

MINING OPERATIONS (BLOOMFIELD COLLIERY)

REHABILITATION MANAGEMENT PLAN

Ver	Date	Description	By	Chk	App
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3	28/02/10	Final Draft	JH	KH	SD
4	15/06/11	Revised Final Draft - incorporating Project Area as approved by Section 75W Modification	KH	JH	SG
5	18/08/17	Revised Final – Revised and Updated	GL		BC
6	20/11/17	Revised Final – incorporating DPE consultation	GL		BC

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INTRODUCTION

This rehabilitation management plan (RMP) has been prepared in response to Project Approval, 07_0087, (Approval) granted under section 75J of the Environmental Planning and Assessment Act (EP&A) and modifications to the Approval was granted in accordance with section 75W of the Environmental Planning and Assessment Act 1979.

The LMP takes into consideration the commitments stated in the Part 3A Environmental Assessment, conditions outlined in schedules 2 to 5 of the Approval granted under Section 75 J of the Environmental Planning and Assessment Act 1979 and Modifications issued under section 75w of the Environmental Planning and Assessment Act 1979. In addition, commitments outlined in Bloomfield Group Environment Management Policy are also taken into account.

PURPOSE AND OBJECTIVES

The purpose of the RMP is to:

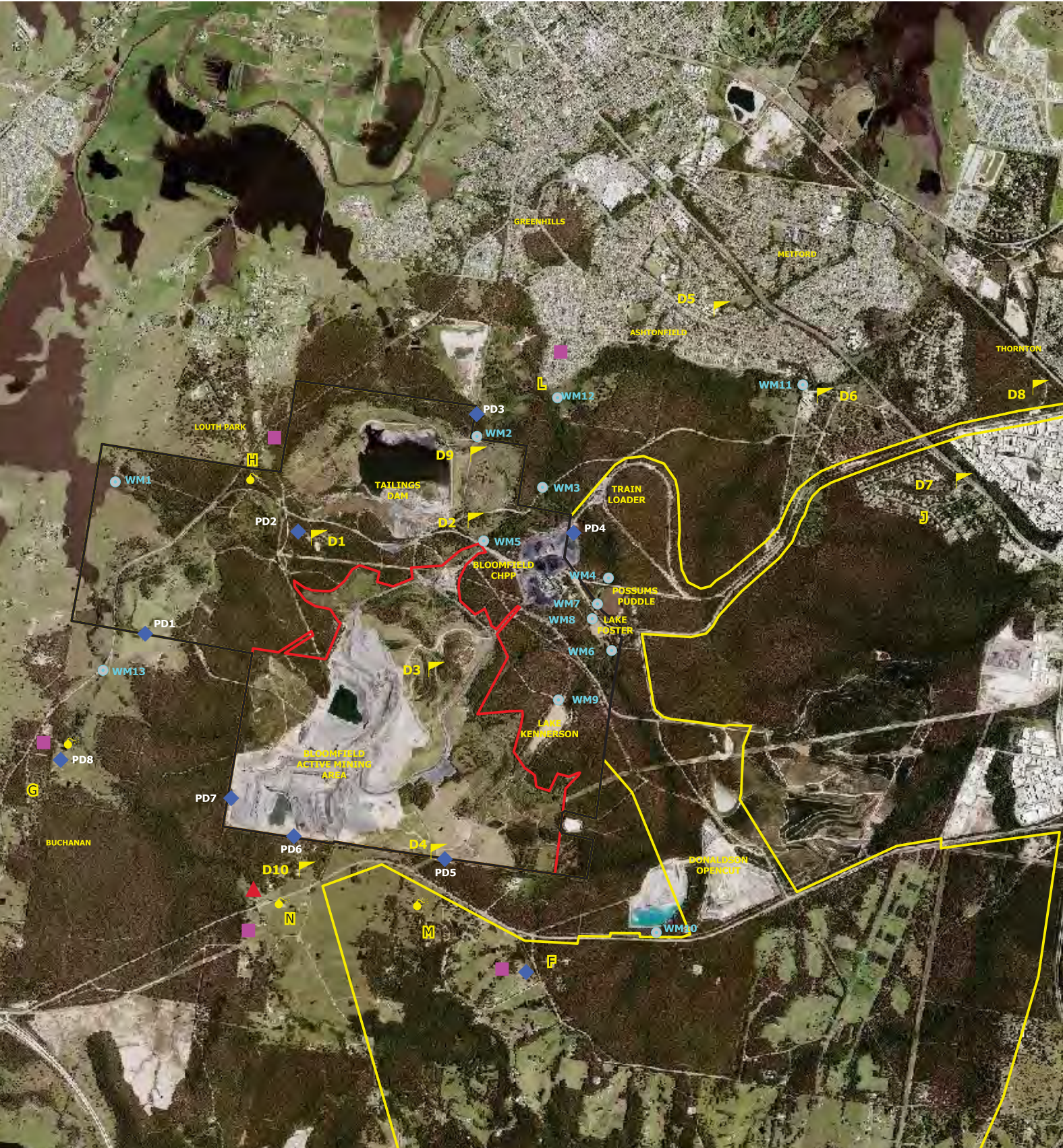
- address the relevant conditions of the development consent;
 - address commitments made within the Environmental Assessment;
 - address legislative requirements and guidelines relevant to the RMP and related management plans; and
 - provide a clear and concise description of responsibilities in relation to Landscape Management (including Rehabilitation, Final Void Management & Mine Closure) during the operation and subsequent closure of the Bloomfield group mining operations.
-

SCOPE

This RMP addresses rehabilitation management of the area covered by the project area as shown in Figure 1. It should be noted that although the scope of this plan specifically addresses the area covered by the approved Project Area, the general approach and methodologies are also applied across the Bloomfield Group operations.

RELATIONSHIP WITH OTHER PLANS

The EMS establishes the overall environmental management strategy for mining and related activities on the site. The LMP provides the framework for rehabilitation and mine closure related issues. This document, the RMP addresses specific rehabilitation objectives and measures that are used to monitor the success of rehabilitation initiatives on site. Refer to Figure 2.



LEGEND

0 1 km



	Bloomfield Project Area		High Volume Air Sampler
	Abel Mine Project Area		Noise Monitor
	Bloomfield Mining Lease		Peizometers
	Blast Monitor		Water Monitoring
	Dust Monitor		



Bloomfield Colliery

Rehabilitation Management Plan

Figure 1 Bloomfield Colliery Project Area

Scale: 1:33,333

Date: January 2016
Photo: January 2016

Drawing: A3

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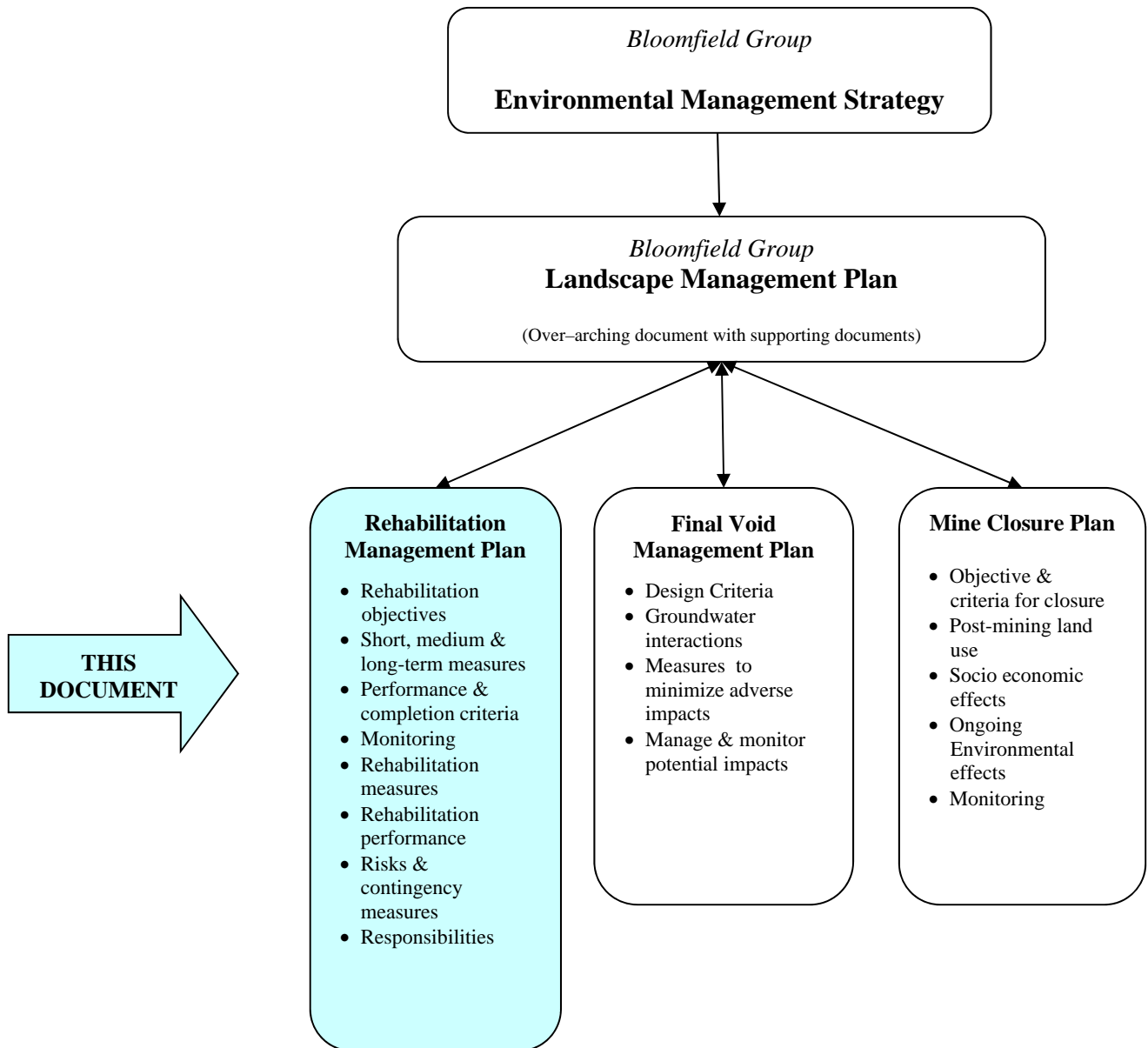


