

APPENDIX O

Rehabilitation Plan



PGH Bricks & Pavers Ltd

**Rehabilitation Plan
for:
Andersons Clay Mine
Environmental Impact Statement
November 2018**

Prepared by:
**VGT Environmental
Compliance Solutions Pty Ltd**



PGH Bricks & Pavers Ltd

Rehabilitation Plan for: Andersons Clay Mine Environmental Impact Statement November 2018

Prepared by:	
VGT Environmental Compliance Solutions Pty Ltd 4/30 Glenwood Drive, Thornton NSW 2322 PO Box 2335 Greenhills NSW 2323	ph: (02) 4028 6412 email: mail@vgt.com.au www.vgt.com.au ABN: 79 103 636 353

Report Date:	27/11/2018
Report Number:	3618_AN_EIS_RP_F0
Report Authorised by:	Tara O'Brien 27/11/2018
	Joe Gauci 27/11/2018
Checked by:	Rich Mason 27/11/2018

Revision Table

Date	
7/08/2018	3618_AN_EIS_RP_D0
3/10/2018	3618_AN_EIS_RP_D1
27/11/2018	3618_AN_EIS-RP_F0

This Copyright is included for the protection of this document

COPYRIGHT

**© VGT Environmental Compliance Solutions Pty Ltd
and
© PGH Bricks & Pavers Pty Ltd**

All intellectual property and copyright reserved.

Apart from any fair dealing for the purpose of the private study, research, criticism or review, as permitted under the Copyright Act 1968, no part of this report may be reproduced, transmitted, stored in a retrieval system or adapted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without written permission. Enquiries should be addressed to VGT Environmental Compliance Solutions Pty Ltd.

Disclaimer

This report was prepared in accordance with the scope of services set out in the contract between VGT Environmental Compliance Solutions Pty Ltd ABN 79 103 636 353 and the Client and is not to be reproduced except in full. To the best of our knowledge, the report presented herein accurately reflects the Client's intentions when the document was printed. However, the application of conditions of approval or impacts of unanticipated future events could modify the outcomes described in this document. In preparing the report, VGT used data, surveys, analyses, designs, plans and other information provided by individuals and organisations referenced herein. While checks were undertaken to ensure that such materials were the correct and current versions of the materials provided, except as otherwise stated, VGT did not independently verify the accuracy or completeness of these information sources.

Table of Contents

	Page No.
Section 1. Introduction	3
1.1. Background	3
1.2. Secretary's Requirements	3
Section 2. Statutory Requirements and Guidelines	7
2.1. Environmental Planning and Assessment Act 1979	7
Section 3. Existing Environment	11
3.1. Topography	11
3.2. Land Capability	13
3.3. Soil Characteristics	15
3.4. Potential Soil Loss	17
3.5. Vegetation Communities	18
3.6. Existing Rehabilitation	22
3.7. Surrounding Land Uses	25
Section 4. Post Mining Land Use Options	28
Section 5. Rehabilitation Objectives	29
5.1. Rehabilitation Objectives	29
Section 6. Proposed Rehabilitation Planning and Management	30
6.1. Land Clearing	30
6.2. Mine Staging and Progressive Rehabilitation	30
6.3. Areas to be Rehabilitated	30
6.4. Buffer Areas	31
6.5. Conceptual Final Landform	31
6.6. Revegetation	31
6.7. Rehabilitation Trials and Research	35
Section 7. Barriers or Limitation to Effective Rehabilitation	36
7.2. Constraints and Opportunities Analysis of Final Void	40
Section 8. Performance Criteria	43
Section 9. Impacts and Mitigation	50
9.1. Topography and Geotechnical Stability	50
9.2. Land Capability	51
9.3. Soils and Erosion	53
9.4. Geochemical Constraints	60
9.5. Vegetation	60
9.6. Compatibility with Other Land Users	60
Section 10. Intervention and Adaptive Management	61
10.1. Threats to Rehabilitation	61
10.2. Trigger Action Response Plan	63
Section 11. Monitoring and Maintenance	69
11.1. Soils and Erosion Control	69
11.2. Water Quality	69
11.3. Weed Control	70
11.4. Pest and Stock Control	70
11.5. Vegetation Monitoring	70
11.6. Fire	71
11.7. Post Closure Maintenance	71
Section 12. Rehabilitation Cost Estimate	72
12.1. Domain 1: Infrastructure	72
12.2. Domain 2: Tailings and Rejects Emplacement	72
12.3. Domain 3: Waste Rock Dumps	72
12.4. Domain 4: Active Mine and Voids	72
12.5. Domain 5: Other	73
12.6. Third Party Project Management and Contingencies	73
Section 13. References	75

Figures

Figure One.	Site Location	9
Figure Two.	Site Layout Plan	10
Figure Three.	Land Capability Mapping	14
Figure Four.	Vegetation Communities and Threatened Species within a 2km radius of the site	19
Figure Five.	Vegetation Communities and Threatened Species within the proposal site	20
Figure Six.	Existing Domains	24
Figure Seven.	Surrounding Landuse	26
Figure Eight.	Conceptual Final Landform	32
Figure Nine.	Soil Resources	57
Figure Ten.	Security Domains	74

List of Tables

Table 1.	SEARs Rehabilitation Issues to be Addressed	3
Table 2.	Albury City Council Rehabilitation Issues to be Addressed	4
Table 3.	DPE Rehabilitation Issues to be Addressed	4
Table 4.	Soil Analysis	15
Table 5.	Constraints and Characteristics	17
Table 6.	Operational Domain Codes	22
Table 7.	Post Mining Land Use Domain Codes	22
Table 8.	Summary of Current Rehabilitation Phases (by Domain)	25
Table 9.	Rehabilitation Objectives and Targets	29
Table 10.	White Box – Blakely's Red Gum – Yellow Box grassy woodland of the NSW South Western Slopes Bioregion, Blakleys Red Gum -White Box -Yellow Box – Black Cypress Pine box grass/shrub woodland	33
Table 11.	White Box-Blakely's Red Gum- Red Box – Red Stringybark shrubby Woodland	34
Table 12.	Constraints and Opportunities Analysis of Void in Final Landform	40
Table 14.	Land Capability Assessment of Existing Extension Area	51
Table 15.	Land Capability Assessment of Final Landform	52
Table 16.	Topsoil and Subsoil Volumes	55
Table 17.	Topsoil and Subsoil Volumes Required in Final Landform	55
Table 18.	Limitations to Access	58
Table 19.	Maximum acceptable C-factors at nominated times during life of mine	59
Table 20.	Plant Species for Temporary Cover	59
Table 21.	Analysis of Rehabilitation Threats	61
Table 22.	Trigger Action Response Plan	63

Appendices

Appendix A	Water Analysis
Appendix B	Soil Testing
Appendix C	Blue Book Calculations
Appendix D	Rehabilitation Cost Estimate

Section 1. Introduction

1.1. Background

The subject land is described as Lot 2, DP 856969, 253 Shaw Road, Springdale Heights, located in the suburb of Springdale Heights, approximately 7km north east of Albury, see *Figure One*.

The land contains a functioning mine known as Anderson's Clay Mine.

The property is owned by PGH Bricks and Pavers Pty Ltd under freehold title.

A development application is being sought for the proposed expansion of an existing clay mine located at 253 Shaw Street, Springdale Heights. The proposed development is deemed to be a Designated Development in Schedule 3 of the Environmental Planning and Assessment Regulation 2000 and a request for the Secretary's Environmental Assessment Requirements (SEARs) was made in April 2017. The SEARs were issued by the Secretary on the 18th of May 2017.

The aim of this report is to provide additional information, as guided by the SEARs to assist the Department and relevant authorities in determining the development application.

1.2. Secretary's Requirements

1.2.1. SEARs

The SEARs require that the EIS, which will include this report, shall address the following issues relating to rehabilitation.

Table 1. SEARs Rehabilitation Issues to be Addressed

Key Issue	Where Addressed in this Document
In particular, the EIS must include; - A comprehensive description of the development, including: - A detailed rehabilitation plan for the site;	This Document
The EIS must address the following specific issues: Rehabilitation- including; A detailed description of the proposed rehabilitation measures that would be undertaken throughout the development and during quarry closure.	This Document
A detailed rehabilitation strategy, including justification for the proposed final landform and consideration of the objectives of any relevant strategic landuse plans or policies; and	Section 2, Section 3.6, Section 4, Section 5 & Section 7.2
The measures that would be undertaken to ensure sufficient financial resources are available to implement the proposed rehabilitation strategy, recognising that a rehabilitation bond will likely be required as a condition of any future development consent.	Section 12

1.2.2. Council Requirements

Table 2. Albury City Council Rehabilitation Issues to be Addressed

Key Issue	Where Addressed in this Document
The following issues should be considered and satisfactorily addressed: • The extent and progress of rehabilitation of all areas previously disturbed;	Section 3.6
• The EIS should include an assessment of all potential impacts of the proposed development on the existing environment (including cumulative impacts where relevant and appropriate). ○ Continuous rehabilitation and remediation of disturbed areas;	Section 6 & Section 8

1.2.3. DPE Royalties and Advisory Services Requirements

Table 3. DPE Rehabilitation Issues to be Addressed

Key Issue	Where Addressed in this Document
Rehabilitation Objectives and Domains d) Inclusion of a set of project rehabilitation objectives and completion criteria that clearly define the outcomes required to achieve the post-mining landuse for each domain. Completion criteria should be specific, measureable, achievable, realistic and time-bound. If necessary, objective criteria may be presented as ranges;	Section 3.6, Section 5 & Section 8
Rehabilitation Methodology e) Details regarding the rehabilitation methods for disturbed areas and expected time frames for each stage of the rehabilitation process;	Section 6, Section 8
f) Mine layout and scheduling, including maximising opportunities for progressive final rehabilitation. The final rehabilitation schedule should be mapped against key production milestones (i.e. ROM tonnes) of the mine layout sequence before being translated to indicative timeframes throughout the mine life. The mine plan should maximise opportunities for progressive rehabilitation;	Section 6

Key Issue	Where Addressed in this Document
Conceptual Final Landform Design g) Inclusion of a drawing at an appropriate scale identifying key attributes of the final landform, including final land contours and the location of the proposed final land use(s).	Section 6.5
Monitoring and Research h) Outlining the monitoring programs that will be implemented to assess how rehabilitation is trending towards the nominated land use objectives and completion criteria;	Section 10, Section 11
i) Details of the process for triggering intervention and adaptive management measures to address potential adverse results as well as continuously improve rehabilitation practices;	Section 10
j) Outlining any proposed rehabilitation research programs and trials, including their objectives. This should include details of how the outcomes of research are considered as part of the ongoing review and improvement of rehabilitation practices;	Section 6.7
Post Closure Maintenance k) Description of how post-rehabilitation areas will be actively managed and maintained in accordance with the intended land use(s) in order to demonstrate progress towards meeting the rehabilitation objectives and completion criteria in a timely manner;	Section 8 & Section 11.7
Barriers or Limitation to Effective Rehabilitation l) Identification and description of those aspects of the site or operations that may present barriers or limitation to effective rehabilitation, including: i. evaluation of the likely effectiveness of the proposed rehabilitation techniques against the rehabilitation objectives and completion criteria;	Section 7.1.5
ii. an assessment and life of mine management strategy of the potential for geochemical constraints to rehabilitation (e.g. acid rock drainage, spontaneous combustion etc.), particularly associated with the management of overburden/interburden and reject material;	Section 7
iii. the processes that will be implemented throughout the mine life to identify and appropriately manage geochemical risks that may affect the ability to achieve sustainable rehabilitation outcomes;	Section 8

Key Issue	Where Addressed in this Document
iv. a life of mine tailings management strategy, which details measures to be implemented to avoid the exposure of tailings material that may cause environmental risk, as well as promote geotechnical stability of the rehabilitated landform: and	Section 7.1.2
v. Existing and surrounding landforms (showing contours and slopes) and how similar characteristics can be incorporated into the post-mining final landform design. This should include an evaluation of how key geomorphological characteristics evident in stable landforms within the natural landscape can be adapted to the materials and other constraints associated with the site.	Section 3, Section 6, Section 7, Section 8
m) Where a void is proposed to remain as part of the final landform, include:	Section 7.2
i. A constraints and opportunity analysis of final void options, including backfilling, to justify that the proposed design is the most feasible and environmentally sustainable option to minimise the sterilisation of land post-mining;	
ii. A preliminary geotechnical assessment to identify the likely long-term stability risks associated with the proposed remaining high wall(s) and low wall(s) along with associated measures that will be required to minimise potential risks to public safety; and	Section 7.1.4
iii. Outcomes of the surface and groundwater assessments in relation to the likely final water level in the void. This should include an assessment of the potential for fill and spill along with measures required be implemented to minimise associated impacts to the environment and downstream water users.	Section 6.5.1
n) Where the mine includes underground workings:	Not Applicable
i. Determine (with reference to the groundwater assessment) the likelihood and associated impacts of groundwater accumulating and subsequently discharging (e.g. acid or neutral mine drainage) from the underground workings post cessation of mining; and	
ii. Consideration of the likely controls required to either prevent or mitigate against these risks as part of the closure plan for the site.	Not Applicable

Key Issue	Where Addressed in this Document
o) Consideration of the controls likely to be required to either prevent or mitigate against rehabilitation risks as part of the closure plan for the site;	Section 8
p) Where an ecological land use is proposed, demonstrate how the revegetation strategy (e.g. seed mix, habitat features, corridor width etc.) has been developed in consideration of the target vegetation community(s);	Section 3.5, Section 6.6
q) Where the intended land use is agriculture, demonstrate that the landscape, vegetation and soil will be returned to a condition capable of supporting this; and Consider any relevant government policies. The following government policies should be considered when addressing rehabilitation issues: • Mine Rehabilitation (Leading Practice Sustainable Development Program for the Mining Industry, 2006) • Mine Closure and Completion (Leading Practice Sustainable Development Program for the Mining Industry, 2006) • Strategic Framework for Mine Closure (ANZMEC-MCA, 2000)	Section 3.5, Section 6.6, Section 9.2

Section 2. Statutory Requirements and Guidelines

2.1. Environmental Planning and Assessment Act 1979

The clay extraction activities will continue to be subject to the provisions of the AEAP&A Act for any subsequent changes or modifications to the operations. Additionally the operations will need to be able to demonstrate compliance against the current Conditions of Approval issued under the provisions of the EP&A Act.

2.1.1. Current Council Consent Conditions

In August 1983, the Albury -Wodonga Development Corporation granted a permit (number N72), which approved the mining of clay brick within the north-eastern portion of the subject land. The activity involved an area of 7.975 hectares. The permit did not include an end date to the approval.

Council consent conditions that pertain to the management of Rehabilitation are reproduced below.

'12. ii) Stock shall be kept out of the quarried area to assist in the regeneration of native vegetation and so that planted vegetation is protected.

14. ii) When extraction has ceased, and not later than one month before expiry of the permit, terminal faces are to be battered from natural ground level into the pit at a slope not steeper than 1 vertical in 5 horizontal for a minimum horizontal distance of 10 metres. For this purpose battering may commence at a point 10 metres outside of the excavation limit, or in accordance with a landscape restoration plan.

In carrying out this work, no vegetation is to be effected within the remaining 10 metres of the buffer-zone. The terminal faces are to be covered with a minimum of 30cm of topsoil and planted with suitable vegetation. All reclamation works shall be carried out to the satisfaction of the Corporation who may specify at that time that additional works are to be undertaken.

15. The permit holder shall ensure that only those trees impeding the proper working of the quarry should be removed or disturbed after prior consultation with the corporation.

16. A landscape development plan shall be submitted to the Corporation for approval. The reclamation and planting shall be carried out to the satisfaction of the Corporation within one month of the date of permit issue. All vegetation shall be maintained during the term of the permit and the buffer strips generally retained in a neat and tidy condition to the satisfaction of the Corporation.

17. i) As the quarried area progresses, restoration is to be progressively carried on, in areas where quarrying is completed.

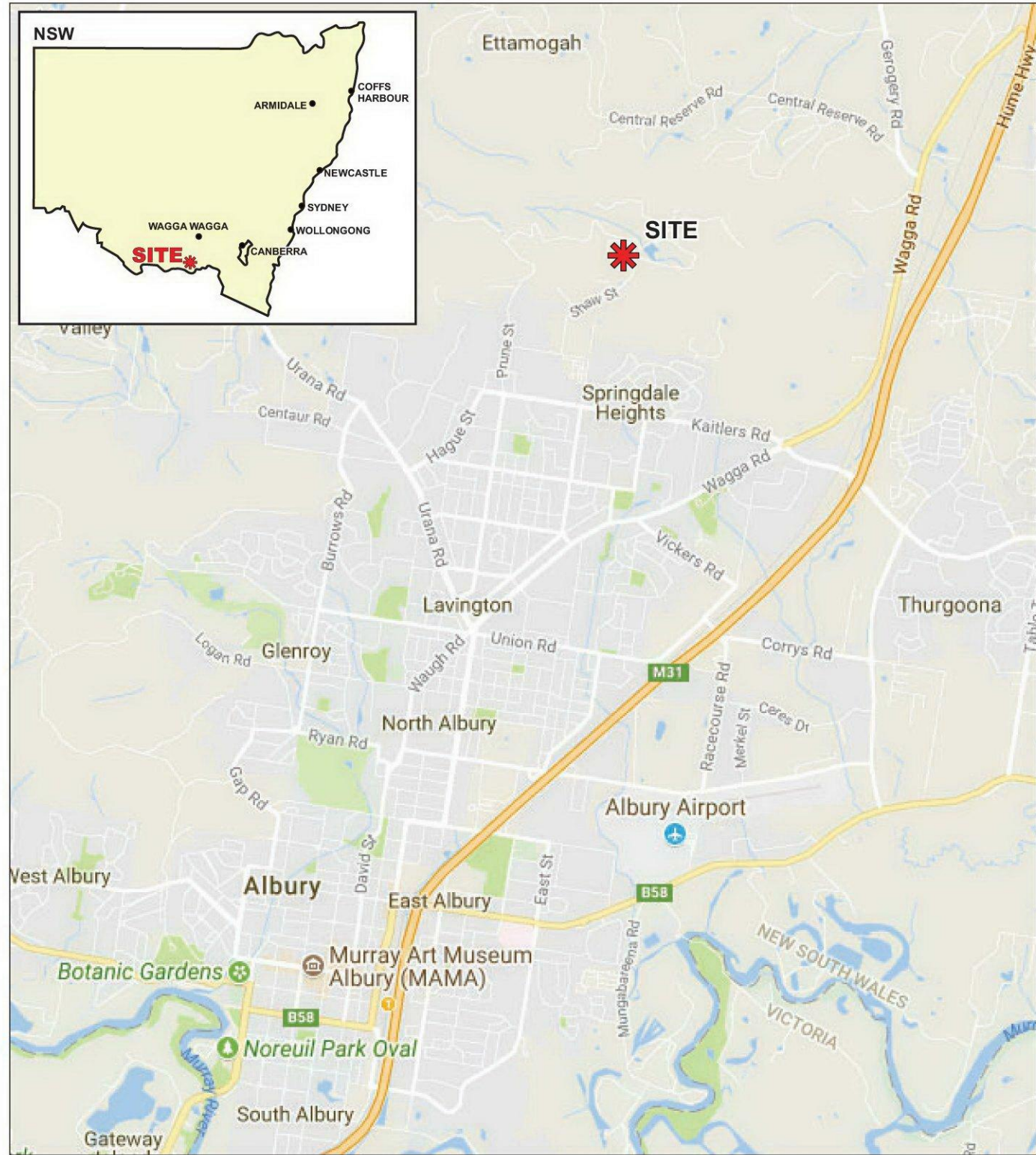
ii) All residues, including topsoil is to be returned to the excavations and topsoil is to be retained at all times on the quarries sites.

18. The permit holder shall ensure that topsoil is only stripped in stages sufficient for one year's extraction or 2 Ha in area whichever is the lesser. Topsoil which is disturbed, shall be removed separately and placed in dumps. Soil required to comply with the requirements of condition 14 ii) is to be stored within the excavation area and excess topsoil should be placed as far as possible along the southern boundary of the current and proposed mining operations. This is to be sown with grasses to prevent erosion and so as to provide an aesthetic and effective screen on approach from Albury. All topsoil storage is to be located and designed to the satisfaction of the Corporation.

20. Restoration of the existing pit for possible future recreation use shall be undertaken to the satisfaction of the Corporation and shall include the lowering of the existing road in accordance with drawing S5499/1 and the maintenance of the access through existing workings.

Plan of:	Rehabilitation Plan for Andersons Clay Mine Environmental Impact Statement 2018 - Site Location	Location:	253 Shaw Street, Springdale Heights, NSW	Source:	nearmap - Image Date 01/05/2018 & Google Maps 2018	Our Ref:	3618_BAN_RP_DA17_C001_V1_F1.cdr
Figure:	ONE	Council:	Albury Wodonga Shire Council	Survey:	N/A	Plan By:	JD
Sheet:	1 of 1	Tenure:	Permit Number N72	Projection:	N/A	Project Manager:	TO
Version/Date:	V1 04/10/2018	Client:	PGH Bricks & Pavers Pty Ltd	Contour Interval:	N/A	Office:	Thornton

This figure may be based on third party data which has not been verified by vgt and may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and vgt does not warrant its accuracy.



