Land and Biodiversity Management Plan

(Landscape Management Plan)

710-005-EN-PLA-0025

DOCUMENT CONTROL

This plan must not be modified altered or changed unless authorised by the document owner.

Document Owner: Superintendent- Environment

AMENDMENTS

Rev.	Date Issued	Date Approved	Approved by	Developed By	Nature of Amendment
0	29/06/2011	19/03/2012	NSW Dept of Planning and Infrastructure	John Ford	
1	20/02/2013	16/05/2013	NSW Dept of Planning and Infrastructure	John Ford	
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3	20/01/2017	30/05/2017	NSW Dept of Planning and Environment	John Ford	
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5	24/09/2021	13/10/2022	NSW Dept of Planning and Environment	John Ford	Review and update following DPIE request for additional information.

APPROVAL

Revision No.	Approval Date	Signature
5	24/09/2021	Vicki Hood
		Superintendent- Environment

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1. INTRODUCTION

Cadia is a gold/copper mining and processing complex in central west NSW near the town of Orange. The complex comprises Ridgeway and Cadia East mines, minerals processing facilities and associated infrastructure. Mining commenced in 1998, with current approvals taking the project through to 2031. The project mines and processes up to 32Mtpa of ore to produce 220,000 T of copper concentrate and 500,000 oz of gold. This document outlines the approach to land and biodiversity management and includes the mine disturbed landscape, the agricultural landscape and the landscape of the Cadia East Offset.

The Land and Biodiversity Management Plan (Landscape Management Plan) aims to meet all commitments and requirements from the Cadia East Project approval and the Rehabilitation Strategy. The Plan describes how the management of land and biodiversity will be undertaken on the mine site, surrounding farming land and within the Cadia East Offset areas. The plan will identify potential links across Newcrest owned land and identify opportunities to extend and add value on a regional basis. The Plan provides a detailed overview of the objectives, guiding principles and activities relating to the management of the mine disturbed landscape, the agricultural landscape and the landscape of the Cadia East Offset.

1.1 Purpose

The purpose of this document is to provide an overview of the approach to land and biodiversity management at Cadia. The Plan has been developed to meet the broad rehabilitation, biodiversity and land management commitments made as part of the Cadia East Project Approval (under Part 3A of the NSW Environmental Planning and Assessment Act and under the Commonwealth Environment Protection and Biodiversity Conservation Act) and as contained in the Cadia East Environmental Assessment (CHPL 2009).

The plan also aims to implement current best practice land and biodiversity management across Newcrest owned land and where possible link to land management initiatives on a regional basis.

This plan specifically addresses land and biodiversity management across the following main landscapes:

- Mine Disturbed Landscape
- Agricultural Landscape (including vegetation corridors)
- Cadia East Offset Landscape

1.2 Structure of this Plan

Section 1 of this plan provides general background information, outlines consent requirements and other commitments that apply to the mine disturbed landscape, the agricultural landscape and the landscape of the Cadia East Offset.

Section 2 of this plan provides specific information and action plans regarding the management of land and biodiversity within the mine disturbed landscape including objectives, mine closure overview, specific management actions, specific rehabilitation methodologies and processes.

Section 3 of this plan provides specific information and action plans regarding the management of land and biodiversity within the Agricultural landscape which includes Cadia's vegetation corridor program. The section includes objectives, specific

management actions for farming land and vegetation corridor areas, specific methodologies and processes.

Section 4 of this plan provides a risk assessment for the implementation of works within the mine disturbed and agricultural landscapes. It provides a range of corrective actions should the un-wanted event to occur.

Section 5 provides a list of key documents that apply and support the implementation of the Land and Biodiversity Management Plan – these documents are applicable to the mine disturbed and agricultural landscapes.

Section 6 outlines roles and responsibilities that relate to the mine disturbed and agricultural landscapes.

Sections 7 and 8 provides an explanation of how Cadia will monitor the success of rehabilitation works for the mine disturbed and agricultural landscapes (vegetation corridor aspects). Section 7 outlines the process and methodology of deterring mine closure criteria and tracking progress against these criteria.

Section 9 is a 'stand-alone' section that addresses the management of Cadia East conservation offset areas, the section includes separate risk assessments and success measures to meet the specific requirements of both the federal and state approvals. Consent requirements and other commitments (Section 1) remain relevant to this section.

Section 10 is common to all three landscapes (mine disturbed, agricultural and the Cadia East Offset landscape) and outlines the periodic review and update of the land and biodiversity management plan and consultation undertaken (particularly for the mine disturbed landscape as required by the Cadia East Project Approval)

Table 1.1-1: Condition Reference Table

Condition	Section addressing condition
(i) the rehabilitation objectives for the site and offset areas;	2.2 9.5
(ii) a description of the short, medium, and long term measures that would be implemented to: · *rehabilitate the site in accordance with the Rehabilitation Strategy (see condition 36);* · *implement the offset strategy; and* · *manage the remnant vegetation and habitat on the site and in the offset areas;*	2.6 9.10
(iii) detailed performance and completion criteria for the site rehabilitation and implementation of the offset strategy;	8 9.11
(iv) a detailed description of the measures that would be implemented over the next 3 years, including the procedures to be implemented for: · *progressively rehabilitating disturbed areas;* · *implementing revegetation and regeneration within the disturbance areas and offset areas, including*	1.6 2.4 2.6 2.7 2.8 2.9 2.12.1

establishment of canopy, sub-canopy (if relevant), understorey and ground strata; · *investigating ways to salvage and beneficially use resources in areas subject to subsidence (including timber, fauna habitat, seed and soil resources);* · *protecting vegetation and soil outside the disturbance areas;* · *rehabilitating creeks and drainage lines on the site (both inside and outside the disturbance areas);* · *managing potential acid forming material (including ensuring effective isolation of potential acid forming material in rock dumps);* · *managing salinity;* · *conserving and reusing topsoil;* · *undertaking pre-clearance surveys;* · *managing impacts on terrestrial and aquatic fauna (including a Squirrel Glider conservation strategy);* · *landscaping the site to minimise visual impacts;* · *collecting and propagating seed for rehabilitation works;* · *salvaging and reusing material from the site for habitat enhancement;* · *controlling weeds and feral pests, including terrestrial and aquatic species;* · *managing grazing and agriculture on site;* · *controlling access;* · *bushfire management;* · *managing and minimising any potential adverse impacts associated with the final voids; and* · *managing and minimising any adverse socio-economic effects associated with mine closure;*	3.6 3.8 3.9 9.10 9.13
(v) a program to monitor the effectiveness of these measures, and progress against the performance and completion criteria;	8.1
(vi) 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	4
(vii) details of who would be responsible for monitoring, reviewing, and implementing the plan	6

1.3 Responsibilities

The responsibility for implementing, monitoring and reviewing the Land and Biodiversity (Landscape) Management Plan lies with the Cadia Health, Safety and Environment (HSE) Manager.

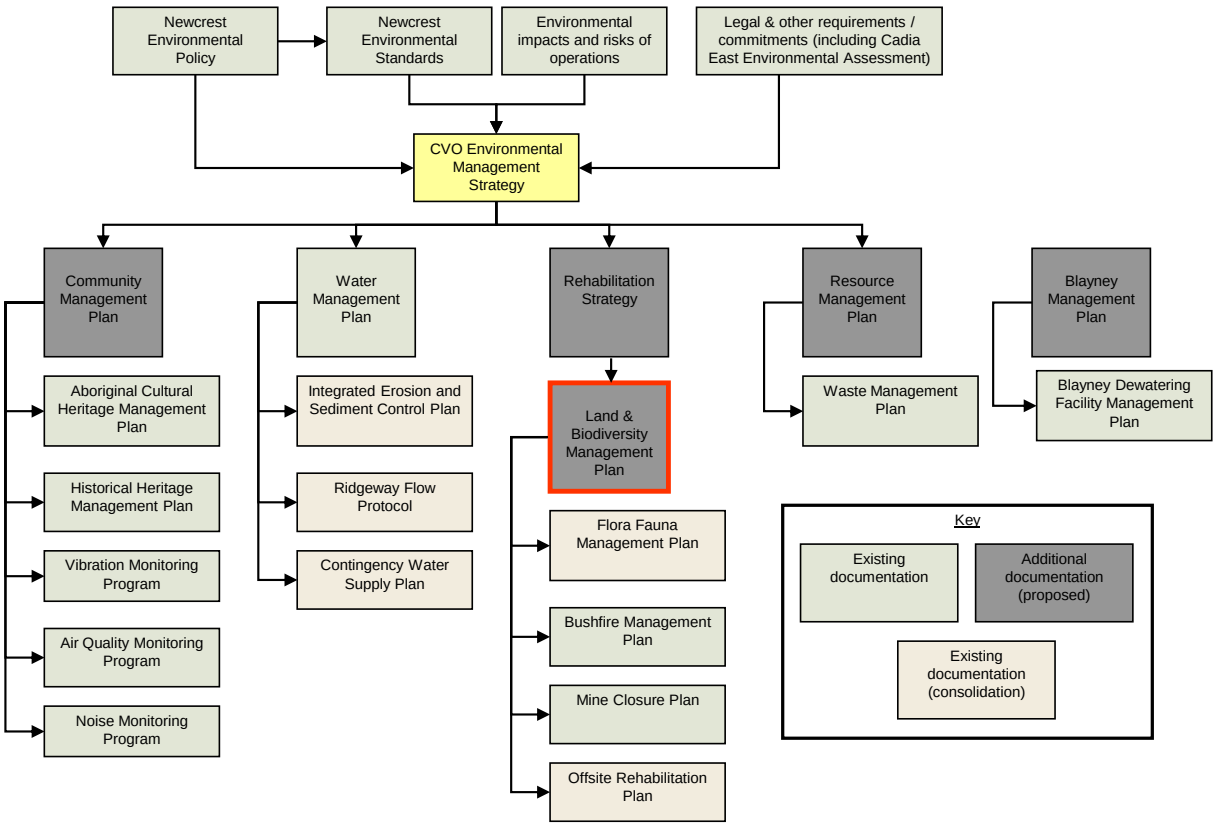
1.4 Environmental Management Strategy

The Environmental Management Strategy has been developed to meet the requirements of the International Standard - Environmental Management Systems (EMS) ISO140001. Cadia has an Environmental Management System (EMS) that has 3 specific purposes:

- Meet all legal and other requirements
- Manage environmental impacts and risk
- Demonstrate continuous improvement in environmental performance

The following flowchart (Figure 1-1) shows how the Land and Biodiversity (Landscape) Management Plan fits within the overall Cadia EMS framework.

Figure 1-1: EMS Framework



1.5 Rehabilitation Strategy

The overall rehabilitation goal is to generate enduring land value, including both ecological value (e.g. biological diversity and other environmental values) and agricultural value (i.e. the ability to produce agricultural goods).

Rehabilitation activities at Cadia would aim to generate safe and sustainable landforms at the mine site and on CHPL-owned land by rehabilitating mine disturbed lands to:

- Enhance biodiversity and add value to the current vegetation corridor programme (ecological value);
- Allow for the future land use of sustainable grazing where appropriate (agricultural value);
- Retain areas that may be important for future industry and infrastructure needs and for cultural heritage conservation; and
- Provide safe and stable landforms and minimise any adverse potential impacts so that there is no future liability for Newcrest or the community.

CHPL would aim to provide a balanced rehabilitation outcome, recognising the alternative land uses that exist in the region and aiming to establish a combination of indigenous woodland and strategic grazing on final landforms.

As one of the largest landholders in the Central West, Cadia recognises it has the opportunity to create a production and conservation landscape on a scale presently unobtainable in such a highly modified landscape. The works undertaken by Cadia has the ability to provide an ecologically sustainable and productive landscape for future generations.

Rehabilitation programmes would be adjusted over the life of the project as necessary, based on the outcomes of research trials, rehabilitation monitoring results, community and regulatory consultation, regional infrastructure requirements and industry knowledge.

Progressive rehabilitation would be undertaken throughout the life of the Project, where practicable.

1.6 Environmental Management Plans

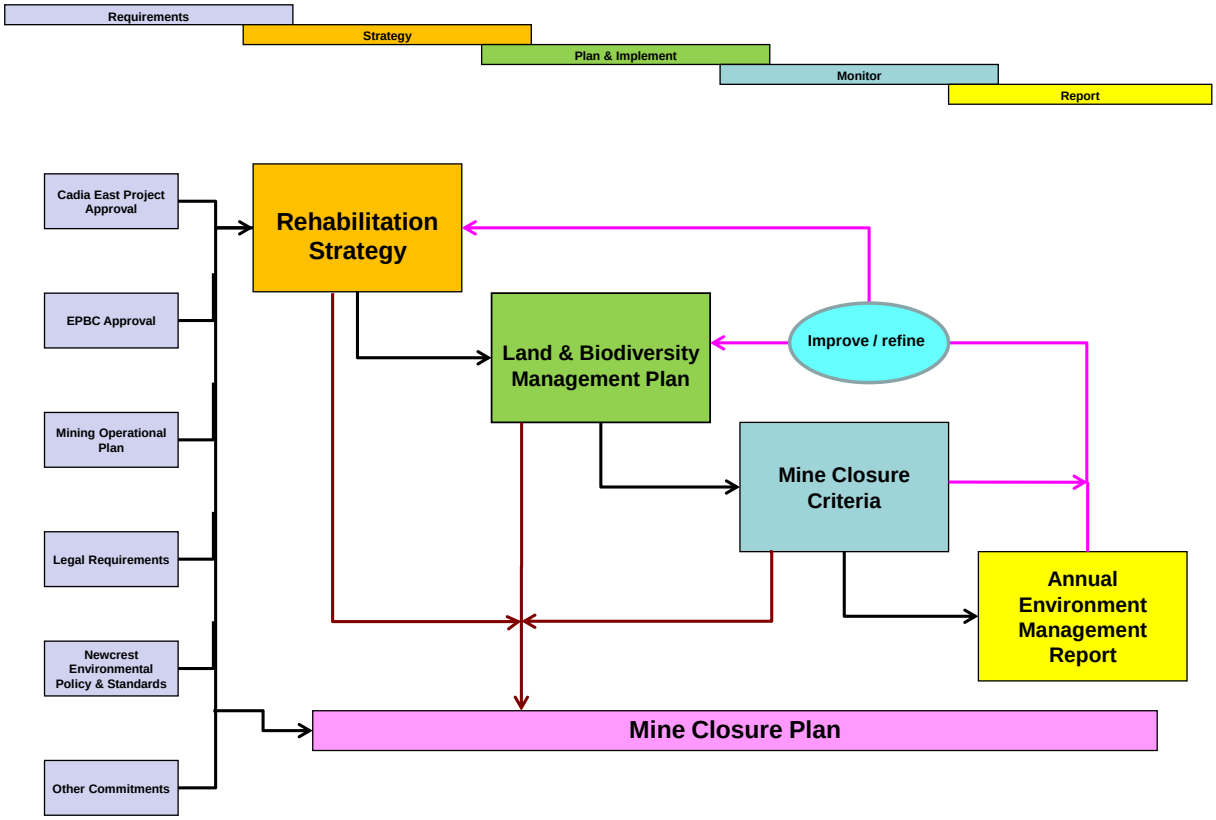
The Land and Biodiversity (Landscape) Management Plan has the following relationship with other management plans, strategies and documents:

Table 1.2: Relationship of the Land and Biodiversity Management Plan with other documents

Replaces	Strategically aligned with	Consistent with
Land Management Plan (CHPL 2009a)	Environmental Management Strategy (CHPL 2020)	Mining Operations Plan (MOP) (CHPL 2020)
Flora and Fauna management Plan (2009)	Rehabilitation Strategy (CHPL 2020)	Rehabilitation and Environmental Management Plan. (REMP)
Off-Site Rehabilitation Management Plan (2006)	Mine Closure Plan (CHPL 2014)	Water Management Plan (CHPL 2019)
Farm Management Plan (2007)	Bushfire Management Plans.	Historical Heritage Management Plan (CHPL 2020)
		Aboriginal Cultural Heritage Management Plan (CHPL 2012)
		National Strategy for the Conservation of Australia's Biological Diversity
* At the time of writing this plan, these documents had been submitted to NSW Department of Planning and Environment. Approval pending.		

Figure 1-2 shows how the Land and Biodiversity Management Plan relates to the Rehabilitation Strategy, legal requirements, project approvals, Newcrest commitments and reporting requirements.

Figure 1-2: Relationships of the Land and Biodiversity Management Plan to other Documents



1.6.1 Bushfire Management Plan

The CHPL Bushfire Management Plan (CHPL 2015) includes the three 'landscapes' addressed as part of the Land and Biodiversity (Landscape) Management Plan. The Bushfire Management Plan is a standalone document and will outline bushfire mitigation and control measures for the mine disturbed area, agricultural areas and conservation offset areas.

1.7 Land and Biodiversity Management Commitments

The following sections provide a summary of Cadia's current land and biodiversity management requirements and commitments. The relevant approvals that relate to this plan include:

- Cadia East Project Approval
- Cadia East Commitments (as stated in the Cadia East Environmental Assessment (CHPL 2009))
- Mine Lease Conditions (ML1405, ML1449, ML1472, ML1481, ML1689, ML1690)
- Federal, State and Local legislation
- State Environmental Planning Policies
- Newcrest policies and guidelines

1.7.1 Cadia East Project Approval

Project Approval for the Cadia East Project was granted by:

- The NSW Minister for Planning under Part 3A of the Environmental Planning and Assessment Act, 1979 (EP&A Act) on 6 January 2010. (Including Modifications)
- The Commonwealth Department of the Environment, Water, Heritage and the Arts on the 18th of February 2010. (Now the Department of the Environment and Energy)

The Cadia East Project is described in Schedule 1 of the Project Approval (EP&A Act) as including the Cadia East underground mine, the Cadia Hill open cut mine, the Ridgeway underground mine, the Blayney and CVO Dewatering Facilities, ancillary infrastructure and a biodiversity offset area. These components are collectively known as Cadia Valley Operations (CVO).

Conditions relating to the offset area (being Black Rock Range and areas at the confluence of Flyers Creek and the Belubula River) are included in both the NSW and Federal approval of the Cadia East Project.

The following is a summary of rehabilitation requirements contained in the Cadia East Project Approval (including Modifications) (NSW Government, Department of Planning (2010) & Commonwealth Department of the Environment, Water, Heritage and the Arts). (Now the Department of the Environment and Energy)

1.7.1.1 Environmental Planning and Assessment Act 1979

Rehabilitation

36. By the end of 2010, the Proponent shall prepare a Rehabilitation Strategy for the project to the satisfaction of the Secretary. This strategy must:

(a) be prepared by a team of suitably qualified and experienced experts whose appointment has been endorsed by the Secretary;

(b) be prepared in consultation with relevant stakeholders, including the RR, DRG, DPIE Water, Councils and the CCC;

(c) investigate options for the future use of disturbed areas including voids upon the completion of mining;

(d) describe and justify the proposed rehabilitation strategy for the site, including the post-mining landform and use; and

(e) define the rehabilitation objectives for the site, as well as the proposed completion criteria for this rehabilitation; and

(f) be prepared in accordance with any relevant RR guideline.

Note: The strategy should build on the concept strategy depicted in Appendix 6 (Cadia East Environmental Assessment).

37 The Proponent shall:

(a) carry out rehabilitation progressively, that is, as soon as reasonably practicable following disturbance; and

(b) achieve the rehabilitation objectives in the Rehabilitation Strategy, to the satisfaction of the Minister of Mineral Resources.

Biodiversity Offsets

38. The Proponent shall:

(a) implement the biodiversity offset strategy as described in the EA, and summarised in Table 14 (and shown conceptually in Appendix 6 [Cadia East Environmental Assessment]): and

(b) investigate ways to salvage and beneficially use resources (including timber, fauna habitat, seed and soil reserves) in areas subject to subsidence as far as reasonable and feasible to the satisfaction of the Secretary.

Table 14: Biodiversity Offset Strategy

Area	Minimum Size
Black Rock Range Offset Area – Enhancement Area	647 ha
Black Rock Range Offset Area – Revegetation Area	162 ha
Flyers Creek and Belubula River Offset Area	97 ha
Stratton Vale Offset Area	60 ha
Total	**966 ha**

**Subject to survey constraints*

39. Within 2 years of the date of this approval, the Proponent shall make suitable arrangements to provide appropriate long term security for the offset areas to the satisfaction of the Secretary.

40. Within 6 months of the approval of the Landscape Management Plan (see condition 41 below), the Proponent shall lodge a conservation and biodiversity bond with the Department to ensure that the offset strategy is implemented in accordance with the performance and completion criteria of the Landscape Management Plan. The sum of the bond shall be determined by:

(a) calculating the full cost of implementing the offset strategy; and

(b) employing a suitably qualified quantity surveyor to verify the calculated costs, to the satisfaction of the Secretary.

Notes:

- *If the offset strategy is completed to the satisfaction of the Secretary, the Secretary will release the conservation bond.*
- *If the offset strategy is not completed to the satisfaction of the Secretary, the Secretary will call in all or part of the conservation bond, and arrange for the satisfactory completion of the relevant works.*
- *If amendments to the Mining Act 1992 allow the Minister for Mineral Resources to require rehabilitation securities under a Mining Lease which apply to the implementation of rehabilitation works outside the boundary of a Mining Lease, the Proponent may transfer the conservation bond required under this approval to the Minister of Mineral Resources provided the Secretary and DRE agree to the transfer.*

Landscape and Biodiversity Management Plan

41. The Proponent shall prepare and implement a Landscape Management Plan for the project to the satisfaction of the Minister for Natural Resources and the Secretary. This plan must:

(a) be prepared in consultation with OEH, NOW and the Councils, and be submitted to the Secretary within 18 months of the date of this approval;

(b) include:

(i) the rehabilitation objectives for the site and offset areas;

(ii) a description of the short, medium, and long term measures that would be implemented to:

- *rehabilitate the site in accordance with the Rehabilitation Strategy (see condition 36);*
- *implement the offset strategy; and*
- *manage the remnant vegetation and habitat on the site and in the offset areas;*

(iii) detailed performance and completion criteria for the site rehabilitation and implementation of the offset strategy;

(iv) a detailed description of the measures that would be implemented over the next 3 years, including the procedures to be implemented for:

- *progressively rehabilitating disturbed areas;*
- *implementing revegetation and regeneration within the disturbance areas and offset areas, including establishment of canopy, sub-canopy (if relevant), understorey and ground strata;*
- *investigating ways to salvage and beneficially use resources in areas subject to subsidence (including timber, fauna habitat, seed and soil resources);*
- *protecting vegetation and soil outside the disturbance areas;*
- *rehabilitating creeks and drainage lines on the site (both inside and outside the disturbance areas);*
- *managing potential acid forming material (including ensuring effective isolation of potential acid forming material in rock dumps);*
- *managing salinity;*
- *conserving and reusing topsoil;*
- *undertaking pre-clearance surveys;*
- *managing impacts on terrestrial and aquatic fauna (including a Squirrel Glider conservation strategy);*
- *landscaping the site to minimise visual impacts;*
- *collecting and propagating seed for rehabilitation works;*
- *salvaging and reusing material from the site for habitat enhancement;*
- *controlling weeds and feral pests, including terrestrial and aquatic species;*

- *managing grazing and agriculture on site;*
- *controlling access;*
- *bushfire management;*
- *managing and minimising any potential adverse impacts associated with the final voids; and*
- *managing and minimising any adverse socio-economic effects associated with mine closure;*

(v) a program to monitor the effectiveness of these measures, and progress against the performance and completion criteria;

(vi) 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

(vii) details of who would be responsible for monitoring, reviewing, and implementing the plan

48. Upon receiving a written request from an owner of privately owned land with significant direct views from a residence to the mining operations, the Proponent shall implement additional visual impact mitigation measures (such as landscaping treatments or vegetation screens) in consultation with the landowner, and to the satisfaction of the Secretary.

These mitigation measures must be reasonable and feasible, and must be implemented within a reasonable timeframe.

If within 3 months of receiving this request from the owner, the proponent and the owner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Secretary for resolution.

1.7.1.2 Environment Protection and Biodiversity Conservation Act 1999

1. *The following are the conditions of approval from the Federal Environment Protection and Biodiversity Conservation Act 1999 and relate specifically the provision of the Cadia East Offset.*

The person taking the action must prepare a plan to offset the loss of 23 ha of the White Box-Yellow Box-Blakely's Red Gum grassy woodland and derived native grassland ecological community.

The plan must include

- *The desired outcomes of implementing the plan;*
- *The short (12 months from the date of the approval), medium (five years from the date of approval) and long term measures that will be employed to implement the plan;*
- *Details of how the person taking the action will provide for the long term security of the offset areas and details of the timing of when this will occur;*

- *Detailed performance and completion criteria for the implementation of the plan, including details of methods to rehabilitate areas of the ecological community, and methods to control weeds, feral animals, grazing, access and bushfires.*
- *A detailed description of how the performance of the implementation of the plan would be monitored over time to achieve the performance and completion criteria;*
- *A description of the potential risks to successful management and rehabilitation in the offset area, and a description of the contingency measures that would be implemented to mitigate these risks; and*
- *Details of who is responsible for monitoring, reviewing and implementing the plan.*
- *The plan must be submitted to the Minister within 18 months of the date of this approval and prior to any subsidence impacts on the White Box-Yellow Box-Blakely's Red Gum grassy woodland and derived native grassland ecological community. The plan must be approved by the Minister and the approved plan must be implemented.*

2. *Within 14 days of commencement of the action, the person taking the action must advise the Department in writing of the actual date of commencement*
3. *Within three months of every 12 month anniversary of the commencement of the action, the person taking the action must submit to the Department a report addressing compliance with the conditions of this approval. This report must include details of how the plan required by Condition 1 has been implemented. Annual reports must be provided until the Minister is satisfied that the person taking the action has complied with all conditions of the approval.*
4. *Upon the direction of the Minister, the person taking the action must ensure that an independent audit of compliance with the conditions of approval is conducted and an audit report submitted to the Minister. The independent auditor must be approved by the Minister prior to commencement of the audit. Audit criteria must be agreed to by the Minister and the audit report must address the criteria to the satisfaction of the Minister.*
5. *If the person taking the action wishes to carry out any activity otherwise than in accordance with the plan referred to in Condition 1 the person taking the action must submit for the Minister's approval a revised version of the plan. If the Minister approves such a revised plan that plan must be implemented in place of the plan originally approved.*
6. *If the Minister believes that it is necessary or desirable for the better protection of the White Box-Yellow Box-Blakely's Red Gum grassy woodland and derived native grassland ecological community, the Minister may request that the person taking the action make specified revisions to the plan approved pursuant to Condition 1 and submit the revised plan for the Minister's approval. The person taking the action must comply with any such request. The revised approved plan must be implemented in place of the plan originally approved.*
7. *If, at any time after 5 years from the date of this approval, the Minister notifies the person taking the action in writing that the Minister is not satisfied that there has been substantial commencement of the action, the action must not thereafter be commenced without the written agreement of the Minister.*

The above conditions relating to the securing and management of offset areas are addressed in Section 9 – (Cadia East Offset Landscape) of this plan. The section outlines

the broad objectives, actions and timeframes to implement the plan to meet the conditions of approval.

