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Marulan South Limestone Mine

REHABILITATION MANAGEMENT PLAN

Prepared for Boral Cement Limited | 29 December 2023



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SSD 7009 | REHABILITATION MANAGEMENT PLAN

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29 December 2023

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1 PART 1 – INTRODUCTION TO MINING PROJECT

1.1 History of operations

a. Mine Operator

Boral Cement Limited (Boral) owns and operates the Marulan South Limestone Mine (the mine), an open cut mine located in Marulan South, New South Wales (NSW).

The mining area following the grant of a new authorisation, Mining Lease ML 1857 (Act 1992) on 14 July 2023 is defined by survey and covers an area of 688.5 hectares. In addition, remnant areas of Consolidated Mining Lease CML 16 (Act 1992) not covered by ML 1857 occupy a further 75.1 hectares.

The mine is 10 km south-east of Marulan village and 35 km east of Goulburn. It is in the Goulburn Mulwaree Local Government Area (LGA). The mine is separated from the Bungonia National Park (NP) and State Conservation Area to the south by Bungonia Creek and is separated from the Shoalhaven River and Morton NP to the east by Barbers Creek.

Limestone mining north of Bungonia Gorge began around 1830 with major developments emerging in the 1920s to supply limestone for cement manufacturing and steel making.

The limestone mine was opened in 1929 to supply limestone for cement, manufacturing and steel making. By 1953 two main pits (northern mine pit and southern mine pit) were well established and by the early 1970s the facets of the business included limestone for cement, steel making, agriculture, glass making, lime manufacturing, quicklime and hydrated lime.

The mine has produced up to 3.38 million tonnes (Mt) of limestone based products per year for the cement, steel, agricultural, construction and commercial markets.

b. Existing mining overview

Historically limestone mining was covered by over 66 authorisations or mining titles and focused within the approximately 200-400 m wide Eastern Limestone that was split between a north pit and a south pit.

As at 23 April 2004 all previous authorisations covering the mining area were consolidated into Consolidated Mining Lease, (CML) No.16 (Act 1992) over an area of about 616.5 hectares.

CML No. 16 covered in part Boral's private rail line connecting the mine and Peppertree Quarry with the Main Southern Railway approximately 6 km to the north together with a water supply pipeline from Tallong dam.

Within a 12.04 hectare area of CML No.16 an additional mining lease ML 1716 (Act 1992) was granted on 4 September 2015 to effectively remove a 30.48 m mining depth restriction.

(Note that the grant of ML1857 as detailed further in Section 1.2.b will effectively lead to cancellation of authorisations CML No.16 and ML 1716).

Until 2016/2017, a limestone wall (referred to by the mine as the "centre ridge") rising almost to the original land surface, divided the north and south pits. Mining the centre ridge has formed a single contiguous pit, approximately 2.5 kilometres (km) in length.

Limestone and shale are extracted using open-cut hard rock drill and blast techniques. Limestone is loaded using front end loaders and hauled either to stockpiles or the processing plant using

haul trucks. Oversized material is stockpiled and reduced in size using a hydraulic hammer attached to an excavator.

Limestone processing facilities including primary and secondary crushing, screening, conveying and stockpiling plant and equipment are in the northern end of the north pit. Kiln stone grade limestone is also processed on site through the existing lime plant comprising kiln stone stockpiles, rotary lime kiln, hydration plant and associated auxiliary conveying, processing, storage, despatch plant and equipment.

Overburden from stripping operations has historically been emplaced in the Middle Gully or Western Overburden Emplacement areas (WOE), west of the open cut pits and along the eastern mine batters where remnant, overburden emplacements from the 1960/1970 period include Bryce's Gully and Barbers Creek. Overburden emplacement within the south pit has commenced.

Prospecting/exploration continues as an ongoing mining activity to further improve understanding of the quantity and quality of the limestone resource, the contact boundaries with surrounding sediments and to inform mine planning. Since 2004 seven phases of exploration "infill" drilling have been completed with over 12,000 metres drilled.

c. Mine rehabilitation

The SSD 7009 Project site of 846.4 hectares includes the 688.5 hectares of ML1857 and extends northwards to include the Marulan South Road re-alignment, the Northern Overburden Emplacement (NOE) currently being constructed by Peppertree Quarry and the proposed but deferred Marulan Creek Dam development.

The 846.4 ha Project site covers the existing pre SSD disturbance footprint of 341.5 ha together with 256.5 ha of new disturbance associated with the approved 30-year mine plan.

Within ML1857 and the remnant areas of CML16 the existing disturbance footprint is approximately 333 ha and includes early c1970s rehabilitation areas collectively grouped into the Eastern Batters, "trees over grass" domain of approximately 37 ha together with progressive rehabilitation of a similar 37 ha area of the WOE.

d. Approved SSD 7009 overview

SSD 7009 was granted for a 30-year mine plan accessing approximately 120 Mt of limestone down to a depth of 335 m AHD.

Mining operations including limestone extraction of up to 4 Mtpa may be carried out within the approved disturbance area until 31 August 2051. Limestone will be processed to create limestone and lime products including limestone aggregates and sand, hydrated lime and quick lime.

Clay shale will also continue to be extracted at up to 200,000 tonnes per annum.

The mine footprint focuses on an expansion of the pit westwards to mine the Middle Limestone and to mine deeper into the Eastern Limestone. The north pit will also be expanded southwards, encompassing part of the south pit, leaving the remainder of the south pit for overburden emplacement and a visual barrier.

Existing infrastructure is being retained along with the following changes:

- relocation of a section of high voltage power line to accommodate a proposed overburden emplacement;

- realignment of a section of Marulan South Road, to accommodate a proposed overburden emplacement;
- relocation of the processing infrastructure and the stockpile and reclaim area at the northern end of the north pit to allow the northward expansion of the pit;
- development of a shared Road Sales Stockpile Area including a weighbridge and wheel wash to service both the mine and Peppertree Quarry; and
- construction of a 118 megalitre (ML) in-stream water supply dam on Marulan Creek.

Boral will transport up to 600,000 tpa of limestone and hard rock products along Marulan South Road to the Hume Highway, as well as 120,000 tpa of limestone products to the agricultural lime manufacturing facility.

The mine provides continued direct employment for approximately 118 people onsite and 73 offsite. Mining operations can operate 24-hours per day, 7 days per week. Blasting will continue to be restricted to daylight hours between 9.00am and 5.00pm on weekdays, excluding public holidays.

1.2 Current development consents, leases and licences

Details of the current development consent, SSD 7009 together with all relevant authorisations, leases and licences for the mining area are provided in Table 1.2 and are discussed further in this section.

a. SSD 7009

Due to changes in the *NSW Mining Act 1992* (Mining Act) and the *NSW Environmental Planning & Assessment Act 1979* (EP&A Act), a State Significant Development (SSD) consent under the EP&A Act was required to move mining operations beyond the area covered by the previous mining operations plan (MOP).

Two approvals were required for Marulan South Limestone Mine's continued operations:

- a consent for the project (SSD 7009) under Part 4, Division 4.7 of the EP&A Act; and
- controlled action approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) for impacts on listed threatened species and communities (sections 18 and 18A of the Act).

An environmental impact statement, (EIS) dated March 2019 was prepared to accompany the application for SSD 7009 and to address the requirements of State agencies under the EP&A Act and the Commonwealth Department of Agriculture, Water and the Environment. A response to submissions (RTS) report was subsequently prepared to consider and respond to agency and public submissions and provide clarification of project components where relevant.

Development consent (SSD 7009) was granted by the former Department of Planning, Industry and Environment, now the Department of Planning & Environment (DPE) on 19 August 2021, to continue mining limestone at a rate of up to 4 million tonnes per annum (Mtpa) for a period of up to 30 years (the Project).

To satisfy Condition of Consent (CoC) D5(i), the EIS, RTS, development consent and other publicly available information related to the assessment and determination of SSD 7009 can be accessed on DPE's Major Projects Planning Portal.

(<https://www.planningportal.nsw.gov.au/major-projects/project/9691>).

The consent requires the preparation and implementation of a number of management plans, strategies, protocols and procedures detailing environmental commitments, controls and performance objectives at the mine throughout its operational life. A Rehabilitation Management Plan (RMP) is required in accordance with CoC B82.

b. Authorisations

Following SSD 7009 approval on 19 August 2021 a new mining lease, ML1857 was granted on 14 July 2023 covering an area of 688.5 hectares.

ML 1716 was subsequently cancelled on 17 July 2023 and is currently subject to final environmental management, protection and rehabilitation obligations in accordance with the Mining Act 1992. These final obligations are addressed by being included in those affecting ML 1857 as detailed in submission of Form ESF2 – Rehabilitation Completion and/or Review of Rehabilitation Cost Estimate.

CML 16 was granted 23 April 2004 with an expiry date 26 February 2023. A renewal application was lodged in October 2021 in conjunction with the new mining lease application (MLA 607) leading to grant of ML 1857. This renewal application was required to ensure continuity of mining

authorisations over areas covered by grant of ML 1857 and those remaining or remnant areas of CML 16 no longer required under mining lease.

The renewal of CML 16 (currently pending) will be withdrawn following the completion of final environmental management, protection and rehabilitation obligations in accordance with the Mining Act 1992. The remnant areas of CML 16 totalling some 75.1 hectares include both undisturbed and disturbed areas as detailed in Table 1.1.

The process to complete final environmental management, protection and rehabilitation obligations and Form ESF2 requirements is expected to extend into 2024.

The remnant areas of CML 16 are therefore included in this first RMP together with ML 1857 with authorisations effectively covering a total area of 763.6 hectares.

Table 1.1 Remnant CML16 areas

No.	Lot	DP	Tenure	Area (ha)	Current Land Use / Description under CML16	Final Land Use on cancellation of CML16 and Development Approval
Undisturbed						
1	130	750029	Freehold-Boral	15.351	western block of relatively flat land with existing native woodland	Remain as undisturbed, Boral owned land, no existing DA
2	7303	1149129	Crown	7.435	Bungonia Creek and lower escarpment slopes, 100m wide north side.	Remain as vacant Crown Land subject to sign-off. Within SSD7009
3	7300	1149129	Crown	29.17	eastern rugged terrain, native vegetation, west side of Barbers Creek	Remain as vacant Crown Land subject to sign-off. Within SSD7009
Sub-total Undisturbed				51.956		
Disturbed						
4a	2	527500	Freehold-Boral	0.032	Peppertree emplacement	Emplacement area, within Peppertree Quarry PA 06-0074 Mod 5 and SSD7009
4b	4	106569	Freehold-Boral	0.044	Peppertree emplacement	Emplacement area, within Peppertree Quarry PA 06-0074 Mod 5 and SSD7009
5	2	527500	Freehold-Boral	1.073	Site entry, existing house and old house sites	Infrastructure within SSD7009
6	4	106569	Freehold-Boral	2.536	Site entry road and railway	Infrastructure within SSD7009
7	1	1124189	Freehold-Boral	15.996	Railway	* Railway within parts of Peppertree Quarry PA 06-0074 and SSD 7009
8a	100 part 1064794	Freehold-Boral		0.280	part water pipeline	Water pipeline within Peppertree Quarry PA 06-0074 and SSD 7009
8b	24 & 95 part 867667 part 750029	Freehold-Boral		0.499	former water pipeline removed	Former water pipeline removed and now within Peppertree Quarry PA 06-0074
8c	2 part 1124189	Freehold-Boral		0.594	water pipeline	Water pipeline to Marulan Creek within Peppertree Quarry PA 06-0074 and SSD 7009
8d	2 part 1124189	Freehold-Boral		2.128	water pipeline	* Water pipeline within SSD 7009 north of Marulan Creek subject to easement. See Note below
Sub-total Disturbed				23.182		
TOTAL Remnant CML 16				75.138	ha	* Note: northern sections of railway and water pipeline subject to land exchange and easement creation with adjoining landholder prior to application for CML16 cancellation.

c. Environment Protection Licence EPL 944

Boral is the licensee of EPL 944 for the “Marulan South Limestone Mine and Lime Plant” for 100,000-250,000 tpa of lime production and 2-5 Mtpa of minerals obtained by mining.

EPL 944 was amended 14 March 2023 to align with SSD 7009.

Table 1.2 Consents, leases and licences

No	Description	Number	Approval Authority	Date Granted	Expiry Date	Comments
Development consents (planning) and approvals						
1	State Significant Development Consent	SSD-7009	NSW Department of Planning, Industry and Environment (DPIE)	19/08/2021	31/08/2051	
2	Modification 1 Mod1- Appendix 1, Schedule of Lands - Correction	SSD-7009-Mod-1	NSW Department of Planning & Environment (DPE)	08/07/2022	31/08/2051	DPIE now DPE Correcting Lot 32 DP750029 to Lot 132 DP750029
3	Environment Protection and Biodiversity Conservation Act Approval	EPBC ID Number 2015/7521	Australian Government Department of Agriculture, Water and the Environment	07/10/2021	31/08/2071	
Mining Authorisations						
4	Authorisations under the Mining Act 1992	ML1857	Regional NSW – Mining, Exploration and Geoscience	14/07/2023	14/07/2044	
5		CML 16		23/04/2004	26/02/2023	Cancellation subject to withdrawal of pending renewal.
6		ML 1716	Department of Industry, Resources and Energy	04/09/2015	04/09/2036	Cancelled 17/07/2023
Environment Protection Licence						
5	Protection of the Environment Operations Act 1997 (POEO Act) Licence	944	NSW Environment Protection Authority	25/08/2000	next licence review date 24/02/2025	cement or lime production >100kT - 250kT mining for minerals >2MT – 5MT
Water Licences						
6	Groundwater Aquifer Access Licence Work Approval Number Certificate of Title	WAL41976 10CA122907 9HCT-TR-S2YW	Water NSW Water Management Act 2000	 23/03/2020	 continuing	838ML groundwater allocation in the Goulburn fractured rock groundwater source granted 27/09/2017. 838 units

No	Description	Number	Approval Authority	Date Granted	Expiry Date	Comments
7	Unregulated River Water Access Licence Reference number Certificate of Title	WAL25221 10AL102589 TG59-ZY-JZ7C	Water NSW Water Management Act 2000	 12/04/2023	 continuing	3ML water share from the Shoalhaven River water source. 3 units
8	Water Supply Works Approval (2 x Bores, North Pit) Previously 10BL602077 & 10BL602078 Lot 7300, DP1149129 Certificate of Title	10WA116142 WAL 24697 W3M9WS6FLQ	DPI Water Water NSW Water Management Act 2000	01/07/2011 09/05/2013	10/10/2024 continuing	10WA116142 is to be surrendered. Extraction of 12ML per annum of groundwater for industrial purposes. Bores WP16 & WP17. 12 units
9	Water Supply Works and Use Approval (1 x Bore for construction) Lot 114 DP750029 Reference number	10CA122907 WAL 41976 10AL122346	Natural Resources Access Regulator Water NSW	 	03/12/2028	
10	Water Supply Works and Use Approval (2 x Bores for construction) Lot 4 DP106569	10CA123795 WAL 41976	Natural Resources Access Regulator	 	08/04/2030	
11	Water Supply Works and Use Approval (2 x Bores for construction) Lot 114 DP750029	10WA124508 WAL 41976	Natural Resources Access Regulator Water NSW	27/09/2021	26/09/2031	Water supply works for two bores GW117344 and GW117345 within Goulburn Fractured Rock Groundwater Source. 49ML/yr.
12	Surface Water Works and Supply Licences x 2 (1 x Overshot Dam & 2 Pumps) Previously 10SL012214 Lot 1, DP37041	10WA102352 WAL 25352 WAL 25207	DPI Water	01/07/2011	30/06/2024	Water supply (76ML) for mining and (1ML) for domestic purposes per annum from Barbers Creek. (See Note 1)
13	Surface Water Licence (1 x 38mm Centrifugal Pump) Previously 10SL025561 Lot 204, DP870194	10WA102377 WAL 25373	DPI Water	01/07/2011	25/04/2026	Water supply (10ML) for mining purposes per annum from Barbers Creek.
14	Monitoring Bore Licences 10AL116141D	10BL605442 10BL605443 10BL605444 10BL605445 10BL605449 10BL605450 10BL605796	DPI Water Water NSW	10/10/2013 26/10/2016	Continuing continuing	Six monitoring bore licences issued 10 Oct 2013 in perpetuity. Additional monitoring bore

No	Description	Number	Approval Authority	Date Granted	Expiry Date	Comments
Explosives and Dangerous Goods Licences						
15	Notification of Schedule 11 hazardous chemicals (dangerous goods) on Premises Refer to comments	35/008099	Safe Work NSW	NA	NA	Storage area detail covering for example, petrol & diesel storage, flammable liquid, gases and explosives that exceed quantities specified in Schedule 11 of WHS regulation 2017 and as updated. as per Schedule 11 Site plans and emergency contacts to be kept in the manifest box
16	Licence to import explosives or SSDS	Orica Licence 11-100005-004	Safe Work NSW	Orica	15/06/2024	5 Year licence Issued to Orica for import supply of explosives
17	Licence to manufacture explosives and/or SSDS	Orica Licence XMNF100002 XTRN10012	Safe Work NSW	Orica	Orica	SSDS – (security sensitive dangerous substances)
18	Blasting explosives user licence	Individual	Safe Work NSW	individual	Individual	Refer Guide for blasting explosives user licence.
Other Licences include the following						
19	Apparatus Licence Land mobile "two-way" systems	1958988 & 989 9922223 1203917	Australian Communications and Media Authority (ACMA)		23/01/2024 22/02/2024 21/07/2024	
20	Radiation Management Licence	5061123	NSW Environment Protection Authority	01/07/2013	21/08/2024	Licence to sell/possess radioactive substances or items containing radioactive substances. (Converted to Radiation Management Licence from 01/07/13 by EPA)
21	Motor Vehicles Repairers Licence (Motor Vehicles Repairs Act 1980)	MVRL 36381	NSW Fair Trading Motor Vehicle Repair Industry Authority		02/01/2024	Motor Mechanic Fixed Workshop
22	Refrigerant Trading Authorisation Certificate	AU 04450	ARC		10/03/2024	Refrigerant trading authorisation

1.3 Land ownership and land use

1.3.1 Land ownership and land use figures

Land ownership and land use in and around the mine is summarized in figures obtained from the EIS and attached in Appendix A. Each figure is described in further detail and referenced under the following sections.

a. Land ownership

The total area under mining authorization is 763.6 ha and includes the area of ML 1857 covering 688.5 ha and the remnants of CML 16 over an area of some 75.1ha as detailed in Table 1.1.

Figure 1.3.1a – Appendix A shows land ownership in and surrounding the mining leases covered by the project boundary. Land owned by Boral of approximately 590.7 ha now includes the five privately owned titles, totaling 110.48 ha.

The Project site is approximately 846.4 ha with land ownership outlined in Table 1.3.

