



ABN: 82 003 061 890

Mining Operations Plan

**(incorporating Rehabilitation
Management Plan)**

for the

Wallerawang Quarry

March 2018

Prepared by:



R.W. CORKERY & CO. PTY. LIMITED

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Mining Operations Plan (incorporating Rehabilitation Management Plan)

for the

Wallerawang Quarry

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March 2018



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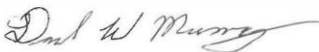
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Wallerawang Quarry

Mining Operations Plan

Name of Mine:	Wallerawang Quarry
MOP Commencement Date:	15 May 2018
MOP Completion Date:	15 December 2019
Mining Authorisations (Lease / License No.):	ML1633
Name of Authorisation / Authorisation holder(s):	Walker Quarries Pty Ltd
Name of Mine Operator (if different):	N/A
Name and Contact Details of the Mine Manager (or equivalent):	Mr Ray Sharwood Quarry Manager Lot 6, Great Western Highway Wallerawang, NSW, 2845 Phone: (02) 6324 4066 / 0429 272 148
Name and Contact Details of Environmental Representative:	David Murray Managing Director Lot 6, Great Western Highway Wallerawang, NSW, 2845 Phone: 0418 680 022
Name of Representative(s) of the Authorisation Holder(s):	David Murray
Title of Representative(s) of the Authorisation Holder(s):	Managing Director
Signature of Representative(s) of the Authorisation Holder(s):	
Date 28 March 2018	Draft – Final – Amended
Version: 1	

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Plan 2	Mine Domains at Commencement of Mop
Plan 3	Mining and Rehabilitation
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LIST OF ACRONYMS

AHD	Australian Height Datum
DA	Development Consent
DoI Water	Department of Industry - Water
DPE	Department of Planning and Environment
DRG	Division of Resources & Geoscience (of the Department of Industry)
EA	Environmental Assessment
EIS	Environmental Impact Statement
EL	Exploration Licence
EPA	Environment Protection Authority
EPL	Environment Protection Licence
FCNSW	Forestry Corporation NSW
LGA	Local Government Area
ML	Mining Lease
MOP	Mining Operations Plan
OEH	Office of Environment & Heritage
PIRMP	Pollution Incident Response Management Plan
RCE	Rehabilitation Cost Estimation
RWC	R.W. Corkery & Co Pty Limited
SWMP	Soil and Water Management Plan
TSS	Total Suspended Solids

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1. INTRODUCTION

1.1 SCOPE AND FORMAT

1.1.1 Scope

This Third Mining Operations Plan (MOP) for the Wallerawang Quarry (“the Quarry”) has been prepared by R.W. Corkery & Co. Pty Limited (RWC) on behalf of Walker Quarries Pty Ltd (“the Company”), a subsidiary of Sitegoal Pty Ltd (Sitegoal) which operates the Quarry. The Quarry is located on land adjoining the Great Western Highway to the south of Wallerawang, approximately 8km northwest of Lithgow (see **Figure 1**).

Mining Lease (ML) 1633 was issued to Walker Quarries on 15 July 2009 (see **Appendix 1**). For the purpose of this document, the area covered by ML1633 is referred to as the “Quarry Site”.

The operations described in this MOP comply with the conditional requirements of Development Approval DA 344-11-2001 for the Quarry, originally issued to Sitegoal by the then Minister for Planning & Infrastructure on 19 October 2004 and modified under delegation of the Minister for Planning on 25 August 2017 (see **Appendix 2**), and the conditions of ML1633.

Previous versions of this document were as follows.

- First MOP – dated September 2006.
- First MOP (Amendment A) – dated 15 July 2015.
- Second MOP – dated 11 July 2016.
- Second MOP (Amendment B) – dated 11 April 2017.
- Second MOP (Amendment C) – dated 19 December 2017.

The duration of this MOP is for the period 14 May 2018 to 15 December 2019. This incorporates the approved period of quarrying remaining under DA 344-11-2001 and an extended period for ongoing rehabilitation. Plans are currently being finalised to make application to extend the life of the Quarry beyond 2019 with an application to be made to the Department of Planning & Environment (DPE) by the end of 2018. Subject to the determination of this development application, mining beyond the term of this MOP is anticipated with a future MOP to be prepared and submitted prior to July 2019.

This document also incorporates the requirements of a *Rehabilitation Management Plan* required under Condition 3(31) of DA 344-11-2001 (as amended).

1.1.2 Format of this Document

This MOP has been prepared in accordance with the guideline *ESG3: Mining Operations Plan (MOP) Guidelines, September 2013* (“the Guidelines”) and provides detailed information on mining, processing and rehabilitation operations within ML1633. This MOP also provides information to demonstrate the environmental risks associated with the operations on ML1633 are being appropriately managed and mitigated.



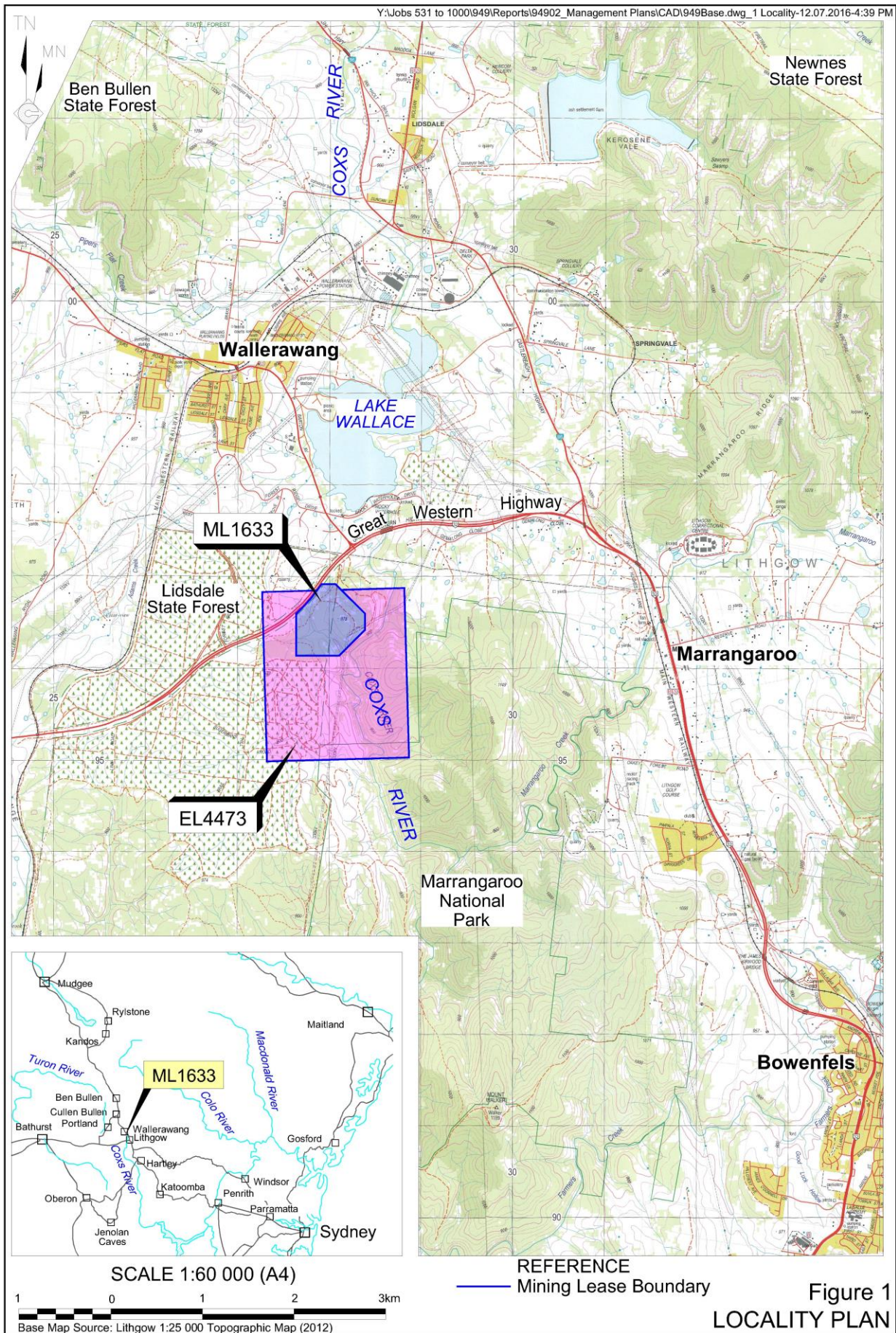


Table 1 provides a summary of where the required tables, figures and plans are presented in this MOP.

Table 1
Summary of Required Tables, Figures and Plans

Section of MOP	Table/Plan Reference	Source
Inside cover	MOP Title Block	
1.1.2	Summary of Required Tables, Figures and Plans	
2.3.11	Material Production Schedule during MOP term	Mine Schedule
5.3	Summary Rehabilitation Phases for end of MOP term	Mine Schedule
7.2	Disturbance and Rehabilitation Progression during MOP term	Mine Schedule
11	Plan 1A – Pre-mining Environment – Project Locality	DA 344-11-2001
11	Plan 1B – Pre-mining Environment – Natural Environment	
11	Plan 1C – Pre-mining Environment – Built Environment	
11	Plan 2 – Mine Domains at Commencement of MOP	Field Survey and Inspection
11	Plan 3 – Mining and Rehabilitation – End of MOP	Quarry Personnel
11	Plan 4 – Final Rehabilitation and Post-mining Land Use	DA 344-11-2001

The format generally complies with that provided under the heading ‘*Compiling a Mining Operations Plan*’ in the Guideline and by doing so also provides the *Rehabilitation Management Plan* for the mine, as required by *Condition 3(31)(a)* of DA 344-11-2004.

An updated rehabilitation security estimate dated March 2018, prepared using the Department’s Rehabilitation Cost Estimation (RCE) Tool in accordance with the *Rehabilitation Cost Estimation Tool Handbook, June 2017* (DRG, 2017), is also included with this MOP as **Appendix 3**.

1.1.3 Authorship

This Mop has been prepared by Mr Alex Irwin (BSc(Hons)), Senior Environmental Consultant of RW Corkery & Co Pty Limited. Endorsement of Mr Irwin was provided by the DPE on 22 December 2017 (see **Appendix 4**). The Plans which accompany this MOP have been prepared by Mr Dean Brownlee of Rangott Mineral Exploration Pty Limited based on information provided by Mr Irwin, as well as Messrs Paul Hensley (Director), Kerry Burke (Director), Trevor Hoffman (Quarry Operations Manager), and Ray Sharwood (Quarry Manager).

All information provided with respect to current and planned mining and rehabilitation activities has been supplied by Messrs Hensley, Burke, Hoffman and Sharwood.

1.2 HISTORY OF OPERATIONS

The Quarry is located 2.5km southeast of the town of Wallerawang (refer to **Plan 1A**), in the Lithgow City Council Local Government Area (LGA). The former Hoskins Quarry, which was last operated in 1927, is located adjacent to the current quarry (refer to **Plan 1B**).

Following the submission of an Environmental Impact Statement in 2001, and the granting of Development Consent by the NSW Minister for Infrastructure and Planning in October 2004. DA 344-11-2004 provides for the production of up to 500 000t of quarry products from an open cut area as defined by **Figure 2** and limited to a depth of 930m AHD. On initial issue of DA 344-11-2001, the development consent limited operations to 10 years from the date of granting of a mining lease. ML1633 was granted by the NSW Minister for Mineral Resources on 15 July 2009, commencing the approved 10 years of operations. Following modification to DA 344-11-2001 on 25 August 2017, the period of approved quarrying operations (defined as the extraction, processing, stockpiling and transportation of extractive materials) has been confirmed and restricted to 15 July 2019 (as nominated by *Condition 2(5)* of DA 344-11-2009). Rehabilitation of the Quarry may continue beyond this date. In December 2009, notification was received from the Director General of the Department of Planning that all the applicable conditions of DA 344-11-2001 has been satisfied to enable commencement.

Operations at the Quarry commenced in 2014 with the construction of a new intersection with the Great Western Highway. Mining activities commenced in late 2014 with the Quarry now producing a range of aggregates, pebbles and sand. DA 344-11-2001 was modified on 25 August 2017 to regularize several constructed components of the Quarry and formalise the approval of production of a more extensive range of quarry products. At commencement of this MOP, the area of disturbance was 14ha which will increase to 15.3ha over the term of this MOP. This represents approximately 93% of the approved 16.5ha disturbance area of DA 344-11-2004 (which accounts for further extension of the extraction area (see **Figure 2**).

To date, only a very limited proportion of the 3.5Mt approved resource has been extracted from the Quarry and as noted in Section 1.1.2, an application to extend the life of the Quarry, as well as the resource approved for extraction is planned for later in 2019. The Company anticipates an extension in Quarry life of 20 to 25 years to maximise the recovery of the resource.

1.3 CURRENT CONSENTS, AUTHORISATIONS AND LICENSES

Table 2 presents the consents, authorisations and licences held in relation to the Mine.

The Quarry has approval to produce greater than 200 000t per year and as such is categorised as State Significant Development under the Section 76A(7) of the *Environmental Planning and Assessment Act 1979*. The Quarry is considered a Level 1 Mine in accordance with the Guidelines, however, it is noted that due to the limited term of the current MOP, the Plans prepared for the MOP align more closely to those of a Level 2 Mine.

1.4 LAND OWNERSHIP AND LAND USE

ML1633 is located over three land titles (see **Table 3**).

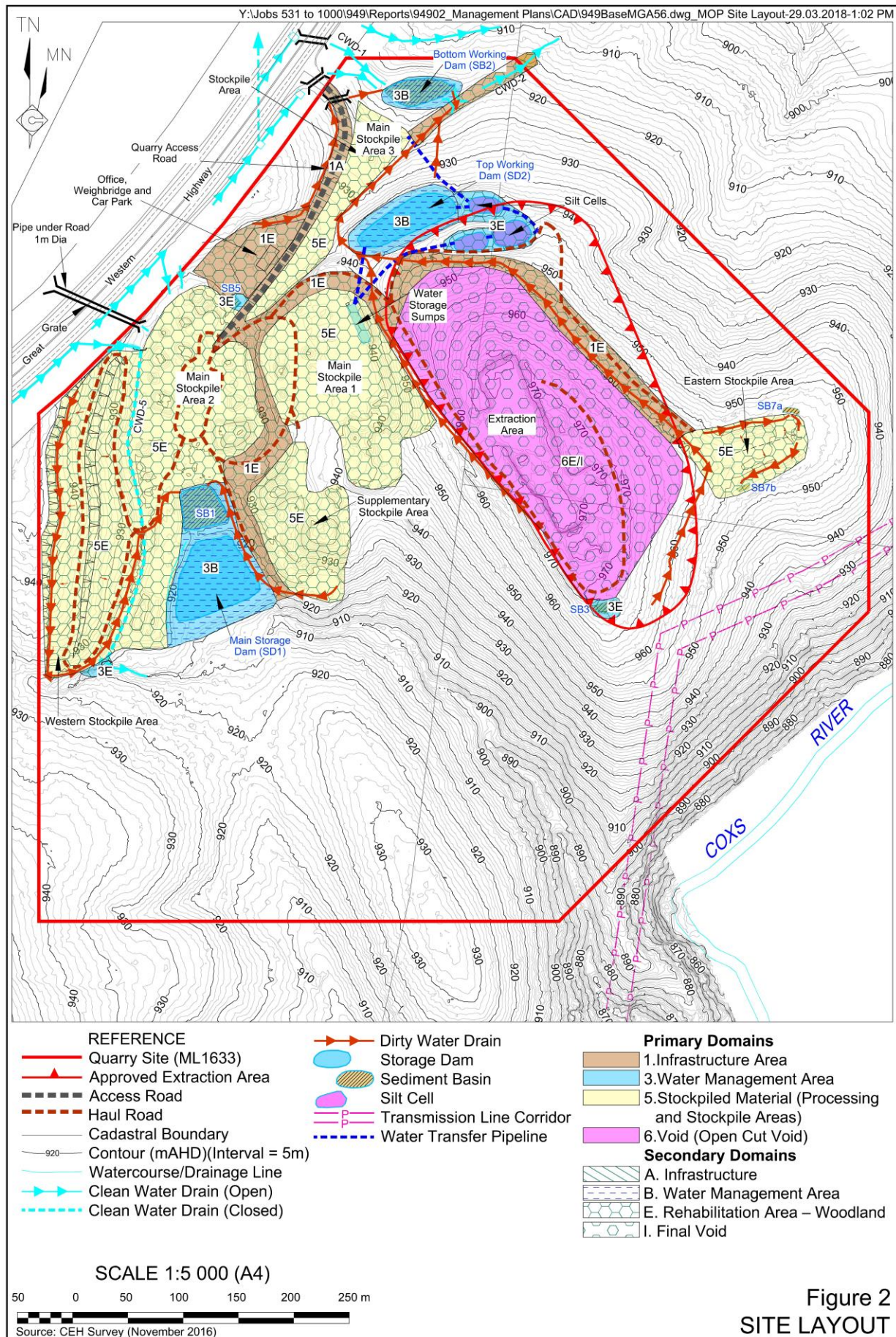


Table 2
Current Consents, Authorisations and Licenses

Number	Granted by	Grant Date	Expiry Date	Purpose
Development Consent				
DA 344-11-2001	Minister for Planning & Infrastructure	19 October 2004	15 July 2019	Extraction, processing and production of up to 500 000t of quarry products per year for a period of 10 years from the issue date of ML1633.
DA 344-11-2001 – MOD 1	Minister for Planning	25 August 2017	15 July 2019	Regularization of Quarry Site layout and incorporation of sand washing operations to allow for the production of sand and increased range of aggregate products.
Mineral Authorities				
EL4473	Minister for Mineral Resources	1 March 1994	12 January 2023	Exploration Activities.
ML1633		15 July 2009	15 July 2019	Mining activities at Wallerawang Quarry.
Licences – Environmental				
EPL13172	Environment Protection Authority	21 October 2009	Reviewed every 5 years	Regulation of noise, dust and water emissions from the Mine Site.
Source: Walker Quarries Pty Ltd				

Table 3
Land Ownership of ML1633

Property (Lot / DP)	Parish	County	Owner
7071/1201227	Lidsdale	Cook	State of New South Wales
7322/1149335	Lidsdale	Cook	State of New South Wales
6/872230	Lidsdale	Cook	Sitegoal Pty Ltd

Plan 1B presents the land ownership surrounding the Quarry Site. In addition, **Plan 1B** provides an aerial photo of the Quarry Site and its surrounds. Land uses within and surrounding the Quarry Site include the following.

