Marulan South Limestone Mine | SSD 7009

REHABILITATION STRATEGY

Prepared for Boral Cement Limited | 30 August 2022

Marulan South Limestone Mine

SSD 7009 | REHABILITATION STRATEGY

Prepared for Boral Cement Limited
30 August 2022

PR163

	Prepared by	Reviewed by
Name	Gordon Atkinson	Les Longhurst
Company	Gordon Atkinson & Associates Pty Ltd	Boral Cement Limited
Position	Director	Site Manager
Project Role	Marulan South Mine Planner	Site Manager
Signature		
Date	30 August 2022	30 August 2022

DOCUMENT CONTROL

Revision	Date	Description	Prepared by	Reviewed by
0	28 March 2022	For Boral Cement Limited review	Gordon Atkinson & Associates Pty Ltd	Boral Cement Limited
1	14 April 2022	For consultation with relevant agencies	Gordon Atkinson & Associates Pty Ltd	Boral Cement Limited
2	5 August 2022	Addresses recommendations from relevant agencies	Gordon Atkinson & Associates Pty Ltd	Boral Cement Limited
3	30 August 2022	Addresses comments from DPE	Gordon Atkinson & Associates Pty Ltd	Boral Cement Limited

Contents

Tables

Figures

Appendices

1 INTRODUCTION

1.1 Background

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

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 mining operations plan (MOP).

Two approvals are required for the mine:

- 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) was prepared to accompany the application for SSD 7009 and addresses 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 (the consent) was granted by the Department of Planning, Industry and Environment (DPIE) 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 DPIE'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 Strategy (RS, the strategy) is required in accordance with CoC B79.

This strategy incorporates the relevant management measures presented in the EIS, RTS and conditions of consent relating to rehabilitation**.** The RS will be a dynamic document which will be updated as required over the life of mining operations until 31 August 2051.

This strategy has been prepared by Gordon Atkinson of Gordon Atkinson & Associates Pty Ltd on behalf of Boral. DPIE has endorsed Gordon as a suitably qualified and experienced person for the preparation of this strategy (DPIE, 2021a).

1.2 Overview of operations

1.2.1 Site description

The Project site is 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 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 Project site and surrounds are 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.

Access is via Marulan South Road, which connects the mine and Boral's 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.

The Project site covers historical and proposed future areas of disturbance and comprises two geographically separate areas:

- the existing mine including the proposed 30-year mine footprint and associated infrastructure; and
- the proposed Marulan Creek dam to be on Marulan Creek, within Boral landholdings approximately 2.5 km north of the mine entrance.

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

Most of the Project site is zoned RU1 - Primary Production under the Goulburn Mulwaree Local Environmental Plan (LEP) 2009. Mining and extractive industries are permissible in this zone with consent. The remaining area is zoned E3 - Environmental Management. Mining and extractive industries are prohibited in this zone. However, as agriculture is permitted in the E3 zone with consent, mining is also permitted in this zone under the Mining State Environmental Planning Policy with consent.

1.2.2 Overview of existing mining

The mine is sited on a high-grade limestone resource. Subject to market demand the mine has typically produced up to 3.38 Mt of limestone and up to 200,000 t of shale per annum.

The mine currently produces a range of limestone products for internal and external customers in the Southern Highlands/Tablelands, the Illawarra and Metropolitan Sydney markets for use primarily in cement and lime manufacture, steel making, agriculture and other commercial uses. Products produced at the mine are despatched by road and rail, with the majority despatched by rail.

Historically limestone mining was focused on the approximately 200-400 m wide Eastern Limestone and was split between a north pit and a south pit. A limestone wall (referred to by the mine as the 'centre ridge') rising almost to the original land surface, divided the two pits. The north and south pits were joined in 2016/2017 by mining the centre ridge to form a single contiguous pit, approximately 2.5 kilometres (km) in length. However, the north pit/south pit nomenclature remains important as current mining operation locations continue to be reported with respect to one or other of the old pits.

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 is emplaced in the Western Overburden Emplacement (WOE), west of the open cut pits.

1.2.3 Overview of approved project

Consent was granted for a 30-year mine plan accessing approximately 120 Mt of limestone down to a depth of 335 m. The mine footprint focuses on an expansion of the pit westwards to mine the Middle Limestone and to mine deeper into the Eastern Limestone. As the Middle Limestone lies approximately 70-150 m west of the Eastern Limestone, the 30-year mine plan avoids mining where practical the interburden between these two limestone units thereby creating a smaller second, north-south oriented west pit with a ridge remaining between. 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.

Limestone will be extracted at up to 4 Mtpa for 30 years until 31 August 2051. Clay shale will also continue to be extracted at up to 200,000 tonnes per annum (tpa). The limestone will be processed to create limestone and lime products including limestone aggregates and sand, hydrated lime and quick lime.

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 Project provides continued direct employment for 118 people on the mine site and 73 offsite. It will operate 24-hours per day, 7 days per week. Blasting will continue to be restricted to daylight hours on weekdays, excluding public holidays.

1.3 Environmental management framework

The mine operates in accordance with the Boral integrated Health Safety, Environment and Quality Management System (HSEQ MS) which establishes a strategic platform for regulatory compliance and continual improvement in environmental management.

This framework is documented in GRP-HSEQ-1-01 Management System Framework and Operational Control. The Boral HSEQ MS is aligned with the international standard ISO-14001.

1.3.1 Environmental Management System

CoC D1 requires the preparation of an Environmental Management Strategy (EMS) for the mine. The EMS provides the mine's strategic framework for environmental management under which the RS operates.

1.3.2 Alignment with other plans

The RS builds upon the rehabilitation objectives contained in Table 6, CoC B76 and aligns strategically with rehabilitation and mine closure objectives of the *Strategic Framework for Mine Closure (ANZMEC and MCA, 2000).*

The RS integrates with measures in the Biodiversity Management Plan (BMP) referred to in CoC B54 and the mine planning process as further detailed in the Rehabilitation Management Plan (RMP) prepared in accordance with CoC B82.

The RS aligns with sections of the Water Management Plan (WMP) in particular with the requirements for erosion and sediment control works and overburden emplacement design as detailed in CoC B43 – Table 4. In addition, CoC B45 (e) (ii) covering requirements for erosion and sediment control includes a program to monitor the geomorphological stability of emplacement areas in consultation with WaterNSW.

1.4 Purpose and objectives

This RS describes how Boral will build upon the rehabilitation objectives contained in Table 6, CoC B76 to progressively achieve the mine site's rehabilitation outcomes.

This strategy applies to all land disturbed by the development. Land disturbed is characterized into a series of mining domains or land management units with a discrete operational function for example, overburden emplacement, infrastructure or mine void etc.

Specific objectives of the RS that are to be complied with are contained in Table 6, CoC B76. These rehabilitation objectives are represented in Table 1.1

The RS is prepared for a mixed audience of stakeholders including consent authorities, environmental regulators, affected landholders, local community and site personal. The strategy informs and is implemented through the RMP that is required in accordance with mining lease conditions.

Table 1.1 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 *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC* • 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 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

1.5 Responsibility for implementation

The applicant, Boral the entity who is also the lease holder and mine operator is responsible for the preparation of this RS and for providing the necessary resources as required for implementation.

Once approved, the Site Manager is responsible for the implementation of this strategy through the RMP. The site Environmental Coordinator is responsible for assisting in the implementation and in the maintenance of both the RS and the RMP.

Operations personnel are responsible for responding to the RS through the RMP and adjusting mine operations as appropriate to meet rehabilitation objectives.

1.6 Commencement of the Rehabilitation Strategy

In accordance with CoC B80, approval of this RS by the Planning Secretary has been extended by a further 3 months and is now required by 19 May 2022.

Refer to letter of approval (DPIE, 2021b).

1.7 Periodic review protocol

The RS is to be reviewed and updated as required at least every three years in accordance with CoC B79(m).

To improve the environmental performance of the mine, cater for future modifications or comply with regulator direction, it may be necessary to revise this strategy to the satisfaction of DPIE. Boral will continue to apply the approved RS until approval of the revised RS.

1.8 Document structure

The structure of the strategy is outlined in Table 1.2.

Table 1.2 Structure of the Rehabilitation Strategy

Section	Content
1	Provides an overview of the project and objectives of the RS.
2	Outlines the statutory requirements of the RS associated with the development consent, conditions of the mining lease (ML), the EPBC Act, environmental protection license (EPL) and consultation undertaken to develop the RS.
3	Provides a summary of baseline and historical rehabilitation data that informs the RS and the key learning constraints to be considered in the RS.
4	Presents the RS based upon rehabilitation objectives and rehabilitation completion criteria for a conceptual final landform developed from past learning, risk assessment, stakeholder consultation together with specialist rehabilitation advice, knowledge and relevant guidelines. Outlines how the strategy aligns with both the BMP and WMP and how the strategy integrates with the mine planning process.
5	This section of the RS presents detail from relevant SSD 7009 - EIS Project assessments including biodiversity, the SLRRA, surface water and visual, and in particular how details from these studies have been incorporated within the final concept landform design and the control measures adopted to minimise environmental impact.
6	Detail provided on the existing rehabilitation monitoring program and the strategy behind how monitoring will be developed further in the RMP based on rehabilitation objectives, completion criteria and the final concept landform design.
7	Discussion on threats to successful rehabilitation and the strategy to adapt TARP.
8	RS performance review and improvement program.
9	Rehabilitation records, reporting and notification in accordance with Mining Amendment (Standard Conditions of Mining Leases – Rehabilitation) Regulation 2021.
10	References.

2 STATUTORY REQUIREMENTS

2.1 Development consent

This RS has been prepared in accordance with the development consent. Table 2.1 presents the consent conditions relevant to the strategy and identifies where each condition has been addressed in this document.

Table 2.1 Rehabilitation Strategy requirements

Condition No.		Condition requirement REHABILITATION	Section reference
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 2.2 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 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 1.4 Section 5.2.1
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 1.4
	(a)	be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Planning Secretary;	Section 1.1
	(b)	be prepared in consultation with DPIE Water, BCD, Resources Regulator and Council;	Table 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 3.4
	(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 5.3.1: Table 5.1; Table 5.2
	(h)	include details of target vegetation communities and species to be established within the proposed revegetation areas;	Section 3.4
	(i)	investigate opportunities to refine and improve the final landform and final void outcomes over time;	Section 5
	(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
	(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;	Section 5.1
	(j) (iii)	utilise existing mining infrastructure, where practicable; and	Section 5.1
	(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 5.1
	(m)	include a program to periodically review and update this strategy at least every three years.	Section 8
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 1.6
B81		The Applicant must implement the Rehabilitation Strategy approved by the Planning Secretary	Section 1.5
D5		**Management Plan Requirements** Management plans required under this consent must be prepared in accordance with relevant guidelines, and include:	
	(a)	Summary of relevant background or baseline data;	Section 3
	(b)	Details of	
	(b)(i)	The relevant statutory requirements (including any relevant approval, licence or lease conditions);	Section 2
	(b)(ii)	Any relevant limits or performance measures and criteria; and	Section 3; Section 6.2
	(b)(iii)	The specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;	Section 6.2
	(c)	Any relevant commitments or recommendations identified in the document/s listed in condition A2(c);	Table 1.1; Figure 2; Figure 4
	(d)	A description of the measures to be implemented to comply with the relevant statutory requirements, limits, or performance measures and criteria;	Section 2.2; Section 6; Section 9.1
	(e)	A program to monitor and report on the:	
	(e)(i)	Impacts and environmental performance of the development; and	Section 8

	(e)(ii)	Effectiveness of the management measures set out pursuant to condition D4(c);	Section 2.2; Section 9.1
	(f)	A contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible;	Section 7
	(g)	A program to investigate and implement ways to improve the environmental performance of the development over time;	Section 8
	(h)	A protocol for managing and reporting any:	
	(h)(i)	Complaint; or	Section 9.2
	(h)ii)	Failure to comply with other statutory requirements;	Section 4.6
	(i)	Public sources of information and data to assist stakeholders in understanding environmental impacts of the development; and	Section 4.3
	(j)	A protocol for periodic review of the plan.	Section 8
D6		The Applicant must ensure that management plans prepared for the development are consistent with the conditions of this consent and any EPL issued for the site.	Section 2.1 & 2.3

2.2 Mining Lease Conditions

For mining leases in NSW, the NSW Government through the Department of Regional NSW's – NSW Resources Regulator (Resources Regulator) has introduced new standard rehabilitation and reporting conditions under the Mining Amendment (Standard Conditions of Mining Leases – Rehabilitation) Regulation 2021, effective 2 July 2021. These conditions support best practice mine site rehabilitation by ensuring progressive rehabilitation occurs in a manner that achieves sustainable final land uses following the completion of mining.

In accordance with CoC D76 Boral as the lease holder must rehabilitate the site in accordance with the conditions imposed on the mining lease(s) associated with the development under the Mining Act 1992 and in particular Mining Amendment (Standard Conditions of Mining Leases – Rehabilitation) Regulation 2021.

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 under the Protection of the Environment Operations Act 1997 as detailed in Section 2.3.

Conditions of a mining lease 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.

2.3 Environmental Protection Licence

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 will be amended to align with the development consent, after which this strategy will be updated in accordance with any relevant requirements of the EPL.

2.4 EPBC Act

Boral has been granted approval EPBC 2015/7521 dated 7 October 2021 under the 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 State development consent conditions, in particular CoC B78, B79, B80, B81 and B82 as detailed in Table 2.1.

2.5 Consultation

CoC B79(b) requires this RS to be prepared in consultation with DPIE Water (now DPE Water), BCD, Resources Regulator and the Goulburn Mulwaree Council (Council).

Initial consultations and feedback in regard to mine site rehabilitation took place during the environmental impact assessment process as part of SSD 7009.

Subsequent consultation has been undertaken with the required government departments. Consultation details are summarised in Table 2.2 including comments and recommendations from BCD, DPE Water and the Resources Regulator regarding RS (revision 1) dated 14 April 2022.

No comments to date have been received from Council following consultation on 19 April 2022 when copy of RS (revision 1) dated 14 April 2022 was forwarded with follow up on 15 July 2022 as detailed in Table 2.2 and email correspondence attached in Appendix J.

In addition, ongoing consultation to guide rehabilitation and the mine closure planning - processes and outcomes will be conducted in accordance with a stakeholder engagement plan as detailed in Section 4.3.

Table 2.2 Consultation undertaken with regulators

Regulator	Representative	Date	Discussion	Outcomes	Section of 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 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 2.3 Consultation undertaken with DPE Water

No.	DPE Water - Key Comment Details	Section of 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

3 REHABILITATION - BASELINE & HISTORICAL DATA

An assessment of baseline and historical rehabilitation data at the mine was undertaken between November 2014 and July 2015 (with revisions during February 2018) by LAMAC Management, (September 2018) as part of the EIS for SSD 7009. This soil, land resources and rehabilitation assessment (SLRRA) conducted by a team of soil and rehabilitation specialists included both field investigations and a review of relevant background data and information contained in Mining Operations Plans (MOP)s, Review of Environmental Factors (REF)s, site rehabilitation and revegetation strategies and reports.

The assessment covered baseline data for soils, land capability, local vegetation communities, and existing rehabilitation areas within CML 16 and the surrounding Project and MLA area.

This historic assessment of background data identified several key constraints to establishing rehabilitation within both existing disturbance and future disturbance areas of the new Project. These constraints are summarised at the end of this section and will be used as the basis for further rehabilitation risk assessments.

3.1 Soils and Land Capability

The 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 m^3 of good quality topsoil was identified as available for stripping with recommended stripping depths as shown in

Table 3.1. Actual stripped areas or depths may vary with local topography, specific conditions or constraints encountered during stripping.

The 215,510 m^3 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 3.2 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 3.1 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 included as Appendix 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 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) and are included as 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.

3.2 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 Appendix D.

3.3 Water

Assessment of proposed surface water and ground water management systems using baseline data collected since 2014 has been undertaken as part of the EIS for SSD 7009. Details are presented in the March 2019 surface water assessment (EIS – Volume 2, Appendix G) undertaken by Advisian, Advisian (2019) and in the groundwater assessment (EIS – Volume 3, Appendix H) prepared by Australasian Groundwater and Environmental Consultants Pty Ltd, AGE (2019).

Advisian (2019) undertook simulations of the proposed water management system, identified potential impacts of the continued mine development on water supply, stream flows and water quality together with post-mining impacts and presented management and monitoring measures to minimise these impacts. Similarly AGE (2019) described the hydraulic properties of the geology underlying the continued mine development, the potential impacts on groundwater level and quality and the mitigation measures where impacts are unavoidable.

Key findings from Advisian (2019) and AGE (2019) considered integral with mine rehabilitation activities are summarised in the following sections, Sections 3.3.1, 3.3.2 and 3.3.3.

3.3.1 Water use and supply

The site water balance model determined the annual median water use and average annual water supply for the continued mine development. Site water use and supply details are as summarised in Table 3.2

The main water source will be runoff, which will be collected in sediment basins and mine water dams. Groundwater inflow to the mine pits will not provide significant water supply as most of it will evaporate. During extended drought and when there is a shortage of water in the on-site water storage dams there will be a deficit of up to 5 ML in the water balance as indicated in Table 3.2 This deficit during dry periods can be addressed with the use of chemical dust suppressants in water used for dust suppression with potential to reduce water needed by up to 50%.

Water will mainly be lost from the water management system via seepage from the mine pits, followed by evaporation from storages and overflows from sediment basins when runoff exceeds their design capacities.

Table 3.2 Average annual water balance over life of mine

Water demand		Water supply	
Water use	**Median annual (ML)**	**Water source**	**Average annual (ML)**
Plant demands	80	Runoff	848
Dust suppression	126	Rainfall	36
		Groundwater	14
		Marulan Creek dam	98
		Bore/Tallong weir	7
		Evaporation	-64
		Sediment basin overflow	-9
		Diversion	-7
		Seepage	-714
		Adjustment for change in storage	-8
Total	**206**	**Total**	**201**

3.3.2 Catchment areas

Catchment areas and receiving waters that will be impacted upon by continued mine development and overburden emplacement are summarised in Table 3.3. Changes to catchments identified by Advisian (2019) will result in minor impacts to flows and comprise the overflows from sediment basins estimated to be between 18 to 25% of the inflow runoff or under median climate conditions an average of 1.6 days per year of overflows from the basins (one to two overflows per year) and a maximum of 2.9 days per year

Table 3.3 Changes in catchment areas in Mine Project area

Catchment	Receiving water	WSP management zone	Existing catchment area (ha)	Future catchment area (ha)	Overflow control
NOE (north-west corner)	Tangarang Creek (north-eastern tributary)	Barbers Creek	40	73 (26 ha overburden emplacement)	Sediment Basin N2 with controlled discharge
WOE (northern section)	Tangarang Creek (north-eastern tributary)	Barbers Creek	99	116 (49 ha overburden emplacement)	Sediment Basin W1 with controlled discharge
Tangarang Creek upstream of	Tangarang Creek dam	Barbers Creek	614	664 (75 ha overburden emplacement)	See above

Tangarang Creek dam					
WOE and adjoining areas	Main Gully	Bungonia Creek	38	186 (93 ha overburden emplacement)	Sediment Basin S2
Tributaries of Barber Creek	Barbers Creek	Barbers Creek	98	98 (65 ha overburden emplacement)	Revegetated Overburden Emplacement (Eastern Batters)
Tributaries of Bungonia Creek	Bungonia Creek	Bungonia Creek	45	45	Revegetated Overburden Emplacement (Eastern Batters)

3.3.3 Water quality

Water will be released as occasional overflows from the mine's proposed water management system and as clean runoff from rehabilitated overburden emplacement areas following completion of mining. Seepage from the mine pit as described in Advisian (2019) is not considered a release.

As stated in Section 3.3.2 there will be an average 1.6 days of overflows at the sediment basins per year. This is in the range of one to two overflows per year as specified by Department of Environment and Climate Change, (2008a) for sediment basins designed to capture fine or dispersive sediments in runoff from a 95th percentile rainfall event before discharging to sensitive environments. This level of treatment is consistent with requirements of the Neutral or Beneficial Effect (NorBE) checklist.

According to the Advisian (2019) dissolved metals and metalloids in initial runoff and seepage from most overburden emplacements are unlikely to mobilise and impact surface water quality as they are sparingly soluble in slightly alkaline contact water. Runoff and seepage from overburden emplacements report to sediment basins around the site.

However, in alignment with the groundwater management plan (GWMP) component of the WMP this RS also includes monitoring of potential runoff and seepage from overburden emplacements.

Monitoring will comprise one seepage monitoring location to be sampled at each of the overburden emplacements, once per annum (if and when seepage is observed) from when each of the facilities are constructed.

The water quality analytical suite, to be analysed by a NATA accredited laboratory, includes the following parameters:

- pH, electrical conductivity and total dissolved solids (calc.);
- total hardness;
- anions - fluoride, bromide, sulphate, chloride;
- alkalinity - hydroxide, carbonate, bicarbonate and total alkalinity;
- cations – calcium, magnesium, sodium, potassium;
- nitrate
- total and dissolved metals - aluminium, arsenic, beryllium, barium, cadmium, chromium, cobalt, copper, lead, manganese, molybdenum, nickel, selenium, strontium, vanadium, zinc, boron, iron;
- dissolved and total recoverable mercury;
- dissolved silica; and
- oil and grease.

The monitoring of potential runoff and seepage from overburden emplacements is in addition to groundwater level and quality monitoring from the mine sites monitoring locations as listed in

Table 3.4. Summarised in Table 3.4 are the trigger thresholds for each monitoring site and the water quality indicator as determined from baseline data.

Table 3.4 Groundwater quality trigger thresholds

Monitoring location	Water quality baseline period		Trigger threshold calculated from baseline data			
	WQ date from	WQ date to	pH		EC (µS/cm)	
			5th %	95th %	5th %	95th %
MW3S	30/06/2014	29/09/2020	7.4	7.9	1208	1452
MW3D	30/06/2014	30/03/2021	7.4	8.1	1096	1375
MW4S	30/06/2014	30/03/2021	7.3	7.8	1490	1728
MW4D	30/06/2014	14/05/2019	7.7	8.8	1076	1384
MW5	30/06/2014	15/06/2021	6.5	11.5	765	1386
MW6	16/07/2014	30/03/2021	7.1	7.9	1039	2315
Blow Hole	10/11/2014	13/04/2021	7.7	8.2	565	687
* WB07, MW8 and MW9	-	-	-	-	-	-

The mine's water management system aims to reduce sediment loads in the mine pit, which will result in less sediment discharge to groundwater and its receiving waters.

Further, infilling of the south pit will increase the distance between the pit and discharge points along Bungonia Creek. Infilling will also slow the rate of seepage from the mine pit, which will act as a large sediment basin.

The effectiveness of the mine's water management system is further monitored in receiving waters identified by Advisian (2019). A trigger action response plan (TARP) will incorporate typical trigger values as shown in Table 3.5, which modify the (Australian and New Zealand Environment and Conservation Council, 2000) guidelines for ecosystem protection to account for the 20th and 80th percentile values from historical monitoring in the Shoalhaven River. The values will be triggered by results of monitoring upstream and downstream of the mine on Barbers and Bungonia creeks.