1.7.2 Mining Lease Conditions

The following requirements are contained in the Mining Lease conditions for CVO and relate to the management of land and biodiversity:

- *Any topsoil that is removed in the course of operations is to be set aside for replacement at a later date. Other soil, rock and residues are to be used to fill abandoned shafts and excavations and are to be covered by topsoil previously removed.*
- *The land over which operations have been carried on:*
    - *Is to be appropriately restored and landscaped, to the satisfaction of the Regional Inspector of Mines, to ensure that the land is properly drained and protected from soil erosion; and*
    - *Is to be planted with vegetation appropriate to the area and at a density acceptable to the Regional Inspector of Mines. Where the agreed final land use is to include native vegetation, indigenous species must be used in all revegetation programs, unless otherwise directed.*
- *The lease holder must comply with any reasonable direction given by the Regional Inspector of Mines regarding the stabilisation and revegetation of any mine residue, tailings or overburden dumps associated with the mining operation.*
- *On completion of operations the lease holder must rehabilitate all areas disturbed as a result of operations having been carried out within the subject area and must ensure that such areas are adequately maintained for such a period as is necessary to satisfy the Minister that long term rehabilitation standards and environmental safeguards have been fulfilled.*
- *The leaseholder must not fell trees, strip bark or cut timber on any private land, or Crown land held under a pastoral lease within the subject area, otherwise than in accordance with the consent of the owner or occupier of the land or, if the owner or occupier refuses consent or attaches unreasonable conditions to the consent, with the approval of a warden.*
- *The leaseholder must not destroy or injure any tree, sapling, shrub or scrub on any protected land, as determined by the Soil Conservation Act 1938, except in accordance with an authority issued by the Department of Land and Water Conservation under Section 21D of that Act.*
- *The leaseholder must not cut, destroy, ringbark or remove any timber or other vegetative cover on any other land subject of this lease except such as directly obstructs or prevents the carrying on of the operations.*
- *The leaseholder must obtain any necessary licence from the Forestry Commission of NSW before taking timber from any Crown land within the subject area.*
- *All trees, shrubs and undergrowth which the lease holder proposes to cut down, remove or damage for the purpose of the operations must be disposed of in accordance with the Mining Operations Plan.*

- *The lease holder must observe any instructions given by any responsible authority with a view to the eradication of noxious weeds. The lease holder must make all reasonable efforts to prevent the introduction and establishment of noxious weeds.*
- *Operations must be carried out in a manner that minimises soil erosion or stream sedimentation. The lease holder must observe and perform any reasonable instruction given by the Regional Inspector of Mines in this regard.*
- *Land disturbed must be rehabilitated to a stable and permanent form suitable for a subsequent land use acceptable to the Director General and in accordance with the Mining Operations Plan so that:-*
    - *There is no adverse environmental effect outside the disturbed area and that the land is properly drained and protected from soil erosion.*
    - *The state of the land is compatible with the surrounding land and land use requirements.*
    - *The landforms, soil, hydrology and flora require no greater maintenance that that in the surrounding land.*
    - *In cases where revegetation is required and native vegetation has been removed or damaged, the original species must be re-established with close reference to the flora survey included in the Mining Operations Plan. If the original vegetation was not native, any re-established vegetation must be appropriate to the area and at an acceptable density.*
    - *The land does not pose a threat to public safety.*
- *Any topsoil that is removed must be stored and maintained in a manner acceptable to the Director General.*
- *The lease holder shall prepare a Mine Closure Plan at least two years prior to the cessation of mining operations to the satisfaction of the Director General.*
- *Operations must be carried out in a manner that interferes as little as possible with the natural flora and fauna.*
- *The leaseholder must take all precautions against causing an outbreak of fire and must comply with the provisions of and regulations under the Bush Fires Act 1949, as amended.*

1.7.3 Other Applicable Legal Requirements

The following Acts and associated regulations may be applicable to the rehabilitation and management of land and biodiversity at Cadia Valley Operations:

- Contaminated Lands Management Act, 1997;
- Noxious Weeds Act, 1993;
- Protection of the Environment Operations Act, 1997;
- Threatened Species Conservation Act, 1995;
- Mining Act, 1992;
- Local Government Act, 1993;

1.7.4 State Environmental Planning Policies

The following State Environmental Planning Policies (SEPPs) are relevant to the Project:

- SEPP - Major Projects;
- SEPP - Mining, Petroleum Production and Extractive Industries;
- SEPP 44 - Koala Habitat Protection, and
- SEPP 55 - Remediation of Land.

1.7.5 Newcrest Policies and Guidelines

1.7.5.1 Environmental Policy

The Newcrest Environmental Policy (NML 2011) states the intentions and principles for environmental performance across all of its operations including the Cadia Valley Operations. The policy states:

"Newcrest is committed to achieving an excellent standard of environmental performance in all its business activities."

From a land and biodiversity management perspective, the policy also states that:

Newcrest will:

- "Contribute to conservation of biodiversity and integrated approaches to land use planning."
- "Rehabilitate sites or areas disturbed by company activities to comply with the applicable Environmental Management Plan."

1.7.5.2 Group Environmental Standard EN-ST-08 – Mine Closure

The Group Environmental Standard EN-ST-08 Mine Closure (NML 2017) applies to Cadia and relates to site rehabilitation and mine closure.

Intent

This Standard details the requirements for Mine Closure management at Newcrest operations.

- The site remains safe and stable for the period of temporary closure;
- Compliance with relevant regulatory requirements and environmental permits is maintained;
- Contractual obligations are considered;
- Community agreements and obligations are met; and,
- Potential environmental impacts are mitigated.

1.7.6 Cadia East Environmental Assessment

The following is a brief summary of land and biodiversity management commitments contained in the Cadia East Environmental Assessment (CHPL 2009) and the Rehabilitation Strategy (CHPL 2012).

1.7.6.1 General Land Management

Land Use

CHPL-owned lands not specifically required by CHPL's existing and proposed mining operations would continue to be managed as rural enterprises during the life of the Project.

Rehabilitation activities would be undertaken in consultation with relevant statutory authorities and be consistent with the Mining Operations Plan (MOP), the Rehabilitation and Environmental Management Plan (REMP) and the Mine Closure Plan.

Landforms and Topography

Progressive rehabilitation would be undertaken where possible to further integrate constructed landforms with the surrounding landscape.

Soil Erosion

The following broad measures would be implemented to prevent, reduce and manage soil erosion at Cadia.

- minimise disturbance during all phases of the Project and restrict access to undisturbed areas;
- sequence construction activities such that sediment control works are completed early in the construction phase;
- divert clean water around disturbance areas;
- rehabilitate / revegetate mine infrastructure areas at the earliest possible stage;
- minimise compaction during soil excavation and movement;
- use erosion control features (e.g. silt fences and temporary sediment traps, diversion banks, channels and rip-rap structures) to minimise sediment migration, divert surface water around disturbed areas and control runoff velocity; and
- construct collection drains, diversion drains and culverts to control surface runoff from access roads.

Soil Management

Soil management includes the stripping of topsoil and clay resources for future rehabilitation uses. Cadia will implement the following broad management measures to maximise the salvage and use of this valuable resource.

- formulate soil stripping guidelines including the nomination of appropriate depths, schedules and identifying areas to be stripped;
- progressively strip disturbance areas to optimise topsoil recovery;
- where possible, transfer and re-spread topsoil onto prepared rehabilitation areas to minimise handling and reduce soil degradation;
- undertake soil characterisation to determine suitability for use in rehabilitation;
- store topsoil in a manner which maintains the long-term viability of the resource;
- selectively stockpile soil according to soil type (i.e. great soil group, topsoil or subsoil); and
- segregate recovered soil based on seed content (i.e. native pasture area, native woodland area, improved pasture area).

Topsoil stockpiles are managed to maximise long-term viability through implementation of the following practices:

- Stockpiles are located outside of Project disturbance areas.

- Stockpiles are formed with a 'rough' surface to reduce erosion hazard, increase drainage and promote establishment of the species contained within the soil seed bank.
- Stockpiles with soils suitable for grazing pastures (i.e. improved pastures) will be fertilised and seeded with introduced pasture species to promote stability, maintain soil organic matter levels, soil structure and microbial activity.
- Stockpiles with soils suitable for native woodland and grassland rehabilitation will be seeded with sterile cover crops only to promote stability, maintain soil organic matter levels, soil structure and microbial activity. Introduced species and artificial fertilisers will not be used as they are likely to alter the natural soil biota and encourage non indigenous species which are not conducive to the final rehabilitation objectives.
- The final height of stockpiles will be kept to the minimum necessary to fit within the available local footprint.
- These management measures would continue to be implemented for the Project.

Land Contamination – Other

The mitigation measures presented below would prevent or reduce the potential for contamination of land from spills/leaks of hazardous materials. The measures include:

- Maintenance of mobile and fixed plant and equipment in accordance with the manufacturer's recommended maintenance schedule.
- Operator and driver training and (where appropriate) licensing for their job descriptions.
- Construction of all civil engineering structures in accordance with applicable codes, guidelines and Australian Standards.
- All contractors employed by CHPL would be required to operate in accordance with the relevant Australian Standards, NSW Legislation and CHPL's Contractor Management Plan.
- Storage and usage procedures for potentially hazardous materials (i.e. fuels and lubricants) would be developed in accordance with Australian Standards and relevant legislation.

Bushfire Hazard

The existing Bushfire Management Plan (BMP) would be revised as necessary to include the Project, farming land and Offset areas. The new revision would be prepared in consultation with relevant local bushfire brigades. The BMP includes details of training and emergency response procedures, a fuel management plan and an annual hazard reduction programme. The annual hazard reduction programme is prepared in consultation with the Canobolas Zone Bushfire Management Committee. The plan will take into consideration conservation and biodiversity objectives to ensure that the ecological attributes of the area are not compromised.

Visual Amenity

Progressive Rehabilitation

Progressive rehabilitation would be undertaken throughout the life of the Cadia. Rehabilitation of the tailing's storage facilities, South Waste Rock Dump, and other mine infrastructure areas (e.g. ore processing facilities, workshops, etc.) would include revegetation with pasturelands and woodlands as described in Section 2.5. (For more information, refer to the Cadia East Environmental Assessment Section 4.13)

Vegetation Screens

Maintenance of the existing vegetation screens (e.g. addition and replacement of plants where required) would continue to be undertaken. An increase in screening effect over time as plants grow would continue as a result. If required, additional vegetative screens would be planted at nearby dwellings and/or along public roads and vantage points in consultation with landholders and community groups. For example, it is envisaged that a screen would be planted along the western perimeter fence at the Cadia Dewatering Facility.

1.7.6.2 Biodiversity

Flora

The following measures would be implemented to avoid, mitigate and offset potential impacts of the Project on flora, and their habitats:

- rehabilitation and revegetation of Project disturbance areas;
- protection and management of flora in the surrounding Cadia;
- Vegetation Clearance Protocol;
- Threatened Species Management Protocol (TSMP);
- fire management;
- dust controls and monitoring;
- weed management;
- restricted access areas and traffic control
- animal pest management and monitoring; and
- offset measures.

Fauna

The following measures would be implemented to avoid, mitigate and offset potential impacts of the Project on fauna, and their habitats:

- habitat rehabilitation;
- management of fauna habitats in the surrounding Cadia;
- Vegetation Clearance Protocol;
- Threatened Species Management Protocol (TSMP);
- animal pest management and monitoring;
- aquatic ecosystem monitoring;
- fire management;

- measures to reduce artificial lighting impacts;
- noise controls and monitoring;
- restricted access areas and traffic controls;
- other fauna protection and management initiatives; and
- offset measures.

1.7.6.3 Specific Mine Disturbed Landscapes

The following section provides a brief overview of the rehabilitation and mine closure considerations for each of the major mine disturbed landforms at Cadia. A summary of these commitments is contained in Section 2.6.

North Waste Rock Dump (NWRD)

- The North Waste Rock Dump would have maximum batter slopes of 1:3, with 15 to 20 metre (m) wide, step-back, reverse graded berms and rock lined drains.
- PAF material contained in the dump would be encapsulated by covering with 0.5 m of compacted clay followed by 2 to 3 m of non-acid forming (NAF) material.
- This would be covered by 20 to 30 centimetres (cm) of topsoil. Where possible topsoil will be used that has been stripped from an area with a consistent final land use.
- Drainage control structures would be installed where necessary, utilising 'chain of ponds' concepts where appropriate.
- The North Waste Rock Dump would be revegetated with indigenous bushland species with a final land use of conservation.

South Waste Rock Dump (SWRD)

- The revegetation objective for the South Waste Rock Dump is to provide woodland across the dump surface and batters with a final land use of conservation.
- Selective encapsulation of PAF waste rock with a low permeability seal followed by NAF material and topsoil;
- 20 to 30 centimetres (cm) of topsoil will be placed as the surface substrate. Where possible topsoil will be used that has been stripped from an area with a consistent final land use.
- Grading the final surface of the dump to blend in with the natural topography of the area, with an overall outer batter slope of 1:4 comprising 1:3 outer slopes and 15 to 20 m wide, step-back, reverse graded berms;
- Installation of rock lined drains and detention ponds to channel runoff safely to constructed outlet areas;
- Creation of additional habitat using trees cleared from disturbance areas supplemented with additional habitat structures targeting threatened and declining woodland species (e.g. nesting boxes, bat boxes, salvaged hollows etc)
- The woodland areas will be linked to other conservation areas in the Cadia through the vegetation corridor programme.
- Rehabilitation trials would be conducted by CHPL to determine the best combination of techniques for the establishment of native woodland species (including soil treatments, seed mixes, sowing methods etc).

SWRD Interaction with the Northern Tailings Storage Facility

- A clay capping layer will be installed along the southern face of the South Waste Rock Dump to minimise the potential for tailings seepage into the SWRD. The clay layer would be keyed into the in-situ ground surface at the toe of the dump.

SWRD Water Management

- The top surface of the South Waste Rock Dump would be designed with a slight dish shape that would generally drain towards the north. Rock lined channels would be installed along the northern edge of the top surface to provide a stable means for surface water runoff to drain from the top of the SWRD.
- On the batters of the dump, surface water runoff would flow perpendicularly down the slope to the toe of each batter where it would be re-directed by the 15 to 20 m wide reverse graded berms. The water would gradually flow short distances along the berms to rock lined channels which would be constructed at regular intervals down the faces of the batters. These channels would enable water from one berm to be channelled in a controlled manner down the face of the batter to the next berm and ultimately to the base of the dump.
- Rock lined channels would be used at the base of the dump to direct runoff into natural creek lines, the surface of the NTSF, or the Rodds Creek Water Holding Dam.
- Drainage control structures would utilise ‘chain of ponds’ concepts where appropriate.
- The existing sediment ponds and leachate collection ponds downstream of the dump would be retained until the revegetated surface of the dump is stable and the runoff water quality is acceptable.

Tailings Storage Facility

- Each upstream lift would be approximately 4 metres in height, constructed at slopes of 1:2 and, following the completion of tailings deposition at the end of mine life, would be stabilised with the application of topsoil and direct seeded and/or planted with endemic tree and shrub species and grasses.
- The final surface of the tailings storage facilities would be rehabilitated through the application of topsoil (approximately 20 to 30 cm deep) and/or other growth medium such as biosolids, and would be direct seeded and/or planted with a mixture of locally occurring woodland species with a final land use of conservation.
- Strategic and targeted grazing may be permitted to enhance the rehabilitation and biodiversity outcomes of the site (pending landscape capability assessment).
- A layer of NAF waste rock may be used, if required, to line the decant area to allow access for machinery during rehabilitation. This would be assessed at the time of rehabilitation.
- Shallow drainage channels (spoon drains utilising “Chain of Ponds” principles) would be constructed on the surface of the tailings storage facilities to manage runoff and minimise ponding. The central part of each channel would be lined (with for example geotextile fabric and / or rock) to minimise erosion potential.
- Drainage from the top surface of the tailings storage facilities down the batters would be managed via engineered structures. These structures could involve, but are not necessarily restricted to, concrete channels, rock gabions or rock lined channels. The structures would direct the runoff to sediment stilling dams, and

possibly through a constructed wetland (if required to achieve appropriate water quality), prior to release.

- Creation of additional habitat using trees cleared from disturbance areas supplemented with additional habitat structures targeting threatened and declining woodland species (e.g. nesting boxes, bat boxes, salvaged hollows etc)

Ridgeway Subsidence Zone

- The rehabilitation concept involves construction of a bund and fence around the void to restrict stock and human access. The subsidence zone would be partitioned from the remainder of the 'Tunbridge Wells' property and surrounded by planted native woodland to provide visual screening and additional biodiversity outcomes.
- It is predicted that a water body would eventually form at the base of the Ridgeway subsidence zone and it would take approximately 150 years for a water body to reach equilibrium in the subsidence zone.

Cadia East Subsidence Zone

- It is not proposed to clear the native vegetation communities from this area prior to subsidence occurring, however a range of other materials with ecological value that can be used for rehabilitation will be salvaged such as native seed, trees with hollows, regionally significant species.
- Stripping of soils from the cleared agricultural lands within the subsidence zone would be undertaken if the soils from these areas are suitable, and they are required for rehabilitation of the South Waste Rock Dump or other Project landforms.
- After mining and mine dewatering cease the final void created by the Cadia East subsidence zone would be allowed to fill with water.
- The subsidence zone and zone of influence would not be sufficiently stable to safely allow human or stock access, therefore a bund and fence would be erected around the zone of influence to restrict human and animal access.
- A native woodland screen would be planted around the fence to provide a visual barrier and delineation of the zone to assist in future landuse planning. Where possible the native woodland screen would be used as a link in the vegetation corridor programme.

Cadia Hill Pit

- Following the cessation of mining of the Cadia Hill Open Pit, in April 2018 approval was granted for the deposition of tailings into the pit. At the completion of tailings deposition the remainder of the pit would be allowed to fill with water.
- A fence, bund and vegetation screen (native trees and shrubs) would be established around the open pit. The vegetation screen would provide a link as per the vegetation corridor programme.

Cadia Extended Pit

- The waste rock in Cadia Extended would be re-profiled to create a stable final land surface and blend in with the natural topography of the area.
- The final surface would have maximum batter slopes of 1:3, plateau slopes of 1:100 and water management drains, bunds and sediment dams would be

constructed. A low permeability cover would be installed to minimise infiltration into the waste rock.

- Following the application of 2 to 3 m of NAF material and topsoil (approximately 20 to 30 cm), the batters would be revegetated with indigenous woodland species with a final land use of conservation.

Infrastructure

- Dismantle and remove fixed equipment and infrastructure for removal from site and re-use at another location, if possible, or recycling.
- Non-salvageable/non-recyclable and non-contaminated surface infrastructure would potentially be disposed of in the underground workings, or at suitable off-site disposal areas.
- Once all the equipment and infrastructure components have been removed from an area it would be topsoiled, deep ripped and seeded.
- Land contamination assessments would be conducted as required and contaminated soil would be remediated in accordance with the relevant guidelines.
- Some concrete hardstands, site access roads, sheds, buildings and sediment dams may be retained for alternate post-mining uses.
- Electricity transmission infrastructure would be retained for future use by landholders unless it is no longer required, in which case it would be decommissioned and removed.
- Retain discussions with regulatory bodies, community groups and future user groups regarding possible future landuse and infrastructure options.

Declines, Portals and Underground Workings

- At the completion of mining, all recyclable and re-usable underground infrastructures would be removed and the Ridgeway mine dewatering programme would cease operation.
- Portals would be sealed with a concrete plug, the box cut backfilled and shaped to be consistent with natural topography and seeded. Bunding would also be constructed around the portals as described in the Mine Closure Plan.
- Surface ventilation infrastructure (e.g. fans, vents and electrical substations (except the concrete collars)) would be removed.
- The sealing/capping procedure for ventilation rises would be determined in consultation with the relevant regulatory authorities and other stakeholders, but would include appropriate geotechnical investigations, design work, capping and topsoil placement over the cap with the area revegetated with pasture species.

Roads

- Some of the site roads would be retained following the cessation of mining and be used for rehabilitation, monitoring, maintenance activities and for use by future landholders,
- Remaining roads would be ripped, topsoiled and sown to pasture or woodland species.

Water Management Infrastructure

- In consultation with the regulatory authorities and the community, and considering future regional water infrastructure needs, site water dams (i.e. Rodds Creek Water Holding Dam, Cadiangullong Dam), weirs (i.e. Flyers Creek and Cadia Creek), the Belubula River water pipeline, Blayney concentrate/return water pipelines and the Orange effluent pipeline may be retained for future use.
- As part of negotiations with future land-use bodies (regarding dams, weirs etc) ensure conservation and biodiversity objectives are considered.
- A long-term commitment is in place to negotiate with Orange City Council regarding the post mining use of select infrastructure (as per agreement with Orange City Council) as part of a regional water supply network subject to the due process of the relevant water authority at that time.
- In the event that the Belubula River water pipeline, Blayney concentrate/return water pipeline and the Orange effluent pipeline cannot be utilised by other groups, the concentrate and effluent pipelines would be flushed clean. All pipes would remain in situ, capped and surface infrastructure removed.
- Sediment dams would remain pending long-term acceptable water quality and may be kept for stock water if suitable.
- The site runoff pond and the process water pond would be cleaned out if necessary and temporary fencing would be installed if required. Once water quality meets regulatory discharge criteria through the process of ongoing water quality monitoring, the dams would be emptied, high-density polyethylene (HDPE) liners removed, contaminated soils removed, clean fill placed, topsoiled and seeded to pasture species.
- Consistent with Section 3.4.2 of the Water Management Plan (CHPL 2019), any baseflow losses from the Belubula River and / or associated creeks caused by the project will be offset in consultation with the appropriate regulatory bodies to satisfy Condition 25 of the Project Approval.

Heritage Sites

- The long-term future of heritage sites would be decided following consultation with regulatory authorities and the community. Options may include:
- Transfer of sites to the care and control of heritage conservation bodies such as NSW Office of Environment and Heritage (NEH), The National Trust, Department of Planning and Environment, etc.
- Care and maintenance agreement with local government (Cabonne or Blayney Shire Councils), or specific interest groups subject to demonstrating capacity to manage heritage relics to an appropriate standard.

Blayney Dewatering Facility

- Decommissioning of the Blayney Dewatering Facility would involve the removal of tanks, pumps, plant and infrastructure.
- Concentrate and dewatering lines would be flushed with clean water, capped and left in-situ. However consideration would first be given to their possible use within a regional water management scheme as per Cadia Hill Development Consent.
- Following the removal of infrastructure, attempts may be made to offer the site to another industrial user who can make use of the concrete pad and shed. If such a user is not identified, the shed would be demolished and the concrete pad left in place. The decision would be made in consultation with the regulatory authorities and stakeholders.
- A final land contamination assessment would be undertaken and amelioration measures implemented if required.

Cadia Dewatering Facility

- Decommissioning of the Blayney Dewatering Facility has been completed which involved the removal of tanks, pumps, plant, concrete pad and infrastructure.
- Concentrate and dewatering lines to the Facility have been disconnected and removed.
- All contaminated material has been removed from site.
- A final land contamination assessment would be undertaken and amelioration measures implemented if required.
- The land on which the Cadia Dewatering Facility is located is leased. Closure options have been subject to the terms of the lease agreement and negotiations with the landowner.

Plant Species Selection

- Native species used in mine rehabilitation would be selected on a site-by-site basis depending on nearby remnant vegetation associations, soil types, aspect, site conditions and the final land use objectives.
- Native species selection for revegetation would also be based on vegetation lists obtained from the Cadia Hill and Ridgeway EISs, species recorded within the Project area and surrounds (Attachment BC in Appendix B of the Cadia East Environmental Assessment), rehabilitation monitoring reference sites and results from relevant trials and studies.
- Native species used in mine rehabilitation will be sourced (or propagated) from seed collected from within the local area wherever possible, or from within an acceptable regional distribution limit.
- Unless otherwise required (e.g. tall trees for screening purposes) all areas would attempt to maximise habitat value by considering structural and species diversity applicable to the final land use and the target vegetation type.
- At suitable locations (and where available), locally rare, regionally significant species and communities would be incorporated into revegetation activities.
- Under some circumstances, non-endemic native species may be selected to allow the revegetation and stabilisation of site gardens and difficult landforms (e.g. sterile cover crops). Known environmental or agricultural weeds will not be used under any circumstances.

- Where the agreed final landuse for an area includes improved pasture (grazing), non-native pasture species will be sown.
- In consultation with regulatory authorities and landholders, additional species may be included over time as rehabilitation progresses and the results of ongoing rehabilitation trials become available.

2. THE MINE DISTURBED LANDSCAPE

The mine disturbed landscape refers to any ground disturbance and infrastructure directly associated with the Cadia East Project Approval (including Cadia Hill, Ridgeway and Ridgeway Deeps). A description of major landscapes and management commitments (summarised from the Cadia East Environmental Assessment (CHPL 2009)) is contained in Sections 1.7.6. The aim of this section is to address and meet the conditions of approval contained in Section 1.7.

2.1 Description

The mine disturbed landscape includes voids and pits, major landforms (Waste Rock Dumps, Tailings Storage Facilities), site infrastructure (water, power, processing plant, offices, workshops) and associated disturbance. The total area of disturbance is approximately 2241 Ha (as at June 2011) and is projected to be approximately 2355 ha by the end of approved mining activities.

