METROMIX

METROMIX PTY LTD

ABN: 39 002 886 839

Rehabilitation Management Plan

for the

Marrangaroo Quarry

Prepared by:

RWCorkery&co

March 2024

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Prepared for:

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RWCorkery&co

Summary Table

Name of Mine		Marangaroo Quarry		
RMP Commencement Date		2 July 2022		
Mineral Authorities		ML4365	**Expiry Date**	1 July 2043
		ML4636		1 July 2043
		ML6388		1 July 2043
		PLL584		1 July 2043
		PLL602		7 September 2025
		MPL221		3 January 2026
		ML1522		9 October 2043
		ML1801		9 March 2041
Name of Leaseholder		Metromix Pty Limited (ABN: 39 002 886 839)		
Version	**Author**	**Purpose**	**Approved by**	**Date of Submission**
1	RWC	Preparation of initial Rehabilitation Management Plan	D. Lythgo	2 July 2022
2	RWC	Rehabilitation Management Plan update to reflect approved ROBJs and FLRP	M. Yunusa	21 March 2024

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LIST OF ACRONYMS

AEMR	Annual Environmental Management Report
AHD	Australian Height Datum
CWS	Central West Scientific
DA	Development Application
EPA	Environment Protection Authority
EPL	Environment Protection Licence
ha	hectares
LGA	Local Government Area
m	metres
ML	Mining Lease
NSW	New South Wales
PLL	Private Lands Lease
RMP	Rehabilitation Management Plan
RWC	R.W. Corkery & Co. Pty Limited
tpa	tonnes per annum

1. Introduction to Mining Project

This Rehabilitation Management Plan (RMP) has been prepared in accordance with the following documents and guidelines.

- *Form and Way: Rehabilitation Management Plan for Large Mines (July 2021).*
- *Form and Way: Rehabilitation Objectives, Rehabilitation Completion Criteria and Final Landform and Rehabilitation Plan for Large Mines (October 2022).*
- *Guideline 1: Rehabilitation Risk Assessment (July 2021).*
- *Guideline 2: Rehabilitation Records (July 2021).*
- *Guideline 3: Rehabilitation Controls (July 2021).*
- *Guideline 5: Rehabilitation Objectives and Rehabilitation Completion Criteria (December 2023).*

1.1 History of Operations

The Marrangaroo Quarry (the Quarry) is located approximately 4km northwest of Lithgow (see **Figure 1**) and commenced operations in 1912 when Newbold Silica Firebrick Company Limited quarried quartzite to supply lump silica for the production of silica fire bricks. It is understood that Newbold General Refractories operated the Quarry on a continuous basis until 1977 and, at that time, produced up to 35,000t of quartzite annually. During the period from 1977 to 1989 Taminga Units Pty Ltd (1977-1980) and Marrangaroo Aggregates Pty Ltd (1980-1989) also operated the Quarry prior to its purchase by Metromix Pty Ltd (the Company) in September 1989.

Although the Quarry commenced as an important source of industrial mineral silica, by the early 1970s quartzite was recognised as a high-quality construction material. Since that time, the proportion of products produced from the Quarry and used for construction purposes has increased. At present, the proportion of quartzite product sold as lump silica for the production of iron is in the order of 4% to 6%, with the remaining production sold as concrete aggregate, roadbase, ballast for railways or as drainage and fill material.

All activities associated with the Quarry are undertaken within an area identified as the "Quarry Site" (**Figure 2**).

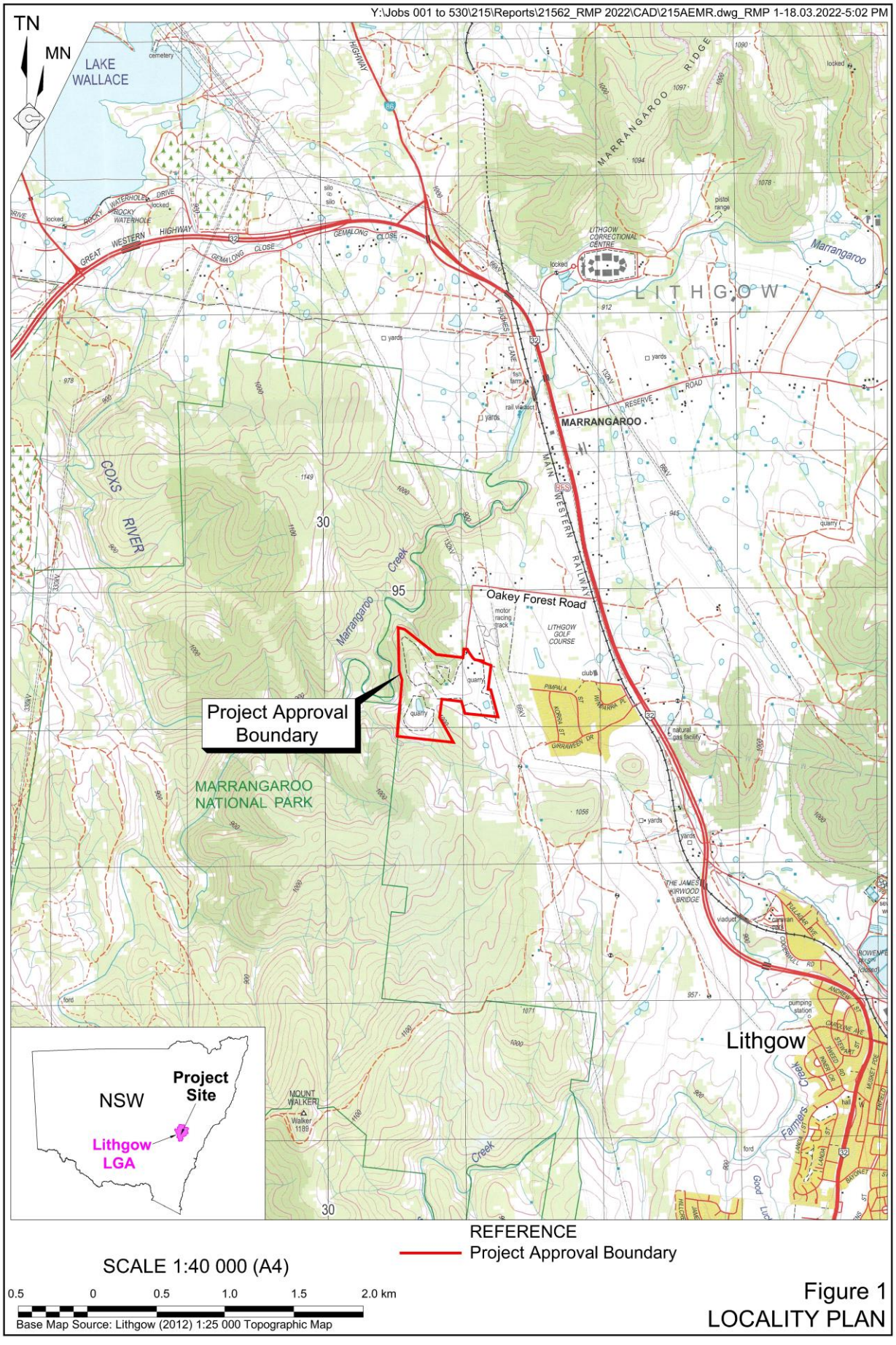


Figure 1
LOCALITY PLAN

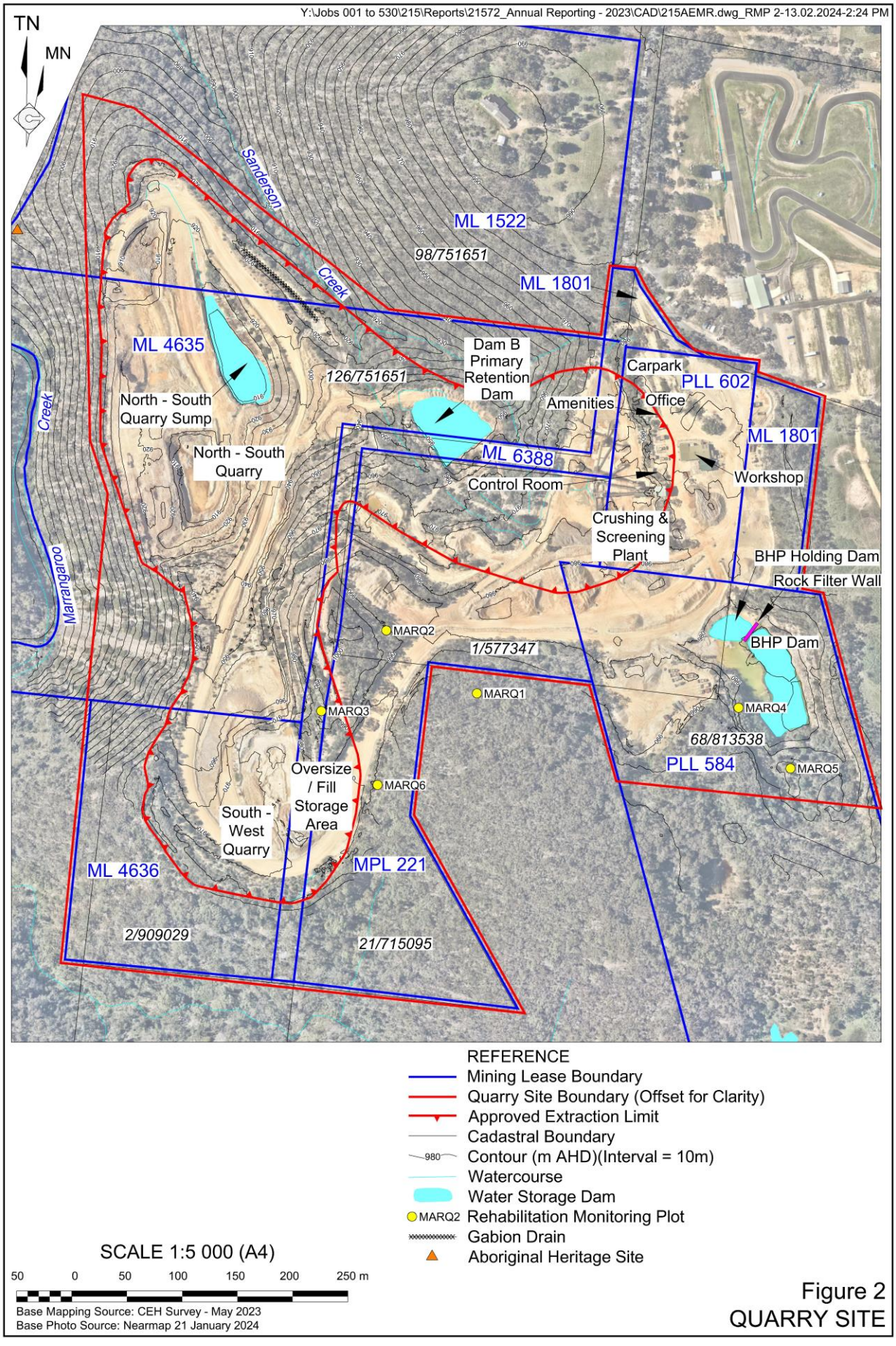


Figure 2
QUARRY SITE

1.1.1 Historic Rehabilitation Outcomes

The Quarry has been operating over a 109 year period with a number of areas achieving final landform status. The following provides a description of final landform activities undertaken to date.

- Partially backfilling and establishment of sustainable revegetation of the BHP Quarry void to the extent possible while still allowing use of, and access to, a water retention dam. It is noted that the (former) Division of Resources and Energy released the Company's security bond for this area in 2007.
- Placement of production wastes, overburden and biomass within areas of the South-West Quarry and North-South Quarry.

1.2 Current Development Consents, Leases and Licences

Table 1 provides a summary of the current approvals, leases, and licenses held by the Company for the Quarry. The Mining Authorisations under which the Quarry operates are presented on **Figure 2**.

Table 1
Current Approvals, Leases, and Licenses

Approval/ Lease/Licence	Issue Date	Expiry Date	Details / Comments
Development Consent			
DA 090/95	18 Dec 1995	Nil	Initially granted by then Greater Lithgow City Council. Last amended 12 December 2016. Permits production rate of up to 220,00tpa.
DA 486/01	21 May 2002	Nil	Granted by Council for the expansion of the North-South Quarry to the north. Last amended in January 2004 to modify Conditions 31 to 35.
Mining Authorisations*			
ML 4635	1 Jul 1941	1 Jul 2043	Covers an area of 16.19ha of Crown Land and permits the mining of Clay/Shale, Quartzite, Structural Clay.
ML 4636	1 Jul 1941	1 Jul 2043	Covers an area of 4.047ha of Crown Land and permits the mining of Clay/Shale, Quartzite, Structural Clay.
ML 6388	06 Apr 1973	1 Jul 2043	Covers an area of 1.69ha of Crown Land and permits the mining of Clay/Shale, Kaolin, Quartzite, Structural Clay.
PLL 584	22 Jun 1942	1 Jul 2043	Covers an area of 15.5ha of land owned by Council and the Company and permits the mining of Quartzite.
PLL 602	7 Sep 1942	7 Sep 2025	Covers an area of 2.428ha of land owned by the Company and permits the mining of Clay/Shale, Quartzite, Structural Clay.
MPL 221	4 Jan 1984	3 Jan 2026	Covers an area of 7.752ha of land owned by the Company and is issued for mining purposes.
ML 1522	10 Oct 2002	9 Oct 2043	Covers an area of 14ha of land owned by the Company and permits the mining of Quartzite.
ML1801	9 Mar 2020	9 Mar 2041	Covers an area of 1.438ha of land owned by Council, the Company, Crown Land and private land and is for ancillary mining activities.
Other Approvals and Licences			
EPL1464	26 Sep 2000	Re-issued Annually 1 June	Issued by the NSW EPA. Current licence version dated 30 June 2015.
* See **Figure 2**			

1.3 Land Ownership and Land Use

The Quarry and associated infrastructure are located within land owned by the Company, Lithgow City Council and the Crown. Details of current land ownership on and in the vicinity of the Quarry and the boundaries are shown on **Figure 3** and presented in **Table 2**. **Figure 4** presents land uses in the vicinity of the Quarry Site and within the broader Marrangaroo region. **Figure 5** presents land zoning in the vicinity of the Quarry Site.

Table 2
Land Ownership

Lot	Deposited Plan	Tenure	Owner	Leases
Quarry Site				
98	DP751651	Freehold	Metromix Pty Ltd	ML1522
126	DP751651	Crown Land	State of NSW	ML4635, ML6388
2	DP909029	Crown Land	State of NSW	ML4636
21	DP715095	Freehold	Metromix Pty Ltd	MPL221
1	DP577347	Freehold	Metromix Pty Ltd	MPL221
68	DP813538	Freehold	Lithgow City Council	PLL584, PLL602
2	DP519275	Freehold	Combined Districts Kart Club	ML1801
Land Adjacent to the Quarry Site				
3	DP1227647	Freehold	Private Landowner	
7324	DP1151158	Crown Land	State of NSW	
7323	DP1151158	Crown Land	State of NSW	
Road reserve associated with Oakey Forest Road				
Marrangaroo National Park				

Land uses within and surrounding the Marrangaroo Quarry include the following.

- Nature conservation – within Marrangaroo National Park to the west.
- Grazing native vegetation – within various MLs covering the Quarry Site, as well as to the north, south, east and west.
- Residential and farm infrastructure – including residential housing development, "Marrangaroo Fields", to the east and southeast.
- Services – including Lithgow Go-Kart track, immediately to the northeast.
- Transport and communication – including Korra Street, Pimpala Street and Girraween Drive within the "Marrangaroo Fields" housing development.
- Mining – within the Quarry Site.

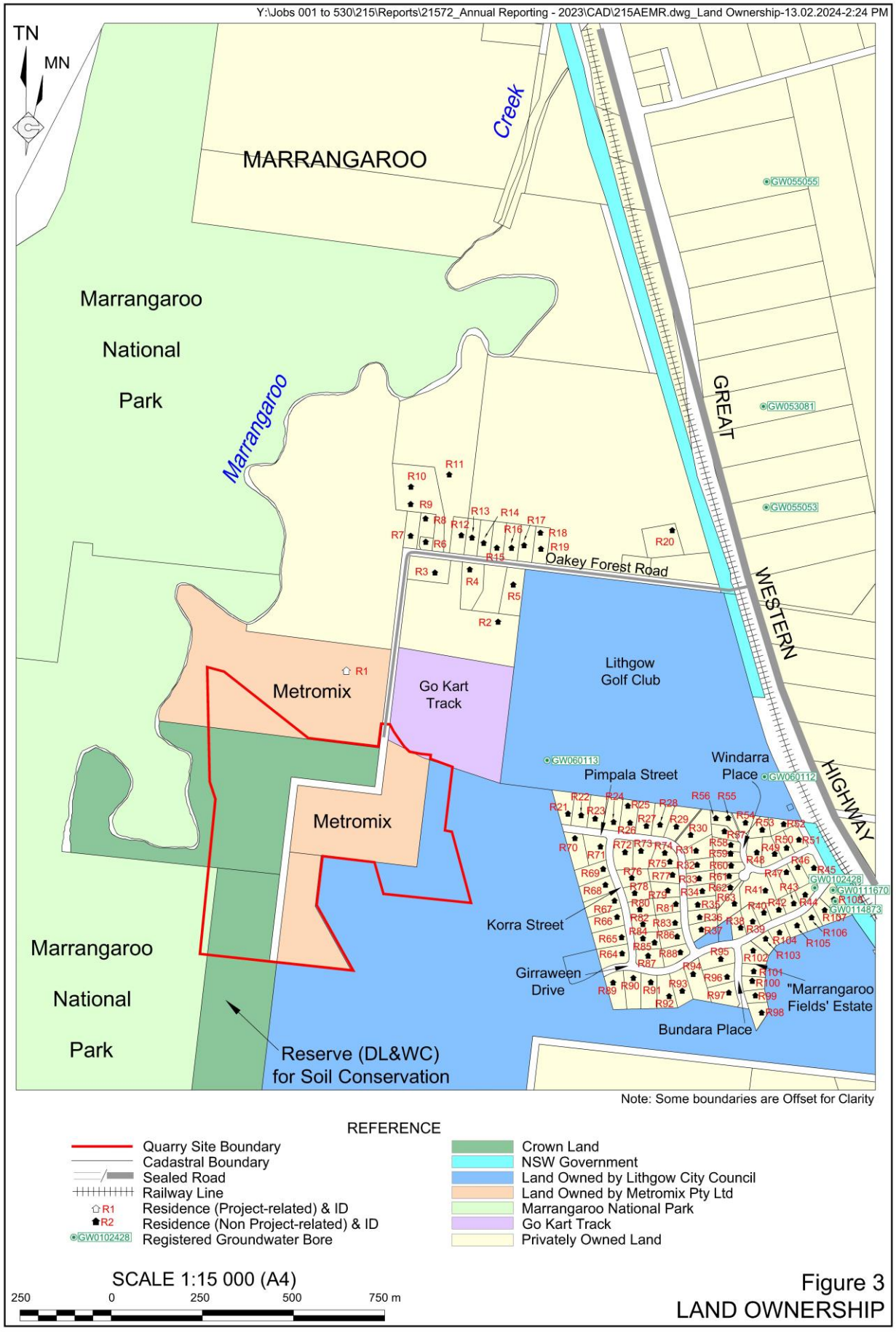


Figure 3
LAND OWNERSHIP

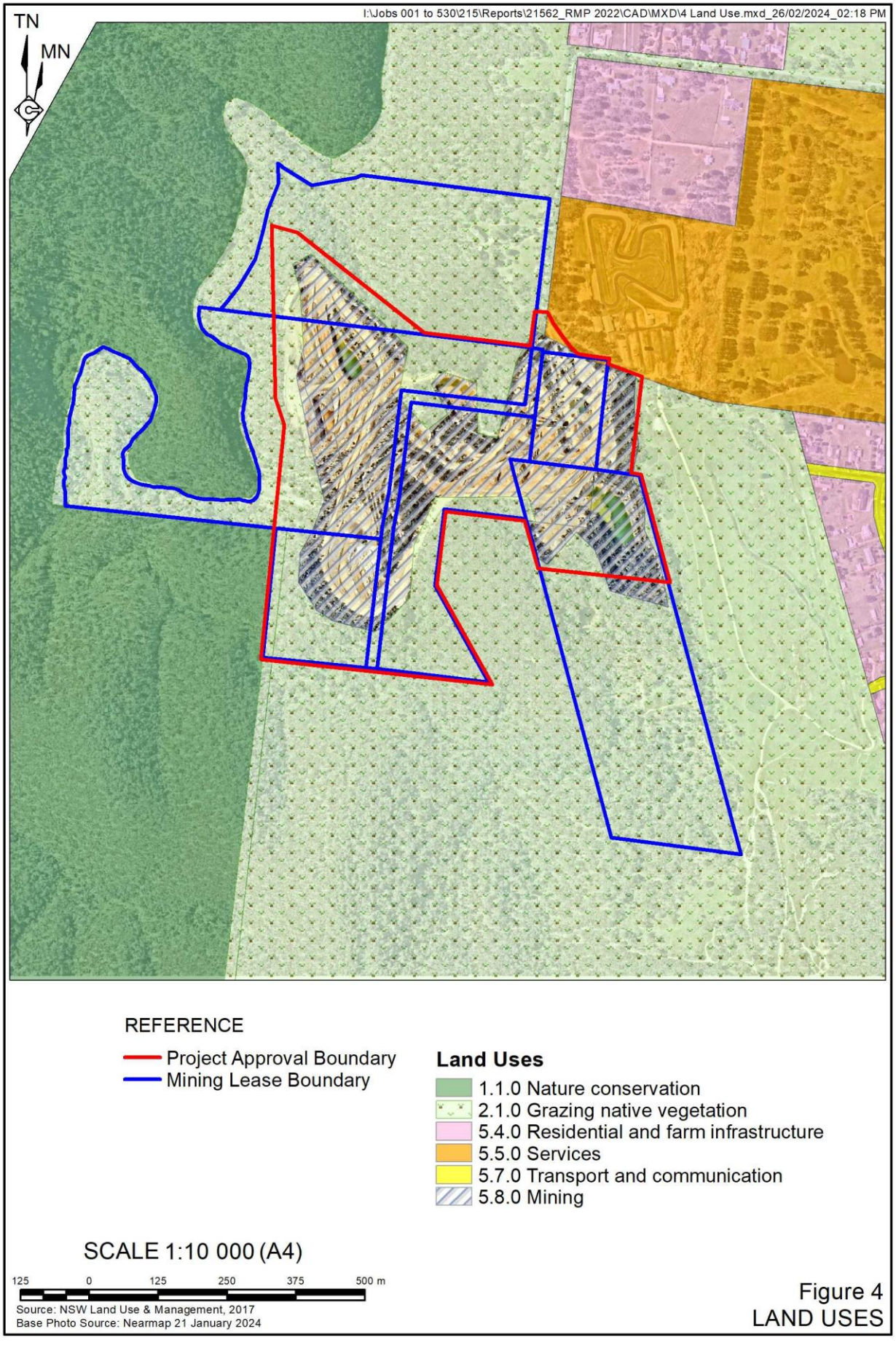


Figure 4
LAND USES

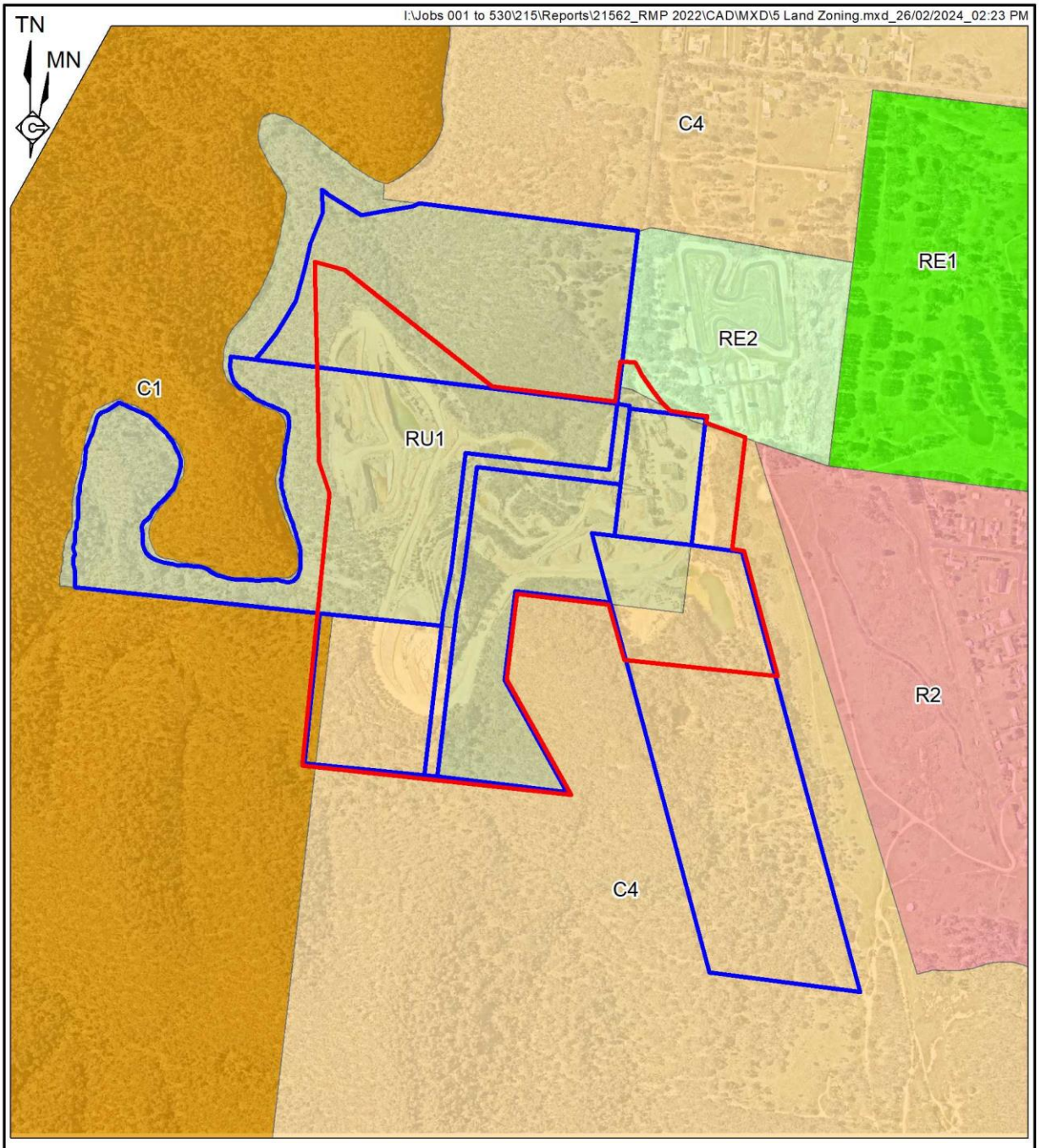


Figure 5
LAND ZONING

2. Final Land Use

2.1 Regulatory Requirements for Rehabilitation

Table 3 lists the regulatory requirements relating to rehabilitation of the Quarry Site and post-mining land uses.