Table 3.5 Trigger values for Bungonia Creek and Barbers Creek

Parameter	ANZECC default trigger for ecosystem protection	Trigger values
pH	6.5 – 8.0	6.5 – 8.5
EC (µS/cm)	350	1,600
Total nitrogen (mg/L)	0.25	4.0
Total phosphorus (mg/L)	0.02	0.03
Turbidity (NTU)	25	25
Total suspended solids (TSP) (mg/L)	N/A	50

Construction of the proposed Marulan Creek dam will be subject to a site specific Construction Environmental Management Plan. Construction of Marulan Creek dam has been deferred and the area required is not included in the new MLA area.

Detail regarding the Marulan Creek dam is therefore not considered in this RS.

3.4 Biodiversity

A biodiversity development assessment report (BDAR) was prepared as part of the Project EIS studies (Niche, 2018). The BDAR identified five native and one non-native plant community types (PCT)s as summarised in Table 3.6.

Table 3.6 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.

Of these types, one threatened ecological community (TEC) is PCT 1334 being the Yellow Box Blakey's Red Gum grassy woodland on the tablelands, South-eastern Highlands (SR670). This community is listed as an endangered ecological community (EEC) under the EPBC Act and a critically endangered ecological community (CEEC) under the EPBC Act.

Using the then NSW Office of Environment and Heritage's biodiversity assessment method (BAM) the BAM Calculator predicted 31 threatened flora species could occur in the search radius, but it was determined only the *Solanum celatum* would occur within the Project site, with one specimen recorded during the survey.

The BAM Calculator also predicted 64 threatened fauna species could occur in the search radius, with 25 of these candidates for species credits (requiring offsetting if their habitat is present and/or habitat would be impacted). The list of candidate species was reduced to the Large-eared Pied Bat (*Chalinolobus dwyeri*) and Koala (*Phascolarctos cinereus*) after fieldwork. A further seven threatened species were recorded in or adjacent to the Project site.

The approved 30-year mine development will directly impact existing native vegetation and associated habitat by conservatively clearing an estimated 182.4 ha, including 88.6 ha of White Box Yellow Box Blakely's Red Gum Grassy Woodland TEC, divided as shown in Table 3.6.

In addition, clearing of associated species credit fauna habitat, comprising;

- clearing of an estimated 132.4 ha of Koala habitat;
- clearing of an estimated 140.3 ha of Large-eared Pied Bat habitat; and
- removal of one individual Solanum celatum.

A biodiversity offset strategy together with a BMP has been prepared to offset the impacts of the Project on biodiversity.

The key vegetation communities identified by LAMAC Management, (September 2018) as most relevant to rehabilitation planning are the Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands (SR670) and the Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills, South Eastern Highlands Bioregion (SR524).

These two PCTs will be used as indicative reference communities for revegetation of the level to moderately sloping rehabilitation areas and steeply sloping rehabilitation areas, respectively.

The SLRRA recommended revegetation seed species mix for native grasses and ground cover, for understorey to mid-storey and for over-storey canopy are presented in Appendix E together with a hydro-seeding, erosion control grassland species mix.

3.5 Visual Amenity

A visual assessment of the 30-year mine development was undertaken by (Richard Lamb and Associates, 2018) as part of the Project EIS investigations. The assessment determined that the Project would have low overall visual exposure to its visual catchment.

Of the 24 assessed viewpoints, only two were considered to have medium impacts and the remainder to have low impacts. The viewpoints with medium impacts are Bungonia Lookdown and the viewpoint from near Long Point Lookout.

Views from the affected viewpoints will improve over time as overburden emplacements are rehabilitated. Bungonia Lookdown has the most significant views to the mine, which will substantially reduce by Year 30 when the Southern Overburden Emplacement (SOE) is complete and being rehabilitated.

3.6 Existing Rehabilitation

Historic rehabilitation performance within the mine's Project site has been mixed.

Successful woodland rehabilitation has been established in the Western Overburden Emplacement (WOE). However, sections of rehabilitation on the Eastern Batters require further attention. The performance of previous rehabilitation programs and trials within the Project site indicate several key challenges.

Existing site rehabilitation areas and a summarised history of rehabilitation activities and challenges within these areas include:

Western (Main Gully) Overburden Emplacements

- A variety of revegetation methods were used to initially establish grass cover to stabilise the southern slopes in the mid-1980s.
- During 2003 the area, following the removal of a widespread Serrated Tussock invasion was direct seeded with a variety of tree and shrub species in conjunction with Greening Australia. In addition, areas of the lower, flat waste emplacement were similarly revegetated.
- In 2005 a nominal 2 ha trial area was deep ripped and then seeded with a recommended seed mix under the guidance of revegetation specialists GSS Environmental and in association with the Site Environmental Officer. At first the trial appeared successful with large numbers of natives germinating only to be "burnt off" as a hot, dry and windy weather pattern emerged. A "second germination round" did not eventuate as hoped in 2006 / 07.
- Further trials conducted in late 2008 included both drill and direct seeding of 1 to 2 ha areas adjacent to the 2005 trial plots and hydro-mulching areas of both Main and Middle Gully emplacement.
- In late 2013 to early 2014, a total area of eight hectares was directly sown with tree seed. The principal objective of tree seeding was to re-establish native forest on these areas. To this effect seed of a range of locally occurring tree, shrub and groundcover, including native grasses was used.
- During the 2020/2021 Annual Environmental Management Review (AEMR, 2021) period three seed spray trials were undertaken on the first completed bench at the southwestern toe of the WOE covering approximately 4 hectares. The initial trial site (Trial 1) at the southern end utilised a standard spray media including a sterile ryegrass and couch cover seed mix, the northern area (Trial 2) included a binder, Flexterra FGM while a pro-organic spray media was used in the middle section (Trial 3) that also included a cover of topsoil.
- Trial 1 site has been included in the Ecosystem Function Analysis (EFA) rehabilitation monitoring system and in April 2021 was reported to have a dense cover of grass and weed species developed on the top half of the monitoring transect and dense *Acacia mearsii*, growing up to 3 metres tall further downslope.

Bryce's Gully Overburden Emplacement

- The rehabilitation area, occupying approximately 5.3 ha, was originally contoured and benched approximately 25-35 years ago to look similar to the surrounding topography. It is very steep, rocky and free draining and therefore retains little moisture. It has been grassed to help prevent erosion. Mixed tube stock containing wattles, gums and she-oaks were planted. Of the original trees planted about 60% survived the first year however under drought conditions further plants were lost with only about 10% of the original planting surviving.
- The first three benches were planted out again in 2005 with tube stock and water retaining crystals as well as a slow-release fertiliser. Some 400 trees and shrubs were planted on the benches in 2005. Of these 400 trees about 50% survived helping to re-establish bushland corridors and to stabilize the first three benches reducing erosion and subsequent sediment release into creeks below.

- During 2019 a site specific, Bryce's Gully Rehabilitation Strategy was implemented to improve landform safety and stability, reduce visual impact and promote revegetation.
- As required by the strategy, tube stock has been planted in nominated, fenced locations along benches and drainage lines in the upper part of the gully and along steep sections adjacent to erosion channels in the southern part of the gully.
- Maintenance activities include hand spot-spraying of serrated tussock and hand weeding inside fenced areas together with the application of fertiliser and water via an irrigation system installed on the slope weed control.
- Inspections during April 2021 indicated that regeneration is going well with tube stock becoming more established. Low levels of loss were recorded, and thus replacement of tube stock has not yet been required.

PML 18

- An old mullock dump area of approximately 11 ha with similar characteristics as Bryce's Emplacement but has been irrigated using a dripper irrigation system. Gums, wattles and she-oaks were planted as tube stock. Out of approximately 2,000 trees planted a loss of about 19% was incurred. Losses in this area have been replaced with mixed tube stock and the area is now fully fenced to keep feral and native animals out. Although revegetation progress is encouraging the area will require ongoing maintenance supported by additional plantings.
- A section of this early rehabilitation area has now been used to relocate the mine site's high explosive magazine. The 30-year mine development will subsume the majority of the remaining area.

Barbers Creek Emplacement

- This emplacement occupies an area of approximately 11 ha and is located on the Eastern Batters. Some grassed revegetation has assisted in stabilising north facing benched slopes but the majority of the area remains unvegetated due to steepness of existing slopes that are subject to movement and slippage.
- These north facing slopes continue to be assessed as part of the mine site's annual geotechnical review as reported in the (AEMR, 2021). Options for long term monitoring and revegetation of these Eastern batters are currently undergoing consideration as part of the 30-year mine development.

Eastern Batters (south)

- Trees of mixed species have been planted with black she-oaks being the dominant species. An initial loss of 15% occurred in the first year, with that figure increasing to a total of approximately 40% in the year 2003 to 2004, primarily due to dry conditions. The trees that have survived are healthy.
- At the end of 2005 over half of this area was deep ripped and seeded using the same method as the trial plots within the WOE with guidance from GSS Environmental. Success to date has been limited due to drought conditions, insect attack and feral animals including rabbits and goats.
- The re-designed SOE including South Pit backfill included in the 30-year mine development will provide improved access for rehabilitation maintenance but climatic conditions, insect and feral animal impacts remain an ongoing revegetation challenge.

South-East South Pit Revegetation Trial Area

- This trial commenced in September 2004. An area of approximately 1.3 hectares was prepared and planted in November – December 2004 with local species using seed ball and tube stock planting methods. Direct seeding trials have also been conducted on benches within this area during 2005 in addition to natural revegetation that has been observed to occur.
- This area will be subsumed within the 30-year development of the SOE.

Freddy's Hill is located adjacent to Marulan South Road

- This area of tube stock revegetation developed in 1998 occurred in "in-situ" soil and amongst large stones or rocks that came to the surface when the area was deep ripped. The area had previously been grazed but improved considerably when grazing was stopped with large numbers of native ground covers re-establishing as well as native grasses. The mulch from establishing trees has also helped. The use of water retaining crystal has assisted tube stock plantings. Some weeds still persist in this area but will be slowly reduced as the tube stock establish. Native birds are starting to nest there and native reptiles are also present, including lizards. The area is naturally revegetating but monitoring will be maintained to record the fauna that are re-establishing habitat.

Marulan South Village

- Revegetation of the former Marulan South Village commenced during 1999 to 2002 and has become progressively more established with good evidence of natural re-vegetation. Some trees and shrubs are still small but have survived drought conditions. Good rainfall has assisted revegetation within this area that has a very good soil depth and structure and an established grass cover. Tree watering was conducted in the first six months of planting. Two years on trees have survived with only mowing of the grass that surrounds them required and minor maintenance. This area is considered re-vegetated with only maintenance plantings as required.

North-western Buffer Zone "Weather Station Paddock"

- Tree screen plantings and trials have been conducted directly north of the current WOE in an area previously referred to as "T-1". This "T-1" buffer zone situated outside the CML16 boundary was originally direct and drill seeded by Greening Australia in 2005.
- During 2008 the area was re-seeded and expanded to include approximately 10km of rip lines in length. Revegetation has progressed establishing tree screens that provide a "northern" visual barrier to the advancing WOE and in the creation of a natural corridor for native fauna.
- This area will be included in the new MLA and will be subsumed within the 30-year development of the WOE as this emplacement extends northwards across the existing Marulan South Road.

3.7 Preliminary Rehabilitation Completion Criteria

Based on the assessment of baseline and historical rehabilitation presented, a set of preliminary rehabilitation completion criteria have been developed as referenced in the current 2018-2023 MOP, and are detailed in Table 3.7.

Rehabilitation completion data will be refined as required and presented in the RMP.

Table 3.7 Preliminary rehabilitation completion criteria (2018–2023 MOP)

Rehabilitation element	Indicator	Criteria
Landform Stability	Slope gradient	• Where the slopes are steeper than 10°, additional water management structures will be utilised (as required). • Where hostile material is present and exposed, the landform is capped with a minimum of 1.5m of inert material and is free draining.
	Erosion control	• Erosion control structures are installed at intervals commensurate with the slope of the landform. • Dimensions and frequency of occurrence of erosion rills and gullies are generally no greater than that in reference sites that exhibit similar landform characteristics.
	Surface water drainage	• Use of contour banks and diversion drains to direct water into stable areas or sediment control basins. • All landforms will be free draining except where specific structures (i.e. dams) have been constructed for the storage of water as required for sediment and erosion control or some post mining land-use.
Topsoil	Salinity (EC)	• Soil salinity content is <0.6 dS/m.
	pH	• Soil pH is between 5.5 and 8.5.
	Sodium content	• Soil exchange sodium percentage (ESP) is <15%.
	Nutrient cycling	• Nutrient accumulation and recycling processes are occurring as evidenced by the presence of a litter layer, mycorrhizae and / or other microsymbionts. Adequate macro and micro-nutrients are present.
Vegetation	Land use	• Area accomplishes and remains as healthy native woodland.
	Surface cover	• Minimum of 70% vegetative cover is present (or 50% if rocks, logs or other features of cover are present).
	Species composition	• Subject to proposed land use, comprise a mixture of native trees, shrubs and grasses representative of regionally occurring woodland where possible.
	Resilience to disturbance	• Established species survive and / or regenerate after disturbance. • Weeds do not dominate native species after disturbance or after rain. • Pests do not occur in substantial numbers or visibly affect the development of native plant species.
	Sustainability	• Species are capable of setting viable seed, flowering or otherwise reproducing. Evidence of second generation of shrub and understorey species. • Vegetation develops and maintains a litter layer evidenced by a consistent mass and depth of litter over subsequent seasons. • No evidence of premature die back or senescence.
Fauna	Vertebrate species	• Representation of a range of species characteristics from each faunal assemblage group (e.g., reptiles, birds, mammals), present in the ecosystem type, based on pre-mine fauna lists and sighted within the three-year period preceding mine closure.

		• The number of vertebrate species does not show a decrease over a number of successive seasons prior to mine closure.
	Invertebrate species	• Presence of representatives of a broad range of functional indicator groups involved in different ecological processes.
	Habitat structure	• Typical food, shelter and water sources required by the majority of vertebrate and invertebrate inhabitants of that ecosystem type are present, including: a variety of food plants; evidence of active use of habitat provided during rehabilitation such as nest boxes, and logs and signs of natural generation of shelter sources including leaf litter.
Water quality		• As per water quality trigger values presented in the WMP, CoC and regulatory limits.
Safety		• Risk assessment has been undertaken in accordance with relevant guidelines and Australian Standards and risks reduced to levels agreed with relevant stakeholders.

3.8 Rehabilitation – Key Constraints

The experience gained from assessing historic rehabilitation at the site's described in Section 3.6 together with the process in developing preliminary completion criteria as presented in Table 3.7 has identified several key constraints to establishing future rehabilitation.

These key constraints are summarised as follows:

- *Soil pH conditions*: The overall limited availability of topsoil material suitable for use in rehabilitation is exacerbated by elevated pH levels exhibited in the overburden materials used as growth medium layers to date. This has impeded the successful development of a growth medium layer that can support rehabilitation.

- *Steep slopes*: Although overburden emplacements have been designed to mimic adjacent natural steep slopes, landform steepness has contributed to rehabilitation establishment issues in some emplacements, leading to potential derivative impacts of erosion and downstream water quality impacts.

- *Climate*: Highly variable and irregular climatic conditions hinder rehabilitation development. Such conditions include hot summers, cold winters and periodic droughts. It is important to plan towards rehabilitation in the traditional windows of Spring and Autumn, but allow flexibility in long term rehabilitation planning to allow for drought periods and capitalising on *La Nina* (wetter) periods.

- *Water supply*: Rehabilitation success has been impacted upon by water shortages following good initial germination. Irrigation trials have been set up previously, with limited success. The most effective irrigation has been natural rainfall.

- *Environment*: Local environmental factors resulting from mine location have impeded rehabilitation establishment. Such factors include browsing by herbivorous pests such as goats and rabbits, native macropod species, as well as weed competition.

Key constraints will be used as the basis in further rehabilitation planning and risk assessment and in the refining of rehabilitation completion criteria as required in the RMP.

4 REHABILITATION STRATEGY

4.1 Background

The *Strategic Framework for Mine Closure (ANZMEC and MCA, 2000),* (Strategic Framework) was developed by the Australian and New Zealand Minerals and Energy Council (ANZMEC) and the Australian Minerals Industry represented by the Minerals Council of Australia (MCA) to provide a broadly consistent framework for mine closure across Australia.

The Strategic Framework is structured around a set of objectives and principals grouped under six key areas being, stakeholder involvement, planning, financial provision, implementation, standards and relinquishment.

Following this early Strategic Framework for Mine Closure several similar publications and guidelines have been developed by the Australian Government as part of the *"Leading Practice Sustainable Development Program for the Mining Industry"* including Mine Rehabilitation and Mine Closure (September 2016). These handbooks build on the six key areas of the Strategic Framework and provide numerous case studies covering mine rehabilitation and mine closure.

For mining leases in NSW, the NSW Government has introduced new standard rehabilitation and reporting conditions under the Mining Amendment (Standard Conditions of Mining Leases – Rehabilitation) Regulation 2021, effective 2 July 2021. These conditions support best practice mine site rehabilitation by ensuring progressive rehabilitation occurs in a manner that achieves sustainable final land uses following the completion of mining.

In addition, the new mining conditions specify that documents covering for example rehabilitation objectives, rehabilitation completion criteria and final landform and rehabilitation plan must be prepared in an approved "form and way".

The Resources Regulator has developed a series of "form and way" documents supported by guidelines including rehabilitation risk assessment, rehabilitation objectives and rehabilitation completion criteria, rehabilitation controls, rehabilitation records, achieving rehabilitation completion sign-off and the mine rehabilitation portal.

4.2 Developing the Rehabilitation Strategy

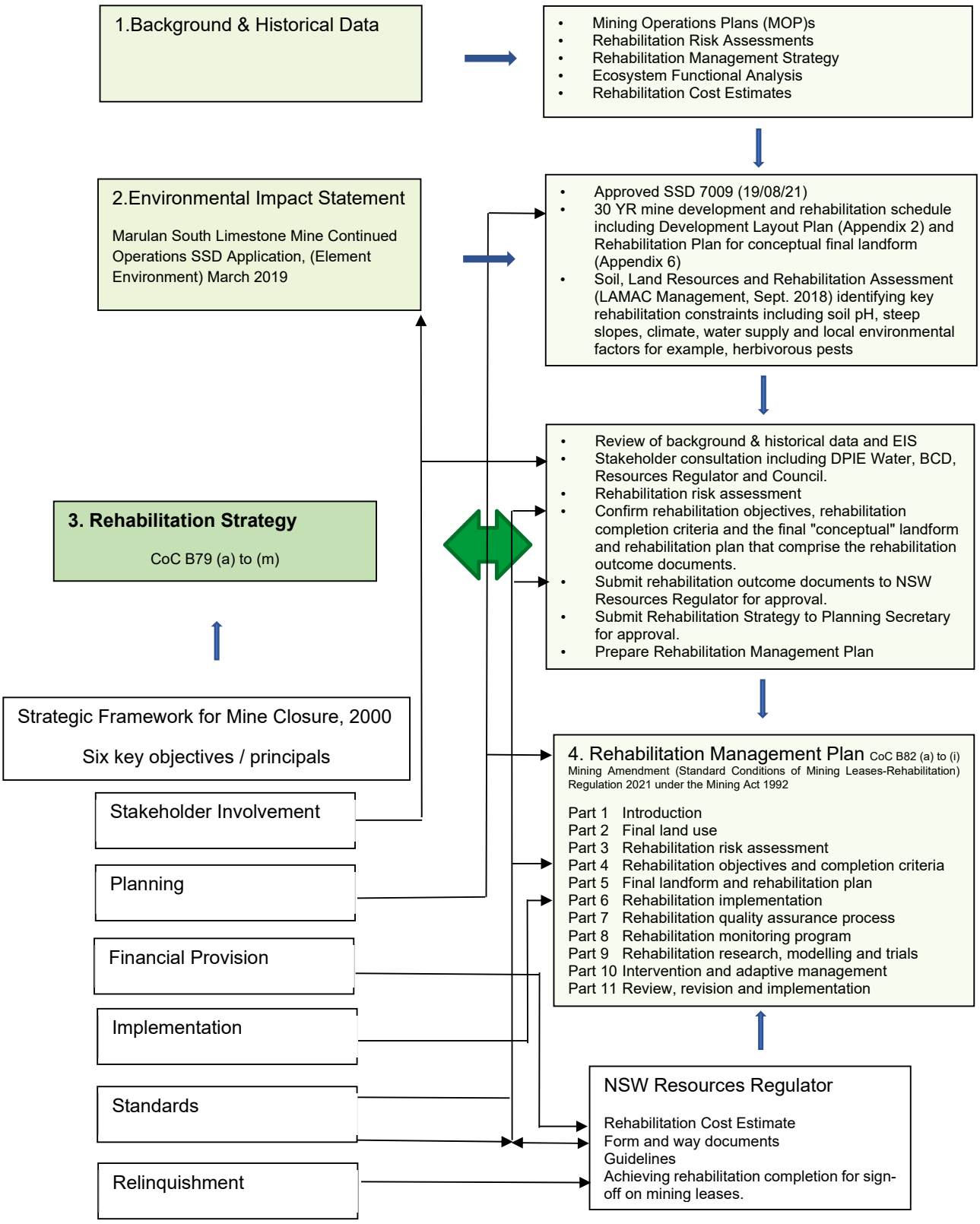
The approach in developing this strategy for the approved 30 year mine development, mining approximately 120 Mt of limestone to a depth of 335m is presented diagrammatically in Figure 1.

The principal aim of the RS is to address conditions of consent, lease and licences following approval of SSD 7009 and grant of new mining lease(s). Important considerations also include stakeholder consultation, the incorporation of risk assessment principals together with aligning this strategy with the Strategic Framework for Mine Closure and the NSW Resources Regulator's rehabilitation guidelines.

This RS utilises past rehabilitation knowledge and site experience gained through "boxed item" 1. Background & Historical Data and most recently the environmental impact assessment process under "boxed item" 2. Environmental Impact Statement.

The relationship between "boxed item" 3. Rehabilitation Strategy and "boxed item" 4. Rehabilitation Management Plan together with their respective alignment to the Strategic Framework for Mine Closure is represented by the series of "arrowed" lines.

Figure 1 Development of the Rehabilitation Strategy



4.3 Stakeholder Consultation

Stakeholder and local community input into the planning process for the approved 30-year mine development 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.

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.

Mine closure is considered to be well beyond the current 30-year mine life but as detailed in Section 4.4 a conceptual final land use and closure strategy has been developed.

4.4 Mine Closure Strategy

The approved, 30-year SSD 7009 mine development as presented in Figure 2 is based on mining approximately 120 million tonnes of limestone at 4 million tonnes per annum. This mine development includes emplacement of approximately 113 million tonnes of overburden of which an estimated 30 million tonnes will be emplaced within the southern overburden emplacement (SOE) at the southern end of the south pit. Backfilling the southern section of the void is a significant component of the Project rehabilitation and mine closure strategy, which aims to balance resource utilisation with environmental considerations.

The 120 million tonnes of limestone to be mined during this 30-year term is only part of the much larger deposit identified and estimated by (GeoRes, 2018) to be 640 million tonnes. Complete extraction of this larger deposit is unlikely, given the associated potential for environmental impacts. However, it is anticipated that operations could continue beyond the initial 30-year mining period with a further 110 million tonnes of limestone available for mining by extending the mine north, north-westwards and down to 300m elevation. This post 30-year mine development would require the further relocation of infrastructure and the removal of an additional 141 million tonnes of overburden.