2.2 Objectives

The following objectives relate to the Mine Disturbed Landscape:

- Maintain compliance with legislative and regulatory obligations and other environmental commitments.
- Progressively rehabilitate mine disturbed areas as early as possible.
- Base future land uses on an assessment of landscape capability.
- Allow for future industrial use of site infrastructure and resources.
- Create safe and stable, sustainable and productive landforms which conform to the natural topography of the Cadia area.
- Ensure there is no future or residual liability from the site (e.g. from soil or water contamination) for Newcrest or the wider community.
- Create sustainable ecological and if applicable, production (agricultural) ecosystems which are comparable to local reference sites or similar vegetation associations or broad vegetation types.
- Rigorously assess any mine disturbed areas with a future land use for agriculture / grazing to ensure it remains a sustainable land use and will not be subject to degradation.
- Incorporate ‘chain of ponds’ concepts into riparian system restoration.
- Protect the wider environment from potential long-term environmental impacts (e.g. impacts from Acid Rock Drainage ARD) via best practice design and rehabilitation.
- Undertake regular / annual inspections and monitoring to assess rehabilitation progress and success and to refine maintenance and corrective actions.
- Consult with future user groups and other stakeholders regarding post mining land use and rehabilitation objectives.

- Link the post mine land uses to wider (Newcrest owned) and regional networks and objectives with a focus on ecological and agricultural sustainability.
- Control weeds and pests.
- Protect and enhance remnant vegetation (outside project limits) from unauthorised disturbance or degradation.
- Develop and undertake pre-clearance surveys and salvage rehabilitation assets (seed, soils, habitat features etc) where practical to reduce impact upon native fauna and maximise rehabilitation outcomes.
- Prevent, control and repair areas of erosion.
- Improve aquatic and terrestrial health and sustainability via managed grazing and habitat restoration and enhancement programs.
- Manage bushfire fuels and plan for emergencies, taking into consideration conservation objectives.
- Restrict unauthorised access to rehabilitation areas.
- Conduct trials and research to enhance rehabilitation outcomes.
- Maximise the harvesting of topsoil and clay resources.
- Minimise site disturbance and restrict to approved areas only.
- Consult with relevant agencies and stakeholders concerning the post mining use of water infrastructure as part of a regional water management network.
- Consult with relevant user groups about possible post closure land use options (for example conservation / heritage area, industrial area, rural residential, recreational etc).

2.3 Guiding Principles

The following guiding principles will be implemented for the Mine Disturbed Landscape.

- Rehabilitation for the post mining land use of woodland, forest or native communities to use:
  - A range of indigenous species (trees, shrubs, grasses, forbs (and aquatic species where applicable)).
  - Seed that has been locally collected.
  - A range of species to provide diversity (including structural diversity) consistent with the target vegetation association (based on soil type, aspect, slope and adjacent (or pre-existing) communities).
- Rehabilitation for the post mining land use of agriculture / grazing to use:
  - Predominantly perennial species (supplemented with annual species as required such as legumes etc).
  - Ranges of native and / or introduced pasture species where suitable.
  - Scattered paddock trees to match the surrounding agricultural landscape.
- Species will be selected based on the target vegetation community and derived from vegetation survey species lists from a similar community type or monitoring reference site. (Refer to Appendix B Cadia East Environmental Assessment (CHPL 2009)).
- Where possible attempt to re-create communities consistent with local Endangered Ecological Communities (EEC).

- The recovery and use of habitat and rehabilitation resources from remnant areas destined for clearance / subsidence should be maximised to enhance the success and colonisation of rehabilitated sites.
- Locally uncommon species from remnant areas or species that are difficult to propagate should be re-located / re-planted prior to approved clearing.
- Native seed to be collected from within 20km of mine lease boundary or within an acceptable distribution radius.
- Where possible immediately re-spread harvested topsoil to take advantage of seed banks and soil biota and to reduce damage to soil structure through rehandling.
- Utilise topsoil from areas with a similar post mining land use to take advantage of available seed banks.
- Undertake annual monitoring of rehabilitation sites and compare a range of parameters against selected reference sites (Section 7).

2.4 Summary of Mine Disturbed Landscapes

Table 2.3 provides a summary of current rehabilitation and mine closure concepts for the major mine related landscapes at Cadia. Information in the table builds on the concepts outlined in Section 1.7. Information from the table has been used to develop a conceptual final land use plan (Figure 2-1). A more detailed rehabilitation schedule for the next 3 years has been developed and is illustrated in Figure 2-2 and is consistent with the Mining Operations Plan. The schedule of works is summarised in the following table (Table 2.1) and is consistent with the Mining Operations Plan (CHPL, 2020) (including amendments).

Table 2.1: Three Year Rehabilitation Schedule (as at April 2016)

Area Description	Approximate Area	Scheduled Completion Date
Laydown yards	0.9 ha	June 2020
Cadia Extended	2.8 ha	
NWRD Ramp	9 ha	June 2022
TOTAL	**12.7 ha**	

2.4.1 Projected Rehabilitation Conservation Areas

As at the 30th of June 2020, the following is a summary of the current land planned for rehabilitation with a final land use of conservation. (Refer to Figure 2-1).

Table 2.2: Areas with final land use of woodland / conservation (within mining operational areas)

Pre Newcrest	Projected end of mine life
571* ha 18% of total^	Total 2100ha 66 %
*Figures are approximate only and based on aerial photography calculations. # Includes undisturbed remnant areas, rehabilitation completed prior to July 2012, NWRD (66ha) and road services corridor (8ha) ^Total Mining Operational Area 3,160 ha (as at December 2015)	

2.5 Action Plan

Section 2.6 contains a detailed action plan that outlines the specific actions, timeframes, responsibility and performance measures for the mine disturbed landscape. This section addresses conditions of approval contained in Section 1.7 and commitments relating to mine disturbed areas as outlined in Section 1.7.6.

Table 2.3: Summary of Mine Disturbed Landscapes

Domain	Area (ha)	Aspect	Rehabilitation Measures / Procedures	End land Use / Comments
Southern Waste Rock Emplacement	442	PAF encapsulation	Plateaus – Compacted waste rock Batters - 0.5M compacted clay with permeability < 5 x 10-6 cm/sec* Berms – GCLL or HDPE 10m overlap with NAF areas All areas covered by 2-3M of Silurian or benign waste rock and 20-30cm of topsoil. Clay covered immediately with rock to prevent erosion. Clay wall to be constructed to manage water interactions between the South Waste Rock Dump and the Northern Tailings Storage Facility. *If clay resources are insufficient, a seal with a lower level of permeability will be installed (e.g. HDPE / GCLL Liner)	Woodland community (Local trees & shrubs / conservation) (*Eucalyptus albens*, *E. melliodora, E. blakelyi, E. bridgesiana* community (1a, 2a, 2b) Vegetation corridor links where possible. Runoff to be channelled via artificial wetlands
		Site preparation	Outer batters maximum slope of 1:3 with 20m reverse graded berms. Total slope 1:4. Contour banks, detention ponds, rock lined drop structures & formal drainage channels / pathways.	
		Rehabilitation	Placement of habitat structures, timber, logs nesting boxes etc. Topsoil ripped along the contour. Seeding of topsoil by air / ground spread 'Chain of ponds' concepts used in drainage structures / channels	
North Waste Rock Emplacement	74	PAF encapsulation	Plateaus – 0.5M compacted clay with permeability < 5 x 10-6 cm/sec* Batters - 0.5M compacted clay with permeability < 5 x 10-6 cm/sec* Berms – 0.5M compacted clay with permeability < 5 x 10-6 cm/sec* 10m overlap with NAF areas All areas covered by 2-3M of Silurian or benign waste rock and 20-30cm of topsoil. Clay covered immediately with rock to prevent erosion. *If clay resources are insufficient, a seal with a lower level of permeability will be installed (e.g. HDPE / GCLL Liner)	Bushland community (Local trees & shrubs / conservation) (*Eucalyptus macrorhyncha, E goniocalyx, E. polyanthemos* community (3a, 3b) Vegetation corridor links where required. Runoff to be channelled via artificial wetlands
		Site preparation	Outer batters maximum slope of 1:3 with 20m reverse graded berms. Total slope 1:4. Contour banks, rock lined drop structures & formal drainage channels / pathways.	
		Rehabilitation	Placement of habitat structures, timber, logs nesting boxes etc. Topsoil ripped along the contour. Seeding of topsoil by air / ground spread 'Chain of ponds' concepts used in drainage structures / channels	

Domain	Area (ha)	Aspect	Rehabilitation Measures / Procedures	End land Use / Comments
Northern & Southern Tailings Storage facilities	1030	Embankments	1:3 maximum batter slopes. 5m wide benches at 15 metre (vertical) intervals. Contour banks, rock lined drop structures & formal drainage channels / pathways. Spreading of topsoil 200-300mm deep Direct seeding of topsoil.	Improved pasture.
		Surface	Drainage control using geotextile fabric & large rock in formal channels and drains. 'Chain of ponds' concepts used in drainage structures / channels NAF rock may be placed in decant areas to allow access for rehabilitation Spreading of topsoil 200-300mm deep Placement of habitat structures, timber, logs nesting boxes etc Direct seeding of topsoil.	Woodland community (Local trees & shrubs / conservation) (*Eucalyptus albens, E. melliodora, E. blakelyi, E. bridgesiana* community (1a, 2a, 2b) Vegetation corridor links where possible. Occasional grazing to facilitate rehabilitation outcome Runoff to be channelled via artificial wetlands.
Open Pits, voids / subsidence zones	465	Safety	Voids are safe with minimal risk to the public, native fauna and livestock Access is 100% restricted to subsidence zone areas. Animal proof fencing (and erect warning signs) and construction of safety bund Access is restricted to the Cadia Hill Pit, with the exception of undertaking water sampling (if safely accessible) Water quality is consistent with modelling predictions (Cadia East and Ridgeway Subsidence zones) Undertake hydrogeochemistry assessment of Cadia Hill Pit water body to determine long term risks (including water quality / saline waters). Nominally 5 to 8 years from mine closure or as part of future options studies. There is no impact on wider groundwater quality. Water quality or the void is suitable for future industrial use or use within a regional water management scheme.	Exclusion / potential water body partially filled or landfill. (Subject to modelling and water quality studies to be conducted at closure) Maximise habitat and resource recovery prior to exclusion.
		Vegetation Screen	Plant safety bund to trees and shrubs (open pit) Plant buffer / vegetation screen around subsidence zones.	

Figure 2-1: Mine Disturbed Area Rehab Final Land Use

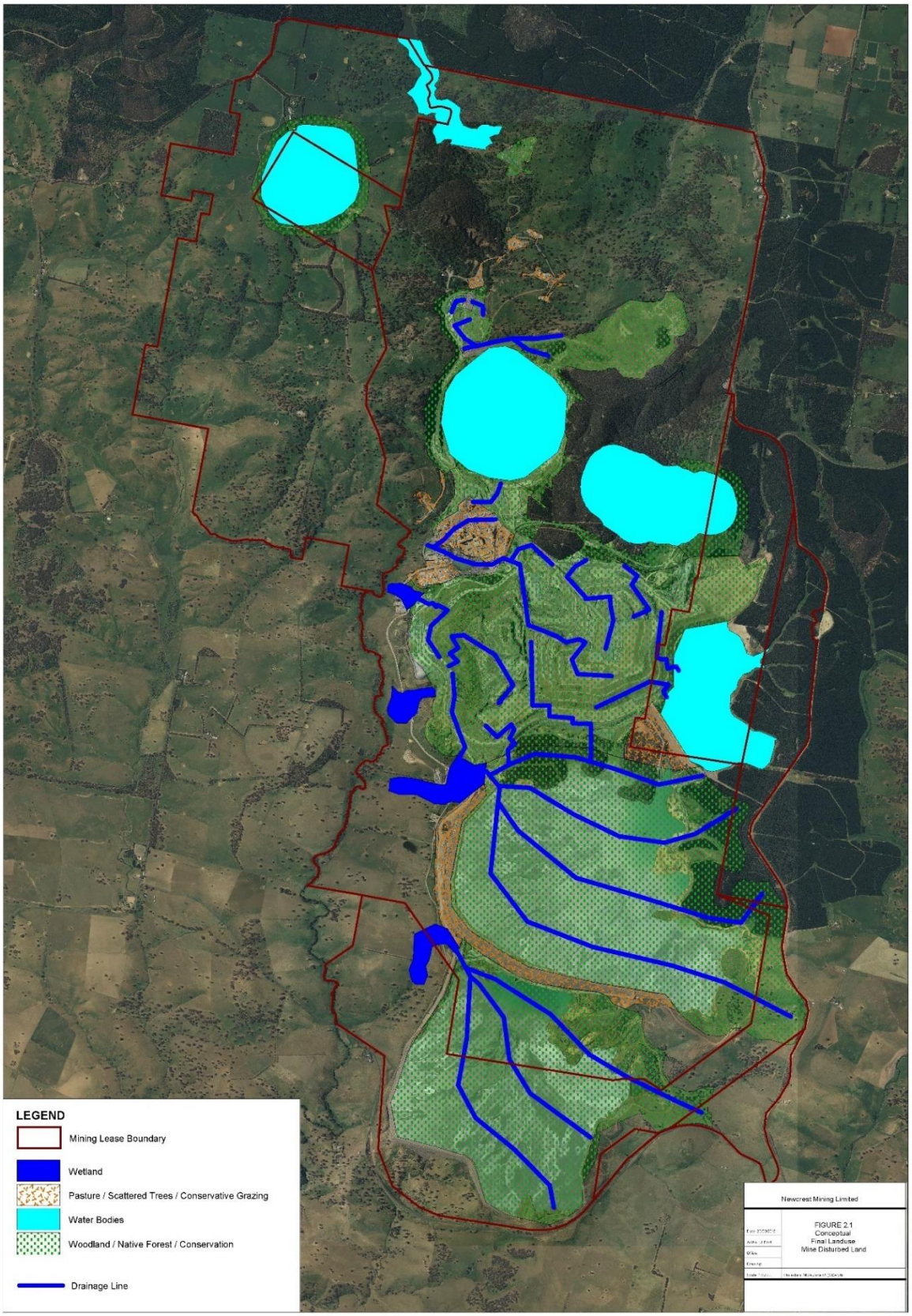


Figure 2-2: Mine Disturbed Rehab Schedule

2.6 Action Plan – Mine Disturbed Areas

Management Statement	Action	Responsibility	Timeframe					Performance Measure
			Ongoing	Annual	Short Term	Medium Term	Long Term	
Ongoing: required throughout life of project. Annual: undertaken every year. Short Term: undertaken within 1 year of plan approval. Medium Term: between 1 and 5 years of plan approval. Long Term: >5 years from plan approval.								
Undertake progressive rehabilitation of mine disturbed areas.	Implement progressive rehabilitation as per the Mining Operations Plan (MOP) / Rehabilitation and Environmental Management Plan (REMP). Refer to Figure 2-2.	Manager HSE Manager Mining	☒	☐	☐	☐	☐	Rehabilitation completed as per schedule outlined in MOP & REMP.
	Implement Natural Sequence Farming and Landscape Functional Analysis concepts. Implement works to capture water, sediment and nutrient to reduce leakage from the system and improve landscape function.	Manager HSE	☒	☐	☐	☐	☐	Achievement of mine closure criteria (Section 8).
	Monitor rehabilitation success / progression and compare against closure criteria (refer to Section 8).	Manager HSE	☐	☒	☐	☐	☐	Monitoring of rehabilitation sites is conducted annually with results presented in AEMR.
	Incorporate fauna component into annual rehabilitation monitoring and comparison against reference sites.	Manager HSE	☐	☐	☐	☒	☐	Fauna component integrated into annual rehabilitation monitoring.
	Annual inspection of rehabilitation works for erosion, failed rehabilitation, weeds etc. Corrective actions implemented as required.	Manager HSE	☐	☒	☐	☐	☐	Annual inspections undertaken and documented. Corrective actions implemented as required.
	5 years prior to commencing rehabilitation of Tailings Storage Facilities finalise / confirm final drainage design and rehabilitation plans. Use tailings deposition to assist in final landform construction.	Manager HSE	☐	☐	☐	☐	☒	Final rehabilitation and drainage plans confirmed through Mining Operations Plan.
Ensure areas identified for grazing are not exposed to degradation.	Undertake rigorous landscape capability assessment of all areas identified for potential grazing. Modify final land use if there is a risk of long-term degradation.	Manager HSE	☐	☐	☐	☒	☐	Assessment undertaken and final land use modified if required.

Management Statement	Action	Responsibility	Timeframe					Performance Measure
			Ongoing	Annual	Short Term	Medium Term	Long Term	
Ongoing: required throughout life of project. Annual: undertaken every year. Short Term: undertaken within 1 year of plan approval. Medium Term: between 1 and 5 years of plan approval. Long Term: >5 years from plan approval.								
Maximise species and structural diversity	Select species for rehabilitation based on the final land use, soil type aspect and closure criteria (selected from species lists from vegetation surveys of project areas refer to Appendix B Cadia East Environmental Assessment (CHPL 2009)). (Refer to Section 2.12).	Manager HSE	☒	☐	☐	☐	☐	Species selected are suitable for the site and final and use and are comparable with local remnant vegetation. Progression towards closure criteria.
	Maximise the diversity of species selected to achieve structural diversity and closure criteria. (Refer to Section 2.12).	Manager HSE	☒	☐	☐	☐	☐	Vegetation diversity, structure and density are suitable for the site and are comparable with the local remnant vegetation / reference site. Progression towards closure criteria.
	Select predominantly deep-rooted perennial species to assist in the prevention of dryland salinity. (Refer to Section 2.12).	Manager HSE	☒	☐	☐	☐	☐	Species selected are suitable for the site and are comparable with local remnant vegetation. Progression towards closure criteria.
	Investigate the planting and / or relocation of regionally uncommon, rare, locally rare or difficult to propagate species from mine disturbed areas to vegetation corridor, rehabilitation or offset areas.	Manager HSE	☐	☐	☐	☐	☐	Complete. Assessment undertaken. High effort and risk associated with transplanting / relocating native species. Continue to focus on direct relocation of topsoil where possible, diversity is seed collection and establishment of native seed orchard.
Pre-clearance surveys undertaken prior to clearing.	Undertake pre-clearance surveys prior to the clearing of any remnant native vegetation.	Manager HSE	☒	☐	☐	☐	☐	Pre-clearance surveys undertaken and documented via EIP process.
	Vegetation clearance protocol followed and documented via EIP process (refer to Section 2.7 and 2.8).	Manager HSE	☒	☐	☐	☐	☐	
Protect remnant vegetation	Identify remnant vegetation that is not approved for clearing which is to be protected.	Manager HSE	☐	☐	☒	☐	☐	Protected remnant areas are identified, mapped and communicated to workforce. Clearance managed / controlled through EIP process.
	Undertake habitat enhancement works within remnant areas such as installation of bat / possum boxes / habitat structures, replanting etc.	Manager HSE	☐	☐	☐	☒	☐	Habitat structures erected, additional planting undertaken etc. Reported via AEMR.

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Maximise the salvage / re-use of habitat resources.	Salvage available habitat and other resources (soil, seed etc) from within the Cadia East Subsidence Zone and other clearance areas. (Section 2.11).	Manager HSE	☒	☐	☐	☐	☐	Program developed and implemented. Reported through EARM process. Materials salvaged and re-located.
	During pre-clearance surveys identify and clearly mark all habitat structures suitable for re-location. (Including hollows, logs, rocks and general timber etc).	Manager HSE	☒	☐	☐	☐	☐	Habitat structures identified and documented via EIP Process.
	During clearing, stockpile or directly re-locate all resources to rehabilitation or habitat enhancement areas.	Manager HSE Manager Ore Treatment Manager Surface Operations	☒	☐	☐	☐	☐	Habitat structures stockpiled or directly relocated. Targets contained in Environmental Management Strategy met. Reported in AEMR.
Implement management practices to reduce impacts on native fauna.	Implement vegetation clearance and threatened species protocols (refer to Sections 2.7 & 2.10).	Manager HSE	☒	☐	☐	☐	☒	Pre-clearance surveys undertaken and documented via EIP process.
	Operate within noise, dust and fugitive lighting project approval criteria.	Manager HSE	☒	☐	☐	☐	☐	Monitoring undertaken and reported through the AEMR.
	Control predatory pest species that may impact upon native fauna populations including feral cats, foxes, dogs etc.	Manager HSE	☒	☐	☐	☐	☐	Pest control program implemented. Reported annually through AEMR.
	Develop and implement a program for the management of injured wildlife.	Manager HSE	☒	☐	☐	☐	☐	Program implemented and ongoing.
	Discourage the release of introduced fish species into Cadiangullong Dam. Implement steps to prevent the introduction of non-native fish into Rodds Creek Dam.	Manager HSE Manager Ore Treatment	☐	☐	☐	☐	☐	Complete. Site access is controlled to prevent access to Rodds Creek Dam. Public access remains possible to upper reaches of Cadiangullong Dam where CVO have no control over activities. CVO will continue to refuse access for the release of non-native fish where consulted.
	Maintain screens on the Belubula river pump intake.	Manager Ore Treatment	☒	☐	☐	☐	☐	Annual audit / check.
	Develop and implement a process, register and procedure for tracking and reporting accidental native fauna kills (including fish).	Manager HSE	☒	☐	☐	☐	☐	Complete - register and procedure established and implemented. Now ongoing.

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	Develop and implement a process for native animal rescue.	Manager HSE	☒	☐	☐	☐	☐	Complete. Program developed and communicated to workforce. Now ongoing.
	Develop and implement programs as required to reduce accidental native fauna kills.	Manager HSE	☒	☐	☐	☐	☐	Complete. Program developed and communicated to workforce. Now ongoing.
	Consistent with Section 2.9, develop and implement a Squirrel Glider Monitoring program to determine its presence on site and manage potential impacts.	Manager HSE	☐	☐	☒	☐	☐	Squirrel Glider Monitoring program developed and implemented. Results of monitoring to be reported in AEMR.
	Consult recovery and threat abatement plans for known threatened species and implement actions as appropriate.	Manager HSE	☒	☐	☐	☐	☐	Actions implemented as required.
	Ensure fencing around voids restricts the entry of native animals (but allows animals to escape from area),	Manager HSE	☐	☐	☐	☒	☐	Fencing erected – medium and large native animals restricted from entering areas.
Maximise the recovery of topsoil and clay resources	During pre-clearance / EIP surveys, identify topsoil and clay resources for salvage. Identity current land use, depth of stripping and stockpile locations.	Manager HSE	☒	☐	☐	☐	☐	Topsoil resources and salvage requirements documented through EIP process.
	Where possible directly relocate topsoil / clay to rehabilitation sites to minimise re-handling and loss of soil structure.	Manager HSE. Manager Surface Operations. Manager Ore Treatment	☒	☐	☐	☐	☐	Progression towards closure criteria.
	Investigate the salvage of soil resources from cleared agricultural land within the Cadia East subsidence zone.	Manager HSE	☒	☐	☐	☐	☐	Complete. Several campaigns have been completed and directly relocated to the South Waste Rock Dump. Other opportunities will be considered as available.
	Where possible match the pre-strip land use with the post mining land use. E.g. spread soil from a pasture area to an area with a final land use of pasture.	Manager HSE. Manager Surface Operations. Manager Ore Treatment	☒	☐	☐	☐	☐	Progression towards closure criteria.

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	Separately stockpile topsoil and clay resources (outside project disturbance areas). Clearly identify and survey for volume. Log of available topsoil and clay resources maintained and reported annually.	Manager Surface Operations. Manager Ore Treatment	☒	☐	☐	☐	☐	Survey maps and volumes available and reported annually in AEMR.
	Stockpiles to be left rough, have sediment control in place and seeded with suitable seed mix (pasture seed for 'pasture sourced topsoil' and sterile cover species for 'native sourced topsoil'). The final height of stockpiles will be kept to the minimum necessary to fit within the available local footprint. Nominal maximum stockpile height 10m.	Manager Surface Operations. Manager Ore Treatment	☒	☐	☐	☐	☐	Site Audit and survey results.
Minimise site disturbance	Manage site disturbance through the EIP process (Section 2.7). Disturbance must be consistent with project approval and kept to a minimum.	Manager HSE	☒	☐	☐	☐	☐	Compliance with project approval.
	Maintain groundcover over as much of the site as possible to prevent / reduce erosion and land degradation potential.	Manager HSE Manager Surface Operations. Manager Ore Treatment	☒	☐	☐	☐	☐	Audit / inspection.
	Establish and maintain a site disturbance register.	Manager HSE	☒	☐	☐	☐	☐	Complete. Register established (MapInfo) and kept up to date (through MOP / reporting processes). Register used in MOP / REMP process.
	Access tracks are kept to a minimum and rehabilitated at completion of use.	Manager Surface Operations. Manager Ore Treatment	☒	☐	☐	☐	☐	Audit / inspection and rationalise / rehabilitate tracks as identified.

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Prevent, contain and remediate pollution / contamination. *Note: water and sediment containment structures are addressed in the Water Management Plan*	Develop and distribute instructions for containing potential pollution sources and materials (e.g. bunding for chemicals and hydrocarbons).	Manager HSE	☒	☐	☐	☐	☐	All chemical and hydrocarbon containment is consistent with AS1940. Audit / Inspection.
	Develop and distribute procedures for the reporting and investigation of spills, incidents and near misses.	Manager HSE Superintendent Safety	☒	☐	☐	☐	☐	Environmental incidents are reported, stored and tracked through “CHESS”. Corrective actions are implemented as per incident investigation.
	All spills and near misses relating to potential pollution sources are reported to the Manager HSE.	ALL	☒	☐	☐	☐	☐	All incidents reported. Audit & site inspection.
	All contaminated areas are registered (contaminated land register) and remediated as appropriate.	Manager HSE	☒	☐	☐	☐	☐	Complete. Contaminated land register developed and maintained. Updated as required.
	Conduct annual and random inspections and audits of potential pollution / contamination sources.	Manager HSE	☒	☐	☐	☐	☐	Complete. Audit program completed and implemented. Now ongoing with corrective actions assigned, tracked and implemented through CHESS.
	Develop and implement a spill control training package.	Manager HSE	☐	☐	☐	☒	☐	Spill control training package developed and implemented. > 40% of workforce trained within 2 years of plan approval.
	Maintain mobile and fixed plant and ensure operators (including contractors) are sufficiently trained and operate within applicable codes etc.	Manager Ore Treatment	☒	☐	☐	☐	☐	Plant maintained, operators trained and operate within applicable codes etc.
	-Ensure no residual contamination is present at mine closure. Undertake assessments and remediation as required. -Undertake hydrogeochemical assessment of Cadia Hill pit to determine water quality risks and inform mine closure decisions. -Verify subsidence zones water quality is within predictions.	Manager HSE	☐	☐	☐	☐	☒	No residual contamination present at mine closure.
	Retain sediment dams (at mine closure) until site fully rehabilitated and water quality meets ANZECC guidelines for livestock.	Manager HSE	☐	☐	☐	☐	☒	Sediment structures maintained until water quality meets ANZECC guidelines for livestock.

