CENTENNIAL CLARENCE

Mining Operations Plan

Clarence Colliery

1 January 2018 to 2 July 2022

Amendment A

Amendment B

Clarence Colliery	
Mining Operations Plan	
Name of Mine	Clarence Colliery
MOP Commencement Date	1 January 2018
MOP Completion Date	2 July 2022
Mining Authorisations (Lease / Licence No.)	ML 1353 ML 1354 ML 1583 ML 1721 CCL 705 AUTH 307 AUTH 416 AUTH 451 EL 5072
Name of Authorisation holder(s)	Coalex Pty Limited and Clarence Coal Investments Pty Limited
Name of Mine Operator (if different)	Clarence Colliery Pty Limited
Name and Contact Details of the Mine Manager (or equivalent)	Brian Nicholls Mine Manager T: (02) 6353 8033 E: Brian.Nicholls@centennialcoal.com.au
Name and Contact Details of Environmental Representative	Isobel Standfast Environment and Community Officer T: (02) 6353 8039 E: Isobel.j.Standfast@centennialcoal.com.au
Name of Representative(s) of the Authorisation Holder(s)	Brian Nicholls
Title	Mine Manager
Signature	
Date	31/12/21
Version	Amendment B

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1 Introduction

Clarence Colliery is an underground coal mining operation located within the New South Wales (NSW) Western Coalfields, approximately 10 kilometres east of Lithgow. Coal is extracted from the Katoomba Seam using the bord and pillar partial extraction method, supplying coal to both domestic and export markets. The regional locality of Clarence Colliery is shown on **Figure 1**.

The Centennial Coal Company Limited is a wholly owned subsidiary of Banpu Public Company Limited. Centennial Coal Company Limited owns Clarence Colliery Pty Ltd, which has been appointed as the management entity for the Clarence Joint Venture.

Centennial Coal Company Limited has an 85% share in the Clarence Joint Venture, comprised of a number of wholly owned subsidiaries being Coalex Pty Ltd (51% share), Clarence Coal Investments Pty Ltd (29% share), SK Networks Resources Australia Pty Ltd (15% share) and Centennial Clarence Pty Ltd (5% share).

This Mining Operations Plan (MOP) Amendment has been prepared in accordance with the Department of Planning and Environment – the Resources Regulator (RR) publication titled *ESG3: Mining Operations Plan (MOP) Guidelines* (DRG, 2013).

The document outlines the proposed operations at Clarence Colliery for the period 1 January 2018 to 31 October 2022, herein referred to as the MOP term.

This MOP Amendment A has been prepared to incorporate the decommissioning and rehabilitation of Reject Emplacement Area (REA) III. The Amendment also incorporates changes to mine operations and rehabilitation.

This MOP Amendment B has been prepared to incorporate additional conditions stipulated in DA504-00 Modifications 6 and 7. The Amendment also incorporates changes to rehabilitation.

1.1 History of Operations

Clarence Colliery was granted Development Consent IRM.GE.76 on 15 June 1976 by the former Blaxland Shire Council (now Lithgow City Council). Underground coal mining commenced in 1979, with coal extracted from the Katoomba Seam using the bord and pillar partial extraction methods.

On 21 July 1993, IRM.GE.76 was modified by the former Greater Lithgow County Council (now Lithgow City Council) to amend the reject emplacement areas (REA) proposed in the original Environmental Impact Statement (EIS).

Development Consent 174/93 was granted on 15 February 1994 to extend underground coal mining operations and upgrade the REAs, water management facilities and ancillary structures within the Clarence Colliery Pit Top.

On 19 December 2005, Development Consent DA 504-00 was granted approval from the Department of Infrastructure, Planning and Natural Resources (now the Department of Planning and Environment (DPE)) to expand operations and covert four exploration tenements (EL5072, ALA5, ALA8 and A307) into a new mining lease (ML) (ML 1583) (refer **Figure 2**).

Since then DA 504-00 has been modified six times, with both MOD 2 and MOD 3 approved on 17 June 2014 (MOD 1 was withdrawn in 2009), MOD 4 approved August 2019, MOD 5 approved October 2019, MOD 6 approved August 2021 and MOD7 approved October 2021. MOD 2 approved an increase to the number of employees, an additional REA (REA VI) and the relocation of the treated effluent irrigation system which operated partially within the REA VI footprint. MOD 3 approved an increased road haulage limit of 100,000 tpa to west of the Blue Mountains and altered the haulage route. The maximum total haulage limit of 200,000 tpa to the east remained unchanged. MOD 4 approved increased road haulage to the West to facilitate delivery of coal to Mt Piper Power Station until 31 December 2020. MOD 5 approved a manning increase. MOD 6 approved coarse coal reject (CCR) transfer of up to 350,000 tpa from Clarence REA VI to Charbon Colliery via rail for rehabilitation purposes. MOD 7 approved the incorporation of extraction plan conditions to DA504-00 to apply to areas that are not covered by an existing Subsidence Management Plan.

Operations at Clarence Colliery have been undertaken in accordance with the MOPs outlined in **Table 1**. This document replaces the previous 2014 – 2017 MOP (Centennial Coal, 2014) which was approved on 1 January 2014.

Table 1 – MOP History

Detail	Amendment	Status	Issue Date	Expiry Date
Mining Operations Plan 2001-2006	Original MOP	Superseded	June 2001	31 December 2006
Mining Operations Plan 2007-2013	Original MOP	Superseded	27 February 2007	31 December 2013
	Amendment	Superseded	30 November 2010	31 December 2013
Mining Operations Plan 2014-2017	Original MOP	Superseded	1 January 2014	31 December 2017
Mining Operations Plan 2018-2022	Original MOP	Superseded	1 January 2018	31 October 2022
	Amendment	Current	27 May 2019	31 October 2022

This MOP Amendment B will replace *Clarence Colliery MOP Amendment A 1 January 2018 – 31 October 2022*. The end of this MOP term will be changed to 2 July 2022 and the Mining Amendment (Standard Conditions of Mining Leases-Rehabilitation) Regulation 2021 will commence on 2 July 2022 for Clarence Colliery.

1.1 Current Consents, Authorisations and Licences

1.1.1 Development Consent

Clarence Colliery currently operates under three development consents:

IRM.GE.76

IRM.GE.76 was approved by the former Blaxland Shire Council in 1976 for the construction of surface infrastructure and mining operations. It was later modified in 1993 by the former Greater Lithgow County Council to amend the REAs proposed in the original EIS.

The Consent was modified again on 6 May 2019 to permit the decommissioning and rehabilitation of REA 3.

174/93

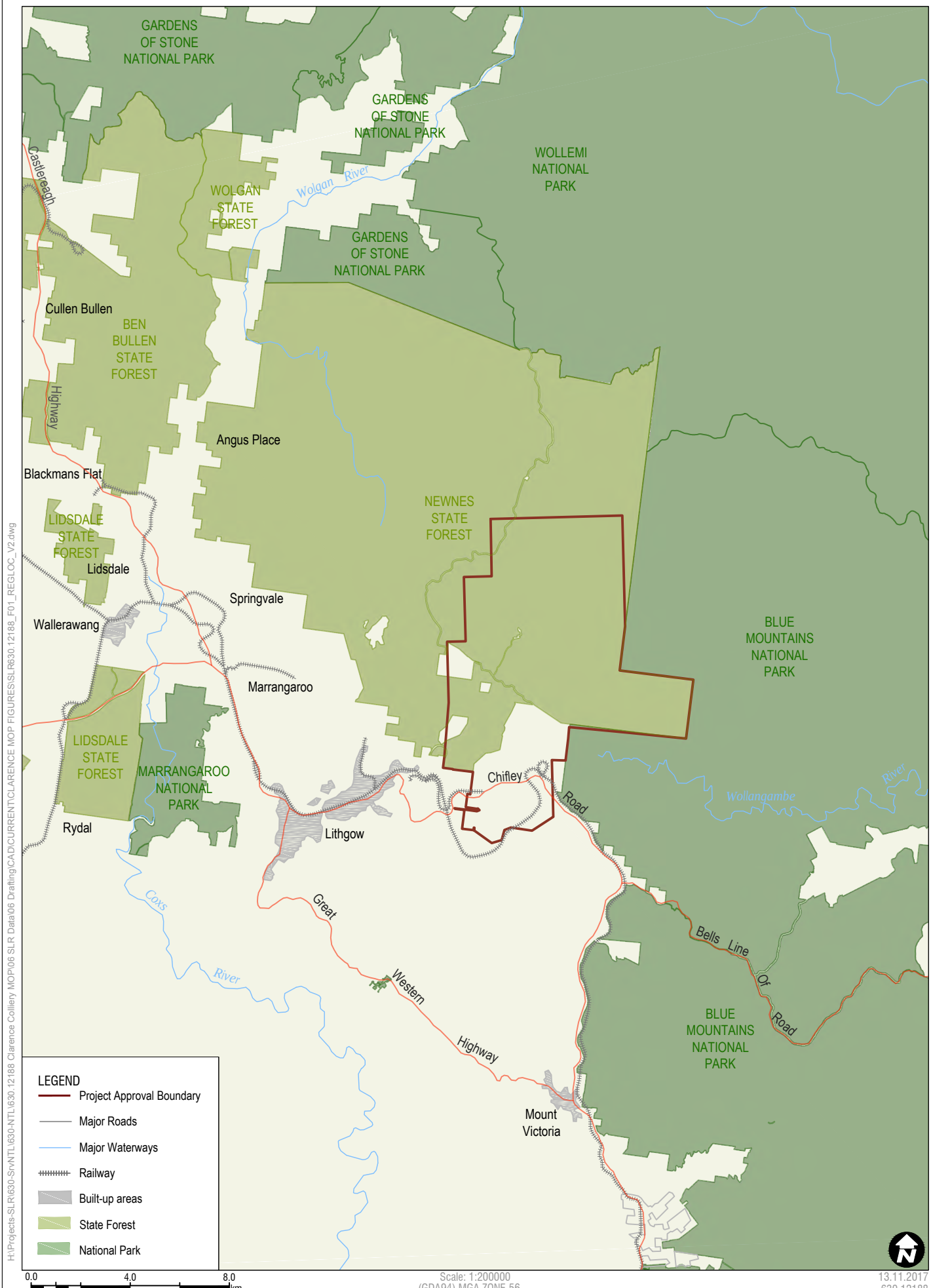
This consent was granted approval in 1994 by the former Greater Lithgow County Council for the extension of underground coal mining and reject disposal areas.

Consent 174/93 was modified on 8 February 2018 to allow relocation of the REA V access and to allow associated vegetation clearing.

504-00

Development Consent DA 504-00 was approved in December 2005 by the then Department of Infrastructure, Planning and Natural Resources to expand operations and covert four mining tenements (EL5072, ALA5, ALA8 and A307) into a new mining lease (ML1583) (refer **Figure 2**).

DA 504-00 has since been modified six times (MOD 2, 3, 4, 5, 6 and 7), the last modification approved in October 2021.



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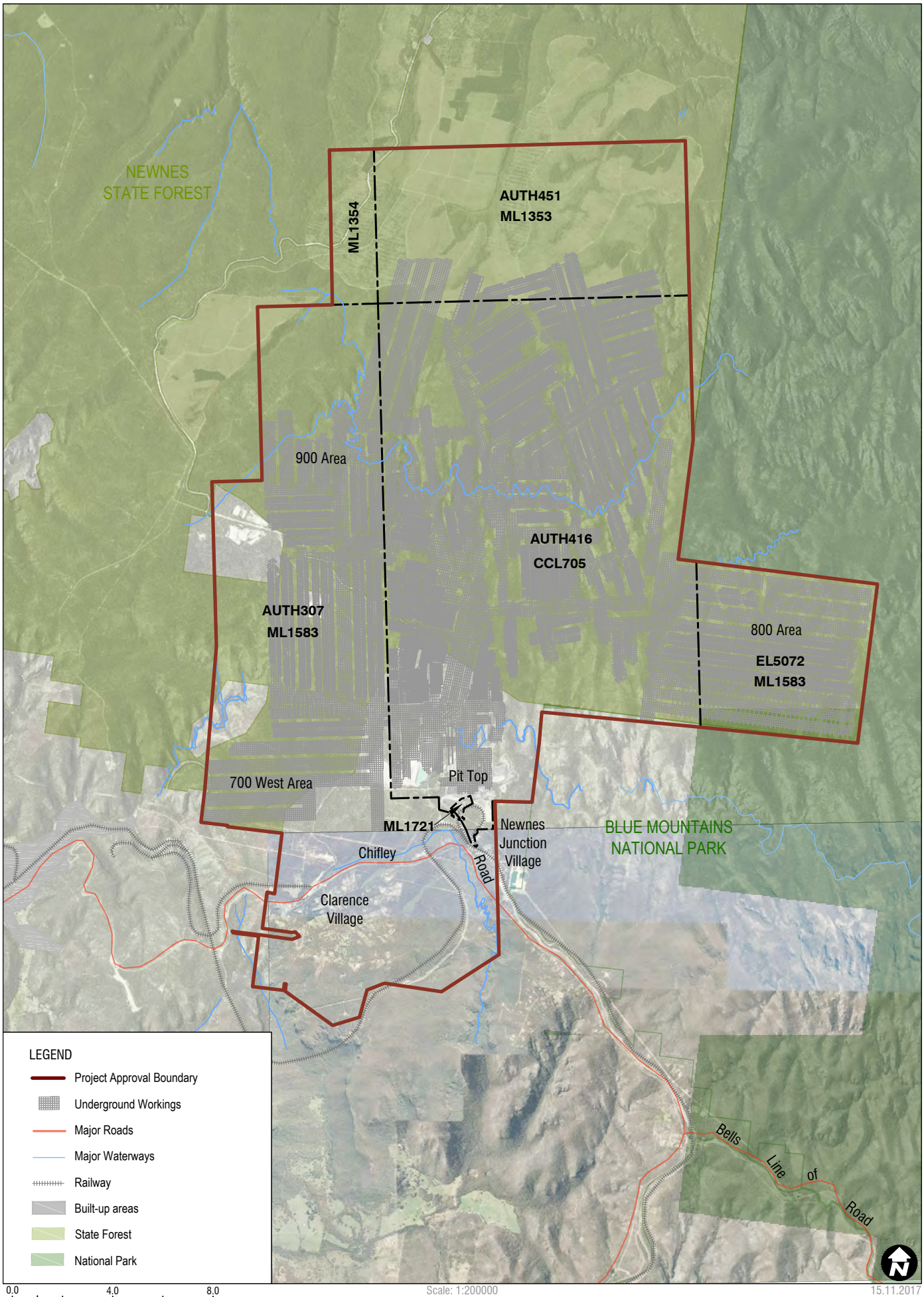
REGIONAL LOCALITY

FIGURE 1



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SITE LAYOUT

FIGURE 2

Additional detail pertaining to Clarence Colliery Development Consents is provided in **Table 2**.

Table 2 – Development Consents

Development Consent	Details	Date of Issue	Expiry
IRM.GE.76	Original development consent	15 June 1976	Perpetuity
	MOD 1 - amend the REAs	21 July 1993	
	MOD 2 – REA III decommissioning and rehabilitation	6 May 2019	
174/93	Extension underground coal mining and surface REAs	15 February 1994	Perpetuity
	Relocation of REA V access and associated vegetation clearing	8 February 2018	
DA504-00	Extension of the Clarence Underground Coal Mine.	19 December 2005	31 December 2026
	MOD 1 – Increased road haulage (withdrawn)	Withdrawn	
	MOD 2 – REA 6	17 June 2014	
	MOD 3 – Road haulage to the west	17 June 2014	
	MOD 4 – Road haulage to Mt Piper Power Station	August 2019	
	MOD 5 – Manning increase	October 2019	
	MOD 6 – CCR transfer to Chabon via rail	August 2021	
	MOD 7 – Addition of Extraction Plan conditions	October 2021	

1.1.2 Authorisations

The Clarence Colliery holding includes Consolidated Coal Lease (CCL) CCL 705 and mining leases ML 1353, ML 1354, ML 1583 and ML 1721. Clarence Colliery undertake exploration activities in accordance with Exploration Licence (EL) 5072 and Authorisation (AUTH) AUTH 307, AUTH 416 and AUTH 451. The Clarence Colliery holding and relevant mining tenements are shown on **Figure 2**. Additional details relating to Clarence Colliery mining tenements have been provided in **Table 3**.

Table 3 –Mining Tenements

Name	Grant Date	Expiry Date
CCL 705	20 December 2005	20 December 2026
ML 1353	21 July 2015	21 July 2036
ML 1354	21 July 2015	21 July 2036
ML 1583	9 July 2006	9 July 2027
ML 1721	7 December 2015	7 December 2036
AUTH 307	21 May 2015	24 August 2019 (Renewal submitted 16 July 2019)
AUTH 416	21 May 2015	24 August 2019 (Renewal submitted 16 July 2019)
AUTH 451	27 March 2015	24 August 2019 (Renewal submitted 16 July 2019)
EL 5072	31 July 1996	31 July 2022

Subsidence Management Plan Approvals

Underground mining at Clarence Colliery is undertaken in accordance with approved Subsidence Management Plans (SMPs) which are prepared to satisfy the requirements of relevant mining authorities. Details pertaining to the SMP approvals are provided in **Table 4**.

Table 4 – Subsidence Management Plans

Area	Approval	Description	Issue Date	Expiry Date
900	SMP Approval (Original) CL999	SMP for 900 Area submitted September 2013	22 January 2014	31 January 2023
	SMP Approval Variation 1 CL1076	Variation 1 to: • Realignment of a roadway for the conveyor belt going in to the 907 Panel; • Moving the 903a and 900 panels to the north by one pillar – again for belt installations and ventilation; • Removing one heading from the 905 Panel (which was only first workings) to accommodate the 903 and 903a Panels; and • Introduction of a bleeder roadway off A Heading on the 903a Panel to allow flood ventilation on extraction.	7 May 2014	
	SMP Approval Variation 2 CL1164	Variation 2 to: • Extraction of 901 panel with dual and single spine pillars; • The 903 Panel was modified from an eleven heading layout to two single panels inclusive of the 905 Panel (seven heading layout) and the 907 Panel (six heading layout); • The 911 Panel was modified from a seven heading panel to a six heading panel, retaining 30m centres; and • Pillar dimensions in Panel 905 were modified.	10 February 2015	
	SMP Approval Variation 3 CL1294	Variation 3 to: • Remove the east-west oriented panels of 911, 913, 915 and 917 and replace them with north-south oriented panels to be named 911, 913, 915 and 917; • Move the 910 panel to the east to allow for a bleeder roadway off A Heading (enabling flood ventilation) whilst maintaining a minimum 40m barrier; • A name change for the 982 panel, now known as 912 panel; and • Establishment of a set of mains (900 Panel) in an east northeast-west southwest orientation from which panels will be developed. These panels will extend outside of the existing 900 SMP area and will not be extracted before 31 January 2019 (the life of the 900 Area SMP).	7 June 2016	
	SMP Approval Variation 4 CL1294	SMP variation 4 extended approved mining to 31 January 2023.	25 January 2019	
	SPM Approval Variation 5 CL1620	Variation 5 to: • Modify the extraction layout of the 906, 908 and 910 panels, using a new 7 heading development layout; and • Introduce the double sided extraction method to these 3 panels	26 July 2019	
800	SMP Approval (Original) CL960	SMP 800 Areas submitted November 2011 (originally in conjunction with Area 700W) following addendum.	1 November 2013	24 December 2025

Area	Approval	Description	Issue Date	Expiry Date
	SMP Approval Variation 1 CL1078	SMP 800 variation 1 to: • The replacement of the three Enhanced 5 Heading Flexible Conveyor Train (FCT) panels 804, 806 and 808 with two 7 Heading Shuttle car panels (808 and 806 Panels); • The 6 heading shuttle car panel, 810, was changed to an Enhanced 5 Heading FCT panel; and • The 11 Heading Shuttle car panel, 803, was to be partially extracted on a seven heading shuttle car configuration.	7 May 2014	
	SMP Approval Variation 2 CL1128	SMP 800 variation 2 to panel 812.	26 September 2015	
	SMP Approval Variation 3 CL1236	SMP 800 variation 3 to panels minor changes to the extraction configuration of panels 814, 816 and 818 and a review of pillar and panel stability in light of an updated geological model.	16 November 2015	
	SMP Approval Variation 4 CL1410_1	SMP 800 variation 4 to: • Developing a set of mains to the north off 808 panel (808 Mains) at 38-43 cut through. Two panels will then diverge off the 808 Mains, namely the 804a and the 806a panels, both in an east – west orientation; • Extraction off the 808 Mains; • Reducing the 806 panel to 36 cut through (just outbye of a projected fault); • Reducing the 804 panel to 36 cut through (just outbye of a projected fault); • Addition of the 822 Panel (FCT). • Extension of the SMP Approval to 30th October 2021.	8 June 2017	
	SMP Approval Variation 5	• Reducing the 818 panel to 24 cut through; • Relocation of the 820 panel to the south; • Development and extraction of a new panel known as the 819 panel; • Modify the 820 panel from a Five Heading Enhanced FCT layout to a Four Heading FCT up to 23 cut through; • Development and extraction of the 818 Mains; • Development and extraction the 818A panel; • 800 South Mains have varied in their orientation; and • 822 panel has had to be relocated to the south.	15 February 2018	
	SMP Approval Variation 6 CL1753	• Secondary extraction of the 809 Panel to the west of the 801N mains panel	11 August 2021	
	SMP Approval Variation 7 CL1826	• The secondary extraction of the 818A, 822 and 801S panels • Extension of the expiry date to 24 December 2025	13 May 2021	
700 West	SMP Approval (Original)	SMP 700W Areas submitted November 2011 (originally in conjunction with Area 800)	18 June 2012	1 June 2025

Area	Approval	Description	Issue Date	Expiry Date
	SMP Approval Variation 1 CL865	SMP 700 West Variation 1 to: • Enable extraction of the 716 and 707 Panels that lie within the Lithgow No.2 Notification Area following approval from the Dam Safety Committee; and • The addition of 15 cut throughs of extraction, extending the 714 and 716 panels to the north.	7 August 2012	
	SMP Approval Variation 2 CL911	SMP 700 West Variation 2 to: • Reduce the length of 714 Panel by some 23 cut throughs due to intersection of geological structure.	16 October 2012	
	SMP Approval Variation 3 CL969	SMP 700 West Variation 3 to: • Reduce SMP boundary to align with 900 Area SMP Extraction of 700 Mains.	18 September 2013	
	SMP Approval Variation 4 CL986	SMP 700 West Variation 4 to: • Reduce the length of 716 Panel due to intersection of geological structure, aligning with 714 Panel.	18 September 2013	
	SMP Approval Variation 5 CL986	SMP 700 West Variation 5 to: • Variation seeking to extend the Period of Approved Mining to the 1 June 2021 submitted on 26 May 2017.	5 September 2017	
	SMP Approval Variation 6 CL986	SMP 700 West Variation 6 to: • Variation seeking to extend the period of Approved Mining to 1 June 2025 submitted on 11 May 2021	28 May 2021	

1.1.3 Licences

Environment Protection Licence

Clarence Colliery operates under Environmental Protection Licence (EPL) 726, issued under the *Protection of the Environment Operations Act 1997* (POEO Act). The licence has an anniversary date of 1 January and allows four licenced discharge points (LDPs) and requires three dust monitoring points.

