G

Rehabilitation Management Plan

BYLONG COAL PROJECT
Response to PAC Review Report

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

global environmental solutions

Bylong Coal Project

Draft - Rehabilitation Management Plan

Report Number 634.10061-R01

18 December 2017

Worley Parsons Pty Ltd

Version: v0.1

Bylong Coal Project

Draft - Rehabilitation Management Plan

PREPARED BY:

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
PO Box 11034
Tamworth NSW 2340 Australia

+61 408 474 248 +61 2 9427 8200
tamworth@slrconsulting.com www.slrconsulting.com

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
634.10061-R01-v0.1	18 December 2017	Clayton Richards		
634.10061-R01-v0.1	1 December 2017	Clayton Richards		
634.10061-R01-v0.1	6 November 2017	Clayton Richards		
634.10061-R01-v0.1	6 November 2017	Clayton Richards		
634.10061-R01-v0.1	20 October 2017	Clayton Richards		

Table of Contents

Table of Contents

Table of Contents

TABLES

Table of Contents

1 PREAMBLE

This draft Rehabilitation Management Plan has been prepared in support of the planning approvals process for the Bylong Coal Project (the Project). This draft Plan is one of a number of draft Environmental Management Plans which have been prepared to provide further information around the proposed management of potential environmental and social issues associated with the Project.

On the 27 July 2017, the NSW Planning and Assessment Commission (PAC) issued the PAC Merit Review Report (PAC Review Report) for the Project, which identified a number of issues and concerns with the information provided to-date.

In this regard, the PAC in its Review Report sought further assurances in regard to the mitigation treatments for the project.

To assist the relevant authorities in the determination stage of the Project, draft Environmental Management Plans have been prepared to detail the proposed environmental management and mitigation measures that will be implemented throughout the life of the Project. The early development of the draft Environmental Management Plans should provide certainty and assurance that effective controls, procedures and processes (surpassing contemporary environmental management within the NSW coal mining industry) will be adequately implemented for the Project to minimise potential risks or impacts to the environment.

Should the Project be approved, the draft Environmental Management Plans will be reviewed and updated in accordance with any final Development Consent conditions issued for the Project. Furthermore, consultation with the relevant regulatory agencies will be undertaken during the review and update of this draft Plan to ensure that any outstanding matters or concerns are adequately addressed. The revised Plan will be submitted to the relevant regulatory agencies, as required, for approval.

2 INTRODUCTION

2.1 Background

The proposed Bylong Coal Mine (Bylong Mine) is a greenfield underground and open cut coal mine located in the Bylong Valley of NSW, which is seeking State Significant Development (SSD) approval to extract up to 6.5 Million tonnes per annum (Mtpa) of Run of Mine (ROM) coal for a period of 25 years. Approximately 71% of the coal resource will be extracted via the underground operation with the remaining 29% of coal output extracted via two open cut pits. The Bylong Mine is fully owned by KEPCO Bylong Australia Pty Limited (KEPCO).

The Bylong Mine is located within the Mid-Western Regional Council (MWRC) Local Government Area (LGA) approximately 55 km to the north-east of Mudgee or 95 km by road. The Bylong Mine is approximately 230 km by rail from the Port of Newcastle. The regional setting for the Bylong Mine is shown in **Figure 1.**

This Draft Rehabilitation Management Plan (the Plan) describes strategies for implementing and managing rehabilitation for the Project. This Plan forms part of the Environmental Management Strategy (EMS) for the Project and will form the basis for the management of rehabilitation of the Project.

BYLONG COAL PROJECT

Locality Plan

FIGURE 1

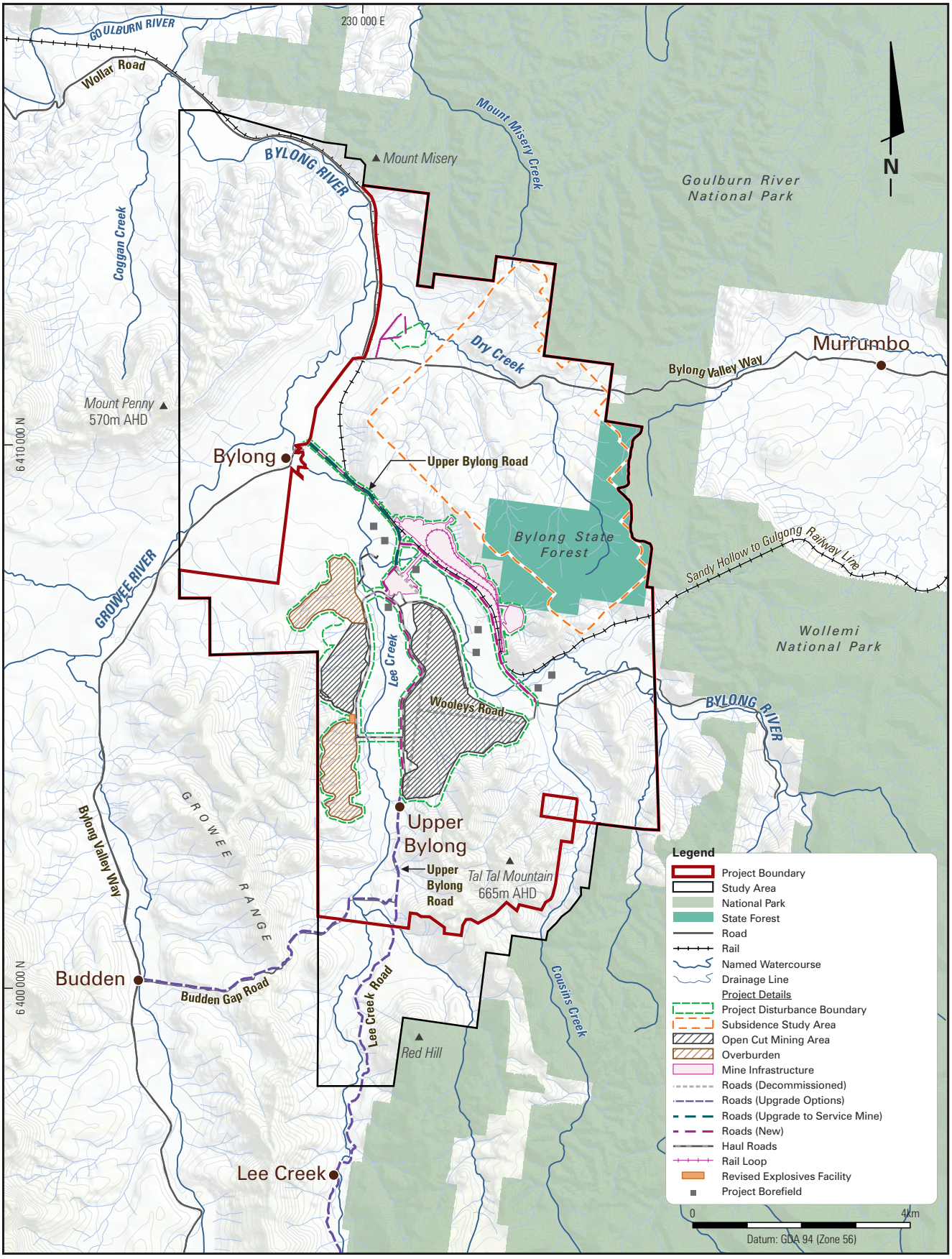
2.2 Project Description

Mining is proposed to be undertaken in two open cut mining areas utilising open cut excavator mining techniques supported by trucks and other ancillary mining equipment. Underground mining, using contemporary longwall mining techniques, is anticipated to commence within 7 years from construction.

The key features and components of the proposed Bylong Mine are shown on **Figure 2** and include:

- Two open cut mining areas, Overburden Emplacement Areas (OEAs) and associated haul roads. Open cut mining including mine rehabilitation is undertaken 24 hours a day, 7 days a week over an approximate 10 year period;
- An administration, workshop, bathhouse, explosives magazine and other open cut mining related facilities;
- An underground coal mine operating 24 hours a day, 7 days a week for an approximate 20 year period, commencing within 7 years from the commencement of construction of the mine;
- Primary access to the underground mine via drifts constructed within the disturbance boundary, adjacent to the rail loop and Coal Handling and Preparation Plant (CHPP);
- Facilities to support underground mining operations including access roads, ventilation shafts, workshop, offices and employee amenities, fuel and gas management facilities;
- A CHPP with a designed throughput of approximately 6 Mtpa of ROM, equipped with dewatering technology to facilitate the dewatering of fine rejects material;
- Co-disposal of dewatered fine and coarse reject materials within OEAs and final open cut voids (avoiding the need for a tailings dam);
- A rail loop and associated rail load out facility and connection to the Sandy Hollow to Gulgong Railway Line to facilitate the transport of product coal to the Port of Newcastle;
- Surface and groundwater management and water reticulation infrastructure including diversion drains, dams (clean, dirty and raw water), borefield; pipelines, pumping stations and other required infrastructure;
- Communications and electricity reticulation infrastructure; and
- A Mine Access Road to provide access to the site facilities.

The Project Boundary covers an area of approximately 6,958 ha. Within the Project Boundary, the various Project features cover an area of approximately 2,875 ha, comprising of surface components including administration buildings, workshop, bathhouse, explosives magazine, personnel and materials access to the underground mining area, ventilation shafts, workshop, offices, employee amenities, fuel and gas management facilities and other mining related facilities within the Project disturbance boundary. This area also includes 1,714 ha within the Subsidence Study Area which may be affected by longwall mining subsidence. The construction and operation of surface and groundwater management and water reticulation infrastructure including diversion drains, dams, borefield, pipelines, pumping stations, powerlines and other required infrastructure.



HB BYLONG Social Impact Management Plan 1538 F2 Revised Conceptual Project Layout 19 12 2017

BYLONG COAL PROJECT

Conceptual Project Layout

FIGURE 2

2.3 Structure and Purpose of this Document

This Management Plan describes the measures to be implemented to manage rehabilitation for the Bylong Mine.

This Management Plan is structured as follows:

- **Section 2** outlines the project including the structure and purpose of this management plan;
- **Section 3** outlines the Statutory requirements associated with the project development consent, licenses permits, policies guidelines and rehabilitation commitments;
- **Section 4** outlines the principles and objectives of mine rehabilitation for the Project;
- **Section 5** provides the detailed plan of the management measures and procedures that will be implemented to rehabilitate the project;
- **Section 6** details the completion criteria against which the rehabilitation outcomes will be measured;
- **Section 7** provides the monitoring program for all aspects of rehabilitation along with areas of research that will be undertaken throughout the mine life;
- **Section 8** outlines the mine closure management program for the Project;
- **Section 9** outlines the processes for rehabilitation intervention and adaptive management;
- **Section 10** outlines the reporting and review program for the rehabilitation and this management plan;
- **Section 11** details the roles and responsibilities of all aspects of mine rehabilitation for the Project; and
- **Section 12** lists the references used in the development of this plan.

2.4 Stakeholder Consultation

As per Condition 65 of Schedule 4 of the Recommended Development Consent conditions (SSD-6367), this Plan is to be prepared in consultation with the NSW Department of Primary Industries (DPI), NSW Office of Environment and Heritage (OEH), Mid-Western Regional Council and the Bylong Community Consultative Committee (CCC) and to the satisfaction of the Secretary of NSW Department of Planning and Environment (DP&E). The Department of Planning and Environment, Division of Resources and Geosciences (DRG) will also be consulted.

This draft plan will be submitted to the Department of Environmental and Planning (DP&E) for consultation and input prior to finalisation.

3 STATUTORY REQUIREMENTS

3.1 Development Consent

3.1.1 Requirements of this Management Plan

Condition 65 of Schedule 4 of the Recommended Development Consent conditions (SSD-6367) outlines the requirements that are applicable to the preparation of this draft Rehabilitation Management Plan. **Table 1** presents these requirements and indicates where they are addressed within this Plan.

Table 1 Development Consent Rehabilitation Plan Requirements

Condition	Document Section
65. Prior to carrying out any development under this consent, unless otherwise agreed by the Secretary, the Applicant must prepare a Rehabilitation Management Plan for the development to the satisfaction of the Secretary. This plan must:	This Document
(a) be prepared in consultation with the Department, DPI, OEH, Council and the CCC;	Section 2.4
(b) be prepared in accordance with any relevant NSW Government mining rehabilitation guidelines;	Section 3.3
(c) include a detailed soil balance for the development;	Section 5.6.4
(d) include a detailed plan for reinstatement and review of the proposed:	Section 5 Section 6
(i) agricultural land capability across the site, including a protocol for periodic trials to demonstrate that the land capability is being achieved;	Section 5 Section 6.3
(ii) BSAL, including a protocol for verification of the land as BSAL-equivalent land; and	Section 5 Section 6.2
(iii) Woodland areas.	Section 5 Section 6.4
(e) include detailed performance and completion criteria for evaluating the performance of the rehabilitation of the site, and triggering remedial action (if necessary);	Section 6.1
(f) describe the measures that would be implemented to ensure compliance with the relevant conditions of this consent, and address all aspects of rehabilitation including mine closure, final landform, final land use and post mining social impacts;	Section 3.1.2 Section 5
(g) describe the rehabilitation methodologies that will be implemented to achieve the rehabilitation performance measures;	Section 5
(h) describe the process for managing minor delays or changes to progressive rehabilitation forecasts;	Section 5.16
(i) include interim rehabilitation where necessary to minimise the area exposed for dust generation;	Section 5.12
(j) include a program to monitor, independently audit and report on the effectiveness of the measure, and progress against detailed performance and completion criteria; and	Section 7 Section 10
(k) build to the maximum extent practicable on the other management plans required under this consent.	Section 1

3.1.2 Development Consent Rehabilitation Objectives

Condition 63 of the Development Consent SSD-6367 specifies that the Applicant must rehabilitate the site to the satisfaction of the Secretary.

This rehabilitation must be consistent with the proposed rehabilitation strategy described in the EIS (and depicted conceptually in the figure in Appendix 7 of the Development Consent SSD-6367), and comply with the objectives in **Table 2** below.

Table 2 Development Consent Rehabilitation Objectives

Feature	Objective
Mine Site (as whole)	• Safe, stable and non-polluting final landforms designed to incorporate micro-relief and integrate with surrounding landforms • Final landforms maximise geotechnical performance, stability and hydrological function • Constructed landforms maximise surface water drainage to the natural environment • Minimise long term groundwater seepage from the site to ensure negligible environmental consequences beyond those predicted for the development • Minimise visual impact of final landforms as far as is reasonable and feasible
Surface Infrastructure	• To be decommissioned and removed, unless the Secretary agrees otherwise
Final Voids	• No final void and free draining to the natural drainage system

Agricultural Land	• Restore or maintain land capability generally as described in the EIS and shown conceptually in Appendix 7, including at least:
	  • 319.5 hectares of LSC Class 3 land;
	  • 172.3 hectares of LSC Class 4 land; and
	  • 423.1 hectares of BSAL equivalent land

Woodland revegetation	• Native vegetation to be re-established, with the restoration of at least 33.6 hectares of native vegetation on LSC Class 6 or 7 land
Community	• Ensure public safety • Minimise the adverse socio-economic effects associated with mine closure

3.1.3 Progressive Rehabilitation

Condition 64 of the Development Consent SSD-6367 specifies that the Applicant must rehabilitate the site progressively and as soon as reasonably practicable following disturbance. All reasonable and feasible measures must be taken to minimise the total area exposed for dust generation at any time. Interim rehabilitation strategies shall be employed when areas prone to dust generation cannot be permanently rehabilitated.

3.2 Licences, Permits and Leases

In addition to the Development Consent, all activities will be conducted in accordance with the various licences, permits and leases issued for the Project including:

- Mining Leases _____ issued by the Minister for Resources and Energy on _____ in accordance with the NSW *Mining Act 1992*.
- Environmental Protection Licence (EPL) _____ issued under the NSW *Protection of Environment Operations Act 1997* (POEO Act) by the NSW Environment Protection Authority (EPA).
- Schedule 3 – High Risk Activities, Part 5 – All Coal Mines – Section 26 Emplacement Areas, approval issued by the Minister for Resources and Energy on _____ in accordance with the NSW *Work Health and Safety Act (Mines) Regulation 2014*.
- Mining Operations Plan (MOP) for the period _____ to _____ and approved by the NSW Division of Resources and Geoscience (DRG)) on _____.

The following Mining Lease conditions are applicable to this Plan:

Table 3 Relevant Mining Lease Requirements

ML Condition	Requirement
UPDATE WHEN ML RECEIVED	

3.3 Policy, Guidelines and Regional Strategies

3.3.1 ESG3 Mining Operations Plan Guidelines

The *ESG3: Mining Operations Plan (MOP) Guidelines, September 2013* (DRE, 2013) details the process for monitoring and managing progression towards successful rehabilitation outcomes for surface disturbance generally from open cut mining activities. The guideline requires industry to identify and provide measurable data and demonstrate that proposed rehabilitation outcomes are achievable and realistic within a given timeframe.

For new mining titles (such as this Project), MOPs must be prepared in accordance with ESG3. The requirements of the MOP Guidelines have been considered in the development of this Plan to ensure this Plan is consistent with MOP requirements.

3.3.2 Extraction Plan and Subsidence Rehabilitation

An approved Extraction Plan must be implemented by the proponent for the area subjected to underground mining and subsidence impacts as a requirement of both the development consent and mining lease. The *EDG17 Guideline for Applications for Subsidence Management Approvals (NSW Trade and Investment 2003)* includes rehabilitation requirements for subsidence impacts. Generally, this plan will be updated to fulfil the requirements of the Extraction Plan.

3.3.3 Local Environmental Plan (LEP)

The Mid-Western Regional LEP 2012 under the *Environmental Planning and Assessment Act 1979* has mapped the Project Area as predominantly Zone RU1 Primary Production. The objectives of this land use zone are:

- To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.
- To encourage diversity in primary industry enterprises and systems appropriate for the area.
- To minimise the fragmentation and alienation of resource lands.
- To minimise conflict between land uses within this zone and land uses within adjoining zones.
- To maintain the visual amenity and landscape quality of Mid-Western Regional by preserving the area's open rural landscapes and environmental and cultural heritage values.
- To promote the unique rural character of Mid-Western Regional and facilitate a variety of tourist land uses.

The Project aims to reinstate disturbed land to land capable of primary production with a post-mining landform consistent with the character and landscape of the Bylong Valley. These rehabilitation objectives align with the objectives of the Mid-Western Regional LEP Primary Production zoning of the Project Boundary.

The Sandy Hollow to Gulgong Railway Line is zoned SP2 (Infrastructure). Some components of the Project will be undertaken on land zoned as SP2, upon which mining is prohibited under the Mid-Western Regional LEP. However Clauses 7(1), 7(1)(a) and 7(1)(d) of the SEPP Mining provides that mining is permitted with development consent on any land where agriculture or industry can be carried out and that underground mining is permissible with development consent on any land, and that facilities for the processing and transportation of minerals are permissible with development consent on any land on which mining may be carried out, provided that the minerals were mined from that land or the adjoining land. Therefore, the components of the project are permissible with development consent under the EP&A Act on the land on which they are proposed to be carried out.

3.3.4 Regional Plan

The Central West and Orana Regional Plan 2036 (Regional Plan) acknowledges the diversity of industries in the region. The Regional Plan states that Mining is the largest gross regional product contributor at $2.5b representing 5% of the regions jobs. This is followed by Agriculture, Forestry and Fishing at $1.3b which represented 11% of the regions jobs. The Regional Plan's *Direction 8 – Sustainably Manage Mineral Resources* states that the mineral resources sector underpins many local economies and will continue to drive economic growth. The Actions nominated in the Regional Plan are listed below:

- *Consult with the Division of Resources and Geosciences when assessing applications for land use changes (strategic land use planning, rezoning and planning proposals) and new development or expansions.*
- *Protect areas with potential mineral and energy resources extraction through local land use strategies and local environmental plans.*
- *Protect infrastructure that facilitates mining from development that could affect current or future extraction.*
- *Support communities that transition out of mining to manage change in population and demand for services, and explore new economic opportunities.*
- *Work with councils to scope the application and implementation of a scenario planning or impact modelling tool to be applied at a regional level to help communities plan for the impacts of mining.*

The Regional Plan position in relation to mining is to ensure that mining can continue to grow and develop communities, whilst ensuring this temporary land use will be able to be used for future productive uses such as agriculture, forestry, conservation etc.

The connectivity of the Project with regional land use strategies and project initiatives has been considered. There are a number of these landscape connectivity projects relevant to the Bylong district occurring at the National, State and local levels, in addition to volunteer and private initiatives. However, these primarily focus on environmental (rather than agricultural) connectivity conservation, with the Great Eastern Ranges initiative and Central Tablelands Local Land Service in particular having large and relevant native vegetation connectivity projects. At a more local scale, the MWRC has a roadside corridor management project aimed at improving habitat and remnant vegetation condition throughout the local area.

Identified initiatives and relevant planning instruments include:

- Great Eastern Ranges Initiative (Anon, 2015): Bylong is located just to the west of the ranges, abutting the Wollemi National Park, and close to the Goulburn River National Park and several State Forests;
- Central Tablelands Local Land Services – Catchment Action Plan (Anon, 2013): This is a multi-catchment management plan including creeks and rivers found within the immediate vicinity of Bylong;
- NSW Upper Hunter Strategic Regional Land Use Plan (NSW DP&I, 2012): Recommendations extend to the Bylong and Mudgee mining districts;
- NSW Mining Operations Plan Guidelines (i.e. ESG Guidelines): Emphasises integration of post mining landforms with local environment and catchment management plans;
- Mid-Western Regional Council – Roadside Corridor Management Project (Applied Ecology, 2010): This project is conducted across the MWRC LGA, including Bylong; and
- Watershed Landcare – the local Landcare initiative covering Mudgee, Bylong, Gulgong and surrounds (Anon, 2009).

3.4 Rehabilitation Commitments

The key rehabilitation commitments made throughout the planning approvals process for the Project are summarised in **Table 4** below.

Table 4 Summary of Rehabilitation Commitments

	Rehabilitation
1	The Rehabilitation Strategy will endeavour to:
	• Rehabilitate all mined areas and implement best industry standard soil management measures to minimise degradation of soil reserved for rehabilitation;
	• Manage soil resources in accordance with the Soil Resources Management Plan,
	• Reinstate BSAL to be directly and permanently impacted;
	• Conduct the required rehabilitation and weed/ feral animal management to ensure compliance with the preliminary rehabilitation criteria; and
	• Conduct the rehabilitation monitoring as specified in **Section 7.15** of this EIS.
2	KEPCO will record the original soil type stripped and used in the rehabilitation of BSAL to demonstrate the original inherent fertility ranking of the proposed BSAL material used on rehabilitated mining landforms
3	KEPCO will contribute to and actively participate in trials research to improve mine site rehabilitation techniques and enhance performance outcomes.
4	KEPCO will seek to participate in the NSW Minerals Council's working group on rehabilitation
5	KEPCO will progressively rehabilitate mined areas, with an emphasis on re-establishing existing land uses.

4 REHABILITATION PRINCIPLES AND OBJECTIVES

4.1 General Principles

Section 3.1.2 outlines the rehabilitation objectives for the Project as committed to within the EIS and supporting planning approvals documentation and as specified in the Development Consent SSD-6367.

In addition, the overarching rehabilitation objectives for the Project are:

- Rehabilitation will comply with the relevant regulatory requirements, and regulatory consensus will be attained on the successful closure and rehabilitation of the Project;
- The rehabilitated final landforms will be stable with soils and ecosystems having maintenance needs no greater than those of the comparable surrounding land;
- Appropriately recover, store and re-handle suitable soil resources for future rehabilitation;
- Undertake progressive rehabilitation as soon as areas become available;
- Undertake temporary rehabilitation measures on stockpiles or disturbed areas which would otherwise remain so for greater than 6 months.
- Establish healthy and self-sustaining soil profiles and vegetation cover for future land use on re-contoured mined lands;
- Create a post-mining landform consistent with that which existed prior to mining and which enables agricultural land use and areas of native vegetation;
- Conduct maintenance (e.g. weed control, follow-up fertiliser, reseeding, erosion repair etc.) until rehabilitation is sustainable; and
- Monitor and manage rehabilitation areas to facilitate the process of achieving sign-off on pre-determined completion criteria.

