignition in rehabilitation areas.
			Response	No response required. Continue monitoring program.	Investigate sources of potential ignition. Excavate material with propensity for spon com in proximity to rehabilitated surface. Review overburden / coarse reject emplacement practices.	Consult with regulators to develop remediation plan to mitigate spon com such as increased capping. Review Spon Com Management Plan and material emplacement practices.

Aspect/ Category	Key Element	Element Number	Trigger Response	Condition Green	Condition Amber	Condition Red
Soil/spoil Quality	Monitoring parameters	7	Trigger	Properties of soil/spoil are not limiting the plant establishment.	Rehabilitation vegetation underperforming, i.e. limited establishment/diversity of vegetation present over areas >400m^2	Rehabilitation vegetation underperforming, i.e. bare areas of rehabilitation greater than >400m^2
			Response	No response required. Continue monitoring program.	Investigate application of additional soil, and/or use of appropriate soil ameliorants or management options to address soil/spoil quality if deemed necessary.	Consultant to be engaged to assist with recommendations to appropriately remediate soil/spoil quality and depth. Remediate as soon as practicable.
Topsoil Availability	Topsoil quantity	8	Trigger	Sufficient topsoil identified for rehabilitation over the MOP term and for the Life of the Mine.	Topsoil balance indicates a deficiency in topsoil available for rehabilitation over the Life of the Mine.	Deficiency significant enough to delay rehab progression the MOP term
			Response	No response required.	Investigate options and alternatives (e.g. OGM) to be able to meet future topsoil requirements Continue direct seeding on spoil where possible and approved.	Source and budget for purchasing topsoil for use in rehabilitation. Investigate use of alternatives such as OGM.
Vegetation	Ground cover	9	Trigger	Vegetation is on a timely trajectory developing groundcover of diversity and density consistent with final landform and completion criteria.	Vegetation is not on a timely trajectory of developing groundcover of diversity or density consistent with final landform and/or completion criteria.	No target groundcover present.
			Response	No response required. Continue monitoring program.	Review procedures where required to increase vegetation cover.	A suitably trained person to inspect the site. Investigate use of appropriate management options to remediate. Remediate as appropriate.
	Weed presence	10	Trigger	Weed presence is within range found at analogue sites and does not present a risk to rehabilitation.	Weeds present a risk to the establishment of rehabilitation areas.	Weeds are limiting the establishment of rehabilitation significantly.
			Response	No response required. Continue monitoring program.	Engage weed management contractor to remove introduced species from the site.	Engage weed management contractor to remove introduced species from the site as soon as practicable. Investigate management measures to assist native plant establishment including use of ameliorants and implement as appropriate.
	Species composition	11	Trigger	Woodland vegetation is on a timely trajectory developing groundcover of native tree and shrub species consistent with final landform and completion criteria.	Woodland vegetation is not on a timely trajectory of developing native tree and shrub species composition consistent with final landform and/or completion criteria.	Woodland vegetation is not developing or has significant maintenance required to achieve composition consistent with final landform and/or completion criteria.
			Response	No response required. Continue monitoring program.	Review native seed mix and amend accordingly. Consider remedial actions such as tubestock planting, reseeding or other management practices to achieve required species composition.	An inspection of the site will be undertaken by a suitably trained person. Investigate remedial options to achieve required species composition.
		12	Trigger	Pasture vegetation is on a timely trajectory developing grass and legumes species consistent with final landform and completion criteria, appropriate to the district and suitable for cattle grazing.	Pasture vegetation is not a timely trajectory developing grass and legumes species consistent with final landform and completion criteria, appropriate to the district and suitable for cattle grazing.	Pasture vegetation is not developing or has significant maintenance required to achieve composition consistent with completion criteria, appropriate to the district and suitable for cattle grazing.
			Response	No response required. Continue monitoring program.	Investigate additional weeding and re-seeding where required and ensure seed mix utilised is consistent with desired species composition.	An inspection of the site will be undertaken by a suitably trained person. Investigate remedial options to achieve required species composition.

Aspect/ Category	Key Element	Element Number	Trigger Response	Condition Green	Condition Amber	Condition Red
Biodiversity	Habitat Corridors	13	Trigger	Monitoring indicates corridors are successfully established and consistent with the desired vegetation community composition and being utilised for fauna species movement.	Habitat corridors are successfully established and consistent with the desired vegetation community composition however are not being utilised for fauna species movement.	Monitoring indicates that vegetation corridors do not contain the desired vegetation community composition and are not being utilised for the movement of fauna species.
			Response	No response required. Continue monitoring program.	Investigate whether sufficient habitat features (rock piles, felled hollow bearing trees, nest boxes etc.) are available and have been incorporated into the corridors.	Engage ecologist to recommend remedial rehabilitation works such as additional planting or seeding, soil amelioration, or weed reduction. Ensure sufficient habitat features are available for fauna.
Bushfire	Fuel Load	14	Trigger	Fuel loads are assessed and managed as required and the Bushfire Management Plan is being implemented.	Bushfire Management Plan is not being implemented increasing the risk of bushfire impact to rehabilitation.	A fire on site damages rehabilitated areas.
			Response	No response required. Continue monitoring program.	Reduce fuel loads and ensure access tracks are cleared. Inspect water sources are and ensure sufficient water is available.	Review and update (if required) the Bushfire Management Plan to ensure monitoring and maintenance is completed for fuel loads, access tracks, and water bodies.
Tailings	Inadequate capping	15	Trigger	The capped tailings landform is constructed in accordance with the approved capping design and is free-draining and no ponding is present.	Inspections indicate some temporary ponding on the tailings landform, however settlement is within the range considered in the detailed capping design.	Landform is exhibiting permanent or significant ponding issues.
			Response	No response required. Continue monitoring program.	A suitably trained person to inspect the site. Investigate opportunities to improve landform drainage. Remediate as appropriate.	Undertake a review of the capping and drainage design and provide recommendations to appropriately remediate the area. Remediate as soon as practicable.
Groundwater	Void water balance	16	Trigger	Water balance and groundwater monitoring indicate void water balance is correct	Groundwater monitoring indicates that inflows into the void may be higher than the water balance assumptions which in combination with high surface runoff could result in the voids filling higher than predicted.	Groundwater inflows are significantly higher than predicted in the water balance and in combination with high surface runoff could result in overtopping of the voids.
			Response	No response required. Continue monitoring program.	Undertake additional groundwater monitoring and review water balance	Engage a qualified groundwater specialists and engineers and consider amending the final void design.

10. Reporting

The AR, which is submitted to relevant government agencies and made publically available on the LCO website (*www.liddellcoal.com.au*), reports on the following information relating to rehabilitation:

- An overview of rehabilitation undertaken each year;
- Results of annual rehabilitation inspections;
- Outcomes of the annual ecological monitoring; and
- Progress against the projected rehabilitation in the approved MOP.

11. Plans

LCO is classified as a Level 1 Mine as defined by *ESG3 Mining Operations Plan (MOP) Guideline* (DRE, 2013). Accordingly, the following plans have been prepared:

- **Plans 1A, 1B and 1C** show the location and pre-mining natural and physical environment of LCO;
- **Plan 2** shows the mine domains and mining features at commencement of the MOP term;
- **Plan 3A – 3C** are a series of Plans which show the annual sequence of mining and rehabilitation activities over the MOP term;
- Plan **4** shows the proposed post mining land use and landform five years after closure(2032); and
- Plan **5** shows vertical and longitudinal cross sections.
- Note, Plan 3C and Plan 4 have been revised following AMA modification to ML1597 to reflect the works occurring in Mountain Block remediation project as per **Section 9.1.2**. These Plans are contained in **Appendix A**.

12. Review and Implementation of the MOP

12.1 MOP Review Protocol

This section provides the protocol for periodic review of this MOP. Reviews are conducted to assess the effectiveness of the procedures against the objectives of MOP. The MOP may be reviewed, and if necessary revised, following the submission of the following:

- Annual Review;
- Incident report;
- Audit; or
- Any modification to the conditions of the Development Consent.

This MOP may also be revised due to:

- Deficiencies being identified;

- Results from the monitoring and review program;
- Recommendations resulting from the monitoring and review program;
- Changing environmental requirements;
- Improvements in knowledge or technology become available;
- Change in legislation;
- Where a risk assessment identifies the requirement to alter the MOP; and
- Change in the activities or operations associated with LCO.

Any major amendments to the MOP that affect its application will be undertaken in consultation with the appropriate regulatory authorities and stakeholders. Any amendments would be completed in accordance with the latest MOP guidelines

13. Implementation

Table 30 defines the personnel who are responsible for the monitoring, review and implementation of this MOP.

Table 30 Responsibilities for Implementation of this MOP

Title	Responsibility
Operations Manager	• Implement the procedures referenced in this MOP; • Undertake training in relevant Management Plans and procedures as required; • Provide resources required to support and implement these procedures; • Provide adequate resources for the completion of rehabilitation activities; and • Approve this document and any subsequent reviews/amendments.
Manager Mining Engineering	• Integrate mine rehabilitation into the short and long term mine planning process to provide that it is effectively implemented. • Construct landforms in accordance with this MOP;
Environment & Community Manager	• Prepare the relevant Management Plans; • Implement, monitor and review the programs and procedures linked to this MOP; • Consult with regulatory authorities as required; • Provide measures for continual improvement to this MOP and procedures; • Ensure all personnel undertaking works in relation to this MOP are trained and competent;

Title	Responsibility
	• Report the progress of any rehabilitation and monitoring of biodiversity in the AEMR; • Undertake site based actions to implement this MOP in cooperation with relevant site departments; • Coordinate the development of Annual Rehabilitation Plans to guide rehabilitation activities; • Coordinate the completion of rehabilitation activities in accordance with this document; • Coordinate the development of the site rehabilitation objectives and closure criteria in consultation with key stakeholders; • Coordinate the rehabilitation monitoring program and an annual review of monitoring results to provide a continual improvement process for rehabilitation; and • Coordinate biodiversity and land management baseline studies, participate in risk assessments, contribute to the development of management strategies in consultation with affected parties and co-ordinate their implementation as part of the site EMS. • Review and analyse rehabilitation monitoring data and assess progress against mine closure objective and criteria. • Develop and implement care and maintenance programs to progress rehabilitation areas towards meeting the closure criteria in a timely manner. • Review rehabilitation methodologies based on the outcomes of monitoring programs to facilitate continual improvement. • Complete reporting requirements relating to rehabilitation in the Annual Environmental Management Report and MOP. • Provide that all relevant records are effectively maintained on site.
Technical Services Manager	• Schedule rehabilitation activities as per this MOP. • Implement the procedures referenced in this MOP; • Undertake training in relevant Management Plans and procedures as required; • Provide resources required to implement these procedures; • Provision of landform construction survey control • Develop mine plans and dumping strategies to allow for progressive rehabilitation of mined land; and • Liaise with the Environment and Community Department to ensure that regulatory commitments relating to rehabilitation are considered during mine planning processes. • Coordinate updates to the MOP as required including information on mine rehabilitation.

Title	Responsibility
Commercial Manager	• Provide that adequate provisions are available for mine closure by implementing and updating an accrual system over the life of the mine.
Environment & Community Officer	• Have a sound understanding of the MOP. • Implement, monitor and review programs, systems and procedures linked to the MOP. • Monitor and review the data that is being collected for the MOP. • Monitor, document and communicate progress against MOP objectives and targets. • Undertake monitoring as required; • Undertake maintenance as required; • Monitor all firefighting equipment and ensure hose connections to suit the Rural Fire service are available.

13.1 Reference Information

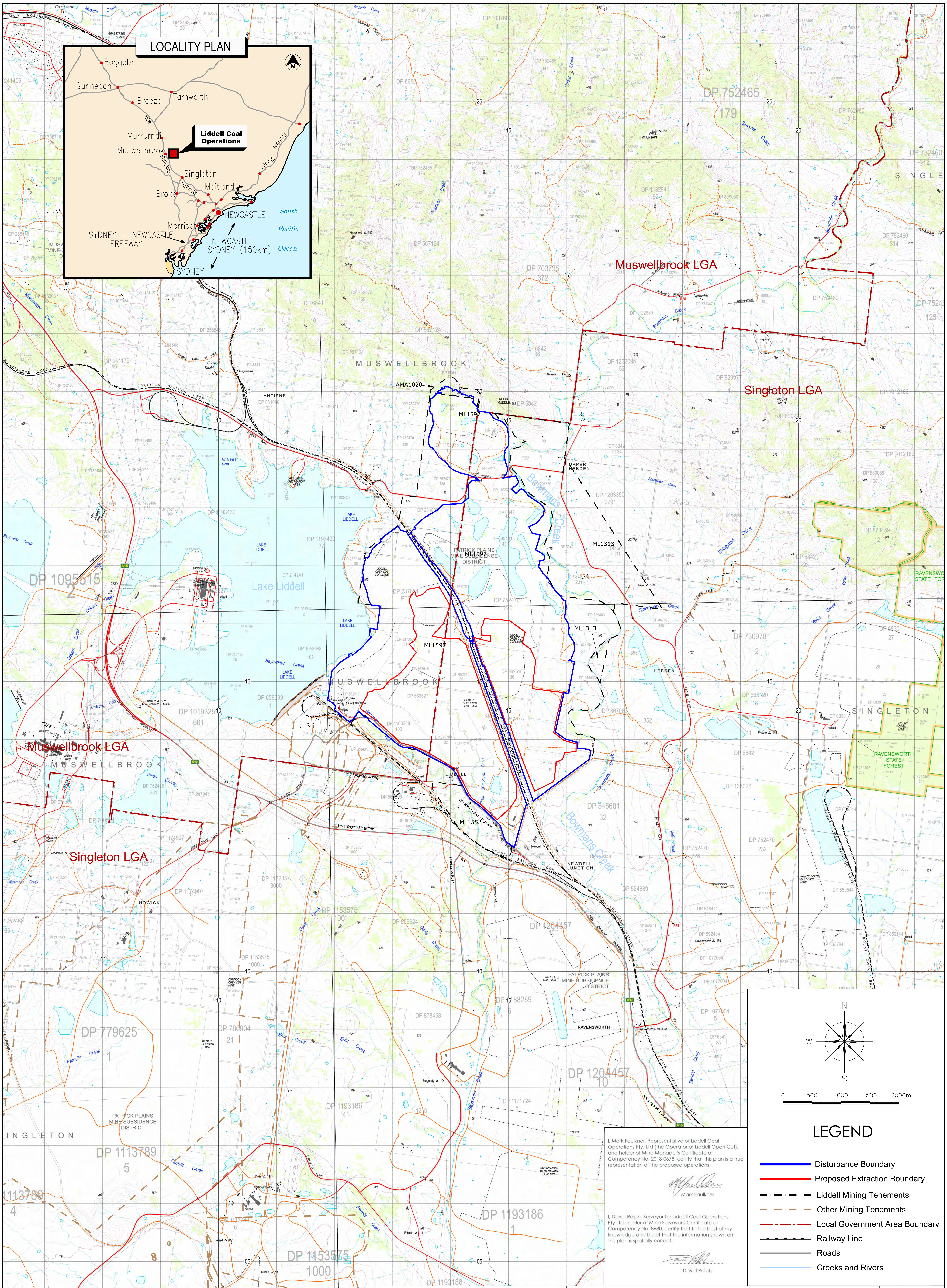
Reference information, listed in **Table 30** below, is *information* that is directly referred to for the development of this document.

Table 30 Reference Information

Reference	Title
LIDOC-90533967-797	Environmental Management Strategy
LIDOC-90533967-507	Rehabilitation Procedure
LIDOC-90533967-3687	Biodiversity Management Plan
LIDOC-90533967-3755	Biodiversity Offset Management Plan
LIDOC-90533967-3694	Water Management Plan
GCAA-625378177-10325	GCAA Mine Closure Planning Protocol
LIDOC-90533967-166	Stakeholder Engagement Strategy
GCAA-625378177-10325	Mine Closure Planning Protocol
LIDOC-90533967-37	Geotechnical Monitoring Procedure
LIDOC-90533967-2849	Ground or Strata Failure Plan
LIDOC-90533967-2800	Air Quality Management and Monitoring Plan
LIDOC-90533967-84	Spontaneous Combustion Management Plan

Reference	Title
Muswellbrook Shire Council Draft Local Strategic Planning Statement 2020 – 2040;	
Hunter Regional Plan 2036	
Singleton Council Local Strategic Planning Statement 2041;	
DTIRIS (2013), *ESG3 - Mining Operations Plan (MOP) Guidelines*.	
DTIRIS (2012a), EDG01 - Borehole Sealing Requirements on Land: Coal Exploration.	
EPA (2000), NSW Industrial Noise Policy.	
Landcom (2004) Managing Urban Stormwater: Soils & Construction, Volume 1", 4th Edition, March.	
Muswellbrook Shire Council (2012) Land Use Development Strategy – A Guide for Strategic Land Use in the Muswellbrook Shire.	
Peake, TC. (2006), The Vegetation of the Central Hunter Valley, New South Wales. A report on the findings of the Hunter Remnant Vegetation Project. Hunter- Central Rivers Catchment Authority, Paterson.	
Standards Australia (1984), AS 2724.3 Ambient Air – Particulate Matter – Determination of Total Suspended Particulates (TSP) – High Volume Sampler Gravimetric Method	
Standards Australia (1989), AS 1289 - Methods of testing soil for engineering purposes - Part B - Soil moisture content tests - Establishment of correlation between a subsidiary method of moisture content determination and the standard method AS 1289.B1.1	
Standards Australia (1993), AS 1940 – 1993 Storage and Handling of Flammable and Combustible Liquids.	
Standards Australia (1997a), AS 1055 – Acoustics, Description and Measurement of Environmental Noise.	
Standards Australia (1997b), AS 2482 – 1997 Control of the Obtrusive Effects of Outdoor Lighting.	
Standards Australia (1998), AS 5667.11 – 1998 Water Quality Sampling – Guidance on Sampling of Groundwaters	
Standards Australia (2003), AS 3580.10.1 Methods for Sampling and Analysis of Ambient Air – Determination of Particulate Matter – Deposited Matter – Gravimetric Method	
Standards Australia (2009), AS/NZS ISO 31000:2009 Risk Management – Principles and Guideline;	

Appendix A - MOP Plans


LOCALITY PLAN
Boggabri
Gunnedah
Breeza
Tamworth
Murrurundi
Muswellbrook
Liddell Coal Operations
Singleton
Maitland
Broke
NEWCASTLE
Morrisett
SYDNEY – NEWCASTLE FREEWAY
NEWCASTLE – SYDNEY (150km)
SYDNEY
South Pacific Ocean
NEW ENGLAND HIGHWAY
PACIFIC HIGHWAY
Muswellbrook LGA
Singleton LGA
MUSWELLBROOK
SINGLETON
Lake Liddell
LAKE LIDDELL
LIDDELL OPEN CUT COAL MINE
PATRICK PLAINS MINE SUBSIDENCE DISTRICT
ML1597
ML1313
ML1552
AMA1020
ANTIENE
UPPER HEBDEN
HEBDEN
NEWDELL JUNCTION
HOWICK
RAVENSWORTH
LIDDELL
MOUNT OWEN
MOUNT MUDDLE
WELL MOUNTAIN
RAVENSWORTH STATE FOREST
Bowmans Creek
Bayswater Creek
Stringybark Creek
Yorks Creek
Farrells Creek
Davis Creek
Emu Creek
Main Northern Railway
New England Highway
DRAYTON BALLOON LOOP
NEWDELL BALLOON LOOP
MOUNT OWEN BALLOON LOOP
N
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0
500
1000
1500
2000m
LEGEND
Disturbance Boundary
Proposed Extraction Boundary
Liddell Mining Tenements
Other Mining Tenements
Local Government Area Boundary
Railway Line
Roads
Creeks and Rivers

I, Mark Faulkner, Representative of Liddell Coal Operations Pty. Ltd (the Operator of Liddell Open Cut), and holder of Mine Manager's Certificate of Competency No. 2018-0678, certify that this plan is a true representation of the proposed operations.