Water Licences

The main extraction licence held by Clarence is WAL 36479 which entitles extraction of 6,623 ML from the Sydney Basin Richmond Water Source and one Surface Authority which authorises Council's transfer of water from a dam located at Clarence Colliery to Farmers Creek for town water supply.

Clarence Colliery also holds a number of water monitoring bore licences in accordance with Section 115 of the *Water Act 1912* and Water Supply Works approvals issued under the *Water Management Act 2000*.

Clarence Colliery will continue to liaise with DPIE Water with regard to future licencing requirements during the MOP term.

Dangerous Goods Licence

Clarence Colliery possesses a Dangerous Goods Licence (NDG020999) for the storage and handling of dangerous chemicals on the premises. Under the Regulation, further notification or renewal to

SafeWork NSW is only required for significant changes to the type, quantity and locations of hazardous chemicals within the premises or a change of contact details.

Radiation Management Licence

Radiation Management Licence 5078394 was granted renewal by the Environment Protection Authority (EPA) to extend the expiry date of the licence by a year to 8 February 2020. The renewal was granted in accordance with the *Radiation Control Act 1990* and extends the manufacturers working life for four fixed radiation gauges.

A summary of all licences held by Clarence Colliery is presented in **Table 5**.

Table 5 – Licences

Licence	Date of Issue	Expiry
EPL 726	28 November 2018	1 January**
WAL36479	23 October 2014	Perpetuity
Water supply works – 10WA10715	1 July 2011	18 May 2026
Joint water supply works – 10WA103852	1 July 2011	29 September 2027
10UA103853	1 July 2011	29 September 2027
Water supply works – 10WA118758	1 July 2013	11 December 2027
Water access licence - 10AL122285	1 July 2018	Perpetuity
Surface Authority 10SA001409	1 July 2011	29 September 2017*
Bore Licence 10BL156676	12 May 1995	Perpetuity
Bore Licence 10BL161964	13 August 2003	Perpetuity
Bore Licence 10BL161965	13 August 2003	Perpetuity
Bore Licence 10BL161962	13 August 2003	Perpetuity
Bore Licence 10BL161963	13 August 2003	Perpetuity
Bore Licence 10BL602211	10 December 2007	Perpetuity
Bore Licence 10BL602212	10 December 2007	Perpetuity
Bore Licence 10BL602213	10 December 2007	Perpetuity
Bore Licence 10BL602819	9 March 2009	Perpetuity
Bore Licence 10BL602820	9 March 2009	Perpetuity
Bore Licence 10BL603337	7 September 2009	Perpetuity
Bore Licence 10BL604063	7 June 2010	Perpetuity
Bore Licence 10BL604098	5 July 2010	Perpetuity
Bore Licence 10BL604099	5 July 2010	Perpetuity
~~Bore Licence 10BL604765~~	~~12 December 2012~~	~~11 December 2017~~*
Bore Licence 10BL605316	30 January 2013	Perpetuity
Bore licence 10BL605494	12 December 2013	Perpetuity
Dangerous Goods Licence NDG020999	5 March 2015	Perpetuity
Radiation Management Licence 5078394	8 February 2017	8 February 2022

* 10SA001409 is under renewal. 10BL604765 has been converted to 10WA118758.

** Anniversary date.

1.1.4 Other Approvals

Access Agreement

Clarence Colliery also has an access agreement with the State Rail Authority to allow the construction of a road over the Lithgow to Sydney Rail Line.

Occupation Permit

Clarence Colliery has formal arrangements with the Forestry Corporation of NSW (FCNSW) in the form of an Occupation Permit (OP). The OP sets out access arrangement to subsidence lines and groundwater monitoring locations on the Newnes Plateau. In addition, the OP details rehabilitation and relinquishment requirements for infrastructure including exploration boreholes.

Threatened Species Licence

Clarence currently holds three Threatened Species Licences under Part 2 of the *Biodiversity Conservation Act 2016*, one granted on 22 September 2017. The licence allows for installation and operation of a hand augured shallow piezometer for the purpose of groundwater monitoring. The piezometer is located within the Newnes Plateau Shrub Swamp (EEC).

OEH issued Clarence with a Section 95(2) Certificate on 2 February 2017. This Certificate was to confirm that installation of two hand augured shallow piezometers in Paddy's Swamp was not likely to significantly affect threatened species, populations, ecological communities or their habitats and consequently the Proposed Action does not require a licence under the Threatened Species Conservation Act 1995.

On 4 June 2019, OEH issued Clarence with a Threatened Species Licence to allow the installation of a piezometer and a soil moisture monitoring station with the Newnes Plateau Shrub Swamp (EEC) known as Pagoda Swamp.

Table 6 – Other Approvals

Name	Description	Agreement with	Date of agreement	Expiry Date
Q648-100	Access Agreement with State Rail Authority	State Rail Authority	10 July 1981	Life of loop
PB54303	Level 2 Occupation Permit	Forestry Corporation of NSW	21 December 2012	Renewed Annually
C0003012	Threatened Species Licence	Office of Environment and Heritage	22 September 2017	22 September 2022
C0002449	Section 95(2) Certificate	Office of Environment and Heritage	2 February 2017	2 February 2022
C0004884	Threatened Species Licence	Office of Environment and Heritage	4 June 2019	31 December 2026

1.2 Land Ownership and Land Use

The Clarence Colliery holding lies within the Parishes of Clwydd, Cook and Rock Hill within the County of Cook. The area is encompassed by the Lithgow City Council Local Government Area (LGA). The majority of land within the Clarence Colliery holding is associated with the Newnes State Forest, owned and managed by the Forestry Corporation of NSW. The Pit Top and adjacent land is located on Crown Land, with the exception of some Centennial owned land and private freehold (including the Hanson Quarry to the north-west).

Land adjacent to the Clarence Colliery holding includes: the Blue Mountains National Park to the east of the Pit Top, the Newnes State Forest to the north and west of the holding.

Land ownership is shown on Plan 1C (refer **Appendix 2**), with a Schedule of Lands located within the Clarence Colliery holding presented as **Appendix 3**.

1.2.1 Historic Land Use

Historic land uses in the vicinity of the Clarence Colliery holding include residential uses, underground coal mining, transport infrastructure, sand quarrying, conservation and commercial forestry. Lithgow is the closest retail and commercial centre, located approximately 10 km west of the Pit Top.

As Clarence Colliery is an underground coal mine, disturbance associated with the operation is confined to the Pit Top area. The remaining surface lease areas associated with Clarence Colliery are generally forested, with the exception of residential areas (Newnes Junction and Clarence villages) and infrastructure corridors which allow Bells Line of Road and the Main Western Railway to cross the surface of ML 1583.

1.2.2 Current Land Use

Land use within the Clarence Colliery holding predominantly consists of historical and existing mining operations, sand quarrying, residential and commercial forestry in the Newnes State Forest. Newnes State Forest comprises approximately 25,000 ha of pine plantation and native hardwood forest that is selectively logged under the FCNSW tenure and management. In addition to the timber industry, the Newnes State Forest supports a number of recreational land uses. Public access is permitted in the Newnes State Forest with common recreation activities consisting of motorcycle riding, four wheel driving, bushwalking, camping, mountain bike riding, canyoning, photography, bird watching and other recreational and adventure activities.

Surrounding land uses include former coal mines including the Blue Mountains Colliery to the south-west of the Pit Top, an approved but yet to commence sand quarry to the east of the Pit Top (the Kaolin Sands project) and conservation to the east (in the Blue Mountains National Park).

1.2.3 Future Land Use

In accordance with the commitments of the approved 2014 – 2017 MOP (Centennial Coal, 2014), all surface infrastructure at the Clarence Colliery pit top will be rehabilitated to a woodland community commensurate with the adjacent remnant vegetation. The final land use will be 'environmental protection works' which is consistent with the surrounding land use of the Newnes State Forest and the Blue Mountains National Park. Additionally the final land use aligns with the current *Lithgow Local Environmental Plan (LEP) 1994*, the *Draft Lithgow LEP 2013* and the *Lithgow Draft Land Use Strategy 2010 – 2030*.

The water management structures at the Clarence Colliery Pit Top will be retained in the post-mining landform to provide water resources for any fauna habiting the area and to provide water storages for potential future use by Council.

It is proposed to also retain some access tracks on the Newnes Plateau for future use as fire trails or access by recreational users and FCNSW. Clarence Colliery also propose to retain the access road to the Main Storage Dam, allowing future use and management by Council. However, unless retention for future use, including management responsibility has been accepted by the landowner these access roads will be rehabilitated following the cessation of mining activities.

1.3 Stakeholder Consultation

1.3.1 Community Consultation

Clarence Colliery is aware of its community obligations and the importance of open communication with the community. During the MOP term Clarence Colliery will endeavour to keep the local community affected by its operation informed of its direction, plans and environmental performance. This will be achieved by the following activities:

- The Community Consultative Committee (CCC);
- Holding Open Days and Displays at local Shows;
- Distribution of letters and newsletters;
- Information sessions;
- Local newspapers;
- The Centennial Coal website; and
- Engaging in informal discussions with local residents as required.

A complaints line currently exists at Clarence Colliery to receive calls from the local community. The complaints line (02 6353 8010) operates 24 hours a day, 7 days a week. The phone number is listed in the local directory and on the Centennial Coal Website for easy access and all residents are encouraged to contact the site regarding any issue of concern.

Community Consultative Committee

In accordance with the requirements of Schedule 5, Condition 9 of DA-504-00, a CCC has been established to monitor the operations and provide a forum whereby the community can communicate with Clarence Colliery and be kept up to date with the progress of the mine.

The CCC comprises of:

- An independent chairperson;
- Two representatives from Centennial Coal, including the Environment and Community Coordinator;
- One representative from Council; and
- At least three representatives from the local community.

The appointment of the committee members were approved by the Department of Planning and Environment (DPE), in consultation with Council. The first meeting of the CCC was held on 5 June 2006.

1.3.2 Statutory Authorities

Clarence Colliery has consulted with the RR during the preparation of this MOP. On 5 October 2017 a teleconference was undertaken to discuss the proposed activities during the MOP term, MOP domains and production based triggers for activities (refer **Section 2.2.6**).

The RR was also consulted during the preparation of this MOP Amendment, with a meeting held on 21 February 2019.

The RR was also consulted during the preparation of this MOP Amendment B, with a meeting held on 28 October 2021.

Clarence Colliery regularly engages with various government and other agencies to report on its environmental performance. This is facilitated through a number of means including:

- Council and local community representation on the CCC;
- Annual Review to the DPE, RR, EPA, CCC and other relevant Government agencies and stakeholders;
- Provision of the Annual Return to EPA; and
- Provision of the National Pollution Inventory (NPI) to the Commonwealth Department of the Environment and Energy via the Office of Environment and Heritage (OEH).

Consultation will continue to be undertaken with relevant stakeholders as required under relevant approval conditions and other regulatory requirements relevant to the mine.

1.3.3 Cultural Heritage

Clarence Colliery works closely with local Aboriginal people through professional engagement and consultation on cultural heritage management. Consultation between Centennial and the Aboriginal community is undertaken in accordance with the approved *Western Region – Aboriginal Cultural Heritage Management Plan* (ACHMP) (RPS, 2018).

The Registered Aboriginal Parties for the Clarence Colliery are:

- Bathurst Local Aboriginal Land Council;
- Gundungurra Tribal Council Aboriginal Corporation Native Title Claimants;
- Mingaan Aboriginal Corporation;
- Mooka Traditional Owners;
- North-East Wiradjuri;
- Warrabinga Native Title Claimants Aboriginal Corporation;
- Warrabinga/Wiradjuri People Native Title Claimants;
- Wiradjuri Council of Elders;
- Wiray-dyuraa Maying-gu; and
- Wiray-dyuraa Ngambaay-dyil.

The ACHMP has been prepared to provide Centennial with a consistent approach to their consultation with the local Aboriginal communities regarding Aboriginal cultural heritage matters and identifying consistent minimum standards and processes for Aboriginal cultural heritage identification, monitoring and management across Centennials western operations.

The ACHMP also provides the framework for ongoing consultation and engagement with the Aboriginal community, which will be continued by Clarence Colliery throughout the life of the mine.

1.3.4 Stakeholder Expectations Regarding Post Mining Land Use

As discussed in **Section 1.3.2**, Clarence Colliery routinely engages with stakeholders in regards to the operations and environmental performance. Previous MOPs including the most recent 2014 – 2017 MOP (Centennial Coal, 2014), outlined the post mining land use goals.

Rehabilitation monitoring reports are supplied as part of the Annual Review. This outlines progress of rehabilitation and assessment of the rehabilitation techniques used. Further communications regarding the post mining land use include:

- Stakeholders meetings;
- Letters and community newsletters;
- Community information sessions and open days; and
- Providing information on the Centennial Coal website.

The post-mining land use and rehabilitation commitments outlined within this MOP are consistent with the previous Clarence Colliery MOPs, Centennial western operations MOPs and with statutory requirements for the mine.

2 Proposed Mining Activities

2.1 Project Description

Development Consent DA 504-00 allows Clarence Colliery to extract up to 3 Mpta of run of mine (ROM) coal until 31 December 2026. Clarence Colliery development consents approve the following activities:

- Construction and operation of pit top facilities:
  - Mine administration and bath house building;
  - Store and workshop building;
  - Water treatment plant;
  - Rail loop and load out facilities;
  - Conveyor systems to transfer coal from the underground mine to the pit top facilities including the load out on the rail loop;
  - Run-of-Mine stockpile area;
  - Ventilation facility;
  - Washed coal stockpile area;
  - Coal Handling and Preparation Plant (CHPP);
  - Various water management structures include storage and leachate dams and irrigation area which forms part of the water management on site;
  - Sewage treatment plant; and
  - A downcast ventilation shaft located on the Newnes Plateau.
- Underground coal mine for extraction from the Katoomba and Lithgow Seams using board and pillar techniques,
- Construction and operation of reject emplacement areas (REAs) I-VI and associated water management infrastructure;
- Extraction of up to 3 million tonnes per annum (Mtpa) of Run-of-Mine (ROM) coal;
- Transport of up to 200,000 tonnes per annum (tpa) of coal products by road in total, with a maximum 100,000 tpa transported to the west, via the Darling Causeway and the Great Western Highway haulage route.

2.2 Activities over the MOP Term

2.2.1 Exploration

Clarence Colliery will continue to undertake exploration activities for the duration of the MOP term. The exploration will be used to obtain specific geological information in terms of geotechnical conditions, coal seam quality and thickness, through core sampling. Information obtained is used for the ongoing refinement of the site's existing geological model which then allows detailed mine planning.

Disturbance from previous exploration activities will be rehabilitated prior to mine closure. All exploration drill holes will be sealed in accordance with relevant RR guidelines at the time. Completed and proposed exploration activities will be reported in the Annual Environment Management Report.

2.2.2 Construction

REA V will be constructed during the MOP term. The construction will consist of Stage 1 and 2:

- Stage 1 will commence in 2019 and will include the emplacement of rejects within the easternmost portion of the proposed REA and the establishment of the supporting dirty water dam. For more information (refer to **Section 2.2.6**).
- Stage 2 timing will be subject to necessary approvals being in place for activities and is also dependent upon the removal of approximately 280,000 m^3 of fine coal material from REA III (refer to **Section 2.2.6**), and also production rates and generation of rejects by the operations.

The REA will be established within the existing rail loop and will provide for approximately 800,000 – 850,000 tonnes (approximately 510,000 m^3 capacity) of coarse coal reject material emplacement. This capacity will be achieved by excavating an average 3 m depth, with material obtained to be used for REA III rehabilitation and other REAs, as required. Approximately 6.4 hectares (ha) of new disturbance will be needed to allow the construction of REA V and the additional water management infrastructure (known as Leachate Dam 4) (refer **Figure 3**).

Clarence Colliery has gained approval to modify Development Consent IRM.GE.76 to allow recovery of suitable fine coal and coarse coal reject (CCR) material from the existing REA III. The recovered fine coal/CCR material will be transported via haul truck to the existing washed coal stockpile. The material will then be blended with ROM coal, pushed into the reclaim feeders and then loaded onto trains, as is current practice at the mine. Following the recovery of all available fine coal/CCR material, the final landform will be built through the emplacement of compacted coarse coal reject. When the final landform is achieved, REA III will be capped, rehabilitated and decommissioned.

The commencement of activities associated with REA III, REA VI and REA V Stage 2 are dependent upon the removal of approximately 280,000 m^3 of fine coal material from REA III (refer to **Section 2.6.6**) and other operational requirements. The removal of this material will be subject to market conditions. It is anticipated that these activities will be commenced within 12 months from the completion of reject extraction from REA III and that all works will be undertaken within the MOP term as shown on Plan 3B (refer **Appendix 2**). This timing is subject to necessary approvals being in place for activities.

Clarence Colliery received approval to modify Development Consent 174/93 on 8 February 2018 to allow:

- Relocation of an approved intersection from immediately west of the train loading facility (as proposed in the 1993 EIS) to the eastern side of the rail loop;
- Facilitate additional vegetation clearing (approximately 340 m^2) required to construct the intersection; and
- Extend the current Project Site Boundary to encompass the additional vegetation clearing required for the construction of the intersection.

Clarence Colliery will undertake these activities prior to commencement of REA V construction. Additional details regarding the proposed works are provided in *Clarence Colliery New Intersection s96(2) Modification – Statement of Environmental Effects* (GHD, 2017) and shown on **Figure 3**.

During the MOP term, Clarence Colliery will also construct a new haul road which will extend from the existing stockpile area south-east through the former REA IV rehabilitation to the new REA V intersection. Clarence Colliery also propose to undertake upgrades to the existing water treatment plant. This will involve some minor clearing, with due diligence ecological survey completed prior to works. The location of these proposed activities has been shown on **Figure 3**.

2.2.3 Mining Operations

The mining system is the partial extraction system, which has been designed such that remnant pillars that remain within and between panels are long-term stable. Subsidence analysis results have proven this method of extraction results in extremely low levels of subsidence. Unlike full extraction mining, partial extraction minimises subsidence through leaving a proportion of the resource in situ. This provides support to the overlying strata, minimising the breakage and falling of the overburden and maintains the integrity of the above aquifers. Within future mining areas maximum vertical long-term subsidence is predicted to not exceed 100 millimetres (mm) (but may typically range from 40 - 50 mm), and is considered to be negligible. Modelling based on these results provides great confidence that further mining in the Clarence Colliery holding using the partial pillar extraction method will have negligible impacts.

During the MOP term, Clarence Colliery will undertake mining operations within the 700 West Area, 800 Area and 900 Area (refer **Figure 3**). The mining system at Clarence is inherently flexible and progress within mining areas is largely driven by machinery availability and variations in geological conditions. To this end, mine sequencing is subject to change.

All mining activities during the MOP term will be undertaken in accordance with an approved SMP.