4.5 Post Mining Final Land Use

As continuation of mining following the approved 30-year mine life is a likely option, post mining land use is currently considered in conceptual terms, particularly in regard the mine void. Further development of final land use over the approved 30-year mine life will be guided by regulatory approvals in particular those of the Resources Regulator and will be undertaken in consultation with local interested parties, such as neighbouring landowners / managers, regulators and community groups.

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 proposed for development by the adjoining Peppertree Quarry in accordance with Modification Application DA 06_0074 MOD5.

The 30-year reshaped emplacements, as shown on Figure 4, will be the likely final concept landforms, even if mining should continue past the current 30-year mine life.

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 3.4.

Specifically, overburden emplacement rehabilitation will incorporate the:

- Re-establishment of native woodland communities that reflect the structure and composition of the Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands (SR670) in the NOE (Peppertree Quarry) and in the WOE (Boral), by incorporating key tree species of this community into the proposed seed mix for emplacement rehabilitation;

- Establishment of woodland communities in the vicinity of the WOE that will also improve movement corridors for native fauna species, including Koalas and Yellow-bellied Gliders; and

- Selection of species from the *Coast Grey Box – stringybark dry woodland* community, (commonly found on the upper slopes of adjacent steep gorges) for the rehabilitation of steep slopes of the SOBE.

The re-establishment of native woodland communities within the NOE and WOE is compatible with the proposed rehabilitation objectives of the adjacent Peppertree Quarry, which are to rehabilitate disturbed areas to "*Blakely's Red Gum - Yellow Box - Grassy open woodland*", increase native wildlife habitat and re-establish movement corridors across the site.

In addition, the re-establishment of native woodland communities is consistent with the Goulburn Mulwaree Biodiversity Strategy, (July 2007) that identified land clearing as both a historical and ongoing impact on biodiversity values within the Goulburn Mulwaree Council Local Government Area (LGA).

The reported objective of this LGA strategy is:

"To improve and maintain the extent and condition of native vegetation, wetlands, riparian environments, known threatened ecological communities and populations of species and reduce the impact of invasive species".

The rehabilitation of approximately 222ha of overburden emplacement as described in this RS with native woodland communities including both the EEC and CEEC listed Yellow Box Blakey's Red Gum grassy woodland is a significant part of the 30-year final land use that supports a sustainable future for the LGA post mining.

If mining were to cease towards the end of the approved 30-year mine life, potential post-mining use options for the final 156 ha mine void include:

(a) temporary water storage;

(b) landfill / backfill capacity, including additional overburden emplacement or metropolitan infrastructure projects; or

(c) potential recreation area consistent with adjacent State administered conservation and recreation areas.

A conceptual final landform design has been developed as detailed in Section 5 to guide the post mining land use planning process and assist in the development of rehabilitation objectives.

4.6 Rehabilitation Security

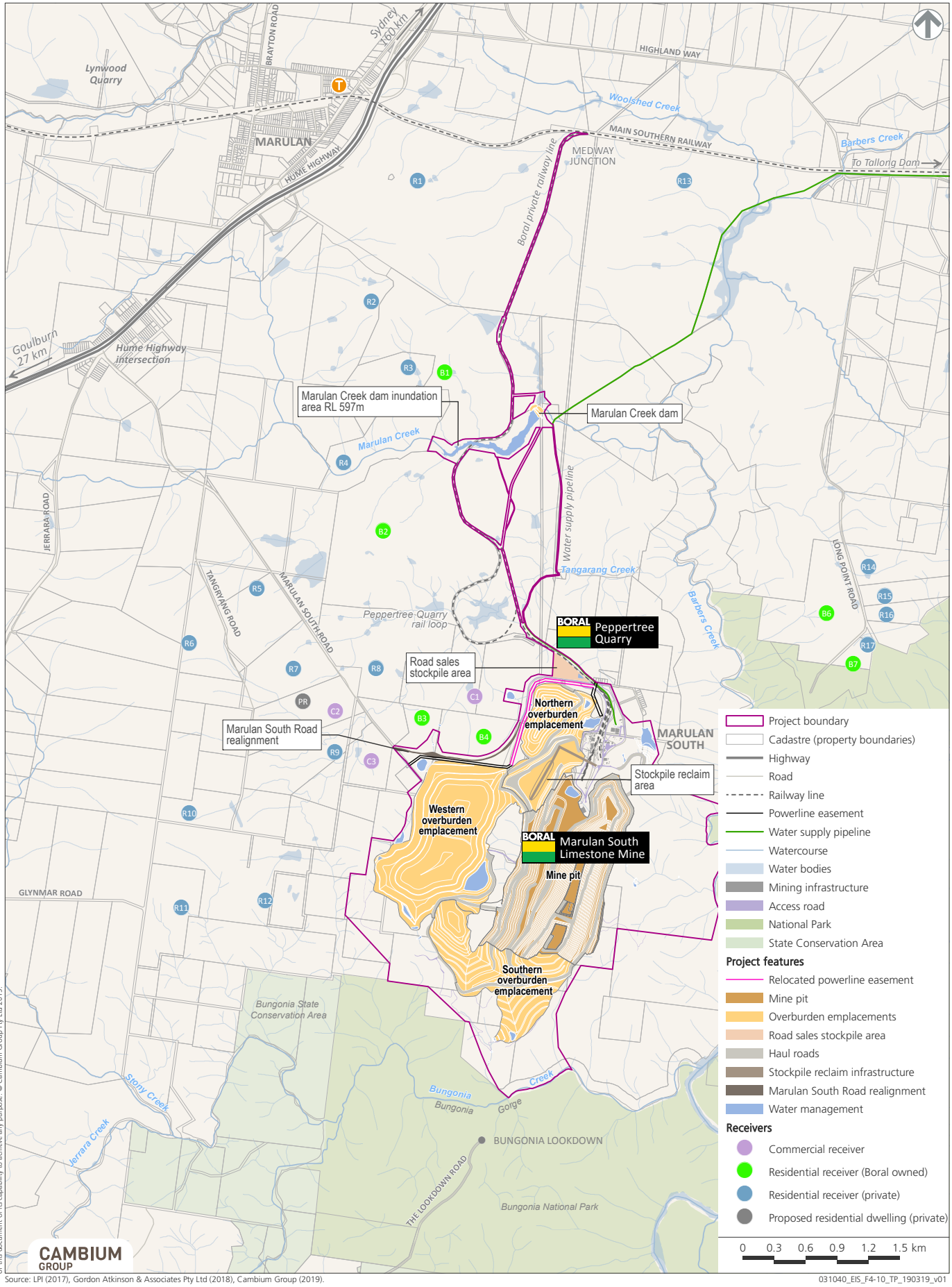
For mining lease authorisations in NSW, a security deposit or bond is required for the fulfillment of obligations under the authorisation, including those related to rehabilitation and obligations that may arise in future.

Boral as mining lease holder currently maintains a security deposit of $20.8 million held by the Department of Regional NSW – Mining, Exploration and Geoscience (MEG) to cover the government's full costs in undertaking rehabilitation in the unlikely event that the authorisation holder defaults on its rehabilitation obligations. The amount of security is determined by a Rehabilitation Cost Estimate (RCE) that is assessed and determined by the Resources Regulator. The RCE will be updated for the new MLA and is continuously revised over the 30-year mine life.

Figure 2 Development Layout Plans (from CoC - Appendix 2)

Figure 4.10
The Project

MARULAN SOUTH LIMESTONE MINE CONTINUED OPERATIONS - SSD APPLICATION
ENVIRONMENTAL IMPACT STATEMENT



CAMBIUM GROUP

Source: LPI (2017), Gordon Atkinson & Associates Pty Ltd (2018), Cambium Group (2019).

031040_EIS_F4-10_TP_190319_v01

5 FINAL CONCEPT LANDFORM DESIGN AND CONTROL MEASURES

This section of the RS presents detail from several EIS Project assessments including biodiversity, the SLRRA, visual, surface and ground water and in particular how details from these studies have been incorporated within the final concept landform design and the control measures adopted to minimise environmental impact.

An important strategy control measure for successful rehabilitation is the planning component as discussed in Section 5.3 and in particular for mining leases, the RMP.

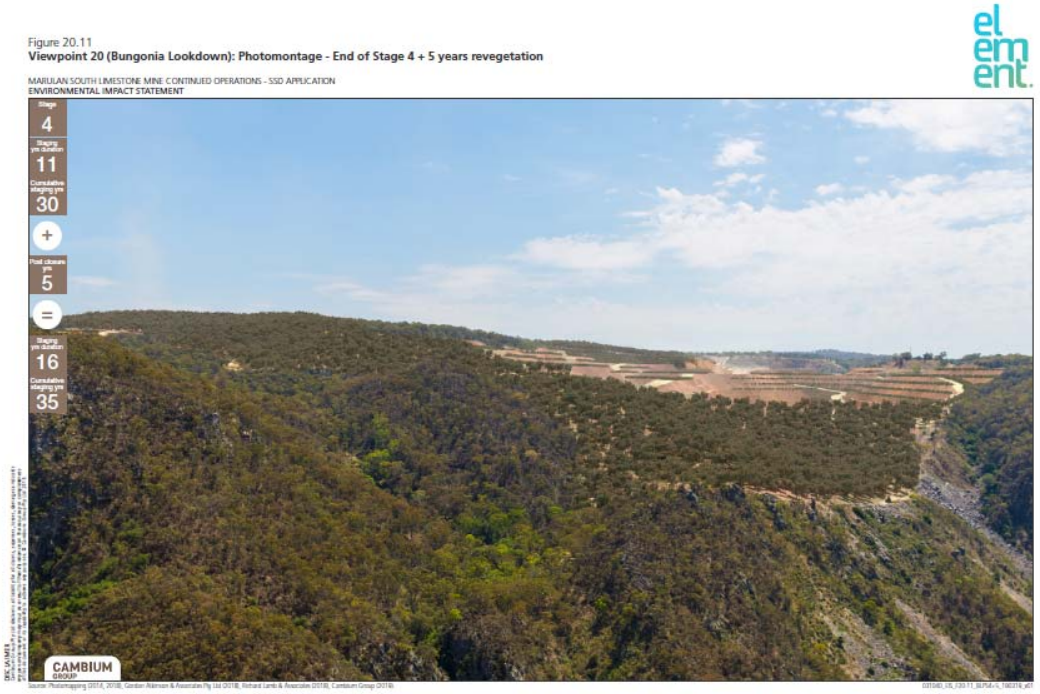
5.1 Conceptual Final Landform Design

If operations were to cease at the end of the approved 30-year mine life, detailed closure planning would commence at approximately the midway point of Stage 4 (five to six years prior to closure). This would allow sufficient time to complete limestone mining, including the removal and emplacement of overburden in accordance with final land use and closure planning commitments. Until confirmation of closure timing triggers the requirement for detailed closure planning, the proposed 30-year mine development and overburden emplacement schedule allows for some final land use flexibility, while maintaining public safety, providing guidance for rehabilitation design and minimising potential environmental impacts.

Figure 4 provides a “snap shot” of a conceptual final landform design, including rehabilitated areas and retained infrastructure, approximately five years after the approved 30-year mine project period. This conceptual final landform design is also presented as a 3D visualisation in

Figure 3 as viewed from the Bungonia Lookdown.

Figure 3 Conceptual 30-year Final Landform Design with Rehabilitation after 5 years



Design features and control measures considered in the conceptual 30-year final landform design, are outlined as follows.

Safety
Development of a nominally 30m wide haul road access around the mine void at an elevation of between 560m and 590m (western side) and 545m (eastern side), permitting the installation of security fencing (typically 2.1m in height) and earth / rock safety berms to physically restrict access to the mine void. The location of proposed and existing security fences is indicated by the black dashed line on **Figure 4.**

Approximately 10 to 13m of the former 30m wide haul road can be planted / seeded with trees, forming a visual barrier whilst still providing safe road / track access around the approximate 7.1 km perimeter of the final mine void.

Visual
To improve visual amenity, additional tree planting / seeding may be established on the 9m wide berms of the upper 15m bench and 50-degree face slope, down to the approximately 500m elevation. Possible bench planting locations (4m to 5m wide) are shown on **Figure 4** as darker green shaded areas from 600m down to 530m elevations on the western rim, and from 560m to 500m around the eastern perimeter.

Wider areas, from 60m to 140m wide, are available for planting at the 530m and 545m elevations (western side), with safe road / track access being maintained for revegetation monitoring and maintenance.

The upper in-pit slopes of the SOE would, where practical, be battered to achieve 1:2 to 1:3 slope gradients down to 485m, and revegetated to improve visual amenity from the south. If the lower in-pit slopes, concealed from view by the southern rim of the SOE, were not battered to approximately 1:3 in the final closure planning period then plantings along the three, 9m wide berms (at approximately 455m, 440m and 395m elevations) could be undertaken to assist with slope stabilisation, as indicated in **Figure 4**.

In total, approximately 30 ha of additional “Visual Screening” Rehabilitation has been identified within the mine void as shown on Figure 4, assuming no further mining was to be undertaken. This rehabilitation comprises 24 ha of planting / seeding over the remaining 9m wide mine benches, and 6 ha of the SOE in-pit slopes and berms.

If final mine closure did occur at the end of the approved 30-Year mine life, the majority of the infrastructure area would also be subject to final rehabilitation. An estimated 70 ha of the infrastructure area (comprising existing processing plant, shared product stockpile and the relocated mine stockpile / reclaim facility) would be decommissioned and rehabilitated. Retained infrastructure areas would include road access, services and infrastructure used in support of future land uses.

The existing Eastern Batter rehabilitated areas (east of the mine void) would also be well advanced towards the post mining land use objective of a stable landform with established native woodland vegetation, following a further 30-years of progressive rehabilitation, monitoring and maintenance.

Water Management
Sediment and water retention dams included as part of the 30-year mine development, together with water supply pipelines and multiple water tank storages, are likely to be retained for continued sediment and erosion control, and to facilitate water supply in support of the post-mining land use.

To address the final 30-year mine void’s water management objectives as detailed in CoC B76 – Table 6, the conceptual 30-year mine void, (assuming mining were to cease after 30 years) has been designed to continue to operate, post-mining, as a large sedimentation basin.

If mining were to cease after 30 years the final mine pit floor configuration is planned to include two large sediment retention basins, a northern basin at about 365/355m AHD and a southern basin at about 350/335m AHD as shown on Figure 4. These basins can provide an estimated storage capacity of 70ML and 400ML respectively. The first basin would be sized to provide initial settlement of sediment. An outlet structure or spillway in this pre-treatment basin would release flows into the second basin through which treated flows where required would discharge to receiving waters as seepage as currently occurs in the mine pit.

Based on the characterisation of current seepage from the base of the mine pit floor as described by AGE (2019), the water balance analysis for this final 30-year mine void shows that, on average 466ML/year of all water draining to the mine void, including runoff from the mine void itself is likely to be captured in this large sedimentation basin system and treated prior to seeping into groundwater.

Following periods of heavy rainfall the water level in the final 30-year mine void has been modelled to rise as much as 13m above the mine floor but is very unlikely to reach a level where overflow to the surface drainage system could occur being approximately 140m above mine floor elevation.

As discussed in Section 3.3.3 infilling of the south pit as shown in Figure 4 with emplaced overburden forming the SOE will increase the distance between the final mine void and discharge points for seepage along Bungonia Creek, decreasing the potential for the carriage of sediment to receiving waters.

A post-mining water monitoring system would, as required be maintained to monitor the effectiveness of the post- mining water management system.

Services and Infrastructure

Subject to landholder agreement (Boral being the landholder for the majority of land titles), and with the agreement of the Resources Regulator in accordance with CoC B76 (Table 6: Rehabilitation objectives) services including rail and road access, and electricity supply would be retained to service post-mining land uses.

Maintaining partial road and rail access to, and around, the mine's Project site is considered necessary for ongoing land 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.

Proposed infrastructure to remain at the end of the Project is shown in **Figure 4**.

Socio-economic

The socio-economic effects of the continued mine operation as assessed in the EIS for SSD7009 determined an overall net social benefit for the cost analysis benefit undertaken and both a positive local (LGA) and regional supplementary effects analysis based upon input-output tables.

The option for mining to continue following the 30-year mine development is considered to extend the benefits of employment and wages within the LGA.

If operations were to cease at the end of the approved 30-year mine life, detailed closure planning as previously described would commence at approximately the midway point of Stage 4 (five to six years prior to closure).

This period not only provides time for planning final rehabilitation work associated with final land use options considered in Section 4.5 but possible socio-economic opportunities including alternate employment if, for example, use of the mine as a potential recreation area consistent with adjacent State administered conservation and recreation areas was a final land use.

The utilisation of existing mining infrastructure where safe, appropriate and consistent in supporting final land use will be undertaken in detail during the proposed five to six year mine closure, planning stage.

As described in Section 4.5 the final land use of approximately 222ha of overburden emplacement as native woodland is consistent with the Goulburn Mulwaree Biodiversity Strategy, (July 2007) in supporting both a sustainable future for the LGA post mining that is considered a benefit and therefore assists in minimising potential adverse socio-economic effects with rehabilitation and mine closure.

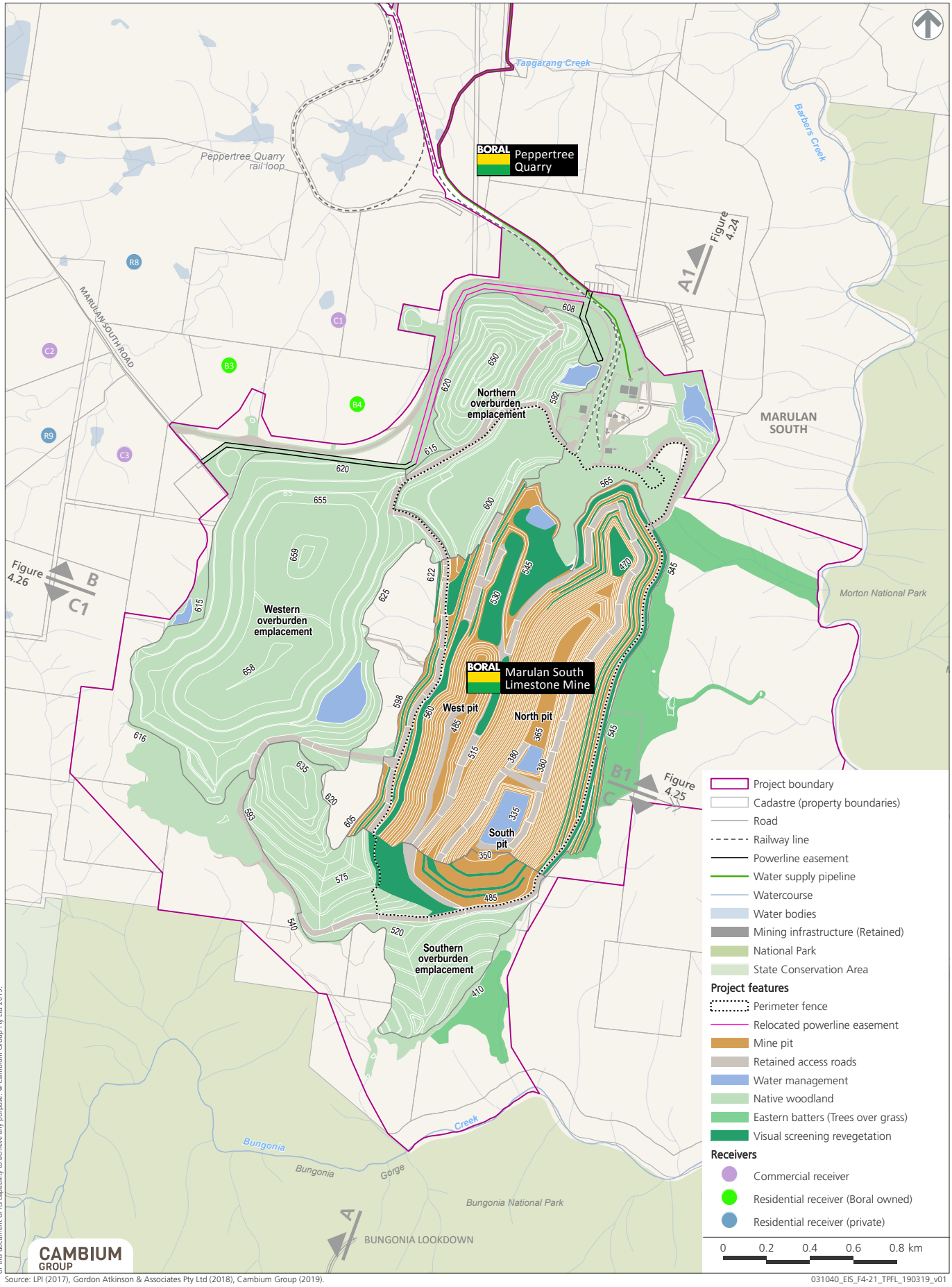
Additional benefits contributing to a sustainable future for the LGA and assisting in minimising potential adverse socio-economic effects post mining include;

- improved visual amenity in particular from the Bungonia Lookdown as visualised in Figure 3. Backfilling of the southern end of the south pit, landform rehabilitation and revegetation with native woodland is a significant component of this RS.
- The adjoining Bungonia National Park / State Recreation Area is one of three listings for the LGA on the Register of the National Estate according to the Goulburn Mulwaree Biodiversity Strategy, (July 2007). Improving visual amenity from the Bungonia Lookdown and minimising impact within Bungonia Creek will contribute to and align with the LGA's Social Sustainability and Action Plan 2019-2029.
- Engagement with community is an important component of the LGA's Social Sustainability and Action Plan 2019-2029. Boral will continue to engage with the LGA through the combined Peppertree Quarry & Marulan South Limestone Mine Community Plan and current Community Consultative Committee as a means for engagement to assist in understanding and minimising potential adverse socio-economic effects associated with mine closure that is not considered likely within the next 30-year period.

Figure 4 Conceptual Final Landform (from CoC - Appendix 6)

Figure 4.21
The Project - Final landform

MARULAN SOUTH LIMESTONE MINE CONTINUED OPERATIONS - SSD APPLICATION
ENVIRONMENTAL IMPACT STATEMENT



Source: LPI (2017), Gordon Atkinson & Associates Pty Ltd (2018), Cambium Group (2019).

031040_EIS_F4-21_TPFL_190319_v01

5.2 Strategic Considerations

As well as the biodiversity enhancement opportunities discussed in Section 3.4 and Section 4.5, the following aspects of rehabilitation planning were considered in the EIS during development of the approved, conceptual final landform, rehabilitation and mine closure strategy as presented in **Figure 4**.

5.2.1 Surface Water Quality

Surface water runoff from the SOE and the southern sections of the WOE will drain to the mine void via sediment dams. Once mining is complete and the emplacements are sufficiently rehabilitated, surface drainage will flow via Main Gully to Bungonia Creek.

The northern sections of the NOE and WOE will report to Tangarang Creek during and after emplacement operations.

The southern section of the NOE, and adjacent areas will drain to the North Pit during and after mining operations.

Bryces and Barbers Overburden Emplacements will continue to report to Barbers Creek.

These creeks flow to the Shoalhaven River, which discharges into Lake Yarrunga, which is a water supply dam for the Sydney Catchment Authority. Bungonia National Park, State Conservation Area and Morton National Park, all heavily used recreationally by the public, are also located immediately to the south and east of the mine site. Increased erosion resulting from unsuccessful rehabilitation within the mine site could potentially impact on these receptors. To reduce potential erosion impacts, graded banks, drop structures and sediment detention structures have been incorporated into the final landform design.

