Enhance Place Pty Limited

ABN: 31 077 105 867

Enhance Place Mine

Care and Maintenance Mining Operations Plan

Prepared by

Enhance Place Pty Limited

December 2016

ENHANCE PLACE MINE

CARE AND MAINTENANCE

MINING OPERATIONS PLAN

Name of Mine:	Enhance Place Mine
C&M MOP Commencement Date:	1 April 2017
C&M MOP Completion Date:	29 August 2023
Mining Authorisations:	ML 1520, ML 1458, ML 1422
Name of Authorisation/ Authorisation holder(s):	Enhance Place Pty Limited
Name of Mine Operator:	Enhance Place Pty Limited
Mining Engineering Manager:	Graham Goodwin Pine Dale Mine, Castlereagh Highway, Blackmans Flat, NSW 2790 Ph. (02) 63 551 761
Environmental Representative:	Graham Goodwin
Name of Representatives(s) of the Authorisation Holder(s):	Andrew Fisher
Title of Representatives(s) of the Authorisation Holder(s):	Director
Signature of Representatives(s) of the Authorisation Holder(s):	Andrew Fisher
Date:	24/1/17

Revision History			
Version	**Date**	**Author**	**Authorised by:**
1	February 2014	Ben Eastwood, Michelle Evans	Graham Goodwin
2	January 2015	Tom Hurdley	Graham Goodwin
3	December 2016	Karen Tripp	Graham Goodwin

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1 Introduction

1.1 History of Operations

EnergyAustralia owns Enhance Place Pty Ltd (Enhance Place) which operates the Enhance Place Mine. Enhance Place Mine was established in 1997 to recover remnant coal from areas previously open cut mined in the 1950's. Open cut operations ceased in June 2005 when economically feasible coal reserves were exhausted.

Enhance Place Mine extracted coal over the abandoned Eastern Main Underground Mine workings (Eastern Main Mine). The Eastern Main Mine operated as a bord and pillar mine until 1975. Enhance Place operated Enhance Place Mine from 1997 until its closure in June 2005 following the extraction of all economically feasible coal reserves. Since the cessation of mining, surface water control, landform rehabilitation, seeding and feral animal and weed control programmes have been implemented.

1.2 Current Consents, Authorisations and Licences

A list of current consents, authorisations and licences applicable to the site is shown in **Table 1**.

Table 1: Status of leases, licences and approvals

Document	Date Granted	Expiry Date	Comment
Mining Lease 1520	29 August 2002	29 August 2023	ML 1520 incorporates 9.636 ha of land
Mining Lease 1458	29 November 1999	29 November 2020	ML1458 incorporates 13.98 ha of land
Mining Lease 1422	3 December 1997	3 December 2018	ML 1422 incorporates 6.992 ha of land

Enhance Place Mine is a Non-State Significant Development as described under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Lithgow City Council is the consent authority.

This C&M MOP has been prepared in accordance with the requirements for a Level 2 Mine as defined in the DRE *ESG3: Mining Operations Plan Guidelines* (NSW DPI, 2013a).

1.3 Land Ownership and Land Use

Enhance Place Mine is located in the Western Coalfields of NSW at Blackmans Flat, 15km north of Lithgow on the southern side of the Castlereagh Highway. The site is approximately 3km south-west of Mount Piper Power Station and adjacent to the Springvale Coal Handling Facility. The current status of land ownership, tenure and pre-mining land use at Enhance Place Mine is summarised in **Table 2** and **Plan 1A and 1B** (**Appendix A**).

Table 2: Land Ownership

Land Owner/Occupier	Lot/DP	Tenure (freehold leasehold)	Pre-mining land use
Mr & Mrs J. Cherry	301/751636	Freehold	Grazing
Mrs J. Cope	302/751636 303/751636	*Perpetual Lease*	Grazing
D & J Hunt	370/751651	Freehold	Grazing
State of NSW - Glen Davis Recreation Area (R. 59960)	304/751636 305/751636	Crown Land	Grazing
State of NSW	7004/1026541	Crown Land	Bush/grazing
M & L Morris	101/1145705	Freehold	Grazing

1.4 Stakeholder Consultation

This C&M MOP has been prepared in consultation with Department of Trade, Investment Regional Infrastructure and Services Division of Resources and Energy (DRE). Enhance Place will continue to undertake ongoing consultation with relevant stakeholders in regards to its activities and at the Enhance Place Mine.

2 Proposed mining activities

2.1 Project Description

There are no mining activities proposed to be undertaken at Enhance Place Mine during the term of the C&M MOP.

2.2 Asset Register

The identified site domains including their major assets are summarised in **Table 3** and shown in **Appendix A**.

Table 3: Enhance Place Asset Register

Domain	Area	Major Asset
Rehabilitation area – Pasture (D)	20 ha	Fence lines, pasture land and water management structures
Rehabilitation area – Treed areas (F)	6 ha	Fence lines and water management structures.

2.3 Activities over the MOP term

The following activities will not be undertaken during the term of the C&M MOP:

- Exploration;
- Construction;
- Mining operations;
- Rock/overburden emplacement;
- Processing residues and tailings;
- Waste management;
- Decommissioning and demolition activities; and
- Temporary stabilisation.

Progressive Rehabilitation and Completion

Rehabilitation activities have included land forming and revegetation. Activities to be undertaken during the term of the C&M MOP include erosion control works, vegetative groundcover maintenance / improvement, integrated weed management, livestock management and rehabilitation monitoring. The location, extent and status of rehabilitated land are shown in **Appendix A**.

Material Production Schedule during C&M MOP Term - No mining activities will be undertaken during the term of this C&M MOP and as such, no material production schedule is available.

3 Environmental Issues Management

3.1 Environmental Risk Assessment

Review of environmental issues associated with activities conducted under ML1520, ML1458 and ML1422 has been undertaken in accordance with standard risk assessment practices outlined in *AS/NZ ISO 31000:20009 Risk Management – Principles and Guidelines* and identifies issues and risks that require the documentation and implementation of specific mitigation measures (see **Table 4**).

Table 4: Environmental risk identification matrix

Issue	Rehabilitation activities	Rehabilitated land and remaining features
Air pollution, dust/other	Low	Low
Erosion/sedimentation	Medium	Low
Surface water pollution	Low	Low
Ground water pollution	Low	Low
Contaminated or polluted land	Low	Low
Threatened flora protection	Low	Low
Threatened fauna protection	Low	Low
Weed establishment	Medium	Medium
Operational noise	Low	Low
Visual amenity, stray light	Low	Low
Aboriginal heritage	Low	Low
Natural heritage conservation	Low	Low
Spontaneous combustion	Low	Low
Bushfire	Low	Low
Public safety	Low	Low

3.2 Environmental Risk Management

Erosion, cracking soils and weed establishment have been identified as being of medium risk to rehabilitation, in that each is likely to occur but the effects are considered to be of minor consequence. These risks will be managed through rehabilitation monitoring (refer **Section 8**), in accordance with the findings and recommendations made in the annual *Enhance Place Mine Rehabilitation Monitoring Report***.**

3.2.1 Specific risks relating to rehabilitation

Geology and Geochemistry - Enhance Place Mine is located near the western edge of the Permo-Triassic Sydney Basin, in a province referred to as the Western Coalfield and mainly occupies an extensive plateau of Triassic sandstone, deeply dissected by numerous canyons and deep sided valleys. The geochemistry of the site does not pose any significant risk to rehabilitation activities.

Material prone to spontaneous combustion - Enhance Place Mine does not have a history of spontaneous combustion and there have been no incidents recorded during active mining operations. The potential impact of spontaneous combustion to rehabilitation works is considered to be low.

Material prone to generating acid mine drainage - Enhance Place Mine does not have a history of acid mine drainage and there have been no incidents recorded during active mining operations. The potential for acid mine drainage is considered to be low.

Mine subsidence - Enhance Place Mine does not have a history of mine subsidence and there have been no incidents recorded during active mining operations. The potential for mine subsidence is considered to be low. It should be noted that the rehabilitated open cut mining area is subject to settling and movement.

Erosion - Enhance Place Mine does not contain any soil stockpiles or tailings dams. Soils and underlying geology of the site are prone to erosion when exposed. Soil surfaces at Enhance Place Mine have been rehabilitated to pasture or treed vegetation communities. Potential soil erosion and sedimentation is addressed through rehabilitation monitoring (see **Section 8**).

Soil types(s) and suitability - No soil handling, transport or stockpiling activities will be undertaken during the term of the C&M MOP. Long-term soil viability is addressed through rehabilitation monitoring (see **Section 8)** and discussed further at **Appendix B**.

Flora and fauna - Potential for disturbance to threatened species is low. No seed collection or rehabilitation activities for threatened species are proposed during the term of the C&M MOP. Enhance Place Mine has been rehabilitated for agricultural use, consistent with surrounding land uses and no habitat management activities are proposed during the term of the C&M MOP. Weed management practices will be implemented to improve pasture.

Rehabilitation monitoring (**Section 8.1**) aims to assess rehabilitation performance against nominated completion criteria (**Section** 6).

Other risks - Additional risks considered in the risk assessment and have been identified as very low or not applicable include:

- Air pollution, dust/other;
- Surface water pollution;
- Ground water pollution;
- Contaminated or polluted land;
- Operational noise;
- Visual amenity, stray light;
- Aboriginal heritage;
- Natural heritage conservation;
- Bushfire; and
- Public safety.

No mining activities will be undertaken during the term of the C&M MOP. As such, the potential impact of these risks on rehabilitation activities is considered to be low. Rehabilitation activities are not considered to pose a potential risk to any heritage items or increase the potential ignition or spread of bushfire. The site is not accessible to the general public and the potential impact of rehabilitation monitoring and integrated weed management activities on public safety is low.

4 Post Mining Land Use

4.1 Regulatory Requirements

Enhance Place Mine rehabilitation has been undertaken in accordance with the relevant planning approval and the conditions of ML 1520, ML 1458 and ML 1422. A summary of regulatory requirements is included in **Table 5**.

Table 5: Rehabilitation regulatory requirements

Reference	Condition
ML1458 *Schedule 21* **ML1520** *Schedule 21* **ML1422** *Schedule 11*	*If so directed by the Minister the lease holder shall rehabilitate to the satisfaction of the Minister any lands within the subject area which may have been disturbed by the lease holder.*
ML1458 *Schedule 23* **ML1520** *Schedule 23* **ML1422** *Schedule 13*	*If so directed by the Minister the lease holder shall rehabilitate to the satisfaction of the Minister and within such time as may be allowed by the Minister any lands within the subject area which may have been disturbed by mining or prospecting operations whether such operations were or were not carried out by the lease holder.*
ML1458 *Schedule 25* **ML1520** *Schedule 25* **ML1422** *Schedule 15*	*The lease holder shall provide and maintain to the satisfaction of the Minister efficient means to prevent contamination, pollution, erosion or siltation or any river, stream, creek, tributary, lake, dam, reservoir, watercourse or catchment area or any undue interference to fish or their environment and shall observe any instruction given or which may be given by the Minister with a view to preventing or minimising the contamination, pollution, erosion or siltation of any river, stream, creek, tributary, lake, dam, reservoir, watercourse or catchment area or any undue interference to fish or their environment.*
ML1458 *Schedule 35*	*The lease holder shall:* *(j) Complete work in relation to rehabilitation within the Warragamba Outer Catchment Area before termination of the authority to the satisfaction of the Corporation.*
ML1520 *Schedule 64*	*The lease holder shall consider the type of rehabilitation vegetation to reflect the locally indigenous flora of the area in the vicinity of the Enhance Place Colliery.*

4.2 Post Mining Land Use Goal

The post mining land use goal for Enhance Place Mine is to rehabilitate the site to pasture and some treed areas suitable for stock including cattle grazing and horses. Final rehabilitation and post mining land use is shown in **Plan 3** (**Appendix A**).

4.3 Rehabilitation Objectives

The rehabilitation objectives for the area covered by the C&M MOP are consistent with those described in the Statement of environmental Effects (1997) which supports development Application 97/97 which states:

> *'The Company's rehabilitation objectives for all areas of mine related disturbance within the*
>
> *Project Site are to:*
>
> - *Create a low maintenance, geotechnically stable and safe landform;*
> - *Stabilise all earthworks, drainage lines and disturbed areas associated with both past and future activities in order to minimise erosion and the associated generation of sediment-laden water;*
> - *Reduce the visual impact from both local or distant vantage points by means of final rehabilitation of areas of disturbance;*
> - *Blend the created landform with the surrounding land fabric; and*
> - *As appropriate, revegetate with native tree and shrub species and/or pasture species comparable with those on surrounding lands or which occurred in each area prior to agriculture of mining-related disturbance.'*

These rehabilitation objectives are considered relevant and valid and continue to apply to this C&M MOP.

5 Rehabilitation planning and management

5.1 Domain Selection

Rehabilitation has occurred in the overburden emplacement area (primary domain). The identification of secondary domains at Enhance Place Mine are summarised in **Table 6**.

Table 6: Site Domains

Code	Primary domain	Code	Secondary domain
4	Overburden emplacement area	D	Rehabilitation area - pasture
		F	Rehabilitation area – woodland

5.2 Domain rehabilitation objectives

Rehabilitation objectives for each domain are the same as the overall Enhance Place Mine rehabilitation objectives, summarised in **Section 4.3**. Post mining land use as described in **Section 4.2** will be achieved by ensuring that:

- The mitigation measures referred to in **Section 3** relating to risks to rehabilitation are implemented;
- The completion criteria /indicators as outlined for each domain and rehabilitation phase (see **Section** 6) are met by monitoring rehabilitation performance against the nominated completion criteria /indicators; and
- By mitigating any identified rehabilitation shortfalls in a timely manner.

5.3 Rehabilitation Phases

The current rehabilitation domains and status of rehabilitation phase are summarised in **Table 7**. A description of the rehabilitation phase is summarised in **Table 8.**

Table 7: Summary of rehabilitation domains and phase

Rehabilitation phase / Domain	Overburden emplacement area – pasture (4D)	Overburden emplacement area — woodland (4F)
Active Mining Area	✓	✓
Decommissioning	✓	✓
Landform Establishment	✓	✓
Growth Medium Development	✓	✓
Ecosystem and Land Use Establishment	✓	✓
Ecosystem and Land Use Sustainability	✓	✓
Relinquished Lands	×	×

Table 8: Description of rehabilitation phase

Rehabilitation Phase	Description	Ongoing monitoring and maintenance requirements	Responsibility
Ecosystem and land use sustainability	Weed management Erosion management	Identification of weed establishment and management of noxious weeds Identification and management of soil erosion	Mining Engineering Manager

6 Performance indicators and completion /relinquishment criteria

Detailed rehabilitation performance criteria have been developed for Enhance Place Mine in accordance with the DRE *ESG3: Mining Operations Plan Guidelines* (NSW DPI, 2013a) and are consistent with the rehabilitation objectives described in the Statement of Environmental Effects (1997), see **Table 9**.

Table 9: Rehabilitation completion criteria

Objective	Performance Indicator	Completion Criteria	Justification/Source	Complete (Yes/No)	Link to Trigger Action Response Plan (TARP)	Progress / Status at start of MOP
Phase **- Ecosystem and land use sustainability** ***Domain*** **- Rehabilitation Area - Pasture**						
Stable and safe landform	Erosion	Stable landform, suitable for grazing and horses	*Statement of Environmental Effects (1997), Best Practice Erosion and Sediment Control (IECA 2006)*	Yes	Yes	Satisfactory – Continue to monitor
		No exposed highwalls and adits to underground mine workings		Yes	Yes	Complete
Minimal cracking of soils from soil settling	Surface cracks	Limited areas of high concentration with cracking due to soil settling	*Statement of Environmental Effects (1997; Australian Soil and Land Survey Field Handbook (CSIRO, 2009)*	Yes	Yes	Satisfactory – Continue to monitor
Final landform is commensurate with surrounding landscape	Landform	Shape and form is visually similar to adjacent land	*Statement of Environmental Effects (1997); Australian Soil and Land Survey Field Handbook (CSIRO, 2009)*	Yes	Yes	Complete
Landscape is free draining	Ponding of water	Sediment ponds constructed	*Statement of Environmental Effects (1997)*	Yes	Yes	Complete
		Contour drains constructed		Yes	Yes	Ongoing – manage active erosion
		Relief ensures water flows as designed and directs water off site		Yes	Yes	Ongoing – maintain surface water infrastructure
Site is accessible and stock management controls in place	Access tracks, fences & gates	Site access tracks constructed	*Statement of Environmental Effects (1997)*	Yes	No	Ongoing – manage track erosion
		Fences erected		Yes	No	Complete
		Gates installed		Yes	No	Complete
Pasture areas can support cattle and horse grazing	Rural Land Capability	Pasture Rehabilitation areas are assessed to have a Rural Land Capability Class VI or better (suitable for grazing)	*Land and Soil Capability Assessment (OEH 2007); Pastures for Horses (NSW DPI 2007).*	Yes	No	Satisfactory – Continue to monitor
	Cattle and horses	Area has successfully supported stock and/or horses for >12 months at modest rates	*Statement of Environmental Effects (1997); Stock Management Plan (First Field Environmental 2016).*	Yes	No	Ongoing – manage stock rates
Pasture rehabilitation areas will be established comparable to surrounding undisturbed pasture lands	Species composition	Establishment of pasture comprising approximately 70% perennial grass and 20% annual legume, representative of species at analogue sites.	*Soil Assessment and Recommendations for Rehabilitation Areas (SLR 2014)*	Yes	No	Satisfactory – continue to monitor
	Weed presence	Weeds including African Lovegrass to comprise <10% of the pasture sward	*Soil Assessment and Recommendations for Rehabilitation Areas (SLR 2014)*	Yes	Yes	Ongoing – continue to treat & monitor
Soil profile of pasture areas developing appropriately for the intended post mining land use	Soil quality	Soil chemical characteristic including: pH, EC, major cations (K,Na, Al, Ca, Zn) Sulphur and nitrate are comparable with analogue site (PD3)	*Soil Assessment and Recommendations for Rehabilitation Areas (SLR 2014)*	Yes	No	Ongoing
	Ground cover	Ground cover (vegetation, leaf litter, mulch) >70%	*Soil Assessment and Recommendations for Rehabilitation Areas (SLR 2014)*	Yes	No	Satisfactory

Table 9: Rehabilitation completion criteria (continued)

Objective	Performance Indicator	Completion Criteria	Justification/Source	Complete (Yes/No)	Link to Trigger Action Response Plan (TARP)	Progress / Status at start of MOP
Phase **- Ecosystem and land use sustainability** ***Domain*** **- Rehabilitation Area - Woodland**						
Stable and safe landform	Erosion	Stable landform, suitable for grazing and horses	*Statement of Environmental Effects (1997), Best Practice Erosion and Sediment Control (IECA 2006)*	Yes	Yes	Satisfactory – Continue to monitor
		No exposed highwalls and adits to underground mine workings		Yes	Yes	Complete
Minimal cracking of soils from soil settling	Surface cracks	Limited areas of high concentration with cracking due to soil settling	*Statement of Environmental Effects (1997; Australian Soil and Land Survey Field Handbook (CSIRO, 2009)*	Yes	Yes	Satisfactory – Continue to monitor
Final landform is commensurate with surrounding landscape	Landform	Shape and form is visually similar to adjacent land	*Statement of Environmental Effects (1997); Australian Soil and Land Survey Field Handbook (CSIRO, 2009)*	Yes	Yes	Complete
Landscape is free draining	Ponding of water	Sediment ponds constructed	*Statement of Environmental Effects (1997)*	Yes	Yes	Complete
		Contour drains constructed		Yes	Yes	Ongoing – manage active erosion
		Relief ensures water flows as designed and directs water off site		Yes	Yes	Ongoing – maintain surface drainage infrastructure
Site is accessible and stock management controls in place	Access tracks, fences & gates	Site access tracks constructed	*Statement of Environmental Effects (1997)*	Yes	No	Ongoing – manage track erosion
		Fences erected		Yes	No	Complete
		Gates installed		Yes	No	Complete
Tree rehabilitation areas will be established and compatible with surrounding treed vegetation	Species composition	Vegetation is established in accordance with the approved species mix	*Statement of Environmental Effects (1997)*	Yes	No	Complete
	Vegetation health	More than 75% of planted species are assessed to be healthy and growing.	*Ecosystem function Analysis (CSIRO 2008)*	Yes	No	Satisfactory – continue to monitor
	Vegetation distribution	Native trees planted in designated areas as generally shown in MOP Plan 3.	*Statement of Environmental Effects (1997)*	Yes	No	Complete
	Ground cover	Ground cover (vegetation, leaf litter, mulch) >70% at year 5.	*Statement of Environmental Effects (1997); Ecosystem function Analysis (CSIRO 2008)*	Yes	No	Satisfactory – continue to monitor
Reduced visual impact	Visual amenity	Completion of bulk earthworks to create final landform	*Statement of Environmental Effects (1997)*	Yes	No	Complete
		Completion of seeding and tree plantings		Yes	No	Ongoing – monitor /maintain plantings

7 Rehabilitation implementation

7.1 Status at MOP commencement

A summary of the status of each domain is included in **Table 10** and **Plan 2** (**Appendix A**).

Table 10: Domain activities

Code	Secondary domains (post mining land use)	Description
D	Rehabilitation – pasture	- Surface drainage implemented - Taller grasses slashed. Current landowner has introduced horses and commenced grazing. - Stock Management Plan implemented - Noxious weeds treated with selective herbicide
F	Rehabilitation – treed areas	- Surface drainage implemented - Fencing erected to prevent access by horses - Tube stock planted

7.2 Proposed rehabilitation activities during the MOP term

Rehabilitation activities will generally be conducted in accordance with best practice management to ensure the rehabilitation completion criteria is achieved (refer to **Table 9**). The location of rehabilitation activities is shown in **Appendix A**. Rehabilitation activities proposed to be conducted during the term of the C&M MOP may include:

- Erosion management;
- Soil stabilisation;
- Pasture improvement;
- Treed area improvement; and,
- Weed management.

Erosion management – the final landform shaping and drainage control structures have been completed. The potential for major erosion (gully or tunnel erosion; mass movement) is considered to have been mitigated as there is no evidence of significant erosion occurring at the site. Surface erosion may occur in areas where rehabilitation has not been successful, or as a result of overgrazing. Active surface and rill erosion will be identified and treated through replanting, installation of temporary fencing or through the improvement of surface drainage structures as appropriate.

Cracking soils, waterlogging – Cracking soils and waterlogging may occur in areas of overgrazing or where rehabilitation has not been successful or adjacent the highwall as a results of subsidence and soil movement. Areas of cracking soils and waterlogging will be mechanically improved, filled and replanted as appropriate. Temporary fencing may be required to prevent overgrazing during regrowth.

Poor surface drainage – Surface water pooling may occur as a result of inappropriate or inadequate drainage structures. Sediment ponds and contour drains have been constructed where appropriate and there is no evidence of failure to date. Drainage structures will continue to be examined, in the unlikely event that poorly drained surfaces are identified relevant maintenance works will be undertaken.

Pasture improvement - The study area is privately owned with stock management being the responsibility of the landowner. Enhance Place has previously installed fencing to create three fenced and watered paddocks to assist the land owner with stock management and consequently assist with rehabilitation of the pasture. However, rehabilitation and soil assessment studies have noted that the land has been heavily overgrazed by horses as one large set stocked paddock.

During the previous MOP term, Enhance Place have engaged with the landowner and implemented the stock management practices noted in the *Enhance Place Mine Stock Management Plan* (First Field Environmental, 2016), **Appendix C**. This includes utilisation of the existing fencing layout to assist with time control or rotational grazing to improve pasture. Outcomes of the engagement will be reported to DRE in the Annual Environmental Management Report.

Pastured areas would also be treated consistent with the recommendations provided at **Appendix B**.

Treed area improvement - maintenance of the additional tube stock that has been planted within the treed rehabilitation area depicted at **Appendix A** will continue as required. Maintenance of the weed management, groundcover species and mulch / woody debris applied to support tree development will also be undertaken. Current fencing will be maintained to minimise adverse impacts from adjacent horse grazing.

Weed management – Management of noxious weeds will be controlled in accordance with the recommendations provided in the Weed Management Plan documented in the *Enhance Place Mine Stock Management Plan* (First Field Environmental, 2016) **Appendix C**.

7.3 Summary of rehabilitation areas during the MOP term

The change in size of rehabilitation areas is shown in **Table 11**.

Table 11 Rehabilitation data

Primary Domain	Secondary Domains	Code	Rehabilitation Phase	Start of MOP (ha)	End of MOP (ha)
Overburden Emplacement (4)	Pasture (D)	4D	Ecosystem Establishment	0	0
			Ecosystem Development	20	20
			Relinquished Lands	0	0
			TOTAL	**20**	**20**
	Treed areas (F)	4F	Ecosystem Establishment	0	0
			Ecosystem Development	6	6
			Relinquished Lands	0	0
			TOTAL	**6**	**6**
TOTAL				**26**	**26**

7.4 Relinquishment phase achieved during the term of the MOP

Enhance Place is seeking to move towards relinquishment of the Enhance Place Mine, as such every effort is being made to ensure the objectives of the rehabilitation are achieved. The Completion criteria have been achieved, and ongoing maintenance will continue in parallel with relinquishment formalities.

8 Rehabilitation monitoring and research

8.1 Rehabilitation monitoring

Results of rehabilitation monitoring will be used to identify successes and failures in the applied rehabilitation techniques. This will enable rehabilitation methods that have worked well to be identified and applied in future mining rehabilitation areas. Any areas identified through monitoring as not achieving the agreed completion criteria will be treated accordingly. Rehabilitation monitoring results will be reported in the Annual Environmental Management Report.

Mapping - Field mapping will identify the location and extent of:

- Erosion;
- Cracking soils;
- Drainage impediments;
- Fences and gates; and,
- Noxious weeds

Landform assessment - Landform description will provide background data for the evaluation of rehabilitation progress and will include:

- Slope angle; and
- Slope type:
  - Crest;
  - Upper slope;
  - Mid slope;
  - Lower slope;
  - Flat;
  - Open depression; and
  - Closed depression.

Erosion assessment - The assessment and management of erosion includes the identification of:

- Erosion type;
- Location; and
- Extent.

Weed assessment – The location and extent of noxious weeds (as declared for the Upper Macquarie County Council area (NSW DPI, 2013b) will be recorded. Target weeds species, particularly African Lovegrass will be identified.

Monitoring and photo points - Photographic evidence will be obtained at points within the site in order to provide a visual comparison of erosion and weed presence over time.

Overgrazing – Vegetation damage, soil erosion and waterlogging will be identified across grazed areas of the study area. Note that the study area is privately owned and managed.

8.2 Research and rehabilitation trials and use of analogue sites

No research or rehabilitation trials or use of analogue sites are to be conducted during the term of the C&M MOP.

9 Intervention and adaptive management

9.1 Threats to rehabilitation

Potential threats to rehabilitation areas at Enhance Place Mine have been identified and proposed mitigation and management measures are summarised in **Table 12**.

9.2 Trigger action response plan

The Trigger Action Response Plan (**Table 13**) summarises the mitigation measures that will be implemented in the event that rehabilitation monitoring triggers any of the identified criteria or does not meet the agreed rehabilitation criteria as described in **Table 9.**

Any exceedance having the potential to result in major impacts will be communicated to the NSW Department of Trade and Investment and relevant stakeholders. Communication will be undertaken at the earliest convenience and will be the responsibility of the Enhance Place Mine Environmental Representative.

10 Reporting

Reporting mechanisms implemented at Enhance Place Mine to ensure compliance with the MOP include:

- Rehabilitation monitoring surveys;
- Annual Environmental Management Report;
- Results against rehabilitation tables in the C&M MOP; and
- Key trends in monitoring results and progression towards achievement of rehabilitation objectives and completion /relinquishment criteria.

Table 12: Threats to rehabilitation

Secondary domains (post mining land use)	Potential threat(s)	Mitigation and management measures
Treed area (F) Pasture (D)	Loss of topsoil	Install erosion control devices. Sow with pasture species or replant tube stock and mulch. Install temporary fencing to restrict grazing pressure. Undertake erosion management in accordance with *Best Practice Erosion and Sediment Control* (IECA 2006)
	Waterlogged or cracking soils	Mechanically improve soil structure if required. Sow with pasture species and install temporary fencing to restrict grazing pressure. Undertake soil amelioration in accordance with *Diagnosing and Ameliorating Problem Soils* (WA Department of Agriculture, 2005) and *Managing Waterlogging and Inundation in Pastures, Farmnote 79/93* (WA Department of Agriculture and Food, n.d.)
	Impeded surface water drainage and increased erosion potential	Install erosion control devices and temporary fencing to restrict grazing pressure. Maintain surface drainage structures where required. Undertake drainage works in accordance with *Managing Waterlogging and Inundation in Pastures, Farmnote 79/93* (WA Department of Agriculture and Food, n.d.)
	Noxious weed infestation, non-compliance with weed management requirements	Conduct weed treatment, sow with pasture species or replant tube stock and mulch. Install temporary fencing to restrict grazing pressure. Manage noxious weeds in accordance with the *Noxious and Environmental Weed Control Handbook* (NSW DPI, 2011) and *Weed Control in Pasture and Lucerne* (NSW DPI, 2010).
	Potential spread of target weeds to other properties, competition with preferred species	Apply herbicide to actively growing plants and sow with pasture species or replant tube stock and mulch. Install temporary fencing to restrict grazing pressure. Manage African Lovegrass and other target weeds in accordance with *Weed Control in Pasture and Lucerne* (NSW DPI, 2010) and *African lovegrass* Eragrostis curvula *Fact Sheet* (DAFF, Biosecurity QLD, 2013) and Appendix B.
	Overgrazing, damage to vegetation and decreased soil stability	Install fences and gates in accordance with agreed post-mining land use requirements
	Overgrazing, damage to vegetation and decreased soil stability	Advise landholder of recommended stocking rates in accordance with *Pastures for Horses Primefacts* (NSW DPI, 2007) and recommend the Enhance Place Stock Management Plan (2016) continue to be implemented by landholder.