2.2.4 Materials Handling and Processing

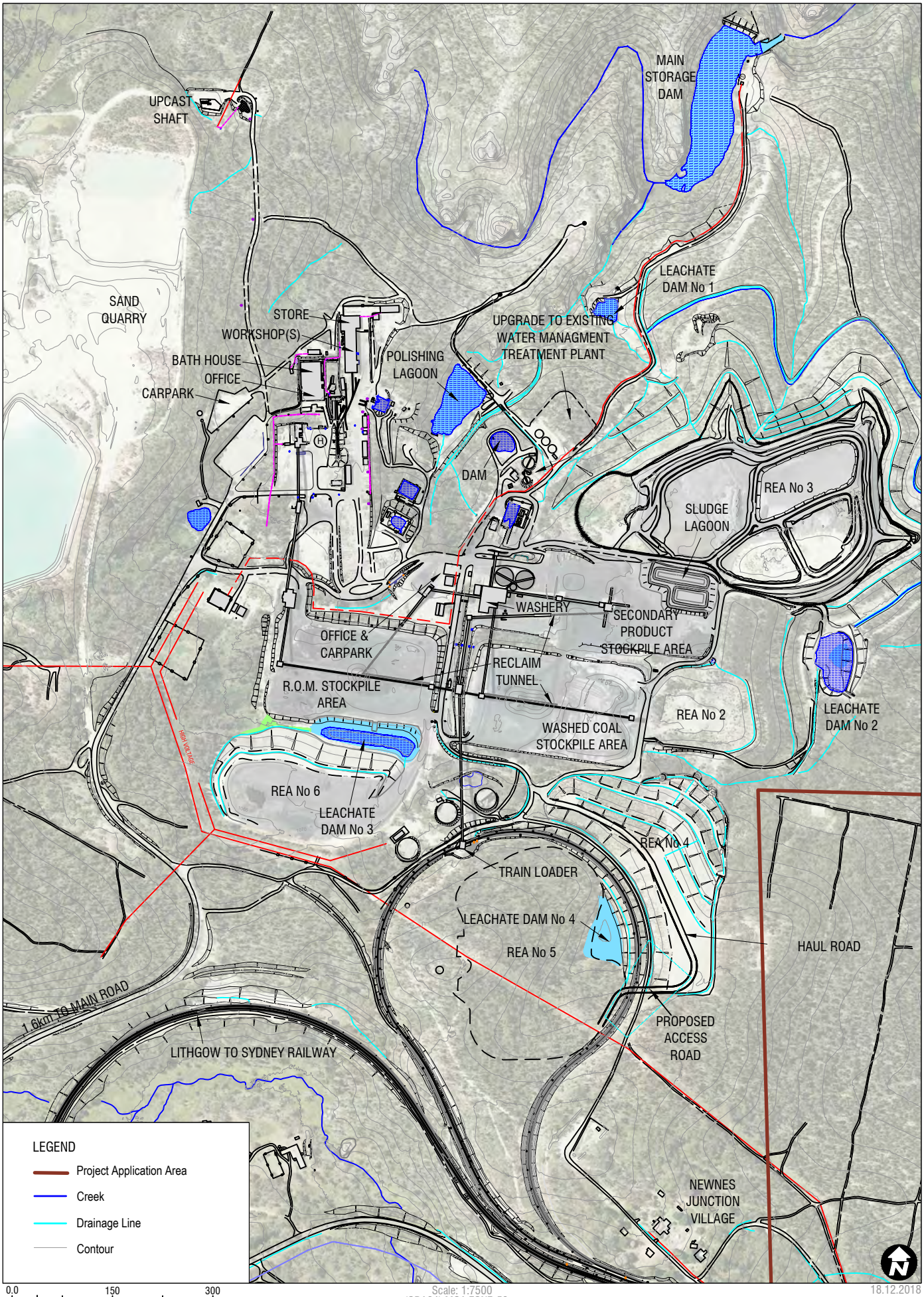
Coal from the underground operations is brought to the surface via the main ROM conveyor which is located to the south of the administration building. Coal is then run through a rotary breaker and crusher to reduce the size of the coal to 50 mm or less where it is conveyed to the ROM stockpile.

An understack coal reclaim system can either direct coal to the train loading bin or the CHPP for processing. The ROM stockpile is approximately 4 ha in size and has the capacity to store 300,000 tonnes of coal.

Material from the ROM stockpiles is fed into the CHPP where it is washed and then either sent to the washed coal stockpile or the product stockpile. During the washing of the coal, fines material (less than 0.05 mm) are collected and are run through a thickener and into Belt Filter Presses which compress the slurry into cakes which are stored on site to be blended with product coal for sale (Centennial Coal, 2014). The coarse reject material not suitable for sale is currently placed in REA VI. Additional detail regarding the recovery of fine coal materials has been provided in **Section 2.2.6**.

Coal entering the product stockpile is run through a screening plant which separates the coal into the following sizes: 25 - 50 mm, 15 - 25 mm, and < 15 mm loading onto trucks for domestic sale, along with the cakes of the fine material. The Domestic Product Stockpile has an area of approximately two hectares.

Coal which is sent to the washed coal stockpile is not sorted by size. The washed coal stockpile has an area of approximately four hectares and has a storage capacity of 300,000 tonnes of coal. Coal from the wash coal stockpile is collected via under stack coal reclaim system and transported to the train loading bin adjacent to the train loader which is located on the rail loop line which is accessed off the Main Western Rail Line. This coal is predominately then sent to Wollongong (Port Kembla) for export.



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ACTIVITIES DURING MOP TERM

FIGURE 3

Coal from the product stockpile is loaded onto semi-trailers and truck-and-trailer units with a front end loader for transport from the site. Clarence Colliery are approved to transport up to 200,000 tonnes per annum (tpa) of coal products by road in total, with a maximum 100,000 tpa transported to the west, via the Darling Causeway and the Great Western Highway haulage route. All loading and haulage within the site is undertaken within the product stockpile area and dedicated haul roads within the Pit Top.

The layout of Clarence Colliery Pit Top is shown in **Figure 3**.

2.2.5 Rock/Overburden Emplacement

Clarence Colliery is an underground coal mine, subsequently there is no overburden generated at the site.

2.2.6 Processing Residues and Tailings

The site currently has several REAs which are at various levels of operations, including:

- REA I, REA II and REA IV are rehabilitated but not closed under the High Risk Activity (HRA) Notification process;
- REA III is in the early stage of rehabilitation, which involves ongoing removal of final coal material and reshaping to final landform with CCR.;
- REA V is operational; and
- REA VI is operational.

During the MOP term Clarence Colliery will undertake the following activities:

- Construction of REA V Stage 1 commenced in 2019. This will include the emplacement of rejects within the easternmost portion of the proposed REA and the establishment of the supporting dirty water dam as shown in Plan 3A (refer **Appendix 2**);
- Approximately up to 280,000 m^3 of fine coal material will be recovered from REA III. It is anticipated that the fine coal material may require drying on the surface to improve handling post excavation. If required, the material will be stored within the washed coal stockpile area, where it will be periodically turned over and dried ready for blending with the product coal prior to dispatch;
- Approximately up to 140,000 m^3 of coarse coal rejects will be recovered from REA III;
- Approximately up to 32,000 m^3 of unsuitable material will be removed from REA III;
- Suitable coarse coal rejects will be used to fill and reshape REA III to form the foundation of a stable final landform.
- Active areas of REA VI will remain open due to potential for transfer of CCR to Charbon Colliery; and
- Construction of REA V Stage 2.

The commencement of activities associated with REA III, REA VI and REA V Stage 2 are dependent upon the removal of approximately up to 280,000 m^3 of fine coal material from REA III, and other operational requirements such as reject generation over the MOP period. The removal of this material will be subject to market conditions. It is anticipated that these activities will be commenced within 12 months from the completion of reject extraction from REA III and that all works will be undertaken within the MOP term as shown on Plan 3B (refer **Appendix 2**). This timing is subject to necessary approvals being in place for activities.

As described in the *Environmental Impact Statement: Proposed Clarence Colliery* (Dames and Moore, 1975), the neighbouring Hanson Quarry could be a suitable future reject emplacement area. However, such emplacement would be subject to a MOP amendment or a new MOP and other appropriate approvals.

Should Centennial proceed with transfer of CCR from Clarence REA VI to Charbon Colliery, the Reject Management Strategy will be updated to include the requirements outlined in DA504-00 Schedule 3, Condition 24B.

Details of reject emplacement facilities, geochemistry of reject material and planning of future reject emplacements are provided in the *Clarence Colliery Long Term Reject Emplacement Strategy* (Centennial Coal, 2014), *REA 3 Engineering Assessment Report* (GHD, 2017b), *Clarence REA3 Rehabilitation Design Report* (GHD, 2018), *Clarence REA 3 Rehab (AMD) Acid Mine Drainage Study* (GHD 2021) and *Centennial Coal Clarence Coal Reject Disposal and Storage Strategy* (Centennial 2021).

2.2.7 Waste Management

Production Waste

The reject materials produced during the processing of ROM coal is discussed in **Section 2.2.6**.

Non-Production Waste

The major general waste streams from the mine include water, packaging material including plastic, paper and cardboard, wood, waste oil, oil filters, oil drums, scrap metal, hoses, bottles (plastic and glass), sewage effluent, as well as general putrescible rubbish.

General waste is disposed of to landfill by licensed waste contractors. Recyclable materials, for example, plastic, paper and cardboard products, are recycled whenever possible at the site. Oil drums and filters are recycled with other waste metals, and are removed from site by a metal recycling company. Waste oil collected in the workshop is stored in an underground collection sump before being removed off site by a licensed contractor for recycling. Sewage and grey water from the bathhouse and offices at the pit top areas is treated on site by a sewage treatment facility. Underground sewage is contained by Aflab activated biological toilets.

Paper, plastic and cardboard are recycled both from bulk packaging from the store and site offices, either at the pit top or other infrastructure areas or transferred to a recycling facility.

All potentially hazardous material at Clarence Colliery is stored and/or bunded appropriately in accordance with relevant standards. Hazardous materials that need to be disposed of are stored within an allocated area prior to being removed by a licenced hazardous waste contractor. Where possible, all quantities of waste or recyclable material are quantified and recorded for benchmarking and continuous improvement purposes as well as reporting in accordance with the National Greenhouse and Energy Reporting Scheme, and National Pollution Inventory.

2.2.8 Decommissioning and Demolition Activities

A High Risk Activity (HRA) Notification process has been completed, to allow for operational activities in preparation for the rehabilitation and decommissioning of REA III. Progressive rehabilitation of REA VI has commenced.

Additional detail regarding the decommissioning of REAs during the MOP term has been provided in **Section 7.3.2**.

2.2.9 Temporary Stabilisation

Temporary stabilisation may be required at construction areas during the MOP term. Prior to the re-establishment of vegetation cover, temporary control measures will be utilised for erosion and sediment control. These measures may include the use of sediment fences for non-channelised flow over disturbed areas, sand bags, rip rap, or any combination of those materials. Consideration will be given to erosion and sediment control procedures for activities undertaken during the construction phase. These procedures may include restricted access during wet weather or to areas under rehabilitation, reporting of erosion and sediment hazards or incidents and regular checking and maintenance of structures.

The temporary control measures utilised are selected dependent on the site constraints (dispersive soils, slope), time of year, type of flow (concentrated or sheet flow) and the duration of disturbance.

2.2.10 Progressive Rehabilitation and Completion

Rehabilitation will be progressively undertaken on areas that cease to be used for mining or mine-related activities as soon as reasonably practicable. This will reduce the amount of disturbed land at any one time and minimise the amount of contact water to be managed on site. REA III, REA V and REA VI (refer **Section 2.2.6**). Where possible, topsoil and subsoil stripped for the development of REAs will be directly applied to rehabilitation areas in accordance with best practices.

Results of progressive rehabilitation will be used to refine rehabilitation methods for future application such as the selection of appropriate drainage measures and plant species for re-establishment.

2.2.11 Material Production Schedule during MOP Term

The material production schedule during the MOP term is provided in **Table 7**. Any proposed changes to this schedule will be outlined in the Annual Review.

Table 7 – Production Schedule

Material	Unit	2018	2019	2020	2021	2022*
Stripped topsoil#	m^3	0	49,740	2,200	0	0
Rock/Overburden	m^3	0	0	0	0	0
ROM coal	Mt	2,476,411	2,738,789	2,823,077	1,800,170	2,245,962
Reject material	Mt	89,151	98,596	101,631	136,690	123,528
Product**	Mt	2,387,260	2,640,192	2,721,447	1,680,081	2,122,434

*Projected values cover the period from 1 January – 31 October 2022.

topsoil production associated with REA V Stage 2 (forecast for 2020) works is subject to material production targets outlined in **Section 2.2.6**.

** Product volumes will vary dependant on blending of fines and coarse reject material with product.

2.3 Primary Domains

For the purpose of this MOP, primary (operational) domains have been defined as the set of discrete areas that have a particular operational or functional purpose. All areas previously disturbed by mining, or proposed to be subject to the activities described in **Sections 2.1** and **2.2** have been assigned to an appropriate primary domain. Primary domains at Clarence Colliery are defined in **Table 8**.

Table 8 – Primary Domains

Domain	Description	Code
Infrastructure	Includes all existing infrastructure and facilities at Clarence Colliery, including: all buildings (including workshops, administration buildings, general and sheds); CHPP buildings and fixed plant (including the conveyors, drive station, transfer points, rejects bins, thickener tanks, dump hoppers and pit top storage); coal stockpile areas (ROM and washed); refuelling station; train loading facility and rail loop; switchyard; ventilation facility and downcast shaft; upcast shaft and buildings; potable water plant and tanks; old water tanks; roads and tracks; ballast boreholes and related water management infrastructure; surface water diversions; access roads; car parks and hard stand areas; laydown areas; sewerage treatment plant and effluent irrigation area; and grit traps. Equipment components within this domain that are not sold at mine closure or relocated to other Centennial Coal sites will be decommissioned and/or demolished. The disturbed areas at the pit top will be rehabilitated, with the exception of water management infrastructure (and associated tracks) to be utilised by Lithgow City Council. Other tracks on the Newnes Plateau may be retained for use as fire trails or access tracks by recreational users of Newnes State Forest and FCNSW.	1
Tailings Storage Facility	Constitutes all active reject emplacement areas (REA).	2
Water Management Area	Includes the network of dams and associated water management infrastructure at the Pit Top. These structures will not be decommissioned at the end of mine life but will be maintained for future use.	3
Existing Rehabilitation Area	Includes the rehabilitation completed at the pit top. Includes the rehabilitation completed on REA I, II, IV and VI, rehabilitated drilling pads on the Newnes Plateau, the former location of the 11kV earthmat and batters of the coal stockpiles.	4
Other Lands	This domain incorporates all lands within the MOP area not captured by domains 1 to 4 above. The Domain includes the existing mining areas where limited rehabilitation works may be required due to subsidence impacts. This also includes some infrastructure on the Newnes plateau, such as boreholes, where remediation may be required. However, this excludes all disturbance associated with the construction/maintenance activities undertaken by service providers (i.e. power and roads).	5
Conservation and Biodiversity Offset Area	Includes the Airly Offset Site, Wolgan Road Northern Offset Site, Wangcol Creek Rehabilitation, Lamberts Gully Rehabilitation, Commonwealth Colliery Rehabilitation Site, Wolgan Road Southern Management Site, Brays Land Lidsdale Management Site and the Coxs River Angus Place Management Site. The Conservation Sites are managed collectively by the Centennial West Operations in accordance with the October 2014 version of the *Regional Biodiversity Strategy Western Projects* (RPS, 2014)	6

2.4 Asset Register

The asset register included as **Table 9** provides a summary of the key features of each primary domain at MOP commencement (refer **Section 2.3**) and principal activities required for rehabilitation. This asset register is intended to provide a suitable level of context for the Rehabilitation Cost Estimate (RCE) (refer **Section 2.5**).

The areas for each primary domain represent the total disturbance footprint for each domain at the commencement of the MOP Term, as depicted on **Plan 2** (refer **Appendix 2**). Domain selection is described further in **Section 5.1**.

2.5 Rehabilitation Cost Estimate

The RCE prepared for this MOP submission has been calculated to undertake the necessary works to achieve the desired final land use (refer **Section 4** and **Plan 4**). In accordance with the *ESG1: Rehabilitation Cost Estimate Guidelines* (DPE 2017), the RCE has been prepared based upon a "snapshot" of disturbance at the end of 2021. 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.

A copy of the RCE was submitted to RR for approval in February 2019. A revised RCE was submitted with MOP Amendment B to RR for approval in November 2021.

Table 9 – Asset Register

Major Assets	Use	Demolition / Rehabilitation Activities	Approvals Required	Quantity	Unit
Domain 1. – Infrastructure: 46.34 ha					
CHPP	Coal handling, crushing, screening and washing – currently utilised	Disconnect and terminate all services; demolish and remove buildings, infrastructure and concrete pads; removal of roads not required post closure; demolish and remove coal crushing, screening and washing plant; remove carbonaceous material; all hazardous materials and contaminated materials removed/remediated; stable landform and landform shaping; drainage designed in accordance with Blue Book; rehabilitate with woodland seed mix.	Demolition certificates; Contamination Assessments	1	item
Train Loading Facility, Rail Line and Loop	Coal loading and dispatch – currently utilised			1,807	m
Workshops	Workshops, service buildings and storage of materials/equipment – currently utilised			2,839	m^2
Administration Buildings	Administration and staff facilities – currently utilised			2,151	m^2
Access Roads & Haul Roads	Paved and unpaved roads for access to and around site – currently utilised			15.5	ha
Coal conveyors and coal conveyor drive	Transporting coal from the underground workings to the surface – currently utilised			1,785	m
Car Parking Areas	Car park - currently utilised			7,180	m^2
Sewage / Water Treatment Plant	Treatment of waste water/sewerage from amenities on site – currently utilised			2	item
Hardstand /Laydown Areas (across the entire site)	Equipment storage – currently utilised			25,377	m^2
Diesel Tanks	Fuel storage and supply – currently utilised			1	item

Major Assets	Use	Demolition / Rehabilitation Activities	Approvals Required	Quantity	Unit
Concrete Water Storage Tanks	Water storage and fire-fighting – currently utilised	Disconnect and terminate all services; demolish and remove buildings, infrastructure and concrete pads; removal of roads not required post closure; demolish and remove coal crushing, screening and washing plant; remove carbonaceous material; all hazardous materials and contaminated materials removed/remediated; stable landform and landform shaping; drainage designed in accordance with Blue Book; rehabilitate with woodland seed mix.	Demolition certificates; Contamination Assessments	3	item
Coal Stockpile Areas (ROM and washed)	Storage of ROM and washed coal – currently utilised			11.04	ha
Transformers	Power supply – currently utilised			2	item
Refuelling Station	Refuelling plant– currently utilised			355	m^2
Power/Pumping/Services/Ballast Holes	Supply of power etc. to underground mine – currently utilised	Seal with an appropriately designed and engineered plug reinforcement that complies with relevant construction standards and RR guidelines.	RR approval for sealing	1	item
Ventilation Facility - Downcast Shaft	Mine air ventilation – currently utilised	Remove ventilation fans and equipment; backfill and seal shafts; construct engineered plug; disconnect services; demolish and remove infrastructure; and remove concrete pads.		1	item
Ventilation Facility - Upcast Shaft	Mine air ventilation – currently utilised			1	item
Surface Portals/Decline Entries	Access portals – currently utilised	Sealed in accordance with RR guidelines		2	item
Surface Water Diversions	Diversion of clean water from dirty water – currently utilised.	Re-shape, deep rip and ameliorate.	None	11,262	m^2
Power Lines	Power supply to site plant – currently utilised	Disconnect and terminate powerlines; Demolish and remove support infrastructure.	Demolition certificates; Contamination Assessments	2.05	km
Monitoring Infrastructure	Monitoring of water and subsidence – currently utilised	Piezometers will be decommissioned in accordance with relevant RR requirements; surface water monitoring devises (e.g. transducers) will be decommissioned and removed; subsidence survey markers will be decommissioned and removed; boreholes will be sealed in accordance with RR requirements.	None	100 monitoring pegs 33 boreholes	item
Domain 2 – Tailings Storage Facility: 18.4 ha					

Major Assets	Use	Demolition / Rehabilitation Activities	Approvals Required	Quantity	Unit
Reject Emplacement Area III	Emplacement of reject materials – currently in care and maintenance	To be capped and top soiled; stabilised and revegetated.	High Risk Activity Notification	9.3	ha
Reject Emplacement Area VI	Emplacement of reject materials – currently utilised			3.4	ha
Reject Emplacement Area V	Emplacement of reject materials – currently utilised			5.7	ha
Domain 3 – Water Management Area: 2.73 ha					
Dams including Leachate Dam, Main Dam, Polishing Lagoon, REA VI and smaller dams	Water storage – currently utilised	Drain and remove contaminated sediments from the floor of the dams to enable it to be converted into a clean water structure.	Contamination Assessments	2.73	ha
Domain 4 – Existing Rehabilitation: 22.0 ha					
No buildings or plant located within this domain	N/A	N/A	N/A	N/A	N/A
Domain 5 – Conservation and Biodiversity Offset Area: 834.9 ha					
No buildings or plant located within this domain	N/A	N/A	N/A	N/A	N/A
Domain 6 – Other Lands: 7,658.7 ha					
No buildings or plant located within this domain	N/A	N/A	N/A	N/A	N/A

Note: Unsealed exploration boreholes have been excluded from this asset register as they have been addressed by separate RCEs as part of the exploration programs.

3 Environmental Issues Management

3.1 Environmental Risk Assessment

A risk assessment was undertaken for this MOP which addressed all risks to rehabilitation at the Clarence Colliery (refer **Appendix 3**). The risk assessment was facilitated by Centennial Coal on 26 September 2017 and included key Clarence Colliery personnel and SLR Consulting.