Mark Faulkner

I, David Rolph, Surveyor for Liddell Coal Operations Pty Ltd, holder of Mine Surveyor's Certificate of Competency No. 8680, certify that to the best of my knowledge and belief that the information shown on this plan is spatially correct.

David Rolph

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LIDDELL COAL OPERATIONS

Mining Operations Plan
PLAN 1A - Pre-Mining Environment - Project Locality
Application Date: September 2020

Date:	Scale:	Drawn:	Checked:	Approved:	Dwg No:	Plan No:	Rev:	Sheet:
10.02.2021	1:20,000	J. Gray	J.Young	D.Rolph	APP-364	JG-A0-1	B	A0

LAND CLASSIFICATION AND SOIL CONSERVATION PRACTICES			INTERPRETATIONS AND IMPLICATIONS
SUITABLE FOR REGULAR CULTIVATION	I	No Special soil conservation works or practices.	Land suitable for a wide variety of uses. Where soils are fertile, this is land with the highest potential for agriculture and may be cultivated for vegetable and fruit production, cereal and other grain crops, energy crops, fodder and forage crops and sugar cane in specific areas. Includes "prime agricultural land".
	II	Soil conservation practices such as strip cropping, conservation tillage and adequate crop rotation.	Usually gently sloping land suitable for a wide variety of agricultural uses. Has a high potential for production of crops on fertile soils similar to Class I but increasing limitations to production due to site conditions. Includes "prime agricultural land".
	III	Structural soil conservation works such as graded banks, waterways and diversion banks, together with soil conservation practices such as conservation tillage and adequate crop rotation.	Sloping land suitable for cropping on a rotational basis. Generally used for the production of the same type of crops as listed for Class I, although productivity will vary depending upon soil fertility. Individual yield may be the same as for Classes I and II, but increasing restrictions due to the erosion hazard will reduce the total yield over time. Soil erosion problems are often severe. Generally fair to good agricultural land.
SUITABLE GRAZING — Occasional Cultivation	IV	Soil conservation practices such as pasture improvement, stock control, application of fertiliser and minimal cultivation for the establishment or re-establishment of permanent pasture.	Land not suitable for cultivation on a regular basis owing to limitations of slope gradient, soil erosion, shallowness or rockiness, climate, or a combination of these factors. Comprises the better classes of grazing land of the State and can be cultivated for an occasional crop, particularly a fodder crop or for pasture renewal. Not suited to the range of agricultural uses listed for Classes I to III. If used for "hobby farms", adequate provision should be made for water supply, effluent disposal and selection of safe building sites and access roads.
	V	Structural soil conservation works such as absorption banks, diversion banks and contour ripping, together with the practices as in Class IV.	Land not suitable for cultivation on a regular basis owing to considerable limitations of slope gradient, soil erosion, shallowness or rockiness, climate, or a combination of these factors. Soil erosion problems are often severe. Production is generally lower than for grazing lands in Class IV. Can be cultivated for an occasional crop, particularly a fodder crop or for pasture renewal. Not suited to the range of agricultural uses listed for Classes I to III. If used for "hobby farms", adequate provision should be made for water supply, effluent disposal and selection of safe building sites and access roads.
SUITABLE GRAZING — No Cultivation	VI	Soil conservation practices including limitation of stock, broadcasting of seed and fertiliser, prevention of fire and destruction of vermin. May include some isolated structural works.	Productivity will vary due to the soil depth and the soil fertility. Comprises the less productive grazing lands. If used for "hobby farms", adequate provision should be made for water supply, effluent disposal and selection of safe building sites and access roads.
OTHER	VII	Land best protected by green timber.	Generally comprises areas of steep slopes, shallow soils and/or rock outcrop. Adequate ground protection must be maintained by limiting grazing and minimising damage by fire. Destruction of trees is not generally recommended, but partial clearing for grazing purposes under strict management controls can be practised on small areas of low erosion hazard. Where clearing of these lands has occurred in the past, unstable soil and terrain sites should be returned to timber cover.
	VIII	Cliffs, lakes or swamps and other lands unsuitable for agricultural and pastoral production.	Land unusable for agricultural or pastoral uses. Recommended uses are those compatible with the preservation of the natural vegetation, namely: water supply catchments, wildlife refuges, national and state parks and scenic areas.
	U	Urban areas	CLASS SUBSCRIPTS: c — SPECIAL USES: Terrain developed for a specific crop (capability class range IV to VII) as a result of the combination of particular soil, terrain, climatic and economic conditions. The class includes such crops as grapes, bananas, avocados and pineapples.
	M	Mining and quarrying areas.	d — Terrain developed for intensive agricultural production and associated with flood irrigation. The class includes land developed for cotton and rice production.

AMA1020

ML1597

ML1313

ML1552

Lake Liddell

LAKE LIDDELL NOTIFICATION AREA

Main Northern Railway

Pikes Gully Road

New England Highway

Old New England Highway

Lemington Road

Bowmans Creek

N 6 418 000

N 6 417 000

N 6 416 000

N 6 415 000

N 6 414 000

E 314 000

160 150 110 100 90 80 70

I, Mark Faulkner, Representative of Liddell Coal Operations Pty. Ltd (the Operator of Liddell Open Cut), and holder of Mine Manager's Certificate of Competency No. 2018-0678, certify that this plan is a true representation of the proposed operations.

Mark Faulkner

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David Rolph

N

W E

S

0 200 400 600 800 1000m

LEGEND

- Disturbance Boundary
- Proposed Extraction Boundary
- Liddell Mining Tenements
- Railway Line
- Roads
- Creeks and Rivers
- Liddell Dam Notification Area
- 70 Contours 5m Interval
- IV Land Capability Classification

VEGETATION COMMUNITIES

- Aquatic or Riparian Vegatation
- Central Hunter Box Ironbark Woodlands
- Central Hunter Bulloak Forest Regeneration
- Central Hunter Swamp Oak Forest
- Derived Grassland
- Hunter Valley River Oak Forest
- Narrow-leaved Ironbark - Bulloak Open Forest
- Narrow-leaved Ironbark - Spotted Gum Woodland
- Rusty Fig Dry Rainforest
- Undifferentiated Woodlands

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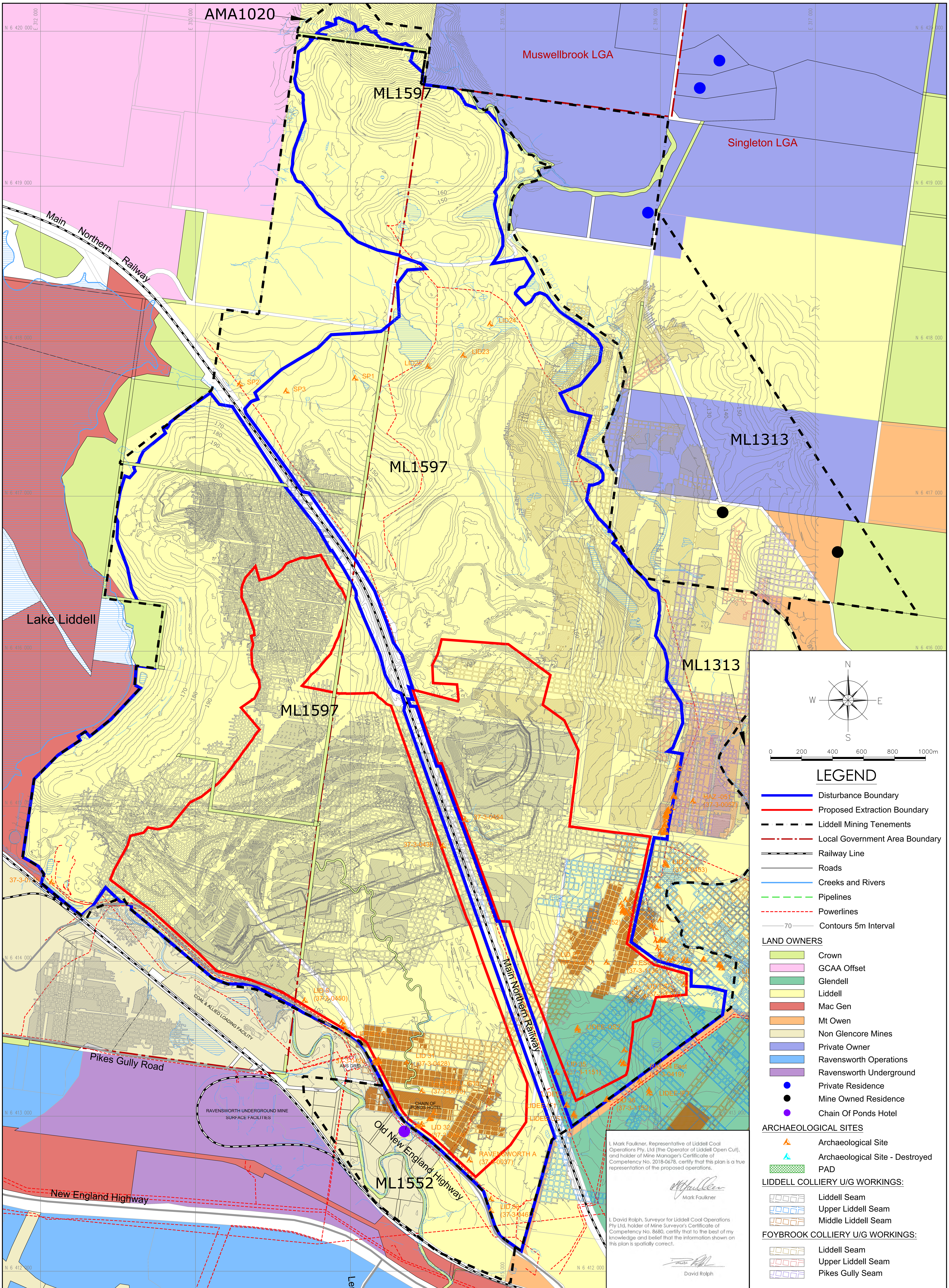
LIDDELL COAL OPERATIONS

Mining Operations Plan
PLAN 1B - Pre-Mining Environment - Natural
Application Date: September 2020

Dwg No:	Plan No:	Rev:
APP-365	JG-A0-2	B

Date:	Scale:	Drawn:	Checked:	Approved:	Sheet:
10.02.2021	1:7,500	J. Gray	J. Young	D.Rolph	A0



AMA1020
ML1597
Muswellbrook LGA
Singleton LGA
Main Northern Railway
ML1313
Lake Liddell
ML1552
Pikes Gully Road
New England Highway
Old New England Highway
Lemington Road
COAL & ALLIED LOADING FACILITY
RAVENSWORTH UNDERGROUND MINE SURFACE FACILITIES
CHAIN OF PONDS HOTEL
AUS GRID
SP1
SP2
SP3
LID23
LID24
LID25
LID 5 (37-3-0450)
LID 31 (37-3-0428)
LID 2 (37-3-0453)
LID 35 (37-3-1151)
LID 36 (37-3-1152)
RAV 24 East (37-3-0419)
LIDEE-OS2
LIDEE-IF1
LIDEE-IF2
LIDEE-IF3
LIDEE-OS1
RAVENSWORTH A (37-3-0037)
37-3-0439
N
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1000m
LEGEND
Disturbance Boundary
Proposed Extraction Boundary
Liddell Mining Tenements
Local Government Area Boundary
Railway Line
Roads
Creeks and Rivers
Pipelines
Powerlines
70 Contours 5m Interval
LAND OWNERS
Crown
GCAA Offset
Glendell
Liddell
Mac Gen
Mt Owen
Non Glencore Mines
Private Owner
Ravensworth Operations
Ravensworth Underground
Private Residence
Mine Owned Residence
Chain Of Ponds Hotel
ARCHAEOLOGICAL SITES
Archaeological Site
Archaeological Site - Destroyed
PAD
LIDDELL COLLIERY U/G WORKINGS:
Liddell Seam
Upper Liddell Seam
Middle Liddell Seam
FOYBROOK COLLIERY U/G WORKINGS:
Liddell Seam
Upper Liddell Seam
Pikes Gully Seam

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LIDDELL COAL OPERATIONS

Mining Operations Plan
PLAN 1C - Pre-Mining Environment - Built
Application Date: September 2020

Date:	Scale:	Drawn:	Checked:	Approved:	Sheet:
10.02.2021	1:7,500	J. Gray	J.Young	D.Rolph	A0

Dwg No: APP-366
Plan No: JG-A0-3
Rev: B

AMA1020

ML1597

ML1313

ML1552

Main Northern Railway

Bowmans Creek

Lake Liddell

RESERVOIR NORTH

ANTIENE TAILINGS DAM

RESERVOIR WEST TAILINGS

DURHAM TAILINGS

DECANT DAM

RESERVOIR SOUTH TAILINGS

CHPP SETTLING POND

ROM

COAL PREPARATION PLANT

SOUTH DAM

ADMIN OFFICE

PRODUCT STOCKPILE AREA

HUNTER VALLEY COAL LOADING FACILITY

COAL & ALLIED

WORKSHOP SED DAM

LIDDELL WORKSHOP

OPEN CUT ADMINISTRATION OFFICE

Pikes Gully Road

Old New England Highway

New England Highway

Lemington Road

A

A'

B

B'

C

C'

D

D'

N

W

E

S

0 200 400 600 800 1000m

LEGEND

- Disturbance Boundary
- Proposed Extraction Boundary
- Liddell Mining Tenements
- Railway Line
- Roads
- Cadastral
- 70 Contours 5m Interval
- Creeks and Rivers
- Existing Dam
- A A' Section Location
- Pipelines
- Powerlines
- Buildings
- Decommissioning
- Ecosystem Establishment

Primary Domains

- Active Mining
- Water Management
- Infrastructure
- Overburden Emplacement
- Tailings Storage Area

Secondary Domains

- Rehabilitation Area - Grassland
- Rehabilitation Area - Woodland

I, Mark Faulkner, Representative of Liddell Coal Operations Pty. Ltd (the Operator of Liddell Open Cut), and holder of Mine Manager's Certificate of Competency No. 2018-0678, certify that this plan is a true representation of the proposed operations.

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LIDDELL COAL OPERATIONS

Mining Operations Plan
PLAN 2 - Mine Domains and Operations
Application Date: September 2020

Dwg No:	Plan No:	Rev:
APP-367	JG-A0-4	B

Date:	Scale:	Drawn:	Checked:	Approved:	Sheet:
10.02.2021	1:7,500	J. Gray	J.Young	D.Rolph	A0

AMA1020

ML1597

ML1313

ML1552

Main Northern Railway

Bowmans Creek

RESERVOIR NORTH

DURHAM TAILINGS

DECANT DAM

Lake Liddell

2021

CHPP SETTLING POND

ROM

COAL PREPARATION PLANT

SOUTH DAM

ADMIN OFFICE

PRODUCT STOCKPILE AREA

HUNTER VALLEY COAL LOADING FACILITY

COAL & ALLIED

WORKSHOP SED DAM

LIDDELL WORKSHOP

OPEN CUT ADMINISTRATION OFFICE

Pikes Gully Road

Old New England Highway

New England Highway

Lemington Road

A

A'

B

B'

C

C'

D

D'

N

S

E

W

0 200 400 600 800 1000m

LEGEND

- Disturbance Boundary
- Proposed Extraction Boundary
- Liddell Mining Tenements
- Railway Line
- Roads
- 70 Contours 5m Interval
- Creeks and Rivers
- Existing Dam
- A A' Section Location
- Landform Establishment
- Ecosystem Establishment
- Decommissioning
- 2021 Proposed Rehabilitation

Primary Domains

- Active Mining
- Water Management
- Infrastructure
- Overburden Emplacement
- Tailings Storage Area

Secondary Domains

- Rehabilitation Area - Grassland
- Rehabilitation Area - Woodland

I, Mark Faulkner, Representative of Liddell Coal Operations Pty. Ltd (the Operator of Liddell Open Cut), and holder of Mine Manager's Certificate of Competency No. 2018-0678, certify that this plan is a true representation of the proposed operations.

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LIDDELL COAL OPERATIONS

Mining Operations Plan
PLAN 3A - Mining & Rehabilitation 2021
Application Date: September 2020

Dwg No:	Plan No:	Rev:
APP-368	JG-A0-5	B

Date:	Scale:	Drawn:	Checked:	Approved:	Sheet:
10.02.2021	1:7,500	J. Gray	J.Young	D.Rolph	A0

AMA1020

ML1597

ML1313

ML1552

Main Northern Railway

Bowmans Creek

RESERVOIR NORTH

DURHAM TAILINGS

DECANT DAM

2022

Lake Liddell

ROM

CHPP SETTLING POND

COAL PREPARATION PLANT

SOUTH DAM

ADMIN. OFFICE

PRODUCT STOCKPILE AREA

HUNTER VALLEY COAL LOADING FACILITY

COAL & ALLIED

WORKSHOP SED DAM

LIDDELL WORKSHOP

OPEN CUT ADMINISTRATION OFFICE

Pikes Gully Road

Old New England Highway

New England Highway

Lemington Road

A

A'

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B'

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C'

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LEGEND

- Disturbance Boundary
- Proposed Extraction Boundary
- Liddell Mining Tenements
- Railway Line
- Roads
- 70 Contours 5m Interval
- Creeks and Rivers
- Existing Dam
- A — A' Section Location
- Landform Establishment
- Ecosystem Establishment
- Decommissioning
- 2022 Proposed Rehabilitation

Primary Domains

- Active Mining
- Water Management
- Infrastructure
- Overburden Emplacement
- Tailings Storage Area

Secondary Domains

- Rehabilitation Area - Grassland
- Rehabilitation Area - Woodland

I, Mark Faulkner, Representative of Liddell Coal Operations Pty. Ltd (the Operator of Liddell Open Cut), and holder of Mine Manager's Certificate of Competency No. 2018-0678, certify that this plan is a true representation of the proposed operations.