4.2 The Domain Approach

Rehabilitation of the final landform within the Project will be undertaken on a domain basis, which represent land management units, discrete rehabilitation areas or post-mining landforms that will be rehabilitated using varying techniques suited to the type of disturbance and the proposed post-mining land use. The domains are listed below in **Table 5** and illustrated in **Figure 3**:

Table 5 Project Domains

Primary Domain		Description	Area (ha)
1	Open Cut Mining Area	• Western Open Cut • Eastern Open Cut	532.7
2	Overburden Emplacement Area (OEA)	• South-western OEA • North-western OEA	225.0
3	Mine Infrastructure Area	• Employee & materials drift • Overland Conveyor • ROM coal pad • Main access • Administration buildings	85.0
4	Rail Loop	• Rail Loop, associated rail load out and CHPP	88.3
5	Roads	• Haul Roads • Internal Roads	191.8

Primary Domain		Description	Area (ha)
6	Water Storage Facilities	• Raw water storage • Dirty water storage	26.5
7	Subsidence Study Area	• Angle of draw for the Underground Extraction Area within the Study Area boundary	1,714.3
8	Stockpile Area	• Land nominated for storage and management of stripped soil	11.1
9	Temporary Construction Disturbance Areas	• Land disturbed in construction of operational areas and support infrastructure	*
Total			**2,874.7**

*Areas identified as Temporary Construction Disturbance are included within the other noted Domains Areas (total ha). The Domain has been separated to ensure land disturbed by construction activities is adequately rehabilitated within a practicable timeframe.

The remaining area within the Project will be maintained in its existing condition with only minor disturbances from ancillary facilities associated with mining or construction activities.

The Project seeks to minimise risks to agricultural resources and to minimise long-term impacts. The Project's Rehabilitation Objectives for each domain are described below in **Table 6**. This strategy will drive post-mining land use goals and capabilities.

Table 6 Domain Rehabilitation Objectives and Land Use

Domain		Rehabilitation Objectives	Post-mining land use
1	Open Cut Mining Area	Shape overburden to provide a stable landform consistent with the surrounding environment and landscape elements and proposed post-mining land use. Any carbonaceous material emplaced within the Open Cut Mining Areas will be capped with suitable inert material.	Grazing Only, Cropping/Grazing, Woodland
		Void remaining within the Eastern Open Cut Mining Area at the completion of open cut mining operations will be progressively backfilled with coarse and fine reject materials for the remaining term of underground mining operations. Following completion of mining operations, the area will be capped and rehabilitated as per the conceptual final landform.	
2	OEA	Shape OEAs to provide a stable landform consistent with the surrounding environment and landscape elements and to facilitate the proposed post-mining land use.	Grazing Only, Cropping/Grazing, Woodland
3	Mine Infrastructure Area	Remove all aboveground infrastructure and seal and recover underground mining infrastructure where feasible. Regrade embankments and cuttings where required and reshape landform to be similar to pre-mining landform. Drift to be rehabilitated by emplacement of a concentre plug with topdressing material for rehabilitation.	Pre-mining land use
4	Rail Loop	Rail Loop will be removed at closure. Carbonaceous material associated with the CHPP, located within the rail loop, to be removed with CHPP and associated rail loading infrastructure decommissioned. The land will be regraded, topsoiled and rehabilitated to present a natural environment to ensure the site is stable, free draining and revegetated.	Pre-mining land use
5	Roads:		
	Haul Roads	Haul roads will have road base materials removed. Roads will be re-shaped to blend with the surrounding landform and revegetated with appropriate species.	Pre-mining land use

Domain		Rehabilitation Objectives	Post-mining land use
	Internal Roads	Internal roads will be left in-situ as they form part of the road network.	Infrastructure to remain
6	Water Storage Facilities		
	Raw water storage dam	The majority of dams will be drained and de-silted with dam walls re-shaped to blend in with the surrounding landscape. Any dams remaining will be considered beneficial for future use by post mine landowners and will be left in place in accordance with relevant stakeholder or landowner agreements.	Pre-mining land use or beneficial farm dams
	Mine water dam		
7	Subsidence Study Area	Monitor and repair erosion, ponding and surface cracking during operations and post closure.	Pre-mining land use
8	Stockpile Area	Stockpiles will be removed and rehabilitated.	Pre-mining land use
9	Temporary Construction Disturbance Areas	At completion of construction activity reshape landform to be similar to pre-mining landform. Establish vegetation and ensure landform stability.	Pre-mining land use

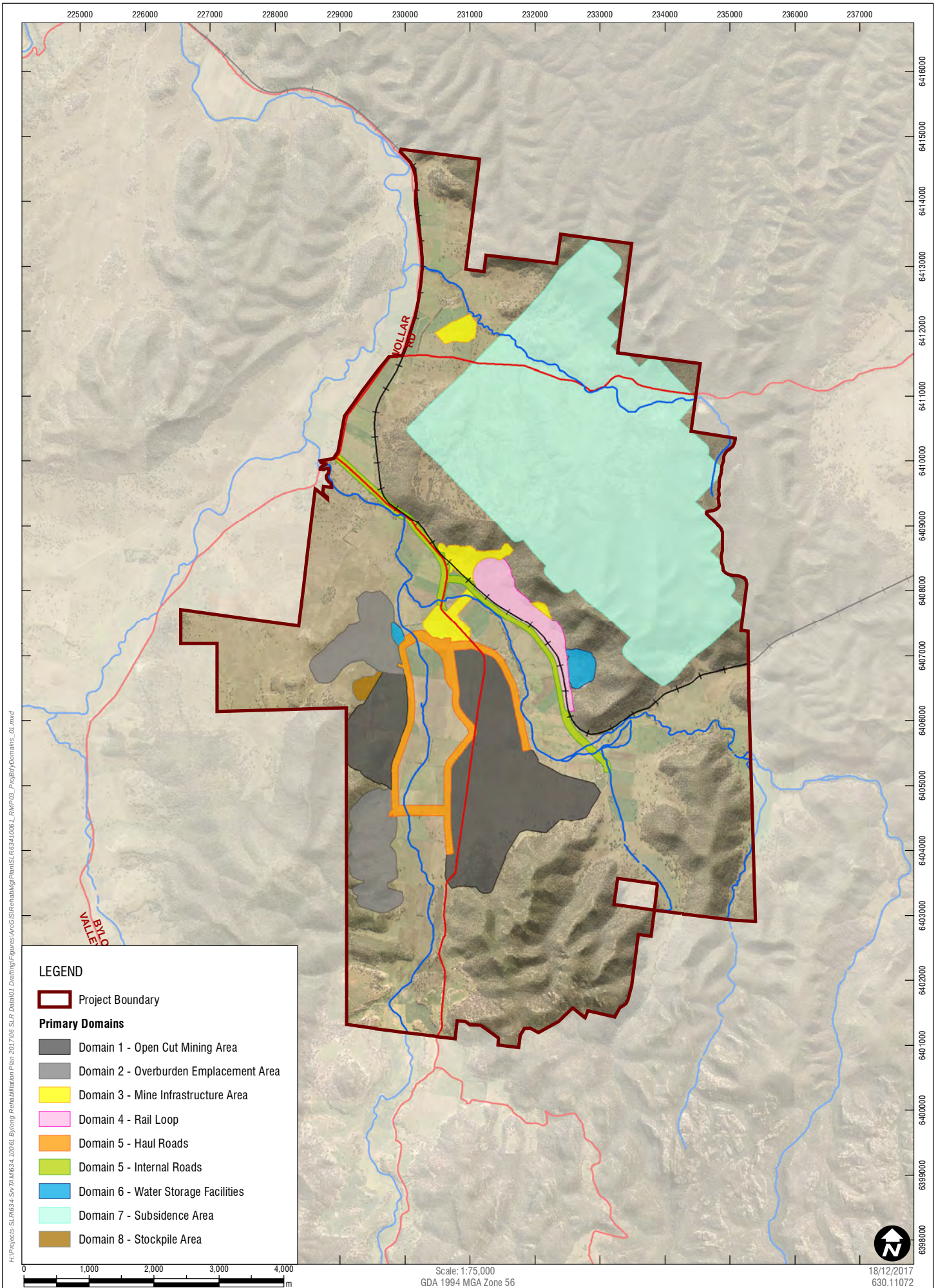
4.3 Short Term and Long Term Procedural Objectives

All land disturbed by construction and mining activities will be rehabilitated to ensure a stable landform is achieved. Short-term rehabilitation objectives include:

- The minimisation of clearing and/or vegetation disturbance (consistent with approved MOP);
- Scheduling of construction and mining operations, including overburden/interburden emplacement shaping and revegetation;
- Timely rehabilitation of the disturbed areas no longer required for mining-related operations;
- Application of topdressing material (topsoil/subsoil) to the final landform based on soil availability and post-mining BSAL and/or Land and Soil Capability (LSC) targets;
- Stabilisation of all earthworks, drainage lines and disturbed areas in order to minimise erosion and sedimentation; and
- Control of vermin, feral animals and noxious weeds.

Overall, long-term mine rehabilitation objectives are to provide a landform that is safe, low maintenance, and geotechnically stable that blends in with the surrounding topography and consistent with the inherent landscape elements. Land use will provide for a mixture of rehabilitated native vegetation, pastoral land and potential cropping areas. Specific long-term objectives include:

- The re-establishment to BSAL-equivalent land, pastoral land or native vegetation in areas disturbed by the mine;
- The long-term conservation of native vegetation and/or habitat corridors on the mine site;
- The provision of habitat for fauna within the final landform;
- Ensuring that the quality of run-off water from rehabilitation areas will not cause environmental harm off site; and
- Monitoring and manage rehabilitation to ensure success in terms of physical, chemical and biological parameters.



H:\Projects-SLR\634.Snr7A.MI\634.10061 Bylong Rehabilitation Plan 20170606 SLR Data\02 Drafting\Figures\ArcGIS\RehabMgtPlan\SLR634.10061_RMP03_ProjBdyDomains_01.mxd

Scale: 1:75,000
GDA 1994 MGA Zone 56

18/12/2017
630.11072

Sheet Size : A4

SLR

www.slrconsultingaustralia.com.au PH: 61 2 4037 3200

Project Boundary & Domains

FIGURE 3

4.4 Key Rehabilitation Objectives

4.4.1 Final Landform

Landform design and planning takes into account four main components:

- Landform stability;
- Erosion minimisation;
- Landform compatibility with the surrounding environment having regard to the landscape; and
- Post mining landuse criteria.

Rehabilitation has been designed to achieve a stable final landform compatible with the surrounding environment. Pells Sullivan Meynink (2014) conducted a geotechnical study to determine stable slope design criteria for the pit excavation slopes, overburden emplacement areas (OEAs) and in pit slopes. All finished slopes are designed to a safe, geotechnical maximum angle. This will involve shaping the completed OEAs, where practical, to achieve slopes of 10 degrees or less. Where slopes exceed 10 degrees, additional drainage and revegetation works will be carried out to aid groundcover establishment and enhance erosion and sediment control.

The final landform will incorporate contour-graded banks installed during the rehabilitation process. The spacing and ultimate dimensions of these banks will be a function of the final slope and catchment area. On the slopes exceeding 18%, linear contour bank spacing will generally range between 50 and 80 m.

Ongoing mine planning will limit the total area of disturbance at any one time, considering both clearance in advance of operations and rehabilitation of areas disturbed. This will reduce the potential for wind-blown dust, visual impact and sediment-laden run-off. Any treed vegetation along the toe of rehabilitation areas will not be cleared unless an unacceptable safety or erosion risk remains.

The final landform will contain no voids, with the two open cut mining areas to be backfilled to surface level in accordance with the final landform design. The void associated with the Western Open Cut will be backfilled with overburden at the completion of open cut mining operations. The void associated with the Eastern Open Cut will remain as an open void for the storage of coarse and fine reject materials and surplus mine water for the longer term underground mining operations. This void will be filled over the life of the Project and will be capped and rehabilitated at the end of the mine life, so that no final void remains. The void will be capped with overburden material from the South-Western OEA and/or the OEAs within the Eastern Open Cut.

4.4.1.1 Domains 1 & 2 (Open Cut Mining Areas and OEAs)

The land to be directly and permanently disturbed by the open cut mining areas and OEAs will be backfilled with overburden and reshaped in accordance with the landform design. Reshaping will ensure that final slopes are generally 10 degrees or less, excluding some slopes around the margin where the landform integrates into the surrounding mountainous terrain. This landform will differ from its pre-mining state, however is still consistent with the surrounding landscape.

The reshaped South-Western OEA will be an elevated landform largely composed of moderately inclined land with some steeper slopes on the western perimeter where it abuts the existing rugged topography. The re-shaped South Western and North-Western OEA's are largely comprised of flat to gently inclined land with some moderately inclined slopes on the perimeter.

The Western Open Cut will contain an elevated landform largely composed of moderately inclined land in the south and flat to gently inclined land in the north. The re-shaped Eastern Open Cut will be an elevated landform largely composed of gently inclined land with some fringing steeper slopes where it abuts the existing rugged topography in the south. All final landforms will remain consistent with the surrounding low hills and rises landform patterns.

4.4.1.2 Domains 3, 4, 6, 7 and 8

All land covered by main infrastructure components, rail loop, water dams, subsidence area and stockpile area will be returned to the approximate pre-mining landform or similar natural landform and will be capable of supporting pre-mining land uses.

4.4.1.3 Domains 5

It is proposed that all upgraded and realigned roads (part of Domain 5), will be retained at closure. This landform will therefore differ from its pre-mining shape within these Domains.

4.4.1.4 Temporary Construction Disturbance

All land temporarily disturbed in the construction of the above noted Domains will be rehabilitated where possible to pre-mining landform or similar natural landform and capable of supporting pre mining land uses. Rehabilitation will occur in a reasonable timeframe at completion of the relevant construction activity.

4.4.2 Visual Outlook of Landform

The rehabilitation has been designed to achieve a stable final landform compatible with the surrounding environment and consistent with the landscape elements of this part of the Bylong Valley. The following Plates visually compare the pre-mining and post-mining landform with respect to the domains and proposed final land uses.

Plate 1 and **Plate 2** show the footprint from a northerly aspect through the Upper Bylong Valley. Land that is being directly and permanently impacted upon is labelled and shown in colour in **Figure 3**. All other land is being returned to its pre-mining land capability and land use. As can be seen from these plates, the final land uses blend into the surrounding environment. **Plate 3** and **Plate 4** show the footprint from a south-easterly aspect through Bylong Valley.

Plate 1: Pre-mining landscape with Project components: northerly aspect through Upper Bylong Valley

Plate 2: Post-mining landscape with post-mining land use: northerly aspect through Upper Bylong Valley

Plate 3: Pre-mining landscape with Project components: south-easterly aspect through Upper Bylong Valley

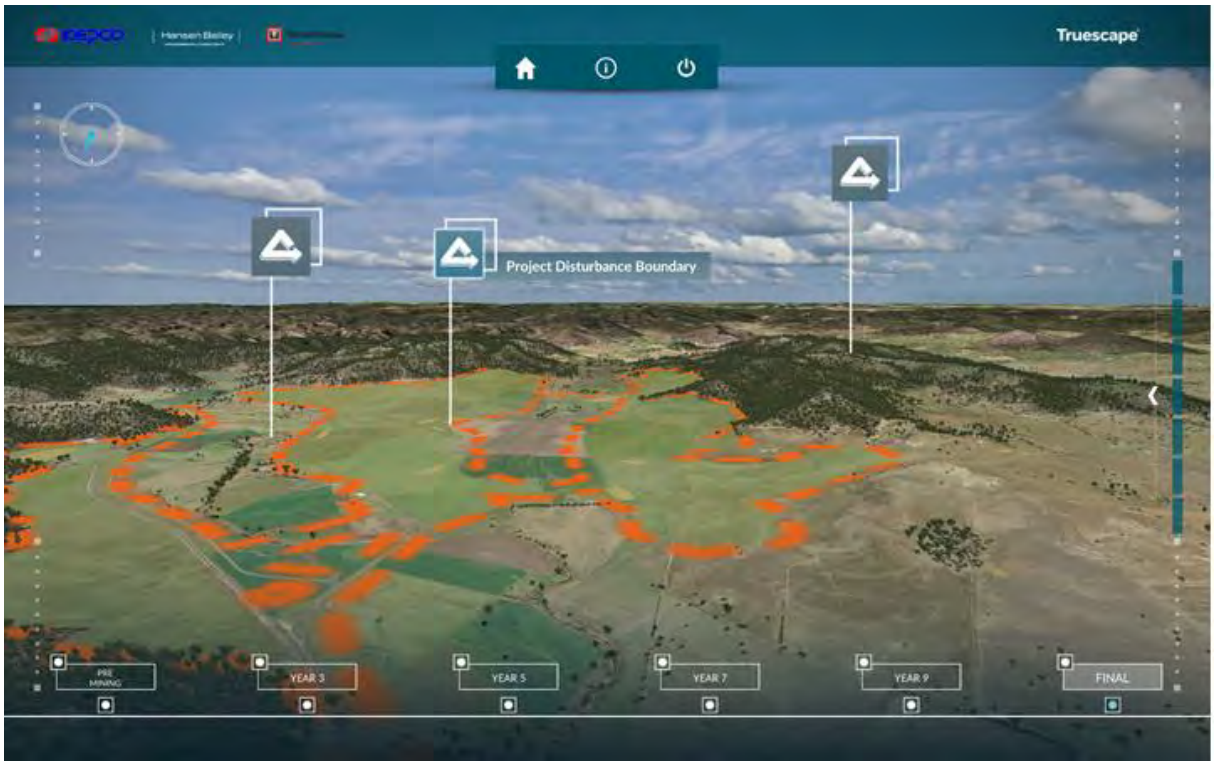


Plate 4: Post-mining landscape with post-mining land: south-easterly aspect through Upper Bylong Valley

4.4.3 Specific Post Mining Landuse

KEPCO will implement an integrated approach to the future rehabilitation and management of the land within the Project Area to facilitate the establishment of native woodland communities and agricultural land for ongoing production. Specific landuse objectives are outlined below.

4.4.3.1 Agricultural Land and BSAL

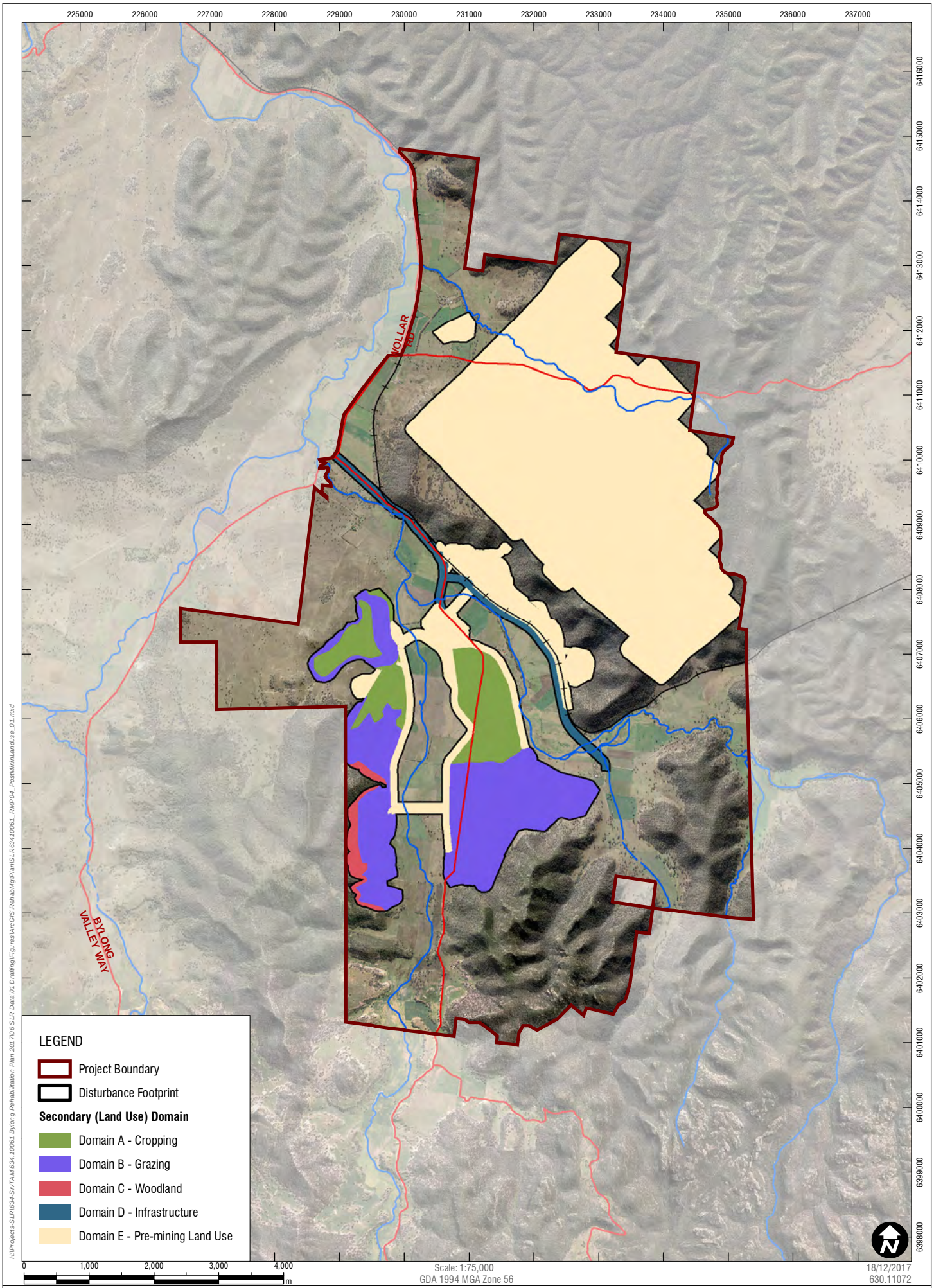
The re-instatement of agricultural land will compensate for the temporary loss of available agricultural land as a result of the Project. Within the proposed re-instated agricultural land, KEPCO will re-instate 319.5 ha of BSAL equivalent land within Domain 1 and 2. Reinstated BSAL will be located proximal to the existing agricultural lands with consideration for road infrastructure and paddock size economies of scale. Upon completion, this land will be dedicated for agricultural purposes and integrated with the existing KEPCO agricultural enterprise.

The reinstatement areas for agricultural land and BSAL in relation to the broader conceptual final landform are illustrated on **Figure 4**.

KEPCO will continue to manage all company owned land for agricultural purposes in accordance with the Bylong Farm Management Plan. KEPCO has prepared the Farm Management Plan to assist with the management of the land. The Farm Management Plan details strategies for the ongoing landuse for grazing and cropping management, erosion and sediment controls and weed and pest controls. KEPCO has a dedicated Farm Manager to facilitate these activities as identified with the Farm Management Plan, This commitment ensures the continued productivity of agricultural land not directly impacted by the Project

4.4.3.2 Native woodland

The rehabilitation of native vegetation areas will, facilitate a self-sustaining post-mining landscape that resembles the original vegetation communities prior to clearing for agricultural purposes. Revegetation efforts will in the long term aim to support a diverse range of viable flora and fauna populations, link remnant native vegetation and maximise conservation of biodiversity values. As such, it will focus on the establishment of ecological communities, including White Box Grassy Woodland and Yellow Box Grassy Woodland. The indicative rehabilitation areas for native vegetation in relation to the broader conceptual final landform are illustrated on **Figure 4**.



Sheet Size : A4

SLR

www.slrconsultingaustralia.com.au PH: 61 2 4037 3200

Post Mining Land Uses

FIGURE 4

5 REHABILITATION MANAGEMENT

5.1 Temporary Construction Areas

The areas associated with construction activities which are not used for infrastructure purposes following construction, will be rehabilitated to provide stable, non-polluting vegetated landforms. These areas will include temporary slopes and drainage areas which will be used to transport surface water from hardstand areas and buildings to sediment dams prior to leaving site. All temporary construction areas will be designed and rehabilitated using the following principles:

- Minimise bare areas which may be exposed to wind and dust generation and surface water erosion, by maintaining a minimal disturbance footprint and revegetating with grass and pastures;
- Minimise steepness of final slopes and batters where practical;
- Ensure cut off and diversion drains are in place during and post construction, to ensure these areas have minimal exposure to run on water;
- Ensure these areas are maintained for grass/pasture cover around infrastructure whilst providing infiltration and or transport of rainwater in non-eroding channels and stormwater pipes.