Table 13: Rehabilitation trigger action response plan

Potential threat(s)	Trigger level	Response action
Loss of topsoil	Presence of active surface erosion in rehabilitated areas	Undertake erosion management as required in accordance with *Best Practice Erosion and Sediment Control* (IECA 2006)
Impeded soil water holding capacity and drainage	Vegetation loss or soil exposure on cracking soils	Undertake soil amelioration as required and in accordance with *Diagnosing and Ameliorating Problem Soils* (WA Department of Agriculture, 2005)
Waterlogged soils	Vegetation loss or soil exposure on waterlogged soils	Undertake drainage works as required and in accordance with *Managing Waterlogging and Inundation in Pastures, Farmnote 79/93* (WA Department of Agriculture and Food, n.d.)
Impeded surface water drainage and increased erosion potential	Presence of surface water pooling and active water erosion	Undertake drainage works as required and in accordance with *Managing Waterlogging and Inundation in Pastures, Farmnote 79/93* (WA Department of Agriculture and Food, n.d.)
Noxious weed infestation, non-compliance with weed management requirements	Presence of noxious weeds	Manage noxious weeds in accordance with the *Noxious and Environmental Weed Control Handbook* (NSW DPI, 2011) and *Weed Control in Pasture and Lucerne* (NSW DPI, 2010) and recommendations provided at Appendix B.
Potential spread of target weeds to other properties, competition with preferred species	Establishment of African lovegrass or target weed patches excluding or outcompeting preferred species	Manage African Lovegrass and other target weeds in accordance with *Weed Control in Pasture and Lucerne* (NSW DPI, 2010) and *African lovegrass* Eragrostis curvula *Fact Sheet* (DAFF, Biosecurity QLD, 2013) and recommendations provided at Appendix B.
Overgrazing, damage to vegetation and decreased soil stability	Evidence of overgrazing and active surface erosion in rehabilitated pasture areas.	Manage stocking rates and recommendations provided in the *Enhance Place Mine Stock Management Plan* (2016) to achieve a Rural Land Capacity Class VI or better, as per the *Land and Soil Capability Assessment* (OEH 2007) and against *Pastures for Horses* (NSW DPI 2007).

11 Review and implementation of the MOP

11.1 Review of the MOP

Review of the C&M MOP is the responsibility of the Mining Engineering Manager and will be undertaken as required or when significant changes to the mining operation occur. Revised documents will be controlled.

11.2 Implementation

Responsibility for monitoring, review and implementation of the C&M MOP is summarised in **Table 14.**

Table 14 Responsibilities

Action	Responsibility	Timing
Monitoring	Enhance Place Mine Environmental Representative	Annually
Review	Manager of Mining Engineering	As required
Implementation	Manager of Mining Engineering	C&M MOP term
Reporting	Manager of Mining Engineering	As required
Document control	Manager of Mining Engineering	Ongoing

12 References

R W Corkery (1997) *Statement of Environmental Effects for the proposed integrated small scale open cut coal mining and rehabilitation activities at the former Newport No.2 open cut mine at Blackmans Flat*.

CSIRO (2009) *Australian Soil and Land Survey Field Handbook*, CSIRO, Australia

CSIRO (2008) *Ecosystem function Analysis.*

DAFF, Biosecurity QLD (2013) African lovegrass Eragrostis curvula Fact Sheet, Commonwealth Government Department of Agriculture, Fisheries and Forestry, and Biosecurity Queensland, http://www.daff.qld.gov.au/__data/assets/pdf_file/ 0011/69284/IPA-African-Lovegrass-PP63.pdf

IECA (2008) *Best Practice Erosion and Sediment Control* Books 1-6.International Erosion Control Association (Australasia), http://www.austieca.com.au/

First Field Environmental (2016) *Stock Management Plan*

NSW DPI (2007) *Pastures for Horses Primefacts,* New South Wales Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0011/109982/pastures-for-horses.pdf

NSW DPI (2010) *Weed Control in Pasture and Lucerne,* New South Wales Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0007/309157/Weed-control-in-pastures-and-lucerne.pdf

NSW DPI (2011) *Noxious and Environmental Weed Control Handbook,* New South Wales Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0017/123317/Noxious-and-environmental-weed-control-handbook.pdf

NSW DPI (2013a) *DRE ESG3: Mining Operations Plan Guidelines,* New South Wales Department of Primary Industries, http://www.resources.nsw.gov.au/__data/assets/pdf_file/0009/475434/ESG3-Mining-Operations-Plan-MOP-Guidelines-September-2013.pdf

NSW DPI (2013b) *Noxious weed declarations for Upper Macquarie County Council*, New South Wales Department of Primary Industries, http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/noxweed/

OEH (2007) *Land and Soil Capability Assessment*, Office of Environment and Heritage, NSW

SLR (2014) *Soil Assessment and Recommendations for Rehabilitation Areas.*

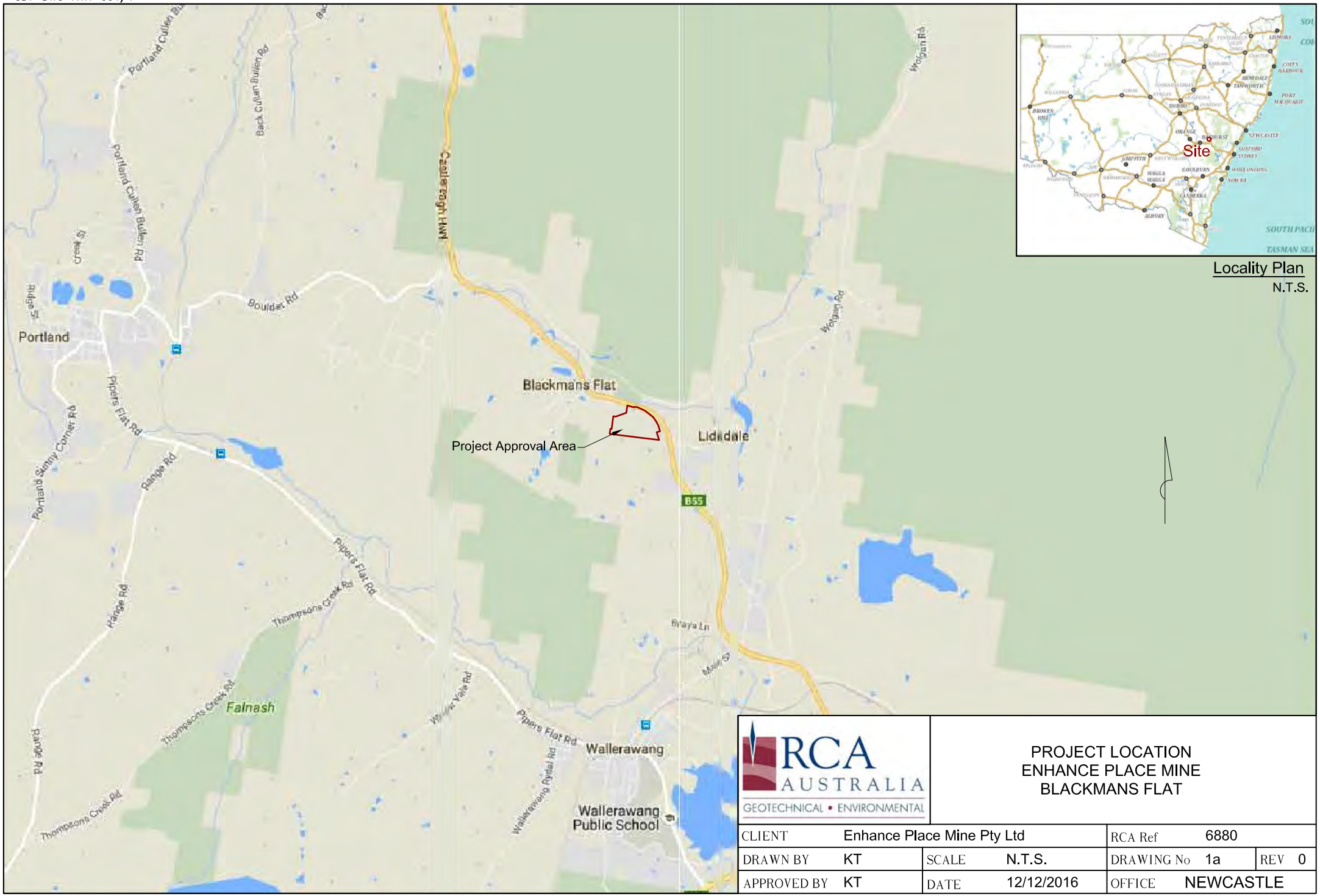
WA Department of Agriculture (2005) *Diagnosing and Ameliorating Problem Soils,* Western Australian Department of Agriculture, http://archive.agric.wa.gov.au/objtwr/imported_assets/content/lwe/land/compact/problemsoils.pdf

WA Department of Agriculture and Food (n.d.) *Managing Waterlogging and Inundation in Pastures, Farmnote 79/93,* Western Australian Department of Agriculture and Food, http://archive.agric.wa.gov.au/PC_92777.html

Appendix A

C&M Mining Operation Plans

CDT-DWG-A4H-001/1



RCA AUSTRALIA
GEOTECHNICAL • ENVIRONMENTAL

PROJECT LOCATION
ENHANCE PLACE MINE
BLACKMANS FLAT

CLIENT	Enhance Place Mine Pty Ltd			RCA Ref	6880
DRAWN BY	KT	SCALE	N.T.S.	DRAWING No 1a	REV 0
APPROVED BY	KT	DATE	12/12/2016	OFFICE	NEWCASTLE

CDT–DWG–A4H–001/1

LEGEND

H House

Natural features

0 50 100 150 200 250

metres

NOTE: Drawing adapted by plan supplied by Enhance Place Mine
Drawn by Craven, Elliston & Hayes (Lithgow) Pty Ltd
Dwg No. ENH-REH, Plan 3, 18-12-13

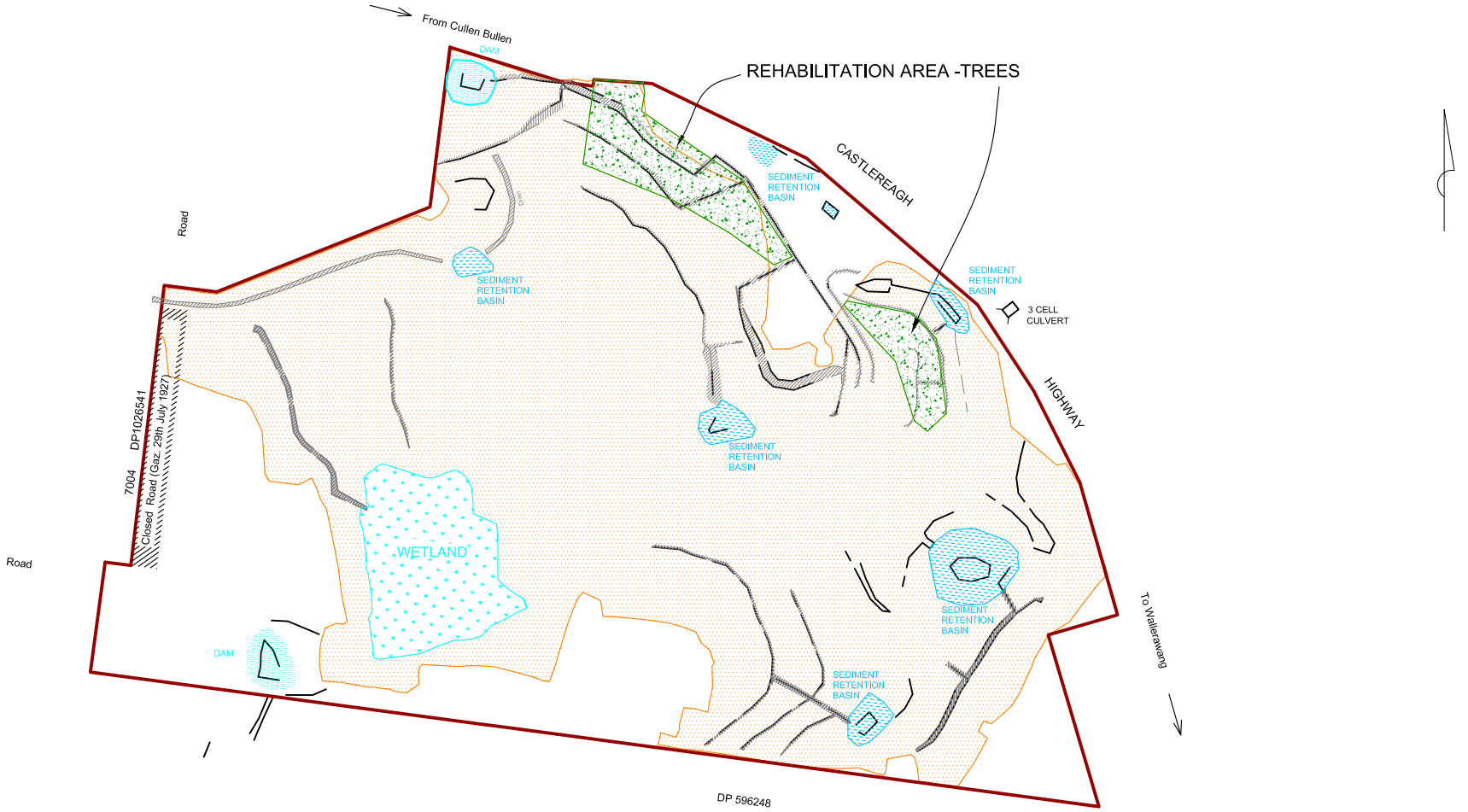
Aerial image taken from Google Earth, May 23 2006
Image position is approximate only

RCA AUSTRALIA
GEOTECHNICAL • ENVIRONMENTAL

PRE MINING ENVIRONMENT
ENHANCE PLACE MINE
BLACKMANS FLAT

CLIENT	Enhance Place Mine Pty Ltd			RCA Ref	6880
DRAWN BY	KT	SCALE	1 : 5000 (A4)	DRAWING No 1b	REV 0
APPROVED BY	KT	DATE	12/12/2016	OFFICE	NEWCASTLE

CDT–DWG–A4H–001/1



LEGEND

- Rehabilitation Area - Pasture
- Rehabilitation Area - Treed Area
- Existing dams

NOTE: Drawing adapted by plan supplied by Enhance Place Mine
Drawn by Craven, Elliston & Hayes (Lithgow) Pty Ltd
Dwg No. ENH-REH, Plan 3, 18-12-13

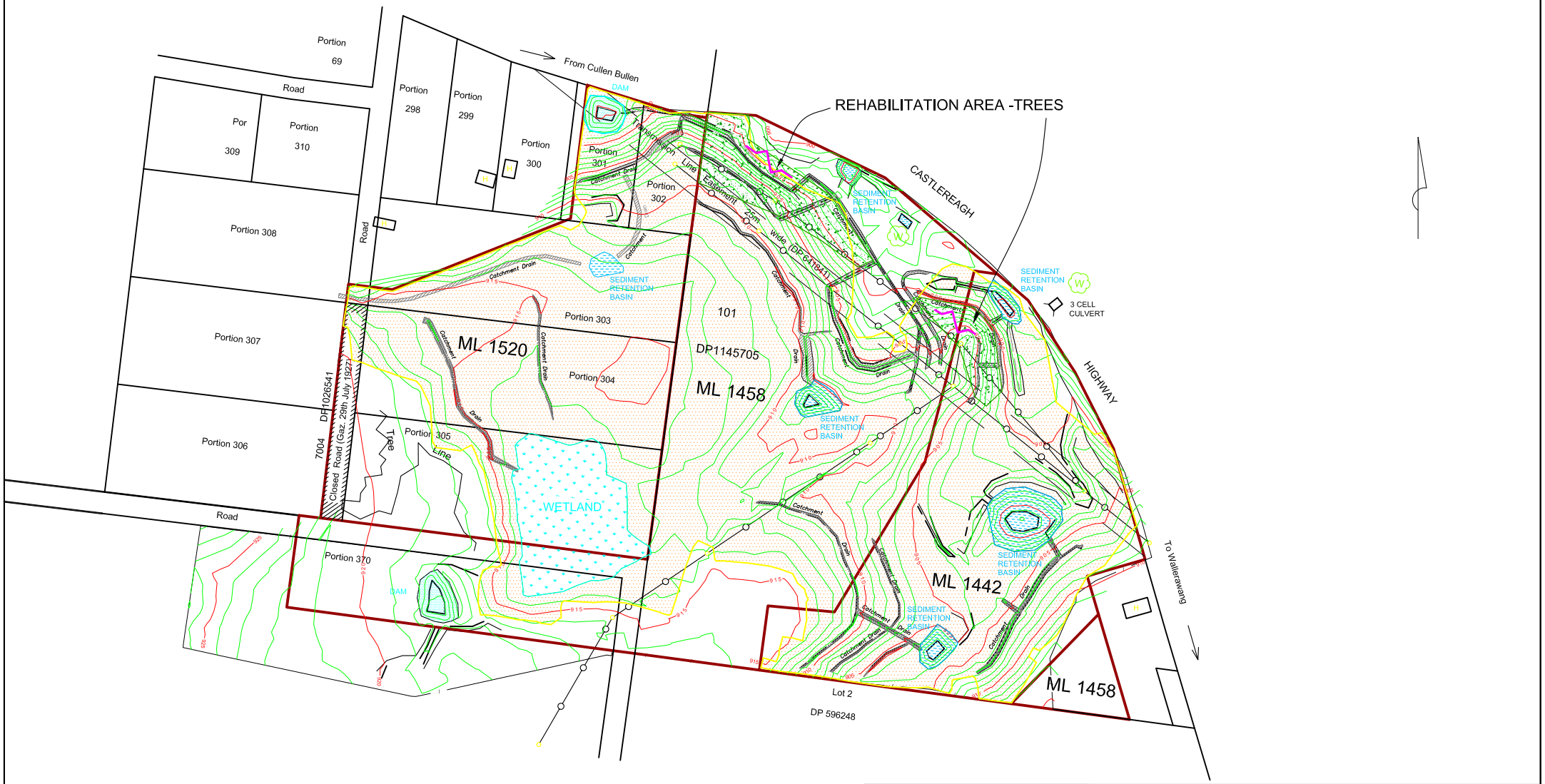
0 50 100 150 200 250
metres

RCA AUSTRALIA
GEOTECHNICAL • ENVIRONMENTAL

MINE DOMAINS AT COMMENCEMENT OF MOP ENHANCE PLACE MINE BLACKMANS FLAT

CLIENT	Enhance Place Mine Pty Ltd			RCA Ref	6880
DRAWN BY	KT	SCALE	1 : 5000 (A4)	DRAWING No 2	REV 0
APPROVED BY	KT	DATE	12/12/2016	OFFICE	NEWCASTLE

CDT-DWG-A4H-001/1



LEGEND

- Rehabilitation Area - Trees
- Rehabilitation Area - Pasture
- Existing dams

NOTE: Drawing adapted by plan supplied by Enhance Place Mine
Drawn by Craven, Elliston & Hayes (Lithgow) Pty Ltd
Dwg No. ENH-REH, Plan 3, 18-12-13

0 50 100 150 200 250
metres

RCA AUSTRALIA
GEOTECHNICAL • ENVIRONMENTAL

FINAL REHABILITATION AND POST MINING LAND USE ENHANCE PLACE MINE BLACKMANS FLAT

CLIENT	Enhance Place Mine Pty Ltd			RCA Ref	6880
DRAWN BY	KT	SCALE	1 : 5000 (A4)	DRAWING No 3	REV 0
APPROVED BY	KT	DATE	12/12/2016	OFFICE	NEWCASTLE

Appendix B

Soil Assessment Recommendation for Rehabilitated Areas

SLR

global environmental solutions

Soil Assessment and Recommendations for Rehabilitated Areas

Pine Dale Mine and Enhance Place Mine

Report Number 630.11011

10 November 2014

for Enhance Place Pty Ltd

Version: Final

Soil Assessment and Recommendations for Rehabilitated Areas

Pine Dale Mine and Enhance Place Mine

PREPARED BY:

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
10 Kings Road New Lambton NSW 2305 Australia

(PO Box 447 New Lambton NSW 2305 Australia)
T: 61 2 4037 3200 F: 61 2 4037 3201
E: newcastleau@slrconsulting.com www.slrconsulting.com

DOCUMENT CONTROL

Reference	Status	Date	Prepared	Checked	Authorised
630.11011	Draft 1	23 October 2014	Murray Fraser	Andrew Hutton	Andrew Hutton
630.11011	Final	10 November	Murray Fraser	Andrew Hutton	Andrew Hutton

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TABLES

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1 INTRODUCTION

Enhance Place Pty Ltd (Enhance Place) owns and operates the Pine Dale Mine and Enhance Place Mine in accordance with Project Approval (PA) 10_0041 and PA 451_01 respectively, granted by the Minister for the Department of Planning and Environment.

SLR was engaged by Enhance Place to:

- Undertake soil analysis and any other assessment as required, to inform development of quantitative rehabilitation completion criteria for Growth Media Development phase of rehabilitation; and
- Provide advice and recommendations for pasture improvement strategies required to achieve the agreed rehabilitation completion criteria as described in the relevant Mining Operations Plan.

Five sites have been rehabilitated between Pine Dale Mine and Enhance Place Mine and require ongoing monitoring and maintenance to ensure they continue to move towards achieving the agreed rehabilitation completion criteria. These sites are shown in **Figure 1** and **Figure 2** and are identified as the following:

Pine Dale Mine

- Area A;
- Area C (Jenkins property); and
- Area 8.

Enhance Place

- Morris Property; and
- Crown Land block.

2 METHODOLOGY

A detailed walk-through inspection of these five areas was undertaken by Murray Fraser (SLR Senior Agronomist) and Ben Eastwood (Environmental Manager) on 10th September 2014. The initial objective of the inspection was to assess the current condition of these rehabilitated areas and particularly the extent African lovegrass (*Eragrostis curvula*) and formulate an action plan so as rehabilitation objectives can be met.

Where possible soil samples were taken from the topsoil (0-10 cm) and subsoil (between 20-40 cm) at each inspection site and sent to Soiltec Laboratories for nutrient testing and further analysis.

A traffic light risk rating has been used to describe any soil nutrient deficiencies/toxicities which may be limiting plant establishment and production in the rehabilitation areas at each of the sites. **Table 1** below outlines the meaning of each rating as per the traffic light methodology. Detailed soil test results are contained in **Appendix A**.

Table 1 Soil Nutrient Descriptors

Rating	Descriptor
	Soil nutrient is present in levels that are deficient /toxic and are highly likely to be impacting optimum plant growth.
	Soil nutrient is present in levels that are marginally deficient /toxic and may be impacting optimum plant growth.
	Soil nutrient is present in levels which are ideal for optimum plant growth.

The principal intention of the inspection was to develop an overall practical and staged strategy to supplement the initial rehabilitation strategy and subsequently meet mine rehabilitation commitments and completion criteria.

H:\Projects-SLR\630-SydNTL\630-NTL-630.11011 Enhance Place Rehab Completion Criteria\SLR Data\Drafting\Figures\ArcGIS\SLR630.11011_FieldPoints_PD_01.mxd

SLR
10 KINGS ROAD
NEW LAMBTON
NEW SOUTH WALES 2305
AUSTRALIA
T: 61 2 4037 3200
F: 61 2 4037 3201
www.slrconsulting.com

Project No.:	630.11011
Date:	11/11/2014
Drawn by:	LH
Scale:	1:10,000
Sheet Size:	A4
Projection:	GDA 1994 MGA Zone 56

N

0 100 200 300 400 m

Enhance Place Pty Ltd

Pine Dale Rehab Completion Criteria

Inspection Points

FIGURE 1

SLR
10 KINGS ROAD
NEW LAMBTON
NEW SOUTH WALES 2305
AUSTRALIA
T: 61 2 4037 3200
F: 61 2 4037 3201
www.slrconsulting.com

Project No.:	630.11011
Date:	23/10/2014
Drawn by:	LH
Scale:	1:4,000
Sheet Size:	A4
Projection:	GDA 1994 MGA Zone 56

Enhance Place Pty Ltd

Enhance Place Rehab Completion Criteria

Inspection Points

FIGURE 2

3 INSPECTION RESULTS

The following section summarises the results for each of the sites inspected at both Pine Dale Mine and Enhance Place Mine. It is intended to show the general condition of each site at the time of the inspection as well as document some of the constraints identified, such as lack of topsoil depth and nutrient toxicities or deficiencies which may be limiting desirable plant establishment and growth.

Further information is included in **Section 5** which includes a list of recommendations for each of the sites.

3.1 Pine Dale Mine

3.1.1 Area A

Plate 1 below shows the general landscape setting for site PD5 within Area A at Pine Dale Mine during the site inspection undertaken on the 10th September 2014. The rehabilitation objective for PD5 is to be rehabilitated to a native woodland vegetation community.

Plate 1: Site PD5 Pine Dale Mine Area A – Landscape Setting

During the inspection it was observed that there has been limited success with establishment of eucalypt species, although where tracks were bulldozed through the initial planting, saplings now appear to be growing reasonably well.

Mushroom compost, lime and gypsum spread in 2013 can be seen on the soil surface. This appears to have boosted the growth of young trees and encouraged volunteer clover growth, both through addition of nutrients and soil moisture retention. Testing confirmed the topsoil is highly acidic and may be contributing to the very slow establishment of eucalypts.

Plate 2 below shows the groundcover composition at PD5 during the site inspection.

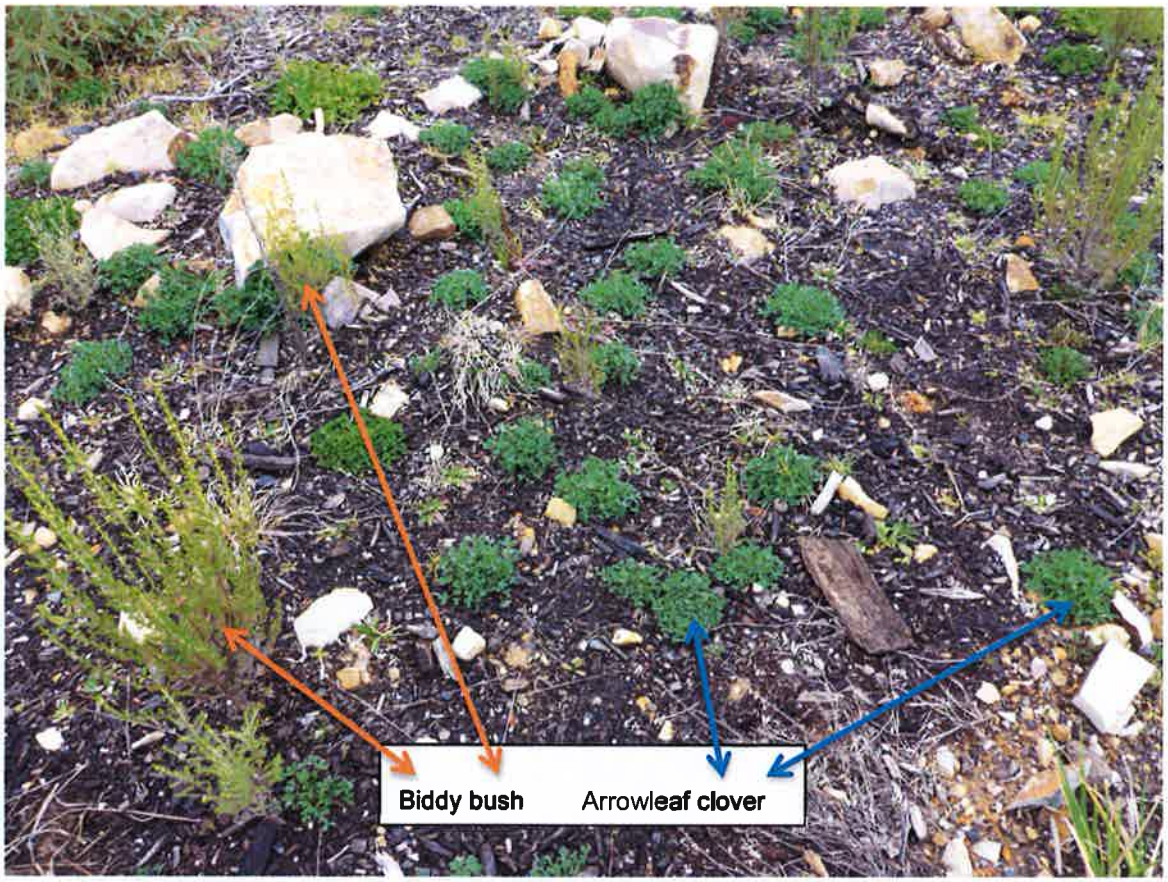

Plate 2: Site PD5 Pine Dale Mine Area A – Groundcover Composition

Recently established clover plants can be seen after application of lime with mushroom compost and gypsum which has reduced acidity at the soil surface and provided improved moisture holding capacity.