Table 1.3 Land ownership in the Project site

Land owner	Area of land in Project site
Boral Cement Limited	409.88
Boral Limited	23.14
Boral Resources (NSW) Pty Ltd	47.17
Crown Land	236.61
Freehold (Boral owned)	110.48
Undefined	17.94
Gaps	1.15
TOTAL	846.37

b. Location

The Marulan South Limestone Mine as previously described in Section 1.1 is located in Marulan South, 10 km south-east of Marulan village and 35 km east of Goulburn. It is in the Goulburn Mulwaree Local Government Area (LGA).

The location plan provided in Figure 1.3.1b – Appendix A shows the local setting within a regional context.

The mine is separated from the Bungonia National Park (NP) and State Conservation Area to the south by Bungonia Creek and is separated from the Shoalhaven River and Morton NP to the east by Barbers Creek.

The area is characterised by rolling hills of pasture interspersed with forest to the west, contrasting with the heavily wooded, deep gorges that begin abruptly to the east of the mine, forming part of the Great Escarpment and catchment of the Shoalhaven River.

c. Authorisations

Detail covering authorisations granted under the Mining Act 1992 are included in Section 1.2.b and include ML 1857 covering 688.5 ha and the remnants of CML 16 over an area of some 75.1ha. Refer to Figure 1.3.1b – Appendix A.

d. Vegetation community boundaries

Vegetation communities have been identified during a biodiversity development assessment report (BDAR) prepared as part of the project EIS studies (Niche, 2018). The BDAR identified five native and one non-native plant community types (PCTs) as summarised in Table 1.4.

Vegetation community boundaries for undisturbed areas within the project area are shown on Figure 1.3.1d – Appendix A.

Table 1.4 Summary of PCTs in Project site

PCT	TEC	% Cleared	Condition	Area (ha)
PCT 1334 Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands (SR670)	EEC under BC Act CEEC under EPBC Act	92	Medium	48.8
			Poor	31.9
			Acacia*	7.9
PCT 778 Coast Grey Box – Stringybark dry woodland on slopes of the Shoalhaven Gorges -Southern Sydney Basin (SR534)	Not listed	15	Medium	57.9
			Poor	7.5
PCT 1150 - Silvertop Ash - Blue-leaved Stringybark shrubby open forest on ridges, north east South Eastern Highlands Bioregion (SR624)	Not listed	40	Medium	13.7
			Poor	2.6
731 - Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills, South Eastern Highlands Bioregion (SR524)	Not listed	80	Medium	12.0
PCT 1334 Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands (SR670)	Not listed	92	Non-EEC water dependent	0.1
Non-native vegetation	-		-	70.0
Total				252.4
Total native vegetation				182.4

*Consisting of planted and regenerating Acacias and occasional Eucalypts; not a CEEC under the EPBC Act.

e. Land use

Land use surrounding the mine is a mixture of extractive industry, grazing, rural residential, commercial/industrial and conservation as shown on Figure 1.3.1e – Appendix A.

Peppertree Quarry borders the mine to the north. The site of the former village of Marulan South is located between the mine and Peppertree Quarry on land owned by Boral. The village was established principally to service the mine but has been uninhabited since the late 1990s. The majority of the village's infrastructure has been removed and only a village hall and former bowling club remains. The bowling club has been converted into administration offices for the mine and the hall is used by the mine services team.

A small number of rural landholdings surround the Boral properties to the north and west, including an agricultural lime manufacturing facility, fireworks storage facility, turkey farm and rural

residential (a number of these properties are actively grazed). The main access for these properties is via Marulan South Road. Rural residential properties are also located to the north-east of the mine along Long Point Road. These properties are separated from the mine by the deep Barbers Creek Gorge.

f. Surface contours

Surface contours at 5m interval are shown on Figure 1.3.1f – Appendix A. This contour set is derived from a combination of 2014/2019 (EIS) and 2023 current contour data for the surrounding and mine areas respectively.

The contours are overlain on the total disturbance footprint for the project.

g. Areas of environmental, cultural or heritage sensitivity

The biodiversity development assessment report (BDAR) undertaken for the 2019 EIS by Niche Environment and Heritage together with previous assessments of the mine and adjacent areas provide detail to characterise the existing environment including sensitive flora and fauna. Results of these studies are presented in Figure 1.3.1g(1) and summarised below.

Soils and vegetation vary markedly across the bioregion in association with variation in altitude, temperature and rain. The Bungonia SCA contains threatened Wingless Raspwort (*Haloragis exalata*), *Pterostylis calceolus* and Chalker's Wattle (*Acacia chalkerii*). There is a Koala (*Phascolarctos cinereus*) population in the area and the Brush-tailed Rock Wallaby (*Petrogale penicillate*) has been observed in the area.

Limestone caves in the area provide bat wintering and nursery sites for several bat species including a population of the vulnerable Large Bent-wing Bat (*Miniopterus schreibersii*).

The previous assessments and their results were:

Flora

- Sinclair Knight Merz (1994) – this survey of the west side of the northern pit identified dry sclerophyll woodland with a tree height of approximately 25 m and a canopy dominated by Apple Box (*Eucalyptus bridgesiana*), Yellow Box (*Eucalyptus melliodora*) and Narrow-leaved Stringybark (*Eucalyptus oblonga*). The mid storey was dominated by juvenile *Euc.* spp. and *Acacia falciformis*, *Acacia implexa* and *Acacia ulicifolia*. Groundcover comprised *Persoonia mollis subsp ledifolia*, *Lonmandra glauca*, *Lonmandra longifolia*, *Bursaria spinosa* and Sweet Pittosporum (*Pittosporum undulatum*). No threatened flora species were identified.
- URS Corporation (2006) – this survey of the west side of the northern pit identified the above canopy species plus Forest Red Gum (*Eucalyptus tereticornis*) and Thin-leaved Stringybark (*Eucalyptus eugenoides*). No threatened flora species were identified.
- RPS Harper Sommers O'Sullivan (2009) – this survey of emplacement areas identified the following communities in the study area:
 - Brittle Gum Stringybark;
 - Forest Redgum Stringybark Woodland;
 - Coastal Grey Box Forest Redgum Woodland;
 - cleared/disturbed planted vegetation; and
 - planted trees and shrubs.

No threatened flora species were identified.

Fauna

Fauna was surveyed around the west of the north pit by Gunninah Environmental Consultants in 1997 and URS Corporation in 2006, which only found common to abundant species. RPS Harper Sommers O'Sullivan (2009) determined the following threatened species could occur in the Project site. However, none were observed during the survey:

- Gang-Gang Cockatoo (*Callocephalon fimbriatum*);
- Glossy Black Cockatoo (*Calyptorhynchus lathami*);
- Swift Parrot (*Lathamus discolor*);
- Squirrel Glider (*Petaurus norfolkensis*);
- Koala;
- Grey-headed Flying-fox (*Pteropus poliocephalus*);
- Large-eared Pied Bat (*Chalinolobus dwyeri*);
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*);
- Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*); and
- East Coast Freetail-bat (*Mormopterus norfolkensis*).

Aboriginal heritage

A 10 km by 10 km area was searched on the Aboriginal Heritage Information System (AHIMS) on 1 September 2014 and 20 February 2018 for the *Marulan Limestone Mine Continued Operations Project – Aboriginal cultural heritage assessment* report (EMM Consulting, 2018a) to identify existing recorded Aboriginal sites in the area.

Sites were distributed across multiple landforms but clustered near watercourses. A diverse range of site types occurred, the most common being isolated finds and open camp sites which comprise over 90% of the total sites in the region. Smaller numbers of modified trees and stone arrangements were also present, with one rock shelter with art identified.

Nineteen of the 112 registered sites in the search area were in (4 sites) or adjacent to (15 sites) of the Project site as detailed in Table 1.5 and in Figure 1.3.1g(2). However, two of the sites previously recorded in the Project site were removed during a previous salvage activity.

EMM was commissioned by Boral to enact the management measures for the southern section of the project area, as per the guidelines set out within the Aboriginal Cultural Heritage Management Plan (ACHMP). The field work was carried out between 19 – 22 June 2023 by EMM Archaeologists accompanied by representatives from Ngunawal Heritage Aboriginal Corporation, Thunderstone Aboriginal Cultural and Land Management Services and Pejar Local Aboriginal Lands Council.

Each of the 38 Aboriginal sites with management requirements within the southern section of the project area were visited and were managed according to the guidelines set out within the ACHMP. A total of 72 artefacts were collected from 16 Aboriginal sites. One new Aboriginal site (MSL2301) was recorded during the work.

Table 1.5 AHIMS sites in and adjacent to the Project site

AHIMS site number / Name	Site description	Location
52-4-0195: M1 (BCSC1)	A site containing five flakes in quartz and silcrete. It appears this site and site 52-4-161 below are the same site but with different AHIMS coordinates. Notwithstanding, the site has been destroyed.	Inside Project site
52-4-161: BCSC1	A site containing approximately 91 artefacts associated with converging minor drainage lines. It appears that this site and site 52-4-0195 above are the same site. It was considered to have no archaeological potential as the area was subject to severe disturbance from historical mining activities. Artefacts were collected prior to impact from additional mining activities. The site has been destroyed.	Inside Project site
52-4-0246: M2	Three silcrete flakes.	Inside Project site
52-4-0276: BCSC IF11	A grey green quartzite flake in a woodland area.	Inside Project site
52-4-0271: BCSC IF3	A red silcrete flake piece in a woodland area on a mid-slope landscape.	Inside Project site
52-4-0272: BCSC IF4	A grey silcrete flake in woodland on a gentle north facing slope.	Inside Project site
52-4-0270: BCSC IF2	A single red brown silcrete flake in the woodland area of the mine at the base of an eroded slope.	Inside Project site
52-4-0274: BCSC IF8	One red silcrete core in the woodland area, near some historic ruins.	Inside Project site
52-4-0273: BCSC IF7	One grey brown red silcrete flake in woodland.	Inside Project site
52-4-0279: BCSC IF9	A grey silcrete flake located in a cleared area.	Inside Project site
52-4-0269: BCSC AS4	An artefact scatter consisting of 22 artefacts of silcrete and chert located on an east facing lower slope.	West of Project site
52-4-0278: BCSC IF13	A white quartz flake on an east facing lower slope.	Inside Project site
52-4-0277: BCSC IF12	A red brown silcrete flake piece on a lower slope facing east.	Inside Project site
52-4-0279: BCSC IF14	A grey green quartzite flake at the base of a slope facing east.	Inside Project site
52-4-0268: BCSC AS3	Two artefacts; a silcrete flake and a quartz flake on an eastern facing lower slope.	Inside Project site
52-4-0267: BCSC AS2	A scatter of two flakes at the base of a woodland area on an east facing lower slope.	Inside Project site
52-4-0266: BCSC AS1	A scatter of seven artefacts including silcrete and quartz flakes and cores. The site is on an east facing lower slope.	Inside Project site
BCSC IF1	One grey silcrete core along an eastern ridgeline in the mid-west gully area of the mine, to the south of a mine access road which connects to the western mine area. It was not located <i>in situ</i> and was among eroded soil and shale rock.	Inside Project site
BCSC AS5	A scatter of ten artefacts on a lower slope facing east.	West of Project site

Historic heritage

The following Commonwealth, State and local heritage databases were searched for the *Marulan South Limestone Continued Operations Project – historic heritage assessment and statement of heritage impact* report (EMM Consulting, 2018b).

- National Heritage Register (NHL) made under the EPBC Act;
- Commonwealth Heritage Register (CHL) made under the EPBC Act;
- State Heritage Register (SHR) made under the NSW *Heritage Act 1977* (Heritage Act);
- Heritage and Conservation Register (s170 Register) made under the Heritage Act;
- Schedule 5 of the LEP; and
- State Heritage Inventory (SHI), which is a central collection of statutory heritage listings in NSW.

No items of state historic heritage significance have been registered in the Project site. The following listed heritage items are near the Project site:

- Bungonia State Recreation Area (now the Bungonia SCA and Bungonia NP) is listed in the LEP and is adjacent to the southern Project boundary; and
- Glenrock Homestead and Outbuildings is listed on the LEP and the nearest extent of its heritage curtilage is approximately 2.4 km north from the Marulan Creek dam.

In addition, field survey was undertaken on 1 April 2015 and 26 June 2015 over targeted areas predicted to have evidence of local historical development.

Items of local heritage significance identified during these surveys are summarised on Figure 1.3.1g(3).

The survey results are described in the following terms:

- village – the former site of Marulan South comprising buildings, roads and street plantings;
- house – former dwellings with evidence of stone walls, mortar, chimney bases, landscape modification;
- camps – areas with evidence of habitation;
- industrial areas – remnants, for example, of kilns and aerial ropeway; and
- roads – identified on current or historical maps, aerial photography and the field survey.

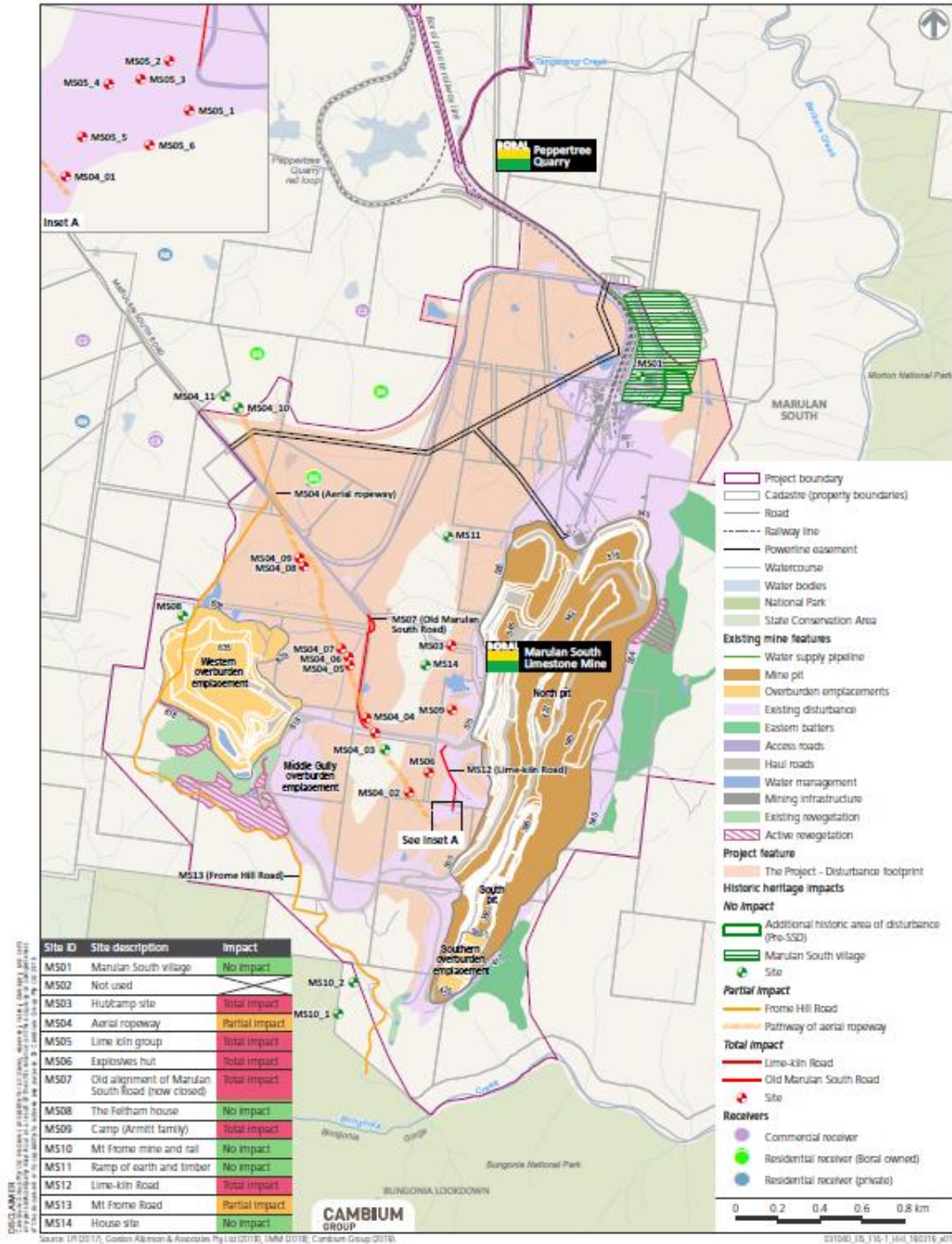
All of these items were recorded in the main mine area of the Project site. No items of historic heritage significance were discovered in the area of the proposed Marulan Creek dam.

In accordance with Boral's Historic Heritage Management Plan (HHMP) field work commenced 16 October 2023 and continued through until 4 December 2023 to record and or salvage where appropriate items of local historic significance in the main mine area subject to disturbance.

Figure 1.3.1g(3) Historic heritage site impacts

Figure 16.1
Historic heritage impacts

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h. Water catchment areas

The mine site is in the headwaters of the Barbers Creek and Bungonia Creek tributaries to the Shoalhaven River as indicated on Figure 1.3.1b – Appendix A. The mine site is drained by ephemeral drainage lines into Barbers Creek to the east and Bungonia Creek to the south. The Shoalhaven River is, at its closest point, approximately 1.5 km east of the Project site and flows east into Lake Yarrunga (the waterbody behind Tallowa dam), and eventually to the ocean approximately 100 km east of the Project site.

The drainage pattern has been altered in places by mining activities over time. Steep batters have been constructed in external sections of both the north and south pits on the eastern and southern sides of the mine above the steep ravines below.

The southern end of the mine area drains naturally towards Bungonia Creek. Incised gullies near the mine drain into Barbers and Bungonia Creeks before discharging into the Shoalhaven River immediately south-east and east of the mine respectively.

Water catchment areas are shown on Figure 1.3.1h – Appendix A.

There are a number of small farm dams on ephemeral creeks within the mine site, which appear to retain water with little seepage. Main Gully is a drainage line that, prior to mining, had a catchment area of 230 ha, much of which has been subsumed by prior mining or overburden emplacements. However, it remains the main drainage line for the southern part of the mine.

Marulan Creek and Tangarang Creek are ephemeral drainage lines in the Barbers Creek catchment. The catchments of both creeks contain several farm dams and Tangarang Creek has been dammed to supply water for Peppertree Quarry.

As described above, the mine is in the catchments of Bungonia and Barbers creeks, which flow into the Shoalhaven River. The Shoalhaven River is in the Tallowa dam catchment, which is a drinking water source for Sydney and the Illawarra.

The mine is in the area of the Greater Metropolitan Region Unregulated Area Water Sharing Plan (WSP) and the following surface water sources in the WSP:

- Bungonia Creek Management Zone (commenced July 2011);
- Barbers Creek Management Zone (commenced July 2011); and
- Shoalhaven River Gorge Management Zone (commenced July 2011).

Surface and groundwater licences held by Boral are detailed in Table 1.2 and include the current surface water entitlement of 76 million litres (ML) per year for water extracted from Tallong Weir in the Barbers Creek Management Zone. The proposed Marulan Creek dam will also be in the Barbers Creek Management Zone.

Groundwater sources in and around the mine site are shallow unconsolidated aquifers and deep consolidated aquifers. The shallow groundwater is in the pore spaces in the sediment or regolith. The deep groundwater is in the rock fractures in the bedrock, which have been caused by geologic and structural movement associated with intrusive volcanic activity or dissolution of limestone.