The location of final water management infrastructure for the approved 30-year conceptual final landform is shown in **Figure 4**.

5.2.2 Drainage Features

The surface water assessment by Advisian (2019) includes detail on the indicative staging of construction of water management facilities including drainage from overburden emplacements to sediment basins and water storage dams and management of any overflows including drainage routes and pipeline connections.

Staging of water management features is linked with the staged development of overburden emplacements and their rehabilitation to achieve the final targeted surface drainage outcomes as outlined above in Section 5.2.1

Detailed erosion and sediment control plans (or maps) together with drainage and water course design (where applicable) has been undertaken to be consistent with the requirements of the following NSW Government publications.

- Managing Urban Stormwater: Soils and Construction, Volume 1 (Landcom 2004) – referred to as the “Blue Book”, and
- Managing Urban Stormwater: Soils and Construction, Volume 2E – Mines and Quarries (DECC, 2008).

Construction of the proposed Marulan Creek dam as indicated in Section 3.3.3 has been deferred. A remediation and rehabilitation strategy is required as a component of CoC B45 (e) (iv) – Marulan Creek Dam Management Plan, to be prepared having regard to A Rehabilitation Manual for Australian Streams (Land and Water Resources Research and Development Corporation 2000).

5.2.3 Visual Amenity

From most public vantage points and private residences to the north and west, development within the mine's Project site is screened by existing topography, remnant native trees and woodlands.

The WOE is marginally visible from a short section along Marulan South Rd. Bungonia Lookdown, located in Bungonia National Park across the gorge from the mine and Project site, is a popular local tourist attraction. The SOE and WOE, and the open cut mine, are highly visible from the scenic lookout.

The open woodland vegetation communities proposed for the SOE and WOE, and remedial planting on the existing Eastern Batters rehabilitation, will reduce the visual impact of the mine by partially screening these emplacements. The proposed establishment of tree screens on the perimeter of the mine void and, where possible, on in-pit benches, will also reduce the visual impact of the void.

5.3 Rehabilitation Planning

Changes in rehabilitation planning and assessment for mining leases in NSW, effective 2 July 2021 include the introduction of new standard rehabilitation and reporting conditions under the Mining Amendment (Standard Conditions of Mining Leases – Rehabilitation) Regulation 2021 as detailed in Section 2.2.

These new conditions effectively replace MOPS under the NSW Trade and Investment, 2013 ESG3 - Mining Operations Plan Guidelines (ESG3) with RMPs.

As detailed in Section 2.2 the mine is classed as a "large mine" and requires the preparation of a RMP that includes other *"rehabilitation outcome documents"* comprising a *"rehabilitation objectives statement"*, a *"rehabilitation completion criteria statement"* and the *"final landform and rehabilitation plan"* showing a spatial depiction of the final land use as presented in **Figure 4**. Similarly, under ESG3 an important component of the RMP is the use of final land use and mining domains together with phases of rehabilitation as a means of planning and assessing the mine's rehabilitation program.

The following sections discuss these rehabilitation planning concepts, with regards to the approved 30-year mine development. Detailed rehabilitation planning will be included in the RMP required in accordance with CoC B82. The components of a RMP are presented in Figure 1.

5.3.1 Domains

Domains are defined in the Resources Regulator, "form and way" document "*Rehabilitation management plan for large mines*" in accordance with Clause 9 of Schedule 8A to the Mining Regulation 2016.

Domain is now defined as an area (or areas) of the land that has been disturbed by mining and has specific operational use (mining domain) or specific final land use (final land use domain). Land within a domain typically has similar geochemical and/or geophysical characteristics and therefore requires specific rehabilitation activities to achieve the associated final land use.

Mining domains were previously referred to as "primary" domains and final land use domains were previously known as "secondary" domains.

The approved Project disturbance footprint totals 598 ha and has been divided into the proposed primary domains, (now mining domains) as shown on Figure 5 and as detailed in Table 5.1**.**

The Project application area included the majority of CML 16 together with additional areas for overburden emplacements and a new mine water supply dam located on Marulan Creek. These proposed primary domains will now be subject to further revision and refinement resulting from the new MLA. Details of the new mining domains will be included in the RMP required in accordance with CoC B82.

Proposed secondary domains (now final land use domains) for the post mining rehabilitated mine site, as presented in Figure 4 and as summarised in Table 5.2 will similarly be revised and updated in the RMP.

5.3.2 Rehabilitation Phases

The broad rehabilitation strategy for disturbed land within the mine site includes the reshaping and stabilisation of post-mining landforms, topdressing of reshaped landforms, and the establishment and development of native woodland vegetation communities. In accordance with CoC B82 for a RMP, this plan will detail the stages and sequences of actions required to rehabilitate disturbed land to achieve the 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).

The active mining phase includes clearing of existing vegetation and stripping of available topsoil as identified in Section 3.4 and Section 3.1 respectively.

Where native woodland vegetation is to be cleared for mine development purposes including overburden emplacement and construction activities, the area will be assessed for potential habitat resources available for potential recovery.

Concurrently, areas that may potentially benefit from the inclusion of these resources will also be assessed. An evaluation will be made regarding the feasibility and overall benefit of recovering and re-using those resources in the rehabilitated landscape.

Topsoil stripped from woodland areas ahead of mine-related disturbance will generally contain a natural seedbank in the top 3 - 5cm. This seedbank can be useful for vegetation re-establishment, especially where direct placement of topsoil is possible. Native trees and shrubs have also been known to re-establish from roots and saplings transported with stripped topsoil. Where feasible, direct placement of topsoil, and integration of cleared vegetation debris, will be practiced during the disturbance of woodland areas.

Topsoil management recommendations have been developed by LAMAC Management, (September 2018) and are included as Appendix C.

Biodiversity value in rehabilitated native woodland vegetation can also be increased by recovering trees with hollows (and other potential habitat features including logs, stumps, stags and boulders) during clearing and placing these features on rehabilitated land.

This requires a considerable degree of prior planning to execute well, but does encourage early faunal colonisation of rehabilitated areas.

This planning will be detailed in the RMP and annual rehabilitation report and forward program required in accordance with the Mining Amendment (Standard Conditions of Mining Leases – Rehabilitation) Regulation 2021 as detailed in Section 4 and as presented in Figure 1.

Table 5.1 Primary domains at start of Project.

	Mining Domain	Description	Area (ha)
1	Infrastructure Area	Mining related infrastructure situated on lower gradient land in the central northern section of the Project site, including processing facilities, workshops, administrative buildings, roads, rail facilities, dams, pipelines, and hard stands. Some additional disturbance associated with site haul and access roads together with existing access tracks of about 1ha. Infrastructure within the domain will generally remain operational (and unrehabilitated) until end of Project life. Infrastructure not required post mining will be decommissioned and demolished. It is expected that the Marulan Creek Dam (and vehicle access road) will remain operational post-mining, and will be in parts rehabilitated at the end of the mine life.	106.2
2	Waste Lime Storage / Emplacement Area	Discrete area within WOE designated for placement and capping of waste lime materials.	2.0
3	Water Management Areas	Sediment control and water supply dams across the mine site including Marulan Creek Dam infrastructure.	30.0
4	Overburden Emplacement Areas	Existing overburden emplacement to the west and south of the open cut pit.	246.3
5	Stockpiled Material Area	Designated areas within infrastructure and mine void areas for management of raw, processed and product materials. This area has been incorporated into domain 1 (infrastructure).	0
6	Open Cut Mine Void	Open cut mine void. Will expand towards the west as the pit develops.	155.5
7	Rehabilitation Areas	Rehabilitated overburden emplacement areas, currently consisting of rehabilitation areas of WOE; Bryces Gully Emplacement; Barbers Emplacement and Eastern Batters (South).	58
		Total Area	598

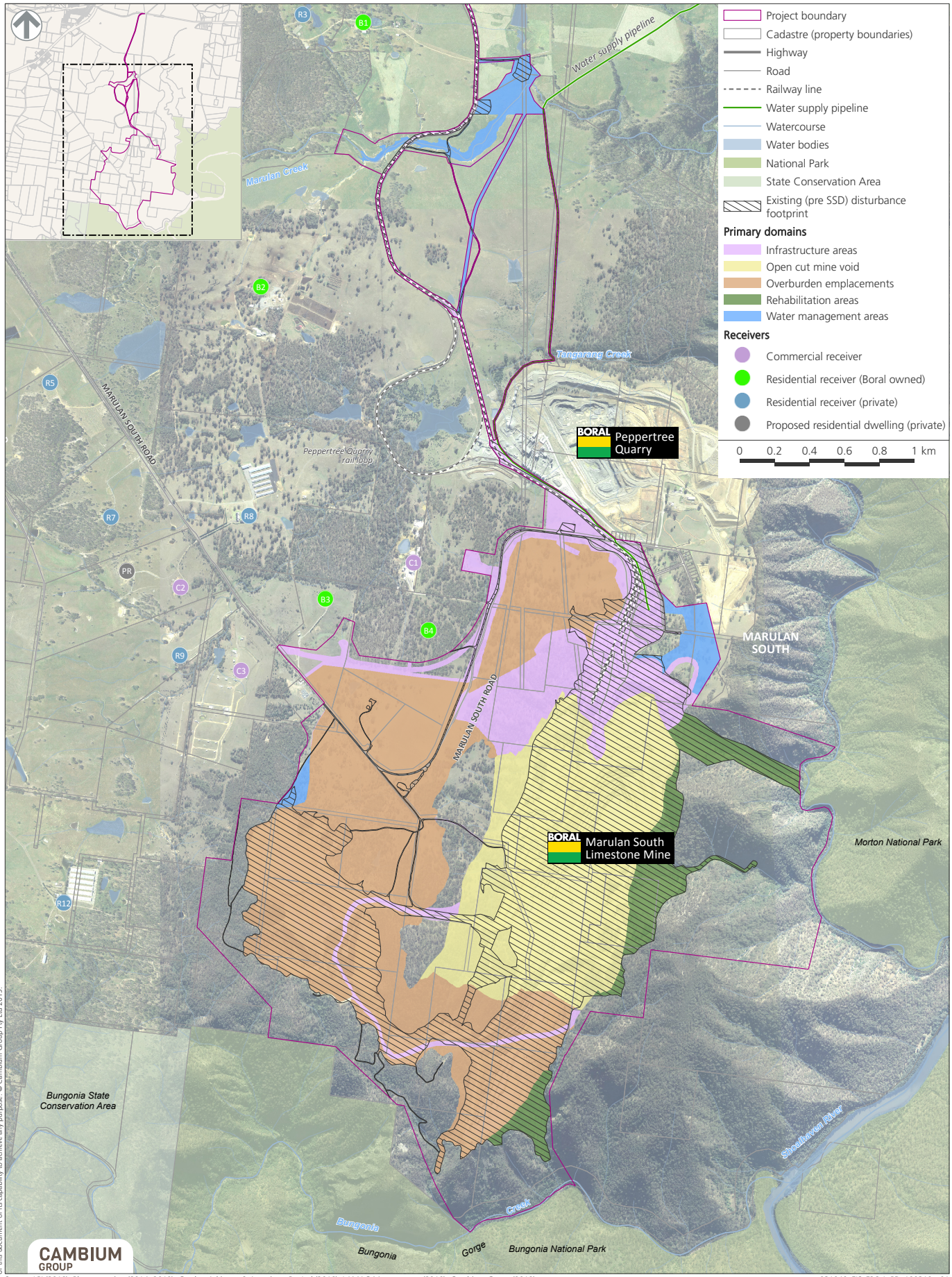
Table 5.2 Secondary domains at Project end

	Rehabilitation Domain	Description	Area (ha)
A	Native woodland areas	Former overburden emplacements and infrastructure areas rehabilitated to native woodland communities.	326.8
B	Trees over Grass – landform stability	Mix of tree, shrub and groundcover vegetation established on the Eastern batters to promote long term erosion control and landform stability.	37.1
C	Final mine void	Post mining, the residual void will be approximately 240-270 m deep, up to 900m wide (east to west) and 2000m long (north to south) with steeply sloping “benched” walls and generally level floor. This domain also includes approximately 8.9 ha of the SOE.	106.3
D	Visual Screening	Tree and shrub vegetation established around void perimeter and upper slopes / benches to promote visual screening visual screening and landform stability.	29.7
E	Water management	Drainage control and water supply structures	23.4
F	Infrastructure	Individual infrastructure items (mainly roads) incorporated into other domains to support post mining land use.	74.6
		Total Area	598

Figure 5 Domains

Figure 26.1
Primary domains

MARULAN SOUTH LIMESTONE MINE CONTINUED OPERATIONS - SSD APPLICATION
ENVIRONMENTAL IMPACT STATEMENT



Source: LPI (2018), Photomapping (2014, 2018), Gordon Atkinson & Associates Pty Ltd (2018), LAMAC Management (2018), Cambium Group (2019).

031040_EIS_F26-1_PD_190319_v01

6 REHABILITATION MONITORING

In accordance with CoC B82 and as detailed in Section 2.2 covering the statutory requirements for rehabilitation on mining leases the new MLA for the Project site requires a RMP.

The process in preparing a RMP for this mine is reproduced from Section 2.2 and is as follows;

- 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.

The RMP “form and way” document includes in Part 8, a rehabilitation monitoring programme to be developed and implemented to evaluate the progress of rehabilitation towards fulfilling rehabilitation objectives and rehabilitation completion criteria.

The scope of the monitoring programme should reflect the identified risks to rehabilitation associated with the mine, the final land use obligations and development consent conditions and commitments.

The monitoring programme should select the most appropriate indicators and monitoring methods that align the programme with the rehabilitation objectives and rehabilitation completion criteria, are relatively simple to measure and are reproducible and are effective for tracking rehabilitation progress, or regression and potential risks.

The design of the monitoring programme should be flexible enough to, incorporate industry accepted techniques and/or expert recommendations to address any emerging issues and assess any new or refined rehabilitation completion criteria that are proposed as a result of rehabilitation and/or analogue site monitoring.

In developing the required rehabilitation monitoring programme, the general rehabilitation objectives as presented in Section 6.1 below, together with those from CoC B76 included in Table 1.1 will form the basis of the required RMP *“rehabilitation objectives statement*”.

Completion criteria for primary and secondary domains, now mining and final land use domains respectively have been developed as part of the SLRRA undertaken by LAMAC Management, (September 2018).

These criteria as presented in will be revised and refined as required in the RMP to align with current rehabilitation monitoring as discussed in Section 6.2.

6.1 Rehabilitation Objectives

To facilitate effective long-term rehabilitation planning and monitoring requirements, the general objectives applicable across all rehabilitation domains are presented below.

These objectives have been selected as part of the Project EIS - SLRRA and will be used to guide rehabilitation planning and assess rehabilitation performance. The objectives discussed are conceptual and may be further defined in the RMP.

General rehabilitation objectives applied across all rehabilitation domains include;

- Rehabilitated land will be geotechnically stable and will not present a greater safety hazard than surrounding land to land-users, public, livestock and native fauna accessing or transiting the post-mining area.
- Land capability will, at a minimum, be returned to a class similar to that existing prior to Project commencement (Class V, VII or VIII).
- Except for mine void, mined land will be visually compatible with the surrounding natural landscape.
- Rehabilitated landforms will be designed to shed water without causing excessive erosion or increasing downstream pollution.
- Rehabilitated landforms will not negatively impact visual amenity for nearby residents and users of conservation reserves.

6.2 Completion Criteria

Rehabilitation development should be periodically measured and assessed to determine whether rehabilitated communities are progressing towards the objectives.

Rehabilitation completion criteria set the benchmark values for key attributes (indicators) proposed to demonstrate that the rehabilitation objectives have been met. At a minimum, completion criteria should address landscape parameters such as stability, soils, vegetation establishment, and potential for off-site impacts and suitability for the agreed post-mining land-use.

A set of preliminary rehabilitation completion criteria have previously been developed for the mine as referenced in the current 2018-2023 MOP, and are presented in Table 3.7. These criteria have been used in developing the domain-specific rehabilitation objectives and completion criteria included in the approved SSD 7009 as detailed in Table 6.1.

Rehabilitation completion criteria and any future refinements will be presented in the RMP for approval by the Resources Regulator.

6.3 Rehabilitation Monitoring Programme

Boral has currently adopted the Ecosystem Function Analysis (EFA) monitoring methodology to assess rehabilitation progress. EFA is a transect-based monitoring method that measures for:

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

EFA involves the periodic measurement of landscape and vegetation parameters along transects established in rehabilitated areas. The data collected is converted into indices for comparison against measurements made at nearby analogue (or reference) sites established in undisturbed target communities. Repeated EFA measurements should demonstrate development of rehabilitation towards rehabilitation completion criteria over time.

The use of EFA as a stand-alone monitoring methodology may be reviewed during the approved 30-year mine development with likely improvements and additions discussed in Section 8.

Table 6.1 Domain rehabilitation objectives and completion criteria

No.	Functional objective	Rehabilitation phase					
		Decommissioning	Landform establishment	Growth medium development	Ecosystem and land use establishment	Ecosystem and land use sustainability	Relinquishment
Primary 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 secondary domains: A – Native woodland area, for the majority of the rehabilitated Infrastructure area; or F – Infrastructure, for residual access roads and residual post-mining structures.			
2	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 secondary domain A – native woodland area.			
3	Receive and store water for operational use, or temporarily hold surface catchment run-off	Water management structures not required for post-mining use decommissioned	Water management structures to remain post mining assessed as geotechnically stable, meeting water quality requirements, and meeting selected land use function.	See secondary domain E – water management.			

No.	Functional objective	Rehabilitation phase					
		Decommissioning	Landform establishment	Growth medium development	Ecosystem and land use establishment	Ecosystem and land use sustainability	Relinquishment
	for sediment control purposes.	and backfilled or removed.					
4	Stable, safe, free draining and non-polluting landform capable of sustaining a native woodland vegetation community	Emplaced landform generally matches maximum elevation and contours shown in relevant MOP plans.	Slopes reshaped to designed contours and gradients < 1:3 to 1:6. Benches and drainage structures incorporated and functioning as designed. Landforms shed water, and drain to sediment control structures. Landform surfaces accessible and able to be rehabilitated.	See secondary domain A – native woodland area.			
5	Temporary storage of stockpiled materials within infrastructure areas (raw materials, processed materials and waste materials).	Infrastructure demolished and potentially contaminating materials removed / scalped. Compacted surface layers ripped or capped to ensure near-surface material compatible with rehabilitation.	Landforms shed water, and drain to sediment control structures. Landform surface merges seamlessly with adjacent landform, is accessible and able to be rehabilitated.	See secondary domain A – native woodland area.			
6	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.	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 secondary domains: C – Final void, general safety and stability treatment for the residual void: or D - 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
		Safe access to void maintained, while unauthorised access controlled.					
7	Native woodland community of variable density and function enhancing slope stability and visual amenity.	Ongoing monitoring and maintenance.	Variable, but generally safe, stable, non-polluting, and conforming to adjacent landscape.	See secondary domain B – trees over grass.			
Secondary domains							
A	Resilient and self-sustaining native woodland community providing slope stability, biodiversity enhancement and visual amenity.	See relevant primary domains: infrastructure area; waste lime storage / emplacement area; overburden emplacement areas; or stockpiled material areas.		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.	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.

No.	Functional objective	Rehabilitation phase					
		Decommissioning Landform establishment	Growth medium development	Ecosystem and land use establishment	Ecosystem and land use sustainability	Relinquishment
			High risk: Rock / soil mulch. Or suitable ameliorant (i.e., organic growth medium (OGM)) used as per industry leading practice.			
B	Resilient and self-sustaining vegetation community, promoting visual screening, landform stability and erosion control.	See primary domain 7 – rehabilitation areas.	Where used, topdressing material (meeting EC, pH and ESP criteria) placed as per erosion risk: Low risk: 10cm depth topdressing material. Mod risk: 10 cm depth good quality topsoil. High risk: Rock / soil mulch. Or suitable ameliorant	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 LFA monitoring. Evidence of reproduction (setting viable seed, flowering or plants establishing).	Sufficient monitoring evidence to indicate woodland community exhibiting essential ecosystem processes, landform stabilisation, habitat enhancement and visual screening.

No.	Functional objective	Rehabilitation phase					
		Decommissioning	Landform establishment	Growth medium development	Ecosystem and land use establishment	Ecosystem and land use sustainability	Relinquishment
				(i.e., OGM) used as per industry leading practice.			
C	Resilient and self-sustaining native dominated tree / shrub community (where vegetation establishment achievable) providing landform stability and habitat value.	See primary domain 6 – open cut void.		Inert weathered material used to establish growth medium on non-flooded flat surfaces. Or suitable ameliorant used as per industry leading practice.	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 premature senescence. Evidence of reproduction observed.	Sufficient monitoring evidence to indicate diverse native woodland community essential exhibiting ecosystem processes and landform stabilisation and habitat enhancement.
D	Resilient and self-sustaining dense to moderately dense native woodland vegetation community, with mid-storey and canopy providing visual screening.	See primary domain 6 – open cut void.		As for C – 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.
E	Receive and store water for selected post-mining land	See primary domain 3 – water management area.		Placement of 10 cm of topdressing	Erosion control groundcover vegetation	Mix of tree and shrub species establishing and groundcover >	Sufficient monitoring evidence to indicate groundcover

No.	Functional objective	Rehabilitation phase					
		Decommissioning	Landform establishment	Growth medium development	Ecosystem and land use establishment	Ecosystem and land use sustainability	Relinquishment
	use, or temporarily hold surface catchment run-off for sediment control purposes.			material (meeting EC, pH and ESP criteria) on outer batters of sediment basins, dams, drains or other infrastructure slopes with high erosion risk.	established on water management infrastructure slopes. No trees to be established where roots may penetrate and compromise water holding / carrying capability of structures.	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.	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.

7 REHABILITATION THREATS & CONTINGENCIES

As discussed in Section 6 of this RS the approved 30-year mine development and new MLA requires a RMP In accordance with CoC B82 and in meeting the statutory requirements for rehabilitation on mining leases.

The structure of the required RMP in accordance with Clause 9 of Schedule 8A to the Mining Regulation 2016 is presented in Figure 1 and in particular includes the following parts;

- Part 7 – Rehabilitation quality assurance program
- Part 8 – Rehabilitation monitoring program
- Part 9 – Rehabilitation, research, modelling and trials
- Part 10 – Intervention and adaptive management, and
- Part 11 – Review, revision and implementation

The RMP includes a rehabilitation monitoring program to be implemented to assess rehabilitation progress towards a set of objectives, completion criteria and post-mining land use and to identify potential threats that may impede success.

