

Landscape Management Plan

for the

New Berrima Clay/Shale Quarry

PA08_0212

Prepared by:



R.W. CORKERY & CO. PTY. LIMITED

September 2018

Approved by
the Secretary's nominee, Megan Dawson,
on 28 September 2018

Landscape Management Plan

for the

New Berrima Clay/Shale Quarry

PA08_0212

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COMMONLY USED ACRONYMS

AHD	Australian Height Datum
AS	Australian Standard
CCC	Community Consultation Committee
DPE	Department of Planning and Environment
DRG	Division of Resources and Geoscience
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPA	Environment Protection Authority
EPL	Environment Protection Licence
NATA	National Association of Testing Authorities
OEH	Office of Environment and Heritage
PA	Project Approval

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1. INTRODUCTION

This *Landscape Management Plan* (LMP) has been prepared by R W Corkery & Co Pty Limited on behalf of The Austral Brick Company Pty Limited (Austral) for the New Berrima Clay/Shale Quarry (the Quarry). The Quarry is located within the “Mandurama” property approximately 1.5km east of New Berrima in the Southern Highlands of NSW (**Figure 1**). For the purposes of this document, the area of the approved quarry is referred to as “the Quarry Site”. It is noted that this plan relates to the area within the Quarry Site boundary which does not include the riparian zone adjacent to the Wingecarribee River. This area remains part of the residual property managed as a pastoral enterprise.

This LMP has been prepared in satisfaction of Project Approval (PA) 08_0212 PA Conditions 3(35), 3(19), 3(21) and 5(3) of Project Approval (PA) 08_0212¹. The Office of Environment and Heritage (OEH) and Wingecarribee Shire Council have also previously been consulted in relation to the LMP.

This LMP forms part of the Quarry’s overall Environmental Management System which includes the preparation and implementation of the following management plans.

- Environmental Management Strategy.
- Transport Management Plan.
- Air Quality Management Plan.
- Water Management Plan.
- Noise Management Plan.
- Aboriginal Heritage Management Plan.

The objectives and procedures outlined within the LMP are also reflected in the Mining Operations Plan prepared in accordance with the requirements of Mining (Mineral Owners) Lease 6 (see Section 3.2).

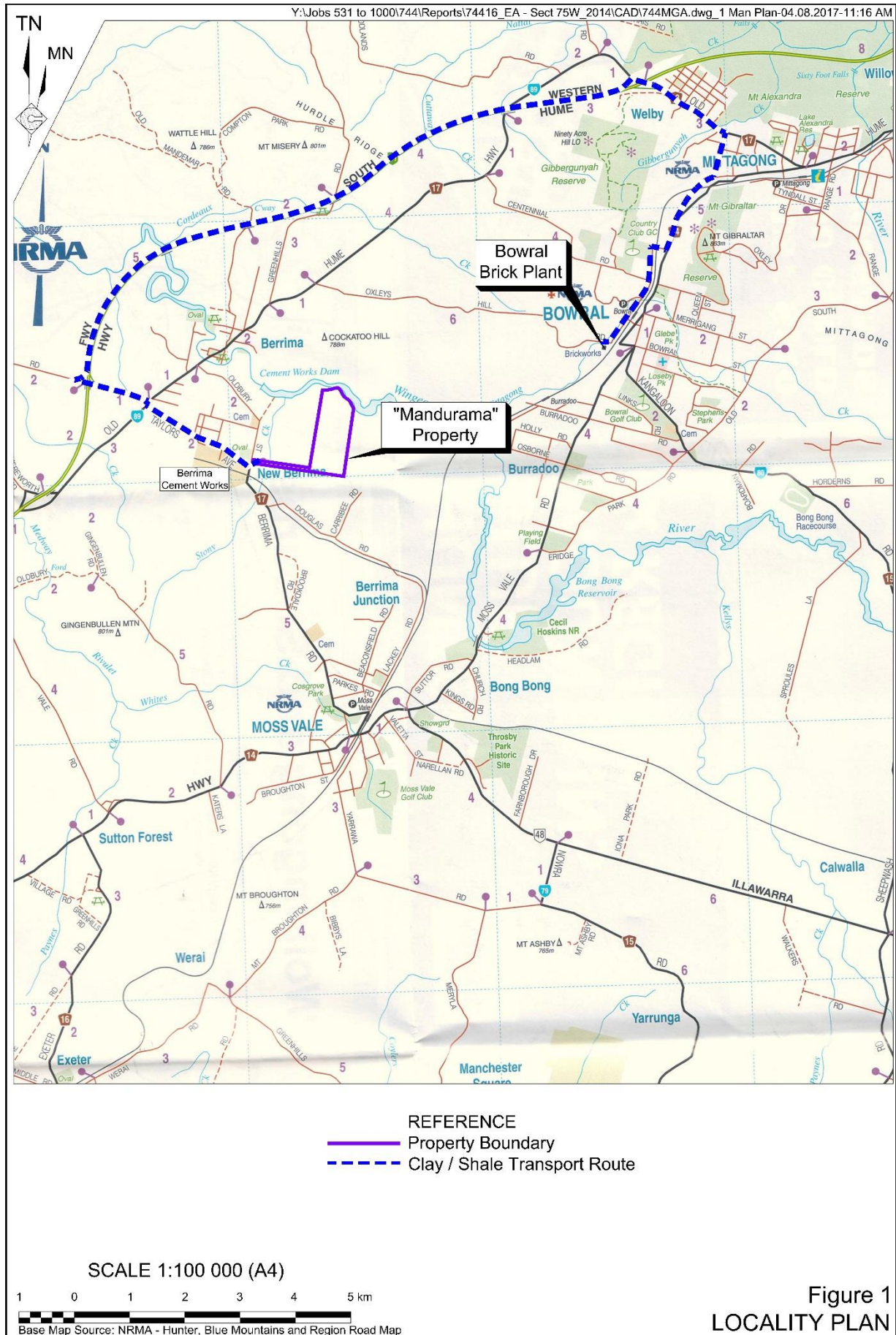
2. APPROVED ACTIVITIES AND STAGED OPERATIONS