The main weed observed at PD5 during the inspection is biddy bush (*Cassinia arcuata*) which SLR understands is currently spot-sprayed for control in this area.

Plate 3 following shows approximately 4 cm of highly acidic, darker topsoil, which was sandy clay loam texture over the lighter coloured sub soil, which was a medium sandy clay texture.

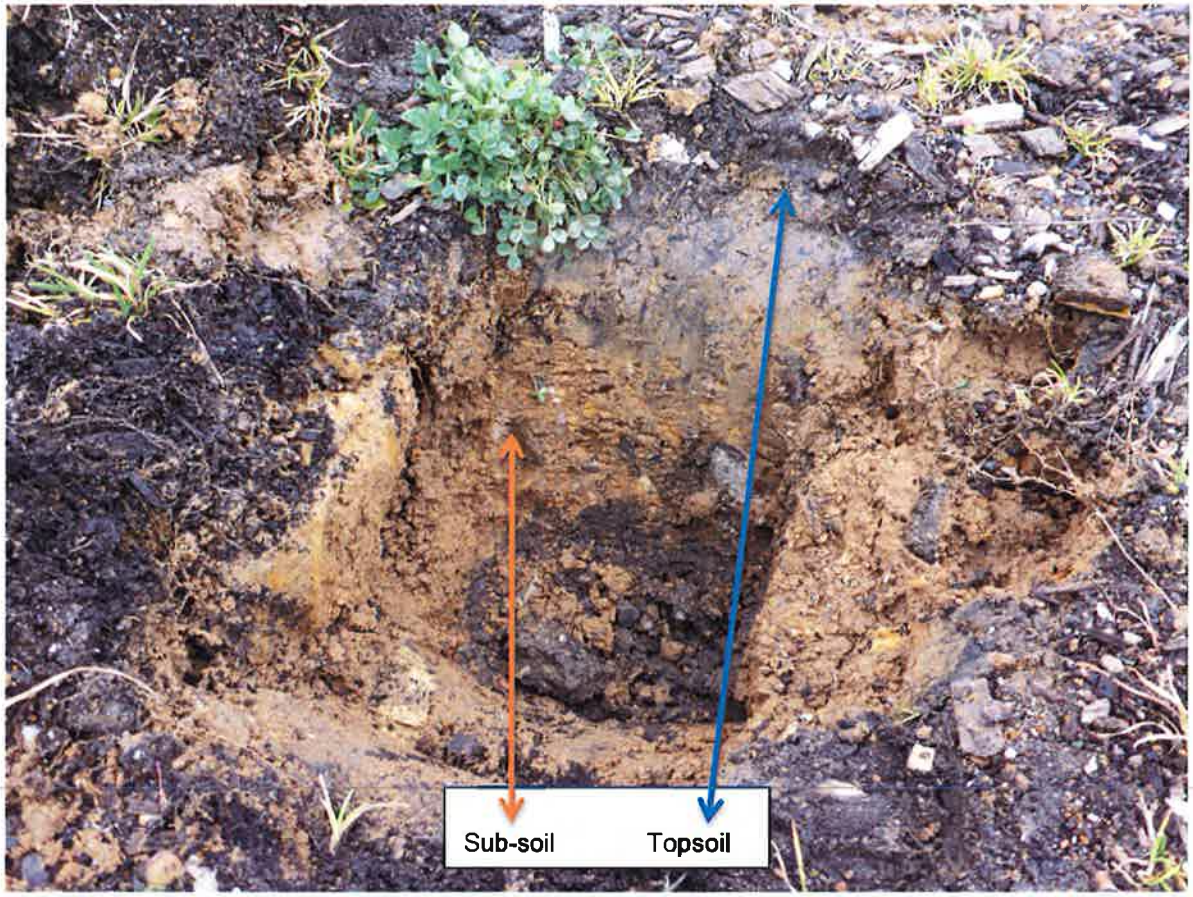

Plate 3: Site PD5 Pine Dale Mine Area A – Depth of Topsoil

Table 2 below describes the soil nutrient descriptors which are limiting plant establishment and production in the rehabilitation Area A as demonstrated by samples collected at site PD5.

Table 2 PD5 Soil Test Summary

Site	Soil Element	Descriptor 0-4 cm	Descriptor 20-30 cm
PD5 Area A Native Vegetation Rehabilitation	pH		
	Potassium		
	Sodium		
	Aluminium		
	Sulfur		
	Nitrogen		
	Zinc		
	Calcium		

Nutrient deficiencies/toxicities limiting vegetation and pasture growth at PD5 are very low pH and very high aluminium in the topsoil, along with sodium, sulfur and calcium, whilst potassium and nitrogen are marginal.

3.1.2 Area C (Jenkins Property)

Plate 4 below shows PD3, and represents a reference site located adjacent to the previously mined area. Site PD3 has not been disturbed by mining activity and has not been rehabilitated. Site PD3 is considered to be representative of pre mining land use conditions in regards to soil profile and vegetation cover for this area and is a reference site for the purpose of this assessment.

Plate 4: Site PD3 Pine Dale Mine Area C – Landscape Setting

As PD3 has not been disturbed by mining or rehabilitation activity, this represents an original grazing area prior to mining.

Topsoil consists of a sandy clay loam less than 10 cm in depth over a medium clay subsoil. This area supports a perennial grass and clover pasture, including cocksfoot, tall fescue, phalaris, sub clover, with some annual ryegrass and *Vulpia* sp., some of which can be seen in **Plate 5**.

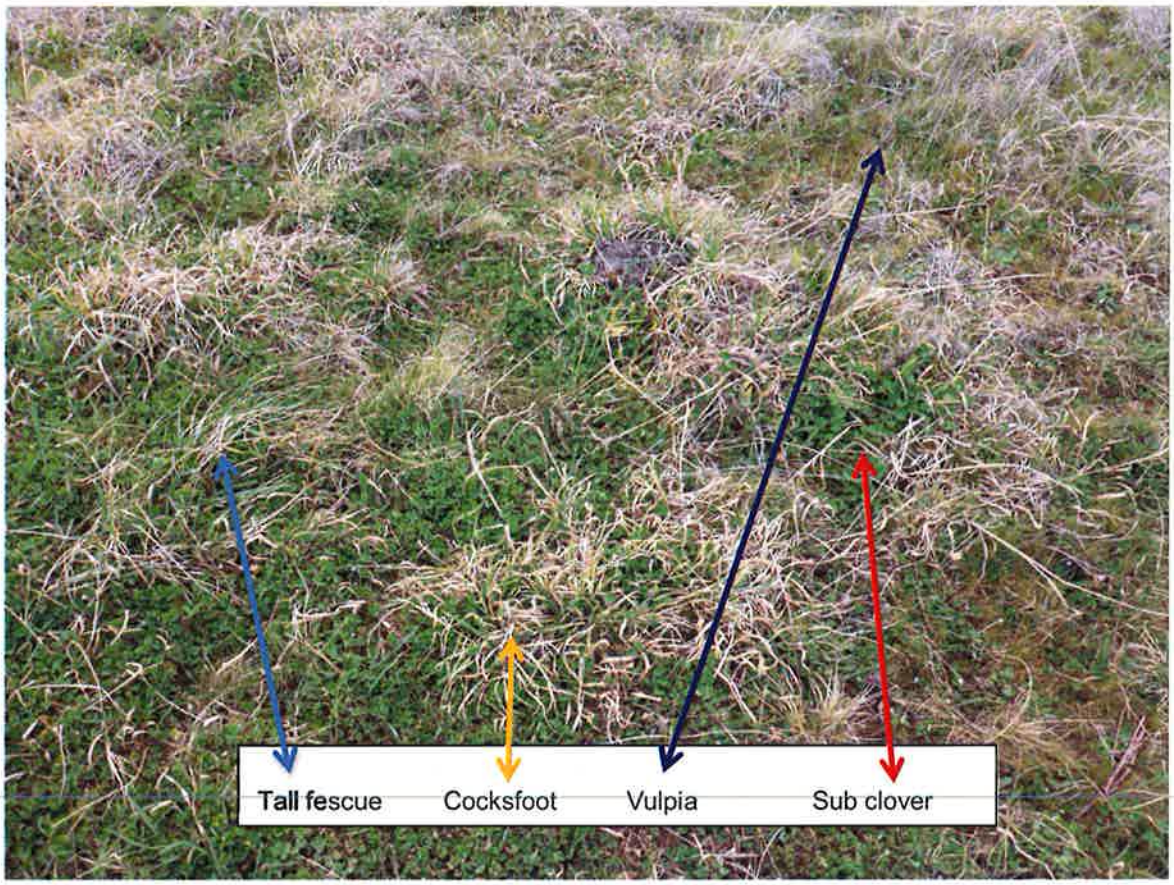

Plate 5: Site PD3 Pine Dale Mine Area C – Pasture Composition

PD3 has 100% groundcover with a mixed perennial grass and clover pasture. Whilst pH in the topsoil is marginal and highly acidic at depth, the varieties present are tolerant of acidity resulting in minimal impact on pasture growth or persistence. There is no African lovegrass present in this area which is likely due to minimal disturbance of this site.

Darker topsoil to a depth of 10 cm over the lighter coloured sub soil can be seen following in **Plate 6**.

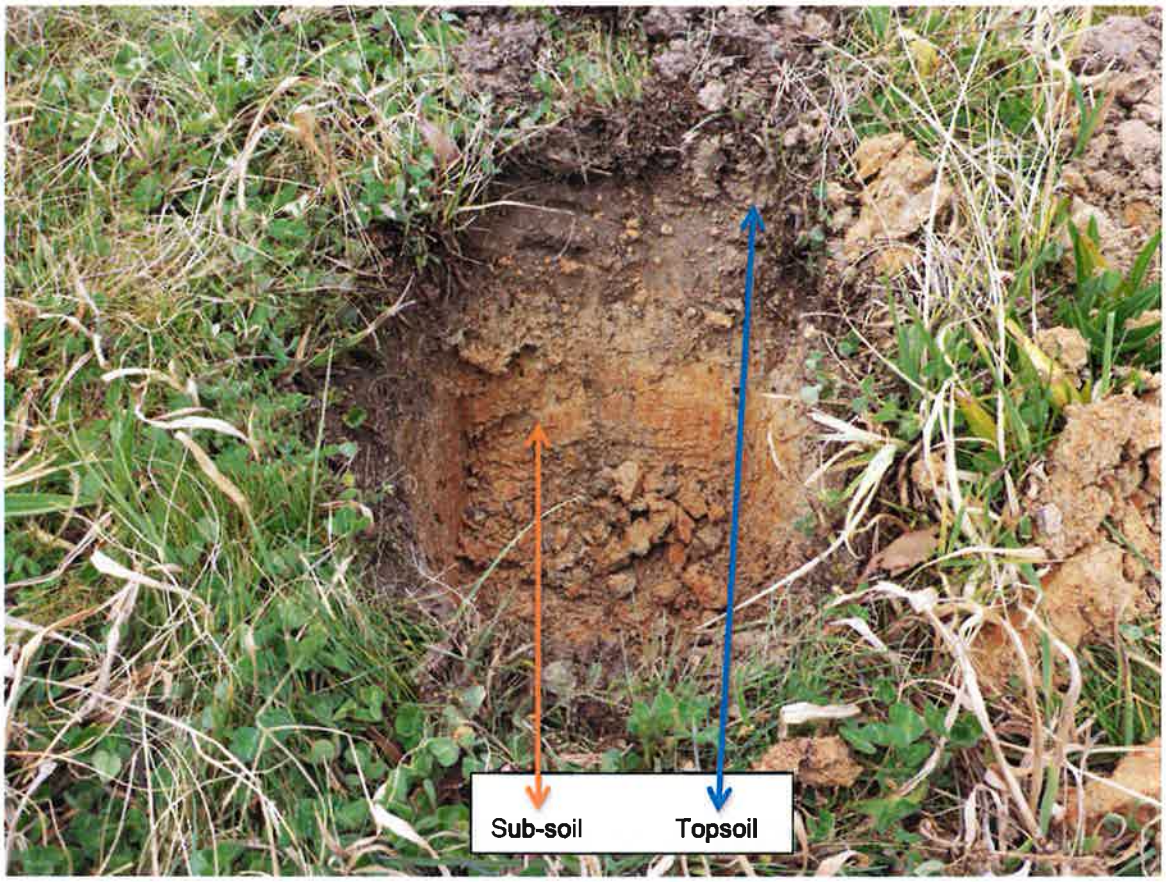

Plate 6: Site PD3 Pine Dale Mine Area C – Depth of Topsoil

Table 3 PD3 Soil Test Summary

Site	Soil Element	Descriptor 0-10 cm	Descriptor 30-40 cm
PD3 Area C Nil Disturbance	pH		
	Potassium		
	Sodium		
	Aluminium		
	Sulfur		
	Nitrogen		
	Zinc		
	Calcium		

Nutrient deficiencies limiting pasture growth at PD3 are sulfur, nitrogen, zinc and calcium, whilst sodium levels and pH are marginal.

Plate 7 below shows the landscape setting of the earliest rehabilitation undertaken at Pine Dale Mine Area C (PD1).

Plate 7: Site PD1 Pine Dale Area C – Landscape Setting

PD1 was one of the initial areas to be rehabilitated when the original Pine Dale Mine was operating, with the resulting cocksfoot based pasture having 100% groundcover. The main factor behind the successful pasture establishment is the depth of topsoil (over 30 cm) laid down over the subsoil. This depth of topsoil provides an excellent growing medium for the cocksfoot based pasture, although while a number of nutrients are deficient. The high water holding capacity of the topsoil also aids in excellent pasture growth.

Plate 8 following shows the composition of the cocksfoot and clover pasture at PD1.

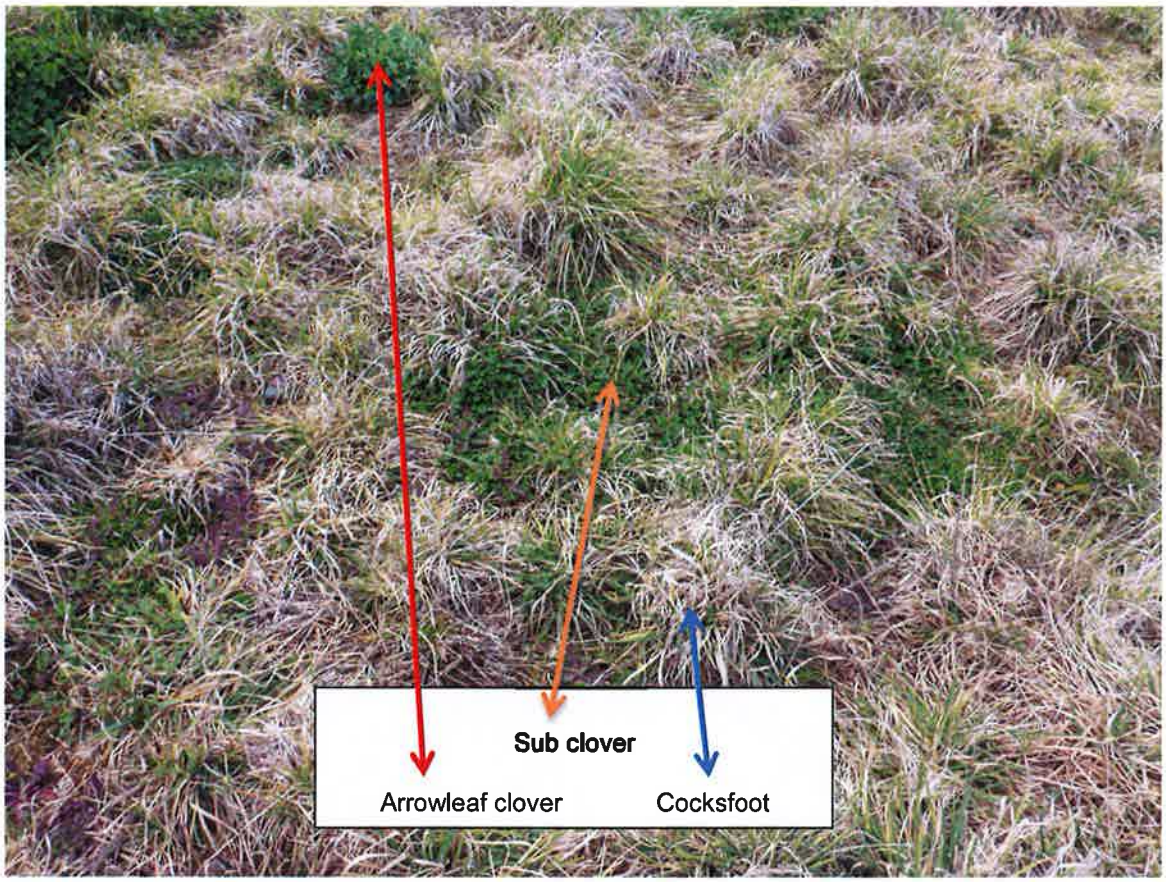

Plate 8: Site PD1 Pine Dale Mine Area C – Pasture Composition

Other desirable pasture species present at PD1 include perennial phalaris, arrowleaf clover, sub clover and vetch. Due to the excellent groundcover of this perennial pasture there are few weeds of any significance present.

PD1 has an excellent capacity for sustainable cattle grazing, both through the established pastures vigour and species composition, with an ideal perennial grass/clover ratio (80% grass to 20% clover).

Plate 9 following shows the 30 cm of darker topsoil over the lighter coloured sub soil at PD1.

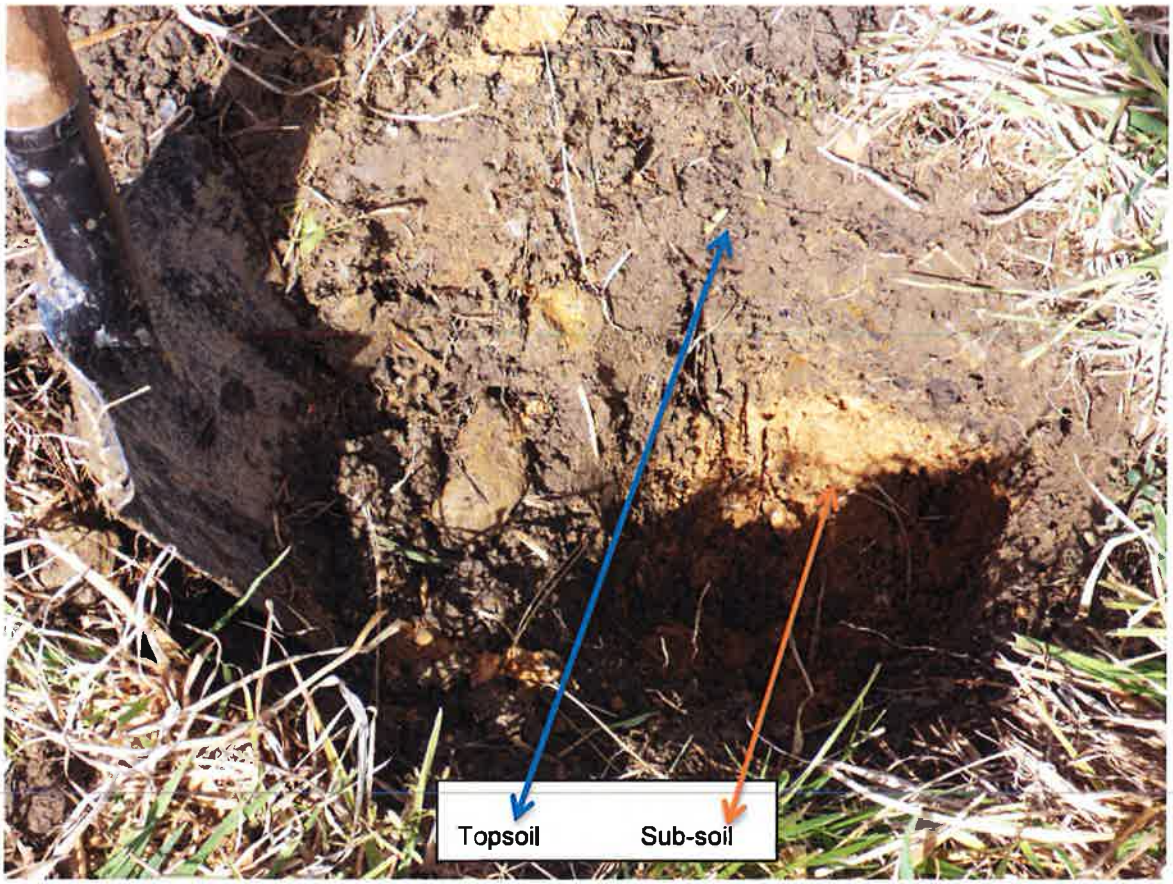

Plate 9: Site PD1 Pine Dale Mine Area C – Depth of Topsoil (30 cm)

Table 4 below describes the soil nutrient descriptors which are limiting plant establishment and production in the rehabilitation areas for site PD1.

Table 4 PD1 Soil Test Summary

Site	Soil Element	Descriptor 0-10 cm	Descriptor 30-40 cm
PD1 Area C Excellent Pasture Rehabilitation	pH		
	Potassium		
	Sodium		
	Aluminium		
	Sulfur		
	Nitrogen		
	Zinc		
	Calcium		

Nutrient deficiencies limiting pasture growth at PD1 are potassium, sulfur, nitrogen, zinc and calcium, whilst sodium levels are marginal. Correction of these deficiencies will result in greater rainfall use efficiency and an extended growing season for this area of pasture, which results in a greater capacity to support more livestock for a longer period of time.

Plate 10 below shows pasture at PD2 dominated by annual clover, with some African lovegrass present.

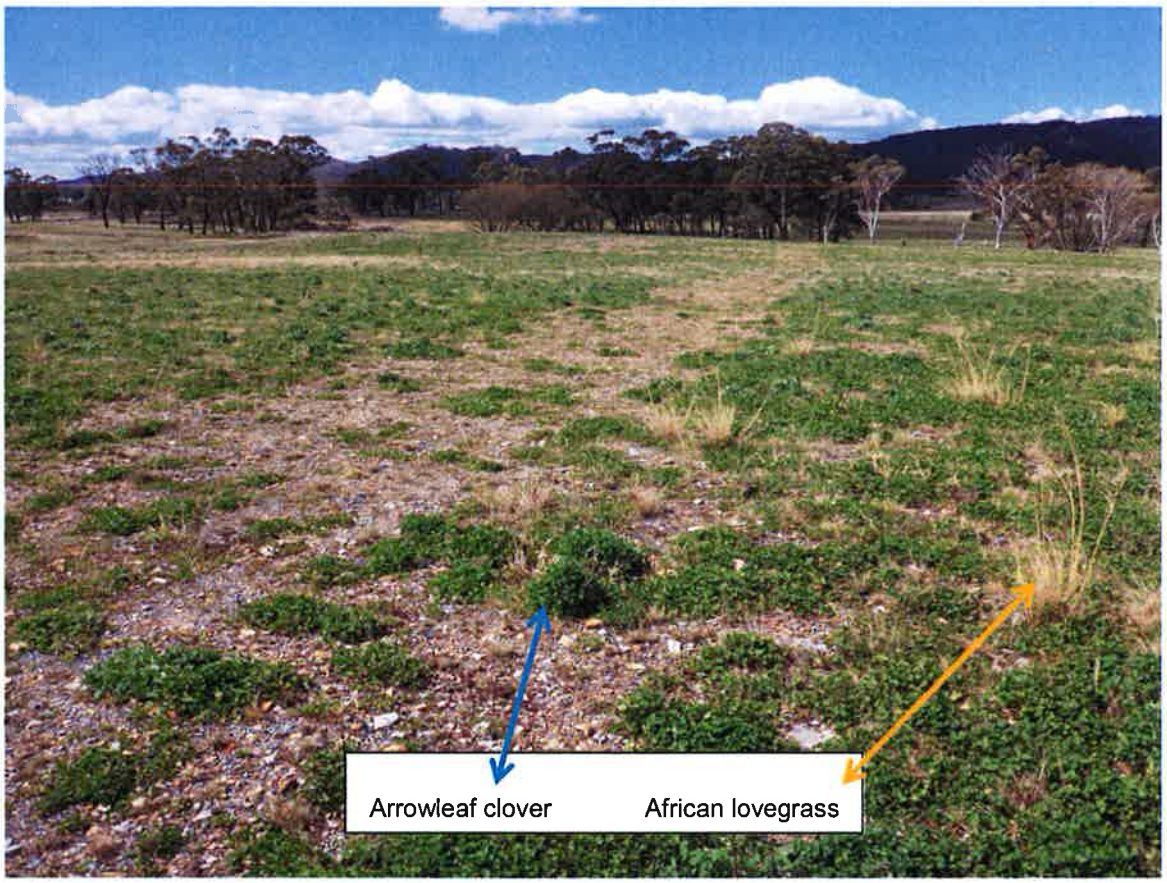

Plate 10: Site PD2 Pine Dale Mine Area C – Landscape Setting

PD2 was rehabilitated at a later stage to PD1 and has had very little topsoil applied, with the majority of the area appearing to be just overburden and subsoil. The pasture is dominated by annual clover with few perennial pasture grasses. Once the clover hays off in late spring it is expected that there will be very little in the way of pasture for grazing livestock during summer and early autumn.

There are significant areas of African lovegrass which will need control with *Taskforce* herbicide (745 g/L Flupropanate) during autumn or spring before any pasture improvement is undertaken. This will provide residual control on further germinations of African lovegrass for 2-3 years whilst not impacting pasture seed germination.

Spreading the mushroom/lime/gypsum compost mixture previously used on Area A would be extremely beneficial here to start the process of "making" topsoil and increasing soil microbial activity. The contour banks which have been cut into the hillsides post pasture establishment should also undergo this treatment, as in their current condition they will not support any significant pasture growth.

Plate 11 below shows arrowleaf clover at PD2 with overburden clearly seen between clover plants.

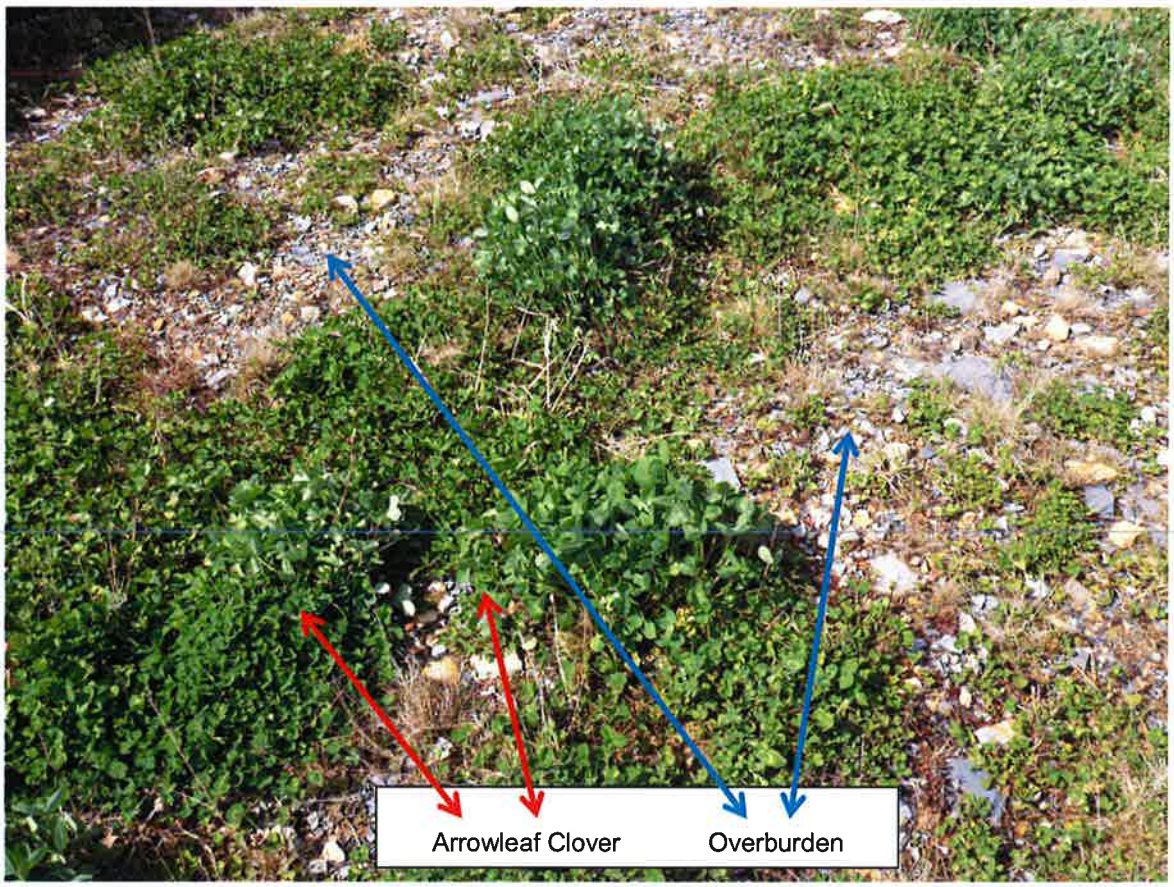

Plate 11: Site PD2 Pine Dale Area C – Pasture Composition

Table 5 following describes the soil nutrient descriptors which are limiting plant establishment and production in the rehabilitation areas for site PD2.

