Hillview Hard Rock Quarry

Rehabilitation Strategy

ADW Johnson Pty Ltd

Warners Bay NSW 2282

Prepared by:

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Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
01	23 February 2024	Drew Williams	Stephen Shoesmith	Stephen Shoesmith
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Basis of Report

This report has been prepared by SLR Consulting Australia (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with ADW Johnson Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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1.0 Introduction

1.1 Project Background

Coastwide Materials Pty Limited (Coastwide Materials) is applying for a development consent for a new hard rock quarry within the rural locality of Booral in the Great Lakes Region of New South Wales (NSW) (See **Figure 1**). The proposed Hillview Hard Rock Quarry (the Development) proposes to extract up to 1.5 million tonnes per annum (Mtpa) of rhyolite over a planned life of 30 years, utilising site infrastructure, including a processing plant and transport material off site via public roads.

The Development is classified as a State Significant Development (SSD) under the provisions of Division 4.7 of Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) in accordance with the State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP). It will require development consent from the Minister (or delegate), along with secondary approvals. The NSW Department of Planning and Environment (DPE) has issued the Planning Secretary's Environmental Assessment Requirements (SEARs) for the preparation of the required EIS dated 03 June 2024.

1.2 Project Description

Based on the Central Coast of NSW, Coastwide Materials Pty Limited company directors have collectively been involved in the operation of construction material developments for approximately 40 years.

Details of the proposed project description are as follows:

- The site is approximately 400.3 hectares (ha) in total area
- Comprises of eight lots: Lot 60 DP 1094397, Lot 1 DP 159902, Lot 62 DP 95029, Lot 63 DP 95029, Lot 2 DP 1166923, Lot 3 DP 1166923, Lot 4 DP 1166923, and Lot 64 DP 95030.
- The total proposed quarry footprint is 48 ha (see **Figure 2**).
- Clearing of vegetation is required to gain access to the processing pad and extraction areas, site preparation works and installation of infrastructure and supporting services to facilitate operations at the site.
- Road upgrades to Maytoms Lane and the Bucketts Way will also be required to cater for vehicle movements. The Development will be undertaken over seven (7) key stages during which approximately 45 million tonnes of resource material is proposed to be extracted, increasing to a rate of up to 1.5 Mtpa over 30 years. As shown in **Figure 3**.

During the initial years of operation, it is not expected that extraction amounts will reach 1.5 million tonnes due to the site establishment works to be completed prior to main extraction activities commencing.

The establishment works will include:

- The new intersection of The Bucketts Way and Maytoms Lane.
- Construction of the main access to the processing pad.
- Creation of the processing pad.
- Installation of other infrastructure including site offices and facilities, weigh bridges, and processing machinery.

Some of these processes will result in the winning of saleable material, however some of this material will also be used in site establishment activities.

A summary of key project details is presented in **Table 1**.

Table 1: Key Project Details

Project Element	Summary of Project	
Address	67 Maytoms Lane, Booral NSW 2425	
Proponent	Coastwide Materials Pty Limited	
Local Government Area	MidCoast Council	
Proposed development	Hard Rock Quarry	
Mining method	Drilling, blasting and truck shovel mining over an extraction area of 45 ha	
Resource	Quarry extraction of Rhyolitic Tuff from Reduced Level (RL) 205 mAHD (highest point) down to final RL 95 mAHD	
Disturbance areas	**Total disturbance area:**	**48 ha**
	Stage 1 disturbance area:	9.5 ha
	Stage 2 disturbance area:	2.4 ha
	Stage 3 disturbance area:	10.6 ha
	Stage 4 disturbance area:	1.1 ha
	Stage 5 disturbance area:	5.4 ha
	Stage 6 disturbance area:	9.6 ha
	Stage 7 disturbance area:	9.4 ha
Annual production	Up to 1.5 million tonnes	
Project life	30 years	
Total resource recovered	45 million tonnes	
Management of mining waste	Over Burden (How to manage?)	
General infrastructure	Access roads, offices, maintenance area, upgraded road intersection, solar and generators, water supply and on-site sewer management system	
Product transport	Transport by truck with average of 358 movements (178 in, 178 out) throughout the 11-hour day	
Water management	During operation of the quarry, a series of water storage dams will be used to manage the site water balance including discharges. A Water Management Plan (WMP) will be developed to detail requirements and procedures for managing quantity, monitoring, erosion and sediment control and management of hydrocarbons.	
Operational workforce	25=30 full time employees anticipated to comprise quarry manager, supervisors, drivers, weighbridge operator and administration	
Hours of operation	Extraction and processing operations	Monday to Saturday: 6am to 10pm
	Internal product transfers to stockpiles	Monday to Saturday: 6am to 12am (midnight)

Project Element	Summary of Project	
	Haulage from and to the development site	Monday to Saturday: 7am to 6pm
	Blasting activities	Monday to Friday: 9am to 4pm
	Maintenance activities	24 hours a day, 7 days a week
Capital Investment Value	$6.5 million	