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	Develop and implement water quality monitoring program for voids (pending safe access) at mine closure.	Manager HSE	☐	☐	☐	☐	☒	Monitoring undertaken (post closure) and reported in AEMR.
	Ensure critical pipelines (Concentrate, Blayney Return Water, and Orange Effluent) have adequate controls in place to identify and shut off any leaks / breaks (such as telemetry, pressure monitoring etc).	Manager – Ore Treatment Manager HSE	☒	☐	☐	☐	☐	Complete. Routine checks of systems and inspections of pipelines in place and documented. Now ongoing.
Prevent / reduce potential impacts from Acid Rock Drainage (ARD)	Potentially acid forming (PAF) waste is assessed and separately stockpiled (including relocation of Cadia East Waste to PAF cell).	Manager HSE Manager Mining	☒	☐	☐	☐	☐	PAF waste is separately stockpiled as per Geology Dept procedures.
	PAF waste will be encapsulated to reduce the risk of long-term contamination of waterways and soil.	Manager HSE Manager Surface Operations.	☒	☐	☐	☐	☐	Encapsulation completed as per MOP and included in 5-year plan / budget process.
	Encapsulation will be placed (as a minimum) as per O'Kane Consultants (O'Kane Consultants 2010) report June 2010. (Refer to Table 2.3 for brief detail).	Manager HSE Manager Surface Operations.	☒	☐	☐	☐	☐	QA / QC program developed and implemented as encapsulation is constructed.
	Monitoring equipment will be installed to monitor the effectiveness of the cover. Monitoring results presented annually in AEMR.	Manager HSE	☒	☐	☐	☐	☐	Complete. Monitoring equipment installed in NWRD and SWRD. Now ongoing with results presented annually in AEMR.
	Develop and implement research programs to test the potential use of artificial wetlands in the treatment of ARD leachate.	Manager HSE	☐	☐	☒	☒	☐	Program commenced with species assessment PhD. Constructed 'trial wetland' to be built. Progress reported in AEMR.
Prevent weed outbreaks and control noxious and environmental weeds.	Prevent weed outbreaks by restricting import of soil and potential weed containing products.	Manager HSE	☒	☐	☐	☐	☐	Complete. Information regarding restrictions is distributed to employees (LTO Theme).
	Control weeds using integrated weed management principles where establishment is reduced through competition and seed set is reduced through control techniques. Management techniques would be based on industry best practice and include; physical, chemical and biological means.	Manager HSE	☒	☐	☐	☐	☐	Contract and works program in place for the control of noxious and environmental weeds. Frequent inspections undertaken of all areas.

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Control vertebrate pests.	Develop and implement programs for the control of vertebrate pests including mice, rats, rabbits, foxes, feral cats, feral pigs etc. Management techniques would be based on industry best practice and include baiting, destruction of harbour, exclusion (fencing) etc.	Manager HSE	☒	☐	☐	☐	☐	Program developed and implemented. Program reported in AEMR.
	Manage waste to discourage the habitation of mice and rats.	Manager HSE	☒	☐	☐	☐	☐	Waste is managed through the use of solid / vermin resistant waste receptacles.
	Workforce informed of methods to reduce incidence and impact of vertebrate pests. e.g. waste management, not feeding pests etc.	Manager HSE	☒	☐	☐	☐	☐	Completed. LTO theme distributed. Now ongoing.
	Manage the eastern grey kangaroo population to reduce over-population, damage to rehabilitation, remnant and agricultural assets and safety risks.	Manager HSE	☒	☐	☐	☐	☐	Completed. Ongoing control program implemented depending on population.
Maintain and improve visual amenity.	When determining priority areas for rehabilitation, consideration will be given (where possible) to screening of the mine site and mine structures from public areas. E.g. planting of dense vegetation to block views of tailings dams etc. Works will be implemented as per the MOP, REMP and based on community concerns.	Manager HSE	☒	☐	☐	☐	☐	Visual amenity considered during planning of revegetation works (during frequent review of this document). Plans developed and implemented following consultation with affected landholders. Now ongoing.
	Site buildings will be made from materials with non-reflective surfaces (i.e. colorbond) in suitable colours.	Relevant Project Manager	☒	☐	☐	☐	☐	Buildings built from non-reflective materials.
	Investigate and attempt to mitigate any community concerns regarding visual amenity.	Manager HSE	☒	☐	☐	☐	☐	Community concerns investigated and managed as per community complaints protocol. Action is ongoing depending on community feedback.
	Plant vegetation screens around subsidence zones / voids.	Manager HSE	☐	☐	☐	☐	☒	Vegetation screens planted as per MOP / REMP.

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Plan for the re-use of infrastructure at mine closure.	5 years prior to mine closure, commence negotiations with stakeholders regarding the future industrial use of the site and / or selected infrastructure (e.g. water management assets). Basics of agreement incorporated into Mine Closure Plan.	Manager HSE	☐	☐	☐	☐	☒	Agreement in place by 30 June 2028. Strategy developed for retention of water infrastructure.
	Participate in relevant regional water and land management strategy discussions such as through CENTROC and local government. Basics of agreement incorporated into Mine Closure Plan.	Manager HSE	☐	☐	☐	☐	☒	CVO participated in discussions and regional strategy development.
	Identify all infrastructure that is to be retained at mine closure for future land uses (e.g. selected roads, sheds, powerlines etc). Update mine closure plan to include infrastructure.	Manager HSE	☐	☐	☐	☐	☒	Mine closure plan updated to include selected infrastructure. Strategy developed for retention of infrastructure.
	Maximise the re-use, recovery and recycling of post mining waste.	Manager HSE	☐	☐	☐	☐	☒	Minimal (nominally < 30%) material taken to landfill.
Access tracks	Access tracks are kept to a minimum across site.	Manager Mining Manager Ore Treatment Manager Surface Operations	☒	☐	☐	☐	☐	Tracks remain rationalised through the EIP process.
	As access tracks are decommissioned, they are rehabilitated consistent with the final land-use for that area.	Manager HSE	☒	☐	☐	☐	☐	Redundant tracks are closed and rehabilitated.
	Formal and permanent access tracks will be sheeted and graded to reduce the accumulation of sediment in drains, dust and erosion.	Manager Mining Manager Ore Treatment Manager Surface Operations.	☒	☐	☐	☐	☐	Access tracks are properly constructed and maintained.
	Water / runoff from roads will be captured in formal sediment containment dams.	Manager HSE Manager Surface Operations.	☒	☐	☐	☐	☐	Water from roads is contained and managed as per the Water Management Plan.

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	Hi-use roads will be watered to reduce dust generation. Consideration given to use of dust suppression products as per Dust Management Strategy.	Manager HSE	☒	☐	☐	☐	☐	Dust generation is minimised. Few dust complaints from residents.
Maintain rehabilitation areas.	Rehabilitation areas inspected on an annual basis for erosion, vegetation health, species diversity, structural diversity etc. Soil samples are taken annually (via monitoring programs). As a result of inspections, corrective actions are designed and implemented and may include replanting / seeding, erosion repair, drainage correction, fertiliser application etc.	Manager HSE	☐	☒	☐	☐	☐	Complete. Annual inspections undertaken. Corrective actions designed and implemented as required. Annual rehabilitation monitoring undertaken and reported in AEMR. Now ongoing on annual basis.
	Restrict access to rehabilitation areas. Install fences / bunds / windrows and signs as required to restrict access.	Manager HSE	☒	☐	☐	☐	☐	Completed as rehabilitation is undertaken. Now ongoing.
Collect native seed for rehabilitation purposes.	Opportunistically collect seed during clearing / felling operations. (Refer to Section 2.12.1).	Manager HSE	☒	☐	☐	☐	☐	The presence of seed is identified through the EIP process. Works are arranged to collect seed as available.
	Arrange an annual collection of seed from Newcrest owned land (including rehabilitation / corridor areas) and other areas (pending approval from land manager). Seed to be collected (nominally) within 20km of mine lease boundary.	Manager HSE	☐	☒	☐	☐	☐	Completed. Contract in place for seed collection. Seed collector has written permission from other land managers.
	Native seed collection and storage to be consistent with best management practice (Florabank).	Manager HSE	☒	☐	☐	☐	☐	Seed collecting consistent with Greening Australia and Florabank guidelines.
	Maintain a seed store database.	Manager HSE	☒	☐	☐	☐	☐	Data base in place and kept up to date.
	Consider participating in regional seed bank / storage / exchange programs.	Manager HSE	☐	☐	☐	☒	☐	Participate – pending approach from other parties.
	Investigate and establish (if required) a 'seed orchard' to allow the efficient collection of 'difficult to collect' species.	Manager HSE	☐	☐	☐	☒	☐	Seed orchard investigated and established if required.

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Develop and implement a Bushfire Management Plan.	Have a Bushfire Management plan in place for Newcrest owned land.	Manager HSE	☒	☐	☐	☒	☐	Completed. Plans have been developed for conservation offset areas, farming lands and CVO site. Plans are now under periodic review and update.
	Consult with relevant stakeholders during the development and implementation of the plan.	Manager HSE	☒	☐	☐	☐	☐	Completed. Consultation has been undertaken with site personnel, agistees and neighbours of conservation offset areas. Feedback considered and incorporated into the plan where required. Plans are now under periodic review and update.
	Implement actions as outlined in Bushfire Management Plan.	Manager HSE	☐	☒	☒	☒	☒	Works implemented.
	Periodically review the Bushfire Management Plan and update as required.	Manager HSE	☐	☐	☐	☒	☐	Plan reviewed at least every 3 years.
Prevent control and repair any areas of erosion.	Erosion control is considered with controls put in place through EIP process.	Manager HSE	☒	☐	☐	☐	☐	EIP process in place to consider and mitigate erosion and erosion potential.
	Erosion is actively identified, mapped, controlled and stabilised.	Manager HSE	☒	☐	☐	☐	☐	Areas of erosion identified through site inspections / audits and controlled as required etc. Works reported in AEMR.
	Manage the site's drainage for effective sediment and erosion control.	Manager HSE Manager Surface Operations.	☒	☐	☐	☐	☐	Site drainage for sediment and erosion control is consistent with Water Management Plan.
	As part of rehabilitation planning incorporate erosion and drainage control structures including contour banks, rock lined channels and drains, drop structures, sediment fencing etc.	Manager HSE Manager Surface Operations.	☒	☐	☐	☐	☐	Structures included in planning design and installed.
Undertake Aquatic and Riparian Rehabilitation.	Assess success of Cadiangullong Creek Diversion rehabilitation. Undertake additional restoration works as required. (Refer to Table 2.3).	Manager HSE	☐	☐	☐	☒	☐	Cadiangullong Creek Diversion rehabilitation success is undertaken through annual monitoring and assessment against closure criteria. Actions implemented as required.

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	Undertake additional riparian restoration works within mine operations area. (Refer to Section 2.12.2).	Manager HSE	☐	☐	☒	☐	☐	Planning for other riparian restoration is included in the Vegetation Corridor Program.
	Rehabilitation of aquatic / riparian areas, including constructed drainage lines, constructed wetlands etc of mine disturbed areas to incorporate 'Chain of ponds' concepts and practices.	Manager HSE	☐	☐	☐	☐	☐	"Chain of ponds' concepts incorporated into riparian and aquatic restorations works.
	Monitor aquatic health through rehabilitation monitoring (progression toward closure criteria) and aquatic invertebrate sampling programs.		☐	☒	☐	☐	☐	Monitoring program implemented. Results presented in AEMR.
	5 years prior to mine closure, conduct a detailed assessment of Tailings Storage Facility closure & drainage options and decide on most viable option.	Manager HSE	☐	☐	☐	☐	☒	Most viable solution selected and included in REMP and Mine Closure Plan.
	Implement habitat enhancement around site storage dams (as part of corridor program), process to include, placement of habitat structures (logs, rocks litter etc) planting (edge, floaters, emergents etc). Link dams through the restoration of mine disturbed landscapes/ catchment channels implementing 'chain of ponds' concepts.	Manager HSE	☐	☐	☒	☐	☐	Outcomes reported annually in AEMR.
Use Biosolids and other growth mediums to supplement rehabilitation substrates.	Develop agreement with Orange City Council for the acceptance of biosolids.	Manager HSE	☒	☐	☐	☐	☐	Complete. Agreement in place and signed by representatives of both parties. Agreement subject to renewal as required.
	Stockpile biosolids in suitable locations in preparation for use in mine site rehabilitation.	Manager HSE	☒	☐	☐	☐	☐	Complete. Suitable areas are selected, bunded and access controlled for biosolids storage. Now ongoing.
	Undertake trials to determine the best use of biosolids including rates, application methods, suitable vegetation types etc.	Manager HSE	☐	☐	☐	☒	☐	Trials conducted – results reported in AEMR.
	Use biosolids in accordance with relevant industry guidelines including waste exemptions, and CVO biosolids guideline (Geolyse 2006).	Manager HSE	☐	☒	☐	☐	☐	Annual audit / check against guidelines, exemptions etc.

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	Investigate other opportunities to utilise growth mediums to enhance rehabilitation outcomes.	Manager HSE	☐	☐	☐	☒	☐	Opportunities assessed as they arise.
Waste Management	Waste management is conducted to maximise reuse and recycling and to reduce waste generation and the volume going to landfill.	Senior Leadership Team.	☒	☐	☐	☐	☐	Ongoing. > 65% of waste generated at site is recycled / re-used.
	As part of major contracts negotiate with suppliers to reduce waste generation on site such as returning packaging (i.e. pallets, 1000L pods etc) for re-use or supplying goods in re-usable, recyclable materials.	Manager Commercial.	☐	☐	☒	☐	☐	Contracts in place, less waste generated at CVO.
	Educate workforce in separation and recycling waste.	Manager HSE	☒	☐	☐	☐	☐	Completed and now ongoing. Programs implemented including LTO themes.
	Only benign, non-putrescible materials, where there is no viable waste management alternative can be placed within the South Waste Rock Dump (such as crushed concrete, geological samples, HV tyres). All other materials to be removed from site.	Manager HSE	☒	☐	☐	☐	☐	Completed and now ongoing. Education of workforce through induction, bulletins and training. EPL 5590 modified to allow.
	No waste is to be brought onto site from outside sources (with the exception of specific items as scheduled in EPL 5590.	Manager HSE	☒	☐	☐	☐	☐	Completed and now ongoing. Education of workforce. Compliance with EP Licence.
Heritage Landscape	The heritage landscape is to be protected from unauthorised disturbance as per the Historical Heritage Management Plan.	Manager HSE	☒	☐	☐	☐	☐	EIP Procedure. Education of workforce.
	Work with the NSW Heritage Office, NSW Office of Environment and Heritage (OEH) and other bodies to reduce and repair erosion within heritage landscapes.	Manager HSE	☐	☐	☐	☒	☐	Erosion management plan submitted to regulators for approval, works implemented.
Control access to Mining Operational Areas.	Control access to mining operational areas through the use of locked gates and formal / controlled entry / exit points manned with trained security personnel 24hs per day. Voids are protected from unauthorised with a bund or trench and 1.8m chain wire fence.	Manager HSE	☒	☐	☐	☐	☐	Security controlled – no unauthorised access.

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			Ongoing	Annual	Short Term	Medium Term	Long Term	
Ongoing: required throughout life of project. Annual: undertaken every year. Short Term: undertaken within 1 year of plan approval. Medium Term: between 1 and 5 years of plan approval. Long Term: >5 years from plan approval.								
Research and trials	Opportunistically and strategically undertake research and trials to improve rehabilitation performance. (For example to maximise rehabilitation success, grazing trials, constructed wetland etc).	Manager HSE	☐	☐	☐	☒	☐	To be conducted on an 'as needs' / opportunistic basis.
	Investigate methods of improving the quality of the final tailings dam surface to facilitate rehabilitation outcomes. For example placing additives to final tailings surface deposition to alter pH, provide organic matter or increase fertility.	Manager HSE	☐	☐	☐	☐	☒	Literature and industry search conducted. Possibility of undertaking a research trial investigated.
	Benchmark the establishment of Grassy Box woodland communities on mine disturbed areas with particular emphasis on ground cover species.	Manager HSE	☐	☐	☐	☒	☐	Literature and industry search conducted. Possibility of undertaking a review on results from other sites.
Plan for the potential socio-economic effects of mine closure.	5 years prior to mine closure, undertake a comprehensive socio-economic study of the impact on the community of mine closure. Newcrest to assess consequences of closure and develop and implement strategies to lessen / mitigate the impact.	Manager HSE	☐	☐	☐	☐	☒	Strategies identified and implemented to lessen / mitigate the potential consequences.
Plan for future community and regional needs.	5 years prior to mine closure undertake detailed consultation with all stakeholders regarding current and future needs of the community (on a local, regional, state and federal basis). Adjust mine closure plans accordingly.	Manager HSE	☐	☐	☐	☐	☒	Consultation undertaken and plans adjusted accordingly.

2.7 Environmental Impact Permits

In order to ensure disturbance is in accordance with project approvals and to implement environmental controls (such as sediment control, dust control, drainage, vegetation clearance, fauna impact, heritage impact) an Environmental Impact Permit (EIP) system has been developed. (Internal procedure Cadia PRO_Environmental Impact permit (CHPL 2011a)). An EIP is required for any works which are undertaken in environmentally sensitive areas or which require clearing / disturbance of vegetation.

For EIP's requiring the removal of vegetation, the Vegetation Clearance Protocol (Section 2.8) is triggered and implemented, followed by the Threatened Species Management Protocol (if required) (Section 2.10)

2.8 Vegetation Clearance Protocol

A Vegetation Clearance Protocol (VCP) has been developed to minimise the impact of vegetation clearance on flora and fauna. The key components of the VCP are the identification of areas requiring clearing; pre-clearance surveys; fauna management strategies; vegetation clearance; and management of threatened species. Should threatened species be identified through this process the Threatened Species Management Protocol is implemented. The vegetation clearance protocol is implemented as per the following flowchart (Figure 2-3).

2.9 Threatened Species

The following threatened species and Endangered Ecological Communities (NSW Threatened Species Conservation Act 1995) have been identified within the Cadia East project area.

2.9.1 Species

- Superb Parrot,
- Swift Parrot,
- Turquoise Parrot,
- Brown Treecreeper
- Speckled Warbler
- Regent Honeyeater,
- Diamond Firetail,
- Squirrel Glider
- Yellow-bellied Sheathtail Bat and the
- Eastern Bent-wing bat.

The presence and possibility of a viable population of Squirrel Glider was thought to have occurred in earlier studies, however later studies revealed that this scenario was unlikely as further described below.

2.9.1.1 Squirrel Glider.

The identification of the Squirrel Glider within the project area is significant as the project area is more than 50km from the nearest official Squirrel Glider record. This species was recorded within an isolated habitat patch, located between the existing South Waste Rock Dump and the Northern Tailings Storage Facility. At the time of compiling the Cadia East Environmental Assessment it was stated that "The removal of this habitat would almost certainly lead to the loss of the population. However, the project would not result in the wider extinction of the species, or place it at risk of state-wide extinction given the known distribution of the species in NSW." In a subsequent survey conducted during August and September 2009, Cenwest Environmental Services (Cenwest Environmental Services 2010) concluded "It is very unlikely that a Squirrel Glider resides within the Southern Remnant, or in the immediate surrounds, and even less likely that a viable population of the Squirrel Glider is extant within the remnant. From time to time it is possible that individual Squirrel Gliders may also be observed within suitable locations of the Cadia."

- In addition, surveys of the proposed Black Rock Range Offset area have confirmed the presence of Squirrel Gliders in that area.
- As such when undertaking mine related clearing, potential impacts on Squirrel Gliders, other threatened species and native fauna will be managed through the implementation of the Vegetation Clearance Protocol (Section 2.8) and the Threatened Species Management Protocol (Section 2.10). Management of Squirrel Gliders located within the Black Rock Range Offset area will be managed as per Section 9.14 of this document.

2.9.2 Communities

- White Box – Yellow Box – Blakely's Red Gum Woodland

The following Critically Endangered Ecological Community (Commonwealth Environment Protection and Biodiversity Conservation Act) have been identified within the Cadia East project area.

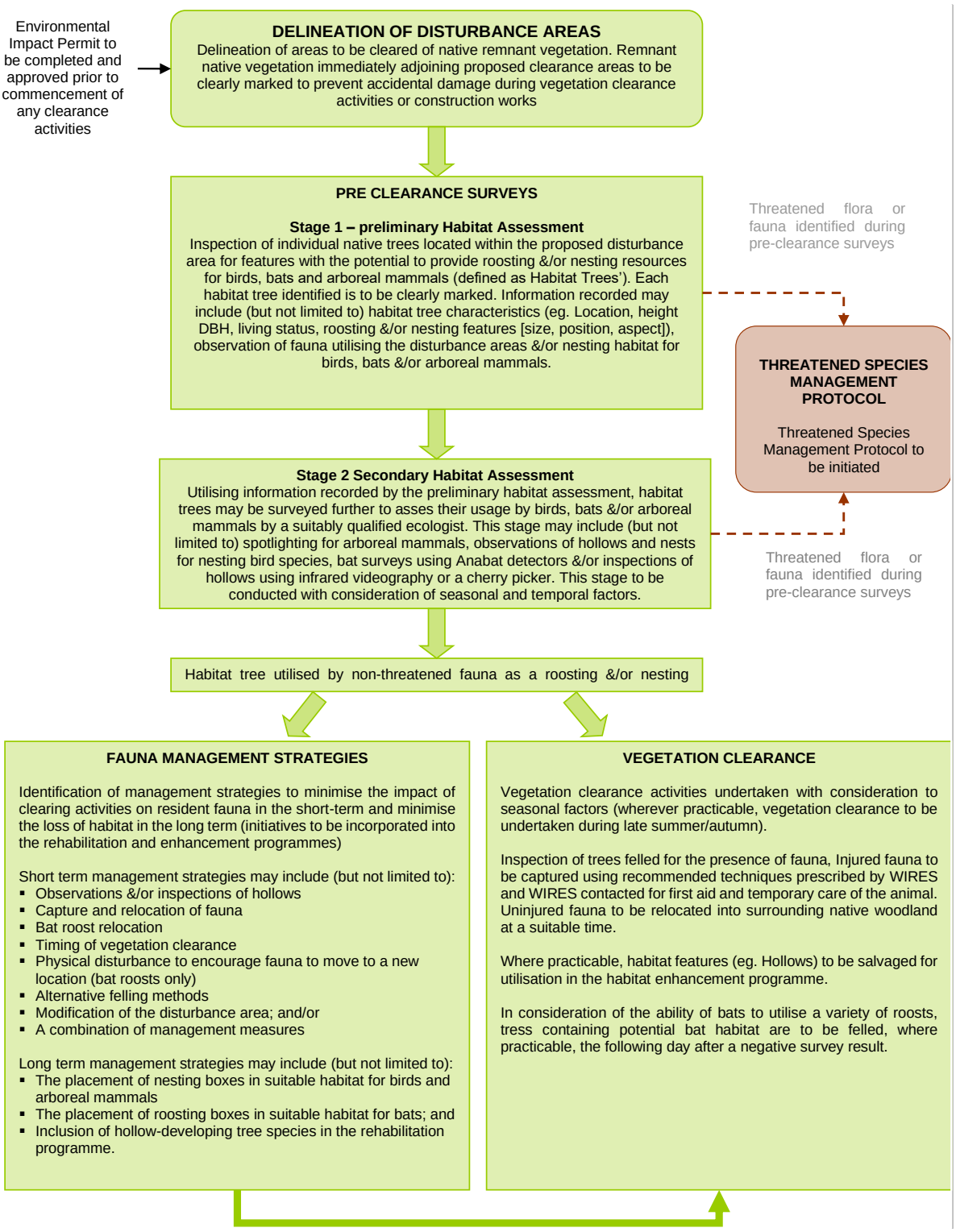
- White Box- Yellow Box – Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands.

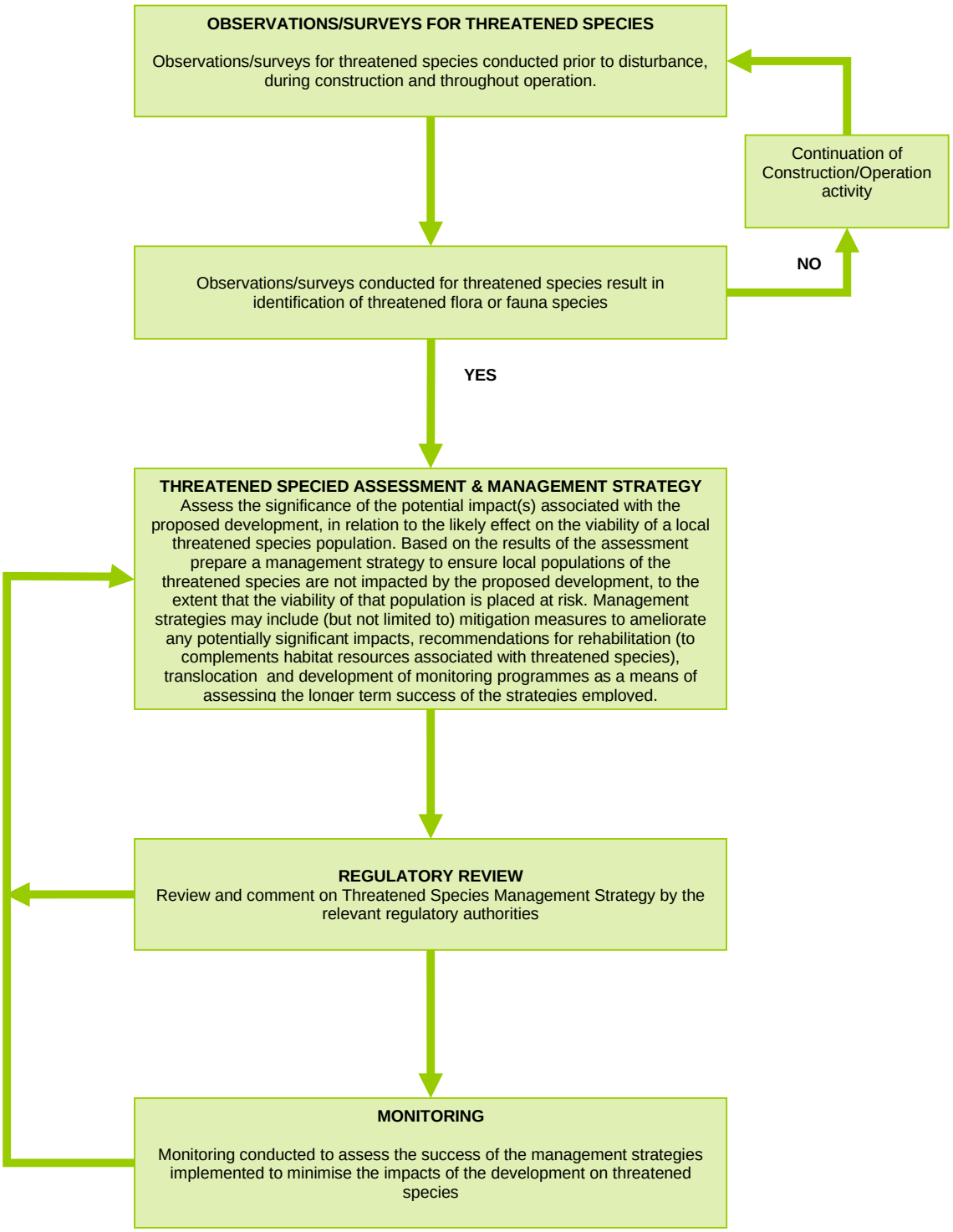
For more information concerning these species and communities including potential impacts refer to the Cadia East Environmental Assessment (CHPL 2009).