The groundwater is in the Goulburn Fractured Rock Groundwater Source and is classified as a 'low productivity' groundwater source according to the AIP.

There are according to the NSW Government's Pinneena database some 22 registered bores surrounding the mine site of which the majority are for domestic water supply and a few for industrial use by poultry farmers.

i. Main roads, railways and public infrastructure

Mine access is via Marulan South Road, which connects the mine and Peppertree Quarry with the Hume Highway approximately 9 km to the north-west. Boral's private rail line connects the mine and Peppertree Quarry with the Main Southern Railway approximately 6 km to the north.

Refer to Figure 2.1 – Appendix A.

Marulan South Road, a two-lane rural road is predominantly 80 km/h except at/near the Hume Highway intersection and at the mine where it is 60 km/h.

The Hume Highway is a high standard four lane divided road with dual carriageways. It is the main road between Sydney, Canberra and Melbourne, and services towns in south-western NSW, and the ACT.

In the Marulan area the Hume Highway provides two through lanes in each direction plus additional turning and/or diverging/merging lanes at intersections for vehicles entering or leaving the Highway.

j. Neighbouring residences and industries

Nearby residences and commercial businesses are considered potentially sensitive receivers and are identified in land ownership and land use plans, Figure 1.3.1a and Figure 1.3.1e – Appendix A as 'R' – private residential, 'B' – Boral owned residences and 'C' commercial business.

2 PART 2 – FINAL LAND USE

2.1 Regulatory requirements for rehabilitation

Regulatory requirements for rehabilitation are detailed in Table 2.1 and include requirements under the following consents, leases and licences.

a. SSD 7009

Under Part 4, Division 4.7 of the Environmental Planning & Assessment Act 1979 (EP&A Act) State Significant Development SSD 7009 approval CoC B76, B77, B78, B79, B80, B81 and B82.

The requirement to prepare a Rehabilitation Strategy in accordance with CoC B79 and other relevant rehabilitation conditions (CoC B76, B77, B78, B80 and B81) has been completed with Rehabilitation Strategy (revision 3, 30 August 2022) approved by DPE on 16 September 2022.

In regard to CoC B82 clauses (c) to (i) the DPE has agreed to remove these clauses as they duplicate requirements already covered by RMP guidelines and “form and way” documentation in accordance with the Mining Amendment (Standard Conditions of Mining Leases – Rehabilitation) Regulation 2021. These clauses are therefore omitted from Table 2.1.

b. Mining Leases ML1857 and CML16

For CML 16 (in particular for existing remnants of CML16) together with new ML 1857 the Mining Amendment (Standard Conditions of Mining Leases – Rehabilitation) Regulation 2021 effective 2 July 2021 apply.

The Marulan South Limestone Mine is defined as a “large mine” as the mine is the subject of one or more mining leases, where the carrying out of activities requires an environment protection licence, EPL 944 under the Protection of the Environment Operations Act 1997 as detailed in Section 1.2**Error! Reference source not found..**

Conditions of the mining leases granted under the Mining Act 1992 require Boral to:

- Prepare rehabilitation objectives and rehabilitation completion criteria in the “form and way” approved by the Secretary,
- Submit the rehabilitation objectives, rehabilitation completion criteria and the final landform and rehabilitation plan to the Secretary for approval (collectively referred to as the “rehabilitation outcome documents”),
- Prepare a RMP which includes the rehabilitation objectives and rehabilitation completion criteria in the “form and way” approved by the Secretary,
- Implement the RMP, and
- Achieve the final land use as stated in the approved rehabilitation objectives, rehabilitation completion criteria and the final landform and rehabilitation plan.

The Secretary referred to is the Secretary of the Department of Regional NSW and the “form and way” means the form and way documents approved by the Secretary as available on the Department of Regional NSW’s – NSW Resources Regulator website.

c. EPBC Act

Boral has been granted approval EPBC 2015/7521 dated 7 October 2021 under the Environment Protection and Biodiversity Conservation Act 1999, (EPBC Act) until 31 August 2071.

Conditions specific to the action to expand an existing limestone and clay mining operation (CML16) and construct and operate mine related infrastructure, for up to 30 years are included in Annexure A – Conditions of Approval, Part A conditions 1, 2 and 3.

Boral as the approval holder must limit clearing and retire ecosystem credits in accordance with conditions 1 and 2 and relating to rehabilitation must comply with SSD 7009 conditions, in particular CoC B78, B79, B80, B81 and B82 as detailed in Table 1.2.

d. Other

Prior to the grant of ML1857 on 14 July 2023 both the NSW Resources Regulator and the EPA were notified of a landslip failure that occurred at the Eastern Batters upstream of Barbers Creek on 25 November 2022.

During the preparation of this RMP this landslip failure was subject to a Notice under the Mining Act section 240 and is now subject to Commencement of Investigation dated 19 October 2023.

In particular in accordance with Direction 1d, a geotechnical assessment that must nominate a FoS and PoF that is to be used as the criteria to assess remedial options to achieve a long term stable landform. Provide a justification for the FoS and PoF taking into account the requirement for the landform to sustain the approved final land uses and to comply with rehabilitation objectives as nominated in the Rehabilitation Strategy with the development consent SSD 7009.

Refer to Section 1.2.c for details of EPL 944.

Table 2.1 Regulatory requirements for rehabilitation

Requirement / Condition No.		Regulatory requirement for rehabilitation	Section reference RMP
2.1a		SSD 7009 - CoC B76, B77, B78, B79, B80, B81 and B82.	RS (rev 3, 30/08/2022)
B76		Rehabilitation Objectives The Applicant must rehabilitate the site in accordance with the conditions imposed on the mining lease(s) associated with the development under the Mining Act 1992. This rehabilitation must be generally consistent with the proposed rehabilitation strategy described in documents listed in condition A2(c) and shown in Appendix 6, and must comply with the objectives in Table 6.	Section 2.1a & Section 2.1b Section Error! Reference source not found. Section 5 Figure 2; Figure 4 Table 1.1
B77		The rehabilitation objectives in Table 6 apply to the entire site, including all landforms which were lawfully constructed prior to the commencement of development under this consent. \ However, the Applicant is not required to retrospectively incorporate micro-relief and drainage features that mimic natural	Section 2.3 Section Error! Reference source not found.

		topography and mitigate erosion on landforms that have been approved and constructed under the previous consents. However, further erosion control works may be required to these landforms to address long term stability issues (if identified).	Section Error! Reference source not found.
B78		Progressive Rehabilitation The Applicant must rehabilitate* the site progressively, that is, as soon as reasonably practicable following disturbance. All reasonable steps must be taken to minimise the total area exposed at any time. Interim stabilisation and temporary vegetation strategies must be employed when areas prone to dust generation, soil erosion and weed incursion cannot be permanently rehabilitated. *This condition does not prevent further disturbance at some later stage of the development of areas that have been rehabilitated.	Section 1.4
B79		Rehabilitation Strategy The Applicant must prepare a Rehabilitation Strategy for all land disturbed by the development to the satisfaction of the Planning Secretary. This strategy must:	Section 2.1a Section 1.4
	(a)	be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Planning Secretary;	Section Error! Reference source not found.
	(b)	be prepared in consultation with DPIE Water, BCD, Resources Regulator and Council;	Error! Reference source not found. 2.2
	(c)	build upon the Rehabilitation Objectives in Table 6, describe the overall rehabilitation outcomes for the site, and address all aspects of rehabilitation including mine closure, final landform (including final voids), post-mining land use/s and water management;	Section 4 Section 5
	(d)	align with strategic rehabilitation and mine closure objectives and address the principles of the Strategic Framework for Mine Closure (ANZMEC and MCA, 2000);	Section 1.3.2 Figure 1
	(e)	describe how the rehabilitation measures would be integrated with the measures in the Biodiversity Management Plan referred to in condition B54;	Section 1.3.2 Section Error! Reference source not found.
	(f)	describe how rehabilitation will be integrated with the mine planning process, including a plan to address premature or temporary mine closure;	Section 1.3.2
	(g)	include indicative mine plans and scheduling for life-of-mine rehabilitation showing each rehabilitation domain;	Section 5.3.2 Table 5.1

			Table Error! Reference source not found.
	(h)	include details of target vegetation communities and species to be established within the proposed revegetation areas;	Section Error! Reference source not found.
	(i)	investigate opportunities to refine and improve the final landform and final void outcomes over time;	Section Error! Reference source not found.
	(j)	include a post-mining land use strategy to investigate and facilitate post-mining beneficial land uses for the site (including the final void), that:	Section 4.5 Error! Reference source not found.
	(j) (i)	align with regional and local strategic land use planning objectives and outcomes;	Section 4 Section 4.5
	(j) (ii)	support a sustainable future for the local community;	
	(j) (iii)	utilise existing mining infrastructure, where practicable; and	Section Error! Reference source not found.
	(j) (iv)	avoid disturbing self-sustaining native ecosystems, where practicable;	Section 3.4
	(k)	include a stakeholder engagement plan to guide rehabilitation and mine closure planning processes and outcomes;	Section 4.3
	(l)	investigate ways to minimise adverse socio-economic effects associated with rehabilitation and mine closure; and	Section Error! Reference source not found.
	(m)	include a program to periodically review and update this strategy at least every three years.	Section Error! Reference source not found.
B80		The Rehabilitation Strategy must be approved by the Planning Secretary within 6 months from the date of the consent, unless otherwise agreed by the Planning Secretary.	Section 2.1a Section 1.6
B81		The Applicant must implement the Rehabilitation Strategy approved by the Planning Secretary	Section 1.5
B82		The Applicant must prepare 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. This plan must:	
	(a)	be prepared in consultation with the Department and Council;	
	(b)	be prepared in accordance with any relevant Resources Regulator Guidelines;	Section 2.1 b
	(c)-(i)	clauses omitted	Section 2.1 a
2.1b		Mining Amendment (Standard Conditions of Mining Leases – Rehabilitation) Regulation 2021 Clause 9 and Clause 10 of Schedule 8A CML 16, ML1716 and ML1857	
ML 1857 – Special Conditions			
5		Rehabilitation of Previous Mining Operations	Section 1.2b

		The lease holder must rehabilitate to the satisfaction of the Minister, any part of the lease disturbed by previous mining operations carried out under Consolidated Mining Lease 16 (Act 1992) and Mining Lease 1716 (Act 1992).	
2.1c		EBPC Act	Section 2.1c
2.1d		Other	Section 2.1d

2.2 Final land use options assessment

A final land use options assessment was undertaken as part of the environmental impact assessment conducted for SSD 7009 and is included in the 2019 EIS. In particular Volume 1, Sections 4.8, 4.9 and 4.10 provide detail covering the current post 30 year mine concept, the mine closure strategy and likely post 30 year alternative land use options respectively.

An important post 30 year land use option is the continuation of mining operations.

For SSD 7009 approval a conceptual 30 year final landform design for domain based final land uses is included in the CoC – Appendix 6 and is reproduced as Figure 3 in this RMP.

As detailed in the approved Rehabilitation Strategy (revision 3, 30 August 2022) required in accordance with SSD 7009 CoC B79 an important control measure for final landform design and final land use is rehabilitation planning. Considering the current 30 year approved mine life, this RMP and future revisions provide Boral with an ongoing rehabilitation management planning, control document.

2.3 Final land use statement

The rehabilitation objectives supporting final land use are provided in SSD 7009 CoC B76 – Table 6 and form the basis of the final land use statement. Table 6 is reproduced as Table 2.2 below.

Rehabilitation objectives incorporating SSD 7009 CoC B76 – Table 6 have been developed further to include remnant areas of CML 16 and to address proposed remediation of the recent Eastern Batters landslide failure discussed under Section 2.1d

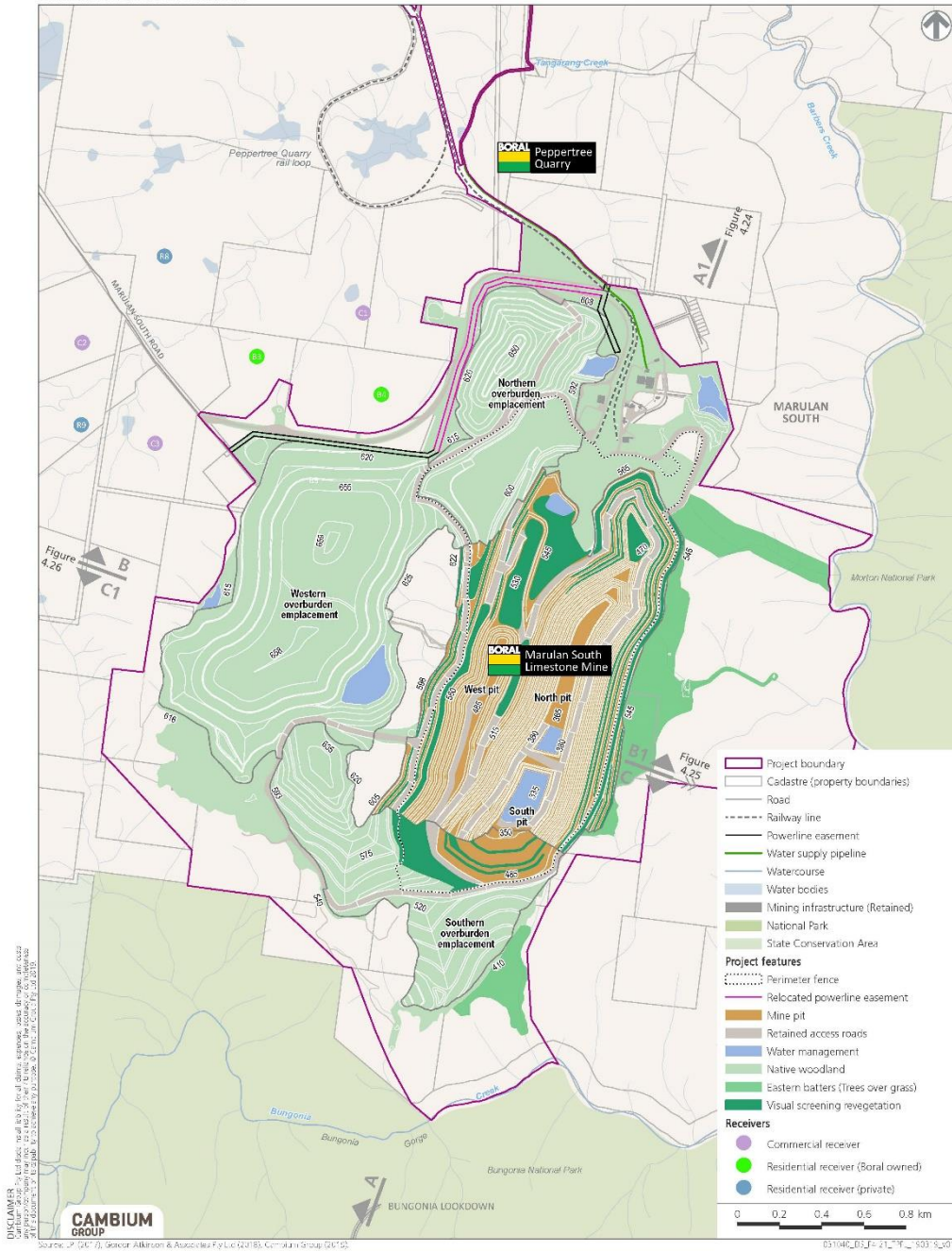
Table 2.2 Rehabilitation objectives

Feature	Objective
All areas of the site affected by the development	• Safe, stable and non-polluting • Fit for the intended post-mining land use/s • Establish the final landform and post-mining land use/s as soon as practicable after cessation of mining operations • Minimise post-mining environmental impacts
Areas proposed for native ecosystem re-establishment	• Establish/restore self-sustaining native woodland ecosystems • Establish local plant community types, with a particular focus on species commensurate with <i>White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC</i> • Establish: – riparian habitat within any retained water features; – habitat, feed and foraging resources for threatened fauna species (including the Koala); and – vegetation connectivity and wildlife corridors, as far as is reasonable and feasible
Final Landform	• Stable and sustainable for the intended post-mining land use/s • Integrated with surrounding natural landforms and other mine rehabilitated landforms, to the greatest extent practicable • Incorporate micro-relief and drainage features that mimic natural topography and mitigate erosion, to the greatest extent practicable • Maximise surface water drainage to the natural environment i.e. free draining (excluding final void catchment) • Minimise visual impacts, where practicable
Final void	• Designed as long term groundwater sink to prevent the release of saline water into the surrounding environment, unless further mine planning and

Feature	Objective
	final landform design processes identify a more suitable outcome for the final void (see condition B79) - Minimise to the greatest extent practicable: - the size and depth; - the drainage catchment; - any high wall instability risk; and - the risk of flood interaction - Maximise potential for beneficial reuse, where practicable
Surface infrastructure of the development (excluding Marulan Creek Dam)	To be decommissioned, removed and rehabilitated, unless the Resources Regulator agrees otherwise
Water quality	- Water retained on the site is fit for the intended post-mining land use/s - Water discharged from the site is suitable for receiving waters and fit for aquatic ecology and riparian vegetation
Community	- Ensure public safety - Minimise adverse socio-economic effects associated with mine closure

Figure 3 Conceptual Final landform (from SSD7009 CoC – Appendix 6)

Figure 4.21
The Project - Final landform

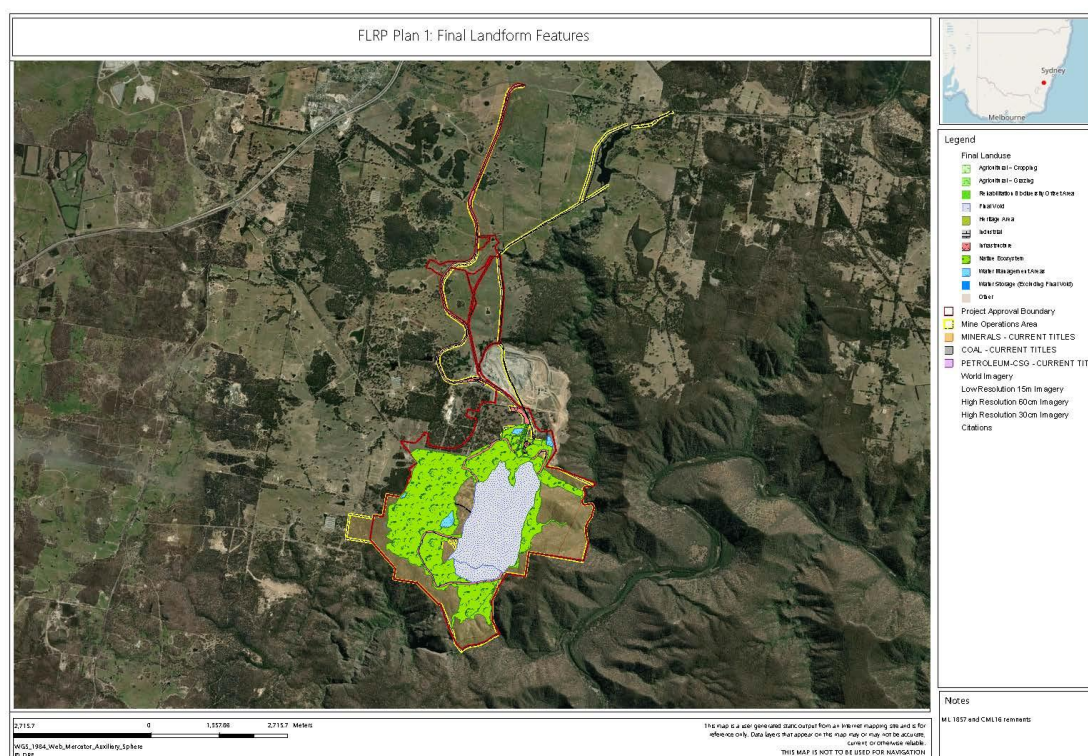
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2.4 Final land use and mining domains

Final land use domains based on the SSD 7009 CoC – Appendix 6 conceptual final landform are presented in Plate 1 below that shows an image capture of the final landform rehabilitation plan, Plan 1 that is included in Appendix B.