Figure 2 RELATIONSHIP WITH OTHER MANAGEMENT PLANS

STATUTORY OBLIGATIONS

Approval was granted by the Minister for Planning on 3 September 2009 under Section 75J of the Environmental Planning and Assessment Act, 1979. Condition 27 of Schedule 3 of the Approval states:

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Requirement	RMP Reference
The Rehabilitation Management Plan must include:	
(a) the rehabilitation objectives for the site;	Rehabilitation Aims
(b) a description of the short, medium, and long term measures that would be implemented to: <ul style="list-style-type: none"> • rehabilitate the site; and • manage the remnant vegetation and habitat on the site; 	Rehabilitation Aims
(c) performance and completion criteria for the rehabilitation of the site;	Rehabilitation Indicators and Completion Criteria
(d) a detailed description of the measures that would be implemented over the next 3 years, including the procedures to be implemented for: <ul style="list-style-type: none"> • minimising and rehabilitating disturbed areas; • protecting vegetation and soil outside the disturbance areas; • undertaking pre-clearance surveys; • managing impacts on fauna; • landscaping the site to minimise visual impacts; • conserving and reusing topsoil; • collecting and propagating seed for rehabilitation works; • salvaging and reusing material from the site for habitat enhancement; • controlling weeds and feral pests; • controlling access; and • bushfire management; 	Management Measures
(e) a program to monitor the effectiveness of these measures, and progress against the performance and completion criteria;	Monitoring Protocol
(f) a description of the potential risks to successful rehabilitation and/or revegetation, and a description of the contingency measures that would be implemented to mitigate these risks; and	Risks to Rehabilitation
(g) details of who would be responsible for monitoring, reviewing, and implementing the plan.	Roles and Responsibilities

A modification (MOD 1) to the Approval was granted in accordance with section 75W of the Environmental Planning and Assessment Act 1979 which allows for improvements to be made to some historically rehabilitated areas within the site to ensure contemporary standards are met.

In addition to the Approval and Modifications granted under the Environmental Planning and Assessment Act, 1979 there is a range of other relevant legislation that has been taken into consideration in developing the RMP. These include various Mining Leases and requirements of the Environment Protection Licence (EPL) that must be satisfied.

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ENVIRONMENTAL ASSESSMENT COMMITMENTS

Section 4 of the Statement of Commitments presented in the Environmental Assessment relates to rehabilitation. The relevant commitments are reproduced as follows:

All site rehabilitation, including monitoring and maintenance will be undertaken in accordance with procedures documented in the EA and the existing Bloomfield Rehabilitation Management System.

4.1 Any additional rehabilitation requirements and plans for this Project will be included in the existing Bloomfield Rehabilitation Management System.

4.2 Land that has been mined will be rehabilitated to a safe and stable form with a land capability similar to that existing prior to mining, and with a landform compatible with the surrounding landscape.

4.3 Post mining landform and land use plans will be developed in 3.6.1 consultation with the landowner and with reference to the objectives of the Lower Hunter Regional Strategy (DoP, 2006).

As stated in the commitments, it is the intent of the company to rehabilitate the project area so that a safe and stable landform is provided that is compatible with post mining land use.

CONSULTATION WITH REGULATORY AUTHORITIES

The closure, decommissioning and rehabilitation process will be regulated by the Department of Planning - Division of Resources and Geosciences (DRG). Relevant agencies will be consulted throughout the process and include the following:

- environmental inspections following the submission of the Annual Environmental Management Report
- submission of Mining Operations Plan for Closure, Decommissioning and Rehabilitation;
- periodic inspections with Departmental throughout closure process;
- the preparation and submission to DRG of “as constructed” drawings of final landforms on completion of decommissioning.

Throughout the mining phase, copies of the AEMR will continue to be distributed to the relevant authorities to enable feedback on the strategy and overall progress of rehabilitation.

ROLES AND RESPONSIBILITIES

The company directors are responsible for the overall rehabilitation and environmental performance of Bloomfield Colliery. Senior Operational managers have direct responsibility for the rehabilitation process. The Environmental Officer provides direction and advice to ensure site environmental compliance is maintained. The key management positions are shown in Table 1.

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Table 2 MANAGEMENT TEAM

Position	Name
Managing Director	John Richards
Manager of Mining Development	Garry Bailey
Mine Manager	Brendon Clements
General Manager Technical Services	Simon Grassby
Environmental Officer	Greg Lamb

REHABILITATION APPROACH

As stated in the commitments, it is the intent of the company to rehabilitate the project area so that a safe and stable landform is provided that is compatible with post mining land use.

The methodology and approach taken in developing the rehabilitation management plan for the site is described in detail in Appendix A. In summary, there are a number of key steps which include:

- identification and agreement on the objectives for rehabilitation;
- establishment of short, medium & long-term rehabilitation measures;
- identify performance and completion criteria in which to assess the success of rehabilitation;
- monitor rehabilitation performance ;
- develop contingencies to identify and address risks that might reduce the success of rehabilitation; and
- outline responsibilities with regard to monitoring, reviewing and implementation of the RMP.

The final land use (post mining) has yet to be agreed upon with the landowners and relevant government departments. To address the likely requirements the site will be designed to be stable and safe that allows for a range of likely possible uses.

The final land use will be influenced by land use planning initiatives and decisions of the NSW Government such as the Lower Hunter Regional Strategy (LHRS). In order to meet regulatory requirements and land owner expectations, an agreement has been established that sets out general obligations for post-mining rehabilitation, such as the requirement to provide a safe and stable landform. It also sets criteria for the removal of infrastructure and the rehabilitation of overburden dumps, roads, final voids, dams and tailings emplacements.

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REHABILITATION AIM The aim of the rehabilitation plan is to provide a safe and stable landform that is compatible with the surrounding landscape and can allow for a range of potential future land uses.

In general overburden dumps will be reshaped with a maximum slope of 18 degrees. Where steep slopes are constructed, suitable erosion and sediment control banks will be incorporated to provide for stability.

Objectives The rehabilitation program has a number of objectives. Those objectives directly related to the land owner “O” and those that reflect leading industry practice, or regulatory compliance, are noted with an “L”.

General

- Land will be rehabilitated in accordance with relevant DII standards applicable at the time of rehabilitation (L, O).
- Rehabilitated land will represent a minimal source of offsite environmental impacts, such as dust, water pollution, visual amenity and weeds (L, O).
- All infrastructure not agreed (with the land-owner) to remain post-mining will be rehabilitated (O)
- Rehabilitated land will require ongoing management inputs no greater than similar adjacent land (L)
- Rehabilitation will be compatible with the proposed post-mining land-use (mixed used development) (L).

Landform

- Rehabilitated land will be safe and stable (A).
- Land capability will be returned to a class similar to that existing prior to the commencement of mining (A).
- Mined land will be recontoured to a landform compatible with the surrounding natural landscape (L).

Vegetation

- Rehabilitated land will be top dressed, fertilised and sown with grass and/or native vegetation species (A).
 - A sustainable vegetation cover will be established on rehabilitated land (L).
-

Short, Medium and Long Term Measures

Rehabilitation will be undertaken in accordance with the procedures outlined in *Appendix A – Rehabilitation Methodology*, which includes short, medium and long term measures to achieve these objectives.

Short Term Rehabilitation Measures

- Scheduling rehabilitation to minimise the disturbance footprint of the mining operation;
 - Clear delineation of the areas of vegetation to be cleared;
 - Pre-clearing surveys, topsoil stripping and stockpiling;
-

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- Final landform shaping involving the reconstruction of a drainage pattern, construction of erosion and sediment control works;
- Topdressing using topsoil and application of soil ameliorants as required, such as biosolids and mulch;
- Sowing/fertilizing with selected species mix.