2.10 Threatened Species Management Protocol

The Cadia Threatened Species Management Protocol (TSMP) has been developed to facilitate the identification and management of significant impacts on any threatened flora and fauna species. The aim of the TSMP is to ensure local populations of threatened species and their essential habitat resources are not likely to be adversely affected by a proposed action, to the extent that the viability of the population(s) is placed at risk. The key components of the TSMP are observations/surveys for threatened species (prior to disturbance and during operations), threatened species assessment and management strategy, regulatory review and monitoring. The Threatened Species Management Protocol is implemented as per the following flowchart (Figure 2-3).

Figure 2-3: Vegetation Clearance Protocol Flowchart




OBSERVATIONS/SURVEYS FOR THREATENED SPECIES
Observations/surveys for threatened species conducted prior to disturbance, during construction and throughout operation.
Continuation of Construction/Operation activity
Observations/surveys conducted for threatened species result in identification of threatened flora or fauna species
NO
YES
THREATENED SPECIED ASSESSMENT & MANAGEMENT STRATEGY
Assess the significance of the potential impact(s) associated with the proposed development, in relation to the likely effect on the viability of a local threatened species population. Based on the results of the assessment prepare a management strategy to ensure local populations of the threatened species are not impacted by the proposed development, to the extent that the viability of that population is placed at risk. Management strategies may include (but not limited to) mitigation measures to ameliorate any potentially significant impacts, recommendations for rehabilitation (to complements habitat resources associated with threatened species), translocation and development of monitoring programmes as a means of assessing the longer term success of the strategies employed.
REGULATORY REVIEW
Review and comment on Threatened Species Management Strategy by the relevant regulatory authorities
MONITORING
Monitoring conducted to assess the success of the management strategies implemented to minimise the impacts of the development on threatened species

2.11 Habitat Salvage

Conditions 38(b) and 41(b) (IV) (Schedule 3) of the Cadia East Project Approval requires investigation into the salvage and beneficial use of resources from the Cadia East subsidence zone. The following is a brief description of how CVO propose to utilise resources from the subsidence zone and other areas proposed for removal of vegetation including (for example) tailings dam inundation areas. The following is based on the Draft CVO Habitat Salvage Program. (CHPL 2011b)

- It is not proposed to clear all native vegetation communities from this area prior to subsidence occurring, although some native seed collection would be undertaken, and fauna habitat resources (such as tree hollows) would be salvaged where practicable for use within rehabilitation areas or other fauna habitat enhancement areas.
- Stripping of soils from the cleared agricultural lands within the subsidence zone would be undertaken if the soils from these areas are suitable, and they are required for rehabilitation of the South Waste Rock Dump or other Project landforms.
- Habitat salvage will be targeted to provide suitable habitat for threatened species as a priority.
- Habitat Salvage areas will include the Cadia East Subsidence Zone, inundation areas around the Tailings Storage Facilities and other areas approved for clearing as part of the Cadia East Project.
- The habitat features chosen to relocate will be determined by known threatened species in the locality and their nesting, roosting, shelter and feeding requirements
- Priorities for recipient sites will be:
  - Mine disturbed / rehabilitated landscapes.
  - Vegetation Corridor Areas.
  - Conservation Offset areas.

These priorities are based on their suitability to become viable habitat for species groups, location / proximity to current remnants (identified for clearing / impact) suitability to grow food sources, aspect and proximity to water. Other considerations include efficiencies / cost of relocating and the availability and proximity of suitable machinery.

The Habitat salvage methodology will be:

- A survey of clearance areas to identify habitat features
- Implement Cadia's Vegetation Clearance Protocol and Threatened Species Management Protocol (if required).
- An earth moving contractor will be commissioned to remove the features from the area. Equipment used will be determined by the size, weight and type of the habitat and accessibility to the area.
- Habitat including dead wood, hollow logs, stag trees and bush rocks will be loaded as carefully as possible on the trucks and secured for transport.
- The salvaged habitat will be transported to the recipient sites. Each habitat feature will have a corresponding GPS destination point and be unloaded with the excavator.
- Once unloaded, the features will be arranged to best replicate suitable habitat.

- The program will be staged and implemented progressively.
- Monitoring will be undertaken to determine the success of habitat relocation and occupancy of habitat.
- Outcomes of the program will be reported in the Annual Environment Management Report.

2.12 Species Selection / Rehabilitation Methodology

The following sections outline species lists (Table 2.4) and rehabilitation methodologies for the rehabilitation of mine disturbed areas (including riparian areas).

2.12.1 Collection of native seed

Native seed is collected from site and nearby areas (nominally within 20km of the mine lease boundary to ensure local providence) to be used in the rehabilitation of mine disturbed, vegetation corridor and offset areas. Greening Australia / Florabank guidelines (ref www.florabank.org.au) are used to guide the collection and storage of seed. Seed is either used in direct seeding operations (aerial or ground spread) or provided to local nurseries to propagate tubestock.

'Introduced perennial species' and 'ground stabilisation species' (Table 2.4) are sourced from local agricultural supply companies and are purchased on an 'as needs' basis.

2.12.2 Mine disturbed areas

The relevant vegetation community that will be used for the rehabilitation of mine disturbed areas is indicated in Table 2.3. Generally direct seeding will be utilised for bulk areas with application via ground or aerial seeding techniques. In addition to sowing seed mixes targeted at the final land use – stabilisation species will be used as indicated by Table Table 2.4. Seeding rate will be between 6-10kg/ha.

Every effort will be made to co-ordinate the completion of rehabilitation earthworks to coincide with favourable climatic conditions for planting / sowing (nominally between May and October for tubestock and between September and December for seeding). Due to the nature of the mine disturbed landscape, and the risk of erosion and rapid degradation, seeding will commence regardless of preferred timing in an attempt to stabilise the site as soon as possible. Irrigation will not be used.

Tubestock may be used for 'difficult to access' areas. Tubestock planting rate will be between 250-750 plants / ha. Planting will occur as favourable soil moisture conditions allow.

Species selection for riparian / aquatic areas will be in accordance with vegetation Community 6a (Table 2.4). Within mine disturbed areas, riparian restoration will essentially involve constructed drainage channels as part of mining landforms (such as Waste Rock Dumps and Tailings Storage facilities etc). The following methods will be utilised in the rehabilitation of aquatic / riparian areas:

- Design of drainage channels with a maximum slope of 1-3%
- The placement of rock armouring to reduce / prevent erosion.
- Placement of dissipation / sediment ponds to reduce water energy and to capture sediment
- For difficult areas (such as drop structures on waste rock dumps or steeper areas) geotextile fabric may be placed underneath rock armouring to prevent scouring.

- Implement Natural Sequence farming (Chain of Ponds) techniques to slow water flow and reinstate the floodplain.
- Rehabilitation using direct seeding. (Consider applying higher rates of seed adjacent and within drainage lines).
- Placement of habitat structures, timber, logs, rocks etc
- Ongoing repair of any erosion areas if required.
- Monitoring (comparison against “riparian” closure criteria (Section 8))
- Reporting via the Annual Environment Management Report.

Works associated with Cadiangullong Creek (including the Creek diversion) are outlined in Table 2.3).

Table 2.4: Revegetation Species list (source CHPL 2009)

Rehabilitation Species Lists									
Native Species	**common name**	**Community 1a**	**Community 2a**	**Community 2b**	**Community 3a**	**Community 3b**	**Community 4a**	**Community 5a**	**Pasture**
	Dominant Species	E. albens	E. macrorhyncha	E. melliodora	E. macrorhyncha	E. macrorhyncha	E. melliodora	C. cunninghamiana	
			E. goniocalyx	E. bridgesiana	E. goniocalyx	E. goniocalyx	E. viminalis	E. viminalis	
			E. melliodora	E. blakelyi	E. dives	E. polyanthemos	E. bridgesiana	E. bridgesiana	
Callitris endlicheri	Black cypress pine					1			
Callitris glaucophylla	White cypress pine		1						
Casuarina cunninghamiana	River she-oak							1	
Bossiaea buxifolia	Matted bossiaea					1			
Daviesia leptophylla	Narrow leaf bitter pea	1		1		1	1		
Dillwynia juniperina	Prickly parrot pea					1			
Dillwynia phylicoides	Heathy parrot pea	1		1		1	1		
Dillwynia retorta	Twisted parrot pea	1		1	1	1	1		
Hardenbergia violacea	False sarsparilla	1	1	1		1	1		
Hovea linearis	Erect Hovea		1						
Indigophera adesmiifilia	Indigo		1						
Indigophera australis	Australian indigo	1	1	1	1	1	1		
Pultenea cunninghamii	Grey bush pea	1	1	1	1	1	1		
Pultenea microphylla	Spreading bush pea				1	1			
Pultenea procumbens	Heathy bush pea			1	1	1	1		
Pulteneae subternata	Downy grey bush pea					1			
Swainsona reticulata	A darling pea					1			
Acacia acinacea	Gold dust wattle			1		1	1		
Acacia brownii	golden prickly wattle					1			
Acacia buxifolia	box leaf wattle					1			
Acacia dealbata	silver wattle	1	1	1	1	1	1	1	
Acacia falciformis	Broad leaved hickory					1			
Acacia genistifolia	Spreading wattle			1		1	1		
Acacia gunnii	Ploughshare wattle					1			
Acacia implexa	Hickory wattle	1	1	1	1	1	1		
Acacia leucoclada	Northern silver wattle	1							
Acacia melanoxylon	Blackwood		1	1	1	1	1	1	
Acacia paradoxa	Kangaroo thorn				1	1			
Acacia penninervis	Mountain hickory				1				
Goodenia hederacea	Ivy goodenia			1	1	1	1		
Gonocarpus elatus	Raspwort					1			
Gonocarpus tetragynus	Raspwort					1			
Calytrix tetragona	common fringe myrtle					1			
Eucalyptus albens	white box	1		1			1		
Eucalyptus blakelyi	Blakely's red gum	1	1	1		1	1		
Eucalyptus bridgesiana	Apple box		1	1		1	1	1	
Eucalyptus camalduensis	River red gum								
Eucalyptus dives	broad leaved peppermint				1	1			
Eucalyptus goniocalyx	bundy box	1	1	1	1	1	1		
Eucalyptus macorhyncha	red stringy bark		1	1	1	1	1		
Eucalyptus melliodora	yellow box	1	1	1	1	1	1	1	
Eucalyptus polyanthemos	red box			1		1	1		
Eucalyptus canobolensis	canobolas candlebark				1				
Eucalyptus viminalis	ribbon gum			1		1	1	1	
Kunzea ericoides	burgan					1			
Billardiera scandens	climbing apple berry					1			
Bursaria spinosa	kangaroo thorn					1			
Persicaria decipens	knotweed				1			1	
Persicaria prostrata	knotweed					1			
Grevillea ramosissima	Fan grevillea					1			
Hakea decurrens	inland silky hakea					1			
Persoonia rigida	Stiff Geebung					1			
Exocarpus cupressiformis	native cherry		1		1	1			
Dodonea viscosa	hop bush			1	1	1	1		
Carex spp.	sedge	1	1	1		1	1	1	
Juncus spp.	rush							1	
Lomandra spp.	matrush			1	1	1	1		
Dianella longifolia	long leaved flax lily					1			
Dianella revoluta	common flax lily					1			
Stypandra glauca	nodding blue lily					1			
Native Grasses									
Bothriochloa macra	red grass	1	1	1	1		1		1
Cymbopogon refractus	barbed wire grass				1				
Danthonia spp.	wallaby grass	1	1	1	1	1	1	1	1
Dichelachne spp.	Plumegrass		1		1	1			
Echinopogon	forest hedgehog grass	1	1		1			1	
Elymus sp.	wheat grass		1	1	1	1	1		
Microlaena stipoides	microlaena / weeping grass	1	1	1	1		1	1	1
Phragmites australia	common reed			1		1	1	1	
Poa labillardieri	Tussock	1			1	1		1	
Poa sieberiana	snow grass	1	1	1	1	1	1	1	
Stipa spp.	speargrass	1		1	1	1	1		
Themeda australis	kangaroo grass	1				1			1
Typha spp.	cumbungi / bullrush							1	
Eleocharys acuta	Spike rush							1	
Isolepis cernua	Nodding club rush							1	
Lepidosperma laterale	broad sword sedge							1	
Schoenus apogon	common bog rush							1	
Luzula spp.	woodrush							1	
Introduced Perennial Species									
Lolium perenne	perennial ryegrass	1*	1*	1*	1*	1*	1*	1*	1
Phalaris aquatica	phalaris	1*	1*	1*	1*	1*	1*	1*	1
Paspalum dilatatum	paspalum								1
Dactylis glomerata	cocksfoot	1*	1*	1*	1*	1*	1*	1*	1
Trifolium repens	white clover								1
Trifolium subterraneum	sub clover	1*	1*	1*	1*	1*	1*	1*	1
Medico sativa	Lucerne								1
Ground Stabilisation Species									
Echinochloa esculenta	Japanese Millet	1	1	1	1	1	1	1	
Secale cereale	Cereal Rye	1	1	1	1	1	1	1	
* Very low rates used on mine disturbed areas during direct seeding to provide perennial soil protection while native plants establish.									

3. THE AGRICULTURAL LANDSCAPE

3.1 Introduction

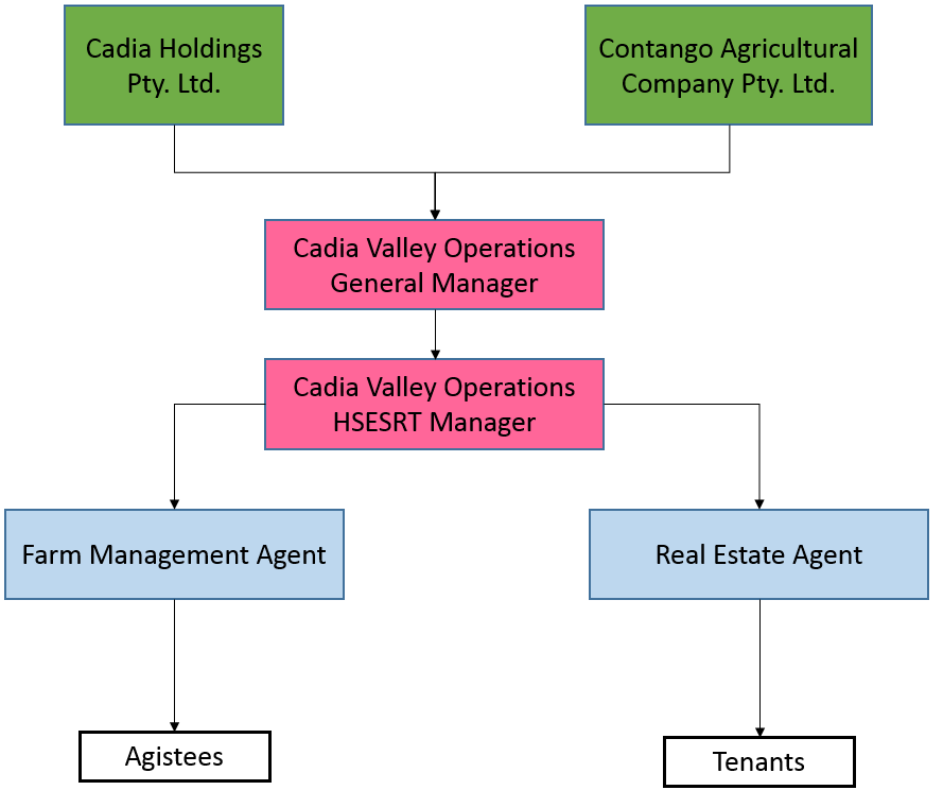
Cadia Farms refers to properties owned by Cadia Holdings Pty. Ltd and Contango Agricultural Pty Ltd which total approximately 6,250 ha (refer to Figure 3-2). These farms form an important 'buffer zone' to minimise impacts from mining operations on the wider Cadia community.

Cadia contracts a third party as farm management agents to plan and oversee operational aspects of farm management. Their role also includes the selection of agistees and the formation of grazing rights agreements.

A real estate agent is contracted by Cadia to manage tenancy agreements associated with farmhouses

The following figure (Figure 3-1) shows the current management structure for Cadia farms.

Figure 3-1: Cadia Farms Management Structure



3.2 Objectives

The management objectives of the CVO Farms are to:

- Ensure the health, safety and welfare of all agistees, their employees, visitors, contractors and residents.
- Act as a buffer between operational areas and surrounding properties, stakeholders and the community.
- Achieve broader environmental objectives through:
  - Improving ecological function and economic performance through best practice management.
  - Adopting sustainable agricultural practices through best practice grazing management and / or conservation farming principles.
  - Enhancing ecological assets by protecting, expanding and linking areas of remnant vegetation including native grasslands.
- Conduct farming activities so as to ensure minimal disruption to operational activities.
- Maintain and over time enhance the overall value of the Cadia Farms.
- Allow agistees to conduct their businesses by providing and maintaining suitable infrastructure and where possible minimise interruption from mining operations.
- Identity and plan for future land management needs, issues and options.
- Taking into account the above objectives, achieve at least a cost neutral to modest profit on an annual basis across the business unit.

3.3 Guiding Principles

The following principles will be used to guide the management of Cadia Farms.

- Formal agistment agreements (Grazing Rights Agreement, Grazing Management Protocol, Farm Safety Management Plan) will be in place for each property. The agreement will address:
  - The term of the agreement
  - Agistment fee payable
  - Maximum stocking rates (and the ability to influence based on seasonal conditions)
  - Management requirements
  - Maintenance requirements
  - Conservation grazing / improvement measures
  - Termination clauses
  - Safety requirements
  - Reporting requirements
- The selection of agistees and renewal of agistment agreements will be based on the agistment fee, conservation grazing and management style / ability / performance.
- Local landholders will be given preference where their tender is equivalent to successful applicants tender.

- The management style of the farms will focus on low impact conservation grazing techniques.
- Maximum ground cover will be maintained across all farms to reduce erosion potential and increase water quality. Nominally > 2t/ha dry matter will be maintained.
- It is recognised that some areas currently used for agriculture may be more suited to conservation / biodiversity land uses. Areas need to be identified and incorporated into vegetation corridor programs.
- Remnant native vegetation areas including native grasslands will be identified and progressively fenced, rehabilitated and linked in line with the Vegetation Corridor Program (refer to Figure 3-3). Priority areas will be selected based on Endangered Ecological Communities (EEC), quality of the remnant area (including native grasslands), size of the remnant area, proximity of vegetation links / opportunities, proximity to riparian areas. The focus will be on re-creating sustainable native woodland ecosystems rather than 'amenity' landscape plantings.
- Riparian areas (other than selected stock watering points) will be protected from damage by grazing and erosion.
- Soil fertility, structure and quality to be maintained and improved over time through management inputs and improved grazing practices.
- Woodland rehabilitation works will match the locally occurring vegetation community and will use:
  - A range of indigenous species.
  - Seed that has been locally collected.
  - Species to provide structural diversity.
- Management systems that promote and encourage persistent deep rooted perennial species will be used.
- Remnant native grasslands will be identified, conserved and expanded where appropriate and may be used as a seed source for other rehabilitation works.
- Weed control will be achieved using a range of management techniques (including chemical, physical and biological means) aimed at preventing seeding of weeds and encouraging strong competition from desirable species.
- Frequently review the management of farming areas. Adjust management style and objectives to allow for future land management needs, issues and options.
- Erosion areas will be identified and actively controlled.
- Farming infrastructure will be maintained and improved in line with future land management goals.
- Manage bushfire fuel loads to protect farm, mining and community assets with consideration for conservation and biodiversity objectives.

3.4 Land Holdings

As at June 2020, the following properties (Table 3.1) are owned by Newcrest mining in the vicinity of Cadia Valley Operations. The properties and areas will change progressively as areas are resumed for rehabilitation and new properties acquired. Areas refer to available grazing land and exclude mining operational land and land that has been resumed for rehabilitation.

Table 3.1: Summary of CVO Farms

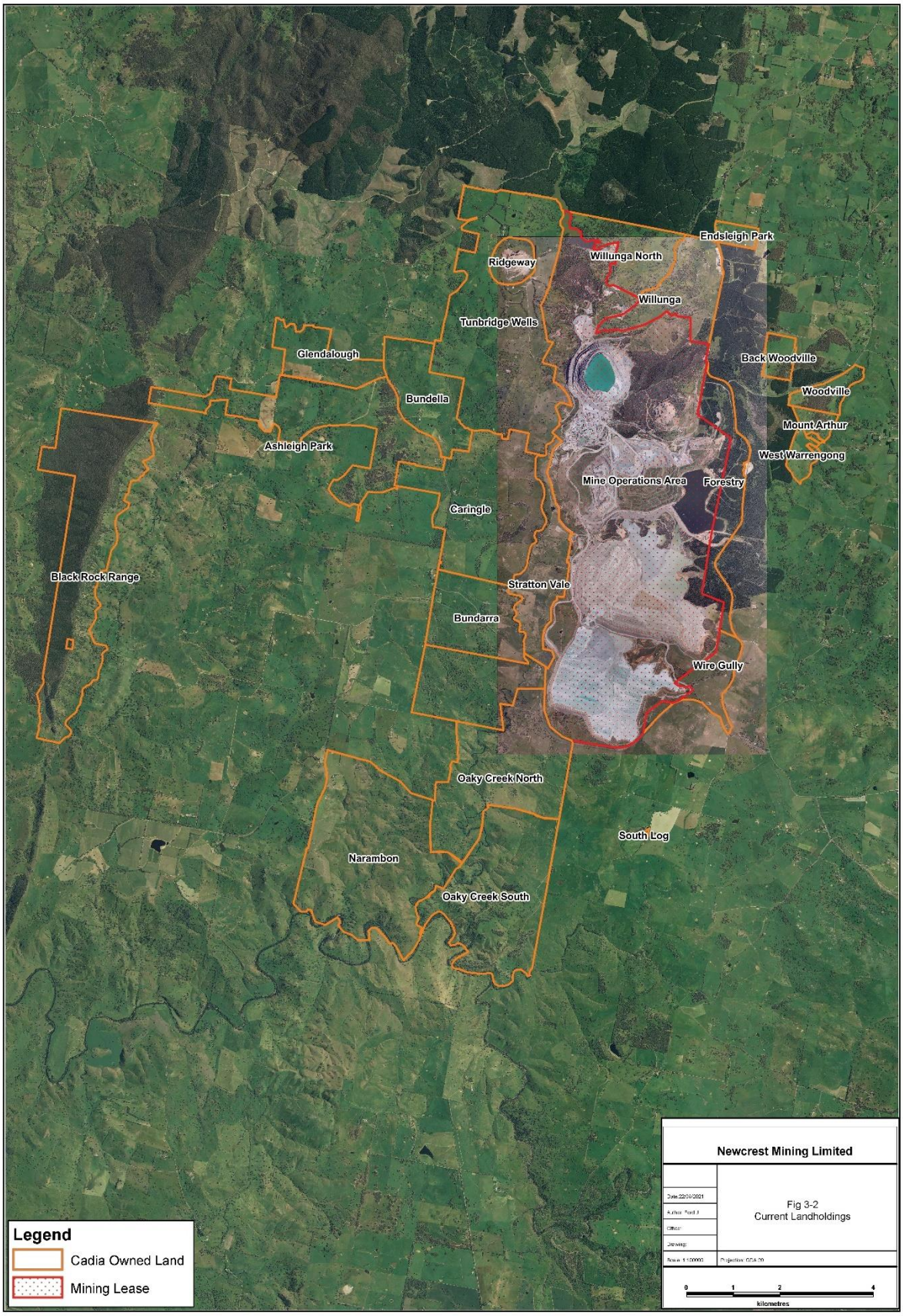
Cadia Holdings Pty Ltd. (refer to Figure 3-2)	
Tunbridge Wells	956 Ha
Willunga / Willunga North	264 Ha
Caringle	601 Ha
Triangle / Wire Gully	143 Ha
Sub Total	1964 Ha

Contango Agricultural Company Pty Ltd. (refer to Figure 3-2)	
Stratton Vale/Te Anau	641 Ha
Oaky Creek South	523 Ha
Oaky Creek North (including portions Weemalla)	611 Ha
Ashleigh Park	622 Ha
Bundella	259 Ha
Glendalough	186 Ha
Bundarra	274 Ha
Narambon	920 Ha
Endsleigh Park	38 Ha
Back Woodville	58 Ha
Woodville	66 Ha
Mount Arthur	40 Ha
Warrengong West	48 Ha
Sub Total	4286 Ha
TOTAL AREA	**6,250 Ha**

3.5 Action Plan

Section 3.6 contains a detailed action plan that outlines the specific actions, timeframes, responsibility and performance measures for the agricultural landscape.