Potential threats and / or key constraints toward successful rehabilitation have been identified in Section 3.8 and discussed further as follows, including;

Soils, Geology & Erosion

- Poor quality / insufficient topsoil due to natural deficiency or poor management preventing establishment of desired vegetation communities;
- Erosion leading to degradation of growth medium and rehabilitation;
- Major geotechnical failure of overburden emplacements and void walls, such as slumping or subsidence;
- Failure of water management structures (or natural drainage lines), leading to erosion, unstable landform and potential pollution;
- Targeted land capability class not met by rehabilitated landform and soils;

Biological and Environmental factors

- Insufficient, poor quality or incorrect species seed / seedlings leading to poor vegetation establishment;
- Inadequate weed control, leading to extreme weed competition preventing establishment of desired species;
- Vertebrate predation of juvenile vegetation and / or insect attack, disease infestation causing premature vegetation die-back;
- Poor vegetation development leading to simplified, non-stratified community structure of poor habitat value;
- Severe and / or prolonged drought leading to widespread failure of revegetation;
- Uncontrolled bush fire events leading to widespread failure of revegetation areas;

In addition, major storm events may result in flooding, geotechnical instability, major erosion and / or widespread damage to rehabilitation areas.

RMP - Part 10 requires a rehabilitation, trigger action response plan (TARP) and other contingency strategies that will be implemented when rehabilitation monitoring indicates that there are emerging threats to rehabilitation or rehabilitation is not on a trajectory to achieving the final land use.

8 REHABILITATION STRATEGY PERFORMANCE REVIEW AND IMPROVEMENT PROGRAM

In accordance with CoC B79(m) a program is required to periodically review and update the RS at least every three years.

As the strategy forms a significant part of the RMP, review and update of the RS will be linked with Part 11 – Review, revision and implementation and Part 9 – Rehabilitation, research, modelling and trials of the RMP.

An annual rehabilitation report (ARR) and forward program is a statutory requirement for Boral being the holder of a mining lease. Following every three ARRs and subsequent review of report detail this strategy will be reviewed and updated as required.

If the RMP is amended the RS will be reviewed and updated as required to ensure that both strategy and RMP are aligned.

Opportunities identified for improving both this strategy and the RMP covering future 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 BMP.

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.

9 RECORDS, REPORTING AND NOTIFICATION

For mining leases in NSW, the requirement for records, reporting and notification of rehabilitation is covered under Division 4 of the Mining Amendment (Standard Conditions of Mining Leases – Rehabilitation) Regulation 2021 (Division 4) as referenced in Section 2.2.

Under this RS the Division 4 requirements as summarised below will form the basis of rehabilitation records, reporting and notifications.

9.1 Records demonstrating compliance

Records must be created and maintained of all actions taken that demonstrate compliance with each of the conditions set out in this Part being Part 2 - Standard conditions of the Mining Amendment (Standard Conditions of Mining Leases – Rehabilitation) Regulation 2021.

Under the provisions of sections 163D and 163E of the Mining Act 1992 records are to be kept in a legible form for at least four years following the expiry or cancellation of the mining lease.

Typical records that Boral as holder of a mining lease may require to demonstrate compliance with lease conditions for a large mine are found in the Resources Regulator's Guideline: Rehabilitation Records, copy attached in Appendix F.

9.2 Report on non-compliance

Division 4 – Clause 18 details the requirements for reporting to the Minister a written report detailing any non-compliance with a condition of the mining lease or a requirement of the Mining Act 1992 or the Mining Amendment (Standard Conditions of Mining Leases – Rehabilitation) Regulation 2021.

The report is to be provided within 7 days after the holder of a mining lease becoming aware of the non-compliance.

The report is to include identification of the condition of the mining lease or requirement to which the non-compliance relates, a description of the non-compliance, date or dates on which or the period during which the non-compliance occurred, description of the cause or likely causes of the non-compliance and actions taken or will be taken to mitigate effects and to prevent any recurrence of the non-compliance.

9.3 Nominated contact person

Boral is to nominate a natural person to be the contact person with whom the Secretary of the Department of Regional NSW can communicate in relation to the mining lease for the purposes of the Act.

For the mine that nominated person is the Site Manager whose full name and contact details including phone number and postal and email addresses are included in the RMP.

Any changes to the nominated person and / or contact details is to be advised within 28 days after the change occurs.

10 REFERENCES

Advisian (2019). Marulan South Limesone Mine Continued Operations – Surface Water Assessment. Prepared for Boral Cement Limited.

AEMR (2021). Annual Environmental Management Review (1 July 2020 to 30 June 2021) Marulan South Limestone Mine prepared by Boral Cement Limited

AGE (2019). Marulan South Limesone 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

ANZMEC and MCA (2000). Australian and New Zealand Minerals and Energy Council and Minerals Council of Australia (2000). Strategic Framework for Mine Closure.

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.

DPIE (2021a). Letter to Rachel Snape 17 September 2021 RE: Marulan South Limestone Mine Continued Operations Project (SSD-7009) Endorsement of Experts. NSW Department of Planning, Industry and Environment (DPIE).

DPIE (2021b). Letter to Les Longhurst 27 October 2021 RE: Marulan South Limestone Mine (SSD-7009) Time Extension for Management Plans. NSW Department of Planning, Industry and Environment (DPIE).

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.

Goulburn Mulwaree Biodiversity Strategy (July 2007) Project No. 145-001 FINAL Report prepared for Goulburn Mulwaree Council by Ecological Australia Pty Ltd 5 July 2007

Goulburn Mulwaree Council Social Sustainability Strategy and Action Plan 2019-2029 prepared for Goulburn Mulwaree Council by Cred Consulting 27 May 2020

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

NSW Trade and Investment (2013). ESG3: Mining Operations Plan (MOP) Guidelines. NSW Government.

RGS Environmental (2015) Letter Report entitled Geochemical Assessment of Waste Rock Materials from the Marulan Limestone Quarry

Richard Lamb and Associates (2018). Marulan South Minestone Mine SSD 7009 Continued Operations - Visual Impact Assessment. Prepared for Boral Cement Limited.

APPENDIX A

LAMAC Management, (October 2015) BSAL assessment report

MARULAN SOUTH LIMESTONE MINE CONTINUED OPERATIONS PROJECT

Assessment of Biophysical Strategic Agricultural Land (BSAL)

LAMAC Management, October 2015

Document Control

Document Title	Marulan South Limestone Mine Continued Operations Project – BSAL Assessment
General Description	Assessment of Project site against BSAL verification criteria

Rev No	Date	Description	By	Checked
0	06 September 2015	Draft	L.Crawford	N.Hattingh
1	10 October 2015	Final	L.Crawford	D.McKenzie

TABLE OF CONTENTS

1. Introduction

The Marulan South Limestone Mine (the mine) is an existing open cut mining operation situated in Marulan South, 10 km southeast of Marulan village and 35 km east of Goulburn, within the Goulburn Mulwaree Local Government Area in the Southern Tablelands of NSW.

Limestone mining and lime manufacturing has occurred on the site since 1875, with the current mine having been in continuous operation since 1953. The mine has produced up to 3.38 million tonnes of limestone and lime-based products per year for the cement, steel, agricultural, construction and commercial markets. The mine is owned and operated by Boral Cement Limited (BCL).

The mine currently operates under Consolidated Mining Lease (CML) 16, Environment Protection Licence 944, a combination of development consents issued by Goulburn Mulwaree Council and continuing use rights. BCL is seeking approval for continued operations at the site through a development application for a State Significant Development (SSD) including a 30 year mine plan, associated overburden emplacement areas and a mine water supply dam (hereafter referred to as 'the Project').

LAMAC Management Pty Ltd has been engaged by BCL to undertake a soils, land and rehabilitation assessment, as part of the SSD approval process. A component of the SSD approval process is the completion of a Biophysical Strategic Agricultural Land (BSAL) verification assessment in support of a Site Verification Certificate (SVC) application for the Project area.

This BSAL assessment report has been prepared in accordance with the *Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land* (NSW Government 2013) (interim protocol).

1.1. Project Area

The mine is located in a rural area bordered by extractive industry (Peppertree Quarry) to the north, Bungonia National Park and State Conservation Area to the South, Morton National Park to the East and an agricultural lime facility, fireworks storage facility and Turkey farm to the west.

The mine is situated on the edge of a plateau, approximately 560 m above the deeply incised Shoalhaven River. The terrain bordering the mine to the east and south-west is very steep with limited accessibility, characteristic of limestone environments. The land to the west and north-west of the mine (on which the BSAL assessment area is largely situated) consists of flat to undulating plateau landforms.

Local tributary gullies drain the Project area in an easterly and southerly direction to Barbers and Bungonia Creeks, which discharge into the Shoalhaven River further to the east.

The BSAL assessment area is described in greater detail in Section 3.1.

1.2. BSAL Process

The NSW government introduced a *Gateway Process* in 2013 to protect high value agricultural land from potential mining development impacts. The Gateway Process requires BSAL to be identified, and potential impacts assessed, before a development application can be lodged for mining and petroleum projects.

Under the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) Amendment (Resource Significance) 2013* (Mining SEPP amendment), the Gateway process applies to the following State Significant Development located wholly or partially on BSAL:

- State significant mining development that requires a new mining lease;
- Extraction of a bulk sample of more than 20,000 tonnes of coal or any mineral ore (ie. State significant mining exploration activity);
- State significant petroleum development that requires a new petroleum production lease;
- State significant petroleum exploration activity;
- Excluding any associated development, such as linear infrastructure, outside the area of a proposed mining or production lease.

The NSW government has mapped BSAL at a regional scale to assist with preliminary identification of BSAL during project planning. Regardless of whether a project area has been regionally mapped as BSAL or not, project proponents may apply for a SVC, which certifies that a project area does not meet BSAL criteria and is, therefore, exempt from the Gateway process. Applications for SVC must be accompanied by a BSAL assessment report completed in accordance with the interim protocol.

Under clause 17A of the Mining SEPP amendment, only those parts of a project area requiring a new mining lease (under the *Mining Act 1992*) are subject to the Gateway Process. Project development on existing mining leases, or on land not proposed for a mining lease, is not subject to, BSAL assessment or the Gateway Process.

2. Method

This assessment followed the initial steps outlined in Section 5 of the interim protocol to verify the presence of BSAL. These steps consisted of:

Step 1: Identify the project area which will be assessed for BSAL;
Step 2: Confirm access to a reliable water supply;
Step 3: Choose the appropriate approach to map the soils information; and
Step 4: Risk Assess the project area with respect to the proposed development.

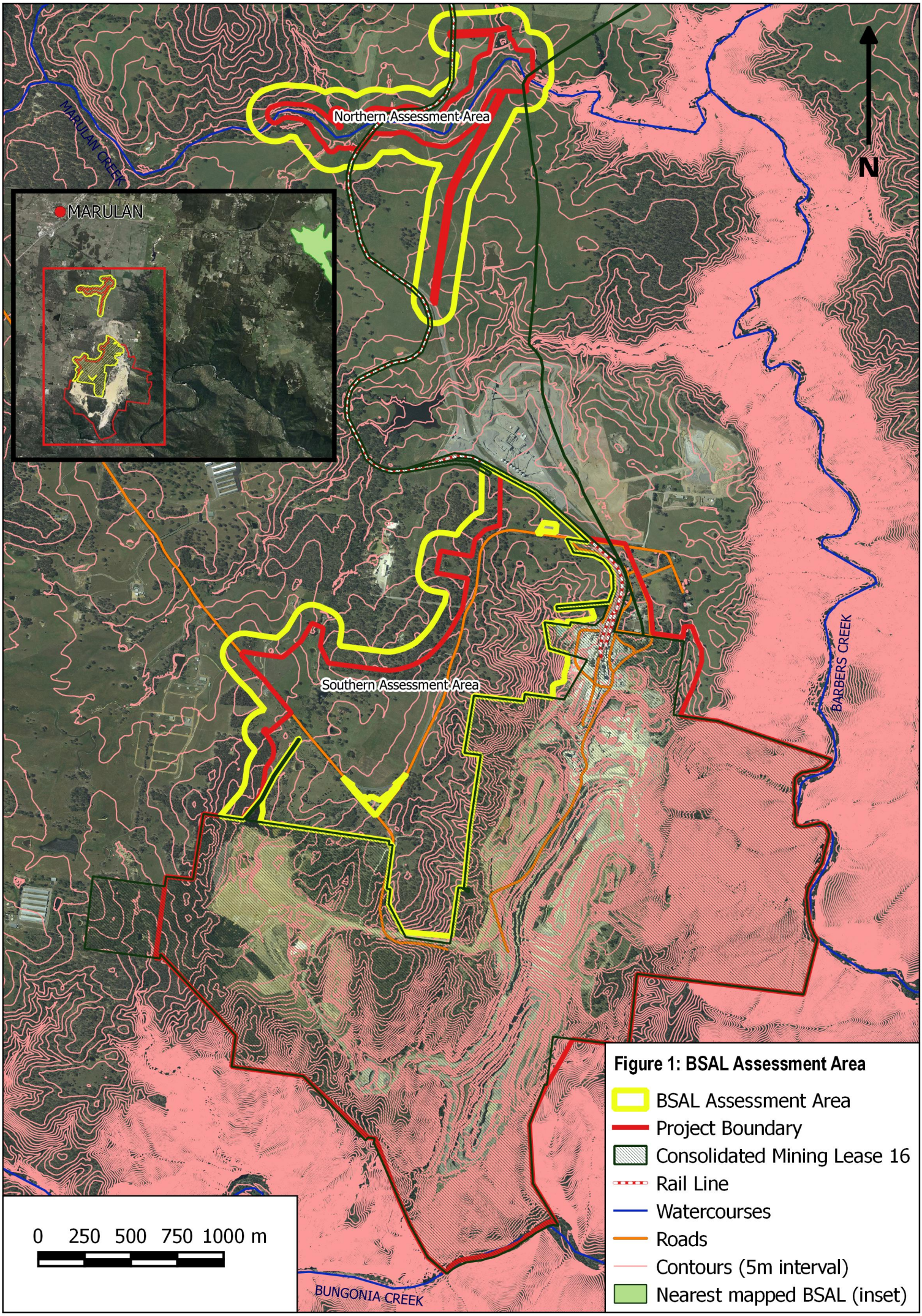
The methods used to complete these steps are presented in the following sections.

2.1. Assessment Area Definition

For the purposes of this BSAL assessment, the Project has been separated into two areas, referred to as the *Northern assessment area* and *Southern assessment area*, and are shown on Figure 1.

The Northern assessment area includes a proposed water supply dam for the Project on Marulan Creek, approximately 3km north of the mine. The Northern assessment area is defined by the likely maximum inundation level, and possible surface disturbance area resulting from the construction of the dam, including two proposed haul roads to facilitate construction access. The interim protocol also requires a 100m buffer zone around the proposed Project area to be included in the BSAL assessment area. Including this 100m buffer zone, the Northern assessment area is 94 ha.

The Southern assessment area includes land within the proposed Project boundary for the continued open cut mine operations, but excluding land within CML 16 and other areas subject to historic disturbance. The Southern assessment area was delineated by the maximum proposed surface disturbance footprint required for continued operations of the mine including expansion of the open cut pit, out of pit overburden emplacement and the construction or realignment of associated infrastructure such as Marulan South Road. Including the 100m buffer zone, the Southern assessment area is 226 ha. Therefore the total BSAL assessment area is 320 ha. The 100m buffer zone to the Project boundary required under the interim protocol represents 102 ha, or 32% of the total assessment area.


Northern Assessment Area
Southern Assessment Area
MARULAN CREEK
MARULAN
BARBERS CREEK
BUNGONIA CREEK
N
0 250 500 750 1000 m
Figure 1: BSAL Assessment Area
BSAL Assessment Area
Project Boundary
Consolidated Mining Lease 16
Rail Line
Watercourses
Roads
Contours (5m interval)
Nearest mapped BSAL (inset)

2.2. Access to Water

The interim protocol requires a property to have a reliable water supply to be classified as BSAL land.

Rainfall records are available from the Bureau of Meteorology Station at Marulan (George St) (Station 70063), located approximately 6km to the northwest of the Project Area. Rainfall data from this station indicates Annual Mean Rainfall of 709mm for the period July 1894 to May 2015. This meets the BSAL criteria for reliable water supply of rainfall of 350mm or more per annum (9 out of 10 years).

2.3. Assessment Approach

The BSAL assessment areas are situated on land owned by Boral and access was possible to both areas. Therefore, soils and landscape were assessed against BSAL verification criteria using on-site assessment.

2.4. Risk assessment

A risk assessment was completed to identify potential impact on agricultural/land resources and determine the appropriate scale of investigation. The methodology for the risk assessment followed the process outlined in the *Guideline for Agricultural Impact Statements at the Exploration Stage* (DTIRIS, 2012). This process assesses risk based on the probability of impact occurring, and the expected consequence of that impact. The interim protocol indicates that soil sampling densities can range between:

- 1 site per 25 – 400 ha for low risk; and
- 1 site per 5 – 25 ha for high risk.

Determination of appropriate investigation scale, based on risk assessment outcomes, is outlined below. Detailed risk assessment results are presented in Appendix 1.

Northern Assessment Area

Of the 94 ha investigated in the Northern assessment area, 18 ha is predicted to be impacted by the Project. This includes approximately 10 ha of inundation (at maximum dam capacity as defined by the 598m AHD contour) and up to 8 ha of disturbance related to dam construction. This 18 ha was assessed as being moderate to high risk of impact to agricultural resources. The remaining 76 ha of land within the Northern assessment area, was assessed as having a low risk of impact as it is located outside of the Project disturbance footprint. A survey density of 1 detailed site per 30 ha, with the priority of effort being centred on the high risk zone, was selected for the Northern assessment area.

Southern Assessment Area

Of the 226 ha investigated in the Southern assessment area, approximately 169 ha is predicted to be impacted by the Project. This includes approximately 164 ha of overburden emplacement and approximately 5 ha in the construction or realignment of roads and the development of the Road Sales Stockpile Area. This 169 ha is assessed as being a high risk of impact to agricultural resources. The remaining 57 ha of land within the Southern assessment area was assessed as having a low risk of impact as it is located outside of the Project disturbance footprint. An investigation density of approximately 1 detailed site per 20 ha was selected for the Southern assessment area.

2.5. Soils and Landscape Assessment

Following the completion of the four initial BSAL verification steps, an investigation of the assessment areas was undertaken to identify and map soil types, and compare soil and landscape properties with the BSAL verification criteria presented in the interim protocol. The assessment consisted of two main components: the preliminary assessment and the field assessment.

The soil and landscape assessment was completed in accordance with the requirements of the interim protocol, and following the methodology presented in Part 5 of *Guidelines for Surveying Soil and Land Resources* (McKenzie *et al*. 2008). Soil and landscape attributes were characterised using the terminology described in the *Australian Soil and Land Survey Field Handbook* (National Committee on Soil and Terrain 2009), and soil profiles were classified according to the *Australian Soil Classification* (Isbell 2002) (ASC).

2.5.1. Personnel

The planning and assessment work for this BSAL investigation was undertaken by Lachlan Crawford of LAMAC Management. Lachlan is an environmental consultant with 20 years' experience in land resource management and disturbed land rehabilitation, including numerous soil and land resource assessments for mining projects in NSW and QLD.

David McKenzie (Certified Professional Soil Scientist, Stage 3, Soil Science Australia and 'CPSS Competent in Australian Soil Survey') was engaged to audit the approach, quality and accuracy of the work completed as part of the BSAL assessment.

2.5.2. Preliminary Assessment

Before commencing the field assessment, a preliminary assessment was undertaken to produce a preliminary soil and landscape map. This assessment involved the following sources of information.

- Surface Geology Mapping (online Atlas of NSW, NSW Land & Property Information);
- Regional BSAL mapping (NSW Government 2014);
- Land and Soil Capability mapping (Office of Environment and Heritage 2013);
- Soils and landscape information contained in BCL documents;
- Aerial photography and LIDAR imagery provided by BCL; and
- Soil profile and landscape information contained in the Soil and Land Information System (SALIS), accessed via eSPADE spatial viewer.

No detailed soil mapping covers the assessment area; however, *Soil Landscapes of the Goulburn 1:250 000 sheet* (Hird, 1991) maps soil landscape units to within 800 m of the western boundary of the assessment area and was referenced for background information.

During the preliminary assessment, land within the assessment area of slope greater than 10 percent was identified using Light Detection and Ranging (LIDAR) imagery provided by BCL. Detail on the slope analysis methodology is provided in Appendix 2.

Provisional site locations for soil investigation were allocated during the preliminary assessment, based on the information discussed above.

2.5.3. Field Assessment

2.5.3.1. Reconnaissance Inspection

An inspection of the assessment areas was undertaken on the 7 April 2015 to finalise and mark out the soil investigation site locations selected during the preliminary assessment. Likely exclusion areas were identified during this inspection, based on the BSAL criteria relating to rock outcropping, surface rock fragments and gilgai presence.

2.5.3.2. Test Pits

Thirteen test pits (Sites 1 to 14, excluding Site 10) were excavated to 1.4m, or until refusal on weathered bedrock, to facilitate detailed soil profile description. Test pit locations were selected to provide even and representative coverage of the assessment areas, according to the selected investigation densities discussed in Section 2.4.

The proposed Site 10 was not investigated, as it was located within the existing CML 16 boundary.

Landscape features surrounding each test pit were photographed and described including:

- Site identification and location;
- Excavation method and depth;
- Landuse and vegetation cover;
- Slope gradient;
- Microrelief; and
- Rock outcropping.

Soil profiles were photographed and sampled, with soil profiles being described in accordance with the requirements of the interim protocol. The following soil profile attributes were recorded for each location.

- Horizon identification and lower boundary depth;
- Horizon boundary distinctiveness;
- Horizon colour and mottling;
- Field texture;
- Soil structure/ pedality;
- Field pH (using Raupach test kit);
- Soil moisture and drainage conditions;
- Coarse fragments and segregations;
- Root presence;
- Dispersion and slaking in deionised water; and
- Lower horizon carbonate presence (effervescence with 1M HCL).

Several test pits had been hand-excavated to the upper boundary of the B horizon as part of an archaeological assessment being undertaken across the Project area. Several of these pits were inspected during the field assessment, with near surface soil horizons being assessed. As these pits were only 30 cm deep, they did not meet interim protocol requirements for check sites, and are not designated as such. However, these archaeological test pits (ATP) were used, along with other surface observations (such as road, creek and erosion cuttings) to assist with delineation of soil unit boundaries. Test Pits ATP 18 and ATP 38, in particular, were used to confirm soil type

along the proposed Marulan Creek Dam southern construction access road. Photographs of ATP 18 and 38 are included in Appendix 3, with locations shown on Figure 3.

2.5.3.3. Laboratory Analysis

Sixty-three soil samples were collected from test pit horizons and sent for analysis to the NATA (National Association of Testing Authorities) registered NSW Soil Conservation Service Laboratory, Scone NSW.

Samples were typically collected from depth intervals 0-5cm; 5-15cm; 15-30cm; 30-60cm; and, 60-100cm. However, minor variations in sampling interval depths did occur to ensure samples did not cross horizon boundaries.

Samples were analysed for:

- Soil pH (1:5 soil:water or 1:5 soil:$CaCl_2$);
- Electrical conductivity (EC 1:5, and calculation of ECe);
- Cation Exchange Capacity (CEC);
- Exchangeable cations for calculation of exchangeable sodium percentage (ESP) and Ca:Mg ratio; and
- Seven samples that indicated moderate to high dispersion in field testing were also tested for EAT including:
    - Site 1: 30-60 cm;
    - Site 4: 30-48 cm;
    - Site 6: 9-15 cm;
    - Site 7: 32-60 cm;
    - Site 8: 8-15 cm;
    - Site 8: 15-30 cm; and
    - Site 14: 15-30 cm.

Tabulated analytical results are included in Appendix 4, and the laboratory analysis report is included as Appendix 5.