- Forestry. ML1633 is located on non-plantation land within Lidsdale State Forest with plantation forest located less than 100m to the south.
- Nature conservation. Marrangaroo National Park is located 650m south of ML1633 with native woodland retained on non-plantation sections of Lidsdale State Forest and Lot 6 DP872230.
- Rural residential. Low density residential blocks are located to the north and northeast of ML1633, primarily on the opposite side of the Great Western Highway. The closest residence is located 650m northwest of the void with additional.
- Transportation (Great Western Highway).

- Electrical infrastructure (high-voltage power line and easement). Lake Wallace, which is the principal water storage for the Wallerawang Power Station and a Prescribed Dam under the *Dams Safety Act 1978*, is located 1.3km north of the void.
- Former quarrying and prospecting operations. The Hoskins Quarry and numerous small prospecting pits are located within ML1633.

1.5 STAKEHOLDER CONSULTATION

1.5.1 Community Consultation

Consultation undertaken with the local community, indigenous representatives and relevant government agencies in relation to the proposed development, operation and rehabilitation of the Quarry, as well as post-quarry land use was included in the Environmental Impact Statement for the Wallerawang Quarry (Pacrim Environmental, 2001) and the *Environmental Assessment* for DA 344-11-2001 MOD 1 (RWC, 2017a).

In addition, the Company has formed a Community Consultative Committee which meets approximately every six months. Representatives of the Company also meet with, or correspond with by phone or email, local and other concerned stakeholders on an ad hoc basis, i.e. opportunistically or as issues are identified. Moreover, a community information / complaints line is maintained by the Company and a complaints register is available on the Company's website (www.walkerquarries.com.au). As complaints or requests for information are received, the Company responds as quickly and comprehensively as possible. Furthermore, Representatives of the Company or their consultants visit several of the surrounding properties to undertake monitoring activities, providing an opportunity for issues to be identified and discussed.

1.5.2 Government Agency Consultation

In accordance with *Condition 3(31(b))* of DA 344-11-2001, the following government agencies and authorities were contacted by email on 20 October 2017 and asked to provide advice on their expectations of the Rehabilitation Management Plan.

- Department of Planning & Environment (DPE).
- Department of Industry – Lands and Water (formerly Department of Primary Industries) (DoI – Water / DoI – Crown Lands).
- Forestry Corporation NSW (FCNSW).
- Office of Environment & Heritage (OEH).
- Lithgow City Council (Council).

In addition to the community consultation described in Section 1.5.1, this addresses the stakeholder consultation requirements of the Guidelines.

The following summarises the advice provided by these agencies and authorities with information included as to how any recommendations or requests are addressed in this MOP. Copies of the consultation is provided in full as **Appendix 5**.

Department of Planning & Environment

The DPE confirmed in correspondence of 23 October 2017 it had no additional requirements to those outlined in Condition 3(31) of DA 344-11-2001. As requested in the correspondence of 23 October 2017, a copy of the MOP has been provided to the DPE for review.

Department of Industry – Lands and Water (formerly Department of Primary Industries)

Advice was received from the Water Regulation Group on 20 October 2017 that the request for advice had been referred to the Water Referrals section of the department. As of 20 March 2018, no further correspondence or advice has been received from DoI Water.

On 11 December 2017, the DoI – Crown Lands responded to the request for input and requested that the final landform void is rehabilitated to a standard that will ensure there is no ongoing maintenance requirement greater than the surrounding bushland.

Section 5.2 (Table 15) formalises this objective as part of the MOP and the rehabilitation performance indicators have been prepared to provide clear criteria to assess and confirm the achievement of this objective at the completion of Quarry operations (refer to Table 17).

Forestry Corporation NSW

In email correspondence of 15 November 2017, Forestry Corporation NSW (FCNSW) provided the following comments in relation to rehabilitation of the Quarry. It is noted that in several cases, these comments are contrary to the approved Quarry operations of DA 344-11-2001. In each case, further comment on the statements of FCNSW is included.

- FCNSW opposes the Quarry site entrance and access road, within the State forest boundary, to be retained.

The retention of the Site entrance and portion of the quarry access road to the office area was presented in the Environmental Assessment and not objected to by FCNSW at this time. By virtue of inclusion as an approved component of DA 344-11-2001, rehabilitation planning provides for the retention of this site entrance and access.

Furthermore, Endeavour Energy will require ongoing access to a pole substation to be constructed on ML1633 (refer to Section 2.3.2), regardless of a continuation of operations beyond the term of this MOP.

While noting the Company considers the retention of the Site entrance and access road to be approved, the Company also considers this provides an important and well-maintained access point to the property which could be used in the future by logging trucks or emergency services (during periods of local bushfire activity).

Noting the above, the Company will continue to liaise with FCNSW and should operations cease at the completion of this MOP, provide appropriate assistance to FCNSW should it wish to close the Site entrance post-development.

- FCNSW opposes an open cut void being retained.

*The Company notes that retention of the void is approved by DA 344-11-2001. As illustrated by **Plan 3** and description of the final landform (Section 4.2), however, the scale of the void at the completion of the MOP term would be restricted. Notably, the final floor elevation of the void (for this MOP term) will be 950m AHD with the following dimensions.*

- *The norther perimeter of the void would daylight with standing woodland vegetation retained to the immediate north to screen views.*
- *The eastern and western perimeters of the void would be less than 10m below the surrounding natural landform and slope at no greater than 55°.*
- *The southern perimeter of the void would be retained at an angle of 70°, however, would not exceed 15m in height.*

It is further noted that a significant portion of the final void is located on privately owned land.

- FCNSW opposes the former Hoskins Quarry being left in the form it was prior to commencement of operations.

The Hoskins Quarry currently retains stockpiles of materials previously screened and removed from the product stream. The Company is currently selectively excavating and despatching this material, either as an individual or blended product. As a consequence, the Hoskins Quarry will be returned to the pre-(Wallerawang Quarry) disturbance which is considered compliant with DA 344-11-2001.

- FCNSW opposes the main (or any) water storages of the Quarry Site to be retained.

As noted above, the Company considers the retention of water storages SB-1, SB-2, SD-1 and the major silt cell to the north of the open cut to be approved by virtue of the approved final landform of DA 344-11-2001. The Company also considers that these retained structures would provide an important resource in the event of bushfire activity in the future, or for any future water requirements of FCNSW (dust suppression, washing, etc.).

As above, while not the responsibility of the Company under DA 344-11-2001, the Company is happy to liaise with FCNSW regarding these water storages and assist as far as practical in landform preparation prior to exiting the Quarry Site should FCNSW propose further works.

Office of Environment & Heritage

In responding to the request for comment on the content of a Rehabilitation Management Plan and Biodiversity Management Plan, the NSW Office of Environment & Heritage (OEH) concentrated on the requirements of a Biodiversity Management Plan. Noting this, several of the guiding principals referenced for the management of biodiversity on the Quarry Site, are equally applicable to rehabilitation. These are as follows.

- Of particular importance is the description of the site, delineation of the site into appropriate management zones, development of an appropriate monitoring program, creation of KPIs that link into that monitoring plan, and development of a TARP to ensure that the KPIs are met.
- Where a management zone requires “active” management (e.g. revegetation) ensure that KPIs are developed for relevant timeframes (e.g. 2, 5, 10, 15 years etc) so that the expected ecological trajectory can be monitored and relevant response actions can be implemented where the KPIs aren’t met.

*Section 5.1 identifies how the rehabilitation of the Quarry is delineated into management zones (domains), Section 6 (**Table 17**) identifies the performance indicators developed for each rehabilitation domain and phase, Section 8.1 describes monitoring to be undertaken and Section 9.2 provides TARPs linked to the performance indicators.*

Lithgow City Council

Council responded on 15 November 2017 confirming no additional requirements to those of Condition 3(31) of DA 344-11-2001.

2. PROPOSED MINING ACTIVITIES

2.1 PROJECT DESCRIPTION

The approved Wallerawang Quarry includes the various components listed below and identified on **Figure 2**.

- Continued extraction from the approved quarry area using conventional drill and blast, load and haul methods.
- A crushing and screening plant to produce a range of aggregate sizes located within the void of the Quarry.
- A sand washing plant for the removal of clay and other small diameter particulates and three silt cells for the settlement of these finer particles.
- Three principal hardstand stockpile areas, Main, Western and Eastern, as identified on **Figure 2**.
- An office, car park and amenities buildings.
- Various water storages and drainage structures.
- An intersection with the Great Western Highway, security gates and sealed entrance road.
- A range of ancillary infrastructure, including internal roadways, bunds, soil stockpiles and laydown areas.

Detailed information regarding approved activities is available in the following documents.

- EIS titled *Proposed Wallerawang Quarry, Report 01/206.1*, dated November 2001 (Pacrim, 2001);
- Report titled *Supplementary Report to the EIS for the Proposed Wallerawang Quarry, Report 02/206.1*, dated July 2002 (Pacrim, 2002); and
- *Wallerawang Quarry Mining Operations Plan*, for the period 14 August 2016 to 14 August 2018 (RME, 2016).
- *Environmental Assessment for Modification to Operations at the Wallerawang Quarry (DA 344-11-2001)*, dated May 2017 (RWC, 2017a) and approved August 2017.

The following activities are undertaken, subject to market demand.

- Where it can be accessed, topsoil will be stripped and stockpiled for use in rehabilitation activities. Vegetation that is cleared will be selectively placed within areas being revegetated to take advantage of the existing seed bank, where available.
- Extraction by conventional drill and blast, load and haul methods.

- Overburden material is temporarily stockpiled within the footprint of the open cut from where it is either used within the site for approved construction activities or sold.
- Processing of raw material involving crushing, screening and washing using fixed or mobile plant to meet customer requirements.
- Product transportation involves loading of road registered trucks. Trucks then enter the Great Western Highway directly from the Quarry Site entrance.
- Progressive rehabilitation of eastern slopes of the extraction area and rehabilitation of the remaining landform at Quarry closure in accordance with the approved Mining Operations Plan.

All operations will be undertaken in accordance with the approved hours of operation presented in **Table 4**.

Table 4
Approved Hours of Operation

Activity	Permissible Hours
Quarrying operations	<ul style="list-style-type: none"> • 7:00am to 6:00pm Monday to Friday; • 8:00am to 1:00pm Saturday; and • At no time on Sundays or public holidays.
Loading and despatch of trucks	<ul style="list-style-type: none"> • May be conducted at any time, provided that these activities comply with the noise criteria in Table 2 of DA 344-11-2001, dated August 2017.
Blasting	<ul style="list-style-type: none"> • 9:00am to 5:00pm Monday to Friday; • 9:00am to 1:00pm Saturday; and • At no time on Sundays or public holidays.
Maintenance.	<ul style="list-style-type: none"> • May be conducted at any time, provided that these activities are not audible at any privately-owned residence.
Source: DA 344-11-2001 dated August 2017 – <i>Schedule 3 Condition 1</i>	

It is noted that under *Schedule 3 Condition 2* of DA 344-11-2001, material may be delivered to the Quarry Site outside of the hours of operation if required by police or other authorities for safety reasons, and/or the operation or personnel or equipment are endangered. In such circumstances prior notification shall be provided to the EPA and affected residents as soon as practically possible, or within a reasonable period in the case of emergency.

2.2 ASSET REGISTER

Table 5 details the domains within the Quarry Site, their size and major assets contained. Note that the areas detailed are based on maximum disturbance within the term of this MOP. A detailed description of each domain is provided in Section 5.1.

Table 5
Major Assets in each Domain

Domain (see Plan 2)	Area (ha)	Assets	Use and Details
1 – Infrastructure Area	2.4	Roads: Bitumen sealed Site Access Road to the office, weighbridge and wheel wash, and internal haul roads for access to stockpiles and the void.	Sealed roads provide entry and exit.
		Buildings: Demountable style office building (including crib and toilet facilities), supplementary contactor building, car park, weighbridge, wheel wash and water tanks.	Unsealed roads provide access to stockpile areas (for road trucks and void for haul trucks and site personnel.
		Processing: Mobile crushing train located within the void and mobile sand washing circuit located on the Main Stockpile Area.	Mobile crushing and washing operations are required to produce the range of products marketed by the Company.
3 – Water Management Area	2.3	Sediment Basins (SB-1 to SB-6) and water storage dams (SD-1 and SD-2).	The Quarry relies upon harvested surface water and the storage dams and sediment basins maximise the collection and storage of water.
		Silt cells.	The silt cells, which include concrete aprons and culverts are used to settle silt and clay from water used to wash the sand prior to re-sue.
		Water diversion drains and sumps.	Drainage channels are for both clean water diversion and management of run-off.
5 – Stockpile Areas	8.0	Main Stockpile Areas 1 to 3.	The Main Stockpile Areas are used to stockpile the primary products of the Quarry. The sand washing plant is located on Main Stockpile Area 1.
		Supplementary Stockpile Area (Hoskins Quarry).	This area has traditionally been used to stockpile crusher fines and other processing rejects. These materials are now being blended or sold as select fills.
		Western Stockpile Area.	This two-tiered structure provides additional storage area for the primary products of the Quarry.
		Eastern Stockpile Area.	The Eastern Stockpile Area is used for the stockpiling or pebbles, low volume products and for the drying of silt removed from the silt cells.
6 – Void (Open Cut)	4.0	Includes that portion of the approved extraction area (DA 344-11-2001) to be disturbed during the term of this MOP.	
9 – Conservation and Biodiversity Offset Area	27.3	Includes all undisturbed lands of ML1633.	
Source: Walker Quarries Pty Ltd			

2.3 ACTIVITIES OVER THE MOP TERM

2.3.1 Exploration

No exploration activities within ML1633 will be carried out during the term of this MOP. Exploration will be undertaken on land contained within the Company's exploration licence in accordance with the requirements of the Division of Resources & Geoscience (DRG) of the Department of Planning & Environment (DPE).

2.3.2 Construction

In accordance with Endeavour Energy issued approvals and procedures, a new 11kV pole substation will be constructed to the north of the site office (see **Appendix 6**) within an 8.5m x 27m easement. This construction will be independent of Quarry operations and does not require rehabilitation at the conclusion of the MOP term.

2.3.3 Land Preparation and Soil Management

An area of 1.3ha surrounding the existing void will be cleared and stripped of soil during the term of this MOP. This material will be stockpiled in the location identified on **Plan 2** for use in progressive or final rehabilitation activities.

Care will be taken during soil stripping, stockpiling and re-excavation to avoid loss of structure or compaction. Clearing and stripping will be implemented in accordance with the following principles during the MOP term.

Vegetation Management

- Mature trees will be chainsaw felled or pushed by bulldozer in accordance with the vegetation clearance protocol nominated in the Flora and Fauna Management Plan (to be replaced by a Biodiversity Management Plan following confirmation of a final Biodiversity Offset Strategy).
- Felled trees would be track rolled (unless not safe to do so) and pushed into wind row stockpiles to the north of the void to be disturbed during the term of this MOP (but within the approved extraction area limit of DA 344-11-2001).
- The remaining shrub and understorey vegetation would be grubbed and pushed into stockpiles adjacent to the larger track rolled vegetation.
- If to remain unused in vegetation for greater than 18 months, the track rolled vegetation will be mulched to reduce the potential for these stockpiles to become havens for vermin or weed species.
- Vegetation clearing will be undertaken separate to soil stripping (as far as practicable) to avoid contamination of soils with large quantities of green material as this promotes biological degradation (composting) of this material (which would otherwise be a source of regrowth when the topsoil is respread).

Soil Stripping

- Where horizons are distinguishable between topsoil and subsoil, these would be stripped separately. In particular, care will be taken to ensure that subsoil clays are not removed with the topsoil (as this material is dispersive and will reduce the quality of material available for rehabilitation activities). However, inspection of soil profiles available along internal road cuttings suggests the soil layer is relatively thin (<400mm) with limited differentiation between upper topsoil and lower subsoil layers.
- The soil will either be pushed into wind rows beyond the extent of the void (to the northern and adjacent to the vegetation stockpiles) or loaded into trucks and either transported directly to areas being rehabilitated or to these stockpiles.
- Care will be taken when forming stockpiles that the material is not overly compacted through the manual application process or by equipment driving over the stockpiles.
- Where the soil is not expected to be utilised for 3 months, the surface will be revegetated with a groundcover species to stabilize the surface and limit erosion from the stockpiles.
- Timber, logs, rocks and other vegetative matter which will interfere with respreading applications or surface stability will be removed.

Section 5.4 provides an inventory of soil / growth media availability against the requirements of rehabilitation.

2.3.4 Mining Operations (Including Mining Purposes)

The Company will continue to mine from the approved extraction area using conventional drill and blast, load and haul methods. Blasting will be carried out in accordance with the approved Quarry Blast Management Plan (including a Blast Monitoring program and Blasting/Vibration Protocol).

The void is to be extended to the extent identified on **Plan 3** (4.0ha). The floor level of the void, which currently rises from 955.5m AHD at the northern end to approximately 960m AHD, will be reduced to 950m AHD.

Extraction faces will generally be limited to between 10m and 15m in height, with 3m to 5m benches maintained between faces where required (only at the southern end of the void during the term of this MOP). The southern and western extraction faces will be constructed at an angle of between 70° and 80°. The eastern face will be developed at an angle of 55° which follows the contact with the underlying geology. The northern face will daylight behind retained native woodland vegetation at 950m AHD.

The Company proposes to complete mining in a generally north to south direction over the term of this MOP.



2.3.5 Rock/Overburden Management

No overburden emplacements are required as the limited overburden which may be encountered will be used to sheet internal roads and hardstands, maintain bund walls or blended to produce specialty products to customer specifications.