Table 5 PD2 Soil Test Summary

Site	Soil Element	Descriptor 0-10 cm	Descriptor 20-30 cm
PD2 Area C Poor Pasture Rehabilitation	pH		
	Potassium		
	Sodium		
	Aluminium		
	Sulfur		
	Nitrogen		
	Zinc		
	Calcium		

Nutrient deficiencies limiting pasture growth at PD2 are highly acidic pH, low potassium, sulfur, nitrogen, zinc and calcium, whilst sodium and aluminium levels are marginal. The main constraint limiting pasture growth at PD2 is lack of moisture holding capacity due to minimal topsoil.

3.1.3 Area 8

Plate 12 below shows the landscape setting for site PD4 at Area 8, with only very limited pasture establishment.

Plate 12: Site PD4 Pine Dale Mine Area 8 – Landscape Setting

PD4 was also rehabilitated at a later stage to PD1 and has had very little topsoil applied, with the majority of the area appearing to be overburden and subsoil. Due to the amount of overburden/rock present from a depth of 10 cm, only 0-10 cm was sampled for laboratory testing at PD4.

There are significant areas of African lovegrass which will need control with *Taskforce* during autumn or spring before any pasture improvement is undertaken. This will provide residual control of further germinations of African lovegrass whilst not impacting pasture seed germination.

Spreading the mushroom/lime/gypsum compost mixture previously used on Area A would be extremely beneficial here to start the process of "making" topsoil and increasing soil microbial activity.

Plate 13 following shows some arrowleaf clover with a significant number of African lovegrass tussocks.

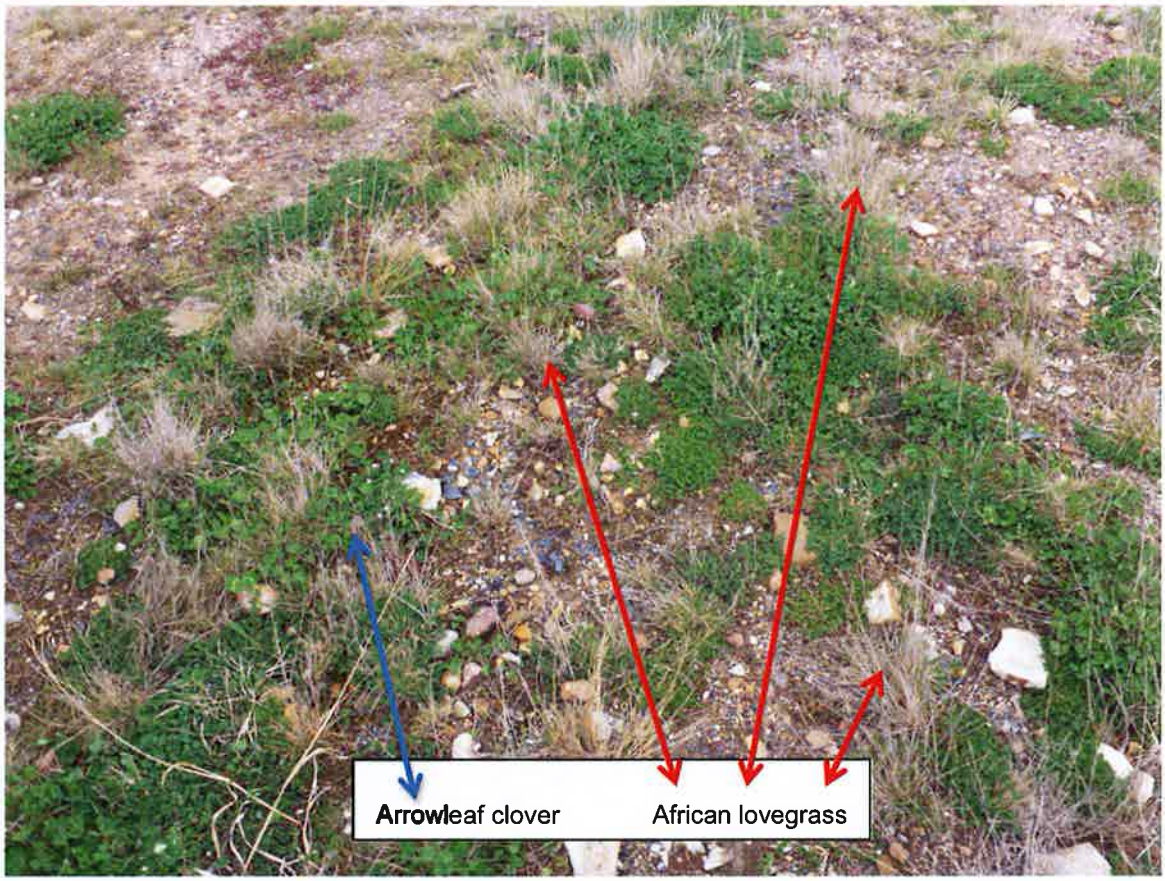

Plate 13: Site PD4 Pine Dale Mine Area 8 – Pasture Composition

African lovegrass can be seen spread between the clover plants. This pasture will provide very little grazing value once the clover hays of in late spring.

Table 6 below describes the soil nutrient descriptors which are limiting plant establishment and production in the rehabilitation areas for site PD4.

Table 6 PD4 Soil Test Summary

Site	Soil Element	Descriptor 0-10 cm	Descriptor 20-30 cm
PD4 Area 8	pH		Not Tested (Rock)
	Potassium		
	Sodium		
	Aluminium		
	Sulfur		
	Nitrogen		
	Zinc		
	Calcium		

Nutrient deficiencies limiting pasture growth at PD4 are nitrogen and zinc, whilst sodium, sulfur and calcium are marginal. The main constraint for pasture growth at Area 8 is lack of topsoil.

3.2 Enhance Place Mine

3.2.1 Morris Property

Plate 14 below shows the landscape setting at EP1 on the Morris property, showing very little growth of the established pasture.

Plate 14: Site EP1 Enhance Place Mine (Morris Property) North – Landscape Setting

The Morris property is heavily overgrazed, whilst there are three fenced and watered paddocks the block is being grazed by horses as one large set stocked paddock. This has resulted in palatable pasture species being grazed right down to ground level and a decline in pasture quality and quantity.

The pasture has reasonable populations of perennial grass and clover, although with the continued heavy grazing pressure by horses the perennial grasses will thin out and be replaced by less palatable annual weeds.

Plate 15 following shows weeds present at EP1 including wild sage, scotch thistle, spear thistle and flatweed, which can all be controlled by a broadleaf weed herbicide application.

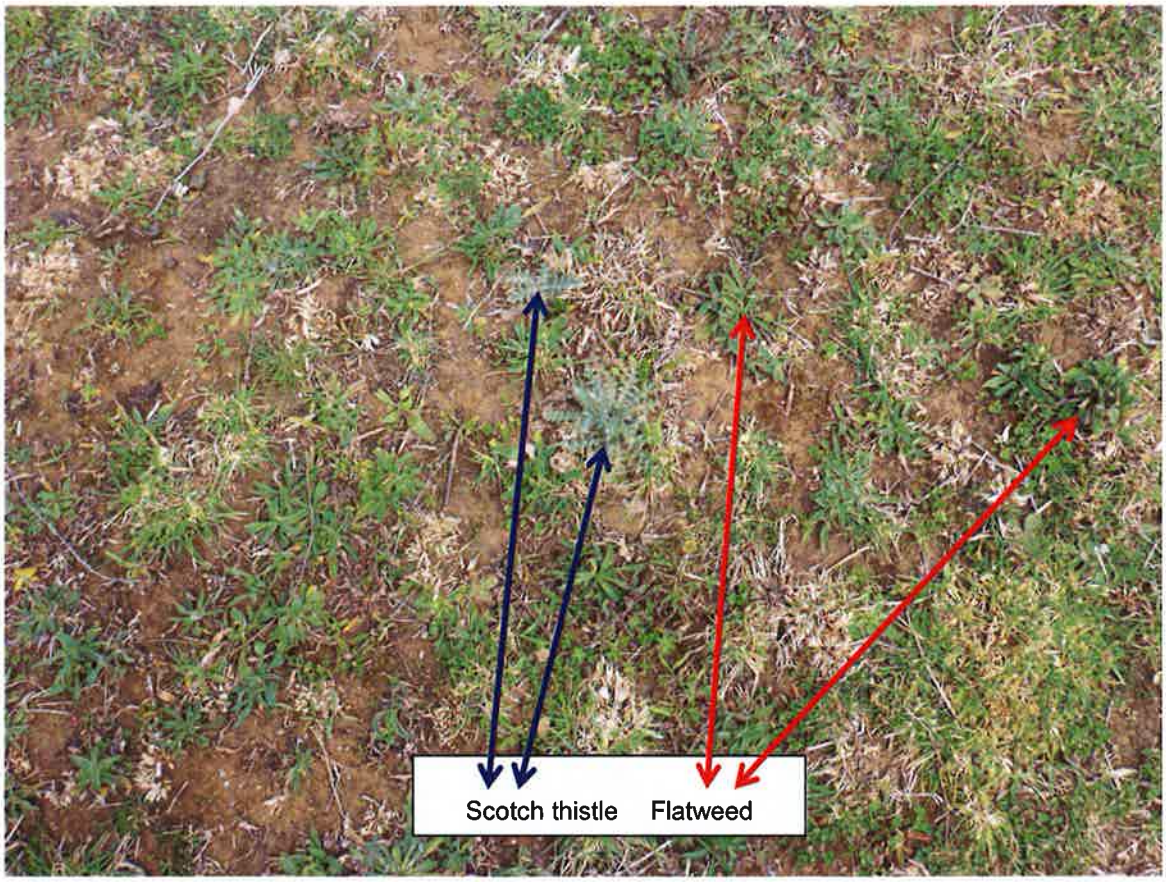

Plate 15: Site EP1 Enhance Place Mine (Morris Property) North – Pasture Composition

Table 7 below describes the soil nutrient descriptors which are limiting plant establishment and production in the rehabilitation areas for site EP1.

Table 7 EP1 Soil Test Summary

Site	Soil Element	Descriptor 0-10 cm	Descriptor 30-40 cm
EP1 Morris North	pH		
	Potassium		
	Sodium		
	Aluminium		
	Sulfur		
	Nitrogen		
	Zinc		
	Calcium		

Nutrient deficiencies limiting pasture growth are nitrogen and calcium, whilst sulfur, potassium and zinc are marginal.

Plate 16 below shows the landscape setting at EP3 on the Morris property, where the pasture is dominated by annual clovers and medic.

Plate 16: Site EP3 Enhance Place Mine (Morris Property) South – Landscape Setting

Again there are very few perennial grasses due to constant overgrazing and trampling by horses. Some annual medic is present which proved reasonable winter and spring grazing, however these paddocks will be bare during summer and autumn with few palatable pasture plants.

There are significant areas of African lovegrass which will need to be controlled before any pasture improvement is undertaken. It is recommended that this is controlled using *Taskforce* during autumn or spring.. This will provide residual control on further germinations of African lovegrass whilst not impacting on pasture seed germination.

The Morris property will have no improvement in pasture composition or density without adopting time control or rotational grazing methods where by each paddock can have a period of rest and growth before grazing again.

Plate 17 following shows the dominance of the annual clover and medics in the pasture at EP3.

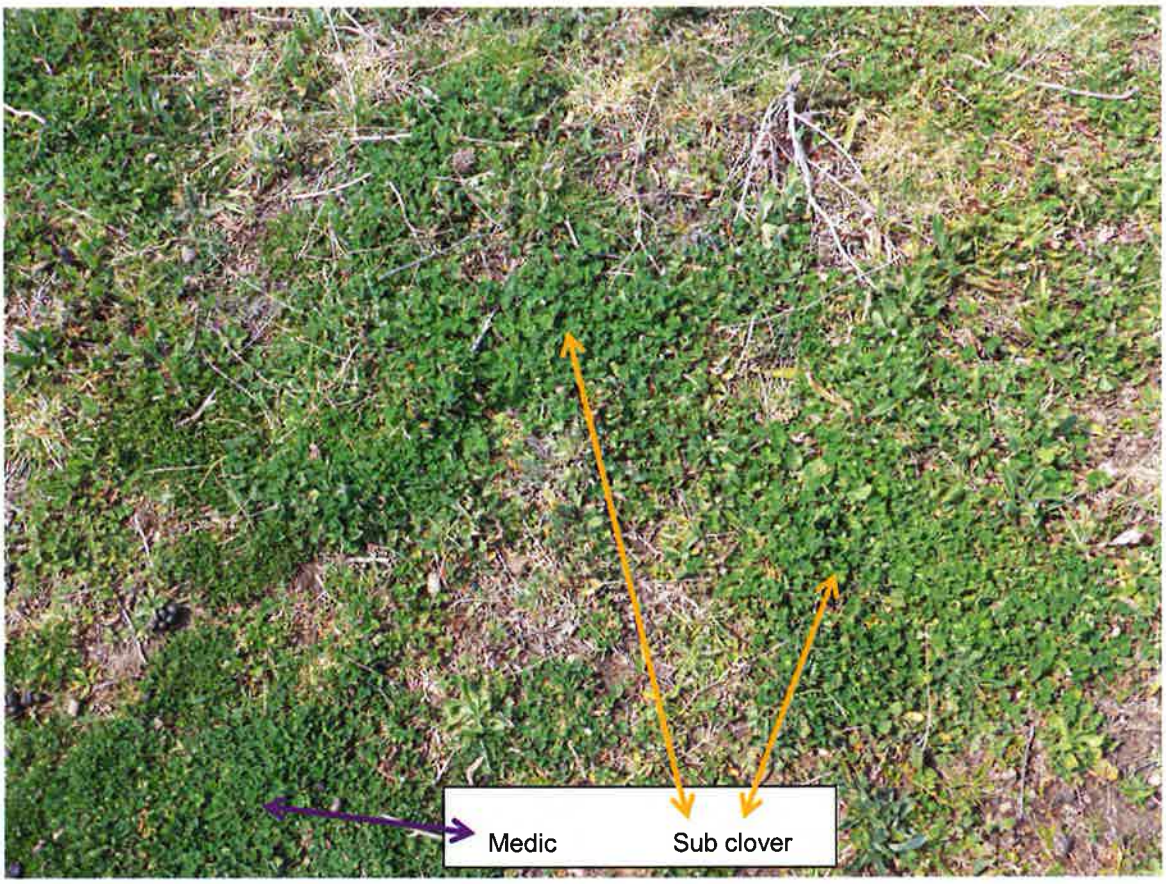

Plate 17: Site EP3 Enhance Place Mine (Morris Property) South – Pasture Composition

Table 8 below describes the soil nutrient descriptors which are limiting plant establishment and production in the rehabilitation areas for site EP3.

Table 8 EP3 Soil Test Summary

Site	Soil Element	Descriptor 0-10 cm	Descriptor 20-30 cm
EP3 Morris South	pH		
	Potassium		
	Sodium		
	Aluminium		
	Sulfur		
	Nitrogen		
	Zinc		
	Calcium		

Nutrient deficiencies limiting pasture growth at EP3 are sulfur, nitrogen, zinc and calcium, whilst potassium and sodium levels are marginal. The main constraint for pasture growth and persistence at the Morris property is constant overgrazing by horses with the pasture not given any rest period

3.2.2 Crown Land Block

Plate 18 below shows the landscape setting at EP2 on the Crown land, with good pasture groundcover.

Plate 18: Site EP2 Enhance Place Mine (Crown Land) – Landscape Setting

The Crown land area adjacent to the Morris property is being grazed by kangaroos with domestic stock being excluded, and as such this area has better pasture composition and groundcover than both EP1 and EP3, with satisfactory populations of phalaris, cocksfoot and sub clover.

Plate 19 following shows phalaris and sub clover in good populations at EP2.

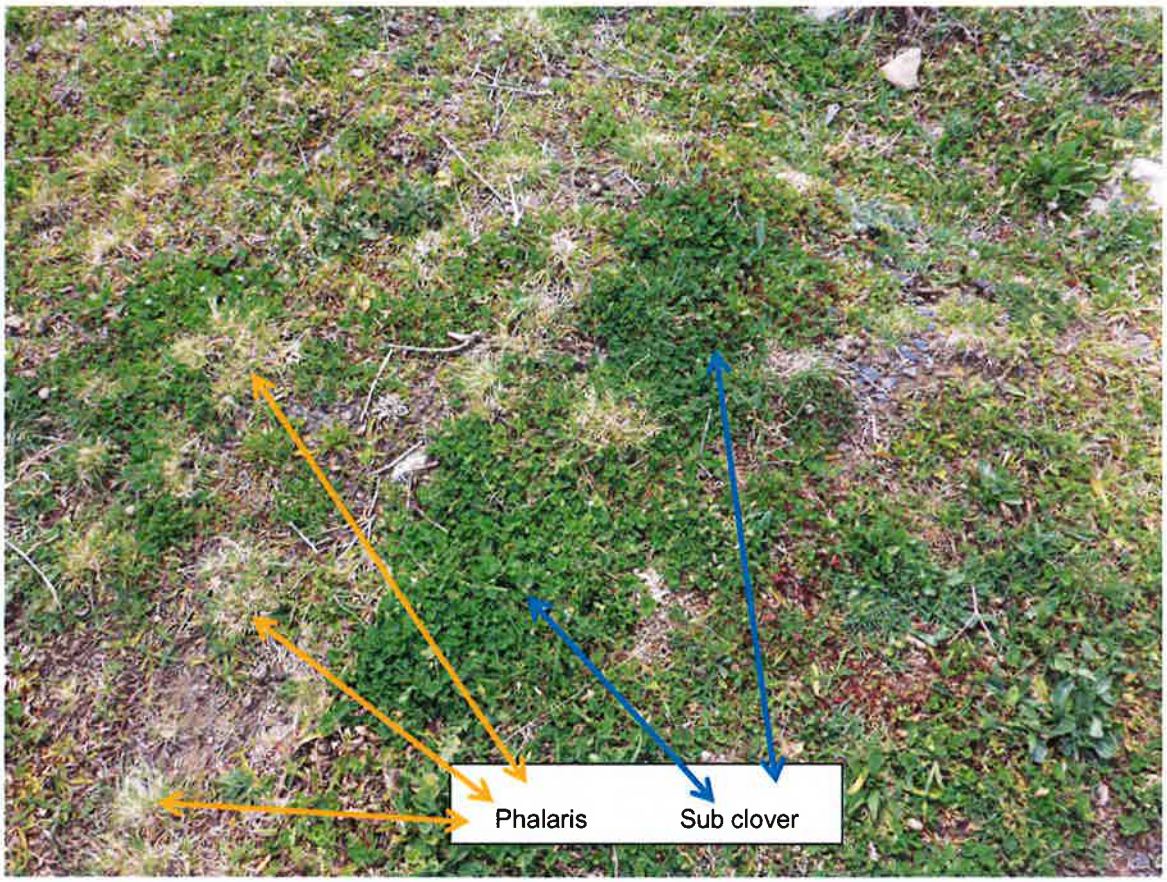

Plate 19: Site EP2 Enhance Place Mine (Crown Land) – Pasture Composition

Table 9 below describes the soil nutrient descriptors which are limiting plant establishment and production in the rehabilitation areas for site EP3.

Table 9 EP2 Soil Test Summary

Site	Soil Element	Descriptor 0-10 cm	Descriptor 20-30 cm
EP2 Crown Land	pH		
	Potassium		
	Sodium		
	Aluminium		
	Sulfur		
	Nitrogen		
	Zinc		
	Calcium		

Nutrient deficiencies limiting pasture growth at EP2 are sulfur, nitrogen, zinc and calcium, whilst sodium levels are marginal.

As EP2 has sufficient groundcover, a desirable pasture species composition and is not grazed by domestic livestock no further remediation work is necessary.

When compared to the undisturbed site at PD3, levels of pH, potassium, sodium and aluminium at EP2 are all comparable, rating as either green or amber, indicating a suitable growth medium for desirable pasture species.

4 SUMMARY

All areas tested at Pine Dale Mine and Enhance Place Mine showed good to excellent levels of phosphorus (refer **Appendix A**), indicating previous phosphorus fertiliser application; however sulfur, nitrogen, zinc and calcium are generally deficient and are limiting plant establishment and growth.

There are significant areas of African lovegrass which will require control in autumn or spring with *Taskforce* before any pasture improvement program is undertaken. *Taskforce* will provide residual control for further germinations of African lovegrass for 2-3 years post-application.

It is recommended to apply *Taskforce* during autumn or spring by boom spray at 3 litres/ha using a minimum of 150 litres/ha of water. The plant back period for sowing new pasture or crop is a total of 100 mm of rainfall in greater than 5 mm increments.

SLR recommends that the pasture seed mix used to re-sow the poorly established areas should be cocksfoot dominant as this is the most successful species in Area C. The recommended mix is:

- Kasbah Cocksfoot 5 kg/ha
- Atlas Phalaris 1 kg/ha
- Zulu Arrowleaf Clover 2 kg/ha
- Goulburn Sub Clover 2 kg/ha

All pasture seed should be treated with an insecticide such as *Cosmos* (500 g/L Fipronil), trace element coating and clovers inoculated with rhizobium.

Re-sowing of poorly established areas should be undertaken and by broadcasting pasture seed and fertiliser into furrows that have been ripped by a narrow tyned chisel plough, scarifier or similar equipment. The seed and fertiliser should then be covered by mushroom compost/ lime/ gypsum mix and await rainfall for germination.

Once fertility is improved and competitive pasture species are introduced it is unlikely that African lovegrass will be able to re-infest the rehabilitation areas. This has been demonstrated in the Crown Land block at Enhance Place.

Where little or no topsoil has been used during previous rehabilitation attempts, performance has been very poor, especially in comparison to PD2, where 30 cm of topsoil was used and the subsequent pasture establishment has been highly successful.

The main factor hampering successful pasture establishment and growth on the Morris property is continual overgrazing by horses.

5 RECOMMENDATIONS

This section provides a summary of the recommendations for each rehabilitation area to ensure the growth medium development continues to move towards achieving the agreed rehabilitation completion criteria and final land use objectives.

5.1 Pine Dale Mine - Area A

Continue control of biddy bush with current spot-spraying regime. Continue with further application of mushroom compost/lime/gypsum at rates shown in **Table 10**. Potassium needs to be increased with Muriate of Potash (MOP) or similar. Rainfall will incorporate the lime, gypsum and MOP into the soil profile. Increased growth from the application of these nutrients will provide a nitrogen source for the eucalypts species.

Table 10 PD5 Area A Fertiliser Requirements

Site	Fertiliser Requirement	Tonnes/ha	Total tonnes
PD5 Area A Approx. 7 hectares	MOP	0.25	1.75
	Mushroom compost	10	70
	Lime	3	21
	Gypsum	2	14

5.2 Pine Dale Mine - Area C (Jenkins Property)

The initial rehabilitation of approximately 8 hectares does not currently require any remedial action, although this area will require soil nutrient maintenance once time control (rotational) grazing begins. The later rehabilitation areas with poor pasture establishment and growth require boom spray application of *Taskforce* for the control of African Lovegrass prior to any pasture establishment works being undertaken.

Once this has occurred the area needs to be ripped with a narrow tyned chisel plough to create furrows. The pasture seed mix, MOP and di-ammonium phosphate (DAP) is then spread and finally the mushroom compost/lime/gypsum mix spread over the top of the pasture seed mix, at rates shown in **Table 11**.

Table 11 PD2 Area C Fertiliser Requirements

Site	Fertiliser Requirement	Tonnes/ha	Total tonnes
PD2 Area C Approx. 14 hectares	MOP	0.25	3.5
	DAP	0.20	2.8
	Mushroom compost	10	140
	Lime	4	56
	Gypsum	1	14

5.3 Pine Dale Mine - Area 8

Area 8 requires a boom spray application of *Taskforce* for the control of African Lovegrass prior to any pasture establishment works being undertaken.

Once this has occurred the area needs to be ripped with a narrow tyned chisel plough to create furrows. The pasture seed mix, MOP and DAP should then be spread over the area prior to applying the mushroom compost/lime/gypsum mix over the top at rates shown in **Table 12**.

Table 12 PD4 Area 8 Fertiliser requirements

Site	Fertiliser Requirement	Tonnes/ha	Total tonnes
PD4 Area 8 Approx. 7 hectares	DAP	0.20	1.4
	Mushroom compost	10	70
	Lime	1	7
	Gypsum	3	21

5.4 Enhance Place Mine - Morris Property

The Morris property requires a boom spray application of *Taskforce* to control African lovegrass and also broadleaf weed control prior to any pasture renovation being undertaken.

Once this has occurred apply DAP and MOP to supply nitrogen and potassium, along with gypsum to supply calcium and sulfur at rates shown in **Table 13**. However, if the current grazing practices are not altered to a time control or rotational grazing system, allowing each paddock to have a period of rest and growth, the fertiliser application will have little impact on pasture improvement.

Table 13 EP 1 & EP 3 Morris Property Fertiliser Requirements

Site	Fertiliser Requirement	Tonnes/ha	Total tonnes
EP1&3 Morris Property Approx. 23 hectares	DAP	0.20	4.6
	MOP	0.25	5.75
	Gypsum	3	69

5.5 Enhance Place Mine - Crown Land

The Crown Land (EP 2) blocks do not currently require any remedial action as it has satisfactory pasture groundcover and appears to be only grazed by kangaroos. It is recommended that this area continues to be monitored against agreed rehabilitation completion criteria.

6 GRAZING PASTURE COMPLETION CRITERIA

Enhance Place proposes the following completion criteria for the grazing areas at Enhance Place Mine and Pine Dale Mine

Enhance Place proposes the following completion criteria to be achieved within five years for the grazing areas at Enhance Place Mine and Pine Dale Mine:

- Establishment of a vigorous perennial grass and annual legume pasture, comprising approximately 70% perennial grass and 20% annual legume.
- Obtain a year round pasture groundcover of greater than 70%.
- African lovegrass to comprise less than 10% of the pasture sward.
- Soil nutrient levels tested to meet the minimum completion targets shown in **Table 14**.

Soil element completion target measures we developed using a combination of the ideal range for soil elements and those measured at the undisturbed Site PD3 in Area C (**Appendix A**), where there is a vigorous perennial grass and annual clover based pasture established.