2.5.3.4. Mapping and BSAL Verification

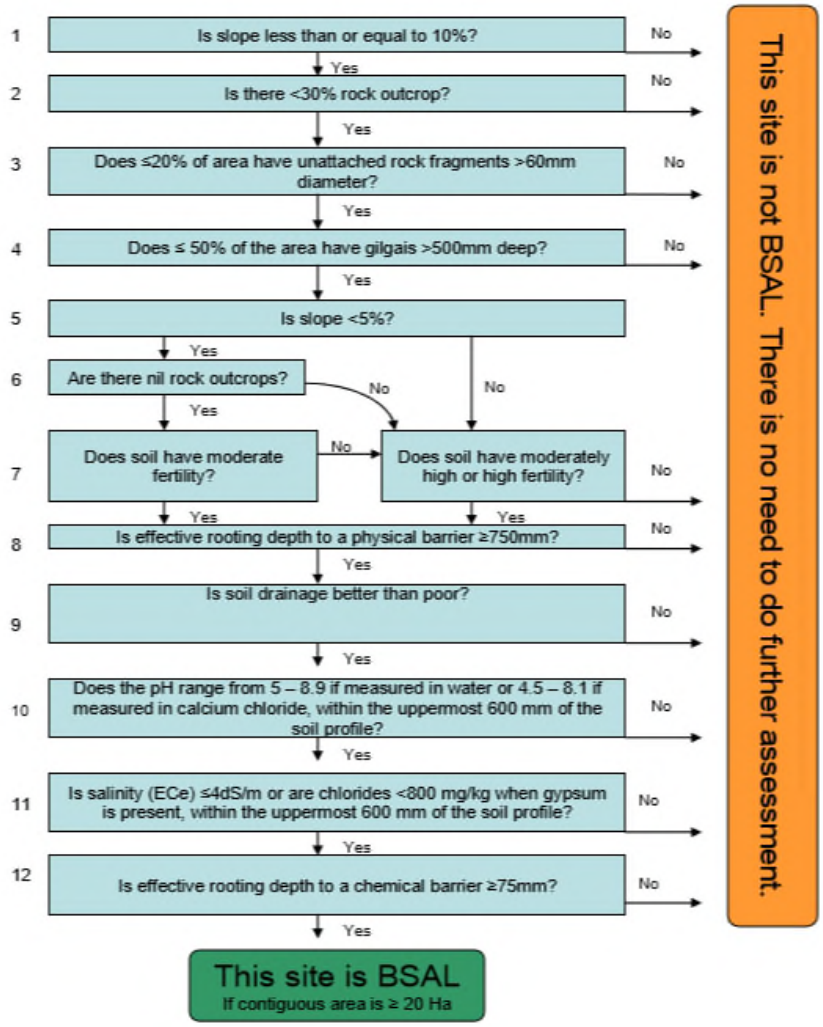
The interim protocol presents ten criteria for verifying the presence of BSAL, as shown in Figure 2, with the minimum area for BSAL being 20 ha. If soils or landform (of area > 20 ha) does not meet any one of these criteria, it is not considered BSAL.

Exclusion mapping based on the first criterion (land gradient > 10% slope) was undertaken during the preliminary assessment, and potential for exclusion due to criteria 2 to 4 (rock outcrop, surface rock fragments and gilgai) was assessed during the field assessment.

Soil profile and landscape attributes recorded during the field assessment were used to:

a) Classify soil type, using the ASC, to Family level;
b) Map soil types within the assessment areas; and
c) Compare soil and landscape attributes against BSAL verification criteria.

Figure 2: Twelve criteria presented in interim protocol to verify presence of BSAL.



3. Assessment Results

3.1. Preliminary Assessment

The following background information on soils and landscape within the assessment areas was noted during the preliminary assessment from the sources outlined in Section 2.5.2.

3.1.1. Geology

The Northern assessment area overlies the Glenrock Granodiorite intrusion. The majority of the Southern assessment area overlies a Silurian-Devonian geology unit known as the Bungonia Limestone formation, consisting of interbedded fossiliferous shale, sandstone, limestone and siltstone. Weathered granodiorite bedrock was also encountered in the far south and east of the Southern assessment area.

3.1.2. Landscape

Land and Soil Capability mapping (OEH 2013) indicates that the flat to undulating plateau that comprises the majority of the Northern and Southern assessment areas is considered *Class V: Severe Limitations - land not capable of sustaining high impact landuses without special management*. The eastern margins of the Southern assessment area, consisting of moderately steep upper slopes, are mapped as *Class VII: Extremely severe limitations – land incapable of sustaining most landuses*. The far eastern corner of the Northern assessment area, consisting of extremely steep and rocky upper slopes is mapped as *Class VIII: Extreme limitations – land incapable of sustaining any landuses*.

Slope exclusion mapping, derived from aerial photography and LIDAR imagery and prepared in accordance with the methodology presented in Appendix 2, indicates that approximately 6.9 ha (7%) of the Northern assessment area has a slope gradient greater than 10 percent. Approximately 37.7 ha (17%) of the Southern assessment area has a slope gradient greater than 10 percent. This slope exclusion mapping is presented in Figures 3 and 4.

3.1.3. Soils

A review of the background soils information listed in Section 2.5.2 indicates that texture contrast soils are dominant within the BSAL assessment area. An assessment of topsoil suitability for use in post-mine rehabilitation identified the dominant soil types in the south and east of the Southern assessment area as Yellow Duplex and Red Duplex soils (GSS Environmental, 2010).

Regional mapping of ASC soil types (accessed via eSPADE) within the BSAL assessment area identifies the following soil landscape associations:

- Kurosols, natric – lower slopes, flats and drainage depressions within the Southern assessment area;
- Sodosols – mid-slopes, upper-slopes and crests within the Northern and Southern assessment areas; and
- Rudosols/Tenosols – steep slopes in east margins of the Southern assessment area.

The SALIS database (accessed via eSPADE) identified two recorded soil profiles in the vicinity of the assessment areas. Although neither of these eSPADE soil profiles included laboratory analyses, they did include detailed descriptions. The profiles included:

Location	***ASC Classification***
50m east of northeast boundary of Southern assessment area	Brown Chromosol, - Haplic, thin, slightly gravelly, loamy, clayey, deep
350m northwest of western boundary of Southern assessment area	Brown Sodosol, -, -, thin, non-gravelly, loamy, clayey, deep

3.1.4. Mapped BSAL and Critical Industry Clusters

The 2014 BSAL mapping of NSW indicates that the nearest mapped BSAL is approximately 7.5 km to the northeast of the assessment areas. The nearest mapped BSAL land is shown on Figure 1.

Critical Industry Clusters (CIC) are concentrations of highly productive agricultural industries located within the NSW Upper Hunter, such as the equine (horse) and viticulture (wine) industries. The NSW government has mapped CIC, and potential Project impacts on CIC are assessed as part of the Gateway Process.

As CIC mapping covers only the NSW Hunter Valley, approximately 300km north of the assessment areas, mapped CIC are of no relevance to this assessment.

3.2. Field Assessment

Soil profiles at each of the 13 sites were classified according to the ASC, to Family level. Soil attributes observed during field assessment are presented in Appendix 4. The soil types identified are shown in Table 1, to Subgroup level. From these soil classifications, three soil units were identified within the assessment areas, consisting of:

- 87 ha (Northern assessment area) and 138 ha (Southern assessment area) of Brown/Red Sodosols (dominant)/ Brown Chromosol (minor) associated with mid to upper slopes across both the Northern and Southern assessment areas;
- 38.6 ha of Brown-Orthic/ Bleached-Orthic Tenosols associated with the crests and steep eastern slopes of the ridgeline in the south and east of the Southern assessment area; and
- A minor area (12.5 ha) of Brown Kurosol associated with the lower slopes, flats and depressions in the central part of the Southern assessment area.

Based on assessment of archaeological test pits ATP 18 and 38, which were exposed as deep as the upper boundary of the B horizon, soils along the proposed Marulan Creek Dam, southern construction access road within the Northern assessment area were identified as texture contrast soils, consistent with the Red Sodosols observed at nearby Site 01. On this basis, the Brown/Red Sodosol soil unit extended across the entire Northern assessment area.

The typical attributes of these soil units are described in Section 3.5, with mapped soil units shown on Figure 3.

Soil profile descriptions have been submitted via the eDIRT online data entry portal for inclusion in the SALIS database. Acknowledgements of successful submission of soil profiles are included in Appendix 6. These soil profiles will be available for viewing on the eSPADE online access.

3.3. BSAL Presence

The soil and landscape attributes of each site were compared against the BSAL verification criteria presented in the interim protocol. As indicated in Table 1, none of the 13 sites met all the BSAL criteria. Limiting factors for each soil landscape unit are discussed in Section 3.4 and major limiting factors for BSAL are shown in Figure 4.

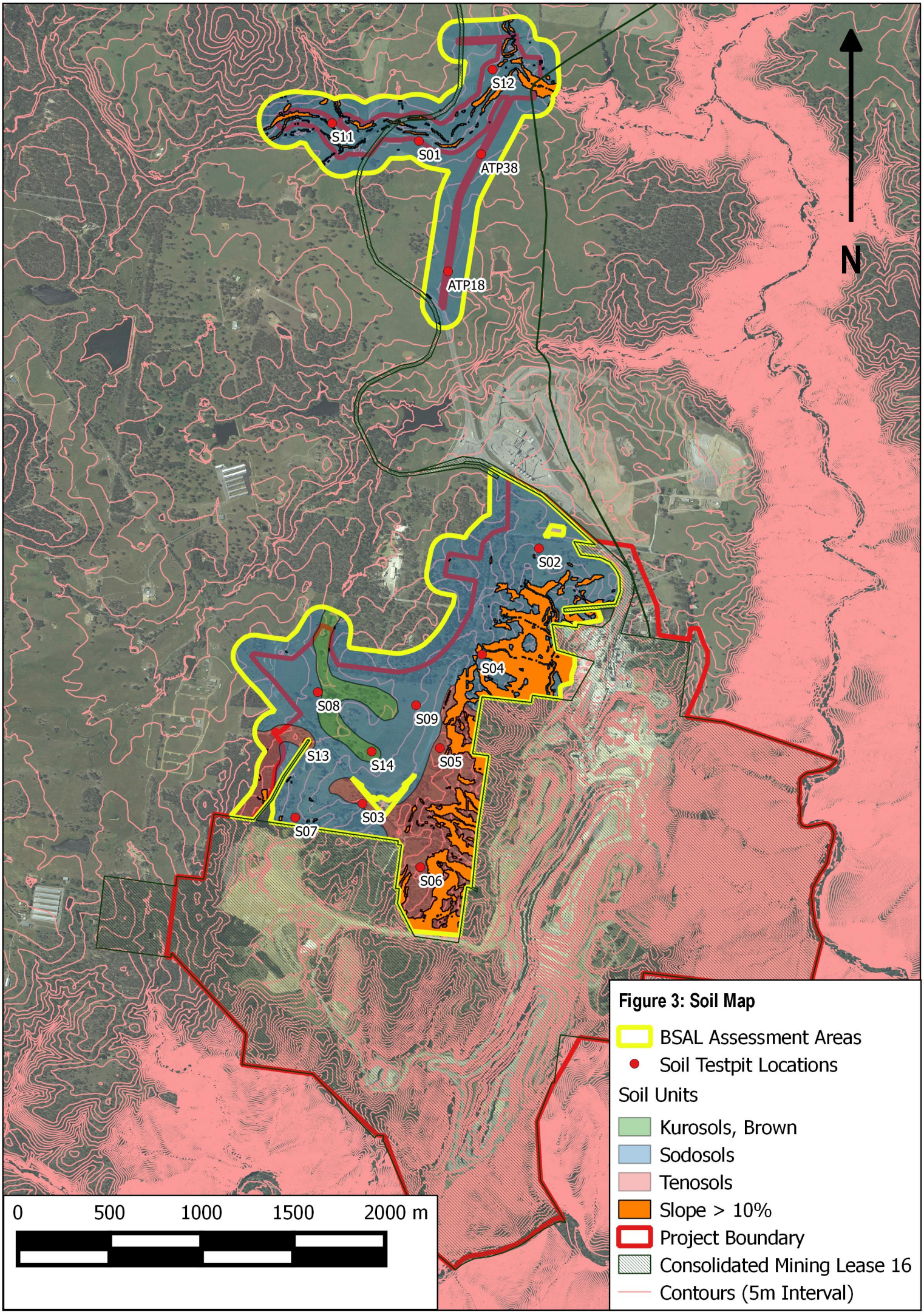
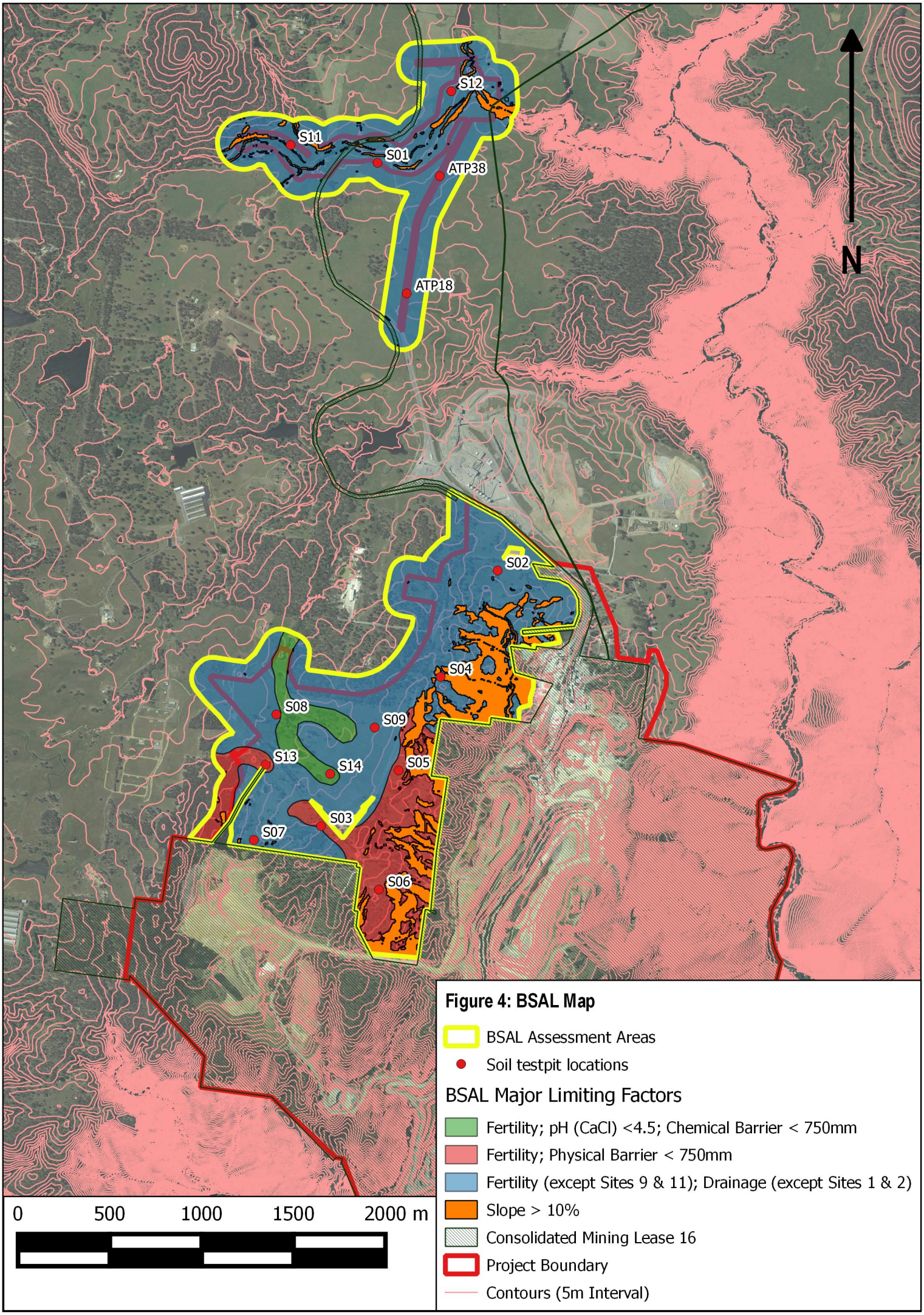

S12
S11
S01
ATP38
ATP18
N
S02
S04
S08
S09
S13
S14
S05
S03
S07
S06
0
500
1000
1500
2000 m
Figure 3: Soil Map
BSAL Assessment Areas
Soil Testpit Locations
Soil Units
Kurosols, Brown
Sodosols
Tenosols
Slope > 10%
Project Boundary
Consolidated Mining Lease 16
Contours (5m Interval)

Table 1: BSAL Verification Summary

Site Number	Inspection Site Type	Australian Soil Classification (to ASC Family)					1. Is slope < 10%?	2. Is there < 30% Rock Outcrop?	3. < 20% unattached Rock Fragments > 60mm?	4. Does < 50% have Gilgais >500mm deep?	5. Is Slope <5%?	6. Are there nil rock outcrops?	7a. Does Soil Have Moderate fertility?	7b. Does soil have Moderately High or High fertility?	8. Is effective rooting depth to a physical barrier >750mm?	9. Is drainage better than poor?	10. Is pH (CaCl2) between 4.5 and 8.1 in upper most 600mm?	11. Is salinity (ECe) < 4 dS/m in uper most 600mm?	12. Is effective rooting depth to a chemical barrier >750mm?	Is the Site BSAL?
		Subgroup	Great Group	Suborder	Order	Family														
1	Detailed	Eutrophic	Subnatric	Red	Sodosol	Medium, non-gravelly, loamy, clayey, moderate	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	No
2	Detailed	Eutrophic	Mottled-Subnatric	Brown	Sodosol	Medium, non-gravelly, loamy, clayey, moderate	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	No
3	Detailed	Basic	Ferric	Bleached-Orthic	Tenosols	Medium, non-gravelly, loamy, clay loamy, shallow	Yes	Yes	Yes	Yes	Yes	Yes	No	No	50% Fe nodule layer at 30-41cm	Red mottle 30% & distinct	No	Yes	pH 4.3 at 41-60cm	No
4	Detailed	Eutrophic	Mottled-Subnatric	Brown	Sodosols	Medium, non-gravelly, loamy, clayey, shallow	Yes	Yes	Yes	Yes	No	N/A	N/A	No	Yes	Grey mottle 30% & distinct	No	Yes	pH 4.4 at 30-48cm	No
5	Detailed	Basic	Paralithic	Brown-Orthic	Tenosol	Thick, slightly gravelly, loamy, clayey, shallow	Yes	Yes	Yes	Yes	Yes	Yes	No	No	50% weath sandstone at 60cm	Yes	Yes	Yes	Yes	No
6	Detailed	Basic	Paralithic	Bleached-Orthic	Tenosol	Medium, slightly gravelly, loamy, clayey, shallow	Yes	Yes	Yes	Yes	Yes	Yes	No	No	60% weath granite at 60cm	Grey mottle 30% & distinct	Yes	Yes	Yes	No
7	Detailed	Magnesic	Mottled-Subnatric	Red	Sodosol	Thick, non-gravelly, loamy, clayey, moderate	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Y.br. mottle 20% & distinct	Yes	Yes	Ca:Mg ratio < 0.1 at 60cm	No
8	Detailed	Eutrophic	Mottled-Subnatric	Brown	Sodosol	Medium, non-gravelly, loamy, clayey, moderate	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	R.Br. mottle 40% & distinct	Yes	Yes	Yes	No
9	Detailed	Bleached-Mottled	Mesotrophic	Brown	Chromosol	Thick, non-gravelly, loamy, clayey, moderate	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Red mottle 40% & distinct	Yes	Yes	Ca:Mg ratio < 0.1 at 60cm; pH 4.3	No
11	Detailed	Mottled-Sodic	Eutrophic	Brown	Chromosol	Medium, non-gravelly, clay loamy, clayey, deep	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Grey mottle 50% & distinct	Yes	Yes	Yes	No
12	Detailed	Eutrophic	Mottled-Subnatric	Brown	Sodosol	Thick, non-gravelly, loamy, clayey, deep	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Grey mottle 20% & distinct	Yes	Yes	Yes	No
13	Detailed	Basic	Paralithic	Brown-Orthic	Tenosol	Medium, slightly gravelly, clay loamy, clayey, moderate	Yes	Yes	Yes	Yes	Yes	Yes	No	No	70% weath granite at 70cm	Yes	Yes	Yes	Yes	No
14	Detailed	Bleached-Sodic	Mesotrophic	Brown	Kurosol	Thick, non-gravelly, loamy, clayey, moderate	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	pH 4.4 at 45-60cm	No

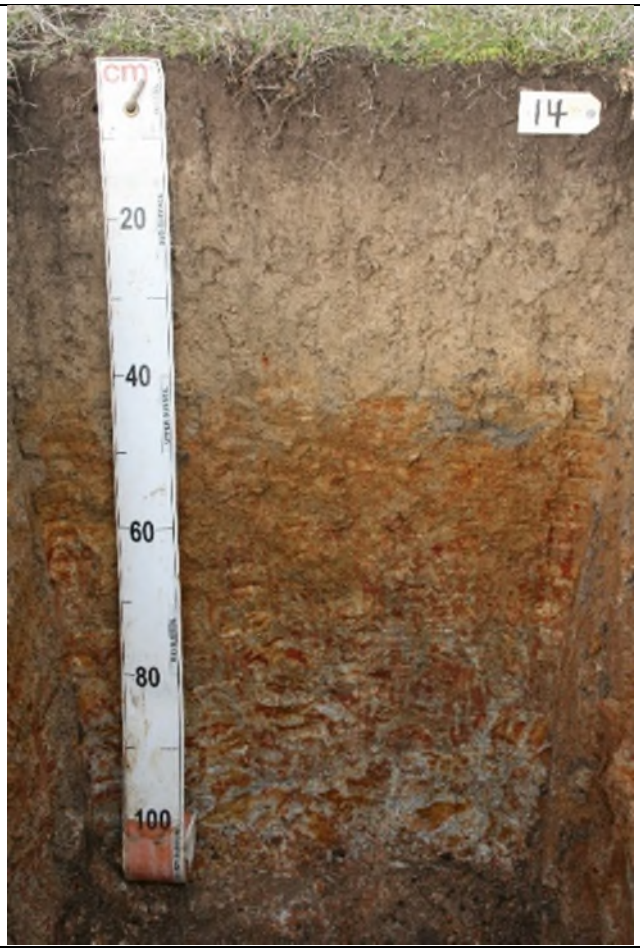

S12
S11
S01
ATP38
ATP18
S02
S04
S08
S09
S13
S14
S05
S03
S07
S06
N
0
500
1000
1500
2000 m
Figure 4: BSAL Map
BSAL Assessment Areas
Soil testpit locations
BSAL Major Limiting Factors
Fertility; pH (CaCl) <4.5; Chemical Barrier < 750mm
Fertility; Physical Barrier < 750mm
Fertility (except Sites 9 & 11); Drainage (except Sites 1 & 2)
Slope > 10%
Consolidated Mining Lease 16
Project Boundary
Contours (5m Interval)