Approx Scale: 0 1 2km

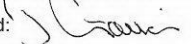
Legend

- Site (Lot 2 DP 856969)
- N72 Consent Boundary
- Lot Boundary



Approx Scale: 0 150m

Manager/Authorisation Holder PGH Bricks & Pavers Pty Ltd: Joe Gauci

Signed: 
Date: 27/11/2018

Project Manager VGT: Tara O'Brien

Signed: 
Date: 27/11/2018

Plan of:	Rehabilitation Plan for Andersons Clay Mine Environmental Impact Statement 2018 - Site Layout	Location:	253 Shaw Street, Springdale Heights, NSW	Source:	nearmap - Image Date 01/05/2018 & Landair Surveys	Our Ref:	3618_BAN_RP_DA17_C002_V1_F2.cdr
Figure:	TWO	Council:	Albury - Wodonga Shire Council	Survey:	Landair Surveys - Image Flown 08/02/2017	Plan By:	SK/JD
Sheet:	1 of 1	Tenure:	Permit Number N72	Projection:	MGA	Project Manager:	TO
Version/Date:	V1 04/10/2018	Client:	PGH Bricks & Pavers Pty Ltd	Contour Interval:	1m	Office:	Thornton

This figure may be based on third party data which has not been verified by vgt and may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and vgt does not warrant its accuracy.



Manager/Authorisation Holder PGH Bricks & Pavers Pty Ltd: Joe Gauci
Signed:
Date: 27/11/2018
Project Manager VGT: Tara O'Brien
Signed:
Date: 27/11/2018

LEGEND	
Feature/Domain	
	Property Boundary
	Consent Boundary (N72)
	Water Management Area
	River/Major Drainage Line
	Road
	Contour
	Area of Disturbance

Section 3. Existing Environment

3.1. Topography

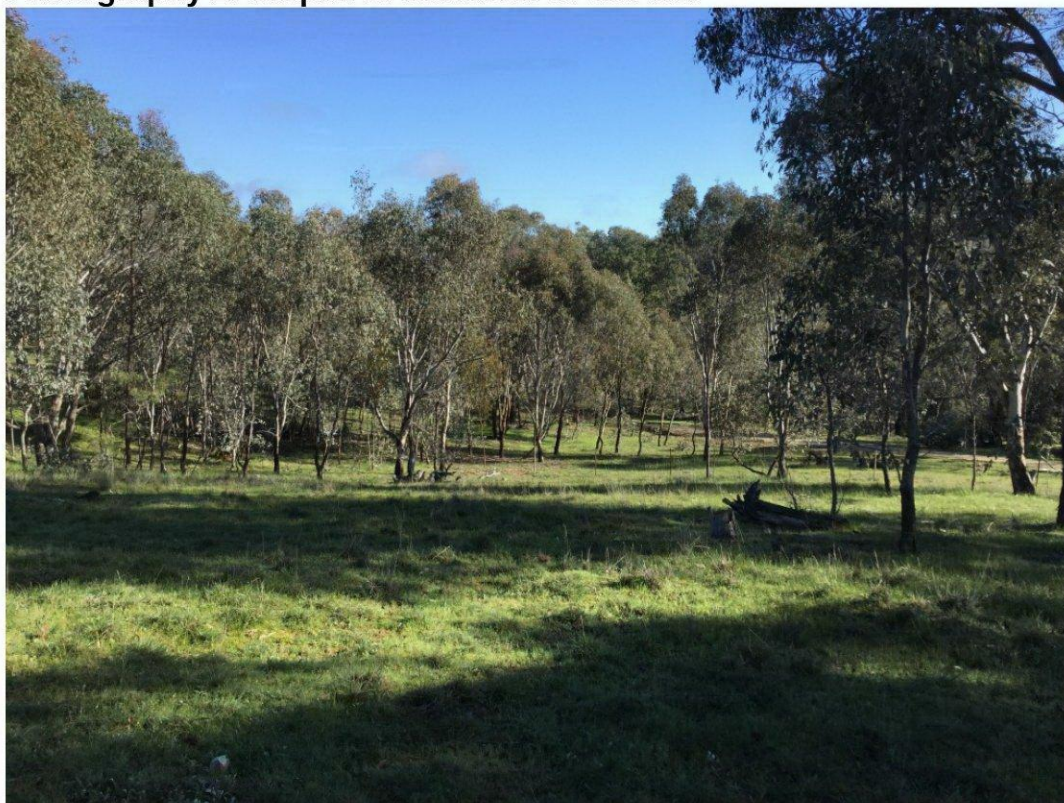
The site is located in a ridge on the northern outskirts of Albury with the highest elevations at approximately 320m RL in the south sloping to 300mRL to the north.

Slopes on the site range from 5 to 45 % with the steeper slopes within the excavation itself.

Photography 1: Typical natural drainage line



Photography 2: Slopes to the north of the site



Photography 3: Slopes to the south of the site



Photography 4: Ridgeline to the west of the site

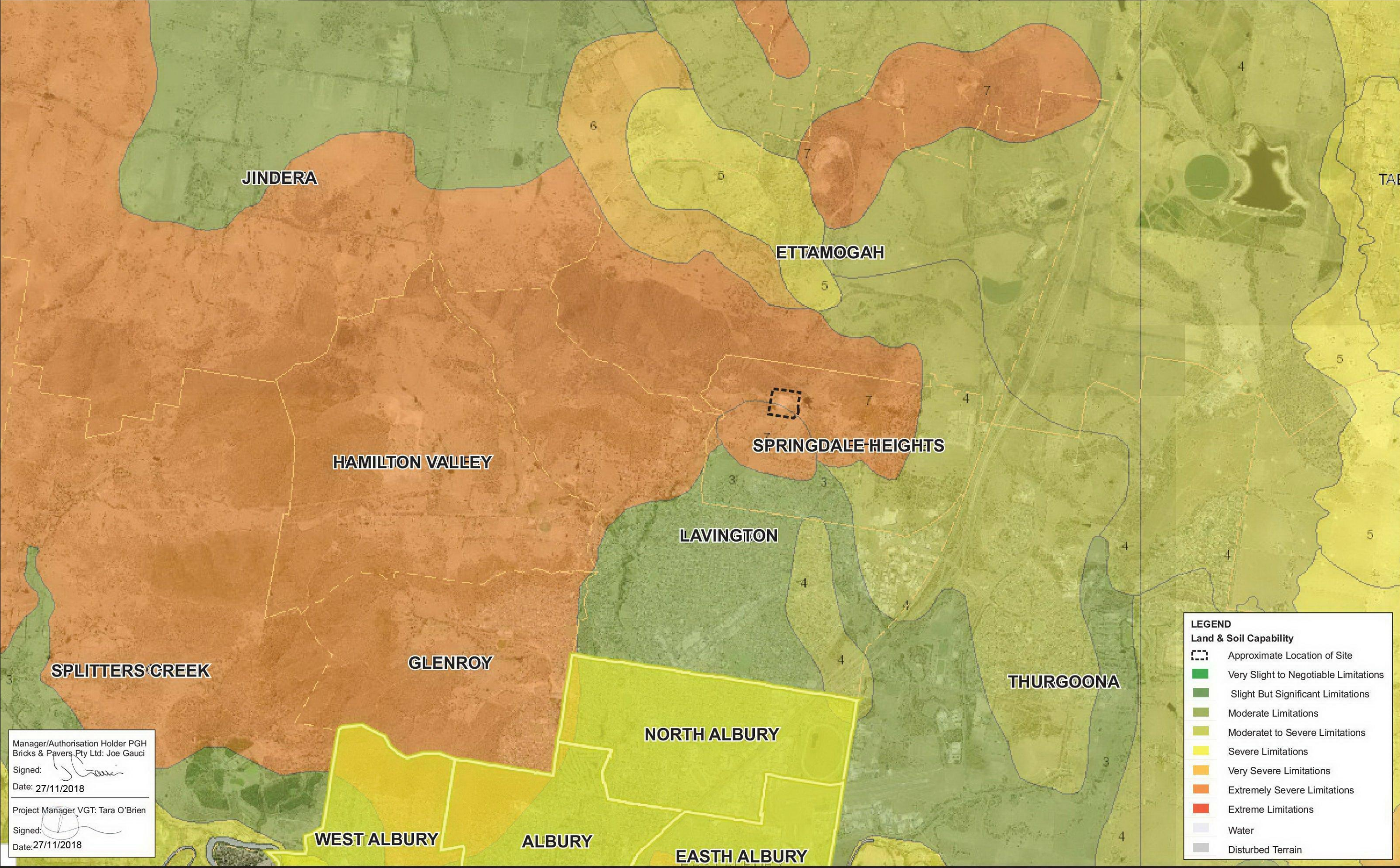


3.2. Land Capability

According to Land Capability mapping for NSW on the SEED portal, maintained by the NSW Government, the site is classified as having a land capability of 7. That is, land generally incapable of agricultural land use (selective forestry and nature conservation), very low capability land: Under this classification it is described as land has severe limitations that restrict most land uses that generally cannot be overcome. In addition it is said that on-site and off-site impacts of land management practices can be extremely severe if limitations not managed and there should be minimal disturbance of native vegetation.

Plan of:	Rehabilitation Plan for Andersons Clay Mine Environmental Impact Statement 2018 - Land Capability	Location:	253 Shaw Street, Springdale Heights, NSW	Source:	SEED, Dept of Finance, Services & Innovation 2017 & Water NSW	Our Ref:	3618_BAN_RP_DA17_C003_V1_F3.cdr
Figure:	THREE	Council:	Albury - Wodonga Shire Council	Survey:	N/A	Plan By:	SK/JD
Sheet:	1 of 1	Tenure:	Permit Number N72	Projection:	N/A	Project Manager:	TO
Version/Date:	V1 04/10/2018	Client:	PGH Bricks & Pavers Pty Ltd	Contour Interval:	N/A	Office:	Thornton

This figure may be based on third party data which has not been verified by vgt and may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and vgt does not warrant its accuracy.



Manager/Authorisation Holder PGH Bricks & Pavers Pty Ltd: Joe Gauci
Signed:
Date: 27/11/2018

Project Manager VGT: Tara O'Brien
Signed:
Date: 27/11/2018

3.3. Soil Characteristics

A soil profile sample was taken from the extension area and each horizon was analysed for pH and Conductivity as shown in the table below.

Table 4. Soil Analysis

Soil Horizon		pH	Conductivity (dS/m)
'A' Topsoil 0-0.1m		4.6	0.8
'B' Topsoil 0.1-0.2m		4.5	0.3
'C' Horizon		5.2	<0.1

The topsoil in the extension area is quite thin (approximately 10 to 20cm in depth) overlaying the very hard weathered Shale shown as the 'C' Horizon in the table above and Photography 6 below. The soils are slightly acidic and have low to moderate conductivities.

Photography 5: Soil Sampling Site



Photography 6: Typical Topsoil and Subsoil Profile



3.4. Potential Soil Loss

The NSW Managing Urban Stormwater handbook, also known as the Blue Book, was used to assist in making the following determinations regarding the potential soil loss at the site for a design storm event.

The Soil Hydrological Group for the soil materials is assumed to be D, very high run-off potential. Water moves into and through these soils very slowly when thoroughly wetted. They regularly shed run-off from most rainfall events.

The likely soil loss is calculated with the Revised Universal Soil Loss Equation (RUSLE). The values of the other RUSLE factors are: P of 1.3 and the C is assumed to be 1.0 for bare soil. Calculations can be found in *Appendix C*.

The potential soil loss of the site has been calculated using *Managing Urban Stormwater, Soil and Construction, Volume 2E Mines and Quarries* for a 90th percentile, 5-day rainfall event assuming a non-sensitive receiving environment. Important site physical characteristics are identified in the table below.

Table 5. Constraints and Characteristics

Constraint/Opportunity	Value
IFD:2 year, 6 hour storm	6.02 (from the BOM IFD data)
Slope Gradients	Low to Moderate to high (Average 6-10%)
Potential Erosion Hazard	Very Low
Soil Erodibility	K= 0.050 High (assumed)
Calculated Soil Loss	From 14 to 572 tonnes/ha/yr depending on particular internal mine slopes.
Soil Loss Class	1 on the pit floor to 5 on the pit high walls
Soil Texture Group	Type D
Soil Hydrological Group	D
Runoff Coefficient	0.64 (Soil Hydrological Group D)
Current Disturbed Site Area	4.7 ha approximately
Developed Disturbed Site Area	11 ha approximately

The site is located in rainfall zone 10 according to *Figure 4.9* of the Blue Book. Works are appropriate to be undertaken at all times during the year within this rainfall zone for Soil Loss Classes 1 to 4. Works on Soil Loss Class 5 soils (on the highwalls) are recommended to be only undertaken from the end of March to December. However these restrictions are not appropriate for the mine due to the supply demands from the brickworks. In addition, the resource lost from the highwalls through erosion is still captured in the pit and will eventually be re-extracted.

3.5. Vegetation Communities

3.5.1. Desktop Review of Vegetation Communities

A desktop review and field survey was undertaken by NGH in May 2017 on the proposal area, the results of which are reproduced below.

'The VIS mapping shows two native vegetation types as potentially occurring in the proposal area. One of the vegetation communities' matches the description of the White Box - Blakely's Red Gum - Yellow Box grassy woodland of the NSW South Western Slopes Bioregion (Benson 282) in the BioMetric Vegetation Types database (referred to as Box-Gum Woodland Community and also known as Tablelands and Slopes Box-Gum Woodland-Murray VIS Map 2906). This community conforms to the TSC Act listed endangered ecological community, Grassy White Box - Blakely's Red Gum - Yellow Box woodland and derived native grassland. It is listed under the EPBC Act as the critically endangered ecological community (CEEC) White Box Yellow Box Blakely's Red Gum Woodlands and derived native grassland.

*The second native vegetation community potentially occurring in the proposal area is listed as Dry Foothill Forest. According to the Office of Environment and Heritage, "Dry Foothill Forest occurs at lower elevations of the upper Murray, on drier sites with northerly aspects or slopes with poorly developed soils. Dominant tree species include Red Stringybark (*E. macrorhyncha*), Broad-leaved Peppermint (*E. dives*), Scribbly Gum (*E. rossii*) and Brittle Gum (*E. mannifera*)".*

An area of cleared land is also identified on the VIS mapping.

Three Threatened Ecological Communities were identified within the EPBC Protected Matters search. Only one, White Box Yellow Box Blakely's Red Gum Woodlands and derived native grassland is identified on the VIS mapping as potentially occurring at the site.....

3.5.2. Desktop Review of Threatened Species

.....A total of 37 species of threatened fauna and four species of threatened flora have been previously recorded within ten kilometres of the proposal area (Bionet and EPBC search). [Figure Four below in this report] shows the location of records within 2km of the proposal area.'

3.5.3. Field Survey of Vegetation Communities

There were two distinct vegetation communities identified in the proposal area during the field survey:

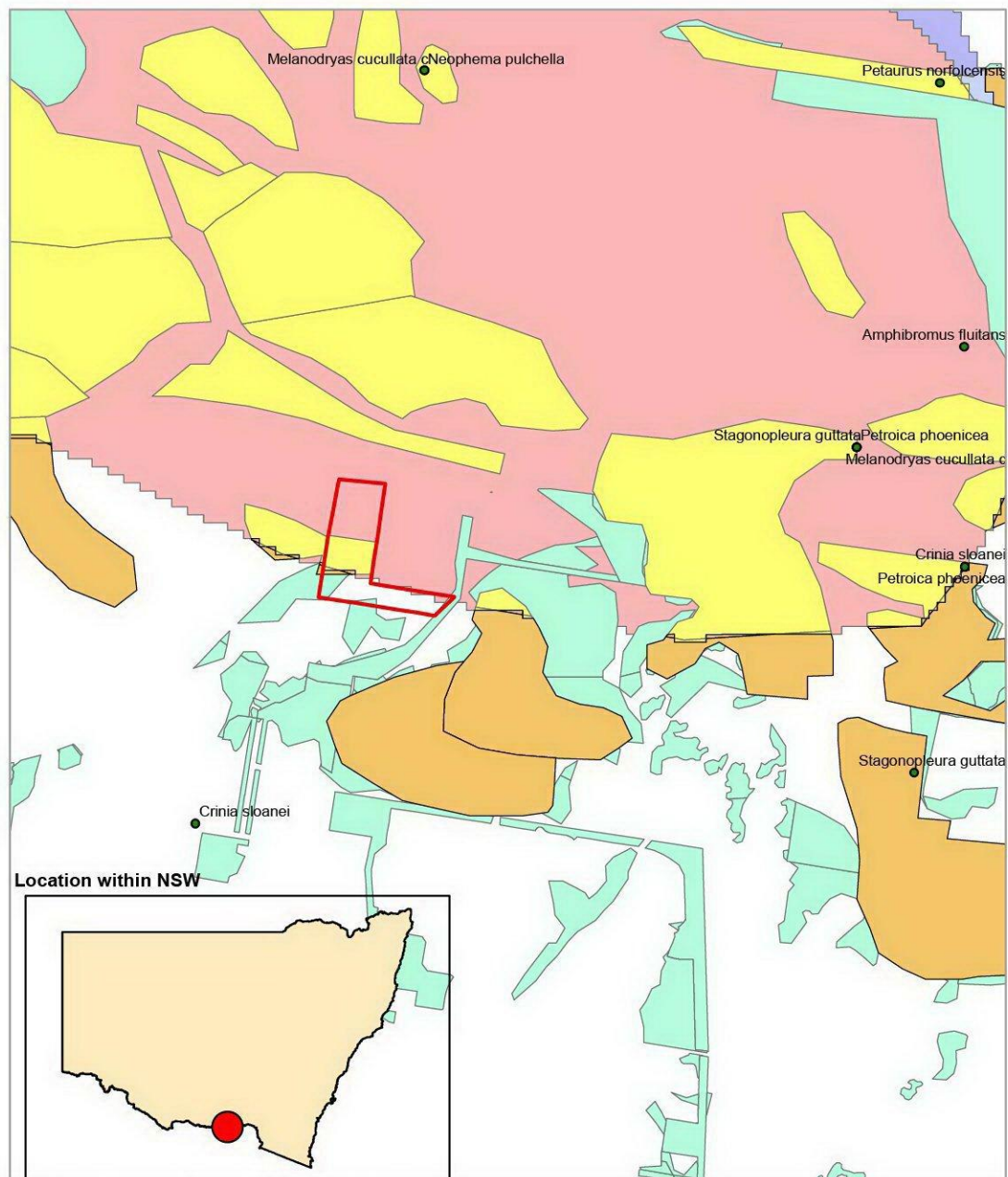
1. White Box Yellow Box Blakely's Red Gum Woodlands and derived native grassland (Box-Gum Woodland).
2. White Box - Blakely's Red Gum-Red Box-Red Stringybark Woodland.

In addition, there were two vegetation assemblages which do not conform with any native vegetation communities:

3. Exotic Vegetation.
4. Planted White Cypress Pine trees.

Figure Four.
of the site

Vegetation Communities and Threatened Species within a 2km radius



Vegetation Communities and Threatened Species

- Andersons Quarry Proposal Site Boundary
- Threatened Species Records

Murray VISmap 2907

LABEL_092

- Box - Ironbark Forest
- Dry Foothill Forest
- Eastern Rainshadow Woodland (24)
- River Red Gum Forest
- Tablelands and Slopes Box-Gum Woodland (19)
- White Box Yellow Box Blakely's Red Gum Woodland
- none
- VEGTYPE**
- Grassy Box Gum Woodland

Murray VISmap 2906

LABEL_092

- Box - Ironbark Forest
- Cypress Pine Yellow Box Woodland
- Dry Foothill Forest
- Eastern Rainshadow Woodland (24)
- Grey Box White Cypress Pine Yellow Box Woodland
- Kyeamba Granites Open Forest
- Riverina Plains Grassland Complex
- Stringybark Black Cypress Pine Open Forest
- Tablelands and Slopes Box-Gum Woodland (19)
- Wetland Formation

0 170 340 680 Meters



Note: White within the map refers to cleared land.

Figure Five.
site

Vegetation Communities and Threatened Species within the proposal



Results

- Anderson's Quarry Proposal Site Boundary
- Hollow Bearing Tree

Habitat Threatened Species

Habitat

- Pink-tailed Legless Lizard
- Sloane's Froglet

Vegetation Communities

Vegetation

- Box Gum Woodland
- Dry Forest Community
- Exotic Vegetation
- Planted White Cypress Pine

0 50 100 200 Meters

Ref: Anderson's Quarry
Author: CW



3.5.4. White Box - Blakely's Red Gum - Yellow Box Grassy Woodland

This vegetation community covers approximately 3ha of the proposed area, and, prior to extensive historical clearing, would have covered a large area. Although the understorey was not surveyed to a great level of detail, it is estimated that the percentage foliage native cover is greater than 50% native making the cleared areas derived grassland.

Its biometric condition is moderate to good based on the over storey percent foliage cover being >25% of the lower benchmark for the community. The ground layer comprises a combination of exotic and native species. Further assessment of the groundcover has not been undertaken to date to confirm the biometric condition. Seven hollow bearing trees were recorded during the assessment, and provide habitat for arboreal mammals, some frogs and lizards and woodland birds. Fallen timber and leaf litter were common across the proposal area. Two areas of rocky outcrop were also identified during the survey.

This vegetation community is listed as an endangered ecological community under the TSC Act. No threatened flora and fauna species were recorded during the field survey.

3.5.5. White Box - Blakely's Red Gum-Red Box-Red Stringybark Woodland

The other native vegetation community within the proposal area is White Box - Blakely's Red Gum-Red Box-Red Stringybark Woodland. It covers approximately 1.83 hectares of the site within the north and central sections. The overstorey in the property is dominated by Red Stringybark (*E. macrorhyncha*) and Red Box (*E. polyanthemos subsp. vestita*) with scattered White Box (*Eucalyptus albens*), and Blakely's Red Gum (*E. blakelyi*) also present. The community in the proposal area supports a shrubby understorey and sparse ground layer. Grazing has changed components of the understorey and species observed included ferns (*Cheilanthes sieberi*) and Raspwort (*Gonocarpus sp.*).

Its biometric condition is estimated to be moderate to good based on the over storey percent foliage cover being >25% of the lower benchmark for the community. The ground layer is a combination is mostly native species with exotics present. This community provides foraging and nesting habitat for birds and arboreal fauna. Two hollow-bearing trees were observed within the proposal site. The shrub and ground layer provides some foraging and refuge habitat for small-medium sized mammals and reptiles. Fallen timber is common throughout the proposal area and provides shelter and foraging habitat for terrestrial and avian fauna.