2.3.6 Processing Residues and Tailings

The silt collected in the silt cells is periodically excavated and placed within drying cells on the Eastern Stockpile Area. The dried silts are managed as overburden but will also be blended with stockpiled soils to produce an enhanced soil, with increased mineral content and better water holding capacity, for rehabilitation.

2.3.7 Waste Management

In most cases, non-production waste generated across this MOP period will be collected on Mine Site and removed for disposal or recycling by a suitably qualified contractor. **Table 6** presents an estimate of the non-production waste and briefly describes how each class of waste is stored and subsequently removed from Quarry Site.

2.3.8 Decommissioning and Demolition Activities

There are no areas or permanent structures expected to be decommissioned or demolished during this MOP period.

2.3.9 Temporary Stabilization

During the term of this MOP, the only features likely to require stabilization are soil stockpiles and the steeper batters of the Western Stockpile Area and some water storages. Temporary stabilization and soil stockpile management includes the following practices.

- Minimising, as far as practicable, the operation of machinery on soil stockpiles to minimise compaction.
- Leaving the surface of the soil stockpile with an even but roughened surface to assist in erosion control and seed germination and emergence.
- Establishing an appropriate vegetative cover on any soil stockpile that is retained for more than three months.

In the event groundcover cannot be quickly established using the methods nominated above, hydroseeding will be the primary method used to temporarily stabilize steeper slopes greater than 30°. Other methods of stabilization may be investigated during the period of the MOP.

Table 6
Non-Production Waste Management

Waste Type	Storage / Management	Removal / Disposal
General waste (including food scraps)	Covered bins or skips located within lunch rooms, offices, outside workshops and elsewhere as required. Where these bins are located in open areas they are fitted with animal proof lids.	Collected on a regular basis by a licensed contractor and transported to an appropriately licensed facility for disposal.
General Recyclables	Covered bins or skips located within lunch rooms, offices, outside workshops and elsewhere as required. Where these bins are located in open areas they are fitted with animal proof lids.	Collected on a regular basis by a licensed contractor and transported to an appropriately licensed facility for recycling.
Waste Oils and Greases	Placed within bunded tank(s) within the workshop area. Where required, smaller, temporary storage containers may be positioned close to work areas, with the contents of those containers transferred to a larger storage tank prior to collection.	Collected on a regular basis by a licensed contractor and transported to an appropriately licensed facility for recycling.
Batteries	Placed within a covered and marked used battery storage area until removed from Mine Site.	Collected on a regular basis by a licensed contractor and transported to an appropriately licensed facility for recycling.
Tyres	Placed within a marked used tyre storage area until removed from site or used for another purpose.	Tyres are re-used on Mine Site for construction of retaining walls, erosion protection, traffic control etc. These tyres (at the end of use for that purpose) and others not used are disposed of to a licensed waste management facility or a third party approved to recycle tyres.
Scrap Metal	Stored in a specified area within the workshop area or elsewhere as required.	Collected on a regular basis by a scrap metal recycler.

2.3.10 Progressive Rehabilitation and Completion

Opportunities for progressive rehabilitation during the term of this MOP will be limited as the majority of disturbed areas will either be required for ongoing operations or have been subject to rehabilitation activities already. The Company will monitor the success of rehabilitation on the batter slopes of the Western Stockpile Area, dam walls and cleared areas near the Site Entrance and undertake remedial works as required where rehabilitation fails to meet the criteria set in Section 6 of the MOP.

2.3.11 Material Production Schedule during MOP Term

Table 7 presents the material production schedule for the term of this MOP.



Table 7
Material Production Schedule during the MOP term

Material	Unit	Remining Term of DA 344-11-2001 (14/05/17 – 15/07/19)	Average Monthly
Stripped Topsoil	m ³	0	0
Rock / Overburden	bcm	0	0
Quarried Material (ROM)	m ³	100 000	7 700
Reject Material (oversize, undersize / fines)	t	<1 000	<100t
Product	t	260 000	20 000

3. ENVIRONMENTAL ISSUES MANAGEMENT

3.1 ENVIRONMENTAL RISK ASSESSMENT

An environmental risk assessment has previously been completed for previous version of the MOP. This has been reviewed and updated following the recommendations and guidance provided by *AS/NZS ISO 31000:2009 Risk Management – Principles and Guidelines* focusing on rehabilitation-specific risks. **Tables 8, 9 and 10** present the consequence, likelihood and risk rating used during this analysis. **Table 11** presents the results of the risk analysis assuming that industry minimum standard mitigation measures only are implemented.

Table 8
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 and Guidelines		

Table 9
Qualitative Likelihood Rating

Level	Descriptor	Description	Indicative Frequency
A	Almost Certain	Is expected to occur in most circumstances	Once a year or more
B	Likely	Will probably occur in most circumstances	Once every three years
C	Possible	Might occur at some time	Once every ten years
D	Unlikely	Could occur at some time	Once every thirty years
E	Rare	May occur only in exceptional circumstances	Once every 100 years
Note: Rating modified after AS/NZS ISO31000:2009 Risk Management – Principles and Guidelines			

Table 10
Qualitative Risk Rating

Likelihood	Consequences				
	Insignificant 1	Minor 2	Moderate 3	Major 4	Catastrophic 5
A (Almost Certain)	M	H	H	VH	VH
B (Likely)	M	M	H	H	VH
C (Possible)	L	M	H	H	H
D (Unlikely)	L	L	M	M	H
E (Rare)	L	L	M	M	H
Note: Rating modified after AS/NZS ISO31000:2009 Risk Management – Principles and Guidelines					

Table 11
Key Rehabilitation-related Risks during the MOP Term

Issue	Exploration	Land preparation, vegetation and topsoil stripping	All construction activities including earth moving	Mine development and mining, surface and underground	Use / maintenance of roads, track and equipment	Waste rock emplacement management	Ore stockpiling and handling	Processing facilities and infrastructure	Residue Storage Facility management	Water management including storage event contingencies	Hazardous materials and fuel, handling / spills management	Sewerage	Rubbish disposal	Rehabilitation activities	Rehabilitated land and remaining features
Air Pollution (Dust)	-	M(2C)	■	M(2C)	L(2D)	L(2D)	L(2D)	L(1E)	M(2C)	L(1E)	L(1E)	L(1E)	L(1E)	M(2C)	L(2E)
Erosion & Sedimentation	-	L(1C)	■	L(1E)	L(1D)	L(2D)	L(1D)	L(1D)	L(1D)	M(2C)	L(1E)	L(1E)	-	M(2C)	L(2E)
Surface Water Pollution	-	L(2D)	■	L(1E)	L(1D)	L(2D)	L(1D)	L(1D)	L(1D)	M(2C)	L(1E)	L(1E)	-	M(2C)	L(2E)
Ground Water Pollution	-	-	-	L(2D)	-	-	-	-	-	-	L(2D)	L(2D)	-	-	-
Contaminated or Polluted Land	-	-	-	-	-	-	-	M(3D)	M(3D)	-	M(3D)	L(2D)	L(1E)	-	-
Threatened Flora Protection	-	M(3D)	-	-	-	-	-	-	-	-	-	-	-	L(2D)	L(2D)
Threatened Fauna Protection	-	L(2D)	-	-	-	-	-	-	-	-	-	-	-	L(2D)	L(2D)
Weed Control and Management	-	L(1E)	-	-	-	-	-	-	-	-	-	-	-	M(2C)	M(2C)
Operational Noise	-	M(2C)	■	L(2D)	L(1E)	L(1D)	L(2D)	L(2D)	L(1E)	L(1E)	-	-	-	L(2D)	L(2D)
Vibration and Air Blast	-	-	-	L(2D)	-	-	-	-	-	-	-	-	-	-	-
Visual Amenity	-	L(2D)	-	H(3B)	L(1E)	L(2D)	L(1E)	L(1E)	L(1E)	L(1E)	-	-	-	L(1C)	L(1C)
Aboriginal Heritage	-	M(3D)	-	-	M(3D)	-	-	-	-	-	-	-	-	M(3D)	M3(D)
Non-Aboriginal Heritage	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bushfire	-	L(2E)	-	-	-	-	-	-	-	-	-	-	-	L(2E)	L(2E)
Hydrocarbon Contamination	-	-	-	M(3E)	-	-	-	-	-	-	-	-	-	-	-
Public Safety	-	L(2D)	L(2D)	L(2D)	L(2D)	L(2D)	L(2D)	L(2D)	L(2D)	L(2D)	L(2D)	-	L(2D)	L(2D)	L(2D)

3.2 ENVIRONMENTAL RISK MANAGEMENT

3.2.1 Approach to Risk Management

The following management plans have been prepared and are implemented to further reduce the risk of environmental incident.

- Environmental Management Strategy.
- Water Management Plan (incorporating a Soil and Water Management Plan).
- Noise Management Plan.
- Blast Management Plan.
- Air Quality Management Plan.
- Flora and Fauna Management Plan (to be replaced by a Biodiversity Management Plan within 6 months of approval of a final Biodiversity Offset Strategy).
- Bushfire Management Plan.
- Environmental Monitoring Program.
- Pollution Incident Response Management Plan.

3.2.2 Specific Risks Relating to Rehabilitation

3.2.2.1 Geology and Geochemistry

The mineral to be extracted – quartzite (SiO_2), is generally inert and is non-hazardous to the environment. The processed product does not differ chemically from the ore.

3.2.2.2 Soil Type(s) and Suitability

Soil stripping and stockpile management measures are identified in Section 2.3.3. These measures would maximise the potential for the stripped soil remains viable for use during rehabilitation. As a result, risks associated with soil and its suitability are not considered to be significant.

Care will be taken to avoid fuel spills in the machinery laydown/refuelling area. Any stored fuel will be kept in an existing concrete containment tank. Any contaminated soil will be removed for disposal at an approved waste facility.

3.2.2.3 Erosion and Sediment Control

The principal potential sources of surface water pollution, erosion and sediment during the MOP term include stormwater runoff from the stockpile areas, processing pad and haul roads. Surface water and erosion and sediment control measures are outlined within the Quarry Soil and Water Management Plan.



In summary, the following principal surface water and erosion control measures are or will be implemented at the Quarry.

- Stormwater runoff generated in those areas disturbed by Quarry activities is directed via gravity or drainage infrastructure to seven sediment basins.
- Water from undisturbed (clean) catchments, on site or upstream, is directed away from disturbed areas via diversion drains which discharge directly to the receiving environment downstream of the Quarry.
- Use of temporary erosion and sediment control structures including sediment fencing, straw bale filters and check dams where required to minimise the discharge of sediment-laden water from erosion susceptible areas (installed preferably prior to commencement of disturbance) and non-vegetated stockpile areas.
- Use of permanent erosion control structures including check dams, jute mesh and rock armouring where required.
- Installation of energy dissipaters and outlet protection at the outlet of pipe drains if required.

3.2.2.4 Surface Water Quality

Surface water is managed in accordance with the approved Soil & Water Management Plan (RWC, 2017b). The plan promotes the separation of clean and dirty water runoff with clean water diverted away from or through the Quarry Site. Dirty water, i.e. water which has come into contact with disturbance associated with the Quarry, is diverted to sediment basins for collection, settlement and re-use on-site. Except under rainfall conditions exceeding a 5-day 95th percentile event, no water is discharged from the Quarry Site unless it can be established it achieves the water quality criteria nominated in the Soil & Water Management Plan.

The control of water in the manner nominated above, reduces the risk of uncontrolled flows of water affecting lands where rehabilitation has been commenced or completed.

3.2.2.5 Groundwater

Groundwater is not expected to be encountered during the term of this MOP. The Soil & Water Management Plan provides for management of the potential risks associated with groundwater contamination.

3.2.2.6 Flora and Fauna

A Flora and Fauna Management Plan (RWC, 2016), detailing procedures for flora and fauna management has been prepared for the Quarry and approved by the DPE. This Plan includes measures for managing threatened species, seed collection, weed control and habitat

management. The following documents the key management measures contained within this plan which have the potential to influence the relative success of rehabilitation of the Quarry. These management measures are implemented to:

- ensure that remnant vegetation within the Quarry Site is documented and suitably protected and maintained;
- reduce risks to bushland adjacent to the Quarry Site, as much as practically possible;
- guide revegetation of disturbed areas no longer required for operations; and
- minimise potential impacts to native flora and fauna as a result of quarry operations.

Vegetation Clearing Protocol

Vegetation clearing within the Quarry Site will be undertaken as the extraction area is progressively developed to its full extent and the establishment of surface infrastructure.

Clearing will be limited to approved areas only, with areas to be minimised to avoid impacts to native vegetation. Progressive clearing will ensure that vegetation is retained for as long as possible and only removed immediately before an area is required for operations.

Clearing campaigns will be scheduled to avoid spring to reduce the potential impact to roosting or breeding fauna species.

Vegetation clearing within the Quarry Site will occur in accordance with the following protocols.

- Areas to be cleared will be subject to a pre-clearing survey, including survey of individual trees specifically directed towards detecting any roosting or nesting fauna.
- Investigation of trees will be conducted on the day that they are to be cleared, to detect any individual animals present at the time.
- Where arboreal species are detected, a 10m buffer will be established around the tree and it will be left overnight to allow animal to vacate the tree.
- Large habitat trees and those in which species have previously been identified will be carefully felled and any hollows checked at the end of the process for wildlife.
- Where fauna remains or is captured during vegetation clearing the animal will be released into nearby native vegetation where it is considered that doing so does not put the species at risk of injury.
- Should clearing activities result in injury to any native fauna species, the local WIRES organisation or a suitable alternative will be contacted immediately for assistance.

Hollow-bearing Tree Management

Tree-hollows are an important resource for many native fauna species and are vital for some species. The retention and protection of hollow-bearing trees is an important element in the maintenance of biodiversity and in the execution of an environmentally sound development. The following specific protocols relating to hollow-bearing trees will be implemented.

- Hollow-bearing trees that have been felled will be placed in rehabilitation areas or undisturbed areas of the Quarry Site.
- A controlled felling technique will be used for clearing of hollow-bearing trees that includes the following.
 - Initially nudging the tree to induce any fauna to vacate. This process should progressively increase in force.
 - Wait a period of five minutes to allow the fauna to vacate the tree. Repeat this step if necessary.
 - Select the preferred direction of fall and push the tree from a high point along the trunk towards the preferred direction of fall.
 - If the tree is too strong to be pushed with all roots intact, some of the roots on the restraining side will be cut and/or excavated.
 - The speed of fall and ground impact will be reduced where possible.

Salvage, Storage and Reuse of Materials

As noted in Section 2.3.3, large landscape features such as major tree trunks, major tree limbs and if possible minor branches, along with large boulders, will be salvaged and used directly in progressive rehabilitation activities. This activity will create habitat with structural complexity and encourage many species into the rehabilitated areas.

Larger materials surplus to these requirements will be track rolled and stockpiled for future placement over final surfaces of the Quarry which have been covered with soil or other growth media. Where stockpiles of cleared vegetation are retained, or likely to be retained for in excess of 18 months, these will be mulched to reduce stockpile size and the potential for these as havens for vermin and weeds.

Collecting or Purchase of Seed

Options for revegetation from seed include the following.

- Unassisted revegetation. This method ensures only endemic species, able to withstand the harsh climate of the area, will succeed. In this scenario only weed control and feral and overabundant animal control would be required.

This method of revegetation has been and will continue to be applied successfully to smaller areas of disturbance where remnant or rehabilitated vegetation adjoins this disturbance. Areas such as internal roads and drill pads, temporary sumps or stockpiles are effectively revegetated in this way.

- Assisted revegetation. This method includes collecting or purchasing seed. Collecting and propagation of naturally occurring seed produces plant material of local provenance and genetic suitability that can be used in revegetation programs.

This method is and will continue to be applied to larger areas of disturbance to be rehabilitated, in particular where there is no adjoining remnant native vegetation to provide seed for natural regeneration.

Local nursery and rehabilitation contractors have been commissioned to collect seed from endemic species with a seed bank established at a local nursery. The seeds are stored until sowing in labelled zip-lock bags and refrigerated until required (to reduce humidity or warmth that may cause seed to deteriorate or die from fungal disease or rotting). Most seed will remain viable in this way for many years. The seeds are included in mixes that are directly seeded to stabilized surfaces with an established growth media or used to propagate tubestock for individual planting.

Seed may also be purchased from suitable dealers.

Tubestock Planting

Tubestock propagated from endemic seed are planted where quick establishment of trees and shrubs is required, e.g. on bunds to screen views of the Quarry. The procedures for tubestock planting and establishment are as follows.

- Rip lines are made along the contour where access by machinery is available. These provide for easier planting and also increase the capture of runoff and stabilize the land and prevent sheet or channel erosion.
- Tubestock area planted with water crystals and fertiliser tablets to increase the success of the plantings.
 - Water crystals become wet and expand, keeping water at the roots of the plants, ready to be utilised for growth.
 - The fertiliser tablets are suitable for native plants, with a low phosphorus level.
 - Water crystals can provide nutrients to the plants for up to 18 months.

Hydromulch Application

On steeper slopes (>30°), a hydromulch (water, polymer and seed mix) is applied as soon as practicable following soil application to bind the soil until groundcover can establish.

Aras hydromulched will be inspected every 2 to 3 months with reapplication undertaken where groundcover does not achieve 70%.

Purple Copper Butterfly Management

Several targeted surveys have been undertaken within the Quarry Site to locate potential resident populations of the Purple (or Bathurst) Copper Butterfly (*Paralucia spinifera*). No examples of the species have been identified to date, however, some examples of the

Blackthorn plant (*Bursaria spinosa ssp lasiophylla*) have been identified. Purple Copper Butterfly is known to be dependent on this plant as a food source and has developed a symbiotic relationship with the ant species *Anonychomyrma nitidiceps* which are thought to offer the butterfly larvae some protection while they feed on the Blackthorn in return for nutritional secretions from the larvae (CSIRO 2002; Dexter & Kitching 1991a).