2.2 Final Land Use Options Assessment

2.2.1 Background to Final Landform and Land Use

The final landform will be dependent on further geological and groundwater investigations which will determine whether or not the North-East Quarry area (which incorporates the current processing area) is developed. The investigations will focus upon the quality of quartzite, ratio of overburden, and potential for groundwater inflows, which will inform the development of an economic and geotechnically feasible extraction plan. These investigations will be undertaken as part of future exploration activities prior to the completion of extraction within the North-South Quarry.

Regardless of whether or not the North-East Quarry is developed, it is intended that the final landform will reflect the existing natural landform in the area which includes relatively steep slopes and gullies. It is likely that the final landform will also contain a number of water storages.

Within the 1995 development application (RWC, 1995) for continued operations, it was anticipated that all areas of the Quarry would be returned to native vegetation. However, following the 2014 rezoning of areas on the eastern side of the Great Western Highway to IN1 General Industrial and B6 Enterprise Corridor[1], the 2015 modification application (RWC, 2015) outlined the potential for a combined final land use of nature conservation and commercial / industrial land uses.

However, as no formal requirements for final land uses exist as part of any existing MLs or development consents, a final land use options assessment has been undertaken in consideration of relevant environmental planning instruments and consultation with relevant stakeholders.

2.2.2 Lithgow Local Environmental Plan 2014

The *Lithgow Local Environmental Plan 2014* guides development in the Lithgow local government area by encouraging the proper management, development and conservation of natural resources and the built environment.

As identified on **Figure 5**, the majority of the Quarry Site is located on land zoned RU1 Primary Production, with a small area of the north-eastern section of the Quarry Site located within land zoned RE2 Private Recreation. The south-western and south-eastern areas of the Quarry Site are located within land zoned C4 Environmental Living.

[1] A draft Development Control Plan for the rezoned areas has been developed.

Table 3
Regulatory Requirements for Rehabilitation

Consent	Condition No.	Requirement	Area	Timing	RMP Section
DA 090/95 (S96053/16f)	A(10)	All cleared native vegetation to be used either as brush matting, mulch or biomass. This is to be used as ground cover on areas to be revegetated.	Quarry Site	During construction, operation, and rehabilitation.	6.2.3
	A(11)	Revegetation monitoring to be undertaken by qualified botanist or bush regenerator on at least a three yearly basis and the methods and results presented in the Annual Environmental Management Report. Additional to this, photographic monitoring (at least one control point for each rehabilitation area) should be included each year within the annual report.		During operation and rehabilitation.	8.1
	A(12)	The applicant to consult with the Soil Conservation Service during topsoil stripping and stockpiling in respect to erosion protection and long term viability of the stockpiles where immediate reuse is not possible.		During construction, operation, and rehabilitation.	Noted
	A(14)	The applicant shall consult with the Soil Conservation Service, Division of Resource & Energy and Council with regard to progressive and final implementation of rehabilitation works. Such works to be carried out to the satisfaction of the Division of Resource & Energy and include final landform and use.		During operation and rehabilitation.	Noted
	A(15)	Soil erosion control structures will be required to be maintained in the rehabilitation areas until evidence of soil stability is provided.			6.2.1.10
	A(17)	Ongoing and final landform rehabilitation to be effected as outlined in the Statement of Environmental Effects.			Noted
	A(18)	Applicant to identify in the rehabilitation plan areas requiring rehabilitation for nature conservation purposes with the management objective for these areas to be clearly defined.			4, 5.1
	A(19)	Fencing of rehabilitation areas to be undertaken where appropriate.		During construction, operation and rehabilitation.	6.2.2.1
	A(27)	The applicant to submit to Council and associated authorities an Annual Environmental Management Report covering all matters in compliance with this consent; works rehabilitation, production and management undertakings set out in the Statement of Environmental Effects dated June 1995, Statement of Environmental Effects dated April 2003 and Statement of Environmental Effects sated September 2014. The Report shall detail the performance of the development and effectiveness of environmental controls, particularly those identified in the Soil and Water Management Plan. Annual rehabilitation monitoring is also to occur including photographic monitoring within the report.	Quarry Site and surrounds	Annually during construction, operation and rehabilitation	11

Table 3 (Cont'd)
Regulatory Requirements for Rehabilitation

Consent	Condition No.	Requirement	Area	Timing	RMP Section
DA 090/95 (S96053/16f) (Cont'd)	A(43)	Prior to transporting overburden from the Quarry, the proponent will ensure that the impact of the removal of this overburden on final land use and landform is addressed in an approved Mining Operations Plan (MOP).	Quarry Site and surrounds	During construction, operation and rehabilitation.	This document
DA 486/01	11	All vegetal material removed during the quarry extension shall be retained and placed over rehabilitated areas, so as to assist erosion control and encourage revegetation.	Quarry Site		6.2.1
	15	At least two years prior to the cessation of quarrying operations the applicant shall investigate, determine and report, taking into account of the potential community benefits, on a final strategy for the future use of the quarry site and any general infrastructure components, in consultation with Department of Land and Water Conservation, Sydney Catchment Authority and Lithgow City Council and for approval of Department of Mineral Resources.	Quarry Site and surrounds	At least two years prior to decommissioning and rehabilitation.	2.2
ML 4635 ML 4636 ML 6388 ML 1522 PLL 584 MPL 221 PLL 602	4	**Must prevent or minimise harm to the environment** The holder of a mining lease must take all reasonable measures to prevent, or if that is not reasonably practicable, to minimise, harm to the environment caused by activities under the mining lease. In this clause – ***harm*** to the environment has the same meaning as in the *Protection of the Environment Operations Act 1997.*	ML 4635 ML 4636 ML 6388 ML 1522 MPL 221 PLL 602 PLL 584	During operation and rehabilitation.	Noted
ML 4635 ML 4636 ML 6388 ML 1522 PLL 584 MPL 221 PLL 602	5	**Rehabilitation to occur as soon as reasonably practicable after disturbance** The holder of a mining lease must rehabilitate land and water in the mining area that is disturbed by mining activities under the mining lease as soon as reasonably practicable after the disturbance occurs.			Noted
ML 4635 ML 4636 ML 6388 ML 1522 PLL 584 MPL 221 PLL 602	6	**Rehabilitation must achieve final land use** The holder of a mining lease must ensure that rehabilitation of the mining area achieves the final land use for the mining area. The holder of a mining lease must ensure any planning approval has been obtained that is necessary to enable the holder to comply with subclause (1). The holder of the mining lease must identify and record any reasonably foreseeable hazard that presents a risk to the holder's ability to comply with subclause (1)		During rehabilitation.	2.2, 3

Table 3 (Cont'd)
Regulatory Requirements for Rehabilitation

Consent	Condition No.	Requirement	Area	Timing	RMP Section
	6 (Cont'd)	**Note –** clause 7 requires a rehabilitation risk assessment to be conducted whenever a hazard is identified under this subclause.			
		In this clause – ***final land use*** for the mining area means the final landform and final land uses to be achieved for the mining area – as set out in the rehabilitation objectives statement and rehabilitation completion criteria statement, and for a large mine – as spatially depicted in the final landform and rehabilitation plan, and if the final land use for the mining area is required by a condition of development consent for activities under the mining lease – as stated in the condition. ***planning approval*** means – a development consent within the meaning of the *Environmental Planning and Assessment Act 1979*, or an approval under that Act, Division 5.1.			2.2, 3
ML 4635 ML 4636 ML 6388 ML 1522 PLL 584 MPL 221 PLL 602	7	**Rehabilitation risk assessment** The holder of a mining lease must conduct a risk assessment (a ***rehabilitation risk assessment***) that – identifies, assesses and evaluates the risks that need to be addressed to achieve the following in relation to the mining lease – the rehabilitation objectives, the rehabilitation completion criteria, for large mines – the final land use as spatially depicted in the final landform and rehabilitation plan, and identifies the measures that need to be implemented to eliminate, minimise or mitigate the risks. The holder of the mining lease must implement the measures identified.		During construction, operation and rehabilitation.	3

Table 3 (Cont'd)
Regulatory Requirements for Rehabilitation

Consent	Condition No.	Requirement	Area	Timing	RMP Section
	7 (Cont'd)	The holder of a mining lease must conduct a rehabilitation risk assessment – for a large mine – before preparing a rehabilitation management plan, and for a small mine – before preparing the rehabilitation outcome documents for the mine, and whenever a hazard is identified under clause 6(3) – as soon as reasonably practicable after it is identified, and whenever given a written direction to do so by the Secretary.	ML 4635 ML 4636 ML 6388 ML 1522 MPL 221 PLL 602 PLL 584	During construction, operation and rehabilitation.	3
ML 4635 ML 4636 ML 6388 ML 1522 PLL 584 MPL 221 PLL 602	9	**General requirements for documents** A document required to be prepared under this Division must— be in a form approved by the Secretary, and **Note**— The approved forms are available on the Department's website. include any matter required to be included by the form, and if required to be given to the Secretary—be given in a way approved by the Secretary.			This document
ML 4635 ML 4636 ML 6388 ML 1522 PLL 584 MPL 221 PLL 602	10	**Rehabilitation management plans for large mines** The holder of a mining lease relating to a large mine must prepare a plan (a rehabilitation management plan) for the mining lease that includes the following— a description of how the holder proposes to manage all aspects of the rehabilitation of the mining area, a description of the steps and actions the holder proposes to take to comply with the conditions of the mining lease that relate to rehabilitation, a summary of rehabilitation risk assessments conducted by the holder, the risk control measures identified in the rehabilitation risk assessments, the rehabilitation outcome documents for the mining lease, a statement of the performance outcomes for the matters addressed by the rehabilitation outcome documents and the ways in which those outcomes are to be measured and monitored. If a rehabilitation outcome document has not been approved by the Secretary, the holder of the mining lease must include a proposed version of the document.	ML 4635 ML 4636 ML 6388 ML 1522 MPL 221 PLL 602 PLL 584	During construction, operation and rehabilitation.	This document

Table 3 (Cont'd)
Regulatory Requirements for Rehabilitation

Consent	Condition No.	Requirement	Area	Timing	RMP Section
	10 Cont'd)	A rehabilitation management plan is not required to be given to the Secretary for approval. The holder of the mining lease— must implement the matters set out in the rehabilitation management plan, and if the forward program specifies timeframes for the implementation of the matters—must implement the matters within those timeframes.			
ML 4635 ML 4636 ML 6388 ML 1522 PLL 584 MPL 221 PLL 602	11	**Amendment of rehabilitation management plans** The holder of a mining lease must amend the rehabilitation management plan for the mining lease as follows— to substitute the proposed version of a rehabilitation outcome document with the version approved by the Secretary—within 30 days after the document is approved, as a consequence of an amendment made under clause 14 to a rehabilitation outcome document—within 30 days after the amendment is made, to reflect any changes to the risk control measures in the prepared plan that are identified in a rehabilitation risk assessment—as soon as practicable after the rehabilitation risk assessment is conducted, whenever given a written direction to do so by the Secretary—in accordance with the direction.	ML 4635 ML 4636 ML 6388 ML 1522 MPL 221 PLL 602 PLL 584	During construction, operation and rehabilitation.	11
ML 4635 ML 4636 ML 6388 ML 1522 PLL 584 MPL 221 PLL 602	12	**Rehabilitation outcome documents** The holder of a mining lease must prepare the following documents ***(the rehabilitation outcome documents)*** for the mining lease and give them to the Secretary for approval— the ***rehabilitation objectives statement***, which sets out the rehabilitation objectives required to achieve the final land use for the mining area, the ***rehabilitation completion criteria statement***, which sets out criteria, the completion of which will demonstrate the achievement of the rehabilitation objectives, for a large mine, the ***final landform and rehabilitation plan***, showing a spatial depiction of the final land use.			4, 5

Table 3 (Cont'd)
Regulatory Requirements for Rehabilitation

Consent	Condition No.	Requirement	Area	Timing	RMP Section
	12 (Cont'd)	If the final land use for the mining area is required by a condition of development consent for activities under the mining lease, the holder of the mining lease must ensure the rehabilitation outcome documents are consistent with that condition.	ML 4635 ML 4636 ML 6388 ML 1522 MPL 221 PLL 602 PLL 584	During construction, operation and rehabilitation.	N/A
ML 4635 ML 4636 ML 6388 ML 1522 PLL 584 MPL 221 PLL 602	13	**Forward program and annual rehabilitation report** The holder of a mining lease must prepare a program (a ***forward program***) for the mining lease that includes the following— a schedule of mining activities for the mining area for the next 3 years, a summary of the spatial progression of rehabilitation through its various phases for the next 3 years, a requirement that the rehabilitation of land and water disturbed by mining activities under the mining lease must occur as soon as reasonably practicable after the disturbance occurs. The holder of a mining lease must prepare a report (an ***annual rehabilitation report***) for the mining lease that includes— a description of the rehabilitation undertaken over the annual reporting period, a report demonstrating the progress made through the phases of rehabilitation provided for in the forward program applying to the reporting period, a report demonstrating progress made towards the achievement of the following— the objectives set out in the rehabilitation objectives statement, the criteria set out in the rehabilitation completion criteria statement,			8.3
		for large mines—the final land use as spatially depicted in the final landform and rehabilitation plan. If a rehabilitation outcome document has not been approved by the Secretary, the holder of the mining lease must rely on a proposed version of the document. The holder of the mining lease must give the forward program and annual rehabilitation report to the Secretary. In this clause— ***annual reporting period*** means each period of 12 months commencing on— the date on which the mining lease is granted, or if the Secretary approves another date in relation to the mining lease— the other date.	ML 4635 ML 4636 ML 6388 ML 1522 MPL 221 PLL 602 PLL 584	During construction, operation and rehabilitation.	8.3

Table 3 (Cont'd)
Regulatory Requirements for Rehabilitation

Consent	Condition No.	Requirement	Area	Timing	RMP Section
ML 4635 ML 4636 ML 6388 ML 1522 PLL 584 MPL 221 PLL 602	14	**Amendment of rehabilitation outcome documents and forward program** This clause applies to— a rehabilitation outcome document if it has been approved by the Secretary, and a forward program if it has been given to the Secretary. The holder of a mining lease must not amend a document to which this clause applies that relates to the mining lease unless— the Secretary gives the holder a written direction to do so, or the Secretary, on written application by the holder, gives a written approval of the amendment. The holder of the mining lease must amend the document in accordance with the Secretary's direction or approval. Nothing in this clause prevents the holder of a mining lease preparing a draft amendment for submission to the Secretary for approval.			Noted
ML 4635 ML 4636 ML 6388 ML 1522 PLL 584 MPL 221 PLL 602	15	**Times at which documents must be prepared and given** The holder of a mining lease must do the following before the end of the initial period— prepare a rehabilitation management plan, and prepare rehabilitation outcome documents and give them, other than the rehabilitation completion criteria statement, to the Secretary for approval, and prepare a forward program and give it to the Secretary. The holder of the mining lease must prepare a forward program and annual rehabilitation report and give them to the Secretary before— 60 days after the last day of each annual reporting period, commencing with the annual reporting period in which the forward program was given to Secretary under subclause (1)(c), or a later date approved by the Secretary. A rehabilitation completion criteria statement relating to completion of rehabilitation during a period covered by a forward program must be given to the Secretary for approval when the forward program is required to be given to the Secretary.	ML 4635 ML 4636 ML 6388 ML 1522 MPL 221 PLL 602 PLL 584	During construction, operation and rehabilitation.	11

Table 3 (Cont'd)
Regulatory Requirements for Rehabilitation

Consent	Condition No.	Requirement	Area	Timing	RMP Section
	15 (Cont'd)	The holder of the mining lease must prepare updated rehabilitation outcome documents for the mining lease and give them to the Secretary for approval before— 60 days after a development consent is modified following an application referred to in clause 20(1)(b), or a later date approved by the Secretary. A rehabilitation completion criteria statement is not required to be given to the Secretary under subclause (4) unless a rehabilitation completion criteria statement has already been given to the Secretary under subclause (3).			
		The Secretary may, by written notice, direct the holder of a mining lease to prepare, or give to the Secretary, a document required to be prepared under this Division at a time other than that specified in this clause. The holder of the mining lease must comply with the direction. In this clause— initial period means the period commencing when the mining lease is granted and ending— 30 days, or other period approved by the Secretary, after this Division first applies to the mining lease, or if this Division applies to the mining lease because of an increase in the required security deposit— when the surface of the mining area is disturbed by activities under the mining lease, or at a later date approved by the Secretary.	ML 4635 ML 4636 ML 6388 ML 1522 MPL 221 PLL 602 PLL 584	During construction, operation and rehabilitation.	11
ML 4635 ML 4636 ML 6388 ML 1522 PLL 584 MPL 221 PLL 602	16	**Certain documents to be publicly available** This clause applies to the following documents— a rehabilitation management plan, a forward program, an annual rehabilitation report. The holder of a mining lease must make a document to which this clause applies publicly available by— publishing it on its website in a prominent position, or if the holder does not have a website— providing a copy of it to a person— on the written request of a person, and without charge, and within 14 days after the request is received.			Noted

Table 3 (Cont'd)
Regulatory Requirements for Rehabilitation

Consent	Condition No.	Requirement	Area	Timing	RMP Section
	16 (Cont'd)	If a document is published on the website of the holder of the mining lease, the holder must ensure that it is published— for a rehabilitation management plan—within 14 days after it is prepared or amended, or for a forward program or an annual rehabilitation report—within 14 days after it is given to the Secretary or amended, Personal information within the meaning of the *Privacy and Personal Information Protection Act 1998* is not required to be included in a document made available to a person under this clause.	ML 4635 ML 4636 ML 6388 ML 1522 MPL 221 PLL 602 PLL 584	During construction, operation and rehabilitation.	Noted
ML 4635 ML 4636 ML 6388 ML 1522 PLL 584 MPL 221 PLL 602	17	**Records demonstrating compliance** The holder of a mining lease must create and maintain records of all actions taken that demonstrate compliance with each of the conditions set out in this Part. **Note—** The Act, sections 163D and 163E provide for the form in which records must be kept and the period for which they must be retained.			This document
ML 4635 ML 4636 ML 6388 ML 1522 PLL 584 MPL 221 PLL 602	18	**Report on non-compliance** The holder of a mining lease must provide the Minister with a written report detailing any non-compliance with— a condition of the mining lease, or Note— The Act, section 364A contains provisions relating to the use and disclosure of information provided under this condition. a requirement of the Act or this Regulation relating to activities under the mining lease. The holder of the mining lease must provide the report within 7 days after becoming aware of the non-compliance.			Noted

Table 3 (Cont'd)
Regulatory Requirements for Rehabilitation

Consent	Condition No.	Requirement	Area	Timing	RMP Section
	18 (Cont'd)	The holder of the mining lease must ensure the report— identifies the condition of the mining lease, or the requirement of the Act or this Regulation, to which the non-compliance relates, and describes the non-compliance and specifies the date or dates on which, or the period during which, the non-compliance occurred, and describes the causes or likely causes of the non-compliance, and describes the action that has been taken, or will be taken, to mitigate the effects, and to prevent any recurrence, of the non-compliance.	ML 4635 ML 4636 ML 6388 ML 1522 MPL 221 PLL 602 PLL 584	During construction, operation and rehabilitation.	Noted
MPL221	29	The lease holder shall: complete work in relation to rehabilitation within the Warragamba Outer Catchment Area before termination of the authority to the satisfaction of the Authority.	MPL 221		Noted
LEGISLATION					
Commonwealth Legislation					
Environmental Protection and Biodiversity Conservation Act 1999	s15B-15C	Discusses the requirement for approval for activities that may affect matters of national environmental significance including National Heritage places.	Quarry Site	During decommission and rehabilitation works.	6.2.1.12
NSW Legislation					
Protection of Environmental Operations Act 1997	s42-58	Discusses the provision of Environment Protection Licences.	Quarry Site	During operations and rehabilitation works.	1.2
	s89-113	Discusses the application of Clean-up Notices.		During operations.	
	Chapter 5	Discusses environmental offences including water, air, noise and land pollution.		During operations and rehabilitation works.	
Heritage Act 1977	Part 3 (s27-30)	Discusses interim orders for items of State or local significance.		During decommission and rehabilitation works.	6.2.1.12
	Part 3A (s31-38)	Discusses listing of items, places or buildings on the state heritage register.		During construction, operations and rehabilitation works.	
	Part 4	Discusses the effect of interim heritage orders and listings on the State Heritage Register			
	Part 6	Discusses other measures for the conservation of environmental heritage.			

Table 3 (Cont'd)
Regulatory Requirements for Rehabilitation

Consent	Condition No.	Requirement	Area	Timing	RMP Section
LEGISLATION (Cont'd)					
NSW Legislation (Cont'd)					
Heritage Act 1977 (Cont'd)	Division 8	Discusses controlling and restricting harm to buildings, works, relics and places not subject to interim heritage orders or State Heritage Registered listings.			
Mining Act 1992	Division 3	Under these sections the Minister can direct a company to rehabilitate their land, or, should the company not comply with this direction, rehabilitate the land at the Ministers expense and recover the cost from the company.		During rehabilitation works.	Noted
Long-term Rehabilitation Objectives					
2014 SoEE (RWC, 2014)		Rehabilitation and rehabilitation outcomes are consistent with the approved Mining Operations Plan.	Quarry Site	During construction, operations and rehabilitation works.	This document
		Rehabilitation is based on mine closure criteria and rehabilitation outcomes developed through stakeholder consultation.			4
		Rehabilitated native vegetation is integrated with undisturbed native vegetation to provide larger areas and wildlife corridors.			
		The rehabilitation is sustainable in terms of the final land use as is compatible with the surrounding land fabric.			
		Stable and permanent landforms with soils, hydrology, and ecosystems with maintenance needs no greater than those of surrounding land.			
		End land use is non-polluting.			
		The site must not present an undue hazard to persons, stock or native fauna and is clean and tidy, and free of rubbish, metal and derelict equipment/structures.			