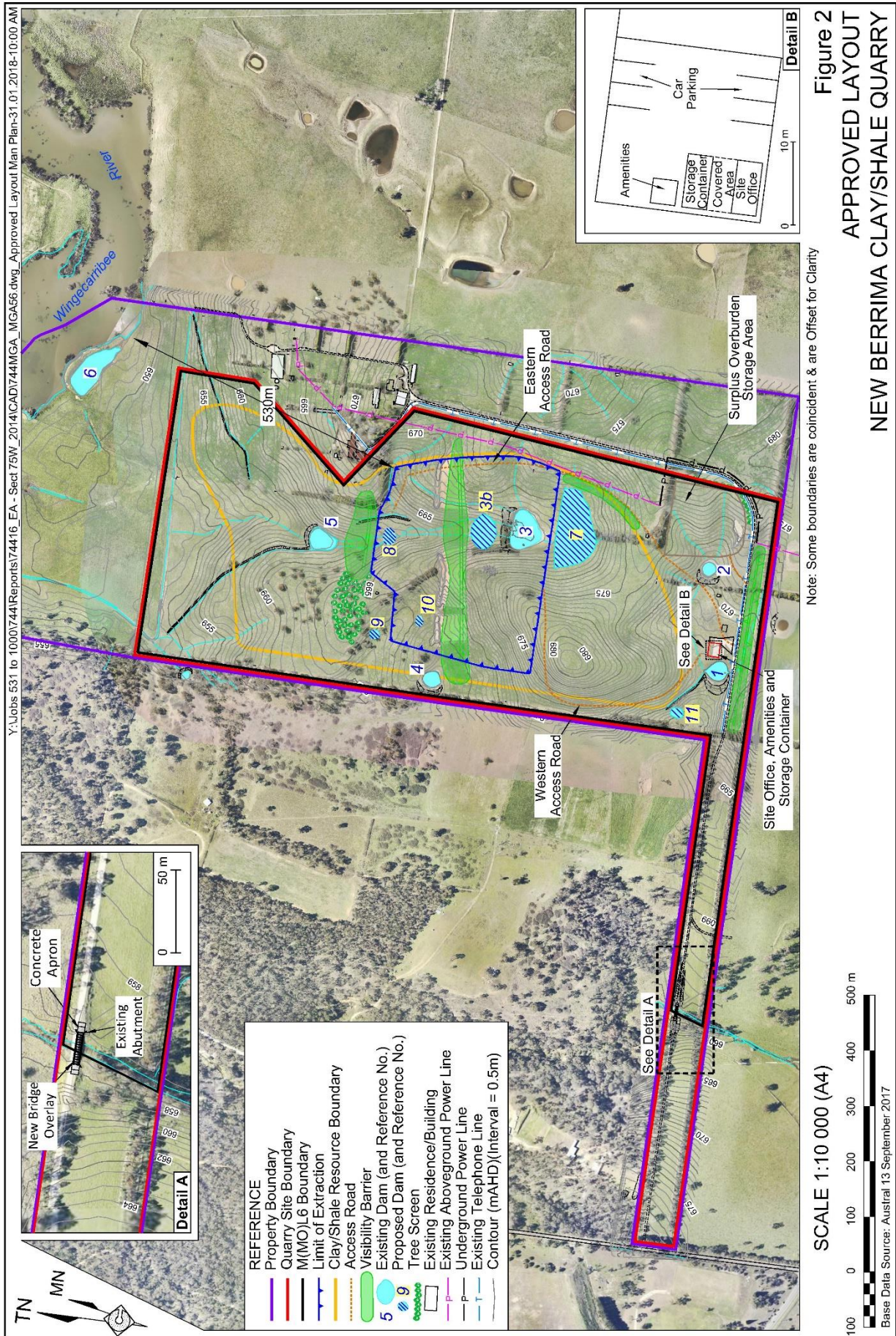
2.1 APPROVED ACTIVITIES

The principal activities approved at the Quarry (**Figure 2**) comprise the following.

- Construction of visibility barriers to provide visual screening for the quarry operations.
- Extraction and stockpiling of clay/shale from the extraction area using standard ripping, pushing and loading techniques.
- Transportation of up to 150 000t per year of quarry products via Berrima Road using articulated and rigid trucks not exceeding 19m in length.

¹ All conditions in Project Approval 08_0212 are referred to as the schedule number followed by the condition number in brackets, e.g. PA Condition 3(35).





The relevant limitations upon the approved activities nominated in Conditions within PA08_0212 are as follows.

- “The Proponent must not carry out any development in the extraction area below a level of 640mAHD” *PA Condition 2(6)*.
- “The Proponent must not extract more than 150 000 tonnes of extractive materials from the site in any calendar year” *PA Condition 2(7)*.
- “The Proponent must not transport more than:
 - a) 150,000 tonnes of product from the site in any calendar year;
 - b) 68 laden trucks from the site in a day; and
 - c) 8 laden trucks from the site in an hour.

The approved quarry life is until 31 December 2045 and the approved hours of operation are outlined in **Table 1**.

Table 1
Hours of Operation

Day	Construction & Extraction Operations	Clay/Shale Transportation
Monday – Friday	7:00am to 5:00pm	7:00am to 4:00pm
Saturday	8:00am to 1:00pm	8:00am to 1:00pm
Sundays and Public Holidays	None	None

2.2 STAGED OPERATIONS

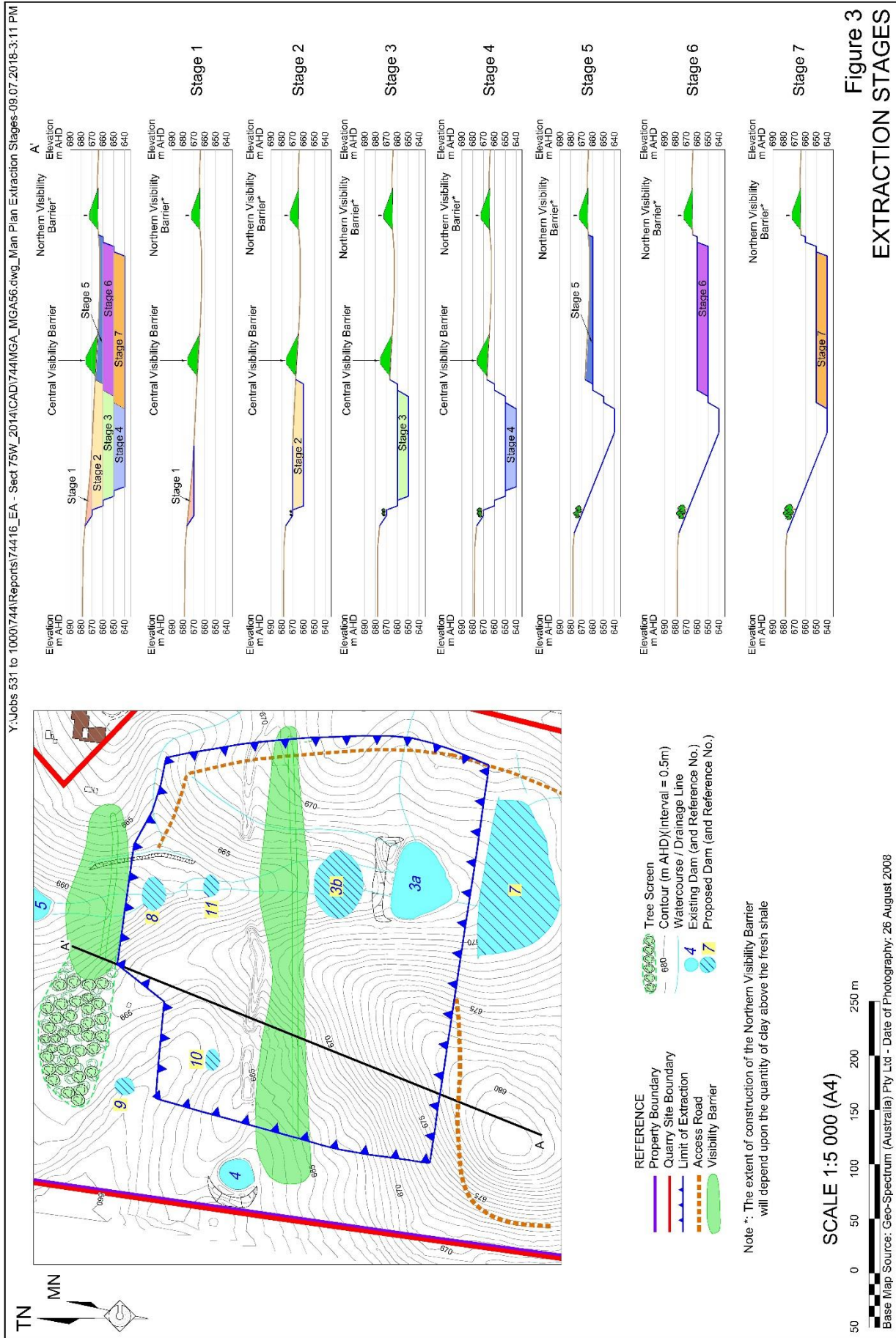
Figure 3 displays the staging sequence throughout the life of the Quarry. The southern section would be extracted in four stages, namely Stages 1 to 4. Once extraction ceases in the southern section, extraction would commence in the northern section with extraction undertaken in three stages, namely Stages 5 to 7. It is noted that, whilst the stages will progress sequentially, the actual timing for each stage will be largely dependent on the raw material requirements at the Bowral Brick Plant.

3. LEGAL AND OTHER REQUIREMENTS

3.1 PROJECT APPROVAL 08_0212

Austral was granted PA08_0212 by the Director-General of Planning and Infrastructure on 7 July 2012 pursuant to Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Modification 1 of PA08_0212 was approved on 15 December 2015 to incorporate modifications to the Quarry associated with an alternate extraction area boundary.

Modification 2 of PA08_0212 was approved on 6 July 2017 to incorporate modifications to the Quarry associated with the construction of a new bridge over Stony Creek, the realignment of the western access road, the repositioning of the site office, amenities and storage container, and the installation of underground power and removal of a section of overhead power line. PA08_0212 includes conditions that Austral needs to comply with and sets out the matters that need to be addressed within this LMP.



Relevant rehabilitation and landscape-related conditions in PA08_0212 are reproduced in **Tables 2** and **3** with a reference provided to the section(s) of this document where each conditional requirement / commitment is addressed.