The mining domains that define the type of mining disturbance subject to final landform rehabilitation for the various land uses are detailed in Table 2.4.

Plate 1 Final landform rehabilitation plan



a. Final land use domains

A summary of final land use domains based on the final landform rehabilitation plan FLRP Plan 1: Final Landform Features included in Appendix B is provided in Table 2.3.

Table 2.3 Summary of Final land use domains

Final Land Use Domain	Mining Domain	Spatial Reference	Vegetation Community	Area
native ecosystem	infrastructure area	A1		19.14
native ecosystem	overburden emplacement area	A4		283.30
water management areas	water management area	G3		6.80
infrastructure	infrastructure area	I1		40.32
final void	active mining area (open cut void)	J5		172.15
Total Area				521.70

The FLRP includes remnant areas of CML16.

b. Mining domains

Table 2.4 Detail for Final land use and Mining domains

Final Land Use Domain	Mining Domain	Site Name	Spatial Reference	Vegetation Community	Area
FNLNDDOM	MINEDOMT	SITEN	SPATREF	VEGCOM	HECTARES
native ecosystem	infrastructure area	Building, access and railway infrastructure	A1	PCT 1334	1.07
native ecosystem	infrastructure area	mine infrastructure	A1	PCT 1334	18.07
native ecosystem	overburden emplacement area	Eastern Batters Bryces Gully	A4	PCT 778	10.85
native ecosystem	overburden emplacement area	Eastern Batters Barbers Creek	A4	PCT 778	19.46
native ecosystem	overburden emplacement area	Eastern Batters Bungonia Creek	A4	PCT 778	6.81
native ecosystem	overburden emplacement area	NOE Peppertree	A4	PCT 1334	0.08
native ecosystem	overburden emplacement area	NOE	A4	PCT 1334	37.34
native ecosystem	overburden emplacement area	SOE	A4	PCT 1334	28.60
native ecosystem	overburden emplacement area	WOE	A4	PCT 1334	146.97
native ecosystem	overburden emplacement area	SOE Middle Gully	A4	PCT 1334	33.20
water management areas	water management area	Central dam	G3		3.80
water management areas	water management area	Closed catchment dam	G3		0.53
water management areas	water management area	Eastern gully dam	G3		1.26
water management areas	water management area	Kiln dam	G3		1.21
infrastructure	infrastructure area	mine infrastructure	I1	PCT 1334	17.37
infrastructure	infrastructure area	Retained haulroads and access	I1		17.08
infrastructure	infrastructure area	Building, access and railway infrastructure	I1		1.20
infrastructure	infrastructure area	Rail Line	I1	PCT 1334	4.67
final void	active mining area (open cut void)	Open Cut Mine	J5		155.37
final void	active mining area (open cut void)	Open Cut Mine - Backfill	J5		16.78
Total Area					521.70

3 PART 3 – REHABILITATION RISK ASSESSMENT

a. History of risk assessments

To identify mine activities including rehabilitation which required control strategies to ensure compliance with conditions of lease, license and development consent, the former Blue Circle Southern Cement Ltd initially conducted a “Broad Brush Environmental Risk Assessment” in January 2008 that was facilitated by GSS Environmental.

In preparation of subsequent Mining Operations Plan (MOP) documents the original “Broad Brush Environmental Risk Assessment” (February 2008) was updated for the 2009-2015 MOP. In 2017 a further environmental risk assessment was undertaken for the 2018/2019-2023 MOP period.

The methodology used followed AS/NZS ISO 31000:2009, Risk management - Principles and guidelines. The revised 2017 environmental risk assessment indicated that with appropriate management controls in place environmental risks could be minimised and maintained within low to medium category.

In regard overburden emplacements and in particular the older “1970s” Eastern Batter emplacements comprising Bryce’s Gully, Barbers Creek and South Pit locations it has been recognised that maintaining a good revegetation cover over these steep (angle of repose) slopes is key to minimising surface erosion, reducing sedimentation and maintaining surface stability.

The 2019 – 2023 MOP included the Bryce’s Gully Water Management Plan (WMP) as a requirement of both the EPA and the former DPIE – Resources Regulator following Boral’s reporting of an erosion and sedimentation issue from Bryce’s Gully on 31 January 2018.

In preparation for this first RMP, further risk assessment has been undertaken commencing in June 2022 with the focus on rehabilitation. The initial rehabilitation risk assessment team comprised Boral site management, supervisors and operations personnel together with mining consultant and earthmoving contractor personnel.

This rehabilitation risk assessment has further been updated following the slip failure on the Eastern Batters, upstream of Barbers Creek on 25 November 2022.

The current rehabilitation risk assessment, RRA – 1 version 4 is included in Appendix C.

b. Current rehabilitation risks

The list of risks to rehabilitation are presented in the current rehabilitation risk assessment, RRA – 1 version 4 that is included in Appendix C.

c. Rehabilitation risk controls

Without suitable controls, initial high risk rehabilitation items or issues included the following.

- Provision of experienced personnel with defined responsibilities for rehabilitation
- Provision of adequate funding for and the prioritising of rehabilitation activities
- Impacts on heritage items, and
- Material contamination e.g. hydrocarbon during decommissioning phase
- Unstable landform due to poor design, erosion, adverse or unsuitable materials during landform establishment
- Lack of suitable quality and quantity of growth medium combined with unstable landforms prone to erosion and movement requiring further remediation.

- Lack in availability and quality of target seed resources and the impact of climate during the establishment phase of ecosystem and land uses
- During the ecosystem and land use development phase climate, water, feral animal, re-disturbance and failure of erosion and sediment controls are considered a potential high risk to successful rehabilitation
- In regard mine subsidence or slip failures in particular the Eastern Batters the impact of poor or inadequate drainage

With suitable controls, as detailed in the current RRA – 1 version 4, rehabilitation risk assessment (Appendix C) all initial high risk rehabilitation items or issues except one are considered medium or low risk.

The exception at present is for the landform establishment phase of rehabilitation, Item 4.1.

In particular, “unstable landform due to erosion and /or mass movement issues associated with inappropriate design and/or quality assurance during landform construction”.

The Eastern Batter areas comprise older “1970s” designed in part, overburden emplacements. These legacy emplacement areas in difficult terrain have previously been recognized and during the environmental impact assessment for the 2019 EIS were recorded as a separate “trees over grass” domain.

As indicated in Section 2.1d the recent slip failure, upstream of Barbers Creek and largely contained within the EIS project total disturbance footprint is currently the subject of ongoing investigation.

In accordance with the current rehabilitation risk assessment the slip failure area is the subject of a revised long term landform and mine development design with geotechnical input.

4 PART 4 – REHABILITATION OBJECTIVES AND REHABILITATION COMPLETION CRITERIA

The rehabilitation objectives (ROBJ)s listed in Table 4.1 are currently proposed rehabilitation objectives subject to approval by the NSW Resources Regulator following submission of these ROBJs via the NSW Resources Regulator Portal and the supporting spatial data via the Mine Rehabilitation Portal.

These objectives are based on the rehabilitation objectives provided in SSD 7009 CoC B76 – Table 6 (Table 2.2) supporting the approved, conceptual 30 year final landform design (SSD 7009 CoC – Appendix 6) included as Figure 3.

These rehabilitation objectives include remnant areas of CML 16 and have been revised further to address proposed remediation of the recent Eastern Batters landslip failure as discussed under Section 2.1d and Section c.

4.1 Rehabilitation objectives and rehabilitation completion criteria

Table 4.1 Rehabilitation Objectives

Rehabilitation Objective Category	Rehabilitation Objectives	Spatial Reference
Landform stability	Safe, stable and non-polluting	A4
Landform stability	Fit for the intended post-mining land use/s	A4
Landform stability	Establish the final landform and post-mining land use/s as soon as practicable after cessation of mining operations	A4
Native revegetation	Minimise post-mining environmental impacts	A4
Native revegetation	Establish: - riparian habitat within any retained water features; - habitat, feed and foraging resources for threatened fauna species (including the Koala); and - vegetation connectivity and wildlife corridors, as far as is reasonable and feasible	A4

Landform stability	Integrated with surrounding natural landforms and other mine rehabilitated landforms, to the greatest extent practicable	A4
Landform stability	Incorporate micro-relief and drainage features that mimic natural topography and mitigate erosion, to the greatest extent practicable	A4
Water quality	Maximise surface water drainage to the natural environment i.e. free draining (excluding final void catchment)	A4
Landform stability	Minimise visual impacts, where practicable	A4
Water quality	Water retained on the site is fit for the intended post-mining land use/s	A4
Water quality	Water discharged from the site is suitable for receiving waters and fit for aquatic ecology and riparian vegetation	A4
Landform stability	Ensure public safety	A4
Removal of infrastructure	Minimise adverse socio-economic effects associated with mine closure	A4
Land and water contamination	There is no residual soil contamination on site that is incompatible with the final land use or that poses a threat of environmental harm.	A4
Management of waste and process materials	Residual waste materials stored on site (e.g. tailings, coarse rejects and other wastes) will be appropriately contained / encapsulated so it does not pose any hazards or constraints for intended final land use.	A4
Landform stability	The final landform is stable for the long-term and does not present a risk of environmental harm downstream / downslope of the site or a safety risk to the public/stock/native fauna.	A4
Landform stability	Landform that is commensurate with surrounding natural landform and where appropriate, incorporates geomorphic design principles	A4
Bushfire	The risk of bushfire and impacts to the community, environment and infrastructure has been addressed as part of rehabilitation.	A4
Water quality	Runoff water quality from mine site meets the requirements of the relevant development consent(s) / Environment Protection Licence and does not present a risk of environmental harm.	A4
Groundwater	Groundwater quality meets the requirements of the relevant development consent(s) / Environment Protection Licence and does not present a risk of environmental harm	A4
Groundwater	Impacts to groundwater regime are within range as per the development consent.	A4

Native revegetation	The vegetation composition of the rehabilitation is recognisable as the target vegetation community PCT 1334, White Box, Yellow Box - Blakelys Red Gum Grassy Woodland and Derived Native Grassland CEEC or PCT 778, Coast Grey Box - stringybark dry woodland.	A4
Native revegetation	The vegetation structure of the rehabilitation is recognisable as, or is trending towards (based on ongoing monitoring data) the target vegetation community PCT 1334, White Box, Yellow Box - Blakelys Red Gum Grassy Woodland and Derived Native Grassland CEEC or PCT 778, Coast Grey Box - stringybark dry woodland.	A4
Native revegetation	Levels of ecosystem function have been established that demonstrate the rehabilitation is self-sustainable.	A4
Landform stability	Safe, stable and non-polluting	G3
Landform stability	Fit for the intended post-mining land use/s	G3
Landform stability	Establish the final landform and post-mining land use/s as soon as practicable after cessation of mining operations	G3
Native revegetation	Minimise post-mining environmental impacts	G3
Water quality	Water retained on the site is fit for the intended post-mining land use/s	G3
Water quality	Water discharged from the site is suitable for receiving waters and fit for aquatic ecology and riparian vegetation	G3
Landform stability	Ensure public safety	G3
Removal of infrastructure	Minimise adverse socio-economic effects associated with mine closure	G3
Land and water contamination	There is no residual soil contamination on site that is incompatible with the final land use or that poses a threat of environmental harm.	G3
Management of waste and process materials	Residual waste materials stored on site (e.g. tailings, coarse rejects and other wastes) will be appropriately contained / encapsulated so it does not pose any hazards or constraints for intended final land use.	G3
Landform stability	The final landform is stable for the long-term and does not present a risk of environmental harm downstream / downslope of the site or a safety risk to the public/stock/native fauna.	G3

Bushfire	The risk of bushfire and impacts to the community, environment and infrastructure has been addressed as part of rehabilitation.	G3
Water quality	Runoff water quality from mine site meets the requirements of the relevant development consent(s) / Environment Protection Licence and does not present a risk of environmental harm.	G3
Water approvals	Structures that take or divert water such as final voids, dams, levees etc. are appropriately licensed (e.g. under the Water Management Act 2000) and where required ensure sufficient licence shares are held in the water source(s) to account for water take.	G3
Landform stability	Safe, stable and non-polluting	I1
Landform stability	Fit for the intended post-mining land use/s	I1
Landform stability	Establish the final landform and post-mining land use/s as soon as practicable after cessation of mining operations	I1
Native revegetation	Minimise post-mining environmental impacts	I1
Removal of infrastructure	To be decommissioned, removed and rehabilitated, unless the Resources Regulator agrees otherwise	I1
Water quality	Water retained on the site is fit for the intended post-mining land use/s	I1
Water quality	Water discharged from the site is suitable for receiving waters and fit for aquatic ecology and riparian vegetation	I1
Landform stability	Ensure public safety	I1
Removal of infrastructure	Minimise adverse socio-economic effects associated with mine closure	I1
Retention of infrastructure	All infrastructure that is to remain as part of the final land use is safe, does not pose any hazard to the community	I1
Retention of infrastructure	All infrastructure that is to remain as part of the final land use benefits from the relevant approvals (e.g. development consent and / or licence/lease/binding agreement, etc)	I1
Land and water contamination	There is no residual soil contamination on site that is incompatible with the final land use or that poses a threat of environmental harm.	I1
Management of waste and process materials	Residual waste materials stored on site (e.g. tailings, coarse rejects and other wastes) will be appropriately contained / encapsulated so it does not pose any hazards or constraints for intended final land use.	I1

Bushfire	The risk of bushfire and impacts to the community, environment and infrastructure has been addressed as part of rehabilitation.	I1
Water quality	Runoff water quality from mine site meets the requirements of the relevant development consent(s) / Environment Protection Licence and does not present a risk of environmental harm.	I1
Landform stability	Safe, stable and non-polluting	J5
Landform stability	Fit for the intended post-mining land use/s	J5
Landform stability	Establish the final landform and post-mining land use/s as soon as practicable after cessation of mining operations	J5
Native revegetation	Minimise post-mining environmental impacts	J5
Groundwater	Designed as long term groundwater sink to prevent the release of saline water into the surrounding environment, unless further mine planning and final landform design processes identify a more suitable outcome for the final void (see condition B79)	J5
Groundwater	Minimise to the greatest extent practicable: - the size and depth; - the drainage catchment; - any high wall instability risk; and - the risk of flood interaction	J5
Landform stability	Maximise potential for beneficial reuse, where practicable	J5
Water quality	Water retained on the site is fit for the intended post-mining land use/s	J5
Water quality	Water discharged from the site is suitable for receiving waters and fit for aquatic ecology and riparian vegetation	J5
Landform stability	Ensure public safety	J5
Removal of infrastructure	Minimise adverse socio-economic effects associated with mine closure	J5
Land and water contamination	There is no residual soil contamination on site that is incompatible with the final land use or that poses a threat of environmental harm.	J5
Management of waste and process materials	Residual waste materials stored on site (e.g. tailings, coarse rejects and other wastes) will be appropriately contained / encapsulated so it does not pose any hazards or constraints for intended final land use.	J5
Landform stability	The final landform is stable for the long-term and does not present a risk of environmental harm downstream / downslope of the site or a safety risk to the public/stock/native fauna.	J5

Landform stability	Landform that is commensurate with surrounding natural landform and where appropriate, incorporates geomorphic design principles	J5
Bushfire	The risk of bushfire and impacts to the community, environment and infrastructure has been addressed as part of rehabilitation.	J5
Water quality	Runoff water quality from mine site meets the requirements of the relevant development consent(s) / Environment Protection Licence and does not present a risk of environmental harm.	J5
Water approvals	Structures that take or divert water such as final voids, dams, levees etc. are appropriately licensed (e.g. under the Water Management Act 2000) and where required ensure sufficient licence shares are held in the water source(s) to account for water take.	J5
Groundwater	Groundwater quality meets the requirements of the relevant development consent(s) / Environment Protection Licence and does not present a risk of environmental harm	J5
Groundwater	Impacts to groundwater regime are within range as per the development consent.	J5

4.2 Rehabilitation objectives and rehabilitation completion criteria – stakeholder consultation

Stakeholder consultation for rehabilitation was undertaken as part of the process in developing a rehabilitation strategy required under SSD7009 CoC B79(b). Initial consultations and feedback in regard to mine site rehabilitation took place during the environmental impact assessment process as detailed in the approved RS (revision 3, 30 August 2022).

Consultations with government departments are detailed in Table 4.2 and Table 4.3 including comments and recommendations from BCD, DPE Water and the Resources Regulator regarding the initial RS document and subsequent revisions.

Table 4.2 Consultation undertaken with regulators

Regulator	Representative	Date	Discussion	Outcomes	Section of RS report
Resources Regulator	Will Mitry via Zoom presentation	03/08/2021	Mine Rehabilitation Portal Workshop	Introduction to the Portal and Portal access	Section 4.1
Resources Regulator	David Humphries, Matthew Newton, Will Mitry, Craig Campbell	26/11/2021	Engagement Session – New standard rehabilitation conditions on mining leases	Presentation covering new legislative requirements for rehabilitation on mining leases	Section 4.1
Regulator	Representative	Date	Discussion	Outcomes	Section of RS report
BCD	Michael Saxon	27/05/2022	Review RS (revision 1) 14 April 2022	RS meets approval requirements	Appendix G copy of letter
DPE Water	Georgia McKeon	02/06/2022	Review RS (revision 1) 14 April 2022	Three key comments. Two requiring additional information regarding seepage the third a commitment to reference guidelines for stream and drainage line rehabilitation	Appendix H copy of letter Refer to Table 2.3 for details
Resources Regulator	Christopher Hammersley	14/06/2022	Review RS (revision 1) 14 April 2022	RS has been prepared to align with new RMP as required under new legislation.	Appendix I copy of email
Goulburn Mulwaree Council	Scott Martin	19/04/2022 & 15/07/2022	Review RS (revision 1) 14 April 2022	No comments received	Appendix J

Table 4.3 Consultation undertaken with DPE Water

No.	DPE Water - Key Comment Details	Section of RS report
1	Additional information is required to describe how seepage from the final void (open pit) will be managed and how this will be incorporated into the Surface Water Management System. This to address the final void rehabilitation requirements set out in Table 6 of Condition of Consent B76 and Condition of Consent B79(c).	Section 3.3 – Water Section 5.1 – Conceptual Final Landform Design – water management
2	Additional information is required to describe how monitoring of seepage from the overburden emplacements will be addressed. This was a post approval recommendation in DPE Water's response to the EIS for this project	Section 3.3.3 – Water quality
3	The strategy should include a commitment that the final design and location of drainage features to achieve a stable landform and achieve riparian outcomes will be completed with reference to industry guidelines such as: Rehabilitation Manual for Australian Streams (LWRRDC 2000) and Guideline: Works that interfere with water in a watercourse for a resource activity (DNRME 2019).	Section 5.2.2 – Drainage Features

During the planning process for the SSD7009 approved 30-year mine development stakeholder and local community input essentially involved a polycentric problem-solving process whereby stakeholders identified additional or different issues to Boral's Project team or attributed higher values to certain issues.