Management of the species will be directed towards protection of the Blackthorn. The following measures will be implemented to protect, conserve and re-establish Blackthorn within the Quarry Site.

- Operations will, where possible, be designed to avoid the removal of Blackthorn.
- Natural vegetation screenings will be developed for the existing Blackthorn populations within the Quarry Site to minimise dust impacts from operations.
- Existing Blackthorn populations will be marked so the site personnel will be able easily identify the species and avoid contact or unnecessary removal.
- Targeted monitoring of the Blackthorn and Purple Copper Butterfly will be undertaken by a qualified ecologist on an annual basis. Monitoring is described in more detail in Section 5.
- Blackthorn populations will be included in revegetation activities associated with progressive rehabilitation of the Quarry Site. A suitably qualified person will be commissioned to provide advice on establishment of the Blackthorn to encourage development of suitable habitat for the Purple Copper Butterfly.

3.2.2.7 Weed Management

All noxious weeds will be managed and controlled in accordance with the requirements of the *Noxious Weeds Act 1993*.

Weed control within the Quarry Site will focus upon the removal of Weeds of National Significance (WoNS), noxious weeds and reducing the risk of further weed invasion. This will be achieved by deterring the growth of weeds in recently disturbed areas and preventing the transportation of weeds into the Quarry Site.

A list of declared weed species, their classification and suitable management approach for each species that is relevant to the Quarry is maintained by the Department of Primary Industries – Agriculture for the Upper Macquarie County Council (this Local Control Authority area includes the local council areas of Bathurst Regional Council, Blayney Shire Council, City of Lithgow Council and Oberon Council).

As cleared areas are removed from operations, they will be revegetated with a suitable groundcover to stabilize the surface and limit the potential for weed growth. An annual weed spraying and, where necessary, manual removal or slashing campaign will be continued to address any weeds that are evident. Any weed removal campaign will need to consider the weather conditions, soil conditions and time available for spraying. All herbicides will be handled and applied generally in accordance with the manufacturer's instructions.

3.2.2.8 Bushfire Management

Bushfire management is described in the *Bushfire Management Plan* for the Quarry. In summary the principle management measures include the following.

- Provision of fire extinguishers and other infrastructure.
- Management of hazardous and flammable material such that the potential for ignition is limited.
- Limiting smoking to specific areas within the Quarry Site.
- Ensuring a suitable supply of water is available for site and public use for firefighting purposes.
- Establishment of suitable fire breaks along the perimeter of the Quarry Site.

There are no recently recorded fire events within the Quarry Site. Any requirements for mosaic burning will be undertaken in accordance with directions from the NSW Rural Fire Service.

3.2.2.9 Other Risks

Slope management

As far as possible, slopes of the final landform will be less than 18°. The exception will be the southern face of the void which will retain a face of 70° and the eastern and western faces of the void which will be rehabilitated at 55°. In both cases, the Company will confirm geotechnical stability of the final slopes prior to lease relinquishment.

Access and Site Security

The following will be implemented to ensure access to the Quarry Site is restricted, as much as practically possible.

- Inspection and maintenance of fencing as required (after high wind / storm events).
- Gates installed and maintained.
- Installation of appropriate signage.
- Awareness training for site personnel, contractors and neighbours.

4. POST MINING LAND USE

4.1 REGULATORY REQUIREMENTS

Regulatory requirements specifically affecting the progress towards the post mining land use are detailed in **Table 12**.

Table 12
Regulatory Requirements for Rehabilitation

Page 1 of 2

Source Document	Subject	Rehabilitation Requirement
Mining Lease	General	Any disturbance as a result of activities under this lease must be rehabilitated to the satisfaction of the Secretary of the Division of Resources and Geoscience.
	Rehabilitation Security	Provide and maintain a security deposit.
Environmental Assessment	Decommissioning	Decommissioning of structures and facilities as described in Section 2.8.4.1 of the <i>Environmental Assessment</i> (RWC, 2017a).
	Final Landform and Land Use	Establish a final landform and land use in accordance with Section 4.5 and Figures 4.4 and 4.5 of the original <i>Environmental Assessment</i> for the Quarry (Pacrim, 2001), and Section 2.8.3 and Figure 7 of RWC (2017a).
	Revegetation	Revegetation in accordance with Section 4.5.5 of Pacrim (2001) and Section 4.6.2 of RWC (2017a).
	Soil Management	Follow the procedures for Soil Stripping and Stockpile Management detailed in Sections 4.5.3 of Pacrim (2001) and Best Management Practices of the Wallerawang Quarry: Erosion and Sediment Control Plan.
DA 344-11-2001	General	The Applicant must rehabilitate the site to the satisfaction of DRG. This rehabilitation must be generally consistent with the proposed rehabilitation activities described in the EIS and EA (Mod 1); and Schedule 2 (and shown conceptually in the Rehabilitation Plan in <i>Appendix 2</i>).
	Rehabilitation Objectives (Table 6)	<p>All areas of the site affected by the development</p> <ul style="list-style-type: none"> • Safe, hydraulically and geotechnically stable and non-polluting. • Fit for the intended post-mining land use(s). • Final landform integrated with surrounding natural landforms as far as is reasonable and feasible, and minimising visual impacts when viewed from surrounding land. <p>Surface Infrastructure</p> <ul style="list-style-type: none"> • Decommissioned and removed, unless otherwise agreed by the Secretary. <p>Quarry benches and pit floor</p> <ul style="list-style-type: none"> • Landscaped and vegetated using native tree and understorey species. <p>Final Void</p> <ul style="list-style-type: none"> • Minimise the size, depth and slope of the batters of the final void. • Minimise the drainage catchment of the final void.

Table 12 (Cont'd)
Regulatory Requirements for Rehabilitation

Page 2 of 2

Source Document	Subject	Rehabilitation Requirement
DA 344-11-2001 (Cont'd)	Progressive Rehabilitation	The Applicant must rehabilitate the site progressively, that is, as soon as reasonably practicable following disturbance. All reasonable and feasible measures must be taken to minimise the total area exposed for dust generation at any time. Interim stabilization measures must be implemented where reasonable and feasible to control dust emissions in disturbed areas that are not active and which are not ready for final rehabilitation.
	Rehabilitation Management Plan	The Applicant must prepare a Rehabilitation Management Plan for the project to the satisfaction of DRG.

4.2 POST MINING LAND USE GOAL

The nominated post mining land use goals for the Quarry are:

- to implement successful design and rehabilitation of landforms to ensure structural stability, revegetation success and prevention of pollution;
- to ensure rehabilitation and revegetation is self-sustaining and follows the principles of sustainable development; and
- to return the Quarry Site to an area of passive conservation, i.e. sustainable native woodland with management requirements no greater than the surrounding landforms.

4.3 REHABILITATION OBJECTIVES

In order to achieve the nominated post mining land use goals, the objectives of rehabilitation activities are as presented in **Table 13**.

Table 13
Rehabilitation Objectives and Targets

Page 1 of 2

Feature	Objective	Target
Land Use	Produce a sustainable native woodland community with management requirements no greater than the surrounding landforms.	Rehabilitate Mine Site in accordance with Plan 4 .
	Minimise adverse socio-economic outcomes following mine closure.	Consult with the community and government agencies in relation to the post-mining land use Rehabilitate the Mine Site in accordance with Plan 4 , unless otherwise agreed.

Table 13 (Cont'd)
Rehabilitation Objectives and Targets

Page 2 of 2

Feature	Objective	Target
Landform	Provide a low maintenance, geotechnically stable and safe, non-polluting landform and provides land suitable for the proposed final land use.	Geotechnical results show the landform is stable.
	Construct the final landform such that it is self-sustaining.	The final landform has maintenance requirements consistent with the agreed post mining land use(s). Rehabilitate the Mine Site in accordance with Plan 4 .
	Provide rehabilitated woodland communities which adjoin conserved and improved native vegetation remnants to create a contiguous corridor of woodland vegetation.	Monitoring to confirm that woodland vegetation is established, sustainable and contiguous.
Biodiversity	Establish a native ecosystem over the Quarry Site (excluding the access tracks and water management features to be retained) to develop a landform that is self-sustaining, low maintenance, and closely resembles the ecosystem surrounding the Quarry Site, i.e. PCT732 or PCT1093 ¹ .	Establish a Biodiversity Offset Strategy and prevent disturbance to remnant native vegetation of ML1633 (not approved for disturbance by DA 344-11-2001).
Surface Infrastructure	Decommission and remove all surface infrastructure (unless required for a lawful post mining land use).	All surface infrastructure removed (unless required for a lawful post mining land use).
Final Voids	Ensure the final void are safe, stable and secure.	Construct a safety bund around the void.
Other	Allow for the relinquishment of the Mining Lease and the return of the security lodged over the Mining Lease within a reasonable time after the end of the mine life.	Within 5 years of final rehabilitation.
Note 1: Refer to Section 5.1.3 for discussion on remnant Plant Community Types (PCTs)		

More detailed rehabilitation objectives specific to specific features of the Quarry Site, identified as 'domains', are provided in Section 5.1.3 and **Table 15**.

5. REHABILITATION PLANNING AND MANAGEMENT

5.1 DOMAIN SELECTION

5.1.1 Introduction

A domain is a land management unit within the Quarry Site. Rehabilitation domains refer to areas of related disturbance based on processes and use prior to rehabilitation and for which decommissioning and rehabilitation activities would be similar. For the purposes of this MOP, the Quarry Site domains comprise primary and secondary domains as follows.

1. Primary or operational domains – categorised on the basis of mining-related activities occurring within each domain.
2. Secondary or post-mining land use domains - categorised on the basis of similar post-mining land use objectives and rehabilitation outcomes.

Table 14 identifies the relevant domains listed in the MOP Guidelines used to define the rehabilitation of the Quarry Site throughout this MOP.

Table 14
Primary and Secondary MOP Domains

Code	Primary Domains (operational)	Code	Secondary Domains (Post Mining Land Use)
1	Infrastructure Area	A	Infrastructure
3	Water Management Area	B	Water Management Area
5	Stockpiled Material (Processing and Stockpile Areas)	E	Rehabilitation Area – Woodland
6	Void (Open Cut Void)	I	Final Void
7	Rehabilitation Area (Temporary Stabilization)	J	Conservation and Biodiversity Offset Area
9	Conservation and Biodiversity Offset Area		
Source: Modified after ESG3: Mining Operation Plan Guidelines, September 2013 – Table 4			

Plan 2 presents the status of the rehabilitation domains at MOP commencement, and **Plan 3** presents the status at the end of this MOP term. Sections 5.1.2 and 5.1.3 provide a description of the nominated primary and secondary domains of ML1633.

5.1.2 Primary Domains

Domain 1 – Infrastructure Areas

This domain includes the Quarry Site Entrance and Access Road, offices and car park, weighbridge and miscellaneous surrounding hardstand surfaces.

Domain 3 – Surface Water Management Structures

This domain includes all clean and dirty water dams, diversion drains and associated infrastructure.

Domain 5 – Stockpile Areas

This domain includes the following individual areas identified on **Figure 2**.

- the Main Stockpile Areas (1 to 3).
- Supplementary Stockpile Area (within the former Hoskins Quarry).
- Western Stockpile Extension Area (WSEA).
- Eastern Stockpile Extension Area (ESEA).

Domain 6 – Void

This domain includes the final open cut void and main haul ramp.

Domain 9 – Conservation and Biodiversity Offset Areas

This domain includes all lands of ML1633 beyond the approved disturbance footprint which retains remnant native vegetation. Depending on the outcome of investigation currently ongoing to establish the most effective Biodiversity Offset Strategy (BOS) for the Quarry, this could include a formal Biodiversity Stewardship Site. Information on the status of the development and implementation of a Biodiversity Offset Strategy is provided in an Interim BOS prepared by Ecoplaning Pty Ltd which has been approved by the DPE (Ecoplaning, 2018).

5.1.3 Secondary Domains

Domain A – Infrastructure

This domain includes those items of infrastructure that would remain following quarry closure for a lawful land use, namely a land use permitted without consent or following granting of development consent. In the absence of further approvals, this would be limited to the entrance and sealed access road.

Domain B – Water Management Areas

This includes those water management structures of the Quarry to be retained in the final landform. In accordance with the *Environmental Assessment* which accompanied the most recent modification to DA 344-11-2001, this includes:

- Main Storage Dam (SD-1);
- Main Sediment Basin (SB-1);
- Top Working Dam (SD-2);
- Bottom Working Dam (SB-2); and
- the clean water diversion drain.

All silt cells, sediment basins and water storage sumps are to be decommissioned, backfilled and profiled.

Domain E – Rehabilitation Area –Woodland

This domain includes those areas of the Quarry Site that would be rehabilitated to a woodland consistent with the surrounding woodland communities.

- PCT732: Broad-leaved Peppermint – Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion.
- PCT1093: Red Stringybark – Brittle Gum – Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion.

This domain includes the Processing and Stockpile Area (Primary Domain 5) in its entirety as well as the decommissioned water management structures of Primary Domain 3, all but the site entrance and access road of Domain 1 and a large portion of the void (Primary Domain 6).

Domain I – Final Voids

This domain would be restricted to those sections of Primary Domain 6 which cannot be profiled and rehabilitated as a woodland domain. As identified on Plan 3, this includes the retained 70° faces at the northern and southern perimeters of the open cut.

Domain J – Conservation and Biodiversity Offset Areas

This remains unchanged from Primary Domain 9.

5.2 REHABILITATION DOMAIN OBJECTIVES

Table 15 presents the rehabilitation domain objectives. These objectives have been used to develop the performance indicators and completion/relinquishment criteria presented in Section 6.

Table 15
Rehabilitation Domain Objectives

Page 1 of 2

Primary Domain	Secondary Domain	Rehabilitation Objective
1 – Infrastructure Area	A – Infrastructure	<ul style="list-style-type: none"> • Site entrance and sealed access road retained. • Safe and free from contamination. • Retained infrastructure suitable for a lawful final land use.
	E – Woodland	<ul style="list-style-type: none"> • All buildings and infrastructure (excluding site entrance and sealed access road) decommissioned and removed. • Safe and free from contamination. • Stable and permanent landform established. • Soil properties are suitable for the establishment and maintenance of selected vegetation species. • Vegetation: <ul style="list-style-type: none"> – contains a diversity of species comparable to that of the local remnant vegetation; – is maturing and/or naturally regenerating and trending towards that of local remnant vegetation; and – is developing in structure and complexity comparable to that of the local remnant vegetation.

Table 15 (Cont'd)
Rehabilitation Domain Objectives

Page 2 of 2

Primary Domain	Secondary Domain	Rehabilitation Objective
3 – Water Management Areas	B – Water Management Areas	<ul style="list-style-type: none"> Retain selected water storages for future land use and/or fire fighting purposes. Landform non-polluting. Stable and permanent landform established.
	E - Woodland	<ul style="list-style-type: none"> Stable and permanent landform established. Landform non-polluting. Soil properties are suitable for the establishment and maintenance of selected vegetation species. Vegetation re-establishment objectives as for 1E.
5 – Processing and Stockpile Areas	E - Woodland	<ul style="list-style-type: none"> All plant decommissioned and surplus stockpiles removed. Stable and permanent landform established. Landform non-polluting. Soil properties are suitable for the establishment and maintenance of selected vegetation species. Vegetation re-establishment objectives as for 1E.
6 – Void	I – Final Void	<ul style="list-style-type: none"> Final landform safe and secured. Stable and permanent landform established. Landform non-polluting. Soil properties are suitable for the establishment and maintenance of selected vegetation species. Native Vegetation established. Vegetation re-establishment objectives as for 1E.
9J – Conservation and Biodiversity Offset Areas		Maximise preservation of remnant native vegetation (PCT732 and PCT1093) ¹
<p>Note 1: PCT732: Broad-leaved Peppermint – Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion PCT1093: Red Stringybark – Brittle Gum – Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion</p>		

5.3 REHABILITATION PHASES

Successful rehabilitation is best considered in terms of logical steps or phases. That is, the successful achievement of objectives for one phase is the precursor for progression to the next phase, and so on until all rehabilitation objectives and criteria are complete. The use of rehabilitation phases in this manner allows the progress of rehabilitation to be clearly managed and monitored.

The rehabilitation hierarchy used in this MOP follows the guidance provided Explanatory Note 2(h) of ESG3, which references six separate phases as follows.

Phase 1: Decommissioning

The decommissioning phase involves the cessation of infrastructure usage, dismantling or demolition, removal and remediation of the land on which the infrastructure was located. The over-riding objectives associated with this phase of rehabilitation are as follows.

- To maximise the re-use or recycling of materials.

- To stabilize the area surrounding the infrastructure to be decommissioned in order to prevent pollution to air, land or water.
- To remediate any contamination and ensure the area is non-polluting prior to commencement of the landform establishment phase.

No decommissioning activities are planned during the term of this MOP.

Phase 2: Landform Establishment

The landform establishment phase involves the earthworks required to create a landform suitable for the proposed final land use and which blends with the adjacent topography. This phase would also include the construction of any drainage structures needed for the area.

The over-riding objectives associated with this phase of rehabilitation are as follows.

- To stabilize all disturbed areas and minimise erosion and dust generation.
- To provide a low maintenance, geotechnically stable and safe landform suitable for the intended final land use.
- To achieve the nominated design for each landform.
- To blend the created landform with the surrounding topography.

Phase 3: Growth Medium Development

The growth media development phase involves the replacement of soil over disturbed areas and preparation for revegetation including fertiliser or ameliorant application and ripping or scarifying the soil.

The over-riding objectives associated with this phase of rehabilitation are as follows.

- To achieve a soil profile capable of sustaining the specified final land use.
- To minimise the potential for erosion, sedimentation and dust generation prior to establishment of vegetation.

Phase 4: Ecosystem and Land Use Establishment

The ecosystem and land use establishment phase involves the revegetation of the rehabilitated landform with species commensurate with the targeted final land use.

The over-riding objectives associated with this phase of rehabilitation are as follows.

- To reduce the visual impact upon surrounding residents by early establishment of vegetation in areas where operations have been completed, i.e. on the external face of visibility bunds, exposed terminal faces of the mining area and completed lifts of the overburden emplacement.
- To select and establish vegetation with the species diversity commensurate to the relevant ecological community or agricultural land use.