Table 2
Rehabilitation and Landscape Management-related Project Approval Requirements

Page 1 of 3

Cond. No.	Requirement	Plan Section																									
3(3)	The Proponent must construct the Visibility Barriers prior to carrying out any quarrying operations on site under this approval to the satisfaction of the Secretary. This condition does not prohibit the winning of extractive material on site to be used in the construction of the Visibility Barriers.	Section 8.2																									
3(3A)	The Visibility Barriers and surplus overburden must be constructed to meet the dimensions specified in Table 1A, unless the Secretary agrees otherwise. <i>Table 1A - Visibility Barriers and Surplus Overburden Stockpile Dimensions</i>	Section 8.2																									
	<table border="1"> <thead> <tr> <th>Structure</th> <th>Height</th> <th>Base Width (m)</th> <th>Length (m)</th> <th>Surface Area (ha)</th> </tr> </thead> <tbody> <tr> <td>Central Barrier (minimum)</td> <td>675 (m AHD)</td> <td>30 - 45</td> <td>420</td> <td>1.5</td> </tr> <tr> <td>Northern Barrier (minimum)</td> <td>672 (m AHD)</td> <td>35 - 50</td> <td>160</td> <td>0.7</td> </tr> <tr> <td>Southern Barrier (minimum)</td> <td>4 metres above the natural land surface</td> <td>20</td> <td>350</td> <td>0.7</td> </tr> <tr> <td>Overburden Stockpile (maximum)</td> <td>683 (m AHD)</td> <td>-</td> <td>-</td> <td>-</td> </tr> </tbody> </table>	Structure	Height	Base Width (m)	Length (m)	Surface Area (ha)	Central Barrier (minimum)	675 (m AHD)	30 - 45	420	1.5	Northern Barrier (minimum)	672 (m AHD)	35 - 50	160	0.7	Southern Barrier (minimum)	4 metres above the natural land surface	20	350	0.7	Overburden Stockpile (maximum)	683 (m AHD)	-	-	-	
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3(19)	The Proponent must vegetate (with grasses, shrubs and trees) the Visibility Barriers as soon as practicable after the completion of the construction of the bunds, to the satisfaction of the Secretary.	Section 8.2																									
3(19A)	Prior to transporting any product from the site, the Proponent must establish a 0.68 ha tree screen adjacent to the Northern Visibility Barrier, as shown on Figure 1 in Appendix A of PA08_0212. The screen must include native plant species from the <i>Southern Highlands Shale Woodland Endangered Ecological Community</i> .	Section 7.2.3																									
3(20)	The Proponent must not erect or display any advertising structure(s) or signs on the site without the written approval of the Secretary. <i>Note: This condition does not require approval for any business identification, traffic management, and/or safety or environmental signs.</i>	Section 8.2																									
3(21)	The Proponent must a) implement all reasonable and feasible measures to minimise the visual impacts and any off-site lighting impacts of the project; and b) maintain and improve the effectiveness of the bunds and vegetative screens, listed as A – F in the project layout plans in Appendix 2, over the life of the project.	Section 8.2																									
3(33)	The Proponent must rehabilitate the site to the satisfaction of the DRG. This rehabilitation must be generally consistent with the proposed rehabilitation strategy in the EA (Mod 1), and comply with the objectives in Table 6. <i>Table 6 – Rehabilitation Objectives</i>	Section 9																									
	<table border="1"> <thead> <tr> <th>Feature</th> <th>Objective</th> </tr> </thead> <tbody> <tr> <td>Site (as a whole)</td> <td>Safe, stable & non-polluting</td> </tr> <tr> <td>Surface Infrastructure</td> <td>To be decommissioned and removed, unless the DRE agrees otherwise</td> </tr> <tr> <td>Quarry Walls</td> <td>Final slopes of 1:3 (vertical : horizontal), except the southwestern wall of Bench 1 Vegetated with native endemic flora species to be consistent with surrounding landscape and to minimise visual impacts</td> </tr> <tr> <td>Quarry Pit Floor</td> <td>Suitable for grazing or other agricultural activities</td> </tr> <tr> <td>Other Land affected by the project</td> <td>Restore ecosystem function, including maintaining or establishing self-sustaining eco-systems comprised of: <ul style="list-style-type: none"> local native species; and a landform consistent with the surrounding environment </td> </tr> </tbody> </table>	Feature	Objective	Site (as a whole)	Safe, stable & non-polluting	Surface Infrastructure	To be decommissioned and removed, unless the DRE agrees otherwise	Quarry Walls	Final slopes of 1:3 (vertical : horizontal), except the southwestern wall of Bench 1 Vegetated with native endemic flora species to be consistent with surrounding landscape and to minimise visual impacts	Quarry Pit Floor	Suitable for grazing or other agricultural activities	Other Land affected by the project	Restore ecosystem function, including maintaining or establishing self-sustaining eco-systems comprised of: <ul style="list-style-type: none"> local native species; and a landform consistent with the surrounding environment 														
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Table 2 (Cont'd)
Rehabilitation and Landscape Management-related Project Approval Requirements

Page 2 of 3

Cond. No.	Requirement	Plan Section
3(34)	The Proponent 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 rehabilitation strategies must be employed when areas prone to dust generation cannot yet be permanently rehabilitated.	Section 9
3(35)	The Proponent must prepare and implement a Landscape Management Plan for the project to the satisfaction of the Secretary. This plan must:	Section 1
	a) be prepared in consultation with OEH and Council, and submitted to the Secretary for approval prior to carrying out any development on site under this approval;	Section 1
	b) describe the short, medium and long term measures that would be implemented to:	Section 7
	• manage the remnant vegetation and habitat on site;	NA
	• rehabilitate the riparian land adjacent to the Wingecarribee River on site;	NA
	• ensure compliance with the rehabilitation objectives and progressive rehabilitation obligations in this approval;	Sections 9.6, 10
	c) include detailed performance and completion criteria for evaluating the performance of the rehabilitation of the site, including triggering remedial action (if necessary);	Section 9
	d) include a detailed description of the measures that would be implemented over the next 3 years, including the procedures to be implemented for:	Sections 9.6, 10
	• ensuring compliance with the rehabilitation objectives and progressive rehabilitation obligations in this approval;	Sections 9.6, 10
	• enhancing the quality of existing vegetation and fauna habitat;	Section 7
	• restoring native endemic vegetation and fauna habitat within the biodiversity areas and rehabilitation area;	Section 7
	• maximising the salvage of resources within the approved disturbance area – including vegetative and soil resources – for beneficial reuse in the enhancement of the biodiversity areas or rehabilitation area;	Section 7.1, 7.2
	• collecting and propagating seed;	NA
	• minimising the impacts on fauna on site, including undertaking pre-clearance surveys;	NA
	• controlling weeds and feral pests;	Section 9.6
	• controlling erosion;	Sections 7.1, 9.5
	• managing grazing and agriculture on site;	NA
	• controlling access; and	Section 9.5
	• bushfire management.	Section 7.3
3(35) (Cont'd)	e) a program to monitor the effectiveness of these measures, and progress against the performance and completion criteria;	Section 9.6
	f) identify the potential risks to successful implementation of the rehabilitation of the site, and include a description of the contingency measures that would be implemented to mitigate against these risks; and	Section 9.6
	g) include details of who would be responsible for monitoring, reviewing, and implementing the plan.	Section 4
5(3)	The Proponent must ensure that the Management Plans required under this approval are prepared in accordance with any relevant guidelines, and include:	NA
	a) detailed baseline data;	NA

Table 2 (Cont'd)
Rehabilitation and Landscape Management-related Project Approval Requirements