Table 14 Soil Nutrient Level Completion Targets

Soil Element	Measure & Test	Site PD3 Soil Test	Ideal Soil Element Range	Completion Target Measure
pH	1:5 $CaCl_2$	4.94	Between 5.2 – 8.0	Greater than 4.9
Potassium	% of Total CEC	3.17	Greater than 2%	Greater than 2%
Sodium	% of Total CEC	1.90	Less than 3%	Less than 3%
Aluminium	% of Total CEC	0.53	Less than 5%	Less than 5%
Sulfur	mg/kg KCl 40 S	6.8	Greater than 8	Greater than 6.8
Nitrogen	mg/kg Water Extract	4.6	Greater than 10	Greater than 4.6
Zinc	mg/kg DTPA	0.7	Greater than 1	Greater than 0.7
Calcium	Calcium to Magnesium Ratio	2.14	Greater than 3	Greater than 2.1

Appendix A

Pine Dale Mine and Enhance Place Mine

Rehabilitated Areas

Laboratory Soil Test Results

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SOIL AND PLANT ANALYSIS

2/37 OWENS CR (PO BOX 374) ALSTONVILLE NSW 2477
PHONE 02 66281411 FAX 02 66285868 EMAIL : chemist@soiltec.com.au

Soil Test Report #s14-0897 (1)

Client: ***SLR***
Account: **Pdk 1**

Sample Received: 3.10.2014 Report Reply: 9.10.2014
SAMPLE I.D: 0-10cm **INTENDED USE:**
TEXTURE

			RESULT	***OPTIMAL***
Conductivity (dS/m)(1:5 water)			0.03	<0.15
pH	(1:5 $CaCl_2$)		6.60	5.2-5.5
Exchangeable Cations: (Measured)				
Calcium		(Ca)(meq/100g)	9.15	See Percentage
Magnesium:		(Mg)(meq/100g)	5.66	See Percentage
Potassium:		(K)(meq/100g)	0.26	0.5-1.0
Sodium:		(Na)(meq/100g)	0.39	Zero
Aluminium:		(Al)(meq/100g)	0.00	Zero
Total Cation Exchange Capacity (CEC):			**15.46**	
Exchangeable Cations (as a % of Total)				
Calcium:			59.18	65-80%
Magnesium:			36.61	15-20%
Potassium:			1.68	2-5%
Sodium:			2.52	<3%
Aluminium:			0.00	<5%
Phosphorus:	(mg/kg)	(Bray-1)	13.5	
Sulphur	(mg/kg)	(KCl 40 S)	5.4	8-10
Nitrate Nitrogen	(mg/kg)	(water extract)	6.9	At least 10
Organic Carbon	(%)	(Walkely & Black)	1.8	2% or more
Trace Elements				
Copper		(mg/kg) (DTPA)	0.7	
Zinc		(mg/kg) (DTPA)	0.7	
Manganese		(mg/kg) (DTPA)	14.6	
Iron		(mg/kg) (DTPA)	36.2	
Boron		(mg/kg) (Hot CaCl)	0.9	
Calculations:				
Lime Requirement (Cregan)			0.00	(see notes on page 2)
Calcium/Magnesium Ratio:			1.62	3-5

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SOIL AND PLANT ANALYSIS

2/37 OWENS CR (PO BOX 374) ALSTONVILLE NSW 2477
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Soil Test Report #s14-0897 (2)

Client: ***SLR***
Account: **Pdk 1**

Sample Received: 3.10.2014 Report Reply: 9.10.2014
SAMPLE I.D: 30-40cm **INTENDED USE:**
TEXTURE

			RESULT	OPTIMAL
Conductivity (dS/m)(1:5 water)			0.05	<0.15
pH	(1:5 $CaCl_2$)		4.20	5.2-5.5
Exchangeable Cations: (Measured)				
Calcium		(Ca)(meq/100g)	6.99	See Percentage
Magnesium:		(Mg)(meq/100g)	5.32	See Percentage
Potassium:		(K)(meq/100g)	0.19	0.5-1.0
Sodium:		(Na)(meq/100g)	0.66	Zero
Aluminium:		(Al)(meq/100g)	0.63	Zero
Total Cation Exchange Capacity (CEC):			**13.79**	
Exchangeable Cations (as a % of Total)				
Calcium:			50.69	65-80%
Magnesium:			38.58	15-20%
Potassium:			1.38	2-5%
Sodium:			4.79	<3%
Aluminium:			4.57	<5%
Phosphorus:	(mg/kg)	(Bray-1)	13.7	
Sulphur	(mg/kg)	(KCl 40 S)	3.6	8-10
Nitrate Nitrogen	(mg/kg)	(water extract)	2.3	At least 10
Organic Carbon	(%)	(Walkely & Black)	0.3	2% or more
Trace Elements				
Copper		(mg/kg) (DTPA)	0.5	
Zinc		(mg/kg) (DTPA)	0.4	
Manganese		(mg/kg) (DTPA)	3.5	
Iron		(mg/kg) (DTPA)	9.4	
Boron		(mg/kg) (Hot CaCl)	0.6	
Calculations:				
Lime Requirement (Cregan)			0.82	(see notes on page 2)
Calcium/Magnesium Ratio:			1.31	3-5

~ASPAC~

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Soil Test Report #s14-0897 (3)

Client: ***SLR***
Account: **Pdk 2**

Sample Received: 3.10.2014 Report Reply: 9.10.2014
SAMPLE I.D: 0-10cm **INTENDED USE:**
TEXTURE

			RESULT	OPTIMAL
Conductivity (dS/m)(1:5 water)			0.04	<0.15
pH	(1:5 $CaCl_2$)		4.57	5.2-5.5
Exchangeable Cations: (Measured)				
Calcium		(Ca)(meq/100g)	7.78	See Percentage
Magnesium:		(Mg)(meq/100g)	4.25	See Percentage
Potassium:		(K)(meq/100g)	0.22	0.5-1.0
Sodium:		(Na)(meq/100g)	0.30	Zero
Aluminium:		(Al)(meq/100g)	0.59	Zero
Total Cation Exchange Capacity (CEC):			**13.14**	
Exchangeable Cations (as a % of Total)				
Calcium:			59.21	65-80%
Magnesium:			32.34	15-20%
Potassium:			1.67	2-5%
Sodium:			2.28	<3%
Aluminium:			4.49	<5%
Phosphorus:	(mg/kg)	(Bray-1)	30.5	
Sulphur	(mg/kg)	(KCl 40 S)	6.0	8-10
Nitrate Nitrogen	(mg/kg)	(water extract)	4.6	At least 10
Organic Carbon	(%)	(Walkely & Black)	2.0	2% or more
Trace Elements				
Copper		(mg/kg) (DTPA)	0.6	
Zinc		(mg/kg) (DTPA)	0.8	
Manganese		(mg/kg) (DTPA)	16.2	
Iron		(mg/kg) (DTPA)	28.4	
Boron		(mg/kg) (Hot CaCl)	0.8	
Calculations:				
Lime Requirement (Cregan)			0.77	(see notes on page 2)
Calcium/Magnesium Ratio:			1.83	3-5

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SOIL AND PLANT ANALYSIS

2/37 OWENS CR (PO BOX 374) ALSTONVILLE NSW 2477
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Soil Test Report #s14-0897 (4)

Client: ***SLR***
Account: **Pdk 2**

Sample Received: 3.10.2014 Report Reply: 9.10.2014
SAMPLE I.D: 20-30cm **INTENDED USE:**
TEXTURE

			RESULT	OPTIMAL
Conductivity (dS/m)(1:5 water)			0.04	<0.15
pH	(1:5 $CaCl_2$)		3.78	5.2-5.5
Exchangeable Cations: (Measured)				
Calcium		(Ca)(meq/100g)	3.92	See Percentage
Magnesium:		(Mg)(meq/100g)	2.66	See Percentage
Potassium:		(K)(meq/100g)	0.14	0.5-1.0
Sodium:		(Na)(meq/100g)	0.55	Zero
Aluminium:		(Al)(meq/100g)	0.65	Zero
Total Cation Exchange Capacity (CEC):			**7.92**	
Exchangeable Cations (as a % of Total)				
Calcium:			49.49	65-80%
Magnesium:			33.59	15-20%
Potassium:			1.77	2-5%
Sodium:			6.94	<3%
Aluminium:			8.21	<5%
Phosphorus:	(mg/kg)	(Bray-1)	26.2	
Sulphur	(mg/kg)	(KCl 40 S)	3.0	8-10
Nitrate Nitrogen	(mg/kg)	(water extract)	2.3	At least 10
Organic Carbon	(%)	(Walkely & Black)	0.3	2% or more
Trace Elements				
Copper		(mg/kg) (DTPA)	0.5	
Zinc		(mg/kg) (DTPA)	0.5	
Manganese		(mg/kg) (DTPA)	5.8	
Iron		(mg/kg) (DTPA)	11.7	
Boron		(mg/kg) (Hot CaCl)	0.5	
Calculations:				
Lime Requirement (Cregan)			0.85	(see notes on page 2)
Calcium/Magnesium Ratio:			1.47	3-5

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Soil Test Report #s14-0897 (5)

Client: ***SLR***
Account: **Pdk 3**

Sample Received: 3.10.2014 Report Reply: 9.10.2014
SAMPLE I.D: 30-40cm **INTENDED USE:**
TEXTURE

			RESULT	OPTIMAL
Conductivity (dS/m)(1:5 water)			0.04	<0.15
pH	(1:5 $CaCl_2$)		4.60	5.2-5.5
Exchangeable Cations: (Measured)				
Calcium		(Ca)(meq/100g)	7.26	See Percentage
Magnesium:		(Mg)(meq/100g)	5.93	See Percentage
Potassium:		(K)(meq/100g)	0.16	0.5-1.0
Sodium:		(Na)(meq/100g)	0.81	Zero
Aluminium:		(Al)(meq/100g)	0.11	Zero
Total Cation Exchange Capacity (CEC):			**14.27**	
Exchangeable Cations (as a % of Total)				
Calcium:			50.88	65-80%
Magnesium:			41.56	15-20%
Potassium:			1.12	2-5%
Sodium:			5.68	<3%
Aluminium:			0.77	<5%
Phosphorus:	(mg/kg)	(Bray-1)	24.9	
Sulphur	(mg/kg)	(KCl 40 S)	4.2	8-10
Nitrate Nitrogen	(mg/kg)	(water extract)	2.3	At least 10
Organic Carbon	(%)	(Walkely & Black)	0.3	2% or more
Trace Elements				
Copper		(mg/kg) (DTPA)	0.4	
Zinc		(mg/kg) (DTPA)	0.3	
Manganese		(mg/kg) (DTPA)	6.9	
Iron		(mg/kg) (DTPA)	15.6	
Boron		(mg/kg) (Hot CaCl)	0.4	
Calculations:				
Lime Requirement (Cregan)			0.14	(see notes on page 2)
Calcium/Magnesium Ratio:			1.22	3-5

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Soil Test Report #s14-0897 (6)

Client: ***SLR***
Account: **Pdk 3**

Sample Received: 3.10.2014 Report Reply: 9.10.2014
SAMPLE I.D: 0-10cm **INTENDED USE:**
TEXTURE

			RESULT	OPTIMAL
Conductivity (dS/m)(1:5 water)			0.06	<0.15
pH	(1:5 $CaCl_2$)		4.94	5.2-5.5
Exchangeable Cations: (Measured)				
Calcium		(Ca)(meq/100g)	6.08	See Percentage
Magnesium:		(Mg)(meq/100g)	2.84	See Percentage
Potassium:		(K)(meq/100g)	0.30	0.5-1.0
Sodium:		(Na)(meq/100g)	0.18	Zero
Aluminium:		(Al)(meq/100g)	0.05	Zero
Total Cation Exchange Capacity (CEC):			**9.45**	
Exchangeable Cations (as a % of Total)				
Calcium:			64.34	65-80%
Magnesium:			30.05	15-20%
Potassium:			3.17	2-5%
Sodium:			1.90	<3%
Aluminium:			0.53	<5%
Phosphorus:	(mg/kg)	(Bray-1)	14.7	
Sulphur	(mg/kg)	(KCl 40 S)	6.8	8-10
Nitrate Nitrogen	(mg/kg)	(water extract)	4.6	At least 10
Organic Carbon	(%)	(Walkely & Black)	1.5	2% or more
Trace Elements				
Copper		(mg/kg) (DTPA)	0.8	
Zinc		(mg/kg) (DTPA)	0.7	
Manganese		(mg/kg) (DTPA)	19.3	
Iron		(mg/kg) (DTPA)	30.8	
Boron		(mg/kg) (Hot CaCl)	0.8	
Calculations:				
Lime Requirement (Cregan)			0.07	(see notes on page 2)
Calcium/Magnesium Ratio:			2.14	3-5

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PHONE 02 66281411 FAX 02 66285868 EMAIL : chemist@soiltec.com.au

Soil Test Report #s14-0897 (7)

Client: ***SLR***
Account: **Pdk 4**

Sample Received: 3.10.2014 Report Reply: 9.10.2014
SAMPLE I.D: 0-10cm **INTENDED USE:**
TEXTURE

			RESULT	OPTIMAL
Conductivity (dS/m)(1:5 water)			0.10	<0.15
pH	(1:5 $CaCl_2$)		5.71	5.2-5.5
Exchangeable Cations: (Measured)				
Calcium		(Ca)(meq/100g)	6.80	See Percentage
Magnesium:		(Mg)(meq/100g)	2.57	See Percentage
Potassium:		(K)(meq/100g)	0.34	0.5-1.0
Sodium:		(Na)(meq/100g)	0.14	Zero
Aluminium:		(Al)(meq/100g)	0.00	Zero
Total Cation Exchange Capacity (CEC):			**9.85**	
Exchangeable Cations (as a % of Total)				
Calcium:			69.04	65-80%
Magnesium:			26.09	15-20%
Potassium:			3.45	2-5%
Sodium:			1.42	<3%
Aluminium:			0.00	<5%
Phosphorus:	(mg/kg)	(Bray-1)	32.6	
Sulphur	(mg/kg)	(KCl 40 S)	7.4	8-10
Nitrate Nitrogen	(mg/kg)	(water extract)	4.6	At least 10
Organic Carbon	(%)	(Walkely & Black)	1.9	2% or more
Trace Elements				
Copper		(mg/kg) (DTPA)	0.7	
Zinc		(mg/kg) (DTPA)	0.8	
Manganese		(mg/kg) (DTPA)	23.8	
Iron		(mg/kg) (DTPA)	33.7	
Boron		(mg/kg) (Hot CaCl)	0.9	
Calculations:				
Lime Requirement (Cregan)			0.00	(see notes on page 2)
Calcium/Magnesium Ratio:			2.65	3-5

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SOIL AND PLANT ANALYSIS

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Soil Test Report #s14-0897 (8)

Client: ***SLR***
Account: **Pdk 5**

Sample Received: 3.10.2014 Report Reply: 9.10.2014
SAMPLE I.D: 0-10cm **INTENDED USE:**
TEXTURE

			RESULT	OPTIMAL
Conductivity (dS/m)(1:5 water)			0.11	<0.15
pH	(1:5 $CaCl_2$)		4.08	5.2-5.5
Exchangeable Cations: (Measured)				
Calcium		(Ca)(meq/100g)	5.14	See Percentage
Magnesium:		(Mg)(meq/100g)	3.26	See Percentage
Potassium:		(K)(meq/100g)	0.27	0.5-1.0
Sodium:		(Na)(meq/100g)	0.71	Zero
Aluminium:		(Al)(meq/100g)	0.62	Zero
Total Cation Exchange Capacity (CEC):			**10.00**	
Exchangeable Cations (as a % of Total)				
Calcium:			51.40	65-80%
Magnesium:			32.60	15-20%
Potassium:			2.70	2-5%
Sodium:			7.10	<3%
Aluminium:			6.20	<5%
Phosphorus:	(mg/kg)	(Bray-1)	14.4	
Sulphur	(mg/kg)	(KCl 40 S)	6.3	8-10
Nitrate Nitrogen	(mg/kg)	(water extract)	6.9	At least 10
Organic Carbon	(%)	(Walkely & Black)	1.2	2% or more
Trace Elements				
Copper		(mg/kg) (DTPA)	0.6	
Zinc		(mg/kg) (DTPA)	0.9	
Manganese		(mg/kg) (DTPA)	20.2	
Iron		(mg/kg) (DTPA)	39.2	
Boron		(mg/kg) (Hot CaCl)	0.8	
Calculations:				
Lime Requirement (Cregan)			0.81	(see notes on page 2)
Calcium/Magnesium Ratio:			1.58	3-5

SOILTEC

SOIL AND PLANT ANALYSIS

2/37 OWENS CR (PO BOX 374) ALSTONVILLE NSW 2477
PHONE 02 66281411 FAX 02 66285868 EMAIL : chemist@soiltec.com.au

Soil Test Report #s14-0897 (9)

Client: ***SLR***
Account: **Pdk 5**

Sample Received: 3.10.2014 Report Reply: 9.10.2014
SAMPLE I.D: 20-30cm **INTENDED USE:**
TEXTURE

			RESULT	OPTIMAL
Conductivity (dS/m)(1:5 water)			0.13	<0.15
pH	(1:5 $CaCl_2$)		5.91	5.2-5.5
Exchangeable Cations: (Measured)				
Calcium		(Ca)(meq/100g)	7.28	See Percentage
Magnesium:		(Mg)(meq/100g)	5.15	See Percentage
Potassium:		(K)(meq/100g)	0.20	0.5-1.0
Sodium:		(Na)(meq/100g)	1.06	Zero
Aluminium:		(Al)(meq/100g)	0.00	Zero
Total Cation Exchange Capacity (CEC):			**13.69**	
Exchangeable Cations (as a % of Total)				
Calcium:			53.18	65-80%
Magnesium:			37.62	15-20%
Potassium:			1.46	2-5%
Sodium:			7.74	<3%
Aluminium:			0.00	<5%
Phosphorus:	(mg/kg)	(Bray-1)	13.3	
Sulphur	(mg/kg)	(KCl 40 S)	3.4	8-10
Nitrate Nitrogen	(mg/kg)	(water extract)	2.3	At least 10
Organic Carbon	(%)	(Walkely & Black)	0.4	2% or more
Trace Elements				
Copper		(mg/kg) (DTPA)	0.3	
Zinc		(mg/kg) (DTPA)	0.5	
Manganese		(mg/kg) (DTPA)	11.2	
Iron		(mg/kg) (DTPA)	12.8	
Boron		(mg/kg) (Hot CaCl)	0.5	
Calculations:				
Lime Requirement (Cregan)			0.00	(see notes on page 2)
Calcium/Magnesium Ratio:			1.41	3-5

SOILTEC

SOIL AND PLANT ANALYSIS

2/37 OWENS CR (PO BOX 374) ALSTONVILLE NSW 2477
PHONE 02 66281411 FAX 02 66285868 EMAIL : chemist@soiltec.com.au

Soil Test Report #s14-0897 (10)

Client: ***SLR***
Account: **EP1**

Sample Received: 3.10.2014 Report Reply: 9.10.2014
SAMPLE I.D: 0-10cm **INTENDED USE:**
TEXTURE

			RESULT	OPTIMAL
Conductivity (dS/m)(1:5 water)			0.07	<0.15
pH	(1:5 $CaCl_2$)		7.17	5.2-5.5
Exchangeable Cations: (Measured)				
Calcium		(Ca)(meq/100g)	6.18	See Percentage
Magnesium:		(Mg)(meq/100g)	2.29	See Percentage
Potassium:		(K)(meq/100g)	0.27	0.5-1.0
Sodium:		(Na)(meq/100g)	0.16	Zero
Aluminium:		(Al)(meq/100g)	0.00	Zero
Total Cation Exchange Capacity (CEC):			**8.90**	
Exchangeable Cations (as a % of Total)				
Calcium:			69.44	65-80%
Magnesium:			25.73	15-20%
Potassium:			3.03	2-5%
Sodium:			1.80	<3%
Aluminium:			0.00	<5%
Phosphorus:	(mg/kg)	(Bray-1)	14.9	
Sulphur	(mg/kg)	(KCl 40 S)	7.0	8-10
Nitrate Nitrogen	(mg/kg)	(water extract)	2.3	At least 10
Organic Carbon	(%)	(Walkely & Black)	3.2	2% or more
Trace Elements				
Copper		(mg/kg) (DTPA)	0.8	
Zinc		(mg/kg) (DTPA)	0.8	
Manganese		(mg/kg) (DTPA)	24.7	
Iron		(mg/kg) (DTPA)	26.4	
Boron		(mg/kg) (Hot CaCl)	0.9	

Calculations:

Lime Requirement (Cregan)	0.00	(see notes on page 2)
Calcium/Magnesium Ratio:	2.70	3-5

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SOIL AND PLANT ANALYSIS

2/37 OWENS CR (PO BOX 374) ALSTONVILLE NSW 2477
PHONE 02 66281411 FAX 02 66285868 EMAIL : chemist@soiltec.com.au

Soil Test Report #s14-0897 (11)

Client: ***SLR***
Account: **EP1**

Sample Received: 3.10.2014 Report Reply: 9.10.2014
SAMPLE I.D: 30-40cm **INTENDED USE:**
TEXTURE

			RESULT	*OPTIMAL*
Conductivity (dS/m)(1:5 water)			0.09	<0.15
pH	(1:5 $CaCl_2$)		5.53	5.2-5.5
Exchangeable Cations: (Measured)				
Calcium		(Ca)(meq/100g)	7.56	See Percentage
Magnesium:		(Mg)(meq/100g)	3.81	See Percentage
Potassium:		(K)(meq/100g)	0.21	0.5-1.0
Sodium:		(Na)(meq/100g)	0.38	Zero
Aluminium:		(Al)(meq/100g)	0.00	Zero
Total Cation Exchange Capacity (CEC):			**11.96**	
Exchangeable Cations (as a % of Total)				
Calcium:			63.21	65-80%
Magnesium:			31.86	15-20%
Potassium:			1.76	2-5%
Sodium:			3.18	<3%
Aluminium:			0.00	<5%
Phosphorus:	(mg/kg)	(Bray-1)	11.4	
Sulphur	(mg/kg)	(KCl 40 S)	4.2	8-10
Nitrate Nitrogen	(mg/kg)	(water extract)	2.3	At least 10
Organic Carbon	(%)	(Walkely & Black)	0.2	2% or more
Trace Elements				
Copper		(mg/kg) (DTPA)	0.4	
Zinc		(mg/kg) (DTPA)	0.3	
Manganese		(mg/kg) (DTPA)	8.0	
Iron		(mg/kg) (DTPA)	13.3	
Boron		(mg/kg) (Hot CaCl)	0.4	
Calculations:				
Lime Requirement (Cregan)			0.00	(see notes on page 2)
Calcium/Magnesium Ratio:			1.98	3-5

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SOIL AND PLANT ANALYSIS

2/37 OWENS CR (PO BOX 374) ALSTONVILLE NSW 2477
PHONE 02 66281411 FAX 02 66285868 EMAIL : chemist@soiltec.com.au

Soil Test Report #s14-0897 (12)

Client: ***SLR***
Account: **EP2**

Sample Received: 3.10.2014 Report Reply: 9.10.2014
SAMPLE I.D: 0-10cm **INTENDED USE:**
TEXTURE

			RESULT	OPTIMAL
Conductivity (dS/m)(1:5 water)			0.09	<0.15
pH	(1:5 $CaCl_2$)		7.12	5.2-5.5
Exchangeable Cations: (Measured)				
Calcium		(Ca)(meq/100g)	4.37	See Percentage
Magnesium:		(Mg)(meq/100g)	2.05	See Percentage
Potassium:		(K)(meq/100g)	0.27	0.5-1.0
Sodium:		(Na)(meq/100g)	0.14	Zero
Aluminium:		(Al)(meq/100g)	0.00	Zero
Total Cation Exchange Capacity (CEC):			**6.83**	
Exchangeable Cations (as a % of Total)				
Calcium:			63.98	65-80%
Magnesium:			30.01	15-20%
Potassium:			3.95	2-5%
Sodium:			2.05	<3%
Aluminium:			0.00	<5%
Phosphorus:	(mg/kg)	(Bray-1)	19.7	
Sulphur	(mg/kg)	(KCl 40 S)	6.5	8-10
Nitrate Nitrogen	(mg/kg)	(water extract)	4.6	At least 10
Organic Carbon	(%)	(Walkely & Black)	3.0	2% or more
Trace Elements				
Copper		(mg/kg) (DTPA)	0.7	
Zinc		(mg/kg) (DTPA)	0.7	
Manganese		(mg/kg) (DTPA)	26.4	
Iron		(mg/kg) (DTPA)	21.3	
Boron		(mg/kg) (Hot CaCl)	0.7	
Calculations:				
Lime Requirement (Cregan)			0.00	(see notes on page 2)
Calcium/Magnesium Ratio:			2.13	3-5

SOILTEC SOIL AND PLANT ANALYSIS

2/37 OWENS CR (PO BOX 374) ALSTONVILLE NSW 2477
PHONE 02 66281411 FAX 02 66285868 EMAIL : chemist@soiltec.com.au

Soil Test Report #s14-0897 (13)

Client: ***SLR***
Account: **EP2**

Sample Received: 3.10.2014 Report Reply: 9.10.2014
SAMPLE I.D: 20-30cm **INTENDED USE:**
TEXTURE

			RESULT	OPTIMAL
Conductivity (dS/m)(1:5 water)			0.09	<0.15
pH	(1:5 $CaCl_2$)		6.70	5.2-5.5
Exchangeable Cations: (Measured)				
Calcium		(Ca)(meq/100g)	6.84	See Percentage
Magnesium:		(Mg)(meq/100g)	4.87	See Percentage
Potassium:		(K)(meq/100g)	0.30	0.5-1.0
Sodium:		(Na)(meq/100g)	0.28	Zero
Aluminium:		(Al)(meq/100g)	0.00	Zero
Total Cation Exchange Capacity (CEC):			**12.29**	
Exchangeable Cations (as a % of Total)				
Calcium:			55.66	65-80%
Magnesium:			39.63	15-20%
Potassium:			2.44	2-5%
Sodium:			2.28	<3%
Aluminium:			0.00	<5%
Phosphorus:	(mg/kg)	(Bray-1)	12.9	
Sulphur	(mg/kg)	(KCl 40 S)	3.3	8-10
Nitrate Nitrogen	(mg/kg)	(water extract)	2.3	At least 10
Organic Carbon	(%)	(Walkely & Black)	0.4	2% or more
Trace Elements				
Copper		(mg/kg) (DTPA)	0.5	
Zinc		(mg/kg) (DTPA)	0.5	
Manganese		(mg/kg) (DTPA)	11.7	
Iron		(mg/kg) (DTPA)	8.4	
Boron		(mg/kg) (Hot CaCl)	0.5	
Calculations:				
Lime Requirement (Cregan)			0.00	(see notes on page 2)
Calcium/Magnesium Ratio:			1.40	3-5

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SOIL AND PLANT ANALYSIS

2/37 OWENS CR (PO BOX 374) ALSTONVILLE NSW 2477
PHONE 02 66281411 FAX 02 66285868 EMAIL : chemist@soiltec.com.au

Soil Test Report #s14-0897 (14)

Client: ***SLR***
Account: **EP3**

Sample Received: 3.10.2014 Report Reply: 9.10.2014
SAMPLE I.D: 0-10cm **INTENDED USE:**
TEXTURE

			RESULT	*OPTIMAL*
Conductivity (dS/m)(1:5 water)			0.09	<0.15
pH	(1:5 $CaCl_2$)		6.80	5.2-5.5
Exchangeable Cations: (Measured)				
Calcium		(Ca)(meq/100g)	8.44	See Percentage
Magnesium:		(Mg)(meq/100g)	5.21	See Percentage
Potassium:		(K)(meq/100g)	0.35	0.5-1.0
Sodium:		(Na)(meq/100g)	0.54	Zero
Aluminium:		(Al)(meq/100g)	0.00	Zero
Total Cation Exchange Capacity (CEC):			**14.54**	
Exchangeable Cations (as a % of Total)				
Calcium:			58.05	65-80%
Magnesium:			35.83	15-20%
Potassium:			2.41	2-5%
Sodium:			3.71	<3%
Aluminium:			0.00	<5%
Phosphorus:	(mg/kg)	(Bray-1)	21.0	
Sulphur	(mg/kg)	(KCl 40 S)	5.9	8-10
Nitrate Nitrogen	(mg/kg)	(water extract)	2.3	At least 10
Organic Carbon	(%)	(Walkely & Black)	2.8	2% or more
Trace Elements				
Copper		(mg/kg) (DTPA)	0.8	
Zinc		(mg/kg) (DTPA)	0.8	
Manganese		(mg/kg) (DTPA)	25.1	
Iron		(mg/kg) (DTPA)	26.8	
Boron		(mg/kg) (Hot CaCl)	0.7	

Calculations:

Lime Requirement (Cregan)	0.00	(see notes on page 2)
Calcium/Magnesium Ratio:	1.62	3-5

SOILTEC SOIL AND PLANT ANALYSIS

2/37 OWENS CR (PO BOX 374) ALSTONVILLE NSW 2477
PHONE 02 66281411 FAX 02 66285868 EMAIL : chemist@soiltec.com.au

Soil Test Report #s14-0897 (15)

Client: ***SLR***
Account: **EP3**

Sample Received: 3.10.2014 Report Reply: 9.10.2014
SAMPLE I.D: 20-30cm **INTENDED USE:**
TEXTURE

			RESULT	OPTIMAL
Conductivity (dS/m)(1:5 water)			0.10	<0.15
pH	(1:5 $CaCl_2$)		5.38	5.2-5.5
Exchangeable Cations: (Measured)				
Calcium		(Ca)(meq/100g)	5.28	See Percentage
Magnesium:		(Mg)(meq/100g)	4.28	See Percentage
Potassium:		(K)(meq/100g)	0.29	0.5-1.0
Sodium:		(Na)(meq/100g)	0.34	Zero
Aluminium:		(Al)(meq/100g)	0.00	Zero
Total Cation Exchange Capacity (CEC):			**10.19**	
Exchangeable Cations (as a % of Total)				
Calcium:			51.82	65-80%
Magnesium:			42.00	15-20%
Potassium:			2.85	2-5%
Sodium:			3.34	<3%
Aluminium:			0.00	<5%
Phosphorus:	(mg/kg)	(Bray-1)	12.7	
Sulphur	(mg/kg)	(KCl 40 S)	2.8	8-10
Nitrate Nitrogen	(mg/kg)	(water extract)	2.3	At least 10
Organic Carbon	(%)	(Walkely & Black)	0.3	2% or more
Trace Elements				
Copper		(mg/kg) (DTPA)	0.4	
Zinc		(mg/kg) (DTPA)	0.3	
Manganese		(mg/kg) (DTPA)	10.2	
Iron		(mg/kg) (DTPA)	11.1	
Boron		(mg/kg) (Hot CaCl)	0.5	
Calculations:				
Lime Requirement (Cregan)			0.00	(see notes on page 2)
Calcium/Magnesium Ratio:			1.23	3-5

Appendix C

Enhance Place Mine Stock Management Plan

Enhance Place Mine
Stock Management Plan

1449 Castlereagh Highway
Blackmans Flat NSW 2790

Report prepared for Mr & Mrs Morris
by First Field Environmental
on behalf of Enhance Place Mine Pty Ltd

April 2016

Revision history			
Version	**Date**	**Author**	**Authorised by**
Draft	10 February 2016	Michelle Evans /Anna Douglas Morris	
Draft revision	29 February 2016	Michelle Evans	
Final	18 April 2016	Michelle Evans	Michelle Evans

This report has been prepared by First Field Environmental for Enhance Place Mine Pty Ltd. The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report.