Medium Term Rehabilitation Measures

- Maintenance programs including: weed control, bushfire management through managing fuel loads by slashing or grazing and re-sowing where vegetation establishment has been poor;
- Control access to rehabilitated and remnant vegetation areas;
- Assessment program, annual maintenance inspections, scheduled rehabilitation monitoring and review of inspection/measurement data over time to assess rehabilitation performance.

Long term Rehabilitation Measures

- Final maintenance inspection and rehabilitation monitoring;
- Review monitoring results to determine progress is on a trajectory to achieving the rehabilitation objectives;
- Submission for rehabilitation signoff from Regulators and stakeholders.

REHABILITATION INDICATORS AND COMPLETION CRITERIA

The process of developing rehabilitation criteria will be progressive and allow for continual improvement. The criteria will consider:

- Protection of environmental values;
- Stakeholder expectations;
- Integration with adjoining mined areas;
- Long term sustainability; and
- Post closure monitoring and management.

Column 2 of Table 2 contains the completion criteria that all rehabilitation will be assessed against when determining suitability for sign off. Rehabilitated land less than five years old will be monitored against the progress indicators outlined in Column 3 of Table 2.

These criteria are flexible and allowances can be made to update and incorporate technological improvements over time.

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Table 2 REHABILITATION OBJECTIVES AND CRITERIA

Objective	Completion Criteria	Progress Indicators
General		
Land will be rehabilitated in accordance with relevant DII standards applicable at the time of rehabilitation.	<input type="checkbox"/> DRG sign-off on land submitted for sign-off.	<input type="checkbox"/> Findings from annual DRG rehabilitation audits addressed or rectified.
Rehabilitated land will: <ul style="list-style-type: none"> <input type="checkbox"/> represent a minimal source of offsite environmental impacts; <input type="checkbox"/> require ongoing management inputs no greater than similar adjacent land; <input type="checkbox"/> be compatible with the proposed post-mining land-use. 	<ul style="list-style-type: none"> <input type="checkbox"/> All completion criteria regarding landform stability and vegetation cover met. <input type="checkbox"/> No significant infestations of declared weeds. 	<ul style="list-style-type: none"> <input type="checkbox"/> All progress indicators regarding landform stability and vegetation cover met. <input type="checkbox"/> Weeds reported and treated during monitoring program.
All infrastructure not agreed (with the land-owner) to remain post-mining, will be rehabilitated.	<ul style="list-style-type: none"> <input type="checkbox"/> Non-agreed infrastructure removed. <input type="checkbox"/> Agreed infrastructure to be shown on sign-off plans (i.e. roads, dams, powerlines) 	<input type="checkbox"/> Year 1: Non-agreed infrastructure removed prior to or during recontouring works.
Landform		
Rehabilitated land will be: <ul style="list-style-type: none"> <input type="checkbox"/> safe and stable; <input type="checkbox"/> compatible with the surrounding natural landscape. 	<ul style="list-style-type: none"> <input type="checkbox"/> No rehabilitated areas of greater than 18° slopes <input type="checkbox"/> No evidence of failed sediment control structures (dams, drains and drops structures). <input type="checkbox"/> Surface tailings emplacement areas will be capped with 2m of overburden and rehabilitated. <input type="checkbox"/> Erosion rills remaining stable. No significant increases in number and/or size of rills since last monitoring. 	<ul style="list-style-type: none"> <input type="checkbox"/> Year 1: Rehabilitated areas of greater than 10° slopes will be minimised during recontouring; <input type="checkbox"/> Year 1: Appropriately designed water/sediment management structures (contour banks, drains and drop structures) to be incorporated into landform design and constructed during recontouring. <input type="checkbox"/> Year 3: No evidence of slumping, settling or subsiding landform. <input type="checkbox"/> Year 3: Erosion rills stabilising, compared to Year 1 results. <input type="checkbox"/> Year 5: No evidence of failed water management structures.
Land capability will be returned to a class similar to that existing prior to the commencement of mining (generally Classes IV, V and VI).	Land capability classes mapped on sign-off plan.	Landform stability progress indicators met.

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Table 2 REHABILITATION OBJECTIVES AND CRITERIA (CONT)

Objective	Completion Criteria	Progress Indicators
Vegetation		
Rehabilitated land will be topdressed, fertilised and sown with grass and/or native vegetation species.	<input type="checkbox"/> Rehabilitation documented, indicating the required works completed (only applicable for rehabilitation conducted post-2003).	<input type="checkbox"/> Year 1: Biosolids to be applied in accordance with Environmental Guidelines: Use and Disposal of Biosolids Products (NSW EPA, 1997); <input type="checkbox"/> Year 3: 50 % vegetation cover, with evidence of tree establishment.
A sustainable vegetation cover will be established on rehabilitated land.	<input type="checkbox"/> Achieve a vegetation cover of at least 70%. <input type="checkbox"/> Tree belts or plots established, with evidence of continued recruitment. <input type="checkbox"/> Surface litter layer present at 75% of sites.	<input type="checkbox"/> Year 3: Evidence of litter layer developing <input type="checkbox"/> Year 3: Tree plots indicating good tree growth. <input type="checkbox"/> Year 5: Tree species displaying successful recruitment. <input type="checkbox"/> Year 5: Tree species displaying successful recruitment.
	Soils in the rootzone should meet the following criteria: <input type="checkbox"/> EC <0.6 dS/m (Grigg et al, 2001). <input type="checkbox"/> pH between 4.5 and 9 (Qld EPA, 1995a) <input type="checkbox"/> EAT Class 3 - 8	<input type="checkbox"/> Year 3: pH and EC moving towards completion criteria. <input type="checkbox"/> Year 5: pH, EC and EAT at or near completion criteria.

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MANAGEMENT MEASURES

A series of management measures have been implemented to address the management of rehabilitation, fauna, and remnant vegetation areas during all phases of mining. The following measures have been implemented in a continuous manner during the period since development approval granted and will continue to be implemented over the next three years and beyond.

Minimising and rehabilitating disturbed areas

For the remainder of the life of mine plan only 6 Ha of vegetation is scheduled to be cleared for mining operations.

Prior to the disturbance of any areas a Clearance Permit form must be completed and approved by the Environmental Officer. The form identifies any potential environmental issues associated with the disturbance, control measures to be undertaken and conformity with regulatory approvals. The boundaries of the disturbance areas will be clearly identified to minimise the extent of clearing. No clearing will occur outside these boundaries without approval.

Rehabilitation works will be carried on a progressive basis generally in accordance with the Mining Operations Plan (MOP) and be designed to meet the objectives outlined in this Plan. Scheduling of rehabilitation will be implemented to minimise the disturbance footprint of the mining operations.

Protecting vegetation and soil outside disturbance area

Impacts to vegetation and soil outside the disturbance area will be avoided through the use of existing access tracks and the restriction of all mining and ancillary activities to the area within the active mining areas.

The following management controls and activities are permitted in areas of remnant native vegetation, ie the area outside disturbance areas:

- Use and maintenance of existing access tracks;
 - Exclusion of stock;
 - Fencing repair/installation (where required);
 - Erosion and sediment control (where required);
 - Management of vegetation for bushfire, in consultation with the RFS;
 - Routine weed control; and
 - Feral animal control (if required).
-

Undertaking pre-clearance surveys

Pre-clearance surveys will be conducted prior to any vegetation clearing works in advance of mining. The following procedure is being implemented by Bloomfield:

- The area to be cleared clearly delineated;
 - A qualified ecologist conducts a habitat tree assessment on the area and potential habitat trees clearly marked;
 - Following the assessment clearing around the identified habitat trees carried out;
 - Habitat trees left standing for a number of days to encourage any fauna species present to self-relocate;
 - Habitat trees then felled under the supervision of the same ecologist;
 - Trees felled using the 'soft-fell' technique. Before commencing, this technique will be explained to the excavator operator and positive communication between the operator and ecologist is held throughout soft-felling;
 - For this process, each tree is nudged several times to allow any fauna species to self-relocate before being felled as gently as possible;
-

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- All hollows and potential habitat fissures then inspected after each tree is soft-felled; and
 - Any fauna found then safely relocated into the adjacent bushland.
-

Managing impacts on fauna

Bloomfield has put in place many measures to minimise impacts on fauna on the site including the following:

- Undertake progressive rehabilitation of all disturbed areas.
 - Control noxious weeds at all times.
 - Adopt a strategy to rehabilitate specific areas of the mine site to native vegetation;
 - Conserve the existing native vegetation in non-mining area of the mine site during the life of the project and in the final landform.
 - Carry out, where possible, tree removal, especially the mature trees in late spring and early autumn to avoid spring nesting birds and disturbance to roosting bats over the winter period.
 - Undertake pre-clearance surveys and clearing of vegetation as described in the previous section.
-