Stakeholders and the community were engaged over a four-year period and outcomes of this engagement were carefully considered in developing the approved 30-year mine plan.

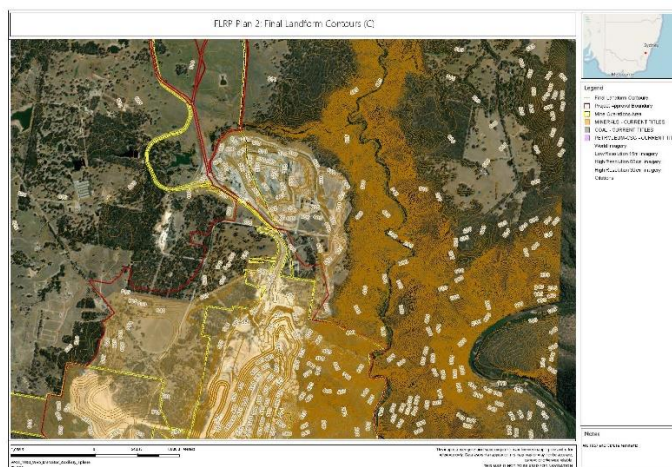
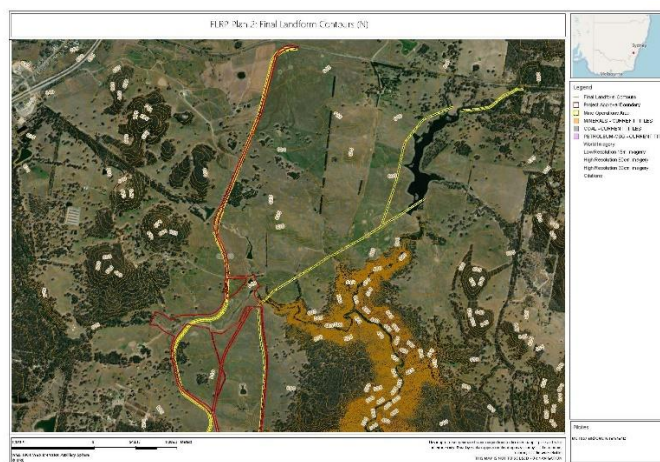
In future the local community will continue to be informed and consulted with during the 30-year mine development through the combined Peppertree Quarry & Marulan South Limestone Mine Community Plan and current Community Consultative Committee.

5

A final landform and rehabilitation plan (FLRP) based on the SSD7009 CoC – Appendix 6, approved but conceptual final landform shown in Figure 3 is presented in the following two plans attached in Appendix B.

FLRP Plan 1: Final Land Use

FLRP Plan 2: Final Landform Contours (plans N, C and S as per images below)



6 PART 6 – REHABILITATION IMPLEMENTATION

A life of mine rehabilitation schedule for the 30 year mine development was developed as part of the 2019 EIS. The four stage development is conceptually presented in Plate 2 and discussed in terms of mining, surface water management and rehabilitation in the following Section 6.1.

The longer than anticipated timing in gaining SSD 7009 approvals and grant of new mining lease, ML1857 (granted 14 July 2023) has resulted in the “likely” or “indicative” commencement date for Stage 1 being delayed by some 3-4 years.

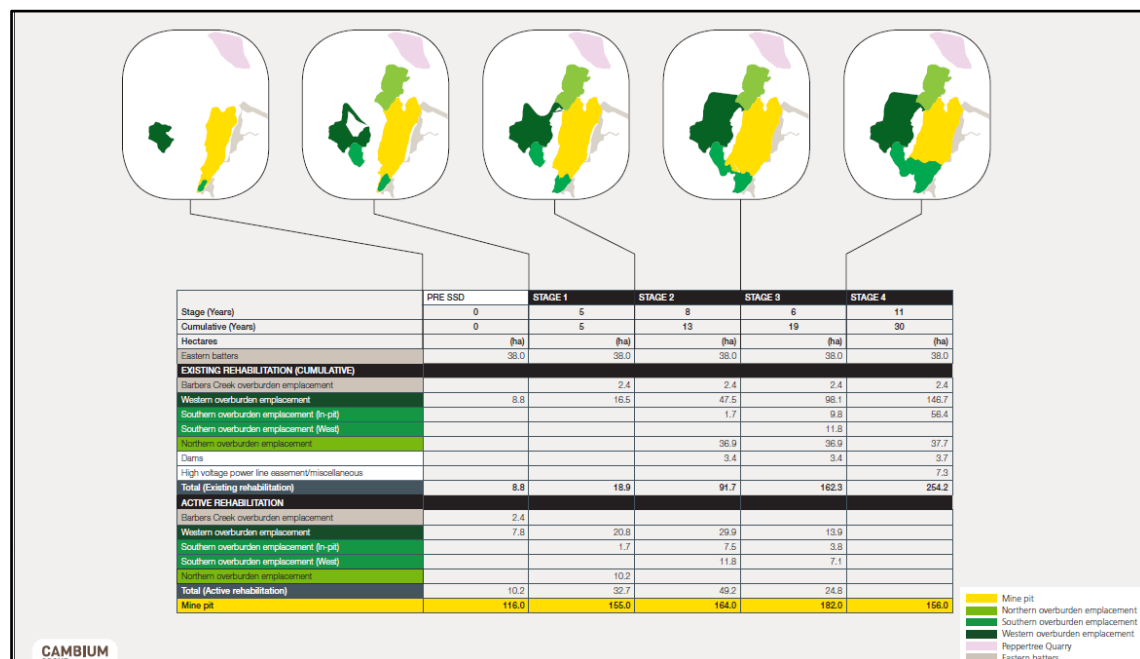
As a consequence, proposed scheduling or staging of mine operations has required reconfiguration with parts of Stage1 and Stage 2 combined. In particular, earlier removal of existing stockpile / reclaim infrastructure to permit limestone mining in the northern end of the North Pit and emplacement of overburden at elevation in the western overburden emplacement, (WOE). To re-establish acceptable tonnage of exposed limestone to meet production and market requirements, a short term increase in overburden removal is also required. In addition, operational changes to address the recent slip failure in the Eastern Batters will require some re-scheduling and re-staging of mine development from western batters to eastern batters earlier than anticipated.

Consultations with the DPE supported by legal planning advice indicate that this amended schedule or staging is generally in accordance with the 2019 EIS, that there will be no further environmental impact as a result of the amended schedules and that the amended staging schedules are not in conflict with any SSD 7009 express condition of the consent.

These revisions have been addressed in the first 2022-2023 Annual Rehabilitation Report and 2023-2026 Forward Program. The 30 June 2023 footprints for disturbance and rehabilitation are shown as overlays on the Stage 1 mining and rehabilitation plan included in Appendix D.

During the amended five year, Stage 1 period (2023-2028) the rehabilitation schedule is forecast to re-align with the proposed 30 year rehabilitation schedule noting that the majority of the northern overburden emplacement (NOE) currently undergoing development by Peppertree Quarry is excluded from ML 1857.

Plate 2 30 year rehabilitation schedule



6.1 Life of mine rehabilitation schedule

a. Stage 1

Mining

Stage 1 now commencing in 2023 will likely occur over 5 years and will involve the removal and emplacement of approximately 18.4 Mt of overburden from the western part of the mine pit to provide access to approximately 20 Mt of limestone resource. Approximately 700,000 t of shale will also be extracted.

Overburden emplacement during stage 1 will involve:

- 10.2 Mt emplaced in the southern part of the WOE to 635 m;
- 5.2 Mt emplaced in the SOE to 425 m in the in-pit part and to 615 m in the western out-of-pit part of the emplacement; and
- 18.2 Mt emplaced in the NOE of which 3 Mt is from the mine and between 13 Mt and 15 Mt is from Peppertree Quarry. Overburden from Peppertree Quarry will complete most of the northern part of the NOE to 650 m, with the remainder coming from the mine. Three million tonnes of overburden from the mine will be used to construct the earthworks platform that forms the southern part of the NOE for the new stockpile reclaim area with a finished level of 600 m. The NOE is complete at the end of Stage 1.

Other key mine infrastructure changes in Stage 1 include:

- realignment of a section of the mine's high voltage supply power line to accommodate the NOE;
- relocation of existing and construction of new stockpile reclaim infrastructure to the north-west of the mine pit to allow for the northern expansion of the mine which will subsume the existing stockpile reclaim area. The new stockpile reclaim infrastructure will comprise use of the existing primary crusher /secondary crushers at 545 m level with crushed limestone conveyed up the existing conveyor to screen house/transfer station where limestone is conveyed westward across the existing rail back shunt onto a nominal 500 kt stockpile via an overhead linear tripper. Reclaim is via a similar route from an underground tunnel with draw down vibratory feeders onto reclaim and transfer conveyors back to the screen house/transfer station; and
- construction of the shared road sales stockpile area to store finished aggregates from the mine and Peppertree Quarry for dispatch by road.

Surface water management

Surface water management proposed during Stage 1 involves:

- construction of the new Marulan Creek, Central and Eastern Gully water storage dams, enlargement of the existing kiln dam;
- upgrade Tallong Weir to Marulan pipeline to allow connection of the Marulan Creek dam to the mine reservoir;
- installation of a pipeline connecting the Eastern Gully dam to the kiln dam via the reservoir;
- construction of the north pit sump towards the end of Stage 1 following north-west mine pit development;
- construction of sediment basins N1 and N2 in preparation for emplacement of overburden in the NOE;
- completion of construction of sediment basin W1 to control runoff from the upper slopes of the WOE that progresses northwards toward Marulan South Road;

- installation of pipelines to connect sediment basins N1 and N2 to the kiln dam, eastern gully dam to kiln dam via the reservoir, and sediment basins W1 and W2 to the central dam; and
- construction of sediment basin P1 to receive runoff from the new shared road sales stockpile area.

Rehabilitation

Stage 1 rehabilitation activities proposed over a 5-year period include:

- Establish existing rehabilitation or 'ecosystem and land use establishment' over 16.5 ha of the lower slopes of the WOE and the 2.4 ha of the active Barbers Creek overburden emplacement.
- Commence growth medium development or active rehabilitation over 10.2 ha of the western and northern lower slopes of the completed NOE.
- Commence active rehabilitation over 20.8 ha of the western and northern lower slopes of the extended WOE. In addition, any final batters constructed for the associated central dam and similarly for the Eastern Gully dam would be revegetated for slope stabilisation.
- Commence active rehabilitation of 1.7 ha of the south-eastern 'outer' slopes of overburden backfilled into the in-pit part of the SOE.

In the 5-year, Stage 1 period 32.7 ha of new, active revegetation is targeted with 18.9 ha of existing revegetation established and subject to ongoing maintenance.

b. Stage 2

Mining

Stage 2 will likely occur over 8 years and will involve the removal and emplacement of approximately 28.38 Mt of overburden material from the western part of the mine pit, to provide access to approximately 29 Mt of limestone resource. Approximately 1.02 Mt of shale will also be extracted.

Overburden emplacement during stage 2 will involve:

- 21.06 Mt emplaced in the southern part of the WOE to 658 m. By the end of Stage 2 the southern part of the WOE will be at its maximum height and extent prior to the realignment of Marulan South Road.
- 7.32 Mt emplaced in the SOE to 470 m in the in-pit part and to 635 m in the western out-of-pit part of the emplacement.

Surface water management

Surface water management during Stage 2 will involve:

- Construction of sediment basin S1 at approximately 440 m as the level of overburden in the in-pit part of the SOE rises above the level of the south pit rim. Water captured in this sediment basin will be used for revegetation purposes and dust suppression in the immediate area. Any overflow will be directed along the contour to limestone benches to drain to the base of the south pit.
- A small area in the SOE (0.8 ha) which would be at a lower elevation than sediment basin S1 would drain towards Main Gully where the existing sediment control facilities would be enlarged (to 1 ML) to form sediment basin S2 to treat any runoff from the emplacement and natural catchment before it discharges towards Bungonia Creek.

Rehabilitation

Stage 2 rehabilitation activities proposed over an 8-year period will include:

- establishing a further 31 ha of the WOE rehabilitation along western and southern slopes including central dam;
- commencement of revegetation of an additional 29.9 ha of upper slopes of the WOE southern batters and north-east haul road access facing toward Marulan South Road up to approximately 650 m AHD;
- completion of rehabilitation of 36.9 ha of the NOE to 650 m AHD;
- establishing initial 1.7 ha of rehabilitation on the south-eastern, outer slopes of overburden in the in-pit SOE and commence a further 7.5 ha of active revegetation; and
- commencement of active revegetation of 11.8 ha of the completed western out-of-pit section of the SOE between 615 m AHD and the domed 635 m AHD top.

In the 8-year Stage 2 period 49.2 ha of new active revegetation is targeted with 91.7 ha of existing revegetation established and subject to ongoing maintenance.

c. Stage 3

Mining

Stage 3 is anticipated to be conducted over a period of approximately 6-years and will involve the removal and emplacement of approximately 31.66 Mt of overburden material from the western part of the mine pit, to provide access to approximately 27 Mt of limestone resource. Limestone mining targeting the middle and upper limestone resource creates a smaller west pit. Approximately 940,000 t of shale will also be extracted.

Overburden emplacement during stage 3 will involve:

- 20.5 Mt emplaced in the northern part of the WOE to 659 m completing this emplacement; and
- 8.46 Mt emplaced in the SOE to 500 m where the in-pit part and out-of-pit part of the emplacement join.

Other key mine infrastructure changes in Stage 3 involve the realignment of a section of Marulan South Road to allow for the northern expansion of the WOE. Old rural residential buildings and infrastructure of the Boral owned residence B5 will need to be demolished to make way for the extended WOE.

Surface water management

Surface water management during Stage 3 will involve:

- decommissioning of sediment basins N1 and N2 as actively managed sediment basins once rehabilitation of the NOE (northern section) is well established, but would likely be retained for water storage and transfer as required for ongoing land management;
- installation of erosion and sediment controls for the construction of the new realigned section of Marulan South Road;
- potential redirection of overflow from Sediment Basin W2 by pipe or into a channel that discharges into the western tributary of Main Gully once rehabilitation of the batter slopes of the southern section of the WOE is completed and runoff water quality is appropriate; and
- runoff collected in the west pit will seep into groundwater, with any overflow reporting to the south pit.

Rehabilitation

Stage 3 rehabilitation activities over a 6-year period will include:

- establishment of a further 50.6 ha of WOE rehabilitation to complete the southern section of this emplacement to 658 m AHD together with a section of western and northern lower slopes in the north-western corner adjacent to the proposed W1 sediment basin;
- commencement of revegetation of an additional 13.9 ha of upper slopes and northern batters of this northern extension to the WOE;
- establishment a further 8.1 ha of rehabilitation along the 1 in 3 outer slopes of the in-pit SOE up to approximately 460 m AHD elevation and commence a further 3.8 ha of active revegetation directly above; and
- maintenance of established 11.8 ha of western out-of-pit SOE revegetation between 615 m AHD and the domed 635 m top and commence revegetation of a further 7.1 ha directly below.

In the 6-year Stage 3 period 24.8 ha of new, active revegetation is targeted with 162.3 ha of existing revegetation established and subject to ongoing maintenance.

d. Stage 4

Mining

Stage 4 will likely occur over 11 years and will involve the removal and emplacement of approximately 29.7 Mt of overburden material from the western part of the mine pit, to provide access to approximately 41.8 Mt of limestone resource. Approximately 1.43 Mt of shale will also be extracted.

Overburden emplacement during Stage 4 will involve 31.97 Mt emplaced in the in-pit part of the SOE to between 496-520 m.

Surface water management

Surface water management during Stage 4 will involve:

- Sediment basins W1 and W2 to be decommissioned as actively managed sediment basins once rehabilitation of the northern section of the WOE is well established, but would likely to be retained for water storage and transfer as required for ongoing land management.
- Once rehabilitation has been well established on the outer slopes of the SOE, the drainage arrangements would be modified so that all runoff from the western part of the emplacement would be allowed to drain directly off site via Main Gully. Drainage from sediment basin S1 would also be directed to Main Gully via the existing S2 series of sediment basins.
- Assuming limestone mining did not continue beyond the proposed 30-year mine plan period the final mine pit floor configuration includes two large sediment retention basins, a northern basin at 365-355m AHD and southern basin at about 350-335 m AHD. These basins will provide an estimated storage capacity of 70 ML and 400 ML respectively.

Rehabilitation

Stage 4 rehabilitation activities proposed over 11 years will include:

- Complete rehabilitation over the total 146.7 ha WOE including the northern section to 659 m.

- Complete rehabilitation of the out-of-pit (western) and in-pit SOE totalling 56.4 ha but leaving in-pit batters covering approximately 16.8 ha active. Note that further stabilisation by revegetation of some 6 ha of in-pit slopes and berms is possible if mining were to cease.
- Complete rehabilitation on remaining minor and miscellaneous areas of the NOE (0.8 ha), dams and high voltage power line easement totalling approximately 11 ha.

During the final 11-year Stage 4 period 91.9 ha of both active revegetation and remaining emplacement disturbance is targeted for completion.

6.2 Phases of rehabilitation and general methodologies

The broad rehabilitation methodology for disturbed land within the mine includes the reshaping and stabilisation of post-mining landforms, topdressing of reshaped landforms, and the establishment and development in the majority of a native ecosystem final land use based on native woodland vegetation communities.

To achieve this final land use the phases of rehabilitation include:

1. Active mining;
2. Decommissioning;
3. Landform Establishment;
4. Growth Medium Development;
5. Ecosystem and Land Use Establishment
6. Ecosystem and Land Use Development; and
7. Rehabilitation completion (sign off).

6.2.1 Active mining phase

For the active mining phase, the risks and opportunities for rehabilitation have been identified during the environmental impact assessment undertaken for the 2019 EIS. In addition, and as required in accordance with SSD 7009 approval a series of management control plans have been developed and approved by DPE for the 30 year mine development.