The specific rehabilitation methods to be employed within the temporary construction areas will be dictated by final construction plans and the erosion and sedimentation control plan associated with the construction activities. However the following design requirements should be considered within these plans:

- All batters remaining 6 months or longer should be covered with a grass/pasture cover. The preferred technique is hydroseeding and straw mulching on angle of repose batters. Consideration may also be given to natural biodegradable erosion control blankets such as jute mesh in very steep batters.
- All temporary construction areas which will no longer be disturbed, will be rehabilitated with the required soil depths as per the pre-construction soil profile depths. These areas will require signage and GIS recording to indicate permanent rehabilitation.
- Other temporary construction areas which are likely to be disturbed in the future may be temporarily rehabilitated with or without a thin veneer of topsoil. Shallow ripping may be required on areas compacted by construction machinery and activities.
- Building and work areas should be designed to include suitable drainage within a minimal footprint to reduce the surface catchment area and therefore volume of surface water requiring transport to holding ponds.
- Temporary erosion and sediment controls will be used whilst permanent vegetation is being established. Once the surface is covered with grass and pasture, these temporary controls may be removed.
- All areas should be free draining and only report to designated holding ponds or sediment dams.
- Rehabilitation of all temporary construction areas will be completed within 6 months of final construction activities. Maintenance of these areas will be included within the landscaping contract for the infrastructure area or the mine operations area depending on which authority boundary the sites are situated.

5.2 Pre-mining Land Management

The management of the pre-mining land is vital in ensuring the soil resources to be ultimately utilised in rehabilitation activities is in the best possible state to handle being mechanically stripped, stockpiled and re-spread. Most agricultural land management practices that are currently applied across the site need to be continued to be applied in areas that are required to be stripped.

The soil resources located within areas to be cleared should be managed with a thick cover of healthy pasture, where possible. The area should be maintained as per the Bylong Farm Management Plan, including the following:

- Weed management practices including herbicide applications to ensure weeds are not present, and the weed seed bank is reduced over the several years leading up to stripping.
- Regular agronomic soil testing and appropriate application of fertilisers should be practiced for several years in the lead up to stripping.
- Rotational grazing of stock to allow the pasture to thicken and provide protection for the soil from drying out, which will reduce the risk of having to strip soil at non-ideal moisture content.

These three aspects of land management should be practiced for at least one year in the lead up to stripping, and preferably for several years to help increase the key resilience factors within the soil such as maintaining moisture content and organic matter and therefore increasing biological activity leading to improving soil structure and minimising compaction. In summary, whilst an ongoing agricultural land use is being undertaken within these areas, in the lead up to soil stripping, the land should be managed as per the Bylong Farm Management Plan to ensure the soil is in a healthy state prior to stripping.

5.3 Pre-Clearance Protocols

Prior to clearing, a pre-clearance survey (the Land Disturbance Protocol) will be conducted to identify whether the proposed clearing is in accordance with the relevant regulatory requirements and that any potential impacts of the vegetation clearance activities are appropriately managed and mitigated. The key components of the survey are:

- Delineation of areas to be cleared of native vegetation;
- Pre-clearance surveys; and
- Vegetation clearance supervision.

The Biodiversity Management Plan provides a detailed description of the Land Disturbance Protocol. The pre-clearance protocols apply to both construction and mining operations.

5.4 Collecting and Propagating Seeds

During the pre-clearance process, and where feasible, trees may also be checked for their provision of seed to be utilised in the rehabilitation programme, followed by the collection of seed during felling activities. A key aim of seed collection is to collect local provenance seed stock for propagation purposes.

The reference text *Plant Germplasm Conservation in Australia – strategies and guidelines for developing, managing and utilising ex situ collections*, by Offord and Meagher (2009) provides best-practice guidelines and standards for the capture, storage and use of wild-plant germplasm for long-term conservation in Australia, including the recovery of threatened plant species and the conservation of genetic diversity in the face of climate change. The guidelines have also been written so as to be accessible and useful to shorter-term projects in the restoration and revegetation industry and community sectors.

Seed present during clearance activities will be collected for use in plant propagation programmes to provide tube stock for revegetation activities. Suitable seed collection techniques include:

- Brush harvesting, to obtain seeds from a diversity of understorey species;
- Suction or vacuum harvesting of grass species with less persistent seed units; and
- Hay strewing; this may be appropriate if a recipient site is ready to receive seed at the time of harvest.

As tube stock will also be needed to achieve suitable vegetation community composition, engagement of a local nursery, school or other group/facility will be undertaken prior to mining in order to produce projected numbers of suitable species. Local provenance seed, when available, will be supplied to the nursery to propagate tube stock, together with a schedule for mine requirements over the following two years. This schedule will be updated regularly and will be closely linked to the MOP. The Biodiversity Management Plan provides additional detail on the seed collection and propagation process.

5.5 Salvaging Habitat Enhancement Material

Habitat features (e.g. tree trunks, logs, large rocks, branches, small stumps and roots) will be salvaged during vegetation clearance activities and stockpiled for relocation to areas undergoing rehabilitation to woodland. These features will potentially provide habitat resources for a range of invertebrate and ground dwelling fauna as well as increasing the mulch cover for the soil.

The ground-layer vegetation and low shrubs will be incorporated into the topsoil when it is stripped. This will possibly enhance the soil seed bank on the rehabilitation, which further justifies the need for weed management in the lead up to the stripping program. The Biodiversity Management Plan provides additional detail on salvaging hollow logs and rocks during clearing.

5.6 Soil Stripping and Handling Process

5.6.1 Assessment of Equipment

Equipment for stripping, stockpiling and reinstatement of topsoils and subsoils will be selected to minimise compaction and to avoid breakdown of the soil structure. Different practices may be implemented for the stripping of the fragile sandier soils and the stiffer and more robust loam and clay soils. Final equipment selection will be based on ongoing research, conditions experienced during stripping and equipment availability.

Equipment and procedures that are successfully used during the stripping process will also be used in the recovery of stockpiles for reinstatement purpose. If necessary, equipment and procedures used, based on experienced gained during stripping, will be amended to minimise compaction and soil structure damage during recovery of stockpiles for reinstatement purposes. Equipment will be selected with the aim of minimising ground pressures where soil structure and moisture conditions indicate this may be a problem.

5.6.2 Access Road for Stripping

The stripping program will be designed to minimise the number of times machines travel over the soil materials. To accomplish this, the following will be implemented:

- For haulage, an access road will be first constructed into defined stripping areas from which topsoil will be removed in advance;
- Heavy vehicles will only travel on these approved access roads to and from defined soils stripping areas;
- Sequencing of stripping operations will be set out to prevent machines running over soil materials;

- Stripping operations will be set out and controlled on a lot basis; and
- Light vehicles will access areas only as approved by the Project's Environmental Manager.

5.6.3 Soil Stripping Volumes

The recommended soil stripping depths have been calculated and mapped during the EIS process and refined during the RTS. The soil stripping depths have been calculated to provide overall soil volumes as shown in **Table 7** Available soil resources based on assessed stripping depths. These stripping depths are estimations based on in field soil test pits and profile assessment, which have been extrapolated based on geomorphology and soil toposequence assessment. It is important to appreciate that local variations in soil type and soil depth are possible and indeed expected to be encountered during the stripping program. The approach required for stripping is essentially to salvage all suitable soil material (topsoil and subsoil) during stripping. This means on ground assessment during active stripping is required, to identify what "suitable soil material" includes. This aspect is addressed in the following sections.

Table 7 Available soil resources based on assessed stripping depths

Domain	Area (ha)	Available Topsoil (MCM)	Available Subsoil (MCM)	Total Available (MCM)
Mining Area	831.2	2.13	3.85	5.98
Rail Loop	88.3	0.18	0.35	0.52
Total	**919.5**	**2.30**	**4.20**	**6.50**
Infrastructure Area *	240.9	0.84	1.35	2.19

**Same material and in-situ depths to be reinstated within infrastructure area.*

5.6.4 Soil Balance

Assuming the soil volumes listed above are salvaged, and made available for reuse in establishing a soil profile on the post mining landform, the following volumes and soil balance has been calculated based on the post mining requirements for soil depths. These depths are derived from the criteria for each LSC class and the BSAL protocol, with adequate buffer to allow for settling consolidating over time.

Table 8 Required soil resources based on reinstatement depths

BSAL Status and Land and Soil Capability (LSC) Class	Reinstatement Depths (m)		Soil Volume Requirements			
	Topsoil	Subsoil	Area (ha)	Topsoil (Primary media) (MCM)	Subsoil (Secondary media) (MCM)	Total (MCM)
BSAL/Class 3	0.30	0.60	319.5	0.96	1.92	2.88
Class 4	0.20	0.40	172.3	0.34	0.69	1.03
Class 5			232.3	0.46	0.93	1.39
Class 6	0.20	0.20	11.0	0.02	0.02	0.04
Class 7	0.20	0.00	22.6	0.05	0.00	0.05
Rail Loop*	0.20	0.40	88.3	0.18	0.35	0.53
Internal Mining Roads**	0.00	0.00	73.5	0.00	0.00	0.00
Total			**919.5**	**2.01**	**3.91**	**5.92**

*Rail loop to be rehabilitated to LSC Class 5 Grazing Land Specs

** Internal roads remaining post mining

The estimated volume of suitable topsoil available from the mining areas is 2.30 MCM. The required volume of suitable topsoil to achieve the post mining BSAL and LSC target areas is 2.01 MCM. Therefore, there is an estimated surplus volume of topsoil resources, including a buffer or excess of 14%. The estimated volume of suitable intermediate subsoil available from the mining areas is 4.20 MCM. The required volume of suitable subsoil to achieve the post mining BSAL and LSC target areas is 3.91 MCM. Therefore, there is an estimated surplus volume of subsoil resources, including a buffer or excess of 7%. It is noted that depth of subsoil below the in-situ measurement of 1.0 m was not included in the calculations, and it is expected that additional subsoil resources may be available below this depth in some soils.

To achieve the desired post mining land capability, the total volume of material required for rehabilitation (topsoil and subsoil) is 5.92 MCM. The total volume of suitable material available for reuse in rehabilitation is 6.50 MCM, which results in a surplus of 0.58 MCM (or 9%). This surplus material will be stored as a contingency, if required, to improve rehabilitation or rectify areas where settlement has occurred.

5.6.5 On-ground Soil Assessment

As mentioned above, on-ground field assessment and sampling will be required during the actual stripping of soil to provide information on soil type, physical and chemical parameters and soil volumes. There are two key methods recommended to provide the on-ground soil assessment:

1. Qualified Soil Scientist (CPSS): At timely stages throughout the stripping program, a CPSS qualified Consultant will attend site and make a field assessment and collect samples of soil to ensure the material is appropriately categorised and recorded. The results of this assessment will ensure the higher quality (BSAL equivalent) material is quarantined and saved for use in recreating the BSAL equivalent soil profiles on the post mining landform.

2. Trained Site Personnel: To support the staged work of the CPSS Consultant, several site personnel will be trained in basic soil identification and sampling protocols. Having site personnel trained in these skills will ensure decisions on stripping depths can be made in real time, which allows the maximum suitable soil material to be salvaged without delays.

The key assessment parameters and soil tests to be undertaken during the stripping program are to assist in ensuring the BSAL quality soil is segregated from any poorer quality material, which may rule out future soil profiles as BSAL. The standard soil assessment parameters and lab tests to be undertaken are listed in **Table 9** below.

Table 9 Standard Soil Assessment Parameters

Detailed Assessment Parameters	
Field Assessment Parameters	**Laboratory Assessment Parameters**
Horizon depth including distinctiveness and shape	pH (water & CaCl)
Field Texture Grade	Electrical Conductivity (EC) and Chloride
Field colour (Munsell Colour Chart)	Cation Exchange Capacity (CEC)
Pedality structure, grade and consistence	Calculated Exchangeable Sodium Percentage
Soil fabric and stickiness	Calculated Ca: Mg ratio
Stones including abundance and size	Particle Size Analysis (PSA)
Mottles including amount, size and distinctiveness	
Segregations (abundance, nature, form and size)	
Pan presence and form	
Permeability, drainage and field moisture	
Field pH	

An on-ground assessment of soil moisture will also be undertaken to determine the suitability of the material for stripping based on the theoretical desirable moisture range for stripping on each soil texture group, as per below:

- Loamy sands and clayey sands 9 -11%
- Sandy clay loams, clay loams, sandy clays 12 -14%
- Silty clays, light clays 20 -22%

It is probable that stripping outside the desired range will be necessary, in which case the stripping procedure or amelioration will be reassessed. Placement at wetter than above may necessitate deep ripping once the profile has been dried to below the plastic limit. Stripping should not occur at wetter than the plastic limit except where the normal moisture regime is above this level. Modifications to the stripping procedure may be required should this occur.

5.6.6 Training and Induction Program for Soil Stripping

The process of training site personnel in soil identification and soil stripping will involve a one day on site program covering the basic soil assessment skills needed to identify soil types and collect samples. For construction operations, training will focus on the identification and delineation of subsoil and topsoil in situ then creating soil stockpiles using both these materials. For mining operations, the training will include the identification requirements of BSAL material and its management. This will be similar to the induction program undertaken by Supervisors prior to the commencement of construction activities on the site. Training manuals and aids will be supplied during these courses and will be used for reference during the stripping operation. Experienced soil consultants will be engaged to carry out such training. Following the training programs, additional support by the CPSS will be offered with communications via photos and assessment results through e-mail. This allows the CPSS to remotely confirm the onsite decisions and discuss any soil stripping related issues to ensure the stripping program runs effectively.

All persons involved in the stripping, stockpiling, recovery and reinstatement of BSAL will attend an induction session, prior to their commencing work. This session will deal with soils issues amongst other things and includes:

- Value of BSAL soils;
- Stockpile control and signage;
- Rules when working on stockpiles;
- Basic soils and land use information; and
- Rules when stripping soils.

Information regarding the soils management operation will be covered and reinforce at regular toolbox meetings.

5.6.7 Soil Stripping and Handling Methods

The following management and mitigation strategies will be implemented to reduce the potential for soil degradation:

- Strip soil to the depths generally stated in EIS and RTS, subject to pre-stripping field and laboratory assessments;
- Soil should preferably be stripped in a slightly moist condition, where possible (refer to **section 5.5.5** above). Material should not be stripped in either an excessively dry or wet condition. Stripping operations will not be undertaken during excessive dry periods to prevent pulverisation of the natural soil aggregates. Similarly, stripping during wet periods will not be undertaken to prevent damage through compaction;

- Stripping of soils will be undertaken during daylight hours;
- Placement of stripped material directly onto area to be rehabilitated and spread immediately (if mining sequences, equipment scheduling and weather conditions permit) to avoid any unnecessary stockpiling;
- Preference will be given to using equipment which can grade or push soil into windrows with graders or dozers for later collection by open bowl scrapers or for loading into rear dump trucks by front-end loaders. This will minimise compaction effects of the heavy equipment that is often necessary for economical transport of soil material. These techniques are examples of preferential less aggressive soil handling systems which may be adopted;
- Soil transported by dump trucks may be placed directly into storage. Soil transported by scrapers is best pushed to form stockpiles by other equipment (e.g. dozer) to avoid tracking over previously laid soil;
- The surface of soil stockpiles will be left in as coarsely structured a condition as possible in order to promote infiltration and minimise erosion until vegetation is established, and to prevent anaerobic zones forming;
- As a general rule, maintain a maximum stockpile height of 3 m. Clay soils should be stored in lower stockpiles for shorter periods of time compared to coarser textured sandy soils;
- If long-term stockpiling is planned (i.e. greater than 12 months), stockpiles will be seeded and fertiliser applied as soon as possible. An annual cover crop species that produce sterile florets or seeds should be sown, as detailed n **Section 5.6.2** below. A rapid growing and healthy annual pasture sward provides sufficient competition to minimise the emergence of undesirable weed species. The annual pasture species will not persist in the rehabilitation areas but will provide sufficient competition for emerging weed species and enhance the desirable micro-organism activity in the soil;
- Soil materials will be segregated into BSAL-suitable material and BSAL-unsuitable material, and within these areas, further segregated into Topsoil-suitable material and Topsoil-unsuitable material, which will be used as a subsoil/intermediate layer between overburden and topsoil;
- An inventory of available soil will be maintained and updated regularly to ensure adequate topsoil and subsoil materials are available for planned rehabilitation activities. Actual depths and position of topsoil and subsoil removed will be picked up by surveys (for active faces only) and recorded. Any subsoils stripped below 1.2 m will also be surveyed at regular intervals and included in records. Reported quantities shall be calculated based on these surveys. Estimates are to be based on scraper and or truck counts and corrected based on survey;
- Subsoil and topdressing will be spread to depths dependent on target BSAL or LSC requirements and as stated in **Section 4.5.3**; and
- Where possible, suitable subsoil/topsoil will be re-spread directly onto reshaped areas. Topsoil will be spread, treated with fertiliser and seeded in one consecutive operation, to reduce the potential for topsoil loss to wind and water erosion.

5.7 Soil Stockpiles

5.7.1 Soil Stockpile Locations and Configuration for Construction Operations

All soils removed from the construction area will be placed nearby in designated stockpile areas. The proposed long term storage of these stockpiles means accurate records are required indicating volumes and areas to be covered by each stockpile upon decommissioning and rehabilitation. Stockpiles will be separated into subsoil and topsoil suitable materials, however the subsoil stockpiles will also have a 0.2m layer of topsoil to facilitate pasture germination and growth, providing a vegetative cover. Soil stockpiles within construction areas may be utilised as long term batters or bunds to facilitate noise and visual screening.

5.7.2 Soil Stockpile Locations and Configuration for Mining Operations

All soils removed from the active mining area will be either placed directly onto shaped areas ready for rehabilitation or will be stockpiled in the areas indicated on the MOP plans. The stockpile areas will be located within the footprint of the OEA, Open Cut mining areas and the designated soil stockpile area adjacent the North west OEA. The stockpile areas will be on land above the 1:100 year flood level. There will be four distinct segregations of soil material, which will be stockpiled in separate sections:

1. BSAL Suitable – Topsoil
2. BSAL Suitable – Subsoil
3. Not BSAL Suitable – Topsoil
4. Not BSAL Suitable – Subsoil

For the temporary and directly impacted land (construction of infrastructure areas) where each individual soil unit will be rehabilitated following decommissioning of infrastructure, topsoil and subsoil for each soil unit will be stored separately.

Maximum stockpile heights are to be no more than 3.0m. Stockpiles will not be disturbed until required for rehabilitation, weed management, erosion control or for seeding and fertilising purposes.

During stripping and stockpiling operations, active stockpiles will be clearly signposted as opened or closed. The supervisor in charge of stripping and stockpiling operations will notify machine operators of the stockpile locations for that day and will regularly check to ensure that material is taken to the correct stockpile location. Operators will immediately be notified of any changes to activities regarding stripping and dumping by the supervisor in charge of operations.

Reflective signs will be erected indicating the stockpile number, soil types and soil class, stripping date range and estimated volume. These signs will be at least 500 mm x 600 mm in size with lettering that is clearly able to be seen from 20 m away by an approaching operator. Signs with arrows will also be used to indicate the correct position of stockpiles. Information on the signs will be correlated to inventories and plans kept during the soil stripping operations. All soil stockpiles will be indicated on mining operations plans.

5.7.3 Erosion Control and Drainage on Soil Stockpiles

The soil stockpile areas will have diversion drains built around their perimeters to divert water away from them. This water will be drained into existing mine sedimentation dams.

Soil will not be stockpiled on any surface with a grade in excess of 5%. Measures will be taken on soil stockpiles to prevent scouring and erosion due to rainfall runoff. This may require the battering down of stockpile edges. Stockpiles will be arranged in the stockpile area to run near parallel to natural contours as far as practical. This will minimise scouring from rain events. Free draining gaps will be left between stockpiles to prevent pooling of water.

Temporary erosion and sediment control measures are detailed in the Water Management Plan, however in relation to soil stockpiles, a combination of straw bales and silt fences will be placed in draining paths as determined on site to capture silt from runoff. Runoff from within the stockpile area will be directed into drainage sumps or sedimentation dams. Stockpiles will be seeded as quickly as possible after placement to minimise scouring from rainfall.

Wind erosion which has the potential to generate dust during stripping and stockpiling operations by earthmoving plant will be managed with the use of mobile water carts. Water cart capacities will be managed so as to ensure active roads and active face areas are regularly watered. Dust will be controlled on completed stockpiles by the establishment of pasture cover.

5.7.4 Seeding Soil Stockpiles

Completed topsoil and subsoil stockpiles will be sown and pasture established, as prevailing weather conditions permit.

The seed mixture will include fast-growing, short-lived species and perennial grasses and legumes. Example pasture mixes for cool and warm seasons are presented in **Table 10**. The pasture mix will be sown simultaneously with an appropriate fertiliser; for example, 250 kg/ha di-ammonium phosphate.

Table 10 Soil Stockpile Seed Mix

Pasture Species	Rate (kg/ha)
Autumn Sowing	
Oats	10
Cocksfoot	3
Perennial Ryegrass	6
Phalaris	3
Subterranean Clover	4
Red Clover	2
Spring Sowing	
Japanese Millet	10
Phalaris	5
Paspalum	5
White Clover	2
Lucerne	3

All legumes (clovers and lucerne) will be inoculated with appropriate rhizobia and lime pelleted.

5.7.5 Soil Stockpile Inspections

Test pits will be excavated through topsoil and subsoil stockpiles during the storage life to determine the 'health' of the material within the stockpiles. This will ensure that critical densities are not being exceeded, that soil structure is not being destroyed, anaerobic conditions are not experienced and to indicate the necessity for deep ripping.

Regular inspections of the stockpile area will be made, particularly after significant rainfall events. The following features will be checked:

- Integrity of sediment controls;
- Effectiveness of drainage;
- Integrity of erosion control measures;
- Grass growth; and
- Weed infestation.

Remedial measures will be undertaken as necessary. Revegetation and weed control will be carried out as assessed at the time. Internal stockpile conditions will be assessed by moisture movement and limited inspection pits.

5.8 Landform Shaping

5.8.1 Infrastructure Area

The temporary disturbance of infrastructure upon the landscape will be rehabilitated to similar or flatter landforms post decommissioning and closure. The general intention of landform shaping of infrastructure areas is to reinstate a free draining gently sloping landform consistent with surrounding topography. There will be large flat areas such as hardstands and CHPP which may require some final shaping to facilitate drainage prior to reinstating the soil profile.

5.8.2 Mining Area

The main objective of re-grading the overburden is to produce slope angles, lengths and shapes that are stable, not prone to an unacceptable rate of erosion, compatible with the surrounding landforms and compatible with the proposed final land use. Integrated with this is a drainage pattern that is capable of conveying runoff from the newly created catchments whilst minimising the risk of erosion and sedimentation. Final slope gradient should not exceed 10 degrees.

There are two main landform design systems that will be used on site for controlling surface flow on disturbed and rehabilitated areas.

1. There is the traditional method of constructing contour furrows or contour banks at intervals down the slope. The effect of these is to divide a long slope into a series of short slopes with the catchment area commencing at each bank or furrow. This prevents runoff from reaching a depth of flow or velocity that would cause erosion. As the slope angle increases, the banks or furrows must be spaced closer together until a point is reached where they are no longer effective. Graded banks are essentially a much larger version of contour furrows, with a proportionately greater capacity to store runoff and/or drain it to some chosen discharge point. The banks are constructed away from the true contour, at a designed gradient (0.5% to 1%) so that they drain water from one part of a slope to another; for example, towards a watercourse or a sediment control dam. Eventually, runoff that has been intercepted and diverted must be disposed of down slope. The use of engineered waterways using erosion blankets, ground-cover vegetation and/or rip rap is recommended to safely dispose of runoff downslope.

2. There are strategies such as GeoFluv™ and Natural Regrade Software. The fundamental concepts of the GeoFluv™ approach to stable landform design are taken from the study of the development of landforms over time, from youthful, actively eroding landforms to mature, 'stable' landforms. The approach has critical input factors that measurements integrate the effects of local variation in climate, earth materials, and vegetation that define local landform stability against erosion. By collecting empirical measurements from stable landforms in the area of interest and using these as inputs to the design, the designer can have a high degree of certainty that the GeoFluv™ landform design will perform similarly to the stable, natural landform. One major advantage of the GeoFluv™ technique is the natural appearance of the landform.

Contour ripping across the grade is by far the most common form of structural erosion control on mine sites as it simultaneously provides some measure of erosion protection and cultivates the surface in readiness for sowing. Contour ripping is possible with both the above landform design methods. Overburden should be left in a rough state to maximise infiltration of rain and to minimise surface erosion prior to the placement of the soil profile.

5.9 Soil Replacement Process

5.9.1 Stockpile Assessment

Sampling and analysis of stockpiled topsoil and subsoil resources will be undertaken prior to respreading. This will assist in ensuring that soil quality is consistent with proposed land use objectives on the final rehabilitation areas. Understanding soil characteristics will also assist in estimating required rates of fertiliser or ameliorants (i.e. gypsum or lime) and may also assist in blending specific soil types to achieve enhanced outcomes.

Prior to re-spreading stockpiled topsoil and subsoil onto reshaped overburden or infrastructure areas (particularly onto designated native vegetation 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 topsoil spreading. The indicative locations of the proposed stockpiles is provided in **Figure 4**.