Page 3 of 3

Cond. No.	Requirement	Plan Section
5(3) (Cont'd)	b) a description of: <ul style="list-style-type: none"> the relevant statutory requirements (including any relevant approval, licence or lease conditions); any relevant limits or performance measures/criteria; and the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures; 	Section 3 Section 9.2
	c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;	Section 7.1, 7.2, 8.2
	d) a program to monitor and report on the: <ul style="list-style-type: none"> impacts and environmental performance of the project; and effectiveness of any management measures (see (c) above); 	Sections 9.6, 10
	e) a contingency plan to manage any unpredicted impacts and their consequences;	Sections 9.6, 11
	f) a program to investigate and implement ways to improve the environmental performance of the project over time;	Sections 10, 11
	g) a protocol for managing and reporting any: <ul style="list-style-type: none"> incidents; complaints; non-compliances with statutory requirements; and exceedances of the impact assessment criteria and/or performance criteria; and 	NA NA Sections 10 NA
	h) a protocol for periodic review of the plan. <ul style="list-style-type: none"> <i>Note: The Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans.</i> 	Section 12
	Within 3 months of the submission of an: <ol style="list-style-type: none"> annual review under condition 4 above; incident report under condition 7 below; audit report under condition 9 below; and any modifications to this approval, the Proponent must review, and if necessary revise, the strategies, plans, and programs required under this approval to the satisfaction of the Secretary. Within 4 weeks of conducting any such review, the Proponent must advise the Secretary of the outcomes of the review, and provide any revised documents to the Secretary for review and approval. <i>Note: This is to ensure the strategies, plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the project.</i>	Section 12

Table 3
Statement of Commitments Related to Rehabilitation and Landscape Management

Objective	Commitment		Plan Section
	Action	Timing	
All approved activities are undertaken in the area(s) nominated on the approved plans and figures (unless moved slightly to avoid individual trees).	1.1 Survey and mark the boundaries of the areas of disturbance on the ground.	Prior to any vegetation clearing.	Section 7.1
Minimisation of the spread of weeds, on and off Site	6.1 Quick establishment of a selected cover crop.	During the construction periods.	Section 9.2
	6.2 Spray weeds with an authorised herbicide	As required.	Section 7.1
	6.3 Ensure all earthmoving equipment is appropriately cleaned prior to being brought to the Quarry for each campaign.	Prior to each campaign.	Section 7.1
Reduce visible amenity impacts.	7.1 Plant trees screening the eastern side of the surplus overburden stockpile area to screen stockpiles from the east.	During the construction periods.	Section 7.2.3
	7.2 Commence progressive rehabilitation of completed faces and all other completed disturbed areas as soon as possible after completion of extraction. Rehabilitation of the southern extraction area wall would be very advanced (13-18 years) and protect against views of extraction faces during Stages 5 to 7.	Ongoing.	Section 9
Conservation of topsoil resources.	9.1 Strip all available topsoil to a depth of approximately 0.15m from the surface of each extraction stage.	Ongoing.	Section 7.1
	9.2 Wherever practicable, place stripped topsoil directly onto the constructed visibility barriers or areas prepared and awaiting rehabilitation.	Ongoing.	
	9.3 Stockpile topsoil around the perimeter of the surplus overburden stockpile area for later reclamation if no areas are available. Limit topsoil stockpiles to no more than 2.0m in height to minimise adverse impacts upon the biological activity of the topsoil.	Ongoing.	
	9.4 Broadcast a pasture seed mix to assist with temporary stabilisation if topsoil stockpiles are likely to remain for extended periods.	As required.	
	9.5 Avoid excessive handling of soil during the stripping and stockpiling operation and handling when the soils are wet to protect soil structure.	Ongoing.	
	9.6 Restrict driving of machinery on the topsoil stockpiles, as well as the respread soil, to maximise soil aggregation and prevent compaction, particularly when the stockpiles are moist.	Ongoing.	
	9.7 Place silt-stop fencing or similar immediately down-slope of stockpiles and visibility barriers where required, until a stable vegetation cover is established.	During the construction periods.	
Minimise the potential for soil contamination.	9.8 Restrict all refuelling and vehicle maintenance activities to designated areas which are either sealed, bunded or located with access to spill control kits.	Ongoing.	Section 7.1
	9.9 Complete regular housekeeping and maintenance of vehicle maintenance areas.	Ongoing.	Section 7.1

4. ROLES AND RESPONSIBILITIES

Table 5 presents the roles and responsibilities of personnel responsible for the implementation of this LMP.

Table 5
Roles and Responsibilities

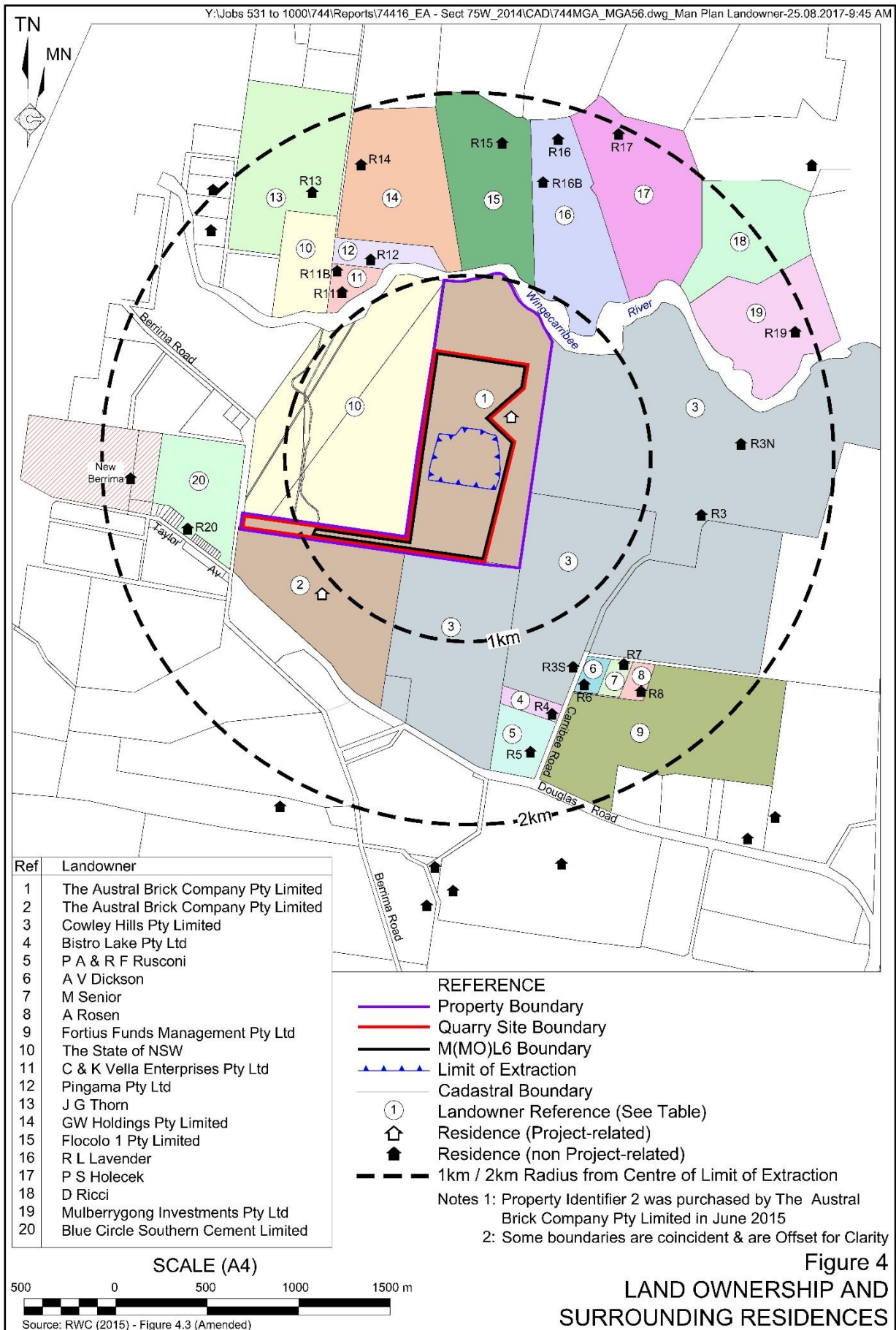
Roles*	Responsibilities
NSW Manufacturing Manager	Must ensure adequate resources are available to enable implementation of the Plan.
Raw Material & Mining Manager	Accountable for the overall environmental performance of the Quarry operations, including the implementation of the management measures identified in Section 9 of this Plan.
Compliance & Environmental Coordinator	Manage the implementation of the following components of this Plan. <ul style="list-style-type: none"> • Ensure measures identified in Section 9 of this Plan are correctly implemented. • Inspecting rehabilitated progress as outlined in Section 9.6 (Rehabilitation Monitoring). • Ensure all relevant information regarding rehabilitation progress is included in each Annual Review. • Reviewing this Plan in accordance with Section 12.
All personnel	Ensure training and awareness induction has been undertaken. Compliance with this Plan.
*Or equivalent position delegated these responsibilities.	