The following sections provide detail of the identified risk and opportunities for rehabilitation and reference both the approved Rehabilitation Strategy (revision 3, 30 August 2022) and the relevant management control plan for the particular matter listed.

a. Soils and materials

The soil, land resources and rehabilitation assessment (SLRRA) undertaken by LAMAC Management, (September 2018) identified no particularly hostile soils, subsoils or overburden material in the disturbance footprint of the approved SSD 7009 that would require special management.

Six soil landscape units within the Project site were identified and mapped, consisting of:

- 143.5 ha Sodosols (Red / Brown);
- 11.5 ha Kurosols, Brown;
- 119.9 ha Tenosols (Bleached-Orthic / Brown-Orthic);
- 229.0 ha Tenosols / Rudosols (Steep Slopes);
- 2.5 ha Rudosols (Alluvial); and
- 340.0 ha Disturbed / Anthroposols

Only the A1 horizons of the texture contrast or duplex soils comprising Kurosols and Sodosols together with the A1 horizon of some of the Tenosol landscape units were identified as suitable for stripping and for use as growing media in mine site rehabilitation. Deeper soils were considered limited by poorer chemical and physical properties including sodicity, increased acidity and heavy clay content.

Within the Project site 215,510 m³ of good quality topsoil was identified as available for stripping with recommended stripping depths as shown in Table 6.1. Actual stripped areas or depths may vary with local topography, specific conditions or constraints encountered during stripping.

The 215,510 m³ of topsoil identified will not be sufficient to cover all rehabilitation areas. Therefore, topsoil will be prioritised for rehabilitation of the high and moderate erosion risk areas on overburden emplacement slopes and alternative growth media will be used on lower slopes and flats.

Potential alternate top-dressing materials identified during the SLRRA included decomposed granite (from the adjacent Peppertree Quarry) and a weathered shale material from overburden within the mine.

Further characterisation testing is recommended prior to the use of these alternate materials as a growth medium in rehabilitation as geochemical testing discussed in Section 6.f **Error! Reference source not found.** has identified potential high erosion, weathered overburden material. Where alternate materials are proposed for use as a growth medium, the supplementary use of composted organic material may be a consideration to ameliorate deficiencies in those materials and enhance vegetation establishment.

Table 6.1 Topsoil Stripping Summary Information

Assessment Section	Soil landscape Unit	Stripping depth (cm)	Proposed Disturbance (m ²)	Volume (m ³)
Northern	Sodosol (creek and dam)	15	48,317	7,248
	Sodosol (access road)	10	23,480	2,348
Southern	Sodosol	10	1,018,764	101,876
	Kurosol, brown	15	104,069	15,610
	Tenosol	10	884,281	88,428
Total				215,510

No Biophysical Strategic Agricultural Land (BSAL) was identified within those parts of the Project site requiring a new mining lease as detailed in LAMAC Management, (October 2015)'s BSAL assessment report. Refer to RS (revision 3, 30 August 2022 - Appendix A).

A Site Verification Certificate dated 17 November 2015 was issued pursuant to clause 17C(1) of the State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 stating that the *“site comprises soil landscapes that are of low fertility or have poor drainage, and does not meet the BSAL criteria”*. Refer to RS (revision 3, 30 August 2022 - Appendix B).

Topsoil management recommendations covering topsoil stripping, the location, construction, management and maintenance of topsoil stockpiles have been developed by LAMAC Management, (September 2018). Refer to RS (revision 3, 30 August 2022 - Appendix C).

Land Capability Classes of land within the Project site are summarised below as:

- 155 ha Class V: Moderate to low capability land;
- 120 ha Class VII: Very low capability land;
- 231 ha Class VIII: Extremely low capability land; and
- 340 ha Not Assessed: Mining disturbed land.

Other than mine site rehabilitation no additional management measures are considered necessary to maintain land capability in the Project site given the low pre-disturbance capability classes (V, VII and VIII) and the relatively small area of proposed disturbance (256.5 ha). Mine disturbance once rehabilitated will have minimal negative impact on the overall land capability.

b. Flora

Refer to Section 1.3 g and the Biodiversity Management Plan

c. Fauna

Refer to Section 1.3 g and the Biodiversity Management Plan

d. Rock/overburden emplacement

The 30-year mine development considers both “above ground” and “in-pit” options for overburden emplacement to achieve a balance between resource utilisation and long-term environmental considerations, especially visual impacts of the rehabilitated landform.

Overburden emplacements developed or expanded during mine operations, including the WOE, western and southern sections of the SOE and existing Eastern Batter slopes will occupy approximately 222 ha of the total 598 ha disturbance footprint at the end of the approved 30-year mine life. This 598 ha total disturbance footprint includes approximately 33ha of the northern overburden emplacement (NOE) that is now under development by the adjoining Peppertree Quarry in accordance with Modification Application DA 06_0074 MOD5.

The 30-year reshaped emplacements, as shown in Figure 3 will be the likely final concept landforms, even if mining should continue past the current 30-year mine life. No material deficit in overburden for landform establishment is considered likely.

The 30-year post mining land use goal for the overburden emplacements is the re-establishment and development of native woodland vegetation communities that reflect the existing ecological communities identified in the EIS BDAR (Niche, 2018) and outlined in Section 1.3 d.

e. Waste management

Domestic and light industrial waste continues to be deposited in large dumpsters which are collected weekly by a licensed waste removal contractor.

The workshop channels all runoff through an oil and grease separator. Recovered grease and oil material is collected and stored for removal by a licensed recycling contractor. Similarly, grease drums and oil filters are stored until collected and disposed of for recycling by a licensed contractor.

Reject lime continues to be placed in the designated area of the Middle Gully waste emplacement and investigations continue for reuse of this material to minimise on-site disposal.

f. Geology and geochemistry

A geochemical assessment of the open cut geological strata likely to be mined (limestone) or emplaced as overburden was undertaken by RGS, (2015) as part of the EIS for SSD 7009. This assessment indicated that both limestone and these potential overburden materials are essentially barren of sulphur, have a high factor of safety with respect to potential acid generation, and can be classified as non-acid forming (NAF).

Potential overburden strata contained relatively low concentration of metals / metalloids in solids. While arsenic, cobalt and manganese concentrations were elevated (compared to average crustal abundance) in some of the contact material between limestone and shales, these elements are sparingly soluble in contact water, and are unlikely to impact upon surface and groundwater quality.

The geochemical assessment concluded that surface runoff and seepage from emplaced overburden materials is also likely to be slightly alkaline and contain low concentrations of dissolved salts.

Erosion potential of likely overburden material was also assessed as part of the SLRRA, with laboratory testing being undertaken for four composite weathered geological samples. Laboratory tests included calculation of K-factor, Emerson Aggregate Test (EAT), and dispersion percentage (D%).

Erosion potential was assessed as being low to moderate, with the exception of one sample (Sample Point 5) collected from transitional weathered clay material in the east of the pit, indicating high erosion potential.

Laboratory results for erosion potential testing of geological strata are included in RS (revision 3, 30 August 2022 - Appendix D).

g. Material prone to spontaneous combustion

No material prone to spontaneous combustion identified.

h. Material prone to generating acid mine drainage

Refer to Section 6.2 f.

i. Ore beneficiation waste management (reject & tailings disposal)

Refer to Section 6.2 f.

j. Erosion and sediment control

Refer to the Water Management Plan that include an Erosion and Sediment Control Plan

k. Ongoing management of biological resources for use in rehabilitation

Refer to Section 6.2 a

l. Mine subsidence

Refer to Section 6.3

m. Management of potential cultural and heritage issues

Refer to Section 1.3 g and the Aboriginal Cultural Heritage Management Plan and the Historic Heritage Management Plan

n. Exploration activities

A staged exploration drilling programme has been undertaken in conjunction with the approved 30-year mine, SSD 7009 development. Since 2004 seven phases of exploration “infill” drilling have been completed with over 12,000 metres drilled.

Prospecting/exploration activities will continue as an ongoing mining activity to further improve understanding of the quantity and quality of the limestone resource, the contact boundaries with surrounding sediments and to inform mine planning.

Drilling investigations have also been undertaken to establish new ground water supply bores in accordance with Water Access Licence (WAL 41976). New ground water supply and ground water monitoring point were required to replace existing “North Pit” bores that were exhumed when mining the northern extent of the North Pit.

Exploration operations and reporting is conducted in accordance with the requirements in Section 163C of the Mining Act 1992 and clauses 59, 60 and 61 of the Mining Regulation 2016 as noted in Schedule 2 of Mining Lease conditions 2021.

6.2.2 Decommissioning

In accordance with SSD 7009 CoC B76 (Refer to Figure 3 containing Table 6 Rehabilitation objectives) and subject to landholder agreement (Boral being the landholder for the majority of land titles) services including rail and road access together with water and electricity supply would be retained to service post-mining land uses.

The process of surrendering remnant areas of CML16, in particular those areas covering existing railway and water pipeline infrastructure has commenced but retention and use of this infrastructure will continue under non authorisation tenure.

Maintaining partial, road and rail access, to and around the mine's Project site is considered necessary for ongoing and long term access and management, including bush fire prevention.

As with services, various buildings (e.g. workshops, stores, production and administration offices) may be retained, where agreed, to support post-mining land uses.

Processing plant and equipment is likely to be decommissioned, removed from site and the remaining area rehabilitated in accordance with final land use requirements.

As decommissioning phase (subject to the option of continued mining) is not expected within the next 30 years detail for this phase will be supplied at the appropriate time.

6.2.3 Landform establishment

To achieve the 30 year conceptual final landform and rehabilitation plan as shown in Figure 3 and as attached in Appendix B, the functional objectives or key characteristics developed by LAMAC Management (September 2018) have been adopted for each mining and final land use domain through the rehabilitation phases.

Refer to Table 6.2.

6.2.4 Growth medium development

Refer to Table 6.2.

6.2.5 Ecosystem and land use establishment

Refer to Table 6.2.

6.2.6 Ecosystem and land use development

Refer to Table 6.2.

Table 6.2 Domain functional objectives and proposed completion criteria

No.	Functional objective	Rehabilitation phase				
		Decommissioning	Landform establishment	Growth medium development	Ecosystem and land use establishment	Ecosystem and land use sustainability
Mining domains						
1	Safe, stable, free-draining and non-polluting landform. Suitable for rehabilitation to native woodland. Select infrastructure retained to facilitate continued site access and support post-mining land use.	Infrastructure not required for post-mining use decommissioned and demolished. Contamination assessment completed, with contamination and contaminant sources removed or managed.	Landform slopes <10° or assessed as geotechnically stable. Accessible for rehabilitation, and suitable for rehabilitation to native woodland or post-mining land use. Surface free-drains to sediment control structure, with no ponding or significant erosion.	See final land use domains: A – Native woodland area, for the majority of the rehabilitated Infrastructure area; or I – Infrastructure, for residual access roads and residual post-mining structures.		
3	Receive and store water for operational use, or temporarily hold surface catchment run-off for sediment control purposes.	Water management structures not required for post-mining use decommissioned and backfilled or removed.	Water management structures to remain post mining assessed as geotechnically stable, meeting water quality requirements, and meeting selected land use function.	See final land use domain G – water management.		
4	Stable, safe, free draining and non-polluting landform capable of sustaining a native woodland	Emplaced landform generally matches maximum elevation and contours shown in FLRP plans.	Slopes reshaped to designed contours and gradients < 1:3 to 1:6. Benches and drainage structures incorporated and functioning as designed.	See final land use domain A – native woodland area.		

No.	Functional objective	Rehabilitation phase				
		Decommissioning	Landform establishment	Growth medium development	Ecosystem and land use establishment	Ecosystem and land use sustainability
	vegetation community		Landforms shed water, and drain to sediment control structures. Landform surfaces accessible and able to be rehabilitated.			
4	Safe, stable and non-polluting encapsulation of waste lime materials.	No (wind or water) migration of waste material from emplacement area. Area capped with 1.5 m of inert overburden to prevent risk of future exposure.	Capped emplacement surface merges seamlessly with adjacent landform, sheds water and drains to sediment control structure. Landform suitable for rehabilitation to native woodland.	See final land use domain A – native woodland area.		
5	Void landforms safe, stable and non-polluting. Void preferentially available for overburden emplacement or short-term water detention.	Slopes and benches shaped to match stability criteria. All sources of potential contamination removed. Safe access to void maintained, while unauthorised access controlled.	Ramps, slopes and benches determined as stable from geotechnical assessment. Void provides water capture, temporary holding (and potentially filtration treatment) capacity. Void perimeter and upper benches accessible and suitable for vegetation establishment.	See final land use domain J: Final void, general safety and stability treatment for the residual void and / or visual screening, for the void perimeter and in-void vegetation screens.		

No.	Functional objective	Rehabilitation phase					
		Decommissioning	Landform establishment	Growth medium development	Ecosystem and land use establishment	Ecosystem and land use sustainability	Relinquishment

Final Land use domains

A	Resilient and self-sustaining native woodland community providing slope stability, biodiversity enhancement and visual amenity.	See relevant mining domains: 1 - infrastructure area; 4 - overburden emplacement areas / waste lime storage	Where used, topdressing material (meeting EC, pH and ESP criteria) placed as per erosion risk: Low risk: 10cm depth topdressing material. Mod risk: 10cm depth good quality topsoil. High risk: Rock / soil mulch. Or suitable ameliorant (i.e., organic growth medium (OGM)) used as per industry leading practice.	Vegetation established, with species mix reflecting species composition of open native woodland. Controls implemented to prevent interference with rehabilitated areas. Monitoring program expanded to ensure representative coverage.	Vegetation community composition (including key species) and structure developing towards reference site as per landscape function analysis (LFA) monitoring. Evidence of reproduction (setting viable seed, flowering or Filial 1 (F1) plants establishing).	Sufficient monitoring evidence to indicate woodland community exhibiting essential ecosystem processes, landform stabilisation, habitat enhancement and visual screening.
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No.	Functional objective	Rehabilitation phase				
		Decommissioning	Landform establishment	Growth medium development	Ecosystem and land use establishment	Ecosystem and land use sustainability
G	Receive and store water for selected post-mining land use, or temporarily hold surface catchment run-off for sediment control purposes.	See relevant mining domain 3 – water management area.	Placement of 10 cm of topdressing material (meeting EC, pH and ESP criteria) on outer batters of sediment basins, dams, drains or other infrastructure slopes with high erosion risk.	Erosion control groundcover vegetation established on water management infrastructure slopes. No trees to be established where roots may penetrate and compromise water holding / carrying capability of structures.	Mix of tree and shrub species establishing and groundcover > 70% for erosion control. No evidence of vegetation failure. Water management structure inspected periodically and assessed as functional. Significant water holding structures assessed periodically as safe and geotechnically stable.	Sufficient monitoring evidence to indicate groundcover vegetation resilient and self-sustaining and providing landform stabilisation function. Water management structures assessed as necessary, functional, safe and stable. Arrangements made to meet ongoing management requirements.
I	Retained Infrastructure	All infrastructure that is to remain as part of the final land use is safe, does not pose any hazard to the community	NA	NA	NA	All infrastructure that is to remain as part of the final land use benefits from the relevant approvals (e.g. development consent and / or licence/lease/binding agreement etc.)
J	Resilient and self-sustaining native dominated tree / shrub community (where vegetation establishment achievable)	See relevant mining domain 5 – active mining area (open cut void).	Inert weathered material used to establish growth medium on	Native grass, shrub and tree species established on non-flooded level surfaces.	Diverse native woodland tree and shrub community developing, with no evidence of vegetation failure or widespread	Sufficient monitoring evidence to indicate diverse native woodland community essential exhibiting ecosystem processes and landform

No. Functional objective		Rehabilitation phase					
		Decommissioning	Landform establishment	Growth medium development	Ecosystem and land use establishment	Ecosystem and land use sustainability	Relinquishment
	providing landform stability and habitat value.			non-flooded flat surfaces. Or suitable ameliorant used as per industry leading practice.		premature senescence. Evidence of reproduction observed.	stabilisation and habitat enhancement.
J	Resilient and self-sustaining dense to moderately dense native woodland vegetation community, with mid-storey and canopy providing visual screening.	See relevant mining domain 5 – active mining area (open cut void).		As for J – final void.	Native grass, shrub and tree species (with key canopy and mid-storey species) established on void perimeter and upper benches and ramps.	Visual screening vegetation moderately dense to dense, with no evidence of vegetation failure or widespread premature senescence. Evidence of reproduction observed.	Sufficient monitoring evidence to indicate diverse native woodland community exhibiting essential ecosystem processes, landform stabilisation and visual screening.

6.3 Rehabilitation of areas affected by subsidence

As detailed in Section 2.1 d both the NSW Resources Regulator and the EPA were notified of a landslip failure that occurred at the Eastern Batters upstream of Barbers Creek on 25 November 2022.

During the preparation of this RMP this landslip failure was subject to a Notice under the Mining Act section 240 and is now subject to Commencement of Investigation dated 19 October 2023.

As part of the subsidence remediation process and in particular in accordance with Direction 1d, a geotechnical assessment is required that must nominate a FoS and PoF that is to be used as the criteria to assess remedial options to achieve a long term stable landform.

In addition, a justification is required for the FoS and PoF taking into account the requirement for the landform to sustain the approved final land uses and to comply with rehabilitation objectives as nominated in the Rehabilitation Strategy with the development consent SSD 7009.

This recent slip failure, upstream of Barbers Creek is largely contained within the EIS project total disturbance footprint and is currently the subject of ongoing investigation.

In accordance with the current rehabilitation risk assessment the slip failure area is the subject of a revised long term landform and mine development design with the required geotechnical input.

7 PART 7 – REHABILITATION QUALITY ASSURANCE PROCESS

The Marulan South Limestone mine is covered by Boral's Environmental Policy. A copy of this policy is included as .

As stated, this policy is delivered through the implementation of Boral's integrated Health, Safety, Environment and Quality (HSEQ) Management System and related strategies, improvement plans and programs. In particular, Group Model Protocol GRP-HSEQ-MP-8-08 provides quality assurance detail for ecosystems and biodiversity management applicable to rehabilitation.

The Rehabilitation Strategy (revision 3, 30 August 2022) provides a framework for this RMP.

The assurance process for determining rehabilitation quality and success in meeting proposed completion criteria is detailed in the Ecosystem Function Analysis methodology described in Section 8.

Plate 3 Boral's Environmental Policy

Version number	4	Implementation date	January 2024
Policy author	Jenny Miller	Policy approver	Vik Bansal
Functional area	Health, Safety, Environment and Quality		

At Boral, we acknowledge that the very nature of our operations means there will be impacts on the environment. We are committed to our goal of zero harm and work to eliminate adverse environmental impacts.

Where elimination is not possible, we seek to minimise any harmful effects from our operations which may mean we target better performance than environmental laws require. Wherever practicable, we will secure improved environmental outcomes.