Centennial Coal's Risk Management Standard Risk Matrix was used to calculate the consequence and likelihood of an event to evaluate the subsequent risk level (risk rank). Risks are ranked as Low, Moderate, Significant, High or Extreme. The risk assessment was undertaken in accordance with the AS/NZS ISO 3100:2009 *Risk Management – Principles and Guidelines*.

The risk assessment identified 36 key rehabilitation risks which are summarised as follows:

- 27 risks were ranked as low;
- 9 risks were ranked as moderate;
- No risks were ranked as significant;
- No risks were ranked as high; and
- No risks were ranked as extreme.

3.2 Environmental Risk Management

The Clarence Colliery has developed an Environmental Management Strategy (EMS) to provide an overarching direction for the implementation of Centennial Coal's Environmental Policy. The EMS establishes the management framework to identify and control potential environmental impacts, and to achieve compliance with environmental legislation and regulatory requirements applicable to Clarence Colliery.

The EMS has been developed and implemented to ensure the effective management of environmental issues and compliance with all regulatory requirements while providing a means for continued improvement in the environmental performance of Clarence Colliery. The EMS incorporates a number of environmental management plans which are designed to assist in meeting community and regulatory expectations.

In accordance with the requirements of DA 504-00, Clarence Colliery operates under the management plans in **Table 10**.

Table 10 – Management Plans

Management Plan	DA-504-00 Condition	Status
700 West Area SMP	Schedule 3, Condition 2	Variation 6 approved 28 May 2021which extends the expiry date to 1 June 2025.
800 Area SMP		Variation 7 was approved 13 May 2021 and expires on 24 December 2025.
900 Area SMP		Variation 5 was approved on the 26 July 2019 and expires on 31 January 2023

Management Plan	DA-504-00 Condition	Status
Water Management Plan - A Water Balance - An Erosion and Sediment Control - A Surface Water Monitoring Program - A Groundwater Monitoring Program - A Surface and Groundwater Response Plan	Schedule 3, Condition 6	Submitted September 2021
Biodiversity Offset Strategy	Schedule 3, Condition 12A	Incorporated into the Centennial *Regional Biodiversity Strategy Western Projects* in November 2020 (RPS, 2014) as part of MOD 3 regarding the construction of REA VI.
Air Quality and Greenhouse Gas Management Plan	Schedule 3, Condition 14	Incorporated into the Centennial *Western Region Air Quality and Greenhouse Gas Management Plan* and submitted November 2021
Noise Management Plan	Schedule 3, Condition 16	Incorporated into the Centennial *Western Region Noise Management Plan* and submitted November 2021
Heritage Management Plan	Schedule 3, Condition 30	Incorporated into the Centennial *Western Region Western Region - Aboriginal Cultural Heritage Management Plan* and dated September 2021
Environmental Monitoring Program	Schedule 5, Condition 3	Submitted November 2021
Environmental Management Strategy	Schedule 5, Condition 1	Submitted November 2021

The environmental management plans listed in **Table 10** are subject to regular review and are therefore subject to change. Any revisions will be submitted for consultation and approval, as required.

The environmental management plans are supported by a comprehensive environmental monitoring program. Monitoring results for most environmental monitoring aspects such as water quality discharges and dust monitoring are reported monthly on Centennial's website and on an annual basis in the EPL Annual Return and the Annual Review, which are available online.

3.2.1 Air Quality

This risk of emissions of particulate matter resulting in complaints or non-compliance was ranked low during the risk assessment. Air quality will be managed in accordance with the *Western Region Air Quality and Greenhouse Gas Management Plan* which was prepared to provide fulfil Schedule 3, Condition 14 of DA 504-00.

The *Western Region Air Quality and Greenhouse Gas Management Plan* includes a number of emission controls and standard work procedures which are implemented across all sites to manage and minimise emissions of dust and particulate matter. These work procedures are current best practice standards for the underground coal mining industry and include:

- The use of water sprays/carts to dampen exposed surfaces and trafficable areas;
- Vehicle speed limits enforced onsite;

- The use of water cannons/water sprays on coal stockpiles;
- The use of an automatic train loader which produces a low and even profile of coal on the surface of the wagon and reduces spillages;
- Transporting coal with a high inherent moisture content;
- A combination of partial and fully enclosed conveyors and conveyor transfer points.
- Maintaining plant and equipment to ensure optimal operating conditions;
- Use of low sulphur diesel;
- Use of diesel engines which conform to the United States EPA Tier 3 standards for exhaust emissions;
- Underground dust suppression system (water strays on coal cutting machinery and running conveyor belts);
- Timely rehabilitation of disturbed areas where practical; and
- All haulage trucks entering and leaving the sites have their loads covered.

3.2.2 Erosion and Sediment Control

Erosion and sediment control activities at Clarence Colliery are undertaken in accordance with the *Water Management Plan*. Management of erosion and sedimentation at Clarence Colliery is implemented principally to ensure that water discharged off site complies with suspended solids limits detailed in EPL 726. This objective is intrinsic to erosion and sedimentation designs and controls, and is achieved by implementing the following principles:

- Separating undisturbed, 'clean water' runoff from disturbed, 'dirty water' runoff to minimise and isolate the amount of 'dirty water' to be treated and either reused or discharged off site;
- Directing sediment-laden runoff into designated sediment control retention ponds
- Diverting 'clean water' runoff unaffected by the operations offsite; and
- Installation and maintaining sediment control structures in accordance with industry standards to ensure the potential for sediment movement off site is minimal.

Clarence Colliery Risk Assessment found the risk to rehabilitation from erosion was considered to be low.

3.2.3 Surface Water and Groundwater

The potential discharge of polluted water offsite due to high rainfall events, inadequate drainage or storage was considered a moderate risk during the risk assessment. The management of erosion and sediment control discussed in **Section 3.2.2** will also continue to be implemented to minimise the potential for polluted water.

A water management system operates across Clarence Colliery which is detailed within the approved *Water Management Plan.* This Plan has been prepared to satisfy Schedule 3, Conditions 6 to 11 of DA 504-00. The principle objectives of the *Water Management Plan* include:

- Separation of clean, dirty and leachate water;
- Capture and treatment of dirty and leachate water to ensure compliance with EPL 726; and
- Appropriate sediment controls are maintained.

The *Water Management Plan* also describes the monitoring program to measure the performance of the water management system and applies to all operations at Clarence Colliery.

The partial extraction technique used at Clarence ensures that impacts on the surrounding groundwater resources are minimised. As part of the *Water Management Plan*, the Clarence Colliery developed a Groundwater Monitoring Program and Response Plan. The objectives of this monitoring program are to monitor and manage any potential impacts resulting from operations at Clarence Colliery on both groundwater baseflows and surface water flows in water bodies above the mine. These flows are critical to the protection of upland swamps and wetlands and supply a source of bore water to the residents of Clarence Village.

The program gathers baseline groundwater levels and quality data, develop groundwater impact assessment criteria, monitor the volume and quality of groundwater seeping into the underground mine workings and monitor regional groundwater levels in a number of geologic formations at the mine as follows:

- Banks Wall Sandstone;
- Burra-Moko Head Sandstone;
- Caley Formation; and
- Katoomba Coal Seam.

Groundwater is also managed and monitored through the SMP process which includes risk assessment, performance monitoring and mitigation of residual risks.

3.2.4 Contaminated Land

Clarence completed a targeted Phase 2 Environmental Site Assessment (ESA) during 2012. The objective of the ESA was to assess the presence of soil and groundwater contamination in targeted areas identified as areas of potential concern within the CHPP and Pit Top areas. As a result of this investigation the risk assessment found that contaminated lands posed a low risk to rehabilitation.

3.2.5 Flora

A range of management measures are implemented by Clarence Colliery to protect threatened species and communities, minimise impacts upon native flora and fauna, manage clearing on the site, control weeds and control access to environmentally sensitive areas.

Eight native vegetation communities have been mapped as occurring within the Clarence Colliery holding. Two of these communities include the Temperate Highland Peat Swamps on Sandstone community which is listed under the *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*. This community is commensurate with the Newnes Plateau Shrub Swamps and Newnes Plateau Hanging Swamps communities listed Endangered Ecological Communities (EECs) under the *Threatened Species Conservation Act 1995* (TSC Act).

Within the mining area, the partial extraction technique ensures minimal subsidence of less than 100 mm. It is therefore extremely unlikely that mining at Clarence Colliery will have an impact on the local flora and ecological communities. A flora monitoring program was setup as part of the SMP process to verify that this is the case and to identify any natural variations. Risk and potential impacts to threatened flora over the mining area is managed through the SMPs and EMPs.

Conservation Sites

The *Regional Biodiversity Strategy Western Projects* (RPS, 2014) was prepared to provide compensatory measures for the impacts associated with the following Centennial projects:

- Clarence Reject Emplacement Area (REA VI);
- Springvale Mine Extension Project
- Springvale Bore 8;
- Angus Place Mine Extension Project;
- Angus Place Ventilation Facility;
- Springvale Western Coal Services; and
- Neubeck Coal Project.

Conservation sites have been proposed that consider several factors, including providing greater areas of commensurate habitat to that being lost, wherever possible. Additionally, sites that have strategic value due to their position in relation to other large tracts of forested habitats or the existing or potential high biodiversity values have been investigated.

The offsets package outlined within the *Regional Biodiversity Strategy Western Projects* (RPS, 2014) has been divided into three forms:

(1) Offsets land to be secured in perpetuity with an Offsets Management Plan:

- Airly Offset Site; and
- Wolgan Road Northern Offset Site.

(2) Rehabilitation land in accordance with a defined Rehabilitation Plan:

- Wangcol Creek Rehabilitation;
- Lamberts Gully Rehabilitation; and
- Commonwealth Colliery Rehabilitation Site.

(3) Land management to be rehabilitated and restored as per a Land Management Plan:

- Wolgan Road Southern Management Site;
- Brays Lane, Lidsdale Management Site; and
- Coxs River, Angus Place Management Site.

EECs listed under the TSC Act to be protected by these offsets include Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland EEC (20.08 ha); and Montane Peatlands and Swamps (1.46 ha). Additionally the offset strategy includes the White Box – Yellow Box – Blakely's Red Gum Woodland Endangered Ecological Community (38.58 ha) which is listed as EEC under the TSC Act and as a Critically Endangered Ecological Community (CEEC) under the EPBC Act.

The location of conservation sites are shown on Plan 4 (refer **Appendix 2**). These sites are managed collectively by the Centennial West Operations in accordance with the *Regional Biodiversity Strategy Western Projects* (RPS, 2014) (refer to **Appendix 5**).

3.2.6 Fauna

The risk to rehabilitation of fauna was found to be moderate based on aquatic fauna. Risks to terrestrial fauna were found to be low.

Habitat Management

Extensive fauna surveys have been undertaken at Clarence Colliery for the purposes of monitoring. Environmental Assessments and due diligence reporting has also been undertaken for greater than 30 years at the Clarence Colliery tenements. To date, greater than 200 species, including more than 133 birds, 36 mammals, 25 reptiles, 13 amphibians have been recorded. This includes 13 threatened bird, 9 threatened mammal, 1 threatened reptile, 1 threatened amphibian and 1 threatened invertebrate species. The fauna species recorded are likely to utilise a majority of the forested habitat throughout the holding and surrounding expansive Newnes State Forest and Blue Mountains National Park areas as part of their foraging, nesting and breeding habitat.

Before surface disturbance occurs, an ecological due diligence survey will be undertaken to identify any threatened species and any key habitat structures including hollow bearing trees. Where possible these habitat structures will be left in situ. If it is not possible to retain these structures they will be relocated to rehabilitation areas on site.

3.2.7 Weeds and Pests

The weeds that have been identified within Clarence Colliery and associated areas include but are not limited to: Pampas grass *(Cortaderia selloana)*, African lovegrass (*Eragrostis curvula*), Whiskey Grass (*Andropogon virginicus*), Blackberry *(Rubus fructicosus)*, Spanish heath (E*rica lusitanica)* and St Johns Wort (*Hypericum perforatum)*. Weed control measures are carried out as required to control the spread of environmental and noxious weeds around the Pit Top including the CHPP, administration buildings, water storages, drainage lines, access roads and rehabilitation areas.

Feral cats, dogs and European Foxes have been previously identified within the Clarence Colliery holding. Environmental inspections have been included in the Clarence Colliery Work Order Management System to identify the presence of pest species and potential corrective actions which may include 1080 baiting and trapping.

3.2.8 Blasting

No blasting is conducted at Clarence Colliery and no explosives are stored on site.

3.2.9 Noise

Noise was considered a low risk to rehabilitation during the risk assessment. Operational noise is managed in accordance with the *Western Region Noise Management Plan*. Key objectives of the Plan include:

- Noise Impact Assessment Criteria for Day, Evening and Nigh Periods at nearby sensory receptors;
- Monitoring to determine compliance with the impact assessment criteria;
- Complaints hotline that operates 24 hours a day, 7 days a week;
- TARP to deal with complaints to ensure prompt response to concerns from nearby residents; and
- Mitigation to ensure the minimisation of operational noise.

3.2.10 Visual and Lighting

Visual impacts and lighting emissions were ranked as a low risk to rehabilitation at Clarence Colliery during the risk assessment. All external lighting associated with operations at Clarence Colliery complies with *Australian Standard AS4282 (INT) 1995 – Control of Obtrusive Effects of Outdoor Lighting*.

No community complaints have been recorded regarding light annoyance at Clarence.

3.2.11 Heritage (Aboriginal and European)

During 2014 Centennial Coal prepared a *Western Region Aboriginal Cultural Heritage Management Plan* (WRACHMP) in consultation with relevant stakeholders. The plan was approved by the Department of Environment and Energy on 23 October 2014. The Plan has since been updated and approved by DPE in October 2021. This document provides Centennial Coal with a consistent approach to the following across the western operations:

- Consultation with Aboriginal groups, native title claimants and Local Aboriginal Land councils regarding identification of Aboriginal cultural heritage sites;
- Identification of consistent minimum standards and processes for identification of Aboriginal heritage sites; and
- Monitoring and management of Aboriginal cultural heritage.

In accordance with the WRACHMP, if it is suspected Aboriginal Cultural Heritage Material has been encountered during any surface clearing or construction, work will cease immediately in that area, and the area will be cordoned off. Contact will be made with OEH, a suitably qualified archaeologist and the relevant Aboriginal stakeholders, so that it can be adequately assessed and managed. In the unlikely event that skeletal remains are uncovered, the relevant command area of the NSW Police will be contacted and if skeletal remains are deemed to be of Aboriginal origin, contact will be made with the OEH, a suitably qualified archaeologist and the relevant Aboriginal stakeholders.

Similarly if, during the course of clearing or construction works, significant European cultural heritage material is uncovered, work will cease in that area immediately. The NSW Heritage Branch will be notified and works only recommence when an appropriate and approved management strategy is instigated.

3.2.12 Bushfire

The MOP risk assessment found that there were two moderates risks associated with bushfire for rehabilitation Clarence Colliery:

- Bushfire impacting rehabilitation activities themselves; and
- Bushfire damaging infrastructure.

The majority of the land within the MOP Area is heavily forested with native vegetation and has been identified as bushfire prone land. As such, there is a risk of impact during extreme fire danger periods and the potential for personnel to be exposed to bushfire in isolated or rough terrain, with limited access provisions and potentially hindering a safe evacuation.

Clarence Colliery has developed a *Bushfire Management Plan*. Fire risk management measures include:

- Managing potential sources of ignition via a hot works management system;
- Maintaining firebreaks surrounding Clarence Colliery operations;
- Providing firefighting equipment at Clarence Colliery operations;
- Maintaining a water supply for firefighting purposes;
- Trained and competent personnel on site who can conduct fire-fighting if required; and
- Regular dialogue with the local Rural Fire Service (RFS) and National Parks and Wildlife Service (NPWS) in relation to Bushfire Management Practices.

3.3 Specific Risks Relating to Rehabilitation

3.3.1 Material Prone to Spontaneous Combustion

Spontaneous combustion can occur when coal oxidises and ignites as a result of internal heat which arises spontaneously due to reactions liberating heat faster than it can be lost to the environment. Spontaneous combustion risks include ROM coal stockpiles, product coal stockpiles and exploration holes. Clarence Colliery has not had any incidences of spontaneous combustion either underground or within surface emplacements and based on coal testing has an extremely low potential for spontaneous combustion.

The mine's telemetric monitoring system has the ability to continuously monitor and respond to any evidence of spontaneous combustion, in the unlikely event that the situation should arise. This system monitors both conveyor belt roadways as well as return roadways of working sections and outbye areas for ventilation flow, methane and carbon monoxide. The monitoring system has a readout and alarm at the surface as well as systems in place defining alarm levels and appropriate responses should they be triggered.

The risk to rehabilitation from spontaneous combustion was found to be low in the MOP risk assessment.

3.3.2 Material Prone to Generating Acid Mine Drainage

Reject material has the potential to produce acid mine drainage (AMD). A low acid neutralising potential of 0.68 kg H_2SO_4 / tonne was determined for the reject material and suggests limited self-neutralising ability. Any leachate released directly to receiving waters prior to treatment has potential to exceed aquatic ecosystem protection triggers and relevant EPL and approval limits. The Water Treatment Plant has been specifically designed to prevent the release of dirty water or leachate to receiving waters. A diversion drain has been constructed around the southern, eastern and western edges of the REA area to intercept and divert any clean catchment run-off prior to it entering the REA site. Only rain falling directly upon the REA footprint has potential to infiltrate through the emplaced material to generate leachate.

The risk to rehabilitation from acid mine drainage was found to be low in the MOP risk assessment.

Following an inspection by the RR on 26 February 2020 and a subsequent Section 240 Notice that was issued to Clarence on 20 May 2020, Clarence commissioned a comprehensive AMD study of REA III to determine the capacity of AMD from REA III and the interaction with the Wollangambe River. The findings of the Clarence REA 3 Rehab (AMD) Acid Mine Drainage Study (GHD 2021) concluded that there is no evidence that uncontrolled AMD is leaving site towards the Wollangambe River.

3.3.3 Mine Subsidence

The partial extraction mining method adopted by Clarence Colliery results in a maximum predicted subsidence of 100 mm with low tilts and strains, virtually immeasurable valley closure, minimal (if any) subsidence and no surface cracking. The primary objective pertaining to surface subsidence is to ensure that subsidence is limited to a value well within that considered to be characteristic of 'elastic' overburden behaviour (i.e. no caving to surface), which is defined as 100 ±25 mm. Monitoring to date has demonstrated that this target has been delivered.

A Trigger Action Response Plan (TARP) is developed for each SMP Area. An SMP must be prepared in accordance with Schedule 3, Condition 2 of DA 504-00 for any mining activity which potentially may lead to subsidence. The TARP establishes trigger levels which are used to monitor against predictions made within the SMP. The TARP also provides strategic management responses to monitoring results with a focus on response to results that exceed predictions or cause actual or potential impacts and consequences.

The risk to rehabilitation from mine subsidence was found to be low in the MOP risk assessment.

3.3.4 Soil Type(s) and Suitability

The risk to rehabilitation due to insufficient suitable topsoil available was found to be moderate. To ensure that all available topsoil resources are appropriately managed, Clarence Colliery will handle topsoil as outlined in **Section 7.7**.

Prior to use in rehabilitation all topsoil and available material will be tested to determine suitability for ameliorant application or if additional material may need to be sourced.

3.3.5 Slopes and Slope Management

The risks to rehabilitation posed from slopes were found to be moderate for stability of dam embankments. In 2015 a coal fines holding cell in REA III overtopped resulting in a discharge of material. Following the incident extensive remediation works took place. In addition all other REAs have been subsequently over-engineering to reduce the risk of such an event occurring again.

The incident also resulted in a number of prohibitions and clean up notices which are still currently in force. Further works involving the construction and decommissioning works for REA III have required the preparation of a HRA Notification under the *NSW Work Health and Safety (Mines) Regulation 2014*. Prior to submission of this MOP, a detailed risk assessment was undertaken to assess the potential risks associated with these activities during the MOP term. Clarence Colliery appointed an independent facilitator to conduct the risk assessment and to ensure that residual risks have been minimised.

Establishment, operation or decommissioning of any REAs at Clarence Colliery will involve the preparation of a HRA Notification. This process provides the RR with significant input to the final landform and stability.

3.3.6 Hazardous Materials and Dangerous Goods

Hazardous materials and dangerous goods were found to be a low risk during the MOP risk assessment. Clarence Colliery has implemented a *Dangerous Goods and Hazardous Substances Management Plan*. The primary objectives of this management plan include but are not limited to:

- Application of a suitable risk management process to identify hazards/risks and establish the appropriate controls;
- Establishing standards, procedures and the appropriate information and communication protocols;
- Ensuring as far as reasonably practicable that person(s) are sufficiently aware of their authority and responsibility;
- Providing means for induction and ongoing training for matters related to this management plan;
- Establishing a structured process for the identification, monitoring, assessment and control of changes associated to this management plan;
- Providing an effective measurement and monitoring process of the control measures including determination of compliance through audit and review; and
- Comply with the provisions of the operations Health and Safety Management System and relevant legislation, as a minimum.

This *Hazardous Substances and Dangerous Goods Management Plan* provides practical guidance for the purchase, storage, use, handling and disposal of Hazardous Substances at Clarence Colliery. Spill kits are available and a Pollution Incident Response Management Plan (PIRMP) is implemented in the event of a spill.