As rehabilitation works are considered incidental or ancillary to mining operations, these works are permissible with consent within areas identified as RU1, RE2 and C4 where the purpose is indicated to be 'mining' by virtue of clause 2.9 (1)(b) of the *State Environmental Planning Policy (Resources and Energy) 2021*.

Permissibility of the potential future land uses within these zones is further discussed for each land use option.

2.2.3 Lithgow City Council Land Use Strategy 2010 – 2030

The following strategic directions and land use principles identified in the *Lithgow City Council Land Use Strategy 2010 - 2030* (Lithgow City Council, 2011) have been considered as part of the land use options assessment.

- Strategic Direction – Environmental Protection and Natural Resource Management:
  - Ensure that environmentally sensitive areas are protected from development that would create and adverse impact.
  - Recognise and protect primary resource lands including agricultural, forestry, and mineral and extractive resources.
  - Continue to integrate environmentally sensitive areas overlays into mainstream land-use planning and development assessment processes.
- Strategic Direction – Social and Economic Analysis:
  - Ensure that sufficient suitable and serviced employment lands are available to cater for a diverse range of employment opportunities.
- Strategic Rural Land Use Planning Principles:
  - Recognise and protect mining, extractive industries, forestry and agriculture (predominantly extensive grazing) as key primary production land uses.
  - Protect environmental conservation areas and their interface from further land fragmentation and land use conflict.
  - Recognise and protect natural and cultural resources and features of the Lithgow LGA.
  - Consider the environmental capacity of the rural land and ensure that any development within rural areas is within the capacity of, and is suitable for, the land having regard to constraints and opportunities analysis and mapping.
  - Recognise the capability of the Lithgow LGA to contribute to renewable energy development.

2.2.4 Assessment of Land Use Options

The following potential land use options have been assessed for the Quarry.

- Nature Conservation

  The Quarry Site is revegetated to achieve ecological communities consistent with / complimentary to the natural vegetation within the adjacent Marrangaroo National Park. The established vegetation communities would provide passive Nature Conservation or could be formally incorporated into the National Park.

  This land use is permissible within land zonings RU1, RE2 and C4.

- Agricultural Use

  Due to the steep topography in the western parts of the Quarry, agricultural uses would be impractical in those areas and would need to be restricted to the flatter eastern sections of Quarry Site. Given the limited soil resources and nature of existing soils surrounding the Quarry, the land and soil capability would be restricted to low intensity pastoral grazing activities. As such, any future agricultural land uses would need to be subject to prescriptive management measures to avoid overgrazing and maintenance of sufficient groundcover to prevent erosion and further degradation of the land capability.

  Extensive agriculture is permitted in zoning RU1 and C4 but is prohibited in RE2.

- Residential Estate

  Potential residential development would similarly be restricted to the flatter eastern sections of the Quarry Site. Development of a residential estate would be consistent with the adjoining "Marrangaroo Fields Estate" east of the Quarry Site. However, given that the final landform in the western part of the Quarry would include retained highwalls and the water quality of the void is unlikely to be suitable for primary contact (i.e. swimming), establishment of an adjoining residential estate would present ongoing safety risk from unauthorised access. Given other more suitable residential development options east of the Great Western Highway, this is not considered a desirable final land use option.

  Dwelling houses are permissible with consent within zoning RU1 and C4 but is prohibited in RE2.

- Industrial / Commercial Estate

  Potential industrial and commercial development would similarly be restricted to the flatter eastern sections of the Quarry Site and also potentially the South-West Quarry. It is considered appropriate access controls to retained highwalls and void could more readily be maintained and the existing water storages (Dam B and BHP void) could potentially provide a valuable industrial water supply. The existing bunding and topographic relief could also provide valuable visual and acoustic shielding. Furthermore, the proximity and access to the Great Western Highway would also likely advantage industries requiring heavy vehicle access.

Various types of industrial and commercial development are permissible with consent within zoning RU1 but is prohibited in RE2 and C4. A substantial portion of the feasible area is zoned RU1, however, some areas currently zoned C4 would require rezoning if all feasible areas were to be developed.

- Waste Emplacement and Processing Facility

  The final void to be retained could potentially be used as a waste emplacement facility whilst the flatter areas could be utilised for waste receival, sorting and recycling. Further studies would be required to confirm the suitability of the void for waste receival, including from a seepage perspective, with some wastes potentially not being suitable for emplacement. Notwithstanding this, the site would be advantageous from a visual, acoustic and air quality perspective given the separation to surrounding sensitive land uses. The need for this scale of additional waste emplacement would also need to be determined.

  Waste facilities are currently not permissible within the RU1, RE2 and C4. As such, rezoning would be required.

- Water Storage and Supply

  Given the zone of acid generating material which drains to the North-South Quarry the final void would not provide a suitable water storage or supply. However, the retained BHP Quarry and Dam B could provide a water supply for future land uses. Given the limited catchment and storage capacity of these storages, these are unlikely to be suitable as a larger scale water storage and supply for other land uses beyond the Quarry site.

  Water supply systems are permissible within RU1, RE2 and C4 with consent.

- Recreational Park

  The flatter areas of the Quarry Site could potentially be developed for various recreational purposes either extending or expanding activities undertaken at the adjacent go-kart facility. Recreational uses could include outdoor recreational facilities such as paint-ball, motor cross / BMX, etc. or indoor facilities such as tennis, squash, gymnasium, etc. The types of recreational facilities would need to be determined based upon the commercial need and the site's proximity to Lithgow compared to other potentially more suitable locations.

  Recreational facilities are permissible within RU1, RE2 with consent and recreation areas are permissible within C4 with consent.

  It is noted that a passive recreational area is considered to have similar ongoing safety risk from unauthorised access to the retained high walls and void.

Following the consideration of potential final land use options, the Company has nominated nature conservation as the final land use for the Quarry Site. The rehabilitation of the Quarry Site to achieve this combination of final land uses would achieve the following key objectives.

- Rehabilitation of the Quarry Site to achieve a safe, stable, and non-polluting landform.

- Establishment of final landforms and final land uses which require sustainable levels of maintenance and management.
- Improvement and expansion of habitat and associated ecological services provided by adjacent native vegetation within Marrangaroo National Park.

These objectives are considered to be consistent with and complimentary to the strategic directions and land use principles identified in the *Lithgow City Council Land Use Strategy 2010 – 2030.*

It is noted that utilising the relatively flat, eastern area of the Quarry Site for a commercial / industrial final land use would leverage easy access to the Great Western Highway and proximity to the Lithgow Go-Kart Track to provide for long-term, sustainable post-closure economic and employment opportunities. While a final land use of this nature is not currently permitted under DA 090/95 or DA 486/01, the Company intends to seek approval for this final land concurrent with a future development application for the extension of extraction operations within ML1522. This Plan and any associated final land use and rehabilitation plans would be updated following receipt of such approval.

2.3 Final Land Use Statement

Final land uses within the Quarry Site will include the following.

- Native Conservation

This final land use is represented by the final land use domains as shown in **Plan 1**, namely:

- Native Ecosystem – revegetated areas.
- Final Void – the retained final void which would be partially filled with water.
- Water Storage Area – the retained BHP Dam and Dam B.
- Infrastructure – retained access roads.
- Other (Rock Scree) – the retained rock scree located within the western area of the Quarry Site.

Final land use and rehabilitation plans for the Quarry Site are presented in Section 5.

2.4 Final Land Use and Mining Domains

The *Form and Way: Rehabilitation Management Plan for Large Mines (July 2021)* guideline defines a domain as follows.

> *"An area (or areas) of the land that has been disturbed by mining and has a specific operational use (mining domain) or specific final land use (final land use domain). Land within a domain typically has similar geochemical and/or geophysical characteristics and therefore requires specific rehabilitation activities to achieve the associated final land use."*

2.4.1 Final Land Use Domains

Table 4 defines the final land use domains for the Quarry as presented in **Figure 6**.

Table 4
Final Land Use Domains

Final Land Use Domain	Domain ID[1]	Domain Description
Native Ecosystem	A	This domain includes all areas disturbed by Quarry activities which will be returned to native woodland, similar to the surrounding existing woodland.
Final Void	J	This domain includes the basin and retained high walls within the North-South Quarry extraction area (expected to be water filled following larger rain events and high rainfall years), which will be retained as a clean water dam.
Water Storage (Excluding Final Void)	G	This domain includes Dam B and BHP Dam. These are to be retained as clean water dams.
Infrastructure Area	I	This domain includes the section of access / haul road to be retained for long-term access within the Quarry Site.
Other (Rock Scree)	K	This domain includes the rock scree located within the western area of the Quarry Site.
Note 1: See **Figure 6**		

2.4.2 Mining Domains

Table 5 defines the mining domains for the Quarry as presented in **Figure 7**.

Table 5
Mining Domains

Mining Domain	Domain ID[1]	Domain Description
Infrastructure Area	1	This domain includes the existing access roads, carpark, office, weighbridge, workshop, amenities, control room, crushing and screening plant. This domain also includes stockpiles of varying size, mostly for product, some for temporary storage of overburden.
Water Management Area	3	This domain includes existing water storages (BHP Dam, Dam B and North-South Quarry Sump), dirty water catch drains, mobile pumping system and associated piping.
Overburden Emplacement Area	4	This domain includes the rock scree to the west of the North-South Quarry. This is a historic overburden emplacement area which was developed during extraction operations in this area during the 1950s and 1960s.
Active Mining Area (Open cut void)	5	This domain includes the active and currently unrehabilitated extraction area (North-South Quarry) and areas where overburden has been placed within the previous extraction area (South-West Quarry).
Note 1: See **Figure 7**.		

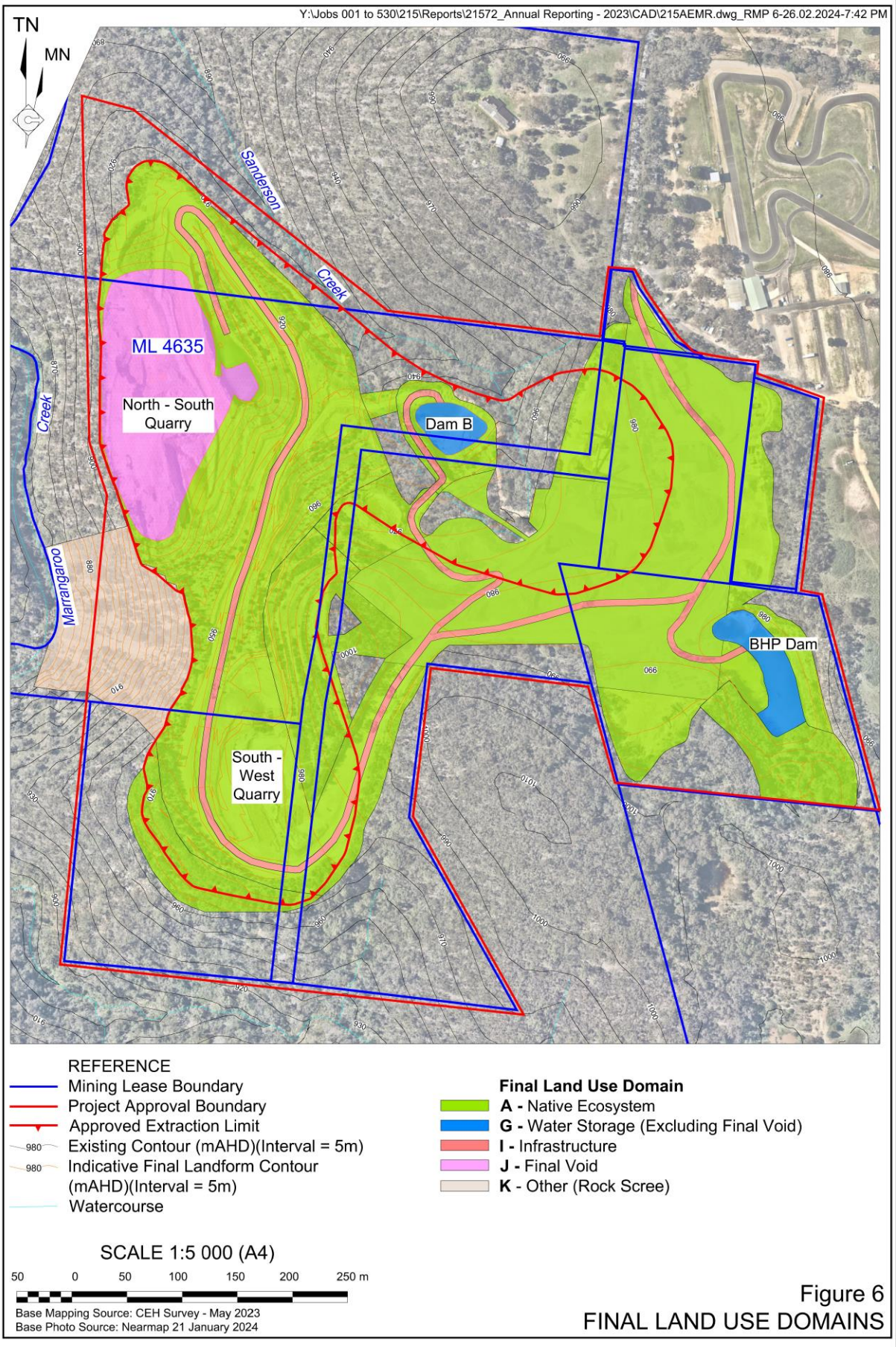


Figure 6
FINAL LAND USE DOMAINS

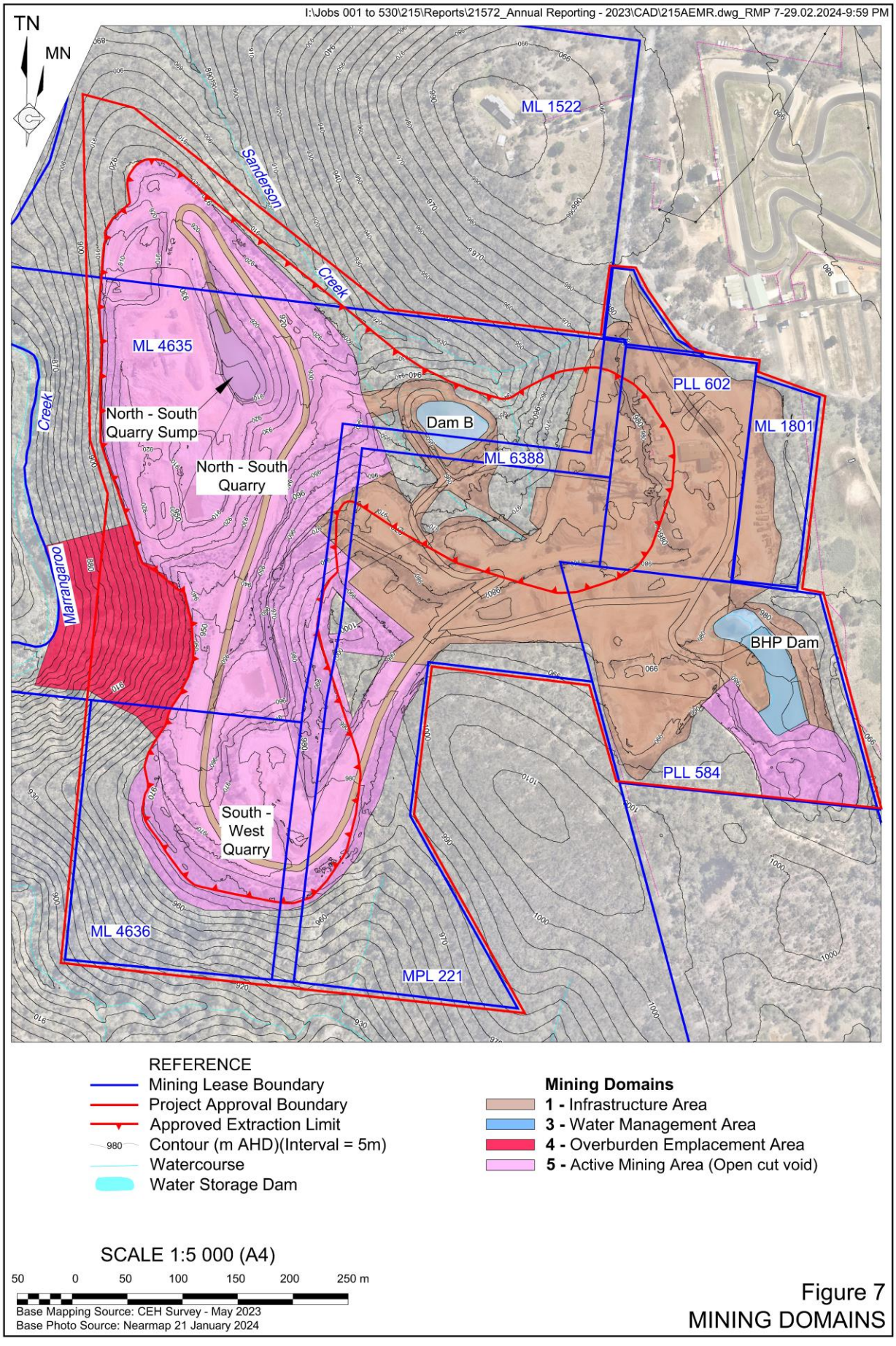


Figure 7
MINING DOMAINS

3. Rehabilitation Risk Assessment

The following risk assessment was undertaken generally in accordance with Australian Standards *HB 203:2006, AS/NZS 4360:2004* and *AS/NZS ISO 31000:2018 Risk Management – Principles & Guidelines.*

Risks to achieving the rehabilitation objectives and rehabilitation completion criteria outlined in Section 4, as well as the final landform outlined in Section 5, were identified, and assessed jointly by the Company and R.W. Corkery & Co. Pty Limited during the preparation of this Plan. Site-specific threats to rehabilitation were assessed based on observations of site-specific conditions and threats to rehabilitation in collaboration with the Company. This risk assessment was completed with consideration of existing controls as well as those risk controls outlined in this Plan.

For each identified risk to rehabilitation, potential adverse outcomes were identified and allocated a risk rating based on the potential consequences and likelihood of occurrence. **Tables 6**, **7** and **8** present the consequence, likelihood and risk rating used during this analysis. Where risks were determined to be unacceptable, namely those risks classified as "Moderate" or above, a Trigger Action Response Plan has been developed and is presented in Section 10.

Table 9 presents the results of the risk analysis assuming the implementation of standard mitigation measures and those outlined within this Plan.

Table 6
Qualitative Consequence Rating

Level	Descriptor	Description
1	Negligible	No detrimental impact on the environment is measurable or envisaged.
2	Minor	An event which could have temporary and minor effects on the environment, such as a non-reportable environment incident.
3	Moderate	An event which would create substantial temporary or minor permanent damage to the environment, such as a reportable incident not likely to result in prosecution.
4	Major	An event which could have a substantial and permanent consequence to the environment such as an environmental incident which would result in prosecution, adverse local publicity and community complaints.
5	Severe	A major event which could cause severe damage to the environment with actual or potential loss of credibility with key stakeholders, environmental liability, regulatory intervention, national publicity/complaints, or could close the operation prematurely.
Note: Rating modified after AS/NZS ISO31000:2009 Risk Management – Principles & Guidelines		

Table 7
Qualitative Likelihood Rating

Level	Descriptor	Description
A	Certain	Is an ongoing occurrence or will occur under all conditions
B	Almost Certain	Is expected to occur in most circumstances
C	Likely	Will probably occur in most circumstances
D	Possible	Will probably occur under favourable circumstances
E	Unlikely	May occur, but only under favourable circumstances
F	Rare	Not expected to occur, unless subject to exceptional circumstances
G	Very Rare	Theoretically possible but not expected to occur
Source: Rating modified after HB 89:2012 – Figure B7		

Table 8
Qualitative Risk Rating

Likelihood	Consequences				
	1 Negligible	2 Minor	3 Moderate	4 Major	5 Severe
A Certain	M	H	H	VH	VH
B Almost Certain	M	M	H	VH	VH
C Likely	M	M	H	H	VH
D Possible	L	M	M	H	H
E Unlikely	L	L	M	M	H
F Rare	L	L	L	M	M
G Very Rare	L	L	L	L	M
Source: Modified after HB 89:2012 – Figure B8					

Table 9
Rehabilitation Risk Assessment

Rehabilitation Phase	Risk	Risk Control	Final Land Use Domain / Risk Ranking					Where Addressed in RMP
			Domain A: Native Ecosystem	Domain J: Final Void	Domain G: Water Storage (Excluding Final Void)	Domain I: Infrastructure	Domain K: Other (Rock Scree)	
General	Insufficient skills and experience of rehabilitation personnel.	Extensive experience of management team. Engagement of specialists consultants to address specific issues if and when required.	L(F3)	L(F3)	L(F3)	L(F3)	L(F3)	7, 10
	Lack of clearly defined responsibilities.	Responsibilities as defined in the *Rehabilitation Management Plan*.	L(F3)	L(F3)	L(F3)	L(F3)	L(F3)	7
	Insufficient funding for or prioritisation of rehabilitation activities.	Rehabilitation cost estimate and maintenance of security bond.	L(F3)	L(F3)	L(F3)	L(F3)	L(F3)	7, 10
Active Mining Phase of Rehabilitation	Inappropriate biological resource (e.g. subsoil, topsoil, vegetative material, seedbank, rocks, habitat resources) through clearing, salvage, and handling practices.	Stockpiling of growth medium in location not subject to run-on water or vehicle access. Spraying of weeds on an as needed basis. *Signposting of growth medium stockpiles.*	L(E2)	N/A	N/A	N/A	N/A	6.2.1.1, 6.2.1.11, 9.2
	Limited pre-existing biological resources for use (e.g. topsoil, woody debris).	Recovery of weathered overburden / interburden material that is suitable for use as a growth medium.	M(D3)	N/A	N/A	N/A	N/A	6.2.1.1, 6.2.1.3, 9.2
	Adverse meteorological conditions during salvage of biological resources.	Review of meteorological forecast prior to vegetation clearing and soil stripping and avoidance of salvage activities during high rainfall. Review site conditions prior to commencement of vegetation clearing and soil stripping.	L(F3)	N/A	N/A	N/A	N/A	6.2.1.1, 8.2
	Adverse geochemical/chemical composition of materials such as overburden, processing wastes, topsoils and subsoils.	No further extraction within areas identified as containing sulphides, if practicable. Selective handling and encapsulation of Potentially Acid Forming materials within Non-Acid Forming overburden materials. Physical compaction of encapsulated materials and addition of crushed/fine limestone to surface. If feasible, permanent storage of Potentially Acid Forming materials under at least 2m of water at all times to reduce the risk of sulphide oxidation. Allowance for application of gypsum and fertiliser in rehabilitation cost estimate. *Implementation of a Geochemical Sampling and Analysis Plan.* *Testing of growth medium following spreading but prior to application of seed to confirm rates of gypsum, fertiliser and/or other soil ameliorants required.*	M(D3)	M(D3)	N/A	N/A	N/A	6.2.1.3, 6.2.1.5, 6.2.1.7, 9.2
	Adverse surface quality and quantity.	Erosion and sediment control structures. Storage of all hydrocarbons and chemicals in accordance with AS1940:2017 – The storage and handling of flammable and combustible liquids. Management of discharge water quality, including use of flocculants / coagulants and alkaline amendments as required.	N/A	M(D3)	M(D3)	N/A	N/A	6.2.1.9, 10
Decommissioning Phase of Rehabilitation	Impacts on heritage items.	Maintenance of the 60m conservation zone around the identified artefact scatter. Unexpected finds protocol.	L(G3)	N/A	N/A	L(G3)	L(G3)	6.2.1.13, 9.2
	Hazards associated with retained infrastructure.	Inspection of retained roads following periods of high intensity rainfall to ensure trafficability. Regular inspection of fencing and safety bunds.	L(G3)	L(G3)	L(G3)	L(G3)	L(G3)	6.2.2.3, 9.2.5
	Contamination resulting from associated activities (e.g. storage and use of hydrocarbons/chemicals, drilling fluid, spillage of dirty water, brine, sewage).	Storage of all hydrocarbons and chemicals in accordance with AS1940:2017 – The storage and handling of flammable and combustible liquids. Single occurrence *Contamination Assessment Report.*	L(F3)	L(F3)	L(F3)	L(F3)	L(G3)	6.2.1.4, 6.2.2.2, 6.2.2.5
	Generation of material and waste products from the demolition process.	*Removal of all wastes in accordance with established protocols.* *Records of waste disposal from decommissioning activities.*	L(E2)	L(E2)	L(E2)	L(E2)	L(E2)	6.2.1.4, 6.2.2.2, 9.2.5