5.9.2 Building Soil Profiles

The process of building soil profiles on the post mining landform involves respreading subsoil and topsoil material on overburden. Soil will be placed by truck and spread by dozers to the required thickness or directly placed by scrapers where conditions allow. To establish the subsoil profile, soils will be placed, shaped and left roughened prior to topsoil spreading. Travel lanes will be set out on the areas being rehabilitated to reduce the potential for soil compaction during placing.

Soil movements onto shaped areas will be sequenced in such a manner as to prevent or minimise travel over areas where either soils or subsoils are in place. This will involve setting out of specific soils access roads to shaped areas on overburden. Areas where such roads exist will be ripped prior to placement of subsoil and if necessary deep ripped upon completion of soils profile.

Where possible replacement sequence of soils profiles will encourage the use of loamy sand and sandy clay loam covers over the silty clays and light clays.

All areas should be contour ripped (after the first layer of subsoil is spread) to create a "key" between the soil and the spoil. Ripping should be undertaken on the contour and the tines lifted for approximately 2 m every 200 m to reduce the potential for channelised erosion.

The respread topsoil surface should be scarified prior to, or during seeding, to reduce run-off and increase infiltration. This can be undertaken by contour tilling with a fine-tined plough or disc harrow. There are specific requirements regarding soil profile depth for each LSC Class, which are outlined below. The proposed post mining LSC areas are shown in **Figure 3**.

5.9.2.1 BSAL/LSC Class 3

The targeted 319.5 ha of rehabilitated BSAL/LSC Class 3 will include a layer of BSAL suitable subsoil between the overburden material and the BSAL suitable topsoil. This will improve the water-holding capacity of the rehabilitated landform. Subsoil will be spread on overburden to a nominal depth of 0.60 m prior to spreading a final cover of topsoil. The depth of topsoil will be spread to a nominal depth of 0.30 m. The aim of these soil depths is to allow for some settling, but still ensure all areas targeted as BSAL/LSC Class 3 will satisfy the minimum soil depth requirement of 0.75 m.

5.9.2.2 LSC Class 4/5

The rehabilitated soil profile will include a layer of subsoil between the overburden material and the topsoil on land to be re-established as LSC Class 4 (172.3 ha) and/or 5 (232.3 ha, plus 88.3 ha rail loop). This will improve the water-holding capacity of the rehabilitated landform to ensure the requirements of LSC Class 4 and 5 are met.

The subsoil layer for LSC Class 4 and 5 will be 0.40 m. Topsoil will be spread to a minimum depth of 0.20 m to give a combined depth of soil material on the rehabilitated landform of 0.60 m. The subsoil layer will be spread on an even but roughened surface that has been ripped on the contour to break any compacted and/or smooth surfaces. Ripping will also assist the keying of subsoil into the overburden, which will in turn assist in the prevention of land slip, assist vegetation penetrate deep into the soil profile, encourage water infiltration and percolation, and minimise erosion.

5.9.2.3 LSC Class 6

The 11 ha of rehabilitated LSC Class 6 land will include a layer of subsoil between the overburden material and the topsoil. This will improve the water-holding capacity of the rehabilitated landform and reinstate a more natural soil profile.

The subsoil layer for LSC Class 6 will be 0.20 m. Topsoil will be spread to a minimum depth of 0.20 m to give a combined depth of soil material on the rehabilitated landform of 0.40 m. The subsoil layer will be spread on an even but roughened surface that has been ripped on the contour to break any compacted and/or smooth surfaces. Ripping will also assist the keying of subsoil into the overburden, which will in turn assist in the prevention of land slip, assist vegetation penetrate deep into the soil profile, encourage water infiltration and percolation, and minimise erosion.

5.9.2.4 LSC Class 7

The 22.6 ha of rehabilitated LSC Class 7 land will consist of a 0.20 m layer of topsoil keyed into overburden. Ripping will also assist in the prevention of land slip, assist vegetation penetrate deep into the profile, encourage water infiltration and percolation, and minimise erosion.

5.10 Pasture Establishment

The long-term aim for areas rehabilitated to a pasture vegetation is to achieve a grazing land use with areas of LSC Class 3 land being capable of cultivation in the future. However, the initial objective is to establish a dense and healthy sward of grasses and pasture to ensure the soil is stable and resistant to erosion.

After the establishment of the targeted LSC class soil profile, the process of achieving a dense and healthy pasture sward will include the following steps:

1. Prior to sowing, soils will be cultivated along the contour using a tyned plough drawn by a bulldozer. On the BSAL areas a specially adapted ripper will be used to provide deep cultivation and to alleviate any compaction of the soil profile that may have occurred during placement;
2. Surface cultivation will be undertaken using a tyned plough such as an “Agro Plough” for seed bed preparation; and
3. Grass and pasture species will be sown and fertilisers will be applied in general accordance with the following species and application rates

Table 11 Rehabilitation Seed Mix

Rehabilitation Years 1 – 3		
Pasture Type	**Variety**	**Rate kg/ha**
Annual Ryegrass	Guard	15
Arrowleaf Clover*	Cefalu	3
Sub Clover*	Urana	5
Persian Clover*	Flash	3
	Total	**26**
Sow with 140 kg/ha Granulock 15S (15% Nitrogen, 13% Phosphorus, 12% Sulfur)		
Rehabilitation Years 3+		
Pasture Type	**Variety**	**Rate kg/ha**
Perennial Phalaris	Holdfast GT	3
Tall Fescue	Grasslands Fletcha	8
Cocksfoot	Tekapo	2
Arrowleaf Clover*	Zulu II	3
Sub Clover*	Campeda	4
Persian Clover*	Nitro	3
Biserulla*	Casbah	3
	Total	**26**
Sow with 180 kg/ha Granulock 15S (15% Nitrogen, 13% Phosphorus, 12% Sulfur)		

The following list of conditions are associated with the pasture species and application rates detailed in Table 11:

- Annual ryegrass is to be used in years 1 – 3 to build organic matter in the topsoil. Annual ryegrass has very rapid growth (roots and leaves) compared to perennial grasses, so this will aid in minimizing erosion during establishment of the rehabilitation (wind and rainfall protection), and improve soil structure and soil biota.

- Legumes (*) are used to provide additional nitrogen for grass growth. Must be inoculated with appropriate rhizobia prior to sowing.

- Where practical, only sow annual ryegrass in autumn, winter or spring for the best chance of successful establishment. The above list is not suitable for summer sowing. In the event summer sowing is required, replace annual ryegrass with Shirohie millet at a rate of 12 kg/ha.

- Where practical, the annual pasture may be grazed with cattle during Year 1-3 to encourage further root growth of ryegrass and help “bed-down” the rehabilitation.

- Years 1-3 allow herbicide options for broadleaf weed control (Bathurst & Noogoora burr, catheads, farmer’s friend etc), therefore providing easy management of germinating weeds from the soil seed bank.

- If gypsum is used as an ameliorant, the Granulock 15S, should be replaced with DAP at 120 kg/ha (18% Nitrogen, 20% Phosphorus).

- In the third year, the annual ryegrass should be either cut for hay or sprayed out before it goes to seed, to reduce seed bank prior to sowing the Year 4 perennial grass pasture. Also need to chemical fallow immediately prior to sowing perennial pasture.

- Sowing of perennial pasture in year 4 will be dependent on suitable stored soil moisture and the forecast seasonal conditions being favourable for successful pasture establishment.

- The sowing of the perennial grass pasture will be undertaken with minimal cultivation where possible, with direct drilling or broadcasting the preferred sowing method.

- Cattle grazing of both annual and establishing perennial pasture may be undertaken where practicable and/or favourable seasonal conditions occur to manage dry matter levels.

- Perennial grass pasture will last for +10 years under good management, which includes the use of fertiliser, rotational grazing, weed control etc, as per the Bylong Farm Plan.

5.11 Native Vegetation Establishment

5.11.1 Timing

Revegetation operations must consider both correct season and timing of potential germination during the drier months. Where possible direct seeding of native vegetation will be undertaken in the months October to February (inclusive). Tubestock planting should occur in the period April to June (inclusive), depending on rainfall. Where rehabilitated areas become available out of season, a temporary cover crop will be sown to stabilize the site until the primary vegetation cover can be established. A spreadsheet will be developed to ensure that adequate advanced planning for the supply of both seed and tubestock is achieved. All works will be scheduled in coordination with the current MOP at that time.

5.11.2 General Native Vegetation Strategies

Species lists for native vegetation communities have been derived from relevant sections of the Ecology Impact Assessment (see Appendix J of the EIS). Of these, the White Box Grassy Woodland community is the dominant Critically Endangered Ecological Community (CEEC) occupying approximately 57 ha of the proposed total rehabilitated area. Smaller areas of other communities will be established to enhance diversity within the rehabilitated landform, and to provide tree shelters and wind breaks within grazing paddocks.

Species proposed in this Plan have been designed to replace lost habitat and create new habitat and corridors for native fauna. Direct seeding will be the main revegetation technique employed. Where not suitable (some species are unsuitable for direct seeding), tubestock will be propagated and planted using locally-collected seed. Seed will be collected in advance of mining through a carefully designed seed collection program. As a result, a combination of both planted tube stock and direct seeding will be used to achieve suitable species composition in most communities. This dual approach is reflected in the **Table 11**.

Based on the need to control weeds and maximise ecological values, it is proposed to create tree/shrub stands which will close canopy between three and five years. Once mining commences, ongoing trials and research will refine strategy parameters.

Some details will be common to all the specifications and include:

- Light Pasture/Cover Crop – A light pasture mix will be incorporated into the above mix. The purpose of inclusion is to ensure early soil stability and erosion control prior to the establishment of native species. This mix has been designed to be functional but not competitive and will include:

- Japanese Millet or Oats (depending on season) 5 kg/ha
- Perennial Rye 2 kg/ha
- Couch 2 kg/ha

- Bulking Agent – Due to the potentially high weed content, fertiliser will not be applied with the seed mix. Instead Kitty Litter, an inert bulking agent, will be mixed with seed at 62.5 kg/ha (equivalent in volume to 100 kg/ha of fertiliser) to assist in the even spreading of seed.
- Seasonal Considerations – If a top-dressed area becomes available out of season (as discussed in Section 5.11.1), the area will be initially sown with a temporary cover crop of oats or Japanese millet (depending on season) at 30 kg/ha. Once the cover crop matures, and the correct season comes around, the cover crop will be deep ripped and sowing/planting of the final vegetation type will be undertaken.
- Ratio of Direct Seeding to Tube Stock Planting – Research will be undertaken within the initial years of mining to determine the success of direct seeding and hence if the direct seeding/tube stock planting ratio needs to be adjusted.

5.11.3 Box Gum Woodland Establishment

White Box Grassy Woodland (CEEC) (57 ha)

White Box Grassy Woodland is the most extensive woodland community occurring within the Project Boundary and occupies the gentle slopes and the more elevated areas over the subsidence area.

Table 12 White Box Grassy Woodland Specifications – Trees and Shrubs

	Species	Recommended Seeding Rate (kg/ha)	Tubestock (Plants per hectare)
Trees and Shrubs	*Eucalyptus albens* (White Box)	1.5	100
	Eucalyptus blakelyi (Blakely's Red Gum)	0.5	0
	Eucalyptus melliodora (Yellow Box)	0.5	30
	Geijera parviflora (Wilga)	0.2	50
	Notelaea microcarpa (Native Olive)	0.1	30
	Capparis mitchellii (Native Orange)	0.1	30
	Callitris glaucophylla (White Cypress Pine)	0.3	30
	Bursaria spinosa (BlackThorn)	0.2	0
	Indigofera adesmiifolia (Tick Indigo)	0.1	0
	Maireana microphylla (Small-leaved Bluebush)	0.1	0

Yellow Box Grassy Woodland (CEEC) (8 ha)

Yellow Box Grassy Woodland occurs within the subsidence area.

Table 13 Yellow Box Grassy Woodland Specifications – Trees and Shrubs

	Species	Recommended Seeding Rate (kg/ha)	Tube Stock (Plants per hectare)
Trees and Shrubs	*Eucalyptus melliodora* (Yellow Box)	1.5	100
	Eucalyptus conica (Fuzzy Box)	0.2	50
	Eucalyptus populnea (Poplar Box)	0.5	0
	Eucalyptus albens (White Box)	0.5	0
	Allocasuarina luehmannii (Buloke)	0.2	20
	Geijera parviflora (Wilga)	0.1	30
	Maytenus cunninghamii	0.1	30
	Maireana microphylla (Small-leaved Bluebush)	0.1	30

Table 14 Box Gum Woodland Specifications - Grasses

	Species	Recommended Seeding Rate (kg/ha)
Grasses	Chloris ventricosa	Combined Total for all native grass species = 6kg/ha
	Austrostipa verticillata	
	A. scabra	
	Bothriochloa decipiens	
	Lomandra filiformis	
	Cymbopogon refractus	
	Others	

5.12 Interim Rehabilitation

In order to minimise the area exposed for dust generation, temporary or interim rehabilitation will be completed. This will be achieved through the use of Japanese millet or oats as a cover crop to reduce the area exposed to wind erosion. These areas will be rehabilitated for temporary purposes only and may be re-disturbed and subject to other detailed rehabilitation processes outlined this Plan on completion.

5.13 Water Management Structures in Rehabilitation Areas

A detailed Water Management Plan has been prepared for the Project which should be referred to for further detail. A summary of key relevant points is provided below.

Where practicable, water management structures (such as contour banks and drains or GeoFluv™ drainage patterns) will be constructed with longitudinal gradients that permit the transfer of water at non-erosive velocities. Consequently, specialised rehabilitation treatments will generally not be required. Similarly, rock-lined drop structures or GeoFluv™ drainage lines constructed on the slopes of the emplacements will be retained and allowed to revegetate naturally.

The planting of trees and other vegetation around the various water management structures will enhance the filtration ability of these structures and surrounding areas and minimise the potential for erosion, as well as encouraging their use by native fauna.

In the event that unacceptable levels of erosion are observed, specific fast-growing species and/or specialised treatments such as bitumen/jute meshing or rock lining are recommended.

Sediment control dams form a component of the water management system for the Project. Sediment control dams will capture sediment laden runoff prior to offsite release. These structures will be responsible for improving water quality throughout the mine site and, through the provision of semi-permanent water storages, enhance the ecological diversity of the area.

The following will be considered when constructing sediment control dams:

- Each dam should be located so that runoff may easily be directed to it, without the need for extensive channel excavation or for excessive channel gradient. Channels must be able to discharge into the dam without risk of erosion. Similarly, spillways must be designed and located so as to safely convey the maximum anticipated discharge;
- The material from which the dam is constructed must be stable. Dispersive clays will require treatment with gypsum to prevent failure of the wall by tunnel erosion. Failure by tunnelling is most likely in dams which store a considerable depth of water above ground level, or whose water level fluctuates widely. Dams should always be well sealed, as leakage may lead to instability, as well as allowing less control over the storage and release of water; and
- The number and capacity of dams should be related to the total area of catchment and the anticipated volume of runoff. The most damaging rains, in terms of erosion and sediment problems are localised, high intensity storms.

5.13.1 Erosion and Sediment Control Measures

The principle objectives of the Erosion and Sediment Control section specifically for rehabilitation areas will be to:

- Minimise erosion and sedimentation from all active and rehabilitated areas, thereby minimising sediment ingress into surrounding surface waters;
- Segregate contact water (surface run-off from disturbed catchments; e.g., active areas of disturbance, stockpiles and rehabilitated areas until stabilised), from clean water (surface run-off from catchments that are undisturbed or relatively undisturbed by project-related activities and rehabilitated catchments) and maximise the retention time of contact water so that any discharge from the Disturbance Area meets the relevant water quality limits;
- Prevent water from being discharged from the Disturbance Area but, should water be displaced from the site, enable sufficient settlement/treatment time prior to discharge so that suspended sediment within the water meets the water quality objectives;
- Manage surface flows upstream of any surface disturbance so that rehabilitation activities are not affected by excessive run-on water;
- Prevent erosion of ephemeral watercourses or gullies that occur on the site;
- Establish sustainable long-term surface water management features following rehabilitation of the site, including implementation of an effective revegetation and maintenance program; and
- Monitor the effectiveness of surface water and sediment controls in order to meet all relevant surface water quality criteria.

There is significant surface rock in some proposed clearing areas. This resource has the potential to be used in both erosion control structures (rock lining of drains) and in habitat enhancement areas similar to the concept proposed for felled timber.

The primary design aspect of the Project is the prevention of clean water in ephemeral drainage channels gullies entering the active mining areas and infrastructure areas. This will be achieved through the use of diversionary structures such as drains, berms and banks, as well as the containment of contact water in sediment control structures within the active areas of the project to eliminate uncontrolled run-off.

Effective erosion and sediment control will require appropriate activities to be carried out over the life of the Project including during construction, mine operations and rehabilitation and mine closure.

5.14 Weed Management

The presence of weed species has the potential to have a major impact on the success of revegetation outcomes. In addition to this, weed species in the surrounding area have the potential to significantly impact on the biodiversity value of rehabilitated areas. Weed management will be a critical component of mine rehabilitation and landscaping activities.

KEPCO will take the necessary precautions to prevent the excessive occurrence of weeds within the rehabilitated areas. The following weed management measures will be implemented during soil stripping and rehabilitation works:

- An induction program will be used to promote awareness of weed management measures;
- Specific training in weed identification and eradication measures will be provided to relevant site personnel and contractors;
- All equipment (including contractor equipment) which is involved with all forms of ground disturbance or work in pasture areas will be hosed down in an approved wash-down area before first entry to site, to avoid the transportation of weed seeds to site;
- When necessary, spraying herbicide or removing the top layer ('scalping'), including weeds, of topsoil stockpiles will take place prior to respreading. Weed control will be improved by constructing topsoil stockpiles with very shallow slopes so that the surface, weed infested layer can be easily scalped off and disposed of prior to recovery of the underlying, clean material;
- Rehabilitation inspections will be carried out to identify potential weed infestations;
- Details of all weed management and eradication programs and follow-up inspections will be entered into the site's environmental management database;
- Existing weed populations on site will be identified and sprayed, together with ongoing weed spraying over the life of the mine;
- Vegetation and topsoil stripped from the weed risk areas with known infestations will be stripped and stockpiled separately. These stockpiles will be marked and recorded as per the soil stockpile location plans;
- Topsoil stripped from weed risk areas with known infestations will either be buried (if treatment is not practicable) or treated (several times if necessary). The decision to bury or treat topsoil from weed risk areas will involve an assessment of the volume of material involved, the dormancy of the particular weed species, the likely number of treatments required, the likely success in eradicating the weed species from the stripped soil and whether the treatment will significantly affect the viability of native seeds and / or the fertility of the soil; and
- Soils from weed risk areas that are used in the rehabilitation program will be closely monitored after rehabilitation and any residual weeds that germinate will be treated as appropriate.

Weed control will be undertaken in a manner that will minimise soil disturbance. Any use of herbicides will be carried out in by a Level 3 chemical accreditation holder as per EPA requirements, and in accordance with DPI, DRG, Local Land Services, and Office of Environment and Heritage (OEH) requirements. Records of weed infestations will be maintained and control programs implemented according to best management practice for the weed species concerned. The management of weeds will be undertaken in line with the Bylong Farm Management Plan.

5.15 Records and Reporting

5.15.1 Reconciliation

Reconciliation of available soil resources and resources used in rehabilitation areas will be carried out as indicated in **Section 4.5.7** during the soil stripping and placement process. Reconciliation surveys shall be completed regularly.

5.15.2 Reports

An Annual Review will be prepared for the Project, in accordance with Condition 11 of Schedule 6 of the Recommended Development Consent conditions, as discussed further in Section 10.1. A section of the Annual Review will detail the following:

- Cumulative stripped quantities;
- Updated reconciliation records;
- Indicated status of stockpiles and soil face positions;
- Seeding and reseeding details; and
- Weed control measures.

5.15.3 Inventory

An inventory recording system shall be kept for each soil type and soil class on a stockpile basis. This shall be updated on a regular basis and shall be used as a means of tracking soils movements from stripped areas to stockpile locations and for reconciliation purposes. The inventory system will enable cross referencing with soil face plans and soil stockpile positions.

5.15.4 Stockpile Height Monitoring

Measures to control and monitor stockpile heights are described in **Section 4.6.1**. Field surveys will be completed on an annual basis or at the completion of a stockpile detailing stockpile heights and stockpile reduced levels (RLs). The results of field surveys will be checked by the Environmental Manager and stored on the GIS database along with the location of soil stockpiles. Any exceedance to the recommended soil stockpile heights will be investigated by the Environmental Manager, resulting in either technical justifications or modification works to the soil stockpile to bring the height down to recommended limits.

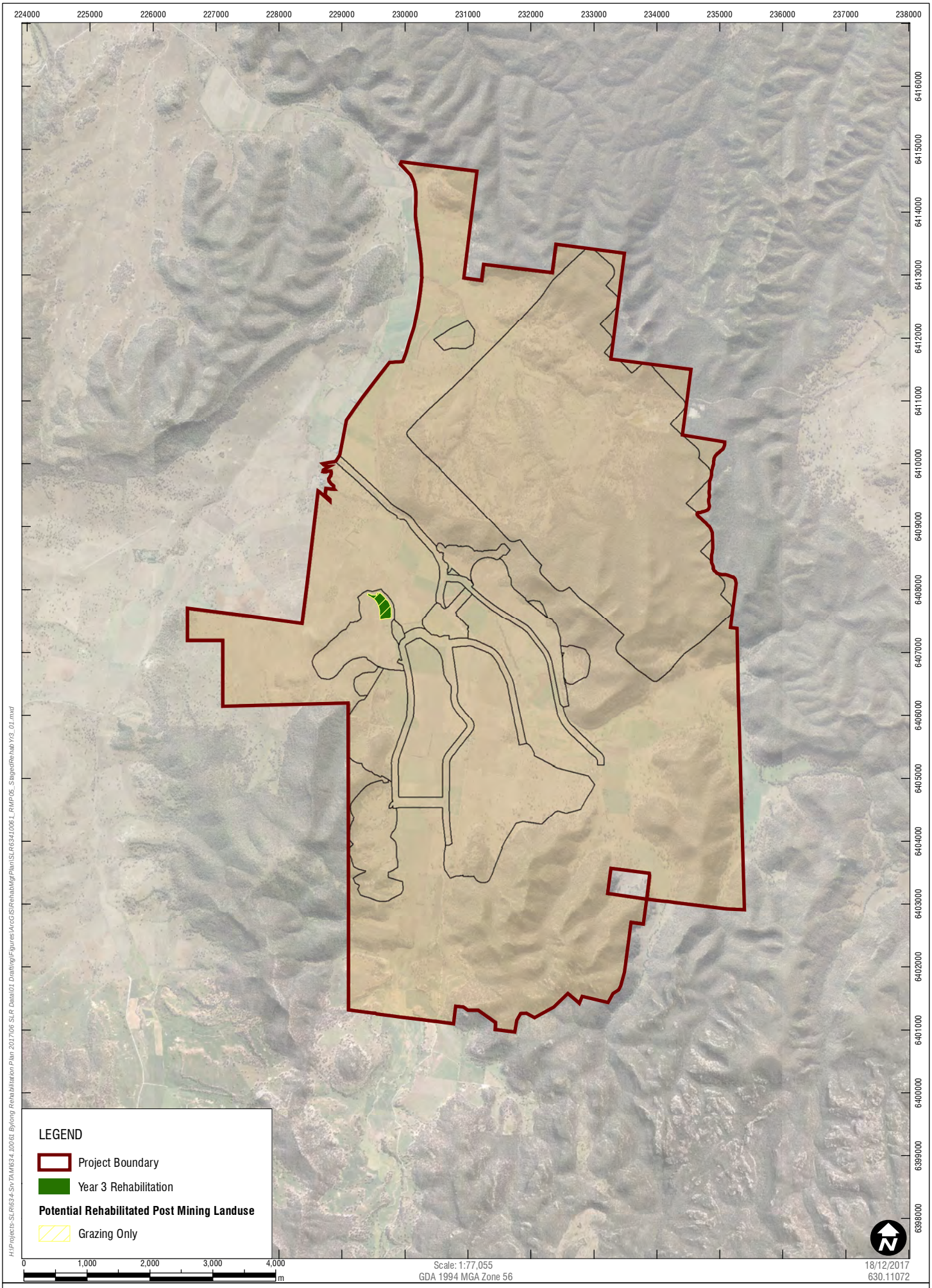
5.15.5 Seeding and Weed Control

Records will be kept and updated on an annual basis showing the status of stockpile seeding. This record will also detail seeding and fertilised mixes and rates applied. On-going assessment of vegetation cover present will be undertaken. Weed control measures and applications will also be indicated.