This vegetation community is not an endangered ecological community under the TSC Act or EPBC Act.

3.5.6. Planted White Cypress Pine

An area which has been previously planted with White Cypress Pine (*Callitris glaucophylla*) was identified in the central part of the proposal area. It covers approximately 0.5 hectares. Although White Cypress Pine does occur naturally in the locality, the plants on the proposal site have been planted and do not comprise of any native vegetation community.

3.5.7. Exotic Dominated Vegetation

An area of vegetation dominated by exotic species (identified as cleared within *Figure Four* and exotic dominated in *Figure Five*) is present in the south east part of the proposal site. This covers an area of about 2 hectares within the proposal area.

This area has been highly modified from its pre-European state and comprises mostly exotic forbs and grasses, with little to no native over storey or understorey remaining.

3.6. Existing Rehabilitation

3.6.1. Rehabilitation Domain Selection

In accordance with the DPE Mine Operation Plan requirements, rehabilitation domains have been assigned to the current site as described in the approved MOP (2016).

The site has been divided into Primary Domains (Operational) as listed in *Table 6* and illustrated on Figure Six and Secondary Domains (Post Mining Land Use) as listed in *Table 7*. The Domains applicable to this mine are based on the ESG3 MOP Guidelines and are highlighted on the table below.

Table 6. Operational Domain Codes

Code	Primary Domains (Operational)
1	Infrastructure Area
3	Water Management Area
4	Overburden Emplacement Area
5	Stockpiled Material
6	Void (open cut void)
7	Rehabilitation Area

Table 7. Post Mining Land Use Domain Codes

Code	Secondary Domains (Post Mining)
A	Infrastructure
B	Water Management Area
C	Rehabilitation Area- Grassland

3.6.2. Primary Domains

3.6.2.1. Domain 1 Infrastructure

This domain consists of the haul roads.

3.6.2.2. Domain 3 Water Management Area

This domain contains the dirty water dam in the pit sump located on the current site. Surface water from the extraction area drains into this dam. No discharge equipment is set up and no controlled discharges have been necessary in recent years. This dam water is used for dust suppression on-site.

3.6.2.3. Domain 4 Overburden Emplacement Area

This domain incorporates the southern overburden stockpiles that run east-west outside the mining area. The location of these bunds may change as the active mining area increases size. This overburden may be used in the future for rehabilitation and to batter slopes.

3.6.2.4. Domain 5 Stockpiled Material

Extracted clay/shale material is transported from Domain 6 to a stockpile area which generally is the centre of the area of disturbance on the pit floor.

3.6.2.5. Domain 6 Void (Open Cut Void)

This domain consists of the batters to the extraction area surrounding the edge of the current mine void, the slopes are generally un-vegetated and subject to erosion.

3.6.2.6. *Domain 7 Rehabilitation*

This domain comprises of rehabilitation areas that are in existence but may be temporary if extraction activities recommence within the domain or transition to final rehabilitation if not further disturbance is undertaken.

3.6.3. **Secondary Domains**

3.6.3.1. *Domain A Infrastructure*

This domain includes the haul roads which will not be removed until necessary. They will not likely be present in the final landform, unless required for site access. The road infrastructure is not considered in a secondary phase at present.

3.6.3.2. *Domain B Water Management Area*

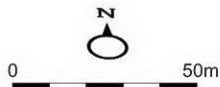
This domain will incorporate the dam that will likely remain in the proposed conceptual final landform, as shown on *Figure Eight*.

3.6.3.3. *Domain C Rehabilitation Area- Grassland*

This domain will incorporate the surrounding gentle slopes to the final dam and any rehabilitated disturbed areas that will be covered with native grasses following mining closure. It is noted that the vegetation re-established within this domain will be generally comparable with the species composition of the existing community.

Plan of:	Rehabilitation Plan for Andersons Clay Mine Environmental Impact Statement 2018 - Existing Domains	Location:	253 Shaw Street, Springdale Heights, NSW	Source:	nearmap - Image Date 01/05/2018 & Landair Surveys	Our Ref:	3618_BAN_RP_DA17_C007_V0_F6.cdr
Figure:	SIX	Council:	Albury - Wodonga Shire Council	Survey:	Landair Surveys - Image Flown 08/02/2017	Plan By:	SK/JD
Sheet:	1 of 1	Tenure:	Permit Number N72	Projection:	MGA	Project Manager:	TO
Version/Date:	V0 04/10/2018	Client:	PGH Bricks & Pavers Pty Ltd	Contour Interval:	1m	Office:	Thornton

This figure may be based on third party data which has not been verified by vgt and may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and vgt does not warrant its accuracy.



LEGEND	
Feature/Domain	
	Property Boundary
	Road
	River/Major Drainage Line
 -290-	Contour
	Direction of Mining
Mining Tenement	
	Consent Boundary (N72)
	Area of Disturbance
	Active Mining Area
Primary Domains (Operational)	
	Infrastructure Area (including Stockpile)
	Water Management Area
	Overburden Emplacement Area
Rehabilitation Phases	
	Rehabilitation Phase (Ecosystem & Land Use Establishment)

Manager/Authorisation Holder PGH Bricks & Pavers Pty Ltd: Joe Gauci
Signed:
Date: 27/11/2018

Project Manager VGT: Tara O'Brien
Signed:
Date: 27/11/2018

3.6.4. Rehabilitation Phases

Table 8. Summary of Current Rehabilitation Phases (by Domain)

Domain/ Rehabilitation Phase	Infrastructure/ Infrastructure (1A)	Water Management/ Water Management (3B)	Overburden Emplacement/ Grassland (4C)	Stockpiles/ Grassland (5C)	Void/ Grassland (6C)	Rehabilitation/ Grassland (7C)
Active Mining Area	✓	✓	✓	✓	✓	✓
Decommissioning	x	x	x	x	x	x
Landform Establishment	x	x	x	x	x	x
Growth Medium Development	x	x	x	x	x	x
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

3.7. Surrounding Land Uses

Albury City includes the main urban centre of Albury, as well as substantial industrial, commercial, recreational and parkland areas and significant rural hinterland. Albury's population generally lives in the outer suburbs including the Springdale Heights locality where the mine is located. Closer to the mine the urban environment gives way to rural and semi-rural dwellings where land is used for mixed agricultural purposes.

The operation of the mine is compatible with the surrounding rural land uses. Similar developments within the locality include a Waste Management Facility 5 kilometres to the west, and the Burgess Earth Moving Pty Ltd quarry on Central Reserve Road located 3 kilometres north of the site and the AP & Delany and Co Pty Ltd's Rockwood quarry on Winchester Lane some 4 kilometres north of the site. Defences forces holds land some 2 kilometres north east of the site which was used as an RAAF ammunition depot storage during World War II and is still held by the government due to remediation works.

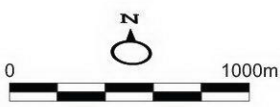
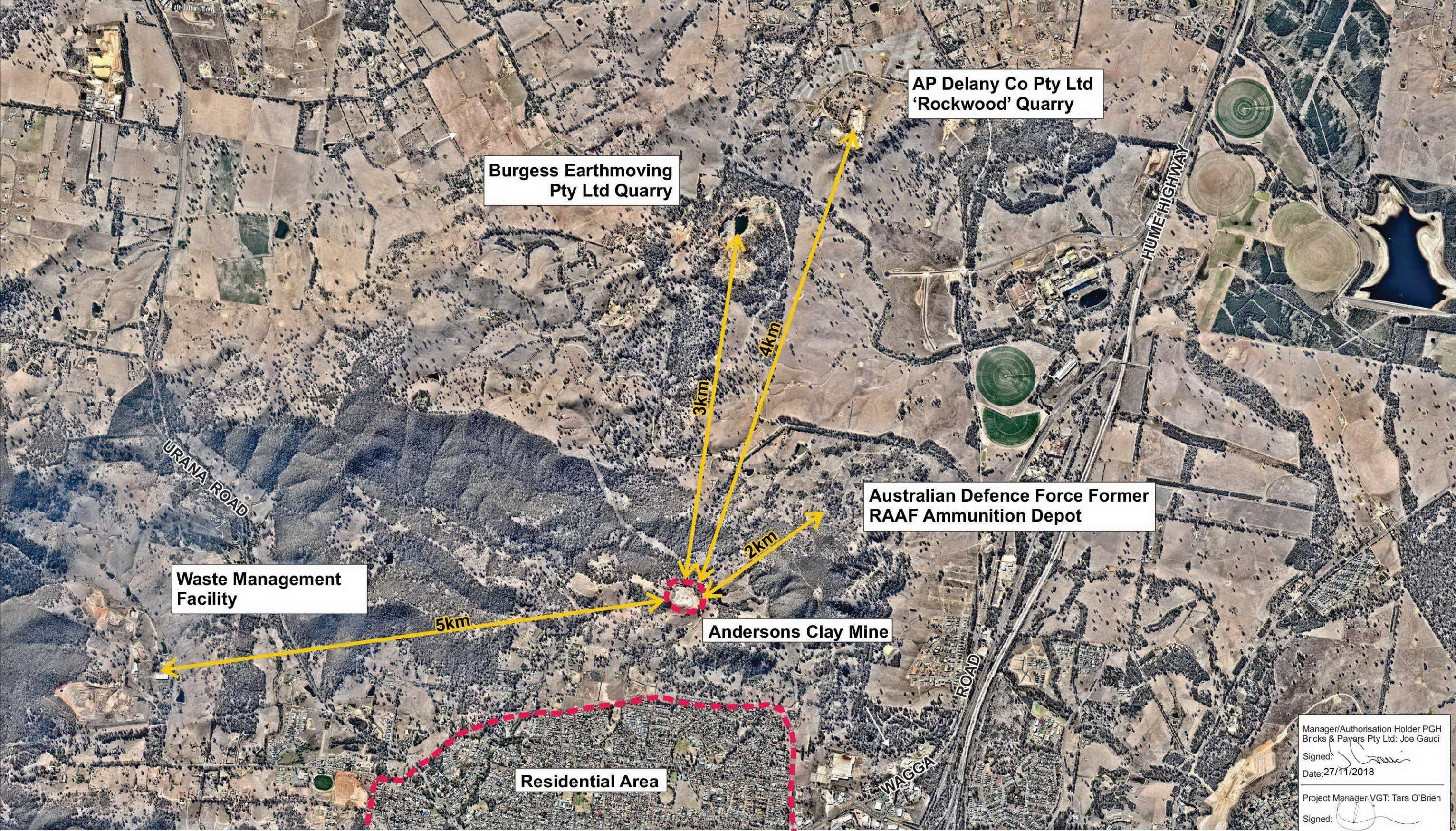
The site has sympathetically operated alongside its neighbours for many decades with few complaints received.

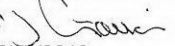
Plan of:	Rehabilitation Plan for Andersons Clay Mine Environmental Impact Statement 2018 - Surrounding Landuse	Location:	253 Shaw Street, Springdale Heights, NSW	Source:	nearmap - Image Date 01/05/2018	Our Ref:	3618_BAN_RP_DA17_C006_V1_F6.cdr
Figure:	SEVEN	Council:	Albury - Wodonga Shire Council	Survey:	N/A	Plan By:	JD
Sheet:	1 of 1	Tenure:	Permit Number N72	Projection:	N/A	Project Manager:	TO
Version/Date:	V1 04/10/2018	Client:	PGH Bricks & Pavers Pty Ltd	Contour Interval:	N/A	Office:	Thornton

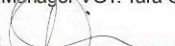
This figure may be based on third party data which has not been verified by vgt and may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and vgt does not warrant its accuracy.



Environmental Compliance Solutions Pty Ltd

Manager/Authorisation Holder PGH Bricks & Pavers Pty Ltd: Joe Gauci
 Signed: 
 Date: 27/11/2018

Project Manager VGT: Tara O'Brien
 Signed: 
 Date: 27/11/2018

The site is located with land zoned E3- Environmental Management. The objectives of the zone are reproduced below from the Albury City Council LEP.

Objectives of zone

- *'To protect, manage and restore areas with special ecological, scientific, cultural or aesthetic values.*
- *To provide for a limited range of development that does not have an adverse effect on those values.*
- *To ensure the long term viability of populations of threatened species, populations and ecological communities by protecting and improving the condition of wildlife habitats and wildlife corridors.*
- *To allow appropriate land uses in close proximity to the Landfill Buffer Area.'*

Developments permitted with consent include;

Aquaculture; Boat launching ramps; Boat sheds; Community facilities; Dual occupancies (attached); Dwelling houses; Environmental facilities; Extensive agriculture; Farm buildings; Group homes; Home-based child care; Information and education facilities; Jetties; Recreation areas; Recreation facilities (indoor); Roads; Signage; Water recreation structures.

In the making of the Albury Local Environmental Plan 2010, the subject land (Lot 2 DP 856969, was included as an additional permitted use under Schedule 1.

Schedule 1 states:

6 Use of certain land at 253 Shaw Street, Lavington

(1) This clause applies to land at 253 Shaw Street, Lavington, being Lot 2, DP 856969.

(2) Development for the purpose of open cut mining or extractive industries is permitted with consent.

Thus Albury City Council has acknowledged the operation of the mine as a legitimate landuse suitable for the locality.

Section 4. Post Mining Land Use Options

The post mining landuse will be consistent with the land zoning objectives stated in *Section 3.6* above. That is, the proposed final landuse of agricultural activities including grazing or recreation area are permitted with consent within the Albury LEP.

No listed threatened flora or fauna species were observed during a site field survey conducted in 2016 or are known from the proposal site. Several potential threatened species habitats were identified however the threatened species were not identified on the site at the time of the survey. The Box Gum Woodland on the property was found to conform to both the NSW and the Federal definitions under both the Threatened Species Conservation (TSC) Act and Environmental Protection Biodiversity Conservation (EPBC) Act although some areas were in better condition than others. The survey also found 2.6ha of moderate to good quality box gum is located outside the proposed area which would not be impacted by the expansion of the mine.

Rehabilitation of the final landform would be sympathetic to the Box Gum Woodland with selection of species and the possibility of establishing tree lots within the grassland. This would enhance wildlife corridors and improve the condition of wildlife habitats in the area.

There are no common boundaries with existing mines at the site therefore the project does not need to accommodate the rehabilitation strategies of other mines.

Any other future land uses will be within the scope of the permitted uses within the Environmental Management land zoning. The potential uses are fairly limited in order to protect the environmental values of the land. Other feasible future land use options other than those currently proposed would most likely include residential dwellings.

Section 5. Rehabilitation Objectives

5.1. Rehabilitation Objectives

At this stage a definitive final land use has not been determined however given the nature of the mine profile several potential land uses would be available. In order to achieve the nominated post mining land use goals, the objectives of rehabilitation activities are presented in *Table 9* below.

Table 9. Rehabilitation Objectives and Targets

Feature	Objective	Target
Land Use	Provide for a Grazing or Recreational Land Use	Rehabilitate the mine to provide: • A mixture of grassland/pasture and shrubs. • A suitable water body for recreational parkland, grazing or other applicable land uses. • Retain access road for future grazing management or recreational parkland uses.
Landform	Provide a geotechnical stable landform	Geotechnical assessment based on-site specific review and, if required, computer modelling determines that the retained slopes are not likely to actively erode or 'slip' to an extent requiring earthworks and profiling.
	Provide a non-polluting landform	Water quality monitoring results show that the landform is non-polluting within the meaning of Section 120 of the Protection of the Environment Operations Act 1997. In particular, 'downstream' water quality monitoring will record total suspended solids <50mg/L of within 10% of 'upstream' levels.
Biodiversity	Revegetated areas provide a vegetation community with maintenance requirements no greater than adjoining vegetation not disturbed by mining activities	Rehabilitation monitoring confirms that the vegetation communities established during final rehabilitation are self-sustaining.
	Revegetated areas contain species consistent with surrounding vegetation communities	Rehabilitation monitoring confirms the non-native and non-target species (weeds) represent less than 10% of projected foliage cover or equivalent to surrounding vegetation not disturbed by mining activities.
Tenement Relinquishment	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	5 years after final rehabilitation

Section 6. Proposed Rehabilitation Planning and Management

6.1. Land Clearing

Land clearing will be undertaken in future years to the south of the site as mining progresses into this area to the full extent of the extraction area as well as into the proposed extension area. The removal of trees impeding the progress of the mine will be required in the south and in the extension area.

Felled trees will be placed in rehabilitation areas perpendicular to the slope to reduce erosion impacts, trap seeds and nutrients as to provide habitat for fauna. Trees not used immediately will be stored in windrows around the perimeter of the site until suitable rehabilitation areas become available.

To date, topsoil and overburden not for immediate use in earth mound construction or rehabilitation has been stockpiled in the southern and south-eastern portion of the mine. It is planned to store any topsoil and overburden won from the land clearing in separate bunds around the perimeter of the site to provide a visual and acoustic screen. These will be vegetated as soon as practicable to reduce erosion and sediment impacts.

6.2. Mine Staging and Progressive Rehabilitation

Due to the mining methodologies, that is long gentle mine face slopes, with stockpiles on the mine floor, coupled with the relatively small floor space available to PGH, active ongoing rehabilitation is not practical. Once final finished battered faces have been established then rehabilitation can commence.

Rehabilitation activities are undertaken on a campaign basis in conjunction with mining due to equipment availability and expediency of completing staged rehabilitation works. Campaigns generally occur three times a year with a duration of approximately 4 weeks per campaign. Revegetation planting or seeding may occur outside these periods as bulk earth moving equipment is not required.

6.3. Areas to be Rehabilitated

The areas to be rehabilitated include areas disturbed for the purposes of material extraction, storage, transport and for the management of the mine. These areas and works include:

- Removal of haul roads;
- Removal of storage and loading areas;
- Battering of the in-pit slopes to meet those outlined in the agreed final landform;
- Removal of material stockpiles offsite or incorporating material into the final batters;
- Incorporating overburden stockpiles in to the final landform; and
- Revegetation of disturbed areas, except the principle access/management tracks.
- Importation of Virgin Excavated Natural Material to complete rehabilitation where required due to on-site material shortfall.

The extent of the areas to be rehabilitated (or those rehabilitated in the previous years) will be identified in the Environmental Management Report submitted annually to the DPE. Rehabilitation will only be undertaken on areas impacted within the disturbed area and consent boundary. The end of Shaw Street, used to gain access to the site, is outside the

property and consent boundaries will remain as is. An entrance road to facilitate access to the site for recreational purposes at the completion of rehabilitation will be retained.

6.4. Buffer Areas

Current consent conditions require that no extraction takes place within 15 metres of the boundary of the permit area. The vegetated buffer areas will be maintained in the future extension area to provide visual amenity to neighbouring landowners and dwellings. If required, further plantings to enhance the existing habitat will be undertaken. Weeds will be monitored and controlled to reduce competitiveness with target species.

6.5. Conceptual Final Landform

The conceptual final landform will include a void with battering of all benches back to between 3 horizontal to 1 vertical and 4 horizontal to 1 vertical. Slope lengths greater than 25 metres will be broken by catch drains to convey the surface water to the remaining water body to reduce erosion impacts. Access roads and hardstand areas not required in the final landform will also be ripped in preparation for topsoiling and vegetation.

The landform will include a sediment dam in the remaining void most likely to the west of the current location, this may remain permanently depending on rainfall intensities and duration of dry weather. Native pasture and grasses will be established on the final void slopes surrounding the sediment dam on pit floor. The landform will also be conducive to low level grazing consistent with neighbouring properties.

The final landuse may change course throughout the lifetime of the mine depending economic or community factors. Thus proposed final landform will aim to not preclude any suitable future landuse not currently anticipated. Apart from grazing, the land might become useful for recreation, as per original council consent.

6.5.1. Final Water Body

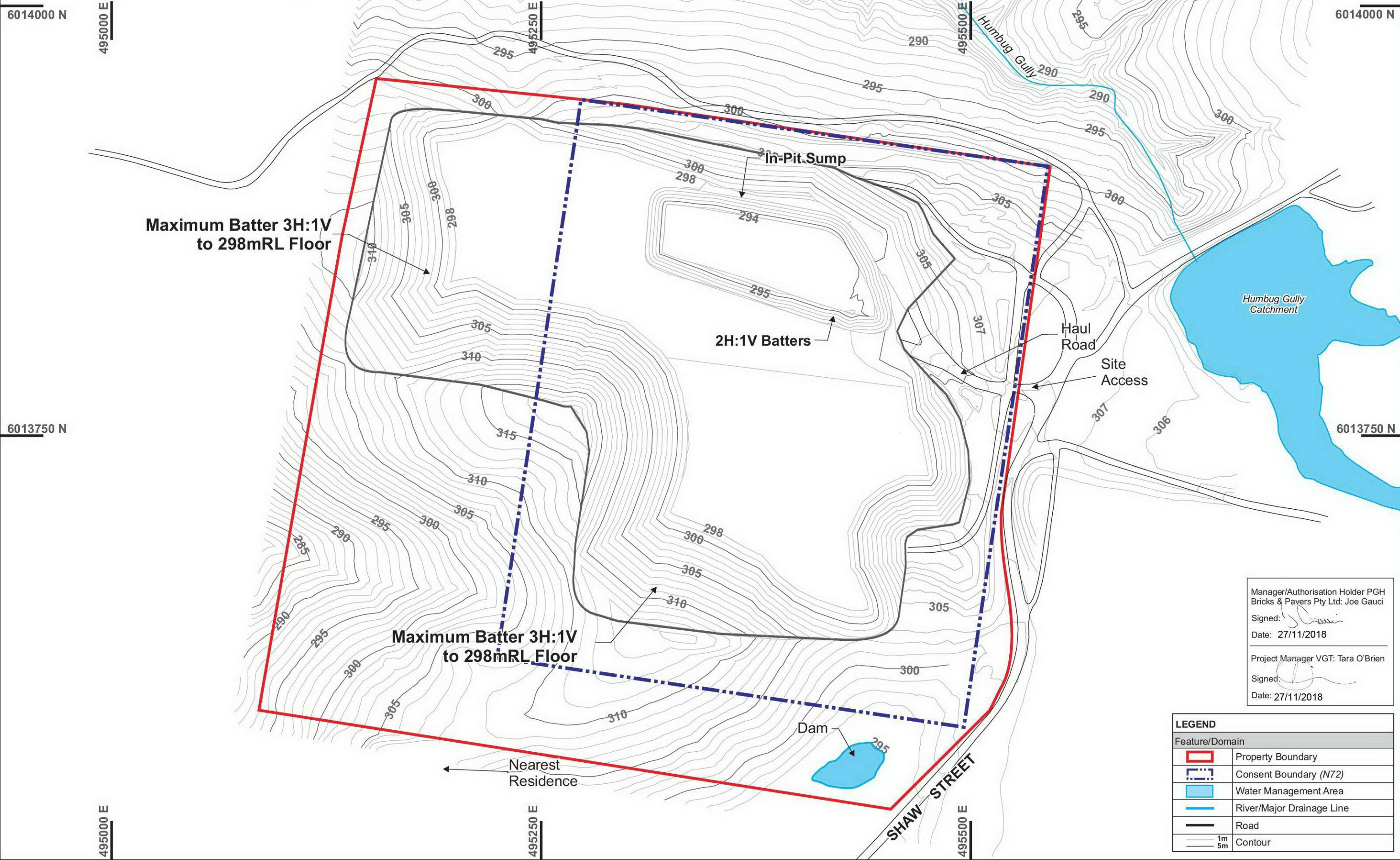
Preliminary calculations suggest that the final void is unlikely to overtop. Losses due to evaporation and dissipation will balance the rate of rainfall received well before the whole void would be filled. In any case, a spillway designed for a 1 in 100 year ARI storm event will be installed in order to safely convey dam water off the site.