5. COMPETENCE TRAINING AND AWARENESS

All Austral personnel and contractors and their employees will undergo Company and site-specific inductions, incorporating basic information in relation to the operation of this plan as a component of the site induction program. The Compliance & Environmental Coordinator or delegate will be responsible for ensuring that all relevant employees and contractors are appropriately inducted prior to undertaking any on-site operational activities and are re-inducted on at least a 2-yearly basis.

6. SURROUNDING RESIDENCES

Figure 4 displays the locations of all residences within 2km of the Quarry. Section 8.1 describes the visibility of the Quarry from surrounding residences.



7. SOIL AND VEGETATION MANAGEMENT MEASURES

7.1 PREPARATORY ACTIVITIES AND SOIL MANAGEMENT

The following management measures will be implemented prior to / during soil stripping and stockpiling and construction of each visibility barrier.

- All areas to be cleared will be clearly pegged or otherwise marked on the ground.
- All equipment operators will be made aware of the areas to be prepared.
- Where weeds are visibly present, an authorised herbicide will be sprayed across the area to be stripped prior to soil stripping to limit the presence of weeds in the stripped topsoil. This would occur at least 2 weeks prior to stripping (or as otherwise specified by the herbicide manufacturer).
- Groundcover vegetation and topsoil, where present, will be stripped in all areas of disturbance. Topsoil will be stripped to a depth of approximately 0.15m unless rocky or heavy clay material is encountered at which point topsoil stripping will be terminated. Where topsoil material is present to greater depths (such as in drainage lines), it will also be stripped and stockpiled for use in rehabilitation.
- Subsoil will be stripped using a bulldozer or scraper. Subsoil will be stripped within the Extraction Area and the footprint of the Southern Visibility Barrier to a depth of approximately 0.6m below the base of the topsoil unless rocky material is encountered, at which point subsoil stripping will be terminated.
- Soil materials will be stripped when they are moderately moist (but not overly wet) to preserve soil structure. If conditions are extremely dry, the area to be stripped will be watered utilising the water cart, a sprinkler system or similar.
- The initial topsoil and subsoil materials stripped will be stockpiled separately adjacent to the footprint of each barrier.
- Soil stockpiles will be constructed as low, flat, elongated mounds. Topsoil stockpiles will be less than 2m high and subsoil stockpiles will be less than 3m high.
- Once completed sections of visibility barriers are available, any further subsoil and topsoil that is stripped will preferentially be directly placed onto the completed northern facing sections.
- Subsoil and topsoil initially stockpiled will then be spread across the remaining faces of the barriers.
- Silt-stop fencing will be installed immediately down-slope of subsoil and topsoil stockpiles and each visibility barrier until a stable vegetation cover is established.
- A pasture seed mix will be broadcast over the spread topsoil or on soil stockpiles to be retained (refer to the Water Management Plan for additional erosion and sediment control measures and time period for establishment of groundcover).

- Driving of machinery on soil stockpiles will be avoided (except where necessary for their formation or soil recovery) to minimise soil compaction and maximise soil aggregation.
- To minimise the spread of weeds, earthmoving equipment will be appropriately cleaned prior to being brought onto the Quarry Site for each campaign.
- To minimise the potential for soil contamination, all refuelling and vehicle maintenance activities will be restricted to designated areas – to be identified for all site personnel.

7.2 VEGETATION MANAGEMENT

7.2.1 Existing Vegetation

As part of the 2010 Environmental Assessment, two vegetation communities were identified within the Quarry Site (Geoff Cunningham Natural Resource Consultants, 2010).

- Community 1 – Cleared Pastureland Community; and
- Community 2 – Remnant Open Woodland Community.

Community 1 is the dominant vegetation community within the Quarry Site which is almost completely cleared of trees and shrubs and sown with ryegrass with a range of weeds evident within the groundcover. A small number of established eucalypts occur within the Quarry Site but are not native to Berrima area. A row of non-indigenous trees also traverses the extraction area.

Community 2 is an open woodland remnant adjacent to the northern edge of the extraction area, comprising scattered trees (mostly 10m to 20m apart) of mainly *Eucalyptus radiata subsp. Radiata* (Narrow-leaved Peppermint) and *E. dives* (Broadleaf Peppermint) with some *E. mannifera* (Brittle Gum) and an occasional *E. pauciflora* (Snow Gum). The groundcover is comprised of a mixture of the groundcover species listed for Community 1, with few native groundcover species present.

7.2.2 Vegetation Disturbance

All disturbances will occur within Community 1. As none of the area of Community 2 will be disturbed by Quarry operations, there will be no disturbance of any flora species native to the area. There will be no impacts to any threatened flora species or threatened ecological communities, and trees to be removed are not potential habitat trees.

The absence of hollow-bearing trees or trees providing fauna habitat within the extraction area negates the need for any pre-clearance fauna surveys.

7.2.3 Revegetation

The following tree planting will take place within the Quarry Site (as shown on **Figure 2**).

- Austral will plant additional trees within the northern tree screen to the west of the Northern Visibility Barrier. Species to be planted will be selected from the Southern Highland Shale Woodland Endangered Ecological Community. This area will be fenced to limit losses of small shrubs from grazing stock and wildlife.
- A tree screen will be planted during the site establishment and construction phase on the southeastern periphery of the Surplus Overburden Stockpile Area. Species to be planted will include *Eucalyptus dives* (Broadleaf Peppermint), *E. mannifera* (Brittle Gum), *E. radiata subsp. Radiata* (Narrow-leaved Peppermint) and selected wattles.

Austral will endeavour to propagate tubestock of the trees to be planted in both areas referred to above, with the seed collected from the remnant vegetation immediately north of the extraction area. For those preferred species not currently present on site, Austral will endeavour to source local provenance tube stock.

7.3 BUSHFIRE MANAGEMENT

The Quarry Site is predominantly cleared land, and as such does not present a high bushfire risk. Furthermore, following stripping of the groundcover and soil material, the majority of operations will occur within areas devoid of any vegetation, greatly reducing the potential of on-site ignition sources. In the unlikely event of a fire, emergency response procedures as outlined within Section 10 of the Environmental Management Strategy would be implemented.

8. MANAGEMENT OF VISUAL AMENITY

8.1 VISIBILITY OF QUARRY

Views of the Quarry will be shielded from the south, east and west by natural topography and existing tree windrows. Without mitigation measures, the southern side of the extraction area will be visible from a number of elevated properties on the northern side of the Wingecarribee River. There will be no direct line of sight to active extraction faces from any residence from Extraction Stage 2 onwards due to the construction of visibility barriers. Residences 13 and 16B which are located approximately 1.5km and 1.4km respectively from the closest edge of the extraction area (**Figure 4**) have clearest views towards the extraction area. Residences 14 and 16 also have restricted views over the extraction area. All other residences on the northern side of the Wingecarribee River are screened from the extraction area by vegetation or natural topography, or the extraction area is only visible at a considerable (>2km) distance. It is also noted that existing views to the south from residences north of the river include the Berrima Cement plant and the Ingham's Stock Feed plant. **Figure 5** presents visual amenity sections from Residences 13 and 16B throughout the life of the Quarry.

8.2 MITIGATION MEASURES

The Quarry will change the visual landscape through the progressive development of the extraction area, the establishment of visibility barriers and temporarily through the introduction of earthmoving equipment. However, due to the existing topography and the implementation of a number mitigation measures, the altered landscape will be largely screened from view or be vegetated consistent with a range of native and exotic vegetation and pasture in the area.

In order to minimise adverse visual amenity impacts associated with the Quarry, the following management and mitigation measures will be implemented.