Landscaping the site to minimise visual impacts

The following controls are being implemented by Bloomfield:

- A buffer zone of native bush land is maintained around the site to screen mining and processing operations.
 - Progressive rehabilitation of all disturbed areas within the mine site will continue to be undertaken. Ongoing rehabilitation by Bloomfield Colliery will improve the visual quality for residences with a view of the current mining operations, especially to the south of the mining area.
 - Priority will be given to the completion of rehabilitation along the southern boundary of the site. This would reduce any potential visual impact, especially for residents in the Buttai Valley and users of John Renshaw Drive.
-

Conserving and reusing topsoil

The activities of stripping and stockpiling of soil resources prior to mining will be undertaken with the aim to:

- Optimise the recovery of topsoil and subsoil available for rehabilitation;
 - Manage topsoil and subsoil reserves so as not to degrade the resource;
 - Determine the suitability and stripping depth of soil material to be removed;
 - Ensure that the reuse of suitable soils is maximised;
 - Where possible, stripped soil material placed directly onto shaped overburden areas and spread immediately;
 - Stockpiles will be constructed with a “rough” surface condition to reduce the risk of erosion, improve drainage and promote revegetation;
 - Topsoil stockpiles will be no deeper than three metres in order to minimise problems with anaerobic conditions;
 - Fertilise and seed stockpiles to maintain soil structure, organic matter and microbial activity;
 - The appropriate soil ameliorant and fertiliser be applied at an appropriate rate when reuse soil on rehabilitation areas; and
 - Implement appropriate weed control strategies particularly for any noxious weeds.
-

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Collecting and propagating seed for rehabilitation works

Coordinated through local suppliers, if it is deemed to be feasible, seed collection will focus on locally native plant species representative of the surrounding native vegetation communities. Where adverse seasonal conditions (ie drought) affect seed production in the project area, local provenance seed should be sought.

Pasture seed will be purchased through local agricultural suppliers.

Salvaging and reusing material for habitat enhancement

Where practical, habitat features including felled hollow-bearing trees, hollow logs and rocks may be salvaged during vegetation clearing. These habitat features may be placed on rehabilitated areas for habitat enhancement which provide shelter habitat in the rehabilitation areas and encourage ground dwelling fauna to recolonise the cleared area.

Controlling weeds and feral pests

Appropriate noxious weed control methods and programs are being undertaken in consultation with the local council weeds control officers. This program of inspection and eradication will continue as part of the post-mine ongoing maintenance program. The weed management will be required for the life of the project to ensure that no lasting legacy is left at the completion of operations at Bloomfield Colliery.

The mine site will be regularly inspected for weeds, particularly areas being revegetated, as part of a monitoring program aimed at assessing the success of rehabilitation. Additional monitoring or eradication will be undertaken at the request of weeds inspectors of Local Councils. The results of all monitoring will be included in the relevant AEMR.

Periodic feral animal control programs have been undertaken in conjunction with neighboring mines. Activities have included feral dog baiting programs. These programs will continue in future on an as need basis.

Controlling access

Being situated close to urban areas, Bloomfield has historically had a problem with dumping of rubbish, theft and vandalism on the site. A major fencing and exclusion barrier program has greatly reduced these occurrences. Bloomfield continues to invest significant time and resources into keeping the site closed to unauthorised access, including fencing along all public roads, installing lockable gates and other temporary barriers (such as logs, rocks and concrete blocks) on major access tracks and ensuring clear signage is placed covering likely approaches.

Bushfire management

Bloomfield has implemented a number of measures and safeguards to minimise bushfire risk which include:

- Fitting fire extinguishers to all earthmoving and mining equipment;
 - Maintaining fire trails and access roads within the lease area and on Bloomfield controlled land, which serve as access for firefighting services as well as establishing a fire break;
 - Regular slashing of boundary fences of the lease area and on Bloomfield controlled land which serve as establishing a fire break;
 - Regular slashing of Bloomfield owned grazing properties surrounding the lease area to reduce potential grass fire fuel loads;
 - Regular contact with Rural Fire Service to assess fuel loads in native bushland surrounding and within the mining operational areas and undertaking hazard reduction burns as deemed necessary;
-

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- On-site water carts with firefighting capabilities.

MONITORING PROTOCOL

Representative monitoring sites will be established in newly rehabilitated areas at an average of one site per 10 hectares of newly rehabilitated land. Each site will be monitored within 12 months of establishment and then every 2 years after. This will provide 3 sets of monitoring data in the first 5 years following rehabilitation.

Each monitoring site will be permanently marked using steel pickets or similar. The inspection protocol includes assessment of the following parameters:

- site establishment;
- general condition of rehabilitation;
- weeds;
- fauna;
- vegetation;
- nutrient recycling;
- soils/surface condition; and
- erosion and stability.

A standard monitoring plot design as shown in Figure 3 will be utilised. Further details are provided in the methodology provided in Appendix A. A site monitoring field sheet is provided in Appendix B.

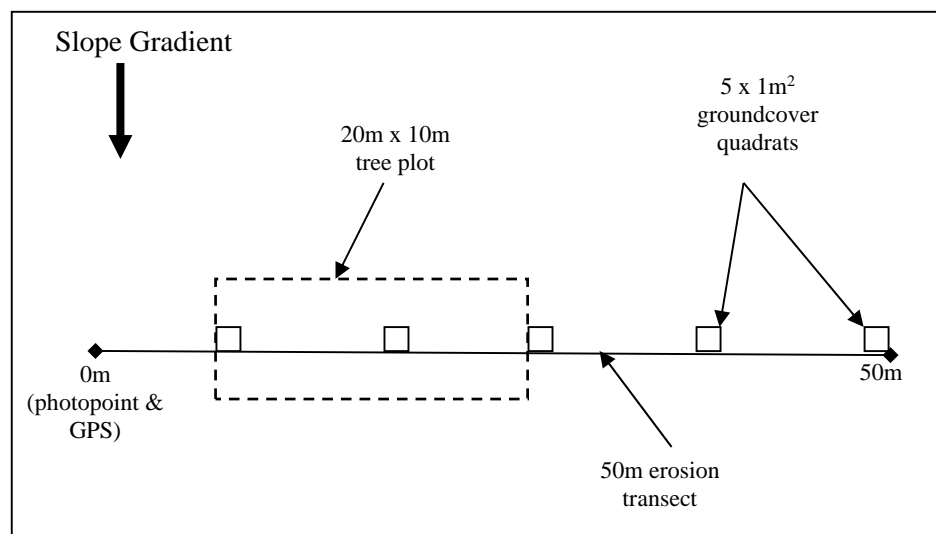


Figure 3 STANDARD LAYOUT OF REHABILITATION MONITORING TRANSECT

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Soil analysis will be undertaken to confirm that growth media is not likely to inhibit the sustainable development of a vegetative cover. As well as field observations and tests made during monitoring, soils analysis will consist of:

- collecting representative root zone soil samples during field monitoring; and
- testing for pH, EC and Emmerson Aggregate Test (indication of erosion potential).

Rehabilitated areas are also inspected annually to note any problem areas (such as bare patches, failed vegetation, drainage structure failure, significant erosion or significant weed infestation) requiring maintenance or further treatment. Remedial works will then be scheduled to address these areas.

ASSESSMENT PROGRAM

The assessment program is designed to collect sufficient data to compare the results of rehabilitation against the agreed completion criteria. The assessment program consists of three components:

- the annual maintenance inspections,
- scheduled rehabilitation monitoring; and
- the review of inspection/measurement data over time to assess rehabilitation performance.

In the event that the annual inspection finds there are problems, further investigations should be undertaken to determine the possible causes and identify an appropriate remediation strategy. Factors to consider include:

- nutrient levels;
- soil characteristics and limitations such as depth, pH, salinity;
- insect attack, weeds or other pests;
- drought or storm damage; and
- excessive grazing.

Where appropriate, the rehabilitation procedures will be amended to improve the standard of rehabilitation.

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FINAL ASSESSMENT

Prior to submission of a sign-off proposal, the land proposed for signoff will be subjected to a final maintenance inspection. This inspection will cover the whole area proposed for sign-off. The outcome of the inspection will be a documented description and photographic record of the general condition of rehabilitation, highlighting any areas of potential concern. This report will be included in the submission to DRG.

Once a rehabilitated area is deemed to be potentially suitable for sign-off, a Sign-off Report will be submitted to the regulators. This report will include the following information for the proposed sign-off area:

- survey land clearly showing the proposed area;
- area size, disturbance and rehabilitation history;
- monitoring data compared against rehabilitation aim, objectives and completion criteria;
- final maintenance inspection findings;
- photographs of the proposed area; and
- analysis of rehabilitation development and sustainability.

RISK TO REHABILITATION

Bloomfield has completed an overarching risk assessment to identify the potential threats to the success of rehabilitation for the operations. Details of the risk assessment are outlined in the Mining Operations Plan (MOP).