Figure 1: Regional Locality

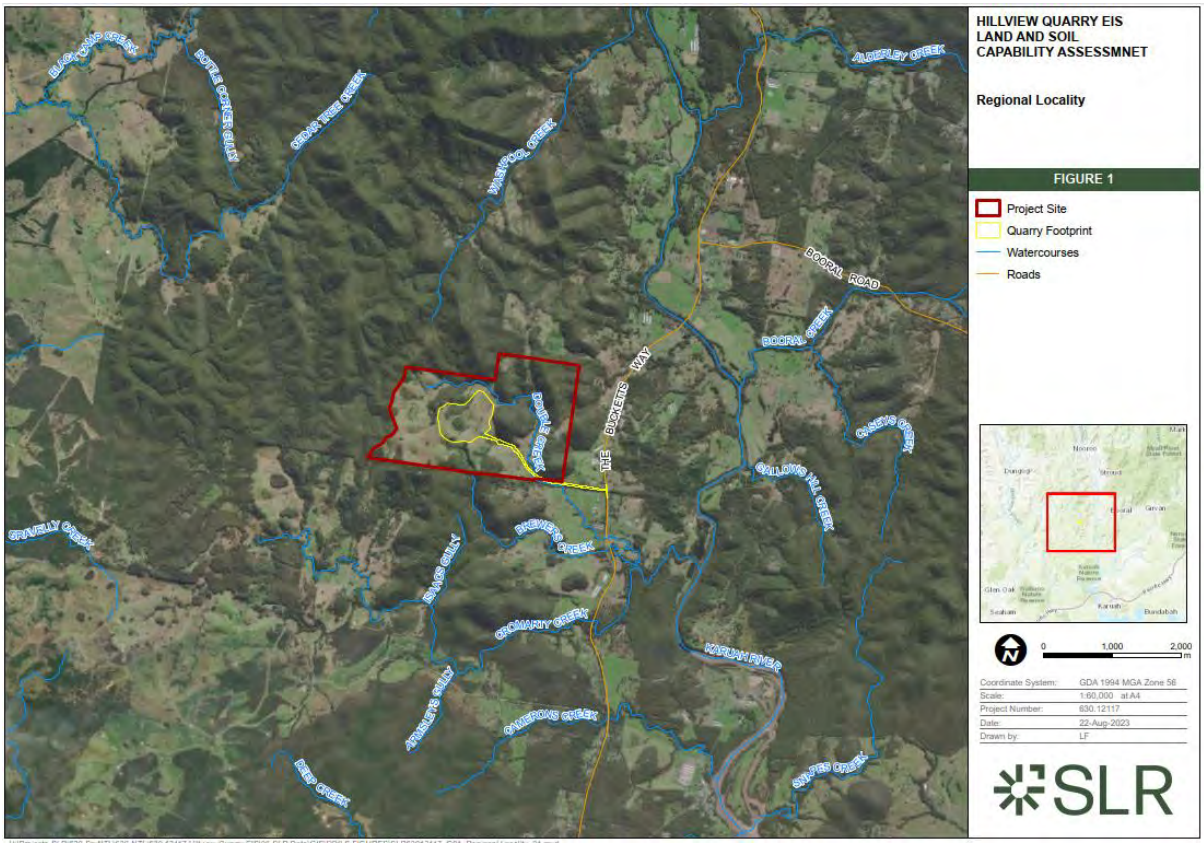


Figure 2: Project Layout

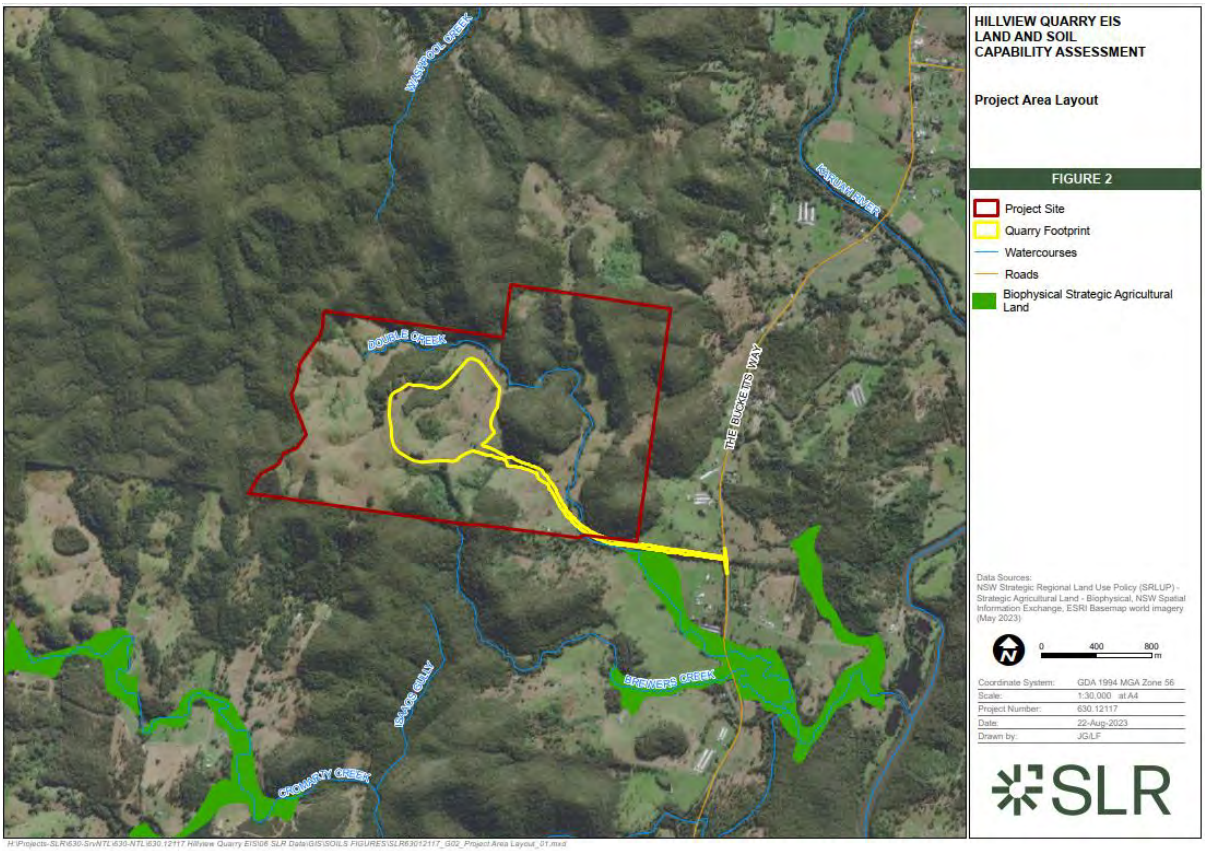
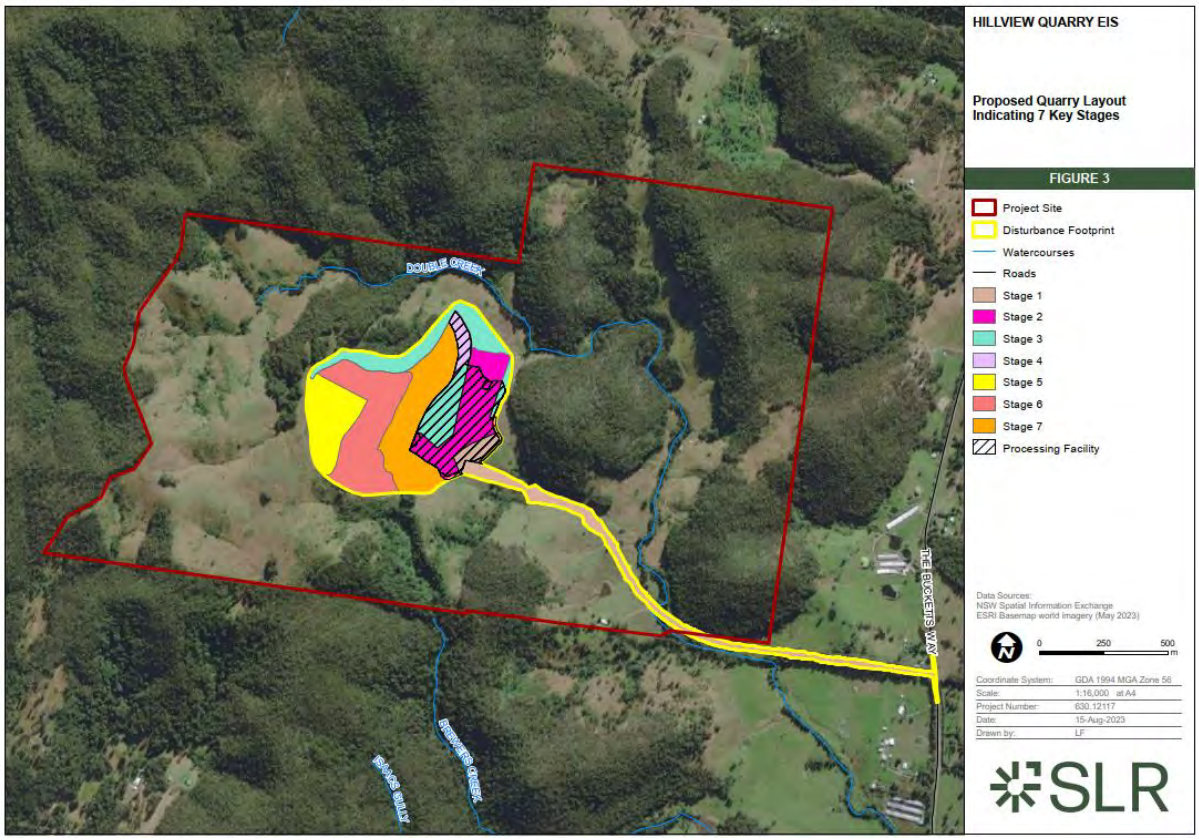


Figure 3: Project Staging



1.3 Secretary's Environmental Assessment Requirements

This Rehabilitation Strategy has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) issued by the former Department of Planning, Industry and Environment (DPIE).

The revised SEARs issued for the Project on 03 June 2024 and are provided in **Table 2**.

Table 2: Rehabilitation Strategy Requirements (SEARS April 2022)

SEARs Requirement	Section/s Addressed
Rehabilitation – including the proposed rehabilitation strategy for the site having regard to the key principles in the Strategic Framework for Mine Closure, including:	
• Rehabilitation objectives, methodology, monitoring programs, performance standards and proposed completion criteria;	Section 8 Section 9
• Nominated final land use, having regard to any relevant strategic land use planning or resource management plans or policies.	Section 6 Section 7
• The potential for integrating this strategy with any other rehabilitation and/or offset strategies in the region.	Section 3

1.4 Regulatory Framework

The key legislation and guidelines for rehabilitation and closure requirements relevant for the Project include:

- Legislation.
- Planning Instruments.
- Guidelines.

The following sub-sections further outlines the regulatory framework relevant in the preparation of this Strategy.

1.4.1 Legislation

Environment Planning and Assessment Act 1979

The *Environment Planning and Assessment Act 1979* (EP&A) Act along with the Environmental Planning and Assessment Regulation 2021 provide the framework for environmental impact assessment in New South Wales. The Project is classified as State Significant Development (SSD) under the provisions of Schedule 1, Section 7- Extractive Industries of State Environmental Planning Policy (Planning Systems) 2021

This Rehabilitation Strategy forms part of the Project EIS and presents a preliminary approach to rehabilitation and closure for consideration as part of the determining authority's merit assessment. Approval under the EP&A would trigger the inclusion of conditions of consent within a Development Consent related to rehabilitation.

Protection of the Environment Operations Act

The *Protection of the Environment Operations Act 1997* (POEO Act) establishes NSW's environmental regulatory framework. The POEO includes licensing requirements for certain activities as a means to minimise the localised, cumulative, and acute impacts of pollution in NSW. The objectives of the POEO Act that relate to decommissioning and rehabilitation include protecting, restoring, and enhancing the environment, to reduce risks to human health and prevent degradation of the environment.

1.4.2 Planning Instruments

Hunter Regional Plan 2041

The Hunter Regional Plan 2041 is a 20-year land use plan prepared under the EP&A, which sets the strategic land use framework for continued economic growth and diversification for Cessnock, Dungog, Lake Macquarie, Maitland, MidCoast, Muswellbrook, Newcastle, Port Stephens, Singleton, and Upper Hunter.

The big ideas presented in the Hunter Regional Plan 2041 include:

- Greater Diversification.
- New approaches to planning for land uses and infrastructure.
- Promotion of economic self-determination and more meaningful recognition and respect for Traditional Custodians of lands.
- Net zero emissions as a guiding principle.
- Embedding resilience in planning and design.
- 15-minute neighbourhoods.
- Preferences for infill developments.
- Renewed focus on green infrastructure public spaces and nature.
- Better access to and networks for walking, cycling and public transport.
- A greater focus on equity.

Creating an economic legacy, returning the site to an appropriate employment generating purpose has been a core consideration of this Rehabilitation Strategy.

Great Lakes Local Environmental Plan 2014

The project area is zoned RU2 Rural Landscape under the Great Lakes Local Environmental Plan 2014 (Great Lakes LEP). Extractive industries are permissible with development consent with land zones RU2.

The objectives of RU2 Rural Landscape under the Great Lakes LEP, include:

- To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.
- To maintain the rural landscape character of the land.
- To provide for a range of compatible land uses, including extensive agriculture.
- To provide for rural tourism in association with the primary industry capability of the land which is based on the rural attributes of the land.
- To secure a future for agriculture in the area by minimising the fragmentation of rural land and loss of potential agricultural productivity.

The RU2 Rural Landscape objectives are applicable to the project and allow consideration of other land uses within the project area.

1.4.3 Guidelines

The relevant guidelines to this Strategy are as follows:

- *Mine Rehabilitation – Leading Practice Sustainable Development Program for the Mining Industry* (Commonwealth).
- *Mine Closure and Completion – Leading Practice Sustainable Development Program for the Mining Industry (Commonwealth).*
- *Strategic Framework for Mine Closure (Australian and New Zealand Minerals and Energy Council)*.

The *Strategic Framework for Mine Closure* was developed collaboratively between the Australian and New Zealand Minerals and Energy Council (ANZMEC) and the Australian Minerals Industry (represented by the Minerals Council of Australia (MCA)). It is designed to provide consistency across jurisdictions and cover a broad range of mining and mining related activities. The objective of the framework is to encourage the development of comprehensive closure plans that return all mine and quarry sites to viable, and wherever practicable, self-sustaining ecosystems. The framework also encourages that plans are adequately financed, implemented, and monitored.

These guidelines were considered in developing this Rehabilitation Strategy.

2.0 Existing Environment

2.1 Soils and Land Capability

SLR Consulting has completed a Land and Soil Capability (LSC) Assessment according to *The Land and Soil Capability Assessment Scheme; Second Approximation* (OEH, 2012) encompassing the proposed Hillview Quarry, comprising 48 hectares. The LSC Assessment found 4.8 hectares of LSC Class 4 (moderate capability land) and 7.6 hectares of LSC Class 5 (moderately low capability land) and 32.3 hectares of LSC Class 6 (low capability land) within the Project Area (Figure 4).

Three Soil Landscape Unit's (SLU's) occur within the Project Area (see **Figure 4**) and are summarised in **Table 3**. Below is a summary of the key agricultural features of each SLU.

- Ten Mile Road SLU is associated with Kurosols and Tenosols and the suitability for grazing and cultivation was not assessed.
- The Gillmore Hill SLU is associated with Tenosols, Kurosols and Kandosols and has high limitations for grazing and extreme limitations for cultivation.
- The Branch SLU is associated with Kurosols and has moderate limitations for grazing and high limitations for cultivation.

Table 3: Soil Properties that Differentiate Soil Mapping Units

Soil Landscape Unit	Project Area		Agricultural Limitation Rating	
	Hectares	%	Grazing	Cultivation
Ten Mile Road	30.2	67%	Not assessed	Not assessed
Gilmore Hill	13.3	30%	High	Extreme
The Branch	1.4	3%	Moderate	High
Total	**44.8***	**1.0**		
*Excludes works on Maytoms Lane and the Bucketts Way				

A preliminary Biophysical Strategic Agricultural Land (BSAL) assessment to map high value agricultural land found the entire Project Area is non-BSAL and was verified as non-BSAL due to slope more than 10% and the remaining BSAL soils do not have a contiguous area of greater or equal to 20 hectares.

The Project Area is suited to grazing and improved pastures. It is not considered highly productive agricultural land as defined in *The Land and Soil Capability Assessment Scheme; Second Approximation* (OEH 2012).

Soils within the Project Area pose minimal risk for erosion during construction, operation, and decommissioning. It is recommended that 10 tonnes/hectare gypsum be applied after topsoil stripping to be mixed into the subsoil during subsoil stripping. This will ensure thorough mixing of gypsum and subsoil prior to stockpiling.

2.2 Surface Water

The Project site is located within the Karuah catchment. Bordered by the Manning River catchment in the north, and the Hunter River catchment in the south and west, the Karuah catchment area is 4,480 km2 (DPE – Water, 2021). Three major river systems drain the Karuah River basin. The Karuah and Myall rivers drain south to Port Stephens, while in the north, the Wallamba, Wallingat, Wang Wauk and Coolongolook Rivers drain east in the northern part of Walls Lake. Of these river systems, the closest to the site is the Karuah River situated about 1.3 km east of the Development.