Table 9 (Cont'd)
Rehabilitation Risk Assessment

Rehabilitation Phase	Risk	Risk Control	Final Land Use Domain / Risk Ranking					Where Addressed in RMP
			Domain A: Native Ecosystem	Domain J: Final Void	Domain G: Water Storage (Excluding Final Void)	Domain I: Infrastructure	Domain K: Other (Rock Scree)	
Landform Establishment Phase of Rehabilitation	Unstable landform due to erosion and/or mass movement issues associated with inappropriate design and/or quality assurance during landform construction.	Formation of landform in accordance with mine design plans. *Site Relinquishment Geotechnical Assessment.*	M(F4)	N/A	N/A	L(F2)	L(G2)	6.2.3.2
	Exposure or release of geochemical and/or geotechnically adverse material associated with containment design and construction, including capping/cover system.	Single occurrence *Contamination Assessment Report.* Note: Existing exposed outcrop of sulfidic material within central area of the North-South Quarry cannot be practically / feasibly capped. No further exposure of material within this area to be undertaken.	M(D3)	M(E3)	N/A	N/A	N/A	6.2.1.7, 6.2.2.4, 6.2.2.5, 10
	Lack of availability of suitable materials for construction of final landform features (e.g. safety bunds).	Use of *in situ* materials. Presence of residual stockpiled material.	L(F3)	L(F3)	L(F3)	L(F3)	L(F3)	6.2.3.2
	Borehole or gas well seals failure.	Piezometers retained for ongoing groundwater monitoring. No boreholes or gas wells present in other final land use domains.	N/A	N/A	N/A	N/A	N/A	-
	Final landform unsuitable for final land use (e.g. large rocks present affecting cultivation, unsuitable surface cover and landform settlement).	*Shaping and ripping of completed areas to provide suitable surface substrate for application of growth medium and to 'key in' growth material to underlying substrate.* *Visual inspection prior to application of growth medium.*	L(F3)	L(F3)	L(F3)	L(F3)	N/A	6.2.3.2, 6.2.3.38
	Uncontrolled public access to highwalls	Retention of property fencing. Retention of safety bunding.	N/A	M(E3)	N/A	N/A	M(E3)	6.2.2.1, 6.2.3.4
Growth Medium Development Phase of Rehabilitation	Inappropriate physical and structural properties of substrate.	*Light ripping of growth medium across contours to key in to substrate, reduce surface runoff velocities, and retain seed (when spread).* Allowance for application of gypsum in rehabilitation cost estimate. *Testing of growth medium following spreading but prior to application of seed to confirm rates of gypsum and/or other soil ameliorants required.* *Restriction of vehicular access following spreading of soil material.*	M(E3)	N/A	N/A	M(E3)	N/A	6.2.4, 8, 9.2
	Subsoil and topsoil deficit for rehabilitation activities.	Supplement shortages with suitable alternatives i.e. suitably weathered overburden / interburden. *If required, suitable source of additional soil material to be identified, including the need for importation of growth medium or soil conditioners to increase volume of on-site growth medium.*	M(E3)	N/A	N/A	M(E3)	N/A	
	Substrate inadequate to support revegetation or agricultural land capability (e.g. lack of organic matter, nutrient deficiency, lack of soil biota, adverse soil chemical properties, exposed hostile geochemical materials, and any other factors impeding the effective rooting depth).	Allowance for application of gypsum and fertiliser in rehabilitation cost estimate. *Testing of growth medium following spreading but prior to application of seed to confirm rates of gypsum, fertiliser and/or other soil ameliorants required.* *Review potential for importation of other soil conditioners, such as biosolids and/or other organic materials.*	M(E3)	N/A	N/A	M(E3)	N/A	
Ecosystem and Land Use Establishment Phase of Rehabilitation	Lack of availability and quality of target seed resources, including genetic integrity.	*Source and purchase of appropriate seed mix for ground stabilisation and ecosystem establishment suitably in advance of planned rehabilitation activities.*	L(F3)	N/A	N/A	L(F3)	N/A	6.2.5, 6.2.6.3, 8
	Poor seed viability or seed dormancy.	*Source and purchase of appropriate seed mix for ground stabilisation and ecosystem establishment from reputable supplier.*	L(F3)	N/A	N/A	L(F3)	N/A	6.2.5, 6.2.6.3, 8
	Seed predation.	*Use of appropriate sowing and seeding techniques.* *Selection of seed mix appropriate to the season / current weather conditions so that germination occurs as soon as practicable following sowing.*	L(F3)	N/A	N/A	L(F3)	N/A	6.2.5, 6.2.6.3, 8
	Damage to seed through revegetation process.	*Use of appropriate sowing and seeding techniques.* *Rehabilitation personnel induction and training.*	L(F3)	N/A	N/A	L(F3)	N/A	6.2.5, 6.2.6.3, 8, 9
	Poor quality tube stock.	*Purchase of suitable tube stock grown from locally collected seed and reputable supplier.*	L(F3)	N/A	N/A	L(F3)	N/A	6.2.6.3, 8, 9
	Weed infestation associated with both introduction and control (or lack thereof).	Weed and pest control program. *Implement equipment delivery protocol to ensure equipment does not import weeds.*	L(E2)	N/A	N/A	L(E2)	L(E2)	6.2.5, 6.2.6.1, 6.2.6.3, 8

Table 9 (Cont'd)
Rehabilitation Risk Assessment

Rehabilitation Phase	Risk	Risk Control	Final Land Use Domain / Risk Ranking					Where Addressed in RMP
			Domain A: Native Ecosystem	Domain J: Final Void	Domain G: Water Storage (Excluding Final Void)	Domain I: Infrastructure	Domain K: Other (Rock Scree)	
Ecosystem and Land Use Establishment Phase of Rehabilitation (Cont'd)	Adopting inappropriate or inadequate rehabilitation techniques, including equipment fleet.	Extensive experience of management team. *Engagement of experienced contractors.* *Rehabilitation personnel induction and training.*	L(F3)	L(F3)	L(F3)	L(F3)	L(F3)	7, 9, 10
	Inappropriate revegetation species mix for targeted final land use.	*Consult with suitably experienced expert to confirm suitable seed mix that compliments the existing / retained native vegetation community and for stabilisation of the retained infrastructure domain.* *Source seed mix from reputable supplier.*	L(F3)	N/A	N/A	L(F3)	N/A	6.25.5, 6.2.6.3, 8, 9
	Adverse weather and climatic influences (e.g. drought; intense rainfall events; bushfire and climate change).	*Review long-term weather forecast prior to purchase of seed mix.* *Consult with suitably experienced expert to confirm suitability of seed mix for seasonal conditions.* *If required, utilisation of stored water (where suitable) for irrigation of revegetation areas to achieve effective root establishment.*	M(E3)	N/A	N/A	M(E3)	N/A	6.2.4, 6.2.5
	Lack of infrastructure to support intended final land use (e.g. bunding, fences, watering facilities).	*Inspection of retained fencing and bunding to confirm integrity.*	L(F3)	L(F3)	L(F3)	L(F3)	L(F3)	6.2.6.4
Ecosystem and Land Use Development Phase of Rehabilitation	Hazards associated with retained infrastructure.	Inspection of retained roads following periods of high intensity rainfall. Regular inspection of fences and safety bunds.	L(G3)	L(G3)	L(G3)	L(G3)	L(G3)	6.2.2.3, 6.2.6.4,
	Adverse weather and climatic influences (e.g. drought; intense rainfall events; bushfire and climate change).	Review long-term weather forecast. *If existing seed mix is inappropriate for current weather conditions, consult with suitably experienced expert to confirm alternative species and/or cover crop or mulch for temporary stabilisation.*	M(E3)	N/A	N/A	M(E3)	N/A	6.2.5, 6.2.6.4
	Substrate inadequate to support revegetation or agricultural land capacity.	*If inadequate groundcover / projected foliage cover achieved, consult with suitably experienced expert to confirm appropriateness of species selection or need for additional soil amelioration requirements (gypsum, fertiliser, organic matter).*	M(E3)	N/A	N/A	M(E3)	N/A	6.2.6.3, 9.2
	Post-closure water quality and quantity issues.	Post-closure water monitoring program. *Water balance modelling to confirm expected water level in final void and risk of outflows.*	N/A	M(E3)	M(E3)	N/A	N/A	6.2.3.1, 6.2.6.4, 9.2
	Damage to rehabilitation (e.g. fauna, domestic stock, vandalism, vehicular interactions, bushfire).	Existing boundary fencing. *Creation of barrier to vehicular entry to the rehabilitation areas* *Rehabilitation monitoring program*.	L(F3)	L(F3)	L(F3)	L(F3)	L(F3)	6.2.2.1, 6.2.6.4, 9.2
	Re-disturbance of established rehabilitation areas.	*Appropriate rehabilitation planning / scheduling.* *Creation of barrier to vehicular entry to rehabilitation areas.*	L(F3)	L(F3)	L(F3)	L(F3)	L(F3)	6.2.2.1, 6.2.6.4, 8
	Insufficient establishment of target species and limited species diversity.	*Rehabilitation monitoring program.* *Supplementary sowing of additional species seed mix (if practicable to maintain adequate projected foliage cover or species diversity).* *If required, suitably qualified ecologist or revegetation expert engaged to assess reasons for failure of appropriate species to emerge and recommend actions to ensure that the final vegetation community is suitably complimentary to the surrounding remnant vegetation community.*	L(F3)	N/A	N/A	L(F1)	N/A	6.2.6.3, 8
	Erosion and failure of landform, drainage and water management/storage structures.	*Site Relinquishment Geotechnical Assessment.* *Visual inspection program.* *Post-closure water monitoring program.*	L(F3)	L(F3)	L(F3)	L(F3)	L(F3)	6.2.3.2, 6.2.6.2, 6.2.6.4
	Lack of infrastructure to support intended final land use (e.g. bunding, fences).	*Inspection of retained fencing and bunding to confirm integrity.*	L(F3)	L(F3)	L(F3)	L(F3)	L(F3)	6.2.2.1, 6.2.6.4
	Lack of resources for rehabilitation maintenance.	Rehabilitation cost estimate and maintenance of security bond. Rehabilitation planning / scheduling	L(F3)	L(F3)	L(F3)	L(F3)	L(F3)	10

4. Rehabilitation Objectives and Rehabilitation Completion Criteria

4.1 Rehabilitation Objectives and Rehabilitation Completion Criteria

Table 10 presents the objectives and rehabilitation completion criteria and the methods used to validate the criteria for the Quarry.

Table 10
Rehabilitation Objectives and Rehabilitation Completion Criteria

Rehabilitation Objective Category	Approved Rehabilitation Objectives	Spatial Reference	Indicator	Proposed Rehabilitation Completion Criteria	Justification/Validation Methods
Removal of Infrastructure	All 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.	A1, A5, G3, I1, J5, K4	Removal of all services (power, water, communications) that have been connected on the site as part of the operation and are not required for the final land use.	All utility infrastructure removed.	Statement provided, utility service disconnection record / notification.
			Heritage obligations (e.g. development consent under the *Environmental Planning and Assessment Act 1979,* approvals under the *Heritage Act 1977,* etc.) have been met (e.g. archival recording, building retention or building demolition with footings preserved).	Permits and approval documents issued. All archival reports required are complete and submitted.	Copy of any relevant approval documentation and archival reports/records.
			Removal of all plant, equipment and associated infrastructure including processing facilities, stockpile areas, portable offices, exploration core samples, storage areas, samples.	Infrastructure removed.	As-constructed final landform plan, photos, decommissioning reports etc.
			Removal of all footings and/or removal to a certain depth that does not constrain the final land use.	Footings removed and/or removed to specified depths to avoid exposure pathways to subsequent final land use.	Surveyed and marked on the as-constructed final landform plan.
			Removal of all water management infrastructure (including pumps, pipes and power).	Infrastructure removed.	Statement provided and before/after photos.
			All drill core has been removed and taken either to an authorised storage or a disposal location.	Core removed and relocated.	Statement provided, receipt records from storage or disposal location.
			Surveying and sealing of all drill holes and boreholes in accordance with departmental guidelines and relevant standards.	Sealing completed and verified.	Engineering report/statement, plug and abandonment log, photos, as-constructed drawings, records of fill materials and concrete plugs, filling methods etc.
Retention of Infrastructure	All infrastructure that is to remain as part of the final land use is safe and does not pose any hazard to the community.	A1, A5, G3, I1, J5, K4	Potential hazards (e.g. electrical, mechanical) have been effectively isolated and secured.	Hazards isolated and secured.	Statement provided by suitably qualified engineer.
			The structural integrity of the infrastructure is suitable and safe for use as part of the intended final land use.	The structural integrity of the infrastructure has been inspected by a suitably qualified engineer and determined to be suitable and safe as part of the intended final land use.	Engineering report/statement, photos, risk assessment verifying modes of failure are adequately addressed to minimise risks to public safety or the environment.
			Infrastructure is in a condition (e.g. structural, electrical, other hazards) that is suitable for the intended final land use.	Formal acceptance from the subsequent landowner that infrastructure is in a condition that is suitable for the intended final land use in accordance with formal agreement.	Formal acceptance from landowner.
			Damage to access tracks has been repaired and stabilised.	Repairs complete.	As-constructed final landform plan, photos etc.
	All infrastructure that is to remain as part of the final land use benefits from the relevant approvals.	A1, A5, G3, I1, J5, K4	Where applicable, necessary approvals are in place (e.g. development consent under the *Environmental Planning and Assessment Act 1979*) where buildings and infrastructure are to be retained as part of final land use.	Permits and approval documents issued.	Copy of any relevant approvals.
			Heritage obligations as required under the *Environmental Planning and Assessment Act 1979*, *Heritage Act 1977,* etc. have been met (e.g. archival recording, building retention and restoration).	Permits and approval documents issued; archival reports (where required) complete and submitted.	Copy of any relevant approvals.
	Those sections of roads/tracks to be retained for a lawful final land use reduced in width / size to that suitable for final land use.	I1	Infrastructure is in a condition (e.g. structural, electrical, other hazards) that is suitable for the intended final land use.	Formal acceptance from the subsequent landowner that infrastructure is in a condition that is suitable for the intended final land use in accordance with formal agreement.	Formal acceptance from landowner.
Land Contamination	There is no residual soil contamination on site that is incompatible with the final land use or that poses a threat of environmental harm.	A1, A5, G3, I1, J5, K4	Waste material and/or visible contamination areas on site surface.	There are no visible signs of contamination following the removal of plant, equipment and materials. All rubbish/ waste materials removed from site.	Statement provided and before/after photos.
			Soil testing for contaminants of concern as listed by Health Investigation Level of the National Environment Protection (Assessment of Site Contamination) Measure (1999) applicable to land use type.	Contamination will be appropriately remediated so that appropriate guidelines for land use are met, e.g. Health Investigation Level of the National Environment Protection (Assessment of Site Contamination) Measure (1999).	Contamination Remediation Report prepared by Land Contamination Consultant
				Excess sludge/material has been removed from surface water dams.	Site Contamination Audit Report and Site Audit Statement prepared by EPA Accredited Auditor (where required).

Table 10 (Cont'd)
Rehabilitation Objectives and Rehabilitation Completion Criteria

Rehabilitation Objective Category	Approved Rehabilitation Objectives	Spatial Reference	Indicator	Proposed Rehabilitation Completion Criteria	Justification/Validation Methods
Management of waste and process materials	Residual waste materials stored on site (e.g. overburden, waste rock and other wastes) will be appropriately contained / encapsulated so it does not pose any hazards or constraints for intended final land use.	A5, J5	Visual – capping material placement, type across emplacement	Visual – verification that capping, type and placement consistent with design	Photos, rehabilitation monitoring reports, as-constructed surveys, quality assurance records for construction (where required), erosion surveys, independent geotechnical reports (where required), groundwater/surface water monitoring reports. The structural integrity of the infrastructure and capping has been inspected by a suitably qualified engineer and determined to be suitable and safe as part of the intended final land use and water material adequately contained.
			Visual – indication of capping performance on final landform – vegetation health	Visual – no signs of compromised capping performance indicated by vegetation health – such as tree death (deeper root systems)	
			Visual – emplacement seepage and other indicators of groundwater issues – wet spots etc.	Visual – no areas of unexpected seepage	
			Measured - survey of emplacement capping to verify construction and to monitor settlement.	Survey verifies that capping placement consistent with design and settlement and/or material loss is within predicted limits and will not compromise final landform drainage via differential settlement.	
			Quality assurance records for the construction of the emplacement material including (where relevant) capping material, liner system, seepage control etc	Quality assurance records verify capping constructed and in accordance with design specifications relevant to site risks and target final land use. For example: - Capping depth - Capping material type - Capillary breaks - Seepage control.	
			Measured- surface and groundwater levels to verify water balance modelling and capping function	Groundwater and surface monitoring verify capping function e.g. 'store and release' and design performance permeability/seepage.	
			Measured – contamination levels in surface and groundwater surrounding emplacement for contaminants of concern associated with waste material emplaced.	Groundwater and surface water monitoring verify adequate containment of waste materials and seepage/leachate is not contributing to land/groundwater contamination.	
Landform Stability	The final landform is stable for the long-term and does not present a risk of environmental harm downstream / downslope of the site or a safety risk to the public/stock/native fauna.	A1, A5, G3, I1, J5, K4	Visual - indicators of erosion and land instability.	Visual- minimal erosion that would not require moderate to significant ongoing management and maintenance works.	Before and after photos, rehabilitation monitoring reports, as-constructed surveys, erosion surveys, independent geotechnical reports (where required) and or erosion modelling reports (where required) that indicate long-term stability of rehabilitated landform.
				Visual – no signs of land instability such as mass movement.	
				Visual - no areas of active gully erosion.	
				Visual - no evidence of tunnel erosion.	
				Visual – no evidence of active scour likely to compromise surface water management structure.	
			Measured - Survey of rehabilitated landform to verify final landform construction in accordance with Final Landform and Rehabilitation Plan.	Survey verifies final landform complies with final landform construction in accordance with approved Final Landform and Rehabilitation Plan.	An engineering assessment undertaken by a suitably qualified person concludes that high risk landforms (such as steep slopes, high walls) have been constructed in accordance with geotechnical design.
				High risk landforms (such as steep slopes, high walls) have been constructed in accordance with geotechnical design.	
			Visual - indicators that surface water management structure are functioning as designed.	Significant surface water management structures (e.g. spillways, drop structures, major drains and creek diversions) have been constructed in accordance with hydrological design.	An engineering assessment undertaken by a suitably qualified person concludes that significant surface water management structures (e.g. spillways, drop structures, major drains and creek diversions) have been constructed in accordance with hydrological design.
				Visual – no evidence of active scour likely to compromise surface water management structure.	
Bushfire	The risk of bushfire and impacts to the community, environment and infrastructure has been addressed as part of rehabilitation.	A1, A5, G3, I1, J5	Appropriate bushfire hazard controls (where required) have been implemented on the advice from the NSW Rural Fire Service.	Bushfire controls implemented.	Statement provided and before/after photos.
Surface Water	Runoff water quality from mine site meets the requirements of the relevant development consent(s) / Environment Protection Licence 1464 and does not present a risk of environmental harm.	A1, A5, G3, I1, J5	Water quality parameters selected from Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000 and or EPL 1464.	Water quality discharged from rehabilitated mining operation meet specifications in EPL 1464 and or ANZECC guidelines for specific environment.	Water quality monitoring reports.
					EPL 1464 relinquished by Environment Protection Authority.
					Independent hydrological assessment report.

Table 10 (Cont'd)
Rehabilitation Objectives and Rehabilitation Completion Criteria

Rehabilitation Objective Category	Approved Rehabilitation Objectives	Spatial Reference	Indicator	Proposed Rehabilitation Completion Criteria	Justification/Validation Methods
Water Approvals	Structures that take or divert water such as final voids, dams, levees etc. are appropriately licensed (e.g. under the *Water Management Act 2000*) and where required ensure sufficient licence shares are held in the water source(s) to account for water take.	G3, J5	Final landform considers advice from relevant Government Agency whether sufficient licence shares are available in the water source to account for water stored in voids and dams in the proposed final landform.	Water approvals / licences are granted by relevant NSW Government Agency.	Confirmation from relevant Government Agency that relevant water approvals / licences are able to be granted.
Groundwater	Groundwater quality meets the requirements of the development consent and does not present a risk of environmental harm.	A1, A5, G3, I1, J5	Water quality parameters selected from Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000 and or EPL 1464.	Water quality discharged from rehabilitated mining operation meet specifications in EPL 1464 and or ANZECC guidelines for specific environment.	Independent hydrological assessment report.
	Impacts to groundwater regime are within range as per the development consent / approved Soil and Water Management Plan.	A1, A5, G3, I1, J5	Groundwater quality both on and off a mining lease represent an acceptable level of change from a defined reference condition.	Groundwater levels and groundwater flow rates are consistent with the relevant approved trigger values / criteria.	Water quality monitoring reports. EPL 1464 relinquished by Environment Protection Authority. Independent hydrological assessment report.
Ecological rehabilitation	The vegetation composition of the rehabilitation contains species that are consistent with native vegetation communities of Central Tableland Peppermint Shrub-Grass Forest (PCT 3735), Newnes Plateau Peppermint-Ash Tall Forest (PCT 3687) and/or Central Tableland Ranges Peppermint-Gum Grassy Forest (PCT 3369) found in the local area.	A1, A5	Native plant species recorded from 0.04 hectare fixed monitoring plots are characteristic of the target vegetation community (PCT 3735, PCT 3687 or PCT 3369).	Native plant species are characteristic of the target vegetation community(s) when compared to analogue sites.	Before and after photos, rehabilitation monitoring reports, independent ecological reports (where required) that validate rehabilitation completion criteria have been met.
	The vegetation structure of the rehabilitation is similar to that of native vegetation communities of Central Tableland Peppermint Shrub-Grass Forest (PCT 3735), Newnes Plateau Peppermint-Ash Tall Forest (PCT 3687) and/or Central Tableland Ranges Peppermint-Gum Grassy Forest (PCT 3369) found in the local area.	A1, A5	Cover and abundance of plant growth forms recorded from 0.04 hectare fixed monitoring plots are characteristic of the target vegetation community (PCT 3735, PCT 3687 and/or PCT 3369), or an ongoing trend toward becoming characteristic is evident from the monitoring data.	Cover, abundance and height range of native plant growth forms are characteristic of, or trending towards, the target vegetation community type(s).	
	Levels of ecosystem function have been established that demonstrate the rehabilitation is self- sustainable.	A1, A5	Indicators of nutrient cycling are suitable for sustaining the target vegetation community (PCT 3735, PCT 3687 and/or PCT 3369).	Litter cover is within 10^{th}-90^{th} percentile variation range of reference sites/data	Rehabilitation monitoring reports, independent soil and/or ecological reports (where required) that demonstrate long-term function of rehabilitated landform.
			Evidence of plant regeneration from 0.04 hectare fixed monitoring plots or a walk over of the ecological rehabilitation area.	Second generation individuals of trees are within the 10^{th}-90^{th} percentile variation range of reference sites/data approved by the consent authority	
			Cover of exotic species within 0.04 hectare fixed monitoring plots is low.	Foliage cover of 'high threat exotic' (HTE) weeds is within 10^{th}-90^{th} percentile variation range of reference sites/data or at a level that does not cause significant risk to rehabilitation.	
			Soil health is suitable to sustain the target vegetation community(s) (e.g. PCT)	Total organic carbon is within 10^{th}- 90^{th} percentile variation range of reference sites/data; and	
				Total microbial biomass is within 10^{th}-90^{th} percentile variation range of reference sites/data approved by the consent authority; and	
				The ratio of fungus to bacteria (fungal:bacterial) biomass is within 10^{th}-90^{th} percentile variation range of reference sites/data	
			Resilience demonstrated by the effects of drought and fire on composition, structure and other function attributes.	Resilience to drought and fire.	
			Threats to rehabilitation.	Vertebrate pest species – presence and damage is recorded at a level that does not cause significant risk to rehabilitation.	
				Domesticated stock - presence and damage is recorded at a level that does not cause significant risk to rehabilitation.	
	Weed management requirements are consistent with surrounding final land uses.	K4	Cover of exotic species within 0.04 hectare fixed monitoring plots is low.	Foliage cover of 'high threat exotic' (HTE) weeds is within 10^{th}-90^{th} percentile variation range of surrounding final land use areas or at a level that does not cause significant risk to rehabilitation.	