3.3.7 Drought

The risk posed by drought to effective rehabilitation activities was considered low during the MOP due to the water storages on site and the availability of water from dewatering activities.

3.3.8 Sealing of Underground Entries

Inadequate sealing of adits was identified as a low risk to rehabilitation at Clarence Colliery. This is due to the mine being operational and closure not occurring in this MOP term.

4 Post Mining Land Use

4.1 Regulatory Requirements

Regulatory requirements specific to post-mining land use, landscape and rehabilitation outcomes at Clarence Colliery are summarised in **Table 11**.

Table 11 – Regulatory Requirements

Condition	Requirement	Applicable areas	Status
DA 174-93			
Condition 11	The applicant shall prepare, within 6 months of the commencement of operations for Reject Emplacement Area IV and Reject Emplacement Area V respectively, a detailed rehabilitation plan for each area. This plan is to be submitted to the Department of Mineral Resources, the Soil Conservation Service and Council for approval.	Project Application Area	Previously approved MOP and this MOP
Condition 12	The applicant shall consult with the Soil Conservation Service in respect of the progressive and final rehabilitation of Reject Emplacement Areas IV and V. Rehabilitation of these areas is to be undertaken to the satisfaction of the Soil Conservation Service, the Department of Mineral Resources and Council.	Project Application Area	Completed as part of the previous MOP update and this MOP
Condition 13	The applicant shall arrange an annual onsite meeting over the life of the project to inspect the results of the rehabilitation works for Reject Emplacement Areas IV and V. Representatives from Council, the Soil Conservation Service, National Parks and Wildlife Service and the Department of Mineral Resources shall be invited to attend to assess the success of rehabilitation works and to recommend any modifications or improvements to the rehabilitation program. The first annual site meeting shall be undertaken not more than One (1) year after the commencement of operations for REA IV and REA V respectively or shall coincide with that required for Reject Emplacement Area No III as per Condition 6 of the amended 1976 approval for Clarence Colliery.	Project Application Area	Part of original requirements of DA 174-93
DA 504-00.			
Schedule 2 Condition 1	The Applicant shall implement all practicable measures to prevent and/or minimise any harm to the environment that may result from the construction, operation, or rehabilitation of the development.	Project Application Area	Ongoing
Schedule 3 Condition 28	**Mine Closure Strategy** At least 3 years prior to the cessation of mining, the Applicant must prepare a Mine Closure Strategy for the development, in consultation with Council, Resources Regulator, DPIE Water and EPA, and to the satisfaction of the Secretary. The plan must: a) define the objectives and criteria for mine closure; b) investigate options for the future use of the site, including the pit top and surface facilities area; c) investigate ways to minimise the adverse socio-economic effects associated with mine closure, including reduction in local employment levels; d) define a strategy for the ongoing management of water inflow to the mine; e) describe the measures that would be implemented to minimise or manage the ongoing f) environmental effects of the development; and g) describe how the performance of these measures would be monitored over time.	Project Application Area	To be prepared within 3 years of mine closure

Condition	Requirement	Applicable areas	Status
Schedule 3 Condition 29	**Rehabilitation** The Proponent shall prepare and implement a Rehabilitation Management Plan for the development, in accordance with the conditions imposed on the mining lease(s) associated with the development under the Mining Act 1992.	Project Application Area	To be completed prior to the end of this MOP term.
EL 5072, AUTH 307, AUTH 416 and AUTH 451			
Condition 9	**Environmental Harm** The Licence holder must implement all reasonably practicable measures to prevent and/or minimise harm to the environment that may result from the conduct of any prospecting operations under this exploration licence	Lease Area	In progress
Condition 10	**Erosion and Sediment Control** The licence holder must prevent erosion and pollution of watercourses resulting from the conduct of prospecting operations by implementing effective erosion and sediment control measures	Lease Area	In progress
Condition 11	**Erosion and Sediment Control** The planning, design and construction of erosion and sediment control measures must be conducted generally in accordance with *Managing Urban Stormwater: Soils and Construction* (DECC 2007), as amended or replaced from time to time.	Lease Area	In progress
Condition 17	**Vegetation Clearing** Vegetation clearing and vegetation disturbance must be limited to the minimum extent necessary to facilitate the conduct of prospecting operations authorised by this exploration licence.	Lease Area	In progress
Condition 25	**Topsoil Management** The licence holder must ensure that all topsoil removed in the course of prospecting operations is stockpiled for later use in rehabilitating those operations.	Lease Area	In progress
Condition 26	**Drilling** The licence holder must: b) Ensure that the construction, operation, maintenance and decommissioning of boreholes does not cause or enhance: i) hydraulic connection between aquifers; ii) contamination or cross-contamination of aquifers; Iii) the escape of natural or noxious gases; iv) the uncontrolled surface discharge of ground waters; v) collapse of the surrounding surface; or vi) hazards to persons, stock and wildlife; g) Remove equipment and logging tools from the borehole prior to plugging and abandonment of the borehole, unless otherwise approved by the Minister; and; h) Once a borehole ceases to be used, the borehole must be completely filled with cement grout during drill rod withdrawal and plugged, unless otherwise approved by the Minister.	Lease Area	In progress
Condition 31	**Safety** The licence holder must carry out operations in a manner that ensures the safety of members of the public, stock and wildlife in the vicinity of the operations.	Lease Area	In progress
Condition 37/38	**Rehabilitation** All disturbance resulting from prospecting operations carried out under this exploration licence must be rehabilitated by the licence holder to the satisfaction of the Minister.	Lease Area	In progress

Condition	Requirement	Applicable areas	Status
Condition 38/39	**Rehabilitation** In rehabilitating the disturbance resulting from the prospecting operations, the licence holder must ensure that: a) All machinery, buildings and other infrastructure is removed from the area, b) the area is left in a clean, tidy and stable condition c) there is no adverse environmental effect outside the disturbed area; d) the land is properly drained and protected from soil erosion; e) the land is not a potential source of pollution; f) the land is compatible with the surrounding land and land use requirements. g) the landforms, soils, hydrology and flora require no greater maintenance than that in, or on, the surrounding land; h) the land does not pose a threat to public safety, and i) in cases where vegetation has been removed or damaged: i) where the previous vegetation was native, species used for revegetation, are endemic to the area: or ii) where the previous vegetation was not native, species used for revegetation are appropriate to the area, and iii) any revegetation is of an appropriate density and diversity.	Lease Area	In progress
Condition 39/40	**Rehabilitation** The licence holder must ensure that all water land and wetland crossings that are disturbed during prospecting operations are rehabilitated such that the natural flow of water is unimpeded and bank stability is maintained to prevent erosion.	Lease Area	In progress
Condition 40/41	**Rehabilitation** The licence holder must comply with any relevant guidelines issued by the Secretary in the rehabilitation of disturbance resulting from prospecting operations under this exploration licence.	Lease Area	In progress
Condition 41/42	**Rehabilitation** All rehabilitation of disturbance resulting from prospecting operations under this exploration licence must be completed before the expiry of this exploration licence or as soon as practicable following cancellation of this exploration licence, unless otherwise approved by the Minister.	Lease Area	In progress
Condition 42/43	**Rehabilitation** Boreholes that have been abandoned as a result of previous mining or prospecting operations, and which have been opened up or used by the licence holder are subject to the conditions of this exploration licence as if the boreholes were constructed by the holder of this exploration licence.	Lease Area	In progress
Condition 43/44	**Reporting** The licence holder must submit an Environmental Management Report to the Department in the following circumstances: a) where the licence holder is seeking to renew this exploration licence, an Environmental Management Report must accompany an exploration licence renewal application; or **b)** where the licence holder is seeking to cancel or part cancel this exploration licence, an Environmental Management Report must accompany an exploration licence cancellation application; **c)** where the licence holder is not seeking to renew or cancel this exploration licence, an Environmental Management Report must be submitted prior to the expiry of this exploration licence.	Lease Area	In progress

Condition	Requirement	Applicable areas	Status
Condition 44/45	**Reporting** The report must be prepared in accordance with any Secretary's requirements for environmental and rehabilitation reporting on exploration licences and include information on all disturbance resulting from prospecting operations and rehabilitation carried out within the exploration licence area. The report must be prepared to the satisfaction of the Secretary.	Lease Area	In progress
CCL 705 and ML 1583			
Condition 2	**Mining, Rehabilitation, Environmental Management Process (MREMP)** **Mining Operations Plan (MOP)** 1) Mining operations, including mining purposes, must be conducted in accordance with a Mining Operations Plan (the Plan) satisfactory to the Director-General. The Plan together with environmental conditions of development consent and other approvals will form the basis for: (a) ongoing mining operations and environmental management; and (b) ongoing monitoring of the project.	Lease Area	This document.
	2) The Plan must be prepared in accordance with the Director-General's guidelines current at the time of lodgement.	Lease Area	This document.
	3) A Plan must be lodged with the Director-General: (a) prior to the commencement of mining operations (including mining purposes); (b) subsequently as appropriate prior to the expiry of any current Plan: and (c) in accordance with any direction issued by the Director-General.	Lease Area	This document.
	4) The Plan must present a schedule of proposed mine development for a period of up to seven (7) years and contain diagrams and documentation which identify: (a) area(s) proposed to be disturbed under the Plan; (b) mining and rehabilitation method(s) to be used and their sequence; (c) areas to be used for disposal of tailings/waste; (d) existing and proposed surface infrastructure; (e) existing flora and fauna on the site; (f) progressive rehabilitation schedules; (g) areas of particular environmental, ecological and cultural sensitivity and measures to protect these areas;	Lease Area	This document.
	5) The Plan when lodged will be reviewed by the Department.	Lease Area	This document.
	6) The Director-General may within two (2) months of the lodgement of a Plan, require modification and re-lodgement.	Lease Area	This document.
	7) If a requirement in accordance with clause (6) is not issued within two (2) months of the lodgement of a Plan, the lease holder may proceed with implementation of the Plan.	Lease Area	This document.
	8) During the life of the Mining Operations Plan, proposed modifications to the Plan must be lodged with the Director-General and will be subject to the review process outlined in clauses (5) - (7) above. Annual Environmental Management Report (AEMR)	Lease Area	This document.
CCL 705			

Condition	Requirement	Applicable areas	Status
Condition 13	**Rehabilitation** (a) Land disturbed must be rehabilitated to a stable and permanent form suitable for a subsequent land use acceptable to the Director-General and in accordance with the Mining Operations Plan so that: • there is no adverse environmental effect outside the disturbed area and that the land is properly drained and protected from soil erosion. • the state of the land is compatible with the surrounding land and land use requirements. • the landforms, soils, hydrology and flora require no greater maintenance than that in the surrounding land. • in cases where revegetation is required and native vegetation has been removed or damaged, the original species must be re-established with close reference to the flora survey included in the Mining Operations Plan. If the original vegetation was not native, any re-established vegetation must be appropriate to the area and at an acceptable density. • the land does not pose a threat to public safety. (b) Any topsoil that is removed must be stored and maintained in a manner acceptable to the Director-General.	Lease Area	In progress
Condition 14	**Rehabilitation** The lease holder must comply with any direction given by the Director-General regarding the stabilisation and revegetation of any mine residues, tailings or overburden dumps situated on the lease area.	Lease Area	In progress
Condition 16	**Prevention of Soil Erosion and Pollution** Operations must be carried out in a manner that does not cause or aggravate air pollution, water pollution (including sedimentation) or soil contamination or erosion, unless otherwise authorised by a relevant approval, and in accordance with an accepted Mining Operations Plan. For the purpose of this condition, water shall be taken to include any watercourse, waterbody or groundwaters. The lease holder must observe and perform any instructions given by the Director-General in this regard.	Lease Area	In progress
Condition 29 (f)	The lease holder shall, upon abandonment of any drillhole on the subject lands, fill in or suitably plug such a drillhole to the satisfaction of the Minister.	Lease Area	In progress
Condition 29 (n)	All topsoil is to be stockpiled prior to the construction of the proposed dams. Such topsoil is to be replaced on the walls of the completed dams.	Lease Area	In progress
Condition 29 (j)	Complete work in relation to rehabilitation within the Warragamba Outer Catchment Area before termination of the authority to the satisfaction of the Authority.	Lease Area	In progress
ML 1721			
Condition 2	**Rehabilitation** Any disturbance resulting from the activities carried out under this mining lease must be rehabilitated to the satisfaction of the Minister.	Lease Area	In progress
Condition 3	**Mining Operations Plan and Annual Rehabilitation Report** a) The lease holder must comply with an approved Mining Operations Plan (MOP) in carrying out any significant surface disturbing activities, including mining operations, mining purposes and prospecting. The lease holder must apply to the Minister for approval of a MOP. An approved MOP must be in place prior to commencing any significant surface disturbing activities, including mining operations, mining purposes and prospecting.	Lease Area	This document.

Condition	Requirement	Applicable areas	Status
	b) The MOP must identify the post mining land use and set out a detailed rehabilitation strategy which: i. identifies areas that will be disturbed; ii. details the staging of specific mining operations, mining purposes and prospecting; iii. identifies how the mine will be managed and rehabilitated to achieve the post mining land use; iv. identifies how mining operations, mining purposes and prospecting will be carried out in order to prevent and or minimise harm to the environment; and v. reflects the conditions of approval under: • the *Environmental Planning and Assessment Act 1979*; • the *Protection of the Environment Operations Act 1997*; and • any other approvals relevant to the development including the conditions of this mining lease.	Lease Area	This document.
	c) The MOP must be prepared in accordance with the ESG3: Mining Operations Plan (MOP) Guidelines September 2013 published on the Department's website at www.resources.nsw.gov.au/environment	Lease Area	This document.
	d) The lease holder may apply to the Minister to amend an approved MOP at any time.	Lease Area	This document.
	e) It is not a breach of this condition if: i. the operations which, but for this condition 3(e) would be a breach of condition 3(a), were necessary to comply with a lawful order or direction given under the *Environmental Planning and Assessment Act 1979*, the *Protection of the Environment Operations Act 1997*, the *Mine Health and Safety Act 2004 / Coal Mine Health and Safety Act 2002* and *Mine Health and Safety Regulation 2007 / Coal Mine Health and Safety Regulation 2006* or *the Work Health and Safety Act 2011*; and ii. the Minister had been notified in writing of the terms of the order or direction prior to the operations constituting the breach being carried out.	Lease Area	This document.
	f) The lease holder must prepare a Rehabilitation Report to the satisfaction of the Minister. The report must: i. provide a detailed review of the progress of rehabilitation against the performance measures and criteria established in the approved MOP; ii. be submitted annually on the grant anniversary date (or at such other times as agreed by the Minister); and iii. be prepared in accordance with any relevant annual reporting guidelines published on the Department's website at www.resources.nsw.gov.au/environment.	Lease Area	Annual Review
Statement of Commitments from 1975 EIS			
Section 4.3.2	…it is also planned to dispose of refuse in the sand quarry adjacent to the proposed quarry. Negotiations are proceeding with the operators of the sand quarry to enable refuse to be used in the restoring the quarried areas to their original contour levels."	Project Application Area	Being investigated
Section 5.1	The rock excavations for the rail loop will become a permanent landscape feature.	Project Application Area	No longer applicable

Condition	Requirement	Applicable areas	Status
Statement of Commitments from 2000 Extension EIS			
Section 2.7.3	Detailed proposals for rehabilitation and environmental management must be provided in regard to any second workings application.	Project Application Area	Included in SMPs
Section 5.2.3	The proposed development will not compromise future land uses for the area since no surface activities will be occurring in relation to this development. The proposed underground mining will employ mining methods that limit subsidence. During and following mining, the surface land will be able to support the same land uses as it currently does.	Project Application Area	In progress
Section 7.2 (Table 7.1)	In areas outside protection zones which may experience full extraction, any surface cracks which may pose an erosion risk will need to be rehabilitated- A surface inspection should be undertaken following full extraction.	Project Application Area	No full extraction
Section 7.5.5	Progressive rehabilitation of the reject emplacements will continue as required.	Project Application Area	In progress
Statement of Commitments from MOD 2 EIS			
Section 15.1	The rehabilitation of the proposed REA VI will be undertaken in accordance with the procedures developed and currently being implemented for REA I to IV.	Project Application Area	In progress
Section 17	Undertake rehabilitation of REA VI in accordance with the Conceptual Rehabilitation and Closure Plan (2012).	Project Application Area	In progress
Potential Environmental Impacts from Modification Report for MOD 6			
Section 7.3	Rehabilitation will be undertaken in accordance with Clarence's MOP	Project Application Area	In Progress

4.2 Post Mining Land Use Goal

The conceptual long term mine rehabilitation objective is to provide a low maintenance, geotechnically stable and safe landform that is commensurate with the surrounding area.

The intended post-mining land use for the disturbed areas around Clarence Colliery is to revegetate to a woodland community commensurate with the adjacent native vegetation. It is anticipated that preliminary options will be reviewed in more detail at the commencement of the detailed closure planning stage which, will be no later than five years from permanent mine closure. During the detailed phase of closure planning, Centennial will undertake additional stakeholder consultation which may see additional items included.

It is recognised that at the time of closure, there may be opportunities for infrastructure such as roads and buildings to remain to service future industries on site and/or neighbouring industries. A number of other opportunities for re-use and/or recycling may also be available, however these opportunities will be considered during the detailed closure planning phase, which will include extensive stakeholder consultation and would require landowner approval.

In addition to tenement and Development Consent conditions, there are further requirements under the *NSW Work Health and Safety (Mines) Regulation 2014* for REAs. Establishment, operation or decommissioning of an REA requires the preparation of a High Risk Activity (HRA) Notification. This process provides the RR with significant input to the final landform.

4.3 Rehabilitation Objectives

Rehabilitation objectives for Clarence Colliery have been provided as **Table 12**.

Table 12 – Rehabilitation Objectives

Feature	Objective
Mine site (as a whole)	• Safe, stable and non-polluting. • Final landforms to be: - compatible with surrounding land uses; and - designed to minimise, as far as is reasonable and feasible, the visual impacts of the development; and - be in keeping with the natural terrain features of the area. • To protect the environment and public health and safety by using safe and responsible closure practices; • To produce a final landform which will be stable, aesthetically consistent with the pre-existing and surrounding landforms and which does not pose an ongoing environmental liability. • To reduce or eliminate environmental effects during the rehabilitation program; • To establish conditions which are consistent with the pre-determined end land use objectives; and • To reduce the need for long term monitoring and maintenance by establishing stable landforms.
Surface infrastructure	• To be decommissioned and removed (unless the Secretary, RR agrees otherwise).
Portals	• To be decommissioned and made safe and stable.
Watercourses subject to mining impacts	• Hydraulically and geomorphologically stable. • To ensure that the drainage system at the site will remain stable and functional under extreme rainfall events
Other land affected by the development	• Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprised of local native plant species.
Community	• Ensure public safety.

To achieve the post mining land use goal outlined in **Section 4.2**, Clarence Colliery has developed a number of additional rehabilitation objectives. These objectives are:

- Rehabilitation of native vegetation will be integrated with undisturbed native vegetation to provide consolidated areas and wildlife corridors where possible;
- Maintain existing rehabilitation works until completion criteria have been satisfied;
- Maintain existing pollution control systems to protect waterways and surrounding ecosystems until such time as the rehabilitation works have achieved the stated completion criteria;
- To create a stable landform with self-sustaining vegetation compatible with the surrounding native communities;
- Maintain a rehabilitation monitoring and verification program utilising Ecosytem Function Analysis (EFA) to provide confidence that the completion criteria can be met;
- Undertake improvements to the existing drainage system to ensure long term stability;
- Control of noxious weeds and feral animals;
- Continuing to act as a responsible member and contributor to the local community; and
- The rehabilitated sites will be clean and tidy and not present a hazard to persons, stock or native fauna.

5 Rehabilitation Planning and Management

5.1 Domain Selection

Primary and secondary domains have been defined in accordance with the methodology prescribed in *ESG3: Mining Operations Plan (MOP) Guidelines* (DRG, 2013). As such, the following applies:

- Primary domains are defined as the set of discrete areas that have a particular operational or functional purpose. Land management units with similar operational function are likely to have similar geophysical features and constraints/opportunities for rehabilitation; and
- Secondary domains are land management units with similar post mining land use objectives, such as woodland communities and native grasslands.

Accordingly, domains have been defined considering the operational function and specific final land use objectives. Domains at the commencement of the MOP period are shown in Plan 2 and listed in **Table 13**.