Phase 5: Ecosystem and Land Use Sustainability

The ecosystem and land use sustainability phase involves the management and maintenance of the revegetated landform whilst completion criteria for the nominated landform and land use are achieved. This phase may be ongoing for a long period of time, depending on what the final land use outcome is, and will include any remedial works or revegetation deemed necessary to achieve the final completion criteria.

The over-riding objectives associated with this phase of rehabilitation are as follows.

- To re-instate ecological communities with biodiversity commensurate with or greater than those communities disturbed.
- To ensure that the ongoing viability of these ecological communities are sustainable following the active management by the Proponent.
- To integrate the rehabilitated ecological communities with those surrounding the disturbed areas.

Phase 6: Land Relinquishment

On achievement of the nominated closure criteria for ML1633, the land will be relinquished and the rehabilitation security held by the DRG released in full for that component of the final landform.

Table 16 provides a summary of the completed phases for the primary and secondary domains at the end of this MOP period.

Table 16
Summary of Rehabilitation Domains and Phases Proposed for Completion

Rehabilitation Phase	Primary Domain – Secondary Domain						
	Infrastructure – Infrastructure (1A)	Infrastructure – Woodland (1E)	Water Management Area – Water Management Area (3B)	Water Management Area – Woodland (3E)	Processing and Stockpile Areas – Woodland (5E)	Void Areas – Final Void (6I)	Conservation and Biodiversity Offset Areas – Conservation and Biodiversity Offset Areas (9J)
Active Quarrying Area	✓	✓	✓	✓	✓	✓	NA
Decommissioning	x	x	x	x	x	x	NA
Landform Establishment	x	x	x	x	x	x	NA
Growth Medium Development	x	x	x	x	x	x	NA
Ecosystem and Land Use Establishment	x	x	x	x	x	x	✓
Ecosystem and land use Sustainability	x	x	x	x	x	x	✓
Relinquished Lands	x	x	x	x	x	x	NA
Note: ✓ = rehabilitation phase completed at end of MOP term P = rehabilitation phase partially completed at end of MOP term x = rehabilitation phase not completed at end of MOP term NA = not applicable							
Source: Walker Quarries Pty Ltd							

Section 7.3 and **Table 19** provides further detail on the relative areas (by rehabilitation phase) of each domain completed over the term of this MOP.

5.4 SOIL AND GROWING MEDIUM BALANCE

The availability of suitable growth media for the revegetation of the Quarry is critical to the achievement of the nominated rehabilitation objectives (both generally and domain specific).

Requirements for Rehabilitation

In order to rehabilitate the Quarry Site, soil / growth media will be required for placement over the final landforms to be rehabilitated as woodland (Secondary Domain E). The volume of soil / growth media required for the proposed rehabilitation of the Quarry Site has been calculated using the Rehabilitation Cost Estimate (RCE) tool of DRG (see **Appendix 3**) with the following assumptions included.

- Replacement of between 100mm and 600mm of soil / growth media will be respread over the final landform.
- The final depth of soil will be dependent on factors such as:
 - Slope: with reduced depths on steeper slopes;
 - Adjacent drainage lines: with reduced depths within 20m of drainage lines; and
 - Reprofilng requirements: with reduced depths required over areas which would involve the re-profilng of landforms constructed using previously stripped top and subsoil, i.e. dam walls, banks between tiers on the stockpile areas.

An average depth of 300mm has been applied which identifies the following volumes of soil / growth media would be required to rehabilitate the domains of the Quarry Site.

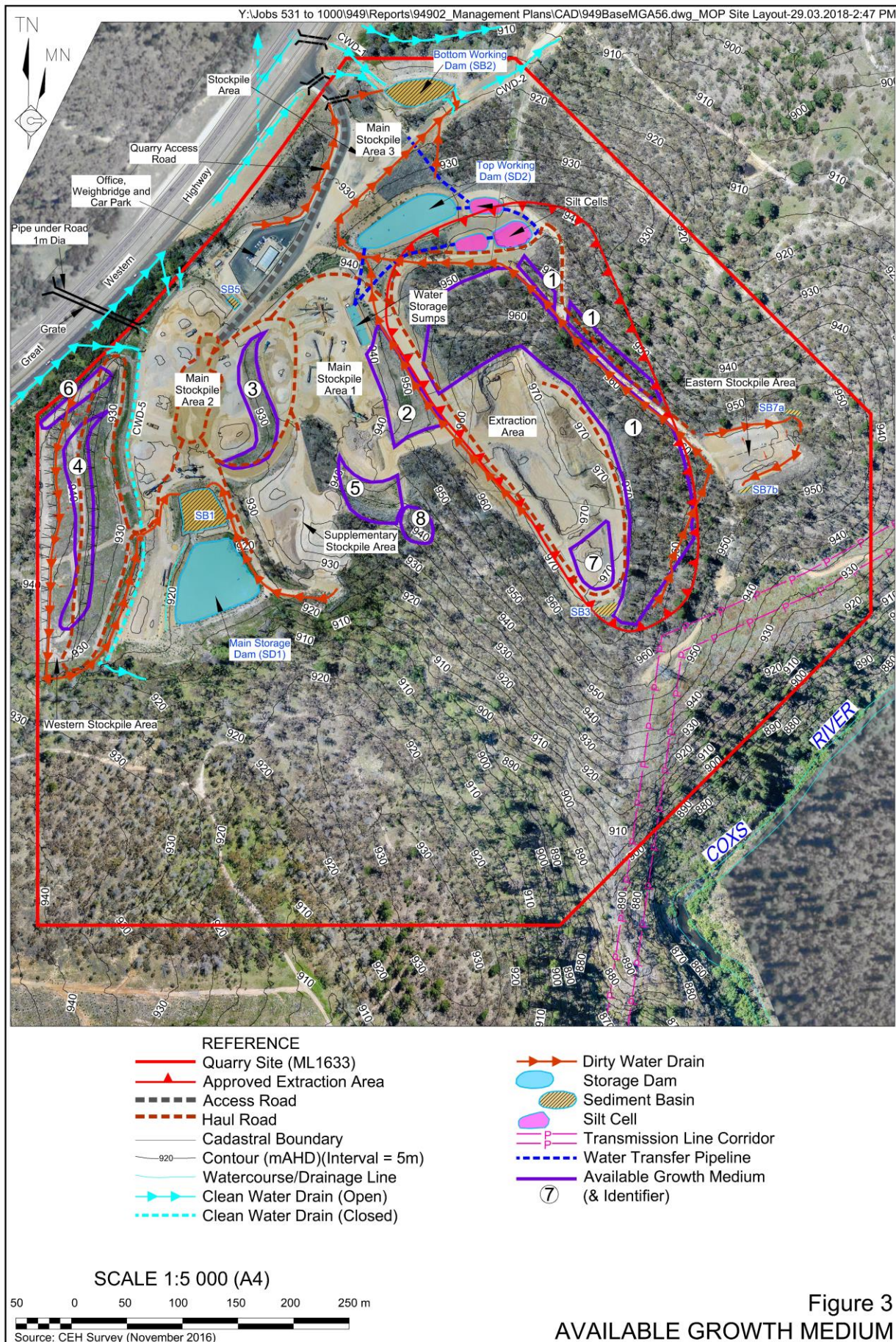
- Domain 1E (Infrastructure / Woodland): **5 000m³**.
- Domain 5E (Stockpile Area / Woodland): **19 300m³**.
- Domain 6E (Void / Woodland): **6 400m³**.

In total, **30 700m³** of growth media is required to effectively rehabilitate the Quarry Site

Soil / Growth Media Availability

The Company has reviewed the availability of growth media contained on the Quarry Site, either in situ (for future stripping), in stockpiles or as the upper layer of temporary landforms which have been stabilized with groundcover but which will be further modified as part of final landform preparation. **Figure 3** identifies each of these locations and the following provides information on the contained volume and condition.

1. In situ soil resources of the open cut. Based on observations of the soil profile, up to **10 000m³** can be stripped from this area. This soil will be stripped during the term of this MOP and placed in stockpiles beyond the boundary of the extent of the void domain (for the period of this MOP).



2. Soil resources were used in the formation of the haul ramp to the open cut. An estimated **2 500m³** of growth media would be available for excavation and spreading over the final landform, noting that this could require some amelioration due to the potential mixing of topsoil and subsoil materials during the formation of the current landform.
3. As above, soil resources were incorporated into the bank between the upper and lower tiers of the Main Stockpile Area. An estimated **2 400m³** of mixed soil would be available for excavation and spreading over the final landform.
4. Recently soil was stripped and reapplied to the bank in between the upper and lower tiers of the Western Stockpile Area. An estimated **1 000m³** of soil would be available for excavation and reapplication to the final landform.
5. To the south of the upper tier of the Main Stockpile Area, soil resources were used in the construction of what was the raised ROM Pad section of the Quarry. While likely to require some ameliorative treatment prior to reuse, an estimated **2 500m³** of mixed soil is contained within this landform and could be re-excavated and applied to the final landform as part of mine closure activities.
6. Soil stripped from the Western Stockpile Area was placed within a bund constructed along the northern perimeter of the Quarry Site (adjacent to the Great Western Highway). **2 000m³** of soil is contained within this bund.
7. At the southern end of the open cut, approximately **7 000m³** of subsoil and overburden stripped from the extraction area has been stockpiled and would be available for use in rehabilitation. Ideally this material would either be blended with freshly stripped soils or mixed with organic material to increase the value of this as a growth media.
8. To the south of the Main Stockpile Area, approximately **3 900m³** of previously stripped soil and vegetation is contained in stockpile. This material would be ideal for blending with the subsoil/overburden contained at location 7 prior to application to final landforms.

Based on the inventory above, **31 300m³** of soil and growth media has been identified either in situ, within constructed landforms or in stockpile. Careful management of this resources will be required with the Company to review alternative sources of soil and growth media over the term of this MOP.

6. PERFORMANCE INDICATORS, MEASURES AND RELINQUISHMENT CRITERIA

Performance indicators, performance measures and relinquishment criteria provide a means by which the progress of rehabilitation can be measured to quantitatively demonstrate the successful achievement of a biophysical process, i.e. the standards that are to be met by successful rehabilitation. Performance indicators, measures and criteria are inter-related as a performance indicator is an attribute of the biophysical environment that can be used to measure the progression of that biophysical process against a defined end point, i.e. the completion/relinquishment criterion.

Table 17 provides the performance indicators and completion criteria developed for the Quarry to achieve the nominated post-quarrying land use goals and rehabilitation objectives (refer to Sections 4.2 and 4.3).

It is noted that details of monitoring completed against completion criteria will be reported through the respective Rehabilitation Reports for the Quarry.

Table 17
Measurement of Rehabilitation Performance

Page 1 of 5

Objective	Performance Indicator	Performance Measure	Completion Criteria (with range as relevant)		Rehabilitation Monitoring Methodology	Monitoring Frequency^	Justification/ Source	Progress at start of MOP	TARP Ref No. (refer to Table 21)
			Lower	Upper					
Phase 1 – Decommissioning									
Domain 1 – Infrastructure Area									
All buildings and infrastructure (excluding site entrance and sealed access road) decommissioned and removed	Removal of all services and Infrastructure not required as part of the final landform	Services not required for final land use disconnected	Relevant services disconnected		Photographs	Following decommissioning	RWC (2017a) S 2.8.4.2	Not Commenced	NA
		Infrastructure not required for final land use removed	Relevant infrastructure removed		Photographs	Following decommissioning	RWC (2017a) S 2.8.4.2	Not Commenced	NA
Site entrance and sealed access road retained	Retained Infrastructure	Site entrance and sealed access road retained	Site entrance and sealed access road retained		Photographs	Following decommissioning	RWC (2017a) S 2.8.4.2	Not Commenced	NA
Domain safe and free from contamination	Pollution potential	Contaminated land remediated	No contaminated lands		Contaminated land assessment prepared by qualified person	Following decommissioning	POEO Act	Not Commenced	1
		Hazardous materials removed	Certificates confirm all hazardous materials removed and disposed of legally		Contamination report prepared by qualified person	Following decommissioning	POEO Act	Not Commenced	NA
Domain 3 – Water Management Areas									
Retain selected water storages for future land use and/or fire fighting purposes	Retained Infrastructure	Final landform	Final landform constructed in accordance with Plan 3		Plan(s) prepared by surveyor Photographs	Following decommissioning	RWC (2017a) S 2.8.3 (Figure 7)	Not Commenced	NA
Landform non-polluting	Pollution potential	Water management structures non-polluting	Monitoring indicates that surface water complies with water quality criteria provided by EPL13172		Water quality testing as per the approved <i>Soil and Water Management Plan</i>	Ongoing	RWC (2017a) S 2.8.4.1 SWMP	Not Commenced	1
Domain 5 – Processing and Stockpile Areas									
All plant decommissioned and surplus stockpiles removed	Removal of all services and Infrastructure not required as part of the final landform	Plant removed	Plant removed		Photographs	Following decommissioning	RWC (2017a) S 2.8.3	Not Commenced	NA
	All remaining material sold and despatched or used in final landform creation	Final landform	Final landform constructed in accordance with Plan 3		Photographs	Following decommissioning	RWC (2017a) S 2.8.3 (Figure 7)	Not Commenced	NA
Phase 2 – Landform Establishment									
Domain 1 – Infrastructure Area									
Stable and permanent landform established	Landform slope	Landform suitable for growth media establishment		<18°	Plan(s) prepared by surveyor Photographs	Following completion	RWC (2017a) S 2.8.3 (Figure 7)	Not Commenced	3
	Active erosion	Visible erosion	No identifiable erosion or sedimentation		Visual inspection Photographs	Following completion	SWMP Sections 4, 9 & 10.4.1	Ongoing	2
		Water quality of discharge (Total suspended solids)		<50mg/L	Water quality testing as per the approved <i>Soil and Water Management Plan</i>	In accordance with the approved <i>Soil and Water Management Plan</i>	SWMP Sections 4, 9 & 10.4.1	Ongoing	2

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Table 17 (Cont'd)
Measurement of Rehabilitation Performance

Page 2 of 5

Objective	Performance Indicator	Performance Measure	Completion Criteria (with range as relevant)		Rehabilitation Monitoring Methodology	Monitoring Frequency^	Justification/ Source	Progress at start of MOP	TARP Ref No. (refer to Table 21)
			Lower	Upper					
Phase 2 – Landform Establishment (Cont'd)									
Domain 3 - Water Management Areas									
Stable and permanent landform established	Silt cells and water storages to be decommissioned, backfilled and profiled	No subsidence over site of former water management feature	No pooling of water over site following rainfall		Observation / Photographs	Following rainfall	No exceedance of maximum harvestable right.	Not commenced	NA
	Central clean water drain reinstated and free-draining	erosion	No visible erosion		Photographs	Following decommissioning	SWMP Sections 4, 9 & 10.4.1	Not Commenced	2
		slope	1°	10°	Plan(s) prepared by surveyor	Following decommissioning	RWC (2017a) S 2.8.3 (Figure 7)	Not Commenced	3
	Landform	Landform suitable for growth media establishment	All slopes <18°		As constructed survey plans	Following completion	RWC (2017a) S 2.8.4.1	Not Commenced	3
Landform non-polluting	Pollution potential	Visible erosion	No identifiable erosion or sedimentation		Visual inspection Photographs	In accordance with the approved <i>Soil and Water Management Plan</i>	RWC (2017a) S 2.8.4.1	Not Commenced	2
		Water quality of discharge (Total suspended solids)		<50mg/L	Water quality testing as per the approved <i>Soil and Water Management Plan</i>		SWMP S 10.4.1	Ongoing	2
Domain 5 – Processing and Stockpile Areas									
Stable and permanent landform established	Landform slope	Landform suitable for growth media establishment		All slopes <18°	As constructed survey plans	Following completion	RWC (2017a) S 2.8.3 (Figure 7)	Ongoing	3
	Former Hoskins Quarry returned to landform pre-dating Quarry operations	Safe and stable landform	All stockpiled material removed Geotechnically stable landform remains		Plan(s) prepared by surveyor Geotechnical report by qualified engineer	Following completion		Not Commenced	4
Landform non-polluting	Pollution potential	Surface water quality	Monitoring of water discharged from the Quarry Site complies with EPL limits		Water quality testing as per the approved <i>Soil and Water Management Plan</i>	In accordance with the approved <i>Soil and Water Management Plan</i>	RWC (2017a) S 2.8.4.1	Ongoing	1
	Active erosion	Non-erosive transfer of runoff	No identifiable erosion or sedimentation		Visual inspection Photographs	Following completion and 6-monthly until confirmed	SWMP S 10.4.1	Ongoing	2
		Number of gullies or rills >0.3m in width or depth in a 50m transect		2	Visual inspections – refer to Section 8.1.3	Annual	RWC (2017a) S 2.8.4.1	Ongoing	2
Domain 6 - Void									
Final landform safe and secured	Access to void restricted by public	Mine fenced and a lockable gate installed	Fencing established to prevent inadvertent access by the public		Photographs	Following decommissioning	Obligations under relevant legislation related to mine safety are met	Not Commenced	4
Stable and permanent landform established	Landform stability	Voids geotechnically stable	Geotechnical report indicating no unacceptable risk of instability		Independent engineers report	Ongoing and following decommissioning	RWC (2017a) S 2.8.3 (Figure 7) Plan 3	Not Commenced	4
	Landform suitable for growth media establishment	Final slope	Floor slope <10°		As constructed survey plans	Following completion		Not Commenced	4
			Floor daylights to the north						
			Eastern / western perimeter slope <55°						
			Southern perimeter slope <70°						
Landform non-polluting	Active erosion	Non-erosive transfer of runoff	No identifiable erosion or sedimentation		Visual inspection Photographs	Following completion and 6-monthly until confirmed	SWMP S 10.4.1	Ongoing	2

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Table 17 (Cont'd)
Measurement of Rehabilitation Performance