Figure 3-2: Map of Current Land Holdings



3.6 Action Plan – Agricultural Landscapes

Management Statement	Action	Responsibility	Timeframe					Performance Measure
			Ongoing	Annual	Short Term	Medium Term	Long Term	
Ongoing: required throughout life of project. Annual: undertaken every year. Short Term: undertaken within 1 year of plan approval. Medium Term: between 1 and 5 years of plan approval. Long Term: >5 years from plan approval.								
Formal agreements are in place for all properties.	Develop and implement a Grazing Rights Agreement (GRA) for all properties.	Manager HSE	☒	☐	☐	☐	☐	Completed - Grazing Rights Agreements in place. Ongoing audits
	Grazing Rights Agreement is signed by Agistee and Newcrest Representative.	Manager HSE Newcrest Legal	☒	☐	☐	☐	☐	Completed - Grazing Rights Agreements in place. Ongoing audits.
	Agistee is made aware of the content of Grazing Rights Agreement and support documents including Grazing Management Protocol, Farm Safety Management Plan etc.	Manager HSE	☒	☐	☐	☐	☐	Induction and sign off in place for each agistee focussing on content of GRA and associated documents. Audit
Undertake Audits of Compliance against GRA	Conduct 2 audits per year on compliance against the GRA and related documents.	Manager HSE	☒	☒	☐	☐	☐	Audit completed, report written and provided to supervisor.
	Identified non-compliances are notified to the Agistee in writing with a time frame for rectification. Actions are checked for completion.	Manager HSE	☒	☐	☐	☐	☐	Audit completed, report written and provided to supervisor.
Selection of Agistees and renewal of agistment agreements is based on: agistment fee, conservation grazing and management style / ability / performance	Develop a formal process and weighting for selection of new agistees.	Manager HSE	☒	☐	☐	☐	☐	Process completed and documented. Now ongoing.
	Use outcomes of audits to aid in the renewal of agistment agreements.	Manager HSE	☐	☒	☐	☐	☐	Audit outcomes used for renewal of agreements and improving agistee performance.
	Process implemented giving priority to local landholders.		☒	☐	☐	☐	☐	Process developed. Now ongoing.
Achieve at least a cost neutral to modest profit across the business unit	Budget vs actual costs monitored on a monthly basis to ensure farming profit is achieved.	Manager HSE	☒	☐	☐	☐	☐	Budget vs actual costs monitored on monthly basis. Internal report to Manager.
Manage Agricultural and Mining activities so that minimal disruption is caused to either business unit	Management and communicate activities to and from either business unit to ensure that disruption to either business unit is minimised.	Manager HSE	☒	☐	☐	☐	☐	Communication undertaken through Environment Team Meetings.
Achieve sustainable grazing management.	Grazing management is undertaken to maintain ground cover, > 2t/ha and to maintain the competitiveness of desirable perennial species.	Manager HSE	☒	☐	☐	☐	☐	Audits, checks against GRA (e.g. fertiliser). Inspection and report by Farm Management Agent.

Management Statement	Action	Responsibility	Timeframe					Performance Measure
			Ongoing	Annual	Short Term	Medium Term	Long Term	
Ongoing: required throughout life of project. Annual: undertaken every year. Short Term: undertaken within 1 year of plan approval. Medium Term: between 1 and 5 years of plan approval. Long Term: >5 years from plan approval.								
	Undertake landscape capability assessment of all farms. Select areas that may be more suitable for woodland / trees / conservation rather than grazing and incorporate into vegetation corridor program.	Manager HSE	☐	☐	☐	☒	☐	Assessment undertaken. Areas selected for trees incorporated into vegetation corridor program. Areas assessed against closure criteria.
	Agistees and farm management agent selected on their knowledge and skills to achieve sustainable / conservation management outcomes including farming being an applied ecology, landscape repair, optimising conservation and production outcomes, LFA principles etc.	Manager HSE	☐	☐	☐	☒	☐	Education programs identified / developed. Course becomes part of GRA.
Undertake pasture renovation as required.	Undertake a thorough assessment of pastures and their ability to regenerate prior to planning renovation.	Manager HSE	☒	☐	☐	☐	☐	Inspections, check, written report to supervisor etc.
	Utilise forage crops to reduce weed seed set prior to attempting pasture renovation.	Manager HSE	☒	☐	☐	☐	☐	Successful pasture establishment.
	Newly renovated pastures to be spelled for a minimum of 12 months prior to being grazed conservatively.	Manager HSE	☒	☐	☐	☐	☐	Successful pasture establishment.
Maintain and improve priority farm infrastructure for safety, effectiveness and efficiency.	An annual inspection of all infrastructure is undertaken and repairs implemented as required.	Manager HSE	☐	☒	☐	☐	☐	Annual inspections, checks written report to supervisor etc
	Future infrastructure is planned based on costs, enterprises and future land management goals.	Manager HSE	☒	☐	☐	☐	☐	Review of required infrastructure, incorporated into 5yr planning process.
Develop strategic long-term objectives for farming areas.	Every five years undertake a review of farm management, income, expenses, enterprises, management structure, land use pressures, community pressures, land use alternatives to devise long term farm strategy etc.	Manager HSE	☐	☐	☐	☒	☐	Strategy developed, incorporated into 5yr planning process.
Maintain and improve soil fertility, structure and quality over time	Fertility maintenance requirements are incorporated into the Grazing Rights Agreement.	Manager HSE	☒	☒	☐	☐	☐	Completed. GRA has fertility requirements for the agistee to implement. Ongoing annual requirement.
	Soil tests are taken on every farm every 3 years to assist in the type and amount of fertiliser to be applied as part of the GRA and to monitor soil improvement over time.	Manager HSE	☒	☐	☐	☒	☐	Soil tests taken every three years for each farm. Data collated to monitor soil improvements over time.
Control access to Agricultural areas.	Control access to agricultural areas through the use of agricultural fences and farm gates. High priority gateways will be locked. Agistees assist with controlled access.	Manager HSE	☒	☐	☐	☐	☐	Access controlled – no unauthorised entry. Ongoing.

Management Statement	Action	Responsibility	Timeframe					Performance Measure
			Ongoing	Annual	Short Term	Medium Term	Long Term	
Ongoing: required throughout life of project. Annual: undertaken every year. Short Term: undertaken within 1 year of plan approval. Medium Term: between 1 and 5 years of plan approval. Long Term: >5 years from plan approval.								
Encourage surrounding landholders to plant native trees.	Issue free trees to local landholders.	Manager HSE	☐	☒	☐	☐	☐	Completed. Annual program through CDEP. Now ongoing.
Maintain vegetation corridor areas	Undertake annual inspection and maintenance of rehabilitation areas including fences, weeds, erosion, plantings etc.	Manager HSE	☐	☒	☐	☐	☐	Inspection undertaken annually with maintenance program implemented as required.
Rehabilitation works providing carbon sequestration benefits.	Undertake formal assessment to determine ability of rehabilitation works to also provide carbon sequestration benefits.	Manager HSE	☐	☐	☐	☐	☐	Complete - assessment undertaken. Decision pending.
	Investigate the establishment of dedicated carbon sequestration plantings and implement as required.	Manager HSE	☐	☐	☐	☒	☐	Decision pending (see above).
	Select areas for carbon sequestration based on landscape capability assessment, reserving better farming areas for agriculture and utilising poorer farming areas for carbon sequestration. Areas planted for carbon capture in line with landscape capability assessment, corporate / company direction and to satisfy regulatory requirements for carbon accounting.	Manager HSE	☐	☐	☐	☒	☐	Decision pending (see above).
Develop and implement a Bushfire Management Plan.	Have a Bushfire Management plan in place for Newcrest owned land.	Manager HSE	☒	☐	☐	☐	☐	Complete. Plan developed and implemented, now ongoing with periodic review.
Maximise species and structural diversity for corridor / revegetation areas.	Select species for rehabilitation based on the local remnant vegetation types, soil type and aspect (refer to Section 3.7).	Manager HSE	☒	☐	☐	☐	☐	Species selected are suitable for the site. Progression towards closure criteria.
	Maximise the diversity of species selected to achieve species and structural diversity. (Refer to Section 3.7).	Manager HSE	☒	☐	☐	☐	☐	Progression towards closure criteria.
	Select predominantly deep-rooted perennial species to assist in the prevention of dryland salinity. (Refer to Section 3.7).	Manager HSE	☒	☐	☐	☐	☐	Species selected are suitable for the site with >70% perennial content. Progression towards closure criteria.
Control vertebrate pests.	Develop and implement programs for the control of vertebrate pests including mice, rats, rabbits, foxes, feral cats etc. Management techniques would be based on industry best practice and include baiting, destruction of harbour, exclusion (fencing) etc.	Manager HSE	☒	☐	☐	☐	☐	Program developed and implemented. Program reported in AEMR. Now ongoing.

Management Statement	Action	Responsibility	Timeframe					Performance Measure
			Ongoing	Annual	Short Term	Medium Term	Long Term	
Ongoing: required throughout life of project. Annual: undertaken every year. Short Term: undertaken within 1 year of plan approval. Medium Term: between 1 and 5 years of plan approval. Long Term: >5 years from plan approval.								
	Manage the eastern grey kangaroo population to reduce over-population and significant agricultural damage and safety risks.	Manager HSE	☒	☐	☐	☐	☐	Management implemented as required consistent with NSW OEH guidelines and procedures.
Prevent weed outbreaks and control noxious and environmental weeds.	Control weeds using integrated weed management principles where establishment is reduced through competition and seed set is reduced through control techniques. Management techniques would be based on industry best practice and include; physical, chemical and biological means.	Manager HSE	☒	☐	☐	☐	☐	GRA directs agistees to control noxious weeds within grazing areas. Contract and works program in place for the control of noxious and environmental weeds within vegetation corridor areas and within mining operational areas.
Implement a Vegetation Corridor Program	Undertake a broad and comprehensive vegetation and fauna survey of all farming areas to assist in selection and prioritising rehabilitation works.	Manager HSE	☐	☐	☐	☒	☐	Survey completed. Priority areas identified and incorporated into corridor plan.
	Prioritise rehabilitation works based on Threatened Species / Endangered Ecological Communities, quality of remnant (including remnant native grasslands), fauna species present, size of remnant, proximity of vegetation linkages, riparian areas, farm dams etc..	Manager HSE	☐	☐	☐	☒	☐	Information used to assist in prioritising areas. Process documented. Priority areas identified and incorporated into corridor plan.
	Develop and implement a Vegetation Corridor Program that focuses on the fencing, expansion, rehabilitation and linking of remnant vegetation patches (Refer to Figure 3-3). Information gathered from broad farm survey used to determine priority areas.	Manager HSE	☐	☒	☐	☐	☐	Complete. Annual program developed. Progress reported in AEMR.
	Implement Natural Sequence Farming and Landscape Functional Analysis concepts. Implement works to capture water, sediment and nutrient to reduce leakage from the system and improve landscape function.	Manager HSE	☒	☐	☐	☐	☐	Achievement of mine closure criteria (Section 8).
	Ensure vegetation corridor areas are of a suitable size to maximise biodiversity outcomes (nominally > 5ha or > 100m wide).	Manager HSE	☒	☐	☐	☐	☐	Corridor size maximised biodiversity outcomes.
	The Vegetation Corridor Program is reviewed and updated with the review of the Land and Biodiversity Management Plan.	Manager HSE	☐	☐	☐	☒	☐	Vegetation Corridor Program reviewed and updated as part of the update of this plan.

Management Statement	Action	Responsibility	Timeframe					Performance Measure
			Ongoing	Annual	Short Term	Medium Term	Long Term	
Ongoing: required throughout life of project. Annual: undertaken every year. Short Term: undertaken within 1 year of plan approval. Medium Term: between 1 and 5 years of plan approval. Long Term: >5 years from plan approval.								
	Stock watering requirements are assessed as part of planning Vegetation Corridors.	Manager HSE	☒	☐	☐	☐	☐	Consideration is given to livestock watering. Alternate supplies installed as required.
	Undertake annual rehabilitation monitoring of representative rehabilitation areas and compare against reference sites (Section 8).	Manager HSE	☐	☒	☐	☐	☐	Annual monitoring program implemented for select sites. Reported in AEMR.
	Incorporate fauna component into annual rehabilitation monitoring and comparison against reference sites.	Manager HSE	☐	☐	☐	☒	☐	Rapid assessment fauna monitoring component included in annual rehabilitation monitoring.
	Investigate and develop strategies for the long-term protection / conservation of corridor areas (i.e. beyond Newcrest ownership). For example re-zoning, voluntary conservation agreement, covenant etc.	Manager HSE	☐	☐	☐	☐	☒	Options investigated, selected and implemented.
	Consult recovery and threat abatement plans for known threatened species and implement actions as appropriate.	Manager HSE	☒	☐	☐	☐	☐	Considerations incorporated into planning and implementation as required.
	Rehabilitation of aquatic / riparian areas to be fenced to exclude livestock and incorporate 'Chain of ponds' concepts and practices.	Manager HSE	☒	☐	☐	☐	☐	'Chain of ponds' concepts and practices implemented. Ongoing.
	Implement habitat enhancement around farm dams (as part of corridor program), process to include, fencing to exclude livestock, placement of habitat structures (logs, rocks litter etc) planting (edge, floaters, emergents etc). Provide alternate stock water. Link dams through the restoration of catchment channels implementing 'chain of ponds' concepts.	Manager HSE	☒	☐	☐	☐	☐	Actions implemented as part of vegetation corridor program. Reported through the AEMR.
	Consult with relevant stakeholders (agistees, near neighbours) during the development and implementation of the plan.	Manager HSE	☒	☐	☐	☐	☐	Consultation undertaken with feedback considered and incorporated into the plan where required.
	Implement actions as outlined in Bushfire Management Plan.	Manager HSE	☐	☒	☐	☐	☐	Works implemented in accordance with plan.

Management Statement	Action	Responsibility	Timeframe					Performance Measure
			Ongoing	Annual	Short Term	Medium Term	Long Term	
Ongoing: required throughout life of project. Annual: undertaken every year. Short Term: undertaken within 1 year of plan approval. Medium Term: between 1 and 5 years of plan approval. Long Term: >5 years from plan approval.								
Collect native seed for rehabilitation purposes.	Arrange an annual collection of seed from Newcrest owned land and other areas (pending approval from land manager). Manage native pastures for harvesting and use in rehabilitation projects. Seed to be collected (nominally) from within 20km of mine lease boundary (Section 2.12.1).	Manager HSE	☐	☒	☐	☐	☐	Contract in place for seed collection. Seed collector has written permission from other land managers. Liaise with agistees regarding the management of native grasslands for conservation and seed harvesting potential.
	Native seed collection and storage to be consistent with best management practice. (Florabank Guidelines).	Manager HSE	☒	☐	☐	☐	☐	Seed collecting consistent with Greening Australia and Florabank guidelines.
	Maintain a seed store database.	Manager HSE	☒	☐	☐	☐	☐	Data base in place and kept up to date.
	Consider participating in regional seed bank / storage / exchange programs.	Manager HSE	☐	☐	☐	☒	☐	Participate – pending approach from other parties.
Prevent control and repair any areas of erosion.	Erosion is actively identified, mapped, controlled and stabilised.	Manager HSE	☒	☐	☐	☐	☐	Areas of erosion identified through site inspections / audits and controlled as required etc. Works reported in AEMR.
	As part of Vegetation Corridor Program planning, incorporate erosion and drainage control structures including contour banks, revegetation, rock lined channels and drains, drop structures etc. Implement 'chain of ponds' concepts into restoration works.	Manager HSE	☒	☐	☐	☐	☐	Structures included in planning design and installed. The NSW 'Blue Book' will be used as a guide.
Increase support to Flyers Creek Landcare Group	Develop and implement the Cadia District Enhancement Program (CDEP). Develop a range of projects to provide benefit to local landholders in the vicinity of Cadia (including the Flyers Creek Area).	Manager HSE	☒	☐	☐	☐	☐	Complete. Program developed involving 2 x brainstorming sessions with the community followed by a prioritisation session where 6 projects were selected. Projects are ongoing and evolving. Governing committee formed to guide the direction of the projects. Committee meet quarterly with project working groups meeting on an ad-hoc manner.

Management Statement	Action	Responsibility	Timeframe					Performance Measure
			Ongoing	Annual	Short Term	Medium Term	Long Term	
Ongoing: required throughout life of project. Annual: undertaken every year. Short Term: undertaken within 1 year of plan approval. Medium Term: between 1 and 5 years of plan approval. Long Term: >5 years from plan approval.								
	Review, adjust, report and publicise the organisation, project objectives, outcomes and future directions.	Manager HSE	☒	☐	☐	☐	☐	Reports etc generated and distributed. Progress reported in AEMR and in community Newsletters
Implement 'leading practice' in high rainfall / perennial pasture grazing systems and the establishment of farm-based conservation areas.	Consider any opportunities to be involved with the trialling and experimentation of holistic farming methods including – using livestock to create successional change, managing water in the landscape, the creation of new soil, repair of malfunctioning ecosystems etc. Possible collaboration through CDEP.	Manager HSE	☐	☐	☐	☒	☐	Cadia a 'partner' in research trials as opportunities arise.
	Develop and implement a formal benchmarking program to seek improvements to Cadia's farming and vegetation corridor programs.	Manager HSE	☐	☐	☐	☒	☐	Improvements identified and implemented. Improvements incorporated into this plan where relevant.
Maintain and over time enhance the overall value of CVO farms	Develop a methodology for monitoring the overall value of Cadia Farms.	Manager HSE	☒	☐	☐	☒	☐	Soil sampling program commenced and ongoing. Additional parameters to be determined. Annual reporting following the development of the full methodology.

3.7 Species Selection / Rehabilitation Methodology

Species for vegetation corridor areas will be based on nearby / adjacent native vegetation communities and will vary on a site-by-site basis (Table 2.4). Generally direct seeding (using ground based commercial direct seeder) will be utilised where ground access permits. Tubestock may be used where ground-based access is difficult or where the pre-existing vegetation is competitive and greater success may be achieved from tubestock. Seeding rate will be between 500-1000g/km. Tubestock rate will be between 250-750 plants / ha. Timing of rehabilitation will be based on favourable (namely soil moisture) seasonal conditions allow (nominally between May and October for tubestock planting and between September and December for direct seeding). If conditions are not suitable, planting / sowing may be deferred to the following season.

Species selection for riparian / aquatic areas will be in accordance with vegetation community 6a (Table 2.4). Riparian areas on agricultural holdings generally consists of pre-existing creeks, farm dams, ephemeral drainage lines and springs. The following methods will be utilised in the rehabilitation of aquatic / riparian areas:

- Exclusion of livestock and provision of alternate water sources where required.
- Repair of any erosion areas if required
- Removal of willows and other invasive species
- Implement Natural Sequence farming (Chain of Ponds) techniques to slow water flow and reinstate the floodplain.
- Rehabilitation using tubestock (near / within the channel / water body) and direct seeding within the fenced area where access allows.
- Placement of habitat structures such as rocks, loge, timber etc
- Monitoring (comparison against “riparian” closure criteria (Section 8))
- Reporting via the Annual Environment Management Report.

3.8 Grazing Rights Agreement

The Grazing Rights Agreement (GRA) (CHPL 2008b) has been developed as a formal agreement between CHPL / Contango and agistees of farming properties. The GRA includes the Grazing Rights Agreement, Grazing Management Protocol Manual and the Farm Safety Management Plan. The GRA includes the following broad topics that directly relate to the sustainable management of land and biodiversity:

- Defines the maximum stocking rate of the land
- Resumption of land for rehabilitation (vegetation corridor) or pasture improvement purposes.

3.9 Destocking During Drought Conditions if overgrazing is observed

- Prevention (and repair) of harm to the environment occasioned by wilful grazing of rehabilitation areas, the felling, clearing or burning of vegetation, allowing active erosion to occur, or allowing pollution of land, waters or air
- Notification of harm or potential harm to the environment
- The cutting / removal of vegetation or creating waste is not permitted
- Maintenance of fences and infrastructure
- Application of fertiliser

- Weed control
- Prevention and control of soil erosion
- Establishment of woodlots etc
- Conservation grazing and protection of pasture resource to improve the perennial component of the pasture's composition.
- Protection of the pasture resource during drought
- Maintenance of adequate groundcover
- Vertebrate pest control.
- Preparation for bushfires through managing fuel loads for asset protection.

3.10 Vegetation Corridor Program

3.10.1 Aim of Cadia Vegetation Corridor Program

The aim of the Cadia Vegetation Corridor Program is to generate enduring land value, including both ecological and agricultural value.

This aim will be achieved through meeting the following objectives throughout the life of the plan:

- Conserve and enhance areas of isolated remnant vegetation.
- Link significant areas of remnant vegetation.
- Provide habitat for native fauna.
- Allow the movement of genetic material between flora and fauna populations.
- Increase the sustainability and biodiversity of CVO farms and environs.

3.10.2 Considerations for Vegetation Corridors

The following considerations will be taken into account when planning and implementing the Vegetation Corridor Program. Figure 3-3 shows the status of the Vegetation Corridor Program including areas completed to date and proposed works for the next 5 years and the ultimate corridor plan.

Figure 3-4 shows how the Vegetation Corridor Program aligns with the proposed mine site rehabilitation concepts to extend corridor linkages across Newcrest owned land (Consistent with Appendix 6 of the Cadia East Project Approval).

- Existing viable remnants should be protected wherever possible.
- Protection is to extend to all strata and native life forms including trees, shrubs, grasses, other herbs and forbs, ground litter, fungi, logs etc.
- Existing remnants should be enlarged or connected by revegetating with the appropriate indigenous species in the landscape.
- Ensure revegetation areas are of sufficient size (nominally >5ha or > 100m wide) where possible to maximise sustainability and biodiversity outcomes.
- Revegetation areas should provide a wide range of habitat features and provide specific habitat for threatened and locally significant fauna species.
- Rehabilitation planning should recognise that physiographic and topographic controls as well as land use objectives may make some areas better suited to pasture and agriculture.

- Rehabilitation planning would be conducted in consultation with the agistee and near neighbours.
- Allow for the protection and enhancement of threatened species, communities and locally significant species.
- Planning for rehabilitation works will take into consideration livestock movement, stock water access, farm operational needs and future mining projects.

3.10.3 Determining priority areas

Vegetation corridor areas will be selected and prioritised based on the following criteria:

- Proximity to and ability to incorporate threatened species and Endangered Ecological Communities (EEC's)
- Quality of remnant vegetation (including native grasslands)
  - Resilience (structural and species diversity or potential seedbank)
  - Land use history (disturbance, presence of introduced perennial grasses)
- Size of remnant area
- Ability to form easy and rapid corridor links
- Riparian areas.

3.10.4 Incorporating other habitat features

Within revegetated areas, all remaining habitat features such as logs, rocks, fallen trees, dead trees etc will remain undisturbed. Where these features are absent from the rehabilitation area and where there is a nearby source, Cadia will consider relocating such features into the revegetation area (Section 2.11).

3.10.5 Projected Rehabilitation Conservation Areas

As at the 30th of June 2020, the following is a summary of the current land planned for rehabilitation / conservation (refer to Figure 3-3).

Table 3.2: Farming Areas Resumed for Rehabilitation

Pre Newcrest	Completed as at June 2020	Post 2023	TOTAL
58* ha 0.6% of total^^	902** ha	728# ha	2670#^ ha 35% of available land^^

*Figures are approximate only and based on aerial photography calculations.

** Includes pre-Newcrest rehabilitated areas.

Figures are approximate only. Actual fence lines are yet to be determined.