Table 13 – MOP Domains

Code	Primary Domain (Operational)	Code	Secondary Domain (Post Mining Land Use)
1	**Infrastructure** – Includes all existing infrastructure and facilities at Clarence Colliery, including: all buildings and infrastructure (including workshops, administration buildings, general and sheds); CHPP buildings and fixed plant (including the conveyors, drive station, transfer points, rejects bins, thickener tanks, dump hoppers and pit top storage); coal stockpile areas (ROM and washed); refuelling station; train loading facility and rail loop; switchyard; ventilation facility and downcast shaft; upcast shaft and buildings; potable water plant and tanks; old water tanks; roads and tracks; ballast boreholes and related water management infrastructure; surface water diversions; access roads; car parks and hard stand areas; laydown areas; sewerage treatment plant and effluent irrigation area; and grit traps. Equipment components within this domain that are not sold at mine closure or relocated to other Centennial Coal sites will be decommissioned and/or demolished. The disturbed areas at the pit top will be rehabilitated, with the exception of water management infrastructure (and associated tracks) to be utilised by Lithgow City Council. Other tracks on the Newnes Plateau may be retained for use as fire trails or access tracks by recreational users of Newnes State Forest and FCNSW.	A	**Retained Water Management Area** – The current water storage ponds, settlement ponds and diversion banks in the pit-top area will be retained to provide erosion and sediment control during closure, and to maximise the availability of water for any future use of the site post closure

Code	Primary Domain (Operational)	Code	Secondary Domain (Post Mining Land Use)
2	**Tailings Storage Facility** – Constitutes all active reject emplacement areas (REA). This includes REA III (currently in care and maintenance), the currently active REA VI and REA V which will be constructed during the MOP period.	B	**Rehabilitation Area – Woodland** – Current plans include rehabilitation to forest for the majority of the current disturbed areas, the only exception is some water management areas.
3	**Water Management Area** – Includes he network of dams and associated water management infrastructure at the Clarence Pit Top. These structures will not be decommissioned at the end of mine life but will be maintained for future use.	C	**Retained Infrastructure** – Includes tracks to pit top water management infrastructure to be utilised by Lithgow City Council. Other tracks on the Newnes Plateau may be retained for use as fire trails or access tracks by recreational users of Newnes State Forest and FCNSW.
4	**Existing Rehabilitation Area** – Includes the rehabilitation completed on REA I, II and IV, rehabilitated drilling pads on the Newnes Plateau, the former location of the 11kV earthmat and batters of the coal stockpiles.	D	**Conservation and Biodiversity Offset Area** – as defined in the Western Region Biodiversity Offset Package
5	**Other Lands** – This domain incorporates all lands within the MOP area not captured by domains 1 to 5 above. The Domain includes the existing mining areas where limited rehabilitation works may be required due to subsidence impacts. This also includes some infrastructure on the Newnes plateau, such as boreholes, where remediation may be required. However, this excludes all disturbance associated with the construction/maintenance activities undertaken by service providers (i.e. power and roads).		
6	**Conservation and Biodiversity Offset Area** – Includes the Airly Offset Site, Wolgan Road Northern Offset Site, Wangcol Creek Rehabilitation, Lamberts Gully Rehabilitation, Commonwealth Colliery Rehabilitation Site, Wolgan Road Southern Management Site, Brays Land Lidsdale Management Site and the Coxs River Angus Place Management Site. The Conservation Sites are managed collectively by the Centennial West Operations in accordance with the October 2014 version of the *Regional Biodiversity Strategy Western Projects* (RPS, 2014)		

5.2 Domain Rehabilitation Objectives

General rehabilitation objectives for Clarence Colliery are outlined in **Section 4.3**. Rehabilitation domains require specific management objectives to realise the desired final land use outcome due to the distinct features associated with the current land function.

Key rehabilitation objectives for the Domains identified in **Section 5.1** are defined in **Table 14**.

Table 14 – Domain Rehabilitation Objectives

Code	Domain	Rehabilitation Objective
Primary Domains		
1	Infrastructure Area	• All infrastructure removed or made safe. • All hazardous materials and contaminated materials removed. • Stable landform that is non-polluting. • Drainage structures will be designed and constructed where required in accordance with Blue Book. • Land and Soil Capability Class 5. • Ecosystem health satisfying completion criteria. • Ecosystem structure satisfying completion criteria. • Ecosystem composition satisfying completion criteria.
2	Tailings Storage Facility	• All hazardous materials and contaminated materials removed. • Stable landform that is non-polluting. • Drainage structures will be designed and constructed where required in accordance with Blue Book. • Land and Soil Capability Class 5. • Ecosystem health satisfying completion criteria. • Ecosystem structure satisfying completion criteria. • Ecosystem composition satisfying completion criteria.
3	Water Management Area	• Water quality non-polluting and appropriate for final land use. • Water quality leaving site to be in accordance with the EPL water quality criteria. • Drainage structures will be designed and constructed where required in accordance with Blue Book requirements.
4	Existing Rehabilitation Area	• Final landforms are safe, stable, non-polluting and compatible with the surrounding landscape; • Post mining land use to be self-sustaining natural ecosystem comprising native trees and shrubs generally representative of vegetation in comparable analogue communities; • Weeds and feral animal species do not present a risk to rehabilitation; • Drainage structures will be designed and constructed where required in accordance with Blue Book requirements; • Erosion does not present a safety hazard or compromise the post mining land capability; and • Vegetation meets the long term completion criteria being low maintenan ce and self-sustaining.
5	Other Lands	• Final landforms are safe, stable, non-polluting and compatible with the surrounding landscape; • All mining related material has been removed; • Cliffs and steep slopes present no additional risk to public safety compared to pre-mining conditions; • All mine openings including boreholes, shafts and declines will be backfilled, sealed and rehabilitated in accordance with the relevant DRE requirements. • Ecosystem composition satisfying completion criteria.

Code	Domain	Rehabilitation Objective
6	Conservation and Biodiversity Offset Area	• Stable landform that is non-polluting. • Drainage structures will be designed and constructed where required in accordance with Blue Book requirements. • Land and Soil Capability Class 5. • Ecosystem health satisfying completion criteria. • Ecosystem structure satisfying completion criteria. • Ecosystem composition satisfying completion criteria. • Local native plant species. • A landform consistent with the surrounding environment. • Overall management in accordance with the *Regional Biodiversity Strategy (RPS 2014).*
Secondary Domains		
A	Retained Water Management Area	• Water quality non-polluting and appropriate for final land use. • Water quality leaving site to be in accordance with the EPL water quality criteria. • Drainage structures will be designed and constructed where required in accordance with Blue Book requirements.
B	Rehabilitation Area – Woodland	• All infrastructure removed or made safe. • All hazardous materials and contaminated materials removed. • Stable landform that is non-polluting. • Drainage structures will be designed and constructed where required in accordance with Blue Book. • Land and Soil Capability Class 5. • Ecosystem health satisfying completion criteria. • Ecosystem structure satisfying completion criteria. • Ecosystem composition satisfying completion criteria.
C	Retained Infrastructure	• All hazardous materials and contaminated materials removed. • Stable landform that is non-polluting. • Drainage structures will be designed and constructed where required in accordance with Blue Book.
D	Conservation and Biodiversity Offset Area	• Stable landform that is non-polluting. • Drainage structures will be designed and constructed where required in accordance with Blue Book requirements. • Land and Soil Capability Class 5. • Ecosystem health satisfying completion criteria. • Ecosystem structure satisfying completion criteria. • Ecosystem composition satisfying completion criteria. • Local native plant species. • A landform consistent with the surrounding environment. • Overall management in accordance with the *Regional Biodiversity Strategy (RPS 2014).*

5.3 Rehabilitation Phases

Achievement of the agreed post mining land use will be achieved through a series of conceptual phases which are described as:

- **Phase 1: Decommissioning** – removal of hard stand areas, plant, equipment, buildings and other structures, contaminated materials, hazardous materials;
- **Phase 2: Landform Establishment** – incorporates gradient, slope, aspect, drainage, substrate material characterisation and morphology;
- **Phase 3: Growth Medium Development** – incorporates physical, chemical and biological components of the growing media and ameliorants that are using to optimise the potential of the media in terms of the preferred vegetative cover;
- **Phase 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;
- **Phase 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
- **Phase 6: Land Relinquishment** – completion criteria for rehabilitation are met and the land is determined to be suitable to be relinquished from the mine lease.

Table 15 provides a summary of the expected completion of rehabilitation phases for each relevant domain at the end of the MOP term. The projected rehabilitation phases in 2022 (end of the MOP term) have been shown on Plan 3B (refer **Appendix 2**).

Table 15 – Summary of Rehabilitation Phases for each Domain at the End of MOP Term

Domain / Rehabilitation Phase	Infrastructure – Rehabilitation Area Woodland (1B)	Infrastructure – Retained infrastructure (1C)	Tailings Storage Facility – Rehabilitation Area Woodland (2B)	Water Management Area – Retained Water Management Area (3A)	Existing Rehabilitation Area – Rehabilitation Area Woodland (4B)	Other lands – Rehabilitation Area Woodland (5B)	Conservation and Biodiversity Offset Area – Conservation and Biodiversity Offset Area (6D)
Active	✓	✓	✓	✓	✓	✓	✓
Phase 1 Decommissioning	x	x	x	x	✓	x	✓
Phase 2 Landform Establishment	x	x	x	x	✓	x	✓
Phase 3 Growth Medium Development	x	x	x	x	✓	x	✓
Phase 4 Ecosystem and Land Use Establishment	x	x	x	x	✓	x	✓
Phase 5 Ecosystem and Land Use Sustainability	x	x	x	x	x	x	✓
Phase 6 Relinquished Lands	x	x	x	x	x	x	x

✓ = Areas of this domain are subject to this rehabilitation phase during MOP Term.

x = Domain not expected to enter this rehabilitation phase during the MOP Term.

6 Performance Indicators and Completion/Relinquishment Criteria

6.1 Performance Measures

Performance measures are used to quantify the rehabilitation and land management program in terms of efficiency and effectiveness. They are also used to establish the indicative timeframes for completion, and the standards of completion.

During the MOP term, performance measures used to quantify rehabilitation will include:

- Inspections for indicators relating to landform design;
- Rehabilitation monitoring;
- Surface water monitoring; and
- Soil sampling.

6.2 Performance Indicators and Completion Criteria

Performance indicators will be used during rehabilitation to assess performance at Clarence Colliery. Indicators relate to both the biophysical and built environment, and can be measured consistently over time. Indicators used will include:

- All buildings/infrastructure to be removed from site;
- Removal of roads not required post-mining;
- Adequate condition of slopes, drainage and erosion on rehabilitation areas;
- Water management structures are safe, stable and non-polluting;
- Water quality within EPL criteria;
- Soil/growing medium parameters adequate to sustain ecosystems; and
- Vegetation communities and structure development consistent with analogue communities.

The performance indicators and completion criteria for each of the rehabilitation phases are included in **Tables 16 – 20**.

Table 16 – Phase 1 – Decommissioning Phase

Domain Objective	Performance Indicator	Completion Criteria	Justification/Source	Complete (Yes/No)	Progress at start of MOP	Progress at end of MOP
All Primary Domains						
Final landforms are safe, stable, non-polluting and compatible with the surrounding landscape	No public safety risk	Excavations have been rendered safe; all holes/pits and other openings are securely capped, filled or otherwise made safe; access to members of the public is restricted as appropriate to site conditions; no rubbish remains at the surface, or at risk of being exposed through erosion.	NSW Work Health and Safety (Mines and Petroleum Sites) Act 2013; Condition 31 of A307, A416 and A451, Springvale MOP, Angus Place MOP, Ivanhoe Colliery MOP	No	Not complete	Not complete
	Site security	Adequate fencing and gates have been installed (where required) prior to commencing decommissioning and demolition works.				
All hazardous and/or contaminated materials will be removed or remediated in-situ such that the land is suitable for the intended post mining land use.	Removal of hazardous materials	A hazardous materials assessment has been undertaken and any hazardous and contaminated materials are identified and removed from site by a licenced contractor (verified by Certificates of disposal).	Springvale MOP, Angus Place MOP, Ivanhoe Colliery MOP, Blue Mountains Colliery MOP	No	Not complete	Not complete
	Remediation of contaminated land as required	A contamination assessment has been undertaken and any contaminated areas have been remediated so that appropriate guidelines for land use are satisfied.				
	Carbonaceous material	Remove remaining carbonaceous material.				
Domain 1 – Infrastructure						
Infrastructure (other than that remaining in the final landform) will be decommissioned progressively and	Removal of infrastructure	All nominated infrastructure that is not required as part of the post-mining land use has been demolished and removed from the site (unless otherwise agreed in writing by the DRE and landowner).	Springvale MOP; Angus Place MOP; Condition 38 of AUTH 307, AUTH 416 and AUTH 451	No	Not complete	Not complete
	Demolition of infrastructure	All demolition work has been carried out in accordance with *AS2601-2001: Demolition of Structures* or its latest version.	*AS2604-2001*	No	Not complete	Not complete

Domain Objective	Performance Indicator	Completion Criteria	Justification/Source	Complete (Yes/No)	Progress at start of MOP	Progress at end of MOP
rehabilitated when no longer required. All other infrastructure will be decommissioned post-mining.	Disconnect / remove services	All services, including power, water, data and telephone, that are not required for demolition activities have been safely isolated, disconnected and terminated. Generally all underground services will be made safe and left buried in-situ. Alternatively, they will be used for another purpose, if one is determined and approved by the RR.	Springvale MOP; Angus Place MOP; Condition 38 of AUTH 307, AUTH 416 and AUTH 451	No	Not complete	Not complete
	All surface entries and shafts sealed in accordance with RR guidelines	All adits, shafts and drifts to be filled and capped in accordance with DRE guideline *MDG 6001 for the Permanent Filling and Capping of Surface Entries to Coal Seams* (DRE, 2012), or contemporary equivalent. Once completed, all capping and filling has been appropriately verified and approved.	*MDG 6001;* Approved Springvale MOP; Approved Angus Place MOP; CCL 705 Condition 29 (f)	No	Not complete	Not complete
	Groundwater piezometers removed and sealed	All piezometers will be decommissioned and sealed in accordance with RR requirements, excluding those being retained for monitoring purposes.	Springvale MOP; Angus Place MOP; CCL 705 Condition 29 (f)	No	Not complete	Not complete
	Removal of machinery	All mobile machinery not required for rehabilitation activities has been removed from the site.	Springvale MOP; Angus Place MOP; Condition 38 of AUTH 307, AUTH 416 and AUTH 451	No	Not complete	Not complete
	No petroleum, chemicals and explosive products on site	All petroleum, chemicals and explosive products have been removed from the site.	Springvale MOP; Angus Place MOP; Condition 38 of AUTH 307, AUTH 416 and AUTH 451	No	Not complete	Not complete
	Obsolete water management structures	All drains and banks not required in the final landform have been demolished and accumulated sediment removed and disposed of in the REA.	Western Coal Services MOP	No	Not complete	Not complete

Domain Objective	Performance Indicator	Completion Criteria	Justification/Source	Complete (Yes/No)	Progress at start of MOP	Progress at end of MOP
Domain 2 – Tailings Storage Facility						
Filling and capping of REAs	REA infrastructure removed	All REA/tailings infrastructure (pipelines pumps and related infrastructure) is decommissioned and removed.	2014 – 2017 MOP (Centennial Coal, 2014); Schedule 3, Condition 29 DA 504-00; Western Coal Services MOP	No	Not complete	Not complete
	Design and approval	A Detailed REA Capping Design will be developed and approved by the RR (or contemporary equivalent) for HRA prior to closure.	*NSW Work Health and Safety (Mines) Regulation 2014*	No	Not complete	Not complete
Domain 3 – Water Management Area						
Mine water dams and sediment dams are dewatered and desilted prior to being converted to clean water dams.	Pumping Infrastructure	All ancillary equipment including pumps and pipelines has been removed and services terminated.	Springvale MOP; Angus Place MOP; Western Coal Services MOP	No	Not complete	Not complete
	Hazardous materials	Sediments accumulated in dams are removed from the floor of the dam floor and emplaced in the REA prior to capping.	Western Coal Services MOP			
	Dams to remain	Dams to remain at closure to remain for future use.	Springvale MOP; Angus Place MOP; Western Coal Services MOP			
	Erosion control	Presence of sediment and erosion controls for the minimisation of discharge of dirty water off site.				
		Presence of water management structures (e.g. contour banks and diversion drains) to direct water into the retained dams or other into stable areas.				
	Water quality	Water quality of the receiving waters is not affected by surface water runoff from the site, discharge is within relevant limits (Electrical Conductivity (EC), pH, Total Suspended Solids (TSS) and oil and grease).				
Domain 4 – Existing Rehabilitation Area						

Domain Objective	Performance Indicator	Completion Criteria	Justification/Source	Complete (Yes/No)	Progress at start of MOP	Progress at end of MOP
No proposed decommissioning activities in this domain						
Domain 5 – Other Lands						
Exploration and groundwater monitoring boreholes decommissioned and sealed	Exploration and groundwater monitoring boreholes decommissioned and sealed	Exploration and groundwater monitoring wells have been decommissioned and sealed in accordance with RR requirements, excluding those being retained for monitoring purposes.	Condition 6 of Water Licenses: 10BL156676; 10BL161962; 10BL161963; 10BL161964; 10BL161965; 10BL602211; 10BL602212; 10BL602213; 10BL603337; 10BL604063; 10BL604098; 10BL605316;	No	Not complete	Not complete
Domain 6 – Conservation and Biodiversity Offset Area						
No proposed decommissioning activities in this domain						

Table 17 – Phase 2 – Landform Establishment

Domain Objective	Performance Indicator	Completion Criteria	Justification/Source	Complete (Yes/No)	Progress at start of MOP	Progress at end of MOP
All Primary Domains						
Final landforms are safe, stable, non-polluting and free-draining and compatible with the surrounding landscape.	Stable final land form	Final landform is consistent with surrounding landforms.	Springvale MOP; Angus Place MOP	No	Not complete	Not complete
	Erosion control	Erosion control structures have been installed at intervals commensurate with the slope of the landform.	Springvale MOP; Angus Place MOP	No	Not complete	Not complete
Domain 1 – Infrastructure						
Final landforms are safe, stable, non-polluting and free-draining.	Surface water drainage	The land form is stable and contour banks and diversion drains are installed to direct water into stable areas or sediment control basins.	Springvale MOP; Angus Place MOP; CCL 705 Condition 16; Condition 10 of AUTH 307, AUTH 416 and AUTH 451	No	Not complete	Not complete
Quality material is used for rehabilitation	Material characterisation	Determine soil characterisation of the topdressing material and treat if necessary with soil conditioners and fertilisers.	Springvale MOP; Angus Place MOP	No	Not complete	Not complete
Domain 2 – Tailings Storage Facility						
Capping of REAs	RR Signoff	REA to be capped in accordance with an approved Detailed Capping Design.	*NSW Work Health and Safety (Mines) Regulation 2014*	No	Not complete	Not complete
Final landforms are safe, stable, non-polluting and free-draining.	Free Draining	Capped REAs to be confirmed by survey to be free draining following the expected settlement period.	*NSW Work Health and Safety (Mines) Regulation 2014*	No	Not complete	Not complete
		Establish drainage systems as part of batter formation to ensure stability.	Western Coal Services MOP	No	Not complete	Not complete

Domain Objective	Performance Indicator	Completion Criteria	Justification/Source	Complete (Yes/No)	Progress at start of MOP	Progress at end of MOP
		Constructed contour banks and diversion drains to direct water into the water management system.	Western Coal Services MOP	No	Not complete	Not complete
		Completed REA batters to be top-dressed and sown within 6 months of completion of construction.	Western Coal Services MOP	No	Not complete	Not complete
	Batter Slopes	REA III batters with gradients of 1:4 (upper 70%) and 1:5 (lower 30%).	Clarence REA 3 Rehabilitation Design Report (GHD, 2018)	No	Not complete	Not complete
	Capping	REA III capped with 400 mm compacted sandy clay / clayey sand. The 400 mm compacted sandy clay / clayey sand cap would then be covered with 600 mm of plant growing media for revegetation purposes. Noting that topsoil application depth is addressed separately in Table 18.	Clarence REA 3 Rehabilitation Design Report (GHD, 2018)	No	Not complete	Not complete
No evidence of Spontaneous Combustion	Spontaneous Combustion	Monitoring records verify that there is no evidence of spontaneous combustion.	Western Coal Services MOP	No	Not complete	Not complete
No evidence of Acid Mine Drainage	Acid Mine Drainage	Capped REA geotechnical analysis indicates there is no evidence of Acid Mine Drainage generation as indicated by acidic pH, high EC or high sulphate content (>1%)	Western Coal Services MOP	No	Not complete	Not complete
Domain 3 – Water Management Area						
Final landform drainage will integrate with surrounding catchments, achieve long term geomorphic stability and minimise erosion.	Stable landform	Water storages to remain in the final landform have been rehabilitated to a stable non-polluting condition.	Springvale MOP; Angus Place MOP; the Blue Book	No	Not complete	Not complete
	Landform drainage design	Landform drainage structures including drains and retained dams have been designed and constructed in accordance with *Managing Urban Stormwater: Soils and Construction, Volume 1 and Volume 2E*, Mines and Quarries (the Blue Book) (Landcom, 2004) requirements and any drainage or other studies .	Springvale MOP; Angus Place MOP; the Blue Book	No	All current structures are designed in accordance with Blue Book	Not complete - all water management structures will be designed in accordance with Blue Book
	Water management	Water management is consistent with the regional catchment management strategy	CCL 705 Condition 29 (j)	No	Not complete	Not complete