First Field Environmental

PO Box 6318 Silverwater NSW 1811

T: 0468 708 520

E: michelle@firstfield.net.au

Contents

Appendices

Figures

Tables

Introduction

This Stock Management Plan has been developed by First Field Environmental, on behalf of Enhance Place Mine Pty Ltd, to provide guidance in relation to stock management on the Morris property.

The Morris property is located on land formerly comprising Enhance Place Mine. The property is within Blackman's Flat on the southern side of Castlereagh Highway at Blackmans Flat, 15km north of Lithgow. The land to which this report relates is shown on Figure 1 and Figure 2 and covers an area of approximately 16.2 ha.

Enhance Place Mine operated as an open cut coal mine from 1997 until its closure in June 2005. Rehabilitation of the former Enhance Place Mine has included the importation of soil and creation of a landform similar to that of the surrounding area. Catchment drains and sediment retention basins have been installed. The land has been revegetated to pasture, internal trails have been constructed and the land is fenced and gated. The pasture area is part of a larger area which includes treed rehabilitation areas on steeper slopes of the landscape. These areas are adjacent to the pasture area but do not form part of the Stock Management Plan.

Although still under mining license to Enhance Place Mine, the land is utilised by Mr and Mrs Morris of 1449 Castlereagh Highway, Blackmans Flat. The land is currently grazed by miniature horses, horses, ponies and cows.

This report aims to provide Mr and Mrs Morris with a plan for maintaining the land as pasture for grazing and to promote appropriate stocking rates in accordance with land capability. The preliminary report will be provided to Enhance Place Mine and Mr and Mrs Morris and will facilitate discussion regarding the feasibility of land management practices in terms of desired land use. The preparation of a final Stock Management Plan will be informed by the outcomes of these discussions.

How to use this document

This document has been prepared for use in ongoing stock and grazing management for the property. **Section one** contains information about the property, including landuse and property characteristics, and provides background information related to the condition of the pasture areas.

Section two provides recommendations for achieving appropriate landuse and includes a trigger action response plan for addressing issues as they are observed. The land management schedule recommends the completion of specific activities on a regular basis. It is intended that the trigger action response plan be checked regularly and that the land management schedule be used for forward planning.

Detailed information relating to stocking rates, fertiliser application and weed control is provided in the Appendices.

1. Property information

1.1 Previous landuse

Enhance Place Mine was established in 1997 to recover remnant coal from areas previously open cut mined in the 1950's. Open cut operations ceased in June 2005 when economically feasible coal reserves were exhausted.

Rehabilitation of the land by Enhance Place Mine Pty Ltd has been conducted in accordance with completion criteria contained within the Care and Maintenance Mining Operations Plan (Enhance Place Mine 2014) and has included:

- Land forming;
- Erosion management;
- Pasture establishment;
- Soil stabilisation; and
- Weed management.

Rehabilitation of the land by Enhance Place Mine Pty Ltd is ongoing. The most recent assessment of rehabilitation completion criteria (Enhance Place Mine 2014) determined the following:

Land forming - The final landform shaping and drainage control structures have been completed. The rehabilitated landform is considered to have no greater management requirements than the surrounding landforms and land uses.

Erosion management –The potential for major erosion (gully or tunnel erosion or mass movement) is considered to have been mitigated as there is no evidence of significant erosion occurring at the site. Surface erosion may occur in areas where vegetation rehabilitation has not been successful, or as a result of overgrazing.

Pasture establishment – The current proportion of annual legume and perennial grass species within the pasture areas is representative of species composition in adjoining unmined land. Ground cover in pasture rehabilitation areas is >70% however areas of sparse to no ground cover do exist.

Soil stabilisation – Cracking soils and waterlogging may occur in areas of overgrazing or where rehabilitation has not been successful.

Weed management – Noxious weeds have been controlled in accordance with the principles of an integrated weed management plan.

1.2 Current and future landuse

The land is currently utilised by Mr and Mrs Morris for grazing and generally supports combinations of the following livestock:

- Miniature horses;
- Horses;
- Ponies; and
- Cows.

Livestock grazing is a common activity in the Blackmans Flat region and it is the intention of Mr and Mrs Morris to continue to graze these animals in the future.

Figure 1 Rehabilitated pastures of the Morris Property

REHABILITATION AREA -TREES

SECONDARY DOMAINS

REHABILITATION AREA - TREES

REHABILITATION AREA - PASTURE

Access trail

Site boundary and internal fencelines

African Lovegrass infestation 2014

3 CELL CULVERT

From Cullen Bullen

To Wallerawang

CASTLEREAGH HIGHWAY

Portion 69

Road

Portion 298

Portion 299

Portion 300

Portion 301

Portion 302

Por 309

Portion 310

Portion 308

Portion 303

Portion 304

Portion 305

Portion 306

Portion 307

Portion 370

DP1026541

7004 Closed Road (Gaz. 29th July 1927)

Road

House

DAM

Transmission Line Easement 25m wide

Tree Line

Catchment Drain

Drain

Catchment

SEDIMENT RETENTION BASIN

WETLAND

ML 1520

ML 1458

ML 1442

101 DP1145705

DP 64 RA

Paddock 1

Paddock 2

Paddock 3

Lot 2 DP 596248

MINE MANAGER

DATE

NOTES:

CRAVEN, ELLISTON & HAYES (LITHGOW) PTY.LTD.
CONSULTING LAND, ENGINEERING AND MINING SURVEYORS
ACN 056 544 551
"ASTROLABE" RUTHERFORD LANE, LITHGOW, 2790 PH: (02) 6351 2281, FAX: (02) 6352 1339
EMAIL : survey@ceh.com.au

DATE	18–12–13
AMENDED	
SURVEYOR	T.H./T.E
DRAWN	K.L.F./D.M.
CHECKED	

ENHANCE PLACE MINE
FINAL REHABILITATION AND POST MINING LAND USE

SCALE - 1 : 1250 (A1 SHEET)

DWG No

ENH-REH PLAN 3

1.3 Property characteristics

1.3.1 Climate

Blackman's Flat is located within the central tablelands of NSW, a region with a temperate cool-season wet climate (Stokes & Howden 2010). The area is characterised by warm summers, cool to cold winters and generally consistent rainfall.

Mean maximum temperatures of around 23°C are experienced from November to March. Mean minimum temperatures of below 5°C are experienced from May to September.

The area received a mean annual rainfall of 700 mm in 2015. January and April received the highest monthly rainfall of approximately 157 mm per month, while September had the lowest monthly rainfall of approximately 9 mm (Bureau of Meteorology 2016).

Mean monthly temperature and rainfall statistics indicate strong seasonality in average temperatures and rainfall patterns throughout the year.

The following average rainfall and temperature data (Figure 3) has been sourced from Bureau of Meteorology records for Mount Boyce Automatic Weather Station and is considered generally indicative of conditions experienced on the property.

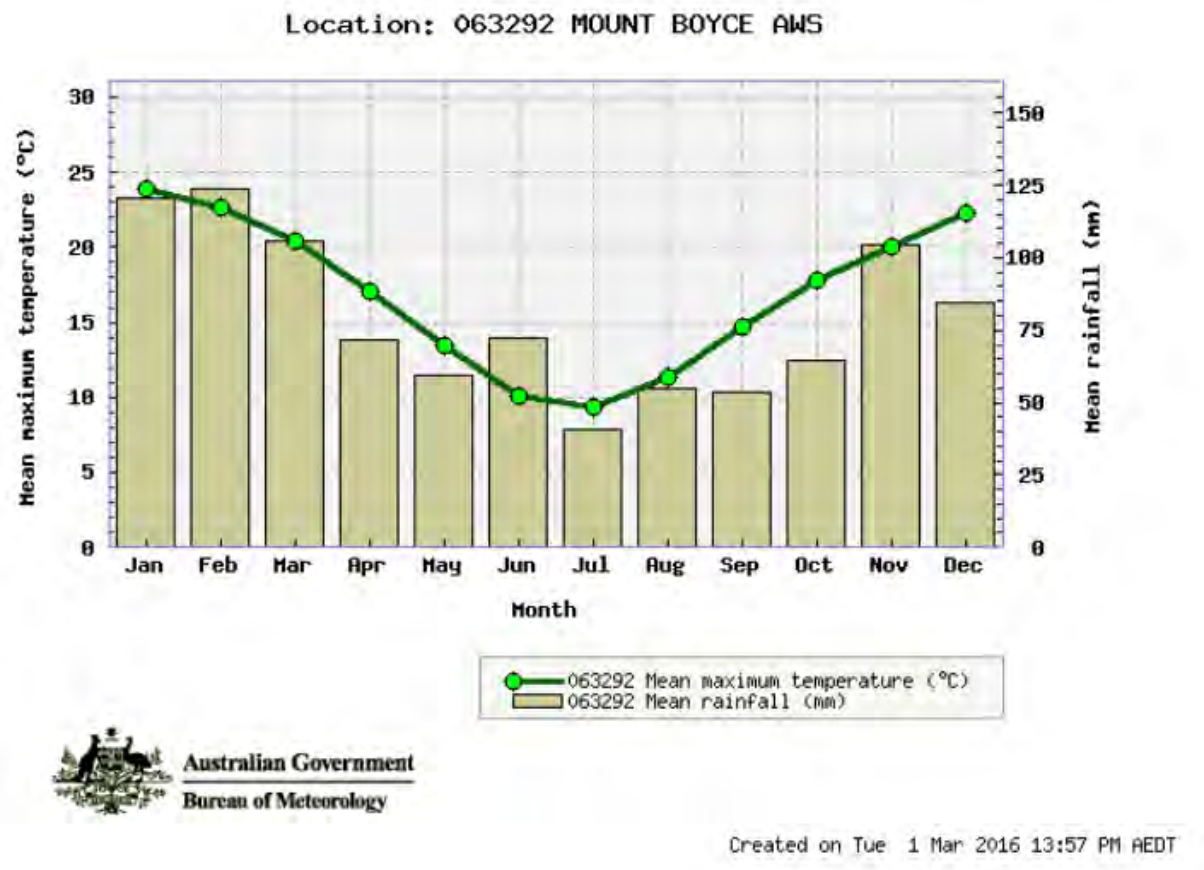

Figure 3 Mean maximum temperature and rainfall

1.3.2 Topography

Blackman's Flat is located on the western side of the Blue Mountains and is at 900 m (Australian Height Datum). The landscape is characterised by rolling hills. Slopes vary between 10% and 25% with a local relief of less than 50m. The study area was filled and contoured prior to 2014 and the shape and form of the landscape is considered to be visually similar to the adjacent landscape.

1.3.3 Soils

Soils on the property are highly disturbed, resulting from rehabilitation activities including filling of the open cut coal mine, soil importation and land forming. As a result; soil physical and chemical characteristics are not consistent with unmined soils of the region.

Unmined soils adjacent to the property are generally mapped as Cullen Bullen soil landscape (*Soil landscapes of the Wallerawang 1:100,000 sheet* King 1993).

Soil characteristics

Various soil components have been surveyed as part of rehabilitation monitoring undertaken by First Field Environmental. Soil samples to a depth of 10 cm were taken randomly from ten points throughout the pasture area, and physical characteristics including soil structure, ped shape and ped surface characteristics were assessed in accordance with the *Australian soil and land survey field handbook* (CSIRO 2009). The results of field tests have been used to determine land and soil capability (see Section 1.3.6).

SLR Global Environmental Solutions conducted soil nutrient analysis of topsoil samples (0-10cm depth) from two locations on the property in 2014. A summary of test results is provided in Table 1. Soil nutrient levels found at the test sites are compared with target levels. These target levels are a product of ideal soil nutrient ranges for pastures and actual soil nutrient levels found in unmined local pastures.

Complete test results are provided in Appendix A.

Table 1 Summary of soil test results

Soil element	Measure and test	Target Measure	Soil test location average	Target Met
pH	1:5 $CaCl_2$	>4.9	6.9	Yes
Potassium (K)	% of total CEC	>2%	2.72%	Yes
Sodium (Na)		<3%	2.75%	Yes
Aluminium (Al)		<5%	0.00%	Yes
Sulfur (S)	mg/kg KCl 40 S	>8mg/kg	6.45 mg/kg	Yes*
Nitrogen (N)	mg/kg water extract	>10mg/kg	2.30 mg/kg	No (see land management schedule (Section 2.8) for mitigation measures)
Zinc (Zn)	mg/kg DTPA	>1mg/kg	0.80 mg/kg	
Calcium (Ca)	Ca:Mg	>3	2.16	

*Sulfur levels of 6.5 mg/kg are optimal for moderately-grazed pastures (DSE 7-12 DSE/ha).

1.3.4 Drainage

Contour drains and sediment retention basins were established prior to 2014 and generally remain in good operational condition with little evidence of surface water flow occurring outside of established contour drainage lines.

Isolated areas accounting for less than 1% of the rehabilitated pasture area show evidence of seasonal waterlogging.

1.3.5 Erosion and sedimentation

There are no significant erosion features that compromise landform stability within the rehabilitation areas. The landform is considered to be stable and is suitable for grazing horses.

There is some evidence of active, minor to moderate wind erosion where pastures are poorly established or absent (see Figure 4 and Figure 5). Minor rilling is occurring on exposed soils of the sediment retention basins and can be seen in Figure 6.

Figure 4 Patchy exposed soils in south-western corner of pasture area

Figure 5 Exposed soils in southern portion of pasture area

Figure 6 Minor erosion of sediment retention basin wall

Surface cracking to 20 cm is evident along slope crests in the northern extent of the pasture area (see Figure 7). Soil samples taken to a depth of 20 cm indicate that soils are not prone to cracking through swelling and shrinking and suggest that cracking is indicative of soil settling.

Figure 7 Example of soil cracking on slope crests

1.3.6 Land and soil capability

Land capability refers to the suitability of land for particular agricultural activities and is determined by the relationship between the physical and chemical properties of soils. An assessment of these properties conducted in accordance with the *Land and Soil Capability Assessment Scheme* (NSW Office of Environment and Heritage, 2012) is summarised in Table 2.

The resulting classification indicates that the pastures are consistent with **Land and Soil Capability Class V** and are suitable for grazing.

Class V land has severe limitations for high impact land management uses such as cropping, and is generally more suitable for grazing with some limitations or very occasional cultivation for pasture establishment. It is important to minimise soil disturbance, maintain cover and maintain good organic matter levels. The limiting factors for land use are generally related to wind erosion hazard.

Table 2 Land and soil capability assessment

Class	Description
Water erosion hazard class	3 3 - <10% slope
Wind erosion hazard class	5 Moderate wind erodibility class of surface soil, high winds erosive power, high exposure to wind, average annual rainfall >500mm
Soil structural decline class	4 Fragile light textured soil - hardsetting
Soil acidification hazard class	4 Very low texture /buffering capacity, pH 5.38 – 7.17 ($CaCl_2$)
Salinity hazard class	1 Moderate to high recharge potential, low discharge potential, low salt store
Waterlogging hazard class	2 0 – 0.25 months typical waterlogging duration, moderately well drained soils
Shallow soils and rockiness hazard class	1 Nil rocky outcrop, soil depth >100 cm
Mass movement hazard class	1 No mass movement present

1.3.7 Pasture species

Pastures were established with Cox's River seed mix prior to 2014 and are representative of species composition of grazing pastures on adjacent, unmined soils.

Cox's River seed mix consists of 70% perennial grasses and 20% annual legumes, sown at the following rates:

- 40% Fescue
- 25% Cocksfoot
- 20% Subterranean clover
- 6% Perennial rye grass
- 5% White clover
- 4% Phalaris

Within this region, cold temperatures (especially in July and August) restrict pasture growth and areas are prone to severe frosts, with the frost-free period varying from 150 to 240 days per year.

In summer, evaporation exceeds rainfall, reducing pasture growth. Winter rainfall exceeds evaporation, but cooler temperatures slow pasture growth. Heavy summer rains face higher evaporation rates than rain falling mid-autumn when evaporation rates are lower.

Appendix B describes the phases of pasture growth.

1.3.8 Weeds

Weeds with the potential to occur in the region are defined as those listed under the Noxious Weeds Act 1993; Weeds of National Significance; and Environmental Weeds. Also included in this report are species harmful to horses.

The following weed species meeting this definition and observed on the property during previous surveys:

- African Lovegrass (*Eragrostis curvula*);
- Blackberry (*Rubus fruticosus* aggregate);
- St John's Wort (*Hypericum perforatum*);
- Sweet Briar (*Rosa rubiginosa*);
- Crofton Weed (*Ageratina adenophora*);
- Fireweed (*Senecio madagascariensis*);
- Wild Radish (*Raphanus raphanistrum*);
- Flatweed (*Hypochaeris radicata*); and
- Paterson's Curse (*Echium plantagineum*).

African Lovegrass infestations (shown on Figure 2) were treated in late 2015 in accordance with control methods listed in Appendix C and are currently not observed to be growing or producing seed.

Appendix D provides a full list of noxious weeds declared in the Upper Macquarie County.

1.3.9 Fencing and access

Figure 2 shows the location and extent of current fencing and access trails. All fences and gates appear to be in good condition.

Access trails within the study area are generally in good condition although minor wind and water erosion is evident in steeper areas of trails.

2. Property management

2.1 Stocking rates

The grazing area (see Figure 2) within the property is comprised of three fenced paddocks with a combined area of ~16.2 ha:

- Paddock 1 (~9.4 ha);
- Paddock 2 (~1.9 ha); and
- Paddock 3 (~4.9 ha).

The success of pastures in supporting current stocking rates has been determined in relation to the pasture and soil condition at the time the field survey was conducted (11th September 2015).

Carrying capacity refers to the 'dry sheep equivalent' (DSE) per hectare supported by the class of pasture. DSE is a standard unit used to measure the feed requirements of different animal classes. Table 3 shows the DSE ratings of different stock classes.

The paddocks have been classified as 'top-dressed pasture with some clover', which according to the NSW Department of Primary Industries (2005) has a DSE rating of 7-10.

The carrying capacity is the number of hectares required for a particular animal on a pasture type and is determined as the livestock DSE divided by the pasture DSE:

Horse – light horse in current top-dressed pastures with some clover = 10.0/(7-10) = 1.42 – 1.0

A light horse therefore requires 1.42-1.0 hectares of top-dressed pasture with some clover to survive. The current capacity of each fenced pasture area on the property is provided in Appendix E.

Table 3 DSE ratings and current carrying capacity of pasture in present and improved conditions

Livestock (DSE rating)	Number of hectares required	Fenced area 1 (9.4 ha)	Fenced area 2 (1.9 ha)	Fenced area 3 (4.9 ha)
Top-dressed pasture with some clover (present state of pasture) (average DSE /ha = 7-10)				
Horses – light horse (DSE = 10)	1.43-1.0	6-9	1-2	3-5

2.2 Grazing management

Grazing management is a cost-effective tool to obtain the most from a pasture (NSW Agriculture 2003). Benefits of good grazing management include:

- Optimisation of pasture growth;
- Maximisation of feed quality; and
- Maintenance of adequate ground cover that in turn prevents erosion and resists weed invasion.

Recent monitoring by First Field Environmental revealed an average total living ground cover of 87.5% within the established quadrats of pasture rehabilitation area. Establishing and maintaining near 100% ground cover across the paddocks can ensure that optimal rainfall is retained in the landscape and concurrently sediments (potential resources) are trapped within the farm-scape, rather than lost through erosive processes (Gleeson & Gleeson 2012).

The establishment and persistence of good ground cover will reduce various forms of soil degradation, including soil acidification, rising water tables and dryland salinisation, as well as increasing beneficial soil micro-organisms and improving soil structure, pasture composition and fertility (NSW Agriculture 2003).

2.3 Pasture management

The pastures currently support a mix of summer and winter-growing species palatable to horses and cattle. Re-sowing is required when favourable pasture cover decreases to <70%, and is addressed by both the trigger action response plan (see Section 2.7) and the land management schedule (Section 2.8). A list of summer and winter-growing pasture species is provided in Appendix F and includes the method, rate and optimal timing for sowing each species.

2.4 Nutrient availability

Soils currently exhibit a pH of 6.7-7.9. While this is within the range of adjacent, unmined soils, a decrease in availability of certain nutrients in slightly acid soils may be mitigated through appropriate fertiliser application. Other nutrients may decline as a result of the removal of biomass through grazing and may require regular application.

Soil tests indicate that the following nutrients are deficient for optimal pasture growth:

- Sulfur (S);
- Nitrogen (N); and
- Calcium (Ca).

These deficiencies may be addressed through scheduled paddock rehabilitation and stock rotation (see land management schedule, Section 2.8). Application rate, method and optimal timing relevant to the property is provided in Appendix G.

2.5 Paddock rotation

The temporary exclusion of livestock from paddocks is required in order to conduct sediment and erosion control works, re-sowing and weed treatment. Livestock may be excluded from one of three fenced paddocks in the pasture area and may also be housed temporarily in the home paddock or stables. Activities requiring the exclusion of livestock are addressed in the trigger action response plan (see Section 2.7). Regular paddock rotation is addressed in the land management schedule (Section 2.8).

2.6 Weed management

The identification and management of noxious weeds is addressed in the trigger action response plan (see Section 2.7), while the land management schedule (Section 2.8) provides for regular and long term strategies for weed management. Best practice integrated weed control methods are described in Appendix C.

2.7 Trigger action response plan

Table 4 summarises the actions required when certain triggers are observed. Whilst some of these actions need to be conducted at specific times, others can be implemented as needed. A schedule of land management actions to be conducted at regular intervals is provided in the following section.

Table 4 Trigger action response plan

Goal	Trigger	Action	Optimal timing
Appropriate stock rate	The number of stock grazing in pastures should be in accordance with the grazing capability of each pasture.	Refer to Section 2.1 for appropriate stocking rates. Match number of stock to specific paddock recommendations provided in Table 3.	Ongoing.
Weeds including African Lovegrass to comprise <10% of the pasture sward with no significant infestations.	More than 10% of the pasture sward composed of weeds. Weeds outcompeting preferred species.	Identify and map the location of noxious weeds, weeds hazardous to horses and weeds of national significance (see Appendices C and D). Treat weeds in accordance with Appendices C and D. Install temporary fencing around outbreaks to restrict grazing pressure during weed treatment and regrowth of preferred species.	As required. Determine optimal timing of weed control in accordance with Appendix C. Spray weeds during target species' growth period and when the desirable species are dormant (refer to Appendices B and C).
Maintenance of ground cover (vegetation, leaf litter, mulch, cryptograms) at or above 70%.	Less than 70% ground cover.	Rip along contours of poorly established pasture rehabilitation areas and re-sow pasture mix and fertiliser. Increase and maintain groundcover in pasture rehabilitation areas to at least 95% to minimise run-off and loss of nutrients and soil, and limit erosion.	As required. Select appropriate seasonal species for re-sowing (refer to Appendix F).
No loss of topsoil.	Presence of active surface erosion. Combined bare surfaces of more than 20 m^2 per hectare.	Remove livestock and install temporary fencing to restrict grazing pressure during regrowth. Sow a cover crop of oats or short-term rye grasses to protect the soil surface (sub-surface root system remains even after grass has died off).	As required.
Limited areas of high concentration	Broad areas of cracking soils	Mechanically improve the soil surface in areas where cracking is more than 20 cm in depth.	As required.

Goal	Trigger	Action	Optimal timing
of soil cracking due to soil settling.	associated with soil settling.		
Minimal waterlogging and ponding in pastures.	Presence of surface water pooling more than 48 hours after rainfall. Yellowing of pasture. When holes are dug 20-30 cm below the surface, water flows into them.	Intercept water upslope with earthworks and redirect into farm dams. Clear impediments from contour drains. Install temporary fencing to restrict grazing pressure and prevent damage to pasture and soil. Plant deep-rooted temperate perennial grass species in areas prone to waterlogging. Graze taller pastures (>10 cm) as it enables animals to eat their allocation quicker and will prevent the need for stock to walk in search of food.	As required. Install drains when soils are moist e.g. after summer or autumn rains.
Stable sediment retention basins.	Active erosion of sediment retention basins.	Revegetate exposed sediment retention basin walls with perennial species.	As required. Select appropriate seasonal species for re-sowing (refer to Appendix F).
Stable trail surfaces.	Water ponding, active erosion and minor rilling on trail surfaces.	Construct a roll-over drain above existing rill erosion on sloping trails to divert water off trail surface more effectively.	Install drains when soils are moist e.g. after summer or autumn rains.
No symptoms of overgrazing are evident.	Symptoms of overgrazing evident e.g. pasture grazed lower than 3 cm; ground cover below 70%.	Locate water points and fences to manipulate grazing distribution, ensure even pasture utilisation and reduce selective grazing. Keep paddock records of stock numbers and use in conjunction with land condition monitoring to help determine suitable stocking rates.	Assess available feed and adjust stocking rates at the end of the growing season (refer to Appendix E).

2.8 Land management schedule

Table 5 Land management schedule

Goal	Description	Activity	Timing	Summer			Autumn			Winter			Spring		
				December	January	February	March	April	May	June	July	August	September	October	November
Appropriate soil nutrient levels and pH range	Soils should be within a pH range of >5.0 and <8.5 to facilitate availability of soil nutrients consistent with soils on adjacent, unmined properties. Soil nutrients deficiencies (as determined by agricultural soil testing) should be balanced to within appropriate ranges as indicated in Section 2.4.	• Apply gypsum at a rate of 3t/ha. • Apply DAP at a rate of 0.20t/ha. • Apply MAP at a rate of 0.25t/ha. • Re-sow exposed soils with a seasonally appropriate pasture mix (see Appendix F). • Fence area to exclude grazing until the pasture is established and then only lightly graze the pasture in the first growing season.	As part of initial pasture regeneration activities. Note: see Appendix G for appropriate timing of gypsum and fertiliser application.												
Erosion control	Less than 20% of the pasture area should have exposed soils.	• Identify and map areas of active surface soil erosion. • Re-sow exposed soils with a seasonally appropriate pasture mix (see Appendix F). • Fence area to exclude grazing until the pasture is established and then only lightly graze the pasture in the first growing season. • Plant trees where mid-slope soils are exposed and fence area to exclude grazing until trees are established.	As part of pasture regeneration activities.												

Goal	Description	Activity	Timing	Summer			Autumn			Winter			Spring		
				December	January	February	March	April	May	June	July	August	September	October	November
Seasonally appropriate pasture growth	More than 70% favourable species in winter pastures. More than 70% favourable species in summer pastures.	• Determine % species presence in pastures (see Appendix F). • Move stock to prevent overgrazing and decline of desirable pasture species.	Seasonally.				Winter pasture species						Summer pasture species		
Weed control	No noxious weeds. No weeds hazardous to horses. No weeds of national significance. Less than 10% of pasture supporting African Lovegrass.	• Identify and map the location of noxious weeds, weeds hazardous to horses and weeds of national significance (see Appendices C and D). • Treat weeds in accordance with Appendices C and D. • Heavily graze annual weeds to remove seed heads and reduce seed set.	During seasonal periods of weed establishment (see Appendix B). As part of pasture regeneration activities. See Appendix C for appropriate timing of weed treatment. See Appendix B to determine optimal timing for grazing during seed production and set.												

Goal	Description	Activity	Timing	Summer			Autumn			Winter			Spring		
				December	January	February	March	April	May	June	July	August	September	October	November
Pasture regeneration	Maintenance of pasture comprising approximately 70% perennial grass and 20% annual legumes.	• Identify priority pasture areas for regeneration. • Exclude stock from regenerating pasture, while ensuring that stocking rates in remaining pasture areas are consistent with Section 2.1. • Only lightly graze newly sown pasture areas in the first season. • Rest pastures for seed set and re-establishment e.g. delay grazing of sub-clover in autumn until the 2-3 leaf stage where feasible.	For pasture regeneration, spelling must occur after effective rainfall has fallen, when the plants are actively growing and restoring their root reserves.												

3. Project outcomes

The project commenced in December 2015 and included a number of visits to the property. Stakeholders were identified as Mr. and Mrs. Morris who are the current landholders and Graham Goodwin, the representative of Enhance Place Mine. Consultation has incorporated a number of phone calls from Michelle Evans to each of the stakeholders, as well as two face-to-face meetings at the Morris property.

An initial meeting at the Morris property was conducted in December 2016 between Michelle Evans and Mr. and Mrs. Morris. This meeting introduced the project aims and identified a number of concerns held by the landholders. A summary of this meeting is provided in Appendix H.

Key points from the initial meeting were discussed with Graham Goodwin and subsequently informed the development of the Draft Stock Management Plan.

The second stakeholder meeting was held at the Morris property in March 2016 and was attended by each of the stakeholders. This meeting provided an opportunity to present the Draft Stock Management Plan and describe how the document may assist in determining appropriate stocking rates and ongoing land management activities. A summary of this meeting is included in Appendix H.

3.1 Ongoing activities

Many of the initial stakeholder concerns listed in Appendix H are addressed in the Stock Management Plan and have been communicated to each of the stakeholders. Those concerns not immediately addressed in the Stock Management Plan are the subject of ongoing activities and focus on two issues: the number of water-holding dams and the need to manage stocking numbers in areas undergoing rehabilitation.