6.6. Revegetation

Once an appropriate growth medium has been applied, revegetation of the site can commence. It is envisaged that the vegetation will be reflective of the White Box – Blakely's Red Gum – Yellow Box grassy woodland of the NSW South Western Slopes Bioregion, the Blakleys Red Gum -White Box -Yellow Box – Black Cypress Pine box grass/shrub woodland of central NSW South Western Slopes Bioregion and White Box-Blakely's Red Gum- Red Box – Red Stringybark shrubby Woodland of the NSW South Western Slopes Bioregion. Grassland communities would be established on the upper slopes of the former void, transitioning to grassland/pasture on the lower slopes leading to the water body. A suitable commercially available species list has been developed from the representative woodlands and grasslands listed above as shown below.

Plan of:	Rehabilitation Plan for Andersons Clay Mine Environmental Impact Statement 2018 - Conceptual Final Landform	Location:	253 Shaw Street, Springdale Heights, NSW	Source:	nearmap - Image Date 01/05/2018 & Landair Surveys	Our Ref:	3618_BAN_RP_DA17_C008_V0_F8.cdr
Figure:	EIGHT	Council:	Albury - Wodonga Shire Council	Survey:	Landair Surveys - Image Flown 08/02/2017	Plan By:	SK/JD
Sheet:	1 of 1	Tenure:	Permit Number N72	Projection:	MGA	Project Manager:	TO
Version/Date:	V0 04/10/2018	Client:	PGH Bricks & Pavers Pty Ltd	Contour Interval:	1m	Office:	Thornton

This figure may be based on third party data which has not been verified by vgt and may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and vgt does not warrant its accuracy.



Manager/Authorisation Holder PGH Bricks & Pavers Pty Ltd: Joe Gauci
Signed:
Date: 27/11/2018

Project Manager VGT: Tara O'Brien
Signed:
Date: 27/11/2018

LEGEND	
Feature/Domain	
	Property Boundary
	Consent Boundary (N72)
	Water Management Area
	River/Major Drainage Line
	Road
	1m
	5m
	Contour

Table 10. White Box – Blakely's Red Gum – Yellow Box grassy woodland of the NSW South Western Slopes Bioregion, Blakleys Red Gum -White Box -Yellow Box – Black Cypress Pine box grass/shrub woodland

Common name	Species name	Density (Percentage of species)	Typical Spacings (metres)
Overstory			
White Box	<i>Eucalyptus albens</i>	2.5	10
Blakely's Red Gum	<i>Eucalyptus blakeyi</i>	2.5	10
Yellow Box	<i>Eucalyptus melliodora</i>	2.5	10
Midstory			
Hickory Wattle	<i>Acacia implexa</i>	2	10
Silver Wattle	<i>Acacia dealbata</i>	2	10
Groundcover			
Snow Grass	<i>Poa sieberiana</i>	15	In clumps of 3 – 3m apart
Weeping Meadow Grass	<i>Microleana stipoides</i>	15	In clumps of 3 – 3m apart
Blue Bells	<i>Wahlenbergia stricta</i>	5	In clumps of 3 – 3m apart
Windmill Grass	<i>Chloris truncata</i>	10	In clumps of 3 – 3m apart
Mat Rush	<i>Lomandra multiflora</i>	10	In clumps of 3 – 3m apart
Flax Lily	<i>Dianella revoluta</i>	5	In clumps of 3 – 3m apart
Kangaroo Grass	<i>Themeda australis</i>	15	In clumps of 3 – 3m apart
Wallaby Grass	<i>Austrodanthonia racemosa</i>	15	In clumps of 3 – 3m apart

Table 11. White Box-Blakely's Red Gum- Red Box – Red Stringybark shrubby Woodland

Common name	Species name	Density – Percentage of each species	Typical Spacings (Metres)
Overstorey			
White Box	<i>Eucalyptus albens</i>	2.5	8
Blakely's Red Gum	<i>Eucalyptus blakeyi</i>	2.5	8
Red Stringybark	<i>Eucalyptus macrorhyncha</i>	2.5	8
Red Box	<i>Eucalyptus polyanthemus</i>	2.5	8
Midstory			
Hickory Wattle	<i>Acacia implexa</i>	10	4
Varnish Wattle	<i>Acacia verniciflua</i>	10	4
Alpine Grevillea	<i>Grevillea alpina</i>	5	4
Bush Pea	<i>Pultanea foliolosa</i>	5	4
Hop Bitter Pea	<i>Daviesia latifolia</i>	5	4
Showy Parrot Pea	<i>Dillwynia sericea</i>	5	4
Groundcover			
Happy Wanderer	<i>Hardenbergia violacea</i>	5	4
Flax Lily	<i>Dianella revoluta</i>	10	In clumps of 3 – 4m apart
Snow Grass	<i>Poa sieberiana</i>	10	In clumps of 3 – 4m apart
Kangaroo Grass	<i>Themeda australis</i>	10	In clumps of 3 – 4m apart
Wallaby Grass	<i>Austrodanthonia racemosa</i>	10	In clumps of 3 – 4m apart

Planting will be achieved by a combination of broadcasting/seed drilling and hand planted seedlings. The final planting density will be similar to analogue sites (yet to be determined) but similar to that stated in the tables above. Felled timber that has been retained on-site will also be placed on the slopes to provide micro habitats for both flora and fauna. Grassland species will be sown on the lower slopes with the aim of achieving a minimum of 70% groundcover. Grass species may include some pasture species such as fescue, cocksfoot, phalaris or ryegrass or other species as advised by an agronomist.

Rehabilitation of the final landform would also be sympathetic to the Box Gum Woodland. This would enhance wildlife corridors and improve the condition of wildlife habitats in the area.

The aim of the revegetation is to stabilise the soil by providing at least 70% groundcover minimising erosion impacts. Until the vegetation is established the target groundcover will be achieved through the application of mulch or other soil binders.

6.7. Rehabilitation Trials and Research

Progressive rehabilitation will incorporate trials and research as required. This may include trials with varying soil thickness, soil ameliorants, plant species or mulches to determine the most effective approach to rehabilitation of the site. All results of trials and research will be reported in the Annual Rehabilitation Report required by the DPE.

Section 7. Barriers or Limitation to Effective Rehabilitation

7.1.1. Geochemical Constraints

The site geochemistry provides a minor risk of pH levels below optimum levels for rehabilitation. Analysis of water from within the pit sump indicates that the water at the contact of the Shale and Clay is neutral with very low conductivities (see *Appendix A*). The risk of acid mine drainage is therefore considered to be low. There is very low risk of spontaneous combustion due to the absence of carbonaceous material at the site.

The geochemistry is not expected to present any particular difficulties with regard to overburden and topsoil management. The soils are somewhat dispersive and will be stored appropriately to minimise erosion if they cannot be immediately utilised.

The site is located on the boundary between the Table Top Hydrogeological Landscape (HGL) and the Nail Can-Bungowannah Hydrogeological Landscape. These landscapes are described as having a moderate to high risk that salinity issues will occur. The Table Top landscape water quality is characterised as having moderate salinity levels whilst the Nail Can-Bungowannah landscape is also moderate with observations of conductivities of greater than 600 μ S/cm within streams.

Conductivities of the water bodies on the site are very low as are the conductivities of the nearby streams (see *Appendix A*). It is concluded that it is unlikely that the soils will experience salinity issues that present limitations to rehabilitation.

Soil chemistry will be investigated prior to revegetation to determine if ameliorants are required. It should be noted that the endemic species selected for revegetation are suitable and adapt to these soils.

7.1.2. Tailings

There will be no tailings generated from the extraction process. Any Shale or Clay material exposed in the active faces of the mine are considered stable and do not constitute a risk to the environment during extraction or rehabilitation. Topsoil and overburden will be managed appropriately as described in *Section 9.3*.

7.1.3. Incorporation of Existing and Surrounding Landforms

The surrounding landform to the south is characterised as moderately to deeply weathered with undulating low hills and rises having rounded crests and long gently inclined foot-slopes. Undulating plains and fans are also present. Slopes are gentle and waxing. Drainage lines are widely spaced and poorly defined. The landform to the north is characterised by narrow ridge crests and upper slopes; long, straight to waning middle and lower slopes; and narrow drainage lines.

The final faces of the extraction area will be battered back between 3 horizontal to 1 vertical and 4 horizontal to 1 vertical and blended with the existing landform. These slopes (10 to 30%) are typical of the location leading into Humbug Gully in the north. To the south the immediate slopes are generally less steep but transition to gradients that replicate these slopes, moving down the ridgeline.

The final water body will not be out of character for the area given the former quarry dam located in Humbug Gully, less than 100m to the east of the site and other farm dams located in the area.

Photography 7: Neighbouring Former Quarry Dam



7.1.4. Geotechnical Constraints

Geotechnical risks related from ground movement include such hazards as subsidence, landslips, toppling, settlement, heave, slumping and fracturing. As no underground activities are undertaken on the site and there is no history of underground working the risk of subsidence is considered low.

The weathered Shale and Clay material remaining the final landform is geotechnical and chemically stable and is unlikely to fail at the proposed batter angles. Current faces at much steeper slopes have proved resistant to failure over the life of the operation and the risk of failure of the final landform is considered to be minimal. Additionally, previously rehabilitated slopes have proven to be stable as shown in *Photography 9* below.

Photography 8: Stable batters and benching in current pit



Photography 9: Previously rehabilitated slopes



The risk of dewatering or ground heave is also considered low given the site does not intersect groundwater nor are there any underground workings on the site. Shale and Clay material is not prone to swelling when wet, the prime cause of heaving. The strata does not contribute chemical leachates harmful to rehabilitation or environment.

The final water body will be created from the mine void and does not require construction of dam walls. The water balance undertaken for this EIS suggests that the final void is unlikely to overtop as losses due to evaporation and dissipation will balance the rainfall received. A spillway will be constructed nonetheless that complies with Blue Book requirements.

7.1.5. Evaluation of Rehabilitation Effectiveness

The proposed rehabilitation techniques are expected to be effective and meet the requirements of the rehabilitation objectives and completion criteria. Site rehabilitation to date has progressed in line with the objectives and has been effective in stabilising the slopes and achieving sufficient erosion control.

Rehabilitation of the site will be assessed and reported within the Annual Rehabilitation Review required by the DPE. Progress against the completion criteria and rehabilitation objectives and any changes or further development of the completion criteria are outlined. Should ineffective rehabilitation be identified, steps to remediate will also be described.

7.2. Constraints and Opportunities Analysis of Final Void

Table 12. Constraints and Opportunities Analysis of Void in Final Landform

Constraint	Opportunity	Issues/ Mitigation Measures	Feasibility	Environmental Sustainability Rating
The final water body sterilises land covered for grazing purposes.	The final void will contain a water body that will provide stock water should grazing be undertaken as the final landuse. The depression would also provide stock shelter from wind.	Land surrounding the water body would be rehabilitated with species suitable for grazing. The area of land lost to grazing would be minimal.	High	High
	The final void could be completely backfilled to provide a free draining landform and additional grazing land.	Imported fill would need to be imported to the site to backfill and compact the void. This would require substantial volumes of fill material to create a free draining landform. Obtaining material suitable for filling i.e. VENM is likely to be difficult due to low availability in the local area. The rehabilitation of the site may therefore be prolonged for many years or decades leaving the site unusable for grazing or other purposes.	Low	High
The water body may exceed that of the Harvestable Rights for farm dams.	A water body would improve the appeal of the site for future land purchases, for purpose of agriculture, with the provision of water security (via a Water Access Licence if required). The land value could feasibly increase.	If the maximum harvestable rights for the property is exceeded a WAL could be obtained.	High	High
	The void could be partially backfilled to provide a water body whose volume is within the Harvestable Rights for farm dams.	Imported fill would need to be imported to the site to partially backfill and compact the void. This would require substantial volumes of fill material. Obtaining material suitable for filling i.e. VENM is likely to be difficult due to low availability in the local area. The rehabilitation of the site may therefore be prolonged for many years or decades leaving the site unusable for grazing or other purposes.	Low	High

Constraint	Opportunity	Issues/ Mitigation Measures	Feasibility	Environmental Sustainability Rating
The final water body sterilises land covered from use as habitat to native fauna.	The water body would provide water for native fauna (including threatened species consistent with the Box Gum Woodland) that may establish after rehabilitation of the site.	Tree stands could be established with species consistent with the Box Gum Woodland to provide habitat and shelter for native fauna. These could be strategically placed to enhance connectivity with other woodland areas.	High	High
	The final void could be completely backfilled to provide a free draining landform and more habitat for native fauna.	Imported fill would need to be imported to the site to backfill and compact the void. This would require substantial volumes of fill material to create a free draining landform. Obtaining material suitable for filling i.e. VENM is likely to be difficult due to low availability in the local area. The rehabilitation of the site may therefore be prolonged for many years or decades leaving the site unusable for grazing or other purposes.	Low	High
The final water body could constitute a drowning hazard to the public or landowners in the final landform.	The final void would provide a pleasing aesthetic should recreational land use be undertaken.	The final water body will not constitute any greater risk to drowning than any other publically accessible water body such as rivers or lakes. Signage could be erected warning of the danger. The site is already securely fenced and fencing is envisaged to remain at the end of the mine life to discourage trespassing.	High	High
	The final void could be completely backfilled to remove the drowning hazard.	Imported fill would need to be imported to the site to backfill and compact the void. This would require substantial volumes of fill material to create a free draining landform. Obtaining material suitable for filling i.e. VENM is likely to be difficult due to low availability in the local area. The rehabilitation of the site may therefore be prolonged for many years or decades leaving the site unusable for grazing or other purposes.	Low	High

Constraint	Opportunity	Issues/ Mitigation Measures	Feasibility	Environmental Sustainability Rating
Riparian ecosystems downstream are impacted by reduced flows.	Riparian ecosystems adapt to the reduced flows and/or habitate the remaining water body instead.	It is not planned release environmental flows into Humbug Gully at the cessation of mining. It is expected that there have already been some adaptations within the ecosystems within the drainage lines since the commencement of mining, several decades ago resulted in reduced flows. The changes to the riparian corridors is considered to be offset by the establishment of an ecosystem within the permanent water body.	High	High
	The final void could be completely backfilled to provide a free draining landform that restores natural flows to the riparian ecosystems.	Imported fill would need to be imported to the site to backfill and compact the void. This would require substantial volumes of fill material to create a free draining landform. Obtaining material suitable for filling i.e. VENM is likely to be difficult due to low availability in the local area. The rehabilitation of the site may therefore be prolonged for many years or decades leaving the site unusable for grazing or other purposes.	Low	High

From the analysis above it can be seen that leaving a water body in the final landform is the most feasible and environmentally sustainable option.

Section 8. Performance Criteria

Table 13. Rehabilitation Objectives and Completion Criteria

Objective	Performance Indicator	Completion Criteria	Monitoring Methodology and Responsibility	Monitoring Frequency	Justification /Source	Progress at start of MOP and Expected Completion
Phase 1 - Decommissioning						
Domain 1 - Infrastructure						
All infrastructure and services not suitable for the final landuse will be removed.	Services not required for final landuse are disconnected	Relevant services disconnected by qualified contractors	Report from qualified contractors Mine manager responsible	Upon decommissioning completion	ML1229	Not commenced/Post extraction completion
	Infrastructure not required for final land use is removed	Relevant infrastructure removed	Relinquishment inspection and report Mine Manager responsible	Upon decommissioning completion	ML1229	Not commenced/Post extraction completion
All roads and hardstand areas to be retained for the final landuse will be reduced in width/size to that suitable for the final landuse	Roads are not required for final landuse are removed	Roads are removed unless specified to be retained	Relinquishment inspection and report Mine Manager responsible	Upon decommissioning completion	ML1229	Not commenced/Post extraction completion
	Roads required for final landuse are reduced in width (if required)	Roads reduced in width to that suitable for final land use	Relinquishment inspection and report Mine Manager responsible	Upon decommissioning completion	ML1229	Not commenced/Post extraction completion
	Hardstand areas reduced to a size required for the final landuse	Hardstand areas reduced in size to that suitable for final landuse	Relinquishment inspection and report Mine Manager responsible	Upon decommissioning completion	ML1229	Not commenced/Post extraction completion
Sediment runoff to be contained	Sediment retained in water management structures	Sediment dams will be designed to Best Practice according to the 'Blue Book' Criteria for a 5-day 90 th percentile storm event. All drains will be designed for the 1 in 10-year design storm event	Mining Manager to continue monitoring of sediment catchment	On construction completion and monthly until relinquishment	DECC- Managing Urban Stormwater.	Not complete/Post extraction completion
Domain safe and free from hazardous materials	No hazardous materials remain	All hazardous material removed	Contamination report prepared by qualified person	Following decommissioning with follow up validation testing as required	ML1229	Not commenced/Post extraction completion

Objective	Performance Indicator	Completion Criteria	Monitoring Methodology and Responsibility	Monitoring Frequency	Justification /Source	Progress at start of MOP and Expected Completion
Phase 1 – Decommissioning (continued)						
Domain 3 - Water Management						
Sediment runoff to be contained	Sediment retained in water management structures	Sediment dams will be designed to Best Practice according to the 'Blue Book' Criteria for a 5-day 90 th percentile storm event. All drains will be designed for the 1 in 10-year design storm event	Mine Manager and Sediment and Erosion Control Specialist responsible	Monthly until relinquishment	DECC-Managing Urban Stormwater	Complete
Water discharged from the site is consistent with the baseline ecological, hydrological and geomorphic conditions of the surrounding environment	Water quality monitoring results show that the landform is non-polluting	Water Quality meets the objective of Section 120 of the Protection of the Environment Operations Act 1997. In particular, 'downstream' water quality monitoring will record pH between 6.5 and 8.5 and total suspended solids <50mg/L or within 10% of 'upstream' levels (which is the greater)	Downstream water to be monitored for TSS prior to discharge. Mine Manager and NATA laboratory responsible.	Prior to discharge	MOP	Not commenced/post extraction
Domain 4 – Overburden Emplacement Area						
All overburden will be removed and reused in the establishment of the final landform	No remaining overburden stockpiles	All overburden stockpiles are removed and/or incorporated into the final landform	Relinquishment inspection and report	Upon decommissioning completion	MOP	Not commenced/Post extraction completion
Domain 5 - Stockpiled Material						
All stockpiles will be removed and/or reused in the establishment of the final landform	No remaining stockpiles	All remaining stockpiles removed	Upon decommissioning completion	Upon decommissioning completion	MOP/ML1229	Not commenced/Post extraction completion
Domain safe and free from hazardous materials	No hazardous materials remain	All hazardous material removed	Contamination report prepared by qualified person	Following decommissioning with follow up validation testing as required	MOP/ML1229	Not commenced/Post extraction completion
Sediment runoff to be contained	Sediment retained in water management structures	Sediment dams will be designed to Best Practice according to the 'Blue Book' Criteria for a 5-day 90 th percentile storm event. All drains will be designed for the 1 in 10-year design storm event	Inspection for capacity by mine manager	On construction completion and monthly until relinquishment	MOP/ML1229	Not complete
Domain 6 - Open Cut Void						
No activities within this domain are required during this phase						

Objective	Performance Indicator	Completion Criteria	Monitoring Methodology and Responsibility	Monitoring Frequency	Justification /Source	Progress at start of MOP and Expected Completion
-----------	-----------------------	---------------------	---	----------------------	-----------------------	--

Phase 2 - Landform Establishment

Domain 1 – Infrastructure

Domain landform is safe, stable and non-polluting, fit for the purpose of the intended final land use	Final landform contours similar to surrounding contours	Final slopes are between 3 horizontal to 1 vertical and 4 horizontal to 1 vertical. Slope lengths shall not exceed 25m for a 3H: 1V batter. Slope lengths shall not exceed 35m for a 4H: 1V batter. Slope lengths shall not exceed 80m for batter <4H:1V	Survey on completion by registered surveyor. Geotechnical assessment report.	Upon completion of landform establishment phase. Progress reported in AEMR	DECC- Managing Urban Stormwater. MOP/ ML1229.	Not commenced/Post extraction completion
	Suitable sediment and erosion controls in place	Sediment Dams will be designed to Best Practice according to the 'Blue Book' Criteria for a 5-day 90 th percentile storm event. All drains will be designed for the 1 in 10-year design storm event.	Basin currently meets specifications. Inspection for capacity by mine manager	On construction completion and monthly until relinquishment	DECC- Managing Urban Stormwater. MOP/ ML1229.	Not commenced/Post extraction completion

Domain 3 - Water Management

Water management structures to be retained. No landform establishment activities applicable to this domain.