The Karuah River flows for approximately 90 km from the foothills of the Barrington Tops Mountain range to the Port Stephens estuary. The Karuah River flows into Port Stephens downstream of the town of Karuah. The Karuah River is a broad tidal estuary along its lower reaches, and oysters are grown along the banks in some areas. The tidal sections of the Karuah River are well downstream of the Project, and flood behaviour at the Project Site are not influenced by backwater from tides.

Double Creek traverses the properties containing the Project. It flows in a generally easterly direction to the north of the Project extraction area, before turning in a south to south-easterly direction through the south-eastern corner of the Project Site.

2.3 Vegetation

A total of 282 plant species were identified within the Project Site: 213 native species and 69 exotic species. No threatened plant species listed under the *NSW Biodiversity Conservation Act 2016,* or the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 were detected.

Native vegetation comprises four plant community types (PCT's) as follows:

- PCT 3241 Lower North White Mahogany-Spotted Gum Moist Forest.
- PCT 3254 Northern Hinterland Tallowwood-Forest Oak Grassy Forest.
- PCT 3436 Hunter Coast Sandy Creekflat Low Paperbark Scrub.
- PCT 3074 Hunter Coast Lowland Grey Myrtle Wet Forest.

Of the native vegetation recorded and mapped within the Project Site, two of the plant communities meet the definition of threatened ecological communities listed under the *Biodiversity Conservation Act 2016*:

- River Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions ('River-flat Forest EEC'), which is listed under Schedule 2, Part 2 of the BC Act and occurs on the subject land as PCT 3436 and PCT 3074. A total of 1.81 ha of River-flat Forest EEC has been mapped within the subject land and will require removal to allow development of the Proposal.
- Lower Hunter Valley Dry Rainforest in the Sydney Basin and NSW North Coast Bioregions ('Lower Hunter Dry Rainforest VEC'), which is listed under Schedule 2, Part 3 of the BC Act and occurs on the subject land as PCT 3436.

Vegetation PCT's are shown in **Figure 5.**

2.4 Land Use

Existing land uses within and adjacent to the Project, as defined by the NSW Land Use and Management database include the following:

- Grazing modified pastures - sheep and goat grazing with pasture modification and widely spaced rural residences / homesteads.
- Grazing native vegetation – mainly sheep and goat grazing with no pasture modification and widely spaced rural residences / homesteads.

- Other minimal use – areas of land that are largely unused, likely due to topographic constraints such as; steep slopes or dense vegetation.
- Residential and farm infrastructure - Rural residential with agricultural commodities.
- Intensive animal production – Poultry farms.

2.5 Regional Offset Strategies

Existing land uses, as defined by the NSW Land Use and Management database within and adjacent to the proposed Hillview Quarry area include the following:

- Grazing.
- Intensive animal production (poultry).
- Manufacturing and industrial.
- Nature conservation (Karuah Nature Reserve).
- Reservoir / dam.
- Mining.
- Other minimal use.

The Hunter Regional Plan 2041 provides linkages between projects and biodiversity offset strategies within the Hunter Region. The Hunter Regional Plan is discussed in **Section 1.4.2** and **Section 3.1**.

2.5.1 Localised Biodiversity Offsets

There is one significant biodiversity offset for a similar project as to the proposed Hillview Quarry within 15km of the site, discussed further below.

Karuah East Quarry Biodiversity Offset

The Karuah East Quarry has large biodiversity offset areas 15 km southeast of the proposed Hillview Quarry site spanning part Lot 13 and Lot 14 DP 1024564, and Lot 5 DP 838128 in Karuah East. The total area of the offset areas is 138.22 ha of which of which 131.44 ha is identified native vegetation, as stipulated in the Karuah East Biodiversity Offset Plan authored by Kleinfelder in June of 2021.

Threatened flora species within the biodiversity offset area include:

- *Asperula asthenes.*
- *Grevillea parviflora subsp. Parviflora.*
- *Tetratheca juncea.*

Vegetation types within the biodiversity offset area include:

- Blackbutt - Turpentine – Tallowwood shrubby open forest.
- Brush Box - Turpentine shrubby open forest.
- Smooth-barked Apple - Red Bloodwood open forest.
- Spotted Gum - Grey Ironbark open forest.
- Sydney Peppermint - Smooth-barked.
- Apple shrubby open forest.

Management arrangements and strategies included in the strategy include:

- Cultural Heritage
- Fencing, Gates, and Signage
- Access Tracks
- Erosion, Sediment and Soil Management
- Existing Dwellings
- Seed Collection and Propagation
- Revegetation and Regeneration
- Habitat Augmentation
- Weed Management
- Vertebrate Pest Management
- Fire Management
- Ecological Monitoring

Based on proximity, there is limited potential to physically integrate this Rehabilitation Strategy with the Karuah East Biodiversity Offset Plan.

Figure 4: Soils and Land Capacity

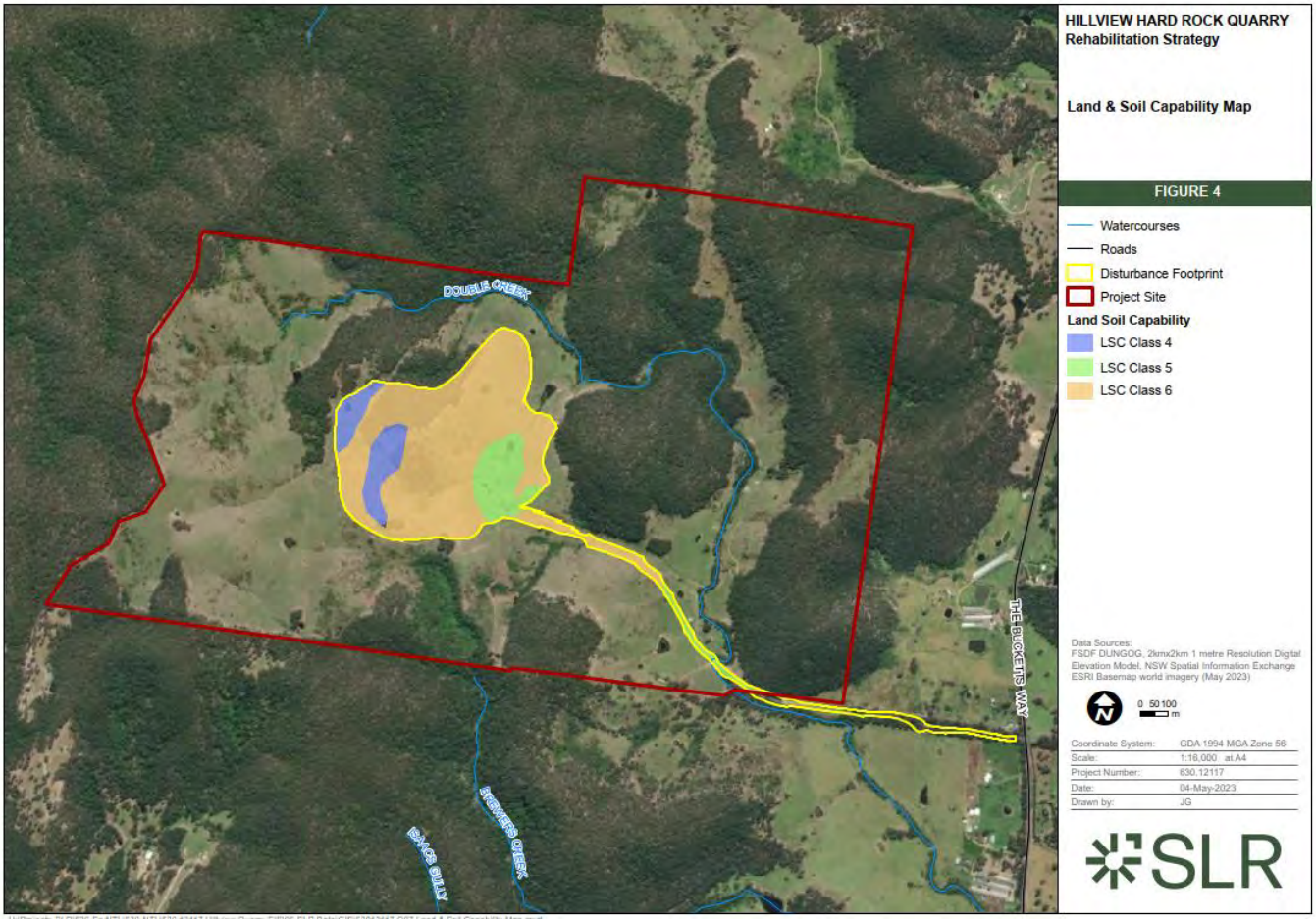
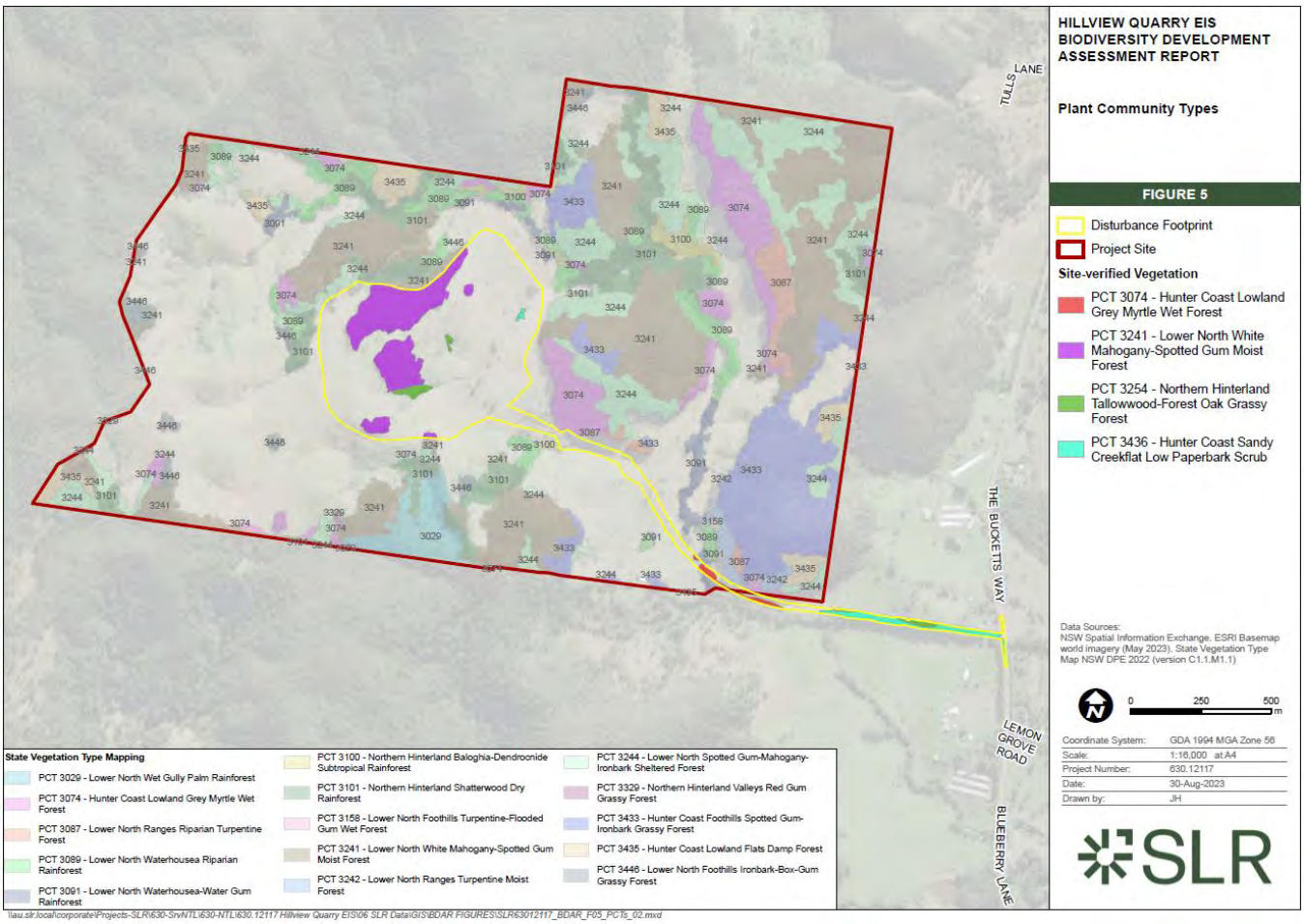


Figure 5 Plant Community Types



3.0 Strategic Context

Coastwide Materials seeks to establish and operate the Project, as a hard rock quarry that will supply Rhyolite products to the local and regional construction industry. Rhyolite has various uses and is sought after for aggregate, building materials and road base.