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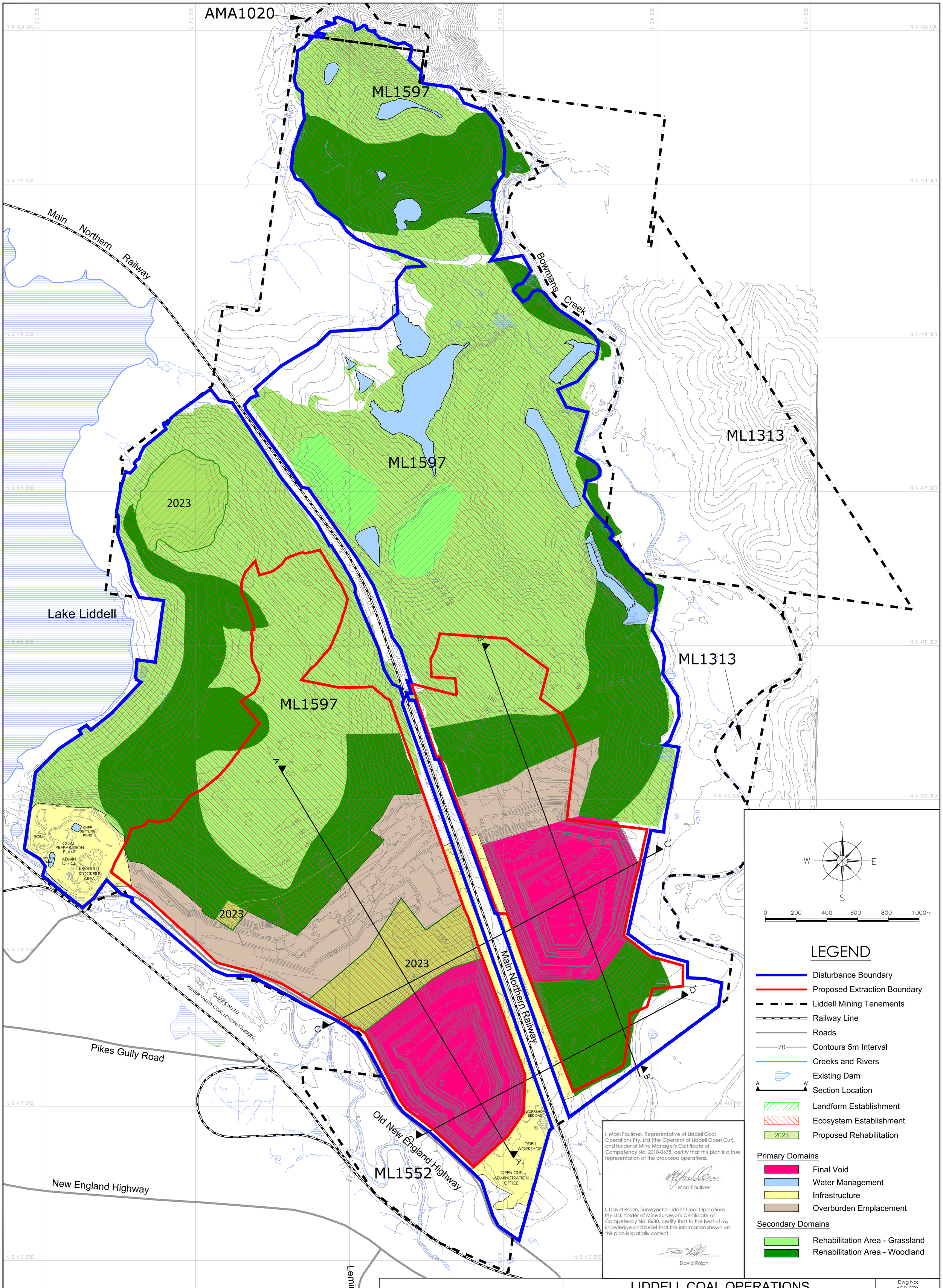
LIDDELL COAL OPERATIONS

Mining Operations Plan
PLAN 3B - Mining & Rehabilitation 2022
Application Date: September 2020

Dwg No:	Plan No:	Rev:
APP-369	JG-A0-6	B

Date:	Scale:	Drawn:	Checked:	Approved:	Sheet:
10.02.2021	1:7,500	J. Gray	J.Young	D.Rolph	A0



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LIDDELL COAL OPERATIONS

Mining Operations Plan
PLAN 3C - Mining & Rehabilitation September 2023
Application Date: September 2020

Dwg No:	Plan No:	Rev:
APP-370	JG-A0-7	B

Date:	Scale:	Drawn:	Checked:	Approved:	Sheet:
10.02.2021	1:7,500	J. Gray	J.Young	D.Rolph	A0

AMA1020

ML1597

ML1313

ML1552

Main Northern Railway

Bowmans Creek

Lake Liddell

Pikes Gully Road

New England Highway

Old New England Highway

Lemington Road

N 6 420 000 | N 6 419 000 | N 6 418 000 | N 6 417 000 | N 6 416 000 | N 6 415 000 | N 6 414 000 | N 6 413 000 | N 6 412 000

E 312 000 | E 313 000 | E 314 000 | E 315 000 | E 316 000 | E 317 000

N

W E

S

0 200 400 600 800 1000m

LEGEND

- Disturbance Boundary
- Proposed Extraction Boundary
- Development Application Boundary
- Liddell Mining Tenements
- Railway Line
- Roads
- 70 Contours 5m Interval
- Proposed Water Management
- Proposed Drop Structure
- Creeks and Rivers
- A — A' Section Location
- V Proposed Land Capability
- Mountain Block Offset Area
- Bowmans Creek Offset Area

Secondary Domains

- Water Management
- Rehabilitation Area - Grassland
- Rehabilitation Area - Woodland

I, Mark Faulkner, Representative of Liddell Coal Operations Pty. Ltd (the Operator of Liddell Open Cut), and holder of Mine Manager's Certificate of Competency No. 2018-0678, certify that this plan is a true representation of the proposed operations.

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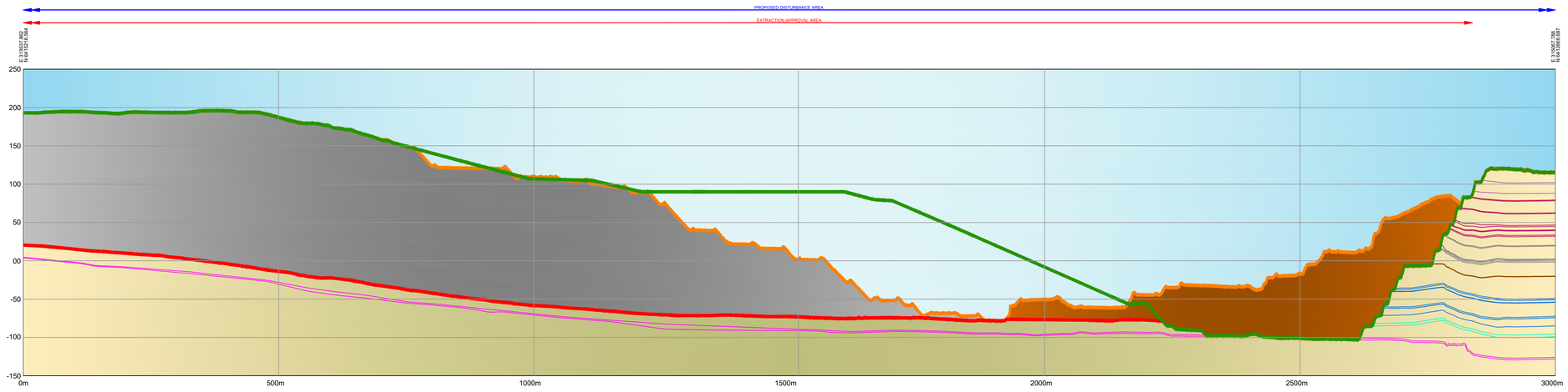
LIDDELL COAL OPERATIONS

Mining Operations Plan
PLAN 4 - Final Rehabilitation & Post Mining Land Use
Application Date: September 2020

Date:	Scale:	Drawn:	Checked:	Approved:
10.02.2021	1:7,500	J. Gray	J.Young	

Dwg No: APP-371
Plan No: JG-A0-8
Rev: B
Sheet: A0



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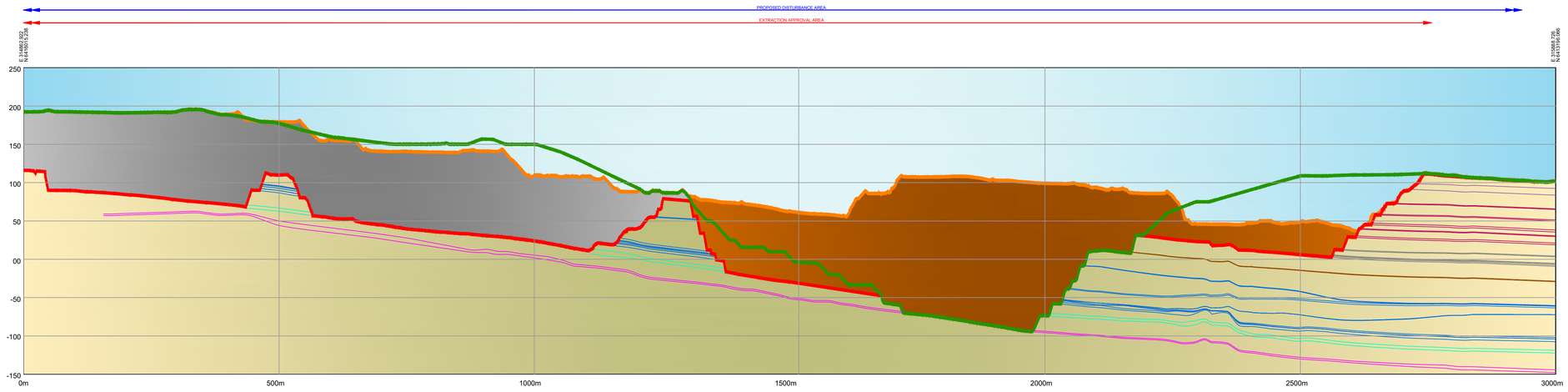

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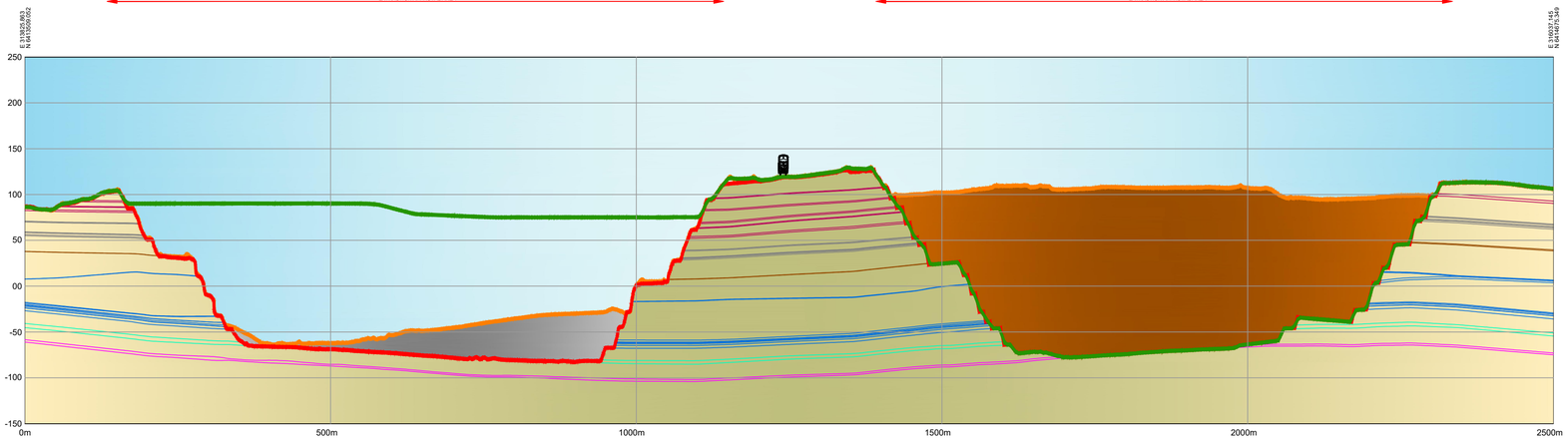

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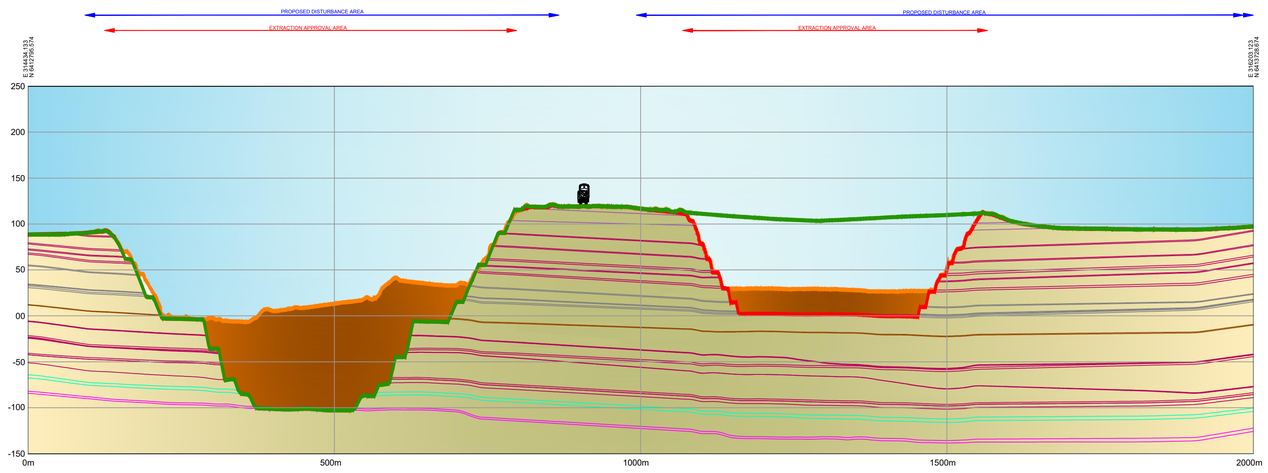

SECTION D - D'

Vertical exaggeration of sections = 1.5

0 100 200 300 400 500m

LEGEND

- Disturbance Boundary
- Proposed Extraction Boundary
- Sky
- Existing Mining Surface (Overburden)
- Existing Fill
- In-situ Ground
- Current Mining Surface 2020
- Conceptual Final Void
- Conceptual Final Rehabilitation Surface
- Railway Line

COAL SEAM LEGEND

- Bayswater Seams
- Lemington Seams
- Pikes Gully Seams
- Arties Seams
- Liddell Seams
- Barrett Seams
- Hebden Seams

I, Mark Faulkner, Representative of Liddell Coal Operations Pty. Ltd (the Operator of Liddell Open Cut), and holder of Mine Manager's Certificate of Competency No. 2018-0678, certify that this plan is a true representation of the proposed operations.

Mark Faulkner

I, David Rolph, Surveyor for Liddell Coal Operations Pty Ltd, holder of Mine Surveyor's Certificate of Competency No. 8680, certify that to the best of my knowledge and belief that the information shown on this plan is spatially correct.

David Rolph

LIDDELL
GLENCORE

Old New England Highway Ravensworth
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Singleton NSW 2330

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Fax: (02) 6570 9999
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LIDDELL COAL OPERATIONS

Mining Operations Plan
PLAN 5 - Cross Sections
Application Date: September 2020

Date:	Scale:	Drawn:	Checked:	Approved:
01.04.2021	1:5,000	J. Gray	J.Young	D.Rolph

Dwg No: APP-372
Plan No: JG-A0-9
Rev: C
Sheet: A0

Appendix B - DA 305-11-01 Mod 7

ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979

INTEGRATED STATE SIGNIFICANT DEVELOPMENT

DETERMINATION OF DEVELOPMENT APPLICATION
PURSUANT TO SECTIONS 76(A)9 & 80

I, the Minister for Planning, pursuant to Sections 76(A)9 & 80 of the Environmental Planning and Assessment Act, 1979 ("the Act") determine the development application ("the application") referred to in Schedule 1 by granting consent to the application subject to the conditions set out in Schedule 2.

The reasons for the imposition of the conditions are to:

(i) minimise the adverse impact the development may cause through water and air pollution, noise, and visual disturbance;

(ii) provide for environmental monitoring and reporting; and

(iii) set requirements for mine infrastructure provision.

Andrew Refshauge MP
Minister for Planning

Sydney, 2002 File No. S00/01703

Red type represents July 2007 modification.
Blue type represents the May 2008 modification
Green type represents the October 2009 modification
Orange type represents the December 2014 modification
Purple type represents the February 2016 modification
Light Blue type represents the January 2019 modification

Schedule 1

Application made by:	Liddell Coal Operations Pty Limited ("the Applicant").
To:	The Minister for Planning (DA 305-11-01)
In respect of:	Land described in Appendix "1".
For the following:	Continued open cut coal mining at the Liddell Colliery and associated surface facilities and infrastructure ("the development").

BCA Classification:

Structure	BCA Classification
Office	Class 5
Amenities	Class 8

NOTE:

1) To ascertain the date upon which the consent becomes effective, refer to section 83 of the Act.

2) To ascertain the date upon which the consent is liable to lapse, refer to section 95 of the Act.

3) Section 97 of the Act confers on an Applicant who is dissatisfied with the determination of a consent authority a right of appeal to the Land and Environment Court exercisable within 12 months after receipt of notice.

TABLE OF CONTENTS

DEFINITIONS

Annual review	The review required by condition 3 of schedule 5
Applicant	Liddell Coal Operations Pty Limited, or its successor
BCA	Building Code of Australia
Biodiversity offset strategy	The conservation and enhancement strategy described in the EA, and depicted conceptually in the figures in Appendix 7
Blast misfire	The failure of one or more holes in a blast pattern to initiate
CCC	Community Consultative Committee
Chain of Ponds Inn	Refers to the State-heritage listed Chain of Ponds Inn Complex
CHPP	Coal Handling & Preparation Plant
Councils	Muswellbrook Shire Council & Singleton Council
DA	Development Application
Day	The period from 7 am to 6 pm on Monday to Saturday, and from 8 am to 6 pm on Sundays and Public Holidays
Department	Department of Planning & Environment
DoI	Division of Land and Water within the Department of Industry
DRG	Division of Resources and Geoscience within the Department
EIS	Development application 305-11-2001 and accompanying documents titled *Liddell Colliery Continued Operations Environmental Impact Statement*, dated October 2001; *Response to NPWS Request for Further Information in Relation to the Archaeological Assessment*, *Liddell EIS*, dated February 2002; correspondence submitted to the Departments and SC, dated 20 December 2001; *Response to Submissions Liddell Colliery Environmental Impact Statement*, dated March 2002; *Continued Operations of Liddell Colliery – Revised Development Application Area*, dated 13 March 2002; and additional air quality contours provided to the Department, dated 7 May 2002
EEC	Endangered ecological community, as defined under the *Threatened Species Conservation Act 1995*
EPA	Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000*
EPL	Environment Protection Licence issued under the POEO Act
Evening	The period from 6 pm to 10 pm
Feasible	Feasible relates to engineering considerations and what is practical to build or to implement
Ha	Hectare
Heritage Council	Heritage Council of NSW
Heritage item	An item as defined under the Heritage Act 1977 and/or an Aboriginal object or place as defined under the National Parks and Wildlife Act 1974
Incident	An occurrence or set of circumstances that causes or threatens to cause material harm and which may or may not be or cause a non-compliance
Land	Land means the whole of a lot, or contiguous lots owned by the same landowner, in a current plan registered at the Land Titles Office at the date of this consent
Material Harm	Is harm that: • involves actual or potential harm to the health or safety of human beings or to the environment that is not trivial, or • results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding $10,000 (such loss includes the reasonable costs and expenses that would be incurred in taking all reasonable and practicable measures to prevent, mitigate or make good harm to the environment) This definition excludes "harm" that is authorised under either this consent or any other statutory approval
Mining operations	Includes the removal and emplacement of overburden and extraction, processing, handling, storage and transport of coal on site
Minister	Minister for Planning, or delegate
Minor	Not very large, important or serious
Mitigation	Activities associated with reducing the impacts of the development
MOD 1 EA	Modification application 305-11-01 MOD 1 and accompanying Schedule of Lands
MOD 2 EA	Modification application 305-11-01 MOD 2 and accompanying documents titled *Liddell Colliery Modification to Development Consent Environmental Assessment*, dated December 2006; *Response to Submissions Environmental Assessment for Liddell Colliery Modification to Development Consent*, dated March 2007; *Response to Submissions*

	from the Roads and Traffic Authority and the Hunter Regional Development Committee Environmental Assessment for Liddell Colliery Modification to Development Consent, dated April 2007; and *Revised Statement of Commitments for the Liddell Development Consent Modification*, dated July 2007
MOD 3 EA	Modification application 305-11-01 MOD 3 and accompanying documents titled *Liddell Coal Operations Pty Limited Statement of Environmental Effects for Liddell Colliery Modification to Development Consent*, dated February 2008
MOD 4 EA	Modification application 305-11-01 MOD 4 and accompanying document and site plans, dated 7 October 2009 and prepared by Umwelt Australia Pty Limited
MOD 5 EA	Modification application 305-11-01 MOD 5 and accompanying document and site plans, dated September 2013 and prepared by SLR
MOD 6 EA	Modification application 305-11-01 MOD 6 and accompanying documents titled *Greater Ravensworth Area Tailing Pipeline Modification Environmental Assessment* dated November 2015, including the response to submissions dated December 2015
MOD 7 EA	Modification application 305- 11- 01 MOD 7 and accompanying documents titled *Liddell Coal Operations Environmental Assessment Modification 7 to DA 305-11-01* dated August 2018 and prepared by Hansen Bailey, including the response to submissions dated November 2018
MSC	Muswellbrook Shire Council
Negligible	Small and unimportant, such as to be not worth considering
Night	The periods from 10 pm to 7 am on Monday to Saturday, and 10 pm to 8 am on Sundays and Public Holidays
Non-compliance	An occurrence, set of circumstances or development that is a breach of this consent
OEH	Office of Environment and Heritage
POEO Act	Protection of the Environment Operations Act 1997
Privately owned land	Land that is not owned by a public agency, or a mining company or its subsidiary, and which is not subject to a negotiated agreement between the Applicant and the applicable landowner
Public infrastructure	Infrastructure that provides services to the general public, such as roads, railways, water supply, drainage, sewerage, gas supply, electricity, telephone, telecommunications, etc.
Reasonable	Reasonable relates to the application of judgement in arriving at a decision, taking into account; mitigation benefits, cost of mitigation versus benefits provided, community views and the nature and extent of potential improvements
Receiver	As defined in the *NSW Industrial Noise Policy* (EPA 2000)
Rehabilitation	The restoration of land disturbed by the development to a good condition to ensure it is safe, stable and non-polluting
Resources Regulator	NSW Resources Regulator
ROM	Run of Mine
RMS	Roads and Maritime Services
SA NSW	Subsidence Advisory NSW
Secretary	Planning Secretary under the EP&A Act, or nominee
Site	Land to which the Consent applies (see Appendix 1 and Appendix 2)
SC	Singleton Council

SCHEDULE 2
ADMINISTRATIVE CONDITIONS

Obligation to Minimise Harm to the Environment

1. In addition to meeting the specific performance criteria established under this consent, the Applicant must implement all reasonable and feasible measures to prevent and/or minimise any harm to the environment that may result from the construction, operation, or rehabilitation of the development.