Domain 4 - Overburden Emplacement Area

Ensure overburden emplacement areas has been battered/shaped to the final landform	Final landform contours similar to pre-disturbance and surrounding contours	Final slopes are between 3 horizontal to 1 vertical and 4 horizontal to 1 vertical. Slope lengths shall not exceed 25m for a 3H: 1V batter. Slope lengths shall not exceed 35m for a 4H: 1V batter. Slope lengths shall not exceed 80m for batter <4H:1V	Survey on completion by registered surveyor. Geotechnical assessment report.	Upon completion of landform establishment phase. Progress reported in AEMR.	DECC- Managing Urban Stormwater. MOP/ ML1229.	Not commenced/Post extraction completion
Sediment runoff to be contained	Sediment retained in water management structures	Sediment dams will be designed to Best Practice according to the 'Blue Book' Criteria for a 5-day 90 th percentile storm event. All drains will be designed for the 1 in 10-year design storm event	Inspection for capacity by mine manager	On construction completion and monthly until relinquishment	DECC- Managing Urban Stormwater	Not complete/Completion of final lake.

Domain 5 - Stockpiled Material

The Stockpile material has been removed previously. No activities within this domain are required during this phase

Objective	Performance Indicator	Completion Criteria	Monitoring Methodology and Responsibility	Monitoring Frequency	Justification /Source	Progress at start of MOP and Expected Completion
Phase 2 – Landform Establishment (continued)						
Domain 6 – Open Cut Void						
Domain is safe, stable and non-polluting, fit for the purpose of the intended post-mining land use(s)	Final landform contours similar to final landform in MOP or that which is decided in the future	Final slopes are between 3 horizontal to 1 vertical and 4 horizontal to 1 vertical. Slope lengths shall not exceed 25m for a 3H:1V batter Slope lengths shall not exceed 35m for a 4H:1V batter Slope lengths shall not exceed 80m for batters <4H:1V	Survey on completion by registered surveyor. Geotechnical assessment report. Mine Manager and Surveyor responsible	Upon completion of landform establishment phase. Progress reported in AEMR	DECC- Managing Urban Stormwater, MOP.	Not commenced/Post extraction completion
Domain Landform is properly drained and protected from erosion	Landform drains towards water management domain	Sediment Dams will be designed to Best Practice according to the 'Blue Book' Criteria for a 5-day 90 th percentile storm event. All drains will be designed for the 1 in 10 year design storm event.	Mine Manager and Sediment and Erosion Control Specialist responsible	Upon completion of landform establishment phase. Progress reported in AEMR	DECC-Managing Urban Stormwater, MOP.	Not commenced/Post extraction completion
Access tracks to be retained	Tracks suitable for private access of pedestrians or vehicles usage	Slopes of major tracks <10° or have cross drains/banks installed. Where unsuitable soils are present, tracks to be stabilised with crushed bricks, concrete, gravel or similar.	Survey on completion by registered surveyor. Stabilisation methods to be recorded and reported by Site Contractor in AEMR. Mine Manager Responsible	Upon completion of landform establishment phase. Progress reported in AEMR	ML Conditions, DECC-Managing Urban Stormwater design MOP	Not commenced/Post extraction completion
Materials (including topsoils of the disturbed areas) are recovered, appropriately managed and use efficiently as resource in the rehabilitation	Available topsoils are stockpiled appropriately and reused on the site	Available topsoil is spread over final landform	Site contractor to record growth medium management procedures in Annual Reports. Records to include amounts stripped, locations and depths re-spread	Annually in AEMR	AEMR	Not commenced/Post Extraction completion

Objective	Performance Indicator	Completion Criteria	Monitoring Methodology and Responsibility	Monitoring Frequency	Justification /Source	Progress at start of MOP and Expected Completion
Phase 3 - Growth Medium Development						
Domain A - Infrastructure						
No revegetation is to occur in this domain, therefore no activities are required during this phase						
Domain B - Water Management						
No revegetation is to occur in this domain, therefore no activities are required during this phase						
Domain C - Rehabilitation Area – Grassland						
Establish soil/growth medium suitable for establishment of grassland vegetation community	Compacted surfaces deep ripped along contour	Photographs of ripped areas	Progress to be reported by suitably qualified persons in AEMR or relinquishment report. Mine Manager and suitable AEMR consultant responsible.	Following deep ripping	MOP	Not commenced/post landform establishment
	Minimum 10cm topsoil spread unless rehabilitation trials indicate that an alternative thickness is acceptable	Report on topsoil volumes used and spread	Photographs of test pits reported through AEMR or relinquishment report	Following spreading of soil	MOP	Not commenced/post landform establishment
	Soil quality comparable to that in undisturbed areas	Analysis of soil samples record similar parameter for pH, EC, dispersion percentage and organic content	Soil analysis report included in AEMR or relinquishment report	Following spreading of soil	MOP	Not commenced/post landform establishment

Objective	Performance Indicator	Completion Criteria	Monitoring Methodology and Responsibility	Monitoring Frequency	Justification /Source	Progress at start of MOP and Expected Completion
Phase 4 - Ecosystem and Land use Establishment						
Domain A - Infrastructure						
No revegetation is to occur in this domain, therefore no activities are required during this phase						
Domain B - Water Management						
Wetlands water management structure to remain therefore no activities required during this phase						
Domain C & D - Rehabilitation Area – Grassland						
Re-establishment of a grassland community with a similar composition to the pre-disturbance community	Revegetation species mix applied	A target coverage factor of 70% will be subject to further refinement	Monitoring including photography to be conducted by suitably qualified person and reported annually	Monthly for the first 6 months, then 6 monthly until completion criteria achieved	MOP	Not commenced/ongoing
	The rehabilitated area does not constitute an erosion hazard	Total projected foliage cover is greater than or equal to 70%	Monitoring including photography to be conducted by suitably qualified person and reported annually	Monthly for the first 6 months, then 6 monthly until completion criteria achieved	DECC- Managing Urban Stormwater MOP	Not commenced/ongoing
	Weeds not preventing revegetation from establishing	Monitoring confirms that after 2 years the non-native/non-target species (weeds) represents less than 20% of projected foliage cover or equivalent to surrounding vegetation not disturbed by mining activities	Monitoring including photography to be conducted by suitably qualified person and reported annually	Monthly for the first 6 months, then 6 monthly until completion criteria achieved	MOP ML1229	Not commenced/ongoing
	Grazing by native and domestic fauna not adversely impacting on ecosystem development	Rural fences and gates installed around disturbed area to allow controlled grazing of domestic stock. Feral animal controls will be implemented if required. Monitoring reports indicate the level of grazing is appropriate.	Monitoring including photography to be conducted by suitably qualified person and reported annually	Monthly for the first 6 months, then 6 monthly until completion criteria achieved	MOP ML1229	Not commenced/ongoing

Objective	Performance Indicator	Completion Criteria	Monitoring Methodology and Responsibility	Monitoring Frequency	Justification /Source	Progress at start of MOP and Expected Completion
Phase 5 - Ecosystem and Land use Sustainability						
Domain A - Infrastructure						
No activities are required during this phase						
Domain B - Water Management						
No activities are required during this phase						
Domain C & D - Rehabilitation Area – Grassland						
Re-establishment of a grassland community with a similar composition to the pre-disturbance community	Vegetation self-sustaining	Monitoring confirms: - Evidence of new growth of endemic species - Evidence of successive generation of endemic species - No further active weed control required (beyond that considered necessary at analogue sites).	Monitoring including photography to be conducted by suitably qualified person and reported annually	Monthly for the first 6 months, then 6 monthly until completion criteria achieved	MOP, ML1229	Not commenced/relinquishment of tenement

Objective	Performance Indicator	Completion Criteria	Monitoring Methodology and Responsibility	Monitoring Frequency	Justification /Source	Progress at start of MOP and Expected Completion
Phase 6 - Relinquishment						
All Domains						
Relinquishment	Demonstrated compliance with all completion criteria	Outlined above	Relinquishment report to be prepared by suitably qualified person describing compliance with all criteria	Prior to relinquishment	MOP, ML1229	Not commenced/relinquishment of tenement

Section 9. Impacts and Mitigation

9.1. Topography and Geotechnical Stability

9.1.1. Mitigation

Walls within the active void are currently at angles of between 1.5 horizontal to 1 vertical and 2 horizontal to 1 with benches cut into the walls in order to maximise resource recovery whilst decreasing the length of slope. As mining progresses and final faces are achieved, walls will be battered to make safer angles of between 3 horizontal to 1 vertical and 4 horizontal to 1 vertical. As stated previously, to date the walls have proven resistant to failure over the life of the operation at these angles. Mining will continue in a similar manner with regards to working faces.

During mining the change in topography will be largely shielded from view from neighbouring properties as the mine face progresses behind the ridgeline. The final landform will be similarly shielded from view. The final slopes will be similar to those typical for the locality and thus the restored topography will blend into the surrounding land.

The site is well fenced and securely locked when no activities are undertaken on-site. The benched extraction plan reduces the risk of harm to personnel and public in case of accidental falls or impact from loose material falling directly down the active face onto personnel or equipment. Signage is also in place to warn of the risk of falls from deep excavations at present and will be maintained on the site until rehabilitation efforts reduce the slopes in the final landform.

9.1.2. Cumulative Impacts

There are no mines or quarries adjacent to the site therefore cumulative impacts to the geotechnical stability of the area of these operations are not relevant. The final landform will not result in an unacceptable change in the overall topography or stability. Current surrounding landuses such as grazing are also not likely to impact significantly on the topography or stability of the location.

Photography 10: Warning signage



9.2. Land Capability

9.2.1. Assessment of Land Capability

The current and proposed final landform has been assessed using the OEH *The Land and Soil Capability Assessment Scheme (second approximation) - A General Rural land Evaluation System for NSW* (LSCAS). The scheme defines LSC classes based on the biophysical features of the land. These biophysical features determine the on-site and off-site limitations and hazards of the land and include soil type, slope, landform position, acidity, salinity, drainage, rockiness and climate.

The landform assessment in the extension area prior to disturbance is summarised in the table below. The final LSC class of the land is based on the most limiting factor.

Table 14. Land Capability Assessment of Existing Extension Area

Aspect	Details	Land Capability Classification
Water Erosion Hazard	Slope along the ridge range from 5% to 15%. (The site is assumed to lie in the Eastern and Central Division)	Class 4
Wind Erosion Hazard	Soil texture is considered to most closely resemble a fine sandy loam with 6-13% clay, therefore the Wind erodibility class of surface soil is 'moderate' (Table 5 of LSCAS). Annual average rainfall is around 600mm per annum and the site lies within a High Wind Erosive Power area (Figure 6 of LSCAS). The exposure to wind is high due to the ridgeline topography.	Class 5
Soil Structure Decline Hazard	Soils most closely resemble clay loam soils with no texture modifiers such as sodicity i.e. fragile medium textured soil	Class 3
Soil Acidification Hazard	The soils most closely resemble Red Earth-less fertile (granites and metasediments) (Table 9 of LSCAS). These soils have a low buffering capacity. Note: pH of soils was tested and found to range from 4.5 to 5.5. Annual average rainfall is around 600mm per annum.	Class 5
Salinity Hazard	Recharge potential is considered low due to the ridgeline setting. Discharge potential is considered low as the site is well above the groundwater table. The salt store is considered moderate i.e. soil conductivity less than 0.8dS/m.	Class 3
Water Logging Hazard	The soils rapidly drain and are moderately well drained	Class 2
Shallow Soil and Rockiness Hazard	The extension area has nil rocky outcrops (Table 15 of LSCAS).	Class 1
Mass Movement Hazard	No mass movement of soil has been noted.	Class 1
Final LCS Class		Class 5

Table 15. Land Capability Assessment of Final Landform

Aspect	Details	Land Capability Classification
Water Erosion Hazard	Slopes within the rehabilitated landform will approximate 20 to 33%. (The site is assumed to lie in the Eastern and Central Division)	Class 6
Wind Erosion Hazard	Soil texture is considered to most closely resemble a fine sandy loam with 6-13% clay, therefore the Wind erodibility class of surface soil is 'moderate' (Table 5 of LSCAS). Annual average rainfall is around 600mm per annum and the site lies within a High Wind Erosive Power area (Figure 6 of LSCAS). The exposure to wind will be low due to the protection of the depression of the remaining void.	Class 3
Soil Structure Decline Hazard	Topsoils stripped during land clearing will be emplaced on the final landform. There is expected to be an increase in coarseness of the material as subsoils and overburden may have some degree of mixing in the topsoil material.	Class 4
Soil Acidification Hazard	The soils most closely resemble Red Earth-less fertile (granites and metasediments) (Table 9 of LSCAS). These soils have a low buffering capacity. Note: pH of soils was tested and found to range from 4.5 to 5.5. Annual average rainfall is around 600mm per annum. The acidification risk is not expected to change in the final landform.	Class 5
Salinity Hazard	Recharge potential may increase to moderate due to the presence of the final void and the final water body. Discharge potential is considered low as the final landform will still be well above the groundwater table. The salt store is considered moderate i.e. soil conductivity less than 0.8dS/m.	Class 3
Water Logging Hazard	The soils outside the final water body are expected to rapidly drain and will be moderately well drained	Class 2
Shallow Soil and Rockiness Hazard	The rehabilitated landform will not contain any rocky outcrops as the landform will be battered with overburden material and then topsoiled (Table 15 of LSCAS).	Class 1
Mass Movement Hazard	No mass movement of soil will be expected due to the minimum batters of 3H:1V to 4H:1V.	Class 1
Final LCS Class		Class 6

The Land and Soil Capability class in the rehabilitated landform is expected to drop from LCS class 5 to Class 6 primarily due to the increase in slopes within the final void. Class 5 land is described as:

'Moderate-low capability land: Land has high limitations for high-impact land uses. Will largely restrict land use to grazing, some horticulture (orchards), forestry and nature conservation. The limitations need to be carefully managed to prevent long-term degradation.'

Class 6 land is described as:

'Low capability land: Land has very high limitations for high-impact land uses. Land use restricted to low-impact land uses such as grazing, forestry and nature conservation. Careful management of limitations is required to prevent severe land and environmental degradation.'

This land capability is suited to the proposed uses of low level grazing and recreational activities.

9.2.2. Cumulative Impacts

As the Land Capability mapping for NSW the site is classified as having a land capability of 7, the assessed proposed final land capability of 6 is considered a slight improvement. The change in landform capability is not expected to have negative cumulative impacts on neighbouring landform capability.

9.3. Soils and Erosion

The control of erosion and sedimentation at the site focusses on source reduction measures. In general these measures include:

- Reading the Land Resources Assessment (this report), the Water Management Plan (WMP) and any other plans or written instructions issued in relation to development at the subject site.
- Ensure contractors undertake all soil and water management works as instructed in this specification and constructed following the guidelines stated in the NSW Managing Urban Stormwater (the "Blue Book") and *Managing Urban Stormwater, Soil and Construction, Volume 2E Mines and Quarries*
- Informing all subcontractors of their responsibilities in minimising the potential for soil erosion and pollution to downslope areas.

9.3.1. Topsoil Stripping and Storage

Prior to stripping all water management features will be constructed which include earth banks (Stormwater Collection Drains) to divert as much clean water as possible and capture the dirty water within the pit sump. Prior to stripping the vegetation should be sprayed for weeds to assist in reducing the weed content in topsoil that may be transferred to new rehabilitation areas.

When a new area is required to be extracted, topsoil will be stripped and where possible emplaced on previously ripped completed faces.

Stripping should not occur when in either and excessively dry or wet condition. Grading or pushing soil into windrows with graders or dozers for later collection for loading into rear dump trucks by front-end loaders are examples of preferential less aggressive soil handling systems. This minimises compression effects of the heavy equipment that is often necessary for economical transport of soil material.

Where immediate reuse of the topsoil is not possible it will be stored appropriately on the perimeter of the site. That is, stockpiles of topsoil to be located at least five metres from areas of likely concentrated or high velocity flows, especially drainage lines and access roads. The surface of soil stockpiles should be left in as coarsely structured a condition as

possible in order to promote infiltration and minimise erosion until vegetation is established, and to prevent anaerobic zones forming.

Topsoil stockpiles are not to exceed 3m in height with a minimum crest width of 3m and are to be seeded with a temporary vegetation cover if stockpiles are to remain longer than 12 months. If necessary, earth banks or drains will be constructed to divert localised run-on.

Topsoil to a depth of 10 to 15cm will be stripped first with the subsoils, if found, to a depth of a further 20 to 30cm stripped and stored separately. The actual depth of stripping of each layer will be recorded and a total volume of topsoil and subsoils estimated and an inventory kept. Each stockpile location will be logged and the stockpiles signposted clearly stating the nature of the soil. Barrier fencing will be installed to limit access to rehabilitated areas or the stockpiles. Management practices will be carried out to minimise areas being affected by wind and water erosion.

9.3.2. Topsoil Quality

Topsoil will be analysed prior to resspreading to determine if amelioration measures are required such as lime, fertilisers or other nutrients to make the soil suitable for the species to be planted.

9.3.3. Topsoil Resspreading

Prior to re-spreading stockpiled topsoil onto reshaped overburden, an assessment of weed infestation on stockpiles should be undertaken to determine if individual stockpiles require herbicide application and / or “scalping” of weed species prior to topsoil spreading. If insufficient on-site topsoil material is available, VENM may be imported to meet the shortfall.

Where topsoil resources allow, topsoil should be spread to a nominal depth of 100 mm on all re-graded subsoils. Subsoils will be emplaced first over the battered overburden material used to create the final landform. The depth of subsoils should aim to replicate that of the original soil profile.

Topsoil should be spread, treated with fertiliser and seeded in one consecutive operation, to reduce the potential for topsoil loss to wind and water erosion.

9.3.4. Seedbed Preparation

Thorough seedbed preparation should be undertaken to ensure optimum establishment and growth of vegetation. All topsoiled areas should be lightly contour ripped (after topsoil spreading) to create a “key” between the soil and the spoil. Ripping should be undertaken on the contour. Best results will be obtained by ripping when soil is moist and when undertaken immediately prior to sowing. The resspread topsoil surface should be scarified prior to, or during seeding, to reduce run-off and increase infiltration. This can be undertaken by contour tilling with a fine-tynd plough or disc harrow.

9.3.5. Topsoil Balance

The topsoil resource has been estimated for the site using site survey to estimate currently stored topsoil stockpiles and the estimated topsoil to be won within full extent of the currently consented extraction area as well as the proposed extension area. The locations of the topsoil stockpiles and areas to be stripped are shown in *Figure Nine*.

Table 16. Topsoil and Subsoil Volumes

Soil Description	Estimated Stripping depth (m)	Area (m ²)	Volume Estimates (m ³)
Topsoil Stockpile 1	-	-	1,800
Topsoil Stockpile 2	-	-	1,400
Topsoil from Undisturbed Area in the South	0.15	20,000	3,000
Topsoil from the Extension Area	0.15	24,000	3,600
Total Topsoil Available			9,800
Subsoil from Undisturbed Area in the South	0.30	20,000	6,000
Subsoil from the Extension Area	0.30	24,000	7,200
Total Subsoil Available			13,200

Table 17. Topsoil and Subsoil Volumes Required in Final Landform

Soil Description	Estimated Emplacement depth (m)	Area to be covered in final landform* (m ²)	Volume Required (m ³)
Topsoil	0.15	70,000	10,500
Subsoil	0.30	70,000	21,000

*Note: The water body in the final landform is assumed to cover an area of approximately 20,000m² from the WMP. The total area of disturbance is estimated to be 90,000m².

Therefore it is estimated that there will be shortfall of topsoil and subsoil of approximately 700m³ and 7,800m³ respectively. Overburden or VENM material may be suitable to assist in making up the shortfall of subsoils. Other options to improve the quality and quantity of topsoil is the addition of mulch or composted organics to 'create' topsoil. These options will be investigated further as required during the life of the mine.

9.3.6. Overburden

Very little overburden is expected to be generated on the site due to the target materials lying very close to the surface in the extension area. Overburden is variable in the south.

The 3-4 Horizontal to 1 Vertical mine final face batters will provide gentler slopes and the requirement for overburden to batter final slopes will be reduced. Further exploration activities will identify the volumes, if any, of overburden material expected.

Photography 11: Subsoils and Overburden in the East



Plan of:	Rehabilitation Plan for Andersons Clay Mine Environmental Impact Statement 2018 - Soil Resources	Location:	253 Shaw Street, Springdale Heights, NSW	Source:	nearmap - Image Date 01/05/2018 & Landair Surveys	Our Ref:	3618_BAN_RP_DA17_C009_V0_F9.cdr
Figure:	NINE	Council:	Albury - Wodonga Shire Council	Survey:	Landair Surveys - Image Flown 08/02/2017	Plan By:	SK/JD
Sheet:	1 of 1	Tenure:	Permit Number N72	Projection:	MGA	Project Manager:	TO
Version/Date:	V0 04/10/2018	Client:	PGH Bricks & Pavers Pty Ltd	Contour Interval:	1m	Office:	Thornton

This figure may be based on third party data which has not been verified by vgt and may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and vgt does not warrant its accuracy.



Manager/Authorisation Holder PGH Bricks & Pavers Pty Ltd: Joe Gauci
Signed: [Signature]
Date: 27/11/2018
Project Manager VGT: Tara O'Brien
Signed: [Signature]
Date: 27/11/2018

LEGEND	
Feature/Domain	
	Property Boundary
	Consent Boundary (N72)
	Water Management Area
	River/Major Drainage Line
	Road
	Contour
	Area of Disturbance
Primary Domains (Operational)	
	Topsoil Stockpile Area
	Overburden Emplacement Area
	Topsoil Stripping Area (South)
	Topsoil Stripping Area (Extension Area)

9.3.7. Access Limitations

The soil erosion hazard on the site will be kept as low as practicable by minimising disturbance. Limiting access to certain areas of the operation during various stages is one way of reducing the erosion hazard and are outlined in *Table 18*.