Establishment, operation, and closure of the Project aligns with the strategic objectives described with Hunter Regional Plan 2041 and the Mid Coast Local Strategic Statement.

3.1 Hunter Regional Plan 2041

The Hunter Regional Plan 2041 was released in December 2022 and presents the outcome of the five (5) year review of the Hunter Regional Plan 2036. The revision of the plan provides adaptation and a chance to reset priorities for the region to foster continual progress and prosperity for the Hunter over the next 20-year period. The Hunter has established itself as one of Australia's most diverse and liveable regions and this Plan sets the strategic land use framework for continued economic transformation.

As outlined in the plan, the regional vision for the Hunter is as follows: "*The leading regional economy in Australia, connected to and caring for Country, with a vibrant metropolitan city and sustainable 15-minute neighbourhoods at its heart*."

The Project aligns with the 2041 Vision for the Hunter through:

- Identifying economic and employment diversification opportunities for post mining land use options.

- Implementing adaptive rehabilitation methodologies over the life of the project.
- Facilitating the availability of hard rock products to be made available for important infrastructure and building projects.
- Provide ongoing and long-term employment opportunities.

3.1.1 Biodiversity Offsets

The Hunter Regional Plan 2041 outlines regional interest in biodiversity conservation planning and the use of offsets to help regenerate and conserve biodiversity values throughout the region. The plan outlines the need for biodiversity networks which include patches of remnant vegetation such as national parks, state forests, offsets, and conservations areas to help create and maintain biodiversity and habitat corridors within the region to enable flora and fauna to continue a natural spread.

3.2 Mid Coast Local Strategic Planning Statement

The Mid Coast Local Strategic Planning Statement (LSPS) sets out a strategic vision for land use planning across the Mid Coast region. The LSPS is used to guide future planning, to achieve and align with the community's vision and values.

The LSPS vision is as follows:

> "*We strive to be recognised as a place of unique environmental and cultural significance. Our strong community connection, coupled with our innovative development and growing economy, builds the quality of life we value."*

The proposed project will contribute to the already thriving and continually growing economy through ongoing employment and contributions to the regions industry and infrastructure projects. The proposed project is consistent with the relevant sections of the Mid Coast LSPS.

3.3 Cumulative Impacts

Potential rehabilitation interactions between the Project and other existing and proposed major developments have been considered, including other nearby mining projects, renewable energy projects and electricity transmission lines.

The Project Area is suited to grazing and improved pastures. It is not considered highly productive agricultural land as defined in The Land and Soil Capability Assessment Scheme; Second Approximation (OEH 2012). A total of 282 plant species were identified within the Project Site: 213 native species and 69 exotic species. No threatened plant species listed under the NSW Biodiversity Conservation Act 2016, or the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 were detected.

The two key rehabilitation domains proposed for the site are Native Ecosystems and Water Storage.

Two projects were identified using the New South Wales (NSW) Planning Portal Tracker, are listed below;

- Bobs Farm Sand Mine Project, SSD-6395 (~8km northeast) - Proposal to establish and operate a sand quarry to extract up to 750,000 tonnes per annum for a period of up to 15 years. Construct sand processing and transport infrastructure, and rehabilitate the site to include forest and an artificial lake.
- Deep Creek Quarry, SSD-11591659 (~6km south) - Proposal for a new hard rock quarry in the Limeburners Creek area to extract up to 500,000 tonnes per annum of

hard rock aggregate products. Construction of new intersection and access road, workshop, stockpiles, weigh bridge, power line and office.

The project area is well suited to re-establishment of Native Ecosystems and grazing activities post quarrying activities and rehabilitation. No cumulative rehabilitation impacts are predicted to the Hillview Quarry site from these developments.

4.0 Rehabilitation Risks

Identifying and managing risks (environmental, social, economic, and technical) associated with rehabilitation and closure is an integral part of mine planning and management. Early identification of risks can minimise closure liabilities through project designs and management measures.

Preliminary strategic rehabilitation and closure risks associated with the project are presented in **Table 4**.

Table 4: Rehabilitation Risks

Aspect	Risk	Proposed Controls
Quarry progression and rehabilitation planning	Uncertainty around the agreed (or approved) post mining landform and/or land use.	• Consent will outline obligations for post mining land use. • Mine Closure Completion Criteria. • Mine Planning and controls in field.
Groundwater	Groundwater dewatering and direct drawdown to receptors as a result of below ground excavation from the Project quarry and haul road cut in the Myall Block Volcanics.	• An Environmental Management Plan (EMP) will be developed. • Erosion and Water Management Plans. • Groundwater Management Plan (GWMP). • Installation of monitoring bores. • Biodiversity Management Plan (BMP).
	Reduction in groundwater to, or through, a receptor as a result of below ground excavation and active dewatering in the upgradient Myall Block Volcanics.	
	Contamination of groundwater from accidental spills, poor water management, or other operational activities.	
Decommissioning	Unidentified contamination resulting in unplanned costs or off-site impacts.	• Site contamination register. • Bioremediation area established at closure for treatment of soil. • Site standard in place for minimising, reporting and remediating hydrocarbon spills.
	Less than Adequate (LTA) planning for the waste streams that will result from the decommissioning and demolition activities (increased costs, impact on environment)	• On site disposal options are forecasted and included in Rehabilitation Cost Estimate (RCE).
Management of rehabilitation materials	LTA understanding of the PAF/NAF materials balance to achieve suitable rehabilitation outcomes	• Rejects are co-disposed and keep away from surface of the dump. • Mineral waste and acid rock drainage management plan.
	LTA understanding of the growth media chemical properties results in failure to achieve preferred rehabilitation outcomes	• Soil testing prior to adding ameliorants.

Aspect	Risk	Proposed Controls
		• Mine Planning uses soil surveys ahead of extraction (stripping depth and plan).
Final Landform	The approved final landform is not able to be achieved and relinquished	• Mine planning is managing the landform to meet consent and EIS expectations. • Detailed drainage design is completed, consistent with the approved final landform.
	Landform and highwall stability	• Mine planning is managing the landform to meet consent and EIS expectations. • Final highwall design includes a geotechnical stability assessment.
Rehabilitation Performance	Rehabilitation not tracking in line with expected or planned performance	• Rehabilitation Management Plan includes quality assurance process. • Rehabilitation monitoring. • Rehabilitation Trigger Action Response Plans are implemented. • Runoff water monitoring.
Failure to meet completion criteria	Inability to demonstrate that the completion criteria have been met	• Quality assurance processes are implemented. • Documented rehabilitation monitoring. • Rehabilitation Trigger Action Response Plans are implemented. • Documented rehabilitation runoff water monitoring. • Mine Closure Record retention process / filing system. • Rehabilitation Cost Estimate (RCE).

Prior to the commencement of operations, or as required by the conditions of consent, Coastwide Materials will undertake a rehabilitation and closure risk assessment to inform the development of a Rehabilitation Management Plan (RMP).

The risk assessment will be undertaken generally in accordance with AS/NZS ISO 31000:2018 Risk Management – Guidelines and the Risk Management Handbook for the Mining Industry (MDG1010).

The objectives of the risk assessment will be to:

- Identify and evaluate the risks associated with rehabilitation and closure of Hillview Quarry.
- Identify any knowledge gaps or studies required during the life of operation.
- Identify the controls and action plans necessary to effectively mitigate risks.
- Inform the development of a Rehabilitation Management Plan.

5.0 Rehabilitation Goals and Objectives

5.1 Rehabilitation Goal

The primary rehabilitation goal is to create a safe, stable and non-polluting post extraction landform that facilitates the achievement of the identified post mining land uses and is commensurate with site constraints.

5.2 Rehabilitation Objectives

General rehabilitation objectives are outlined in **Table 5**. It is noted that any details surrounding rehabilitation objectives that are to be outlined in the future approved consent/s will supersede these general rehabilitation objectives. These general rehabilitation objectives will be revised and aligned with the approval and be made consistent within the RMP.

Table 5: General Rehabilitation Objectives

Aspect	Objectives
Site	Safe, Stable, and non-polluting. Restore ecosystem function, including maintaining or establishing self-sustaining eco-systems.
Surface Infrastructure	Decommissioned and removed, unless otherwise agreed by the relevant agencies and subject to the relevant approvals.
Quarry Walls and Benches	Landscaped and revegetated utilising native species. Restore ecosystem function, including maintaining or establishing self-sustaining eco-systems as far as practicable and within the limitations of rehabilitating Rhyolite landforms.
Quarry Floor	Landscaped and revegetated utilising native tree and understorey species as well as riparian species and habitat features, resulting in a stable, free draining landform. Restore ecosystem function, including maintaining or establishing self-sustaining eco-systems as far as practicable and within the limitations of rehabilitating Rhyolite landforms.
Community	Ensure public safety. Minimise the adverse socio-economic effects associated with quarry closure.

Other general landscape and rehabilitation objectives include:

- To minimise the environmental impact of the operation during the development and operational phases, ensuring that protection of water quality and erosion control works are key priorities, and to ensure progressive rehabilitation is completed as soon as possible.
- Ensuring operations do not have a negative impact on remnant vegetation. This includes only disturbing within the approved footprint and managing weeds and feral animals in the adjacent remnant areas.
- Ensure that site drainage and sedimentation structures remain stable and functional.
- Ensure that vegetative matter and topsoil is made available for the site rehabilitation.
- Ensure that the site rehabilitated in a manner that will maintain the quality of surface runoff at all times.
- Produce a final landform that is geotechnically stable, that blends aesthetically into the surrounding landforms, and does not limit probable future land uses.

6.0 Rehabilitation Domains

The proposed final landform for the Project, incorporating infrastructure and water management areas, as well as the final void and highwall/benches is discussed in **Section 7** and shown in in **Figure 7**.

Preliminary final land use domains have been defined as land management units characterised by similar post mining land use objectives. The nominated mining and final land use domains for the Project are included in **Table 6**.

This Rehabilitation Strategy assumes that the quarry floor/void will be rehabilitated to include areas of native ecosystem as well as reconstructed water management areas, directing water to the retained water storage dams.