3.4. Soil Units Identified in Assessment Area

<table>
<tr><td colspan="3">Soil Unit: Sodosol, Red/ Brown</td></tr>
<tr><td>Representative Dominant Sites:</td><td>1 & 7 (Red)
2, 4, 8and 12(Brown)</td><td rowspan="5"> 
</td></tr>
<tr><td>Minor Sites</td><td>9 & 11 (Brown Chromosol)</td></tr>
<tr><td rowspan="3">Typical Soil Profile</td><td>A1: 0-11 – Very dark grey loam, very weak angular-blocky, rough-faced, peds 30-40mm, moist, nil gravel</td></tr>
<tr><td>A2: 11-21 – Yellowish brown, sandy loam, weak polyhedral, rough faced peds, 20-40mm, moist, nil gravel</td></tr>
<tr><td>B2: 21-95 – Light olive brown heavy clay, apedal massive, moist, increasing weathered bedrock fragments</td></tr>
<tr><td></td><td>B/C: 95- >140 – weathered bedrock</td><td>Soil Profile Site: 2 (Brown Sodosol)</td></tr>
<tr><td>Roots:</td><td>Fine, few to 44cm</td><td rowspan="4">  </td></tr>
<tr><td>Landscape Association:</td><td>Mid to upper slopes</td></tr>
<tr><td>Landuse:</td><td>Low density sheep grazing</td></tr>
<tr><td colspan="2">BSAL Status and limiting factors:
Not BSAL.
Fertility Moderately Low at all sites except 9 and 11.
Indicators of poor drainage (such as distinct mottling) at all sites except Sites 1 and 2.
Site 4 has pH ($CaCl_2$) of 4.4 at < 600mm depth which also represents a chemical barrier at <750 mm depth. Site 9 has pH of 4.3 at <600mm depth and Ca:Mg ratio < 0.1 at < 750mm depth.</td></tr>
<tr><td colspan="2"></td><td>Landscape Site: 4</td></tr>
</table>

<table>
<tr><td colspan="3">Soil Unit: Tenosol, Bleached-Orthic / Brown-Orthic</td></tr>
<tr><td>Representative Dominant Sites:</td><td>3 & 6 (Bleached-Orthic)</td><td rowspan="3"> 


</td></tr>
<tr><td>Co-dominant Sites:</td><td>5 & 13 (Brown-Orthic)</td></tr>
<tr><td rowspan="3">Typical Soil Profile</td><td>A1: 0-11 – Dark brown sandy loam, weak angular-blocky, rough-faced, peds 10-30mm, moist, 0-10% gravel</td></tr>
<tr><td>B2: 11-60 – Yellowish brown heavy clay, apedal massive</td></tr>
<tr><td>B/C: 60- >95 – weathered bedrock</td><td>Soil Profile Sites: 6 & 13</td></tr>
<tr><td>Roots:</td><td>Fine, few to 58cm</td><td rowspan="4">  </td></tr>
<tr><td>Landscape Association:</td><td>Crests and steep slopes</td></tr>
<tr><td>Landuse:</td><td>Mine buffer land</td></tr>
<tr><td colspan="2">BSAL status and limiting factors:
Not BSAL.
Fertility Moderately Low at all sites.
Physical barrier (typically high proportion of weathered bedrock fragments) at <750 mm depth at all sites;
Site 3 has pH ($CaCl_2$) of 4.3 at < 600mm depth, which also represents a chemical barrier at <750 mm depth.
Indicators of poor drainage at Sites 3 and 6.</td><td>Landscape Site: 3</td></tr>
</table>

<table>
<tr><td colspan="3">Soil Unit: Kurosol, Brown</td></tr>
<tr><td>Representative Sites:</td><td>14</td><td rowspan="4"> 
</td></tr>
<tr><td rowspan="3">Typical Soil Profile</td><td>A1: 0-12 – Dark greyish brown sandy loam, weak polyhedral, rough-faced, peds 10-20mm, moist, nil gravel</td></tr>
<tr><td>A2: 12-44 – Light yellowish brown, sandy clay loam, weak polyhedral, rough faced peds, 20-30mm, moist, 20% ironstone nodules</td></tr>
<tr><td>B2: 44-65 – Yellowish brown medium clay, weak polyhedral to platy peds, 5-10mm, moist, 5% weathered bedrock fragments</td></tr>
<tr><td>B/C: 65- >110 – weathered bedrock</td><td>Soil Profile Site: 14</td></tr>
<tr><td>Roots:</td><td>Fine, few to 57cm</td><td rowspan="4">  </td></tr>
<tr><td>Landscape Association:</td><td>Flats and drainage depressions</td></tr>
<tr><td>Landuse:</td><td>Low density sheep grazing</td></tr>
<tr><td colspan="2">BSAL status and limiting factors:
Not BSAL.
Fertility ranking Moderate.
Site 14 has pH ($CaCl_2$) of 4.4 at < 600 mm depth, which also represents a chemical barrier at <750 mm depth.
Indicators of poor drainage (bleached A2 horizon) at Site 14.</td><td>Landscape Site: 14</td></tr>
</table>

4. Conclusion

The BSAL assessment was completed in June- July 2015. The BSAL assessment area, consisting of the Northern assessment area and Southern assessment area, totalled 320 ha. The BSAL assessment was undertaken in accordance with the requirements of the interim protocol. No BSAL was identified within the BSAL assessment area.

5. References

Department of Trade and Investment Regional Infrastructure and Services (2012) *Strategic Regional Land Use Policy, Guideline for Agricultural Impact Statements at the Exploration Stage*

GSS Environmental (2010) *Marulan South Limestone Mine Rehabilitation Strategy*

Hazelton P and Murphy B (2007) Interpreting Soil Test Results – What do all the numbers mean? (CSIRO Publishing: Collingwood Australia)

Hird C (1991) *Soil Landscapes of the Goulburn 1:250 000 sheet*. Department of Conservation and Land Management, NSW

Isbell RF (2002) *The Australian Soil Classification*, Revised Edition (CSIRO Publishing: Collingwood Australia)

McKenzie NJ, Grundy MJ, Webster R, Ringrose-Voase AJ (2008). *Guidelines for Surveying Soil and Land Resources*. 2nd Edition (CSIRO Publishing: Collingwood Australia)

Munsell Color (2009) Munsell Soil-Color Book

National Committee on Soil and Terrain (2009) *Australian Soil and Land Survey Field Handbook* (CSIRO Publishing: Collingwood Australia)

NSW Government (2013) *Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land*

NSW Government (2014) *Regional Biophysical Strategic Agricultural Land mapping.* Online

NSW Land & Property Information. Online Atlas of NSW - Surface Geology Mapping.

Office of Environment and Heritage (2013) Land and Soil Capability mapping. Online

Office of Environment and Heritage. Soil and Land Information System (SALIS), accessed via eSPADE spatial viewer.

Appendix 1 - Risk Assessment

A risk assessment of potential impact to agricultural land was completed for the proposed Project disturbance areas. The assessment utilised the Risk Ranking matrix presented in Table A1, and probability and consequence descriptions presented in Tables A2 and A3, respectively. These risk ranking criteria are taken from the *Guideline for Agricultural Impact Statements at the Exploration Stage* (DTIRIS, 2012). A summary of the assessment findings are presented in Table A4.

Table A1: Risk ranking matrix.

Consequence \ PROBABILITY	A Almost Certain	B Likely	C Possible	D Unlikely	E Rare
1. Severe and/or permanent damage. Irreversible impacts	**A1 high**	**B1 high**	**C1 high**	D1 high	E1 medium
2. Significant and /or long term damage. Long term mgt implications. Impacts difficult or impractical to reverse.	**A2 high**	**B2 high**	**C2 high**	D2 medium	E2 medium
3. Moderate damage and/or medium-term impact to agricultural resources or industries. Some ongoing mgt implications which may be expensive to implement. Minor damage or impacts over the long term.	**A3 high**	**B3 high**	**C3 medium**	D3 medium	**E3 medium**
4. Minor damage and/or short-term impact to agricultural resources or industries. Can be managed as part of routine operations	A4 medium	B4 medium	C4 low	D4 low	**E4 low**
5. Very minor damage and minor impact to agricultural resources or industries. Can be effectively managed as part of normal operations	A5 low	B5 low	C5 low	**D5 low**	**E5 low**

where:

= low risk

= medium risk

= high risk

Table A2: Risk probability class descriptions

Level	Descriptor	Description
A	Almost Certain	Common or repeating occurrence
B	Likely	Known to occur or it has happened
C	Possible	Could occur or I've heard of it happening
D	Unlikely	Could occur in some circumstances but not likely to occur
E	Rare	Practically impossible or I've never heard of it happening

Table A3: Risk consequence class descriptions

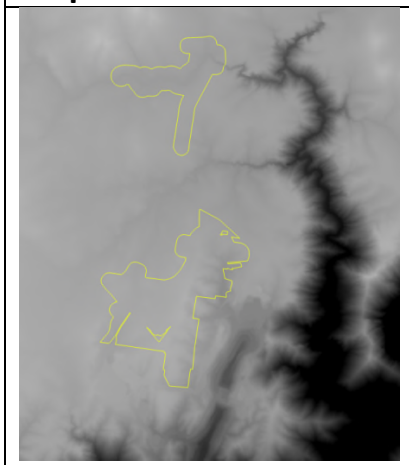
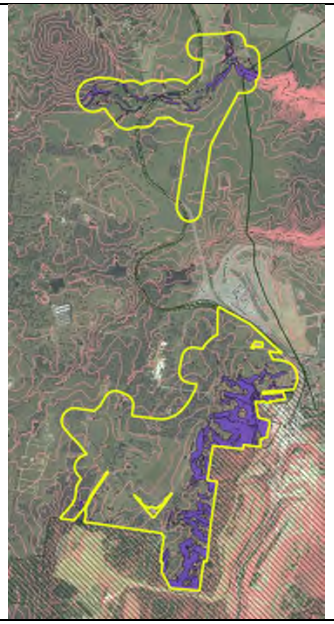
Level: 1	Severe Consequences	Example of Implications
Description	Severe and/or permanent damage to agricultural resources, or industries Irreversible Severe impact on the community	Long term (eg 20 years) damage to soil or water resources Long term impacts (eg 20 years) on a cluster of agricultural industries or Important agricultural lands
Level: 2	**Major Consequences**	**Example of Implications**
Description	Significant and/or long-term impact to agricultural resources, or industries Long-term management implications Serious detrimental impact on the community	Water and / or soil impacted, possibly in the long term (eg 20 years) Long term (eg 20 years) displacement / serious impacts on agricultural industries
Level:3	**Moderate Consequences**	**Example of Implications**
Description	Moderate and/or medium-term impact to agricultural resources, or industries Some ongoing management implications Minor damage or impacts but over the long term.	Water and/ or soil known to be affected, probably in the short – medium term (eg 1-5 years) Management could include significant change of management needed to agricultural enterprises to continue.
Level: 4	**Minor Consequences**	**Example of Implications**
Description	Minor damage and/or short-term impact to agricultural resources, or industries Can be effectively managed as part of normal operations	Theoretically could affect the agricultural resource or industry in short term, but no impacts demonstrated Minor erosion, compaction or water quality impacts that can be mitigated. For example, dust and noise impacts in a 12 month period on extensive grazing enterprises.
Level: 5	**Negligible Consequences**	**Example of Implications**
Description	Very minor damage or impact to agricultural resources, or industries Can be effectively managed as part of normal operations	No measurable or identifiable impact on the agricultural resource or industry

Table A4: Risk ranking for proposed Project disturbance activities.

Assessment Area	Existing Environment	Proposed Disturbance	Area (ha)	Probab-ility	Conse-quence	Risk Ranking
Northern	Cleared land used for livestock grazing. Low undulating rises along creek bed (Land Capability Class V). Steeply incised gully towards eastern margin (Land Capability Class VIII).	Construction of dam at eastern end of area and access roads.	8	A	2/3	High
		Dam inundation area	10	A	2	High
		Buffer zone	76	D	5	Low
Southern	Predominantly cleared land used as mine buffer land in the east and for livestock grazing in the west. Gentle slopes and flats in the west ((Land Capability Class V). Moderate to steep slopes in the east (Land Capability Class VII).	Overburden emplacements	164	A	1	High
		Infrastructure: realignment of Marulan South Rd and drainage infrastructure.	5	A	1	High
		Buffer Zone	57	C	5	Low

Appendix 2 – Slope Analysis

An analysis of terrain within the BSAL assessment areas was undertaken to identify slope gradient greater than ten percent (10%), and exclude those areas from further assessment. LIDAR imagery of the assessment areas was collected in November 2014, and processed using QGIS as described below.

Step 1	Step 2	Step 3	Step 4	Step 5
				
LIDAR imagery of Project area displayed as raster layer in QGIS, with vector polygons of BSAL assessment areas shown in yellow.	LIDAR image clipped to 100m buffer around BSAL assessment areas and analysed for slope using QGIS *Terrain Analysis*, giving a range of 0-25% slope within the area.	QGIS *Raster Calculator* used to identify areas of slope greater than 10% (white areas).	Raster image converted to vector polygons, with brown areas representing slope less than 10%, and green showing areas greater than 10% slope.	Polygons clipped to BSAL assessment areas, with purple polygons representing those areas with slope greater than 10%.

APPENDIX B

Site Verification Certificate dated 17 November 2015

Site Verification Certificate
Marulan South Limestone Mine

Part 4AA, Division 3 of *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007*

Pursuant to clause 17C(1) of the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007*, I determine the application made by Boral Cement Limited by issuing this certificate.

I certify that in my opinion, having regard to the criteria in the *Interim protocol for site verification and mapping of biophysical strategic agricultural land*, the land specified in Schedule 1 is not Biophysical Strategic Agricultural Land.

The reasons for forming the opinion on each of the relevant criteria are contained in Schedule 2.

Secretary
Date certificate issued: 17/1/15

This certificate will remain current for 5 years from the date of issue.

SCHEDULE 1

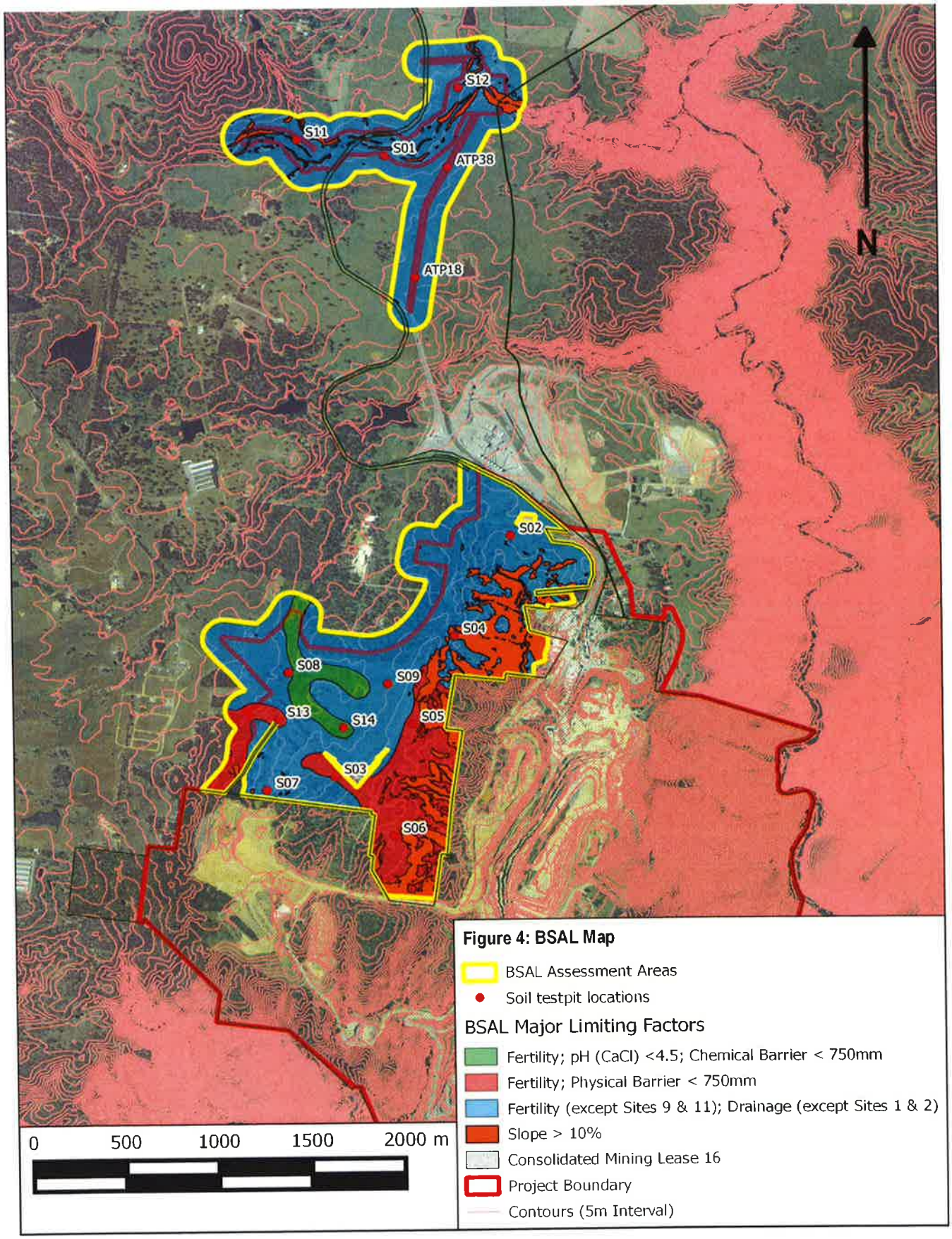


Figure 4: BSAL Map

- BSAL Assessment Areas
- Soil testpit locations

BSAL Major Limiting Factors

- Fertility; pH (CaCl) <4.5; Chemical Barrier < 750mm
- Fertility; Physical Barrier < 750mm
- Fertility (except Sites 9 & 11); Drainage (except Sites 1 & 2)
- Slope > 10%
- Consolidated Mining Lease 16
- Project Boundary
- Contours (5m Interval)

SCHEDULE 2

Relevant criteria	Consideration
Soil type	The site comprises soil landscapes that are of low fertility or have poor drainage, and does not meet the BSAL criteria.

APPENDIX C

Laboratory Results - Erosion potential testing

Department of Primary Industries
Soil Conservation Service

SOIL TEST REPORT

Scone Research Centre

REPORT NO:	SCO15/032R1
REPORT TO:	Lachlan Crawford LAMAC Management Pty Ltd 33 Lerra Road Windella NSW 2320
REPORT ON:	Four soil samples
PRELIMINARY RESULTS ISSUED:	Not issued
REPORT STATUS:	Final
DATE REPORTED:	16 March 2015
METHODS:	Information on test procedures can be obtained from Scone Research Centre

TESTING CARRIED OUT ON SAMPLE AS RECEIVED

SR Young
(Laboratory Manager)

Scone Research Centre, PO Box 283 Scone 2337, 709 Gundy Road Scone 2337
Ph: 02 6545 1666, Fax: 02 6545 2520

SOIL CONSERVATION SERVICE
Scone Research Centre

Report No: SCO15/032R1
Client Reference: Lachlan Crawford
LAMAC Management Pty Ltd
33 Lerra Road
Windella NSW 2320

Lab No	Method	P7B/2 Particle Size Analysis (%)					P8A/2	P9B/2	C6A/2	C1A/5	C2A/4	C2B/4	
	Sample Id	clay	silt	f sand	c sand	gravel	D%	EAT	OC (%)	EC (dS/m)	pH	pH $Cacl_2$	Texture
1	03A	12	13	24	26	25	5	n/a	0.11	0.07	8.7	7.1	Loam
2	05-1/2	14	25	13	11	37	55	2(1)	0.02	0.16	8.7	7.3	Silty loam
3	06-1/2	8	13	22	8	49	4	6	0.06	1.61	8.2	7.4	Loam
4	08-2	40	18	11	10	21	0	6	0.22	0.43	6.2	5.8	Clay

n/a – not available

END OF TEST REPORT

APPENDIX D

Topsoil Management Recommendations

Topsoil Management Recommendations

Topsoil Stripping

Topsoil stripping involves the separate removal of topsoil from the surface, prior to deeper excavation or ground disturbance. The depth of topsoil recovered is dependent on the quality and depth of the material. Topsoil recovery according to the recommended stripping depth is essential. Stripping shallower than the identified depth will result in lost topsoil resource, and stripping deeper than the identified depth could result in the contamination of the topsoil resource with poor quality, or hostile, subsoil material.

During topsoil stripping operations, direct placement of excavated topsoil onto re-shaped areas is preferred to stockpiling, to avoid rehandling and reduce the potential for topsoil degradation or loss. If a re-shaped surface is not available, the topsoil will be stockpiled. The following controls shall be observed when undertaking these actions.

- Stripping depths and limits (including areas of no recovery), are to be marked (pegged or taped) and adhered to during stripping operations.
- Stripping operators shall be experienced in topsoil work, or otherwise be closely supervised, to ensure topsoil stripping depths are adhered to.
- Care is to be taken during topsoil stripping to avoid structural degradation of soils – taking particular care to avoid excessive compaction (i.e. avoid re-handling, limit stripping activities in wet conditions, and prevent heavy equipment trafficking over in situ soil material).
- Potential generation of dust will be considered in planning of topsoil stripping, with weather conditions, water truck availability, potential downtime and alternate standby tasks being key planning considerations.
- Soils should be stripped in a slightly moist condition and should not be stripped in either a dry or wet condition, thus reducing deterioration in topsoil quality and dust generation.

Location of Topsoil Stockpiles

- Topsoil stockpiles should not be located in the path of planned, or potential projects or operations. A long-term perspective should be adopted during this planning (preferably life-of-mine) and organisation-wide consultation should be undertaken during this process. Rehandling of topsoil is expensive and detrimental to topsoil quality.
- The planned final rehabilitation location for the topsoil should be considered when locating the stockpile (i.e. where it is to be used for rehabilitation). Haulage requirements (distance and volume) to get it to the stockpile location, and how it will be recovered from that stockpiled location and transported to that final destination should also be considered.
- Stockpiles should:
    - not be placed on excessively steep landform, that will increase erosion and potentially hamper recovery.
    - not be placed adjacent to, or amongst, existing woodland vegetation, that will potentially cause topsoil loss or damage to remnant vegetation.
    - not be placed on active overburden emplacements, until the final RL has been achieved at the proposed stockpile location.
    - be located away from edges of emplacements, ramps, dams, drains and pits, where future recovery may be constrained, increasing cost or planning complexity.
    - be aligned so as to reduce their susceptibility to wind erosion, especially if placed on top of elevated overburden emplacements.
    - not be located in, across or adjacent to watercourses or drainage lines with potential to flow.
    - not be located on flat and / or low-lying areas susceptible to flooding.

Topsoil Management Recommendations (Cont'd)

Stockpile Construction and Management

Where direct placement of topsoil is not possible, the period of topsoil stockpiling should be minimised to reduce the detrimental effects of storage on topsoil quality, especially topsoil structure, aeration and permeability, native seed bank viability, and biological activity levels in material stockpiled greater than one metre deep. Where topsoil stockpiling is likely to exceed three months, the following measures should be followed.