Table 18. Limitations to Access

Landuse	Access Limitations	Comments
Extraction	- Land disturbances beyond five (preferably two) metres from the edge of the operations are prohibited. - Extraction will take place within a defined work area and materials will be transported only within the site for stockpiling or rehabilitation. - Entry to land not involved directly in the extraction process will be prohibited and will be managed as natural grassland.	All site workers should clearly recognise these areas and they should be clearly marked — suitable materials include barrier mesh, sediment fencing, etc. The project manager will determine their actual location on-site. They can vary in position to conserve existing vegetation best while being considerate of the needs of efficient works activities.
Access Roads	- Roads and tracks are limited to a width that are the minimum necessary to allow safe operation of heavy equipment. - Limit vehicular access to the site to that essential for extraction or rehabilitation work.	
Remaining Lands	Land disturbances are prohibited except for essential management works.	

9.3.8. Soil Stabilisation

Soil stabilisation is primarily achieved through the rehabilitation of exposed areas. Here, rehabilitation means achieving a C-factor (Revised Universal Soil Loss Equation) of less than 0.1 (equivalent of 60% groundcover for recently disturbed soils) and the program that ensures it will drop permanently, by reducing the risk of erosion by vegetation, paving, armouring, etc. as soon as practicable after activities cease.

NOTE: The cover factor, C, is the ratio of soil loss from land under specified crop or mulch conditions to the corresponding loss from continuously tilled, bare soil. A C-factor of 1.0 corresponds to that of bare soil.

While C-factors are likely to rise to 1.0 during the life of the mine, they should not exceed those given in *Table 19* within the specified times.

Table 19. Maximum acceptable C-factors at nominated times during life of mine

Lands	Maximum C-Factor	Remarks
Waterways and other areas subjected to concentrated flows, post construction.	0.05 (70% groundcover)	Applies after ten working days from completion of formation and before they are allowed to carry any concentrated flows. Flows are limited to those indicated in "Blue Book". Foot and vehicular traffic are prohibited in these areas.
Topsoil/ Subsoil/Overburden Stockpiles stored out of the pit	0.1 (60% groundcover)	Applies after ten working days from completion of formation.
All other lands outside of the extraction area	0.15 (50% groundcover)	Applies after 20 working days of inactivity, even though works might continue later.

Note: *working days* does not include public holidays, weekends or days when work is not possible due to wet weather.

The required C factors can be achieved in the short term (temporary protection for up to six months) with either:

- a suitable soil binder in areas of sheet flow, e.g. topsoil stockpiles; or
- anionic bitumen emulsion sprayed over hessian cloth (at 0.5 L/m²) in areas of concentrated flow, e.g. diversion banks and waterways; or
- a temporary vegetative cover.

Application of any soil binders employed should follow the manufacturer's instructions.

A suggested listing of suitable plant species is shown in *Table 20*. Before sowing, additional tests should be undertaken to assess the requirements of ameliorants such as lime to help plant growth.

Table 20. Plant Species for Temporary Cover

Sowing Season	Seed Mix
Autumn/Winter	Oats @ 40kg/Ha Japanese Millet @ 10kg/Ha
Spring/Summer	Oats @ 20kg/Ha Japanese Millet @ 20kg/Ha

While ever the C-factor is higher than 0.1, maintain the lands in a condition that resists removal by wind. This can be achieved by keeping the soil moist (not wet) by sprinkling with water or where practicable, leaving the surface in a cloddy state.

Notwithstanding the above, schedule works so that the duration from the conclusion of land shaping to completion of final stabilisation is less than:

- 10 days on slopes steeper than 30 per cent

- 20 days on slopes less steep than 30 per cent.

Lands planted recently with grass species will be watered regularly until an effective cover has properly established and plants are growing vigorously. Follow-up seed and fertiliser will be applied as necessary in areas of minor soil erosion and/or inadequate vegetative protection.

All waterways, drains, spillways and outlets will be constructed to be stable in accordance with the "Blue Book" for soils with high erodibilities.

9.3.9. Cumulative Impacts

As there is no adjacent extractive industry, nor release of sediment offsite, the cumulative impacts due to erosion of soils resulting in sediment entering the downstream environment are considered low. The downstream environment in Humbug Gully is not affected at present by any other extractive industry of land disturbing activity other than agriculture. None of the other existing quarries are within this catchment area.

9.4. Geochemical Constraints

9.4.1. Amelioration Measures

As described in *Section 3.3* and *Section 7.1.1* the soils on the site are slightly acidic and low to moderately saline. Appropriate amelioration measures may include liming of the topsoil and any subsoils during rehabilitation activities.

Soil chemistry will in any case, be investigated prior to revegetation to determine if ameliorants are required and the appropriate application rates.

9.4.2. Cumulative Impacts

No cumulative impacts are envisaged regarding the soil pH or salinity. Agricultural activities undertaken on adjacent lands are unlikely to be affected geochemically by the extraction activities given the limited pathways for chemical species to migrate such as groundwater. Surface water will be directed to the pit sump which has been established as having neutral pH and low conductivity.

The stripped soils will be reused on the site and the action of stripping, stockpiling and replacement of the soils is not expected to liberate any untoward chemical species nor change the soil chemistry to a degree that it would render establishment of vegetation overly challenging.

9.5. Vegetation

Vegetation species that will be established on the site are described in *Section 3.5* and will be consistent with the present woodland species and pasture species. Planting of vegetation is likely to be a combination of seeding and planting with tubestock as appropriate. The newly planted vegetation will be watered, if required, in order to assist in establishment. Tree guards may also be employed to protect seedlings from adverse weather and vermin.

9.6. Compatibility with Other Land Users

The site activities are compatible with the agricultural activities already undertaken in the adjacent lands and with other extraction industries in the locality. Site activities are limited by operating hours that will reduce the impact to the amenity of adjacent landowners and

residents. Other non-land resource related potential impacts and mitigation measures such as dust, traffic and noise are discussed separately.

The impacts to land resources are not expected to be greater than that already experienced due to the extraction activities.

Section 10. Intervention and Adaptive Management

10.1. Threats to Rehabilitation

A summary of hazards or threats identified for the rehabilitation objectives is given below, along with a risk assessment as required by the DPE's ES3G guidelines. For risks deemed higher than acceptable (namely I to III in *Table 21*), a Trigger Action Response Plan (TARP) has been developed. A TARP identifies proposed contingency strategies in the event of unexpected variations in rehabilitation outcomes. These risks have been determined on the assumption that procedures and mitigation measures outlined in this report and other standard procedures that could be reasonably expected have been undertaken.

Table 21. Analysis of Rehabilitation Threats

Rehabilitation Threat	Potential Adverse Outcome	Likelihood	Consequence	Risk	Link to TARP
Failure to remove infrastructure and services no suitable for the final landuse	Unable to complete rehabilitation or establish the identified final landuse	Rare	Insignificant	V	-
Failure to remove all roads and hardstand areas to be retained for the final landuse and reduce the width/size to that suitable for the final landuse	Unable to complete rehabilitation or establish the identified final landuse	Rare	Insignificant	V	-
Domain is not free from hazardous materials	Unable to complete rehabilitation or establish the identified final landuse	Rare	Moderate	IV	-
Water discharged from the site is not consistent with the baseline ecological, hydrological and geomorphic conditions of the surrounding environment	The final landform is a source of pollution	Unlikely	Minor	IV	-
Final landform does not conform to approved final landform	Unable to complete rehabilitation or establish the identified final landuse	Possible	Moderate	III	1
Domain landform is not safe, stable and secure, fit for the purpose of the intended final land use.	Geotechnical instability of the final open cut void.	Unlikely	Moderate	III	2
Domain landform is not properly protected from erosion.	The final landform is a source of pollution	Rare	Moderate	IV	3
	Vegetation is unable to be established due to erosion	Rare	Major	III	3

Rehabilitation Threat	Potential Adverse Outcome	Likelihood	Consequence	Risk	Link to TARP
Access tracks to be retained are not retained.	Unable to complete rehabilitation or establish the identified final landuse.	Rare	Insignificant	V	-
Incorrect species established on final landform.	Vegetation community does not become established on final landform affecting final land use and ecosystem.	Unlikely	Moderate	III	4
Failure to establish soil/growing medium suitable for establishment of grassland vegetation community.	Insufficient soil available for rehabilitation.	Possible	Moderate	III	5
	Inadequate soil thickness applied to final landform.	Possible	Moderate	III	5
	Soil not capable of sustaining vegetation community.	Possible	Moderate	III	5
Weed or pest management fails	Weeds and pests become established and require significant resources to manage	Possible	Minor	IV	-
Vegetation community is not self-sustaining	Final landform requires significantly more management than analogue sites	Possible	Moderate	III	6
Vegetation community not receiving adequate rainfall to establish/self-sustain	Failure of vegetation community	Possible	Moderate	III	7
Public access to open cut void possible	Damage to rehabilitation areas	Possible	Moderate	III	8

10.2. Trigger Action Response Plan

Table 22. Trigger Action Response Plan

TARP Ref No	Rehabilitation Threat	Potential Adverse Outcome	Trigger level	Actions to be implemented	Evidence / Reference
1	Final landform does not conform to approved final landform	Stockpiles not removed/used in the establishment of the final landform	Inventory indicated stockpiles are not removed/reused. Slopes required by the final landform are not obtained due to material deficits	Stockpile material is to be removed from the site or incorporated into the rehabilitation of the final landform	Survey plan
		Overburden not used in the establishment of the final landform	Inventory indicates stockpiles are not removed/reused. Slopes required by the final landform are not obtained due to material deficits	Overburden material is to be removed from the site or incorporated into the rehabilitation of the final landform	Survey plan
		Slopes too steep to be rehabilitated as planned	Field slope measurements taken during the land forming activities indicate slopes do not meet the completion criteria	Slopes to be reduced until all slopes meet approved final landform unless final landform considered stable by geotechnical review and vegetation establishment success meets completion criteria- subject to approval by DPE	Survey plan prepared by surveyor indicates that final slopes meet the approved final landform
2	Domain landform is not safe, stable and fit for the purpose of the intended final land use	Geotechnical instability of the final open cut void	Monitoring or final closure geotechnical assessment identifies instability/unacceptable movement (actual or potential) in final face of open cut void	Suitably qualified geotechnical engineer engaged to assess the instability and provide a range of recommendations to remediate the instability. Recommendation to be implemented in consultation with the DPE	Geotechnical report

TARP Ref No	Rehabilitation Threat	Potential Adverse Outcome	Trigger level	Actions to be implemented	Evidence / Reference
3	Domain landform is not properly protected from erosion	Vegetation is unable to be established due to erosion	Projected foliage cover is less than 70%	Mine personnel identify site of erosion and remediate through additional earthworks, soil works including addition of ameliorants, supplementary revegetation or other stabilisation method. If the above is unsuccessful, a suitably qualified professional in sediment and erosion control will be engaged to prepare and assessment report and recommendations to be implemented.	DECC-Managing Urban Stormwater CPESC Report
		Final landform is a source of pollution.	Surface water monitoring records indicate that water quality levels are outside the completion criteria. Visual inspection indicated that the final landform is the source of unacceptable levels of sedimentation or is actively eroding	Mine personnel identify site of erosion and remediate through additional earthworks, soil works including addition of ameliorants, supplementary revegetation	DECC-Managing Urban Stormwater CPESC Report

TARP Ref No	Rehabilitation Threat	Potential Adverse Outcome	Trigger level	Actions to be implemented	Evidence / Reference
4	Incorrect species established on final landform	Vegetation community does not become established on final landform effecting final land use and ecosystem.	Monitoring indicates that target species represent less than 80% of the total species number and projected foliage cover after 2 years from planting.	Suitably qualified ecologist or revegetation expert engaged to assess reasons for divergence of failure of endemic species establishment and recommend actions to ensure that the final vegetation community corresponds as closely as possible to the approved community. Additional actions may include: - Sowing of additional seed mix for targeted species or additional species endemic to the pre-disturbance community - Use of Tubestock, seed and mulch mix or other application techniques - Soil amelioration works such as addition of fertiliser - Additional weed control activities (mechanical and/or chemical)	Ecologist report

TARP Ref No	Rehabilitation Threat	Potential Adverse Outcome	Trigger level	Actions to be implemented	Evidence / Reference
5	Failure to establish soil/growing medium suitable for establishment of grassland or woodland vegetation community.	Insufficient soil available for rehabilitation	Soil inventory prior to rehabilitation (particularly stockpile volumes) indicates a deficit of soil material	Suitable sources of additional soil material to be identified, including the need for importation of soils from off-site. Investigation into measures that may be implemented to ameliorate other materials to make them suitable for use as a growth medium.	MOP
		Inadequate soil thickness applied to final landform	Records following placement of soil material identifies placed soil thickness not consistent with final approved soil thickness	Additional soil material spread on the final landform	MOP
		Soil not capable of sustaining vegetation community	Topsoil parameters not within the identified criteria.	Suitably qualified agronomist or soil scientist engaged to prepare a report including a range of recommendations to ensure that the identified criteria are achieved/soil is suitable for sustaining the vegetation community.	Soil analysis reports and interpretation by qualified specialist

TARP Ref No	Rehabilitation Threat	Potential Adverse Outcome	Trigger level	Actions to be implemented	Evidence / Reference
6	Vegetation community is not self-sustaining	Final landform requires significantly more management than analogue sites	Monitoring indicates that: - Established vegetation is not replacing itself through successive generations, or - Weed growth is increasing above a projected foliage cover of 10%	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. Additional actions (to be undertaken in targeted areas) may include: - Sowing of additional seed mix for targeted species or additional species endemic to the pre-disturbance community; - Use of Tube stock, seed and mulch mix or other application techniques - Soil amelioration works such as addition of fertiliser - Additional weed control activities (mechanical and/or chemical) and/or pest management as required.	Ecologist Report
7	Vegetation community not receiving adequate rainfall to establish/self-sustain	Failure of vegetation community	Rainfall below the lowest 10% of records for greater than 3 months	Water cart to be utilised over revegetated areas	BOM website

TARP Ref No	Rehabilitation Threat	Potential Adverse Outcome	Trigger level	Actions to be implemented	Evidence / Reference
8	Public access to open cut void possible	Damage to rehabilitation areas	Monitoring indicates evidence of trespassing and/or damage to rehabilitation areas	Appropriate fencing, signage and bunding is to be repaired and maintained	MOP

Section 11. Monitoring and Maintenance

A regular monitoring program will be undertaken to ensure that rehabilitation goals are met adequately. Monitoring methodology and frequency of rehabilitation progress is discussed in the current MOP under Performance Indicators and Completion Criteria. A new MOP will be developed should this development application be approved and the Performance Indicators and Completion Criteria will be further developed. Proposed criteria are discussed in *Section 8* of this report. The progress towards rehabilitation objectives will be reported annually in an Annual Environmental Management Report (AEMR), until the ML is relinquished.

11.1. Soils and Erosion Control

The site will be inspected for erosion hazards during mining and hauling campaigns and at least monthly at other times. Areas that have been identified as high risk and requiring maintenance will be identified and remedial work undertaken as soon as is practicable. Items of particular concern are discussed below.

- Topsoil stripping to be visually monitored to check moisture content of soil and depth of stripping.
- Topsoil/ Subsoil and overburden stockpiles to be visually assessed at time of forming to check they do not exceed three metres high.
- Ensure soil resources are not placed in hazard areas, including lands closer than five metres from areas of likely concentrated or high velocity flows, especially waterways and access roads.
- Ensuring rehabilitated lands and stockpiles soil resources have effectively reduced the erosion hazard and initiate upgrading or repair as appropriate i.e. ensure groundcover is at least 60% coverage.
- Constructing additional erosion and/or sediment control works as might become necessary to ensure the desired sediment and erosion control is achieved.
- Ensure the actual depth of stripping of each soil layer is recorded and a total volume of topsoil and subsoils estimated and an inventory kept.
- Each stockpile location will be logged and the stockpiles signposted clearly stating the nature of the soil.
- Barrier fencing will be installed to limit access to rehabilitated areas or the stockpiles.
- Visual inspection of the mine batters and slopes to determine if areas of instability are apparent and undertake works to stabilise the landform as required.
- During respreading of soils, the depth of soils will be checked visually (by test pits) to assess if the desired thickness has been achieved.
- Vehicular access to areas of high erosion risk shall be restricted.

11.2. Water Quality

Water quality will be monitored during the operation phase of the mine according to the Environment Protection Licence (EPL) and the Mine Operation Plan (MOP). The site was

issued EPL licence 20938 in June 2017 and any discharged water is required to contain less than 50mg/L of Total Suspended Solids.

During normal operations if water is required to be discharged from the In-Pit Sedimentation Dam (EPL Point 1), it will be flocculated (if required) and discharged when the quality is determined to be suitable. A pump will be engaged to discharge water from the In-Pit Sedimentation Dam. The water will exit the property in the northwest corner of the site through an energy dissipater (EPL Point 3). From the exit point it will flow westerly to a culvert under an access road on the neighbouring property. From there the discharged water will eventually reach Humbug Gully via a natural water course located to the north west of the site. All discharges and testing are reported in the Annual Environmental Management Report.

Once rehabilitation has been completed and revegetation has established, sediment entrainment will be negligible, and the water held in the final water body will be considered clean. Testing will be undertaken to determine its suitability for recreational use using the ANZECC Guidelines prior to relinquishment of the site. There are no other known contaminants or issues at the site at this stage that would preclude the final recreational landuse for the final water body.

11.3. Weed Control

The site will also be inspected regularly for weeds and spraying will be undertaken by appropriately qualified contractors as required. Weeds are currently sprayed approximately twice a year. Documentation of all spraying will be retained by PGH.

11.4. Pest and Stock Control

The site is fenced with rural fencing to prevent incursions by livestock. Fencing will be maintained throughout the life of the project and rehabilitation activities.

If evidence of feral animal impacts on revegetation is noted, control measures such as rabbit proof fencing will be investigated. A baiting program may also be investigated with the appropriate authorities if required.

11.5. Vegetation Monitoring

If it is found that onsite soils required additional nutrients, fertilising options will be reviewed.

Plant guards may be considered if necessary to ensure the establishment of some tubestock and will be erected at the time of planting. These will be regularly inspected to ensure that they are providing sufficient protection for the juvenile plants and replaced when necessary.

The site will be reviewed regularly to examine the vegetation progress of the site. Areas that require more seeding/planting will be identified and remediated. Regular inspections will also indicate the need for regular watering or other assistance. A minimum of 2-3 plants per metre squared will be the aim of the tree lot rehabilitation areas. Grassland areas should aim for at least 70% groundcover.

11.5.1. Use of Analogue Sites

Control analogue sites will be identified in consultation with a DPE representative and person(s) suitably qualified in flora and landform assessment. It is expected that these sites will be used as a comparison to assist in determining whether the objectives relative to slope stability and vegetation coverage have been achieved. Progress towards identifying these sites will be reported in the AEMR.

11.6. Fire

Fire hazards have been considered and are not considered to be a high risk.

Water from the dams may be used for firefighting purposes if required.

11.7. Post Closure Maintenance

Post closure monitoring will continue until mine lease relinquishment when all completion criteria have been met. This will include maintenance as described above as required.

Section 12. Rehabilitation Cost Estimate

The following describes the security Domains in detail. Areas are shown on *Figure Ten*.

The security was reviewed using the DRE 'worksheet' and methodology in the Annual Environmental Management Report in August 2015, and the cost of the Security Deposit was estimated at \$295,477.60. The estimate was made on the current mine footprint, and a reviewed security calculation was requested by the DPE for inclusion in the MOP. The site has not changed significantly, and the security calculation has not changed. Any further mine expansion will necessitate a review of the security, which will be undertaken in a new MOP once the development is approved. The Rehabilitation Cost Estimate spreadsheet and submission form is located in *Appendix D*.

12.1. Domain 1: Infrastructure

Infrastructure includes access roads and stockpile areas. These features will be remediated with the exception of the access roads which will remain and have been included in the calculation.

There are no sewerage, water treatment plants etc. that will require remediation.

The total rehabilitation cost estimate for this Domain is estimated to be \$11,014.67

12.2. Domain 2: Tailings and Rejects Emplacement

This Domain is not applicable to the site.

12.3. Domain 3: Waste Rock Dumps

There is approximately 1.6Ha of previously rehabilitated areas to the north and south of the haul road entrance which will require ongoing maintenance.

Unshaped waste rock dumps

There are two unshaped waste rock dumps on the southern perimeter of the disturbed area which will require minor reshaping.

The total rehabilitation cost estimate for this Domain is estimated to be \$4,944.41

12.4. Domain 4: Active Mine and Voids

The current active pit covers an area of approximately 0.8 Ha and contains the highwall of which the slopes will need to be reduced. The volume of material required to undertake this 'pushing' of the high wall to the required slope is estimated to be 68,000 cubic metres. Given the deficit of overburden on the site and the constraints of the site, this material will be obtained from the south of the site. Thus the total footprint of the active pit required in order to obtain the 5:1 (H: V) slopes is 8.1 Ha.

There are no ramps within the pit area that will require remediation.

There is approximately 0.05 Ha of disturbance ahead of mining at this stage.

The remediation of the pond is considered in the calculation for the Dirty Water Dams.

There are no river or creek diversions to consider.

The total rehabilitation cost of this Domain is estimated to be \$184,298.42

12.5. Domain 5: Other

No other areas are applicable to this site.