Terms of Consent

2. The Applicant must:
   (a) carry out the development generally in accordance with the EIS, MOD 1 EA, MOD 2 EA, MOD 3 EA, MOD 4 EA, MOD 5 EA, MOD 6 EA, MOD 7 EA and the Development Layout Plans; and
   (b) comply with the conditions of this consent.

   Notes: The Development Layout Plans are shown in Appendix 2.

3. If there is any inconsistency between the documents in condition 2(a), the most recent documents must prevail to the extent of the inconsistency. The conditions of this consent must prevail over documents in condition 2(a) to the extent of any inconsistency.

4. The Applicant must comply with any reasonable requirement/s of the Secretary arising from the Department's assessment of:
   (c) any strategies, programs, reviews, audits, reports, plans or correspondence that are submitted in accordance with this consent;
   (d) any reports, reviews or audits commissioned by the Department regarding compliance with this consent; and
   (e) the implementation of any actions or measures contained in these reports, plans or correspondence.

Mining, Processing and Transport Limits on Consent

5. Mining operations may take place on the site until 31 December 2028.

   Note: Under this consent, the Applicant is required to rehabilitate the site. Consequently this consent will continue to apply in all other respects other than the right to conduct mining operations until the site has been rehabilitated to a satisfactory standard.

6. The Applicant must not:
   (a) extract more than 8 million tonnes of ROM coal per annum from the site; or
   (b) process more than 8 million tonnes of ROM coal per annum at the Liddell CHPP, including up to 2 million tonnes per year of ROM coal from Mt Owen; or
   (c) transport more than 1.5 million tonnes of ROM coal per annum to Ravensworth Central Coal Processing Facility for processing; or
   (d) extract more than 0.5 million tonnes of coal tailings per annum with residual energy content from the site for transport to Liddell and Bayswater Power Stations.

7. The Applicant must ensure that all product coal from the site is transported by rail.

Structural Adequacy

8. The Applicant must ensure that all new buildings and structures, and any alterations or additions to existing buildings and structures, are constructed in accordance with:
   (a) the relevant requirements of the BCA;
   (b) the relevant requirements of *AS3959-2009 Construction of buildings in bushfire-prone areas*; and
   (c) any additional requirements of the SA NSW.

   Notes:
   - *Under Part 4A of the EP&A Act, the Applicant is required to obtain construction and occupation certificates for the proposed building works.*
   - *Part 8 of the EP&A Regulation sets out the requirements for the certification of development.*

Demolition

9. The Applicant must ensure that all demolition work is carried out in accordance with *Australian Standard AS 2601-2001: The Demolition of Structures*, or its latest version.

Operation of Plant and Equipment

10. The Applicant must ensure that all plant and equipment used at the site, and equipment used off-site to monitor the performance of the project is:
    (a) maintained in a proper and efficient condition; and
    (b) operated in a proper and efficient manner.

Protection of Public Infrastructure

11. Unless the Applicant and the applicable authority agree otherwise, the Applicant must:
    (a) repair, or pay the full costs associated with repairing, any public infrastructure that is damaged by the development; and
    (b) relocate, or pay the full costs associated with relocating, any public infrastructure that needs to be relocated as a result of the development,

    however this condition does not apply where the Applicant has entered into an agreement with the owner of such public infrastructure that covers the repair and/or maintenance of the infrastructure.

Updating and Staging of Strategies, Plans or Programs

12. With the approval of the Secretary, the Applicant may submit any strategies, plans or programs required by this consent on a progressive basis.

    To ensure the strategies, plans or programs under the conditions of this consent are updated on a regular basis, the Applicant may at any time submit revised strategies, plans or programs to the Secretary for approval.

    With the agreement of the Secretary, the Applicant may prepare any revised strategy, plan or program without undertaking consultation with all parties under the applicable condition of this consent.

    Notes:
    - *While any strategy, plan or program may be submitted on a progressive basis, the Applicant must ensure that the existing operations on site are covered by suitable strategies, plans or programs at all times; and*
    - *If the submission of any strategy, plan or program is to be staged, then the relevant strategy, plan or program must clearly describe the specific stage to which the strategy, plan or program applies, the relationship of this stage to any future stages, and the trigger for updating the strategy, plan or program.*

Planning Agreements

13. By the end of May 2015, or as otherwise agreed by the Secretary, the Applicant must enter into a planning agreement with Singleton Council (SC) in accordance with the general terms in Appendix 8.

14. By the end of May 2015, or as otherwise agreed by the Secretary, the Applicant must enter into a planning agreement with Muswellbrook Shire Council (MSC) in accordance with the general terms in Appendix 9.

Evidence of Consultation

15. Where conditions of this consent require consultation with an identified party, the Applicant must:
    (a) consult with the relevant party prior to submitting the subject document; and
    (b) provide details of the consultation undertaken including:
        (i) the outcome of that consultation, matters resolved and unresolved; and
        (ii) details of any disagreement remaining between the party consulted and the Applicant and how the Applicant has addressed the matters not resolved.

Compliance

16. The Applicant must ensure that all of its employees, contractors (and their sub-contractors) are made aware of, and are instructed to comply with, the conditions of this consent relevant to activities they carry out in respect of the development.

Applicability of Guidelines

17. References in the conditions of this consent to any guideline, protocol, Australian Standard or policy are to such guidelines, protocols, Standards or policies in the form they are in as at the date of this consent.

18. However, consistent with the conditions of this consent and without altering any limits or criteria in this consent, the Planning Secretary may, when issuing directions under this consent in respect of ongoing monitoring and management obligations, require compliance with an updated or revised version of such a guideline, protocol, Standard or policy, or a replacement of them.

SCHEDULE 3
SPECIFIC ENVIRONMENTAL CONDITIONS

NOISE

Impact Assessment Criteria

1. The Applicant must ensure that the noise generated by the development does not exceed the noise impact assessment criteria in Table 1 at any residence.

Table 1: Noise impact assessment criteria dB(A)

Assigned residential location number	Day ($L_{Aeq\ (15min)}$)	Evening ($L_{Aeq\ (15min)}$)	Night ($L_{Aeq\ (15min)}$)	Night ($L_{A\ (1min)}$)
1,5,6,7,8,9,10,11,12,14	35	35	35	45
2	35	35	36	45
3	36	35	37	45
4	36	35	36	45
All other privately-owned land	35	35	35	45

Note: To interpret the locations referred to in Table 1, see Appendix 5

Noise generated at the development is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 6 sets out the meteorological conditions under which these criteria apply and the requirements for evaluating compliance with these criteria.

However, these criteria do not apply if the Applicant has an agreement with the owner(s) of the relevant residence or land to generate higher noise levels, and the Applicant has advised the Department in writing of the terms of this agreement.

Operating Conditions

2. The Applicant must:
   (a) implement all reasonable and feasible measures to minimise the construction, operational, road and rail noise of the development;
   (b) operate a noise management system on site that uses attended noise monitoring data to ensure compliance with the relevant conditions of consent;
   (c) evaluate the effectiveness of the noise management system;
   (d) minimise the noise impacts of the development during meteorological conditions when the noise criteria in this consent does not apply (see Appendix 6); and
   (e) monitor and report on compliance with the relevant noise conditions of this consent,

   to the satisfaction of the Secretary.

Monitoring Program

3. The Applicant must update and subsequently implement the Noise Monitoring Program for the development to the satisfaction of the Secretary. This program must be submitted to the Secretary by the end of May 2015, and must include regular attended monitoring in accordance with Appendix 6, and a noise monitoring protocol for evaluating compliance with the noise impact assessment criteria in this consent.

BLASTING AND VIBRATION

Impact Assessment Criteria

4. The Applicant must ensure that blasts on site do not exceed the criteria in Table 2.

Table 2: Blasting impact assessment criteria

Location	Airblast overpressure level (dB(Lin Peak))	Ground vibration (mm/s)	Allowable exceedance
Residence on privately-owned land	115	5	5% of the total number of blasts over a period of 12 months
	120	10	0%
Newdell zone substation	-	20 (interim)	10% of the total number of blasts over a period of 12 months
	-	25 (interim)	0%
Other public infrastructure	-	50	0%

However these criteria do not apply if the Applicant has:

(a) a written agreement with the relevant owner to exceed these criteria, and has advised the Department in writing of the terms of this agreement; or

(b) in the event that the Applicant is unable to secure a written agreement with an infrastructure owner, demonstrated to the satisfaction of the Secretary that blasting can be carried out at levels in excess of the criteria without causing any damage to the infrastructure.

Notes:

- *The interim criteria for the Newdell zone substation are based on consultation with the substation owner (Ausgrid). It is acknowledged that alternative criteria may be agreed as part of the blast management strategy for the substation (see condition 15A).*
- *An alternate limit for public infrastructure may be agreed to by the Secretary if it can be justified in accordance with the structural design methodology in AS2187.2-2006, or another methodology agreed to by the Secretary.*

Chain of Ponds Inn

5. The Applicant must ensure that blasting at the development does not cause any exceedances of the following performance measures at the Chain of Ponds Inn, to the satisfaction of the Secretary:

(a) negligible loss of heritage value; and

(b) negligible impact on structural integrity of the internal and external fabric of the Inn, having regard to the existing condition and structural integrity of the Inn at November 2014.

Notes:

a) The Applicant will be required to define more detailed performance indicators (including impact assessment criteria) in the Blast Management Plan.

b) Measurement and/or monitoring of compliance with performance measures and indicators is to be undertaken using generally accepted methods that are appropriate for the heritage item. These methods are to be fully described in the Blast Management Plan.

c) The requirements of this condition only apply to the impacts and consequences of mining operations undertaken following the date that consent is granted to DA 305-11-01 MOD 5.

6. DELETED.

7. DELETED.

8. DELETED.

Blasting Hours

9. The Applicant must carry out blasting at the development only between 9 am and 5 pm Monday to Saturday inclusive. No blasting is allowed on Sundays, public holidays, or at any other time without the written approval of the Secretary.

Blasting Frequency

10. The Applicant may carry out a maximum of:

(a) 3 blasts a day; and

(b) 8 blasts a week, average over a calendar year on the site.

This condition does not apply to blasts that generate ground vibration of 0.5mm/s or less at any residence on privately-owned land, blast misfires or blasts required to ensure the safety of the mine, its workers or the general public.

Note: For the purposes of this condition, a blast refers to a single blast event, which may involve a number of individual blasts fired in quick succession in a discrete area of the mine.

Operating Conditions

11. During mining operations, the Applicant must:
    (a) implement all reasonable and feasible management measures to:
        - protect the safety of people and livestock in the area surrounding blasting operations;
        - protect public or private infrastructure/property in the area surrounding blasting operations from blasting damage; and
        - minimise the dust and fume emissions from blasting at the mine;
    (b) operate a suitable system to enable the public to get up-to-date information on the proposed blasting schedule on site; and
    (c) monitor and report on compliance with the relevant blasting conditions in this consent,
    to the satisfaction of the Secretary.

11A. The Applicant must not undertake blasting on site within 500 metres of any public road or any land outside the site that is not owned by the Applicant unless the Applicant has:
    (a) demonstrated to the satisfaction of the Secretary that the blasting can be carried out closer to the infrastructure or land without comprising the safety of people or livestock or damaging the infrastructure and/or other buildings and structures; and
    (b) updated the Blast Management Plan to include specific measures that would be implemented while blasting is being carried out within 500 metres of infrastructure or land; or
    (c) a written agreement with the relevant landowner to allow blasting to be carried out closer to the infrastructure or land, and the Applicant has advised the Department in writing of the terms of this agreement.

Public Notice

12. By the end of February 2015, the Applicant must:
    (a) re-notify the landowner/occupier of any residence within 2 km of the development that they are entitled to register an interest in being notified of the blasting schedule of the mine; and
    (b) re-notify the landowner/occupier of any residence within 2 km of the development of the blasting schedule at the mine, if that landowner/occupier registers an interest in being so notified;
    to the satisfaction of the Secretary.

Property Inspections

13. By the end of February 2015, the Applicant must advise all landowners of privately-owned land within 2 km of the development that they are entitled to a structural property inspection.

14. If the Applicant receives a written request for a structural property inspection from any landowner of privately-owned land within 2 km of the development, the Applicant must within 3 months of receiving this request:
    (a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Secretary, to inspect the condition of any building or structure on the land, and recommend measures to mitigate any potential blasting impacts; and
    (b) give the landowner a copy of the property inspection report.

Property Investigations

15. If any landowner of privately-owned land within 2 km of the site claims that buildings and/or structures on his/her land have been damaged as a result of blasting at the development, the Applicant **must** within 3 months of receiving this request:
    (a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Secretary, to investigate the claim; and
    (b) give the landowner a copy of the property investigation report.

    If this independent property investigation confirms the landowner's claim, and both parties agree with these findings, then the Applicant must repair the damages to the satisfaction of the Secretary.

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

Blast Management Plan

15A. The Applicant must prepare a Blast Management Plan for the development to the satisfaction of the Secretary, this plan must:

(a) be submitted to the Secretary for approval by the end of May 2015, unless otherwise agreed by the Secretary;

(b) describe the measures that would be implemented to ensure compliance with the blasting criteria and operating conditions of this consent;

(c) propose and justify any alternative ground vibration limits for any public infrastructure in the vicinity of the site (if required);

(d) include a monitoring program for evaluating and reporting on compliance with the blasting criteria and operating conditions;

(e) include a specific *Blast Management Strategy for the Chain of Ponds Inn*. This Strategy must:

- be prepared in consultation with the Heritage Council and Coal & Allied, and endorsed by the Heritage Council;
- incorporate the recommendations of the *Former Chain of Ponds Inn Buildings – Investigation of Blast Vibration and Vulnerability Report* (Bill Jordan and Associates, 2013) and *Blast Management Strategy* (Enviro Strata, 2013);
- provide details on the management of potential flyrock impacts on the Chain of Ponds Inn;
- provide details on how the stabilisation measures will be implemented and a timetable for implementation;
- provide details of the ongoing monitoring and maintenance procedures for the Chain of Ponds Inn;
- repair any damage to the Chain of Ponds (should any damage occur) within 6 months of the damage occurring;
- provide and submit an annual report on the condition of the Chain of Ponds Inn to the Heritage Council; and

(f) include a specific *Blast Management Strategy for the Newdell Zone Substation*. This Strategy must:

- be prepared in consultation with the owner of the substation;
- if alternative criteria to those in Table 2 are proposed, include detailed justification for the criteria based on investigations by a suitably qualified expert(s) whose appointment has been endorsed by the Secretary in consultation with the owner of the substation;
- provide details on the management of potential ground vibration and flyrock impacts to ensure that blasting does not affect the structural integrity or serviceability of the substation;
- include a monitoring program for blast vibration and structural integrity at the substation; and
- include a protocol for repairing any damage to the substation in the event that this occurs.

The Applicant must implement the management plan as approved by the Secretary.

AIR QUALITY

Impact Assessment Criteria

16. The Applicant must ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate emissions generated by the development do not exceed the air quality impact assessment criteria listed in Tables 3, 4, and 5 at any residence on privately-owned land.

Table 3: Long term impact assessment criteria for particulate matter

Pollutant	Averaging period	[d]Criterion
Total suspended particulate (TSP) matter	Annual	[a]90 µg/m^3
Particulate matter < 10 µm (PM_{10})	Annual	[a]30 µg/m^3

Table 4: Short term impact assessment criterion for particulate matter

Pollutant	Averaging period	[d]Criterion
Particulate matter < 10 µm (PM_{10})	24 hour	[b]50 µg/m^3

Table 5: Long term impact assessment criteria for deposited dust

Pollutant	Averaging period	Maximum increase in deposited dust level	Maximum total deposited dust level
[c]Deposited dust	Annual	[b]2 g/m^2/month	[a]4 g/m^2/month

Notes to Tables 3-5:

a Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources;

b Incremental impact (i.e. incremental increase in concentrations due to the development on its own);

c Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS3580.10:2003: Methods for Sampling and Analysis of Ambient Air Determination of Particulate Matter – Deposited Matter – Gravimetric Method; and

d Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Secretary.

17. DELETED.

Operating Conditions

18. The Applicant must:
    (a) implement all reasonable and feasible air quality management measures to minimise odour, fume and dust emissions from the development;
    (b) implement all reasonable and feasible measures to minimise the release of greenhouse gas emissions from the site;
    (c) minimise any visible air pollution generated by development;
    (d) minimise surface disturbance on the site;
    (e) operate an air quality management system that uses a combination of high volume samplers and dust deposition gauges to ensure compliance with the relevant conditions of consent; and
    (f) minimise the air quality impacts of the development during adverse meteorological conditions and extraordinary events
    to the satisfaction of the Secretary.

Air Quality Monitoring

19. The Applicant must update and subsequently implement the Air Quality Monitoring Program for the development to the satisfaction of the Secretary. This program must be submitted to the Secretary by the end of May 2015, and must include a combination of real-time air quality monitors and supplementary monitors to monitor the dust emissions of the development; and an air quality monitoring protocol for evaluating compliance with the air quality impact assessment criteria in this consent.

METEOROLOGICAL MONITORING

20. The Applicant must ensure that there is a suitable meteorological station operating in the vicinity of the development in accordance with the requirements in *Approved Methods for Sampling of Air Pollutants in New South Wales*; and to the satisfaction of the EPA and Secretary.

SURFACE AND GROUND WATER

Water Supply

21. The Applicant must ensure that it has sufficient water for all stages of the development, and if necessary, adjust the scale of mining operations to match its available water supply, to the satisfaction of the Secretary.

    Note: The Applicant is required to obtain all necessary water licences and approvals for the development under the Water Act 1912 and/or Water Management Act 2000.

Water Pollution

21A. Unless an EPL or the EPA authorises otherwise, the Applicant must comply with Section 120 of the POEO Act and the *Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Regulation 2002*.

21B. The Applicant must ensure that treated effluent from the wastewater treatment plant does not exceed the discharge limits in Table 6, unless otherwise agreed by the EPA.

21C. The Applicant must monitor the quality of treated effluent to be discharged from the wastewater treatment plant (by sampling and obtaining results by analysis) as specified in Table 6, or as otherwise agreed by the EPA.

Table 6: Wastewater treatment plant discharge limits

Pollutant	Units of Measure	Frequency	Sampling Method	Concentration Limit (100 percentile)
E.coli	Colony forming units per 100 millilitres	Monthly	Representative sample	100

Desalination Unit

22. Prior to the construction of the desalination unit, the Applicant must conduct investigations and identify options concerning the most appropriate method for the treatment and/or disposal of brine, to the satisfaction of the Secretary, DoI and EPA.