- The proposed stockpile pad should be stripped, cleared of surface rocks and vegetation, and isolated from local drainage, with nearby weed infestations treated, if required.
- As a general rule, a maximum stockpile depth of 3 m will be maintained.
- Seed stockpiles as soon as possible with a sterile annual cover crop species (e.g., oats or millet). A rapid growing and healthy annual crop sward provides sufficient competition to minimize the emergence of undesirable weed species.
- Topsoil will be block tipped. Under no circumstances will topsoil be tipped over a tip head or a second lift of block tip be used.
- Stockpiles should be trimmed and graded to ensure they shed water, to avoid pooling or waterlogging.
- Stockpile surfaces should be left coarsely textured to minimise erosion until vegetation is established, and avoid surface compaction and surface sealing.
- Every effort will be made to avoid equipment trafficking over topsoil stockpiles. Stockpiles should be isolated from adjacent operations and accidental vehicle access (by berm, ditch, substantial fence, bollards, old electricity poles, etc), and clearly identified by a sign to reduce the likelihood of interference.
- Following construction, stockpiles will be surveyed and recorded on mine plans. This information will be recorded on the topsoil stockpile register, along with other relevant data pertaining to each stockpile.
- Prior to re-spreading stockpiled material onto reshaped overburden emplacements (particularly onto designated tree seeding areas), an assessment of weed infestation on stockpiles should be undertaken to determine if individual stockpiles require herbicide application and / or "scalping" of weed species prior to spreading.

Maintenance of existing stockpiles

- On an annual basis, the stockpiles should be inspected for erosion, vegetation cover health, weed infestation and other general degradation or interference.
- Maintenance and remedial works will be scheduled, as needed. Such maintenance or remedial works may include:
  - repair of erosion (i.e., regrading of eroded areas), diversion of drainage paths and de-silting of sediment control structures;
  - slashing, re-seeding or supplementary planting;
  - application of fertiliser to address nutrient deficiency;
  - application of lime or gypsum to control pH and improve soil structure;
  - replacing signage and access barriers;
  - bushfire management activities; and
  - weed and pest animal control measures.
- If stockpiles are borrowed from, but not completely removed, the excavated face will need to be re-shaped to ensure water shedding and stockpile stability, and re-sewn with a protective cover crop. Those stockpiles will also need to be ear-marked for re-survey as part of the annual topsoil survey.
- For long-term stockpiles, a strict timetable of weed control and maintenance fertilizing is required as part of the stockpile management program.

APPENDIX E

Recommended Revegetation Seed Mix

1. Recommended Revegetation Seed Mix (Global Soil Systems, 2012)\

Native Grasses & Ground Cover Species	Overstorey / Canopy Species
Themeda *Microleana stipoides* *Hardenbergia violacea* *Chloris truncate* *Austrodanthonia caespitosa*	*Eucalyptus agglomerata* *E. blakelyi* *E. bridgesiana* *E. cinerea* *E. dives* *E. eugenoides* *E. globoidea* *E. goniocalyx* *E. macrorhyncha* *E. mannifera* *E. melliodora* *E. oblique* *E. oblonga* *E. punctata* *E. piperita* *E. radiata* *E. rossii* *E. sclerophylla* *E. sieberi* *E. tereticornis* *E. viminalis* *Allocasuarina littoralis*
Understorey to Mid-Storey Species	
Acacia falciformis *A. decurrens* *A. implexa* *A. mearnsii* *A. parramattensis* *A. rubida* *A. ulicifolia* *Bursaria spinosa* *Dodonaea cuneata* *Indigofera australis* *Lomandra longifolia* *Pittosporum undulatum*	

2. Recommended Hydro-seeding mix (Global Soil Systems, 2012)

Erosion Control / Grassland Species	Rate (kg/ha)
Goulburn Sub clover (*Trifolium subterraneum cv. Goulburn)*	4
Dixie Crimson clover (Trifolium incarnatum cv. Dixie)	2
Haifa white clover (Trifolium repens cv. Haifa)	2
Tahora white clover (Trifolium repens cv. Tahora)	2
Fitzroy (Lolium perenne)	5
Australian II Phalaris (Phalaris aquatica cv. Australian II)	5
Kingston Rye (Lolium perenne cv. Kingston)	5
Currie Cocksfoot (Dactylis glomerate cv. Currie)	1.5
Rye Corn (Secale cereal)	20
Couch (Cynodon dactylon)	5
Japanese millet (Echinochloa esculenta)	10

APPENDIX F

Resources Regulator's Guideline: Rehabilitation Records

NSW GOVERNMENT

NSW Resources Regulator

GUIDELINE

REHABILITATION RECORDS

NSW Resources Regulator

Document control

Published by NSW Resources Regulator

Title: Guideline: Rehabilitation records

First published: 2 July 2021

Authorised by: Director Compliance, NSW Resources Regulator

CM9 reference: DOC21/464493

AMENDMENT SCHEDULE		
Date	Version	Amendment
2 July 2021	1	First published

NSW Resources Regulator

Contents

Purpose of this guideline

Conditions of a mining lease granted under the *Mining Act 1992* require the lease holder to keep and maintain records in relation to the mining lease. The purpose of this guideline is to assist lease holders to identify the types of rehabilitation records that should be kept and maintained. This includes records relating to all rehabilitation risk assessments, rehabilitation management plans, annual rehabilitation reports, forward programs and progressive rehabilitation implementation.

This guideline will help lease holders:

- achieve compliance with the mining lease conditions relating to records
- implement best practice methods for keeping records relating to rehabilitation performance outcomes
- understand the provisions of sections 163D and 163E of the *Mining Act 1992*, which require any record required to be created and maintained under the Act, the Regulations, or a condition of a mining lease to be kept in a legible form for at least four years following the expiry or cancellation of the mining lease.

Role of the lease holder

This section sets out the types of rehabilitation records that the lease holder should keep and maintain in relation to both small and large mines to facilitate compliance with clause 17 of Schedule 8A of the Mining Regulation 2016.

Large mines

A large mine is defined as a mine that requires an environment protection licence under the *Protection of the Environment Operations Act 1997*. The lease holder of a large mine must keep and maintain records that document all activities and actions undertaken to achieve compliance with the mining lease conditions.

Typical records that lease holders may require to demonstrate compliance with lease conditions are listed in Table 1. Large mine lease holders may also be required to maintain additional records based on site-specific environmental characteristics or mining activities.

Table 1: Records for large mines

AREA	TYPES OF RECORDS
Rehabilitation risk assessment	■ All rehabilitation risk assessments. ■ Any updates to rehabilitation risk assessments. ■ All records associated with a rehabilitation risk assessment. ■ All records on the effectiveness of control measures implemented to remove or minimise a risk.
Rehabilitation management plan	■ All rehabilitation management plans. ■ All records associated with a rehabilitation management plan.
Annual rehabilitation report and forward program	■ All annual rehabilitation reports and forward programs. ■ All records associated with an annual rehabilitation report and forward program.

Progressive rehabilitation	■ Photographs of:
	  □ the baseline conditions of disturbed areas
	  □ disturbance caused by mining operations
	  □ progressive rehabilitation
	  □ completed rehabilitation works.
	■ Records of baseline environmental surveys, and any analysis against reference sites and benchmark values.
	■ Records of the salvage of all rehabilitation resources including suitable capping materials, topsoils / subsoils, seeds, habitat structures (e.g. tree hollows and rocks) for use in rehabilitation.
	■ Life of mine rehabilitation material balances, for all materials such as capping materials, soils and habitat resources.
	■ Records of geotechnical and geochemical investigations.
	■ Settlement and stability measurements.
	■ Measures for erosional stability.

AREA	TYPES OF RECORDS
	■ Register of contaminated sites including bioremediation areas. ■ Records of identification and management of actual acid forming, potentially acid forming (PAF) and non-acid forming (NAF) material and ongoing monitoring. ■ Records of any geochemical hazardous material, production wastes and other waste streams and where they are located on site. ■ Registers of topsoil and or soil substitute stockpiles (e.g. biosolids), including management records such as stripping / stockpiling dates, weed control, inoculation with microbes). ■ Records of material characterisation analysis (e.g. overburden, interburden, reject material, subsoils and topsoils). ■ Subsidence monitoring records. ■ Records of methodologies used to rehabilitate the site (e.g. species utilised, how they were applied (i.e. as seed or plant), fertiliser rate, details of ripping and scarifying, timing of sowing, sowing rates, seedling planting density, origin of seed, rainfall). ■ Records of rehabilitation trials and research outcomes. ■ Quality assurance records for progressive rehabilitation such as 'as-constructed' drawings and inspection and test plans/hold point inspection records. ■ Environmental incident reports, including records of any corrective or preventative action taken. ■ Records of maintenance activities undertaken on rehabilitation areas. ■ Rehabilitation inspections and monitoring programs, including outcomes such as specialist recommendations. ■ Assessments of rehabilitation performance against the rehabilitation objectives and rehabilitation completion criteria. ■ Outcomes of relevant stakeholder consultation programs, specifically in relation to outcomes of discussions pertaining to rehabilitation objectives, final land use and final landform.

AREA	TYPES OF RECORDS
	■ Records of any Stewardship Agreements or Conservation Agreements (or similar mechanisms) where the rehabilitation is part of a biodiversity offset on the lease area. Monitoring data on the progress towards achieving the rehabilitation objectives and rehabilitation completion criteria for these areas/domains. ■ Details of specific requirements for rehabilitation on State-owned land. Records of access agreements to confirm post mining land use outcomes relevant to the State government agency that has ownership of the land.

Small mines

A small mine is defined as a mine that does not require an environment protection licence under the *Protection of the Environment Operations Act 1997*. The lease holder of a small mine must keep and maintain records that document all activities and actions undertaken to achieve compliance with the mining lease conditions.

Typical records that small mine lease holders may use to demonstrate compliance with lease conditions are listed in Table 2. Small mine lease holders may also be required to maintain additional records based on site-specific environmental characteristics or mining activities.

Table 2: Records for small mines

AREA	TYPES OF RECORDS
Rehabilitation risk assessment	■ All rehabilitation risk assessments. ■ Any updates to rehabilitation risk assessments. ■ All records on the effectiveness of control measures implemented to remove or minimise a risk.
Rehabilitation management plan	■ All rehabilitation management plans.
Annual rehabilitation report and forward program	■ All annual rehabilitation reports and forward programs.

AREA	TYPES OF RECORDS

Progressive rehabilitation	■ Photographs of:
	  ☐ the baseline conditions of disturbed areas (i.e. pre-disturbance photographs)
	  ☐ disturbance caused by mining operations
	  ☐ progressive rehabilitation
	  ☐ completed rehabilitation works.
	■ Records of the salvage of all rehabilitation resources including suitable capping materials, topsoils/subsoils, seeds, habitat structures (e.g. tree hollows and rocks) for use in rehabilitation.
	■ Register of contaminated sites including bioremediation areas.
	■ Records of methodologies used to rehabilitate the site (e.g. species utilised, how they were applied (e.g. as seed or plant), fertiliser rate, details of ripping and scarifying, timing of sowing, sowing rates, seedling planting density, origin of seed, rainfall).
	■ Environmental incident reports, including any corrective or preventative action taken.
	■ Records of maintenance activities undertaken on rehabilitation areas.
	■ Assessments of rehabilitation performance against the rehabilitation objectives and rehabilitation completion criteria.
	■ Outcomes of relevant stakeholder consultation programs, specifically in relation to outcomes of discussions pertaining to rehabilitation objectives, final land use and final landform.
	■ Details of specific requirements for rehabilitation on State-owned land. Records of any access agreements to confirm post mining land use outcomes relevant to the State government agency that has ownership of the land.

Glossary

TERM	DEFINITION
Annual rehabilitation report	As outlined in the Mining Regulation 2016.
Department	Department of Regional NSW.
Final landform and rehabilitation plan	As defined in the Mining Regulation 2016.
Final land use	As defined in the Mining Regulation 2016.
Forward program	As defined in the Mining Regulation 2016.
Land	As defined in the *Mining Act 1992.*
Large mine	As defined in the Mining Regulation 2016.
Lease holder	The holder of a mining lease.
Life of mine	The timeframe of how long a mine is approved to mine, from commencement to closure.
Mining lease	As defined in the *Mining Act 1992*.
Phases of rehabilitation	The stages and sequences of actions required to rehabilitate disturbed land to achieve the final land use. The phases of rehabilitation are: ■ active mining ■ decommissioning ■ landform establishment ■ growth medium development ■ ecosystem and land use establishment ■ ecosystem and land use development ■ rehabilitation completion (sign-off).
Progressive rehabilitation	The progress of rehabilitation towards achieving the approved or, if not yet approved, the proposed: ■ rehabilitation objectives, and

TERM	DEFINITION
	■ rehabilitation completion criteria, and ■ for large mines – final landform and rehabilitation plan. This may be described in terms of domains, phases, performance indicators and rehabilitation completion criteria.
Rehabilitation	As defined in the *Mining Act 1992*.
Rehabilitation completion	The final phase of rehabilitation when a rehabilitation area has achieved the final land use for the mining area: ■ as stated in the approved rehabilitation objectives and the approved rehabilitation completion criteria, and ■ for large mines – as spatially depicted in the approved final landform and rehabilitation plan. Rehabilitation areas may be classified as complete when the NSW Resources Regulator has determined in writing that rehabilitation has achieved the final land use following submission the relevant application by the lease holder.
Rehabilitation completion criteria	Rehabilitation completion criteria set out the criteria the achievement of which will demonstrate the achievement of the rehabilitation objectives.
Rehabilitation management plan	As defined in the Mining Regulation 2016.
Rehabilitation objectives	Means the rehabilitation objectives required to achieve the final land use for the mining area.
Rehabilitation risk assessment	As defined in the Mining Regulation 2016.
Risk	The effect of uncertainty on objectives. It is measured in terms of consequences and likelihood (AS/NZS ISO 31000:2018).
Small mine	As defined in the Mining Regulation 2016.
State significant development (SSD)	Has the same meaning as that term under the *Environmental Planning and Assessment Act 1979*.

TERM	DEFINITION
	Note: Schedules 1 and 2 of *State Environmental Planning Policy (State and Regional Development) 2011* provide a full list of SSD types and identified sites. Large mining and extraction operations (including all coal mines) are identified as SSD.

Department guidance

- Form and way: Rehabilitation objectives and rehabilitation completion criteria for small mines
- Form and way: Rehabilitation objectives, rehabilitation completion criteria and final landform and rehabilitation plan for large mines
- Form and way: Rehabilitation management plan for large mines
- Form and way: Annual rehabilitation report and forward program for small mines
- Form and way: Annual rehabilitation report and forward program for large mines
- Guideline: Rehabilitation risk assessment
- Guideline: Rehabilitation records
- Guideline: Rehabilitation controls
- Guideline: Mine rehabilitation portal
- Guideline: Rehabilitation objectives and rehabilitation completion criteria
- Guideline: Achieving rehabilitation completion (sign-off)

The above resources are located on our website.

APPENDIX G

Copy of BCD's Letter dated 27 May 2022

Our ref: doc22/412435

Mr Les Longhurst
Planning and Development Management NSW/ACT
Boral Limited
Triniti T2 Level 5
39 Delhi Road North Ryde
New South Wales 2113

Dear Mr Longhurst

Subject: Response to Rehabilitation for Marulan South Limestone Mine SSD 7009

I refer to your request for the Biodiversity and Conservation Division (BCD) to review the Rehabilitation Plan prepared by Gordon Atkinson and Associates Pty Ltd as required under your approval CoC B79. We have reviewed the document and consider that it meets the requirements of the approval.

If you have any further questions about this issue, please contact Ms Tania Ashworth, Senior Conservation Planning Officer, South East Region, on 02 6229 7921 or at tania.ashworth@environment.nsw.gov.au.

Yours sincerely

27/05/2022

MICHAEL SAXON
Director – South East
Biodiversity and Conservation Division

APPENDIX H

Copy of DPE Water's Letter dated 2 June 2022

Department of Planning and Environment

Our ref: OUT22/7063

Les Longhurst

Email: Les.Longhurst@boral.com.au

2 June 2022

Subject: Marulan South Limestone Mine Rehabilitation Strategy

Dear Les

I refer to your email on 20 April 2022 providing the Department of Planning and Environment (DPE) Water an opportunity to comment on the above matter.

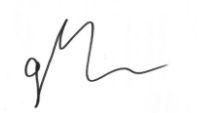
The Department of Planning and Environment - Water (DPE Water) has reviewed the strategy and has the following key comments:

- 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 is to address the final void rehabilitation requirements set out in Table 6 of Condition of Consent B76 and Condition of Consent B79(c).
- 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.
- 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).

Please see attachment A for further detail on the above comments.

Should you have any further queries in relation to this submission please do not hesitate to contact DPE Water Assessments at water.assessments@dpie.nsw.gov.au, or Tim Baker, Water Assessments at Tim.Baker@dpie.nsw.gov.au or 0428162097

Yours sincerely,



Georgia McKeon
Acting Manager, Assessments, Knowledge Division
Department of Planning and Environment: Water

Attachment A

Detailed advice regarding the Marulan South Limestone Mine Rehabilitation Strategy

1.0 Seepage

1.1 Recommendation

The Rehabilitation Strategy describe how seepage from the final void (open pit) will be managed and how this will be incorporated into the surface water management system to ensure the final void remains as a groundwater sink.

Explanation

The model presented in Section 8.7 of Appendix H (Groundwater Assessment) of the EIS shows the water table is to remain below the base of the final proposed pit level at mine closure (year 2049) and after mine closure. Section 9.7.1 of Appendix G of the EIS states that the water balance analysis for the final void shows that all water draining to the pit, including runoff from the pit itself (466 ML/year on average), would seep through the base of the pit. Post closure, any water captured in the final void will therefore seep into groundwater.

The Rehabilitation Strategy does not reference how the surface water management system would be incorporated, or how the final void will remain as a groundwater sink to prevent the release of saline water into the surrounding environment.

1.2 Recommendation

The Rehabilitation Strategy should include a commitment to monitor seepage from overburden emplacements.

Explanation

DPE Water's response to the EIS for this project recommended the proponent conduct monitoring of seepage from the overburden emplacements. Section 3.2 of the Rehabilitation Strategy states that the geochemical assessment concluded that surface runoff and seepage from emplaced overburden materials is likely to be slightly alkaline and contain low concentrations of dissolved salts. Section 6.2.2 of Appendix G of the EIS outlines how overburden emplacements will be rehabilitated in place at the various stages of 'water management system'. However, whilst this is occurring and after it is completed, seepage should be monitored.

2.0 Watercourse rehabilitation and drainage design

1.1 Recommendation

The strategy should include a commitment that the final watercourse and drainage design will be completed with reference to the guidelines "*Rehabilitation Manual for Australian Streams* (LWRRDC 2000)" and "*Guideline: Works that interfere with water in a watercourse for a resource activity* (DNRME 2019)".

Explanation

Significant earthworks are required at mines sites upon final landform creation which need to provide stable pathways for water flow, as well as meeting aquatic and riparian outcomes both on-site and downstream. Early design in accordance with industry standards is critical in meeting these requirements.

End Attachment A

APPENDIX I

Copy of Resources Regulator's Email dated 14 June 2022

Gordon Atkinson

From: Resources Regulator <nswresourcesregulator@service-now.com>
Sent: Tuesday, 14 June 2022 12:37 PM
To: les.longhurst@boral.com.au
Cc: gatkass3@bigpond.com; neville@elementenvironment.com.au
Subject: MAAG0013964 | Consultation re Submission to Resources regulator of Rehabilitation Strategy for Review

Dear Les

The Resources Regulator has reviewed the "Marulan South Limestone Mine - SSD 7009 Rehabilitation Strategy" dated 14 April 2022 (Revision 1, for Consultation with relevant agencies).

It is noted that the Rehabilitation Strategy is required as per condition B79(b) of the consent conditions, and that the Rehabilitation Strategy is to be prepared in consultation with DPIE, BCD, Resources Regulator and Council.

The Rehabilitation Strategy has been prepared to be aligned with the new Mine Rehabilitation Plan (RMP) as required under the new legislation and by the pending new Mining Lease Approvals. This Rehabilitation Strategy incorporates the relevant management measures presented in the EIS and conditions of consent relating to rehabilitation.

The Rehabilitation Strategy recognises the new Mining Lease Conditions and new standard rehabilitation and reporting conditions under the Mining Amendment (Standard Conditions of Mining Leases – Rehabilitation) Regulation 2021, effective 2 July 2021. As such the Rehabilitation Strategy also recognises that the Mine is 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 Resources Regulator advises that is has no further comment to make with regards to the Rehabilitation Strategy submitted for consultation purposes.

Regards,

Christopher Hammersley
Inspector Environment
MAI - Team 1 | Resources Regulator
M 0429 987 324

APPENDIX J

Copy of email correspondence Goulburn Mulwaree Council

Gordon Atkinson

From: Les Longhurst <Les.Longhurst@boral.com.au>
Sent: Friday, July 15, 2022 1:59 PM
To: Scott Martin (scott.martin@goulburn.nsw.gov.au) <scott.martin@goulburn.nsw.gov.au>
Subject: Fw: Marulan South Limestone Mine Management Control Plans for your review

G'day Scott,

I can advise that we have not as yet had any feedback from Council in regards to the request for the review of the Rehabilitation strategy as requested in April. Therefore we assume that there is no comment from the council in this regard and will advise DPIE planning accordingly and will request that the approval process for the document continue with the department of planning.

Regards,
Les

Les Longhurst

Site Manager - Marulan

Mobile: 0401895032

Office (02) 48203061

From: Les Longhurst
Sent: Tuesday, April 19, 2022 11:09 AM
To: Gordon Atkinson (gatkass3@bigpond.com) <gatkass3@bigpond.com>; neville@elementenvironment.com.au (neville@elementenvironment.com.au) <neville@elementenvironment.com.au>; Scott Martin (scott.martin@goulburn.nsw.gov.au) <scott.martin@goulburn.nsw.gov.au>
Subject: Marulan South Limestone Mine Management Control Plans for your review

Good morning Scott - happy Easter to you - hope by now you've had a good break (if that's not going all the way through to Anzac day).

In terms of the Marulan DA Consent conditions, the site is preparing a number of Management Control Plans to assist with the future management of various environmental, heritage, community and mining issues.

One of the requirements is to prepare a Rehabilitation Strategy, which will be closely aligned with the new Mine Rehabilitation Plan as required under the new legislation and by the pending new Mining Lease Approvals.

As per condition B79(b) , an extract of which is shown below, consultation with yourselves is required in the preparation of the Rehabilitation strategy:

Rehabilitation Strategy
B79. The Applicant must prepare a Rehabilitation Strategy for all land disturbed by the development to the satisfaction of
the Planning Secretary. This strategy must:

(a) be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the
Planning Secretary;
*(b) be prepared in consultation with DPIE Water, BCD, Resources Regulator and **Council**;*

Attached for your review is the draft document - could you please advise who might be carrying out a review of this document and if there is anyone else that I should pass it onto. It would be appreciated if this review could take place over the next two weeks if possible in order that we can make final submission to DPIE for approval. The mine has been in a fairly tight corner over the last few years with available resource, so we are looking forward to commencing and expanding as soon as ready under the new consent and new mining lease.

Please advise if there is anything further that you require. I would be happy to meet with you as required to discuss any comments you may have . I have attached the word document in order that we can track any comments or changes from you.

Please feel free to call as necessary. I will check in with you next week.

For your information I can further advise that I am again the Manager of the mine for now - Mark McCarthy has left the business.

Kind regards,
Les

Les Longhurst

Program and Acting Site Manager - Marulan

Mobile: 0401895032

Office (02) 48203061

Boral Cement Limited
5 Hume Street
Marulan South NSW 2579

www.boral.com.au