12.6. Third Party Project Management and Contingencies

The cost estimate for third party project management is \$68,358.50 and contingencies is estimated to be \$26,861.60

Therefore the total Rehabilitation Cost Calculation is estimated to be \$295,477.60

Plan of:	Rehabilitation Plan for Andersons Clay Mine Environmental Impact Statement 2018 - Rehabilitation Cost Estimates Domains	Location:	253 Shaw Street, Springdale Heights, NSW	Source:	nearmap - Image Date 01/05/2018 & Landair Surveys	Our Ref:	3618_BAN_RP_DA17_C010_V0_F10.cdr
Figure:	TEN	Council:	Albury - Wodonga Shire Council	Survey:	Landair Surveys - Image Flown 08/02/2017	Plan By:	SK/JD
Sheet:	1 of 1	Tenures:	Permit Number N72	Projection:	MGA	Project Manager:	TO
Version/Date:	V0 04/10/2018	Client:	Boral CSR Bricks Pty Ltd	Contour Interval:	1 metre	Office:	Thornton

This figure may be based on third party data which has not been verified by vgt and may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and vgt does not warrant its accuracy.



Manager/Authorisation Holder PGH Bricks & Pavers Pty Ltd: Joe Gauci
Signed: [Signature]
Date: 27/11/2018
Project Manager VGT: Tara O'Brien
Signed: [Signature]
Date: 27/11/2018

Section 13. References

- Ref 1.** Albury City Council ((2010) *Local Environmental Plan*
- Ref 2.** ANZMEC and Minerals Council of Australia (2000) *Strategic Framework for Mine Closure*
- Ref 3.** DECC (2004) Managing Urban Stormwater Soils and Construction –Volume 2E Mines and Quarries
- Ref 4.** Environment NSW (2010) eSpade online data *Livingstone Soil Landscape*
- Ref 5.** Environment NSW (2010) eSpade online data *Dora Dora Soil Landscape*
- Ref 6.** EPA (2018) *Contaminated Sites Register*
- Ref 7.** NSW Coal Association (February 1995) – *Mine Rehabilitation*
- Ref 8.** New South Wales Department of Trade & Investment – Resources and Energy (September 2013) *ESG3: Mining Operations Plan (MOP) Guidelines*
- Ref 9.** NSW Government (2018) on line Portal SEED- *Land Capability Mapping of NSW*
- Ref 10.** NSW Office of Environment and Heritage (2012) *The Land and Soil Capability Assessment Scheme (second approximation) - A General Rural land Evaluation System for NSW (LSCAS).*
- Ref 11.** NSW Soil Conservation Service (1978) *Albury District Technical Manual*
- Ref 12.** VGT (2016) *Mine Operations Plan for: Andersons Clay Mine Springdale Heights*
- Ref 13.** Personal Communication Tim Fuge (Fuge Earthmoving) 06/07/2017

Appendix A: Water Analysis

Report Number:

4053

Date Issued: 14/05/2018

Revision Number: 01

Site/Job: Andersons Quarry

Client: .PGH Bricks and Pavers Pty Ltd
 Address: Lot 1
 Hueske Road
 Jindera NSW 2642
 Contact: Joe Gauci

PO Box 2335 Greenhills NSW 2323
 P (02)4028 6412 E mail@vgt.com.au
 www.vgt.com.au ABN 77 621 943 600

The following 2 samples were received on 31/03/2017

Client Sample Reference	Licence Ref /GPS	Date Sampled	Laboratory ID	Matrix	General Comments
Top of Hill Pond		31/03/2017	4053/1	Water	
Main Pit Pond		31/03/2017	4053/2	Water	

The samples have been tested and the following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)



Anthony Crane
 Senior Chemist

NATA Accredited Laboratory – 15230.

Accredited for compliance with ISO/IEC 17025 – Testing. The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.



Test Report Number:**4053**

Date Issued: 14/05/2018

Revision No: 01

**Results**

Physical Components	Units	Method	Limit of Report	4053/1 Top of Hill Pond 31/03/2017	4053/2 Main Pit Pond 31/03/2017
Temperature	°C	Temp	0.1	21.0	21.4
pH	pH Units	VGT-WI/01	0.1	6.8	7.2
Electrical Conductivity	µS/cm	VGT-WI/02	50	112	56
Total Suspended Solids	mg/L	VGT-WI/03A AS3550.4	2	25	2,550

COMMENTS:

Location Analysed : 4/30 Glenwood Dr Thornton NSW 2322

Note: # Where present, indicates the performance of this test is not covered under NATA accreditation

Holding times for some or all of the tests listed below are outside the period recommended in the method: pH (0.25 hrs), TSS, Turbidity (24 hrs).
This may be important to the interpretation of the results.

NATA Accredited Laboratory – 15230.

Accredited for compliance with ISO/IEC 17025 – Testing. The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.



Results have been approved and report finalised on 3/04/2017

Sampling Report Number:

4053



Date Issued: 14/05/2018

Revision No: 01

Sampling Conditions:

Sample#	Description	Date Sampled	Sampler	Method of Sampling	Pre-treatment / Preservation	Comments
4053/1	Top of Hill Pond	31/03/2017 9:45 AM	GVT	Unknown		
4053/2	Main Pit Pond	31/03/2017 9:45 AM	GVT	Unknown		

Sampling procedures have been approved and report finalised on 3/04/2017
Where method is "unknown" sampling procedures are not endorsed

NATA Accredited Laboratory – 15230.

Accredited for compliance with ISO/IEC 17025 – Testing. The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.



Report Number:

4764

Date Issued: 14/05/2018

Revision Number: 01

Site/Job: Andersons Water

Client: .PGH Bricks and Pavers Pty Ltd
 Address: Lot 1
 Hueske Road
 Jindera NSW 2642
 Contact: Joe Gauci

PO Box 2335 Greenhills NSW 2323
 P (02)4028 6412 E mail@vgt.com.au
 www.vgt.com.au ABN 77 621 943 600

The following 3 sample(s) were received on 11/09/2017

Client Sample Reference	Licence Ref /GPS	Date Sampled	Laboratory ID	Matrix	General Comments
Upper Sediment Pond	495215, 6013919	8/09/2017 12:00 AM	4764/1	Water	
Up Stream	495351, 6014064	8/09/2017 12:00 AM	4764/2	Water	
Down Stream	495180, 6014102	8/09/2017 12:00 AM	4764/3	Water	Fence

The samples have been tested and the following reports are included:

- Test Report: Results relate to sample(s) as received
- Chain of Custody (if available)



Anthony Crane
 Senior Chemist

NATA Accredited Laboratory – 15230.

Accredited for compliance with ISO/IEC 17025 – Testing. The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.



Report Number:**4764**

Date Issued: 14/05/2018

Revision No: 01

**Results**

Physical Components	Units	Method	Limit of Report	4764/1 Upper Sediment Pond 8/09/2017	4764/2 Up Stream 8/09/2017	4764/3 Down Stream 8/09/2017
Temperature	°C	Temp	0.1	17.3	17.3	17.5
pH	pH Units	VGT-WI/01	0.1	6.3	6.3	6.4
Electrical Conductivity	µS/cm	VGT-WI/02	50	205	140	73
Total Suspended Solids	mg/L	VGT-WI/03A AS3550.4	2	13	7	9

COMMENTS:

Location Analysed : 4/30 Glenwood Dr Thornton NSW 2322

Note: # Where present, indicates the performance of this test is not covered under NATA accreditation

Holding times for some or all of the tests listed below are outside the period recommended in the method: pH (0.25 hrs), TSS, Turbidity (24 hrs).
This may be important to the interpretation of the results.

Results have been approved and report finalised on 11/09/2017

NATA Accredited Laboratory – 15230.

Accredited for compliance with ISO/IEC 17025 – Testing. The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.



Appendix B: Soil Testing

Sample Receipt Report Number:

5902

Date Issued: 4/10/2018

Revision Number: 01

Site/Job: Anderson Soil testing

Client: .PGH Bricks and Pavers Pty Ltd
Address: Lot 1
 Hueske Road
 Jindera NSW 2642
Contact: Joe Gauci

PO Box 2335 Greenhills NSW 2323
 P (02) 4028 6412 E mail@vgt.com.au
 www.vgt.com.au ABN 77 621 943 600

The following 3 samples were received on 15/05/2018

Client Sample Reference	Licence Ref	Date Sampled	Laboratory ID	Matrix	General Comments
AND1 Soil 0-0.1M			5902/1	Soil	
AND2 Soil			5902/2	Soil	
AND3 C Horizon			5902/3	Soil	

The samples have been tested and the following reports are included:

- Test Report: Results relate to sample(s) as received
- Chain of Custody (if available)



Anthony Crane
 Senior Chemist

Test Report Number: 5902

Date Issued: 4/10/2018



Results

Test Description	Units	Method	Limit of Report	5902/1 AND1 Soil 0 -0.1M	5902/2 AND2 Soil	5902/3 AND3 C Horizon
Temperature	°C	Temp	0.1	24.8	24.1	24.0
Conductivity (1:5)	dS/m	NEPMB36.2 Soil EC	0.1	0.8	0.3	<0.1
pH (1:5)	pH units	NEPMB36.2 Soil pH	0.1	4.6	4.5	5.2

Results have been approved and report finalised on 17/05/2018

Appendix C: Blue Book Calculations

1. Erosion Hazard and Sediment Basins

Site Name: Andersons

Site Location:

Precinct/Stage:

Other Details:

Site area	Sub-catchment or Name of Structure						Notes
	Pit	Dam 2	Dev Pit				
Total catchment area (ha)	4.7	1	11				
Disturbed catchment area (ha)	4.7		11				

Soil analysis (enter sediment type if known, or laboratory particle size data)

Sediment Type (C, F or D) if known:	D	D	D				From Appendix C (if known)
% sand (fraction 0.02 to 2.00 mm)							Enter the percentage of each soil fraction. E.g. enter 10 for 10%
% silt (fraction 0.002 to 0.02 mm)							
% clay (fraction finer than 0.002 mm)							
Dispersion percentage							E.g. enter 10 for dispersion of 10%
% of whole soil dispersible							See Section 6.3.3(e). Auto-calculated
Soil Texture Group	D	D	D				Automatic calculation from above

Rainfall data

Design rainfall depth (no of days)	5	5	5				See Section 6.3.4 and, particularly, Table 6.3 on pages 6-24 and 6-25.
Design rainfall depth (percentile)	90	90	90				
x-day, y-percentile rainfall event (mm)	35.2	35.2	35.2				
Rainfall R-factor (if known)							Only need to enter one or the other here
IFD: 2-year, 6-hour storm (if known)	6.02	6.02	6.02				

RUSLE Factors

Rainfall erosivity (R -factor)	1020	1020	1020				Auto-filled from above
Soil erodibility (K -factor)	0.05	0.05	0.05				RUSLE LS factor calculated for a high rill/interrill ratio.
Slope length (m)	150	150	250				
Slope gradient (%)	6	6	6				
Length/gradient (LS -factor)	2.15	2.15	2.93				
Erosion control practice (P -factor)	1.3	1.3	1.3	1.3	1.3	1.3	
Ground cover (C -factor)	1	1	1	1	1	1	

Sediment Basin Design Criteria (for Type D/F basins only. Leave blank for Type C basins)

Storage (soil) zone design (no of months)	2	2	2	2	2	2	Minimum is generally 2 months
Cv (Volumetric runoff coefficient)	0.64	0.64	0.64				See Table F2, page F-4 in Appendix F

Calculations and Type D/F Sediment Basin Volumes

Soil loss (t/ha/yr)	142	142	194				
Soil Loss Class	1	1	2				See Table 4.2, page 4-13
Soil loss (m ³ /ha/yr)	110	110	149				Conversion to cubic metres
Sediment basin storage (soil) volume (m ³)	86		274				See Sections 6.3.4(i) for calculations
Sediment basin settling (water) volume (m ³)	1059	225	2478				See Sections 6.3.4(i) for calculations
Sediment basin total volume (m ³)	1145		2752				

NB for sizing of Type C (coarse) sediment basins, see Worksheet 3 (if required).

1. Erosion Hazard and Sediment Basins

Site Name: Andersons

Site Location: In Pit Soil Loss

Precinct/Stage:

Other Details:

Site area	Sub-catchment or Name of Structure						Notes
	W HW	S HW	N HW	floor			
Total catchment area (ha)	0.33	0.35	0.3	2.1			
Disturbed catchment area (ha)	0.33	0.35	0.3	2.1			

Soil analysis (enter sediment type if known, or laboratory particle size data)

Sediment Type (C, F or D) if known:	D	D	D	D			From Appendix C (if known)
% sand (fraction 0.02 to 2.00 mm)							Enter the percentage of each soil fraction. E.g. enter 10 for 10%
% silt (fraction 0.002 to 0.02 mm)							
% clay (fraction finer than 0.002 mm)							
Dispersion percentage							E.g. enter 10 for dispersion of 10%
% of whole soil dispersible							See Section 6.3.3(e). Auto-calculated
Soil Texture Group	D	D	D	D			Automatic calculation from above

Rainfall data

Design rainfall depth (no of days)	5	5	5	5			See Section 6.3.4 and, particularly, Table 6.3 on pages 6-24 and 6-25.
Design rainfall depth (percentile)	90	90	90	90			
x-day, y-percentile rainfall event (mm)	35.2	35.2	35.2	35.2			
Rainfall R-factor (if known)							Only need to enter one or the other here
IFD: 2-year, 6-hour storm (if known)	6.02	6.02	6.02	6.02			

RUSLE Factors

Rainfall erosivity (R -factor)	1020	1020	1020	1020			Auto-filled from above
Soil erodibility (K -factor)	0.05	0.05	0.05	0.05			RUSLE LS factor calculated for a high rill/interrill ratio.
Slope length (m)	30	35	25	100			
Slope gradient (%)	45	45	45	1			
Length/gradient (LS -factor)	7.61	8.63	6.55	0.20			
Erosion control practice (P -factor)	1.3	1.3	1.3	1.3	1.3	1.3	
Ground cover (C -factor)	1	1	1	1	1	1	

Sediment Basin Design Criteria (for Type D/F basins only. Leave blank for Type C basins)

Storage (soil) zone design (no of months)	2	2	2	2	2	2	Minimum is generally 2 months
Cv (Volumetric runoff coefficient)	0.64	0.64	0.64	0.64			See Table F2, page F-4 in Appendix F

Calculations and Type D/F Sediment Basin Volumes

Soil loss (t/ha/yr)	504	572	434	14			
Soil Loss Class	5	5	4	1			See Table 4.2, page 4-13
Soil loss (m ³ /ha/yr)	388	440	334	10			Conversion to cubic metres
Sediment basin storage (soil) volume (m ³)	21	26	17	4			See Sections 6.3.4(i) for calculations
Sediment basin settling (water) volume (m ³)	74	79	68	473			See Sections 6.3.4(i) for calculations
Sediment basin total volume (m ³)	95	105	85	477			

NB for sizing of Type C (coarse) sediment basins, see Worksheet 3 (if required).

Appendix D: Rehabilitation Cost Estimate



Summary Rehabilitation Cost Calculation

Note: Sections of this page are automatically filled in from the registration page

Mine Name:	Andersons Clay Mine		
Lease(s):	ML1229		
Mine Owner:	Boral CSR Bricks Pty Ltd		
Mine Operator:	Boral CSR Bricks Pty Ltd		
Expiry of MOP:	1/2/2016		
Current Security:	\$ 60,000.00	Date of Last Security Bond Review:	1/11/2010
Mine Contact:	Mr Joe Gauci		
Position:	Mine Manager		
Address:	56-67 Cecil Road Cecil Park NSW 2171		
Phone:	0417 683 526	email:	jgauci@csr.com.au

Domain	Security Deposit
Domain 1: Infrastructure Areas	\$11,014.67
Domain 2: Tailings & Rejects Emplacements (if applicable)	
Domain 3: Waste Rock Dumps	\$4,944.41
Domain 4: Active Quarry & Voids	\$184,298.42
Domain 5: Other	
Sub-Total (Domains and Sundry Items)	\$200,257.50
Contingency	\$26,861.60
Third Party Project Management	\$68,358.50
Total Security Deposit for the Mining Project (excl. of GST)	\$295,477.60

Note: GST is not included in the above calculation or as part of rehabilitation security deposits required by the Department

- ☐ Alterations have been made to unit prices within this spreadsheet. (Attach a separate sheet providing details of changes)
- ☐ The proposed rehabilitation design is generally consistent with the development consent for the project

This Registration Form, Summary Report and calculation pages are to be printed and attached as an appendix the AEMR.

This mine security calculation has been estimated using the best available information at the time.
It is a true and accurate reflection of the total rehabilitation liability held by this mine.

Signature
General Manager

Print Name

Date:

Signature
Accepted: DRE Reporting Officer

Print Name

Date:

Domain 1: Infrastructure Areas

Detail of person filling out the Worksheet:

Legend:

Name	
Position	
Department	
Date	

	Item fixed no entry required
	Input from site optional (if information available)
	Input mandatory

Management Precinct	Activity / Description	Quantity	Unit	Unit Price	Total Cost	Description / Notes:
Workshops, Rock Crushing & Product Stockpile area(s)	Disconnect and terminate services	0	@	\$12,773.29	\$0.00	This item includes disconnecting and terminating all services such as power, water and sewer. It is a "one off" cost
	Disconnect and terminate powerlines		km	\$14,050.62	\$0.00	This item includes the cost to terminate and remove powerlines, and is based on the average cost to construct.
	Demolish and remove small buildings		m ²	\$89.41	\$0.00	Enter the total area of small buildings and offices (include weigh bridge) at the quarry. It should not include demountables which can be removed from site. It does not include workshops.
	Demolish and remove industrial buildings		m ²	\$204.37	\$0.00	Enter the total area of workshop facilities at the quarry
	Demolish / relocate crushers		@	\$12,773.29	\$0.00	This includes the cost to dismantle the crusher and relocate from the site.
	Demolish and remove conveyors & gantries (includes overland conveyors)		m	\$70.25	\$0.00	Enter the sum of the total length of conveyor and gantries. This includes conveyor to rail load out areas.
	Remove concrete pads and footings		m ²	\$12.77	\$0.00	Enter the total floor area the quarry workshops and buildings.
	Remove contaminated material from workshop and hardstand areas for disposal in the void AND/OR		m ³	\$2.55	\$0.00	i) Enter the total volume (ie. area x depth of material) to be scalped off for disposal. UNIT RATE: Depends on the haulage distance to the point where the material is to be disposed.
	Reshaping, capping, sealing of material presenting environmental difficulties (AMD, Hydrocarbon material, etc)		Ha	\$57,479.81	\$0.00	Enter the total area of material requiring capping or sealing. Where assessments have already been made and the presence/absence of contaminated material is known (and quantified) an alternative rate can be used. If this work has not been undertaken, a default rate can be used.
	Removal of UG tank (including pipes, bunds, etc). Include all facilities on site.		@	\$95,799.69	\$0.00	A default rate per UGT is to be utilised.
	On site remediation of contaminated soil (<1000m ³)		m ³	\$63.87	\$0.00	Where an assessment of the volume of contaminated soil has been made this volume is to be included. Where the volume is not known or has not been quantified a default volume of 1000m ³ per fuel storage facility is to be used in cell C-22.
	On site remediation of contaminated soil (1000-10,000m ³)		m ³	\$51.09	\$0.00	Where an assessment of the volume of contaminated material has been made this volume is to be included. Where the volume is not known or has not been quantified a default volume of 1000m ³ per fuel storage facility is to be used in cell C-22.
	On site remediation of contaminated soil (>10,000m ³)		m ³	\$38.32	\$0.00	Where an assessment of the volume of contaminated soil has been made this volume is to be included. Where the volume is not known or has not been quantified a default volume of 1000m ³ per fuel storage facility is to be used in cell C-22.
	Final trim, rock rake & deep rip	1.3	Ha	\$638.66	\$830.26	This item includes the Rock Crushing and Product stockpile areas and workshop areas.
	Source, cart and spread topsoil.	2636	m ³	\$1.53	\$4,040.45	This includes sourcing, carting and spreading of a suitable volume of topsoil to cover the rock crushing and product stockpile areas.
	Spoil amelioration and supply and spread seed and fertiliser.	1.3	Ha	\$4,726.12	\$6,143.95	This item includes the area requiring the addition of ameliorates such as lime or gypsum prior to the application of grass seed and fertiliser
Precinct Security Deposit					\$11,014.67	
Rail Line and Loop (if applicable)	Remove Rail Loop and spur		m	\$7.66	\$0.00	This item includes the pulling up and removal from site of railway line and sleepers. Calculated as a lineal metre.
	Reshape rail spur and loadout area		Ha	\$6,386.65	\$0.00	Enter the total area of the rail line footprint requiring to be covered with fertiliser (and/or lime & gypsum) prior to seeding Trees will be more expensive than grass.
	Final trim, rock rake & deep rip		Ha	\$638.66	\$0.00	This item includes the area requiring minor reshaping, rock raking and deep ripping (only as required) to enhance revegetation program
	Spoil amelioration and supply and spread pasture seed and fertiliser.		Ha	\$4,726.12	\$0.00	This item includes the area requiring the addition of ameliorates such as lime or gypsum prior to the application of grass seed and fertiliser
Precinct Security Deposit					\$0.00	
Admin Buildings	Disconnect and terminate services	0	@	\$6,386.65	\$0.00	This item includes disconnecting and terminating all services such as power, water and sewer. It is a "one off" cost
	Demolish and remove small buildings		m ²	\$89.41	\$0.00	Enter the total area of small buildings and offices in the admin area. It should not include demountables which can be removed from site. It does not include workshops.
	Demolish and remove industrial buildings		m ²	\$204.37	\$0.00	Enter the total area of workshop facilities in the admin area.
	Remove Concrete pads, Footings and bitumen (carpark)		m ²	\$12.77	\$0.00	Enter the total area the workshops and buildings. Include the area of any bitumen carparks (or similar)
	Final trim, rock rake & deep rip		Ha	\$638.66	\$0.00	This item includes the area requiring minor reshaping, rock raking and deep ripping (only as required) to enhance revegetation program
	Source, cart and spread topsoil.		m ³	\$1.53	\$0.00	This includes sourcing, carting and spreading of a suitable volume of topsoil to cover the admin area and carparks.
	Spoil amelioration and supply and spread pasture seed and fertiliser.		Ha	\$4,726.12	\$0.00	Enter the total area of the admin, etc footprint requiring to be covered with fertiliser (and/or lime & gypsum) prior to seeding UNIT RATE: Depends on the required rehabilitation commitment (ie. Trees will be more expensive than grass)
Precinct Security Deposit					\$0.00	
Access & Haul Roads	Reshape deep rip and ameliorate sealed/unsealed roads		Ha	\$6,386.65	\$0.00	Enter the total area of the road footprint requiring reshaping and deep ripping.
	Source, cart and spread topsoil.		m ³	\$1.53	\$0.00	This includes sourcing, carting and spreading of a suitable volume of topsoil to cover the roads
	Spoil amelioration and supply and spread seed and fertiliser.		Ha	\$4,726.12	\$0.00	This item includes the area requiring the addition of ameliorates such as lime or gypsum prior to the application of grass seed and fertiliser
Precinct Security Deposit					\$0.00	
Sewerage / Water Treatment Plant	Disconnect and terminate services	0	@	\$3,193.32	\$0.00	This item includes disconnecting and terminating all services such as power, water and sewer. It is a "one off" cost
	Demolish and remove small buildings / tanks		m ²	\$89.41	\$0.00	Enter the total area of small buildings and tanks.
	Remove contaminated material from areas for disposal (ie. chemical spillage in / around storage sheds).		m ³	\$2.55	\$0.00	Enter the total volume (ie. area x depth of material) to be scalped off for disposal. UNIT RATE: Depends on the haulage distance to the point where the material is to be disposed.
	Final trim, rock rake & deep rip		Ha	\$638.66	\$0.00	This item includes the area requiring minor reshaping, rock raking and deep ripping (only as required) to enhance revegetation program
	Source, cart and spread topsoil.		m ³	\$1.53	\$0.00	This includes sourcing, carting and spreading of a suitable volume of topsoil to cover the sewerage and water treatment areas.
	Spoil amelioration and supply and spread seed and fertiliser.		Ha	\$4,726.12	\$0.00	This item includes the area requiring the addition of ameliorates such as lime or gypsum prior to the application of grass seed and fertiliser