5.16 Rehabilitation Sequencing

The sequencing of rehabilitation is detailed in each MOP over the life of the mine, however as a general indication **Figures 5, 6, 7, 8** and **9** show the proposed general sequencing of mine rehabilitation areas.

During the life of the mine, minor variations in rehabilitation schedules may occur. In the event of minor delays, (within 12 months) the adjustment of sequencing will be incorporated into the internal production/rehabilitation schedule. However, if the variance continues longer than 12 months, this will be reported on and justified within the Annual Report, with concerted efforts to rectify the delay and bring the rehabilitation sequencing back to the schedule. In the event the delays to rehabilitation extend over the MOP period, revised MOP scheduling may be required.



Scale: 1:77,055
GDA 1994 MGA Zone 56

18/12/2017
630.11072

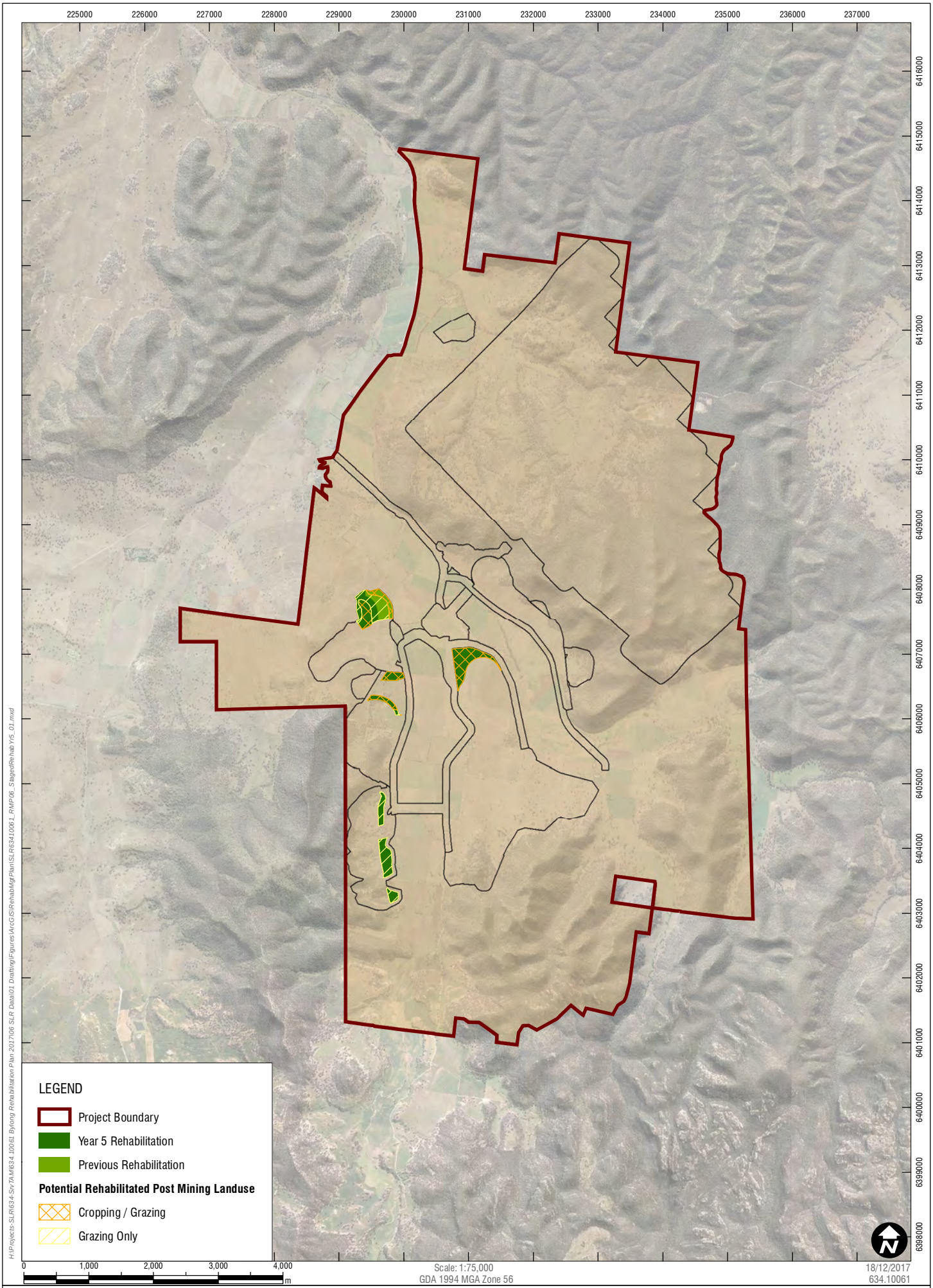
Sheet Size : A4

SLR

www.slrconsultingaustralia.com.au PH: 61 2 4037 3200

Staged Rehabilitation Years 0-3

FIGURE 5



Scale: 1:75,000
GDA 1994 MGA Zone 56

18/12/2017
634.10061

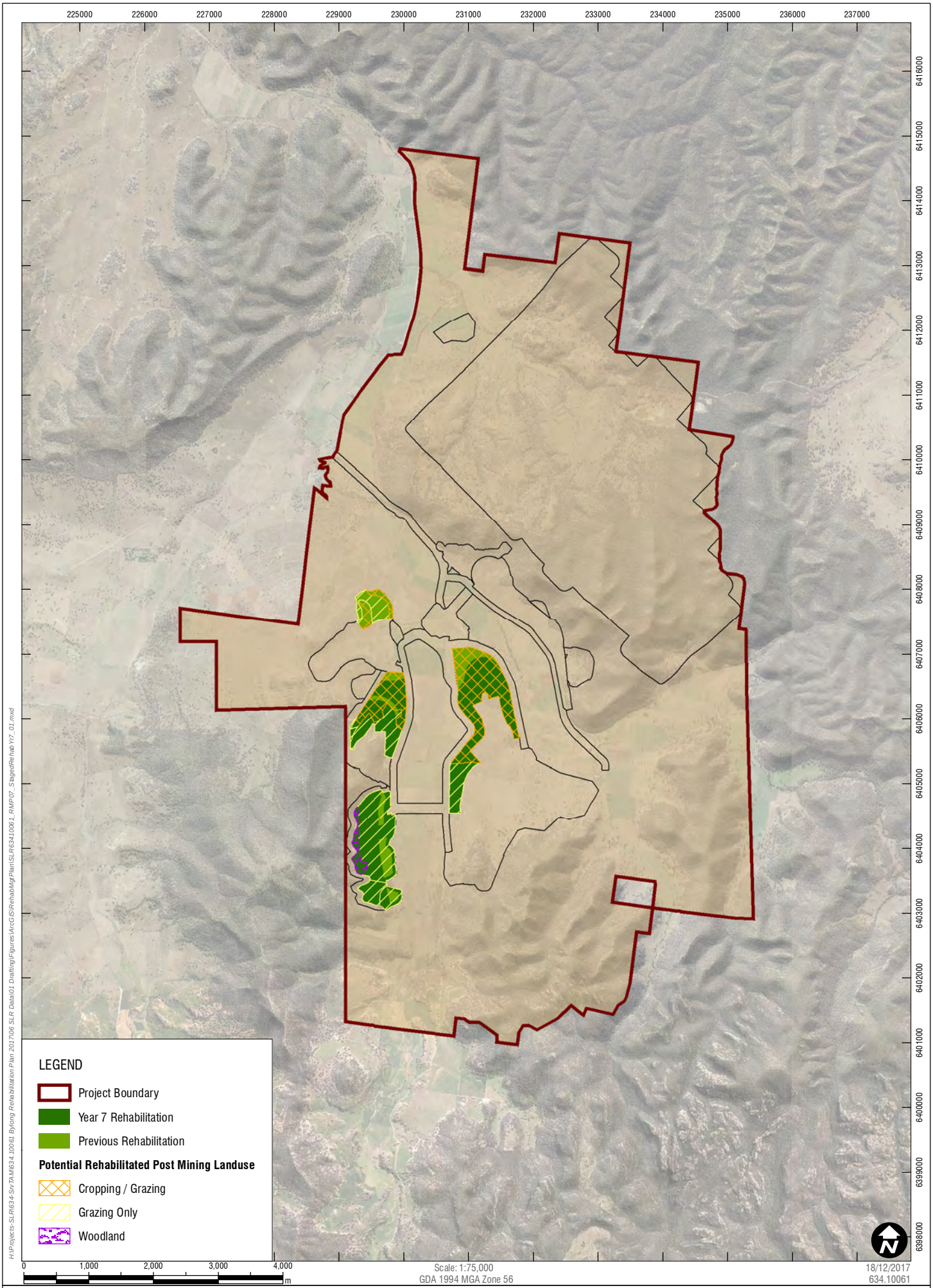
Sheet Size : A4

SLR

www.slrconsultingaustralia.com.au PH: 61 2 4037 3200

Staged Rehabilitation Years 3-5

FIGURE 6



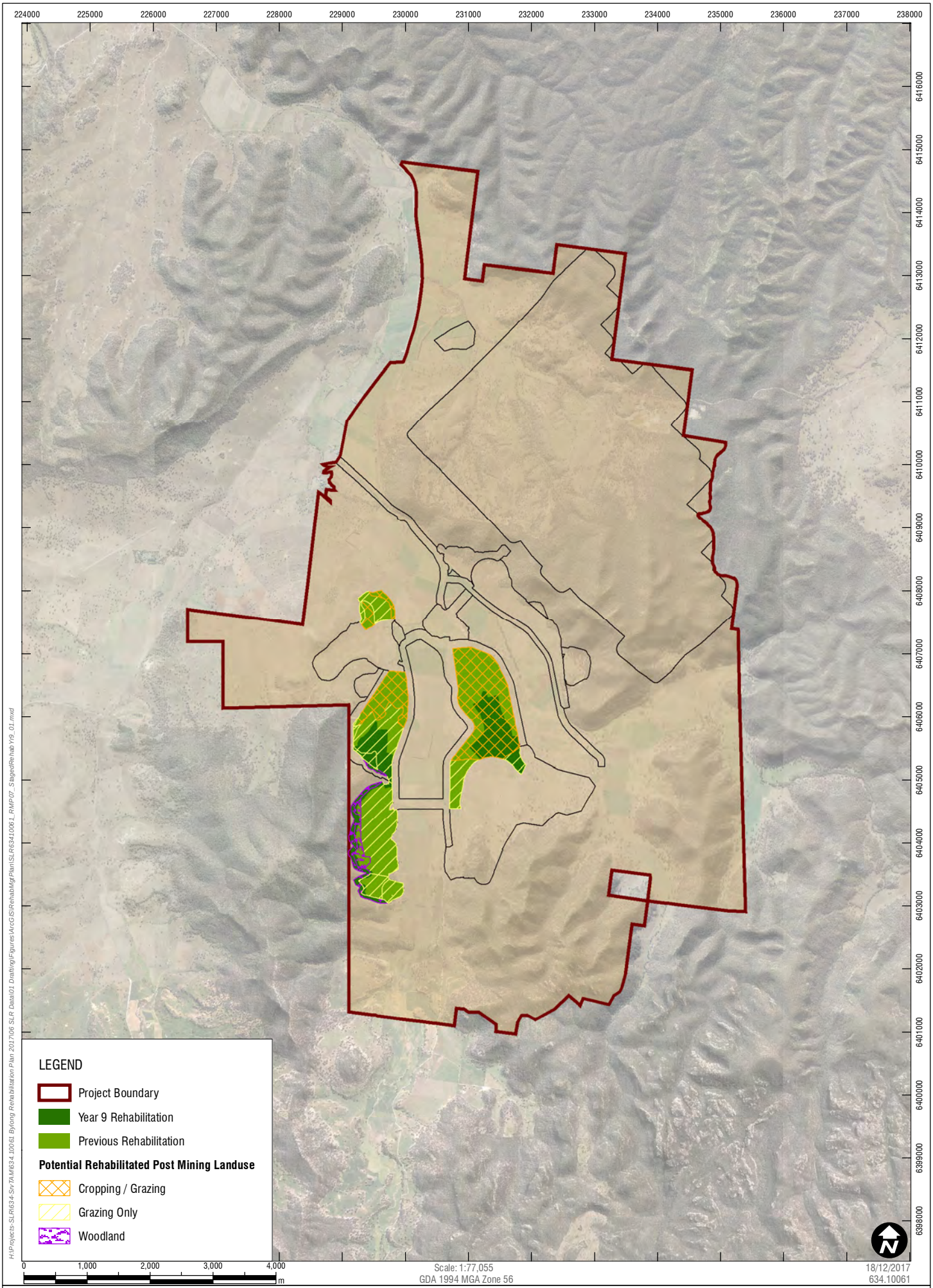
Sheet Size : A4

SLR

www.slrconsultingaustralia.com.au PH: 61 2 4037 3200

Staged Rehabilitation Years 5-7

FIGURE 7



Scale: 1:77,055
GDA 1994 MGA Zone 56

18/12/2017
634.10061

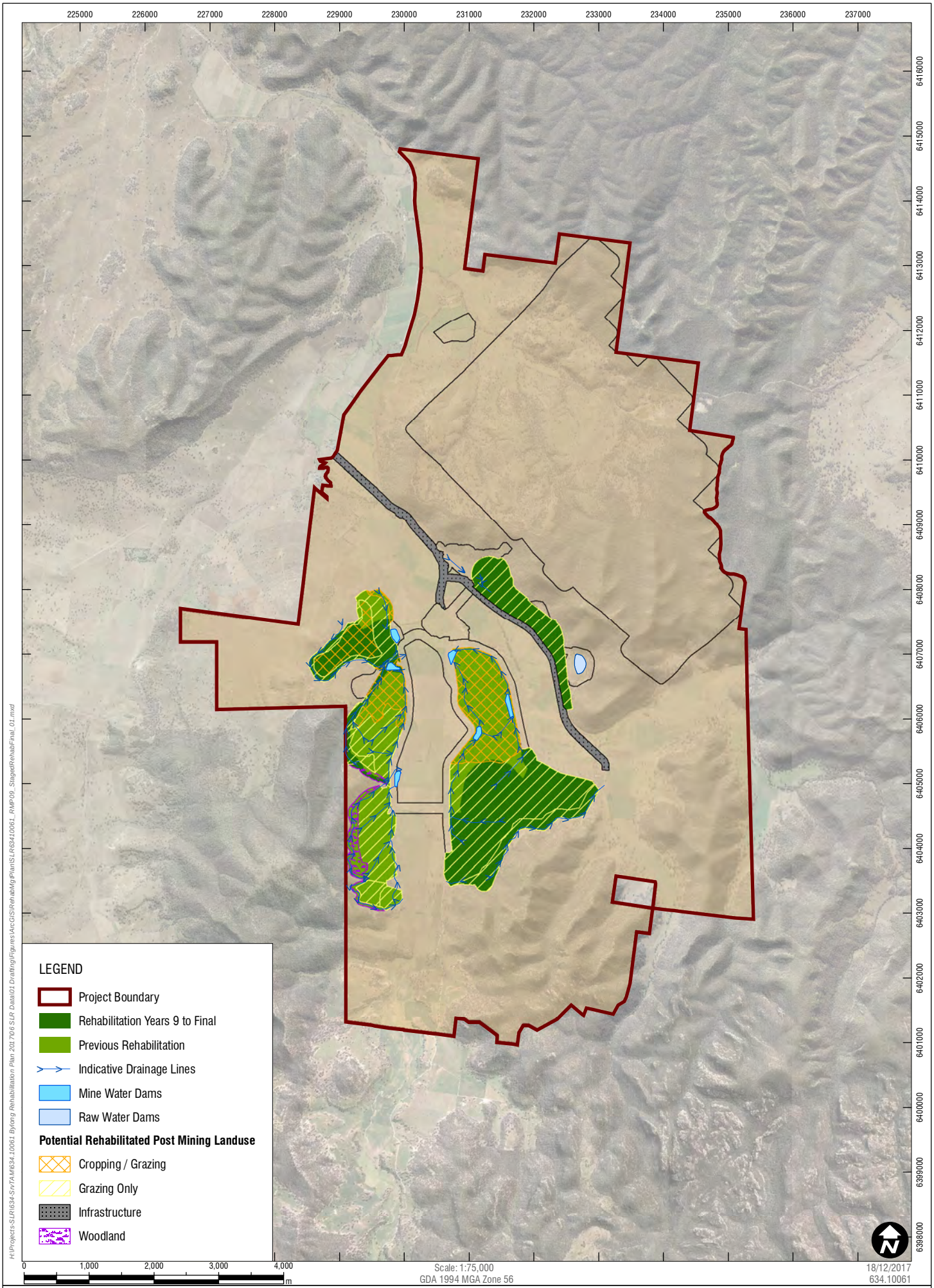
Sheet Size : A4

SLR

www.slrconsultingaustralia.com.au PH: 61 2 4037 3200

Staged Rehabilitation Years 7-9

FIGURE 8



Scale: 1:75,000
GDA 1994 MGA Zone 56

18/12/2017
634.10061

Sheet Size : A4

SLR

www.slrconsultingaustralia.com.au PH: 61 2 4037 3200

Staged Rehabilitation Final

FIGURE 9

6 REHABILITATION COMPLETION CRITERIA

The domain completion criteria (also referred to as success or closure criteria) have been developed to allow tracking of rehabilitation progress towards achieving each of the nominated final land uses and rehabilitation objectives. These criteria are broken up into individual closure and ecosystem succession phases to indicate a progression of the rehabilitation towards a sustainable ecosystem.

The general completion criteria at each specific phase of rehabilitation, as well as specific completion criteria relevant to final rehabilitation goals and final land use are provided in the sections below.

6.1 General Completion Criteria

The rehabilitation completion criteria for the each of the strategic phases and domains are shown in **Table 15** below.

Table 15 General Completion Criteria by Strategic Phases and Domains

Phases of Strategic Rehabilitation	Relevant Domains	Rehabilitation Element	Indicators	General Completion Criteria
1. Decommissioning Phase	Domains:	Services & Structures	Site Services	All services, including power, water, data and telephone communication for the entire site will be isolated, disconnected, terminated and or removed/buried to make them safe.
	3. Mine Infrastructure Area			
	4. Rail Loop		Infrastructure & Buildings	Equipment and buildings will be removed from the site. Should these buildings be identified to be valuable for reuse in situ to support nearby communities, this will require subsequent approvals to retain this infrastructure.
	5. Roads		Roadways Car Parks and Hardstands	The bitumen roadways, car parks and hardstand areas will be ripped up and disposed of appropriately.
	6. Water Storage Facilities		Surface Water Management Structures	All surface water structures will be removed.
2. Landform Establishment	Domains:	Landform stability	Slope gradient	Slopes to be less than 10° within areas re-shaped by the mining process. If GeofluvTM design is utilised on the final landform then the average slope is to be less than 10° with no slope exceeding 14°. The rail loop area will be rehabilitated with slopes similar to the adjacent landforms. Where the slopes are steeper, additional water management structures will be utilised (as required).
	1. Open Cut Mining Area			

Phases of Strategic Rehabilitation	Relevant Domains	Rehabilitation Element	Indicators		General Completion Criteria
	2. Overburden Emplacement Area				Where coal reject is present, the landform is capped with a minimum of 5m of inert material and be free-draining.
	3. Mine Infrastructure Area		Erosion control		Erosion control structures are installed at intervals commensurate with the slope and design of the landform.
	4. Rail Loop				Dimensions and frequency of occurrence of erosion rills and gullies are generally no greater than that in reference sites that exhibit similar landform characteristics.
	5. Roads		Surface Water Drainage		Use of contour banks and diversion drains to direct water into stable areas or sediment control basins or landform designs based on natural gradient and drainage software.
	6. Water Storage Facilities				All landforms will be free draining except where specific structures have been constructed for the storage of water as required for sediment and erosion control or some post mining land use.
	9. Temporary Construction Areas				
3. Growth Media Development	Domains: 1. Open Cut Mining Area 2. Overburden Emplacement Area 3. Mine Infrastructure Area 4. Rail Loop 5. Roads 6. Water Storage Facilities 8. Stockpile Area 9. Temporary Construction Areas	Water quality	EC, pH, TSS and oil and grease		Ensure receiving waters affected by surface water runoff have contaminant limits below those required by the Environment Protection Licence (EPL)
		Land and Soil Profile	Biophysical Strategic Agricultural Land (BSAL)		Interim protocol for site verification and mapping of BSAL (April 2013)
					As a replacement fertility criteria the following information is proposed: 1. Tracking and recording of original parent soil material type; and 2. Cation Exchange Capacity (CEC)
			Land and soil Capability (LSC)		The land and soil capability assessment scheme - second approximation
			Soil Function	Physical stability and support	Hold and sustain vegetation upon the landscape, including the stability of mature trees
					Allow infiltration and internal drainage of water

Phases of Strategic Rehabilitation	Relevant Domains	Rehabilitation Element	Indicators		General Completion Criteria
					Ability to withstand the erosive forces of rainfall and surface water flow
				Habitat for soil organisms	In field soil inspection and sampling of soil identifies indicator species of soil biota present
				Nutrient cycling	Vegetation health assessments indicate good health?
					Soil and pasture testing shows essential nutrients present?
				Hydraulic buffer	Indicator species and analogue sites to show vegetation survival during dry periods and droughts
					Soil profiles will also be assessed to include drainage parameters and moisture content throughout the profile
				Filtering and chemical buffer	Vegetation survival and growth
					Subsurface water monitoring and chemical testing against nearby analogue reference sites
			Soil Resilience	Drought	Vegetation health indicators during and post dry periods
				Agricultural Practices	Comparison of analogue reference sites (refer to Agricultural productivity)
				Fire	Vegetation growth and maturity
			Agricultural Productivity		Comparison of analogue reference sites for: Pasture quality analysis, Pasture production or Feed on Offer (FOO) in kg of dry matter per ha, stocking rates or carrying capacity, livestock growth rates, time to slaughter, slaughter weights and quality, cropping yields, persistence of pasture and maintenance of ground cover.
4. Ecosystem Establishment	All Domains	Vegetation	Surface cover		Minimum of 70% vegetative cover is present (or 50% if rocks, logs or other features of cover are present). No bare surfaces >20 m^2 in area or >10 m in length down slope.
			Species composition		Subject to proposed land use:
					1. Comprise a mixture of native trees, shrubs and grasses representative of

Phases of Strategic Rehabilitation	Relevant Domains	Rehabilitation Element	Indicators	General Completion Criteria
				regionally occurring woodland.
				2. Suitable grass and pasture species which facilitates livestock grazing.
			Species Density	1. Stems per ha of native trees, shrubs and grasses representative of regionally occurring woodland.
				2. Density of grass and pasture species which facilitates livestock grazing.
5. Ecosystem Development	All Domains	Vegetation	Land use	Areas function in accordance with nominated landuse.
			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.
			Ecological Succession	Succession factors such as ground cover, vegetation growth, maturation of dominant species, flowering, seeding and the emergence of new trees via natural processes, and the development of various habitats and micro habitats for wildlife.
			Sustainability	Species are capable of setting viable seed, flowering or otherwise reproducing. Evidence of second generation of shrub and understorey species.
				Grass and Pasture areas are able to recover from grazing activity to continue productivity.
				Vegetation develops and maintains a litter layer evidenced by a consistent mass and depth of litter over subsequent seasons.
				More than 75% of shrubs and/or trees are healthy when ranked healthy, sick or dead.
		Fauna	Vertebrate species	Representation of a range of species characteristics from each faunal assemblage group (e.g. reptiles, birds, mammals), present in the ecosystem

Phases of Strategic Rehabilitation	Relevant Domains	Rehabilitation Element	Indicators	General Completion Criteria
				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;

6.2 Summary of Specific BSAL/LSC Class 3 Criteria

The reinstatement of BSAL requires measurement against completion criteria, as summarised in **Table 16** below. This is based on the 12 criteria of the Interim Protocol as well as consideration of the LSC 3 hazard criteria in the LSC Guideline. It is worth noting that neither the BSAL protocol nor the LSC classification system was designed to include Anthroposols (man-made soils), which includes soils established on post mining landforms. So the completion criteria has been based on these protocols, however there are several items which have been adapted to meet the intent of the original criteria. These parameters have been developed in consultation with, and approved by NSW DPI.