4.2 Rehabilitation Objectives and Rehabilitation Completion Criteria – Stakeholder Consultation

Table 11 presents a summary of consultation undertaken with relevant stakeholders with regards to the rehabilitation objectives, rehabilitation completion criteria and proposed final land uses and landforms presented in this Plan. Further consultation with relevant stakeholders will be undertaken prior to the cessation of mining operations in 2026 to clarify rehabilitation requirements for specific areas within the Quarry, ensure optimal rehabilitation and final land use outcomes within the broader contact of the local region and confirm requirements for any relinquishment processes. As a minimum, this will include consultation with all stakeholders identified in **Table 11**.

Table 11 will be updated with each revision to this Plan to include details of further consultation with relevant and interested stakeholders.

Table 11
Stakeholder Consultation Activities

Stakeholder	Consultation Activities
Resources Regulator	• Form of Consultation: Letter (email transmission). • Date: 14 July 2022. • Matters Subject to Consultation: Rehabilitation Objectives and Rehabilitation Completion Criteria, and Final Land Use Domain Plans. • Outcomes: – The Resources Regulator responded on 25 July 2022 – Response: The Resources Regulator will review, assess and determine the rehabilitation objectives statement and rehabilitation completion criteria once formally submitted for approval.
Mining, Exploration and Geoscience	• Form of Consultation: Letter (email transmission). • Date: 14 June 2022. • Matters Subject to Consultation: Rehabilitation Objectives and Rehabilitation Completion Criteria, and Final Land Use Domain Plans. • Outcomes: No response received by 14 August 2022.
Heritage NSW Department of Planning and Environment	• Form of Consultation: Letter (email transmission). • Date: 11 May 2022. • Matters Subject to Consultation: Rehabilitation Objectives and Rehabilitation Completion Criteria, and Final Land Use Domain Plans. • Outcomes: No response received by 14 August 2022.
Biodiversity, Conservation and Science Directorate (BCS)	• Form of Consultation: Letter (email transmission). • Date: 11 May 2022. • Matters Subject to Consultation: Rehabilitation Objectives and Rehabilitation Completion Criteria, and Final Land Use Domain Plans.

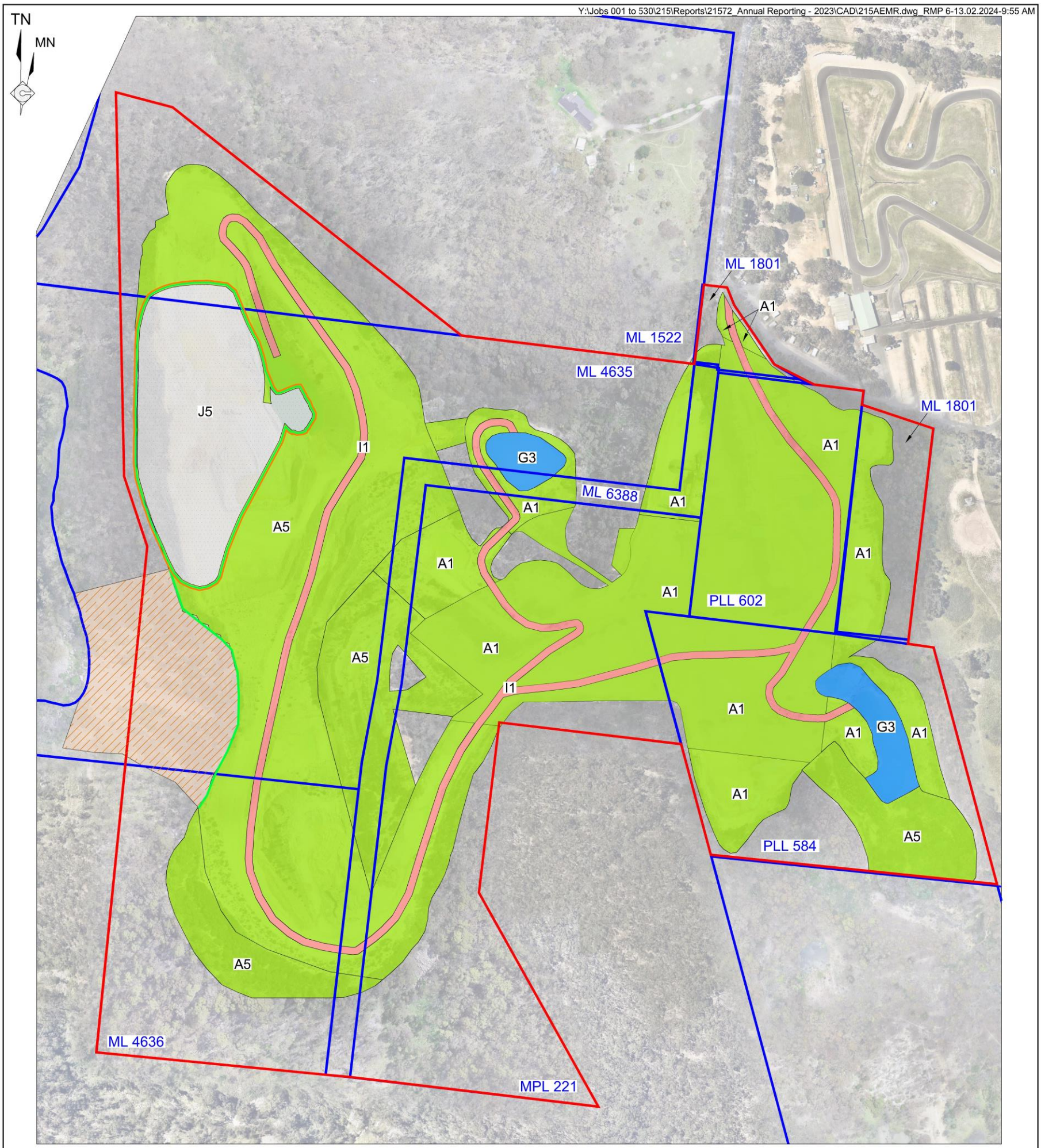
Table 11 (Cont'd)
Stakeholder Consultation Activities

Stakeholder	Consultation Activities
Biodiversity, Conservation and Science Directorate (BCS) (Cont'd)	• Outcomes: – BCS responded on 27 July 2022. – Response: Recommended refinement of performance measures, completion targets and trigger points for corrective action, as well as a request for further consultation regarding identification of analogue sites. – Actions: BCS' feedback has been considered during finalisation of this document and Sections 6.2.5 and 8.1 have been updated to provide clarification on matters raised by BCS. It is noted that BCS has requested quantitative trigger points related to performance or completion criteria within the Trigger Action Response Plan, however, the *Form and Way: Rehabilitation Management Plan for Large Mines (July 2021)* and associated guidelines require the Trigger Action Response Plan to be prepared with regard to the Rehabilitation Risk Assessment rather than objectives or completion criteria.
Department of Planning and Environment – Water	• Form of Consultation: Letter (email transmission). • Date: 11 May 2022. • Matters Subject to Consultation: Rehabilitation Objectives and Rehabilitation Completion Criteria, and Final Land Use Domain Plans. • Outcomes: No response received by 14 August 2022.
Lithgow City Council (Council)	• Form of Consultation: Letter (email transmission). • Date: 11 May 2022. • Matters Subject to Consultation: Rehabilitation Objectives and Rehabilitation Completion Criteria, and Final Land Use Domain Plans. • Outcomes: – Council responded via telephone on 28 July 2022 – Response: Noted that Council is unlikely to support determination of partial Commercial / Industrial Final Land Use for the Quarry Site given that this land use would require re-zoning as commercial / industrial uses are currently not permitted within land zoned C4 under the Lithgow LEP. – Actions: the Company will undertake further consultation with Council closer to cessation of operations and commencement of final rehabilitation of the Quarry Site to ensure an appropriate final land use is achieved.
Environment Protection Authority	• Form of Consultation: Letter (email transmission). • Date: 11 May 2022. • Matters Subject to Consultation: Rehabilitation Objectives and Rehabilitation Completion Criteria, and Final Land Use Domain Plans. • Outcomes: – The EPA responded on 21 July 2022 – Response: The EPA has reviewed the documents and have no specific comments regarding the proposed actions.
Bathurst Local Aboriginal Land Council	• Form of Consultation: Letter (email transmission). • Date: 11 May 2022. • Matters Subject to Consultation: Rehabilitation Objectives and Rehabilitation Completion Criteria, and Final Land Use Domain Plans. • Outcomes: No response received by 14 August 2022.
NSW Crown Lands	• Form of Consultation: Letter (email transmission). • Date: 11 May 2022. • Matters Subject to Consultation: Rehabilitation Objectives and Rehabilitation Completion Criteria, and Final Land Use Domain Plans. • Outcomes: No response received by 14 August 2022.

5. Final Landform and Rehabilitation Plan

5.1 Final Landform and Rehabilitation Plan – Electronic Copy

Plan 1 presents the final landform features for the Quarry Site and **Plan 2** presents the final landform contours for the Quarry.



REFERENCE
- Mining Lease Boundary
- Project Approval Boundary

Final Land Use Domain
- Infrastructure
- Native Ecosystem
- Final Void
- Water Storage (Excluding Final Void)
- Other

Final Landform Feature
- Perimeter Safety Bund
- Security Fence
- Rock Scree

Final Land Use Domain	Mine Domain	Ref	Area (ha)
Infrastructure	Infrastructure Area	I1	1.3
Native Ecosystem	Infrastructure Area	A1	8.5
Native Ecosystem	Active Mining Area (Open Cut Void)	A5	4.0
Final Void	Active Mining Area (Open Cut Void)	J5	2.2
Water Storage (Excluding Final Void)	Water Management Area	G3	0.6
Other (Rock Scree)	Overburden Emplacement Area	K4	1.8

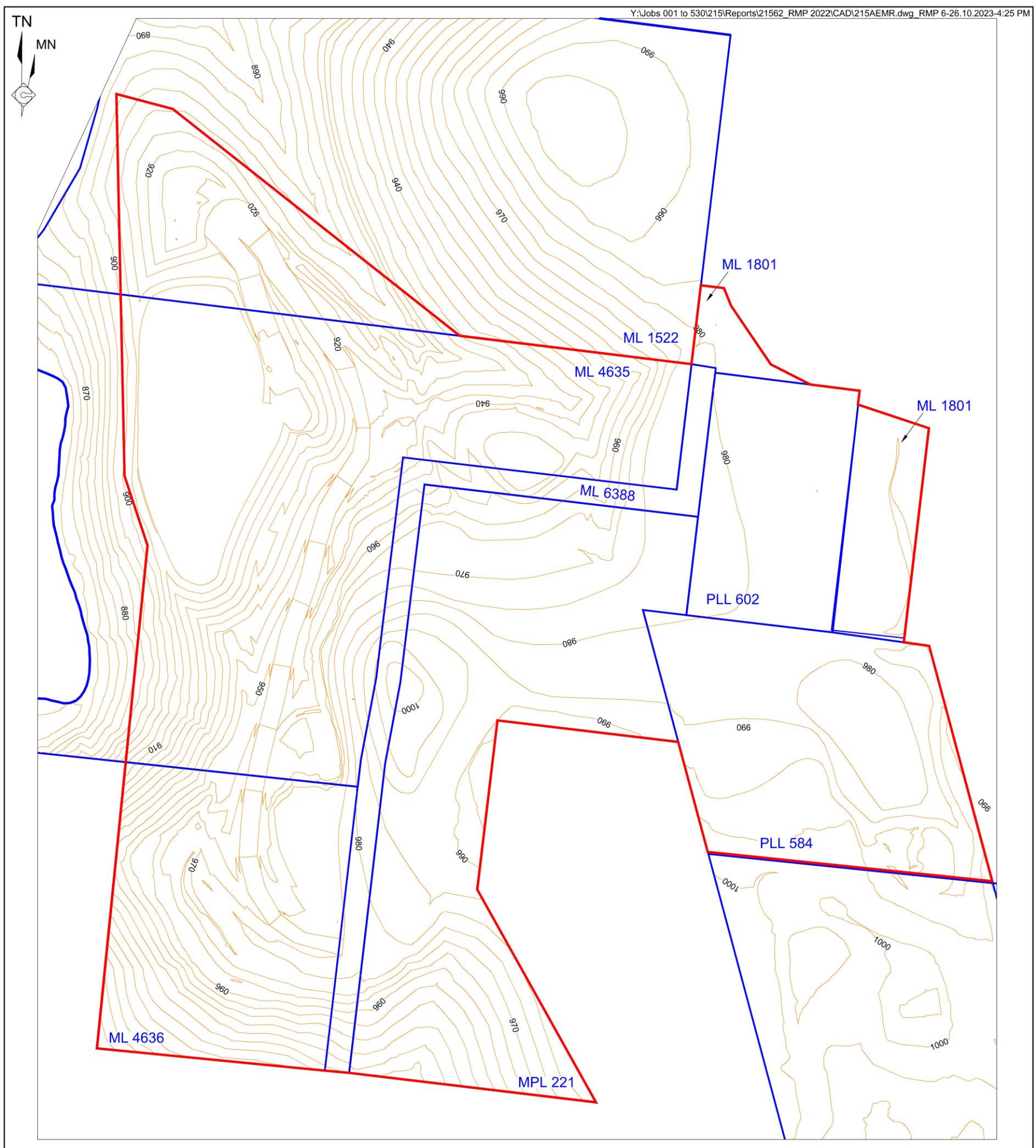
Mine Name	Marrangaroo Quarry
Plan Name	Plan 1 Final Landform Features
Anticipated Year of Relinquishment	2047 (Indicative)
Date Plan Created	12 February 2024
Data Theme Submission ID Numbers	7051 & 7053

SCALE 1:3 500 (A3)

50 0 50 100 150m

Base Photo Source: CEH Survey 17 November 2021

Plan 1
FINAL LANDFORM FEATURES



REFERENCE
- Mining Lease Boundary
- Project Approval Boundary
- Final Landform Contour (mAHD)(Interval = 5m)

Mine Name	Marrangaroo Quarry
Plan Name	Plan 2 Final Landform Contours
Anticipated Year of Relinquishment	2047 (Indicative)
Date Plan Created	26 October 2023
Data Theme Submission ID Numbers	6433

SCALE 1:3 500 (A3)

50 0 50 100 150m

Base Data Source: CEH Survey 17 November 2021

Plan 2
FINAL LANDFORM CONTOURS

6. Rehabilitation implementation

6.1 Life Of Mine Rehabilitation Schedule

Based on current production rates and the extent of known geological deposits, it is anticipated that extraction operations within the North-South Quarry will be completed by 2026. It is noted that there are approximately 20 years of reserves remaining within the North-East Quarry area, however, the existing Processing Plant is located on top of the reserves in this area.

Relocation of the existing Processing Plant to allow for extraction within the North-East Quarry area is approved under DA 090-95 and described in the initial *Statement of Environmental Effects* for the Quarry (RWC, 1995). However, the approved locations for the relocated Processing Plant are either within the South-West Quarry, an area which is currently undergoing rehabilitation and is likely to be fully rehabilitated by cessation of extraction operations within the North-South Quarry, or within the North-South Quarry Sump, an area proposed to be retained as a permanent water storage as shown on **Plan 1**. As a result, relocation of the existing Processing Plant to allow extraction within the North-East Quarry area would require determination of an alternate location for the relocated Processing Plant. Accordingly, these relocation works would be the subject of a future application to modify DA 090_95.

Considering the above, the Company is unlikely to proceed with relocation of the existing Processing Plant within the next two years and is currently developing a targeted program of exploration to determine the extent of mineralisation within ML1522 with the aim of seeking approval for a potential extension to the approved extraction area. This extension would be the subject of a future development application (see Section 6.2.1.14).

Due to the relative uncertainty surrounding future extraction operations following cessation of extraction within the North-South Quarry, **Plan 3** presents the indicative rehabilitation schedule for the Quarry Site by depicting those areas which would be rehabilitated during the 2-yearly period following the commencement of this plan until cessation of extraction within the North-South Quarry. This document will be updated to reflect the future extraction and subsequent rehabilitation of areas within ML1522 and/or the North-East Quarry following receipt of the relevant approvals for these proposed activities.

It is noted that the schedule presented on **Plan 3** is applicable only until the completion of the Ecosystem and Land Use Establishment phase of rehabilitation operations within all Mining Domains (see Section 6.2). Approximate timings for the Ecosystem and Land Use Development phase of rehabilitation have not yet been defined as this phase will principally involve the monitoring and maintenance of completed rehabilitation works until completion criteria identified in Section 4.1 have been achieved.

Following the cessation of extraction operations within the North-South Quarry, all other Mining Domains would be subject to decommissioning, landform establishment, growth medium development and ecosystem and land use establishment rehabilitation phases.

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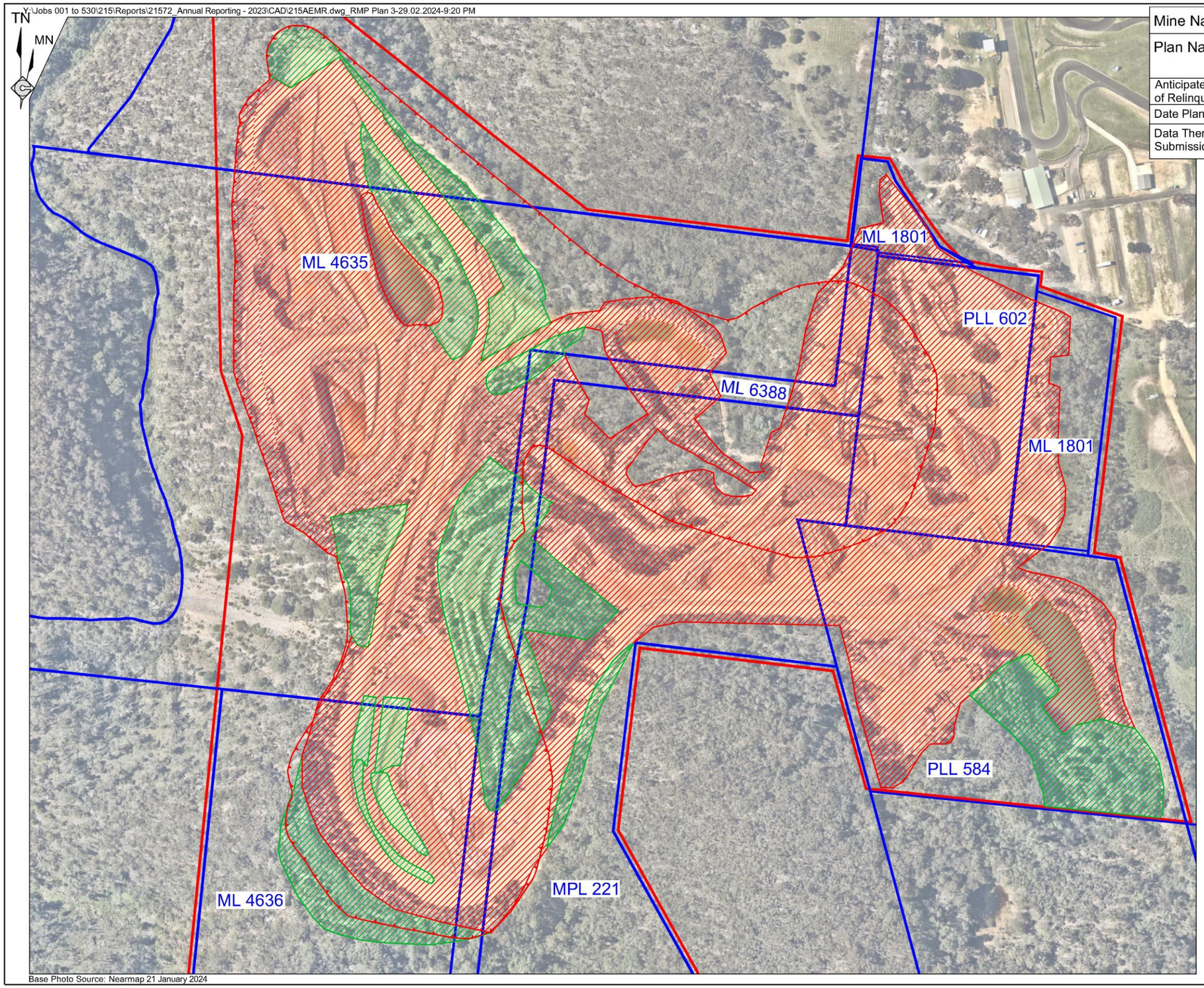

Mine Name	Marrangaroo Quarry
Plan Name	Plan 3 Progressive Rehabilitation Schedule - Year 2
Anticipated Year of Relinquishment	2047 (Indicative)
Date Plan Created	13 February 2024
Data Theme Submission ID Numbers	7062, 7063

REFERENCE
- Mining Lease Boundary
- Project Approval Boundary
- Approved Extraction Limit

Rehabilitation Forecast
- Forecast Disturbance
- Forecast Land Prepared for Rehabilitation
- Ecosystem and Land Use Establishment

SCALE 1:3 000 (A3)

50 0 50 100 150m

Base Photo Source: Nearmap 21 January 2024

Plan 3
PROGRESSIVE REHABILITATION
SCHEDULE - YEAR 2

6.2 Phases of Rehabilitation and General Methodologies

6.2.1 Active Mining Phase

6.2.1.1 Soils and Materials

Soils across the Quarry Site and surrounding areas are generally skeletal due to the steepness of the slopes and outcropping rock. Notwithstanding the relative scarcity of soil resources, on the basis that the Rainfall (R-) Factor for the Marrangaroo area is 1,500, and with the slopes of the local setting exceeding 15%, the Quarry Site is deemed as having a High Erosion Hazard (refer to Figure 4.6 of the *Blue Book*).

In lieu of available soil, weathered overburden has been successfully utilised in rehabilitation. Some of the final benches constructed using overburden approach 30°, which is equivalent to the topography of the surrounding landforms. Notwithstanding this, whilst the steeper benches are sympathetic to the local setting, the construction of final landforms using replacement soils or weathered overburden requires consideration of the High Erosion Hazard.

Areas of disturbance requiring soil stripping will be clearly defined following vegetation clearing (using marker pegs/posts if necessary). Soil will be placed either directly on areas requiring rehabilitation to minimise double handling and maximise efficiencies, or within a temporary stockpile area. The topsoil and subsoil stockpiles will be no higher than 2m and 3m respectively, and with slopes no greater than 1:2 (V:H) with a slightly roughened surface to minimise erosion.

Wherever possible, no soil will be removed in wet conditions to avoid breakdown of the soil structure. Topsoil will be stripped to an average depth of approximately 15cm in all areas of disturbance and subsoil to a depth of approximately 45cm (total depth of 60cm) where present. Stripping will generally be undertaken using an excavator.

6.2.1.2 Flora and Fauna

No flora species of national significance or rare / threatened species have been recorded from previous surveys. The ridge top / upper slopes are covered by mixed eucalypt woodland with tree canopies approximately 10m to 18m in height. Lower slopes also support this vegetation community with canopies up to 22m high. The species mix is similar to that on upper slopes.

The creek flats adjoining Marrangaroo Creek (beyond ML1522) consist of wetter / denser creek flat forest. The unnamed ephemeral tributary dissecting the Quarry Site has poorly developed riparian flora relative to Marrangaroo Creek. Currently there are no infestations of noxious weeds.