Water Management Plan

23. The Applicant must prepare a Water Management Plan for the development to the satisfaction of the Secretary. This Plan must:
    (a) be prepared in consultation with DoI and EPA by suitably qualified and experienced persons whose appointment has been approved by the Secretary;
    (b) be submitted to the Secretary for approval by the end of May 2015, unless the Secretary agrees otherwise;
    (c) this plan must include a:
        (i) Site Water Balance that:
            - includes details of:
                - sources and security of water supply, including contingency planning for future reporting periods;
                - water use and management on site;
                - reporting procedures, including the preparation of a site water balance for each calendar year;
            - describes the measures that would be implemented to minimise clean water use on site;
        (ii) Erosion and Sediment Control Plan that:
            - is consistent with the requirements of *Managing Urban Stormwater: Soils and Construction, Volume 1, 4th Edition, 2004* (Landcom), or its latest version;
            - identifies activities that could cause soil erosion, generate sediment or effect flooding;
            - describes measures to minimise soil erosion and the potential for the transport of sediment to downstream waters, and manage flood risk; and
            - describe what measures would be implemented to maintain the structures over time;
        (iii) Surface Water Management Plan, that includes:
            - reference to detailed baseline data on water flows and quality contained in the EA;
            - a detailed description of the water management system on site;
            - design objectives and performance criteria for the:
                - design and management of final voids;
                - design and management for sodic and dispersible soils and acid or sulphate generating materials;
                - reinstatement of drainage lines on the rehabilitated areas of the site; and
                - control of any potential water pollution from the rehabilitated areas of the site;

- surface water assessment criteria, including trigger levels for investigating any potentially adverse impacts for the following:
  - the water management system, including mine water storages and sediment dams;
  - downstream surface water quality; and
  - stream and riparian vegetation health;
- a program to monitor and report on:
  - the effectiveness of the water management system;
  - surface water flows and quality, stream and riparian vegetation health in the watercourses that could be affected by the development; and
  - stream health and channel stability;
- reporting procedures for the results of the monitoring program;
- a plan to respond to any exceedances of the performance criteria, and mitigate any adverse surface water impacts of the development including:
  - a protocol for the investigation, notification and mitigation of any exceedances;
  - measures to mitigate and/or compensate potentially affected landowners for the loss of surface flows in Bowmans Creek downstream of the development resulting from the development; and
  - the procedures that would be followed if any unforeseen impacts are detected during the development.

(iv) Groundwater Management Plan, that includes:

- reference to baseline data on groundwater levels, yield and quality contained in the EA;
- a detailed description of the groundwater management system on site;
- design objectives and performance criteria, for the:
  - emplacement areas for tailings, acid forming and potentially acid forming materials, and saline and sodic materials;
  - final voids;
- groundwater assessment criteria, including trigger levels for investigating any potentially adverse groundwater impacts beyond those predicted in the EA for Mod 5;
- measures to minimise, prevent or offset groundwater leakage from the Bowmans Creek alluvial aquifer in excess of the drawdown predicted in the EA for Mod 5;
- measures to mitigate any direct hydraulic connection between the backfilled open cuts and the Bowmans Creek alluvium if the potential for adverse impacts is detected;
- a program to monitor and report on:
  - groundwater inflows to the mining operations;
  - the seepage/leachate from water storages, emplacements and final voids;
  - background changes in groundwater yield/quality against mine-induced changes;
  - impacts of the development on:
    - regional and local (including alluvial) aquifers;
    - groundwater dependent ecosystems and riparian vegetation;
    - the seepage/leachate from water storages, emplacements, backfilled voids and final voids;
    - impacts on the Bowmans Creek alluvial aquifer;
- procedures for the verification of the groundwater model;
- a review of existing network to identify additional monitoring locations for the alluvial system focusing on areas where additional drawdown is predicted;
- reporting procedures for the results of the monitoring program and model verification;
- a plan to respond to any exceedances of the predicted groundwater impacts, and mitigation of any unpredicted adverse groundwater impacts of the development;

(v) a program to validate the water balance and groundwater model for the development every 3 years, and compare monitoring results with modelled predictions; and

(vi) a protocol that has been prepared in consultation with the owners of any nearby mines to:

- minimise cumulative water quantity and quality impacts;
- review opportunities of water sharing between the mines;
- share water monitoring data where practicable;

- undertake joint investigations/studies in relation to complaints/exceedances of trigger levels where cumulative impacts are considered likely; and
- where practicable, co-ordinate modelling programs for validation, re-calibration and re-running of water models.

The Applicant must implement the management plan as approved by the Secretary.

BIODIVERSITY

Biodiversity Offset Strategy

24. The Applicant must implement the biodiversity offset strategy described in the EA, summarised in Table 7 and conceptually shown in Appendix 7.

Table 7: Summary of the Biodiversity Offset Strategy

Area	Offset Type	Minimum Size (ha)
Mountain Block Offset	Existing vegetation and vegetation to be established	168
Bowmans Creek Riparian Corridor	Existing vegetation and vegetation to be established	185
Total		**353**

Note: To identify the areas referred to in Table 7 refer to the applicable figures in Appendix 7.

25. The Applicant must ensure that the offset strategy and/or rehabilitation strategy is focused on the re-establishment of:
    (a) significant and/or threatened plant communities, including:
        - Central Hunter Box – Ironbark Woodland EEC;
        - Narrow-Leaved Ironbark – Spotted Gum Woodland EEC;
        - Narrow-Leaved Ironbark – Bulloak Open Forest EEC;
    (b) significant and/or threatened plant species; and
    (c) habitat for significant and/or threatened animal species including the Spotted-tailed Quoll.

Spotted-Tailed Quoll Contribution

26. The Applicant must contribute $200,000 over 5 years towards the implementation of recovery actions under OEH's *Saving Our Species Action Statement* and/or *Final Draft National Recovery Plan for the Spotted-tailed Quoll 2008* for the Spotted-tailed Quoll. The initial payment of at least $50,000 must be made by the end of June 2015, unless otherwise agreed by the Secretary. The timing and quantum of the subsequent payments is to be determined in consultation with OEH.

Long Term Security of Offsets

27. By the end of December 2015, unless the Secretary agrees otherwise, the Applicant must make suitable arrangements to provide appropriate long term security for the land within the biodiversity offset strategy identified in Table 7, to the satisfaction of the Secretary.

Waterbird Habitat

28. Prior to the construction of Dam 13B, the Applicant must undertake habitat enhancement measures to Dam 3 to increase habitat for water birds to the satisfaction of OEH and the Secretary. The Applicant must in addition establish a dam in the Mountain Block area to provide habitat for waterbird species to the satisfaction of OEH and the Secretary. Where achievable, the habitat enhancement measures for each dam must include:
    (a) a maximum water depth of 5 metres over at least half the surface area;
    (b) gently sloping banks (apart from the dam wall) of less than 10 degrees;
    (c) areas of shallow back waters around the dams;
    (d) appropriate levels of vegetation; and
    (e) appropriate fencing and signposting.

Compensatory Planting

28A. The Applicant must plant and maintain, until established, 10 River Oak trees for every established River Oak tree removed during construction of the tailings pipeline under MOD 6.

Note: An established River Oak tree is considered to be two metres or greater in height.

Biodiversity Management Plan

29. The Applicant must prepare a detailed Biodiversity Management Plan for the site to the satisfaction of the Secretary. This plan must:
    (a) be prepared in consultation with OEH and be submitted to the Secretary for approval by the end of May 2015, unless otherwise agreed by the Secretary;
    (b) describe how the implementation of the offset strategy would be integrated with the overall rehabilitation of the site (see below);
    (c) include:
        (i) a description of the short, medium and long term measures that would be implemented to:
            - implement the offset strategy; and
            - manage the remnant vegetation and habitat on the site in the offset areas;
        (ii) detailed performance and completion criteria for the implementation of the offset strategy;
        (iii) a detailed description of the measures that would be implemented over the next 3 years, including the procedures to be implemented for:
            - implementing revegetation and regeneration with the disturbance areas and offset areas, including establishment of canopy, sub-canopy (if relevant), understorey and ground strata;
            - protecting vegetation and soil outside the disturbance areas;
            - rehabilitating creeks and drainage lines that occur on the site;
            - managing salinity;
            - conserving and reusing topsoil;
            - undertaking pre-clearance surveys;
            - managing impacts on fauna;
            - collecting and propagating seed;
            - salvaging and reusing material from the site for habitat enhancement;
            - salvaging, transplanting and/or propagating threatened flora in accordance with the Guidelines for the Translocation of Threatened Plants in Australia (Vallee et at., 2004);
            - controlling weeds and feral pests including investigating alternate technologies to reduce poisoning of non-target species;
            - managing grazing and agriculture;
            - controlling access;
            - bushfire management;
            - habitat enhancement works;
            - seasonal monitoring of in-stream and riparian ecological condition;
            - survey of stygofauna in Bowmans Creek alluvial aquifer (prior to predicted drawdown); and
            - monitoring of stygofauna populations every 6 months following the occurrence of the predicted drawdown;
        (iv) a seasonally-based program to monitor the effectiveness of these measures, and progress against the performance and completion criteria;
        (v) a description of the potential risks to successful revegetation, and a description of the contingency measures that would be implemented to mitigate these risks; and
        (vi) details of who would be responsible for monitoring, reviewing and implementing the plan.

    The Applicant must implement the management plan as approved by the Secretary.

Conservation Bond

30. Within 6 months of the approval of the Biodiversity Management Plan, the Applicant must lodge a conservation and biodiversity bond with the Department to ensure that the biodiversity offset strategy is implemented in accordance with the performance and completion criteria of the Biodiversity Management Plan. The sum of the bond must be determined by:
    (a) calculating the full cost of implementing the biodiversity offset strategy (other than land acquisition costs); and
    (b) employing a suitably qualified consultant to verify the calculated costs,
    to the satisfaction of the Secretary.

    The calculation of the Conservation Bond must be submitted to the Department for approval at least 1 month prior to lodgement of the final bond.

    If the offset strategy is completed generally in accordance with the completion criteria in the Biodiversity Management Plan to the satisfaction of the Secretary, the Secretary will release the bond.

If the offset strategy is not completed generally in accordance with the completion criteria in the Biodiversity Management Plan, the Secretary will call in all, or part of the conservation bond, and arrange for the satisfactory completion of the relevant works.

Notes:

- *Alternative funding arrangements for long term management of the biodiversity offset strategy, such as provision of capital and management funding as agreed by OEH as part of a Biobanking Agreement or transfer to conservation reserve estate can be used to reduce the liability if the conservation bond.*
- *The sum of the bond may be reviewed in conjunction with any revision to the biodiversity offset strategy or completion of major milestones within the approved plan.*

ABORIGINAL CULTURAL HERITAGE

Heritage Management Measures

31. By the end of May 2015, the Applicant must revise and subsequently implement its Aboriginal Cultural Heritage Management Plan to include management measures as identified in Table 7.16 of the EIS, in consultation with relevant Aboriginal stakeholders and OEH and to the satisfaction of the Secretary.

TRAFFIC AND TRANSPORT

Road Transport

32. The Applicant must:
    (a) ensure that transport of:
        - coal tailings by truck along the New England Highway is restricted to old tailings with residual energy content and at a rate of no more than 114 truck movements per day (i.e 57 loaded trucks), 5 days per week; and
        - transport of ROM coal to and from Ravensworth Central Coal Processing Facility is restricted to internal mine haul roads, Pikes Gully Road and Liddell Station Road.

    (b) use its reasonable endeavours to close Liddell Station Road as a public road to the satisfaction of SC, by the end of December 2015 unless otherwise agreed by the Secretary.

Monitoring of Coal Transport

33. The Applicant must:
    (a) keep records of the:
        - amount of coal transported from the site each year; and
        - number of coal haulage train movements generated by the development (on a daily basis); and

    (b) include these records in the Annual Review.

VISUAL IMPACT

Visual Amenity and Lighting

34. The Applicant must:
    (a) implement all reasonable and feasible measures to mitigate visual and off-site lighting impacts from the development;
    (b) ensure no outdoor lights shine above the horizontal;
    (c) undertake screen plantings along the western boundary of the proposed office and workshop area to further minimise potential visual impacts on the New England Highway; and
    (d) ensure that all external lighting associated with the development complies with *Australian Standard AS4282 (INT) 1995 – Control of Obtrusive Effects of Outdoor Lighting,*

    to the satisfaction of the Secretary.

WASTE MINIMISATION

35. The Applicant must:
    (a) monitor the amount of waste generated by the development;
    (b) investigate ways to minimise waste generated by the development;
    (c) implement reasonable and feasible measures to minimise waste generated by the development;
    (d) ensure irrigation of treated wastewater is undertaken in accordance with EPA's *Environmental Guideline for the Utilisation of Treated Effluent*; and
    (e) report on waste management and minimisation in the Annual Review,
    to the satisfaction of the Secretary.

BUSHFIRE MANAGEMENT

36. The Applicant must:
    (a) ensure that the development is suitably equipped to respond to any fires on site; and
    (b) assist the RFS and emergency services as much as practicable if there is a fire in the vicinity of the site.

REHABILITATION

37. The Applicant must rehabilitate the site to the satisfaction of Resources Regulator. The rehabilitation must comply with the objectives in Table 8, and be generally consistent with the proposed rehabilitation strategy in the EIS and as shown conceptually in Appendix 3.

Table 8: Rehabilitation Objectives

Feature	Objective
Mine site (as a whole)	• Safe, stable and non-polluting • Final landforms designed to incorporate micro-relief and integrate with surrounding natural landforms • Constructed landforms drain to the natural environment (excluding the final voids) • Minimise visual impact of final landforms as far as reasonable and feasible • Ensure there are no adverse flood impacts to privately owned properties
Final voids	• Minimise to the greatest extent practicable: - the size and depth of final voids - the drainage catchment of final voids
Surface infrastructure	• To be decommissioned and removed, unless the Secretary agrees otherwise
Revegetation	• Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprising: - at least 731 hectares of Central Hunter Box-Ironbark Woodland - habitat for threatened flora and fauna species including habitat connectivity for the Spotted-tailed Quoll • Maintain, establish and/or restore grassland areas with pockets of native vegetation to support sustainable agricultural activities, as shown conceptually in Appendix 3
Community	• Ensure public safety • Minimise the adverse socio-economic effects associated with mine closure
Final land use	• Restore or maintain land capability generally as described in the EA and as shown conceptually in Appendix 3.

Progressive Rehabilitation

38. The Applicant must carry out rehabilitation progressively, that is, as soon as reasonably, practicable following disturbance. All reasonable and feasible measures must be taken to minimise the total area exposed for dust generation at any time. Interim rehabilitation strategies must be employed when areas prone to dust generation cannot yet be permanently rehabilitated.

Note: It is accepted that parts of the site that are progressively rehabilitated may be subject to further disturbance in the future.

Rehabilitation Management Plan

39. The Applicant must prepare a Rehabilitation Management Plan for the development to the satisfaction of DRG must, This plan must:

(a) be submitted to DRE for approval by the end of June 2015;
(b) be prepared in consultation with the Department, DoI, OEH, MSC and SC;
(c) be prepared in accordance with relevant DRE guidelines;
(d) describe how the rehabilitation of the site would be integrated with the implementation of the biodiversity offset strategy;
(e) include a detailed performance and completion criteria for evaluating the performance of the rehabilitation of the site, and triggering remedial action (if necessary);
(f) describe the measures that would be implemented to ensure compliance with the relevant conditions of this consent, and address all aspects of rehabilitation including mine closure, final landform including final voids and final land use;
(g) include interim rehabilitation where necessary to minimise the area exposed for dust generation;
(h) include a program to monitor and report on the effectiveness of the measures, and progress against the detailed performance and completion criteria; and
(i) build to the maximum extent practicable on other management plans required under this consent.

The Applicant must implement the management plan as approved by the Secretary.

Note: The Rehabilitation Management Plan may be combined with a Mining Operations Plan, or similar plan, required under a mining lease granted under the Mining Act 1992 for the development.

SCHEDULE 4
ADDITIONAL PROCEDURES

NOTIFICATION OF LANDOWNERS

1. By 31 October 2007, the Applicant must notify the landowners of the land listed in Table 1 that they have the right to an independent review in accordance with Condition 4 of Schedule 4 if they consider that the development is exceeding the relevant impact assessment criteria at any stage during the life of the development.

2. If the results of monitoring required in Schedule 3 identify that impacts generated by the development are greater than the impact assessment criteria, except where this is predicted in the EA, and except where a negotiated agreement has been entered into in relation to that impact, then the Applicant must notify the Secretary and the affected landowners and/or existing or future tenants (including tenants of mine owned properties) accordingly, and provide quarterly monitoring results to each of these parties until the results show that the development is complying with the criteria in Schedule 3.

3. The Applicant must send a copy of the NSW Health fact sheet entitled 'Mine Dust and You' (as may be updated from time to time) to advise landowners and/or existing or future tenants (including tenants of mine owned properties) of the possible health and amenity impacts associated with exposure to particulate matter, to the satisfaction of the Secretary where the predictions in the EA identify that the dust emissions generated by the development are likely to be greater than the air quality criteria in Schedule 3.

INDEPENDENT REVIEW

4. If a landowner of privately-owned land considers the development to be exceeding the impact assessment criteria in Schedule 3, then he/she may ask the Secretary in writing for an independent review of the impacts of the development on his/her land.

   If the Secretary is satisfied that an independent review is warranted, the Applicant must within 2 months of the Secretary decision:

   (a) commission a suitably qualified, experienced and independent expert, whose appointment has been approved by the Secretary, to:
   - consult with the landowner to determine his/her concerns;
   - conduct monitoring on the land, to determine whether the development is complying with the relevant impact assessment criteria in Schedule 3; and
   - if the development is not complying with these criteria then:
     - determine if more than one mine is responsible for the exceedances; and if so the relevant share of each mine regarding the impact of the land;
     - identify measures that could be implemented to ensure compliance with the relevant criteria;

   (b) give the Secretary and landowner a copy of the independent review.

5. If the independent review determines that the development is complying with the relevant impact assessment criteria in Schedule 3, then the Applicant may discontinue the independent review with the approval of the Secretary.

6. If the independent review determines that the development is not complying with the relevant impact assessment criteria in Schedule 3, and that the development is primarily responsible for this non-compliance, then the Applicant must:

   (a) take all reasonable and feasible measures, in consultation with the landowner and appointed independent expert to ensure that the development complies with the relevant criteria; or

   (b) secure a written agreement with the landowner to allow exceedances of the criteria in Schedule 3,

   to the satisfaction of the Secretary.

   If the additional monitoring referred to above subsequently determines that the development is complying with the relevant criteria in Schedule 3, then the Applicant may discontinue the independent review with the approval of the Secretary.

   If measures referred to in (a) do not achieve compliance with the criteria in Schedule 3, and the Applicant cannot secure a written agreement with the landowner to allow these exceedances within 3 months, then upon receiving a written request from the landowner, then the Applicant or landowner may refer the matter to the Secretary for resolution.

SCHEDULE 5
ENVIRONMENTAL MANAGEMENT, AUDITING & REPORTING

ENVIRONMENTAL MANAGEMENT STRATEGY

1. The Applicant must prepare an Environmental Management Strategy for the development to the satisfaction of the Secretary. This strategy must:
   (a) provide the strategic context for environmental management of the development;
   (b) identify the statutory requirements that apply to the development;
   (c) describe in general how the environmental performance of the development would be monitored and managed;
   (d) describe the procedures that would be implemented to:
      - keep the local community and relevant agencies informed about the operation and environmental performance of the development;
      - receive, handle, respond to, and record complaints;
      - resolve any disputes that may arise during the course of the development;
      - respond to any non-compliance;
      - manage cumulative impacts; and
      - respond to emergencies;
   (e) describe the role, responsibility, authority, and accountability of all the key personnel involved in environmental management of the development; and
   (f) include:
      - copies of various strategies, plans and programs that are required under the conditions of this consent once they have been approved; and
      - a clear plan depicting all the monitoring to be carried out in relation to the development.

   The Applicant must implement the approved strategy as approved from time to time by the Secretary.

2. DELETED.

ANNUAL REVIEW

3. Each year, the Applicant must prepare an Annual Review to the satisfaction of the Secretary. This review must:
   (a) identify the standards and performance measures that apply to the development;
   (b) describe the works carried out in the last 12 months;
   (c) describe the works that will be carried out in the next 12 months;
   (d) include a comprehensive review of monitoring results and complaints received during the past year, and compare the results against:
      - limits/criteria in this consent, statutory requirements and performance measures/criteria;
      - monitoring results from previous years; and
   (e) predictions in the latest EA;
   (f) identify any trends in the monitoring over the life of the development;
   (g) identify and discuss any non-compliance during the previous year and describe what actions were (or are being) taken to ensure compliance;
   (h) identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and
   (i) describe what measures will be implemented over the next year to improve the environmental performance of the development.