Table 16 Summary of BSAL and LSC Class 3 Completion criteria

Criteria	Relevant BSAL Criteria *(LSC criteria guide)*	BSAL	LSC Class 3 criteria
Slope	BSAL Criteria 1 *(LSC Hazard 1)*	Slope less than 10%	Slope < 10% or < 3% if slope is > 500 m in length
Rock outcrop	BSAL Criteria 2 *(LSC Harzard 7)*	Rock outcrop less than 30%	Rock outcrop less than 30%
Surface Rockiness	BSAL Criteria 3	Less than 20% of the area has unattached rock fragments greater than 60 mm diameter	Not applicable
Gilgai	BSAL Criteria 4	Less than 50% of the area has gilgai depression that are deeper than 500 mm	Not applicable
Relative soil fertility class (including slope and rock outcrop requirements)	BSAL Criteria 5,6,7	Moderate fertility and <5% slope and nil rock outcrop OR	Not applicable
		Moderately high or high fertility and <10% slope and <30% rock outcrop OR	
Physical Barrier	BSAL Criteria 8 *(LSC Hazard 7)*	Effective rooting depth to a physical barrier is greater than or equal to 750 mm	Soil depth is >75 cm
Soil Drainage	BSAL Criteria 9 *(LSC Hazard 6)*	Soil drainage is better than poor	Imperfectly drained soil (waterlogging is 1-8 weeks duration)
pH	BSAL Criteria 10 *(LSC Hazard 4)*	pH within range of 5.0 to 8.9 (water) or 4.5 to 8.1 ($CaCl_2$) within upper 600mm of soil profile	Moderate or higher surface soil buffering capacity and pH >5.5 (water) or low surface soil buffering capacity and pH 6.7-8.0 (water)
Soil Salinity	BSAL Criteria 11 *(LSC Hazard 5)*	ECe less than or equal to 4 dSm/m or if gypsum is present, chlorides less than 800 mg/kg within upper 600mm of soil profile	Low salt store OR low discharge potential and moderate salt store (except high recharge potential and moderate salt store)
Chemical Barrier	BSAL Criteria 12	Effective rooting depth to a chemical barrier is greater than or equal to 750 mm, as defined by:	Not applicable
		pH <5.0 or >8.9;	
		ECe > 4 dSm/m or if gypsum is present, chlorides > 800 mg/kg	
		ESP >15%	
		Ca:Mg ratio <0.1	

Criteria	Relevant BSAL Criteria *(LSC criteria guide)*	BSAL	LSC Class 3 criteria
Wind Erosion	*(LSC Hazard 2)*	N/A	Surface soil texture class, wind erosive power, exposure to wind and average annual rainfall. (See LSC guideline for specific requirements)
Soil Structure Decline	*(LSC Hazard 3)*	N/A	Surface soil texture a sandy loam OR fine sandy loam with <60% silt and very fine sand and <5% ESP (hazard 3) OR normal loam/clay loam OR friable/ferric or weakly self-mulching clay.
Mass Movement	*(LSC Hazard 8)*	N/A	No mass movement
Vegetation	Not Required (Optional Criteria)	Land is useable as a functioning agricultural system as per the Class 3 LSC parameters with yield similar or exceeding known yield of local Class 3 agricultural enterprises.	
Soil fauna	Not Required (Optional Criteria)	Representation of a range of soil species such as earthworms, springtails and fungi relative to nearby reference sites of same class.	

The fertility criteria designed for the post mining assessment of BSAL includes a combination of two parameters:

1. Identification and tracking of original in situ 'parent' soil material, and
2. The analytical testing in the laboratory for Cation Exchange Capacity.

These two parameters best reflect the potential match of the soil material to the BSAL fertility criteria.

6.3 LSC Class 4, 5, 6 and 7 Criteria

The areas of rehabilitation outside the BSAL/LSC Class 3 land have a nominated LSC class ranging from 4 to 7. The parameters to be assessed using the LSC criteria are summarised below. It should be noted that some of the criteria are only applicable for in-situ soils and not Anthroposols. This means some criteria has been developed or modified to fulfil the intent of the criteria. The general descriptions of the LSC Classes are shown in **Table 17** below.

Table 17 Land and Soil Capability (LSC) Classes – General Descriptions

LSC Class	General Definition
Land capable of a wide variety of land uses (cropping, grazing, horticulture, forestry, nature conservation	
1	**Extremely high capability land:** Land has no limitations. No special land management practices required. Land capable of all rural land uses and land management practices.
2	**Very high capability land:** Land has slight limitations. These can be managed by readily available, easily implemented management practices. Land is capable of most land uses and land management practices, including intensive cropping with cultivation.
3	**High capability land:** Land has moderate limitations and is capable of sustaining high-impact land uses, such as cropping with cultivation, using more intensive, readily available and widely accepted management practices. However, careful management of limitations is required for cropping and intensive grazing to avoid land and environmental degradation
Land capable of variety of land uses (cropping with restricted cultivation, pasture cropping, grazing, some horticulture, forestry, nature conservation)	
4	**Moderate capability land:** Land has moderate to high limitations for high-impact land uses. Will restrict land management options for regular high-impact land uses such as cropping, high-intensity grazing and horticulture. These limitations can only be managed by specialised management practices with a high level of knowledge, expertise, inputs, investment and technology
5	**Moderate low capability land:** Land has high limitations for high-impact land uses. Will largely restrict land use to grazing, some horticulture (orchards), forestry and nature conservation. The limitations need to be carefully managed to prevent long term degradation.
Land capable for a limited set of land uses (grazing, forestry and nature conservation, some horticulture)	
6	**Low capability land:** Land has very high limitations for high impact land uses, land use restricted to low impact land uses such as grazing, forestry and nature conservation. Careful management of limitations is required to prevent severe land and environmental degradation
Land generally incapable of agricultural land use (selective forestry and nature conservation)	
7	**Very low capability land:** Land has severe limitations that restrict most land uses and generally cannot be overcome. On-site and offsite impacts of land management practices can be extremely severe if limitations not managed. There should be minimal disturbance of native vegetation.
8	**Extremely low capability land:** Limitations are so severe that the land is incapable of sustaining any land use apart from nature conservation. There should be no disturbance of native vegetation.

The details of the specific requirements for each LSC class can be found in the publication *"The land and soil capability assessment scheme – Second approximation"*, (NSW OEH 2012). A summary of the applicable criteria for LSC Classes 4, 5, 6 and 7 are outlined in **Table 18** below. Some criteria is quite complex to calculate and therefore difficult to summarise in a table, therefore where this is the case, the LSC Assessment Scheme should be referred to for detailed criteria.

Table 18 LSC Criteria for Classes 4, 5, 6 and 7

LSC	Slope (%)	Wind erosion	Soil Structure decline	Acidification hazard	Salinity Hazard	Waterlogging	Rockiness and Shallow Soils	Mass Movement
LSC Class 4	10 to 20%[1]	Refer to LSC Assessment scheme for detailed criteria				waterlogged for 2 to 3 months every 2 to 3 years on imperfectly drained soil	<30% rock outcrop and soil depth 50 to 75cm	No Criteria
LSC Class 5	10 to 20%[2]					waterlogged for 2 to 3 months every year on imperfectly drained soil	No Criteria for <30% rock outcrop	No Criteria
LSC Class 6	20 to 33%					waterlogged for >3 months every year on poorly drained soil	<30% rock outcrop and soil depth 25 to 50cm	Present on slopes <20%
LSC Class 7	33 to 50%					No Criteria	<30% rock outcrop and soil depth <25cm	Present on slopes 20% to 50%

1. No gully erosion or sodic/dispersible soils are present
2. Gully erosion or sodic/dispersible subsoils are present

6.4 Native Vegetation Criteria

The proposed areas of native woodland rehabilitation are located on land also nominated for specific LSC classes. Therefore, the first priority is to establish a landform and soil profile which satisfies the nominated LSC class. The reasoning for this is despite the current proposed land use, the landform and soil profile remains capable of supporting agricultural land uses associated with the specific LSC class, if required in the future. This section covers additional completion criteria to satisfy a native woodland final land use.

When setting completion criteria for native ecosystems, a number of standards can be used for comparative purposes. Some standards, such as those for soils, can relate to standards set for agricultural land and are therefore not particularly relevant to mine land being returned to native ecosystems. Other less rigorous (and more appropriate) standards are based on commonly accepted soil tolerance limits or preferred ranges for native plants. The third option is the use of criteria which are based on a comparison of mine site soil and vegetation results with those in nearby reference (comparison) plots. Analogue plots are usually located on adjacent unmined areas (and in indicative vegetation communities). The objective of this comparison being the return of mined land to similar pre-mining conditions. Proposed criteria in this Plan have therefore used a combination of the latter two with the intention of achieving reasonable post-mining outcomes over time. The following sections outlines the completion criteria specific for native vegetation proposed to be rehabilitated on the post-mining landform.

6.4.1 Native Ecosystems

The minimum revegetation criteria include the following:

- **Species Diversity**. The presence of at least two over story and two under story species in each 10 m x 20 m plot after two years since the completion of rehabilitation activities;
- **Stem Densities**. Minimum total tree/shrub densities for seeded areas are:
    - Year 1 – 600 stems/ha;
    - Year 5 – 400 stems/ha; and
    - Year 15 – 200 stems/ha.
- **Species Composition**. The dominant species (e.g. White box) listed for each community should comprise at least 50% of the above stem numbers;
- **Natural Regeneration**. Evidence of natural regeneration at Project Year 15 for at least one overstorey and one understorey species;
- **Land Capability**. The return of agreed land capability consistent with commitments in the EIS, RTS and detailed in this plan and other relevant consent conditions; and
- **Weeds**. Where clumps of 5 m² or more of a targeted weed (a list to be developed) occur repeatedly across an area, control will be undertaken.

To be researched and agreed on within five years:

- Minimum canopy cover in native ecosystem areas; and
- Minimum tree height and girth standards for the two most important species. *Eucalyptus albens* and *Eucalyptus melliodora* to be researched and benchmarked for 5, 10 and 15 years.

The above future research targets highlight the fact that it is not possible to define all completion criteria at this time and that further investigation and feed-back is needed. These criteria will be developed as new information becomes available and included in this Plan in any subsequent revision.

7 REHABILITATION MONITORING AND RESEARCH

KEPCO will undertake a rehabilitation monitoring program to provide regular feedback on the success of rehabilitation endeavours on site. The objectives of the program will be to:

- Assess the long-term stability and functioning of re-established ecosystems on mine affected land;
- Assess rehabilitation performance against the closure criteria; and
- Facilitate continuous improvement in rehabilitation practices.

In order to verify rehabilitation procedures and outcomes, the monitoring program is required to assess rehabilitation progress towards meeting the completion criteria using appropriate indicators.

A rehabilitation monitoring program will be implemented to describe the processes and activities required to determine the biophysical state of a domain. It will describe a standardised and repeatable approach to the measurement of certain biophysical attributes and processes that can be compared against the completion criteria for the site and domains. The program is designed to ensure collection and storage of data is undertaken in a robust and statistically valid manner.

To facilitate continuous improvement, rehabilitation is an iterative process which allows activities to be defined and improved upon throughout the life of the mine. Monitoring of rehabilitation successes and failures will enable lessons learnt in early years of rehabilitation to be applied in subsequent and later years. It will also ensure that continuous improvement in the site's performance in terms of landscape and land use is achieved.

The monitoring program will be continued within rehabilitated as well as non-mined areas until it can be demonstrated that rehabilitation has satisfied the closure criteria. Information from this monitoring program will also be used to refine completion criteria as required.

The monitoring program has been designed, with recognition of the key sequential rehabilitation stages that need to occur prior to monitoring and which provide the foundation for successful rehabilitation outcomes. Rehabilitation standards are assigned to each stage of the rehabilitation process.

These important stages are described in detail in *Rehabilitation by Design Mine Rehabilitation Handbook (Mark Burns, Director Global Soil Systems, prepared for the New South Wales Minerals Council Ltd – April 2007)* and include:

- Landform Design;
- Surface Water Management/Erosion Control;
- Topsoil Management;
- Overburden Management;
- Site Preparation;
- Re-vegetation;
- Weed Control;
- Maintenance; and
- Monitoring.

Prior to undertaking the monitoring program, KEPCO will need to have confidence that works undertaken within each of the above stages have been completed according to agreed standards.

7.1 General Monitoring Activities

There are various rehabilitation monitoring methods available for use at the Bylong Coal Project. This section provides a list of monitoring methods to be undertaken at key stages in the rehabilitation process. Following on from the management and handling of soil resources outlined in Section 4 above, rehabilitation monitoring begins prior to the soil placement on the shaped overburden, as follows:

1. **Landform**: On ground monitoring of final landform design and implementation including slope and drainage patterns prior to re-spreading soil resources will provide assurance landform rehabilitation criteria and landform parameters are in line with the MOP and on track to be met. This item will be covered through the MOP and mine scheduling, however it should be noted here to regularly check overburden/final landform slopes.

2. **Soil Quality**: The soil quality checks undertaken within stockpiles prior to respreading will ensure soil resources are allocated to the appropriate areas of rehabilitation depending on their BSAL equivalent status and their subsoil topsoil status as outlined in **Section 4** above.

3. **Soil Depth**: During the re-spreading of soil resources on the final landform, measurements of soil depth should be taken and recorded, prior to any revegetation efforts, to ensure soil depth requirements are met for each BSAL and LSC Class.

4. **BSAL and LSC**: In accordance with BSAL protocol and LSC scheme, the final placed landform will undergo BSAL and LSC assessments either prior to sowing or once a vegetation cover has been established.

5. **Vegetation Establishment**: Once the initial sowing, planting and fertiliser application is undertaken, regular monitoring of establishment success is required to provide early indications of maintenance requirements or problem areas. There are various strategies proposed for the ongoing monitoring of revegetation success as outlined in the following sections.

6. **Land Use**: Over the years following initial rehabilitation efforts, periodic soil test pitting should be undertaken to ensure soil depths and soil qualities satisfy the post mining BSAL and LSC requirements as well as floristic assessments to ensure targeted Box Gum Woodland is being established.

7.2 BSAL and LSC Monitoring Program

The Project is committed on the reinstatement of 319.5 ha of BSAL equivalent land within the mining and OEA areas. The ongoing monitoring or assessment of new rehabilitation against the BSAL and LSC criteria is required to confirm achievement of BSAL and LSC status, but also provides early indication of the need for remedial action if certain criteria are not met. The following program outlines the BSAL/LSC monitoring program.

7.2.1 Protocols

The protocols used for the BSAL/LSC monitoring program are provided in Sections 5.2 and 5.3 above, and are based on the following two documents:

- Interim protocol for site verification and mapping of biophysical strategic agricultural land (NSW Government 2013)
- The land and soil capability assessment scheme – second approximation (OEH 2012)

The monitoring and assessment protocols outlined in these documents provide the methods to be employed on the Project.

7.2.2 Timing

New Rehabilitation

Areas of newly shaped rehabilitation will be assessed for soil depth and in field soil profile assessment parameters in line with BSAL and LSC criteria. This will occur immediately following final soil placement and prior to sowing of cover crops where possible. This will allow initial confirmation of soil depths and soil qualities, so areas requiring more soil depth can be attended to prior to sowing.

Every 5 Years

The monitoring program will include a full BSAL and LSC assessment at a scale of 1:25,000 (Approximately 1 site every 20 ha) upon completed rehabilitation every 5 years. This is to provide regular tracking of performance of rehabilitated soil profiles against the BSAL and LSC criteria. Furthermore this will increase the number of test pit results over the mine life, which will adequately cover the potential for high variation in the anthroposol soils on mined land.

7.2.3 Certified Professional Soil Scientist (CPSS)

As required by the Interim Protocol, a CPSS will undertake the BSAL Assessment program every 5 years. This ensures the assessment process is certified by a recognised professional and backed by the accreditation program for soil science in Australia. Analytical testing will also be through a NATA accredited laboratory.

7.2.4 Reporting

The BSAL and LSC assessments on completed rehabilitation areas will be undertaken every 5 years with the assessment results presented within the relevant Annual Report. Full reports will be made available upon request by the NSW Government.

7.3 Native Woodland Monitoring Program

7.3.1 Background to Monitoring Methodology

Monitoring methodologies and criteria proposed in this program have largely been taken from an ACARP study (Project C13048) whose principal objective was the development of a report titled *Development of Rehabilitation Completion Criteria for Native Ecosystem Establishment on Coal Mines in the Hunter Valley* (Nichols, 2005). This study drew heavily on a previous study for Bowen Basin coal mines in Queensland and has delivered a set of guidelines that address the requirement of mining companies for clear rehabilitation objectives and native ecosystem completion criteria relevant to mine closure and relinquishment, together with monitoring programs that verify that these have been achieved. The methodology is relevant to all mines where native revegetation has or will be undertaken.

7.3.2 Monitoring Protocols

KEPCO will undertake several monitoring techniques throughout the mine life to regularly measure the establishment success and development of native woodland rehabilitation on the mine site. The techniques to be used will include (but not limited to) Ecosystem Establishment Checklist, Landscape Function Analysis (LFA), Floristic Surveys and Annual Walk-throughs as detailed in the following sections.

7.3.2.1 Initial Ecosystem Establishment Checklist

The initial ecosystem establishment checklist provides an audit style checklist, which should be completed following final establishment of each discrete revegetation stage. Completion of this checklist is, in effect, the first stage of the monitoring process. If work has been completed according to agreed standards, then the subsequent monitoring process can eliminate poor practice as a factor in observed outcomes. This checklist is indicative and can be adjusted according to local procedures. An example of the checklist is contained in **Appendix A**.

7.3.2.2 Landscape Function Analysis

LFA is a field-based monitoring procedure that assesses the rehabilitated landform from a landscape perspective. The procedure assessed the fate of vital resources such as water, topsoil and organic matter, and identifies both potential accelerated losses and processes that retain those resources. The quality and fate of the resources are compared over time against the relevant reference sites, completion criteria and performance indicators.

LFA was developed by CSIRO scientists Tongway and Hindley (2004) and has been used and tested widely and successfully in the mining industry across the globe. It has been designed for repeated use so that the development, or degradation, of a site can be assessed over time.

The monitoring procedure uses a linear transect positioned vertically down the slope. Transect length ranges from 50-100 m in length depending on the complexity/uniformity of the environment. The assessment uses rapidly assessed, simple visual indicators, to determine how well a landscape functions as a biophysical system and the site assessment is comprised of two major data collection components along the transect:

- Landscape Organisation - measurement of the arrangement of these units along transect(s); and
- Soil Surface Assessment - the measurement of soil surface indicators for each unit to produce three information indices.

The interpretation framework of the LFA provides three numeric values (indices): soil stability, infiltration of water and the cycling of nutrients. Indices are compared with appropriately selected reference sites, representing the most and the least disturbed examples of the landscape type being evaluated. Indices are incorporated into a value for the whole landscape and the application of this value is used to generate comparative graphs between rehabilitation sites of different age and a response curve which relates landscape condition to changes in landscape condition over time. This enables the user to examine the “trajectory” of the ecosystem being monitored and to use this information to decide if the site is converging on a “target” functional state, or needs further work to ensure ultimate success.

Erosion Assessment

Erosion data is to be collected from a 50m cross-section along the centre of each LFA transect. Data to be collected includes:

- Type of erosion;
- Length and width of each site of erosion;
- Erosion depth; and
- Stability of the erosion.

This information will be used to estimate the scale and current activity of erosion at each monitoring site. In addition, information on soil surface stability from the LFA field slake test (Tongway and Hindley, 2004) can be used to assist erosion predictions within the LFA assessment.

7.3.2.3 Floristic Surveys

The floristics survey should aim to monitor changes in particular plants and groups of plants through the various successional phases and should document and/or identify critical changes or management actions required.

The survey should include quantitative data that measures changes in:

- Floristic diversity including species area curves and growth forms;

- Ground cover diversity and abundance;
- Vegetation structure and habitat characteristics;
- Understorey density and growth (including established shrubs, direct seeding, tubestock plantings and tree regeneration);
- Overstorey characteristics including tree density, health and survival; and
- If relevant, other habitat attributes such as the presence of hollows, mistletoe and the production of flowers and seed.

Some simple and rapid procedures for making these assessments were developed by CSIRO scientists (Gibbons 2002, Gibbons et al 2008) to assess habitat quality across a range of vegetation types in the southern NSW Murray-Darling Basin and later developed the Biometric Model (now known as the BioBanking model).

The *Biodiversity Conservation Act 2016,* commenced on 25 August 2017. The Act is a key pillar of the NSW Government's framework for biodiversity assessment and management, together with the land management framework established in the *Local Land Services Act 2013* (as amended by the *Local Land Services Amendment Act 2016*).

The *Biodiversity Conservation Act 2016*, together with the *Biodiversity Conservation Regulation 2017***,** outlines the framework for addressing impacts on biodiversity from development and clearing. It establishes a framework to avoid, minimise and offset impacts on biodiversity from development through the Biodiversity Offsets Scheme.

The Biodiversity Offsets Scheme creates a transparent, consistent and scientifically based approach to biodiversity assessment and offsetting for all types of development that are likely to have a significant impact on biodiversity. It also establishes biodiversity stewardship agreements, which are voluntary in-perpetuity agreements entered into by landholders, to secure offset sites

The Biodiversity Assessment Method (BAM) is the assessment manual that outlines how an accredited person assesses impacts on biodiversity at development sites and stewardship sites. It is a scientific document that provides:

- a consistent method for the assessment of biodiversity on a proposed development or major project, or clearing site,
- guidance on how a proponent can avoid and minimise potential biodiversity impacts, and
- the number and class of biodiversity credits that need to be offset to achieve a standard of 'no net loss' of biodiversity.

This method of assessment will provide information on the status of rehabilitation within the project site as a stewardship assessment. Full detail of this procedure is available within the *Biodiversity Assessment Method* (OEH, 2017).

7.3.3 General Plot Design and Monitoring Frequencies

In developing the rehabilitation monitoring program, the following design aspects have been considered:

- Replicate monitoring sites are needed in representative rehabilitation areas of different ages. One monitoring site per 50 ha is recommended for each community. However, some flexibility in this is recommended. Analogue (comparative) monitoring plots should be established on indicative and undisturbed adjacent land and should be as representative as possible of each community.
- Sites should be monitored annually for the first three years after establishment and then every two years thereafter.

- A standard monitoring plot design for treed areas is shown in **Figure 10** below. The design includes:
  - Five 2m x 2m quadrats will provide some estimate of statistical variance, so that if required, statistical analyses can be undertaken to objectively compare different rehabilitation treatments, changes over time, and others;
  - One 20m x 10m plot overlying the 2m quadrates and located 5m either side of the centreline, for ease of monitoring; and
  - A 50m erosion monitoring transect on contour, running through the centre of the plot.
- Recommended procedures for monitoring native ecosystems using this plot design are shown in **Table 19**.

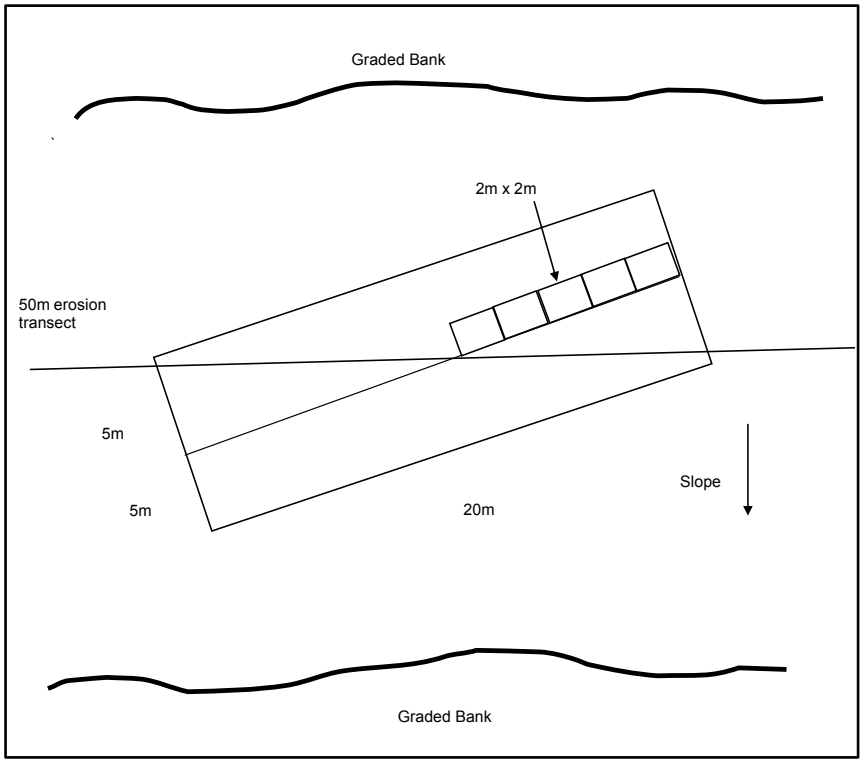


Figure 10 General Plot Design

Source: Nichols, 2005

Table 19 Recommended Procedures for Monitoring Native Ecosystems

Plot Size	Measurement
General description	• Describe the vegetation in general terms, e.g. mixed eucalypt woodland with grass under story and scattered shrubs, dense Acacia scrub, etc.
2m x 2m quadrats	• Count the number of plants of all species, excluding grass • Measure live vegetation cover for under story and grasses (separately) using a line intercept method • Record details of ground cover (litter, logs, rocks etc.)
20m x 10m plots	• Count, by species, all trees

	• Tag and measure DBH of trees >1.6m tall, to a maximum of 10 for any one species • Record canopy cover over the whole 20m centreline when trees are tall enough • Subjectively describe tree health, by species if relevant, noting signs of drought stress, nutrient deficiencies, disease and severe insect attack. Where health problems are noted, record the percentage of unhealthy trees. • Record any new plant species not present in the smaller plots, including any problem and declared noxious weeds • Take five surface soil samples (e.g. at approx. 5m intervals along the centreline) and bulk these for analyses of: pH, EC, exchangeable Ca/Mg/K/Na, ESP, cation exchange capacity, organic carbon %, available N, P.K and S
50m	• Along the 50m erosion monitoring transect, record the location, number and dimension of all gullies >30 cm wide and/or 30 cm deep • Erosion pins should be established in plots located in newer rehabilitation to record sheet erosion if present
Rehabilitation in general	• When traversing between monitoring plots, note the presence of species of interest not previously recorded (e.g. key functional or structural species, protected species, noxious weeds), as well as obvious problems including any extensive bare areas (e.g. those greater than 0.1 ha). • Observations such as this can provide useful, broad scale information on rehabilitation success and problems.
Photographic record	• For each 20m x 10m plot, a photograph should be taken at each end of the plot, along the centreline looking in.