A total of 68 fauna species have been recorded during previous surveys including: 3 amphibians; 4 reptiles; 42 birds (3 vulnerable); and 21 mammals (2 vulnerable bat species). The Purple Copper Butterfly listed as endangered under the *Biodiversity Conservation Act 2016* and vulnerable under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) was also recorded. A referral to the Commonwealth confirmed that the Quarry does not constitute a controlled action under the EPBC Act.

Environmental management control relating to flora and fauna are as follows.

- Vegetation clearing will be restricted to approved areas of disturbance.
- Rehabilitation and maintenance works will continue to be implemented as advised by contracted ecological specialist.
- Weed control will continue to be undertaken by site management and contracted specialist. The principal species that will be targeted include Blackberry and English Broom.
- Ongoing inspections including a three yearly rehabilitation progress inspection and report will continue to be undertaken and reported within the respective AEMR / Annual Rehabilitation Report.

6.2.1.3 Rock/Overburden Emplacement

All waste rock / overburden material, unsaleable fines and split rock not sold as fill material will continue to be placed as backfill within the South-West Quarry void. It is intended that the South-West Quarry will be backfilled to approximately 960m AHD and ultimately be used for product stockpiling until decommissioning.

The rock scree located to the west of the North-South Quarry is a historic overburden emplacement area which was formed during extraction operations in this area during the 1950s and 1960s. No further emplacement of material has been undertaken in this area since the Company's purchase of the Quarry in 1989.

A geotechnical review (PSM, 2023) concluded that the rock scree is unsafe for access by machinery or personnel due to the steepness of the slope and risk of rockfall. In addition, removal of the material on the slope itself is not feasible and cannot be achieved safely. Furthermore, any attempt to remove the material on the slope would result in adverse impacts on the surrounding vegetation and the downslope Marrangaroo Creek.

As a result, and to manage the risk of injury and damage to equipment, it was recommended to allow the scree slope to naturally revegetate. In addition, annual inspections of the rock scree will be undertaken to identify any ongoing weed control requirements, and a suitably qualified weed control contractor engaged to undertake weed spraying as required.

6.2.1.4 Waste Management

The principal wastes that will be generated can be categorised as production and non-production wastes. Production waste includes waste rock / overburden (see above). Non-production wastes may include:

- greases, oils, filters, tyres and batteries from maintenance of vehicles and equipment;
- bulk scrap metal and plastics from discarded equipment;
- general office wastes e.g. paper;

- general waste generated by employees – e.g. food scraps, paper, cardboard, aluminium and steel cans; and
- wastewater from ablution facilities.

All hydrocarbon wastes will typically be stored in 205L drums or a 14,000L bulk storage container within a bunded area until collected by a licensed contractor. Worn tyres will be temporarily stored and removed from site regularly.

Paper, cardboard, steel and aluminium will be stored separately in 240L mobile garbage bins or skip bins and collected regularly by a licenced contractor for recycling. General waste material will also be collected and removed by a licenced contractor to a licensed landfill facility.

All wastewater generated on the site will continue to be treated through the approved on-site septic tank system.

6.2.1.5 Geology and Geochemistry

Host rock units at the Quarry belong to the Upper Devonian Lambie Group, which consists of a folded sequence of interbedded shale, siltstone, sandstone and conglomerate. The Lambie Group is intruded by Carboniferous granite, which metamorphosed the sedimentary units overlying the granite and adjacent to its contact. This metamorphism manifests as a thick sequence of quartzite (formerly sandstone) and narrower hornfels units.

The Quarry stratigraphy comprises an upper shale dominated succession (approximately 50m thick) overlain by unconsolidated sediments (collectively referred to as overburden), and a lower quartzite unit (up to 110m thick). The quartzite and the shale succession are separated by a narrow unit (approximately 10m thick) of mixed quartzite, shale and sandstone (referred to as the contact zone).

The Quarry host rocks are folded along north-northwest to northwest trending fold axes, with a broad central syncline and a smaller anticline in the southwest. The eastern limb of the syncline dips shallowly to the west and the western limb is sub-vertical. Current Quarry extraction is from the North-South Quarry, located on the western limb. Previous extraction operations were undertaken within the BHP Quarry on the eastern limb (now used for water storage) and the South-West Quarry in the core of the anticline (now used for fill storage).

6.2.1.6 Material Prone to Spontaneous Combustion

As no material in the Quarry is prone to spontaneous combustion, no specific management measures are necessary.

6.2.1.7 Material Prone to Generating Acid Mine Drainage

Sulphides have previously been identified within a ‘discrete’ zone of the southern face of the North-South Quarry (see **Figure 8**). This zone is a ‘contact zone’ formed during the emplacement of the Carboniferous granites and contains ‘low grade’ quartzite, shale and sandstone material. The sulphides, whilst significant in their concentration, are limited to a small area for which no further extraction activities are planned, therefore limiting the potential for further exposure.

Geological investigations undertaken by Central West Scientific (CWS) (2015) confirmed that acid rock drainage (ARD) from this discrete contact zone was occurring, however, there are no significant/immediate risks posed by the presence of these sulphides.

An additional minor discrete zone of sulphidic material was identified within the northern area of the North-South Quarry during 2023 (see **Figure 8**). In response, RGS Environmental Consultants Pty Ltd (RGS) were commissioned by the Company to complete a preliminary geochemical assessment and provide advice regarding the ongoing and adaptive management of potentially acidic (sulphidic) material within the Quarry. This information was detailed within a "Stage 1" Technical Memorandum prepared by RGS. In summary, the "Stage 1" Technical Memorandum concluded the following.

- Sulphidic materials within the local stratigraphic profile are likely located in a discrete interval ('zone of interest') within or just below the contact zone (comprising low-grade quartzite +/- shale and sandstone materials) and towards the upper part of the quartzite unit.
- Materials within the 'zone of interest' have the potential to contain elevated concentrations of sulphide minerals (e.g. pyrite) that can react and generate low pH conditions if exposed to air and water.
- Materials represented by scalp samples cannot currently be classified as Virgin Excavated Natural Materials (VENM) due to the presence of sulphides and low pH values.
- To date, no static or kinetic leach testing has been completed on samples of quarry materials to assess the potential release of acidity, salinity and dissolved metals / metalloids either to initial contact water, or to contact water over time.
- ALS Laboratory test results indicate that materials represented by manufactured sand and 20mm road base samples may have potential to generate acid, although this is attributable to a modest amount of total sulphur and low acid neutralising capacity. Hence, there may be some potential to ameliorate the potential acidity in these materials via blending with a small amount of alkaline material such as a crushed / fine limestone.

The following preliminary recommendations were also provided.

- Representative samples of product materials from the existing approved operation should be collected and geochemically tested according to the framework described in the "Stage 1" Technical Memorandum.
- Representative samples of cuttings from the future blast hole programs should be collected and geochemically tested according to the framework described in the "Stage 1" Technical Memorandum.
- The merits of amelioration of the actual and potential acidity in selected quarry products by addition of / blending with a small amount of alkaline material such as a crushed / fine limestone should be considered.

- Potentially Acid Forming (PAF) materials at the 'zone of interest' should remain undisturbed, where possible, and if disturbance cannot be avoided, selective handling and encapsulation of PAF materials within Non-Acid Forming (NAF) overburden materials should be considered.
- If PAF materials require encapsulation, the merits of physical compaction of these materials and crushed / fine limestone addition to surface should be investigated to further limit the potential for ARD.
- If feasible, the merits of disposal of some excavated PAF materials from the 'zone of interest' under water (i.e. within the North-South Quarry sump) should be considered. This approach would aim to permanently store PAF materials underwater, excluding oxygen from these materials and limiting the potential for ARD.

It was further recommended that a "Stage 2" work program should be completed to define any potential ARD risks associated with proposed extraction operations within ML1522. This "Stage 2" work program commenced during early 2024 and this Plan will be updated to reflect any additional outcomes and recommendations arising from completion of this work program.

Notwithstanding, in order to ensure that no acidic water is discharged from the Quarry, water with a pH of <6.5 will continue to be stored on the Quarry Site in a manner such that it will not discharge to land or water external to the Quarry (see Section 6.2.1.9).

A program of dosing on-site water storages with alkaline amendments and monitoring of water quality within the storages and adjacent Sanderson and Marrangaroo Creeks was undertaken by the Company between 2016 and 2018. This program concluded the following.

- Based on an analysis of pH, major ions and major ion ratios, there is an effect on water quality within the local Sanderson Creek catchment area arising from natural acid rock drainage.
- There is insufficient evidence to indicate a relationship between the Quarry Sump or the Retention Dam and Sanderson Creek (i.e. from seepage) and therefore regular dosing with alkaline amendments can be discontinued.
- In recognition of the quality of the receiving waters, it was also recommended that the EPA be requested to amend the discharge water quality criteria for EPL 1464.

Until such time as EPL 1464 is modified, in the event that water discharge is required, water will be treated with alkaline amendment to increase pH to within the required criteria.

6.2.1.8 Ore Beneficiation Waste Management

The only processing residues are the fines and silts produced during washing of the <5mm fines to produce a washed sand product which are collected in BHP Dam and silt wedge pit. These fines and silts are either sold as send product or blended to produce select products. Therefore, there are no 'tailings' areas or facilities.

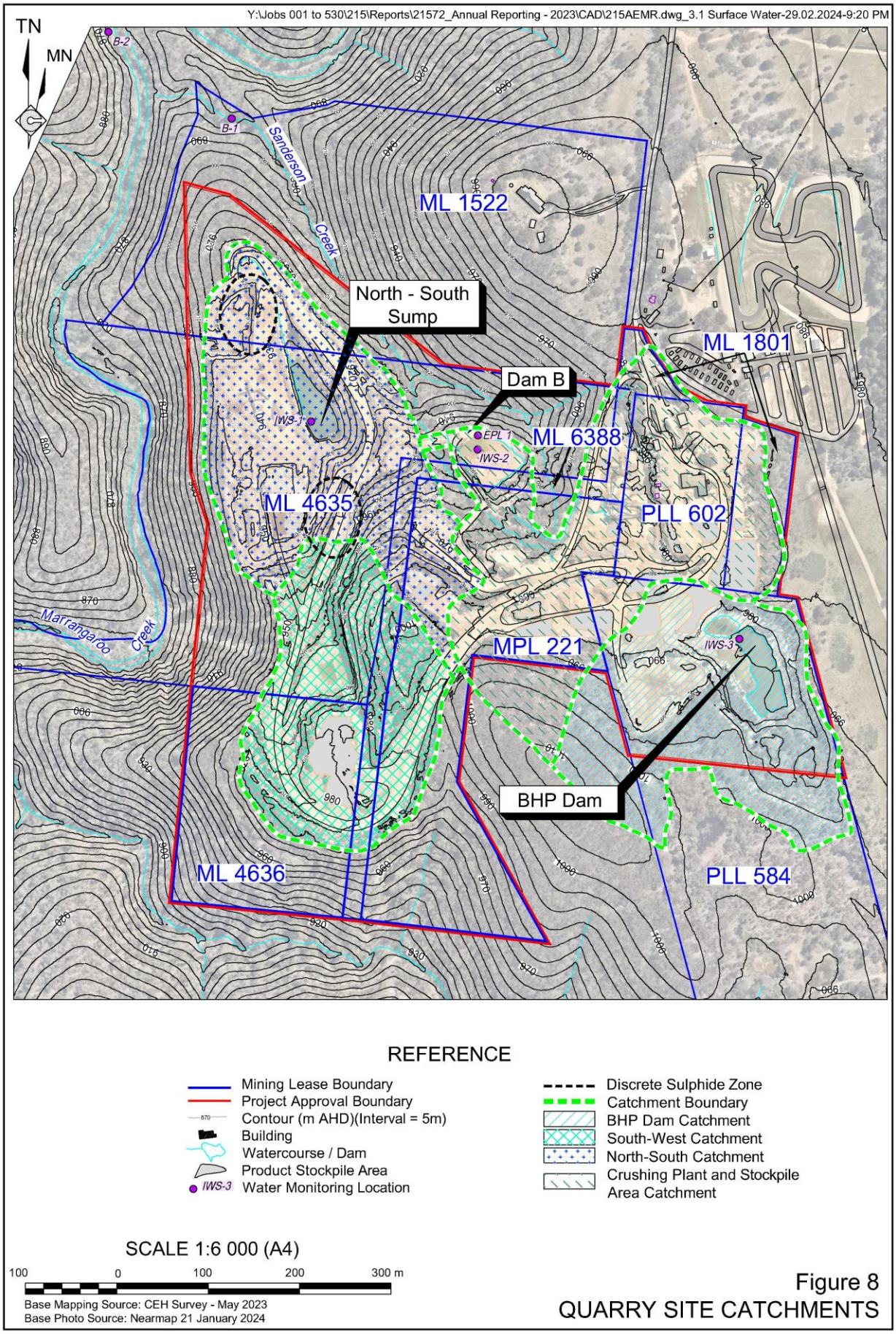

Figure 8
QUARRY SITE CATCHMENTS

6.2.1.9 Erosion and Sediment Control

For management purposes, the water within the Quarry has been divided into two classes of runoff, namely:

- clean water – surface runoff from undisturbed catchment areas; and
- dirty water – surface runoff from areas likely to contain pollutants such as sediments, oil and grease.

As the disturbance areas are at, or near the most elevated points of the local setting, there are minimal catchment areas outside of the approved disturbance and no practical opportunities to divert clean water. Therefore, no external clean water catchments require active management.

All dirty water runoff from disturbed areas is effectively contained on site as follows (see **Figure 8**).

- Surface water runoff from the crushing and screening plant and stockpile area is directed to the primary sediment retention dam (Dam B) which has a capacity of approximately 12ML.
- Surface water runoff from the South-West Quarry area will be directed to the North-South Quarry Sump which has a capacity of approximately 22ML
- Surface water runoff from the BHP Quarry area and the south-eastern section of the stockpile area is directed to the BHP Dam which also has a considerable holding capacity (approximately 11ML).
- Surface water runoff from the North-South Quarry is directed to the active North-South Quarry Sump.

Where necessary, water may be pumped from the active North-South Quarry sump to either Dam B or BHP Dam. Water in these storage dams is either reused for dust suppression, evaporates or leaves the Quarry as groundwater. In the event that water discharge was required, the spillway from Dam B is a licenced discharge point under the EPL 1464 (see **Figure 8**).

6.2.1.10 Ongoing Management of Biological Resources for use in Rehabilitation

Appropriate sedimentation controls, including sediment fencing, will be placed immediately down slope of any soil stockpiles and maintained until such time as a stable vegetation cover over the stockpile is achieved. Any soil stockpile likely to be retained for more than 3 months and that has not naturally established vegetation cover will be stabilised using a non-persistent cover crop.

In the event that unacceptable weed generation is observed on the soil stockpiles, a weed eradication program will be implemented. There will be no vehicle access on the soil stockpiles.

6.2.1.11 Mine Subsidence

As extraction is undertaken by open cut methods, and no previous underground mining has occurred within the immediate area, no specific management measures are necessary.

6.2.1.12 Management of Potential Cultural and Heritage Issues

An artefact scatter has been identified near Marrangaroo Creek to the west of the Quarry Site (see **Figure 2**). A 60m conservation zone has been established surrounding the scatter. The Company will also continue to make all employees and contractors aware of their obligations under the *National Parks and Wildlife Act 1974* and, should any suspected relic be uncovered during extraction-related activities, work in the area surrounding the relic would cease and the Heritage NSW and the Local Aboriginal Land Council will be notified.

There are no recorded items of non-indigenous heritage within or directly adjacent to the Quarry. Therefore, no specific management measures are required.

6.2.1.13 Exploration Activities

An ESF2 application seeking formal confirmation from the NSW Resources Regulator that rehabilitation of exploration related disturbance associated with exploration drilling within ML1522 undertaken during 2023 (APO0001371 / MAAG0017032) was submitted on 12 February 2023.

Rehabilitation of any future exploration activities at the Quarry Site will be undertaken in accordance with the requirements *Exploration Code of Practice: Rehabilitation* and the relevant APO approval(s).

6.2.2 Decommissioning

6.2.2.1 Site Security

Existing site security measures will be maintained during decommissioning and active rehabilitation operations at the Quarry unless they are required to be modified for rehabilitation purposes. No public access to the Quarry Site is currently permitted, with the main site entry points secured by locked gates during and outside of operating hours. Exclusion of the public from the Quarry Site is currently provided via a combination of perimeter security fencing and stock-proof fencing.

Existing security fencing that is to be retained will be structurally assessed and repaired or replaced where necessary. Prior to permitting public access to the Quarry Site, permanent safety bunds will be constructed around the top edge of batter walls to prevent inadvertent access to steep batter slopes and rehabilitated areas. Where safety bunds are already in place, these will be assessed and repaired as required or removed and replaced with waste rock safety bunds where existing safety bunds contain growth medium material required for rehabilitation.

6.2.2.2 Infrastructure to be Removed or Demolished

Table 12 presents a list of the site features to be decommissioned to achieve the final land use. Any infrastructure not required for the final land use will be subject to engineering assessments to identify potential risks associated with closure and decommissioning activities, where required.

Table 12
Assets in Mining Domains to be Removed or Decommissioned

Domain[1]	Assets	Decommissioning and Demolition Requirements
1 – Infrastructure Area	Roads: includes internal unsealed haul roads and access roads.	Selected access roads, internal roads and perimeter access tracks will be retained for future site management and tourism access purposes. All remaining roads and access tracks will be ripped, soiled and revegetated.
	Buildings: includes office, weighbridge, workshop, amenities, control room, crushing and screening plant (hopper, primary, secondary & tertiary crushers, various screens & conveyors).	All buildings, plant and equipment not required for post-mining land use will be dismantled / demolished and removed. The septic system will be pumped out for offsite disposal. Concrete footings will be broken up and removed. All hydrocarbons will be removed from site and any staining remediated.
3 – Water Management Area	BHP Dam, Dam B and North-South Quarry Sump, dirty water catch drains, mobile pumping system and associated piping.	All pumps and piping will be removed. BHP Dam and Dam B to be retained as part of final landform.
4 – Overburden Emplacement Area	No assets present.	No specific demolition requirements.
5 – Active Mining Area (Open cut void)	North-South Quarry: remaining extraction area - contains mobile earthmoving equipment. South-West Quarry: partially backfilled with overburden.	No specific demolition requirements – all mobile equipment to be floated from site following completion of operations / rehabilitation.
Note 1: see **Figure 7**		

All demolition procedures and subsequent waste removal undertaken during the decommissioning phase of rehabilitation operations will comply with requirements as identified through consultation with government agencies. As a minimum, the following controls will be implemented during demolition works at the Quarry Site.

- Sites will be continually damped down with water to suppress dust during demolition, with potentially contaminated water captured as appropriate.
- Works will be undertaken so as to minimise the generation of particulate matter.
- Works will not be undertaken during periods of high wind.
- Loads of waste material removed from demolition sites will be covered prior to transportation.

All material and waste products generated from any demolition, decommissioning and/or removal operations will be collected and either disposed of within the Quarry Site where appropriate, removed immediately from the Quarry Site or stored in appropriate (i.e. disturbed) areas for removal by a licensed waste contractor as soon as practicable.

6.2.2.3 Buildings, Structures and Fixed Plant to be Retained

Figure 6 shows key infrastructure to be retained as part of the final land use. Existing infrastructure to be retained includes:

- the access road off Oakey Forest Road;
- internal access roads for site maintenance;

- the BHP Dam;
- Dam B; and
- existing safety bunds and security fencing around open voids and batters.

Short-term risks associated with the retention of nominated infrastructure and structures are relatively low as these features have primarily been retained for safety purposes (e.g. safety bunds, security fences), to facilitate access to areas of the Quarry Site.

Long-term risks to public safety and the environment associated with retained infrastructure and structures would only occur in the absence of appropriate maintenance. Roads will be inspected following high intensity rainfall events to ensure that conditions remain suitable for safe access to publicly accessible areas. Failure of roads may contribute to the generation of sediment laden water which may impact water quality within local watercourses. Security fencing and safety bunds will also be inspected regularly to ensure that entry to final void areas remains effectively restricted. Failure of security fences and safety bunds would present a significant risk to public safety.

Prior to and during the decommissioning and landform establishment phases of rehabilitation operations, structural and engineering assessments will be carried out as required prior to the relinquishment of retained and newly constructed infrastructure. Any necessary repair, replacement or re-design works recommended as part of these assessments will be carried out and assessed by a suitably qualified engineer before public access is permitted to the Quarry Site.

6.2.2.4 Management of Carbonaceous / Contaminated Material

No contaminated or polluted land has been identified within the Quarry Site, however, as identified in **Table 10**, a single occurrence contamination assessment report will be prepared by a suitably qualified expert prior to the commencement of decommissioning activities.

In the event that contaminated materials are identified and it is not possible or practicable to remediate these materials either on or off site, contaminated materials will either be removed from the Quarry Site and disposed of at an appropriately licenced waste facility or disposed of at the Quarry Site, where appropriate.

6.2.2.5 Hazardous Materials Management

No hazardous materials are proposed to be retained following the cessation of extraction and rehabilitation operations. As identified in **Table 10**, a hazardous materials audit of the Quarry Site will be conducted concurrently during preparation of the single occurrence contamination assessment report by a suitably qualified person prior to the commencement of decommissioning activities to identify all potentially hazardous materials and any associated risks.

Explosives will be retained and stored off-site for any final shaping of void walls, if required, and will be handled exclusively by appropriately licensed persons at all times.

On-site hydrocarbons and storage will be retained for use during rehabilitation operations before being removed. All remaining fuel and oil will be removed from site before storage and filling infrastructure is decommissioned and removed. Any soils or material that is identified as being contaminated by hydrocarbons will be removed and treated as outlined in Section 6.2.2.4.

All other hazardous materials identified at the Quarry Site will either be retained in situ, disposed of at the Quarry Site or removed and disposed of at an appropriately licences facility. Hazardous material types, volumes, removal methods, dates of associated removal works and contractors who completed those works, disposal methods (including the details of any off-site disposal facility) and any waste transportation records and receipts will be recorded in a dedicated *Rehabilitation Quality Assurance Register*.

6.2.2.6 Underground Infrastructure

No underground infrastructure exists at the Quarry Site, therefore, no specific management or decommissioning measures are required.

6.2.3 Landform Establishment

6.2.3.1 Water Management Infrastructure

As identified in **Figure 6**, the BHP Dam and Dam B will be retained as part of the final landform while the North South Quarry open cut void will be retained and converted into a water storage. Landform establishment activities relating to the North South Quarry open cut void are detailed in Section 6.2.3.4.

All other water management structures, including silt ponds and associated infrastructure (e.g. water tanks, pipelines and pumps) will be removed and disturbed areas rehabilitated following the cessation of extraction operations. Water within the silt ponds would be allowed to evaporate naturally.

Sediment material on the floor of all water storage structures will be tested for contamination and any contaminated material will be remediated and disposed of in accordance with procedures outlined in Section 6.2.2.4. Following the removal of any contaminated material, any liners would be removed and disposed of and the growth medium bunds which form the silt pond walls will either be harvested for use elsewhere within the Quarry Site or pushed and spread during profiling of the silt pond footprints. Silt ponds will be capped with approximately 1m of overburden materials and profiled to be consistent with the surrounding landscape. These areas will either allowed to revegetate naturally through the seedbank contained within spread growth medium, colonisation via airborne seed, or revegetated using direct seeding methods.

6.2.3.2 Final Landform Construction: General Requirements

As shown on **Figure 6**, the majority of the Quarry Site will be progressively rehabilitated to achieve the appearance of vegetated natural landforms in the surrounding area. Areas which will remain unvegetated, including the rock scree and water management areas, will be consistent with the final land uses for the Quarry Site.

Disturbed areas within the Quarry Site which do not form part of identified rock scree or water management areas will be rehabilitated to achieve a final land use of Nature Conservation (**Figure 6**). Following revegetation with species based on analogue sites established in the vicinity of the Quarry Site (see Section 8.1), these areas will enhance habitat connectivity and ecosystem values within adjacent areas of remnant vegetation.

Following the completion of rehabilitation operations, it is not expected that these areas will present any specific geotechnical or geochemical risks. Additionally, it is not expected that these areas will require specific erosion and sediment control measures following the establishment of vegetation. Notwithstanding, a geotechnical assessment of the final landform will be completed prior to relinquishment.