Domain Objective	Performance Indicator	Completion Criteria	Justification/Source	Complete (Yes/No)	Progress at start of MOP	Progress at end of MOP
	Geomorphic stability	Drainage structures are assessed to be hydraulically and geomorphologically stable with no active gully heads, tunnel erosion or bank failure.	Springvale MOP; Angus Place MOP; the Blue Book	No	Not complete	Not complete
Domain 4 – Existing Rehabilitation Area						
Quality material is used for rehabilitation	Material characterisation	Soil analysis of (substrate material characterisation) within the existing rehabilitation area will be undertaken to determine potential constraints relating to current rehabilitation.	Springvale MOP; Angus Place MOP	No	Not complete	Not complete
Slopes less than 14 degrees (unless approved)	Slopes	Rehabilitated slopes are generally less than 10 degrees and not more than 14 degrees without RR approval.	*Development of Rehabilitation Criteria for Native Ecosystem Establishment on Coal Mines in the Hunter Valley* (Nichols 2005)	No	All current slopes have been inspected by RR	Not complete
Domain 5 – Other Lands						
Final landforms are safe, stable, non-polluting and free-draining.	Surface water drainage	The land form is stable and contour banks and diversion drains are installed to direct water into stable areas or sediment control basins.	The Blue Book; Condition 38 AUTH 307, AUTH 416 and AUTH 451; CCL 705 Condition 13	No	Not complete	Not complete
Domain 6 – Conservation and Biodiversity Offset Area						
No proposed landform establishment activities in this domain						

Table 18 – Phase 3 – Growth Medium Development

Domain Objective	Performance Indicator	Completion Criteria	Justification/Source	Complete (Yes/No)	Progress at start of MOP	Progress at end of MOP
Domain B – Rehabilitation (Woodland)						
Growth medium has suitable physical and chemical parameters.	Topsoil	Topsoil stockpiles will be less than 3 m high.	Springvale MOP; Angus Place MOP (Blue Book or is it 2m)	No	Not complete	Not complete
		Where resources allow, topsoil will be spread to a nominal depth range of 100 – 300 mm on all rehabilitated areas.				
		Previously stockpiled topsoil has been used in the rehabilitation activities.				
	Amelioration	Suitable and alternative topsoil substitute (for example bio-solids, organics, etc.) have been used on rehabilitation areas, if required to make up any short-fall in the topsoil required for complete rehabilitation.	Springvale MOP; Angus Place MOP			

Table 19 – Phase 4 – Ecosystem and Land Use Establishment

Domain Objective	Performance Indicator	Completion Criteria	Justification/Source	Complete (Yes/No)	Progress at start of MOP	Progress at end of MOP
Domain A – Retained Water Management Elements						
Final landform drainage will integrate with surrounding catchments, achieve long term geomorphic stability and minimise erosion.	Discharge water quality	Water quality of the receiving waters is not affected by surface water runoff from the site, discharge is within relevant limits (Electrical Conductivity (EC), pH, Total Suspended Solids (TSS) and oil and grease).	EPL 726	Yes	Water generally meets criteria.	Water monitoring to continue.
Domain B – Rehabilitation (Woodland)						

Domain Objective	Performance Indicator	Completion Criteria	Justification/Source	Complete (Yes/No)	Progress at start of MOP	Progress at end of MOP
Effective maintenance and management of rehabilitation areas. Woodland rehabilitation areas species diversity is comparable to analogue native vegetation community	Species Selection	A mixture of native trees, shrubs and grasses representative of regionally occurring woodland is present.	Springvale MOP, Angus Place MOP; Condition 38 AUTH 307, AUTH 416 and AUTH 451; CCL 705 Condition 13	No	Not complete	Not complete
		Established species survive and/or regenerate after disturbance.	Springvale MOP, Angus Place MOP	No	Not complete	Not complete
		Weeds do not dominate native species after disturbance or after rain (<15 % weeds present in monitoring sites).	Springvale MOP, Angus Place MOP	No	Not complete	Not complete
		Pests do not occur in substantial numbers or visibly affect the development of planted species.	Springvale MOP, Angus Place MOP	No	Not complete	Not complete
		Minimum of 60% vegetative cover is present (or 50% if rocks, logs or other features of cover are present).	Springvale MOP, Angus Place MOP, AECOM - *Rehabilitation Monitoring - Selected Centennial Mine Sites, Lithgow*	No	Not complete	Not complete
	Rehabilitation monitoring	Undertake annual rehabilitation monitoring as required to determine target community structure and floristics.	AECOM - *Rehabilitation Monitoring - Selected Centennial Mine Sites, Lithgow*	No	Not complete	Not complete
	Development of woodland habitat	Minimum of 60% vegetative cover (vegetation, leaf litter, mulch) is present (or 50% if rocks, logs or other features of cover are present). No bare surfaces >20 m^2 in area or >10 m in length down slope.	Springvale MOP, Angus Place MOP, AECOM - *Rehabilitation Monitoring - Selected Centennial Mine Sites, Lithgow*	No	Not complete	Not complete

Domain Objective	Performance Indicator	Completion Criteria	Justification/Source	Complete (Yes/No)	Progress at start of MOP	Progress at end of MOP
		More than 70% of shrubs and/or trees are healthy when ranked healthy, sick or dead.	Springvale MOP, Angus Place MOP, *Development of Rehabilitation Criteria for Native Ecosystem Establishment on Coal Mines in the Hunter Valley* (Nichols, 2005)	No	Not complete	Not complete
		Habitat features, including structures suitable for fauna habitat are incorporated into native vegetation rehabilitation areas.	Springvale MOP, Angus Place MOP, AECOM - *Rehabilitation Monitoring - Selected Centennial Mine Sites, Lithgow*	No	Not complete	Not complete

Table 20 – Phase 5 – Ecosystem and Land Use Sustainability

Domain Objective	Performance Indicator	Completion Criteria	Justification/Source	Complete (Yes/No)	Progress at start of MOP	Progress at end of MOP
Domain A – Retained Water Management Elements						
Final landform drainage will integrate with surrounding catchments, achieve long term geomorphic stability and minimise erosion.	Discharge water quality	Water quality of the receiving waters is not affected by surface water runoff from the site, discharge is within relevant limits (Electrical Conductivity (EC), pH, Total Suspended Solids (TSS) and oil and grease).	EPL 726	Yes	Water generally meets criteria.	Water monitoring to continue.
Domain B – Rehabilitation (Woodland)						
Ecosystem health	Habitat complexity	Habitat complexity score is >4.0 - ≤6.0.	Approved Springvale MOP, Angus Place MOP, AECOM - *Rehabilitation Monitoring - Selected Centennial Mine Sites, Lithgow*	No	Not complete	Not complete
	Sustainability	Species are capable of setting viable seed, flowering or otherwise reproducing. Evidence of second generation of tree/shrub species.		No	Not complete	Not complete
		Evidence of active use of habitat provided during rehabilitation such as nest boxes, and logs and signs of natural generation of shelter sources including leaf litter.		No	Not complete	Not complete
	Nutrient cycling – rehabilitation monitoring	Nutrient cycling and recycling processes are occurring as evidenced by the presence of a litter layer, mycorrhizae and/or other microsymbionts.		No	Not complete	Not complete
	Rehabilitation monitoring	Continue rehabilitation monitoring until self-sustaining levels are confirmed.		No	Not complete	Not complete
	Vegetation health	More than 75% of trees are healthy and growing as indicated by long term rehabilitation monitoring	*Development of Rehabilitation Criteria for Native Ecosystem Establishment on Coal Mines in the Hunter Valley* (Nichols, 2005)	No	Not complete	Not complete

Domain Objective	Performance Indicator	Completion Criteria	Justification/Source	Complete (Yes/No)	Progress at start of MOP	Progress at end of MOP
	Vegetation Structure	Rehabilitation monitoring confirms woodland rehabilitation areas provide a range of structural habitats (e.g. eucalypts, shrubs, ground cover, developing litter layer etc.).	AECOM - *Rehabilitation Monitoring - Selected Centennial Mine Sites, Lithgow*	No	Not complete	Not complete
	Rehabilitation monitoring results	Total woody species richness differs 10 - 20% from analogue sites	Approved Springvale MOP, Angus Place MOP, AECOM - *Rehabilitation Monitoring - Selected Centennial Mine Sites, Lithgow*	No	Not complete	Not complete
		Less than 40% bare ground cover.		No	Not complete	Not complete
		The dominant species found within rehabilitation sites are found in analogue sites.		No	Not complete	Not complete

7 Rehabilitation Implementation

7.1 Status at MOP Commencement

The status of each Primary and Secondary Domain at the commencement of this MOP Term has been shown on **Plan 2** (refer **Appendix 2**). The status of operations and rehabilitation relevant to each domain at the commencement of the MOP Term is summarised in **Table 21**.

Rehabilitation of exploration drill holes will be undertaken in accordance with the methods detailed in ESF4 applications/Review of Environmental Factors (REFs) for the proposed exploration activities. Clarence will continue to consult with relevant parties on the relinquishment of historic exploration boreholes.

Table 21 – Rehabilitation Status at MOP Commencement

Code	Domain	Status at MOP Commencement
Primary Domains		
1	Infrastructure Area	This domain is active and subject to ongoing operations.
2	Tailings Storage Facility	This domain includes REA III, REA IV, REA V and REA VI. REA III is in the early stage of rehabilitation, which involves ongoing removal of final coal material and reshaping to final landform with CCR. REA IV is inactive and generally rehabilitated, except for an access road leading to REA V. Ongoing rehabilitation trial is being conducted on REA IV. REA V is under construction and active. REA VI is active, progressive rehabilitation has been completed along lower benches
3	Water Management Area	This domain is active and subject to ongoing operations.
4	Existing Rehabilitation Area	This domain includes all rehabilitated areas at MOP commencement. Rehabilitation management and maintenance is being undertaken as required.
5	Other Lands	This domain includes areas where limited rehabilitation works may be required due to subsidence impacts. This domain will be subject to management activities, as required.
6	Conservation and Biodiversity Offset Area	Includes the conservation sites outlined within the October 2014 version of the *Regional Biodiversity Strategy Western Projects* (RPS 2014) (refer **Appendix 5**). This area is under active rehabilitation management.
Secondary Domains		
A	Retained Water Management Area	Final landform water management structures will remain at closure as shown on Plan 4 (refer **Appendix 2**).
B	Rehabilitation Area – Woodland	22.0 ha of woodland rehabilitation has been established at the commencement of the MOP term. This domain will be subject to ongoing maintenance and management as required.
C	Retained Infrastructure	This domain includes access roads that will be retained in the final landform. The locality of these access roads has been shown on Plan 4 (refer **Appendix 2**).
D	Conservation and Biodiversity Offset Area	As per Domain 6.

7.2 Proposed Rehabilitation Activities during the MOP Term

Disturbance and rehabilitation activities during the MOP Term are shown on **Plan 3A** (refer **Appendix 2**). A description of proposed activities for each domain is provided in **Sections 7.2.1 – 7.2.10**.

A summary of forecast disturbance and rehabilitation during the MOP Term has been provided in **Table 22**. The proposed activities will be subject to Clarence Colliery achieving the production targets outlined in **Section 2.2.6**.

Table 22 – Rehabilitation and Disturbance Rates during the MOP Term

Year	Total Disturbance Area (ha)	Total Rehabilitation Area (ha)	Cumulative Rehabilitation Area (ha)	Comments
Start of MOP (2018)	73.7	22.0	22.0	Plan 2
2019	75.4	1.9	23.9	Plan 3A – Reflects the commencement of Stage 1 REA V construction (including Leachate Dam 4) and water treatment plant upgrades.
End of MOP (2022)	64.3	3.9	27.8	Plan 3B – Reflects the completion of REA II and REA III progressive rehabilitation works, REA IV rehabilitation trial works, Stage 1 REA V construction.

Rehabilitation trials will be undertaken during the MOP term, it is proposed that these trials will be implemented at the REA IV area. Further details of these trials are provided in **Section 8.2**.

7.2.1 Domain 1 – Infrastructure Area

This domain will slightly increase during the MOP term following the planned upgrades to the Water Treatment Facility.

This domain will remain active in the MOP Term. There is no proposed rehabilitation within this domain.

7.2.2 Domain 2 – Tailings Storage Facility

During the MOP term activities within this domain will include:

- Commencement of construction of Stage 1 REA V in 2019;
- (HRA) Notification process to allow for operational activities in preparation for the rehabilitation and decommissioning of REA III has been completed.
- REA III will become active during the MOP term. Following the removal of fine coal material/coarse coal reject and unsuitable material (refer **Section2.2.6**) REA III will then be filled with suitable CCR to form the foundation of a stable final landform;
- Partial Rehabilitation of REA VI where possible;
- Establishment of Stage 2 REA V; and

7.2.3 Domain 3 – Water Management Areas

In 2019 a new dam referred to as Leachate Dam 4 will be constructed adjacent to Stage 1 REA V. This will increase the size of the domain during the MOP term.

This domain will remain active in the MOP Term. There is no proposed rehabilitation within this domain.

7.2.4 Domain 4 – Existing Rehabilitation Area

Activities associated with this domain are generally ongoing maintenance and land management. Maintenance at rehabilitated areas will include, but not be limited to:

- Weeds and pest/feral animal species control;
- Managing bushfire risks;
- Minor earthworks to remediate any significant erosion features, including contour banks and diversion channels;
- Infill planting and/or seeding to meet rehabilitation requirements; and
- Maintaining erosion and sediment controls.

7.2.5 Domain 5 – Other Lands

This domain will remain generally undisturbed by mining operations during the MOP term. Should subsidence impacts occur, remediation and rehabilitation will be undertaken in accordance with approved SMPs.

7.2.6 Domain 6 – Conservation and Biodiversity Offset Area

This domain will remain active during the MOP term and will be managed collectively by the Centennial West Operations in accordance with the *Regional Biodiversity Strategy Western Projects* (RPS, 2014).

7.2.7 Domain A – Retained Water Management Area

This domain refers to the surface water management structures (dams) that will be retained in the final landform following mine closure. The water management domain is active and subject to on-going operations. The locality of these structures that will retained in the final landform have been shown on **Plan 4** (refer **Appendix 2**).

7.2.8 Domain B – Rehabilitation Area Woodland

This domain will remain active during the MOP Term.

Areas of existing rehabilitation will be subject to ongoing maintenance and land management.

7.2.9 Domain C – Retained Infrastructure

This domain refers to the forest access roads that will be retained in the final landform following mine closure. It is proposed to also retain some access tracks on the Newnes Plateau for future use as fire trails or access by recreational users and FCNSW. Clarence Colliery also propose to retain the access road to the Main Storage Dam, allowing future use and management by Council. However, unless retention for future use, including management responsibility has been accepted by the landowner these access roads will be rehabilitated following the cessation of mining activities.

The infrastructure domain is active and subject to ongoing operations. The location of the access roads that will be retained in the final landform have been shown on **Plan 4** (refer **Appendix 2**).

7.2.10 Domain D – Conservation and Biodiversity Offset Area

As per Domain 6.

7.3 Summary of Rehabilitation Areas during the MOP Term

A summary of rehabilitation in each primary and secondary domain during the MOP term is outlined in **Table 23**.

Table 23 – Summary of Rehabilitation Proposed during the MOP Term

Primary Domain	Secondary Domain	Code	Rehabilitation Phase	Area at start of MOP (ha)	Area at end of MOP (ha)	Comment
Infrastructure (1)	**Rehabilitation Area - Woodland (B)**	**1B**	Active	50.5	48.1	This domain will decrease slightly during the MOP term following the rehabilitation of a stockpile area adjacent to REA I.
			Decommissioning	0	0	
			Landform Establishment	0	0	
			Growth Medium Development	0	0	
			Ecosystem & Land Use Establishment	0	0	
			Ecosystem & Land Use Sustainability	0	0	
			Relinquished Lands	0	0	
Total for Domain 1B				**50.5**	**48.1**	
Infrastructure (1)	**Retained Infrastructure (C)**	**1C**	Active	7.8	8.2	This domain will increase slightly during the MOP term following the upgrades to the Water Treatment Plant in 2019.
			Decommissioning	0	0	
			Landform Establishment	0	0	
			Growth Medium Development	0	0	
			Ecosystem & Land Use Establishment	0	0	
			Ecosystem & Land Use Sustainability	0	0	
			Relinquished Lands	0	0	
Total for Domain 1C				**7.8**	**8.2**	
Tailings Storage Facility (2)	**Rehabilitation Area - Woodland (B)**	**2B**	Active	12.7	18.4	REA III (inclusive of REA I and II) is in the early stage of rehabilitation, which involves ongoing removal of final coal material and reshaping to final landform using CCR. REA IV is inactive and generally rehabilitated, except for an access road leading to REA V. Ongoing rehabilitation trial is being conducted on REA IV. REA V Stage1 is under construction and active. REA VI is active, progressive rehabilitation has been completed along lower benches
			Decommissioning	0	0	
			Landform Establishment	0	0	
			Growth Medium Development	0	0	
			Ecosystem & Land Use Establishment	0	0	
			Ecosystem & Land Use Sustainability	0	0	
			Relinquished Lands	0	0	
Total for Domain 2B				**12.7**	**2.32**	
Water Management Area (3)	**Retained Water Management Area (A)**	**3A**	Active	2.73	5.7	This domain will increase following the construction of Leachate Dam 4.
			Decommissioning	0	0	
			Landform Establishment	0	0	

Primary Domain	Secondary Domain	Code	Rehabilitation Phase	Area at start of MOP (ha)	Area at end of MOP (ha)	Comment
			Growth Medium Development	0	0	
			Ecosystem & Land Use Establishment	0	0	
			Ecosystem & Land Use Sustainability	0	0	
			Relinquished Lands	0	0	
Total for Domain 3A				**2.73**	**5.7**	
Existing Rehabilitation Area (4)	**Rehabilitation Area - Woodland (B)**	**4B**	Active	0	0	
			Decommissioning	0	0	
			Landform Establishment	0.9	16.0	
			Growth Medium Development	21.1	2.9	
			Ecosystem & Land Use Establishment	0	21.0	
			Ecosystem & Land Use Sustainability	0	0	
			Relinquished Lands	0	0	
Total for Domain 4B				**22.0**	**39.9**	
Other Lands (5)	**Rehabilitation Area - Woodland (B)**	**5B**	Active	7,593.2	7,587.1	This domain covers all areas not associated with Domains 1 – 4. This domain will reduce slightly during the MOP term following the increase to total site footprint associated with REA V and the Water Treatment Plant upgrade.
			Decommissioning	0	0	
			Landform Establishment	0	0	
			Growth Medium Development	0	0	
			Ecosystem & Land Use Establishment	0	0	
			Ecosystem & Land Use Sustainability	0	0	
			Relinquished Lands	0	0	
Total for Domain 5B				**7,593.2**	**7,587.1**	
Conservation and Biodiversity Offset Area (6)	**Conservation and Biodiversity Offset Area (D)**	**6D**	Active	0	0	This domain includes all conservation sites that will be managed collectively by the Centennial West Operations in accordance with the October 2014 version of the *Regional Biodiversity Strategy Western Projects* (RPS 2014). This domain does not change during the MOP term.
			Decommissioning	0	0	
			Landform Establishment	0	0	
			Growth Medium Development	0	0	
			Ecosystem & Land Use Establishment	0	0	
			Ecosystem & Land Use Sustainability	834.9	834.9	
			Relinquished Lands	0	0	
Total for Domain 6D				**834.9**	**834.9**	
Overall Total				**8,523.8**	**8,526.2**	

7.4 Relinquishment Phase Achieved during the MOP Term

As mining activities at Clarence Colliery are planned to continue past the MOP Term, no areas are anticipated to meet the required rehabilitation obligations for lease relinquishment.

7.5 Landform Design

Prior to the commencement of rehabilitation the landform will be established. The primary objective of landform establishment within infrastructure areas will be the stabilisation of batters, road verges, drains, banks, and cleared areas. Disturbed areas will be re-profiled to establish geotechnically stable and self-draining areas. Rehabilitation will be undertaken in accordance with relevant leases/Occupation Permits, and to the satisfaction of landowners.

All areas will be trimmed, shaped, and the proposed rehabilitation works will ensure that the final landforms at the sites are stable and non–polluting, and mimic the near-original landform for an end land use of woodland.

Landform design for REAs will be determined throughout the HRA Notification process.

7.6 Topsoil Management

While the amount of disturbance at Clarence Colliery is considered minimal given the site is an underground mine, there will be a need to strip topsoil for additional disturbance areas. Where possible, topsoil will be re-spread directly onto cleared/reshaped landforms. Where topsoil resources allow, topsoil will be spread to a nominal minimum depth range of 100 – 300 mm on all areas to be rehabilitated.

Thorough seedbed preparation will be undertaken to optimise establishment and growth of vegetation. All topsoiled areas will be lightly contour-ripped (after topsoil spreading) to create a 'key' between the topsoil and the subsoil. Ripping will be undertaken on the contour and the tynes lifted for approximately 2 m every 200 m to reduce the potential for channelised erosion on slopes greater than 10°. Ripping will be undertaken when soil is moist and immediately prior to sowing for best results. The respread topsoil surface will be scarified prior to or during seeding to reduce runoff and increase infiltration.

For areas requiring long duration topsoil stockpiling, opportunities will be investigated for the application of additional ameliorants (e.g. bio-solids) to assist with the regeneration of the desirable microorganism activity in the soil stockpiles.

Soil Amelioration

Prior to respreading soils, sampling will be undertaken (either from stockpiles or in-situ soils) to determine appropriate ameliorant application. Ameliorants will be added to soils in accordance with recommendations from a soil specialist. 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. Ameliorants may include gypsum, lime, fertiliser and biosolids. The use of soil ameliorants is designed to balance pH, prevent surface crusting, increase moisture and organic content, and buffer surface temperatures to improve germination.