The following Trigger Action Response Plan (TARP) identifies the proposed contingencies strategies in the event of unexpected variations or impacts to rehabilitation outcomes with data as obtained from the monitoring programs and performance criteria and indicators as stipulated in this Plan. Table 3 outlines the key identified risks, triggers and proposed mitigation measures.

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Table 3 PROPOSED MITIGATION MEASURES TO REDUCE KEY RISKS

Risk	Trigger	Proposed Mitigation Measure
Off-site release of contaminants from mined materials requiring long term management or treatment.	Data obtained from compliance monitoring program indicates exceedance.	Ongoing monitoring of runoff and seepage waters during operations to validate predictions. Mitigation measures as proposed in the WMP.
Inadequate or insufficient topsoil to create/enhance the desired ecological communities.	Monitoring and vegetation assessments highlight inadequate ground cover and or paucity in species diversity / distribution. Soil analysis indicates soil parameters are not compatible to post mining vegetation community.	Manage topsoil, overburden and substrate management procedures and soil testing. Implement maintenance revegetation program including seeding, tubestock planting of native overstorey species, fertiliser. Amend growing media by the addition of organic matter e/g biosolids in areas returning to pasture. Assess soil for weed contamination and treat affected soil.
Wind and water erosion.	Data obtained from compliance monitoring program indicates exceedance in suspended sediment. Complaints relating to dust.	Erosion and sedimentation controls will be employed during rehabilitation activities, including rehabilitation of the creek diversion and the repair of subsidence areas, in accordance with the WMP. Maintenance earth and revegetation works will be undertaken in the areas where erosion has been noted. Annual monitoring detailed above will be designed to determine the type, source, degree, and location of potential erosion sites and source of sediment.
Impact of weeds and /or vertebrate pest animal leading to widespread failure of revegetation ecosystems.	Monitoring and vegetation assessments highlight increased weed competition.	Careful use of weed free topsoil and/or topsoil management. Encourage rapid establishment of ground cover species designed to outcompete weed species. Assessment and management of weed incursions on topsoil stockpiles prior to respreading. Weed control undertaken in accordance with the requirements of the <i>Noxious Weeds Act 1993</i> . Control of pest animal species in accordance with industry guidelines.

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Risk	Trigger	Proposed Mitigation Measure
Poor vegetation establishment success.	Monitoring data indicates non-compliance with performance criteria of the monitoring program in terms of landscape function, biodiversity and pasture productivity.	Species mix used in enhancement/rehabilitation programs are aligned to the floristic structure of the plant community of the site. Pasture species selection will be reviewed in context of pasture productivity.
Asset Protection Zone (APZ) is not maintained in context of bushfire risk.	Site assessment shows unacceptable fuel levels.	Control and maintain a suitable Asset Protection Zone surrounding rehabilitation areas by slashing and controlled grazing.
Major storm event resulting in flooding, geotechnical instability, major erosion and/or widespread damage to rehabilitated areas.	Weather warnings relate to severe storms and localized flooding. Monitoring program indicates lack of adequate ground cover.	Design final landforms, structures and revegetation to cope with major storm events. Implement maintenance program on sediment structures.
Severe and/or prolonged drought leading to widespread failure of revegetation.	Monitoring and vegetation assessments highlight inadequate ground cover and or paucity in species diversity / distribution.	Selection of drought-tolerant species for revegetation. Selection of species aligned to desired vegetation community. Time plantings to take advantage of ideal weather conditions.
Changing climate leading to failure of rehabilitation, failure of environmental management controls and/or inability to attain completion criteria.	Monitoring and vegetation assessments highlight inadequate ground cover and or paucity in species diversity / distribution. Soil analysis indicates soil parameters are not compatible to post mining vegetation community.	Assess climate change risks and implement appropriate measures where required. Use of biosolids, compost materials and mulches to increase organic carbon levels and improve soil structure with resultant increase in infiltration and water holding capacity.
New regulatory requirements or evolving community expectations leading to difficulties negotiating or attaining completion criteria.	Changes in relevant legislation.	Monitor trends and developments in legislation and changes to community expectations. Consult with stakeholders to gain acceptance of completion criteria.

AUDIT AND REVIEW

The ongoing effectiveness and efficiency of this Management System is monitored as part of the operation's day-to-day management. Feedback from this and other more formal reviews and/ or following special occurrences, form the basis for System improvement and re-design.

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General Conditions of Review

In general Management Systems are reviewed and up-dated conditional as follows:

- Every three years; or
- Whenever there is a significant change to relevant legislation; or
- If required to do so by the Regulations; or
- Whenever there is a significant change to the operations; or
- If required (in writing) to do so by the Chief Inspector; or
- Whenever control measures are found to be ineffective either through:
 - ◆ changes to the working environment; or
 - ◆ changes to operating systems; or
 - ◆ subsequent risk assessments; or
 - ◆ the findings of an audit; or
 - ◆ following a fatality or dangerous incident that could reasonably have been expected to result in a fatality; or
 - ◆ following an assessment of a related safety alert.

Continual Improvement

Operational activities will be subject to regular review to ensure conformance with commitment made in the EMS and subordinate plans and strategies. The blast monitoring program will be reviewed every three years or more frequently if required to identify areas that may require improvement.

The review process may include formalised procedures such as internal and external audits or feedback from consultation.

DOCUMENT MANAGEMENT

Copies of this document are managed under the Group Document Management, Management System. This document and other relevant documents are kept on site and are available to all employees.

APPENDIX A

REHABILITATION METHODOLOGY

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INTRODUCTION During mining operations, the landscape is subjected to substantial disturbance. This disturbance results mainly from the excavation of the open cut pits, and placement of overburden dumps. Land disturbance is also caused by the construction of infrastructure, such as roads, dams, drains, buildings, workshops, CHPP facilities, hardstands and stockpile areas. Once no longer required, these disturbed areas are progressively rehabilitated. Rehabilitation works generally consist of reshaping overburden dumps and re-establishment of a vegetative cover, as outlined in the Rehabilitation Works section of this document.

Following these works, the rehabilitated land is managed to ensure continued development and sustainability. Bloomfield must demonstrate to all relevant stakeholders that the disturbed land has been suitably rehabilitated. Rehabilitation development and sustainability is monitored via a program of periodic assessments, which measure rehabilitation parameters (such as soil characteristics, landform stability and vegetation establishment) against specific criteria for the completion of rehabilitation (referred to as “completion criteria” for the remainder of this document). As well as completion criteria used for final assessment of rehabilitation, appropriate indicators have also been selected to assess rehabilitation development.

This document forms part of the Rehabilitation Management Plan (RMP) implemented by the Bloomfield Group (Bloomfield) to facilitate the preparation, management and sign-off of rehabilitated lands at Bloomfield mining operations. The key processes of this system (i.e. selection of rehabilitation objectives) are described generically in the in this Appendix.

REHABILITATION MANAGEMENT PLAN

The key elements of the RMP include:

- setting overall rehabilitation aim and objectives.
- developing appropriate rehabilitation indicators and completion criteria;
- undertaking land rehabilitation;
- developing and implementing a rehabilitation assessment program;
- continuing rehabilitation management and maintenance; and
- presenting a request for rehabilitation sign-off to regulators, supported by results from the assessment program.

Where required, these elements are completed with input and agreement from relevant external parties, such as landowners and regulators. A flowchart of the RMP is presented in Figure 1. System elements are discussed in the following subsections.

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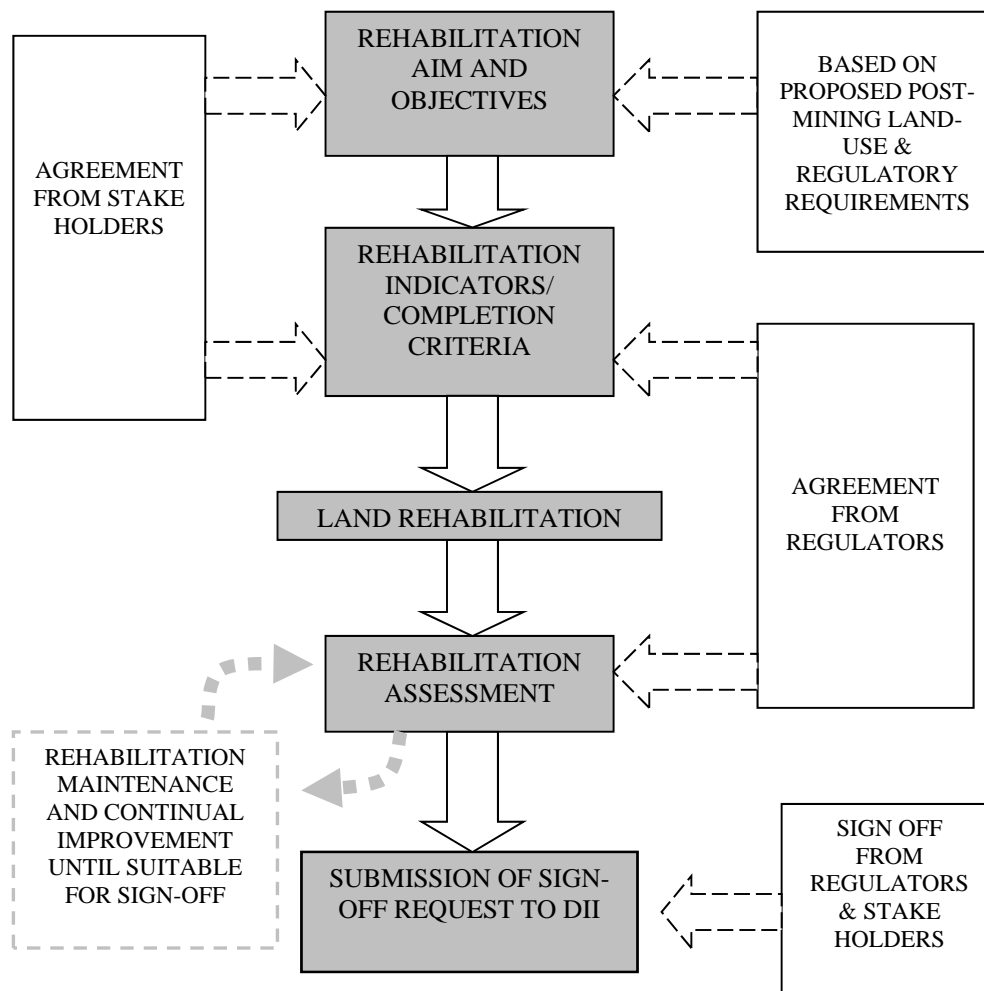