Table 6: Mining and Final Land Use Domains

Mining Domains	Final Land Use Domains
Infrastructure Areas - Includes administration facilities, workshops, access roads, material stockpile area.	**Native Ecosystem -** Areas to be rehabilitated with native species reflective of the composition of site specific PCTs to support the agreed final land use of native ecosystem that can facilitate a range of post mining land uses which may include grazing, woodland vegetation, habitat features for fauna and flora corridors. Some infrastructure to be retained as part of the final land use.
Water Management Areas - Includes any operational sediment dams, temporary creek diversions and other significant constructed drainage features.	**Water Storage -** Includes dams retained for the final land use but excludes any anticipated permanent water body in the final void.
Highwall/Benches – Includes highwall and bench areas.	**Native Ecosystem -** Areas to be rehabilitated with native species reflective of the composition of site specific PCTs as far as practicable and within the limitations of rehabilitating Rhyolite landforms.
Active Mining Area (Final Void) – Includes a shallow quarry floor void area.	**Native Ecosystem -** Areas to be rehabilitated with native species reflective of the composition of site specific PCTs to support the agreed final land use of native ecosystem that can facilitate a range of post mining land uses which may include grazing, woodland vegetation, habitat features for fauna and flora corridors. **Water Management Areas** - includes creek realignments, constructed wetlands, significant final landform drainage features.

7.0 Proposed Final Landform

Elements of the proposed final landform for the Project are proposed to achieve a safe, stable and non-polluting landform. The final landform, include the final void and highwall is shown in **Figure 7**.

7.1 Infrastructure Areas

Following the completion of extraction activities, project infrastructure (predominantly located on the processing pad) will be decommissioned and reshaped, according to the proposed final landform. The reshaped landform will be free draining, rehabilitated and returned to a land use consistent with the adopted post mining land use.

The access road may be retained for use as part of the adopted final land use and/or bushfire access, subject to ongoing closure planning.

7.2 Water Management Areas

Several dams are expected to be retained as part of the final landform to facilitate effective management of water across the site. To achieve the rehabilitation objectives, the rehabilitation of disturbed land within the Project area will be conducted so that:

- Sediment dams that are to remain at closure will be reviewed and if necessary reshaped prior to quarry decommissioning. This will provide safe access for native fauna and to satisfy public safety requirements.
- Sediment will be removed from dams during operations and at closure to increase the storage capacity of dams.
- Retained dams will be rehabilitated in a manner consistent with the adopted final land use.

7.3 Highwall / Benches

The benches will be rehabilitated progressively according to the quarry staging plans. Each bench will be rehabilitated as the quarry deepens to ensure safety of workforce when working on slopes and benches.

The proposed final bench and batter designs are currently free draining benches of 5 metres width and 15-metre-high batters with a slope of 0.5H: 1V (63 Degrees).

The following will be considered when assessing the geotechnical stability of highwalls and preparing detailed final landform designs:

- Long term quarry floor/final void water levels.
- Height and slope of walls, and quantity, spacing and width of intermediate benches.
- Shear strength of the highwall materials.
- Density and orientation of fractures, faults, bedding planes, and any other discontinuities, and the strength along them.
- The effects of the external factors, such as surface runoff and seismic events.

Stability of benches is further discussed in **Section 7.4.2.**

Prior to closure, investigations will be undertaken to confirm the criteria above as outlined in **Section 4.0**.

7.4 Active Mining Area (Pit Floor) – Final Void

A section of the quarry floor is to remain at closure in the form of a self-draining, undulating, shallow final void with strong resemblance to a natural creek line and wetland landscape with the goal to provide habitat for native flora and fauna. This approach is consistent with the proposed final land use of the quarry floor at nearby quarries such as the Karuah Quarry and the Karuah Easy Quarry.

Key design aspects and management of the final void are described further in the following sections.

7.4.1 Water Quality

Water will only be permitted to accumulate in the quarry floor and final void if it maintains a quality that does not compromise its intended final use or surrounding groundwater systems. The aim is to provide a biologically viable water resource for the surrounding environment. The following aspects will be considered with respect to managing quarry floor/void water quality and incorporated into detailed final landform designs:

- Control of surface flow into the quarry floor/void.
- Concentration of elements resulting from the quarrying of material.
- Rainfall and evaporation.

7.4.2 Slope Stability

To ensure the safety of the quarry floor/void, the surrounding final slopes will be left in a condition where the risk of slope failure is minimised as far as practicable. This may require the benches to be battered back from the vertical to enable a stable overall slope angle.

The following will be considered when assessing the geotechnical stability of highwalls and preparing detailed final landform designs:

- Long term quarry floor/void water levels.
- Height and slope of walls, and quantity, spacing and width of intermediate benches.
- Shear strength of the highwall soils and rocks.
- Density and orientation of fractures, faults, bedding planes, and any other discontinuities, and the strength along them.
- The effects of the external factors, such as surface runoff and seismic events.

Prior to closure, investigations will be undertaken to confirm the criteria above as outlined in **Section 4.0**.

7.4.3 Drainage Reinstatement

Combined with the adopted final land use, drainage lines will be reinstated across the quarry floor/void. The following will be considered when assessing the hydrological, ecological and geomorphic performance and preparing detailed final landform designs:

- Restoring hydrological, ecological and geomorphic function.
- Incorporate erosion control measures based on vegetation and engineered structures.
- Revegetate with suitable native species.

7.4.4 Safety

In line with all rehabilitation features, the quarry floor/void will achieve an acceptable level of safety in terms of access by humans, livestock, and wildlife. The following will be considered at the time of closure to ensure that the void is left in a safe manner:

- Appropriate signage and contact details.
- A barrier at a safe distance from the perimeter of the quarry floor/void to prevent access.
- Designing for access by humans, livestock, and wildlife.

Surface runoff from land surrounding the quarry floor/void will be diverted from entering the void so as to maximise stability of quarry walls.

Figure 6: Surface Water Topography and Drainage

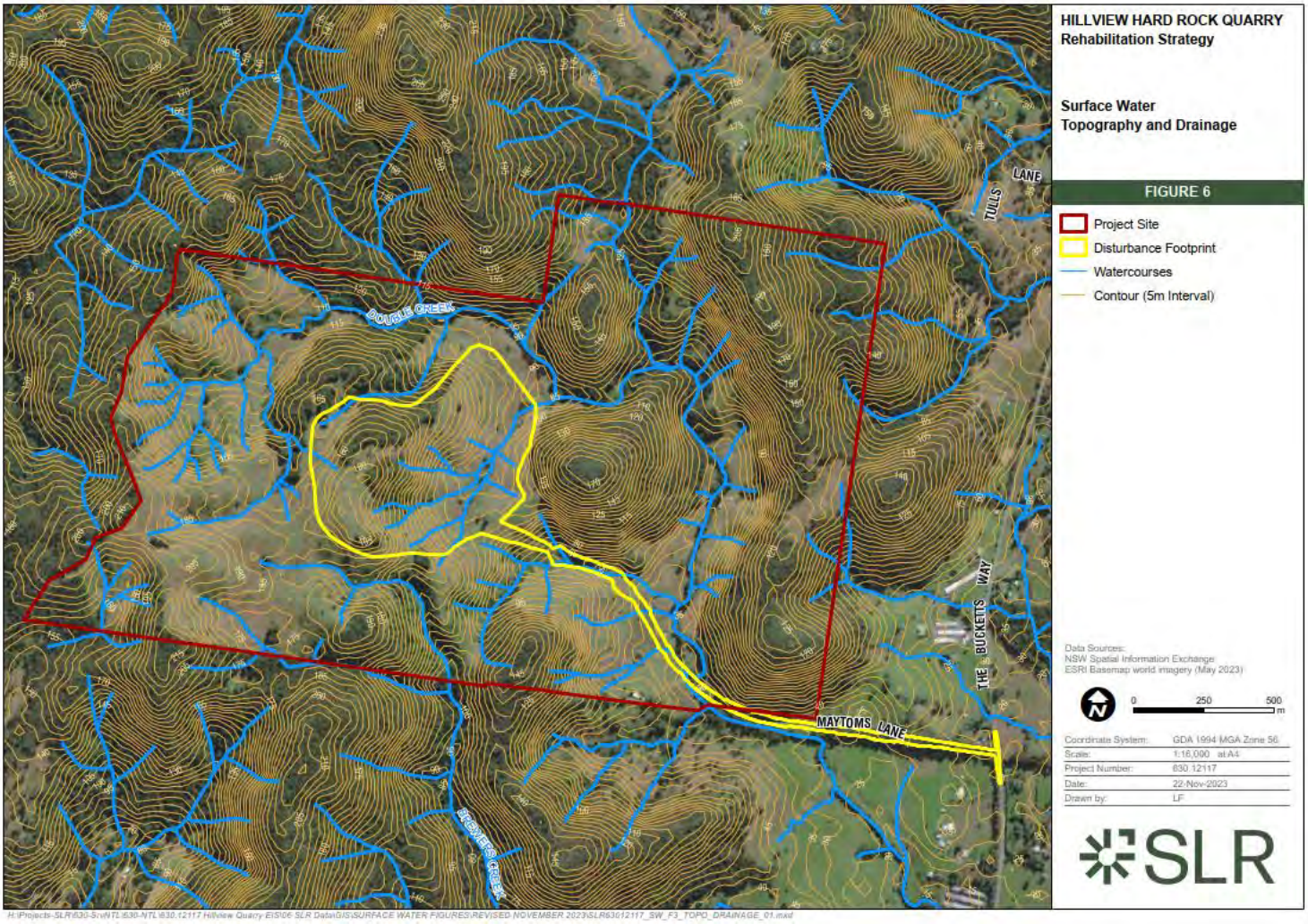
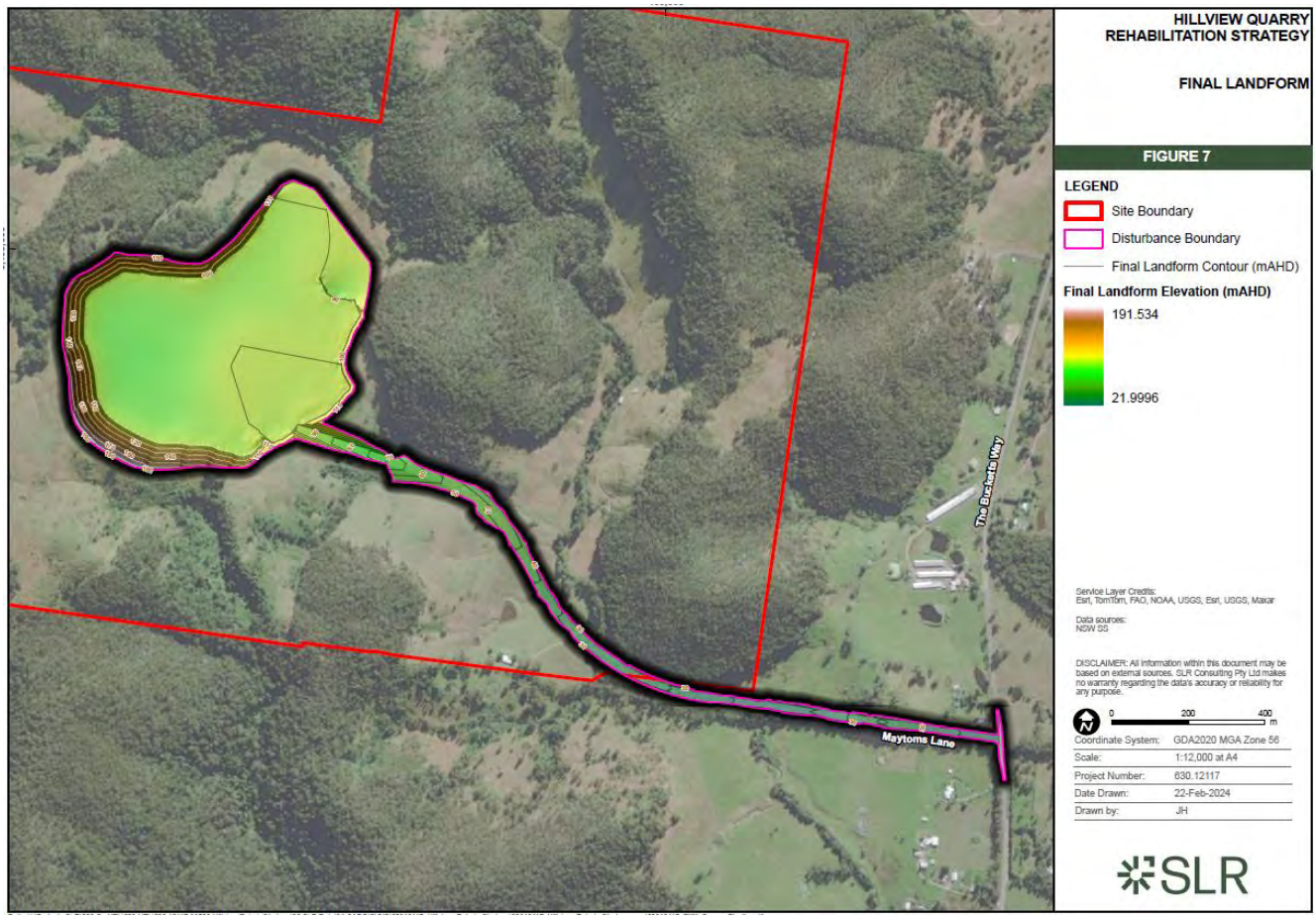