Mr. and Mrs. Morris have supplied a copy of the real estate listing for the property (attached). Enhance Place Mine is currently examining the number and condition of dams on the property.

Appropriate stocking numbers have been determined in the Stock Management Plan and communicated to the landholders. There is agreement between stakeholders to exclude stock from a selected paddock to allow further rehabilitation activities to be undertaken.

3.2 Recommendations

- Assess the current condition of pastures against the land management goals in Table 4 (Section 2.7).
- Exclude stock from a selected paddock to enable further rehabilitation activities. Refer to appropriate stocking numbers provided in Appendix E for remaining paddocks.
- Conduct rehabilitation of selected paddock having regard to the property management guidelines described in Section 2.
- Monitor the success of rehabilitation activities against the land management goals of Section 2.7.
- Reopen the successfully rehabilitated paddock to grazing at appropriate rates.

References

Australian Alpaca Association (2013) *Australian Alpaca Association*, https://www.alpaca.asn.au/

Auld, B (2009) *Guidelines for monitoring weed control and recovery of native vegetation,* New South Wales Department of Primary Industries, http://www.dpi.nsw.gov.au/data/assets/pdf_file/0011/299360/Guidelines-for-monitoring-weed-control-and-recovery-of-native-vegetation.pdf

Bureau of Meteorology (2016) *Weather data Lidsdale (Maddox Street) NSW*, http://www.bom.gov.au /climate/data/stations/

CSIRO Publishing (2009) *Australian Soil and Land Survey Field Handbook* (No. 1). National Committee on Soil and Terrain (Australia) (Eds.). CSIRO Publishing.

Enhance Place Pty Ltd (2014) *Enhance Place Mine Mining Operations Plan,* Enhance Place Pty Ltd, NSW.

First Field Environmental (2014) *Enhance Place Mine Rehabilitation Monitoring Report*, First Field Environmental, NSW.

Gleeson & Gleeson (2012) *Reducing the impacts of development on wildlife.* CSIRO Publishing, Victoria.

International Erosion Control Association (2008) *Best Practice Erosion and Sediment Control,* International Erosion Control Association (Australasia).

King DP (1993) *Soil landscapes of the Wallerawang 1: 100 000 sheet.* NSW Department of Land and Water Conservation, Sydney.

Landform Research (2014) *Assessment suitability for horses, Cavallo Estate, Lot 224 Orton Road, Oakford.*

McNaught et al (2008) *A field manual for surveying and mapping nationally significant weeds*, Second Edition, Bureau of Rural Sciences, Canberra.

Natural Resource Management Ministerial Council (2006) *Australian Weed Strategy – A national strategy for weed management in Australia*, Natural Resource Management Ministerial Council for the Department of the Environment and Water Resources.

NSW Agriculture (1997) *Establishing Pastures*, DairyLink series. NSW Agriculture.

NSW Agriculture (2003) *The grazier's guide to pastures: Sowing and managing profitable pastures in the Central and Southern Tablelands, Monaro, and Upper South-West Slopes of New South Wales (Second Edition).* Information Delivery Program, NSW Agriculture, Dubbo and Orange.

NSW Department of Primary Industries (n.d.) *Calendar of growth cycle and control times for weeds of the Southern Tablelands*, New South Wales Department of Primary Industries, http://www.dpi.nsw.gov.au/data/assets/pdf_file /0019/154504/calendar-weed-south- tablelands.pdf

NSW Department of Primary Industries (2005) *Using DSEs and carrying capacities to compare beef enterprises*. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/agriculture/farm-business/budgets/livestock/beef/info/dse

NSW Department of Primary Industries (2006) *Pasture assessment and livestock production.* Primefact 323. New South Wales Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file /0013/101326/pasture-assessment-and-livestock-production.pdf

NSW Department of Primary Industries (2007) *Pastures for horses*, Primefact 525. New South Wales Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0011/109982/pastures-for-horses.pdf

NSW Department of Primary Industries (2009) *Planning for horse establishments,* Primefact 932. New South Wales Department of Primary Industries, http://www.dpi.nsw.gov.au/agriculture/livestock/horses /management/general/establishments

NSW Department of Primary Industries (2009) *Rejuvenating Perennial Pastures*. New South Wales Department of Primary Industries.

NSW Department of Primary Industries (2011) *Noxious and Environmental Weed Control Handbook,* New South Wales Department of Primary Industries, http://www.dpi.nsw.gov.au/data/assets/pdf_file /0017/123317/Noxious-and- environmental-weed-control-handbook.pdf

NSW Department of Primary Industries (2013) *Noxious weed declarations for Upper Macquarie County Council*, New South Wales Department of Primary Industries, http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/noxweed/

NSW Department of Primary Industries & Dairy Australia (2004) *Successful Silage (Second Edition).* New South Wales Department of Primary Industries and Dairy Australia.

NSW Office of Environment and Heritage (2012) *The land and soil capability assessment scheme: Second approximation*, Office of Environment and Heritage, State of New South Wales.

Sainty and Associates (n.d.) *WEEDeck series*, Sainty and Associates.

SLR Global Environmental Solutions (2014) *Soil Assessment and Recommendations for Rehabilitated Areas, Pine Dale Mine and Enhance Place Mine,* SLR Consulting Australia Pty Ltd, NSW.

Stokes C & Howden M (2010) *Adapting agriculture to climate change,* CSIRO Publishing, Melbourne.

Appendix A Soil test results

SOILTEC

SOIL AND PLANT ANALYSIS

2/37 OWENS CR (PO BOX 374) ALSTONVILLE NSW 2477
PHONE 02 66251411 FAX 02 66285868 EMAIL : chemist@soiltec.com.au

Soil Test Report #s14-0897 (14)

Client: SLR
Account: EP3

Sample Received: 3.10.2014 Report Reply: 9.10.2014
SAMPLE I.D: 0-10cm **INTENDED USE:**
TEXTURE

		RESULT	OPTIMAL
Conductivity (dS/m)(1:5 water)		0.09	<0.15
pH	(1:5 $CaCl_2$)	6.80	5.2-5.5
Exchangeable Cations: (Measured)			
Calcium	(Ca)(meq/100g)	8.44	See Percentage
Magnesium:	(Mg)(meq/100g)	5.21	See Percentage
Potassium:	(K)(meq/100g)	0.35	0.5-1.0
Sodium:	(Na)(meq/100g)	0.54	Zero
Aluminium:	(Al)(meq/100g)	0.00	Zero
Total Cation Exchange Capacity (CEC):		**14.54**	
Exchangeable Cations (as a % of Total)			
Calcium:		58.05	65-80%
Magnesium:		35.83	15-20%
Potassium:		2.41	3-5%
Sodium:		3.71	<3%
Aluminium:		0.00	<5%
Phosphorus:	(mg/kg) (Bray-1)	21.0	
Sulphur	(mg/kg) (KCl 40 S)	5.9	8-10
Nitrate Nitrogen	(mg/kg) (water extract)	2.3	At least 10
Organic Carbon	(%) (Walkely & Black)	2.8	2% or more
Trace Elements			
Copper	(mg/kg) (DTPA)	0.8	
Zinc	(mg/kg) (DTPA)	0.8	
Manganese	(mg/kg) (DTPA)	25.1	
Iron	(mg/kg) (DTPA)	26.8	
Boron	(mg/kg) (Hot CaCl)	0.7	
Calculations:			
Lime Requirement (Cregan)		0.00	(see notes on page 2)
Calcium/Magnesium Ratio:		1.62	3-5

~ASPAC~
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1 of 2

SOILTEC

SOIL AND PLANT ANALYSIS

2/37 OWENS CR (PO BOX 374) ALSTONVILLE NSW 2477
PHONE 02 66281411 FAX 02 66285868 EMAIL: chemist@soiltec.com.au

Soil Test Report #s14-0897 (10)

Client: *SLR*
Account: **EP1**

Sample Received: 3.10.2014 Report Reply: 9.10.2014
SAMPLE I.D: 0-10cm **INTENDED USE:**
TEXTURE

			RESULT	*OPTIMAL*
Conductivity (dS/m)(1:5 water)			0.07	<0.15
pH	(1:5 $CaCl_2$)		7.17	5.2-5.5
Exchangeable Cations: (Measured)				
Calcium:		(Ca)(meq/100g)	6.18	See Percentage
Magnesium:		(Mg)(meq/100g)	2.39	See Percentage
Potassium:		(K)(meq/100g)	0.27	0.5-1.0
Sodium:		(Na)(meq/100g)	0.16	Zero
Aluminium:		(Al)(meq/100g)	0.00	Zero
Total Cation Exchange Capacity (CEC):			8.99	
Exchangeable Cations (as a % of Total)				
Calcium:			69.44	65-80%
Magnesium:			25.73	15-20%
Potassium:			3.03	2-8%
Sodium:			1.80	<3%
Aluminium:			0.00	<5%
Phosphorus:	(mg/kg)	(Bray-1)	14.9	
Sulphur	(mg/kg)	(KCl 40 S)	7.0	8-10
Nitrate Nitrogen	(mg/kg)	(water extract)	2.3	At least 10
Organic Carbon	(%)	(Walkely & Black)	3.2	2% or more
Trace Elements				
Copper		(mg/kg) (DTPA)	0.8	
Zinc		(mg/kg) (DTPA)	0.8	
Manganese		(mg/kg) (DTPA)	24.7	
Iron		(mg/kg) (DTPA)	26.4	
Boron		(mg/kg) (Hot CaCl)	0.9	
Calculations:				
Lime Requirement (Crogan)			0.00	(see notes on page 2)
Calcium/Magnesium Ratio			2.70	3-5

~ASPAC~

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Appendix B Phases of pasture growth

Phases of pasture growth	Characteristics
Phase 1 – Early growing season	• Short, leafy growth • Moderate pasture growth rate • High forage quality but low yield • High sensitivity to grazing pressure
Phase 2 – Mid growing season	• Well-developed leafy-tussock phase • High pasture growth rate • Good forage quality with moderate to increasing yield • Moderate sensitivity to grazing pressure
Phase 3 – Mid to late growing season	• Reproductive phase • Low pasture growth rate • Moderate to low forage quality and maximum yield has been reached • Low to moderate sensitivity to grazing pressure
Phase 4 – Beyond the growing season	• Dormant phase • Little or no growth • Low to very low forage quality and plants have withdrawn protein into their roots • Low sensitivity to grazing pressure

Source: QLD Department of Agriculture, Fisheries and Forestry (2013)

Appendix C Weed management plan

This Plan has been prepared to meet the requirements for noxious weed control in the Upper Macquarie County Council area.

Legal requirements

Individuals, landholders and Government have a responsibility to control noxious weeds on their land under the *Noxious Weeds Act* 1993, which is regulated in the area by the Upper Macquarie County Council. Weeds under this Act include Weeds of National Significance (WoNS) and Environmental Alert Weeds (EAW).

The following legislation and strategies may require consideration when undertaking various weed management activities.

Legislation relevant to weed control

Legislation	Summary
Noxious Weeds Act 1993	The *Noxious Weeds Act* 1993 defines the roles of government, councils, private landholders and public authorities in the management of noxious weeds. The Act sets up categorisation and control actions for the various noxious weeds, according to their potential to cause harm to the environment. Landowners or occupiers of land are required to control noxious weeds on the property and to prevent the spread of noxious weeds to adjoining land.
Pesticides Act 1999	The NSW Department of Environment and Conservation restricts the application of certain pesticides near or within waterways.
Work Health and Safety Act 2011	The Act is administered by Workcover NSW. There are specific requirements relating to use of pesticides and certification of pesticide operators.
Australian Weeds Strategy – A national strategy for weed management in Australia (Department of the Environment and Water Resources 2006)	The Strategy provides a national framework to complement state, territory, regional and local government strategies and industry initiatives and legislative controls; and identifies the Weeds of National Significance (WONS) for priority weed management efforts.
Threat Abatement Plans	Statutory plans under the NSW *Threatened Species Conservation Act* 1995 for control of Key Threatening Processes, which includes some weed species.

Weeds to which this Plan applies

This Plan has been developed for the control and management of Class 4 noxious weeds listed for the Upper Macquarie County Council area (Appendix D).

In addition, this Plan identifies noxious weeds for which there are specific control and notification requirements:

- Control Class 1 and 2 – Plants which must be eradicated from the land and whose presence must be notified to the local control authority;
- Control Class 3 – Plants which must be fully and continuously suppressed and destroyed; and
- Control Class 5 – Outbreaks of which must be reported to the local control authority within three days of discovery.

Weeds listed as WoNS have been determined by the Australian Government based on their invasiveness, potential for spread, and their environmental, social and economic impacts. Listed WoNS have been and continue to be responsible for significant agricultural, forestry and environmental damage.

The EAW list has been compiled by the Australian Government Department of Environment and Heritage in conjunction with other experts and complements the WONS list. Weeds that have been placed on the National Environmental Alert List have been identified as having the potential to become a significant threat to biodiversity if they are not managed in the early stages of establishment.

Weed control

Weed control on the site will include:

- Identification of noxious weeds across the property;
- Determination of control class of noxious weeds observed on the property;
- Weed management scheduling in accordance with the aims of integrated weed management; and
- Monitoring the occurrence and extent of noxious weeds.

Note: Scheduled weed treatment may be determined in accordance with:

- *Weed control in pastures and lucerne 2010* (NSW Industry and Investment, 2010)
- *Noxious and environmental weed control handbook: a guide to weed control in non-crop, aquatic and bushland situations* (NSW DPI, 2011);
- *Calendar of growth cycle and control times for weeds of the Southern* Tablelands (NSW DPI, n.d); and
- *Weed Alerts* (NSW DPI, n.d.).

Integrated weed management

Weed competition is a major cause of pasture establishment failure and may lead to a loss of pasture production. Cultivation, cropping, slashing, herbicides and pasture manipulation can all be effectively used to control weeds (NSW Agriculture 2003). When using herbicides, it is important to remember that selection and correct use of herbicide is crucial.

Grazing by livestock may also be used as a form of weed control, by helping to suppress and reduce weed growth and seed production and/or prevent weed domination (Gleeson & Gleeson 2012).

However this technique varies in effectiveness depending on the palatability of the weed species. A combination of grazing and weed control (through the use of a herbicide application or other techniques to remove unpalatable weeds) can be an effective solution.

Integrated weed management control methods have been sourced from the *Noxious and environmental weed control handbook: A guide to weed control in non-crop, aquatic and bushland situations* (NSW DPI 2011). Chemical control methods may differ between life stages and application method for each species.

Integrated weed management of Control Class 4 noxious weeds

Note: species in **bold** have been recorded on the property

Common name ***Scientific name***	**Physical**	**Biological**	**Cultural**	**Chemical**
African boxthorn *Lycium ferocissimum*	Mechanically remove the top growth and as many of the roots as possible when soil is wet (winter) and burn the removed material.			A number of herbicides may be used for treatment. Regrowth should be sprayed.
African lovegrass ***Eragrostis curvula***			Pasture improvement and grazing management will reduce re-establishment. Main control principle is to ensure it is replaced by better species.	
Arrowhead *Sagittaria montevidensis*	Excavation with machinery or manual digging by hand from waterways. Steam application.		Maintain good hygiene and containment during physical control.	Use of a herbicide registered to control arrowhead. Herbicide treatment will often only suppress infestations and regeneration will occur.

Common name *Scientific name*	Physical	Biological	Cultural	Chemical
Asparagus weeds *Asparagus* species	Carefully dig out the entire crown of *A. aethiopicus*, leaving the roots and tubers in situ; the crown and any fruiting stems should be bagged and burnt. The entire plant (including root system) of *A. declinatus* can be dug out in small to medium sized infestations. Sheep grazing may be effective on *A. asparagoides.*	Biological control agents are available for *Asparagus asparagoides.*		A number of herbicide options are available, most of which require a permit for use.
Bathurst/Noogoora/ Hunter/ South American/ Californian/ Cockle burr *Xanthium* species	Hoe, chip or slash before flowering or seed set.	Biological control agents are available.	Maintaining ground cover in pastures to reduce burr germination and seedling survival. Prevent overgrazing of pastures in spring and summer. Seedling form is toxic to livestock.	A range of foliar and residual herbicide options are available.
Blackberry ***Rubus fruticosus* species *aggregate***	Slashing of juvenile bushes and use of goats (and potentially sheep depending on availability of other feed) will give some control, however these techniques are best used in a combination with herbicides (due to the root structure of the blackberry).	Biological control agents are available.	Improve pastures with a vigorous perennial species. Strong, actively growing pasture will help prevent invasion from weeds.	Herbicides are the most reliable method for achieving local eradication of blackberry, and a number of herbicides are registered for use on this weed.

Common name *Scientific name*	Physical	Biological	Cultural	Chemical
Chilean needle grass *Nassella neesiana*			Good grazing management combined with a pasture improvement program to reduce the soil seed bank.	Herbicide application may be used in combination with other management techniques.
Lippia *Phyla canescens*		The *National Lippia Working Group* is currently investigating biological control options.	Requires an integrated approach of suppression, pasture improvement and pasture maintenance.	Herbicide application should be used in conjunction with cropping, pasture improvement and grazing management where appropriate.
Long-leaf willow primrose *Ludwigia longifolia*	Small plants may be manually removed, taking care not to spread seed.			
Nodding thistle *Carduus nutans* subsp. *nutans*	Grubbing on scattered plants. Remove at least the top 10 cm of the root system and invert the sod to expose the plant roots and prevent regrowth.	Biological control agents are available.	Good perennial pastures with sound grazing management to prevent invasion.	Herbicide application at the early seedling stage or when passing from the seedling to the rosette stage.
Pampas grass *Cortaderia* species	Mechanical removal where possible. Remove the seed heads of large plants and slash before grubbing.	Readily grazed by stock when it is young (which prevents the development of flowers and seed set), before it becomes too abrasive.		May be treated with a Glyphosate-based herbicide such as Roundup.

Common name *Scientific name*	Physical	Biological	Cultural	Chemical
Prickly pear *Opuntia* species		*Cochineal* and *Cactoblastis* biological control agents are available.		
Prickly pear *Cylindropuntia* species	Small plants can be carefully mechanically removed.			
Sagittaria *Sagittaria platyphylla*	Isolated plants can be manually removed.			
Scotch broom *Cytisus scoparius*		Biological control agents may be available.	Use of goats as grazing management tool.	
Scotch, Stemless, Illyrian and Taurian thistles *Onopordum* species	Grub out single plants, removing at least 50 mm of root.	Biological control agents are available.	Establish a strong, perennial, grass-based pasture.	
Serrated tussock *Nassella trichotoma*	Grub out single plants.		Establish perennial pasture with good grazing management.	
Silverleaf nightshade *Solanum elaeagnifolium*			Use strong, competitive crops or pasture.	Seedlings are readily controlled by all registered

Common name *Scientific name*	Physical	Biological	Cultural	Chemical
			Quarantine infestation and prevent seeding. Do not cultivate.	herbicides.
Spiny burrgrass *Cenchrus incertus* */Cenchrus longispinus*			Establish a strong, competitive summer pasture. Ensure equipment hygiene is used to prevent seed dispersal. Quarantine infestations.	Herbicides are best used in a strategy incorporating cultivation, crop rotation and pasture improvement.
St. John's wort ***Hypericum perforatum***		Biological control agents are available.	Prevent invasion. Establish perennial pasture with good grazing management.	Spot-spraying using a registered herbicide can be used on isolated infestations.
Star thistle *Centaurea calcitrapa*	Hoe or chip individual plants or small infestations, removing at least 50 mm of the root.		Improve pasture stand.	Foliar application of a registered herbicide at seedling or rosette stage for best results.
Sweet briar ***Rosa rubiginosa***	Remove mechanically or grub out established plants. Graze with goats. Young seedlings may be grazed with sheep to help prevent establishment.		Vigorous perennial pastures provide competition to reduce invasion.	Registered herbicide may be applied by foliar spray, basal bark treatment, cut stump treatment or root application.

Common name *Scientific name*	Physical	Biological	Cultural	Chemical
Wild radish ***Raphanus raphanistrum***	Young plants may be easily removed by hand. Older plants develop a taproot that makes physical removal difficult. Slashing may reduce seed production but won't destroy the plant.	Biological control is risky as the plant is closely related to many agricultural and horticultural species.	Maintain a well-balanced pasture with good grazing management. Stock should be removed from Wild Radish infested areas.	Herbicide treatment may be used, however some populations have developed herbicide resistance.
Willows *Salix* species	Seedlings may be pulled by hand.			Registered herbicides may be applied by foliar spray, cut stump application or stem injection.

Chemical weed control methods

Species	Weed type /Noxious weed control class	Control method	Effect on grazing	Summer			Autumn			Winter			Spring		
				December	January	February	March	April	May	June	July	August	September	October	November
African Lovegrass *Eragrostis curvula*	4	Flupropanate 745 g/L **(*Taskforce*)** 300 mL per 100 L of water. **Non-chemical options:** appropriate grazing management.	4 month stock withholding period for boom spraying. 14 day stock withholding period for spot spraying.	✓	✓	✓							✓	✓	✓
Blackberry *Rubus fruticosus* aggregate species	4	Triclpyr 300 g/L + Picloram 100 g/L + Aminopyralid 8 g/L **(*Grazon Extra*)** 350 or 500 mL per 100 L water. **Non-chemical options:** slashing of young bushes and use of biological control agents.	No stock withholding period required.	✓	✓	✓	✓								
Crofton Weed *Ageratina adenophora*	Weed of horse pastures	MCPA 340 g/L + Dicamba 80 g/L **(Banvel M, Kamba M)** 2.8 L or 4 L per 100 L water. **Non-chemical options:** small plants can be dug out with mattock, slashing, and biological control agents.	7 days stock withholding period. The slashed and dried plant is still attractive and toxic to horses. Keep horses away until the plant has been completely removed from the paddock.	✓	✓	✓	✓						✓	✓	✓
Fireweed *Senecio madagascariensis*	Weed of horse pastures	Bromoxynil 200 g/L **(Various trade names)** 1.4 L or 2.8 L per 100 L water.	Bromoxynil has 14 days stock withholding period.				✓	✓	✓						

Species	Weed type /Noxious weed control class	Control method	Effect on grazing	Summer			Autumn			Winter			Spring		
				December	January	February	March	April	May	June	July	August	September	October	November
		Diflufenican g/L + Bromoxynil 250 g/L **(Jaguar, Barracuda)** 500 mL per 100 L water. Paraquat 250 g/L **(Gramoxone 250, Paraquat 250, Nuquat 250)** 1.2 L per 100 L water. Paraquat 135 g/L + Diquat 115 g/L **(Spray Seed 250)** 1.6 or 2.4 L per 100 L water. MCPA 250 g/L + Diflufenican 25 g/L **(Tigrex, Nugrex)** 1 L per 100 L water. Triclopyr 300 g/L + picloram 100 g/L **(Grazon Extra)** 350 mL per 100 L water. **Non-chemical options:** slashing, hand weeding, and biological control agents.	Diflufenican + Bromoxynil has 56 days stock withholding period. Paraquat has 7 days stock withholding period for horses. MCPA + Diflufenican has 7 days stock withholding period. No stock withholding period required for Triclopyr + picloram.												
Flatweed *Hypochaeris radicata*	Weed of horse pastures	Bromoxynil 200 g/L **(Various trade names)** 1.4 L or 2 L per 100 L water. Paraquat 250 g/L **(Gramoxone, Paraquat, Nuquat)** 1.2 L. Paraquat 135 g/L + Diquat 115 g/L **(Spray Seed)** 1.6 L to 2.4 L.	Bromoxynil has 14 days stock withholding period. Paraquat has 7 days stock withholding period for horses.										✓	✓	✓

Species	Weed type /Noxious weed control class	Control method	Effect on grazing	Summer			Autumn			Winter			Spring		
				December	January	February	March	April	May	June	July	August	September	October	November
Paterson's Curse *Echium plantagineum*	Weed of horse pastures	2,4-D dma amine 625 g/L **(Amicide 625, Amicide Lo-625A)** 1.1 L or 1.7 L per 100 L water. Glyphosate 450g/l **(Glyphosate ct, Roundup ct)** 800 mL or 1.6 L per 100 L water. Glyphosate 540 g/L **(Roundup Power Max)** 630 mL or 1.37 L per 100 L water. Glyphosate 500 g/L **(Touchdown, Hitech)** 660 mL or 1.32 L per 100 L water. Paraquat 250 g/L **(Gramoxone, Paraquat, Nuquat)** 1.2 L. Paraquat 135 g/L + Diquat 115 g/L **(Spray Seed)** 1.6 L to 2.4 L. Bromoxynil 200 g/L **(Various trade names)** 2 L per 100 L water *(Add 1.5–2.0 L/ha 2,4-DB (500 g/L)* Flumetsulam 800 g/L **(Broadstrike)** 25 g *(Add 0.7 L/ha bromoxynil (200 g/L); Add wetter + 0.1 L/ha diuron (500 g/L); Add 0.3 L/ha terbutryn (500 g/L) + wetter).* 2,4-DB 500 g/L trifolamine **(Buttress)** 1 L or 3.2 L per 100 L water.	2,4-D dma amine has 7 days stock withholding period. No stock withholding period required for Glyphosate. Paraquat has 7 days stock withholding period for horses. Bromoxynil has 14 days stock withholding period. Flumetsulam has 3 days stock withholding period. 2,4-DB has 7 days stock withholding period. Diflufenican + Bromoxynil has 14 days stock withholding period. Imazethapyr has 14 days stock withholding period.				✓	✓	✓						

Species	Weed type /Noxious weed control class	Control method	Effect on grazing	Summer			Autumn			Winter			Spring		
				December	January	February	March	April	May	June	July	August	September	October	November
		Diflufenican g/L + Bromoxynil 250 g/L **(Jaguar, Barracuda)** 500 mL or 750 mL per 100 L water. Imazethapyr 700 g/kg **(Spinnaker, WDG)** 70 g or 140 g. **Non-chemical options:** slashing and hand weeding, burning, grazing management, and biological control agents.													
St. John's Wort *Hypericum perforatum*	4	Triclpyr 300 g/L + Picloram 100 g/L + Aminopyralid 8 g/L **(*Grazon Extra*)** 500 mL per 100 L of water. **Non-chemical options:** appropriate grazing management and use of biological agents.	No stock withholding period required.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
				Twiggy flowering growth stage.			Spindly stem growth stage.						Twiggy flowering growth stage.		
Sweet Briar *Rosa rubiginosa*	4	Triclpyr 300 g/L + Picloram 100 g/L + Aminopyralid 8 g/L **(*Grazon Extra*)** 500 mL per 100 L of water. **Non-chemical options:** mechanical removal or grubbing.	No stock withholding period required.	✓	✓	✓							✓	✓	✓

Source: NSW WeedWise, NSW Dept. Primary Industries, <http://weeds.dpi.nsw.gov.au/>

Appendix D Noxious Weeds declared in the Upper Macquarie County Council

Class 4 noxious weeds

Note: Species in **bold** have been recorded within the property.