Specifically, Boral will strive to:

- Reduce waste in all its forms, leading to:
 - efficient use of energy, including reuse of waste energy
 - conservation of water
 - minimisation and recycling of waste production materials and energy
 - prevention of pollution; and
 - effective use of virgin and recovered resources and supplemental materials.
- Reduce greenhouse gas emissions from our processes, operations and facilities, including appropriate use of alternative fuels
- Protect and where practicable enhance biodiversity values at and around our facilities.
- Openly and constructively engage with communities surrounding our operations.
- Through communication and training, encourage and assist our employees to enhance Boral's environmental performance.
- Comply with environmental legislation, regulations, standards and codes of practice relevant to the particular business, and
- Allocate sufficient resources to meet the commitments of this policy:

This policy is delivered through the implementation of Boral's integrated Health Safety Environment and Quality (HSEQ) Management System and related strategies, improvement plans and programs.



Vik Bansal
CEO & Managing Director

Policy Version History

This table documents the most recent key policy update.

No.	Definition	Comments / Key changes	Next review
4		Reviewed and no changes required.	August 2026

8 PART 8 – REHABILITATION MONITORING PROGRAM

Following the successful completion of rehabilitation phases leading to ecosystem and land use establishment, Boral will undertake rehabilitation monitoring and where required, undertake the necessary maintenance. The monitoring program will be designed to demonstrate that the completion criteria have been met while also planning for remedial action, should monitoring demonstrate that the completion criteria are unlikely to be met.

8.1 Analogue baseline monitoring

The current monitoring methodology adopted by Boral is Ecosystem Function Analysis (EFA).

EFA has the ability to compare the quality of rehabilitation against completion criteria and adjacent analogue areas by providing an indicative measure of how the rehabilitation is tracking against the chosen analogue sites and ultimately toward a self-sustaining landscape.

Three (3) analogue (or reference) sites were established in January 2011 as detailed in the report titled, *“Ecosystem Function Analysis – Marulan South Limestone Mine Rehabilitation Monitoring”* by GSSE, dated June 2011. These reference sites chosen to date are based on their merits of being representative baseline data for proposed final rehabilitation (vegetation and landform) targets or the starting point (i.e. year 0). A further five (5) sites were monitored as an initial assessment of the status of rehabilitation as at January 2011 on areas of the western overburden emplacement and older eastern batter locations.

The EFA monitoring program measured:

- Landscape Function Analysis;
- Vegetation Dynamics;
- Habitat Complexity; and
- Disturbance.

Key Landscape Function Analysis (LFA) and Ecosystem Function Analysis (EFA) indicators are outlined in Table 8.1.

Table 8.1 LFA/EFA Methodology for Marulan South Limestone Mine

Rehabilitation Element	Indicator	Methodology
Soil Assessment (LFA)	Soil Stability	▪ Rain splash protection – assess the degree to which physical surface cover and project plant cover ameliorate the effect of raindrops impacting on the soil surface ▪ Slake Test – assess the stability of natural soil fragments to rapid wetting
	Nutrient Cycling	▪ Perennial vegetation cover – estimate the ‘basal cover’ of perennial grass and/or the density of canopy cover of trees and shrubs ▪ Litter – assess the amount, origin and degree of decomposition of plant litter

		▪ Cryptogam Cover – assess the cover of cryptogams visible on the soil surface
	Water Infiltration Capacity	▪ Crust brokenness – assess to what extent the surface crust is broken, leaving loosely attached soil material available for erosion ▪ Texture – to classify the texture of the surface soil, and relate this to permeability.
	Erosion Potential	▪ Soil Erosion type and severity – assess the type and severity of recent/current soil erosion ▪ Deposited Materials – assess the nature and amount of alluvium transported to and deposited on the query zone ▪ Soil surface roughness – assess the surface roughness for its capacity to capture and retain mobile resources such as water, propagules, topsoil, and organic matter ▪ Surface nature (resistance to disturbance) – assess the ease with which the soil can be mechanically disturbed to yield material suitable for erosion by wind or water
Vegetation Data (EFA)	Vegetation Dynamics	▪ Density of plants per unit area for each life form ▪ For grasses, basal area m² per unit area ▪ For trees and shrubs – Canopy area – Canopy volume, an index of growth – Horizontal cross-sectional area in height classes – an index for wind amelioration

8.2 Rehabilitation establishment monitoring

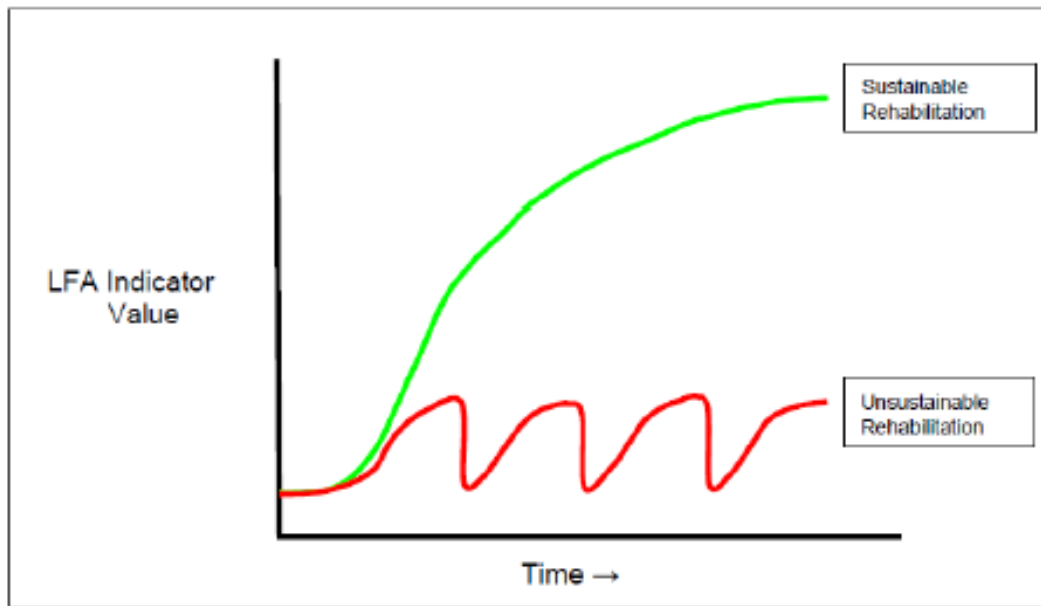
The goal for Boral will be to demonstrate LFA/EFA criteria in the rehabilitation sites are trending towards criteria outlined in analogue sites.

The expected trend of an ecosystem approaching stability and functionality are for LFA values to improve over time resulting in a parabolic trend toward pre-disturbance and/or analogue conditions as indicated in Plate 4.

Values should initially increase rapidly due to establishing vegetation and succession however the increase in values will likely slow over time as the vegetation community stabilises.

Sites that are not improving or are declining would indicate that the site is not approaching a stable state and may require further remediation to achieve ecosystem functionality. In this instance, Boral will need to reassess areas of rehabilitation failure and undertake further rehabilitation or maintenance works.

Plate 4 Using LFA to assess Ecosystem Functionality



The program of rehabilitation monitoring is aimed to continue at the site until such a time as the monitoring records demonstrate that the site is no longer contributing, nor has the potential to contribute, pollutants to the surrounding environment, and that rehabilitation has achieved a satisfactory stage of maturity and ground cover.

8.3 Measuring performance against rehabilitation objectives and rehabilitation completion criteria

The most recent EFA rehabilitation monitoring report is dated January 2023 and was completed by International Environmental Consultants Pty Limited.

An example of assessing the rehabilitation monitoring data collected under the EFA program against rehabilitation objectives and completion criteria is presented in Table 8.2.

Further rehabilitation work is required before any of the current sites meet success criteria.

Table 8.2 Rehabilitation Success Summary

Hierarchy of Ecosystem Succession	Targeted Ecosystem Components	Key Performance Indicators	Units	Satisfaction of the Criteria			
				Site 2	Site 3	Site 4	Site 5
Landform Establishment	Landform Function	LFA Stability	%	✓	x	✓	x
		LFA Infiltration	%	✓	x	x	x
		LFA Nutrient Cycling	%	✓	x	x	✓
Growth Medium Development	Active Erosion	Surface Area	m ²	x	x	✓	x
	Soil chemical/ Physical properties	pH	pH (6.5)	-	x	-	✓
		Organic Carbon	% (>4.5)	-	x	-	x
		Nitrate	ppm (>12.5)	-	✓	-	x
		Total Phosphorous	ppm	-	x	-	x
Ecosystem Establishment	Vegetation Density	Tree Density	Stems/area	x	x	x	x
		Shrub Density	Stems/area	x	x	x	x
	Vegetation Diversity	Native Understorey Diversity	> Species / m ²	x	x	x	x
		Exotic Understorey Diversity	< Species / m ²	✓	x	✓	✓
Ecosystem Development	Groundcover Components	Perennial Plant Cover (<0.5m)	%	✓	x	✓	✓
		Total Ground Cover	%	✓	x	✓	✓
		4-6m height class	% Cover	x	x	x	x
Ecological Stability	Floristic Diversity	Native Species Diversity	> no. / area	x	x	x	x
		Exotic Species Diversity	> no. / area	✓	x	✓	✓
	Ecosystem Health	Healthy Trees	% Population	x	x	x	✓
	Ecosystem Recruitment	Shrub / Recruitment 0-0.5m	no. / area	x	x	x	x
	Ecosystem Composition	Trees	no. / area	x	x	x	x
		Shrubs	no. / area	x	x	x	x

9 PART 9 – REHABILITATION RESEARCH, MODELLING AND TRIALS

9.1 Current rehabilitation research, modelling and trials

Boral has conducted a series of rehabilitation trials and research over the last 15-year period with varied success. A brief description of the type and range of trials conducted includes the following:

- Greening Australia ACT

Preparation of a new area (approximately 0.9 ha) adjacent to original GSS Environmental 2005 trial plot for an Autumn 2008 planting. Preparation included ripping by dozer to 500mm depth then topsoil spreading over the area of approximately 2,500 tonnes, providing a seed bed of between 200 to 250 mm depth.

Plant species as listed below.

– <i>A. falciformis</i>	Broad leaf hickory;
– <i>A. mearnsii</i>	Black wattle;
– <i>A. decurrens</i>	Green wattle;
– <i>A. parramattensis</i>	Parramatta green wattle;
– <i>A. rubida</i>	Red stemmed wattle;
– <i>E. blakelyi</i>	Blakelys red gum;
– <i>E. agglomerata</i>	Blue leaved stringybark;
– <i>E. globoidea</i>	White stringybark;
– <i>E. macrorhyncha</i>	Red stringybark;
– <i>E. punctate</i>	Grey gum;
– <i>E. cinereal</i>	Argyle apple;
– <i>E. rossii</i>	Scribbly gum;
– <i>E. melliodora</i>	Yellowbox;
– <i>E. sclerophylla</i>	Scribbly gum;
– <i>E. radiata</i>	Narrow leaf peppermint;
– <i>E. piperita</i>	Urn fruit peppermint;
– <i>Dodonea cuneate</i>	Wedge leaf hopbush;
– <i>Allocasuarina verticillata</i>	Drooping sheoak;
– <i>Allocasuarina littoralis</i>	Black sheoak;

- SprayGrass (Landscapes Australia Pty Limited)

Hydro-mulching during 2008 of approximately 2 ha of “Middle Gully” and 2 to 3 ha of “Main Gully” as per the specification provided in Table 9.1.

Table 9.1 Rehabilitation Trials (Hydro-mulching)

Type	Detail	Rate
Mulch	Wood fibre cellulose	2 tonnes/ha
Seed	Cover Crop of Rye corn / Jap Millet	35kg/ha
	Acacia species	7kg/ha
	Eucalyptus Species	3kg/ha
Fertilizer	Dynamic lifter	250kg/ha
Binder	Enviro tack	40kg/ha

- GSS Environmental

Direct tree seeding trial conducted in early November 2005 at three locations, (southern end of South Pit, eastern benches of South Pit and a section of the western, “Main Gully” waste emplacement). These areas totalling approximately 2 ha were sprayed for weed control, then deep ripped prior to seeding. The recommended seed mix was heat treated, scarified, dried and mixed with a specified quantity of fertiliser prior to application.

- Goulburn TAFE

An area of approximately 1.3 hectares located on the south-eastern slopes of the South Pit was prepared and planted in November – December 2004 with local species using seed balls prepared by Goulburn TAFE students and tube stock planting methods. Seed balls were distributed at 10 per square metre (or 100,000 per hectare). Approximately 1 cubic metre of clay, 200kg of compost, 20 kg of seed and water for mixing was used to produce 100,000 seed balls.

Seed used in the above trials has been both externally sourced and supplied locally from seed harvested from the mine area, at that time by the Site Environmental Officer in conjunction with Goulburn TAFE and previously stored in the on-site nursery at the time for use in revegetation.

In addition, reconnaissance soil surveys were undertaken during 2005 by GSS Environmental together with additional soil sampling in October 2006.

Information and knowledge gained from the above rehabilitation trials and surveys have been included in the initial development of an earlier “Marulan South Limestone Mine Rehabilitation Strategy” during July 2010.

9.2 Future rehabilitation research, modelling and trials

Opportunities identified for improving both the RMP and the RS covering future rehabilitation research, modelling and field trials include:

- Development of rehabilitation methods that incorporate tolerance / resilience to climatic fluctuations;
- Modelling of erosion on steep overburden emplacement slopes;
- Suitability and availability of alternate growth medium materials;
- Reducing herbivore browsing impacts on revegetation; and
- Further investigation of suitable post-mining land uses.

In regard the existing EFA rehabilitation monitoring program the further addition of a statistical assessment of vegetation community structure and composition may have merit.

Several floristic monitoring options are available with selection of appropriate method largely determined by the target biodiversity conditions and their management as referenced in the Biodiversity Management Plan.

In addition, and given the steepness of the final SOE landform, and sensitivity of downstream receivers, consideration may be given to incorporate erosion assessment methodology into the rehabilitation monitoring program.

10 PART 10 – INTERVENTION AND ADAPTIVE MANAGEMENT

Rehabilitation activities will be undertaken as soon as practicable following the progressive completion of rehabilitation phases identified for the site. The issues and risks that may impact upon the ability of the Marulan South Limestone Mine to achieve rehabilitation goals successfully have been identified in the most recent rehabilitation risk assessment as discussed in Section 3.

The Landscape Function Analysis and Ecosystem Function Analysis rehabilitation monitoring program as outlined in Section 8 will be used as the tool to monitor and trigger response for any actions required to mitigate potential threats to the success of rehabilitation and whether further works are required to achieve the specific closure criteria.

In addition, annual inspections of rehabilitation areas by suitably qualified BCL employees supported by specialist rehabilitation consultants / contractors will continue to be undertaken and reported on as part of the ARR process.

The following aspects of rehabilitation are typically reviewed as part of the LFA/EFA monitoring program or during other ARR inspections:

- evidence of soil profile development (e.g. leaf litter, decomposition etc);
- visual assessment of surface materials (e.g. topsoil cover);
- evidence of and type of erosion;
- Success of erosion and sediment controls;
- Vegetation growth rates;
- evidence of plant mortality or die back;
- Rehabilitation species diversity (native and introduced);
- Evidence and emergence of exotic weed species;
- evidence of spontaneous combustion;
- photographic evidence of rehabilitation to provide annual comparisons.

The following actions may need to be taken as per the recommendations from the LFA/EFA rehabilitation monitoring program:

- controlling weeds within areas under rehabilitation;
- management and control of feral animals (as required);
- management and control of erosion;
- revisiting rehabilitation methodologies in areas that may have failed;
- general maintenance (irrigation and fertilising - as required); and
- repair of fences, access tracks and other general related land management activities.

11 PART 11 – REVIEW, REVISION AND IMPLEMENTATION

This RMP is required to be reviewed, revised and implemented in accordance with SSD 7009 conditions of consent and in accordance with Clause 11 of Schedule 8A to the Mining Regulation 2016.

Section 8 of the RS (revision 3, 30 August 2022) states the important relationship between the strategy and the RMP and the requirement in accordance with SSD 7009 CoC B79(m) for a program to periodically review and update the RS at least every three years.

In accordance with Clause 13 of Schedule 8A to the Mining Regulation 2016 an annual rehabilitation report (ARR) and forward program (FP) is a statutory requirement for Boral being the holder of a mining lease. Following every three ARR's and subsequent review of report detail the RS will be reviewed and updated as required.

In addition, if the RMP requires amendment due to the statutory triggers presented in Table 11.1 then the RS will be reviewed and updated as required to ensure that both strategy and RMP are aligned.

Table 11.1 Amendment of rehabilitation management plans

Clause 11 Schedule 8 Mining Regulation 2016	Statutory Trigger	Timing
(a)	to substitute the proposed version of a rehabilitation outcome document with the version approved by the Secretary	within 30 days after the document is approved
(b)	as a consequence of an amendment made under Clause 14 to a rehabilitation outcome document	within 30 days after the amendment is made
(c)	to reflect any changes to the risk control measures in the prepared plan that are identified in a rehabilitation risk assessment	as soon as practicable after the rehabilitation risk assessment is conducted
(d)	whenever given a written direction to do so by the Secretary	in accordance with the direction.

Rehabilitation outcome documents include the following;

- the **rehabilitation objectives statement**, which sets out the rehabilitation objectives required to achieve the final land use for the mining area,
- the **rehabilitation completion criteria statement**, which sets out criteria, the completion of which will demonstrate the achievement of the rehabilitation objectives,
- for a large mine, the **final landform and rehabilitation plan**, showing a spatial depiction of the final land use.

Implementation details for this RMP are as follows:

The mine holder and operator is Boral Cement Limited.

The address of the Marulan South Limestone Mine is:

Hume Street,

Marulan South NSW 2579

Phone: 02 4820 3000.

The Site Manager is responsible for all mine site operational and environmental compliance obligations and is the nominated contact person with whom the Secretary of the Department of Regional NSW can communicate in relation to the mining lease (s) for the purposes of the Act.

As detailed in Table 11.2, assisting the Site Manager is the Senior Environmental Business Partner, the Environmental and Stakeholder Advisor and a team of senior site personnel.

In addition, and as required, specialist advice is provided by a range of environmental consultants.