- Three visibility barriers, the southern, central and northern, will be constructed during site establishment, prior to commencing extraction of product².
- The southern visibility barrier will be constructed to at least 4m high, 20m wide (north to south), and 350m long (east to west).
- The central visibility barrier will be constructed to at least 675m AHD (approximately 8m to 12m high), 30m to 45m wide (north to south), and 420m long (east to west). This barrier will ensure limited direct line of sight to active extraction areas from Stage 1 to Stage 4 of extraction.
- The northern visibility barrier will be constructed to at least 672m AHD (approximately 8m to 9m high, 35m to 50m wide (north to south), and 160m long (east to west). This barrier will ensure limited direct line of sight to active extraction areas from Stage 5 to Stage 7 of extraction.
- The central and northern barriers will be battered and shaped with an approximately 1:3 (V:H) northern slope and southern slope of approximately 1:1.5 (V:H) whilst the southern barrier will be formed with all slopes approximately 1:4 (V:H). All batters will then have topsoil spread and will be seeded with a fast growing cover crop for stabilisation.
- The top and northern slopes of the central and northern barriers and the southern slope of the southern barrier will also be planted with tubestock of native shrubs and trees (as per Section 7.2.3) at the density and in the season as recommended by a local native tree specialist. This will aid in minimising the visibility of the extraction area highwall from the residences to the north.
- The remaining slopes will be revegetated with a suitable pasture seed mix for rapid stabilisation.
- Additional tree planting will be undertaken within the northern tree screen (as detailed in Section 7.2.3).
- A tree screen will be planted on the southeastern periphery of the Surface Overburden Stockpile Area (**Figure 2**) – as detailed in Section 7.2.3.

² The northern visibility barrier will not perform a screening function until completion of extraction in Stage 4, however, early construction will provide a greater time period for establishment of vegetation.

- Following the removal of material to construct the central visibility barrier, the 670m AHD bench will be rehabilitated with overburden placed on the bench and revegetated utilising native tree and shrub species as per Section 7.2.3.
- The overall Quarry design ensures that the extraction of Stages 2 to 7 will be topographically lower than the visibility barriers and shielded from direct line of sight from the north.
- At the end of Stage 4 of extraction, the material within the central visibility barrier will be relocated to the extraction area against the established southern benches and shaped to produce a permanent interim landform (see Section 9.4).
- In accordance with *PA Condition 3(20)*, no advertising signs or structures will be erected at the Quarry (excluding business identification, safety, environmental, and traffic management signs).

9. REHABILITATION

9.1 INTRODUCTION

Austral will implement and adopt a progressive approach to the rehabilitation of disturbed areas within the Quarry Site to ensure that areas where extraction and activities are completed are quickly shaped and vegetated to provide a stable landform.

The proposed final landform, rehabilitation procedures and the selection of the revegetation species have been based on the long-term objective of returning as much of the disturbed area to its previous use as grazing land.

9.2 REHABILITATION OBJECTIVES AND LAND USE GOALS

Austral's rehabilitation objectives for all areas of quarry-related surface disturbance within the Quarry can be defined in the short term and long term. In the short term, the objectives are as follows.

- To stabilise all earthworks, drainage lines and disturbed areas no longer required for extraction-related activities in order to minimise the risk of erosion, sedimentation and air quality impacts on the environment surrounding the Quarry Site.
- To minimise the visual impacts of the extraction area, particularly from those residences on the northern side of Wingecarribee River through progressive rehabilitation.

Austral will ensure that progressive rehabilitation is undertaken as soon as practicable once an area is no longer required for extraction or transportation-related operations.

In the longer term, Austral's objective is to progressively provide a low maintenance, stable and safe landform and return it to its previous use as grazing land.

9.3 APPROVED FINAL LANDFORM

The final landform (**Figure 6**) incorporates final undulating slopes of 1:3 (V:H) (excluding the southwestern wall of Bench 1), utilising material available from the Central and Northern Visibility Barriers and some recovery of material from the southern side of the extraction area and the footprint beneath the Northern Visibility Barrier at the end of the Quarry life.

The final landform will include a dam (Dam 8) with a capacity of at least 1.8ML in the final sump location (**Figure 6**), collecting runoff from the internal area of the extraction area.

The final landform will be achieved through backfilling the completed sections of the extraction area in two stages, i.e. at the end of Stages 4 and 7, i.e. in the following manner.

- **End of Stage 4** – The material within the Central Visibility Barrier will be relocated to the floor of the extraction area against the established southern benches and shaped to produce a permanent interim landform (see **Figure 7**), as outlined below.
 - On the western section of the extraction area void at the end of Stage 4 (see cross section 16B' – 16B on **Figure 7**), the material will be placed up to the approximate level of the 670m bench, shaped to a final landform no steeper than 1:3 (V:H), except for Bench 1 which will have a slope of 1:1.5V:H, and stabilised with a permanent grass vegetative cover. The 670m bench (Bench 1) will have established (approximately 15 year old) trees and shrubs that will have been planted following the commencement of Stage 1 operations and will remain *in situ* on that bench. No further activities will be undertaken in this section of the Quarry.
 - On the eastern section of the extraction area void at the end of Stage 4 (see cross section 16C – 16B on **Figure 7**), material within the Central Visibility Barrier will be placed against the wall of the extraction area, up to the 660m AHD bench and shaped to create an interim undulating slope no steeper than 1:3 (V:H).
- **End of Stage 7** – The material within the Northern Visibility Barrier will be relocated and placed on the western margin of the excavated void and shaped in the same manner as above, that is creating a final landform no steeper than 1:3 (V:H) and stabilised with a permanent grass vegetative cover – see cross section 16B' – 16B on **Figure 7**.
- Following the extraction of all material within the extraction area and relocation of the Northern Visibility Barrier, the material located beneath the footprint of the Northern Visibility Barrier will be dozer pushed into the extraction area void, as shown on cross section 16B' – 16C on **Figure 7**, to create a final landform of no steeper than 1:3 (V:H). This underlying material will make up the shortfall of material volumes required for the creation of the final landform that could not be recovered from the Northern Visibility Barrier itself, whilst ensuring that the maximum amount of material could be extracted with only a minor and temporary disturbance footprint increase.