7.3.4 Annual Walk-Through Rehabilitation Audit

The above fixed-plot assessment process will produce quantitative data which can be used to chart and demonstrate the mine's progress towards mine closure and subsequent lease relinquishment. However, there is also a simple need to regularly check on rehabilitation progress and take corrective action, if needed. As such, an annual walk-through of all rehabilitated areas will be undertaken to assess the general progress of completed rehabilitation and to identify areas where corrective action is necessary. This assessment will have very simple objectives relating to native vegetation, weeds, surface rock, surface water management and erosion control structures. This walk-through assessment will identify any problems such as failure of a contour drain, localised slope erosion, failed vegetation areas etc. and will provide an action list leading to the correction of the problem.

7.4 Research Trials

While this Plan provides considerable detail on the proposed revegetation strategy and the methodologies associated with the establishment of BSAL, LSC Classes and native woodland, additional research trials will be undertaken over the life of the mine to assist in fine tuning the strategy, and contributing to the broader knowledge of industry best practice in rehabilitation. The research trials undertaken on the site will be defined and detailed for each individual trial basis, however the below sections outline the fields of research to be considered for the Bylong Project.

7.4.1 Site Specific Rehabilitation Conditions

The environmental conditions and rehabilitation parameters experienced on site will be specific to the Project. This Plan has outlined the key methodologies, completion criteria and monitoring program for rehabilitation, however monitoring trials will be implemented to assess and/or confirm the site specific

conditions associated with rehabilitation. These trials will commence following the initial establishment of rehabilitated areas and may include the following:

- Extent of Weeds – Extent of weed emergence on the different respread topsoil types across the mine is currently unknown. The purpose of this trial will be to both assess the nature and level of weed emergence as well is their effect on native species and to develop strategies which will reduce the competitive effects of weeds on sown/planted native species;
- Germination and Establishment of Native Seed – Some of the understorey species have complex dormancy mechanisms which need to be overcome before wide spread use of this seed is applied to the rehabilitation area. Trials on different topsoil materials will examine the germination and suitability of different species both singularly and in combination with other species in direct seeding programs;
- Species Proportions and Densities – Various ratios of sown and planted seedlings will be tested in order to assess the optimum ratios for each community;
- Re-emergence of Native Grasses – The emergence and persistence of native grasses (occurring naturally in topsoil) will be examined over time as well as their success when artificially sown. This will provide guidance as to the extent to which native grasses will need to be incorporated into the original sowing mix;
- Fertiliser Alternatives and Soil Amelioration – The extent of weed reinvasion will determine whether fertiliser alternatives (such as kitty litter) will be needed to reduce weed competition. At this time, it is not proposed to use fertilizer when direct seeding native species due to likely enhancement of weed competition. Similarly, the benefits of different soil ameliorants such as gypsum and mulched timber will also be examined for their potential to enhance preferred community establishment and stability; and
- Mulching of Felled Timber – The project plans to investigate the option of separately collecting, stockpiling and composting mulch prior to respreading onto top-dressed rehabilitation areas. There are benefits and disadvantages with this method versus incorporating mulch directly into the soils. The ratio of timber mulched, compared to that left and reused as coarse timber, will also be examined.

7.4.2 Agricultural Performance of BSAL and LSC Classes

Whilst Section 6.2 details the monitoring program for the confirmation of BSAL and LSC classes on the post mining landform, KEPCO will also undertake research trials in order to compare the agricultural performance of mine rehabilitation versus un-mined land. These trials will be undertaken on like for like LSC class land and BSAL using analogue reference sites nearby with similar landform and soil characteristics. The aim of the research is to demonstrate the long-term productivity of rehabilitated land and identify potential limiting factors to productivity in both mined and unmined land during the process.

These trials may include performance measures such as grazing animal growth rates, cropping yields, pasture coverage and nutrition. The specific trials will undergo the typical rigours of scientifically sound design requirements to ensure the results are statistically valid. These trials will be implemented following confirmation of BSAL and LSC, and pasture cover is considered stable and likely resilient to grazing activities.

7.4.3 Natural Sequence Farming Principles

Areas of mine rehabilitation that are suitable to facilitate some principles of NSF design will be considered where appropriate. Specific proposals for research trials into NSF on rehabilitated land will be considered during the mine planning phases of rehabilitation and in collaboration with the outcomes from current studies undertaken by the University of New England.

8 MINE CLOSURE MANAGEMENT

The Project will employ a range of decommissioning strategies at closure to achieve a stable and compatible landform. These strategies are consistent with the objectives outlined in **Section 3**.

Five years prior to mine closure, a detailed mine closure plan will be prepared. This will include but not be limited to:

- Define the objectives and criteria for mine closure;
- Investigate options for the future use of the site;
- Investigate ways to minimise the adverse socio-economic effects associated with the mine closure, including reduction in local employment levels;
- Describe how the performance of these measures would be monitored over time;
- Describe how stakeholders have been/will be engaged to enable all stakeholders to have their interests considered during the mine closure process;
- Describe the planning process to ensure the process of closure occurs in an orderly, cost effective and timely manner;
- Describe how closure will be implemented to ensure that there is clear accountability, and adequate resources, for the implementation of the closure plan;
- Detail the standards that will used as a set of indicators to demonstrate the successful completion of the closure process; and
- Show how relinquishment will be met to reach a point where the company has met agreed completion criteria to the satisfaction of the responsible authority.

This rehabilitation plan and the proposed BSAL and LSC classes applied to the post mining landform and soil profile will ensure the site maintains the maximum possible options for land use at time of closure.

9 INTERVENTION AND ADAPTIVE MANAGEMENT

Majority of the rehabilitation of the Open Cut and Out of Pit Emplacements will be completed by Year 10 of the project, with monitoring and maintenance of these areas continuing through to year 25 during operations. Where rehabilitation monitoring indicates that rehabilitation outcomes are not trending toward the nominated completion criteria, KEPCO will instigate early intervention and adaptive management to minimise the potential for rehabilitation failure.

Intervention and adaptive management tools such as Trigger Action Response Plans (TARPs) can be used to clearly identify the levels at which management response to unexpected events, such as a flood, drought, fire or poor rehabilitation performance, is required. The overall advantage of developing a TARP is that it provides a summary of the considered and planned early responses if monitoring indicates that a trend towards unacceptable levels of risk is occurring. Accurate identification of trigger levels provide for early responses to emerging risks to rehabilitation. As with monitoring indicators against completion criteria, monitoring against trigger levels is also required.

Identification of threats to rehabilitation and the subsequent intervention is discussed in the sections below.

9.1 Threats to Rehabilitation

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

Table 20 provides examples of key threats to rehabilitation. Where rehabilitation monitoring indicates that there is a significant threat to rehabilitation KEPCO will undertake adaptive management in accordance with the developed TARPs.

Table 20 Key Threats to Rehabilitation

Threat	Cause/s
Bushfire	Seasonal influences (temperature, rainfall) Increased fuel loads Proximity to State Forest and National Parks
Stability of the final landform	Geochemical and Geophysical characteristics of final landform substrate Steep slopes Inadequate vegetative cover
Flooding related geotechnical instability or erosion events	Major storm events
Rehabilitation / revegetation failure	Extreme or prolonged drought Soil nutrient deficiencies or chemical imbalances Weed invasion or predation by vertebrate pests

9.2 Trigger Action Response Plans (TARP's)

The TARPs for rehabilitation have been developed to identify when management actions are required in the event that rehabilitation outcomes/trends are not achieved in an acceptable timeframe. These TARPs have been based on the proposed rehabilitation completion criteria (refer **Section 5**). KEPCO will continue to develop TARPs over the life of the mine, in consultation with stakeholders and experts in relevant fields (rehabilitation professionals, ecological consultants, subsidence engineers etc.).

TARPs will be regularly reviewed by the Environmental Manager with advice from the Project's Farm Manager sought as appropriate. Where necessary, rehabilitation procedures will be amended accordingly with the aim of continually improving rehabilitation standards. KEPCO will notify the NSW Department of Planning and Environment and other relevant stakeholders of any incident resulting in major impacts to rehabilitation. TARPs for each BSAL and/or LSC Class are provided in **Appendix B** and will be reviewed and revised as development of rehabilitation technologies or new threats to rehabilitation are identified.

10 REPORTING AND REVIEW

10.1 Annual Review

In accordance with Condition 11 of Schedule 6 of the Recommended Development Consent conditions, KEPCO will prepare an Annual Review of the environmental performance of the Project by the end of March each year. The Annual Review includes rehabilitation as an integral part of the monitoring and reporting requirements. The requirements outlined below are all relevant to the rehabilitation activities outlines throughout this plan.

11. By the end of March each year, the Applicant must submit a review of the environmental performance of the development for the previous calendar year to the satisfaction of the Secretary. This review must:
(a) Describe the development (including any rehabilitation) that was carried out in the past year, and the development that is proposed to be carried out over the next year.
(b) Include a comprehensive review of the monitoring results and complaints records of the development over the past year, which includes a comparison of these results against the:
- relevant statutory requirements, limits or performance measures/criteria;
- monitoring results of previous years; and
- relevant predictions in the EIS;

(c) identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance:
(d) identify any trends in the monitoring data over the life of the development;
(e) identify any discrepancies between the predicted and actual impacts of the development and analyse the potential cause of any significant discrepancies; and
(f) describe what measures will be implemented over the next year to improve the environmental performance of the development.

Note: The "Post Approval Requirements for State Significant Developments - Annual Review Guideline 2015, NSW Government, October 2015" (or its latest version) provides a reporting framework to integrate the reporting requirements of the Annual Review required by the Department under the development consent and the Annual Environment Management Report (AEMR) required under the Mining Lease.

10.2 Incident Reporting

An incident is defined in the Development Consent as '*a set of circumstances that:*

- *Causes or threatens to cause material harm to the environment, and/or*
- *Breaches or exceeds the limits or performance measures/criteria in the Consent.*

In accordance with Condition 9 of Schedule 6 of the Recommended Development Consent conditions, KEPCO must immediately notify the Secretary of DP&E and any other relevant agencies of any incident associated with the Project immediately after KEPCO becomes aware of the incident. Within seven days of the date of the incident, KEPCO will provide the Secretary of DP&E and any relevant agencies with a detailed report on the incident.

10.3 Community Consultation

In accordance with Condition 8 of Schedule 6 of the Recommended Development Consent conditions, a Community Consultative Committee (CCC) will be operated for the duration of the Project. Regular

briefings to the CCC will be provided, including a summary of results from all rehabilitation monitoring for the Project.

8. The Applicant must operate a Community Consultative Committee (CCC) for the development to the satisfaction of the Secretary. This CCC must be operated in accordance with the *Community Consultative Committee Guidelines, State Significant Projects (*Department of Planning, November 2016) or its latest version *Notes:* *- The CCC is an advisory committee. The Department and other relevant agencies are responsible for ensuring that the Applicant complies with this consent.* *- In accordance with the guideline, the Committee should be comprised of an independent chair and appropriate representation from the Applicant, Council, local community representatives and stakeholder groups*

10.4 Auditing

In accordance with Conditions 12, 13 and 14 of Schedule 6 of the Recommended Development Consent conditions, Independent Environmental Auditing requirements will commence for the Project. The auditing of rehabilitation on site will be undertaken as part of this process in accordance with the conditions below. Furthermore, this plan, along with the MOP plans relating to rehabilitation will be audited against during this process to ensure the Plan is being implemented. The auditing of this plan will specifically include:

- The effectiveness of rehabilitation measures detailed in the plan;
- Progress against performance measures; and

Progress against completion criteria.

12. Within one year of the date of commencement of development and every 3 years thereafter, unless the Secretary directs otherwise, the Applicant must commission and pay the full cost of an Independent Environmental Audit of the development. This audit must: (a) be conducted by a suitably qualified lead auditor and suitably qualified, experienced and independent team of experts in any field specified by the Secretary, whose appointment has been endorsed by the Secretary; (b) include consultation with the relevant agencies; (c) assess the environmental performance of the development and assess whether it is complying with the requirements in this consent, and any relevant EPL or Mining Lease/s (including any assessment, plan, or program required under these approvals); (d) review the adequacy of any strategies, plans, or programs required under the abovementioned approvals; (e) recommend appropriate measures or actions to improve the environmental performance of the development and/or any strategy, plan or program required under the abovementioned approvals; and (f) be conducted and reported to the satisfaction of the Secretary *Note: The "Post Approval Requirements for State Significant Developments - Independent Audit Guideline, NSW Government, October 2015" (or its latest version) provides an audit and reporting framework for the independent audit that will guide compliance with this condition.*
13. Within 12 weeks of commissioning this audit, or as otherwise agreed by the Secretary, the Applicant must submit a copy of the audit report to the Secretary, together with its response to any recommendations contained in the audit report and a timetable for the implementation of these recommendation as required
14. The Applicant must implement these recommendations, to the satisfaction of the secretary

10.5 Plan Review

In accordance with Condition 5, Schedule 6 of the Recommended Development Consent conditions, this Plan will be reviewed within three months of the submission of an Annual Review, Incident Report or independent environmental audit.

Additional review of this Plan will be conducted following changes in statutory requirements, operational or management procedures or when triggered by any event, complaint or finding(s) that identify improvements in the controls that effectively manage the identified hazard.

11 ROLES AND RESPONSIBILITIES

KEPCO will ensure responsibilities for achieving rehabilitation objectives and mine closure are assigned and clearly communicated. General roles and responsibilities for the implementation of this Plan are presented in **Table 21**.

Table 21 Roles and Responsibilities

Project Phase	Task	Responsibility
Construction Phase	Vegetation clearance	Construction Manager
		Environment Manager
	Soil stripping, handling and stockpiling	Construction Manager
		Environment Manager
	Stockpile management and monitoring	Construction Manager
		Environment Manager
	Recording and logging soil stockpiles	Construction Manager
		Environment Manager
	Annual reporting of stripped areas and temporary rehabilitation	Construction Manager
		Environment Manager
	Incident reporting	Construction Manager
		Environment Manager
		Safety Manager
Mining and Decommissioning Phase	Progressive rehabilitation during operations	Mine Manager
		Environment Manager
	Decommission infrastructure	Mine Manager
	Decommission and rehabilitate dams, disused roads,	Mine Manager
		Environment Manager
	Shaping and rehabilitation of OEA	Mine Manager
		Environment Manager
	Weed Management Program	Environment Manager
	Monitoring and treatment of contamination	Mine Manager
		Environment Manager
	Rehabilitation care and maintenance	Environment Manager
	Rehabilitation and Environmental Monitoring	Environment Manager

12 REFERENCES

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

Burns, M. (2007) *Rehabilitation by Design Mine Rehabilitation Handbook*. New South Wales Minerals Council Ltd

Cumberland Ecology (2015) *Ecological Impact Assessment - Appendix J, Bylong Coal Project EIS*

Darmody, R., Dunker, R. and Barnhisel, R. (2002) *Reclamation of Prime Agricultural Lands After Coal Surface Mining: The Midwestern Experience*, Published by ASMR, Lexington KY

Elliot and Reynolds (2007) *Soil and Extractive Industries IN: Soils – their properties and management: 3rd Edition* (Eds P Charman & Murphy) (Oxford University Press, Australia)

SLR Consulting (2015) *Rehabilitation Strategy and BSAL Reinstatement Strategy - Appendix W Bylong Coal Project EIS*

Isbell R.F. (1996) *Australian Soil Classification* (CSIRO Publishing, Australia)

Nelson and Stewart (2007) *Alluvial Lands Reinstatement Project. Hunter Valley Operations Final Report*

Nichols, O.G. (2005) *Development of Rehabilitation Completion Criteria for Native Ecosystem Establishment on Coal Mines in the Hunter Valley*. ACARP Project No. C13048

NSW Department of Planning and Infrastructure (DP&I) (2012) *Strategic Regional Land Use Policy: Upper Hunter Strategic Regional Land Use Plan*

NSW Office of Environment and Heritage (OEH) (2012) *The Land and Soil Capability Assessment Scheme: Second Approximation – A General Rural Land Evaluation System for NSW*

NSW Office of Environment and Heritage and Office of Agricultural Sustainability and Food Security (OEH-OAS&FS) (2013) *Interim protocol for site verification and mapping of biophysical strategic agricultural land*

Scott Barnett and Associates (2015) *Agricultural Impact Assessment - Appendix X, Bylong Coal Project EIS*

SAMPLE EOCOSYSTEM ESTABLISHMENT CHECKLIST

Indicative Post-Establishment Monitoring Checklist for Native Vegetation Areas

Mining area:		**Approx. area (ha):**	
Location:		**Checklist compiled by:**	
Year rehabilitated:		**Date:**	

Checklist Point No.	Detail	Response (Yes/No/NA and reasons)
1	**Earthworks**:	
1.1	Have reshaped batter slopes been constructed to slope angles in accordance with the MOP?	
1.2	Are reshaped surfaces free of large rocks >200 mm in diameter in areas where pasture is to be established?	
2	**Drainage:**	
2.1	Have graded banks been established at vertical spacing in accordance with DRE Guidelines for Drains on Mine Sites?	
2.2	Have graded banks a longitudinal grade of 1% (on average) and do X-sections conform with agreed design parameters?	
2.3	Where possible has water in graded banks been run out onto a vegetated natural surface or onto revegetated level areas within the rehabilitated landform?	
2.4	If 2.3 is not possible, have graded banks been fed into one or more rock lined waterways	
2.5	Have rock lined waterway(s) been constructed in accordance with specifications in the RMP?	
3.	**Topsoil**	
3.1.	Has topsoil and/or subsoil been respread immediately following stripping or has it been stored in stockpiles?	
3.2	If topsoil has been respread immediately following stripping what vegetation community has it come from and does planned revegetation of the new site conform to this community?	
3.3	Have topsoil and subsoil stockpiles been constructed to a maximum height of 3 m and in accordance with RMP?	
3.4	If topsoil has come from a stockpile what was its origin and does it conform to the proposed rehabilitated community?	
3.5	If topsoil and/or subsoil have been stockpiled has adequate weed control been undertaken in accordance with the RMP to ensure that recovered soil has minimum weed content?	
3.6	Have topsoil and subsoil handling and respreading methods been consistent with the Rehabilitation Management Plan (RMP)?	
3.7	Has topsoil and subsoil for each land class been respread to appropriate depths according to the RMP?	
3.8	Have excavated pits/augering been dug to confirm the depth of respread topsoil and subsoil for each LSC class?	
4	**Reuse of Felled/Cleared Timber**	
4.1	Was standing timber mulched or left in coarse form following the clearing process?	
4.2	If mulched, was the mulch stripped and mixed with the topsoil or removed separately and stockpiled?	

4.3	If left as coarse timber was it stockpiled or respread onto other areas? If the later – where?	
5	**Site Preparation/Ripping:**	
5.1	Has deep ripping been undertaken parallel to the contour and to at least 400 mm depth? (Record date).	
5.2	Were any other site preparation activities such as cultivation and rock raking undertaken? (If so – record).	
6	**Vegetation Establishment:**	
6.1	Has direct seeding immediately followed deep ripping and before rain and surface crusting occurs? (Provide date of seeding).	
6.2	(a) Has the correct seed mix been applied? (b) Has the seed/fertilizer mix and all other seeding details been recorded in a systematic and readily available manner?	
6.3	(a) What method was used to spread the seed/fertilizer (kitty litter) mix (hand, tractor, aerial etc.)? (b) Was seed spread evenly?	
6.4	If tube stock has been planted do details conform to the RMP or agreed strategy and have all details such as species, spacing, planting method etc. been recorded in a systematic and appropriate manner?	
7	**Other Details**	
	Have any other relevant details such as weed control, feral pest control, fencing etc., which may have an impact on the vegetation outcome, been undertaken and recorded?	

TRIGGER ACTION RESPONSE PLANS

Table 1 TARP – LSC Class 3/BSAL land (Grazing Land Use with Potential Cropping)

Key Element	Trigger/ Response	Condition Green	Condition Amber	Condition Red
Slope gradient	Trigger	Reinstated land has slopes that are generally <10%.	Reinstated land has slopes that have slopes >10% but <12%.	Reinstated land has slopes that are >12%.
	Response	No response required. Continue monitoring program.	Undertake regrading of the area so that reinstated land is <10%.	Undertake a review of the landform design, including survey if required. Undertake regrading of the area.
Soil depth	Trigger	Secondary media (subsoil) > 0.6m overlain by > 0.25m topsoil.	Secondary media (subsoil) is < 0.6m but > 0.5m, overlain by < 0.25m but > 0.2m topsoil.	Secondary media (subsoil) is < 0.5m, overlain by < 0.2m.
	Response	No response required. Continue monitoring program.	Apply an additional 100mm of subsoil to the area and / or an additional 50mm of topsoil to attain the required depth thresholds.	Undertake a review of the reinstatement process, including topsoil and subsoil sourcing and placement. Apply additional soil to the area to attain the minimum depth thresholds.
Surface rock	Trigger	Surface rock (<60mm diameter) <20%.	Surface rock (<60mm diameter) >20% but <25%.	Surface rock (<60mm diameter) >25%.
	Response	No response required. Continue monitoring program.	Rock rake the area and remove surplus rock to achieve <20% rock (<60mm diameter) threshold.	Undertake a review of the reinstatement process, including topsoil and subsoil sourcing. Rock rake the area and remove surplus rock to achieve <20% rock (<60mm diameter) threshold.
Rooting depth	Trigger	Effective rooting depth to a physical barrier (i.e. bedrock, gravel layer) is >750mm	Effective rooting depth to a physical barrier is <750mm but >650mm.	Effective rooting depth to a physical barrier is <650mm.
	Response	No response required. Continue monitoring program.	Apply an additional 100mm of topsoil to the area to attain the minimum effective rooting depth threshold of 750mm.	Undertake a review of the reinstatement process, including topsoil and subsoil sourcing and placement. Apply additional topsoil to the area to attain the minimum effective rooting depth threshold of 750mm.

Key Element	Trigger/ Response	Condition Green	Condition Amber	Condition Red
Soil drainage	Trigger	Soil drainage is better than poor.	Reinstated land exhibiting minor drainage issues but does not threaten to cause crop failure.	Reinstated land exhibiting poor drainage, causing crop failure.
	Response	No response required. Continue monitoring program.	A suitably trained person to inspect the site. Investigate opportunities to address issues. Rectify as appropriate.	Undertake a review of the drainage design and provide recommendations to appropriately rectify the area and do so as soon as practicable.
pH	Trigger	Soil pH within upper 600mm <8.9 but >5.0	Soil pH within upper 600mm is slightly >8.9 or <5.0	Soil pH within upper 600mm is >9.3 or <4.7
	Response	No response required. Continue monitoring program.	Undertake analytical soil testing and results evaluation. Where appropriate implement recommendations for amelioration to increase pH (e.g. lime addition) or reduce pH (high sulphur fertiliser) to within pH threshold limits.	Undertake a review of the reinstatement process, including topsoil sourcing. Undertake analytical soil testing and results evaluation. Where appropriate implement recommendations for amelioration to increase pH (e.g. lime addition) or reduce pH (high sulphur fertiliser) to within pH threshold limits.
Soil salinity	Trigger	ECe is <4 dS/m or if gypsum is present, chlorides less than 800 mg/kg within upper 600mm of soil profile	ECe is > 4.5 dS/m or if gypsum is present, chlorides >900 mg/kg within upper 600mm of soil profile	ECe is > 5 dS/m or if gypsum is present, chlorides >1,000 mg/kg within upper 600mm of soil profile
	Response	No response required. Continue monitoring program.	Engage a consultant to recommend appropriate measures to reduce soil EC (e.g. deep ripping to encourage salt leaching). Undertake consultant recommendations where possible and viable.	Undertake a review of the reinstatement process, including topsoil sourcing. Engage a consultant to recommend appropriate measures to reduce soil EC (e.g. deep ripping to encourage salt leaching). Undertake consultant recommendations where possible and viable.