Figure 7: Final Landform



8.0 Rehabilitation Management Strategy

The Rehabilitation Strategy specifically address the following rehabilitation relating to Project:

- Identification of the rehabilitation objectives and completion criteria.
- Proposed rehabilitation methodologies for the disturbed areas.
- The management of soil resources for use in rehabilitation of the site.
- Description of the planned rehabilitation activities.
- Final landform and landform stability measures.
- Rehabilitation monitoring and maintenance activities.

8.1 General Rehabilitation Strategy Principles

The following general principles apply to the rehabilitation of disturbed land within the Project area:

- All infrastructure is removed, with the exception of infrastructure required by the landholder to be retained.
- A soil profile is established capable of sustaining the nominated post-mine land uses.
- Suitable species of vegetation are established to achieve the nominated post-mine land uses.
- The potential for water and wind induced erosion is minimised, including the likelihood of environmental impacts being caused by the release of dust.
- The quality of surface water released from the site (if any) is such that releases of contaminants are not likely to cause environmental harm.
- The final landform is stable and not subject to slumping or erosion which will result in the agreed post mining landform not being achieved and does not present a risk of environmental harm or a safety risk the public and / or domestic stock / native fauna.

8.2 Rehabilitation Planning

Rehabilitation planning will be undertaken to ensure the total area of disturbance is minimised as far as practicable at any one time. This will reduce the potential for dust generation, erosion and sediment runoff or visual disruption caused by the site. Rehabilitation of the site will be undertaken to achieve a stable non-polluting landform that is compatible with the surrounding landscape both visually and functionally.

The resultant landscape will be constructed in accordance with the detailed final landform designs, proposed final landform and the recommendations of relevant assessments and studies.

8.3 Rehabilitation Management Plan

A Rehabilitation Management Plan will be developed prior to the commencement of operations, consistent with relevant guidelines and in compliance with the required rehabilitation outcomes outlined within conditions of the development consent.

The objective of the Rehabilitation Management Plan will be to develop a management framework and rehabilitation controls which ensure that rehabilitation will:

- comply with specific objectives, performance targets and timeframes.

- be carried out progressively, as soon as reasonably practicable following disturbance.
- achieve the approved final landform and land use.

8.4 Rehabilitation Phases

Rehabilitation of Hillview Quarry will require a series of sequential activities to address the existing infrastructure and prepare and implement the new landscape and environment. The development of a self-sustaining, stable, and non-polluting landform is intrinsic to the success of the rehabilitation process. Achievement of the agreed post mining land use will be reached through a series of conceptual rehabilitation phases. The rehabilitation phases are presented in **Table 7**.

Opportunities to implement progressive rehabilitation will be identified as part of annual rehabilitation planning processes.

Table 7: Rehabilitation Phases

Rehabilitation Phase	Description
Phase 1: Active Extraction	This phase is associated with active extractive operations across the domains.
Phase 2: Decommissioning	This phase of rehabilitation includes the removal of mining infrastructure, and the removal, remediation, or management of remnant materials on site.
Phase 3: Landform Establishment	This phase of rehabilitation consists of the processes and activities required to construct the approved final landform.
Phase 4: Growth Medium Development	This phase of rehabilitation consists of activities required to establish the physical, chemical, and biological components of the substrate required to establish the desired vegetation community.
Phase 5: Ecosystem and Land Use Establishment	This phase of rehabilitation consists of the processes to establish the final land use following construction of the final landform.
Phase 6: Ecosystem and Land Use Development	This phase of rehabilitation consists of applying appropriate management techniques to develop a maturing ecosystem to achieve rehabilitation objectives
Phase 7: Rehabilitation Completion (sign-off)	The final phase of rehabilitation when a rehabilitation area has been achieved. The final land use for the quarry is consistent with that stated in the approved rehabilitation objectives and completion criteria; and landform is as spatially depicted in the approved final landform and rehabilitation plan.

8.5 Preliminary Final Land Use

Preliminary final land uses (PFLUs) have been proposed in consideration of current and emerging innovative industry practices as well as alignment with the Hunter Regional Plan 2041.

Table 8 presents a range of PFLUs that have the potential to leave an economic legacy for local communities and provide strategic economic benefit to Coastwide Materials during closure.

Table 8: Preliminary Final Land Uses

PFLU	Strategic Context	Opportunities	Constraints	Feasible for Hillview
Grazing Improved Pastures	Sustainable farming and food production. Drive the Hunter's economic performance.	Increased Economic benefit from additional stocking rates	• Maintenance Intensive • Soil Suitability • Capital Intensive • Risk of Failure • Topography	Yes
Grazing (Native Pastures)	Sustainable farming and food production. Drive the Hunter's economic performance.	Maintained Pre-Mining Land-use Economic benefit	• Maintenance Intensive • Soil Suitability • Weed Incursion • Capital Intensive • Risk of Failure • Existing pasture areas	Not Likely without significant intervention
Dairy	Sustainable farming and food production. The land use maximises employment generation or will attract visitors to the region. Drive the Hunter's economic performance.	Productive Use of Land	• Difficult for progressive rehabilitation • Water demand • Maintenance Intensive • Soil Suitability • Effluent management • Insufficient area of suitable soil and topography	Not Likely without significant intervention
Viticulture	The land use maximises employment generation or will attract visitors to the region.	Economic benefit Potential tourism	• Soil Suitability • Intensive soil amelioration • Water demand • Maintenance Intensive • Difficult for progressive rehabilitation • Areas of the final landform (highwall) may not be suitable for viticulture	Not Likely without significant intervention
Native Ecosystem	The land use maintains or enhances corridors within the landscape such as biodiversity corridors or Disused infrastructure corridors	Capacity building / optionality Vegetation / Fauna corridors Habitat creation	• Landform stability • Perceived Land use conflict • Short term costs • Vegetation / Fauna corridors	Yes
Commercial Forestry	The land use attracts employment opportunities	Economic benefit	• Maintenance Intensive • Soil Suitability • Capital Intensive	Not Likely without significant intervention

PFLU	Strategic Context	Opportunities	Constraints	Feasible for Hillview
Industrial development	"The land use makes use of site infrastructure such as rail loops, hard stand areas, power, water and road access, or adjoins existing industrial areas or settlement areas;"	Economic benefit Industrial re-use for some areas	• Economic appetite • Land use conflict • Long term costs	Yes
Renewables (solar / pumped hydro facility)	"The land use maximises employment generation or will attract visitors to the region;"	Economic benefit	• Capital Intensive • Economic appetite	Yes
Multiple Land-use	"The land use maximises employment generation or will attract visitors to the region;"	Economic benefit Industrial re-use for some areas Housing	• Landform stability • Land use conflict • Long term costs	Yes

The PFLUs adopted by the Project are:

- Native Ecosystem: to establish a safe, stable, non-polluting, and sustainable landform revegetated with woodland vegetation communities generally consistent with the pre-extraction landscape.
- Industrial development: to introduce land use opportunities for providing ongoing goods and services, employment, and growth to the local economy.
- Grazing land would provide the region with further sustainable farming and food production adding to an ever-growing industry that is driving the Hunter's economic performance.

Prior to the commencement of operations, or as required by the conditions of consent, Coastwide Materials will develop a Conceptual Closure Plan (CCP). The CPP will incorporate a detailed Final Land Use Options Assessment of the PFLU and other final land use options (such as those listed in **Table 8**). The CCP and final land uses will be progressively refined during the life of the operation.

8.6 Indicative Completion Criteria

Completion criteria are set the benchmark values for key attributes (indicators) proposed to demonstrate that the rehabilitation has been achieved. Indicative completion criteria adopted for the project are presented in **Table 9**.

Table 9: Indicative Completion Criteria

Objective	Performance Indicator	Completion Criteria
Phase 1 - Active		
Minimise risk of injury to people and animals	Risk assessment completed and effective controls actioned	Appropriate security and traffic control measures have been implemented prior to commencing works
Minimise the impact of vegetation clearance activities on flora and fauna	Ground Disturbance protocols developed and implemented	Appropriate measures have been implemented during clearing and operations to minimise the impact on flora and fauna
Erosion will be controlled	Erosion and Sediment Control Plan developed and implemented Water and drainage infrastructure installed and maintained	Erosion and sediment control structures have been installed prior to disturbance
Topsoils will be appropriately stripped and managed	Topsoil inventory established and maintained	Topsoil has been stripped and stockpiled in accordance with requirements
Biological resources are salvaged	Soils, seeds, and vegetation are salvaged and reused	Topsoil has been stripped and stockpiled in accordance with requirements Seed collection program implemented Cleared vegetation is stockpile and reused for habitat augmentation
Phase 2 - Decommissioning		
Infrastructure that is not to be used as part of the final land use is removed to ensure the site is safe and free of hazardous materials	Site records and reports	All surface infrastructure that is not required for the final land use demolished and removed from the site
	Demolition records	All demolition work carried out in accordance with *AS2601-2001: The Demolition of Structures* or its latest version
Disconnection of Services	Site records and reports	All services, including power, water, data, and telephone, that are not required for final land use have been safely isolated, disconnected and terminated
Contaminated areas are identified and managed	Certificates of testing, disposal and/or validation testing	Contaminated soils have been identified and remediated or removed from the areas to be rehabilitated or appropriately managed, consistent with the final land use
Phase 3 – Landform Establishment		
Landform is safe, stable, and non-polluting	Detailed designs Visual inspection / survey records	Landform survey verifies constructed landform safe and stable and is generally in accordance with the approved detailed final landform design
	Survey records, compliance to design	Rehabilitated benches are free draining with appropriate drainage in place to maintain structural integrity in the long term