6.2.3.3 Final Landform Construction: Reject Emplacement Areas and Tailings Dams

With the exception of the historical rock scree, no active overburden emplacement area exists at the Quarry Site. Overburden is used to progressively backfill former extraction areas or is temporarily stockpiled prior to backfilling.

6.2.3.4 Final Landform Construction: Final Voids, Highways and Low Walls

As identified in Section 6.2.3.1, the North South Quarry open cut would be retained following Quarry closure and secured using a combination of perimeter safety bunds and security fencing before conversion into a water storage.

Finalisation of terminal extraction benches will be subject to a geotechnical investigation that will be conducted during the decommissioning phase of rehabilitation operations. In the event that potential geotechnical issues are identified, the recommendations of that report will be implemented in order to ensure that the final void landform is safe and stable.

The Company will engage a suitably qualified expert to undertake groundwater modelling for the Quarry Site in order to determine the likely natural water level in the vicinity of the Quarry Site and therefore the potential final water level within the North South Quarry open cut void. Groundwater modelling will be completed following the cessation of extraction activities. The results of groundwater modelling will be used to identify any likely groundwater inflows into the North South Quarry open cut void and therefore inform any future water licencing requirements.

6.2.3.5 Construction of Creek/River Diversion Works

No creek or river diversion works will be required during the rehabilitation of the Quarry Site.

6.2.4 Growth Medium Development

As identified in **Table 10**, growth medium development activities will primarily involve deep ripping of compacted areas and the spreading of fine overburden material (<150mm) and available soil.

Where growth medium has previously been cleared from disturbed areas within the Quarry Site, growth medium will be applied to a depth of between 50mm and 100mm in order to support the establishment and survival of vegetation. Growth medium will be spread and profiled to achieve slopes consistent with the surrounding landscape. Former road and hardstand surfaces at the Quarry Site will be deep ripped prior to the application of growth medium material to address compaction and allow growth medium to be keyed into underlying material.

Water carts will be employed to lightly wet growth medium material prior to spreading in order to minimise dust generation. In areas where there is an elevated risk of erosion, earthworks and revegetation via direct seeding or hydromulch will be applied to facilitate stabilisation and vegetation establishment. Areas which are not considered vulnerable to erosion will be sown using broadcast seeding methods or allowed to revegetate naturally from the stored seedbank and airborne seed. Growth medium spreading will not be undertaken during excessively wet or windy conditions.

Seasonal and local meteorological conditions will be monitored to identify conditions which may result in delaying vegetation establishment (e.g. extended drought conditions). Land preparation and growth medium spreading activities will only be undertaken where conditions are predicted to be favourable (i.e. average or above average annual rainfall) to the establishment of vegetation.

6.2.5 Ecosystem and Land Use Establishment

Vegetation establishment activities at the Quarry, including the application of hydromulch and broadcast seeding, will occur only where favourable climatic conditions are expected to occur. Consequently, prolonged drought periods may result in extended delays to rehabilitation activities including growth medium spreading and seeding.

Seeding of available areas will be completed using a combination of direct seeding, broadcast seeding and hydromulch application methods. As outlined in Section 6.2.4, the application of individual methods will depend partially upon the vulnerability of individual areas to erosion by wind and water.

Given suitable climatic conditions, rehabilitation earthworks will comprise the first stage of the process. The aim of these earthworks will be to control surface water runoff and also provide micro-scale niche environments where nutrients, water and seed can collect and increase the likelihood of germination and survival of emergent seedling. Contour ripping on flat and sloped ground will be preferentially employed to achieve these aims.

Revegetation will be undertaken following any earthworks and surface preparation works. Areas located adjacent to sustainable vegetation which are generating seed on a routine basis (e.g. former unsealed road areas) may not require the application of supplemental seed during rehabilitation operations. Larger disturbed areas will require direct seeding of local species following the completion of earthworks.

Seed material will be sourced where possible from local suppliers, nurseries and/or propagation specialists. Seed will also be sourced from commercial suppliers where the required volume of seed material or specific species are not available locally for rehabilitation works.

Table 13 presents an indicative (but not exhaustive) list of species that will be used during revegetation of the Quarry Site. The species listed in **Table 13** represent those which have been identified within the analogue site and revegetation monitoring sites representative of the target vegetation community types (see Section 8.1).

Table 13
Target Vegetation Species for Revegetation

Species	Common Name(s)
Eucalyptus sieberi	Silvertop Ash, Black Ash
Eucalyptus mannifera	Brittle Gum
Eucalyptus dalrympleana	Mountain Gum, Mountain White Gum, White Gum, Broad-leaved Ribbon Gum
Eucalyptus radiata	Narrow-leaved Peppermint, Forth River Peppermint
Eucalyptus dives	Broad-leaved Peppermint, Blue Peppermint
Eucalyptus pauciflora	Snow Gum, Cabbage Gum, White Sally
Eucalyptus globoidea	White Stringybark
Eucalyptus macrohyncha	Red Stringybark
Acacia falciformis	Broad-leaved Hickory, Hickory Wattle, Mountain Hickory
Acacia obtusifolia	Stiff-leaf Wattle, Blunt-leaf Wattle
Leptospermum trinervium	Flaky-barked Tea-tree, Slender Tea-tree
Cassinia arcuata	Drooping Cassinia, Biddy Bush, Chinese Scrub, Sifton Bush, Chinese Shrub
Poa sieberiana	Grey Tussock-grass, Snow Grass
Lomandra sp.	N/A
Lomandra filiformis	Wattle Mat-rush
Rytidosperma sp.	N/A
Podolobium ilicifolium	Prickly Shaggy-pea
Einadia hastata	Saloop, Berry Saltbrush
Stypandra glauca	Nodding Blue Lily
Source: Aquila Ecological Surveys	

While the rehabilitation objectives and completion criteria identified in **Table 10** specify that evaluation of weed cover will be undertaken after a two year period to allow sufficient growth, it is noted that there is no time constraint on ongoing vegetation development and as such, rehabilitation will not progress to the Ecosystem and Land Use Development phase until all relevant criterion and performance measures have been met.

6.2.6 Ecosystem and Land Use Development

6.2.6.1 Weed and Pest Management and Monitoring

Several parameters associated with the presence of weeds and grazer impacts will be recorded as part of rehabilitation monitoring activities. The Annual Rehabilitation Report will include the following.

- An overview of any weed and pest management measures implemented at the Quarry Site during the reporting period.
- A list of weed species identified during rehabilitation monitoring and any other inspections completed at the Quarry Site.
- Details of any pests or evidence of grazer damage to revegetated areas identified during inspections, including a plan showing distribution within the Quarry Site, where appropriate.
- Recommendations for specific weed and pest management measures to be implemented during the subsequent 12-month period.

6.2.6.2 Environmental Management and Monitoring Program

Surface Water

Visual inspections of erosion and drainage control structures will be undertaken following significant rainfall events.

Groundwater

No monitoring of groundwater quality is currently undertaken or required at the Quarry.

6.2.6.3 Revegetation

Vegetation establishment activities at the Quarry, including growth medium spreading and seeding operations, will occur only where favourable climatic conditions are expected to occur. Consequently, prolonged drought periods may result in extended delays to these rehabilitation conditions. In the event that extended drought periods occur at the Quarry Site, rehabilitation schedules will be updated to prioritise other rehabilitation activities and opportunities to prepare additional areas for revegetation once favourable conditions return will be investigated.

The management measures will be implemented to monitor revegetation operations during the ecosystem development phase of rehabilitation will be consistent with those identified in **Table 10**, namely, establishment of one monitoring point per 5ha of rehabilitation and two analogue sites.

Results from rehabilitation monitoring will be used to assess the progress of revegetated areas towards target values based on analogue sites for each of the established vegetation community types (see Section 8.1).

The results of rehabilitation monitoring will also be compared against the triggers outlined in Section 10 and additional management actions implemented as required. These additional management actions may include, but would not be limited to:

- growth medium amelioration (e.g. fertiliser or organic matter application);
- reseeding of areas with seed of target species where species assemblages are not consistent with those of analogue sites; and
- engaging a suitably qualified expert to provide recommendations to improve rehabilitation outcomes.

6.2.6.4 Land Management and Infrastructure Maintenance

Site infrastructure including retained roads, security and stock-proof fencing, safety bunds and signage will be inspected on an annual basis. Additionally, infrastructure vulnerable to erosion (e.g. unsealed roads) will be inspected following significant rainfall events.

The results of infrastructure inspections as well as records of annual infrastructure maintenance activities and costs will be included as part of an Annual Rehabilitation Report.

6.3 Rehabilitation of Areas Affected by Subsidence

No incidences of mine subsidence have been identified as occurring within the Quarry Site or as a result of mining operations associated with the Quarry. As outlined in Section 6.2.1.12, subsidence represents a low risk to rehabilitation at the Quarry Site. As such, no specific subsidence-related management and maintenance programs are required at the Quarry.

7. Rehabilitation Quality Assurance Process

The following section details the rehabilitation quality assurance process for the Quarry in accordance with *Guideline 3: Rehabilitation Controls (July 2021)*. The rehabilitation quality assurance checklist included in this section is intended to be used as an indicative guide for rehabilitation operation managers and practitioners responsible for the rehabilitation of the Quarry Site.

As the Quarry is currently operational, many of the pre-disturbance risk controls outlined in *Guideline 3* (e.g. baseline assessments and monitoring) have either been completed or form part of ongoing investigations to be undertaken during rehabilitation planning. As such, **Appendix 1** presents a condensed risk control checklist containing items applicable to the remaining active mining and planned rehabilitation phases of the Quarry Site.

It is anticipated that rehabilitation operations within the Quarry Site will occur on a progressive basis as areas are no longer require for operational purposes. Consequently, it is noted that rehabilitation progress through the planned rehabilitation phases will not occur concurrently across all mining domains identified in **Figure 7**.

As part of the rehabilitation quality assurance process, relevant records and documentation will be recorded in a Rehabilitation Quality Assurance Register and reported as part of the Annual Rehabilitation Report. The Rehabilitation Quality Assurance Register will, as a minimum, include a copy of the checklists presented in **Appendix 1** as well as a compliance register used to assess the status of compliance with requirements under relevant development consents, leases and licences. The Rehabilitation Quality Assurance Register will be maintained, reviewed and refined by the Quarr Manager and/or Site Supervisor to ensure that it is reflective of current rehabilitation progress, risk controls implemented at the Quarry Site and the outcomes of any updated rehabilitation risk assessments.

Table 14 outlines key responsibilities for the Company and Quarry personnel with regards to rehabilitation operations.

Table 14
Key Roles and Responsibilities

Page 1 of 2

Role	Responsibility
Quarry Manager	Comply with applicable laws, regulations, licences and approvals. Ensure all contractors, sub-contractors and service personnel are appropriately qualified and/or licenced to undertake the required work. Ensure that appropriate resources are available to site management and personnel to enable the implementation of this Plan.

Table 14 (Cont'd)
Key Roles and Responsibilities

Role	Responsibility
Site Supervisor	Ensure that the Rehabilitation Quality Assurance register is maintained and up to date based on site activities. Ensure that the workforce is aware of relevant development and rehabilitation risks and management and mitigation measures, including any additional corrective and/or preventative measures. Ensure that the rehabilitation quality assurance process outlined in Section 7 is implemented as required. Ensure that the documentation and recording of rehabilitation risk controls occurs within a suitable timeframe Ensure that specialist contractors adhere to the guidelines and methodologies outlined in this RMP where required, or that the guidelines and methodologies in this Plan are updated to reflect those employed at the Quarry Site.
All Quarry Personnel	Follow direction provided by the Quarry Manager / Site Supervisor. Notify the Quarry Manager / Site Supervisor in the event that uncontrolled rehabilitation risks are identified at the Quarry.

8. Rehabilitation Monitoring Program

8.1 Analogue Site Baseline Monitoring

Three yearly revegetation monitoring and annual photography is undertaken at the Quarry Site in accordance with *Condition 11* of DA 090_95. Six monitoring plots were established in 2016 at the following locations.

- a control site within native bushland located east of the South-West Quarry (MARRQ1);
- south of the aggregate stockpile (MARRQ2);
- north of the South-West Quarry (MARRQ3);
- west of the BHP Dam (MARRQ4);
- south of the BHP Dam (MARRQ5); and
- immediately east of the South-West Quarry (MARRQ5).

As MARRQ1 was established as a control site, and is located within undisturbed land containing natural, native vegetation immediately adjacent to the Quarry Site, it is considered that MARRQ1 is an appropriate analogue site with respect to the Native Ecosystem final land use of the Quarry Site. Further consultation will be undertaken with the relevant stakeholders in the event identification and establishment of additional baseline monitoring sites is required.

As the revegetation monitoring requirements for the Quarry are provided by DA 090_95, it is considered that rehabilitation monitoring in accordance with the Biodiversity Assessment Method (BAM) is not appropriate. Notwithstanding, the number and locations of the monitoring plots outlined above exceed the BAM requirement for establishment of three monitoring plots in areas >5ha to 20ha.

8.2 Rehabilitation Establishment Monitoring

As identified above, rehabilitation establishment monitoring is currently undertaken at the Quarry Site. A summary of monitoring outcomes from the most recent monitoring campaign (undertaken in January 2022) is provided as follows.

Monitoring continued to be undertaken at the six monitoring plots previously established (see Section 8.1). Sites MARRQ4 and MARRQ5 (located adjacent to the former BHP Quarry) continue to show successful regeneration, with MARRQ5 having a high diversity of plant species when compared to the control site (MARRQ1). However, higher than average rainfall since February 2020 appears to have supported the proliferation of introduced grasses and herbs, while the presence of the weed Blackberry was recorded in the southwest corner of MARRQ5.

MARRQ3 was also recorded as showing strong regeneration with a dense groundcover of Wallaby grass, similarly, aided by high volumes of rain. Native species diversity within this plot has increased from 12 species in December 2018 to 19 as of January 2022.

Canopy and shrub species were recorded to have established successfully within MARRQ2 and MARRQ6 albeit with little protective groundcover or leaf litter. Exotic grass spray seeding undertaken in 2018 within MARRQ2 was reported to have died off with the exception of scattered Wallaby grass. As a result, supplementary planting or seed-bombing with native groundcover species within MARRQ2 and MARRQ6 was undertaken as an operational activity during 2022.

As results indicate that current rehabilitation practices can be considered successful, it is proposed that these measures will continue to be implemented.

8.3 Measuring Performance Against Rehabilitation Objectives and Rehabilitation Completion Criteria

Details of validation methods and indicators to be employed during monitoring in order to assess performance against the rehabilitation completion criteria for the Quarry Site are provided in Section 4.1.

The Rehabilitation Quality Assurance Register will be used to record details of any additional management measures or risk controls implemented during the ecosystem development phase in response to the analysis of rehabilitation monitoring results.

An Annual Rehabilitation Report and Forward Program will be prepared for the Quarry as required under *Condition 13* of the various Mineral Authorities for the Quarry as specified by the *Mining Amendment (Standard Conditions of Mining Leases – Rehabilitation) Regulation 2021*. the Company proposes to submit an Annual Rehabilitation Report and Forward Program for the Quarry by 28 February each year to cover the previous 12-month calendar year period. As part of the Annual Rehabilitation Report and Forward Program, the Company will validate and certify that the security deposit covers the estimated cost of rehabilitation liabilities each year.

9. Rehabilitation Research and Trials

9.1 Current Rehabilitation Research and Trials

As results from 3 yearly revegetation monitoring and annual photography undertaken at the Quarry Site show that current revegetation strategies and practices are considered successful (see Section 8.2), no rehabilitation research or trials is currently being undertaken.

9.2 Future Rehabilitation Research and Trials

As above, considering that revegetation strategies and practices are considered successful (see Section 8.2), no future rehabilitation research or trials are required.

10. Intervention and Adaptive Management

Table 15 presents the Trigger Action Response Plan for each of the rehabilitation threats and potential adverse outcomes identified in **Table 9** as having a risk rating of moderate or above.

The results of rehabilitation trials, including the development of procedures to be implemented during rehabilitation operations as outlined in Section 9, will be continually reviewed and reported in the Annual Rehabilitation Report for the Quarry. Where rehabilitation trial outcomes suggest that rehabilitation methods outlined in this Plan may not support the realisation of rehabilitation completion criteria, this Plan will be updated to detail additional or alternative rehabilitation methods as required. Additionally, where the development of procedures or plans described in Section 9 is completed, this Plan will be updated to reflect specific management implications for individual areas of the Quarry Site and/or target values associated with rehabilitation completion criteria.

Table 15
Trigger Action Response Plan

Rehabilitation Risk	Potential Adverse Outcome	Trigger	Action / Response
Active Mining Phase of Rehabilitation			
Limited pre-existing biological resources for use (e.g. topsoil, woody debris).	Insufficient resources available for rehabilitation limiting suitability of final land use.	Rehabilitation resource estimates indicate that sufficient soil and other biological resources are not available within the Quarry Site	Suitable alternative source of additional soil material/ growth medium to be identified. Investigation into measures that may be implemented to ameliorate other materials to make them suitable for use as a growth medium.
Adverse geochemical/chemical composition of materials such as overburden, processing wastes, topsoils and subsoils.	Final landform unsuitable for biological development. Final landform is a source of pollution.	Substrate and material characterisation testing identifies geochemical/chemical composition of materials outside of target values.	Suitably qualified soils or rehabilitation specialist engaged to investigate options of material amelioration and/or alternative suitable source of materials.
Adverse surface water quality and quantity.	Final landform unsuitable for final land use.	Surface water quality monitoring indicates unsatisfactory levels of water contamination resulting from Quarry related operations.	Review and inspect existing water management infrastructure to identify potential sources of contamination and investigate potential control operations, including removal and/or treatment of contaminated material.
Landform Establishment Phase of Rehabilitation			
Unstable landform due to erosion and/or mass movement issues associated with inappropriate design and/or quality assurance during landform construction.	Final landform geotechnically unstable	Monitoring or final closure geotechnical and/or environmental assessment identifies instability / unacceptable movement (actual or potential) in final landform.	Suitably qualified geotechnical engineer engaged to assess the instability and provide a range of recommendations to remediate the instability.

Table 15 (Cont'd)
Trigger Action Response Plan

Rehabilitation Risk	Potential Adverse Outcome	Trigger	Action / Response
Unstable landform due to erosion and/or mass movement issues associated with inappropriate design and/or quality assurance during landform construction. (Cont'd)	Final landform is a source of pollution.	Surface water monitoring or visual inspection indicates that final landform is eroding or is a source of unacceptable levels of pollution.	Remediate eroding area through additional earthworks, soil works, revegetation or other stabilisation works. If the above is unsuccessful, engage a suitably qualified professional in sediment and erosion control to prepare an assessment report and recommendations.
Exposure or release of geochemical and/or geotechnically adverse material associated with containment design and construction, including capping/cover system.	Final landform geotechnically unsuitable. Final landform is a source of pollution.	Monitoring or final closure geotechnical and/or environmental assessment identifies instability / unacceptable movement (actual or potential) in final landform.	Suitably qualified geotechnical engineer engaged to assess the instability and provide a range of recommendations to remediate the instability
Uncontrolled public access to highwalls.	Public access to highwalls poses unacceptable risk to public safety.	Rehabilitation monitoring identifies potential for public access, or access by unauthorised persons is identified.	If necessary, additional security measures to be installed including fencing, suitable signage, additional bunding, etc.
Growth Medium Development Phase of Rehabilitation			
Inappropriate physical and structural properties of substrate.	Soil not capable of sustaining vegetation community.	Soil parameters not consistent with baseline studies.	Prepare a report incorporating soil analysis results and identifying a range of recommendations to be implemented to ensure that the soil is suitable for sustaining the vegetation community.
Subsoil and topsoil deficit for rehabilitation activities.	Insufficient soil available for construction of sustainable final landform and land use.	Sufficient soil resources are not available within a reasonable distance of the Quarry Site.	Suitable source of additional soil material / growth medium to be identified. Commence investigation into measures that may be implemented to ameliorate other materials to make them suitable for use as a growth medium.
Substrate inadequate to support revegetation or agricultural land capability (e.g. lack of organic matter, nutrient deficiency, lack of soil biota, adverse soil chemical properties, exposed hostile geochemical materials, and any other factors impeding the effective root depth.	Inadequate soil thickness applied to final landform.	Test pitting following placement of soil material identifies placed soil thickness not consistent with final approved soil thickness.	Additional soil material spread on the final landform.
	Soil not capable of sustaining vegetation community.	Soil parameters not consistent with baseline studies.	Prepare a report incorporating soil analysis results and identifying a range of recommendations to be implemented to ensure that the soil is suitable for sustaining the vegetation community.

Table 15 (Cont'd)
Trigger Action Response Plan

Rehabilitation Risk	Potential Adverse Outcome	Trigger	Action / Response
Ecosystem and Land Use Establishment Phase of Rehabilitation			
Adverse weather and climatic influences (e.g. drought; intense rainfall events; bushfire and climate change).	Delay to or failure of vegetation establishment.	Visual monitoring during and/or after adverse weather/climatic events identifies limited opportunities for progressive rehabilitation or negative effects on vegetation establishment	Review of rehabilitation schedule and update to forward schedule. Rehabilitation areas are assessed for damage and necessary repairs and/or revegetation efforts are employed as required.
Ecosystem and Land Use Development Phase of Rehabilitation			
Adverse weather and climatic influences (e.g. drought; intense rainfall events; bushfire and climate change).	Delay to or failure of vegetation establishment.	Visual monitoring during and/or after adverse weather/climatic events identifies limited opportunities for progressive rehabilitation or negative effects on vegetation establishment	Review of rehabilitation schedule and update to forward schedule. Rehabilitation areas are assessed for damage and necessary repairs and/or revegetation efforts are employed as required.
Substrate inadequate to support revegetation or agricultural land capacity.	Inadequate soil thickness applied to final landform.	Test pitting following placement of soil material identifies placed soil thickness not consistent with final approved soil thickness.	Additional soil material spread on the final landform.
	Soil not capable of sustaining vegetation community.	Soil parameters not consistent with baseline studies.	Prepare a report incorporating soil analysis results and identifying a range of recommendations to be implemented to ensure that the soil is suitable for sustaining the vegetation community.
Post-closure water quality and quantity issues (e.g. acid-drainage, high salinity).	Final landform unsuitable for final land use.	Surface water monitoring indicates unsatisfactory levels of water contamination resulting from Quarry related operations.	Review and inspect existing water management infrastructure to identify potential sources of contamination and investigate potential control operations, including removal and/or treatment of contaminated material.
	Final landform a source of pollution.		

11. Review and Implementation

Table 16 presents the triggers for reviewing this Plan. Following each review, this Plan will be revised if significant structural amendments are necessary. Additionally, further consultation with relevant stakeholders will be undertaken where revisions to this Plan result in significant changes to proposed final land uses final landforms, rehabilitation objectives, rehabilitation completion criteria and/or the rehabilitation schedule. Milestones as documented in this Plan will be updated in the Annual Rehabilitation Report and will trigger an update to this Plan in the event that a significant change in rehabilitation risks and/or proposed rehabilitation methodologies is identified.

Table 16
Rehabilitation Management Plan Review Triggers

Trigger	Review
Amendment (required under Clause 11 of Schedule 8A of the Mining Regulation 2016)	
Approval of the proposed rehabilitation outcome document by the Secretary.	Within 30 days
Amendment to the rehabilitation outcome document under Clause 14 of Schedule 8A of the Mining Regulation 2016.	Within 30 days
Changes to risk control measures in the Rehabilitation Risk Assessment.	As soon as practicable
Written request from the Secretary.	As required by any notice
Review	
Request from the Resources Regulator or other relevant government agency to review the Plan.	As required by any notice
Modification of an existing development consent.	Within 3 months
Completion of a rehabilitation trial.	Within 3 months
Consultation with relevant stakeholders with significant implications for the final land use and/or final landform.	Within 3 months
Consultation with relevant stakeholders with significant implications for rehabilitation objectives and/or rehabilitation completion criteria.	Within 3 months

In addition to reviews of this Plan as outlined in **Table 16**, a Rehabilitation Quality Assurance Register will be developed and regularly maintained to ensure that mining and rehabilitation activities at the Quarry Site are being conducted in accordance with this Plan. The Rehabilitation Quality Assurance Register will include the checklist presented as **Appendix 1** as well as a compliance register used to assess the status of compliance with requirements under relevant development consents, leases and licences. Additionally, the Rehabilitation Quality Assurance Register will include:

- records of any contaminated water or hazardous materials collected at the Quarry Site and disposed of off site;
- the latest map of weed distribution at the Quarry Site;
- the latest map of contamination at the Quarry Site; and
- details of any additional rehabilitation measures and/or risk controls implemented within individual subdomains during rehabilitation operations.