7.7 Surface Preparation

Surface preparation activities for rehabilitated areas will commence as soon as practicable once land becomes available and/or following the completion of mining activities. The surface preparation process at Clarence Colliery involves the following general steps:

- Installation of contours, drainage structures and erosion control measures;
- Light contour ripping parallel with the contour to provide for an adequate seed bed;
- Installation of habitat features (e.g. stag trees, woody debris) to augment the habitat value of the proposed vegetated corridors;
- Spreading of topsoil;
- Application of soil ameliorants where appropriate;
- The respread topsoil surface will be scarified to reduce runoff and increase infiltration; and
- Revegetation.

7.8 Revegetation

Appropriate revegetation steps and selection criteria for the species mix will be undertaken to ensure a high success revegetation rate, and will comprise, but not be limited to, the following:

- Appropriate species selection for the rehabilitation domain;
- Optimal sowing rates and species proportions;
- Seed pre-treatment; and
- Soil amelioration and fertiliser application, where required.

In Domain B, endemic species mixes will be utilised. The species selection will focus on those species that will successfully establish on the available growth medium, bind the soil and will result in a variety of structure and food/habitat resources. The woodland seed mix will include a mix of understorey, mid-storey and over-storey species. Clarence Colliery will utilise woodland seed mixes to establish vegetation communities that are commensurate with surrounding existing vegetation. Whilst every attempt will be made to use species that existed prior to disturbance, additional species may be required to ensure suitable initial groundcover for site stabilisation and minimal soil erosion. This may include the use of short-lived annual exotic non-invasive grass species, however the use of these species will be minimised or avoided where possible.

Fertiliser will be applied with seed mixes to increase the likelihood of initial revegetation success. All revegetation activities will be undertaken immediately after the landform establishment stage.

7.9 Rehabilitation Maintenance

Where rehabilitation monitoring confirms that the rehabilitation is not successful or is limited, maintenance works will be undertaken. This may include the following:

- Re-seeding and, where necessary, re-topsoiling and/or the application of specialised treatments such as composted mulch or bio-solids to areas with poor vegetation establishment;
- Installation of tree guards around planted seedlings or construction of temporary fencing suitable for excluding native and feral fauna species should grazing by animals be excessive;
- Replacement of drainage controls if they are found to be inadequate for their intended purpose, or compromised by vegetation or wildlife;
- De-silting or repair of sediment control structures; and
- Where monitoring indicates the presence of excessive weeds or the potential for noxious weed infestation, necessary precautions to prevent the development of weeds within the rehabilitated areas will be undertaken.

Monitoring results, any required maintenance activities and any refinements of rehabilitation techniques will be reported in the sites Annual Review.

8 Rehabilitation Monitoring, Research and Reporting

8.1 Rehabilitation Monitoring

A commitment to effective rehabilitation involves an on-going monitoring (and concurrent maintenance as required) program that has been developed in consultation with RR. Areas of completed rehabilitation will be regularly inspected and assessed against the short-term and long-term rehabilitation objectives.

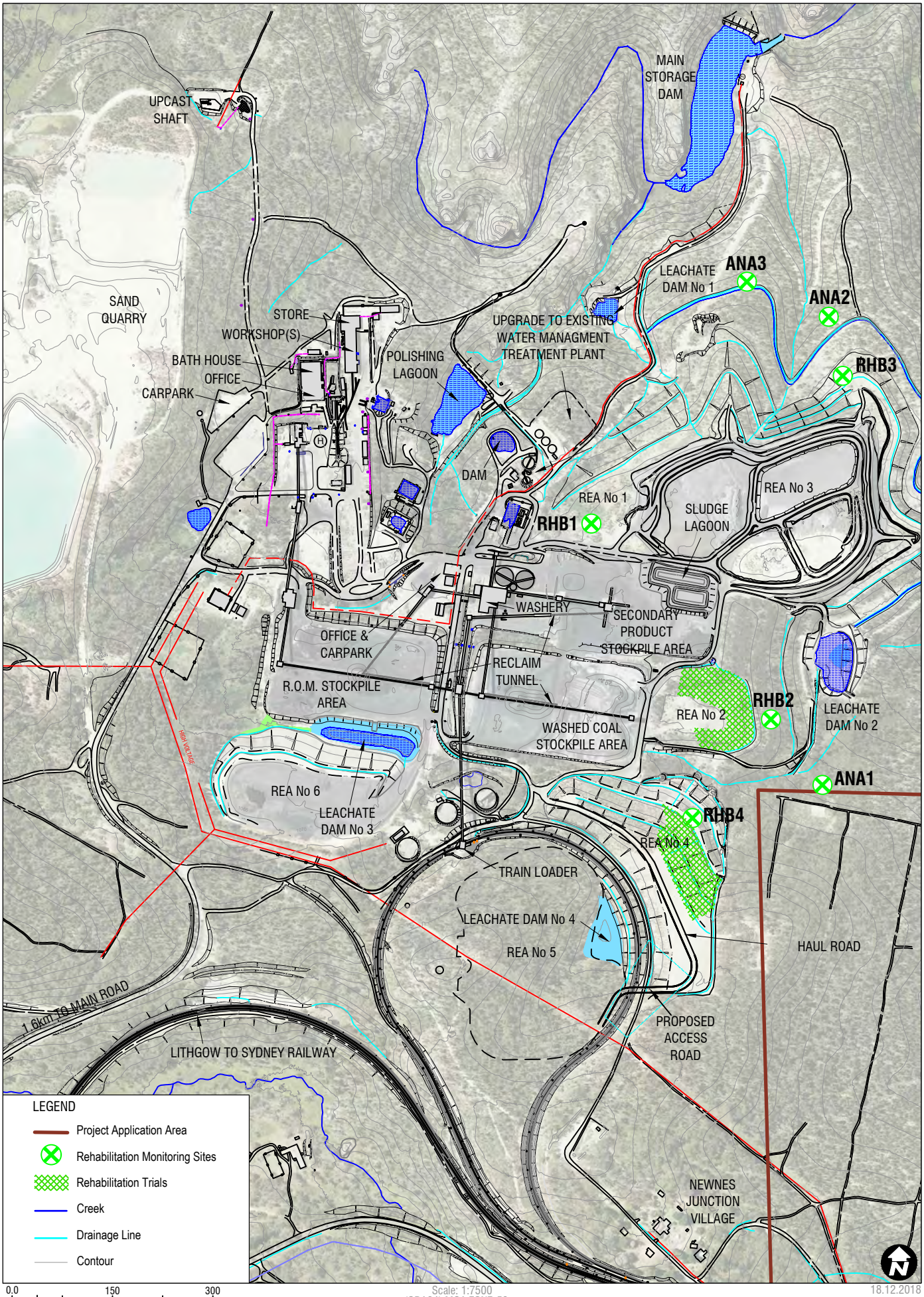
The rehabilitation monitoring program established at Clarence Colliery will continue during the MOP term. The program will be used to assess effectiveness of implementation of the rehabilitation measures and to identify the need for corrective action, as soon as required. Rehabilitation monitoring at Clarence Colliery includes regular inspections where the following key aspects are undertaken:

- Landscape Function Analysis (LFA) assessment which is comprised of:
    - Landscape organisation assessment – producing a Landscape Organisation Index (LOI) and a Patch Area Index (PAI); and
    - Soil surface assessment – producing soil surface condition indices (SSCI), including stability, infiltration and nutrient cycling indices.
- Vegetation dynamics, comprising:
    - Ground cover protection;
    - Canopy Foliage Protective Cover (FPC);
    - Woody plants density; and
    - Woody plants diversity.
- Habitat complexity;
- Disturbance monitoring; and
- Photographic monitoring.

Annual rehabilitation monitoring commenced in 2012 and is undertaken along seven 50m x 5m monitoring sites, as listed in **Table 24**, as a way to track, document and report on the success and performance of rehabilitation activities against the overall rehabilitation objectives for the site. The location of monitoring sites has been shown on **Figure 4**.

Table 24 – Rehabilitation Monitoring Sites

Transect Type	Transect Name	Age of Rehabilitation	Year Transect Established
Rehabilitation	RHB 1	2002	2012
	RHB 2	1996	2012
	RHB 3	2002	2012
	RHB 4	2013-14	2013
Analogue	ANA 1	N/A	2012
	ANA 2	N/A	2012
	ANA 3	N/A	2012



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REHABILITATION MONITORING SITES

FIGURE4

8.1.1 Discussion on the LFA Methodology

The LFA results describe the functionality of the landscape as a biophysical system by providing an assessment of the landscape organisation (through the LOI and PAI) and of the soil surface condition (through the SSCIs):

- The LOI is the proportion of the length of patch to the total length of the transect and reflects the heterogeneity of the landscape in terms of the distribution of ground cover and other deposited materials;
- The PAI is a measure of the area covered by the patches along the transect, and describes the ability of the landscape to capture and retains resources;
- The SSCIs characterise the soil surface performance in terms of stability, infiltration and nutrient cycling:
    - The stability index indicates the ability of the soil to withstand erosive forces, and to reform following disturbance;
    - The infiltration index defines how the soil partitions rainfall into soil-water (water available for plant use), and runoff water which is lost from the local system and may also transport materials (soil, nutrients and seeds) away; and
    - The nutrient cycling index indicates how efficiently organic matter is cycled back into the soil.

Overall, a soil landscape that is on a trajectory to sustainability in context of a vegetative cover and soil stability would have high LOI and PAI values (i.e. close to 1 indicating good vegetation cover – while lower values indicate higher occurrence of bare ground) and high SSCI scores (out of a 100).

In terms of vegetation dynamics, an area that is on a trajectory to self-sustainability would have:

- A low percentage of bare ground;
- High density of woody plants – or density similar to that of corresponding analogue sites;
- High average canopy cover – or similar to that of corresponding analogue sites; and
- High plant species richness – or similar to that of corresponding analogue sites.

The overall performance of a rehabilitated site in term of vegetation dynamics is assessed against the average condition recorded at corresponding analogue sites.

All rehabilitated areas across Clarence Colliery are being returned to a final land use of native woodland/forest. Habitat structure and complexity and the availability of key ecological resources in this ecosystem type influence species richness and abundance, as well as ecological function (Lindenmayer et al, 2000), as can be observed at the analogue sites. In terms of habitat complexity, an area that is on a trajectory to self-sustainability would have:

- Tree and shrub canopy present;
- Ground cover of vegetation present;
- Presence of logs, rocks and woody debris;
- Presence of free standing water and/or soil moisture; and
- Presence of tree hollows.

The higher the complexity score, the more macro-habitats are available for flora and fauna in the area. An ecosystem with a habitat complexity score > 8 is generally considered complex and as providing a range of micro-habitats as available to fauna).

Results of the disturbance monitoring reflect the level to which a site is affected by various disturbance factors. The ultimate objective of rehabilitation transects would be to have the lowest disturbance score (i.e. little or no disturbance factors impacting the site) – or a degree of disturbance that is similar to that impacting the corresponding analogue sites (both in terms of the nature of the disturbance factors and their intensity). The lower the overall disturbance score, the less disturbed the site and therefore the more successful the rehabilitation.

The purpose of the analogue sites is to represent as close as possible the proposed vegetation characteristics of the revegetation areas. The analogue site also provides data on the long-term goal for the revegetation area. Assessing the analogue sites is an integral part of monitoring rehabilitation and is used to generate a "band" of values depending on seasonal effects as well as stochastic events like storms, droughts and fire. In addition, data recording the response and recovery dynamics to stochastic disturbances of the analogue site would provide a test of the resilience of a rehabilitated site (rate of recovery of function after specified disturbance).

Rehabilitation monitoring will continue to be conducted annually by independent, suitably skilled and qualified persons at locations which will be representative of the range of conditions on the rehabilitating areas. The location of Clarence Colliery rehabilitation monitoring sites has been shown on **Figure 4**. Monitoring results, any required maintenance activities and any refinements of rehabilitation techniques will be reported in the Annual Review.

8.2 Research and Rehabilitation Trials and Use of Analogue Sites

Clarence Colliery proposes to undertake trials to improve ground cover within existing rehabilitation areas during the MOP term. These trials will involve supplementary planting of native grasses and shrubs. Species may include but not be limited to: Basket Grass (*Lomandra longifolia*), Poa Tussock (*Poa labillardierei*), Rytidosperma pallidum (*Joycea pallida*), Sunshine Wattle (*Acacia terminalis*), Silky Hakea (*Hakea sericea*), Red-stemmed Wattle (*Acacia rubida*), Yellow Tea Tree (*Leptospermum* polygalifolium) and Geranium solanderi.

In addition to these trials, Clarence Colliery propose to undertake rehabilitation trials on the former REA IV area. The results of the proposed trials will be used to identify suitable methods for the rehabilitation of REA III. The trial design will test the most effective methods to minimise erosion, maximise biodiversity and promote long term cost effective rehabilitation. This will be completed by trailing a variety of:

- Erosion control products;
- Ameliorants including Nitrohumus® and topsoil stripped from REA V; and
- Native seed and tubestock species endemic to the Newnes Plateau;

The locality of the proposed trial areas are illustrated on **Figure 4**. The location and scale of the rehabilitation trials may be subject to change during the MOP term if required to address operational requirements.

9 Intervention and Adaptive Management

9.1 Threats to Rehabilitation

Where rehabilitation performance is not trending to the nominated completion criteria this may indicate that there is a threat to long term rehabilitation success. Threats to rehabilitation may include events such as periods of drought, bushfire events, or pressures from weeds and feral animals.

Section 3.3 provides examples of key threats to rehabilitation. Where rehabilitation monitoring indicates that there is a significant threat to rehabilitation, Clarence Colliery will undertake adaptive management in accordance with the TARP (refer **Section 9.2**).

9.2 Trigger Action Response Plan

The following TARP for rehabilitation has been developed to identify required management actions in the event of impacts specifically to rehabilitation areas, or where rehabilitation outcomes are not achieved in an acceptable timeframe. Where necessary, rehabilitation procedures will be amended accordingly with the aim of continually improving rehabilitation standards.

The TARP is provided as **Table 25**, and will be reviewed and may be revised as conditions at Clarence Colliery change or new risks to rehabilitation are identified.

Table 25 – Rehabilitation Trigger Action Response Plan

Aspect/ Category	Key Element	Trigger Response	Condition Green	Condition Amber	Condition Red
Landform stability	Slope gradient	Trigger	Rehabilitated areas have slopes that are generally <10˚.	Rehabilitated areas have slopes >10° but <14˚ (without RR approval).	Rehabilitated areas have slopes >14° (without RR approval).
		Response	No response required. Continue monitoring program.	Undertake regrading and revegetation of the area.	Undertake a review of the landform design, including survey if required. Undertake regrading and revegetation of the area.
	Erosion control	Trigger	No gully or tunnel erosion. No rilling present.	Minor gully or tunnel erosion present and/or rilling <200 mm deep.	Significant gully or tunnel erosion present and/or rilling >200 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	Trigger	Drainage at Clarence Colliery 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. Liaise with RR regarding landform.
Water Quality	Monitoring parameters	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. Monitoring does not illustrate impact to rehabilitation.	Water quality exceeds criteria, indicating a long term rehabilitation liability. Monitoring illustrates impact to rehabilitation.
		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 statutory reporting requirements. Implement relevant responses and undertake immediate review to determine source of issues and implement remediation measures identified as soon as practicable. Liaison with EPA.

Aspect/ Category	Key Element	Trigger Response	Condition Green	Condition Amber	Condition Red
Topsoil	Monitoring parameters	Trigger	Properties of soil are within 20 % from relevant analogue site after 5 years of rehabilitation.	Properties of soil are > 20 % from results at relevant analogue site after 5 years of rehabilitation; however area is able to sustain selected vegetation species.	Properties of soil are > 20 % from results at relevant analogue site after 5 years, however the area is not able to sustain selected vegetation species.
		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 quality if deemed necessary.	Consultant to be engaged to assist with recommendations to appropriately remediate soil quality and depth. Remediate as soon as practicable.
Topsoil Availability and Quality	Topsoil quantity and quality	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.	Soil deficiency is significant enough to delay rehabilitation progression the MOP term.
		Response	No response required.	Investigate options and alternatives (e.g. organic matter) to be able to meet future topsoil requirements.	Source and budget for purchasing topsoil for use in rehabilitation. Investigate use of alternatives such as organic matter.
Vegetation	Ground cover	Trigger	Five years following rehabilitation to woodland, >60% vegetative cover (vegetation, leaf litter, mulch) is present within rehabilitated areas (or 50% if rocks, logs or other features of cover are present).	Five years following rehabilitation to woodland, total ground cover (vegetation, leaf litter, mulch) of between 50-60% in rehabilitated areas (or 40-50% if rocks, logs or other features of cover are present).	Five years following rehabilitation to woodland, total ground cover (vegetation, leaf litter, mulch) is <50% within rehabilitated areas (or <40% if rocks, logs or other features of cover are 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	Trigger	Twelve months following rehabilitation, no significant weed infestations.	Twelve months following rehabilitation, >10% but <25% weed presence in monitoring sites.	Twelve months following rehabilitation, >25% weed presence in monitoring sites

Aspect/ Category	Key Element	Trigger Response	Condition Green	Condition Amber	Condition Red
		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.
	Pest animal species presence	Trigger	No significant pest animal species present.	Significant pest animal species present but do not threaten to cause rehabilitation failure.	Significant numbers of pest animals causing widespread damage to rehabilitation.
		Response	No response required. Continue monitoring program.	Consult with relevant authorities regarding appropriate pest animal control campaign.	Consult with relevant authorities regarding appropriate pest animal control campaign. Engage a suitably qualified specialist to prepare a site management plan and implement recommendations such as augmenting pest animal exclusion fencing and re-vegetation.
	Species composition	Trigger	Five years following rehabilitation to woodland, species composition comprises native tree and shrub species consistent with analogue site.	Five years following rehabilitation to woodland, native tree and shrub species composition comprises < 75 % consistent with analogue site.	Five years following rehabilitation to woodland, native tree and shrub species composition comprises < 60 % consistent with analogue site.
		Response	No response required. Continue monitoring program.	Review native seed mix and amend accordingly. Consider remedial actions such as tubestock planting or re-seeding 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.

Aspect/ Category	Key Element	Trigger Response	Condition Green	Condition Amber	Condition Red
Bushfire	Fuel load	Trigger	Fuel loads are assessed and managed as required (including maintaining fire-breaks) and there is firefighting access across rehabilitation areas and water resources available for fighting fires.	Monitoring indicates fuel loads have not been managed and fire breaks have not been maintained. **I**n the event of a fire, this would result in firefighters not being able to access the site or water resources.	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.

10 Reporting

As is currently undertaken, during the MOP term a summary of rehabilitation monitoring will be included in each Annual Review. This summary will include:

- Results of rehabilitation monitoring against key performance measures/indicators;
- Comparison of rehabilitation results against predictions presented in this MOP;
- Key trends in monitoring results and progression towards performance indicators and achievement of rehabilitation objectives;
- Reporting on discrepancies between the predicted and actual results;
- Reporting of where a TARP has been implemented to counter poor/unpredicted rehabilitation results or environmental impacts;
- Results of trials;
- Non-compliances;
- Incidents/near misses; and
- Any other requirements from the RR.

Clarence Colliery will also submit Subsidence Management Status Reports to RR during the MOP term.

11 Plans

Clarence is classified as a Level 1 Mine, and therefore the following Plans have been prepared for this MOP:

- **Plans 1A – 1C** show the location and pre mining natural and physical environment at Clarence;
- **Plan 2** shows the mine domains at commencement the MOP;
- **Plans 3A and 3B** show the status of mining and rehabilitation activities in December 2018 and July 2022, respectively;
- **Plan 4** shows the proposed post mining land use and landform at the end of mine life; and
- **Plan 5** shows vertical and longitudinal cross sections.

Plan 3B was updated for the MOP Amendment B submission to align with the revised end of MOP term. The other plans have not been updated as they will all be revised and updated to be submitted to the RR as part of the Rehabilitation Management Plan, prior to the end of the MOP term.

These Plans are contained in **Appendix 2**.

12 Review and Implementation of the MOP

12.1 Review of the MOP

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 the MOP. The MOP will be reviewed, and if necessary revised, following the submission of the following:

- EPL Annual Return
- 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 Clarence.

Any amendments to the MOP will be completed in accordance with the *ESG3: Mining Operations Plan (MOP) Guidelines* (DRG, 2013), or its latest version.

12.2 Implementation

Table 26 defines personnel who are responsible for the monitoring, review and implementation of this MOP.

Table 26 – Responsibilities for Implementation of the MOP

Title	Responsibility
Mine Manager	• Implement the procedures referenced in this MOP. • Undertake training in relevant Management Plans and procedures as required. • Provide resources required to implement this MOP. • Construct landforms in accordance with this MOP.
Mine Surveyor	• Implement the procedures referenced in this MOP. • Undertake training in relevant Management Plans and procedures as required. • Ensure that mining activities are undertaken in accordance with this MOP.
Technical Services Manager	• Implement the procedures referenced in this MOP. • Undertake training in relevant Management Plans and procedures as required. • Ensure that mining activities are undertaken in accordance with this MOP.
Environment and Community Coordinator	• Prepare or project manage the implementation of relevant Management Plans. • Implement, monitor and review the programs and procedures linked to this MOP. • Consult with regulatory authorities as required. • Undertake monitoring as required. • Undertake maintenance 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. • Report the progress of any rehabilitation and monitoring of biodiversity in the Annual Review. • Undertake site based actions to implement this MOP in cooperation with the Mine Manager.

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