Page 3 of 5

Objective	Performance Indicator	Performance Measure	Completion Criteria (with range as relevant)		Rehabilitation Monitoring Methodology	Monitoring Frequency^	Justification/ Source	Progress at start of MOP	TARP Ref No.
			Lower	Upper					
Phase 3 – Growth Medium Development (all domains)									
Soil properties are suitable for the establishment and maintenance of selected vegetation species	Soil occurrence	Soil thickness on shaped landform	100mm	600mm	Test pits (min 5 per hectare)	Following spreading of soil	RWC (2017a) S 2.8.5	Not Commenced	5, 6
	Chemical and physical properties	pH	5.0	8.0	In field test Soil sampling (on application) Annual rehabilitation monitoring – refer to Section 8.1.3	Following spreading of soil Annual	Soil Landscapes of the Katoomba 1:100,000 Sheet map and report (King et al., 1994) – Cullen Bullen & Mt Walker Soil Landscapes	Not Commenced	7
		Erodibility (K-Factor)		0.055					
		Active erosion	Number of gullies or rills >0.3m in width or depth in a 50m transect		1	Visual inspection Photographs	Annual	SWMP S 10.4.1	Ongoing
Phase 4 – Ecosystem and Land Use Establishment									
Domain 1A – Infrastructure (Infrastructure)									
Retained infrastructure suitable for a lawful final land use	Retained services and Infrastructure	Condition and suitability of retained Infrastructure	Infrastructure safe and suitable for a lawful final land use		Photographs	Prior to relinquishment	-	Not Commenced	NA
Domain 3B - Water Management Areas (Water Management Areas)									
Landform non-polluting	Stabilized water management structures	Design of structures	Design in accordance with Landcom (2004) and DECC (2008a) No identifiable erosion or sedimentation		Visual inspection Photographs	Following rainfall event which generated runoff	SWMP S 9	Ongoing	2
	Water quality of any discharge	EPL Water Quality limits	EPL limits		Water quality testing as per the approved <i>Water Management Plan</i>	Quarterly following landform establishment until achievement of criteria demonstrated	EPL13172		2
Domain 6I – Void (Final Void) (Applies to retained steep faces of northern and southern perimeter)									
Final landform safe and secured	Access to void restricted by public	Mine fenced and a lockable gate installed	Fencing established to prevent inadvertent access by the public		Photographs	Following decommissioning	To ensure obligations under relevant legislation related to mine safety are met	Not Commenced	NA
Stable and permanent landform established	Landform stability	Voids geotechnically stable	Geotechnical report indicating no unacceptable risk of instability		Independent engineers report	Ongoing and following decommissioning	RWC (2017a) S 2.8.3 (Figure 7)	Not Commenced	4
	Landform suitable for growth media establishment	Final slope	Northern and southern perimeter slope <70°		As constructed survey plans	Following completion		Not Commenced	4
Native Vegetation established	Appropriate native plant species richness	Native species	Natural regeneration on final benches		Vegetation monitoring by ecologist (refer to Section 8.1.5)	Annually by suitably qualified consultant	BMP (in prep) RWC (2017a) S 2.8.3 (Figure 7)	Not Commenced	8

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Table 17 (Cont'd)
Measurement of Rehabilitation Performance

Page 4 of 5

Objective	Performance Indicator	Performance Measure	Completion Criteria (with range as relevant)		Rehabilitation Monitoring Methodology	Monitoring Frequency^	Justification/ Source	Progress at start of MOP	TARP Ref No.
			Lower	Upper					
Phase 4 – Ecosystem and Land Use Establishment (Cont'd)									
Remaining Domains (1E, 3E, 5E & 6E) (Woodland)									
Vegetation contains a diversity of species comparable to that of the local remnant vegetation	Appropriate native plant species richness	No. of native species	Native plant species numbers (per 100m²) average within 20% of Analogue Site (refer to Note A)		Vegetation monitoring by ecologist (refer to Section 8.1.5)	Annually by suitably qualified consultant, with intermediate monitoring by Mine personnel	BMP (in prep) RWC (2017a) S 2.8.3 (Figure 7)	Ongoing	8,9
	Appropriate density/structure of native overstorey	Overstorey coverage percentage	Average within 20% of Analogue Site (refer to Note A)						
	Appropriate native groundcover is present	Native groundcover percentage	Average within 20% of Analogue Site (refer to Note A)						
	Target Species	<i>Bursaria spinose lasiophylla</i>	Present						
	Weed species and abundance	Exotic species richness and coverage	Number of weed species and abundance average no greater than 20% more than that of analogue sites						
Phase 5 – Ecosystem and Land Use Sustainability									
Domain 1A – Infrastructure (Infrastructure)									
Retained infrastructure suitable for a lawful final land use	As for Phase 4								
Domain 3B - Water Management Areas (Water Management Areas)									
Landform non-polluting	Active Erosion	No erosion	No erosion		Visual inspection Photographs	Annual		Ongoing	2
Domain 6I – Void (Final Void) (Applies to retained steep faces of northern and southern perimeter)									
Final landform safe and secured	As for Phase 4								
Stable and permanent landform established									
Native Vegetation established									
Remaining Domains (1E, 3E, 5E & 6E) (Woodland)									
Vegetation contains a diversity of species comparable to that of the local remnant vegetation	Appropriate native plant species richness	No. of native species	Native plant species numbers (per 100m²) average within 50% of Analogue Site (refer to Note A)		Vegetation monitoring by ecologist (refer to Section 8.1.5)	Annually by suitably qualified consultant, with intermediate monitoring by Quarry personnel	BMP (in prep) RWC (2017a) S 2.8.3 (Figure 7)	Ongoing	8, 9
	Appropriate density & structure of overstorey	Overstorey coverage percentage	Average within 50% of Analogue Site (refer to Note A)						
	Appropriate native groundcover is present	Native groundcover percentage	Average within 50% of Analogue Site (refer to Note A)						
	Target Species	<i>Bursaria spinose lasiophylla</i>	Present						
	Weed species and abundance	Exotic species richness and coverage	Number of weed species and abundance average no greater than 20% more than that of analogue sites						
Vegetation is maturing and/or naturally regenerating and trending towards that of local remnant vegetation	Ecosystem growth and natural recruitment	Shrubs and juvenile trees	Present		Vegetation monitoring by ecologist (refer to Section 8.1.5)	Annually by suitably qualified consultant, with intermediate monitoring by Quarry personnel			

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Table 17 (Cont'd)
Measurement of Rehabilitation Performance

Page 5 of 5

Objective	Performance Indicator	Performance Measure	Completion Criteria (with range as relevant)		Rehabilitation Monitoring Methodology	Monitoring Frequency^	Justification/ Source	Progress at start of MOP	TARP Ref No.
			Lower	Upper					
Phase 5 – Ecosystem and Land Use Sustainability (Cont'd)									
Remaining Domains (1E, 3E, 5E & 6E) (Woodland) (Cont'd)									
Vegetation is developing in structure and complexity comparable to that of the local remnant vegetation	Ecosystem structure	% Foliage cover (tree) ^B	10	20	Vegetation monitoring by ecologist (refer to Section 8.1.5)	Annually by suitably qualified consultant, with intermediate monitoring by Quarry personnel	BMP (in prep) RWC (2017a) S 2.8.3 (Figure 7)	Not Commenced	8, 9
		% Foliage cover (shrub) ^B		35					
		% Foliage cover (ground) ^B	35	80					
	Tree Diversity	% native trees		100					
	Ecosystem health	Growth	Continued increase in height and stabilization in cover						
		Flowering / fruiting trees (% population) ^B	25						
Domain J - Conservation and Biodiversity Offset Areas									
Maximise preservation of remnant native vegetation (PCT732 and PCT1093) ^C	Undisturbed native vegetation	Protection of vegetation beyond the approve disturbance footprint	Disturbance restricted to approved disturbance footprint.		Plan(s) prepared by surveyor	Annual	DA 344-11-2001	Compliant	NA
	Offset areas	Protection of Offset Areas	Biodiversity Offset Strategy in place and enforced Offset areas fenced and signposted		Audit against plan requirements	Following implementation and then annually	BMP (in prep)	Ongoing	NA
Phase 6 – Land Relinquishment									
All domains		Demonstrated compliance with the above					-	Not Commenced	NA
No land is to be relinquished during the term of this MOP. Final relinquishment will rely on sustained demonstration of compliance with relinquishment criteria for Phase 5 – Ecosystem and land Use Sustainability									
Note A: Analogue Sites (AS) for each vegetation community (see Note C) have been identified within a Flora and Fauna Management Plan for the Quarry. Each AS (which are described in Section 8.1.5) exhibits biometric and floristic parameters typical of remnant native vegetation of the local setting									
Note B: Or equivalent to relevant AS									
Note C: PCT732 = Broad-leaved Peppermint – Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion / PCT1093 = Red Stringybark – Brittle Gum – Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion									

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7. REHABILITATION IMPLEMENTATION

7.1 STATUS AT MOP COMMENCEMENT

Table 18 presents the status of rehabilitation at the commencement of this MOP.

Table 18
Status of Rehabilitation at the Commencement of the MOP

Primary Domain	Secondary Domain	Status of Rehabilitation at the Commencement of the MOP
1 – Infrastructure Area	A – Infrastructure	Nil rehabilitation – Active mining area.
	E – Woodland	Nil rehabilitation – Active mining area.
3 – Water Management Areas	E – Woodland	Stabilization of walls complete.
5 – Stockpile Areas	E – Woodland	Stabilization of amenity bund wall adjoining the Great Western Highway perimeter of ML1633 and internal batter slopes.
6 – Void	E – Woodland	Nil rehabilitation – Active mining area.
	I – Final Void	Nil rehabilitation – Active mining area.
7 – Rehabilitation Areas (temporary stabilization)	Various	Stabilization of internal batters and dams walls.
9 – Conservation and Biodiversity Offset Areas	J – Conservation and Biodiversity Offset Areas	Management ongoing.
Source: Walker Quarries Pty Ltd		

7.2 PROPOSED REHABILITATION ACTIVITIES DURING THE MOP TERM

7.2.1 Introduction

This section provides an overview of the rehabilitation activities proposed to be implemented during this MOP term on a domain by domain basis. Reference is made to the rehabilitation phases described in Section 4.3. The descriptions provided in this Section are consistent with the rehabilitation activities presented on **Plan 3**. It is noted, that information in relation to the completion of rehabilitation is based on the proposed material production schedule presented in Section 2.3.11 (refer to **Table 7**). Should the actual material production schedule vary from the proposed schedule, the timing of rehabilitation activities would also vary.

7.2.2 Domain 1 – Infrastructure Area

No rehabilitation activities would be undertaken in this area during this MOP term.

7.2.3 Domain 3 – Water Management Area

Domain 3 – Water Management Area would remain as an active Quarry area throughout the term of this MOP. During the term of this MOP, the Company would continue activities associated with the stabilization of both internal and external walls of storage dams and sediment basins, and the channels of internal drains (principally through the establishment and retention of groundcover over these).

7.2.4 Domain 5 – Stockpile Areas

The Main Stockpile Area, WSEA and ESEA would remain active throughout the term of this MOP. During the term of this MOP, the Company would continue activities associated with the stabilization on batter slopes between tiered sections of these individual stockpile areas.

The success of revegetation on the Visual Amenity Bund will be monitored over the term of this MOP with supplementary seeding or tube-stock planting undertaken to promote the establishment and sustainable growth of groundcover, tree and shrub species associated with the two remnant vegetation communities of ML1633 (PCT732 and PCT1093).

It is not planned to re-excavate and use any of the growth media or vegetation contained in stockpiles during the term of this MOP as the Company intends on continuing Quarry operations beyond the term of this MOP (following receipt of a new development consent for the Quarry). As a result, the primary rehabilitation activity associated with these stockpiles will be the stabilization through establishment of groundcover over these.

7.2.5 Domain 6 – Void Areas

Rehabilitation activities during the term of this MOP would be restricted to the stabilization of the southern face which will have been developed to its maximum (lateral) extent. A safety bund would be constructed and maintained above this section of the final void. The bund would be constructed to a height at least half that of the larger tyre diameter used on the Quarry Site, covered with available growth media and seeded with a native grass and shrub species mix.

No other rehabilitation activities would be undertaken in this area during this MOP term as the void will not have reached the final lateral or vertical extends approved by DA 344-11-2001.

7.2.6 Domain 9 - Conservation and Biodiversity Offset Areas

Management of this domain will be described in a Biodiversity Management Plan for the Quarry, which is in preparation and will be finalised within 6 months of a final Biodiversity Offset Strategy being approved for DA 344-11-2001. At the time of preparation of this MOP, a Biodiversity Offset Strategy was unable to be prepared as the DPE and OEH have yet to release details on how biodiversity credits generated through disturbance (under the now repealed *Threatened Species Conservation Act 1995* and BioBanking Assessment Methodology) are to be converted to credits for retirement under the *Biodiversity Conservation Act 2016* and Biodiversity Assessment Methodology.

7.3 SUMMARY OF REHABILITATION DURING THE MOP TERM

Table 19 presents a summary of the rehabilitation that would be implemented during the life of this MOP (based on comparison of **Plans 2 and 3**). Rehabilitation Phases that would not have commenced at start of this MOP and would be complete by the end of this MOP have not been included in this table.

Table 19
Rehabilitation at Commencement and Completion of MOP

Primary Domain	Secondary Domain	Rehabilitation Phase	Start of MOP (ha)	End of MOP (ha)
1 – Infrastructure Area	A – Infrastructure	Active	0.3	0.3
		Total	0.3	0.3
	E – Woodland	Active	2.0	2.0
		Ecosystem Establishment (temporary stabilization)	0.4	0.4
		Total	2.4	2.4
3 – Water Management Area	B – Water Management Area	Active	1.5	1.5
		Landform Establishment	0.2	0
		Growth Medium Development	0	0
		Ecosystem Establishment (temporary stabilization)	0.2	0.4
		Total	1.9	1.9
	E – Woodland	Active	0.4	0.4
		Total	0.4	0.4
5a – Main Stockpile Areas (1-3)	E – Woodland	Active	4.1	4.1
		Ecosystem Establishment (temporary stabilization)	0.6	0.6
		Total	4.7	4.7
5b – Western Stockpile Extension Area	E – Woodland	Active	1.7	1.7
		Ecosystem Establishment (temporary stabilization)	0.2	0.2
		Total	1.9	1.9
5c – Eastern Stockpile Extension Area	E – Woodland	Active	0.5	0.5
		Total	0.5	0.5
5d – Supplementary Stockpile Area (Hoskins Quarry)	E – Woodland	Active	0.9	0.9
		Total	0.9	0.9
6 – Open Cut Voids	I – Final Void	Active	0.6	1.0
		Total	0.6	1.0
	E – Woodland	Active	2.1	3.0
		Total	2.1	3.0
9 – Conservation and Biodiversity Offset Areas	J – Conservation and Biodiversity Offset Areas	Active	28.6	27.3
		Total	28.6	27.3
Grand Total			44.3	44.3
Source: Walker Quarries Pty Ltd / Rangott Mineral Exploration Pty Limited (survey)				

7.4 RELINQUISHMENT PHASE ACHIEVED DURING MOP PERIOD

The Company does not anticipate that the relinquishment phase will be achieved for any land within the Mine Site during the term of this MOP.

8. REHABILITATION MONITORING AND RESEARCH

8.1 REHABILITATION MONITORING

8.1.1 Introduction

To assess the rate of recovery and determine the performance of rehabilitation areas against the performance of rehabilitation against the performance indicators, measures and criteria of **Table 17**, a monitoring program has been prepared as part of the Quarry Flora and Fauna Management Plan (with key features to be incorporated into a Biodiversity Management Plan which is currently in preparation).

The monitoring program establishes clearly defined, repeatable and consistent methodologies for monitoring changes in various aspects of ecosystem function, succession and long-term sustainability. The monitoring program provides for:

- landform survey prior to application of growth media (where nominated) to confirm landform comply with the nominated limits;
- regular inspection of lands under rehabilitation to assess progression against visual indicators and provide indicative indication of overall progress;
- assessment of growth media prior to attempts to establish vegetation;
- establishment of relevant reference sites to compare and track the progress and inherent ecosystem function of rehabilitation areas; and
- establishment of suitable reference (analogue) sites reflecting the desired ecosystem structure and function contained within Domain J of the Quarry Site.

8.1.2 Landform Survey

On completion of activities within a specific domain, and following any earthworks required to re-profile the landform to that nominated in Pan 3, these areas will be surveyed to ensure that these achieve the completion criteria for Landform Establishment.

In the case of the retained steep faces of the final void (Domain 6I), the Company will obtain confirmation of the geotechnical stability of these faces.

8.1.3 Visual Inspections

An inspection of the landform under rehabilitation will be undertaken on a quarterly basis by the Quarry Manager or delegate with the following features of any areas under rehabilitation to be considered.

- Presence / absence of erosion, in particular the number and width of any rilling.
- Signs of pooling water within drainage channels.

- Approximate coverage of groundcover (grasses, creepers, low shrubs) over areas that are being managed as ‘temporarily stabilization’.
- Vegetation components (overstorey, understorey and groundcover where applicable).
- Presence of weed species.
- Status of safety bunds or fencing.
- disturbance factors including fire and unauthorised access e.g. rubbish dumping.

Photos will be taken to illustrate any signs of erosion, poor groundcover / vegetation or other factors which are detrimental to the achievement of the rehabilitation criteria of **Table 17**. Remedial activities will be programmed as required to address issues such as eroding surface, poor vegetation establishment or weed infestation. Follow-up inspections and photographs will allow for demonstration of remediation of these observations.

8.1.4 Soil Analysis

Following the application of soil or other growth media to the final landform, test pits will be excavated and composite soil samples collected.

- An in-field measurement of soil / growth media depth will be completed to confirm this falls within the lower and upper range nominated in **Table 17**.
- The composite samples will be sent to and analysed by a Soil Laboratory for key parameters (pH and erodibility).

Samples will also be collected from representative stockpiles (constructed during that year) and sent to and analysed by a Soil Laboratory for key parameters (pH and erodibility).