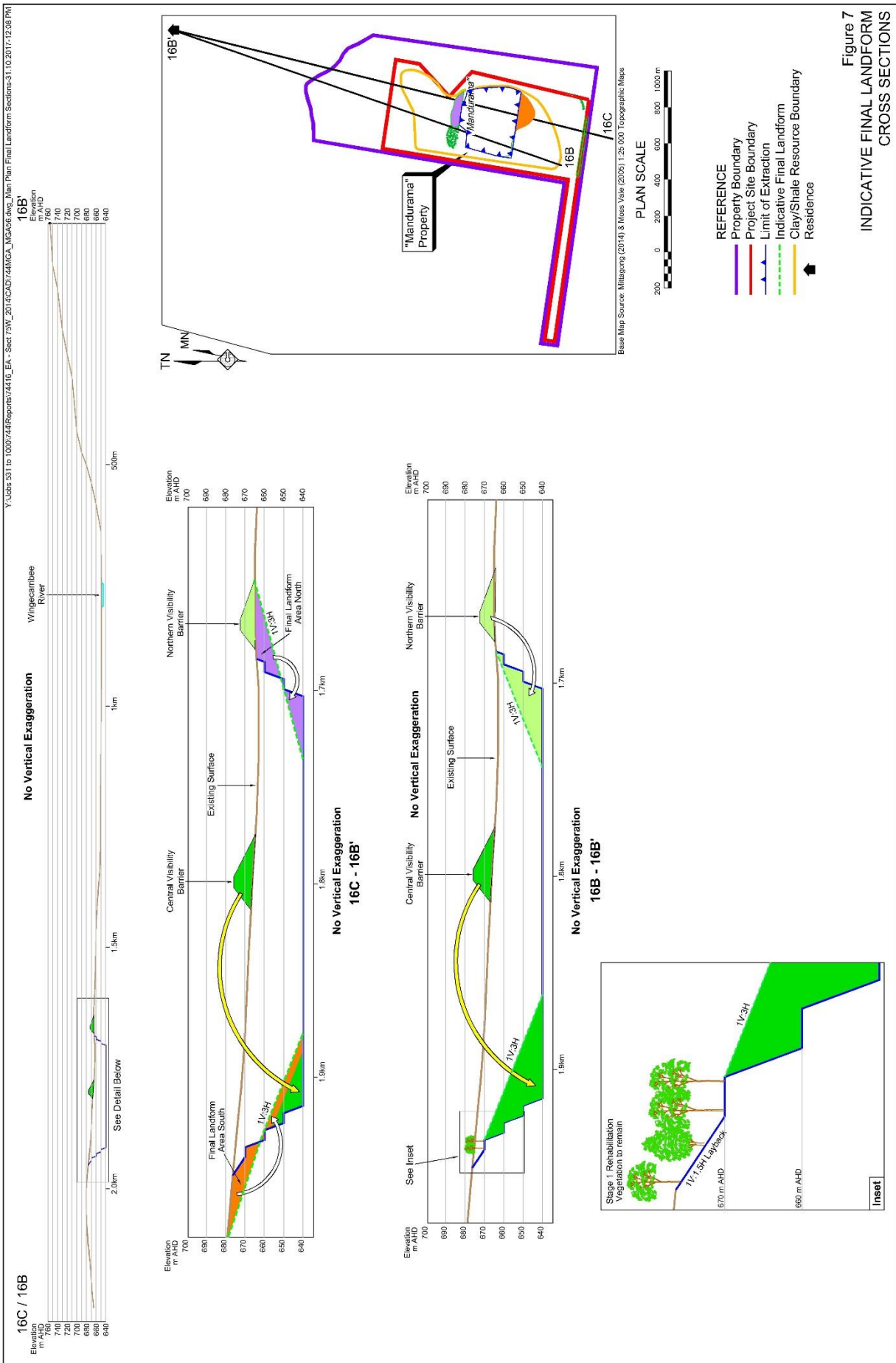


Figure 7
 INDICATIVE FINAL LANDFORM
 CROSS SECTIONS

9.4 REHABILITATION ACTIVITIES

Rehabilitation will be undertaken progressively as soon as practicable after sections of the Quarry are no longer required for extraction or transport-related activities. The following procedures will be implemented throughout each rehabilitation program to ensure the rehabilitation objectives identified in Section 9.2 are achieved.

- a) Sediment and erosion controls will be re-instated as required around all areas of disturbance.
- b) The operational haul road into the extraction area will be regraded to suit any changed grades of the basin walls and used as an access track into the basin within the final landform.
- c) The floor of the excavation area will be deep ripped following the progressive completion of excavation and covered with available overburden and subsoil. Topsoil will be applied over the deposited overburden/subsoil.
- d) The surface of the placed topsoil will be left even but ‘roughened’ to assist with infiltration of water and seed retention.
- e) Pasture species will be seeded over all arable areas and fertilisers applied as recommended. The pasture species will be selected by Austral’s farm manager or appropriate specialist reflecting the stock being carried on the property at that time.
- f) Stock will be prevented from entering rehabilitated areas until pasture is well established.
- g) The area to be rehabilitated will be fenced and signs erected to restrict access to the area.
- h) Rehabilitation will be monitored regularly as described in Section 9.5.

9.5 REHABILITATION PERFORMANCE INDICATORS, COMPLETION CRITERIA AND MONITORING

Performance indicators and completion criteria provide a means by which the progress of rehabilitation can be monitored / 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 and rehabilitation criteria are inter-related, as a performance indicator is an attribute of the biophysical environment (e.g. percentage cover of vegetation, pH, soil depth etc.) that can be used to approximate the progression of the biophysical process against a defined end-point, i.e. the completion/relinquishment criterion.

Table 6 provides the performance indicators and completion criteria developed for the Quarry Site to achieve the rehabilitation objectives and land use goals (see Section 9.2). Indicators and criteria are provided for each ‘phase’ of rehabilitation.

Table 6
Rehabilitation Performance Indicators, Completion Criteria and Monitoring

Page 1 of 2

Objective	Performance Indicator	Completion Criteria	Monitoring Methodology	Monitoring Frequency
Phase 1 – Decommissioning				
All infrastructure and services not approved to be retained will be removed.	Services not required for final land use disconnected.	Relevant services disconnected.	Relinquishment inspection & report, including photographs.	Single occurrence following decommissioning (unless follow up actions identified).
	Infrastructure and roads not required for final land use demolished or removed from site.	All infrastructure and roads demolished or removed.		
Quarry Site free from hazardous materials and contaminants.	Contaminated land identified and remediated.	Contaminated land assessment indicates contamination acceptable for final land use.	Contamination report prepared by qualified person.	Following decommissioning with follow up validation testing as required.
	No hazardous materials remain.	All hazardous materials removed.		Following decommissioning with follow up inspection if required.
Rehabilitated areas are stable and non-polluting.	Water quality monitoring results show water runoff leaving the Quarry Site is non-polluting.	Water quality meets the objective of Section 120 of the <i>Protection of the Environment Operations Act 1997</i> . pH: 6.5 to 8.5. Total Suspended Solids: <50mg/L. Oil & Grease: nil visible.	Water samples analysed by NATA accredited laboratory.	Monthly following decommissioning until three successive monitoring events confirm compliance with criteria. Then quarterly monitoring until relinquishment.
All stockpiles removed / spread.	No remaining clay/shale or overburden stockpiles.	All stockpiles removed.	Relinquishment inspection & report, including photographs.	Single occurrence following decommissioning (unless follow up actions identified).
Phase 2 – Landform Establishment				
Retained dams suitable for providing long-term clean water storage.	Dam structures are stable and contain a suitably stable spillway for overflow of water to surrounding drainage lines.	Dam walls and spillways do not show signs of active erosion and are assessed to be stable.	Relinquishment inspection & report, including photographs.	Single occurrence following decommissioning (unless follow up actions identified).
Stable, permanent and non-polluting landform established.	Final landform contours.	Mapping confirms the landform is consistent with the approved final landform.	Plan(s) prepared by surveyor and photographs.	Single occurrence following completion of final landform establishment (unless further earthworks required).
	Presence of erosion / sedimentation.	No 'active' erosion or sedimentation visible.	Monitoring reports, including photographs.	Quarterly for 1 year following completion of final landform works.

Table 6 (Cont'd)
Rehabilitation Performance Indicators, Completion Criteria and Monitoring

Page 2 of 2

Objective	Performance Indicator	Completion Criteria	Monitoring Methodology	Monitoring Frequency
Phase 3 – Growth Medium Development				
Establish soil suitable for establishment of improved pasture.	Compacted surfaces deep ripped along contour.	Photographs of ripped areas.	Photographs.	Following deep ripping.
	Minimum growth medium depth of 100mm over all areas stripped of soil.	Small 'test pits' (5 per ha) dug by hand and photographed to show final soil depth. Report indicates required thicknesses achieved.	Photographs of test pits.	Following spreading of soil.
Phase 4 – Ecosystem and Land Use Establishment				
Establishment of vegetation communities with a similar species composition to the existing improved pasture (or as otherwise advised by an agronomist).	The rehabilitated area does not constitute an erosion hazard.	Total projected foliage cover is greater than 70% cover or equivalent to analogue sites not disturbed by Quarry activities.	Establish a minimum of one monitoring point per 5ha of rehabilitation and a total of at least two analogue sites.	Annually for a minimum of 5 years after completion of revegetation.
	Weeds are not competing or impacting on rehabilitated areas.	Monitoring confirms that, after 2 years, the non-target species (weeds) represent less than 30% of projected foliage cover ³ or equivalent to analogue sites not disturbed by Quarry activities.	Monitoring to be completed by suitably trained / qualified person and a report prepared summarising performance of the rehabilitation against the completion criteria / analogue monitoring points.	
	Grazing by domestic or feral fauna not adversely impacting on ecosystem development.	Domestic grazing animals are excluded from the rehabilitation area (except for controlled grazing to manage pasture development / reduce bushfire hazard). Feral animal control programs implemented if required.		
Phase 5 – Ecosystem and Land Use Sustainability				
Maintenance of self-sustaining pasture.	If after 5 years the completion criteria for the performance indicators during Phase 4 (Ecosystem and Land Use Establishment) are continuing to be met, it will be considered that a self-sustaining pasture has been established and rehabilitation liability can be relinquished.			

In addition to the monitoring against the specific performance indicators / completion criteria, a general monitoring and maintenance program will be implemented throughout the life of the Quarry. In particular, areas undergoing progressive rehabilitation will be inspected monthly until an estimated 70% groundcover is achieved. Inspections will then occur on a six-monthly basis. During inspections, the following will be monitored.