INDEPENDENT ENVIRONMENTAL AUDIT

4. Within a year of the approval of modification application DA 305-11-01 MOD 5, and every 3 years thereafter, unless the Secretary directs otherwise, the Applicant must commission and pay the full cost of an Independent Environmental Audit of the development. This audit must:
   (a) be conducted by a suitably qualified, experienced, and independent team of experts whose appointment has been endorsed by the Secretary;
   (b) include consultation with relevant agencies;
   (c) assess the environmental performance of the development, and its effects on the surrounding environment;
   (d) assess whether the development is complying with the relevant standards, performance measures, and statutory requirements;
   (e) review the adequacy of any strategy/plan/program required under this consent; and, if necessary,
   (f) recommend measures or actions to improve the environmental performance of the development, and/or any strategy/plan/program required under this consent.

Note: This audit team must be led by a suitably qualified auditor and include experts in the field of mine rehabilitation and mine closure.

5. Within 6 weeks of completing this audit, or as otherwise agreed by the Secretary, the Applicant must submit a copy of the audit report to the Secretary with a response to any recommendations contained in the audit report.

6. DELETED.

COMMUNITY CONSULTATIVE COMMITTEE

7. The Applicant must maintain a Community Consultative Committee for the development to the satisfaction of the Secretary. The CCC must be operated in accordance with the *Department's Community Consultative Committee Guidelines: State Significant Projects (2016)*.

Notes:
- *The CCC is an advisory committee. The Department and other relevant agencies are responsible for ensuring that the Applicant complies with this consent.*
- *In accordance with the Guideline, the Committee should comprise an independent chair and appropriate representation from the Applicant, Councils and the community.*

8. DELETED.

ACCESS TO INFORMATION

9. By the end of February 2015, and for the remainder of the life of the development, the Applicant must:
   (a) make the following information publicly available on its website:
   - a copy of all current statutory approvals for the development;
   - a copy of the current environmental management strategy and associated plans and programs;
   - a summary of monitoring results of the development, which have been reported in accordance with the various plans and programs approved under the conditions of this consent;
   - a complaints register, which is to be updated in a monthly basis;
   - a copy of the CCC minutes;
   - a copy of any Annual Reviews (over the last 5 years);
   - a copy of any Independent Environmental Audit, and the Applicant's response to the recommendations in any audit;
   - any other matter required by the Secretary; and

   (b) keep this information up to date

   to the satisfaction of the Secretary.

REVISION OF STRATEGIES, PLANS AND PROGRAMS

10. Within 3 months of:
   (a) the submission of an Annual Review under condition 3 above;
   (b) the submission of an incident report under condition 11 below;
   (c) the submission of an audit under condition 4 above; or
   (d) any modification to the conditions of this consent,

   the Applicant must review, and if necessary revise, the strategies, plans, and programs required under this consent to the satisfaction of the Secretary. Where this review leads to revisions in any such document, then within 2 months of the review the revised document must be submitted to the Secretary for approval, unless the conditions in Schedule 3 provide for an alternative timing and/or the Secretary agrees otherwise.

Note: This is to ensure the strategies, plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the development.

INCIDENT NOTIFICATION

11. The Applicant must immediately notify the Department and any other relevant agencies immediately after it becomes aware of an incident. The notification must be in writing to compliance@planning.nsw.gov.au and identify the development (including the development application number and name) and set out the location and nature of the incident.

NON-COMPLIANCE NOTIFICATION

12. Within seven days of becoming aware of a non-compliance, the Applicant must notify the Department of the non-compliance. The notification must be in writing to compliance@planning.nsw.gov.au and identify the development (including the development application number and name), set out the condition of this approval that the development is non-compliant with, the way in which it does not

comply and the reasons for the non-compliance (if known) and what actions have been, or will be, undertaken to address the non-compliance.

***Note**: A non-compliance which has been notified as an incident does not need to also be notified as a non-compliance*

13. Any condition of this consent that requires the carrying out of monitoring or an environmental audit, whether directly or by way of a plan, strategy or program, is taken to be a condition requiring monitoring or an environmental audit under Division 9.4 of Part 9 of the EP&A Act. This includes conditions in respect of incident notification, reporting and response, non-compliance notification, compliance report and independent audit.

***Note**: For the purposes of this condition, as set out in the EP&A Act, "monitoring" is monitoring of the development to provide data on compliance with the consent or on the environmental impact of the development, and an "environmental audit" is a periodic or particular documented evaluation of the development to provide information on compliance with the consent or the environmental management or impact of the development.*

APPENDIX 1
SCHEDULE OF LAND

LOCAL GOVERNMENT AREA: MUSWELLBROOK

LOT	DP	COUNTY	PARISH
Part C.R 197 MS 8378		Durham	Liddell
13	Sec C 6841	Durham	Liddell
40	Sec B 6842	Durham	Liddell
1	48556	Durham	Liddell
2	48556	Durham	Liddell
3	48556	Durham	Liddell
1	*211043*	*Durham*	*Liddell*
2	*231880*	*Durham*	*Liddell*
3	231880	Durham	Liddell
1	237654	Durham	Liddell
2	237654	Durham	Liddell
3	237654	Durham	Liddell
4	237654	Durham	Liddell
5	*237654*	*Durham*	*Liddell*
6	237654	Durham	Liddell
7	*237654*	*Durham*	*Liddell*
8	*237654*	*Durham*	*Liddell*
2	574166	Durham	Liddell
12	579783	Durham	Liddell
1	583527	Durham	Liddell
135	752470	Durham	Liddell
31	837350	Durham	Liddell
Pt Lot 33	862516	Durham	Liddell
34	862516	Durham	Liddell
37	862517	Durham	Liddell
Pt Lot 380	869839	Durham	Liddell
1	1012624	Durham	Liddell
101	1053098	Durham	Liddell
102	1103268	Durham	Liddell
1	1103323	Durham	Liddell
1	1193227	Durham	Liddell
3	1193227	Durham	Liddell
4	1193227	Durham	Liddell
Various unformed Crown road reserves		Durham	Liddell

*Note: Lots shown in **bold** font are part of the Cumnock CHPP site.*
*Lots shown in **italic** font are part of the Main Northern Railway easement.*

LOCAL GOVERNMENT AREA: SINGLETON

1	48556	Durham	Liddell
1	135026	Durham	Liddell
1	**213065**	**Durham**	**Liddell**
3	**213065**	**Durham**	**Liddell**
2	233019	Durham	Liddell
1	237655	Durham	Liddell
2	237655	Durham	Liddell
3	237655	Durham	Liddell
1	237766	Durham	Liddell
2	237766	Durham	Liddell
4	237766	Durham	Liddell
5	237766	Durham	Liddell
4	255403	Durham	Liddell
Pt Lot 6	255403	Durham	Liddell
1	**403032**	**Durham**	**Liddell**
2	*534888*	*Durham*	*Liddell*
32	535087	Durham	Liddell
Pt Lot 32	545601	Durham	Liddell
1	*565031*	*Durham*	*Liddell*
80	607296	Durham	Liddell
Pt Lot 81	607296	Durham	Liddell
2	619383	Durham	Liddell
43	654013	Durham	Liddell
Pt Lot 101	700429	Durham	Liddell
225	752470	Durham	Liddell
232	752470	Durham	Liddell
101	**825292**	**Durham**	**Liddell**
25	841160	Durham	Liddell
22	841165	Durham	Liddell
23	841165	Durham	Liddell
24	841165	Durham	Liddell
Pt Lot 201	848078	Durham	Liddell
100	858173	Durham	Liddell
2	859544	Durham	Liddell
Pt Lot 33	862516	Durham	Liddell
35	862516	Durham	Liddell
Pt Lot 36	862516	Durham	Liddell
2	865784	Durham	Liddell/Vane
352	867083	Durham	Liddell
Pt Lot 353	867083	Durham	Liddell
354	867083	Durham	Liddell
22*	869399	Durham	Liddell
31	870789	Durham	Liddell
32	870789	Durham	Liddell

Pt Lot 211	975271	Durham	Liddell
219	975271	Durham	Liddell
601	1019325	Durham	Liddell
102	1103268	Durham	Liddell
1	1103323	Durham	Liddell
181	1126510	Durham	Liddell
602	1019325	Durham	Liddell
11	6842	Durham	Liddell
24	6830	Durham	Goorangoola
1	48490	Durham	Goorangoola
Various unformed Crown road reserves		Durham	Liddell

*Note: Lots shown in **bold** font are part of the Cumnock CHPP site.*
*Lots shown in **italic** font are part of the Main Northern Railway easement.*
*Lots identified with * are the RUM site, incorporating the RCCP facility.*

APPENDIX 2
DEVELOPMENT LAYOUT PLANS

Figure: Development layout plan

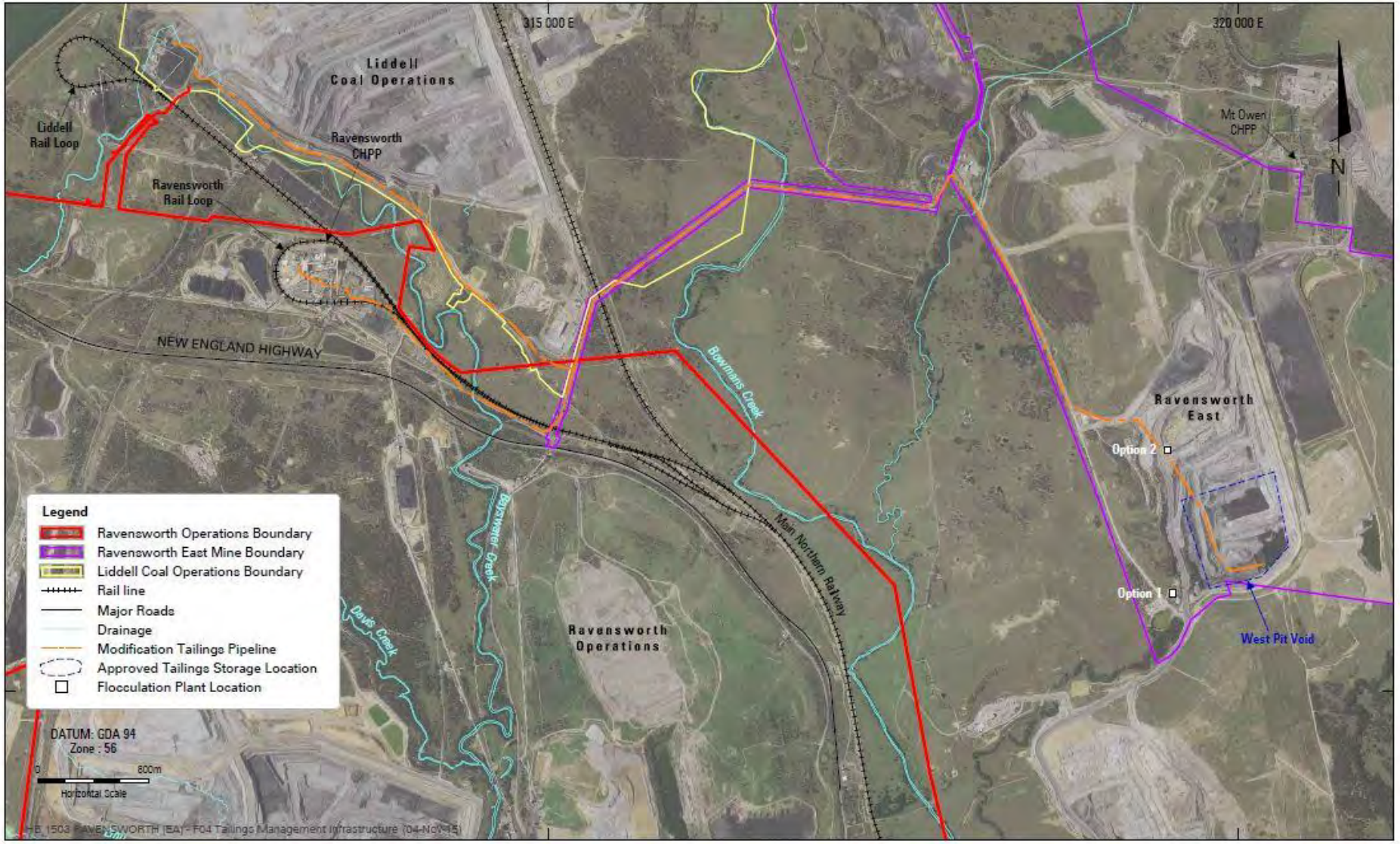

Figure: *Greater Ravensworth tailings management infrastructure*

APPENDIX 3
CONCEPTUAL FINAL LANDFORM

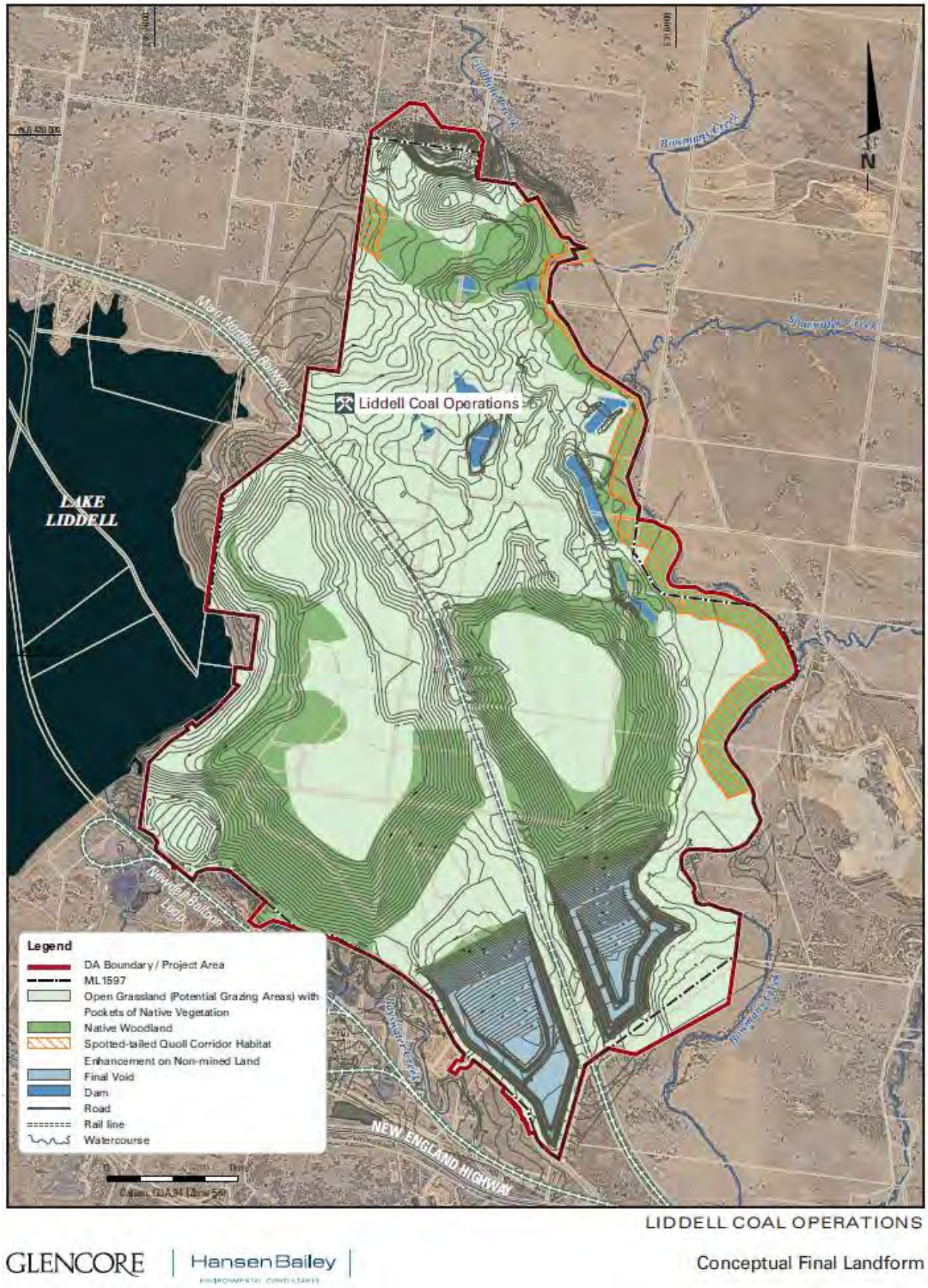

***Figure**: Conceptual Final Landform*

APPENDIX 4

Deleted

APPENDIX 5
RECEIVER LOCATIONS

***Figure**: Sensitive Receptors*

APPENDIX 6
NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

1. The noise criteria in Table 1 of Schedule 3 are to apply under all meteorological conditions except the following:
   (a) during periods of rain or hail;
   (b) average wind speed at microphone height exceeds 5 m/s;
   (c) wind speeds greater than 3 m/s measured at 10 m above ground level; or
   (d) temperature inversion conditions greater than 3°C/100 m, or alternatively stability class F and G.

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station on or in the vicinity of the site.

Compliance Monitoring

3. Attended monitoring is to be used to determine compliance with the relevant conditions of this consent.

4. This monitoring must be carried out at least once a month (but at least two weeks apart), unless the Secretary directs otherwise.

   Note: The Secretary may direct that the frequency of attended monitoring increase or decrease at any time during the life of the development.

5. Unless otherwise agreed with the Secretary, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (as amended from time to time), in particular the requirements relating to:
   (a) monitoring locations for the collection of representative noise data;
   (b) meteorological conditions during which collection of noise data is not appropriate;
   (c) equipment used to collect noise date, and conformity with Australian Standards relevant to such equipment; and
   (d) modifications to noise data collected including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration, with the exception of applying appropriate modifying factors for low frequency noise during compliance testing. This should be undertaken in accordance with Fact Sheet C of the NSW Noise Policy for Industry (EPA, 2017).