12. References

Bush R (1990). *Metromix Quarries Marrangaroo Quarry – Quarry Development Plan – Stage 1 – November 1990 – May 2001.*

Central West Scientific (CWS) (2015). *Geological investigations.*

PSM Consult Pty Limited (PSM) (2023). *Marrangaroo Quarry Site Visit Report and Geotechnical Advice.*

RME (2007). *Geological Assessment and Implications for the Marrangaroo Quarry Site.*

Appendix 1

Rehabilitation Risk Control Checklist

(Total No. of pages including blank pages = 15)

Table A
Rehabilitation Risk Control Checklist

Rehabilitation Phase / Activity	Comment / Completion Date(s)
Phase: Active Mining (Production)	
Soil and Materials Management	
Develop and maintain a materials and soils balance and database to include the following information: • volume of inert capping material, topsoil and subsoil stockpiled. • location, age and quality of stockpiles. • chronology of treatments (e.g. weed control, application of cover crop) undertaken on the stockpile. • volume of material, topsoil and subsoil required for application to current and future disturbance areas (e.g. capping material for tailings dams, reject emplacement areas). • an estimate of the volume of suitable alternative material required to be imported onto site to supplement potential material, topsoil and subsoil deficits. • record data on the location of the stockpiled material including date stripped, source area, indicative volume, pre-strip plant community type. Information is to be stored using site-based GIS.	
Locate soil stockpiles away from traffic areas and at an appropriate distance from watercourses.	
Locate soil stockpiles on level or gently sloping areas to minimise the potential for erosion and soil loss.	
Limit soil stockpiles to less than two to three metres high and set out in windrows to maximise surface exposure and biological activity.	
Install appropriate erosion, dust and sediment controls around soil stockpiles to reduce the potential for soil loss.	
Appropriately sign-post soil stockpiles to identify the area and minimise the potential for unauthorised use or disturbance.	
Monitor and control weed growth on soil stockpiles.	

Table A (Cont'd)
Rehabilitation Risk Control Checklist

Rehabilitation Phase / Activity	Comment / Completion Date(s)
Phase: Active Mining (Production) (Cont'd)	
Materials Handling	
Develop specific strategies (e.g. selective handling, management and placement) for mine materials management to address potential geochemical and geotechnical constraints for rehabilitation as follows: • adopt an appropriate geological model to determine source of problematic material. • continued sampling and testing of overburden/interburden materials during operations to confirm the potential geochemical constraints across the deposit (acid generating materials, sodicity). • continued sampling to ensure materials are understood (e.g. particle size distribution) and to identify potential changes in material properties. • development of a procedure/strategy for selective handling and management of materials (e.g. potentially acid forming and non-acid forming, inert material).	
Seek specialist advice (as relevant) to develop effective mitigation strategies to minimise any potential interference to rehabilitation establishment or downstream pollution because of the exposure of adverse geochemical material.	
Develop and implement an operational and rehabilitation program for reject emplacement areas to ensure geochemical and geotechnical long-term stability.	
Develop and maintain a register of any contaminated sites, waste landfill sites and bioremediation areas and where they are located.	
Environmental Monitoring	
Develop, maintain and document an environmental monitoring program that includes: • surface and groundwater • flora • land contamination • historic heritage	
Management of potential heritage issues	
Before demolition activities, undertake any necessary assessments to determine potential heritage approvals and or management measures that may be required (e.g. retention/restoration of building, archival recording).	

Table A (Cont'd)
Rehabilitation Risk Control Checklist

Rehabilitation Phase / Activity	Comment / Completion Date(s)
Phase: Active Mining (Production) (Cont'd)	
Site Services	
Electricity services to any infrastructure scheduled for demolition will be removed before the start of building demolition works.	
Telecommunications, water supply and other services will also be disconnected and removed where practical.	
Where services are buried (e.g. pipelines, cables) and their retrieval may lead to further disturbance, the infrastructure may be left in situ (subject to any necessary approvals or agreements) if they don't pose constraints to the final land use. In this situation, the location of the services will be surveyed and marked on the site plan and a suitable caveat developed to provide that they are readily identifiable for future land holders.	
Buildings and Fixed Plant	
Before demolition, the infrastructure should be evaluated in terms of the presence of hazardous substances (e.g. asbestos) and appropriate management strategies developed to protect employees, the public and minimise potential environmental harm. This includes the identification of the various waste streams and development of management strategies in accordance with the appropriate waste legislation.	
All buildings, fixed plant and other infrastructure that are not required as part of the final land use will be demolished and removed. Demolition will be carried out in accordance with the relevant Australian Standard.	
Remaining structures will be surveyed and recorded on a plan, with a suitable caveat developed to provide that they are readily identifiable for future land holders.	
Buildings and Fixed Plant to be Retained	
Where infrastructure is approved to remain as part of the final land use, a structural assessment should be prepared by a suitably qualified person to: • determine the structural integrity of the structure. • identify the associated short and long-term risks to public safety and the environment from the infrastructure remaining in situ, which should identify potential modes of failure. Based on assessment, identify and implement controls to address any potential residual risks and modes of failure.	

Table A (Cont'd)
Rehabilitation Risk Control Checklist

Rehabilitation Phase / Activity	Comment / Completion Date(s)
Phase: Active Mining (Production) (Cont'd)	
Equipment Storage Areas, Hardstand Areas, Roadways, Sealed and Unsealed Roads and Car Parks	
Any redundant plant or equipment will either be sold for reuse, recycled (e.g. scrap metal) or disposed of at an authorised landfill facility.	
Removal of spillages and hazardous materials.	
Storage areas and hardstands will be assessed for potential contamination (e.g. hydrocarbons, salt accumulation) and remediation undertaken as required.	
Waste material (e.g. bitumen, concrete) generated as part of the removal of car parks and hardstands is to be managed in accordance with relevant guidelines under the *Protection of the Environment Operations Act 1997*. The relevant guidelines can be found on the Environment Protection Authority's website. Where authorised to dispose of on the site, waste material must be buried at depth or suitably capped to ensure that it does not compromise the final land use.	
Management of Contaminated Material	
Any contaminated material should be managed in accordance with relevant guidelines under the *Contaminated Land Management Act 1997*. Records will need to be retained to validate that contamination has been remediated or managed effectively to meet the final land use rehabilitation objectives and rehabilitation completion criteria.	
Hazardous Materials Management	
All remaining hydrocarbons such as diesel and lubricants and other hazardous materials will be either used or discarded by an authorised waste contractor.	
Removal of any oily water treatment system, following the demolition of the workshop and associated facilities.	
Removal of sewage treatments systems and associated sewerage network.	
Storage tanks of hazardous materials will be removed and, depending on their condition, either sold or disposed at an authorised facility.	
Specific consideration should be given to managing contaminated substances/materials/soils in accordance with relevant guidelines that can be found on the Environment Protection Authority's website.	

Table A (Cont'd)
Rehabilitation Risk Control Checklist

Rehabilitation Phase / Activity	Comment / Completion Date(s)
Phase: Active Mining (Production) (Cont'd)	
At the Completion of Exploration Activity	
Remove and lawfully dispose of all grid pegs, tags, sample bags, flagging tape, drill chips and other waste.	
Remove all drill core.	
Survey, seal and rehabilitate all boreholes.	
Remove and lawfully dispose of all plant and equipment (including surface pipelines) and imported fill material.	
Removal of concrete and footings.	
Undertake a visual contamination assessment where potential pollution generation activities have occurred (e.g. hazardous substance storage, saline water storage) to identify potential signs of contamination. Where contamination is present, develop and implement a contamination remediation program to ensure that the rehabilitation objectives and rehabilitation completion criteria for the intended post-exploration land use are met.	
Phase: Landform Establishment	
Characterisation of Waste Materials (Geochemical and Geotechnical)	
Characterisation analysis is conducted and geochemical and physical properties of waste materials are understood. Consideration should be given to the following as relevant: • adopt an appropriate geological model to determine source of problematic material. • collect rehabilitation material erosion data for calibration of landform stability models. • establish an ongoing sampling program to identify potential changes in material properties. • develop a strategy / procedure/ management plan for selective handling and management of problematic materials (e.g. potential acid forming material). • ensure material handling field practices are in accordance with relevant plan/procedure.	

Table A (Cont'd)
Rehabilitation Risk Control Checklist

Rehabilitation Phase / Activity	Comment / Completion Date(s)
Phase: Landform Establishment (Cont'd)	
Emplacement Areas	
The geotechnical stability of the emplacement areas during construction must be understood and a strategy implemented to ensure: • location of waste/reject emplacement areas are clearly defined. • emplacement dimensions (e.g. height – RL) are consistent with those approved by the development consent. • consideration is given to geotechnical stability during placement, including methods to promote compaction/consolidation during construction. • consideration is given to material selection and treatment (e.g. handling low strength or dispersive/sodic soils). • material handling field practices are in accordance with defined management practices – location, dump process, lift heights, compaction/consolidation treatment.	
A strategy should be developed to manage any geochemically unstable materials (e.g. acid generating materials) with consideration of the following: • emplacement construction design should utilise modelling to optimise design considering the need to limit gas transport (air ingress) and resulting acidity production (if relevant). • placement methods should reduce the likelihood of depositional layering or high permeability zone 'rubble zone' (e.g. base-up via 'paddock dump' rather than 'end tipping'). • treatment during placement to reduce gas transport/oxygen supply (engineered layers – vertical gas management, encapsulation, oxygen consuming materials, sulphide passivation). • monitoring to determine emplacement strategy effectiveness, including a trigger action response plan (TARP). • ensuring material handling field practices are in accordance with defined management practices – placement method, lift height, treatment.	

Table A (Cont'd)
Rehabilitation Risk Control Checklist

Rehabilitation Phase / Activity	Comment / Completion Date(s)
Phase: Landform Establishment (Cont'd)	
Landform Design/Shape	
The final landform design should build on the minimum requirements of the development consent and, wherever practicable, take into account the following: • a landform that is commensurate with surrounding natural landform and, where appropriate, incorporates geomorphic design principles. • appropriate use of landform design stability principles of reduced slope length and surface water management structures. • use of erosion models to optimise the landform design and to show where high-risk erosion areas are likely to occur (and to nominate how risk controls will be incorporated into the final landform design to appropriately treat these risks).	
• use of erosion modelling and/or hydrological projections to demonstrate the long-term competency of problematic material emplacement (e.g. acid generating materials). • use of appropriate parameter model inputs – preferably field parameter data collected from the materials to be used in rehabilitation. • potential for settlement and how this will be accounted for in the design (especially differential settlement). • long-term stability of voids/pit walls and steep slopes, including determination of engineering treatments required for walls/ steep slopes.	
Develop specific strategies (e.g. selective handling and placement) for materials management to address potential geochemical constraints for rehabilitation (e.g. acid generating materials, saline and sodic materials) based on sampling and testing of overburden/interburden materials used to construct the final landform.	
Develop specific strategies (e.g. selective handling and placement) to address any potential geotechnical issues associated with the final landform, including seepage pathways into groundwater and surface waters, for example saline seepage. Based on risk, these strategies may need to be developed in consideration of geotechnical studies.	

Table A (Cont'd)
Rehabilitation Risk Control Checklist

Rehabilitation Phase / Activity	Comment / Completion Date(s)
Phase: Landform Establishment (Cont'd)	
Final Voids	
Where a final void is approved to remain as part of the final landform (e.g. by the development consent), the design and construction should be developed in accordance with the minimum requirements of the development consent, associated environmental assessments/environmental impact statements and in consideration of the following: • a constraints and opportunities analysis of final void options (including backfilling or partial backfilling) to identify and implement the most feasible and environmentally sustainable option (where this option is not inconsistent with the development consent) to minimise the sterilisation of land post-closure.	
• a geotechnical assessment should be undertaken to determine the likely long-term stability risks associated with the proposed final landform, including any remaining highwalls or low walls (if any). Based on the outcome of this assessment, suitable measures (e.g. bunding and highwall fences) are to be implemented to minimise potential risks to public safety as well as support the final land use(s). • updated surface and groundwater assessments should be undertaken in relation to the likely final water level in the void and post-closure water take (groundwater inflows into the void and surface water capture). This should include an assessment of the potential for fill and spill, along with measures required to be implemented to minimise associated impacts to the environment and downstream water users.	
The final void must address any relevant approval requirements of regulatory authorities and demonstrate the satisfaction of licensing requirements under the relevant legislation (e.g. *Water Management Act 2000*). This should include whether sufficient licence shares are available in the water source(s) to account for the water inflow into the final void(s).	
The final stabilisation and revegetation strategy associated with the final void should be designed and implemented based on the outcomes of the above assessments.	
Water Management Infrastructure	
Depending on the final land use, issues that should be addressed as part of the post-closure water management system may include: • removal of excess sediment (e.g. saline sediment) from the surface dams for future use by the subsequent land owner or alternatively filling or removing the dams if they are no longer required. • the installation of appropriate sediment and erosion control measures. • water within final voids is appropriately licensed in perpetuity (e.g. under the *Water Management Act 2000*).	

Table A (Cont'd)
Rehabilitation Risk Control Checklist

Rehabilitation Phase / Activity	Comment / Completion Date(s)
Phase: Landform Establishment (Cont'd)	
Water Management Infrastructure (Cont'd)	
Sediment material extracted from surface dams should be analysed to determine the potential for contamination and, if present, must be appropriately managed as identified above (refer to *Management of carbonaceous/contaminated material* above).	
Construction of Creek/Diversion Works	
Where practicable, similar characteristics and natural features as evident in upstream and downstream sections should be incorporated into the design of a creek or river that is to be constructed or re-established (e.g. pool and riffle sequences, low flow channels, high flow channels, log jams). This should be based on detailed geomorphological and hydraulic modelling to determine whether these key features can be adapted to the materials as well as water flows associated with creek restoration/re-establishment/ diversions works.	
Where engineering structures are required (e.g. drop structures, rock armoured banks, rock groins), they are to be designed and constructed in consideration of hydraulic assessments to ensure the long-term integrity and sustainability of the creek. These structures should also be designed to ensure that fish passage has not been compromised as part of the creek/river diversion works, and that fish passage is incorporated into the final landform (Policy and guidelines for fish habitat conservation and management, NSW Department of Primary Industries (Update 2013)).	
The final stabilisation and revegetation strategy associated with creek remediation/ rehabilitation works should be designed and implemented based on the outcomes of the above assessments as well as ecological assessments. Refer to Policy and guidelines for fish habitat conservation and management, NSW Department of Primary Industries, (Update 2013).	
As-Constructed Drawings	
Prepare 'as-constructed' drawings to verify that drainage and landform have been completed in accordance with design before 'growth medium development' phase.	

Table A (Cont'd)
Rehabilitation Risk Control Checklist

Rehabilitation Phase / Activity	Comment / Completion Date(s)
Phase: Growth Medium Development	
Before Commencing Rehabilitation (substrate preparation)	
Develop rehabilitation methodologies in consideration of site-specific constraints (e.g. topsoil and subsoil availability and quality, presence of contamination) required to achieve the approved, or if not yet approved, proposed rehabilitation objectives and rehabilitation completion criteria.	
Where revegetation is required, analyse representative samples to characterise the nature of the substrate (e.g. sodicity, acid-generating potential, particle size distribution, nutrient levels for planting) and determine any potential limitations to rehabilitation and sustainable plant growth. Immediately prior to application, collect and analyse samples of topsoil stockpiles to characterise material to determine any potential impacts to vegetation (e.g. sodicity, limited microbial activity, nutrients, organic matter).	
Use the results to determine specific amelioration techniques (e.g. addition of gypsum, lime, organic matter, fertiliser) that will be used to overcome potential limitations to landform stability, vegetation establishment and growth. Apply ameliorants (e.g. gypsum or lime) and organic material (e.g. mulch) based on the outcomes of the substrate characterisation analysis (as appropriate to address limitations in the revegetation substrate). Before revegetation activities, analyse the prepared substrate to determine whether amelioration measures have been successful.	
Implement suitable erosion control measures (e.g. catch drains, sediments dams, silt fences, mulches, cover crops) to minimise soil loss from areas undergoing rehabilitation.	
Preferentially schedule and undertake revegetation activities in or just before suitable seasonal conditions.	
Where permissible, should revegetation be delayed due to unsuitable seasonal conditions, undertake temporary stabilisation measures (e.g. sterile cover crops, erosion and sediment controls) to avoid erosion and further land degradation.	
Return topsoil and subsoil layers in sequential order, assuming suitability of material for the final land use.	
During Rehabilitation (general methodologies)	
Use appropriate earthmoving equipment to avoid compacting the rehabilitation substrate.	
Restore soil structure by scarifying or ripping (if soil compaction or erosion has occurred) in parallel with the contour. Apply soil ameliorants (where required) such as fertiliser to the substrate before the start of revegetation activities.	

Table A (Cont'd)
Rehabilitation Risk Control Checklist

Rehabilitation Phase / Activity	Comment / Completion Date(s)
Phase: Growth Medium Development (Cont'd)	
During Rehabilitation (general methodologies) (Cont'd)	
Implement erosion and sediment controls in accordance with Managing Urban Stormwater: Soils and Construction Volume 2E, Mines and Quarries (DECC 2008b).	
Where direct seeding is planned, rip final surfaces parallel with the contour before the application of seed to provide for an adequate seed bed.	
Where access tracks are to be removed (e.g. not to be left as part of the final land use as defined by rehabilitation objectives and rehabilitation completion criteria), remove imported fill material (where used) and reprofile the disturbance area to the pre-existing landform.	
Topsoil shortages are to be supplemented with suitable alternatives such as biosolids, organic growth medium or another substitute, if required. However, the risk of introducing hazards to the establishment of the preferred plant community type (e.g. non-native species, elevated nutrient levels through the application of soil ameliorants) should be evaluated.	
Identify key habitat requirements for key fauna species.	
Use structures such as tree hollows, logs and other woody debris, rock material to augment the target habitat value of native rehabilitation (if appropriate, in consideration of bushfire risks).	
Phase: Ecosystem and Land Use Establishment	
During Rehabilitation (revegetation – native ecosystem)	
Native revegetation activities in rehabilitation areas should preferentially use local provenance seed for direct seeding or tube stock propagation.	
Use of seed orchards or onsite nurseries should be considered to ensure an appropriate stock is maintained for rehabilitation works.	
Consider techniques such as brush-matting where disturbed areas are situated directly adjacent to mature native ecosystems/area of clearing associated with extraction operations that provide a good source of local seed, to stabilise the site while natural recruitment occurs.	
Where adverse seasonal conditions (e.g. drought) or other factors affect the availability of local provenance seed and supplementary non-local provenance seed is required, seed stock should be purchased from reputable suppliers with quality control processes including seed viability testing. (It is good practice to record the name of the supplier and batch of seed being applied. Recording such details may assist in prevention/management of misidentified seeds).	

Table A (Cont'd)
Rehabilitation Risk Control Checklist

Rehabilitation Phase / Activity	Comment / Completion Date(s)
Phase: Ecosystem and Land Use Establishment (Cont'd)	
During Rehabilitation (revegetation – native ecosystem) (Cont'd)	
If revegetation is delayed due to unsuitable seasonal conditions, undertake temporary stabilisation measures (e.g. sterile cover crops, erosion and sediment controls) to avoid erosion and further land degradation.	
Undertake treatment of seed in terms to address issues such as seed dormancy and insect predation. Timing of treatment is to be aligned to timing of application with a focus on reducing the storage time of treated seed.	
Confirm the availability of seed and plant material and amend the seed mix or schedule of revegetation based on material supply.	
Spread seed as soon as possible following ripping/scarifying. If seeding is delayed following ripping/scarifying, undertake an assessment to determine whether further re-ripping/tilling is required before applying seed to ensure sufficient surface roughness (e.g. to break up any crusting that may have resulted from rainfall events).	
Develop a bushfire management plan (having regard to relevant ecological considerations and species fire tolerance) in consultation with NSW Rural Fire Service. Bushfire considerations should be factored into rehabilitation design (e.g. access tracks).	
Revegetation mix to capture species of all strata aligned to the plant community type. (If foundation species are being used, ensure that they do not compromise the attainment of the targeted plant community types).	
Use appropriate earthmoving equipment to avoid compacting the rehabilitation substrate.	
Weed/pathogen control on equipment for sensitive sites to prevent the spread of pathogens.	
Rehabilitation can include direct seeding and/or tube stock planting. Seed germination and seeding/seedling rate records are to be retained so that future rates can be assessed to ensure that target densities are achieved.	
Maximise the number of target species (groundcover, mid-story and canopy) within the first round of revegetation activities to facilitate species richness. If the target plant community type requires a staged seeding approach to achieve the species mix, underrepresented species may be prioritised in subsequent revegetation rounds.	
Stock control fencing should be erected where required to protect ecological rehabilitation areas.	

Table A (Cont'd)
Rehabilitation Risk Control Checklist

Rehabilitation Phase / Activity	Comment / Completion Date(s)
Phase: Ecosystem and Land Use Establishment (Cont'd)	
Rehabilitation Establishment Inspections	
Conduct an initial establishment inspection no later than three months following the completion of each rehabilitation campaign to determine whether performance issues have occurred or are emerging, which have the potential to delay revegetation establishment.	
Conduct regular site inspections (e.g. at least quarterly) to assess soil conditions and erosion, drainage and sediment control structures, runoff water quality, revegetation germination rates, plant health and weed infestation, until vegetation has become well established and the site can be considered stable.	
Where possible, use drones or LiDAR to conduct additional inspections and analysis of developing rehabilitation.	
Record outcomes of inspections and implement any required intervention/adaptive management actions as soon as practicable after a monitoring program indicates that rehabilitation performance is unsatisfactory as part of the rehabilitation management and maintenance program.	
Rehabilitation Monitoring Programs	
Implement long-term rehabilitation monitoring program and evaluate trajectory of rehabilitation against achieving rehabilitation objectives and rehabilitation completion criteria.	
Broadly, the scope of the ecosystem rehabilitation monitoring program will be required to include indicators that measure site condition, vegetation composition and vegetation structure and ecosystem function. The range of indices should directly relate to the rehabilitation objectives and rehabilitation completion criteria identified for the specific ecological outcome.	
While the program should be designed to be comparable between monitoring periods, the program will also need to be flexible to enable incorporating evolving best practice in monitoring techniques.	
Include the monitoring and control of changes to surface and groundwater quality over time.	
The scope of the monitoring program should usually include photographic monitoring from fixed points.	

Table A (Cont'd)
Rehabilitation Risk Control Checklist

Rehabilitation Phase / Activity	Comment / Completion Date(s)
Phase: Ecosystem and Land Use Establishment (Cont'd)	
Rehabilitation Management and Maintenance Program	
Develop and implement a rehabilitation management and maintenance program based on the needs identified in the rehabilitation monitoring program. Examples of what this program may include are as follows: • weed and feral animal control. • erosion and drainage control works. • monitoring and control of changes to surface and groundwater quality over time. • reseeding/planting of failed rehabilitation areas (e.g. through lack of germination, high plant mortality rate). • repairing fence lines, access tracks and other general related land management activities. • regular site inspections to assess rehabilitation performance. The objective of this program is to facilitate rehabilitation progressing towards achieving the rehabilitation objectives and rehabilitation completion criteria in accordance with an approved progressive rehabilitation schedule (forward program).	
Phase: Ecosystem and Land Use Development (Management of Rehabilitated Lands)	
During Rehabilitation (revegetation – native ecosystem)	
Continue rehabilitation management and maintenance program (refer to Ecosystem Establishment Phase) until rehabilitation can be demonstrated to have achieved the approved rehabilitation objectives, rehabilitation completion criteria and (for large mines) the final landform and rehabilitation plan.	
Continue rehabilitation monitoring programs (refer to Ecosystem Establishment Phase) until rehabilitation can be demonstrated to have achieved the approved rehabilitation objectives, rehabilitation completion criteria and (for large mines) the final landform and rehabilitation plan.	
Actively manage rehabilitated lands to achieve the approved final land use(s).	