^ Includes Offset areas

^^Total land owned by Newcrest 7,727 ha outside mining operational areas (as at April 2016 including adjustment for purchase of offset areas)

Figure 3-3: Vegetation Corridor Program

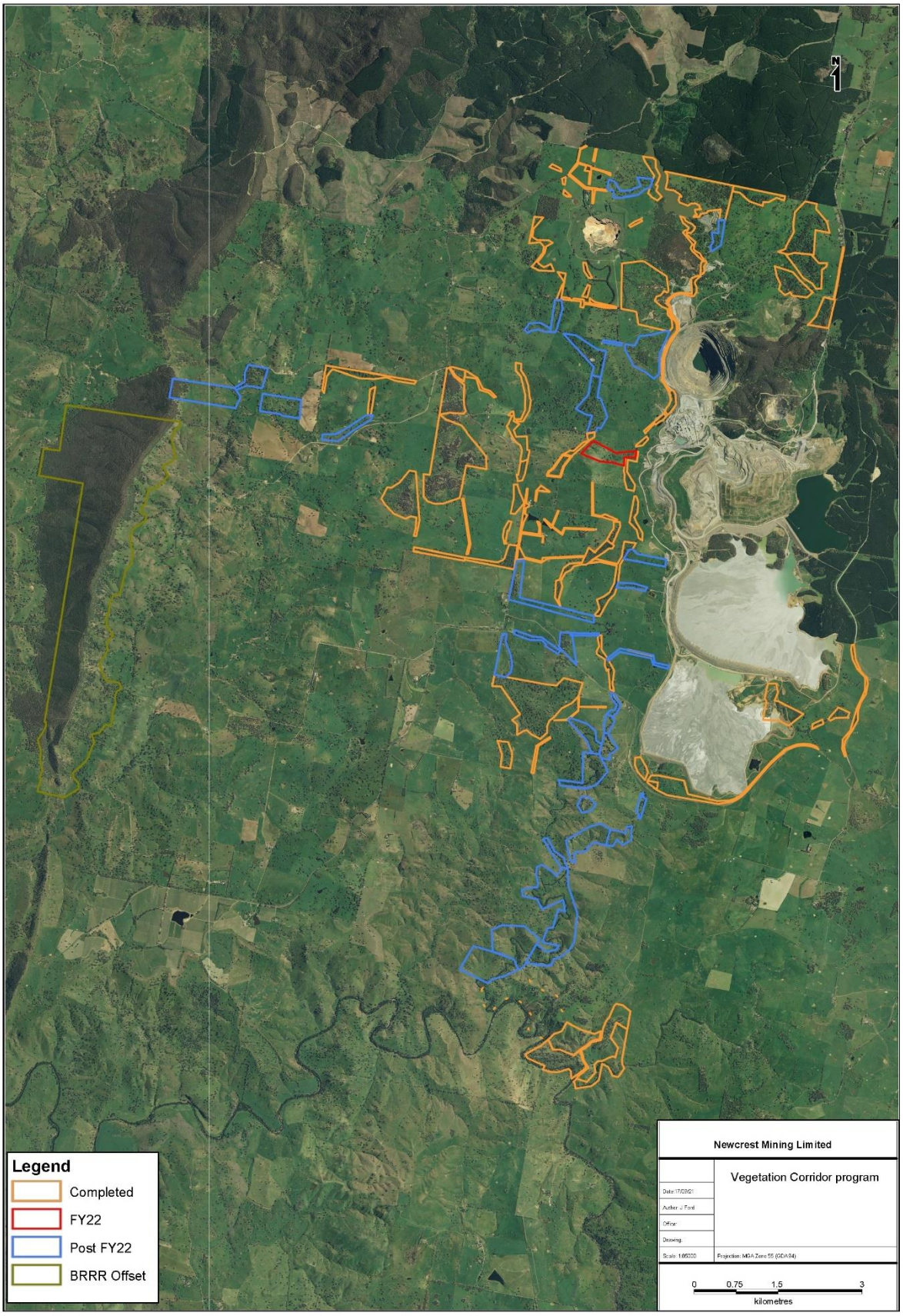
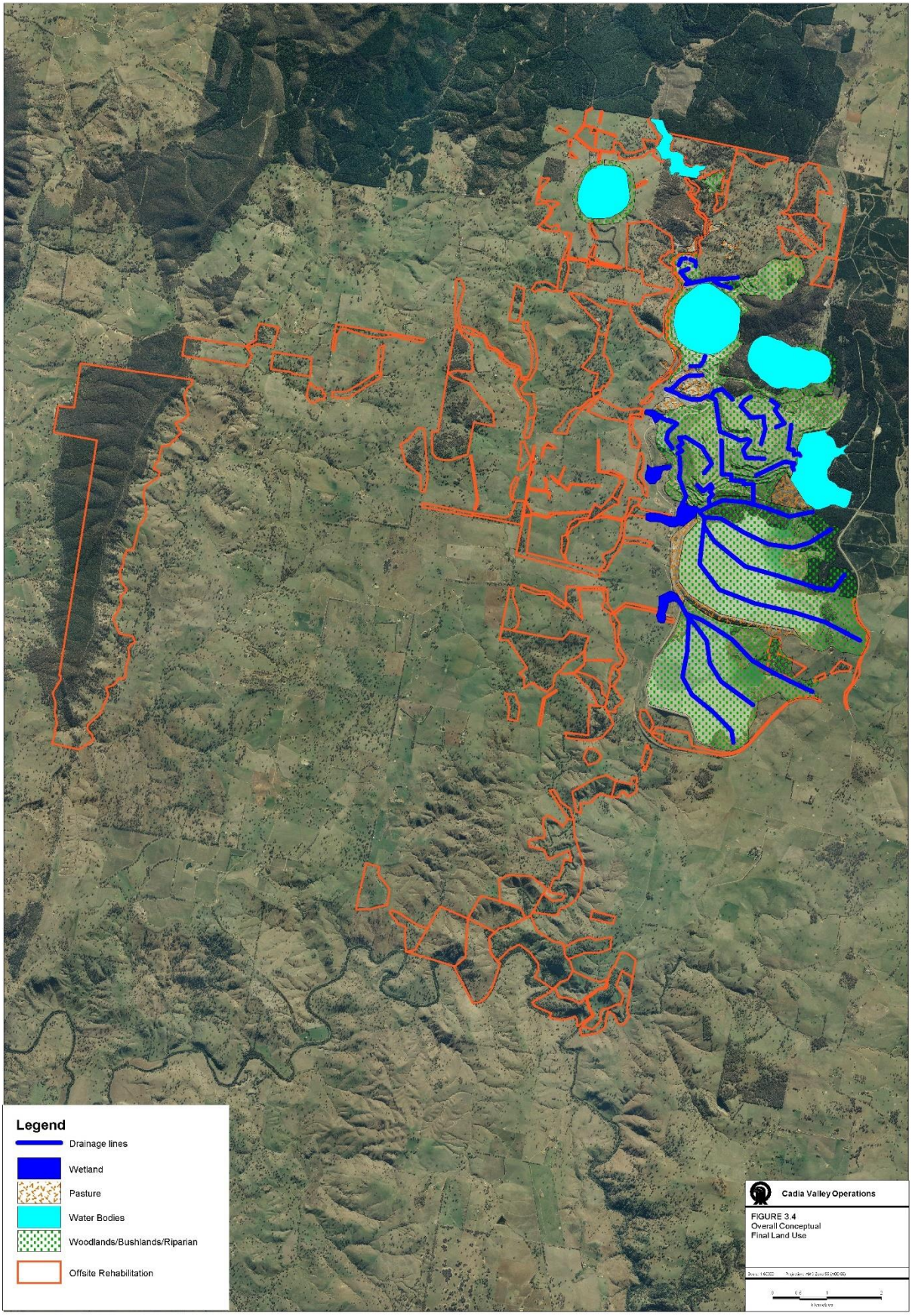


Figure 3-4: Overall Conceptual Final Landuse



4. RISK MANAGEMENT PLAN

The following definitions and risk matrix will be used to assess the risks associated with the implementation of the Land and Biodiversity Management Plan (Landscape Management Plan)

Table 4.1: Definition- Consequence

Ranking	Matrix Score	Example
Insignificant (Insig)	1	Limited damage to minimal area of low significance. Negligible, reversible environmental impact requiring very minor or no remediation. Loss of individuals – no effect on wider population.
Minor	2	Minor effects on biological or physical environment. Minor, reversible environmental impact, requiring minor remediation. Non-reportable environmental incident. Localised decrease in species abundance
Moderate (Mod)	3	Moderate short-term effects but no affecting ecosystem. Moderate reversible environmental impact with short term effect, requiring moderate remediation. A reportable incident not likely to result in prosecution. Reduced viability of population.
Major	4	Serious medium term environmental impacts. Serious environmental impact, with medium term effect, requiring significant remediation. Potential for prosecution. Widespread long-term impact on population. Local extinction.
Catastrophic (Cat)	5	Very serious long term environmental impairment of ecosystem. Disastrous environmental impact with long term effect, requiring major remediation, regulatory intervention or premature / temporary closure of operation. Loss of species from region.

Table 4.2: Definition- Likelihood

A	Almost Certain (AC)
B	Likely (L)
C	Occasional (OCC)
D	Unlikely (UL)
E	Rare (R)

Figure 4-1: Risk Matrix

		Consequence				
		1	**2**	**3**	**4**	**5**
Likelihood	**A**		11	**15**	**18**	**20**
	B		7	12	**16**	**19**
	C		4	8	**13**	**17**
	D		2	5	9	**14**
	E		1	3	6	10

= High risk
= Medium risk
= Low risk

4.1 Risk Assessment

Unwanted event	Inherent Risk				Existing Controls	Recommended Action (Improve existing controls / implement new controls)	By Whom (person responsible for action)	By When (Target completion date)	Final Risk			
	Consequence	Likelihood	Level (H,M,L)	Rank (1 to 20)					Consequence	Likelihood	Level (H,M,L)	Rank (1 to 20)
Failed encapsulation of PAF material leading to land contamination.	Major	Likely	H	16	Statutory requirements - project approval conditions. Encapsulate PAF as per O'Kane modelling recommendations (refer to 2009-10 AEMR).	Develop and implement QA/QC process. Install monitoring equipment to monitor success of encapsulation.	Manager HSE Manager Surface Operations.	Ongoing during rehabilitation works	Minor	UL	L	2
Unstable landforms leading to erosion.	Major	Likely	H	16	Mine lease conditions, project approval conditions. Competent material. Cadia East Environmental Assessment (CE EA) Monitor landform stability & correct / repair as required Rehabilitation monitoring and assessment against closure criteria.	Construct landforms as per Cadia East Environmental Assessment, Rehabilitation Strategy, Land and Biodiversity Management Plan, Mine Closure Plan.	Manager HSE Manager Surface Operations.	Ongoing – life of Mine	Minor	UL	L	2
Un-suitable final land use of grazing leading to long-term land degradation.	Major	Likely	H	16	Mine lease conditions, Cadia East Environmental Assessment (CE EA). Grazing Rights Agreement.	Undertake landscape capability assessment of farms and mine disturbed areas. Modify land-use as required.	Manager HSE	Ongoing – life of Mine	Minor	UL	L	2
Failed rehabilitation on Tailings Storage Facilities due to chemical composition.	Major	Likely	H	16	Competent material. Cadia East Environmental Assessment (CE EA). Outcomes of tailings rehabilitation trial	Undertake 'scaled up' rehabilitation trial. Liaise with Ore Treatment regarding possible changes in chemical composition of tailings material	Manager HSE Manager – Ore Treatment	Trial commenced by December 2025	Minor	UL	L	2
Failed rehabilitation on Waste Rock Dumps due to chemical composition.	Major	Likely	H	16	Competent material. Cadia East Environmental Assessment (CE EA). Outcomes of rehabilitation to date	Undertake annual monitoring of waste rock dump rehabilitation. Investigate root cause of failed plantings / sowing and develop corrective actions.	Manager HSE	Annual	Minor	Rare	L	1

Unwanted event	Inherent Risk				Existing Controls	Recommended Action (Improve existing controls / implement new controls)	By Whom (person responsible for action)	By When (Target completion date)	Final Risk			
	Consequence	Likelihood	Level (H,M,L)	Rank (1 to 20)					Consequence	Likelihood	Level (H,M,L)	Rank (1 to 20)
Failed rehabilitation due to drought / climatic factors	Minor	OCC	M	4	CE EA. Selection and use of native plants. (More drought tolerant than other alternatives). Undertake rehabilitation during times of optimal moisture and seasonal conditions. Delay planting / sowing if conditions unsuitable		Manager HSE	Ongoing during rehabilitation works	Insig	OCC	L	0
Liquidation of Newcrest – unable to complete rehabilitation / Offset requirements.	Major	UL	M	9	Company business plan. External security with NSW Trade and Investment for mine disturbed areas. Mine lease condition. Frequent review of security deposits in line with MOP / REMP process.	Lodge security deposit with NSW Dept of Trade and Investment for mine disturbed areas and with Dept of Planning and Environment for Offset areas.	Manager HSE	Ongoing – life of Mine	Mod	Rare	L	3
No future use of industrial infrastructure	Minor	UL	L	2	Mine Closure Plan, CE EA.	Modify Mine Closure Plan to reflect status of future industrial use of site.	Manager HSE	Ongoing – life of Mine	Minor	UL	L	2
Failure to undertake progressive rehabilitation	Mod	Likely	M	12	CE EA, Mine lease conditions, Rehabilitation Strategy. Newcrest policy. MOP Commit to and implement progressing rehabilitation as per MOP, REMP.	Action taken by regulators.	CVO General Manager. Manager HSE Manager Surface Operations.	Ongoing – life of Mine	Moderate	OCC	M	8
Failure to meet closure criteria.	Major	UL	M	9	CE EA, Mine lease conditions, Rehabilitation Strategy. Newcrest policy.	Undertake regular assessment against closure criteria & correct at first sign of not meeting criteria.	Manager HSE	Ongoing – to relinquishment of mining lease.	Mod	UL	M	5
Failure of vegetation clearance protocol leading to death of fauna individual.	Minor	UL	L	2	CE EA, Newcrest Policy. CVO Incident reporting and management process Communication to workforce.	Report to regulators. Review and correct process.	Manager HSE	Ongoing – life of Mine	Minor	UL	L	2
Un-authorised site disturbance / clearing.	Mod	Likely	M	12	CE EA, Newcrest Policy CVO Incident reporting and management process. Communication to workforce.	Report to regulators. Review and correct process.	Manager HSE	Ongoing – life of Mine	Mod	UL	M	5

Unwanted event	Inherent Risk				Existing Controls	Recommended Action (Improve existing controls / implement new controls)	By Whom (person responsible for action)	By When (Target completion date)	Final Risk			
	Consequence	Likelihood	Level (H,M,L)	Rank (1 to 20)					Consequence	Likelihood	Level (H,M,L)	Rank (1 to 20)
Failure to utilise habitat structures.	Minor	AC	M	11	CE EA, Rehabilitation Strategy.	Re-use habitat resources as per CE EA, Rehabilitation Strategy, Land and Biodiversity Management Plan.	Manager HSE	Ongoing – life of Mine	Minor	OCC	M	4
Failure to harvest adequate topsoil and clay resources.	Major	Likely	H	16	CE EA, Mine lease conditions, Rehabilitation Strategy.	Harvest and store topsoil and clay resources as per CE EA, Rehabilitation Strategy, Land and Biodiversity Management Plan.	Manager HSE Manager Surface Operations.	Ongoing – life of Mine	Major	UL	M	9
Failure to identify, investigate and remediate areas of contamination.	Mod	Likely	M	12	CE EA, Mine Closure Plan, Legal requirements. Maintain a contaminated sites register	Investigate and remediate as opportunity arises. Implement as per Mine Closure Plan.	Manager HSE	Ongoing – to relinquishment of mining lease.	Minor	OCC	M	4
Failure to control noxious weeds.	Major	OCC	H	13	CE EA, Mine lease conditions, Rehabilitation Strategy. Noxious Weeds Act. Undertake weed control as per CE EA,	Rehabilitation Strategy, Land and Biodiversity Management Plan.	Manager HSE	Ongoing – to relinquishment of mining lease.	Minor	UL	L	2
Failure to control vertebrate pests.	Major	OCC	H	13	CE EA, Mine lease conditions, Rehabilitation Strategy. Undertake vertebrate pest control as per CE EA	Rehabilitation Strategy, Land and Biodiversity Management Plan.	Manager HSE	Ongoing – to relinquishment of mining lease.	Minor	UL	L	2
Failure to control soil erosion	Major	Likely	H	16	CE EA, Mine lease conditions, Rehabilitation Strategy.	Identify and control areas of erosion as per CE EA, Rehabilitation Strategy, Land and Biodiversity Management Plan.	Manager HSE	Ongoing – to relinquishment of mining lease.	Minor	UL	L	2
Failure of rehabilitation works from sowing non-local native seed.	Minor	OCC	M	4	CE EA, Rehabilitation Strategy.	Select and use locally occurring native plants as per CE EA, Rehabilitation Strategy, Land and Biodiversity Management Plan.	Manager HSE	Ongoing – to relinquishment of mining lease.	Insig	UL	L	0
Widespread bushfire across rehabilitation areas.	Major	Likely	H	16	RFS Canobolas Zone Fire Management Plan. CVO Bushfire Management Plan (lease areas), CVO emergency response officers.	Bushfire Fuel Management Plans in place for mining and agricultural landscapes. Liaise with stakeholders. Implement Bushfire Fuel Management Plan.	Manager HSE	Ongoing – to relinquishment of mining lease.	Major	Rare	M	6

Unwanted event	Inherent Risk				Existing Controls	Recommended Action (Improve existing controls / implement new controls)	By Whom (person responsible for action)	By When (Target completion date)	Final Risk			
	Consequence	Likelihood	Level (H,M,L)	Rank (1 to 20)					Consequence	Likelihood	Level (H,M,L)	Rank (1 to 20)
Inadequate soil fertility to support rehabilitation.	Mod	Likely	M	12	CE EA, Rehabilitation Strategy Undertake soil tests as part of annual rehabilitation monitoring	Annual rehabilitation monitoring (includes soil tests). Apply fertiliser / organic soil conditioners as required.	Manager HSE	Ongoing (annual) during rehabilitation works	Insig	UL	L	0
Livestock impact on rehabilitation areas.	Major	Likely	H	16	CE EA, Rehabilitation Strategy	Areas fenced and maintained to exclude livestock as per Land and Biodiversity Management Plan.	Manager HSE	Ongoing – to relinquishment of mining lease.	Minor	OCC	M	4
Un-authorised access to rehabilitation areas	Minor	OCC	M	4	CE EA, Rehabilitation Strategy. CVO Security systems.	Areas fenced and maintained to discourage un-authorised access. Offset areas fenced with signs installed.	Manager HSE	Ongoing – to relinquishment of mining lease.	Insig	UL	L	0
Failure to meet requirements / commitments of project approval / management plan	Cat	OCC	H	17	CE EA, CE Project approval. Rehabilitation Strategy. Regulatory review & reporting requirements. 3-year compliance audits as per CE Project approval. Internal continuous improvement process.	Action taken by regulators	CVO General Manager. Manager HSE	Every 3 years commencing 2011.	Mod	UL	M	5
Failure to provide adequate resources to implement Land and Biodiversity Management Plan.	Major	OCC	H	13	CE EA, CE Project approval. Rehabilitation Strategy. Regulatory review & reporting requirements. 3-year compliance audits as per CE Project approval. Internal continuous improvement process	Action taken by regulators	CVO General Manager. Manager HSE	Every 3 years commencing 2011.	Minor	UL	L	2
Overgrazing of farming areas leading to pasture and land degradation.	Mod	Likely	M	12	Grazing Rights Agreement, Grazing Management Protocol. Inspections / audits by Farm Management Agent and CVO.	Land and Biodiversity Management Plan.	Manager HSE	Ongoing – to relinquishment of mining lease.	Insig	UL	L	0
Poor neighbour relations due to conflicting land management issues / expectations.	Minor	OCC	M	4	Community Relations Strategy. Newcrest Policy. Complaints Management Protocol.	Implementation of Land and Biodiversity Management Plan. Liaison with and engagement of stakeholders.	Manager HSE	Ongoing – to relinquishment of mining lease.	Minor	UL	L	0

Unwanted event	Inherent Risk				Existing Controls	Recommended Action (Improve existing controls / implement new controls)	By Whom (person responsible for action)	By When (Target completion date)	Final Risk			
	Consequence	Likelihood	Level (H,M,L)	Rank (1 to 20)					Consequence	Likelihood	Level (H,M,L)	Rank (1 to 20)
Insufficient seed to undertake rehabilitation commitments.	Mod	Likely	M	12	CE EA, CE Project approval. Rehabilitation Strategy. Seed store maintained. Seed collection contracts in place.	Implementation of Land and Biodiversity Management Plan.	Manager HSE	Ongoing – to relinquishment of mining lease	Minor	OCC	M	4
Rehabilitation schedule not met.	Minor	Likely	M	17	CE EA, Mine lease conditions, Rehabilitation Strategy. Newcrest policy. MOP	Commit to and implement progressing rehabilitation. 3-year compliance audits as per CE Project approval	CVO General Manager. Manager HSE Manager Surface Operations.	Ongoing – life of Mine	Minor	UL	L	2
Grazing / clearing of corridor areas post Newcrest Ownership	Mod	Likely	M	12	Grazing Rights Agreement	Investigate and implement strategies for the long-term security of rehabilitation areas such as Voluntary Conservation Agreements.	Manager HSE	Offset areas by 6/1/12 Other areas within 5 years of mine closure.	Mod	UL	M	5

5. KEY DOCUMENTS

Key EMS documents are controlled on the Newcrest intranet site so they are electronically distributed and readily accessible across the organisation. The key documents relating to the mine disturbed and agricultural landscapes include:

- Newcrest Environmental Policy.
- Rehabilitation Strategy
- Environment Strategy
- Land and Biodiversity (Landscape) Management Plan
- Mine Closure Plan
- Mining Operations Plan
- Annual Environmental Management Report

6. ROLES AND RESPONSIBILITIES

The General Manager is responsible for the overall environmental performance of Cadia Valley Operations. The Operational Managers have direct environmental responsibility for their areas of control. The Environment Department provides direction and advice to ensure site environmental compliance is maintained.

Several operational managers hold a key role with the implementation of Land and Biodiversity Management Plan, these are outlined below:

6.1 Manager – Surface Operations

Responsible for:

- Planning and implementation of bulk earthworks (as per MOP schedule) during mining including:
- Shaping of waste rock dumps to the approved profile and other areas as planned
- Encapsulation of PAF waste rock
- Spreading of topsoil
- Major drainage works
- Tailings deposition to achieve a final surface profile requiring minimal earthworks

6.2 Manager – Ore Treatment

Responsible for:

- Site metallurgy, tailings material generation, reagent storage and use.

6.3 Manager – HSE

Responsible for:

- Preparation and implementation of rehabilitation plans, mine closure plan, mine closure estimates etc
- Final surface drainage, seeding, maintenance and monitoring of rehabilitated landforms
- Quality control of rehabilitation outcomes

- Mine closure co-ordination, planning and implementation

7. REHABILITATION MONITORING

Rehabilitation monitoring is undertaken on an annual basis by an independent qualified ecologist. Results from rehabilitation monitoring are compared against a selection of ecological targets or closure criteria, which are based on compatible final land uses and have been developed from a series of representative reference sites (see Section 8).

Reporting of rehabilitation results and comparison against closure criteria is undertaken through the Annual Environmental Management Report (AEMR) and is produced on an annual (financial year) basis.

Ongoing monitoring and maintenance of rehabilitation is undertaken to assess:

- progression of rehabilitated land;
- effectiveness of rehabilitation techniques used (including soil erosion controls, water quality within and outside the mining lease areas and revegetation methods); and
- identify future management requirements and corrective actions.

8. REHABILITATION AND MINE CLOSURE CRITERIA

The following section provides details as to the rehabilitation and mine closure criteria. These criteria will be assessed on an ongoing basis and used to determine whether mine closure and rehabilitation commitments have been met.

8.1 Rehabilitation

The following rehabilitation criteria apply to mine disturbed areas and vegetation corridor areas.

Since 2007-08 Cadia has been developing and assessing rehabilitation monitoring outcomes against a selection of ecological targets or mine closure criteria. The methodology adopted by Cadia involves the selection and monitoring of a series of reference sites (Figure 8-1) that are representative of and reflect the final end land uses proposed for rehabilitation (such as pasture / grazing, woodland / conservation etc). The same monitoring methodology is used to assess ecological targets within the rehabilitation areas and is then compared against the reference sites with the compatible final end land use. For example a rehabilitation site with a proposed final land use of pasture is compared against pasture reference sites. A detailed methodology, extracted from the independent consultant's annual report is contained in Appendix G.

The monitoring techniques and parameters for reference sites and rehabilitation sites are identical allowing the robust and repeatable comparison of rehabilitation success against closure criteria. Reference sites and rehabilitation sites are both assessed annually at the same time of the year to allow for seasonal influences.

Selecting suitable reference sites was essential to this model as it ultimately sets the benchmark for rehabilitation targets and the criteria to be met for closure. Reference sites chosen for Cadia were sites that were typical of the local environment, including those considered to be in best condition within the local context, and as such are a true representation of the pre-mining landscape. The reference sites were spread out where possible to maximise the spatial distribution and subsequent variations in community composition across the local landscape and are not necessarily located on Cadia property. It is acknowledged that reference sites chosen, while they are the best that could be found

in a local context are still subject to impact and change due to (for example) occasional grazing, fire, drought, physical disturbance etc.

Reference sites have been selected based on the following final land uses:

- Woodland / conservation (currently 4 reference sites are monitored)
- Riparian / conservation (currently 2 reference sites are monitored)
- Pasture / grazing (currently 2 reference sites established)

Parameters measured are identical for reference and rehabilitation sites and represent 5 steps of ecological succession and these are consistent with the rehabilitation monitoring and closure criteria guidelines released by NSW Trade and Investment (2010). Essentially in order to receive sign off of rehabilitation, it will be necessary to demonstrate that selected performance indicators (or criteria) have reached their established performance targets or that a satisfactory successional trajectory has been established that will result in a self-sustaining ecosystem. The new approach has been broken down into five major stages of ecosystem development as shown below, by which a set of performance indicators or criteria will need to be monitored and either be equivalent to or exceed those assessed of the reference sites or show positive recovery trends.

Rehabilitation closure criteria (as at 2020) are presented in Section 8.1.1. Each parameter measured (on an annual basis) has a desirable range (based on the minimum and maximum values determined from reference sites). Rehabilitation sites have met the closure criteria parameter if the measurement falls within or exceeds this range. Rehabilitation monitoring and assessment against closure criteria is undertaken by an external independent consultant. A detailed report is produced following annual monitoring which assesses the rehabilitation performance against closure criteria. A summary is placed in the Annual Environment Management Report with the full report provided in the appendices.

Closure criteria are dynamic and will change from year to year based on annual monitoring, therefore the relevant closure criteria at any time will be contained in the most recent AEMR.

Rehabilitation monitoring will be expanded in the coming years to include a fauna component and will be structured in a similar manner to vegetation monitoring as described above.