Objective	Performance Indicator	Completion Criteria
	Detailed designs Survey records	Final landform drainage structures including drains, banks, drop structures and dams constructed in accordance with Blue Book requirements (where required)
	Restricted access to residual void highwall	Access controls installed to prevent unintended entry over highwall into residual void
Phase 4 – Growth Medium Development		
Rehabilitation is top- dressed in a suitable growing media	Rehabilitation records	Topsoil, sub-soil, or suitable alternative is spread uniformly at the specified depth appropriate to the final land use
Growth media characterised and ameliorated for final land use as required	Rehabilitation records Soil analysis records	Soil ameliorants are applied where necessary at the recommended rate per hectare based on soil analysis
Phase 5 – Ecosystem and Land Use Establishment		
Revegetation is sustainable for the long-term and only requires maintenance that is consistent with the intended final land use	Rehabilitation monitoring reports, independent soil reports, environmental monitoring records, independent agronomist reports	The re-established topsoil / subsoil substrate is capable of supporting the targeted pasture / cropping regime on a sustained basis Resilience demonstrated by the effects of drought and fire on composition, structure and other function attributes of pasture and cropping lands
Levels of ecosystem function have been established that demonstrate the rehabilitation is self-sustainable	Planting records	A mixture of native trees, shrubs, and grasses generally commensurate with adjacent woodland communities Indicators of nutrient cycling are suitable for sustaining the target vegetation community (commensurate with adjacent woodland communities)
Erosion does not present a safety hazard or compromise the post construction land capability	Rehabilitation monitoring records	No active erosion features that compromise land capability or the final post construction land use
Weeds and feral animals do not present a risk to rehabilitation	Weed presence in rehabilitation monitoring and site inspection records	No significant weed infestations, and noxious or other weeds present a risk to rehabilitation establishment
	Planting records	Plantings have been installed with appropriate vegetation protection implemented
Phase 6 – Ecosystem and Land Use Development		
Revegetation is sustainable for the long-term and only requires maintenance that is consistent with the intended final land use	Rehabilitation monitoring reports, independent soil reports, environmental monitoring records, independent agronomist reports	The re-established topsoil / subsoil substrate is capable of supporting the targeted pasture / cropping regime on a sustained basis Resilience demonstrated by the effects of drought and fire on composition, structure and other function attributes of pasture and cropping lands
Levels of ecosystem function have been established that demonstrate the rehabilitation is self-sustainable.	Planting records	A mixture of native trees, shrubs, and grasses generally commensurate with adjacent woodland communities.

Objective	Performance Indicator	Completion Criteria
		Indicators of nutrient cycling are suitable for sustaining the target vegetation community (commensurate with adjacent woodland communities).
Erosion does not present a safety hazard or compromise the landform.	Rehabilitation monitoring records	No significant and active erosion that compromises the landform or proposed final land use.
Phase 7 – Rehabilitation Completion (Sign-Off)		
Rehabilitation areas are capable of supporting and maintaining the designated final land use	Reports Monitoring Reports Government forms	Government agencies signoff on rehabilitation, acknowledging that completion criteria has been achieved.

9.0 Rehabilitation Implementation

9.1 Preliminary Rehabilitation and Disturbance Schedule

A preliminary rehabilitation and disturbance schedule for the project is shown in **Table 10** **Table 11**.

Table 10: Preliminary Rehabilitation Schedule (By Stage)

Stage	Undisturbed Area (Ha)	Disturbance (Ha)	Rehabilitation (Ha)
Stage 1	38.9	9.5	0
Stage 2	36.5	11.9	0
Stage 3	25.9	22.5	0.55
Stage 4	24.8	23.6	0.55
Stage 5	19.4	29	0.55
Stage 6	9.8	38.6	1.14
Stage 7	0.0	48.4	1.68
Post Extraction	0.0	48.4	41.7

Table 11: Preliminary Domain Disturbance Schedule (By Stage)

Stage	Total Disturbance (Ha)	Infrastructure (Ha)	Processing Facility (Ha)	Active Extraction (Ha)	Water Management (Ha)	Rehabilitation (Ha)
Stage 1	9.95	6.71	1.24	0	0	0
Stage 2	11.9	7.58	6.8	0	0.63	0
Stage 3	22.5	9.14	9.48	3.29	1.21	0.55
Stage 4	23.6	9.36	10.54	3.13	1.21	0.55
Stage 5	29	12.49	10.54	5.36	1.26	0.55
Stage 6	38.6	12.49	10.54	14.33	1.26	1.14
Stage 7	48.4	6.71	9.64	30.01	0.36	1.68
Post Extraction	48.4	6.71	0	0	0	41.7

Key aspects of the preliminary rehabilitation and disturbance schedule include:

- Rehabilitation does not substantially progress until the Post Extraction due to the nature of the operation, limiting opportunities for progressive rehabilitation approaches.
- The largest areal disturbance occurs between Stage 2 and Stage 7 and is related to the active extraction phase of the quarry.
- The discrepancy between total disturbance and total rehabilitation during the post extraction Stage relates to the retention of Infrastructure (access road).

The rehabilitation and disturbance schedule for implementation will be incorporated into the RMP and reviewed annually.

9.2 Rehabilitation Methodologies

Detailed rehabilitation methodologies will be documented within the RMP and site procedures prior to the commencement of operations.

Preliminary rehabilitation methodologies are described in the following sections. These methodologies and parameters will be refined during the project based on the results of research, trials and monitoring.

9.3 Phase 1: Active Mining / Extraction

9.3.1 Active Mining Vegetation Clearing

Construction activities will be limited to the designated construction areas. The total area cleared will be restricted to the minimum area required.

Prior to Clearing:

- A preclearing inspection will be undertaken by a qualified ecologist.
- An ecologist or spotter/catcher should be present for the removal of hollow-bearing trees, logs or stags which could contain native fauna.
- The boundary of the area authorised for clearing will be identified and clearly marked to ensure earthmoving equipment does not impact on adjacent undisturbed areas.
- A clearing pattern will be determined to allow fauna adequate opportunity for dispersal into adjacent habitat.

During Clearing:

- Regular inspections of the boundary will be undertaken to ensure the area is controlled for the clearing of vegetation.
- Cleared vegetation will be pushed into a series of windrows within the disturbed areas and generally mulched for reuse to stabilise disturbed areas where possible.
- Vegetation identified as potentially valuable habitat e.g., hollow logs, may be stockpiled for use in erosion and sediment control works or for site rehabilitation.

Planning - Planning of disturbance activities will be undertaken to determine the yearly (12-month block) disturbance areas. This planning process will be undertaken as part of an Annual Rehabilitation Plan.

Projection - The clearance of vegetation would be undertaken progressively, with the area of vegetation cleared at any particular time generally being no greater than that required to accommodate projected development activities for the next 12 months.

Disturbance - All disturbance will be captured within a Ground Disturbance Permitting process.

9.3.2 Ground Disturbance Permit (Procedure)

A Ground Disturbance Permit (GDP) process will be established and implemented for all ground disturbance works within the Project Approval boundary in accordance with the GDP Procedure. All clearing activities will be undertaken in accordance with the site approval conditions, site management plans/standards and the conditions contained in the GDP. All works are to be undertaken in an environmentally responsible manner to ensure the conservation of the natural environment as far as practicable.

Permit – The Ground Disturbance Permit (GDP) Procedure and Process will be completed proactively to minimise disturbance impacts through an environmental and approval assessment process.

Assessment/Approval - The GDP process would generally include (but not limited to) the assessment of the following:

- Approvals (including tenements, disturbance boundary, other approvals).
- Flora and Fauna impacts.
- Water management impacts and requirements.
- Topsoil requirements.
- Aboriginal and Historic heritage.

Control measures will be documented in the GDP and approved by an environmental specialist. Depending on the identified risks of the activity, approval may be conditional on controls being verified prior to or at specified stages during works.

Disturbance/Rehabilitation - Vegetation clearing will be minimised and cleared areas are to be re-vegetated, with vegetation consistent with the approved 'Rehabilitation Management Plan', as soon as practicable following the disturbance.

Where possible, felled trees will be salvaged for reuse as habitat augmentation outside of the project disturbance boundary. These requirements will be determined in the GDP process.

9.3.2.1 Flora and Fauna Survey

Prior to clearance activities commencing as part of the GDP process, suitably qualified personnel would conduct a fauna survey to minimise the risk of any resident fauna becoming displaced or injured.

Additionally, the presence of a trained ecological or licensed wildlife handler would be maintained during native vegetation clearance and clearance of rock areas.

9.3.3 Topsoil Management

9.3.3.1 Soil Stripping Assessment

The SLR (2023) LSC Assessment provides recommended stripping depths for each soil unit, together with the dominant limitations and soil erodibility rating for each soil type (refer **Table 12**).

Table 12: Soil Stripping Depths and Limitations

Soil Types	Indicative Stripping Depth		Limitations	
	Topsoil	**Subsoil**	**Topsoil**	**Subsoil**
Eutrophic Kandosol	0-20	10-60	Low Ca: Mg	Weak to massive structure Deficient Ca: Mg
Subnatric Brown Sodosol	0-10	20-60	Low Ca: Mg	Sodic Deficient Ca: Mg Massive structure

9.3.3.2 Soil Volume

Based on the recommended stripping depths as provided in **Table 12**, the anticipated volume of topsoil available is provided in **Table 13** SLR (2023) estimate that approximately 270,000 m^3 of soil is required in rehabilitation, indicating that there are adequate soil resources available.

Table 13: Topdressing Material Volume Estimation

Soil Type	Area (ha)	Volume (m^3)		Total (m^3)
		Topsoil	Subsoil	Total
Eutrophic Kandosol	29.8	59,628	119,256	178,884
Subnatric Brown Sodosol	15.0	15,026	75,130	90,156
	Total	**74,654**	**194,386**	**269,040**

9.3.3.3 Soil Stripping and Handling

Where soil resource stripping and transportation is required, the following soil handling techniques will be adopted to prevent excessive soil deterioration:

- Soil will be maintained in a slightly moist condition during stripping. Material will not be stripped in either an excessively dry or wet condition.
- The surface of soil stockpiles will be left in as coarsely textured a condition as possible in order to promote infiltration and minimise erosion until vegetation is established, and to prevent anaerobic zones forming.
- Where practicable, a maximum stockpile height of 3m will be maintained. Clayey soils will be stored in lower stockpiles for shorter periods of time compared to sandier soils.
- Stockpiles will be seeded and fertilised as soon as possible. An annual cover crop species that produce sterile florets or seeds will be sown. 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.
- Prior to re-spreading stockpiled soil onto disturbed areas, an assessment of weed infestation on stockpiles will be undertaken to determine if individual stockpiles require herbicide application and / or “scalping” of weed species prior to soil spreading.
- An inventory of available soil will be maintained to ensure adequate soil materials are available for planned rehabilitation activities.

9.4 Phase 2: Decommissioning

This phase of rehabilitation includes activities associated with the removal of mining infrastructure, unless agreed to be retained, and the removal, remediation, or management of contaminated and hazardous materials.