Table 11.2 Mine Contacts

Name	Position	Contact Details
Jamie Whittaker	Site Manager	Ph: 0401 895 212 Email: jamie.whittaker1@boral.com.au
Greg Johnson	Senior Environmental Business Partner	Ph: (02) 9033 4916 Email: greg.johnson@boral.com.au
Crystal Perry	Environmental and Stakeholder Advisor	Ph: (02) 4820 3007 Email: crystal.perrys@boral.com.au

12 REFERENCES

- Advisian (2019). Marulan South Limestone Mine Continued Operations – Surface Water Assessment. Prepared for Boral Cement Limited.
- AEMR (2023). Annual Environmental Management Review (1 July 2022 to 30 June 2023) Marulan South Limestone Mine prepared by Boral Cement Limited
- AGE (2019). Marulan South Limestone Mine Continued Operations – Ground Water Technical Study. Prepared for Element Environment on behalf of Boral Cement Limited by Australasian Groundwater and Environmental Consultants Pty Ltd. Project No. G1714C
- Boral Cement Limited (2017). Marulan South Limestone Mine 2018-2023 Mining Operations Plan.
- Boral Cement Limited (2019). Marulan South Limestone Mine 2019-2023 Mining Operations Plan.
- Element Environment (2019) Marulan South Limestone Mine Continued Operations – State Significant Development Application. Environmental Impact Statement. Report prepared for Boral Cement Limited.
- GeoRes (2018). Marulan South Limestone Mine – Geological Report for DRE's input to SEARs. Report prepared for Boral Cement Limited.
- LAMAC (2018). Marulan South Limestone Mine Continued Operations Project – Soil, Land Resources and Rehabilitation Assessment. Report prepared for Boral Cement Limited.
- Niche Environment and Heritage (2018) Marulan South Limestone Mine Continued Operations - Biodiversity Assessment Report

APPENDIX A

Land ownership and land use figures

APPENDIX B

Final landform and rehabilitation plans

APPENDIX C

Rehabilitation Risk Assessment

REHABILITATION RISK ASSESSMENT

Business/Site:

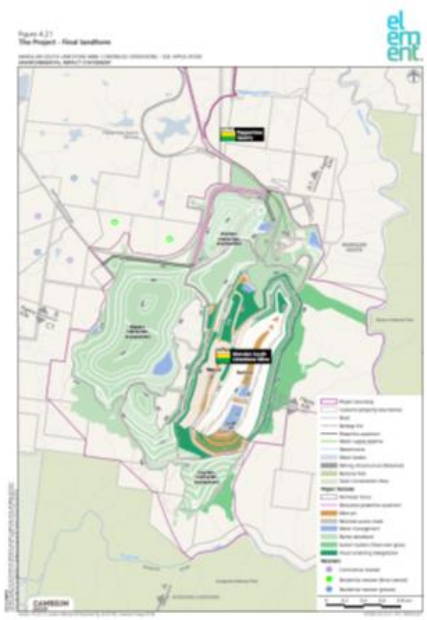
**BORAL CEMENT LIMITED
MARULAN SOUTH LIMESTONE MINE**

Name/Details of the
Area/Space/Plant

**MINING AUTHORITIES - MLA 607, CML 16 and ML1716
STATE SIGNIFICANT DEVELOPMENT - SSD 7009**

Purpose of the Rehabilitation Risk Assessment

Conditions of a mining lease granted under the *Mining Act 1992* require the lease holder to conduct a rehabilitation risk assessment and implement measures to eliminate, minimise or mitigate the potential risks identified. In particular, the risk assessment aims to identify, assess and evaluate the potential risks to achieving the rehabilitation objectives, rehabilitation completion criteria and the final land use as spatially depicted in the final landform and rehabilitation plan for the Marulan South Limestone Mine as shown in the insert below and as appended.

Risk Assessment Number:	RRA - 1	Plant / Task / Asset Identification Number:	REHABILITATION	Date of Assessment:	23/06/2022	New ☒ Yes
				Next Review Date:		Revised ☐
Rehabilitation Risk Assessment Team						
Name	Position	Signature	Date			
Les Longhurst	Site Manager					
Garth Nagle	Technical Manager					
Gordon Atkinson	Mining Consultant					
Therese Hadjia	Environmental Coordinator					
Jamie Whittaker	Production Manager					
Darryl Young	Senior Pit Supervisor					
Partick Lenanne	Operator					
Angus Sheppard	Earthmoving Contractor Supervisor					
Authorised by						
Name	Position	Signature	Date			

Notes

To Complete a Risk Assessment

1. Complete the table above, including a photo to assist identifying the area, task, plant or equipment (if relevant).
Note: Ensure all employees, contractors and specialists involved in the assessment are recorded.
2. Determine if a hazard or potential risk is present.
3. Using the **Risk Matrix** complete the risk assessment process for all identified hazards / potential risks.
Note: For all identified hazards, ensure that you record corrective actions and add comment; this may include existing control measure effectiveness.
4. Ensure all hazards with corrective actions are managed via 3C board or entered into SEquence and where required are referenced in the **Site HSEQ Risk Profile**.
5. Upon completion of the risk assessment including agreed corrective actions, responsibilities and timeframes for completion, a relevant Operations and/or Site Manager shall sign the risk assessment as completed.
6. A review date shall be identified after corrective actions have been implemented to ensure the corrective actions are effective and appropriate.

References

Mining Amendment (Standard Conditions of Mining Leases – Rehabilitation Regulation 2021) under the Mining Act 1992
(Schedule 8A, Part 2 – Division 2 – Risk Assessment)

GUIDELINE - REHABILITATION RISK ASSESSMENT - Published by NSW Resources Regulator 2 July 2021 Version 1

Rehabilitation Item / Location / Issue	Potential Risk	Initial Risk			Controls Required / Comments	Who	When	Residual Risk		
		C	L	R				C	L	R
1 GENERAL										
1.1	Insufficient skills and experience of rehabilitation personnel	3	3	H	Appoint a site based environmental person	Site Manager	Before new DA commences	3	1	L
1.2	Lack of clearly defined responsibilities	3	3	H	Roles and action items defined in the EPP.	Site Manager	From commencement of SSD	3	1	L
1.3	Insufficient funding for or prioritisation of rehabilitation activities	4	2	H	Planning and budgeting of rehabilitation activities Rehabilitation bond available in case of unforeseen business closure.	Site Manager	On-going	4	1	M
2 ACTIVE MINING PHASE OF REHABILITATION										
2.1	Poor biological resource salvage and maintenance (e.g. subsoil, topsoil, vegetative material, seedbank, rocks, habitat resources) through clearing, salvage and handling practices.	2	3	M	Appropriate mine planning indicating areas to be cleared and when Ground disturbance form including final signoff with items in the EPP addressed As a part of the Biodiversity Management Plan, Seed collection and pre-clearance surveys by specialists Topsoil removal, storage and placement is and planned, resourced.	Technical and Environmental Managers	During Clearing	2	2	L
2.2	Limited pre-existing biological resources for salvage (e.g. topsoil, weeds)	2	3	M	Weed management. Quantification of topsoil balance	Technical and Environmental Managers	Pre-Clearing	2	2	L

					Prioritising of available topsoil to areas at high risk of erosion As part of the Rehabilitation Strategy, alternative soil media e.g. decomposed granite, weathered shale Imported organic media for amelioration Hydro mulch with cover crop to generate organic matter					
2.3	Clearing in adverse seasonal and weather conditions when salvaging biological resources.	2	3	M	Timing of clearing when seasons and weather conditions are optimal. Clearing and seed collection ahead of time.			2	1	L
2.4	Adverse geochemical/chemical composition of materials such as overburden, interburden, processing wastes, subsoils and topsoils and imported cover materials.	2	3	M	As per Rehabilitation Strategy, sampling of soils and other media			2	1	L
2.5	Handling and containment of geochemical and geotechnically unsuitable tailings and reject materials. e.g. waste lime	3	2	M	Dedicated containment areas with sufficient capping material.			3	1	L
2.6	Adverse surface and groundwater quality and quantity (underground and surface operations).	2	3	M	Ground and Surface water sampling as per the Water Management Plan. Site inspections after rain events.			2	1	L
3. DECOMMISSIONING PHASE OF REHABILITATION										

3.1	Impacts on heritage items.	4	3	H	Protection and salvage of identified heritage artefacts and sites as per AHMP and HHMP e.g. Sites that are not to be disturbed are to be fenced at a 20m offset. Identification of heritage items during stripping and ceasing operations to investigate if items are found.			4	1	M
3.2	Hazards associated with retained infrastructure. E.g. Central dam	3	2	M	Engineering and construction of infrastructure appropriate Regular inspection			3	1	L
3.3	Contamination resulting from associated activities (e.g. storage and use of hydrocarbons/chemicals, drilling fluids, spillage of dirty or produced saline water, brine, sewage).	3	3	H	Monitoring for hydrocarbon in ground and surface water Spill kits Sediment dams			3	2	M
3.4	Generation of material and waste products from the demolition process.	3	3	H	Waste material to be taken off site if appropriate. Onsite disposal subject to risk assessment			3	2	M
3.5	Groundwater accumulation in former underground workings (e.g. potential for fill and spill or impacts on regional ground water users).				N/A					
3.6	Exposure or access to underground workings.				N/A					
3.7	Habitation of structures and/or underground workings by native fauna (e.g. bats).	2	3	M	Inspection and removal by wildlife handling expert.			2	1	L

4. Landform establishment phase of rehabilitation (new and historical waste emplacements)										
4.1	Unstable landform due to erosion and/or mass movement issues associated with inappropriate design and/or quality assurance during landform construction.	4	3	H	Appropriate design with geotechnical input Monitoring and signoff of landforms pre completion			4	2	H
4.2	Exposure or release of geochemical and/or geotechnically adverse material (typically tailings or waste rock) associated with containment design and construction, including capping/cover system, drainage and liner (if required).	3	3	H	Adhering to design of lime dumps with appropriate capping thickness. Sufficient capacity of lime dumps. Regular capping of lime dumps			3	2	M
4.3	Lack of availability of suitable materials for encapsulation or capping of adverse materials.	3	2	M	Sufficient scheduling of overburden to be used as capping			3	1	L
4.4	Borehole failure.	2	3	M	Capping of exploration bore holes Regular inspection of capping and collar.			2	1	L
4.5	Final landform unsuitable for final land use (e.g. large rocks present affecting cultivation, settlement and surface subsidence leading to extended ponding).	3	3	H	Final landform signoff process to identify any adverse materials and action remedies.			3	2	M

4.6	Landform aspect not suitable for intended target plant species.	2	2	L	Target native species appropriate to aspect.			2	1	L
4.7	Historical landform									
5. Growth medium development phase of rehabilitation										
5.1	Unsuitable physical and structural properties of substrate.	3	3	H	Use of topsoil and amelioration Testing of soil media			3	2	M
5.2	Subsoil and topsoil deficit for rehabilitation activities.	3	4	H	Quantification of topsoil balance Prioritising of available topsoil to areas at high risk of erosion As part of the Rehabilitation Strategy, alternative soil media e.g. decomposed granite, weathered shale Imported organic media for amelioration Hydro mulch with cover crop to generate organic matter			3	2	M
5.3	Substrate inadequate to support revegetation or agricultural land capability (e.g. lack of organic matter, nutrient deficiency, lack of soil biota, adverse soil chemical properties, exposed hostile geochemical materials, and any other factors impeding the effective rooting depth).	3	4	H	As above			3	2	M

5.4	Existing landform Stability	3	3	H	Have historical landforms assessed by a geotechnical expert.			3	2	M
5.5	Historic landforms with low FoS and PoF	3	4	H	Rehabilitate to a safe and stable landform with FoS and PoF as low as reasonably practical.			3	2	M
5.6	Poor environmental outcomes from areas that have had mass movement event (e.g. Excess sedimentation, remobilisation).	3	4	H	Geotechnical monitoring program Monitoring of water quality in downstream water bodies on a regular basis Drone photographic monitoring on a regular basis Rain event monitoring to assess for a set threshold which when met will trigger further more in depth monitoring. Assess after rain event, impact on mass movement area, e.g. Erosion and water pooling. Polymer application triggered by observed movement of sediment below mass movement area. Aerial or ground based application of seeds to surface of disturbed area Investigate potential improvements to sedimentation check dams.			3	2	M
5.7	Remediation of any areas of mass movement.	3	4	H	Geotechnical expert to assess any new areas individually. Design and achieve an acceptable FoS and PoF and achieve a safe and stable landform.			3	2	M
6. Ecosystem and land use establishment phase of rehabilitation										

6.1	Lack of availability and quality of target seed resources, including genetic integrity.	3	3	H	Seed collection onsite from widely spaced individuals. Onsite seed collection to be ongoing through the stages of rehabilitation and includes collection from both areas to be cleared and remnant vegetation.			3	1	L
6.2	Poor seed viability, seed dormancy.	2	2	L	Collection and storage in accordance with the FloraBank Native Seed Collection Guidelines (FloraBank, 2021)			2	1	L
6.3	Ant and insect predation of seed.	2	2	L	As above			2	1	L
6.4	Damage to seed through re-vegetation process.	2	2	L	Revegetation to be conducted during optimal season and by appropriately qualified people			2	1	L
6.5	Poor quality tubestock.	2	2	L	Sourcing tubestock from quality nurseries and use of site sourced seed for production of tubestock.			2	1	L
6.6	Weed infestation associated with both introduction and control (or lack thereof).	2	3	M	Equipment to be cleaned prior to being transported to site Sourcing seed stock from quality providers and/or onsite collection. Weed management program			2	2	L
6.7	Adopting inappropriate or inadequate rehabilitation techniques, including equipment fleet.	2	3	M	Planning and trialling of various rehabilitation techniques.			2	2	L
6.8	Inappropriate re-vegetation species mix for targeted final land use.	2	3	M	Assessment of original and surrounding vegetation communities for species mix			2	2	L

6.9	Weather and climatic influences (e.g. drought; intense rainfall events; bushfire and climate change).	3	3	H	Rescheduling revegetation activities during drought to wetter years. Selection of fire resistant species Bushfire land management Surface water drainage design Weather monitoring and forecasting via onsite weather station			3	2	M
6.10	Availability of areas for revegetation in optimal seasonal conditions.	2	3	M	Scheduling and completion of landforms on time			2	2	L
6.11	Adequacy of habitat structures for colonisation or use.	2	3	M	Species selection for target fauna Use of nest boxes and relocated hollows Ongoing monitoring			2	1	L
7. Ecosystem and land use development of rehabilitation										
7.1	Weather and climatic influences (e.g. drought; intense rainfall events; bushfire and climate change).	3	3	H	Selection of fire resistant species Bushfire land management Surface water drainage design Weather monitoring and forecasting via onsite weather station			3	2	M
7.2	Long term water quality and quantity issues (e.g. acid-drainage, high salinity).	3	3	H	Ongoing Monitoring Drainage design Management of hazardous waste e.g., waste lime, hydrocarbons			3	2	M
7.3	Damage to rehabilitation (e.g. fauna, domestic stock, vandalism, vehicular	2	4	H	Site fencing and security Bushfire management Feral animal control			2	2	L

	interactions, bushfire, insects and plant disease).				Rehabilitation Monitoring Designated roadways					
7.4	Re-disturbance of established rehabilitation areas.	3	3	H	Boundary marking and site training Adequate mine planning			3	2	M
7.5	Insufficient establishment of target species and limited species diversity.	2	3	M	Rehabilitation monitoring against completion criteria Late stage rehabilitation management activates e.g., removal of species in monoculture and planting of desired species			2	2	L
7.6	Limited vegetation structural development and habitat for targeted fauna species.	2	3	M	Rehabilitation monitoring against completion criteria Late stage rehabilitation management activates e.g., removal of species in monoculture and planting of desired species			2	2	L
7.7	Erosion and failure of landform, drainage and water management/storage structures.	3	3	H	Adequate engineering design Site and geotechnical inspections			3	2	M
7.8	Lack of infrastructure to support intended final land use (e.g. dams, fences, watering facilities).	2	3	M	Adequate initial planning Site and geotechnical inspections			2	1	L
8. Mine subsidence affected areas E.g. Eastern Batters										
8.1	Extended water ponding.	3	3	H	Drainage design and maintenance Site and geotechnical inspections			3	2	M

8.2	Redirection of creek and river flows.	3	3	H	Surface water management design of staged and final landforms to balance original catchment size with final			3	2	M
8.3	Subsidence cracking.	3	4	H	Site and geotechnical inspections Establishing vegetation to hold batter together			3	2	M
8.4	Interconnective cracking with underground workings.				N/A					
8.5	Interference with tree roots.				N/A					
8.6	Sink holes.	3	3	H	Site and geotechnical inspections Digging out and refilling sinkholes in pit			3	2	M
8.7	Impacts to aquifers and groundwater loss of water to water users including the environment.	3	3	H	Assessment and modelling of groundwater annual water balance reporting. Mine Pit used as groundwater sink			3	2	M

Hazard Checklist – A guide to reviewing potential hazards - Place a tick ✓ next to appropriate hazards.

1. Cutting, Stabbing and Puncturing		4. Hazardous Manual Tasks		8. Entanglement	
Can anyone be stabbed or punctured due to:		Can anyone be injured due to:		Can anyone be entangled by:	
	Contact with a sharp or flying object?		Poorly designed seating?		Hair, clothing, gloves, jewellery, cleaning brushes, rags or other materials become entangled with moving parts of the plant, or materials in motion?
	Uncontrolled or unexpected movement of the plant or equipment?		Repetitive body movement; constrained body posture or the need for excessive effort?		
	Parts of plant or pieces of equipment disintegrating?				
	Pieces of plant or equipment being ejected?		Inadequate or poorly placed lighting?		
	The quality of the plant or equipment?		Lack of consideration given to human error or human behaviour?		9. Burns
	Contact with moving equipment due to testing, inspection, operation, maintenance, cleaning or repair?		Mismatch of the plant with human traits and natural limitations?		Can anyone be burnt due to contact with
2. Crushing		5. Electrocuting			Moving parts of plant or equipment?
Can anyone be crushed due to:		Can anyone be injured by electrical shock or burnt due to:			Materials handled by the plant or equipment?
	Material falling off plant or equipment?		The plant or person contacting live electrical conductors?		Other structures, equipment or activities?
	Uncontrolled or unexpected movement of the plant or its load?		The plant or person working in close proximity to electrical conductors?		10. Hazardous Substances and Agents
	The plant being unable to be slowed, stopped or immobilised?		Overload of electrical circuits?		Can anyone be injured or suffer ill health from exposure to:
	The plant or equipment tipping or rolling over?		Damaged or poorly maintained electrical leads or cables?		Chemicals, toxic gases or vapours, fumes, dust, noise, vibration, radiation, asbestos and other mineral fibres, high or low temperature?
	Parts of the plant or equipment collapsing?		Damaged electrical switches?		11. Explosion
	Coming in contact with moving parts of the plant during testing, inspection, operation, maintenance or repair?		Water near electrical equipment?		Can anyone be injured by an explosion of:
	Being thrown off or under the plant or equipment?		Lack of isolation procedures?		Gases, vapours, liquids, dust or other substances, triggered by the operation of plant or by materials handled by the plant or people?
	Being trapped between the plant and materials or fixed structures?		Static electricity or electrical conduction?		12. Lighting
3. Slipping, Tripping and Falling		6. Striking			Is lighting:
Can anyone slip, trip or fall due to:		Can anyone be struck by moving objects due to:			Poor or non-existent?
	An uneven or slippery work surface?		Uncontrolled or unexpected movement of plant or materials handled by plant.		Hazardous - too bright, direct, inconsistent, or flickering?
	Poor housekeeping?		Pieces of plant or equipment being ejected?		13. Enter Hazard
	Obstacles being placed in the vicinity of the plant?	7. Psychological / Stress			
	Lack of a proper work platform?	Can employees be exposed to inappropriate levels of:			
	Lack of proper stairs or ladders?		Unreasonable deadlines?		
	Lack of a guardrail?		Workplace bullying, harassment or discrimination?		
	Unprotected holes?		Stress?		
	Penetrations or gaps?		Duties which they are not qualified for or competent in?		
	Poor or unstable floor or walking surfaces				

APPENDIX D

Life of mine rehabilitation schedule

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