Figure 1 BLOOMFIELD GROUP REHABILITATION MANAGEMENT PLAN

REHABILITATION OBJECTIVES & CRITERIA

Before rehabilitation assessment commences, suitable completion criteria must be agreed upon. These criteria are drawn from the rehabilitation aim and objectives which, in turn, reflect the proposed post-mining land-use. The following subsections outline the purpose of these various elements. Rehabilitation aim, objectives and criteria for Bloomfield mining operations are presented in the individual operation Rehabilitation Plans attached to this document.

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Rehabilitation Aim The rehabilitation aim is a broad overview statement which outlines the strategic intention for rehabilitation works at the site. It is a general statement drawn largely from the proposed post-mining land-use, as previously negotiated with regulators and other relevant stakeholders. The aim should be relatively concise, with little technical detail included.

The aim may apply to an entire site or, where distinctly different post-mining land-uses are proposed, may apply to specific areas, or domains, of rehabilitation within a site.

Rehabilitation Objectives The rehabilitation aim should be expanded into a set of rehabilitation objectives that clearly describe the desired outcome for the rehabilitated land. These objectives further describe the specific rehabilitation attributes required to achieve the proposed post-mining land-use. Although completion criteria will be specific to the location and proposed land-use at each mining operation, generic industry leading practice for rehabilitation completion should, at a minimum, include reference to (Nichols, 2006):

- the return of a safe and geotechnically stable landform, compatible with the surrounding landscape;
- the establishment of a sustainable vegetation community;
- minimal offsite impacts (i.e. dust, water quality, visual amenity, weeds);
- minimal requirement for ongoing maintenance; and
- a demonstrated post-mining land-use compatible with adjacent, district and regional land-uses.

Completion Criteria and Indicators Completion criteria present a series of agreed values or characteristics that indicate when rehabilitated land is resilient and sustainable, without the need for excessive continued maintenance. If achieved, completion criteria indicate that rehabilitated land is considered suitable for sign-off. At a minimum, completion criteria should address landscape parameters such as stability, soils, vegetation establishment, potential for off-site impacts and suitability for the agreed post-mining land-use.

To assist with the assessment of rehabilitation development and enable the early identification of problems, progress indicators should also be selected. These indicators should be closely linked to the completion criteria and should trigger remedial action, if required, to ensure rehabilitated land is progressing towards the agreed completion criteria in a timeframe consistent with the overall mine plan.

Rehabilitation Works If the initial rehabilitation of a disturbed area is compromised due to inadequate planning or provision of resources, failure of the rehabilitation is a likely outcome, resulting in costly maintenance and remedial treatment. In order to ensure rehabilitated land meets the agreed outcomes in a cost-efficient manner, the considerations presented in this section should be integrated into rehabilitation planning and works.

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Resource Planning

A diverse range of resources, including natural resources, mobile plant, rehabilitation supplies and technical expertise are required to ensure the successful and cost effective rehabilitation of disturbed areas. Some of these resources may require substantial forward planning. A list of common resources required for the rehabilitation of disturbed areas is presented below. This list is only indicative and additional resources may also be required.

Natural Resources recovered from site

- Pre-clearance surveys will be conducted as per the Land Disturbance Management Procedure
- Water – rainfall or irrigation. Landform design can be used to enhance water retention and availability.
- Tree and grass seed – provenance seed from on-site/district/regional vegetation communities is preferable, but seed is more likely to be bought as a seed mix from seed vendors.
- Topdressing material – if available and of suitable quality, natural topsoil is preferable for topdressing of rehabilitation, due to various physical, chemical and biological advantages.
- Mulch – if practicable, mulch shredded from cleared vegetation pushed up during clearing should be used to supplement topsoil as a growth medium during rehabilitation.
- Rock – competent rock is sometimes required for armouring of water drop structures or steep faces on benched landforms.

Rehabilitation supplies

- Soil ameliorants – depending on overburden/soil geochemistry, may require lime, dolomite or gypsum.
 - Seed mix – seed mix may need to be purchased through seed vendors, as opposed to being collected on-site. Species selection should be based on post-mine land-use (i.e. grazing, habitat, landform stability, etc). Seed should be stored in a cool and secure location.
 - Tubestock – Tubestock will need to be stored in a cool, secure place and should be purchased as close to the planned planting date as possible. Tubestock should be planned for approximately 200 plants pre hectare.
 - Fertiliser – Usually Croplift 15, or as advised, at approximately 200 kg/ha.
 - Mulch – where sufficient topsoil is not available and not practical to shred and spread timber cleared in advance of mining, imported mulch may be arranged through green waste contractors (usually operating out of waste landfills or transfer stations). Imported mulch will comply with the EPA's Resource Recovery Exemptions under the Protection of the Environment Operations (Waste) Regulation 2014. As mulch should only be stored in stockpiles up to 3m high, and requires stockpiling for a minimum of three weeks for weed pasteurisation, substantial stockpile area is required as close as possible to the area under rehabilitation. Mulch should also be co-located with biosolids for mixing before spreading.
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Resource Planning (Cont)

- ❑ Biosolids – a good source of supplementary topdressing material where sufficient natural topsoil is not available. Biosolids should be handled, stored and spread in accordance with the NSW EPA guidelines (1997), including appropriate soil testing to ensure heavy metals threshold concentrations are not exceeded (conducted by biosolids contractor). Imported biosolids will comply with the EPA’s Resource Recovery Exemptions under the Protection of the Environment Operations (Waste) Regulation 2014. As with imported mulch, biosolids require stockpile area as close as possible to the area under rehabilitation. Biosolids stockpile areas should be isolated from surface drainage and natural watercourses to prevent contamination.
- ❑ Natural Material – where sufficient topsoil is not available imported excavated natural material may be utilised as topdressing material for rehabilitation works. Imported natural material will comply with the EPA’s Resource Recovery Exemptions under the Protection of the Environment Operations (Waste) Regulation 2014.
- ❑ Fencing and signage – may be required to isolate or protect established rehabilitation from interference or vehicle access. This may also include temporary sediment control fencing.
- ❑ Geotextiles or fibre matting – sometimes specialist materials such geotextile fabric (for drainage structures) or fibre matting (erosion protection and weed suppression) may also be required.

Plant and machinery

- ❑ Internal transport/haulage – trucks (rear dumps or road trucks) may be required for bulk relocation of rehabilitation resources (i.e. mulch/biosolids or topsoil) from stockpiles to rehabilitation. To eliminate the need for unnecessary double handling, all efforts should be made to establish delivery stockpile pads as close as possible to the areas under rehabilitation.
- ❑ Considerable mobile plant hours will be required, especially during the landform reshaping and rock raking phases. Likely plant include dozer, tractor and spreader, grader and water truck. Mobile plant will generally be supplied “in-house”, with contractors only required where specialist services are necessary.
- ❑ Access to field service support may also be required. In addition to plant operational hours, downtime should be allowed for on longterm projects for routine servicing and maintenance.

Human

- ❑ Human resources will also be required, and may include:
 - ◆ technical experts (i.e. drainage design, native species selection);
 - ◆ surveyors (landform design and planning);
 - ◆ project management (daily supervision, co-ordination and decision making);
 - ◆ media testing (soil/spoil characterisation, biosolids analysis);
 - ◆ plant operators; and
 - ◆ maintenance (fencers and weed sprayers).