Key Element	Trigger/ Response	Condition Green	Condition Amber	Condition Red
Sodicity	Trigger	Exchangeable Na% (ESP) in topsoil <15%	ESP in topsoil >15% but <17%	ESP in topsoil >17%
	Response	No response required. Continue monitoring program.	Undertake analytical soil testing and results evaluation. Where appropriate implement recommendations for amelioration to reduce sodicity (e.g. gypsum addition) so that ESP <15%.	Undertake a review of the reinstatement process, including topsoil sourcing. Undertake analytical soil testing and results evaluation. Where appropriate implement recommendations for amelioration to reduce sodicity (e.g. gypsum addition) so that ESP <15%.
Agricultural productivity	Trigger	Land is useable as a functioning agricultural system as per the Class 3 LSC parameters with yield similar or exceeding known yield of local Class 3 agricultural enterprises.	Land is useable as a functioning agricultural system as per the Class 3 LSC parameters with yield <10% reduction of known yield of local Class 3 agricultural enterprises.	Land is useable as a functioning agricultural system as per the Class 3 LSC parameters with yield >10% reduction of known yield of local Class 3 agricultural enterprises.
	Response	No response required. Continue monitoring program.	Undertake analytical soil testing and results evaluation. Where appropriate implement recommendations for production improvements so that it is similar or exceeding known production of local Class 3 agricultural enterprises.	Engage a consultant to recommend appropriate measures to improve production so that it is similar or exceeding known production of local Class 3 agricultural enterprises. All recommendations shall be implemented.

Table 2 TARP – LSC Class 4 (Grazing Land Use)

Key Element	Trigger/ Response	Condition Green	Condition Amber	Condition Red
Slope gradient	Trigger	Rehabilitated land has slopes that are generally <20%.	Rehabilitated land has slopes that have slopes >20% but <25%.	Rehabilitated land has slopes that are >25%.
	Response	No response required. Continue monitoring program.	Undertake regrading of the area so that rehabilitated land is <20%.	Undertake a review of the landform design, including survey if required. Undertake regrading of the area.
Soil depth	Trigger	Secondary media (subsoil) > 0.4m overlain by > 0.2m topsoil.	Secondary media (subsoil) is < 0.4m but > 0.3m, overlain by < 0.2m but > 0.1m topsoil.	Secondary media (subsoil) is < 0.3m, overlain by < 0.1m.
	Response	No response required. Continue monitoring program.	Apply an additional 100mm of subsoil to the area and / or an additional 100mm of topsoil to attain the required depth thresholds.	Undertake a review of the reinstatement process, including topsoil and subsoil sourcing and placement. Apply additional soil to the area to attain the minimum depth thresholds.
Surface rock	Trigger	Surface rock <40%.	Surface rock >40% but <50%.	Surface rock >50%.
	Response	No response required. Continue monitoring program.	Rock rake the area and remove surplus rock to achieve <40% rock threshold.	Undertake a review of the reinstatement process, including topsoil and subsoil sourcing. Rock rake the area and remove surplus rock to achieve <40% rock threshold.
Soil drainage	Trigger	Soil drainage is better than poor.	Reinstated land exhibiting minor drainage issues but does not threaten to cause pasture failure.	Reinstated land exhibiting poor drainage, causing pasture failure.
	Response	No response required. Continue monitoring program.	A suitably trained person to inspect the site. Investigate opportunities to address issues. Rectify as appropriate.	Undertake a review of the drainage design and provide recommendations to appropriately rectify the area and do so as soon as practicable.

Key Element	Trigger Response	Condition Green	Condition Amber	Condition Red
pH	Trigger	Topsoil pH <8.0 but >4.7	Topsoil pH is slightly >8.0 or <4.7	Topsoil pH is >8.5 or <4.5
	Response	No response required. Continue monitoring program.	Undertake analytical soil testing and results evaluation. Where appropriate implement recommendations for amelioration to increase pH (e.g. lime addition) or reduce pH (high sulphur fertiliser) to within pH threshold limits.	Undertake a review of the reinstatement process, including topsoil sourcing. Undertake analytical soil testing and results evaluation. Where appropriate implement recommendations for amelioration to increase pH (e.g. lime addition) or reduce pH (high sulphur fertiliser) to within pH threshold limits.
Soil salinity	Trigger	Topsoil ECe is <4 dS/m	Topsoil ECe is > 4.5 dS/m	Topsoil ECe is > 5 dS/m
	Response	No response required. Continue monitoring program.	Engage a consultant to recommend appropriate measures to reduce soil EC (e.g. deep ripping to encourage salt leaching). Undertake consultant recommendations where possible and viable.	Undertake a review of the reinstatement process, including topsoil sourcing. Engage a consultant to recommend appropriate measures to reduce soil EC (e.g. deep ripping to encourage salt leaching). Undertake consultant recommendations where possible and viable.
Sodicity	Trigger	Exchangeable Na% (ESP) in topsoil < 8% (adjusted according to texture).	ESP in topsoil >8% but <12% (adjusted according to texture).	ESP in topsoil >12% (adjusted according to texture).

Key Element	Trigger Response	Condition Green	Condition Amber	Condition Red
	Response	No response required. Continue monitoring program.	Undertake analytical soil testing and results evaluation. Where appropriate implement recommendations for amelioration to reduce sodicity (e.g. gypsum addition) so that ESP <8% (adjusted according to texture).	Undertake a review of the reinstatement process, including topsoil sourcing. Undertake analytical soil testing and results evaluation. Where appropriate implement recommendations for amelioration to reduce sodicity (e.g. gypsum addition) so that ESP <8% (adjusted according to texture).
Ground cover	Trigger	Five years following revegetation, a minimum of 70% total ground cover (vegetation, leaf litter, mulch) is present within rehabilitated areas.	Five years following revegetation, total ground cover (vegetation, leaf litter, mulch) of between 50-70% in rehabilitated areas.	Five years following revegetation, total ground cover (vegetation, leaf litter, mulch) is <50% within rehabilitated areas.
	Response	No response required. Continue monitoring program.	Review procedures where required to increase vegetation cover.	A suitably trained person to inspect the site. Investigate use of appropriate management options to remediate. Remediate as appropriate.
Weed presence	Trigger	Twelve months following revegetation, no significant weed infestations present.	Twelve months following revegetation, >10% but <25% cover of undesirable species present.	Twelve months following revegetation, >25% cover of undesirable species present.
	Response	No response required. Continue monitoring program.	Engage weed management contractor to remove introduced species from the site.	Engage weed management contractor to remove introduced species from the site as soon as practicable. Investigate management measures to assist native plant establishment including use of ameliorants and implement as appropriate.
Species composition	Trigger	Five years following revegetation to grassland, species composition consists of grasses and legumes appropriate to the district and recognised as suitable for beef cattle grazing and consistent with target species.	Five years following revegetation to grassland, <75% of grasses and legumes in the area are consistent with target species.	Five years following revegetation to grassland, species composition comprises <50% consistency with target species.

Key Element	Trigger Response	Condition Green	Condition Amber	Condition Red
	Response	No response required. Continue monitoring program.	Investigate additional weeding and re-seeding where required and ensure seed mix utilised is consistent with desired species composition.	An inspection of the site will be undertaken by a suitably trained person. Investigate remedial options to achieve required species composition.
Agricultural productivity	Trigger	Land is useable as a functioning agricultural system as per the Class 4 LSC parameters with production similar or exceeding known production of local Class 4 agricultural enterprises.	Land is useable as a functioning agricultural system as per the Class 4 LSC parameters with production <10% reduction of known production of local Class 4 agricultural enterprises.	Land is useable as a functioning agricultural system as per the Class 4 LSC parameters with production >10% reduction of known production of local Class 4 agricultural enterprises.
	Response	No response required. Continue monitoring program.	Undertake analytical soil testing and results evaluation. Where appropriate implement recommendations for production improvements so that it is similar or exceeding known production of local Class 4 agricultural enterprises.	Engage a consultant to recommend appropriate measures to improve production so that it is similar or exceeding known production of local Class 4 agricultural enterprises. All recommendations shall be implemented.
Damage to Rehabilitation	Trigger	Fuel loads are assessed and managed as required (including maintaining fire-breaks) and there is firefighting access across rehabilitation areas and water resources available for fighting fires.	Monitoring indicates fuel loads have not been managed and fire breaks have not been maintained. In the event of a fire, this would result in firefighters not being able to access the site or water resources.	A fire on site damages rehabilitated areas.
	Response	No response required. Continue monitoring program.	Reduce fuel loads and ensure access tracks are cleared. Inspect water sources are and ensure sufficient water is available.	Review and update (if required) the Bushfire Management Plan to ensure monitoring and maintenance is completed for fuel loads, access tracks, and water bodies.

Table 3 TARP – LSC Class 5 (Grazing Land Use)

Key Element	Trigger Response	Condition Green	Condition Amber	Condition Red
Slope gradient	Trigger	Rehabilitated land has slopes that are generally <20%.	Rehabilitated land has slopes that have slopes >20% but <25%.	Rehabilitated land has slopes that are >25%.
	Response	No response required. Continue monitoring program.	Undertake regrading of the area so that rehabilitated land is <20%.	Undertake a review of the landform design, including survey if required. Undertake regrading of the area.
Soil depth	Trigger	Secondary media (subsoil) > 0.4m overlain by > 0.1m topsoil.	Secondary media (subsoil) is < 0.4m but > 0.3m, overlain by < 0.1m but > 0.05m topsoil.	Secondary media (subsoil) is < 0.3m, overlain by < 0.05m.
	Response	No response required. Continue monitoring program.	Apply an additional 100mm of subsoil to the area and / or an additional 50mm of topsoil to attain the required depth thresholds.	Undertake a review of the reinstatement process, including topsoil and subsoil sourcing and placement. Apply additional soil to the area to attain the minimum depth thresholds.
Surface rock	Trigger	Surface rock <40%.	Surface rock >40% but <50%.	Surface rock >50%.
	Response	No response required. Continue monitoring program.	Rock rake the area and remove surplus rock to achieve <40% rock threshold.	Undertake a review of the reinstatement process, including topsoil and subsoil sourcing. Rock rake the area and remove surplus rock to achieve <40% rock threshold.
Soil drainage	Trigger	Soil drainage is better than poor.	Reinstated land exhibiting minor drainage issues but does not threaten to cause pasture failure.	Reinstated land exhibiting poor drainage, causing pasture failure.
	Response	No response required. Continue monitoring program.	A suitably trained person to inspect the site. Investigate opportunities to address issues. Rectify as appropriate.	Undertake a review of the drainage design and provide recommendations to appropriately rectify the area and do so as soon as practicable.

Key Element	Trigger Response	Condition Green	Condition Amber	Condition Red
pH	Trigger	Topsoil pH <8.0 but >4.7	Topsoil pH is slightly >8.0 or <4.7	Topsoil pH is >8.5 or <4.5
	Response	No response required. Continue monitoring program.	Undertake analytical soil testing and results evaluation. Where appropriate implement recommendations for amelioration to increase pH (e.g. lime addition) or reduce pH (high sulphur fertiliser) to within pH threshold limits.	Undertake a review of the reinstatement process, including topsoil sourcing. Undertake analytical soil testing and results evaluation. Where appropriate implement recommendations for amelioration to increase pH (e.g. lime addition) or reduce pH (high sulphur fertiliser) to within pH threshold limits.
Soil salinity	Trigger	Topsoil ECe is <4 dS/m	Topsoil ECe is > 4.5 dS/m	Topsoil ECe is > 5 dS/m
	Response	No response required. Continue monitoring program.	Engage a consultant to recommend appropriate measures to reduce soil EC (e.g. deep ripping to encourage salt leaching). Undertake consultant recommendations where possible and viable.	Undertake a review of the reinstatement process, including topsoil sourcing. Engage a consultant to recommend appropriate measures to reduce soil EC (e.g. deep ripping to encourage salt leaching). Undertake consultant recommendations where possible and viable.
Sodicity	Trigger	Exchangeable Na% (ESP) in topsoil < 15% (adjusted according to texture).	ESP in topsoil >15% but <17% (adjusted according to texture).	ESP in topsoil >17% (adjusted according to texture).

Key Element	Trigger Response	Condition Green	Condition Amber	Condition Red
	Response	No response required. Continue monitoring program.	Undertake analytical soil testing and results evaluation. Where appropriate implement recommendations for amelioration to reduce sodicity (e.g. gypsum addition) so that ESP <15% (adjusted according to texture).	Undertake a review of the reinstatement process, including topsoil sourcing. Undertake analytical soil testing and results evaluation. Where appropriate implement recommendations for amelioration to reduce sodicity (e.g. gypsum addition) so that ESP <15% (adjusted according to texture).
Ground cover	Trigger	Five years following revegetation, a minimum of 70% total ground cover (vegetation, leaf litter, mulch) is present within rehabilitated areas.	Five years following revegetation, total ground cover (vegetation, leaf litter, mulch) of between 50-70% in rehabilitated areas.	Five years following revegetation, total ground cover (vegetation, leaf litter, mulch) is <50% within rehabilitated areas.
	Response	No response required. Continue monitoring program.	Review procedures where required to increase vegetation cover.	A suitably trained person to inspect the site. Investigate use of appropriate management options to remediate. Remediate as appropriate.
Weed presence	Trigger	Twelve months following revegetation, no significant weed infestations present.	Twelve months following revegetation, >10% but <25% cover of undesirable species present.	Twelve months following revegetation, >25% cover of undesirable species present.
	Response	No response required. Continue monitoring program.	Engage weed management contractor to remove introduced species from the site.	Engage weed management contractor to remove introduced species from the site as soon as practicable. Investigate management measures to assist native plant establishment including use of ameliorants and implement as appropriate.
Species composition	Trigger	Five years following revegetation to grassland, species composition consists of grasses and legumes appropriate to the district and recognised as suitable for beef cattle grazing and consistent with target species.	Five years following revegetation to grassland, <75% of grasses and legumes in the area are consistent with target species.	Five years following revegetation to grassland, species composition comprises <50% consistency with target species.

Key Element	Trigger Response	Condition Green	Condition Amber	Condition Red
	Response	No response required. Continue monitoring program.	Investigate additional weeding and re-seeding where required and ensure seed mix utilised is consistent with desired species composition.	An inspection of the site will be undertaken by a suitably trained person. Investigate remedial options to achieve required species composition.
Damage to Rehabilitation	Trigger	Fuel loads are assessed and managed as required (including maintaining fire-breaks) and there is firefighting access across rehabilitation areas and water resources available for fighting fires.	Monitoring indicates fuel loads have not been managed and fire breaks have not been maintained. In the event of a fire, this would result in firefighters not being able to access the site or water resources.	A fire on site damages rehabilitated areas.
	Response	No response required. Continue monitoring program.	Reduce fuel loads and ensure access tracks are cleared. Inspect water sources are and ensure sufficient water is available.	Review and update (if required) the Bushfire Management Plan to ensure monitoring and maintenance is completed for fuel loads, access tracks, and water bodies.

Table 4 TARP – LSC Class 6 (Woodland land use)

Key Element	Trigger Response	Condition Green	Condition Amber	Condition Red
Slope gradient	Trigger	Rehabilitated land has slopes that are generally <33%.	Rehabilitated land has slopes that have slopes >33% but <40%.	Rehabilitated land has slopes that are >40%.
	Response	No response required. Continue monitoring program.	Undertake regrading of the area so that rehabilitated land is <33%.	Undertake a review of the landform design, including survey if required. Undertake regrading of the area.
Soil depth	Trigger	Secondary media (subsoil) > 0.2m overlain by > 0.1m topsoil.	Secondary media (subsoil) is < 0.2m but > 0.1m, overlain by < 0.1m but > 0.05m topsoil.	Secondary media (subsoil) is < 0.1m, overlain by < 0.05m.
	Response	No response required. Continue monitoring program.	Apply an additional 100mm of subsoil to the area and / or an additional 50mm of topsoil to attain the required depth thresholds.	Undertake a review of the reinstatement process, including topsoil and subsoil sourcing and placement. Apply additional soil to the area to attain the minimum depth thresholds.
Surface rock	Trigger	Surface rock <40%.	Surface rock >50% but <70%.	Surface rock >70%.
	Response	No response required. Continue monitoring program.	Rock rake the area and remove surplus rock to achieve <50% rock threshold.	Undertake a review of the reinstatement process, including topsoil and subsoil sourcing. Rock rake the area and remove surplus rock to achieve <50% rock threshold.
Soil drainage	Trigger	Soil drainage is better than poor.	Reinstated land exhibiting minor drainage issues but does not threaten to cause pasture failure.	Reinstated land exhibiting poor drainage, causing pasture failure.
	Response	No response required. Continue monitoring program.	A suitably trained person to inspect the site. Investigate opportunities to address issues. Rectify as appropriate.	Undertake a review of the drainage design and provide recommendations to appropriately rectify the area and do so as soon as practicable.

Key Element	Trigger Response	Condition Green	Condition Amber	Condition Red
Soil salinity	Trigger	Topsoil ECe is <4 dS/m	Topsoil ECe is > 4.5 dS/m	Topsoil ECe is > 5 dS/m
	Response	No response required. Continue monitoring program.	Engage a consultant to recommend appropriate measures to reduce soil EC (e.g. deep ripping to encourage salt leaching). Undertake consultant recommendations where possible and viable.	Undertake a review of the reinstatement process, including topsoil sourcing. Engage a consultant to recommend appropriate measures to reduce soil EC (e.g. deep ripping to encourage salt leaching). Undertake consultant recommendations where possible and viable.
Sodicity	Trigger	Exchangeable Na% (ESP) in topsoil < 15% (adjusted according to texture).	ESP in topsoil >15% but <17% (adjusted according to texture).	ESP in topsoil >17% (adjusted according to texture).
	Response	No response required. Continue monitoring program.	Undertake analytical soil testing and results evaluation. Where appropriate implement recommendations for amelioration to reduce sodicity (e.g. gypsum addition) so that ESP <15% (adjusted according to texture).	Undertake a review of the reinstatement process, including topsoil sourcing. Undertake analytical soil testing and results evaluation. Where appropriate implement recommendations for amelioration to reduce sodicity (e.g. gypsum addition) so that ESP <15% (adjusted according to texture).
Ground cover	Trigger	Five years following, a minimum of 70% total ground cover (vegetation, leaf litter, mulch) is present within rehabilitated areas.	Five years following revegetation, total ground cover (vegetation, leaf litter, mulch) of between 50-70% in rehabilitated areas.	Five years following revegetation, total ground cover (vegetation, leaf litter, mulch) is <50% within rehabilitated areas.
	Response	No response required. Continue monitoring program.	Review procedures where required to increase vegetation cover.	A suitably trained person to inspect the site. Investigate use of appropriate management options to remediate. Remediate as appropriate.

Key Element	Trigger Response	Condition Green	Condition Amber	Condition Red
Weed presence	Trigger	Twelve months following revegetation, no significant weed infestations present.	Twelve months following revegetation, >10% but <25% cover of undesirable species present.	Twelve months following revegetation, >25% cover of undesirable species present.
	Response	No response required. Continue monitoring program.	Engage weed management contractor to remove introduced species from the site.	Engage weed management contractor to remove introduced species from the site as soon as practicable. Investigate management measures to assist native plant establishment including use of ameliorants and implement as appropriate.
Species composition	Trigger	Five years following revegetation to grassland, species composition consists of grasses and legumes appropriate to the district and recognised as suitable for beef cattle grazing and consistent with target species.	Five years following revegetation to grassland, <75% of grasses and legumes in the area are consistent with target species.	Five years following revegetation to grassland, species composition comprises <50% consistency with target species.
	Response	No response required. Continue monitoring program.	Investigate additional weeding and re-seeding where required and ensure seed mix utilised is consistent with desired species composition.	An inspection of the site will be undertaken by a suitably trained person. Investigate remedial options to achieve required species composition.
Damage to Rehabilitation	Trigger	Fuel loads are assessed and managed as required (including maintaining fire-breaks) and there is firefighting access across rehabilitation areas and water resources available for fighting fires.	Monitoring indicates fuel loads have not been managed and fire breaks have not been maintained. In the event of a fire, this would result in firefighters not being able to access the site or water resources.	A fire on site damages rehabilitated areas.
	Response	No response required. Continue monitoring program.	Reduce fuel loads and ensure access tracks are cleared. Inspect water sources are and ensure sufficient water is available.	Review and update (if required) the Bushfire Management Plan to ensure monitoring and maintenance is completed for fuel loads, access tracks, and water bodies.

Table 5 TARP – LSC Class 7 (Woodland land use)

Key Element	Trigger Response	Condition Green	Condition Amber	Condition Red
Slope gradient	Trigger	Rehabilitated land has slopes that are generally <50%.	Rehabilitated land has slopes that have slopes >50% but <60%.	Rehabilitated land has slopes that are >60%.
	Response	No response required. Continue monitoring program.	Undertake regrading of the area so that rehabilitated land is <50%.	Undertake a review of the landform design, including survey if required. Undertake regrading of the area.
Soil depth	Trigger	Topsoil depth > 0.1m topsoil.	Topsoil depth < 0.1m but > 0.05m.	Topsoil depth < 0.05m.
	Response	No response required. Continue monitoring program.	Apply an additional 50mm of topsoil to attain the required depth thresholds.	Undertake a review of the reinstatement process, including topsoil and subsoil sourcing and placement. Apply additional soil to the area to attain the minimum depth thresholds.
Surface rock	Trigger	Surface rock <70%.	Surface rock >70% but <80%.	Surface rock >80%.
	Response	No response required. Continue monitoring program.	Rock rake the area and remove surplus rock to achieve <70% rock threshold.	Undertake a review of the reinstatement process, including topsoil and subsoil sourcing. Rock rake the area and remove surplus rock to achieve <70% rock threshold.
Soil drainage	Trigger	Soil drainage is better than poor.	Reinstated land exhibiting minor drainage issues but does not threaten to cause vegetation failure.	Reinstated land exhibiting poor drainage, causing vegetation failure.
	Response	No response required. Continue monitoring program.	A suitably trained person to inspect the site. Investigate opportunities to address issues. Rectify as appropriate.	Undertake a review of the drainage design and provide recommendations to appropriately rectify the area and do so as soon as practicable.

Key Element	Trigger Response	Condition Green	Condition Amber	Condition Red
Ground cover	Trigger	Five years following, a minimum of 70% total ground cover (vegetation, leaf litter, mulch) is present within rehabilitated areas.	Five years following revegetation, total ground cover (vegetation, leaf litter, mulch) of between 50-70% in rehabilitated areas.	Five years following revegetation, total ground cover (vegetation, leaf litter, mulch) is <50% within rehabilitated areas.
	Response	No response required. Continue monitoring program.	Review procedures where required to increase vegetation cover.	A suitably trained person to inspect the site. Investigate use of appropriate management options to remediate. Remediate as appropriate.
Weed presence	Trigger	Twelve months following revegetation, no significant weed infestations present.	Twelve months following revegetation, >10% but <25% cover of undesirable species present.	Twelve months following revegetation, >25% cover of undesirable species present.
	Response	No response required. Continue monitoring program.	Engage weed management contractor to remove introduced species from the site.	Engage weed management contractor to remove introduced species from the site as soon as practicable. Investigate management measures to assist native plant establishment including use of ameliorants and implement as appropriate.
Damage to Rehabilitation	Trigger	Fuel loads are assessed and managed as required (including maintaining fire-breaks) and there is firefighting access across rehabilitation areas and water resources available for fighting fires.	Monitoring indicates fuel loads have not been managed and fire breaks have not been maintained. In the event of a fire, this would result in firefighters not being able to access the site or water resources.	A fire on site damages rehabilitated areas.
	Response	No response required. Continue monitoring program.	Reduce fuel loads and ensure access tracks are cleared. Inspect water sources are and ensure sufficient water is available.	Review and update (if required) the Bushfire Management Plan to ensure monitoring and maintenance is completed for fuel loads, access tracks, and water bodies.