- Evidence of erosion or sedimentation from areas with establishing vegetation cover.
- Success of pasture establishment, where present.

³ Additional control measures for any listed weed species would be implemented in accordance with any State or regional control orders issued under the *Biosecurity Act 2015 / Biosecurity Regulation 2017*.

- Incidence of pasture attack by pests.
- Natural regeneration of native species on visibility barriers and benches within the extraction area.
- Adequacy of drainage controls.
- General stability of the rehabilitation areas.

A summary of the monitoring outcomes will be reported through the respective Annual Review.

9.6 THREATS TO REHABILITATION AND ACTION RESPONSE MEASURES

Threats to rehabilitation have been identified based on the non-achievement of the performance indicators and completion criteria identified in **Table 6**. For each threat, potential adverse outcomes were identified and allocated a risk based on the potential consequences and likelihood of occurrence (see **Table 7**). Where risks were determined to be unacceptable, namely those risks classified as ‘moderate’ or above, a Trigger Action Response Plan has been developed (see **Table 8**).

Table 7
Analysis of Rehabilitation Threats

Rehabilitation Threat	Potential Adverse Outcome	Risk Rating (Likelihood and Consequence)
Failure to disconnect services / remove infrastructure.	Unable to complete rehabilitation or establish the identified final land use.	L(2E)
Failure to remove hazardous materials.	Unable to complete rehabilitation or establish the identified final land use.	L(2E)
Failure to address contamination.	Contaminated land present.	M(3E)
Retained dams not suitable for long-term water storage.	Dam structures are not stable and/or suitable spillways are not present.	M(3E)
Final landform not safe and stable.	Landform is not stable with significant erosion and/or slumping.	M(3D)
Final landform does not reflect the approved landform.	Landform contours are steeper than approved.	M(3D)
Respread soil does not conform to completion criteria.	Insufficient soil available for rehabilitation.	L(3F)
	Inadequate soil thickness applied to final landform.	M(2D)
	Soil not capable of sustaining vegetation.	M(3E)
Failure of pasture establishment operations.	Pasture does not become adequately established on final landform (<70% cover or analogue sites).	M(2D)
Weed or pest management fails.	Weeds and pests become established and require significant resources to manage.	M(2D)
Vegetation community is not self-sustaining.	After 5 years Soil characteristics deteriorate below accepted criteria, weeds exceed 30% of the foliage cover or that at analogue sites, pasture cover reduces below 70% or that at analogue sites.	M(3E)

Likelihood	Consequences				
	1 Negligible	2 Minor	3 Moderate	4 Major	5 Severe
A Certain	M	H	H	VH	VH
B Almost Certain	M	M	H	VH	VH
C Likely	M	M	H	H	VH
D Possible	L	M	M	H	H
E Unlikely	L	L	M	M	H
F Rare	L	L	L	M	M
G Very Rare	L	L	L	L	M
L = Low M = Moderate H = High VH = Very High					

Source: Modified after HB 89:2012 - Figure B8

Table 8
Trigger Action Response Plan

Page 1 of 2

Rehabilitation Threat	Potential Adverse Outcome	Trigger	Action/ Response
Failure to address contamination.	Contaminated land present.	Contamination assessment identifies contaminated land present within the Quarry Site.	Recommendations of contamination assessment implemented. Verification monitoring / testing undertaken to confirm contamination has been completely removed.
Retained dams not suitable for long-term water storage.	Dam structures are not stable and/or suitable spillways are not present.	Relinquishment inspection identifies erosion / sedimentation and/or lack of spillway. Surface water monitoring records water quality levels outside of the criteria as specified in the Water Management Plan.	Consult with suitably qualified engineer and implement recommendations for dam stabilisation.
Final landform not safe and stable.	Landform is not stable with significant erosion and/or slumping.	Visual inspections identify significant erosion / slumping.	Consult with suitably qualified engineer and implement recommended stabilisation measures.
Final landform does not reflect the approved landform.	Landform contours are steeper than approved.	Mapping confirms contours are steeper than the approved landform.	Re-profile slopes (first stripping any soil material that has been placed).
Respread soil does not conform to completion criteria.	Inadequate soil thickness applied to shaped landform.	Test pitting following placement of soil material identifies placed soil thickness not consistent with proposed soil thickness.	Additional soil material spread on the final landform.
	Soil not capable of sustaining pasture.	Soil parameters not within the identified criteria (see Table 6).	Suitably qualified agronomist or soil scientist engaged to prepare a report including a range of recommendation to ensure that the identified criteria are achieved / soil is suitable for sustaining pasture
Weed or pest management fails.	Weeds and pests become established and require significant resources to manage.	Weeds exceed 30% of the projected foliage cover or at analogue sites. Pests are impacting upon pasture establishment, preventing achievement of 70% projected total foliage cover.	Implement weed and / or pest control program. If required, consult with a suitably qualified agronomist or revegetation / rehabilitation expert.

Table 8 (Cont'd)
Trigger Action Response Plan

Rehabilitation Threat	Potential Adverse Outcome	Trigger	Action/ Response
Failure of pasture establishment operations.	Pasture does not become adequately established on final landform.	Projected total foliage cover is less than 70% or at analogue sites. Visual inspection indicates that final landform is the source of unacceptable levels sedimentation or is actively eroding.	Company or contract personnel identify site of erosion / sources of sediment and remediate through additional earthworks, soil works including additional of ameliorants, supplementary revegetation or other stabilisation method. Suitably qualified agronomist or revegetation / rehabilitation expert engaged to assess and provide recommendations as to why pasture is not adequately establishing.
Vegetation community is not self-sustaining.	After 5 years Soil characteristics deteriorate below accepted criteria, weeds exceed 30% of the foliage cover or that at analogue sites, pasture cover reduces below 70% or that at analogue sites.	Monitoring indicates that: <ul style="list-style-type: none"> • soil parameters not within the identified criteria (see Table 6); or • weed growth is increasing above a projected foliage cover of 30%;or • pasture cover reduces below 70% projected foliage cover. 	Suitably qualified agronomist or revegetation / rehabilitation expert engaged to assess reasons for additional management requirements and recommend actions. Additional actions may include: <ul style="list-style-type: none"> • sowing of additional seed mix for recommended species; • use of seed and mulch mix or other application techniques; • soil amelioration works such as addition of gypsum, lime, fertiliser etc.; and • additional weed control activities (mechanical and / or chemical) and/or pest management as required.

10. EVALUATION OF COMPLIANCE

An annual review of rehabilitation progress will be undertaken to assess compliance with the relevant rehabilitation conditions. The results of this review will be included in each *Annual Review* which will be distributed by 1 March each year to relevant government agencies, including DPE and DRG.

Following successful completion of rehabilitation, Austral will prepare the necessary completion reporting and seek assessment from DRG for the relinquishment of the rehabilitation security required by M(MO)L 6 and eventual relinquishment of M(MO)L 6.

11. CORRECTIVE AND PREVENTATIVE ACTIONS

In the event that a non-compliance with any landscape-related conditions is identified relevant government agencies will be notified in accordance with the incident reporting procedure outlined within the Environmental Management Strategy for the Quarry (prepared in accordance with *PA Condition 5(1)*). Any such non-compliance or any other issues that arise relating to landscape management, rehabilitation, vegetation or visual amenity, will be reviewed to determine:

- the primary cause of the non-compliance or issue;
- any contributing factors which led to the non-compliance or issue;
- whether appropriate controls were implemented to prevent the non-compliance or issue; and
- corrective and preventative measures that may be implemented to prevent a recurrence of the non-compliance or issue.

Corrective and/or preventative actions will be assigned to relevant personnel of either Austral or its contractor. Actions will be communicated internally, such as through toolbox talks, and the implementation of the corrective actions will be monitored for their effectiveness.

12. PLAN REVIEW

In accordance with PA08_0212 *Condition 5(5)*, this LMP will be reviewed and, if required, revised within 3 months of:

- the submission of an annual review under *PA Condition 5(4)*;
- the submission of an incident report under *PA Condition 5(7)*;
- the submission of an independent environmental audit report under *PA Condition 5(9)*; and
- any modification to the conditions of PA08_0212.