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Scheduling

The following considerations should be integrated into scheduling for rehabilitation projects:

- ❑ Prioritisation – the rehabilitation program will usually be decided on well in advance and will be presented in the most recent mining operations plan (MOP). However, where there is a backlog, or multiple sites to select from, the rehabilitation program should be decided on in consultation with representatives from across the mine, based on selection criteria such as:
 - ◆ Specific rehabilitation requirements due to regulatory conditions or landowner agreement;
 - ◆ High profile areas (i.e. visible to the public);
 - ◆ Areas with the greatest potential for offsite or watercourse impact;
- ❑ Resource intensive areas due to reshaping requirements. Mining schedule – logically, rehabilitation will usually follow the disturbance resulting from mining operations. Therefore, the mining schedule and rehabilitation program should be closely integrated. The mining schedule will also dictate availability of mobile plant and operators. It will also indicate other proposed infrastructure (pads, roads or drains) that will influence or limit the extent of rehabilitation. The mining schedule also includes the proposed pre-stripping plan and, therefore, potential availability of topsoil.
- ❑ Land availability – it is preferable to rehabilitate large areas of landform to take advantage of the economies of scale offered through bulk rehabilitation. Rehabilitation of small sections of land is not only less economical, but increases the likelihood of rehabilitation failure due to the impacts of edge effects. To prevent interference with mining operations, ensure the Mine Manager specifies that an area is available for rehabilitation, before commencing.
- ❑ Climate - although the potential for successful rehabilitation may be increased from timely rainfall, climatic patterns should be considered a lesser priority in rehabilitation scheduling than the availability of plant, resources and land. However, predicted weather patterns (summer v winter) may influence selection of species in the seed mix to suit the anticipated temperature and moisture levels.
- ❑ Maintenance - time and resources also need to be allocated for post-rehabilitation maintenance activities, such as weed treatment, grass slashing, remedial treatment of bare patches and wash outs.

Landform Reshaping

Reshaping principally involves recontouring overburden dumps into the designed shape for final rehabilitation. The bulk movement of overburden is usually undertaken using bulldozers. Ideally, reshaping will result in a stable landform with slopes and drainage patterns which blend in with the surrounding natural topography. Slope stability is integral to rehabilitation design and slopes in excess of 10 degrees are not favoured. However, slopes steeper than 10 degrees may be necessary in some locations to ensure rehabilitation merges seamlessly with adjacent undisturbed land.

Particular attention should be paid to the placement of overburden exhibiting hostile characteristics (low pH, sodicity, etc). Such material should be identified and isolated from vegetation root zones and areas of potentially high surface run off. If possible, such material should be covered with a layer of more inert capping material, if available. Likewise, any reject emplacements integrated into the landform being reshaped will be covered by at least two meters of inert material. Site experience has

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found this to be the minimum cover required to ensure successful long-term revegetation over reject materials.

Once bulk reshaping is completed, the landform is deep-ripped and the final trim/rock raking are undertaken. The ripping loosens up any near surface strata within the landform that have been compacted during placement, aiding root penetration during vegetation establishment. The final trim smooths out any wash-outs and gullies, rough edges, temporary access tracks, local steep slopes and prepares the surface for revegetation. Rock-raking the final stage of reshaping and removes or buries exposed surface rock greater than 200 mm in diameter. This raking is usually done along the contour, leaving a cultivated surface that assists with erosion minimisation until vegetation can be established.

Suitable drainage must also be integrated into the rehabilitation design, to ensure the final landform can safely shed surface runoff without erosion damage being caused. Until an adequate vegetation cover is re-established, there is a high potential for erosion, resulting in resource loss, gully formation and the need for expensive remedial treatment. Therefore, long or steep slopes should be divided up by the construction of contour banks to collect and divert water off the slopes. Contour banks should run the surface water at a drop of no greater than 1 in 100 into a drainage line (via a sediment dam) or into some form of protected drop structure that will run the water down the gradient in a controlled or protected manner.

It is essential that drainage design for rehabilitation projects is fully integrated with the drainage features on the adjacent landscape, whether mine disturbed, rehabilitated or natural. Sufficient sediment control structures should be integrated into the drainage system to reduce, or intercept, sediment load being transported by surface run-off.

Revegetation

Most vegetation establishment during land rehabilitation is via direct seeding. Tubestock planting is only used when required for rapid establishment of tree screens or forestry plots. Tree seed mix, as opposed to pasture grass mix, will generally be sown so as to establish tree communities on areas such as steep slopes and hill tops. This assists in breaking up landform profiles and increasing slope stability. Efforts should be made to ensure that rehabilitated tree areas are not straight edged, but blend in with adjacent remnant vegetation. Trees should not be established on capping layers (i.e. rejects emplacements or hostile spoil) or other structures designed for long term exclusion and shedding of water.

Revegetation of the reshaped landform is generally undertaken in accordance with the steps below. These steps are indicative only and the order may vary, with some steps being excluded completely, based on the specific landform requirements and resource availability:

- Soil amelioration – spreading and integration of soil/spoil ameliorants into surface layer to address soil acidity and assist with soil structural properties. Ameliorants usually include lime and gypsum at a rate of up to 200kg/ha each (or as advised by biosolids contractor), ploughed into the top 30cm of the profile.
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Revegetation (cont) Topdressing - if available, topsoil stripped ahead of mining will be applied to the reshaped surface in an even layer generally not less than 100mm. Depending on the quality of the topdressing material, ameliorants may be integrated with topsoil at this stage. Where topsoil has not been available in sufficient volumes, biosolids and biosolids/mulch mix have been successfully used to improve soil structure and act as a source of nutrients, improving establishment of vegetation. Biosolids are generally applied at a rate no greater than 100 tonnes/ha (wet weight), using a tractor towed spreader trailer. A biosolids/mulch mix (1:1 ratio) has been shown to be very successful topsoil supplement and is usually applied at a rate of 200 – 250 tonnes/ha.

Integration – once the material has been topdressed, the surface will be contour disc or chisel ploughed to integrate the topdressing material. This assists in binding the topdressing material with the underlying spoil and is a requirement of the EPA biosolids guidelines. The area is then contour cultivated to create seed entrapments and microclimates prior to sowing.

- Sowing/fertilising - the area is then sown and fertilised with the selected grass and/or tree seed mixes. These works are undertaken shortly after spreading the topsoil to avoid loss in activity of pre-existing micro flora, it also minimises the loss of topsoil due to wind and rain action. Fertiliser is not required, where biosolids has been applied.
- Rolling – the final stage is rolling the ground. This presses the spread seed, increasing contact with the soil and increasing the probability of germination. It also pushes down any exposed rocks, decreasing surface rockiness.
- Bushfire Management - a hazard reduction plan has been drawn up in consultation with the Rural Fire Service. The Rural Fire Service conduct hazard reduction activities on Company managed lands surrounding the mining operation. The ongoing maintenance program on rehabilitated areas involves slashing to reduce the bulk of vegetative matter. As well as providing surface mulch, this also reduces the fire hazard of those areas. Grazing on older established rehabilitation area may also be conducted to reduce fuel loads.

ASSESSMENT PROGRAM

The aim of the assessment program is to collect sufficient data on the rehabilitated land to compare against the agreed completion criteria to assess rehabilitation development, sustainability and suitability for sign-off. Assessment programs consist of three components, (a) the annual maintenance inspections, (b) scheduled rehabilitation monitoring, and (c) the review of inspection/measurement data over time to assess rehabilitation performance. These components are referred generically as part of the “assessment program”.

Programs should be designed to collect sufficient evidence (i.e. landscape, soils, vegetation, landuse, water quality) to prove achievement of rehabilitation objectives. Cost, repeatability and practicality of the proposed monitoring methodology should also be considered, along with the long-term availability of resources to ensure monitoring completion.

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DOCUMENTING REHABILITATION PRACTICES

Rehabilitation practices and relevant site details are documented during the rehabilitation process so that future rehabilitation assessment data can be correctly interpreted. This is undertaken immediately following the establishment of each new area of rehabilitation. Table A1 presents the type of information which should be recorded.

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Rehabilitation	Location	
	Minescape polygon ID:	
	Approx Area:	
	Date of Rehab:	
Landform	Average slope gradient:	
	Steepest slope gradient:	
Drainage	Contour bank design (number, interval, gradient)	
	Contour banks discharge into?	
	Other drainage structures (dams, drops structures, diversions)	
Surface preparation	Topsoil used (source, depth of spreading)	
	Ameliorants or supplements used (rate/ha)	
	Ripping (depth, type)	
Vegetation Establishment	Method (Direct seeding or tubestock?)	
	Seed mix (species/rate/source)	
	Tubestock (species/density/source)	
	Fertiliser type/rate	
Other notes:		

Table A1 REHABILITATION INFORMATION TO BE RECORDED POST ESTABLISHMENT

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Monitoring Methodology

The following rehabilitation monitoring methodology is based on research into rehabilitation completion criteria for rehabilitation establishment on coal mines by Nichols (2005) and Grigg, Emmerton & McCallum (2001). Provided that it is conducted by experienced and independent operators, it will reliably indicate long term rehabilitation sustainability. The following considerations were incorporated into monitoring program design.