9.4.1 Decommission and Site Infrastructure Removal

Decommissioning of plant, built infrastructure and services that are not to be retained will occur progressively when and if infrastructure becomes redundant. Decommissioning activities may generally include:

- Disconnection of above and below ground services associated with the infrastructure.
- Removal of fixed plant and build infrastructure.
- Disposal of infrastructure.
- Removal and disposal of wastes and hazardous materials.

- Conduct contamination assessments of soil and water.
- Removal or remediation of contaminated soils and water in accordance with contamination assessment/s.
- Install erosion and sediment controls.
- Changes to or removal of Quarry haul road access.

9.5 Phase 3: Landform Establishment

This phase of rehabilitation consists of the processes and activities required to construct the approved final landform.

9.5.1 Design Parameters

The final landform will be constructed progressively in accordance with the approved RMP to achieve a safe, stable, and free draining landform that is appropriate for the desired land use consistent with the surrounding landscape.

9.5.2 Constructed Water Drainage Features

Elements of final landform drainage features such as dams, drains, creek reinstatements and contour drains/banks will be designed and implemented to be a balance of practicality, performance and to be as commiserate with the surrounding environment as practicable:

Final landform drainage features will be designed in accordance with the relevant industry guidelines, the ‘RMP and detailed designs.

9.5.3 Physical and Chemical Capacity

Placement of dispersive soils will be avoided near surface of the final landform where practical to avoid erosion and sediment issues such as rilling, scouring or slumping.

Where dispersive soils are required to be placed near the surface of the final landform, amelioration will be applied (e.g. gypsum) to reduce the dispersive nature of the soil.

9.5.4 Highwalls/Benches

Shaping of quarry benches will be undertaken to ensure geotechnical stability is achieved, particularly the management of runoff. Detailed final landform designs will be completed to avoid ponding of water and concentrating runoff to manage erosion risks.

9.6 Phase 4: Growth Medium Development

This phase of rehabilitation consists of activities required to establish the physical, chemical, and biological components of the growth medium. Growth medium may include overburden, topsoil, subsoil and/or soil substitutes.

Growth medium development activities will generally include:

- Completion of a detailed soil characterisation program to inform growth medium amelioration.
- Application of soil ameliorants to enhance the physical, chemical, and biological characteristics of the growth media.
- Spreading the growth medium in accordance with the RMP including appropriate testing to ensure nutrient balance.

- Deep ripping and/or scarifying compacted the growth medium to assist in development of soils, encourage infiltration and enhance soil moisture availability to new plantings.

9.7 Phase 5: Ecosystem and Land Use Establishment

This phase of rehabilitation consists of the processes implemented to establish the final land use following construction of the final landform.

Ecosystem establishment activities to achieve the desired floristic composition and land use and will generally include:

Direct Seeding and Planting of Native Species

- Native vegetation species seeding and planting will be preferably undertaken (where feasible) between September and March to enhance the promotion of germination and growth.
- Cover crops will be used in revegetation, where necessary, to provide for an effective groundcover until the specific native species are established. This will minimise the likelihood for erosion during the initial establishment phase of the rehabilitation.
- All areas will be shallow ripped/scarified prior to sowing to provide a suitable environment that encourages water infiltration in the soil. Large rocks will be repurposed for habitat features prior to sowing.
- Seeding will be undertaken as soon as possible after ripping / scarifying in order to limit surface crusting and sealing to occur. This will enhance the likelihood of successful seed germination and vegetation establishment.
- Species selected for seeding or planting will be representative of the PCTs associated with the project and include multiple vegetation layers (understorey, mid-storey, and canopy).

Biosecurity - Weed and Pest Management Control Activities

Several weed species, including High Threat Weeds, were identified within the subject land. Accordingly, measures to prevent the spread of weeds should include the following hygiene procedures:

- Induction materials containing detailed information pertaining to the identification of high threat weeds should be prepared by a suitably trained ecologist or bush regenerator. These materials should be provided to contractors who will carry out construction works within the subject land.
- All vehicles, equipment, footwear and clothing should be clean and free of weed propagules prior to entering the subject land.
- Any weeds that are removed during the construction phase should be disposed of via an appropriate waste facility.
- Weed management will be undertaken during operations and rehabilitation phases to minimise weed incursion into rehabilitation areas.
- Minimising the spread of declared noxious and other invasive weeds within rehabilitation areas will be managed across the project area through a series of control measures, generally including (but not limited to):
    - Rehabilitation inspections.
    - Targeted and regular weed management campaigns (spraying of herbicides).

- Pests such as rabbits, pigs and feral goats have the potential to disturb vegetation as it becomes established and the ongoing maintenance. Regular pest control will be undertaken to protect the vegetation during the establishment of rehabilitation through targeted control methods.

Installation of Signage Indicating Rehabilitation Area

Signage will be erected (to site signage standards) to indicate areas of rehabilitation. The signage will help inform employees and visitors of sensitive areas of site that must not be disturbed.

Fencing to Exclude Persons, Vehicles and Browsing Herbivores

Fencing will be erected and inspected on a regular basis to:

- Demarcate rehabilitation areas.
- Establish No go zones for personnel and vehicles.

Rehabilitation Maintenance

Rehabilitated areas will be monitored on a regular basis to ensure that original objectives are achieved. Rehabilitation monitoring will include regular inspections for the following key aspects:

- Soil erosion.

  Revegetation success.
- Weed infestation (primarily noxious weeds, although where rehabilitation areas are dominated by other weeds it will also be monitored and managed).
- Integrity of diversion drains waterways and sediment control structures.

Maintenance works will be undertaken to address any deficiencies or areas of concern identified from monitoring. This may include the re-application of soil, re-seeding, re-planting, weed control, additional fertiliser applications, de-silting or repair of drainage works and sedimentation dams and infill and re-grading of eroded areas.

9.8 Phase 6: Ecosystem and Land Use Development

The Ecosystem and Land Use Development phase includes those activities required to develop sustainable ecosystems that have characteristics comparable to similar undisturbed surrounding vegetation.

This phase aims to continue to ensure the rehabilitation area is undisturbed to establish characteristics of functional self-sustaining ecosystems, such as nutrient cycling, vegetation flowering and reproduction, increasing habitat complexity, and development of a productive, self-sustaining soil profile.

Activities within this phase are informed by the outcomes of the Rehabilitation Inspections and Monitoring program.

Activities in this phase may generally include:

- Supplementary Planting and Tree Thinning in Specific Circumstances (if required)
  - Supplementary planting of target vegetation based on performance and survival rate of original seeding and/or planting.
  - Tree thinning in circumstances where one of the upper storeys is outcompeting a lower story for light and thus restricting growth in the understorey.

- Pest and Weed Control Program to Assist Establishment of New Vegetation
  - Continuation of weed control programs.
  - Introduction of a pest control program if required to control populations of native and non-native (feral) species that are likely to affect the performance of the rehabilitation and native inhabiting species. Some of these species may include Kangaroos (native), Rabbits (feral), Cats (feral) and Dogs (feral).

9.9 Phase 7: Rehabilitation Completion (Sign Off)

The final phase of rehabilitation when a rehabilitation area has achieved the final land use for the extraction area:

- As stated in the approved rehabilitation objectives and the approved rehabilitation completion criteria.
- As spatially depicted in the approved final landform and RMP.

Activities in this phase may generally include:

- Implementation of long-term management techniques to assess the ongoing health and development of a self-sustaining ecosystem.
- Periodic monitoring of site post-handover in accordance with approvals.
- Rehabilitation areas may be classified as complete when Regulators has determined in writing that rehabilitation has achieved the final land use following submission of the relevant application by the lease/approval holder.

10.0 Rehabilitation Research and Trials

10.1 Rehabilitation Methodology Trial

A rehabilitation methodology trial is proposed to be undertaken as part of stabilising batters established within the processing plant area. The trial will be undertaken to monitor the success of specific rehabilitation methodologies and involve:

- Establishing several plots to treat various treatments.
- Utilise an experimental framework, including defined objectives, performance indicators and completion criteria.
- Monitoring to track the performance of the trial.
- Formal evaluation and revision to the rehabilitation methodologies based on outcomes.

The trial will include key elements of rehabilitation phases (landform, erosion, vegetation, growth medium and maintenance). Results of the trial will be reported in annual reports.

11.0 Post Closure Maintenance and Rehabilitation Monitoring Program

11.1 Rehabilitation Monitoring Program

A rehabilitation monitoring program will be undertaken in accordance with best practice standards. The objectives of the program will be to:

- Assess the long-term stability and functioning of re-established ecosystems on affected land; and
- Assess rehabilitation performance against closure criteria.

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.

The proposed rehabilitation monitoring program will be implemented to describe the processes and activities required to determine the biophysical state of each domain. It describes 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 has been designed track performance towards completion criteria and to ensure collection and storage of data is undertaken in a robust and statistically valid manner.

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

Early intervention and adaptive management to minimise the potential for rehabilitation failure will be implemented. The RMP developed for the project will include a rehabilitation Trigger Action Response Plan (TARP).

11.2 Rehabilitation Quality Assurance Process

A rehabilitation quality assurance process (RQAP) will be developed and incorporated into the RMP. This will include details of inspections, monitoring and record keeping which will be required to ensure that:

- Rehabilitation is being implemented in accordance with the nominated methodologies.
- Identified risks to rehabilitation are being adequately addressed at each phase of rehabilitation.

The RQAP will be implemented through every phase of rehabilitation. The RQAP will also include an inspection protocol to ensure that each phase of decommissioning and rehabilitation has been completed.

12.0 References

A Rehabilitation Manual for Australian Streams (LWRRDC and CRCCH)

Landcom - Managing Urban Stormwater: Soils and construction - Volume 1 (Blue Book), 2004.

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NSW Resources Regulator (2021) Guideline Rehabilitation ControlsMine Rehabilitation Trials Online (cerdi.edu.au).

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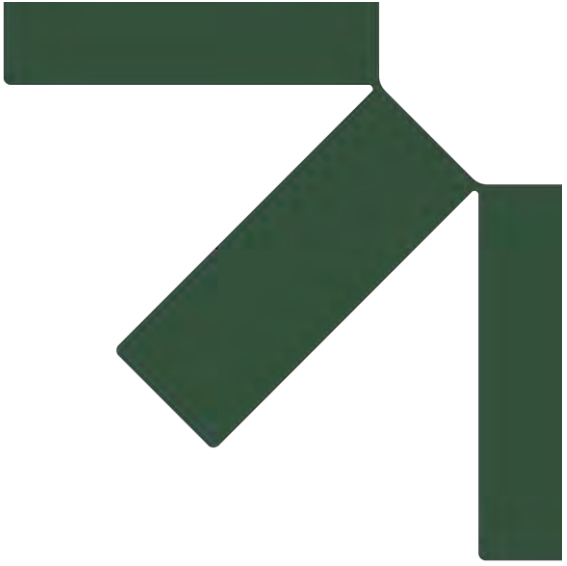
Standards Australia. (2009). Risk Management – Principals and guidelines, AS/NZS ISO 31000:2009. Tongway, D., & Hindley, N. (1996). Landscape Function Analysis. Understanding more about your landscape. A method for monitoring landscape productivity. Canberra, ACT: CSIRO Sustainable Ecosystems.

The Land and Soil Capability Assessment Scheme; Second Approximation (OEH, 2012)



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