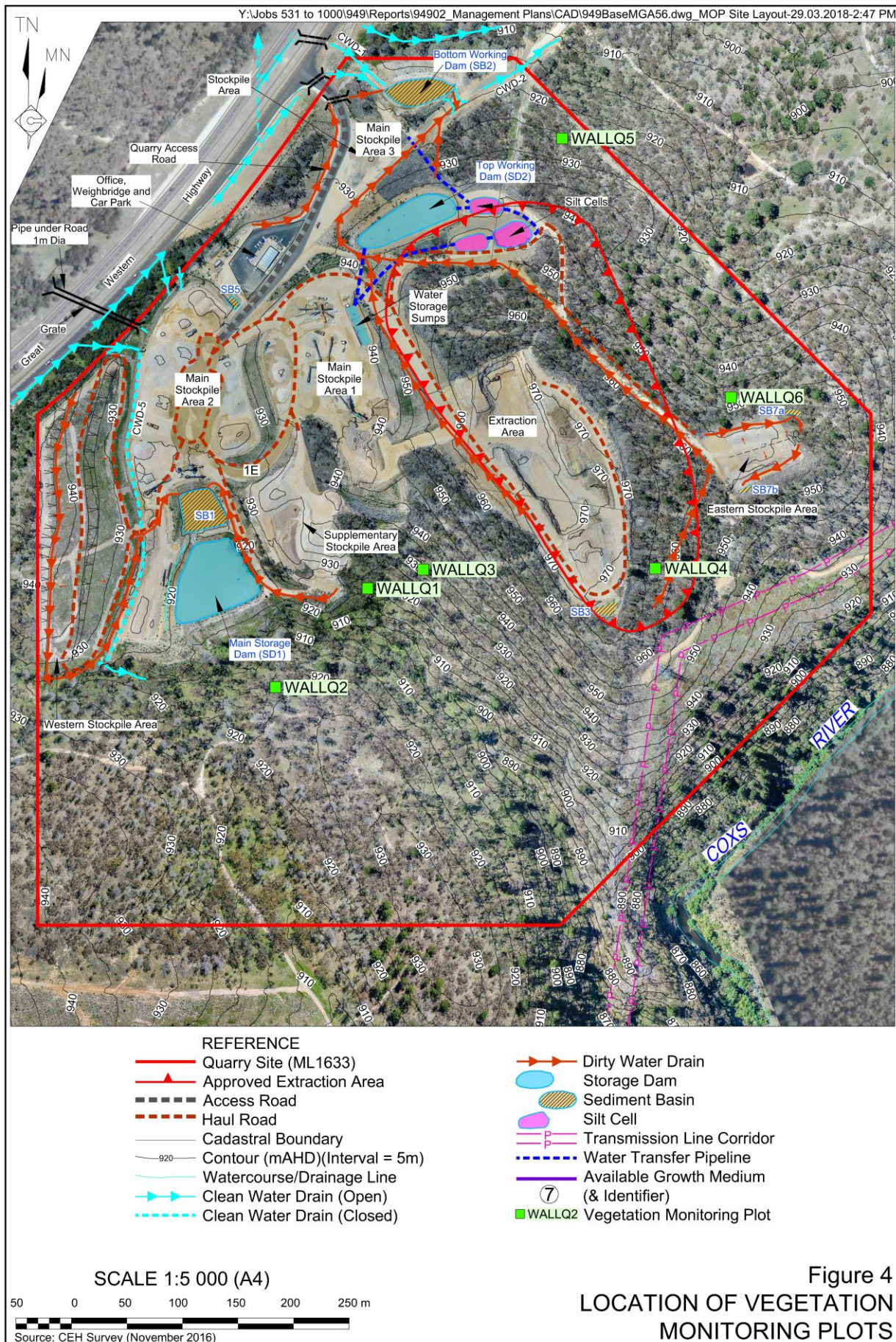
Where the soil pH is outside the target range, or erodibility is higher than desirable, the Company will implement additional rehabilitation management measures aimed at either modifying the soil pH or providing additional erosion controls on application of the soil.

8.1.5 Vegetation Monitoring

An independent ecological consultancy is engaged to undertake monitoring of analogue sites on ML1633 in spring each year. Reference sites on land under rehabilitation have yet to be established as there has yet to be any significant rehabilitation undertaken to allow for this monitoring to be commenced. However, rehabilitation reference sites will be established as follows.

- At least one site within each primary domain / woodland secondary domain area.
- At least one rehabilitation reference site will be established per 15ha of woodland in the final landform.

The locations of the six current analogue sites are provided on **Figure 4**. Each site is 10m x 10m and marked with a star post at its northwestern corner.



A photo of each plot is taken from the northwestern corner with survey completed to identify:

- the abundance of all vascular plant species (using the modified Braun-Blanquet scale);
- the dominant species; and
- foliage cover in each stratum (e.g. canopy, shrub, groundcover).

Two 5m Levy Pole transects at 90° to the quadrat perimeter are established in each quadrat to record species diversity and foliage cover at increments of:

- <0.1 m;
- 0.1m to 0.5 m;
- 0.5m to 1.0m;
- 1.0m to 2.0m; and
- 2.0 to 4.0m.

Soil condition, weed species and fauna presence are also be noted.

8.1.6 Purple Copper Butterfly

Remnant vegetation of the Quarry Site is monitored annually by a qualified ecologist to measure / monitor evidence of Purple Copper Butterfly and the health and distribution of Native Blackthorn (host plant for the Purple Copper Butterfly).

Monitoring will extend to areas of rehabilitation once available and involves following.

- Inspection of known (off-site) populations of Purple Copper Butterfly to confirm the species is active (the species is only observable in the adult ‘on-wing’ form over several weeks in late spring.
- Pedestrian survey of the Quarry Site where targeted survey within potential butterfly habitat.
- mapping of Blackthorn distribution and density; and
- opportunistic sightings during general flora and fauna surveys.

8.2 RESEARCH AND REHABILITATION TRIALS

No rehabilitation trials or research on active rehabilitation are currently planned for the Quarry given the lack of available rehabilitation areas.

9. INTERVENTION AND ADAPTIVE MANAGEMENT

9.1 THREATS TO REHABILITATION

Section 3 of this document presents an assessment of environmental risks associated with the Quarry, describes the management of these risks, and identifies and provides specific focus on risks to rehabilitation success. After consideration of the performance indicators and relinquishment criteria for each phase of rehabilitation (see **Table 17**), developed with consideration to these specific rehabilitation risks, a consolidated summary of threats to rehabilitation, including the potential adverse outcomes, have been compiled (see **Table 20**).

For each threat and potential adverse outcomes, **Table 20** allocates a risk rating based on the potential consequences and likelihood of occurrence. Similar to the assessment of risk considered in Section 3, the analysis has been prepared broadly in accordance with the requirements of *AS/NZS ISO31000:2009 Risk Management - Principles and Guidelines* (see **Tables 8 to 10**) and considers the Company's commitments embodied in the various environmental management plans (refer to Section 3.2).

Where risks were determined to be unacceptable, namely those risks classified as "moderate" or above, a TARP has been developed and is presented in Section 9.2.

9.2 TRIGGER ACTION RESPONSE PLAN

Table 21 presents the Trigger Action Response Plan for each of the rehabilitation threats and potential adverse outcomes identified in **Table 20** as having a risk rating of moderate or above. **Table 21** also provides individual reference numbers for each Trigger Action Response (identified previously in **Table 17**).

Table 20
Analysis of Rehabilitation Threats

Rehabilitation Threat	Potential Adverse Outcome	Consequence	Likelihood	Risk
Failure to remove infrastructure	Unable to complete rehabilitation or establish the identified final land use.	2	E	L
Failure to remove roads and hardstand areas	Unable to complete rehabilitation or establish the identified final land use.	2	E	L
Failure to remove hazardous materials	Unable to complete rehabilitation or establish the identified final land use.	2	E	L
Failure to address contamination	Contaminated land present	3	E	M
	Silt cells, material stockpiles, storage dams and unstabilized surfaces are a source of contaminated leachate.	3	E	M
Final landform not safe, stable and secure	Geotechnical instability of final void.	4	E	M
	Geotechnical instability of the re-profiled landforms of the Stockpile Area domain.	2	E	L
	Public access to the void possible.	2	E	L
Respread soil does not conform to relinquishment criteria	Insufficient soil available for rehabilitation.	3	E	M
	Inadequate soil thickness applied to shaped landform.	3	E	M
	Soil not capable of sustaining identified final land use/vegetation community.	3	E	M
Sediment and erosion control structures inadequate or fail	Final landform is an unacceptable source of sediment.	3	E	M
Inappropriate species established during revegetation operations	Species mix on final landform does not conform with target vegetation communities.	3	E	M
Target vegetation communities do not become established	Detrimental effect on the vegetation communities, and habitat provided by these, on lands surrounding the Quarry.	3	C	H
Weed or pest management fails	Weeds and pests become established and require significant resources to manage.	2	D	L
Vegetation community is not self sustaining	Required mitigation of impacts on biodiversity is not achieved. Mine relinquishment not possible.	3	C	H
Bushfire	Structure / composition of final vegetation community(ies) altered by occurrence of fire.	3	E	M
Drought	Failure of vegetation communities to establish as a consequence of limited water availability.	3	D	M

Table 21
Trigger Action Response Plan

Page 1 of 3

Rehabilitation Threat	Potential Adverse Outcome	Trigger	Action/ Response	TARP No
Failure to address contamination	Contaminated land present.	<ul style="list-style-type: none"> Contamination assessment identifies contaminated land present within Quarry Site. 	<ul style="list-style-type: none"> Implement recommendations of contamination assessment. Repeat contamination assessment until contamination has been removed. 	1
	Silt cells, material stockpiles, storage dams and unstabilized surfaces are a source of contaminated leachate.	<ul style="list-style-type: none"> Visual inspection identifies erosion or sedimentation from these structures / features. Monitoring confirms the water quality of runoff exceeds the nominated criteria of EPL13172. 	<ul style="list-style-type: none"> Remediate eroding area through additional earthworks, soil works, revegetation or other stabilization works. If the above is unsuccessful, engage a suitably qualified professional in sediment and erosion control to prepare an assessment report and recommendations. Implement above recommendations in consultation with DRG. 	2
Final landform does not conform to approved final landform	Slopes too steep to be effectively rehabilitated (>18°).	<ul style="list-style-type: none"> As constructed survey plan indicates that some final slopes exceed 18°. 	<ul style="list-style-type: none"> Slopes to be reduced until all slopes are less than 18° or alternative rehabilitation outcomes/relinquishment criteria agreed to by relevant government agencies. 	3
Final landform not safe, stable and secure	Geotechnical instability of final open cut voids.	<ul style="list-style-type: none"> Monitoring or final closure geotechnical assessment identifies instability/ unacceptable movement (actual or potential) in final face of open cut void. 	<ul style="list-style-type: none"> Suitably qualified geotechnical engineer engaged to assess the instability and provide a range of recommendations to remediate the instability. Implement above recommendations in consultation with DRG. 	4





Table 21 (Cont'd)
Trigger Action Response Plan

Page 2 of 3

Rehabilitation Threat	Potential Adverse Outcome	Trigger	Action/ Response	TARP No
Respread soil does not conform to relinquishment criteria	Insufficient soil available for rehabilitation.	<ul style="list-style-type: none">Soil inventory indicates a deficit of soil material.	<ul style="list-style-type: none">Suitable source of additional soil material to be identified.Investigation into measures that may be implemented to ameliorate other materials to make them suitable for use as a growth medium.	5
	Inadequate soil thickness applied to shaped landform.	<ul style="list-style-type: none">Test pitting following placement of soil material identifies placed soil thickness not consistent with relinquishment criteria (200mm of soil).	<ul style="list-style-type: none">Additional soil material spread on the final landform.	6
	Soil not capable of sustaining identified final land use/vegetation community/land capability.	<ul style="list-style-type: none">Soil parameters not within the identified criteria (see Table 17).	<ul style="list-style-type: none">Suitably qualified soil scientist or rehabilitation specialist engaged to provide recommendations to ensure that the identified closure criteria are achieved.Implement above recommendations in consultation with DRG.	7
Sediment and erosion control structures inadequate or fail	Final landform is an unacceptable source of sediment.	<ul style="list-style-type: none">Surface water monitoring or visual inspection indicates that final landform is eroding or is a source of unacceptable levels sedimentation.	<ul style="list-style-type: none">Remediate eroding area through additional earthworks, soil works, revegetation or other stabilization works.If above unsuccessful, engage a qualified to prepare an assessment report and recommendations.Implement above recommendations in consultation with DRG.	2
Inappropriate species established during revegetation operations	Species mix on final landform does not conform with target vegetation communities.	<ul style="list-style-type: none">Monitoring indicates that species mix on the final landform does not match the approved species mix.	<ul style="list-style-type: none">Qualified ecologist or revegetation expert engaged to recommend actions to ensure that the final vegetation community better reflects the target community.Implement above recommendations in consultation with DRG.	8

Table 26 (Cont'd)
Trigger Action Response Plan

Page 3 of 3

Rehabilitation Threat	Potential Adverse Outcome	Trigger	Action/ Response	TARP No
Target vegetation communities do not become established	Detrimental effect on the vegetation communities, and habitat provided by these, on lands surrounding the Quarry.	<ul style="list-style-type: none"> Monitoring indicates that revegetation program has failed or partially failed. 	<ul style="list-style-type: none"> Qualified ecologist or revegetation expert engaged to recommend actions to ensure that the final vegetation community better reflects the target community. Implement above recommendations in consultation with DRG. 	8
Vegetation community is not self sustaining	Required mitigation of impacts on biodiversity is not achieved. Mine relinquishment not possible.	<ul style="list-style-type: none"> Monitoring of the rehabilitated landform indicates that progress towards identified indices is not occurring or slower than anticipated. 	<ul style="list-style-type: none"> Qualified ecologist or revegetation expert engaged to assess reasons for additional management requirements and recommend actions to align management required with that of the analogue sites. Implement above recommendations in consultation with DRG. 	9
Bushfire	Structure / composition of target vegetation communities altered by occurrence of fire.	<ul style="list-style-type: none"> Monitoring of the rehabilitated landform (post-fire) indicates that progress towards identified indices has been negatively affected. 	<ul style="list-style-type: none"> Qualified ecologist or revegetation expert engaged to assess reasons for additional management requirements and recommend actions to align management required with that of the analogue sites. Implement above recommendations in consultation with DRG 	9
Drought	Failure of vegetation communities to establish as a consequence of limited water availability.	<ul style="list-style-type: none"> Monitoring of the rehabilitated landform indicates that progress towards identified indices is slower than anticipated or non-existent. 	<ul style="list-style-type: none"> Suitably qualified ecologist or revegetation expert engaged to assess reasons for additional management requirements and recommend actions to align management required with that of the analogue sites. Implement above recommendations in consultation with DRG. 	9



10. REPORTING

An AEMR is produced for the Quarry each year in accordance with the requirements of ML1633. The AEMR will provide an update on the status of rehabilitation within the Quarry Site and (when relevant) progress against the rehabilitation performance indicators and relinquishment criteria identified in **Table 17**. The report will also describe the results of rehabilitation trials and research. Each AEMR is posted on the Company's Website.

11. REVIEW AND IMPLEMENTATION OF THE MOP

11.1 REVIEW OF THE MOP

The MOP will be reviewed on a periodic basis, generally concurrent with the preparation of the AEMR. If a review indicates the need to amend the MOP, then an amended MOP will be prepared and submitted to the DRE for review and approval.

11.2 IMPLEMENTATION

Table 22 outlines the roles and responsibilities of personnel who have responsibility for monitoring, review and implementation for this MOP.

Table 22
Summary Roles and Responsibilities for MOP Implementation

Role	Responsibilities
Managing Director	Ensure adequate resources are available to enable implementation of the Plan.
Quarry Operations Manager	Accountable for the overall environmental performance of the Operations, including the outcomes of this Plan. Ensure employees are competent through training and awareness programs. Ensure the AEMR is undertaken.
Quarry Manager	Ensure mine planning and operations practices are consistent with the plans and objectives detailed in this Plan. Monitor and review of performance via field inspections. Ensure other monitoring is commissioned and undertaken.
Compliance Manager	Ensure the implementation of this Plan, including reporting of non-compliances with the trigger values, and subsequent implementation of the relevant action plan.
All employees	Follow direction provided by the Quarry management with respect to activities undertaken and regulatory compliance. Ensure operations are consistent with the plans and objectives detailed in this MOP.