Precinct Security Deposit					\$0.00	
Hardstand /Laydown Areas	Remove contaminated material from areas for disposal (ie. chemical/hydrocarbon spillage in the hard stand area).		m ³	\$2.55	\$0.00	Enter the total volume (ie. area x depth of material) to be scalped off for disposal. UNIT RATE: Depends of the haulage distance to the point where the material is to be disposed.
	Final trim, rock rake & deep rip		Ha	\$638.66	\$0.00	This item includes the area requiring minor reshaping, rock raking and deep ripping (only as required) to enhance revegetation program
	Source, cart and spread topsoil.		m ³	\$1.53	\$0.00	This includes sourcing, carting and spreading of a suitable volume of topsoil to cover the hardstand laydown areas
	Spoil amelioration and supply and spread seed and fertiliser.		Ha	\$4,726.12	\$0.00	This item includes the area requiring the addition of ameliorates such as lime or gypsum prior to the application of grass seed and fertiliser
Precinct Security Deposit					\$0.00	
Other	Other 1 <insert>				\$0.00	This item includes <<to be added by the operator>>
	Other 2 <insert>				\$0.00	This item includes <<to be added by the operator>>
	Other 3 <insert>				\$0.00	This item includes <<to be added by the operator>>
Precinct Security Deposit					\$0.00	

Total Security Deposit for the "Domain"

\$11,014.67

Domain 2: Tailings & Rejects Emplacements (if applicable)

Detail of person filling out the Worksheet:

Legend:

Name	
Position	
Department	
Date	

	Item fixed no entry required
	Input from site optional (if information available)
	Input mandatory

Tailings Dam / Impoundment (Key Information):

Materials Stored (ie. coal fines, coarse or co-disposed)
 Volume Stored (m3)
 Maximum Embankment Height (m)
 Maximum Embankment Length (m)
 Year Dam / Emplacement Commissioned
 Storage area (ha)
 Catchment Area of Tailings Dam / Emplacement (ha)
 Briefly describe embankment construction.
 (earthen, clay /rejects core, etc)

Management Precinct	Activity / Description	Quantity	Unit	Unit Price	Total Cost	Description / Notes:
Tailings Dams / Emplacements	Source, cart and spread suitable material to cap the tailings emplacement (cap thickness determined by MOP)		m ³	\$2.55	\$0.00	This includes sourcing, carting and spreading of a suitable volume material to cap the tailings emplacement. The material must have appropriate chemical & physical properties.
	Apply engineered treatment as required (i.e. capping, capillary breaks, etc) - design in accordance with the MOP commitments.		Ha	\$57,479.81	\$0.00	This includes the area that requires engineering treatment is required to satisfy conditions of the MOP. This may include compaction or addition of multiple layers and / or capillary breaks.
	Reshape walls / buttress around the dam / emplacement - earthworks only		Ha	\$6,386.65	\$0.00	This includes the area that requires stabilisation and reshaping works around the walls of the emplacement (i.e. removal of rills and pipes that may present long term stability issues).
	Final trim, rock rake & deep rip		Ha	\$638.66	\$0.00	This item includes the area requiring minor reshaping, rock raking and deep ripping (only as required) to enhance revegetation program
	Structural works, banks waterways		Ha	\$1,788.26	\$0.00	This item includes the area requiring earthworks (banks, & drains, etc) to manage all surface water on the top of the emplacement to ensure that it is shed off the cap.
	Source, cart and spread topsoil.		m ³	\$1.53	\$0.00	This includes sourcing, carting and spreading of a suitable volume of topsoil to cover the tailings dam / emplacement.
	Spoil amelioration and supply and spread seed and fertiliser.		Ha	\$4,726.12	\$0.00	This item includes the area requiring the addition of ameliorates such as lime or gypsum prior to the application of grass seed and fertiliser
	Maintenance of rehabilitated areas (up to 5 years)		Ha	\$830.26	\$0.00	This item includes the total area of rehabilitation that has been established and requires subsequent fertiliser application. It assumes application twice on the first five (5) years after establishment
	Precinct Security Deposit				\$0.00	
Other	Other 1 <insert>				\$0.00	This item includes <<to be added by the operator>>
	Other 2 <insert>				\$0.00	This item includes <<to be added by the operator>>
	Other 3 <insert>				\$0.00	This item includes <<to be added by the operator>>
	Precinct Security Deposit				\$0.00	

Total Security Deposit for the "Domain"

\$0.00

Domain 3: Waste Rock Dumps

Detail of person filling out the Worksheet:

Legend:

Name	
Position	
Department	
Date	

	Item fixed no entry required
	Input from site optional (if information available)
	Input mandatory

Management Precinct	Activity / Description	Quantity	Unit	Unit Price	Total Cost	Description / Notes:
Successful Rehabilitation	Maintenance of Established Revegetated Area	1.6	Ha	\$830.26	\$1,328.42	This item includes the total area of rehabilitation that have been established and require subsequent fertiliser application. It assumes application twice on the first five (5) years after establishment
	Maintenance of Shaped Topsoiled and Seeded		Ha	\$830.26	\$0.00	This item includes the total area of that have been shaped, topsoiled and seeded and requires subsequent fertiliser application. It assumes application twice on the first five (5) years after establishment
Precinct Security Deposit					\$1,328.42	
Shaped Waste Rock Dumps	Final trim, rock rake & deep rip		Ha	\$638.66	\$0.00	This item includes the area requiring minor reshaping, rock raking and deep ripping to enhance revegetation program.
	Structural works, banks, rock lined waterways		Ha	\$1,788.26	\$0.00	This item includes the area requiring earthworks (banks, & drains, etc) to manage all surface water on the top of the emplacement to ensure that it is shed off the dump.
	Source, cart and spread topsoil.		m ³	\$1.53	\$0.00	This includes sourcing, carting and spreading of a suitable volume of topsoil to cover the shaped overburden dumps.
	Spoil amelioration and supply and spread seed and fertiliser.		Ha	\$4,726.12	\$0.00	This item includes the area requiring the addition of ameliorates such as lime or gypsum prior to the application of grass seed and fertiliser
			Ha	\$830.26	\$0.00	This item includes the total area of that have been shaped, topsoiled and seeded and requires subsequent fertiliser application. It assumes application twice on the first five (5) years after establishment
Precinct Security Deposit					\$0.00	
Unshaped Waste Rock Dumps (minor reshaping required)	Minor pushing, final trim, rock rake & deep rip	.17	Ha	\$638.66	\$108.57	This item includes the area requiring minor reshaping, rock raking and deep ripping to enhance revegetation program.
	Structural works, banks, rock lined waterways		Ha	\$1,788.26	\$0.00	This item includes the area requiring earthworks (banks, & drains, etc) to manage all surface water on the top of the emplacement to ensure that it is shed off the dump.
	Source, cart and spread topsoil.	1672	m ³	\$1.53	\$2,562.83	This includes sourcing, carting and spreading of a suitable volume of topsoil to cover the tailings dam / emplacement.
	Spoil amelioration and supply and spread seed and fertiliser.	.17	Ha	\$4,726.12	\$803.44	This item includes the area requiring the addition of ameliorates such as lime or gypsum prior to the application of grass seed and fertiliser
	Maintenance of rehabilitated areas (up to 5 years)	.17	Ha	\$830.26	\$141.14	This item includes the total area of that have been shaped, topsoiled and seeded and requires subsequent fertiliser application. It assumes application twice on the first five (5) years after establishment
Precinct Security Deposit					\$3,615.99	
Unshaped Waste Rock Dumps (major earthworks required)	Major bulk pushing to achieve grades nominated in the MOP (i.e < 18°)		m ³	\$1.41	\$0.00	This item includes the volume requiring major reshaping, rock raking and deep ripping (only as required) to enhance revegetation program.
	Minor pushing, final trim, rock rake & deep rip		Ha	\$638.66	\$0.00	This item includes the area requiring minor reshaping, rock raking and deep ripping to enhance revegetation program.
	Structural works, banks, rock lined waterways		Ha	\$1,788.26	\$0.00	This item includes the area requiring earthworks (banks, & drains, etc) to manage all surface water on the top of the dump to ensure that the water is shed off.
	Source, cart and spread topsoil.		m ³	\$1.53	\$0.00	This includes sourcing, carting and spreading of a suitable volume of topsoil to cover the tailings dam / emplacement.
	Spoil amelioration and supply and spread seed and fertiliser.		Ha	\$4,726.12	\$0.00	This item includes the area requiring the addition of ameliorates such as lime or gypsum prior to the application of grass seed and fertiliser
	Maintenance of rehabilitated areas (up to 5 years)		Ha	\$830.26	\$0.00	This item includes the total area of that have been shaped, topsoiled and seeded and requires subsequent fertiliser application. It assumes application twice in the first five (5) years after establishment
Precinct Security Deposit					\$0.00	
Other	Other 1 <insert>				\$0.00	This item includes <<to be added by the operator>>
	Other 2 <insert>				\$0.00	This item includes <<to be added by the operator>>
	Other 3 <insert>				\$0.00	This item includes <<to be added by the operator>>
Precinct Security Deposit					\$0.00	

Total Security Deposit for the "Domain"

\$4,944.41

Domain 4: Active Quarry & Voids

Detail of person filling out the Worksheet:

Legend:

Name	
Position	
Department	
Date	

	Item fixed no entry required
	Input from site optional (if information available)
	Input mandatory

Management Precinct	Activity / Description	Quantity	Unit	Unit Price	Total Cost	Description / Notes:
Active Pit (including the voids and any internal benches or mine strips)	Major bulk pushing of the low wall are to achieve grades nominated in the MOP (i.e < 18°)	0	m ³	\$1.41	\$0.00	This item includes the volume requiring major reshaping, rock raking and deep ripping (only as required) to enhance revegetation program UNIT RATE: dozer push rate
	Active pit area - benches blasted and doze to < 18°		m ³	\$1.41	\$0.00	This item includes the total area of rehabilitation that have been established and require subsequent fertiliser application. It assumes application twice on the first five (5) years after establishment UNIT RATE: drill & blast + dozer push
	Final trim, rock rake & deep rip	7.3	Ha	\$638.66	\$4,662.25	This item includes the area requiring minor reshaping, rock raking and deep ripping to enhance revegetation program
	Structural works, banks waterways		Ha	\$1,788.26	\$0.00	This item includes the area requiring earthworks (banks, & drains, etc) to manage all surface water on the top of the emplacement to ensure that it is shed off the reshaped areas
	Source, cart and spread topsoil.	14579	m ³	\$2.55	\$37,244.36	This includes sourcing, carting and spreading of a suitable volume of topsoil to cover the talins dam / emplacement
	Spoil amelioration and supply and spread / tree pasture seed and fertiliser.	7.3	Ha	\$4,726.12	\$34,500.66	This item includes the area requiring the addition of ameliorates such as lime or gypsum prior to the application of grass seed and fertiliser
Precinct Security Deposit					\$76,407.28	
Ramps			m ³	\$1.41	\$0.00	This item includes the volume requiring major reshaping.
	Final trim, rock rake & deep rip		Ha	\$638.66	\$0.00	This item includes the area requiring minor reshaping, rock raking and deep ripping to enhance revegetation program
	Structural works, banks waterways		Ha	\$1,788.26	\$0.00	This item includes the area requiring earthworks (banks, & drains, etc) to manage all surface water on the top of the emplacement to ensure that it is shed off the reshaped areas
	Source, cart and spread topsoil.		m ³	\$2.55	\$0.00	This includes sourcing, carting and spreading of a suitable volume of topsoil to cover the reshaped ramps
	Spoil amelioration and supply and spread pasture / tree seed and fertiliser.		Ha	\$4,726.12	\$0.00	This item includes the area requiring the addition of ameliorates such as lime or gypsum prior to the application of grass seed and fertiliser
Precinct Security Deposit					\$0.00	
Highwall treatment	Drill & Blast Highwall OR		m ³	\$0.89	\$0.00	This item includes the total area of rehabilitation that have been established and require subsequent fertiliser application. It assumes application twice on the first five (5) years after establishment UNIT RATE: drill & blast + dozer push
	Major bulk pushing of the high wall are to achieve grades nominated in the MOP (i.e < 18°)	67976	m ³	\$1.41	\$95,510.50	This item includes the volume requiring major reshaping, rock raking and deep ripping (only as required) to enhance revegetation program UNIT RATE: dozer push rate
	Final trim, rock rake & deep rip	0.83	Ha	\$638.66	\$530.09	This item includes the area requiring minor reshaping, rock raking and deep ripping to enhance revegetation program
	Source, cart and spread topsoil (at 20cm)	1663	m ³	\$1.53	\$2,549.04	This includes sourcing, carting and spreading of a suitable volume of topsoil to cover the reshaped area
	Spoil amelioration and supply and spread pasture seed and fertiliser.	0.83	Ha	\$4,726.12	\$3,922.68	This item includes the area requiring the addition of ameliorates such as lime or gypsum prior to the application of grass seed and fertiliser
	Security Fence around steep section highwall		m	\$63.87	\$0.00	This item includes the erection of a 2m security fence (lineal metre) around the void and other dangerous areas
	High wall treatment - (trench + safety berm)		m	\$73.45	\$0.00	This item includes the construction of a safety berm and fill (lineal metre) around the highwall to stop all vehicles, act accidentally driving over haul road (engineered control).
Precinct Security Deposit					\$102,512.31	
Disturbance ahead of Mining + water management structures	Areas cleared ahead of mining - re-establish vegetation commensurate with surround vegetation	0.05	Ha	\$2,682.39	\$134.12	This includes the direct application of seed to restore the vegetation that was disturbed as part of clearing operations ahead of the mine.
	Areas topsoil stripped ahead of mining - source cart and respread topsoil	117	m ³	\$2.55	\$298.90	This includes sourcing, carting and spreading of a suitable volume of topsoil to cover the that have been disturbed
	Reshape, deep rip, ameliorate and seed highwall / internal access roads and tracks		Ha	\$6,386.65	\$0.00	This item includes the area requiring the addition of ameliorates such as lime or gypsum prior to the application of grass / tree seed and fertiliser
	Reshape, deep rip, ameliorate and seed exploration lines / areas		Ha	\$4,726.12	\$0.00	This item includes the area requiring the addition of ameliorates such as lime or gypsum prior to the application of grass / tree seed and fertiliser
	Clean water dams to be retained after mine closure -make safe and minor earthworks.		@	\$2,554.66	\$0.00	This item includes making the dam spillway, and walls stable and ensuring the integrity of the dam wall, etc.
	Dirty Water Dams (Drain and remove sediments to make dam water clean)	1210	m ³	\$4.09	\$4,945.82	This item includes draining the dam and removing 500mm of potentially contaminated (saline) sediments to be buried in the pit. UNIT RATE: must consider the distance from the dam to the disposal area.
Precinct Security Deposit					\$5,378.83	
River & Creek Diversions	Creek diversion - Channel maintenance through spoil / backfill (20% of estimated diversion construction costs due to unknown in landform stability)		m	\$383.20	\$0.00	This item includes the length (m) requiring ongoing maintenance of diversions constructed through unconsolidated overburden. This will include earthworks repairs and stabilisation following flow events. It assumes a suitably qualified engineer has designed and signed off on construction of the diversion
	Creek diversion - Channel maintenance instu (10% of estimated construction cost for diversion)		m	\$191.60	\$0.00	This item includes the length (m) requiring ongoing maintenance of diversions constructed through unnatural ground. This will include earthworks repairs and stabilisation following flow events. It assumes a suitably qualified engineer has designed and signed off on construction of the diversion
	Creek diversion - Vegetation maintenance		m ²	\$0.38	\$0.00	This item includes the ongoing maintenance of vegetation within the diversion channel & batters.
Precinct Security Deposit					\$0.00	
Other	Other 1 <insert>				\$0.00	This item includes <<to be added by the operator>>
	Other 2 <insert>				\$0.00	This item includes <<to be added by the operator>>
	Other 3 <insert>				\$0.00	This item includes <<to be added by the operator>>
Precinct Security Deposit					\$0.00	

Total Security Deposit for the "Domain"

\$184,298.42

Domain 5: Other

Detail of person filling out the Worksheet:

Legend:

Name	
Position	
Department	
Date	

	Item fixed no entry required
	Input from site optional (if information available)
	Input mandatory

Management Precinct	Activity / Description	Quantity	Unit	Unit Price	Total Cost	Description / Notes:
Other (eg. site contamination, closure plan preparation, etc)	The restoration and care and maintenance of items that have historical significance and are to be retained after the cessation of mining		@	\$25,546.58	\$0.00	This item includes ensuring that sufficient resources are made available to restore items of heritage significance and also provide money to enable the ongoing care and maintenance of the structure (if not the responsibility of any another stakeholder i.e. council, historical society)
	Cap exploration holes		@	\$319.33	\$0.00	This includes capping & rehabilitation of all old Cap exploration holes around the site
	Construction / Deconstruction of Bridges and crossings		@	\$0.00	\$0.00	Value to be provided by company
	Construction of Fencing - general		@	\$63.87	\$0.00	Includes general fencing around site or site works
	Other 5 <insert>				\$0.00	This item includes <<to be added by the operator>>
	Other 6 <insert>				\$0.00	This item includes <<to be added by the operator>>
	Other 7 <insert>				\$0.00	This item includes <<to be added by the operator>>
					\$0.00	This item includes <<to be added by the operator>>
	Other 9 <insert>				\$0.00	This item includes <<to be added by the operator>>
	Other 10 <insert>				\$0.00	This item includes <<to be added by the operator>>
Precinct Security Deposit					\$0.00	

Total Security Deposit for the "Domain" \$0.00

Third Party Project Management & Contingencies

Detail of person filling out the Worksheet:

Legend:

Name	
Position	
Department	
Date	

	Item fixed no entry required
	Input from site optional (if information available)
	Input mandatory

Item	Activity / Description	Quantity	Unit	Cost	Total Cost	Description / Notes:
Sub-Total (Domains)					\$200,257.50	
Third Party Project Management	Mobilisation & Demobilisation (third party contractor rates apply).	1	@	\$0.00	\$0.00	Cost would have to be determined (justified) on the basis of the equipment required and the distance of the mine from the likely contractor to be used.
	DRE Tender Preparation and Assessment	1	@	\$6,386.65	\$6,386.65	Values provided in this cell are provided as a minimum, and should be assessed based on the size of the site, and works required.
	Development of Unplanned Closure Plan	1	@	\$31,933.23	\$31,933.23	Values provided in this cell are provided as a minimum, and should be assessed based on the size of the site, and works required.
	Post closure environmental monitoring	5%	%	\$10,012.88	\$10,012.88	% of the subtotal for all domains
	Project Management & Surveying	10%	%	\$20,025.75	\$20,025.75	% of the subtotal for all domains
	Indexation		@		\$0.00	
	Other <insert>		@		\$0.00	
Sub-Total (Sundry Items)					\$68,358.50	
Sub-Total (Domain and Sundry Items)					\$268,616.00	
Contingency	Contingency	10%	%	\$268,616.00	\$26,861.60	
Precinct Security Deposit					\$295,477.60	exclusive of GST

Sub-Total Rehabilitation Estimate for "Domains"	\$200,257.50
Total Rehabilitation Estimate for "Sundry Items"	\$68,358.50
Contingency (based on Sundry and Domains)	\$26,861.60

VGT Environmental Compliance Solutions Pty Ltd

- Environmental & Geological Assessments
- Environmental Monitoring & Management
- Quarry/Mine Plans & Rehabilitation Plans
- CPESC Endorsed Sediment & Erosion Plans
- Annual Reports
- NATA Accredited Laboratory

Unit 4/30 Glenwood Dr Thornton NSW 2322

PO Box 2335 Greenhills NSW 2323

P (02)4028 6412 E mail@vgt.com.au

www.vgt.com.au ABN 26 621 943 888



Environmental
Compliance
Solutions Pty Ltd