Common Name	Scientific Name	Control Class
African boxthorn	*Lycium ferocissimum*	4; WoNS
African lovegrass	***Eragrostis curvula***	**4**
Arrowhead	*Sagittaria calycina* var. *calycina*	4
Asparagus - climbing asparagus fern	*Asparagus plumosus*	4
Asparagus - ground asparagus	*Asparagus aethiopicus*	4
Asparagus weeds	*Asparagus* species	4
Blackberry	***Rubus fruticosus* species aggregate**	**4; WoNS**
Bridal creeper	*Asparagus asparagoides*	4; WoNS
Burr - Bathurst burr	*Xanthium spinosum*	4
Burr - Californian burr	*Xanthium orientale*	4
Burr - Italian cockleburr	*Xanthium italicum*	4
Burr - Noogoora burr	*Xanthium occidentale*	4
Burr - South American burr	*Xanthium cavanillesii*	4
Chilean needle grass	*Nassella neesiana*	4; WoNS
Columbus grass	*Sorghum x almum*	4
Fireweed	***Senecio madagascariensis***	**4**
Flax-leaf broom	*Genista linifolia*	4

Common Name	Scientific Name	Control Class
Giant reed	*Arundo donax*	4
Golden dodder	*Cuscuta campestris*	4
Harrisia cactus	*Harrisia* species	4
Illyrian thistle	*Onopordum illyricum*	4
Johnson grass	*Sorghum halepense*	4
Leafy elodea	*Egeria densa*	4
Lippia	*Phyla canescens*	4
Mother-of-millions	*Bryophyllum* species	4
Nodding thistle	*Carduus nutans* subsp. *nutans*	4
Pampas grass	*Cortaderia* species	4
Prickly pear - common pear	*Opuntia stricta*	4; WoNS
Prickly pear - Hudson pear	*Cylindropuntia rosea*	4; WoNS
Prickly pear - smooth tree pear	*Opuntia monacantha*	4; WoNS
Prickly pear - tiger pear	*Opuntia aurantiaca*	4; WoNS
Prickly pear - velvety tree pear	*Opuntia tomentosa*	4; WoNS
Privet - broad-leaf	*Ligustrum lucidum*	4
Privet - narrow-leaf	*Ligustrum sinense*	4
Rhus tree	*Toxicodendron succedaneum*	4
Sagittaria	*Sagittaria platyphylla*	4; WoNS
Scotch broom	*Cytisus scoparius* subsp. *scoparius*	4

Common Name	Scientific Name	Control Class
Scotch thistle	*Onopordum acanthium*	4
Serrated tussock	*Nassella trichotoma*	4; WoNS
Silverleaf nightshade	*Solanum elaeagnifolium*	4; WoNS
Spiny burrgrass - longispinus	*Cenchrus longispinus*	4
Spiny burrgrass - spinifex	*Cenchrus spinifex*	4
St. John's wort	***Hypericum perforatum***	**4**
Star thistle	*Centaurea calcitrapa*	4
Stemless thistle	*Onopurdum acaulon*	4
Sweet briar	***Rosa rubiginosa***	**4**
Taurian thistle	*Onopurdum tauricum*	4
Tree-of-heaven	*Ailanthus altissima*	4
Wild radish	***Raphanus raphanistrum***	**4**
Willows	*Salix* species	4; WoNS

Plants requiring eradication

Note: Species in **bold** have been recorded within the property

Common Name	Scientific Name	Control Class
Alligator weed	*Alternanthera philoxeroides*	2; WoNS
Anchored water hyacinth	*Eichhornia azurea*	1
Black knapweed	*Centaurea X moncktonii*	1
Black willow	*Salix nigra*	2
Boneseed	*Chrysanthemoides monilifera* subsp. *monilifera*	1; WoNS
Bridal veil creeper	*Asparagus declinatus*	1
Broomrapes	*Orobanche* species	1
Cat's claw creeper	*Dolichandra unguis-cati*	2
Chinese violet	*Asystasia gangetica* subsp. *micrantha*	1
Eurasian water milfoil	*Myriophyllum spicatum*	1
Frogbit	*Limnobium laevigatum*	1
Grey sallow	*Salix cinerea*	2
Hawkweeds	*Hieracium* species	1
Horsetails	*Equisetum* species	1; EAW
Hydrocotyl	*Hydrocotyle ranunculoides*	1
Hymenachne	*Hymenachne amplexicaulis* and hybrids	1; WoNS
Karroo thorn	*Vachellia karroo*	1
Kidney-leaf mud plantain	*Heteranthera reniformis*	1

Common Name	Scientific Name	Control Class
Kochia	*Bassia scoparia*	1
Koster's curse	*Clidemia hirta*	1
Lagarosiphon	*Lagarosiphon major*	1
Mesquite	*Prosopis species*	2; WoNS
Mexican feather grass	*Nassella tenuissima*	1
Miconia	*Miconia* species	1
Mikania vine	*Mikania micrantha*	1
Mimosa	*Mimosa pigra*	1; WoNS
Parkinsonia	*Parkinsonia aculeata*	2; WoNS
Parthenium weed	*Parthenium hysterophorus*	1; WoNS
Pond apple	*Annona glabra*	1; WoNS
Prickly acacia	*Vachellia nilotica*	1; WoNS
Rubber vine	*Cryptostegia grandiflora*	1; WoNS
Salvinia	*Salvinia molesta*	2; WoNS
Senegal tea plant	*Gymnocoronis spilanthoides*	1; EAW
Siam weed	*Chromolaena odorata*	1
Spongeplant	*Limnobium spongia*	1
Spotted knapweed	*Centaurea stoebe* subsp. *micranthos*	1
Tropical soda apple	*Solanum viarum*	1
Water caltrop	*Trapa* species	1

Common Name	Scientific Name	Control Class
Water hyacinth	*Eichhornia crassipes*	2
Water lettuce	*Pistia stratiotes*	1
Water soldier	*Stratiotes aloides*	1
Witchweeds	*Striga* species	1
Yellow burrhead	*Limnocharis flava*	1

Plants requiring full and continuous suppression

Common Name	Scientific Name	Control Class
Cape broom	*Genista monspessulana*	3
Gorse	*Ulex europaeus*	3; WoNS
Green cestrum	*Cestrum parqui*	3
Long-leaf willow primrose	*Ludwigia longifolia*	3

Plants requiring full and continuous suppression

Common Name	Scientific Name	Control Class
Athel pine	*Tamarix aphylla*	5; WoNS
Cabomba	*Cabomba caroliniana*	5; WoNS
African feather grass	*Cenchrus macrourus*	5
African turnip weed - eastern	*Sisymbrium thellungii*	5
African turnip weed - western	*Sisymbrium runcinatum*	5
Annual ragweed	*Ambrosia artemisiifolia*	5
Artichoke thistle	*Cynara cardunculus*	5
Bear-skin fescue	*Festuca gautieri*	5
Burr ragweed	*Ambrosia confertiflora*	5
Cayenne snakeweed	*Stachytarpheta cayennensis*	5
Clockweed	*Oenothera curtiflora*	5
Corn sowthistle	*Sonchus arvensis*	5
Dodder	*Cuscuta* species	5
Espartillo - broad kernel	*Amelichloa caudata*	5
Espartillo - narrow kernel	*Amelichloa brachychaeta*	5
Fine-bristled burr grass	*Cenchrus brownii*	5
Fountain grass	*Cenchrus setaceus*	5
Gallon's curse	*Cenchrus biflorus*	5
Gamba grass	*Andropogon gayanus*	5

Common Name	Scientific Name	Control Class
Glaucous starthistle	*Carthamus leucocaulos*	5
Golden thistle	*Scolymus hispanicus*	5
Mexican poppy	*Argemone mexicana*	5
Mossman River grass	*Cenchrus echinatus*	5
Red rice	*Oryza rufipogon*	5
Smooth-stemmed turnip	*Brassica barrelieri* subsp. *oxyrrhina*	5
Soldier thistle	*Picnomon acarna*	5
Texas blueweed	*Helianthus ciliaris*	5
Yellow nutgrass	*Cyperus esculentus*	5

Control requirements

Control Class	Legal requirements	Notifiable
1	The plant must be eradicated from the land and the land must be kept free of the plant	All outbreaks must be reported to the local control authority and NSW DPI (phone 1800 680244) within three days of discovery
2		
3	The plant must be fully and continuously suppressed and destroyed	Not notifiable
4	The growth of the plant must be managed in a manner that reduces its numbers, spread and incidence and continually inhibits its reproduction	
5	The requirements in the *Noxious Weeds Act* 1993 for a notifiable weed must be complied with	All outbreaks must be reported to the local control authority and NSW DPI (phone 1800 680 244) within three days of discovery

Appendix E Recommended stocking rates

Livestock (DSE rating)	Number of hectares required	Fenced area 1 (9.4 ha)	Fenced area 2 (1.9 ha)	Fenced area 3 (4.9 ha)
Top-dressed pasture with some clover (present state of pasture) (average DSE /ha = 7-10)				
Horses – light horse (DSE = 10)	1.43-1.0	6-9	1-2	3-5
Horse – under light work (DSE = 13.5)	1.93-1.35	5-7	1	2-4
Pony (DSE = 6)	0.86-0.6	11-15	2-3	5-8
Miniature horse (DSE = 3.5)	0.5-0.35	19-27	4-5	10-14
Cow – dry stock (450 kg) (DSE = 6)	0.86-0.6	11-15	2-3	5-8
Cow – bull (800 kg) (DSE = 10)	1.43-1.0	6-9	1-2	3-5
Alpaca – wether (DSE = 1)	0.14-0.1	67-94	13-19	35-49
Alpaca – pregnant (DSE = 1.5)	0.21-0.15	44-62	9-12	23-32
Alpaca lactating (DSE = 2)	0.29-0.2	32-47	6-9	17-24
Improved pasture, paspalum, kikuyu and clover on good fertility soils + fertiliser (average DSE /ha = 14-24)				
Horses – light horse (DSE = 10)	0.71-0.42	13-22	3-4	7-11
Horse – under light work (DSE = 13.5)	0.96-0.56	10-17	2-3	5-9
Pony (DSE = 6)	0.43-0.25	22-37	4-7	11-21

Livestock (DSE rating)	Number of hectares required	Fenced area 1 (9.4 ha)	Fenced area 2 (1.9 ha)	Fenced area 3 (4.9 ha)
Miniature horse (DSE = 3.5)	0.25-0.15	37-62	7-12	21-32
Cow – dry stock (450 kg) (DSE = 6)	0.43-0.25	22-37	4-7	11-21
Cow – bull (800 kg) (DSE = 10)	0.71-0.42	13-22	3-4	7-11
Alpaca – wether (DSE = 1)	0.07-0.04	134-235	27-47	70-122
Alpaca – pregnant (DSE = 1.5)	0.1-0.06	94-156	19-31	3-81
Alpaca lactating (DSE = 2)	0.14-0.08	67-117	13-24	35-61

Appendix F Pasture sowing guide

Summer pasture species	Winter fodder species	Sowing method[1]	Sowing rate[2]	Sowing period											
				Summer			Autumn			Winter			Spring		
				December	January	February	March	April	May	June	July	August	September	October	November
Fescue		Sow 5–15 mm deep. Broadcast and harrow or drill into a clean, firm seedbed.	4-5 kg/ha										✓	✓	✓
Cocksfoot (European type)	Cocksfoot (Mediterranean type)	Sow into a clean seedbed, no more than 2 cm deep.	1-3 kg/ha				✓	✓	✓				✓	✓	✓
	Subterranean clover	Sow in the better drained parts of the paddock (sow white clover separately in wetter areas to reduce competition).	4 kg/ha				✓	✓	✓						

[1] From Rejuvenating Perennial Pastures (NSW Department of Primary Industries 2009)
[2] From Graziers' Guide to Pastures (NSW Agriculture 2003)

Summer pasture species	Winter fodder species	Sowing method[1]	Sowing rate[2]	Sowing period											
				Summer			Autumn			Winter			Spring		
				December	January	February	March	April	May	June	July	August	September	October	November
	Perennial ryegrass	Direct-drill after suppression of existing growth by herbicide. Drill or broadcast following mulching or into a clean seedbed (NSW Agriculture 1997).	3-20 kg/ha. Restrict sowing rate of annual ryegrass to no more than 7 kg/ha when sown with perennial ryegrass										✓	✓	✓
	Annual ryegrass	Broadcast or drill into clean seedbeds. Direct-drill into clean seedbeds or after suppression of summer pasture growth with herbicides.	15 kg/ha when sown alone or 5-10 kg/ha in mixture				✓								

Summer pasture species	Winter fodder species	Sowing method[1]	Sowing rate[2]	Sowing period											
				Summer			Autumn			Winter			Spring		
				December	January	February	March	April	May	June	July	August	September	October	November
	White clover	Sow on the surface, cover and roll. Avoid sowing too deep Sow in wetter areas of the paddock (sow sub clover in the better drained parts to reduce competition).	0.5-1 kg/ha										✓	✓	✓
	Phalaris		2 kg/ha				✓	✓	✓				✓		
Japanese Millet		Sow into clean seedbed.	8-10 kg/ha	✓	✓									✓	✓
	Cereal Rye										✓	✓	✓	✓	
Red Clover			1-4 kg/ha				✓	✓	✓				✓	✓	✓

Summer pasture species	Winter fodder species	Sowing method[1]	Sowing rate[2]	Sowing period											
				Summer			Autumn			Winter			Spring		
				December	January	February	March	April	May	June	July	August	September	October	November
Rhodes Grass		Sow into a clean seed bed.	1-4 kg/ha			✓	✓						✓	✓	✓
	Oats	Drill or broadcast into a clean seedbed. Direct-drill early sowings after suppression of summer pasture with herbicides.	80-120 kg/ha; reduce rate when sowing with Annual ryegrass			✓	✓	✓							
	Triticale		100-120 kg/ha				✓	✓	✓						
	Barley	Ideal depth is 3-6 cm. Seed should always be sown into moist soil.	Up to 100 kg/ha or reduced rates in a mix with forage legumes.					✓	✓	✓					

Appendix G Fertiliser application

Fertiliser (including lime)	Application rate	Application method	Summer			Autumn			Winter			Spring		
			December	January	February	March	April	May	June	July	August	September	October	November
SULFUR (S)														
Superphosphate	An application of 91 kg of superphosphate per hectare is required to achieve a rate of 10 kg of sulfur per hectare and will include 8 kg of phosphorus and 18 kg of calcium.	Apply when pastures are actively growing. Avoid applying in autumn if pastures are not actively growing.			✓	✓	✓							
Gypsum (calcium sulfate)	An application of 69 kg of gypsum per hectare is required to achieve a rate of 10 kg of sulfur per hectare and will include 69 kg of phosphorus and 13 kg of calcium.				✓	✓	✓							
Note: S-deficient plants accumulate N which may cause N poisoning in livestock.														
CALCIUM (Ca)														
Agricultural lime (calcium carbonate)	An application of 25-29 kg of agricultural lime per hectare is required to achieve a rate of 10 kg of calcium per hectare.	Surface spread or incorporate into the soil to a depth of 10 cm. Incorporate into seed bed when sowing a new pasture or forage crop.	Apply approximately once every ten years. Can be applied at any time of year.											

Fertiliser (including lime)	Application rate	Application method	Summer			Autumn			Winter			Spring		
			December	January	February	March	April	May	June	July	August	September	October	November
Note: Blanket applications of nitrogen fertiliser every 6–8 weeks for perennial ryegrass – clover pastures are not recommended as they will alter the balance between grasses and clovers. **Do not apply lime and nitrogen fertilisers at the same time (the lime will cause freshly applied nitrogen to be lost as gas).**														
POTASSIUM (K)														
Potassium chloride (KCl) (MOP - muriate of potash)	Apply 15 kg of potassium per hectare annually (for dry pasture with 0.2-0.3 meq/100g). An application of 40 kg of potassium chloride (muriate of potash) is required to achieve a rate of 20 kg of potassium.	Apply to moist soils.			✓	✓	✓							
Note: Do not graze pastures within 28 days of potassium application.														
NITROGEN (N)														
Urea	Apply up to 400 kg of nitrogen per hectare per year. An application of 88 kg of urea per hectare is required to achieve 40 kg of nitrogen per hectare.	Best applied within 3 days of last grazing or slashing. Apply to actively growing pasture. Soils must be moist - coincide application with rain or irrigation.								✓	✓	✓		

Fertiliser (including lime)	Application rate	Application method	Summer			Autumn			Winter			Spring		
			December	January	February	March	April	May	June	July	August	September	October	November
	A subsequent application of 72 kg per hectare of lime is required to reduce soil acidity.	Avoid applying when soils are either waterlogged or dry, or if substantial rain is predicted.												
Notes: Urea will only last 6 weeks in the soil. **Do not graze pastures between for 14 days after nitrogen application.** **Increasing the cover and abundance of legumes (clovers, medics) which fix nitrogen from the air is another means to supply the pasture with nitrogen.**														
PHOSPHOROUS (P) (including mixed nutrients)														
Mono ammonium phosphate (MAP)	An application of 364 kg of MAP per hectare is required to achieve a rate of 40 kg of nitrogen per hectare and will include 80 kg of phosphorus. A subsequent application of 216 kg per hectare of lime is required to reduce soil acidity.	Phosphorus can be applied to dry soil. Avoid applying if substantial rain is predicted.			✓	✓	✓							
Di ammonium phosphate (DAP)	An application of 224 kg of DAP per hectare is required to achieve a rate of 40 kg of nitrogen per hectare and will include 44 kg of phosphorous.				✓	✓	✓							

Fertiliser (including lime)	Application rate	Application method	Summer			Autumn			Winter			Spring		
			December	January	February	March	April	May	June	July	August	September	October	November
	A subsequent application of 144 kg per hectare of lime is required to neutralise acidity.													
Do not apply phosphorous fertilisers to holding yards or effluent treated paddocks.														
Mushroom compost	An application of 1000 kg of mushroom compost per hectare is required to achieve a rate of 18 kg of nitrogen per hectare and will include 8 kg of phosphorous and 16 kg of potassium. Also includes manganese, copper and zinc. pH neutral.	Incorporate into top 10-30cm of soil before rain.	Apply approximately once every three to five years. Can be applied at any time of year.											

Appendix H Record of stakeholder liaison

December 5, 2015

Present: Mr. Michael Morris, Mrs. Lorraine Morris and Michelle Evans

1. Background

Michelle Evans of First Field Environmental has been engaged by Enhance Place Mine Pty Ltd (EPM) to facilitate liaison between EPM and the landholders of rehabilitated land under mining lease to EPM. The land is currently used for grazing and it is the intention of EPM that a Stock Management Plan be prepared by First Field Environmental and provided to Mr. and Mrs. Morris (the landholders) and EPM. This document is a summary of initial conversations between Michelle Evans and Mr. and Mrs. Morris, conducted on 5 December 2015 at the property.

2. Discussion

a. Mr. and Mrs. Morris were concerned with the lack of topsoil and subsequent effects on vegetation establishment and sustainability. Surface soil erosion has been ongoing and has been particularly noticeable during extended dry periods. It has not been uncommon to find general waste such as household garbage held within exposed soils.

b. A number of holes have opened up in the rehabilitated area, including cracks associated with slope crests. Mr. and Mrs. Morris reported that one of their horses recently became injured due a hole in the grazing area, and that veterinary care was required.

c. Vegetation damage and surface soil loss is evident at a number of mid-slope locations throughout the grazing area. Mr. and Mrs. Morris and Michelle Evans shared the opinion that this damage is the result of slope and poor vegetation establishment and not overgrazing, as stock will preferentially graze flat areas before slopes of this degree. Mr. and Mrs. Morris suggested that trees could be planted mid-slope to mitigate the effects of soil slippage, loss of surface vegetation and surface soils. Mr. and Mrs. Morris have observed stock congregating beneath existing tree plantings and believe that additional planting would increase available shade and decrease potential soil damage under existing trees.

d. Mr. and Mrs. Morris indicated that there is an obvious difference in pasture health and resilience between the rehabilitated area and pastures adjacent to their property and that they would like their land rehabilitated to resemble adjacent land capability.

e. When suggested, Mr. and Mrs. Morris agreed that areas of grazing land can be closed to exclude grazing and allow for further rehabilitation works to be undertaken by EPM.

f. Mr. Morris identified a number of newly established weeds within the rehabilitated area, namely St John's Wort, Blackberry, Patterson's Curse and Wild Radish. Both Mr. and Mrs. Morris agreed that Scotch Thistle occurs occasionally and that African Lovegrass is present but well controlled as a result of recent chemical application by EMP.

g. There appears to be confusion regarding the number of dams initially prescribed for the property and the actual number of dams present. Mr. and Mrs. Morris believe that a description of the property given to them around the time of purchase stated that there were five dams on their portion of the property. Previous conversations between the landholders and a representative of EPM (no longer involved with the property) indicated to Mr. and Mrs. Morris that the two sediment retention basins would be relined for use as water storage dams.

h. It was ascertained from Mr. and Mrs. Morris that the property currently supports:

- 5 x cows;
- 8 x miniature horses;
- 7 x miniature ponies;
- 2 x horses; and
- 1 x alpaca.

A number of these animals are contained outside of the rehabilitated pasture area and are either stabled or kept in the home paddock. The rehabilitated grazing area generally supports:

- 5 x cows;
- 1 x miniature horse;
- 3 x miniature ponies; and
- 2 x horses.

i. During these conversations Mr. and Mrs. Morris indicated that the development of a Stock Management Plan would be beneficial in providing clarity regarding planned rehabilitation works, pasture and stock management.

3. Actions required

- Provide Mr. and Mrs. Morris with aerial imagery on which they can confirm the location of current fence lines and gates.
- Clarify EPMs position regarding the sediment basins against Mr. and Mrs. Morris's understanding that there be five dams on the property. Mr. and Mrs. Morris to provide original agreement.
- Schedule a meeting between Mr. and Mrs. Morris, Graham Goodwin (EPM representative) and Michelle Evans to agree on optimal outcomes of a Stock Management Plan for the property.

March 20, 2016

Present: Mr. Michael Morris, Mrs. Lorraine Morris, Graham Goodwin and Michelle Evans

1. Background

These records summarise conversations between Michelle Evans, Mr. and Mrs. Morris, and Graham Goodwin conducted on 20 March 2016 at the property.

2. Discussion

a. Michelle Evans presented Mr. and Mrs. Morris with a hard copy of the Draft Stock Management Plan. Discussion included the suggested use and layout of the Plan.

b. Mr. and Mrs. Morris and Graham Goodwin have agreed on the optimal outcomes for the property as reflected in the Draft Stock Management Plan.

c. Information sources for Section 1 of the Plan were discussed and the resulting characteristics of the property as described in the Plan were confirmed.

d. Specific land management goals in Section 2 of the Plan were identified along with methods for addressing potential immediate and long term land management issues.

e. Mr. and Mrs. Morris were provided with aerial imagery on which they confirmed the location of current fence-lines and gates.

f. It was explained to Mr. and Mrs. Morris that the current land capability of the study area is consistent with the land capability class of surrounding agricultural land.

g. Agreement was reached that rehabilitation work may commence immediately and that the closure of one paddock and subsequent exclusion of stock would be acceptable.

h. Mr. and Mrs. Morris provided a copy of the real estate listing for the property (attached below) which stated that the property contained five dams.

3. Actions required

- Clarify EPMs position regarding the sediment basins against Mr. and Mrs. Morris's understanding that there be five dams on the property.
- Undertake an assessment of the site to identify a suitable paddock for rehabilitation activities.
- Exclude grazing from the selected paddock for at least six months to allow rehabilitation works and pasture reestablishment.
- Commence rehabilitation activities as consistent with this Stock Management Plan.
- Audit rehabilitation effectiveness in mid Spring 2016.

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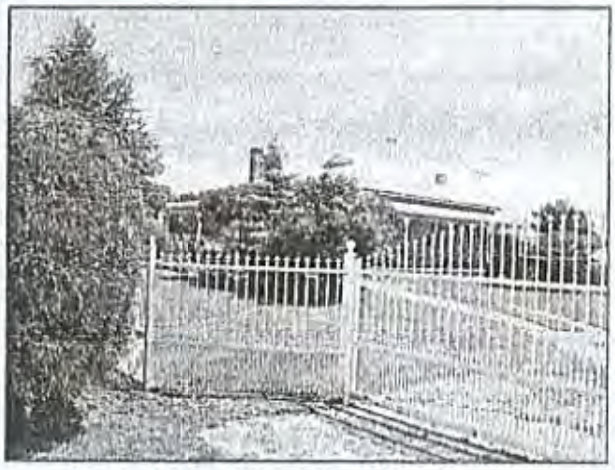
For Sale



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Appendix D

Regulator correspondence

Enhance Place Pty Ltd
Operators of Enhance Place & Pine Dale Open Cut Coal Mines
ACN 077 105 867
ABN 31 077 105 867

Postal address:
P.O. Box 202,
Wallerawang. NSW. 2845
Tel: (02) 6355 7893
Mobile: 0418830598
Email: graham.goodwin@energyaustralia.com.au

Mine office:
Castlereagh Highway,
Blackmans Flat, NSW 2790

13 January 2017

Mr Will Mitry
Inspector – Environment
DT&I - Division of Resources & Energy
PO Box 674
Wollongong NSW 2520

Dear Will,

Subject: ENHANCE PLACE CARE & MAINTENANCE MOP EXTENSION

Enhance Place operates in accordance with its Care and Maintenance Mine Operations Plan (MOP) dated 16 January 2015 and prepared in accordance with the departments ESG3 guidelines dated September 2013. The term of the MOP was initially requested for a two year period from 16 January 2015 and expires on 16 January 2017.

Enhance Place are currently seeking the final signoff of the revised Care and Maintenance MOP by its Company Directors and will forward this through to the Department shortly. To avoid any potential administrative breach of our mining authorities Enhance Place seek an extension to its existing approved Care and Maintenance MOP while the Department reviews the revised MOP. It should be noted that Enhance Place Mine will continue in Care and Maintenance at this time. There has been no change to the Care and Maintenance MOP and the rehabilitation success criteria as previously approved by the Department.

Please do not hesitate to contact me if you have any questions relating to the above on 0418 830 598.

Yours Sincerely

Graham Goodwin
Mining Engineering Manager

ENHANCE PLACE PTY LTD

Registered office:
Level 33, 385 Bourke Street,
Melbourne. VIC. 3000

Trade & Investment
Resources & Energy

The Manager
Enhance Place Pty Limited
PO Box 202
Wallerawang, NSW 2790

Attention: Graham Goodwin

File N°: MCV15/68, OUT17/1222

Dear Graham

RE: ML1520, ML1422, ML1458, Enhance Place PTY Ltd, Approval of the Enhance Place Mine Care and Maintenance Mining Operations Plan, January 2015 – Extension Request

NOTICE OF APPROVAL

I refer to your letter dated 13 January 2017 requesting an extension of the approval period of the Mining Operations Plan (MOP) for Enhance Place Mine. The extension is requested to allow the time for final signoff of the new MOP by the Company Directors and review and approval by the Department.

The current Enhance Place MOP approval was granted on 3 February 2015 (Our Ref OUT15/2234) and was due to expire on 16 January 2017.

Pursuant to Condition 2 of ML1520, ML1422, and ML1458, the Mining Operations Plan (MOP) that was submitted to the Department on 29 January 2015 (DRE Reference: INW15/2860) is approved for the period ending 31 March 2017.

This MOP approved by DRE is limited to:

- the rehabilitation objectives and completion criteria; and,
- the schedule of rehabilitation activities proposed for the MOP period.

It is the responsibility of the Authorisation Holder to ensure that all mining and mining related operations described in this MOP are as approved within the relevant Project Approval or Development Consent and all necessary approvals, consents or permits required under the relevant NSW or Commonwealth regulations have been obtained prior to carrying out the operations.

It is the responsibility of the Authorisation Holder to fulfil their obligations and commitments to the rehabilitation outcomes and performance standards as approved by the relevant consent authority to ensure the rehabilitation outcomes identified are achieved.

DEFINITIONS

In this letter, words have the meaning given to those terms in the *Mining Act 1992*, unless otherwise specified below.

Environmental Sustainability Unit
PO Box 674 Wollongong NSW 2520
Level 3 Block F 84 Crown Street
Wollongong NSW 2500

ABN 51 734 124 190
www.industry.nsw.gov.au
Tel: 02 4222 8333
Fax: 02 4226 3851

Department means NSW Department of Industry, Skills and Regional Development.

Authorisation Holder means the holder of the relevant authorisation(s).

Mining Operations Plan means the project, mining and mining related operations described in the "Enhance Place Mine, Care and Maintenance Mining Operations Plan, January 2015", dated 28 January 2015.

If you have any questions about this Notice, please contact Will Mitry, Inspector Environment, on (02) 4222 8326.

Yours sincerely

Greg Kininmonth
Manager & Principal Inspector Environment (Southern)
Division of Resources and Energy
16 January 2017

Signed under delegation from the Secretary of the Department of Industry, Skills and Regional Development.

Environmental Sustainability Unit
PO Box 674 Wollongong NSW 2520
Level 3 Block F 84 Crown Street
Wollongong NSW 2500

ABN 51 734 124 190
www.industry.nsw.gov.au
Tel: 02 4222 8333
Fax: 02 4226 3851

Trade & Investment
Resources & Energy

The Manager
Enhance Place Pty Limited
PO Box 202
Wallerawang, NSW 2790

Attention: Graham Goodwin

File N°: MCV17/35,
OUT17/10924

Dear Graham

RE: ML1520, ML1422, ML1458, Enhance Place PTY Ltd, Approval of the Enhance Place Mine Care and Maintenance Mining Operations Plan, December 2016

NOTICE OF APPROVAL

Pursuant to Condition 2 of ML1520, ML1422, and ML1458, the Mining Operations Plan (MOP) that was submitted to the Department on 3 February 2017 (DRE Reference: INW17/5754) is approved for the period ending 29 August 2023.

This MOP approved by DRE is limited to:

- the rehabilitation objectives and completion criteria; and,
- the schedule of rehabilitation activities proposed for the MOP period.

It is the responsibility of the Authorisation Holder to ensure that all mining and mining related operations described in this MOP are as approved within the relevant Project Approval or Development Consent and all necessary approvals, consents or permits required under the relevant NSW or Commonwealth regulations have been obtained prior to carrying out the operations.

It is the responsibility of the Authorisation Holder to fulfil their obligations and commitments to the rehabilitation outcomes and performance standards as approved by the relevant consent authority to ensure the rehabilitation outcomes identified are achieved.

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In this letter, words have the meaning given to those terms in the *Mining Act 1992*, unless otherwise specified below.

Department means NSW Department of Industry, Skills and Regional Development.

Authorisation Holder means the holder of the relevant authorisation(s).

Mining Operations Plan means the project, mining and mining related operations described in the "Enhance Place Mine, Care and Maintenance Mining Operations Plan, December 2016", dated 24 January 2017.

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Wollongong NSW 2500

ABN 51 734 124 190
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If you have any questions about this Notice, please contact Will Mitry, Inspector Environment, on (02) 4222 8326.

Yours sincerely

Greg Kininmonth
Manager & Principal Inspector Environment (Southern)
Division of Resources and Energy
10 March 2017

Signed under delegation from the Secretary of the Department of Industry, Skills and Regional Development.

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