12. REFERENCES

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- Pacrim Environmental (Pacrim) (2001).** *Environmental Impact Statement Proposed Wallerawang Quarry.* Prepared for Sitegoal Pty. Limited, November 2001 (report 01/206.1).
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- RW Corkery & Co. Pty Limited (RWC) (2016).** *Flora and Fauna Management Plan for the Wallerawang Quarry.* September, 2016.
- RW Corkery & Co. Pty Limited (RWC) (2017a).** *Environmental Assessment for Modification to Operations at the Wallerawang Quarry (DA 344-11-2001),* May 2017.
- RW Corkery & Co. Pty Limited (RWC) (2017b).** *Soil and Water Management Plan for the Wallerawang Quarry.* November, 2017.
- Sitegoal Pty Ltd (Sitegoal) (2006).** *Mining Operations Plan for the Wallerawang Quarry, October 2006.*

13. PLANS

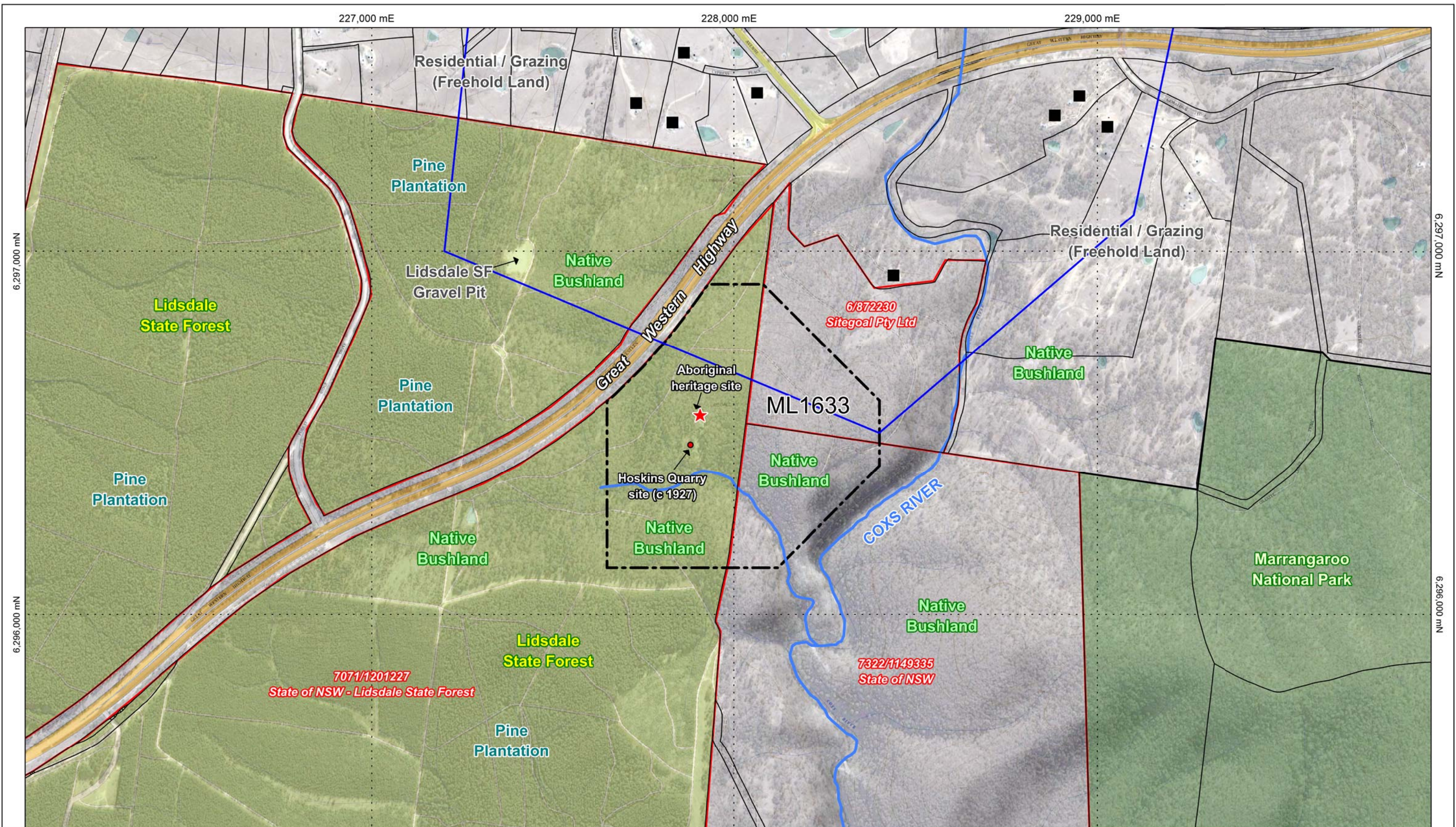
- Plan 1A Pre Mining Environment – Project Locality.
- Plan 1B Pre Mining Environment – Natural and Built Environment.
- Plan 2 Mine Domains at Commencement of MOP.
- Plan 3 Mining and Rehabilitation.
- Plan 4 Final Rehabilitation and Post Mining Use.



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I, David Murray, as Managing Director of Walker Quarries Pty Ltd certify that the information on this plan is a true indication of the pre-mining environment.

David W Murray

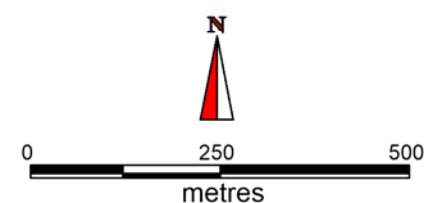
Mine Manager

29/03/2018

Date

- ML1633
- Relevant Landholdings
- Marrangaroo National Park
- Wallerawang Dam Notification Area

- Lidsdale State Forest
- ★ Aboriginal Heritage Site
- Coxs River
- Residence



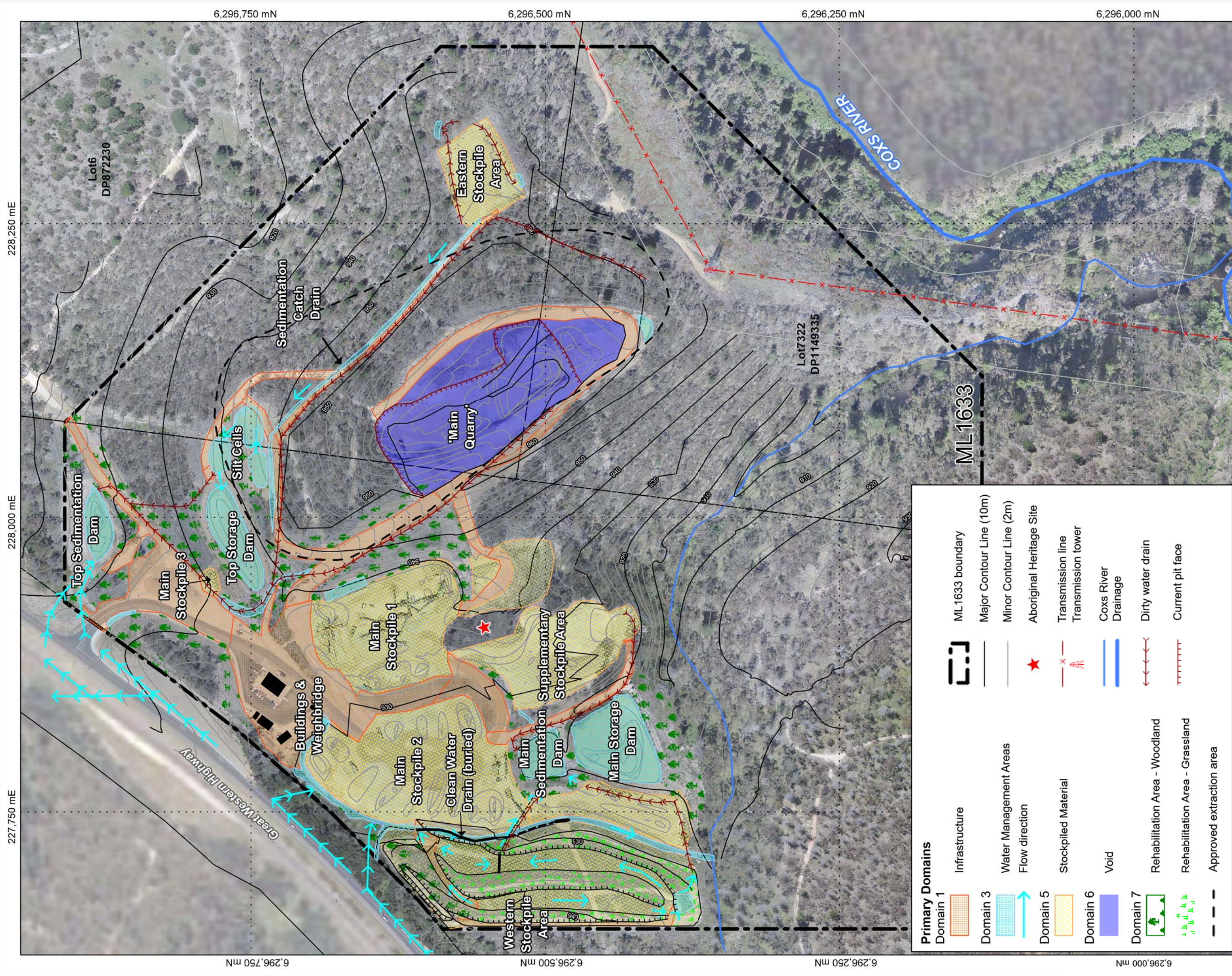
ML 1633 'WALLERAWANG'

PRE-MINING ENVIRONMENT -
NATURAL and BUILT ENVIRONMENT
PLAN 1B

RME Rangott Mineral Exploration Pty Ltd		Date Updated: 10/07/2016		
Prepared: dpb	Author: A. Eastwood	Projection: MGA94z56	Scale: 1:10,000	DrawingID: SGW0109

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Primary Domains

Domain 1

Domain 3

Domain 5

Domain 6

Domain 7

Infrastructure

Water Management Areas

Stockpiled Material

Void

Rehabilitation Area - Woodland

Rehabilitation Area - Grassland

Approved extraction area

Flow direction

Stockpiled Material

Void

Rehabilitation Area - Woodland

Rehabilitation Area - Grassland

Approved extraction area

ML1633 boundary

Major Contour Line (10m)

Minor Contour Line (2m)

Aboriginal Heritage Site

Transmission line

Transmission tower

Coxs River Drainage

Dirty water drain

Current pit face

I, David Murray, as Managing Director of Walker Quarries Pty Ltd certify that the information on this plan is a true indication of the existing development.

David W Murray

Mine Manager

29/03/2018

Date

ML 1633 'WALLERAWANG'

MINE DOMAINS at COMMENCEMENT of MOP

PLAN 2

RME

Rangott Mineral Exploration Pty Ltd

Prepared:

Author:

Projection:

Date Updated:

dpb

A. Eastwood

MGA94Z56

27/03/2018

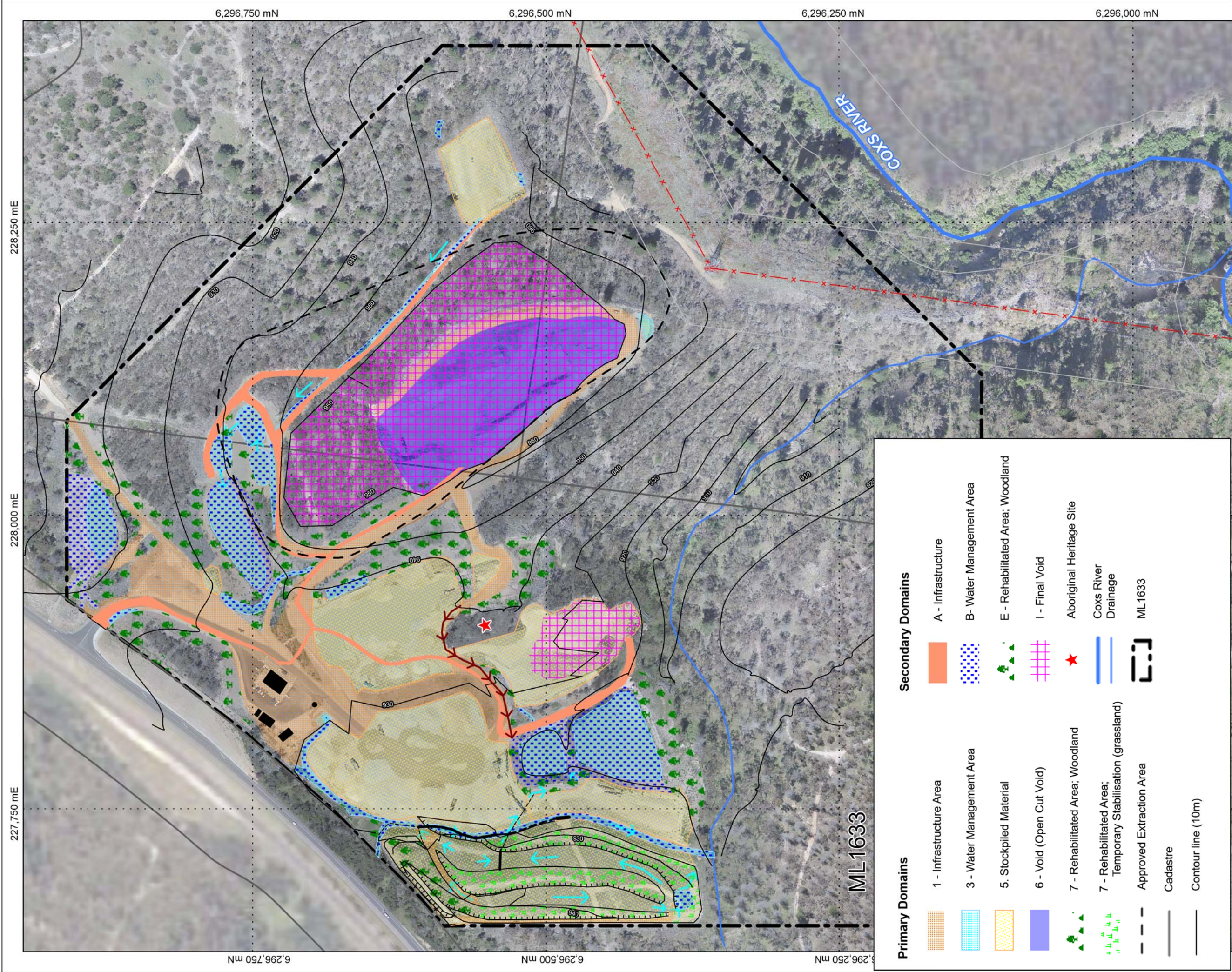
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SGW0110

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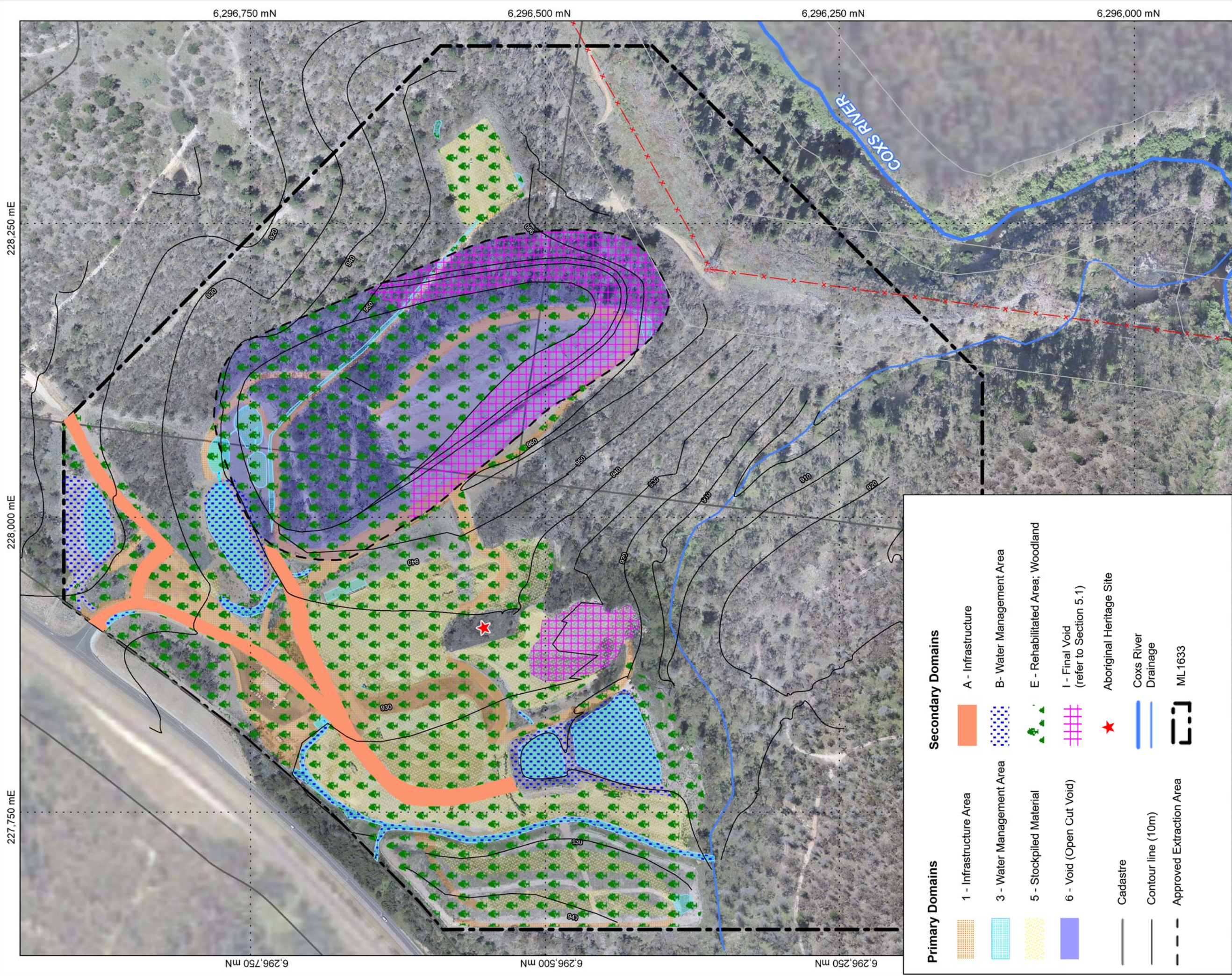
I, David Murray, as Managing Director of Walker Quarries Pty Ltd certify that the information on this plan is a true indication of the planned final rehabilitation and post mining use.

David W Murray
Mine Manager
29/03/2018
Date

ML 1633 'WALLERAWANG'
MINING and REHABILITATION
PLAN 3

RME		Rangott Mineral Exploration Pty Ltd		Date Updated: 28/03/2018	
Prepared: dpb	Author: A. Irwin	Projection: MGA94z56	Scale: 1:3,000	DrawingID: SGW0111	

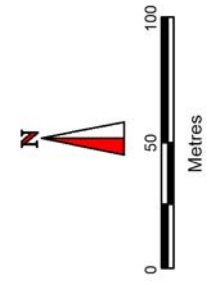
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I, David Murray, as Managing Director of Walker Quarries Pty Ltd certify that the information on this plan is a true indication of the planned final rehabilitation and post mining use.

David W Murray
Mine Manager

29/03/2018
Date



ML 1633 'WALLERAWANG'			
FINAL REHABILITATION and POST MINING USE			
PLAN 4			
RME Rungt Mineral Exploration Pty Ltd	Date Updated: 18/03/2018		
Prepared: dpb	Author: A. Irwin	Projection: MGA94z56	DrawingID: SGW0112
		Scale: 1:3,000	

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