Representative monitoring sites should be established in rehabilitation of different ages. Density of monitoring sites should be based on age and heterogeneity of rehabilitation. For new rehabilitation, or rehabilitation established within the last five years, one monitoring site per 10 ha is recommended. Although no specific density is recommended for older established rehabilitation (>5 years), sufficient density of sites should be monitored to ensure coverage of different rehabilitation types and standards. Sites locations should be selected, so that all rehabilitated landscape and vegetation types are covered (i.e. treed, pasture, slopes, flat ground). If required to meet operation-specific completion criteria, analogue sites should also be selected from adjacent non mining disturbed land for comparative monitoring purposes.

Sites should be monitored within the first 12 months after establishment then every 2 years. This should provide 3 sets of monitoring data in the first 5 years following rehabilitation.

A standard monitoring plot design is shown in Figure 2. The standard measurements to be conducted at each measurement site are outlined in the Standard Monitoring Protocol section. Any operation-specific modifications or additions to this standard protocol will be presented in the Rehabilitation Plans attached.

In addition to the measurement protocols conducted every two years, all rehabilitated areas should be inspected every year. These inspections should note problem areas (such as bare patches, failed vegetation, drainage structure failure, significant erosion or significant weed infestation) requiring maintenance or further treatment. Remedial works should then be scheduled to address these areas.

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Standard monitoring protocol

Site Establishment

Each site will consist of a 50m transect, positioned along the contour of the slope, and permanently marked using steel pickets, or similar.

Photo and General Rehabilitation Condition

- GPS co-ordinates will be recorded for the 0m picket.
- Direction of the transect (to nearest cardinal point – N, SW, etc) from the 0m picket will be noted.
- A photo will be taken from the 0m marker of the general condition of rehabilitation in the vicinity of the transect.
- A brief description of the general condition (i.e. “rhodes dominated pasture grass with scattered shrubs and trees”) and any stand-out issues (evidence of fire, bare patches, weed infestations, tree die back or erosion) will be provided.
- A sketch will be made of the transect location in relation to prominent nearby landmarks.
- Landform gradient in the vicinity of the transect will be noted.

Weeds

Note presence of declared noxious weeds in vicinity of transects, or substantial infestations of weeds that may out compete or otherwise hinder rehabilitation establishment.

Fauna

Note evidence of fauna re-colonisation in rehabilitation along transect, including insects and birds.

Vegetation

The following measurements will be recorded to assess vegetation establishment:

- Five x 1m² quadrats will be established (at the 0m, 10m, 20m, 30m & 40m marks). Groundcover estimate (%), number of groundcover species and dominant groundcover species (top 2 spp.) to be recorded for each quadrat.
 - If trees or shrubs are present, one 20m x 10m plot, located 5m either side of the transect centreline will be established. Number of trees and shrubs taller than 1.2m will be recorded by species (if not known, allocate a number and record by genus – Acacia 1, Euc 2, etc). Stems/ha (total and for dominant spp/genus) should be calculated by multiplying plot results by 50.
 - Evidence of recruitment (seedlings and small saplings) along transect should be noted. If possible, note species/genus and distance to nearest mature tree of that species/genus.
 - Record general condition of tree health along the transect. Specifically recording evidence of senescence, drought stress, nutrient deficiencies, disease or severe insect attack. If applicable, note if specific species/genus are impacted.
-

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Standard monitoring protocol

Nutrient Recycling

- Record the percent coverage and average depth of litter layer in each quadrat.
- Note the degree of litter layer composition.
 - ◆ 0 = Nil: Litter lying loose on surface with little indication of decomposition or incorporation;
 - ◆ 1 = Minor: Litter broken down into smaller fragments in contact with soil surface or slightly incorporated.
 - ◆ 2 = Moderate or greater: Litter has started to form layers, with lower layers demonstrating evidence of decomposition activity.
- Record the presence of cryptograms (algae, fungi, mosses, lichens, etc):
 - ◆ 0 = Nil evidence;
 - ◆ 1 = Minor: <10% cover.
 - ◆ 2 = Moderate or greater: >10% cover

Soils/surface condition

For the characterisation of soil properties, the following actions should be taken along each transect:

- Note significant soil surface characteristics likely to influence rehabilitation development, including excessive surface rockiness, surface cracking, surface precipitates (salts, gypsum, etc), surface hard setting, etc.
- In each of the 5 vegetation plots, note surface rockiness (0=nil surface rock; 1=<10% coverage and/or rocks generally < 25mm diameter; 2 = >10% rock coverage or rocks largely > 25mm diameter), surface horizon soil field texture and surface roughness (0 = surface generally smooth with little capability of impeding surface flow; 1 = some minor cracking or undulations generally <2cm; 2 = dense surface cracking or undulations generally >2cm)
- Excavate a representative soil profile hole and record the surface horizon characteristics – depth, colour, structure, rootzone depth, rock content and field texture.
- Collect surface soil samples for analysis, as required to meet operation-specific soil characterisation criteria. Soil analysis requirements will be outlined in individual operation Rehabilitation Plans.

Erosion and Stability

The following landform attributes should be noted to monitor for evidence erosion and stability:

- Note the presence and, if possible, the cause of scalds or bare patches > 2m² along the length of the 50m transect.
- Record the location and dimension of all erosion rills >30cm wide and/or 30cm deep, where they intersect the 50m transect. Note whether the rills are active or inactive (inactive rills are usually found in areas of well established ground-cover and are filled/partially filled with sediment and/or vegetation established within the rill). The number of active rills deeper or wider than 30cm will be converted to a density per 50m for comparison with subsequent monitoring data.
- Note any failed water management structures (contour banks, drop structures, sediment ponds, etc).

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Monitoring Review Monitoring data will be reviewed upon completion of monitoring. Remedial actions for significant anomalies detected during monitoring (i.e. failed rehabilitation, failed water management structures, significant weed infestations) will be included in environmental works planning.

Monitoring data will be compared with previous years' data, to identify long-term trends in rehabilitation development. Once three sets of data have been collected, this information will be compared to completion criteria and areas deemed suitable for sign-off will be identified. Rehabilitated areas that are not progressing towards the completion criteria will also be identified and corrective strategies devised.

Final Assessment Prior to submission of a sign-off proposal, the land proposed for sign-off will be subjected to a final maintenance inspection. This inspection will cover the whole area proposed for sign-off. The outcome of the inspection will be a documented description and photographic record of the general condition of rehabilitation, highlighting any areas of potential concern. This report will be included in the submission to DII.

FINAL REHABILITATION SIGN-OFF Once a rehabilitated area is deemed to be potentially suitable for sign-off, a Sign-off Report will be submitted to the regulators. This report will include the following information for the proposed sign-off area:

- Survey Plan clearly showing the proposed area;
- Area size, disturbance and rehabilitation history;
- Monitoring data compared against rehabilitation aim, objectives and completion criteria;
- Final maintenance inspection findings;
- Photographs of the proposed area; and
- Analysis of rehabilitation development and sustainability.

Areas that have already been rehabilitated more than five years may display sufficient evidence of sustainability and be considered suitable for sign-off, without need for further monitoring.

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REFERENCE MATERIAL

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BLOOMFIELD GROUP MINING OPERATIONS

Rehabilitation Management Plan

APPENDIX B

Site Monitoring Field Sheet

BLOOMFIELD GROUP MINING OPERATIONS

Rehabilitation Management Plan

Site:			Date: / /			Name:					
GPS:						Photo no:					
General Description (incl. slope gradient, transect direction, general veg):						Sketch of transect area:					
Declared Weeds:											
Fauna Notes:											
Groundcover Plots		Q1	Q2	Q3	Q4	Q5					
Groundcover %:											
Number of species:											
Top g/c 2 species:											
Litter cover/depth (%/cm):											
Litter decomposition (0=nil/ 1=minor/2=>mod):											
Cryptogram presence (0=nil/ 1=minor/ 2=>mod):											
Tree Plots (Gen health, height range, stress indicators, recruitment, etc):											
Spp/genus	Count/plot (> 1.0m)	Stem/ha	Spp/genus	Count/plot (> 1.0m)	Stem/ha						
Total:											
Soil Surface- General surface condition (cracking, hardsetting, etc):											
Surface Plots		Q1	Q2	Q3	Q4	Q5					
Surface rockiness (0 = nil/ 1 = <10%/ 2 = >10% coverage)											
Surface horizon field texture											
Surface roughness (0-2)											
Topsoil Profile Description (at sampling point):											
Sampling location:		pH:		EC:		EAT Class:					
Erosion (General notes, failures, scalds, etc)											
Erosion rills > 30cm depth or width (Number, Location (along transect), width (cm), depth (cm), A= active:											
	L	W	D		L	W	D		L	W	D
1				5				9			
2				6				10			
3				7				11			
4				8				12			