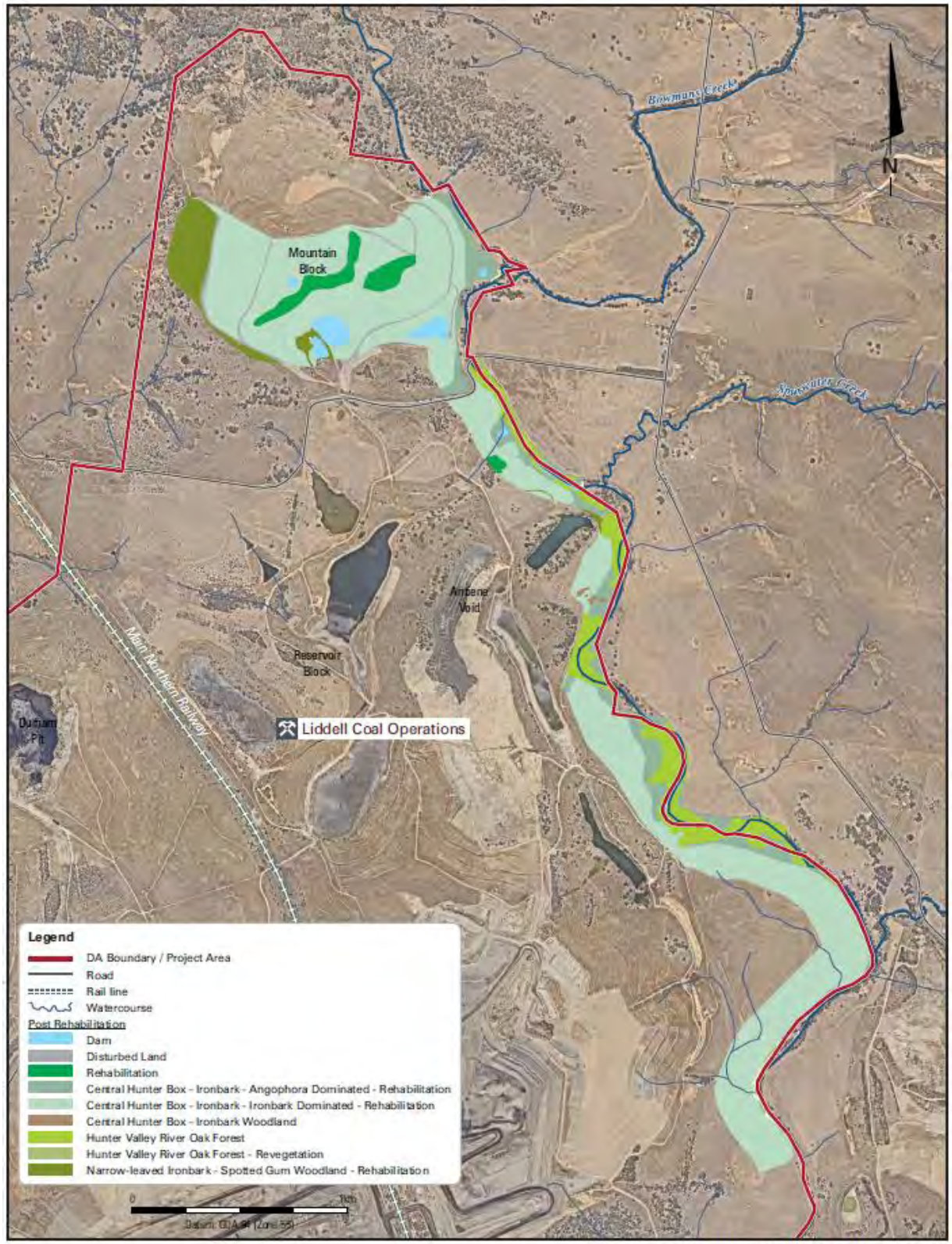

***Figure**: Post Rehabilitation of Bowmans Creek Riparian Corridor*

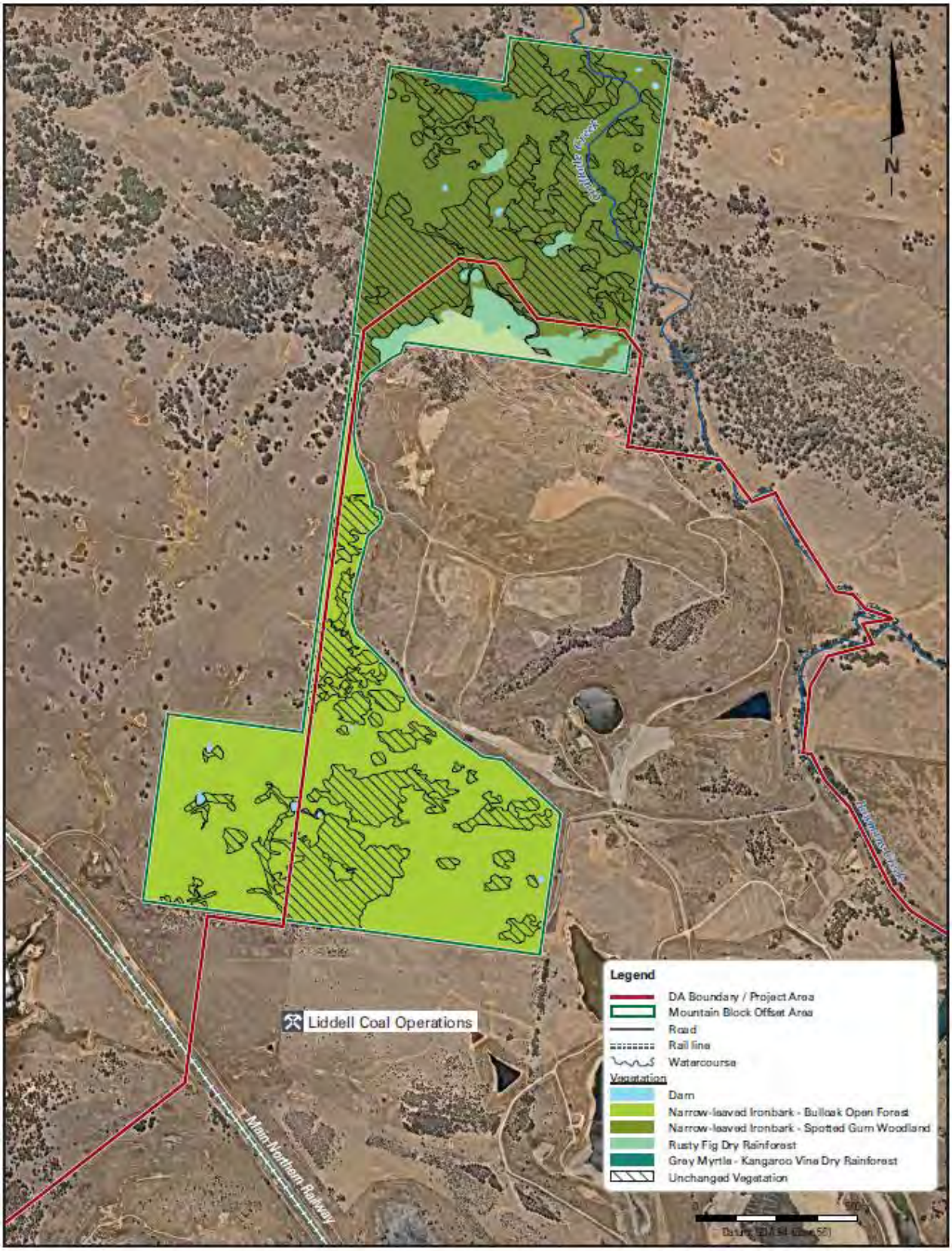

***Figure**: Post Rehabilitation of Mountain Block Offset Area*

APPENDIX 8
GENERAL TERMS FOR THE PLANNING AGREEMENT WITH SINGLETON COUNCIL

Project	Description	Applicant Contribution	Funding Time Frame
Hebden Hall/Rural Halls	Relocate and upgrade the existing Hebden Hall onto a parcel of land adjacent to the community	$200,000	Initiated following approvals. Capital project funded and completed by Applicant. Any remain funds to be allocated to SC Rural Halls
Lake St Clair Recreational Park	Contribution to SC for the construction of a tourism centre at Lake St Clair	$300,000 over a 5 year term $75,000 per annum over the first 2 years with $50,000 per annum thereafter for 3 years	End of quarter following DA approval
Rose Point Netball Amenities Upgrade	Contribution towards funding of upgrade	$80,000	End of quarter following DA approval Contribution to be paid upon request from SC.

APPENDIX 9
GENERAL TERMS FOR THE PLANNING AGREEMENT WITH MUSWELLBROOK SHIRE COUNCIL

Description	Applicant Contribution	Funding Time Frame
Liddell Coal Project including all prior modifications	$320,000	The payment will be paid in two annual instalments within two years of the date of approval of Modification 5.

APPENDIX 10
ENVIRONMENTAL IMPACT ASSESSMENTS

- EIS - Development application 305-11-2001 and supporting information including:
  - *Liddell Colliery Continued Operations Environmental Impact Statement*, dated October 2001 and prepared by Umwelt (Australia) Pty Limited;
  - *Response to NPWS Request for Further Information in Relation to the Archaeological Assessment, Liddell EIS* prepared by Umwelt (Australia) Pty Limited and dated December 2001, as supplemented by the additional information dated 20 February 2002;
  - correspondence submitted to the Department and SC in response to the request for addition information from SC and dated 20 December 2001;
  - *Response to Submissions Liddell Colliery Environmental Impact Statement*, prepared by Umwelt (Australia) Pty Limited and dated March 2002;
  - *Response to EPA request for further information Liddell Colliery Continued Operations Environmental Impact Statement* prepared by Umwelt (Australia) Pty Limited and dated March 2002;
  - *Continued Operations of Liddell Colliery – Revised Development Application Area* prepared by Umwelt (Australia) Pty Limited and dated 13 March 2002; and
  - additional air quality contours provided to the Department by Umwelt (Australia) Pty Limited relating to PM_{10} concentrations on 7 May 2002;
- MOD 2 – (approved 8 July 2007) modification application and supporting information including:
  - *Liddell Colliery Modification to Development Consent Environmental Assessment*, prepared by Umwelt (Australia) Pty Limited and dated December 2006;
  - *Response to Submissions Environmental Assessment for Liddell Colliery Modification to Development Consent*, prepared by Umwelt (Australia) Pty Limited and dated March 2007;
  - *Response to Submissions from the Roads and Traffic Authority and the Hunter Regional Development Committee Environmental Assessment for Liddell Colliery Modification to Development Consent*, prepared by Umwelt (Australia) Pty Limited and dated April 2007; and
  - *Revised Statement of Commitments for the Liddell Development Consent Modification,* prepared by Umwelt (Australia) Pty Limited and dated July 2007 ;
- MOD 3 – (approved 7 May 2008) modification application DA305-11-01 and accompanying Statement of Environmental Effects, titled *Liddell Coal Operations Pty Limited Statement of Environmental Effects for Liddell Colliery Modification to Development Consent*, prepared by Umwelt Australia Pty Limited, and dated February 2008;
- MOD 4 – (approved 27 October 2009) modification application and accompanying document and site plans prepared by Umwelt Australia Pty Limited, and dated 7 October 2009; and
- MOD 5 – (approved 1 December 2014) modification application and accompanying document and site plans prepared by SLR, and dated September 2013;
- MOD 6 – modification application DA 305-11-01 – MOD 6 and accompanying documents and site plans prepared by Hansen Bailey and dated November 2015.

Appendix C - Land Ownership Register

Owner	Lot	DP
Coal and Allied	2	574166
Coal and Allied	2	808431
Coal and Allied	1	808431
Coal and Allied	321	860535
Coal and Allied	1	125406
Coal and Allied	2	125406
Coal and Allied	3	125406
Coal and Allied	4	125406
Coal and Allied	5	125406
Coal and Allied	6	125406
Coal and Allied	7	125406
Coal and Allied	8	125406
Coal and Allied	9	125406
Coal and Allied	10	125406
Coal and Allied	11	125406
Coal and Allied	182	975271
Coal and Allied	183	975271
Coal and Allied	184	975271
Coal and Allied	192	975271
Coal and Allied	193	975271
Coal and Allied	211	975271
Coal and Allied	212	975271
Coal and Allied	217	975271
Coal and Allied	218	975271
Coal and Allied	219	975271
Coal and Allied	221	975271
Coal and Allied	11	858172
Coal and Allied	380	869839
Coal and Allied	1	211043
Coal and Allied	103	1103268
Coal and Allied	1000	1153575
LCO	1	567124
LCO	132	752470
LCO	313	549456
LCO	10	6841
LCO	3	233020
LCO	2	113736
LCO	Z	373693
LCO	139	752470
LCO	1	1128333
LCO	1	860901
LCO	3	532671
LCO	311	549456
LCO	138	752470
CUMNOCK NO.1 COLLIERY PTY LIMITED 90%, ICRA CUMNOCK PTY LIMITED 10%	1	403032
CUMNOCK NO.1 COLLIERY PTY LIMITED 90%, ICRA CUMNOCK PTY LIMITED 10%	1001	1153575
CUMNOCK NO.1 COLLIERY PTY LIMITED 90%, ICRA	3000	1132357

Owner	Lot	DP
CUMNOCK PTY LIMITED 10%		
CUMNOCK NO.1 COLLIERY PTY LIMITED 90%, ICRA CUMNOCK PTY LIMITED 10%	1	213065
CUMNOCK NO.1 COLLIERY PTY LIMITED 90%, ICRA CUMNOCK PTY LIMITED 10%	101	825292
CUMNOCK NO.1 COLLIERY PTY LIMITED 90%, ICRA CUMNOCK PTY LIMITED 10%	16	848095
CUMNOCK NO.1 COLLIERY PTY LIMITED 90%, ICRA CUMNOCK PTY LIMITED 10%	3	213065
Ravensworth Operations Pty Limited	2	1171724
Cumnock No 1 Colliery Pty Ltd 90% ICRA Cumnock Pty Limited 10%	1	1175191
Ravensworth Operations Pty Limited	1	1171724
CUMNOCK NO.1 COLLIERY PTY LIMITED 90%, ICRA CUMNOCK PTY LIMITED 10%	1	859924
Resource Pacific Pty Limited	100	868268
Resource Pacific Pty Limited	602	1019325
Resource Pacific Pty Limited	21	869399
Resource Pacific P/L 53.4 Cumnock No.1 Colliery P/L 32.04 Muswellbrook Coal Company 11 ICRA Cumnock P/L 3.56	22	869399
Glendell Tenements Pty Ltd	3	232149
LIDDELL SOUTHERN TENEMENTS PTY LIMITED	32	545601
LIDDELL SOUTHERN TENEMENTS PTY LIMITED	228	752470
LIDDELL SOUTHERN TENEMENTS PTY LIMITED	2	534889
LIDDELL SOUTHERN TENEMENTS PTY LIMITED	1	1089438
LIDDELL SOUTHERN TENEMENTS PTY LIMITED	2	1089438
LIDDELL TENEMENTS PTY LIMITED	1	1012624
LIDDELL TENEMENTS PTY LIMITED	31	870789
SAVAGE COAL P/L 35% GABUME P/L 32.5% MITSUI MATSUSHIMA AUST 32.5%	33	862516
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	353	867083
SAVAGE COAL P/L 35% GABUME P/L 32.5% MITSUI MATSUSHIMA AUST 32.5%	4	237654
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	354	867083
LIDDELL TENEMENTS PTY LIMITED	35	862516
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	101	1053098
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	37	862517
LIDDELL TENEMENTS PTY LIMITED	1	237655
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	2	48556
LIDDELL TENEMENTS PTY LIMITED	34	862516
LIDDELL TENEMENTS PTY LIMITED	229	752470
LIDDELL TENEMENTS PTY LIMITED	1	583527
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	1	48556

Owner	Lot	DP
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	1	237766
SAVAGE COAL P/L 35% GABUME P/L 32.5% MITSUI MATSUSHIMA AUST 32.5%	31	837350
LIDDELL TENEMENTS PTY LIMITED	32	870789
LIDDELL TENEMENTS PTY LIMITED	12	579783
LIDDELL TENEMENTS PTY LIMITED	20	841165
LIDDELL TENEMENTS PTY LIMITED	100	858173
LIDDELL TENEMENTS PTY LIMITED	24	841165
LIDDELL TENEMENTS PTY LIMITED	21	841165
LIDDELL TENEMENTS PTY LIMITED	23	841165
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	201	848078
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	4	255403
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	81	607296
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	6	255403
Glencore Coal (NSW) Pty Limited	181	1126510
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	135	752470
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	136	752470
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	43	654013
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	42	6842
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	102	1103268
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	1	48536
SAVAGE COAL P/L 35% GABUME P/L 32.5% MITSUI MATSUSHIMA AUST 32.5%	3	237654
LIDDELL COAL OPERATIONS PTY LIMITED	3	48556
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	3	231880
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	36	862516
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	6	237654
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	1	237654
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	3	237655
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	13	6841
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	131	752470

Owner	Lot	DP
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	80	607296
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	225	752470
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	40	6842
ENEX LIDDELL PTY LIMITED 67.5% MITSUI MATSUSHIMA AUSTRALIA PTY LIMITED 32.5%	1	1103323
Enex Liddell Pty Limited 35% Gabume Pty Ltd 32.5% Mitsui Matsushima Australia Pty Limited 32.5%	4	1193227
LIDDELL COAL OPERATIONS PTY LIMITED	2	48536
Macquarie Generation	102	1053098
Macquarie Generation	13	247945
Macquarie Generation	15	247945
Macquarie Generation	2	628645
Macquarie Generation	601	1019325
Macquarie Generation	1	658099
Macquarie Generation	1	574166
Pacific Power	1	645240
Macquarie Generation	2012	1151790
Macquarie Generation	1	1142103
Macquarie Generation	1000	1132937
Macquarie Generation	36	255215
Macquarie Generation	37	255215
Macquarie Generation	4	774680
Macquarie Generation	32	255215
Macquarie Generation	1	236869
Macquarie Generation	33	255215
AGL Macquarie Generation	3	1193186
Ravensworth Operations Pty Limited	1	135027
Ravensworth Operations Pty Limited	202	848078
Mt Owen Pty Limited	4	774683
Ravensworth Operations Pty Limited	1	135026
Ravensworth Operations Pty Limited	1	303842
Ravensworth Operations Pty Limited	352	867083
Mt Owen Pty Limited	25	841160
Mt Owen Pty Limited	21	6842
Mt Owen Pty Limited	355	867083
Mt Owen Pty Limited	3	774683
Mt Owen Pty Limited	22	841165
Mt Owen Pty Limited	180	858299

Appendix D - Risk to Rehabilitation Broad Brush Risk Assessment

Risk Rating

Risk Ratings were assigned by combining the consequence rating and the likelihood rating. A numerical risk rating, between 1 and 25, was allocated for each aspect using the Glencore Coal Assets Australia Risk Matrix Tool. This aims to identify the priority and level of management action(s) required to reduce the risk rating. According to Glencore's Risk Matrix Tool and as identified in **Table A.3**, the following risk ratings were used:

Table A.3: Risk Rating Matrix

	E - Rare	D - Unlikely	C - Possible	B - Likely	A - Almost Certain
5 Catastrophic	15 (M)	19 (H)	22 (H)	24 (H)	25 (H)
4 Major	10 (M)	14 (M)	18 (H)	21 (H)	23 (H)
3 Moderate	6 (L)	9 (M)	13 (M)	17 (H)	20 (H)
2 Minor	3 (L)	5 (L)	8 (M)	12 (M)	16 (M)
1 Negligible	1 (L)	2 (L)	4 (L)	7 (M)	11 (M)

Table A.4: Risk Rating Classification

Consequence Category	Consequence Type	Ownership	Action
Cat 5	Catastrophic Hazard	Divisional / Functional / Operational / Asset Leadership	• Quantitative or semi-quantitative risk assessment required. • Capital expenditure will be justified to achieve ALARP ('As Low As Reasonably Practicable'). • Catastrophic Hazard Management Plans (CHMP) must be implemented where practical, Crisis Management plans (CMP) tested and Catastrophic Event Recovery Plans (CERP) developed.
Cat 4 (Health& Safety Consequence)	Fatal Hazard	Divisional / Functional / Operational / Asset Leadership	• Glencore SafeWork Fatal Hazard Protocols or appropriate management plans must be applied. • Capital expenditure will be justified to achieve ALARP.
Risk Rank	**Risk Rating**	**Ownership**	**Action**
17 to 25	High Risk	Divisional / Functional / Operational / Asset Leadership	• Install additional HARD and SOFT controls to achieve ALARP. • Capital expenditure will be justified to achieve ALARP
7 to 16	Medium Risk	Operational / Asset Leadership	• Install additional HARD and SOFT controls if necessary to achieve ALARP. • Capital expenditure may be justified
1 to 6	Low Risk	Operational / Asset Leadership	• Install additional controls if necessary to achieve ALARP. • Capital expenditure is not usually

The risk ratings assigned to each potential risk identified were dependent on group consensus. **Table A.5** outlines the key identified risks and associated inherent risk ratings. The ratings assume that the risks are untreated i.e. have not been addressed by specific risk mitigation measures.

Table A.2: Consequence Criteria

	Health & Safety	Environment	Financial Impact	Image & Reputation/ Community	Legal & Compliance
5 Catastrophic	• Multiple fatalities • Multiple cases of permanent total disability / health effects	• Environmental damage or effect (permanent; >10 years) • Requires major remediation	• >$600M investment return • >$100M operating profit • >$20M property damage	• Negative media coverage at international level • Loss of multiple major customers or large proportion of sales contracts • Loss of community support • Significant negative impact on the share price	• Major litigation / prosecution at Glencore corporate level
4 Major	• Fatality or permanent incapacity / health effects	• Long-term (2 to 10 years) impact • Requires serious remediation	• $60-600M investment return • $20-100M operating profit • $2-20M property damage	• Negative media coverage at a national level • Scrutiny from government and NGOs • Complaints from multiple “final” customers • Loss of major customer • Loss of community support • Negative impact on share price	• Major litigation / prosecution at Division level
3 Moderate	• Lost time / disabling injury / occupational health effects / multiple medical treatments	• Medium-term (<2 years) impact • Requires moderate remediation	• $6-60M investment return • $2-20M operating profit • $200K-2M property damage	• Negative media coverage at local / regional level over more than one day • Complaint from a “final” customer • Off-spec product • Community complaint resulting in social issue	• Major litigation / prosecution at Operation level
2 Minor	• Medical Treatment Injury (MTI) / occupational health effects • Restricted Work Injury (RWI)	• Short-term impact • Requires minor remediation	• $600K-6M investment return • $200K-20M operating profit • $10-200K property damage	• Complaint received from stakeholder or community • Negative local media coverage	• Regulation breaches resulting in fine or litigation
1 Negligible	• First Aid Injury (FAI) / illness	• No lasting environmental damage or effect • Requires minor or no remediation	• <$600K investment return • <$200K operating profit • <$10K property damage	• Negligible media coverage	• Regulation breaches without fine or litigation

Environmental Risk Assessment: Liddell Open Cut - MOP Rehabilitation Risk Assessment

Appendix B

	Step 2: Assess Type; Key Elements- These change depending on TYPE of Risk Assessment		Step 3: Identify the risks, causes and potential consequences			Step 4: Identify the existing controls to manage the identified risks	Step 5: Determine RCE	Steps 6, 7 & 8: Determine the Expected Consequence / Likelihood applicable to the Expected Consequence / Current level of risk			
Site	Type of Risk Assessment	Key Element (CURA Context/Category)	Risk Description - Something happens……	Consequence - resulting in:	Causes - Caused by	Existing Control Description	Risk Control Effectiveness	Expected Consequence Category	Expected Risk Consequence	Risk Likelihood	Current Risk Rating
Liddell Open Cut	Environmental	Geology and Geochemistry	Delay to achieve the rehabilitation outcomes required within budget and desired timeframe	Increased costs/resources associated with meeting rehab criteria	Soils/substrate material properties not suitable for the post mining vegetation Dispersive soils	1. Rehabilitation Procedure - Geochemical testing 2. Dumping Procedure Selective emplacment of mineral waste materials - spontaneous combustion effected material and rejects not tipped at final surface	Satisfactory	Financial Impact	1	C	4
Liddell Open Cut	Environmental	Geotechnical	Instability of Highwalls (e.g. Railway pillar)	Damage to infrastructure Landform instability	Less than adequate geotechnical knowledge for mine design	1. Ground and Strata Failure Management Plan - High wall design are reviewed by suitably qualified engineer 2. Geotechnical Monitoring Procedure - Regular geotech monitoring and assessment.	Satisfactory	Financial Impact	3	D	9
Liddell Open Cut	Environmental	Geotechnical	instability of Mountain Block rehabilitation	Delay to reach closure and relinquishment of the lease Additional costs for rework Landform instability	Ground failure Exposed sodic soils LTA vegetation cover Erosion from surface water	1. Mining Operations Plan - Remediation activies undertaken during 2020 in accordance with revised landform design has been reviewed by suitable qualified engineers. activities involved QA/QC of construction. 2. Mining Operations Plan - Ongoing monitoring program to review rehabiltiation establishment	Satisfactory	Financial Impact	1	B	7
Liddell Open Cut	Environmental	Acid Mine Drainage	Not considered an issue	Not applicable	Not applicable	Geochemical testing and assessment of mined strata indicates that the over 95% of overburden/interburden materials tested are likely to be Non Acid Forming (NAF), with a significant excess of acid neutralising capacity (ANC) and low leachable salinity.					
Liddell Open Cut	Environmental	Erosion and Sediment Control	Erosion and or uncontrolled discharge offsite of sediment laden water	Erosion impacts on rehab Water pollution	Failure to implement progressive rehab with suitable erosion and sediment controls Failure of existing rehab areas LTA water management system and/or design	1. Water Management Plan a) Closed mine water management system b) standardised erosion and sediment control design and construction. 2. MOP landform drainage design 3. Annual Rehabilitation and Closure Plan 4. Monitoring and maintenance of structures (contour banks, drop structures etc) 5. Ground Disturbance Permit Process 6. Environmental Inspection Systems (refer to EMS) 7. Land cleraing and topsoil stripping procedure 8. Rehabilitation Procedure	Satisfactory	Environment	2	D	5
Liddell Open Cut	Environmental	Soil Type(s) and Suitability	Inadequate volume of topsoils/ subsoils	Delay to reach closure and relinquishment of the lease. Cost of sourcing alternatives	Insufficient suitable resources on within disturbed mining footprint pre-mining to meet required post mining landuse	1. MOP 2. Rehabilitation Procedure a) Direct seeding on spoil b) Sourcing suitable alternatives (organics) c) Topsoil resource register d) soil amelioration such as addition of gypsum 3. Annual Rehabilitation and Closure Plan 4. Land clearing and topsoil stripping procedure - provides for maximum recovery of suitable resources avaliable.	Satisfactory	Financial Impact	1	B	7
Liddell Open Cut	Environmental	Biodiversity	Rehabilitation lacks adequate habitat corridors and connectivity	Delay to reach closure and relinquish lease Additional costs due to delay to establish woodland habitat areas	Failure to achieve habitat connectivity as described in rehabilitation objectives through LTA rehabilitation implementation	1. Annual rehab and closure plan management plan 2. Final landform plan developed with consideration neighbouring woodland areas and offsets 3. MOP - Annual rehab monitoring programs 4. Biodiversity management plan fauna monitoring program 5. Biodiversity Offset Management Plan - Offset strategy in the EA 6. Rehabilitation Procedure - habitat augmentation during landform establishment phase 7. Land clearing Procedure - provides for salvage and reuse of suitable habitat material	Satisfactory	Financial Impact	2	D	5
Liddell Open Cut	Environmental	Biodiversity	Failure to establish key target communities in rehab and offset areas that are consistent with Central Hunter Box Ironbark Woodland within budget and desired timeframe	Delayed lease relinquishment, Not meeting consent rehabiltiation requirements	Not considering requirements in rehab planning (i.e. species mix, topsoil) Failure to manage weeds Fauna grazing pressures (kangaroos, rabbits etc.) are excessive Drought	1. MOP - Rehabiltiation Monitoring Program providing review of rehabilitation performance and trigger of intervention as appropriate 2. Biodiversity Management Plan - Biodiversity Monitoring Program 3. Annual Rehabilitation and Closure Management Plan - Weed and pest control programs	Satisfactory	Environment	2	C	8

Environmental Risk Assessment: Liddell Open Cut - MOP Rehabilitation Risk Assessment

Appendix B

	Step 2: Assess Type; Key Elements- These change depending on TYPE of Risk Assessment		Step 3: Identify the risks, causes and potential consequences			Step 4: Identify the existing controls to manage the identified risks	Step 5: Determine RCE	Steps 6, 7 & 8: Determine the Expected Consequence / Likelihood applicable to the Expected Consequence / Current level of risk			
Site	Type of Risk Assessment	Key Element (CURA Context/Category)	Risk Description - Something happens……	Consequence - resulting in:	Causes - Caused by	Existing Control Description	Risk Control Effectiveness	Expected Consequence Category	Expected Risk Consequence	Risk Likelihood	Current Risk Rating
Liddell Open Cut	Environmental	Biodiversity	Failure to achieve nominated agricultural final land use within budget and desired timeframe	Delayed lease relinquishment, Not meeting consent rehabiltiation requirements	Not considering requirements in rehab planning Failure to manage weeds Inadequate water sources Inadequate soil properties drought	1. MOP - Rehabiltiation Monitoring Program providing review of rehabilitation performance and trigger of intervention as appropriate 2. Biodiversity Management Plan - Biodiversity Monitoring Program 3. Annual Rehabilitation and Closure Management Plan - Weed and pest control programs 4. MOP Grazing trial informed rehabilitation management practices 5. Engagement with local engronomist	**Satisfactory**	Environment	2	D	**5**
Liddell Open Cut	Environmental	Biodiversity (Bowmans Creek corridor)	Failure to establish suitable habitat for the spotted tailed quoll e.g. log/boulder piles	Delay to reach closure and relinquish lease within a desired timeframe and budget.	Failure to achieve habitat connectivity as described in rehabilitation objectives through LTA rehabilitation implementation	1. Annual rehab and closure plan management plan 2. Final landform plan developed with consideration neighbouring woodland areas and offsets 3. MOP - Annual rehab monitoring programs 4. Biodiversity management plan fauna monitoring program 5. Biodiversity Offset Management Plan - Offset strategy in the EA 6. Rehabilitation Procedure - habitat augmentation during landform establishment phase 7. Land clearing Procedure - provides for salvage and reuse of suitable habitat material	**Satisfactory**	Environment	2	D	**5**
Liddell Open Cut	Environmental	Groundwater	Final void water balance - void overtopping	Discharge of saline water, particularly from South Pit void, leading to downstream impacts on water resources Inability to relinquish lease	Groundwater inflows and surface water runoff being different to that predicted in water balance. LTA water infrastructure Failure to implement the final lanform drainage design	1. MOP Final Landform design and drainage design consistent rehabilitation strategy 2. Water management plan provides for monitoring program, review and calibration of water balance 3. Water management plan provides for 3 yearly update of groundwater model 4. The predicted final void level of 67m AHD is well below the spill level of both voids (south pit is 80m AHD and Entrance Pit 95m AHD).	**Satisfactory**	Environment	3	D	**9**
Liddell Open Cut	Environmental	Interactions with underground workings	Not considered a risk to rehab.	Not applicable	Not applicable	Due to age of underground mining, depth and majority of workings now removed by the open cut; there is not considered to be risks to rehabilitation due to underground working interaction.					
Liddell Open Cut	Environmental	Hazardous Materials and Dangerous Goods	Hazardous materials and dangerous goods remaining on the site at closure (e.g. radiation sources)	Breach of licence, exposure of personnel to hazardous materials.	Failure to identify HAZMAT requirements when decomissioning infrastructure areas	1. Radiation management plan Gauge licences 2. Hazardous Materials Registers (Known locations of PCBs and similar assets) 3. Waste management plan 4. Dangerous goods registers in chemalert and hard copy 5. Phase 1 Contaminated Land Assessment 6. Detailed mine closure plan to develop rehabiltiation plans for infrastructure areas (MIA/CHPP) 7. Asbestos Management Plan and Survey Report	**Satisfactory**	Environment	2	E	**3**
Liddell Open Cut	Environmental	Mine Subsidence and Settlement	Settlement of rehab landform resulting in unstable landforms and impact on water drainage structures (contour)	landform erosion	Settlement of dumps	1. Spon com management plan provides for management of hot material 2. MOP Annual rehabiltation monitoring program - provides for rehabilitaiton performance review and intervention measures as appropriate 3. Envionmental Inspection programs to detect excessive landform erosion or subsidence 4. Annual rehabiltiation and Closure plan provides for action of intervention as required.	**Satisfactory**	Financial Impact	2	D	**5**
Liddell Open Cut	Environmental	Tailings	Failure to achieve appropriate rehabilitation of tailings dams within budget and desired timeframe	landform instability Failure to achieve relinquishment in a desired timeframe and budget	Inadequate tailings rehabilitation design Inadequate execution of tailings capping Insufficient capping material available Settlement of capping and/or tailings	1. Relevant capping management plans 2. Adequate volume of stockpiled capping material 3. Inspection and maintenance during operational use phase 4. Operational and maintenance manuals 5. Tailings Rehabiitation Strategy	**Satisfactory**	Financial Impact	3	C	**13**

Environmental Risk Assessment: Liddell Open Cut - MOP Rehabilitation Risk Assessment

Appendix B

	Step 2: Assess Type; Key Elements- These change depending on TYPE of Risk Assessment		Step 3: Identify the risks, causes and potential consequences			Step 4: Identify the existing controls to manage the identified risks	Step 5: Determine RCE	Steps 6, 7 & 8: Determine the Expected Consequence / Likelihood applicable to the Expected Consequence / Current level of risk			
Site	Type of Risk Assessment	Key Element (CURA Context/Category)	Risk Description - Something happens……	Consequence - resulting in:	Causes - Caused by	Existing Control Description	Risk Control Effectiveness	Expected Consequence Category	Expected Risk Consequence	Risk Likelihood	Current Risk Rating
Liddell Open Cut	Environmental	Contaminated Land	Contaminated land occurring on the site at closure	Potential pollution of water resources Constraint for future land use	Less than adequate site remediation Excessive land contamination	1. Pollution incidence response management plan (PIRMP) 2. Phase 1 Land Contamination 3. Waste Management Plan - Bioremediation area provides for treatment of contaminated material 4. No underground fuel tanks Water monitoring program 5. Hazardous Substances and Dangerous Goods Plan 6. Detailed Mine Closure Plan to verify occurance and extent of land contamination	Satisfactory	Environment	2	D	5
Liddell Open Cut	Environmental	Landform	Fialure to adequately incorporate micro-relief into the landfrom	non conformance with rehabilitation reqiurements	LTA landform design or construction	1. MOP - Final landform plan 2. Informal undulations incorporated into landform shaping	Satisfactory	Legal & Compliance	1	D	2
Liddell Open Cut	Environmental	Heritage	Failure to comply with ACHMP requirements (respreading archaeological sensitive topsoil)	Prosecution Loss of culturally significant site	Unintended interaction with Aboriginal site due to lack of awareness LTA stockpile management	1. Aboriginal and cultural Heritage Management Plan provides for protection of archaeology including training of personnel, Fencing and signage of sites and sensitive topsoil resource 2. Ground Disturbance Permit process	Satisfactory	Legal & Compliance	3	D	9
Liddell Open Cut	Environmental	Air Quality	Rehabilitation not completed in accordance with the MOP schedule leading to increase dust emissions	Increased dust emissions	Exposed areas Delays in being able to commence rehab Rehab failure Drought	1. Annual Rehab and closure Management Plan 2. LOM planning process	Satisfactory	Legal & Compliance	2	D	5
Liddell Open Cut	Environmental	Bushfire	Bushfire damage to rehab	Loss of established rehabilitation Additional costs for rework of rehab Exposed areas (erosion, sediment, dust)	Increased fuel loads onsite Lightning/Storm activity Arson Equipment fire	1. Bushfire Management Plan provids for hazard assessment and appropriate land management activities 2. Land Management and environmental Inspections 3. Maintain suitable access in rehab areas 4. Maintain water sources in proximity to rehab areas 5. hot works permits 6. equipment maintenance	Satisfactory	Financial Impact	2	C	8
Liddell Open Cut	Environmental	Spontaneous Combustion	Spontaneous combustion impacts rehabilitation	less than adequate rehabilitation establishment performance.	Poor management of materials with propensity for spon com	1. Spontaneous combustion management 2. MOP Annual rehabilitation inspections 3. Mine design control inspections and management system 4. Dumping procedures to ensure adequate encapsulation of hot material 5. Mining and handling of hot material procedure	Satisfactory	Financial Impact	1	C	4
Liddell Open Cut	Environmental	Rehabilitation	Not meeting the specific criteria of DA305-11- 01 SCH3 Condition 37 (achieving micro relief and/or void size)	Inability to reach closure and relinquish lease	LTA landform design/plan/formation Unknown external influences (market downturn, legislation changes)	1. LOM and Budget planning processes 2. Annual Rehab & Land Management Planning Compliance verification processes 3. Mine design control	Satisfactory	Legal & Compliance	2	D	5
	22	22	22	22	Subtotal CountA (ignoring hidden values)		20				23

Appendix E - MOP Approval

Our ref: MAAG0008666
LETT0005771

LIDDELL TENEMENTS PTY LIMITED
PO BOX 7
SINGLETON NSW 2330
Attn: Jarith Young

By email: jarith.young@glencore.com.au

Dear Jarith Young

CCL 708 (1973), ML 1313 (1992), ML 1552 (1992) and ML 1597 (1992), LIDDELL TENEMENTS PTY LIMITED Approval of Mining Operations Plan and Assessment of Security Deposit

NOTICE OF APPROVAL

Pursuant to the relevant Condition of CCL 708 (1973), ML 1313 (19920, ML 1552 (1992) and ML 1597 (1992), the Mining Operations Plan (MOP) that was submitted to the Resources Regulator on 19 February 2021 (Department Reference: MAAG0008666) is approved for the period from the date of this approval until 1 December 2023.

It is the responsibility of the Authorisation Holder to ensure that all mining and mining related operations described in this MOP are as approved within the relevant Project Approval or Development Consent and all necessary approvals, consents or permits required under the relevant NSW or Commonwealth regulations have been obtained prior to carrying out the operations.

It is the responsibility of the Authorisation Holder to fulfil their obligations and commitments to the rehabilitation outcomes and performance standards as approved by the relevant consent authority to ensure the rehabilitation outcomes identified are achieved.

ASSESSED DEPOSIT

Approval of this MOP has triggered a review of the assessment of the security deposit required to secure funding for the fulfilment of rehabilitation obligations under the listed Mining Authorisation Number(s). Notice of any change in the security deposit condition related to this MOP approval will be provided separately.

DEFINITIONS

In this letter, words have the meaning given to those terms in the *Mining Act 1992*, unless otherwise specified below.

Assessed Deposit has the meaning given by section 261BC of the *Mining Act 1992*.

Authorisation Holder means the holder of the relevant authorisation(s).

Mining Operations Plan means the project, mining and mining related operations described in the Liddell Glencore, Mining Operations Plan 2021 - 2023 dated 19 February 2021.

Signed under delegation from the Minister for Resources and the Secretary Department of Regional NSW

If you require additional information, please contact the Resources Regulator on 1300 814 609 or via email at nswresourcesregulator@service-now.com.

Yours sincerely,

Peter Ainsworth
Manager Environmental Operations
Resources Regulator

18 March 2021

Other copies provided by email to: Paul Amidy, Ben de Somer, Murray Gregson

Planning, Industry & Environment

Ben Desomer
Environment and Community Manager
Old New England Highway
Ravensworth, NSW, 2333

10/02/2021

Dear Mr Desomer

Liddell Coal (DA305-11-01)
Rehabilitation Management Plan

I refer to the Rehabilitation Management Plan which was submitted to the Department for consultation in accordance with Condition 39 of Schedule 3 of the consent for Liddell Coal (DA-305-11-01).

The Department has carefully reviewed the document and provides the following comments for the Rehabilitation Management Plan (Version 1, 1 December 2020). Once approved please ensure that the plan is placed on the project website at the earliest convenience.

Schedule 3
Condition 39 *The Applicant must prepare a Rehabilitation Management Plan for the development to the satisfaction of DRG must, This plan must:*

(a) be submitted to DRE for approval by the end of June 2015;
Not applicable - as this is a new Rehabilitation Management Plan starting in 2020

(b) be prepared in consultation with the Department, DoI, OEH, MSC and SC;
Consultation has occurred with the Department.
Consultation with the other agencies has not been provided.

(c) Be prepared in accordance with relevant DRE guidelines;
To be assessed by DRG

(d) Describe how the rehabilitation of the site would be integrated with the implementation of the biodiversity offset strategy;
Addressed within the document

(e) Include a detailed performance and completion criteria for evaluating the performance of the rehabilitation of the site, and triggering remedial action (if necessary);
Addressed within the document

(f) Describe measures that would be implemented to ensure compliance with the relevant conditions of this consent, and address all aspects of rehabilitation including mine closure, final landfrom including final voids and final land use;
Addressed within the document

(g) Include interim rehabilitation where necessary to minimise the area exposed for dust generation;
Addressed within the document

(h) *Include a program to monitor and report on the effectiveness of the measures, and progress against the detailed performance and completion criteria; and*
Addressed within the document

(i) *Build to the maximum extent practicable on other management plans required under this consent.*
Management Plans integrated within this document

In accordance with the Condition 39 Schedule 3, The Rehabilitation Management Plan is required to be developed to the satisfaction of the Resource Regulator, formerly the Department of Resources and Geosciences.

If you wish to discuss the matter further, please contact Daniel Martin at daniel.martin@dpie.nsw.gov.au

Yours sincerely

Matthew Sprott
Director
Resource Assessments (Coal & Quarries)