*Within the following tables no/area refers to the following:

- Woodland sites – number / 20 x 50m quadrat
- Riparian Sites -- number / 20 x 50m quadrat
- Pasture sites – number / 20 x 50m quadrat

Figure 8-1: Location of Reference and Current Rehabilitation Monitoring Sites (Source DNA Environmental 2020)

8.1.1 Summary of Mine Closure Criteria

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Description of performance indicators	Unit of measurement	2020 Woodland ecosystem range		2019 Riparian ecosystem range		2016 Pasture ecosystem range	
Performance indicators are quantified by the range of values obtained from replicated reference sites assessed in 2015						Lower KPI	Upper KPI	Lower KPI	Upper KPI	Lower KPI	Upper KPI
Phase 2: Landform establishment and stability	Landform slope, gradient	Landform suitable for final landuse and generally compatible with surrounding topography	Slope	Landform is generally compatible within the context of the local topography and final landform design.	< Degrees (18°)	10	14	10	14	8	10
	Active erosion	Areas of active erosion are limited	No. Rills/Gullies	Provides an assessment of the number of gullies or rills occurring in a 50m transect and that these are limited and stabilising	No.	0	4	0	0	0	0
			Cross-sectional area of rills	Provides an assessment of the extent of soil loss due to gully and rill erosion and that it is limited and/or is stabilising	m2	0	0.9	0	0	0	0
Phase 3: Growth medium development	Soil chemical, physical properties and amelioration	Soil properties are suitable for the establishment and maintenance of selected vegetation species	pH	pH is typical of that of the surrounding landscape or falls within desirable ranges provided by the agricultural industry	pH (5.6-7.3)	6.1	7	6.2	6.5	5.5	5.6
			EC	Electrical Conductivity is typical of that of the surrounding landscape or fall within desirable ranges provided by the agricultural industry	< dS/m (<0.150)	0.055	0.142	0.060	0.055	0.059	0.176

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Description of performance indicators	Unit of measurement	2020 Woodland ecosystem range		2019 Riparian ecosystem range		2016 Pasture ecosystem range	
Performance indicators are quantified by the range of values obtained from replicated reference sites assessed in 2015						Lower KPI	Upper KPI	Lower KPI	Upper KPI	Lower KPI	Upper KPI
			Organic Matter	Organic Carbon levels are typical of that of the surrounding landscape, increasing or fall within desirable ranges provided by the agricultural industry	% (>4.5)	7.6	10.2	5.0	6.0	6	6.4
			Phosphorous	Available Phosphorus is typical of that of the surrounding landscape or fall within desirable ranges provided by the agricultural industry	mg/kg (50)	15.4	36.7	16.7	18.7	23.1	30.1
			Nitrate	Nitrate levels are typical of that of the surrounding landscape or fall within desirable ranges provided by the agricultural industry	mg/kg (>12.5)	2.1	37.7	7.4	4.9	10.9	54.5
			CEC	Cation Exchange Capacity is typical of that of the surrounding landscape or fall within desirable ranges provided by the agricultural industry	Cmol+/kg (>14)	13.2	29.9	12.5	20.1	5.1	23.5
			ESP	Exchangeable Sodium Percentage (a measure of sodicity) is typical of that of the surrounding landscape or fall within desirable ranges provided by the agricultural industry	% (<5)	0.3	0.6	0.9	0.2	0.6	3.2

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Description of performance indicators	Unit of measurement	2020 Woodland ecosystem range		2019 Riparian ecosystem range		2016 Pasture ecosystem range	
Performance indicators are quantified by the range of values obtained from replicated reference sites assessed in 2015						Lower KPI	Upper KPI	Lower KPI	Upper KPI	Lower KPI	Upper KPI
Phase 4: Ecosystem & Landuse Establishment	Landscape Function Analysis (LFA): Landform stability and organisation	Landform is stable and performing as it was designed to do	LFA Stability	Based on key physical, biological and chemical characteristics the LFA stability index provides an indication of the sites stability and that it is comparable to or trending towards that of the local remnant vegetation	%	61.8	67.5	75.8	76.0	67.5	69.8
			LFA Landscape organisation	The Landscape Organisation Index provides a measure of the ability of the site to retain resources and that it is comparable to that of the local remnant vegetation	%	64	100	95	100	100	100
	Vegetation diversity	Vegetation contains a diversity of species comparable to that of the local remnant vegetation	Diversity of shrubs and juvenile trees	The diversity of shrubs and juvenile trees with a stem diameter less than 5cm is comparable to that of the local remnant vegetation.	species/ area	0	7	5	7	0	0
				The percentage of shrubs and juvenile trees with a stem diameter less than 5cm dbh which are local endemic species and these percentages are comparable to the local remnant vegetation	% population	0	100	46	46	0	0

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Description of performance indicators	Unit of measurement	2020 Woodland ecosystem range		2019 Riparian ecosystem range		2016 Pasture ecosystem range	
Performance indicators are quantified by the range of values obtained from replicated reference sites assessed in 2015						Lower KPI	Upper KPI	Lower KPI	Upper KPI	Lower KPI	Upper KPI
			Total species richness	The total number of live plant species provides an indication of the floristic diversity of the site and is comparable to the local remnant vegetation	No./area	19	41	45	56	5	14
			Native species richness	The total number of live native plant species provides an indication of the native plant diversity of the site and that it is greater than or comparable to the local remnant vegetation	>No./area	7	31	14	31	4	4
			Exotic species richness	The total number of live exotic plant species provides an indication of the exotic plant diversity of the site and that it is less than or comparable to the local remnant vegetation	<No./area	10	12	25	31	1	10
			Ratio of native to exotic species	The ratio of live native species compared to live exotic plant species provides an indication of the relative native species richness of the site and that it is more than or comparable to the local remnant vegetation	>	0.6	3.1	0.5	1	0.4	4

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Description of performance indicators	Unit of measurement	2020 Woodland ecosystem range		2019 Riparian ecosystem range		2016 Pasture ecosystem range	
Performance indicators are quantified by the range of values obtained from replicated reference sites assessed in 2015						Lower KPI	Upper KPI	Lower KPI	Upper KPI	Lower KPI	Upper KPI
	Vegetation density	Vegetation contains a density of species comparable to that of the local remnant vegetation	Density of shrubs and juvenile trees	The density of shrubs or juvenile trees with a stem diameter < 5cm is comparable to that of the local remnant vegetation	No./area	0	75	13	294	N/A	N/A
	Ecosystem composition	The vegetation is comprised by a range of growth forms comparable to that of the local remnant vegetation	Trees	The number of tree species regardless of age comprising the vegetation community is comparable to that of the local remnant vegetation	No./area	1	3	3	6	0	0
			Shrubs	The number of shrub species regardless of age comprising the vegetation community is comparable to that of the local remnant vegetation	No./area	0	6	2	8	0	0
			Sub-shrubs	The number of sub-shrub species comprising the vegetation community is comparable to that of the local remnant vegetation	No./area	0	0	0	1	0	0
			Herbs	The number of herbs or forb species comprising the vegetation community is comparable to that of the local remnant vegetation	No./area	13	24	22	31	0	6

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Description of performance indicators	Unit of measurement	2020 Woodland ecosystem range		2019 Riparian ecosystem range		2016 Pasture ecosystem range	
Performance indicators are quantified by the range of values obtained from replicated reference sites assessed in 2015						Lower KPI	Upper KPI	Lower KPI	Upper KPI	Lower KPI	Upper KPI
			Grasses	The number of grass species comprising the vegetation community is comparable to that of the local remnant vegetation	No./area	5	7	10	12	4	7
			Reeds	The number of reed, sedge or rush species comprising the vegetation community is comparable to that of the local remnant vegetation	No./area	0	1	1	3	1	1
			Vines	The number of vines or climbing species comprising the vegetation community is comparable to that of the local remnant vegetation	No./area	0	0	0	1	0	0
			Ferns	The number of ferns comprising the vegetation community is comparable to that of the local remnant vegetation	No./area	0	0	0	1	0	0
			Aquatic	The number of ferns comprising the vegetation community is comparable to that of the local remnant vegetation	No./area	0	0	0	0	0	0

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Description of performance indicators	Unit of measurement	2020 Woodland ecosystem range		2019 Riparian ecosystem range		2016 Pasture ecosystem range	
Performance indicators are quantified by the range of values obtained from replicated reference sites assessed in 2015						Lower KPI	Upper KPI	Lower KPI	Upper KPI	Lower KPI	Upper KPI
Phase 5: Ecosystem & Landuse Development	Landscape Function Analysis (LFA): Landform function and ecological performance	Landform is ecologically functional and performing as it was designed to do	LFA Infiltration	Based on key physical, biological and chemical characteristics the LFA infiltration index provides an indication of the sites infiltration capacity and that it is comparable to or trending towards that of the local remnant vegetation	%	52.9	62.2	55.4	61.2	44.3	50.6
			LFA Nutrient recycling	Based on key physical, biological and chemical characteristics the LFA nutrient recycling index provides an indication of the sites ability to recycle nutrient and that it is comparable to or trending towards that of the local remnant vegetation	%	48.5	61.5	51.4	59.8	39.5	49.7
	Protective ground cover	Ground layer contains protective ground cover and habitat structure comparable with the local remnant vegetation	Litter cover	Percent ground cover provided by dead plant material is comparable to that of the local remnant vegetation	%	65	94.5	46	54.5	74	96
			Annual plants	Percent ground cover provided by live annual plants is comparable to that of the local remnant vegetation	<%	0	5.5	1	4	0	0

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Description of performance indicators	Unit of measurement	2020 Woodland ecosystem range		2019 Riparian ecosystem range		2016 Pasture ecosystem range	
Performance indicators are quantified by the range of values obtained from replicated reference sites assessed in 2015						Lower KPI	Upper KPI	Lower KPI	Upper KPI	Lower KPI	Upper KPI
			Cryptogam cover	Percent ground cover provided by cryptogams (e.g. mosses, lichens) is comparable to that of the local remnant vegetation	%	0	0	0	0.5	0	0
			Rock	Percent ground cover provided by stones or rocks (> 5cm diameter) is comparable to that of the local remnant vegetation	%	0	7	0.5	5.5	0	0
			Log	Percent ground cover provided by fallen branches and logs (>5cm) is comparable to that of the local remnant vegetation	%	1	4.5	0	11	0	0
			Bare ground	Percentage of bare ground is less than or comparable to that of the local remnant vegetation	< %	2	7.5	1.5	6	0.5	4.5
			Perennial plant cover (< 0.5m)	Percent ground cover provided by live perennial vegetation (less than 50cm in height) is comparable to that of the local remnant vegetation	%	1	15	28.5	41	0	25.5

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Description of performance indicators	Unit of measurement	2020 Woodland ecosystem range		2019 Riparian ecosystem range		2016 Pasture ecosystem range	
Performance indicators are quantified by the range of values obtained from replicated reference sites assessed in 2015						Lower KPI	Upper KPI	Lower KPI	Upper KPI	Lower KPI	Upper KPI
			Total Ground Cover	Total groundcover is the sum of protective ground cover components (as described above) and that it is comparable to that of the local remnant vegetation	%	92.5	98	94	98.5	96	99.5
	Ground cover diversity	Vegetation contains a diversity of species per square meter comparable to that of the local remnant vegetation	Native understorey abundance	The abundance of native species per square metre averaged across the site provides an indication of the heterogeneity of the site and that it is has more than or an equal number of native species as the local remnant vegetation	> species/m^2	0.4	3	1	6.2	0	2.6
			Exotic understorey abundance	The abundance of exotic species per square metre averaged across the site provides an indication of the heterogeneity of the site and that it is has less than or an equal number of native species as the local remnant vegetation	< species/m^2	0.4	2.8	1.6	4.8	0.6	1.6
	Native ground cover abundance	Native ground cover abundance is comparable to that of the local remnant vegetation	Percent ground cover provided by native vegetation <0.5m tall	The percent ground cover abundance of native species (<0.5m) compared to exotic species is comparable to that of the local remnant vegetation	%	7.1	85.0	18.3	83.6	0	66.7

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Description of performance indicators	Unit of measurement	2020 Woodland ecosystem range		2019 Riparian ecosystem range		2016 Pasture ecosystem range	
Performance indicators are quantified by the range of values obtained from replicated reference sites assessed in 2015						Lower KPI	Upper KPI	Lower KPI	Upper KPI	Lower KPI	Upper KPI
	Ecosystem growth and natural recruitment	The vegetation is maturing and/or natural recruitment is occurring at rates similar to those of the local remnant vegetation	shrubs and juvenile trees 0 - 0.5m in height	The number of shrubs or juvenile trees less than 0.5m in height provides an indication of establishment success and/or natural ecosystem recruitment and that it is comparable to that of the local remnant vegetation	No./area	0	68	5	231	n/a	n/a
			shrubs and juvenile trees 0.5 - 1m in height	The number of shrubs or juvenile trees 0.5-1m in height provides an indication of establishment success, growth and/or natural ecosystem recruitment and that it is comparable to that of the local remnant vegetation	No./area	0	5	5	62	n/a	n/a
			shrubs and juvenile trees 1 - 1.5m in height	The number of shrubs or juvenile trees 1-1.5m in height provides an indication of establishment success, growth and/or natural ecosystem recruitment and that it is comparable to that of the local remnant vegetation	No./area	0	0	0	0	n/a	n/a

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Description of performance indicators	Unit of measurement	2020 Woodland ecosystem range		2019 Riparian ecosystem range		2016 Pasture ecosystem range	
Performance indicators are quantified by the range of values obtained from replicated reference sites assessed in 2015						Lower KPI	Upper KPI	Lower KPI	Upper KPI	Lower KPI	Upper KPI
			shrubs and juvenile trees 1.5 - 2m in height	The number of shrubs or juvenile trees less than 1.5-2m in height provides an indication of establishment success, growth and/or natural ecosystem recruitment and that it is comparable to that of the local remnant vegetation	No./area	0	0	0	1	n/a	n/a
			shrubs and juvenile trees >2m in height	The number of shrubs or juvenile trees greater than 2m in height provides an indication of establishment success, growth and/or natural ecosystem recruitment and that it is comparable to that of the local remnant vegetation	No./area	0	2	0	3	n/a	n/a
	Ecosystem structure	The vegetation is developing in structure and complexity comparable to that of the local remnant vegetation	Foliage cover 0.5 - 2 m	Projected foliage cover provided by perennial plants in the 0.5 - 2m vertical height stratum indicates the community structure is comparable to that of the local remnant vegetation	% cover	0	0	0	0	0	3
			Foliage cover 2 - 4m	Projected foliage cover provided by perennial plants in the 2 - 4m vertical height stratum indicates the community structure is comparable to that of the local remnant vegetation	% cover	0	2	0	6	0	0

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Description of performance indicators	Unit of measurement	2020 Woodland ecosystem range		2019 Riparian ecosystem range		2016 Pasture ecosystem range	
Performance indicators are quantified by the range of values obtained from replicated reference sites assessed in 2015						Lower KPI	Upper KPI	Lower KPI	Upper KPI	Lower KPI	Upper KPI
			Foliage cover 4 - 6m	Projected foliage cover provided by perennial plants in the 4 -6m vertical height stratum indicates the community structure is comparable to that of the local remnant vegetation	% cover	3	6	9	22	0	0
			Foliage cover >6m	Projected foliage cover provided by perennial plants greater than 6m vertical height stratum indicates the community structure is comparable to that of the local remnant vegetation	% cover	37	42	47	49	0	0
	Tree diversity	Vegetation contains a diversity of maturing tree and shrubs species comparable to that of the local remnant vegetation	Tree diversity	The diversity of trees or shrubs with a stem diameter greater than 5cm is comparable to the local remnant vegetation	species/area	1	4	4	5		
				The percentage of maturing trees and shrubs with a stem diameter greater than 5cm dbh which are local endemic species and these percentages are comparable to the local remnant vegetation	%	100	100	100	100		
	Tree density	Vegetation contains a density of maturing tree and shrubs species comparable to that	Tree density	The density of shrubs or trees with a stem diameter > 5cm is comparable to that of the local remnant vegetation	No./area	9	48	8	28		

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Description of performance indicators	Unit of measurement	2020 Woodland ecosystem range		2019 Riparian ecosystem range		2016 Pasture ecosystem range	
Performance indicators are quantified by the range of values obtained from replicated reference sites assessed in 2015						Lower KPI	Upper KPI	Lower KPI	Upper KPI	Lower KPI	Upper KPI
		of the local remnant vegetation	Average dbh	Average tree diameter of the tree population provides a measure of age, (height) and growth rate and that it is trending towards that of the local remnant vegetation.	cm	25	68	32	62	n/a	n/a
	Ecosystem health	The vegetation is in a condition comparable to that of the local remnant vegetation.	Live trees	The percentage of the tree population which are live individuals and that the percentage is comparable to the local remnant vegetation	% population	85.4	95.8	86	88	n/a	n/a
			Healthy trees	The percentage of the tree population which are in healthy condition and that the percentage is comparable to the local remnant vegetation	% population	8.3	11.1	25	32	n/a	n/a
			Medium health	The percentage of the tree population which are in a medium health condition and that the percentage is comparable to the local remnant vegetation	% population	56.3	79.2	46	63	n/a	n/a
			Advanced dieback	The percentage of the tree population which are in a state of advanced dieback and that the percentage is comparable to the local remnant vegetation	% population	0	18.8	0	7	n/a	n/a

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Description of performance indicators	Unit of measurement	2020 Woodland ecosystem range		2019 Riparian ecosystem range		2016 Pasture ecosystem range	
Performance indicators are quantified by the range of values obtained from replicated reference sites assessed in 2015						Lower KPI	Upper KPI	Lower KPI	Upper KPI	Lower KPI	Upper KPI
			Dead Trees	The percentage of the tree population which are dead (stags) and that the percentage is comparable to the local remnant vegetation	% population	0	14.6	13	14	n/a	n/a
			Mistletoe	The percentage of the tree population which have mistletoe provides an indication of community health and habitat value and that the percentage is comparable to the local remnant vegetation	% population	0	0	0	0		
			Flowers/fruit: Trees	The presence of reproductive structures such as buds, flowers or fruit provides evidence that the ecosystem is maturing, capable of recruitment and can provide habitat resources comparable to that of the local remnant vegetation	% population	16.7	88.9	50	54		

8.2 Voids

The following broad criteria have been developed for the closure of the Ridgeway and Cadia East subsidence zones and the Cadia Hill Pit.

- Voids are safe with minimal risk to the public, native fauna and livestock.
- Access is 100% restricted to subsidence zone areas
- Access is restricted to the Cadia Hill Pit, with the exception of undertaking water sampling (if safely accessible)
- Water quality is consistent with modelling predictions
- Undertake hydrogeochemistry assessment of Cadia Hill Pit water body to determine long term risks.
- There is no impact on wider groundwater quality.
- 5 years from mine closure investigate future possible industrial use of the void and / or water from the Cadia Hill Pit or the role of the water body in a regional water use scheme.
- Water quality is suitable for industrial use or use within a regional water management scheme.
- Undertake water sampling (access pending) 5 years post closure.

8.3 Site Infrastructure

The following broad criteria have been developed for the closure and rehabilitation of surface infrastructure areas (excluding revegetation which is addressed in Section 8.1)

- 5 years prior to the completion of mining, commence consultation with local, state and federal authorities and industries regarding potential future industrial uses of the site.
- To have in place by 30 June 2031 an agreement with relevant regulatory agencies and industry for the future industrial use of the site
- Should no future industrial use be identified, demolish and remove site surface infrastructure and rehabilitate to pasture (refer to closure criteria for pasture Section 8.1.1)
- The area is safe with minimal risk to the public, native fauna and livestock
- There is no adverse environmental effect outside the disturbed area and that the area is properly drained and protected from erosion.
- There is no residual soil contamination in the area,
- There is minimal risk to surface and groundwater quality
- Undertake water sampling (access pending) 5 years post closure.

8.4 Water Infrastructure

The following broad criteria have been developed for the closure and rehabilitation of water infrastructure assets

- 5 years prior to the completion of mining, commence consultation with local, state and federal authorities and industries regarding potential future uses of water management assets at the site.

- To have in place by 30 June 2031 an agreement with relevant regulatory agencies and local water authorities for the use of the major water infrastructure.
- Remediation of dams/contaminated sites so that they are fit for agricultural / conservation purposes.
- The area is safe with minimal risk to the public, native fauna and livestock
- There is no adverse environmental effect outside the disturbed area and that the area is properly drained and protected from erosion.
- There is no residual soil contamination in the area,
- There is minimal risk to surface and groundwater quality
- Water quality monitoring confirms stored water meets ANZECC (2018) guidelines for agricultural purposes (livestock drinking water, short- and long-term irrigation).
- Water sampling 5 years post closure

9. CADIA EAST OFFSET (BLACK ROCK RANGE, FLYERS CREEK & STRATTON VALE) LANDSCAPE

9.1 Introduction

In lieu of clearing remnant vegetation as part of the Cadia East project, a conservation offset has been approved. The majority of the offset area is located on Black Rock Range, which is approximately 11 km west of Cadia. The Black Rock Range offset area contains approximately 647 ha of remnant vegetation and approximately 162 ha of predominately cleared agricultural land, the latter of which will be revegetated. The agreed offset also includes a portion of land at the confluence of the Flyers Creek and the Belubula River and comprises 97 ha and a portion of 60 ha on the property 'Stratton Vale' with a history of clearing for agricultural purposes.

9.2 Locality

The following figures show the location of the offset areas within NSW (Figure 9-1) and relative to Cadia (Figure 9-2), a detailed aerial photo of the Black Rock Range Offset Area (

Figure 9-3) and a detailed aerial photo of the Flyers Creek and 'Stratton Vale' portions of the Cadia East Offset (

Figure 9-4). Deposited plan maps showing the formal surveyed lots are located in Appendix A – Deposited Plan Maps.

Figure 9-1: Site locality within NSW

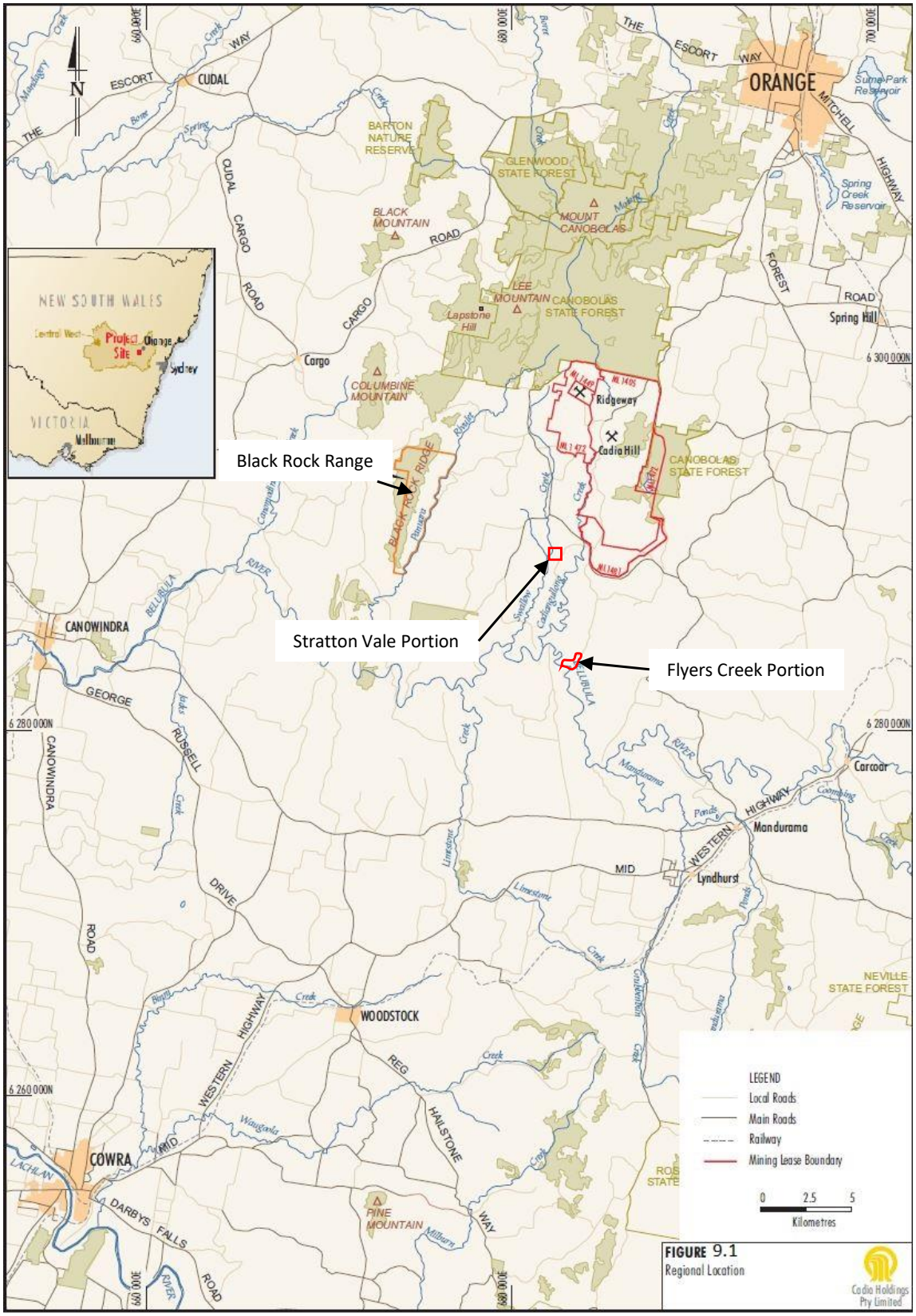


Figure 9-2: Offset proximity to Operations

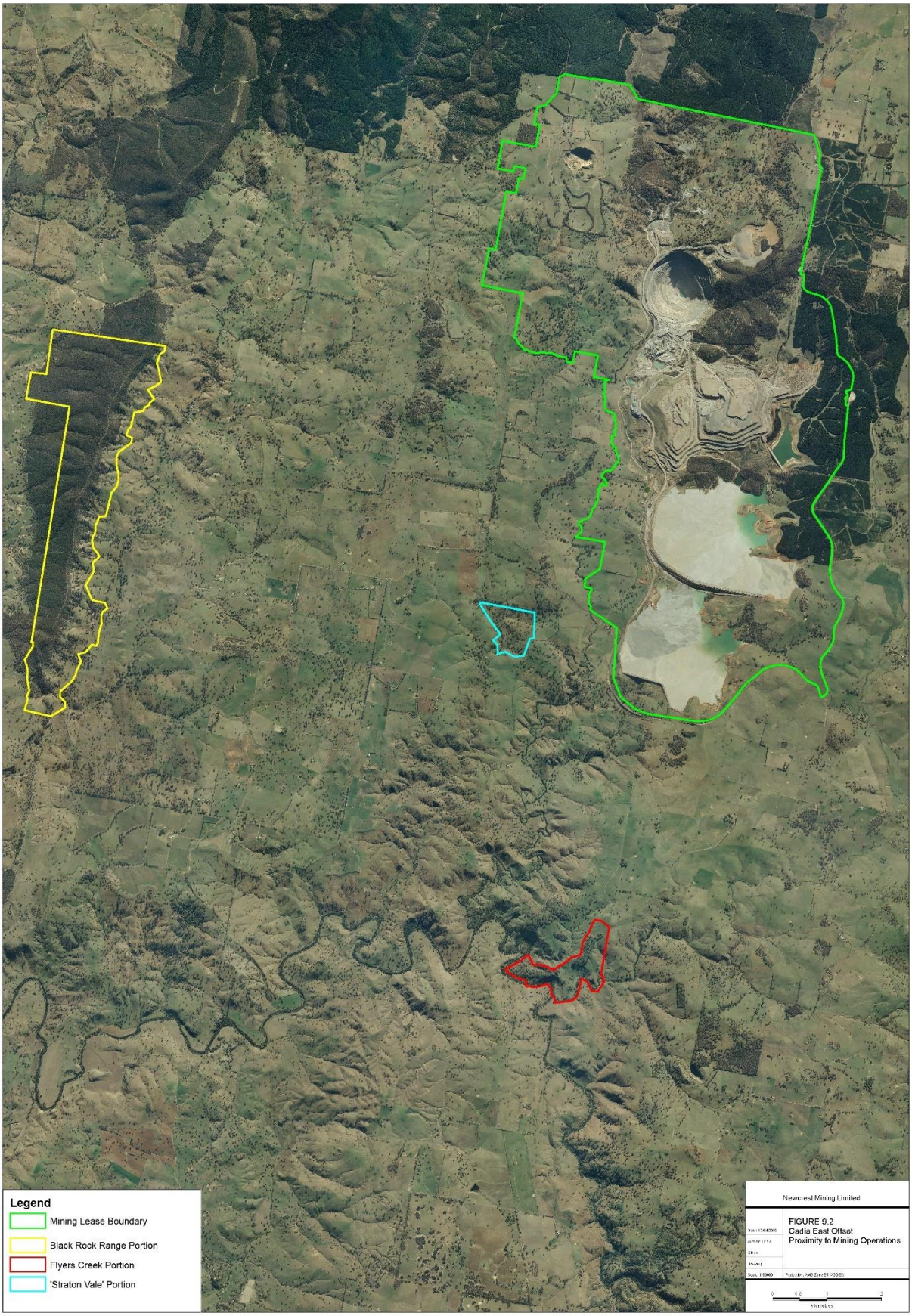


Figure 9-3: Black Rock Range offset area

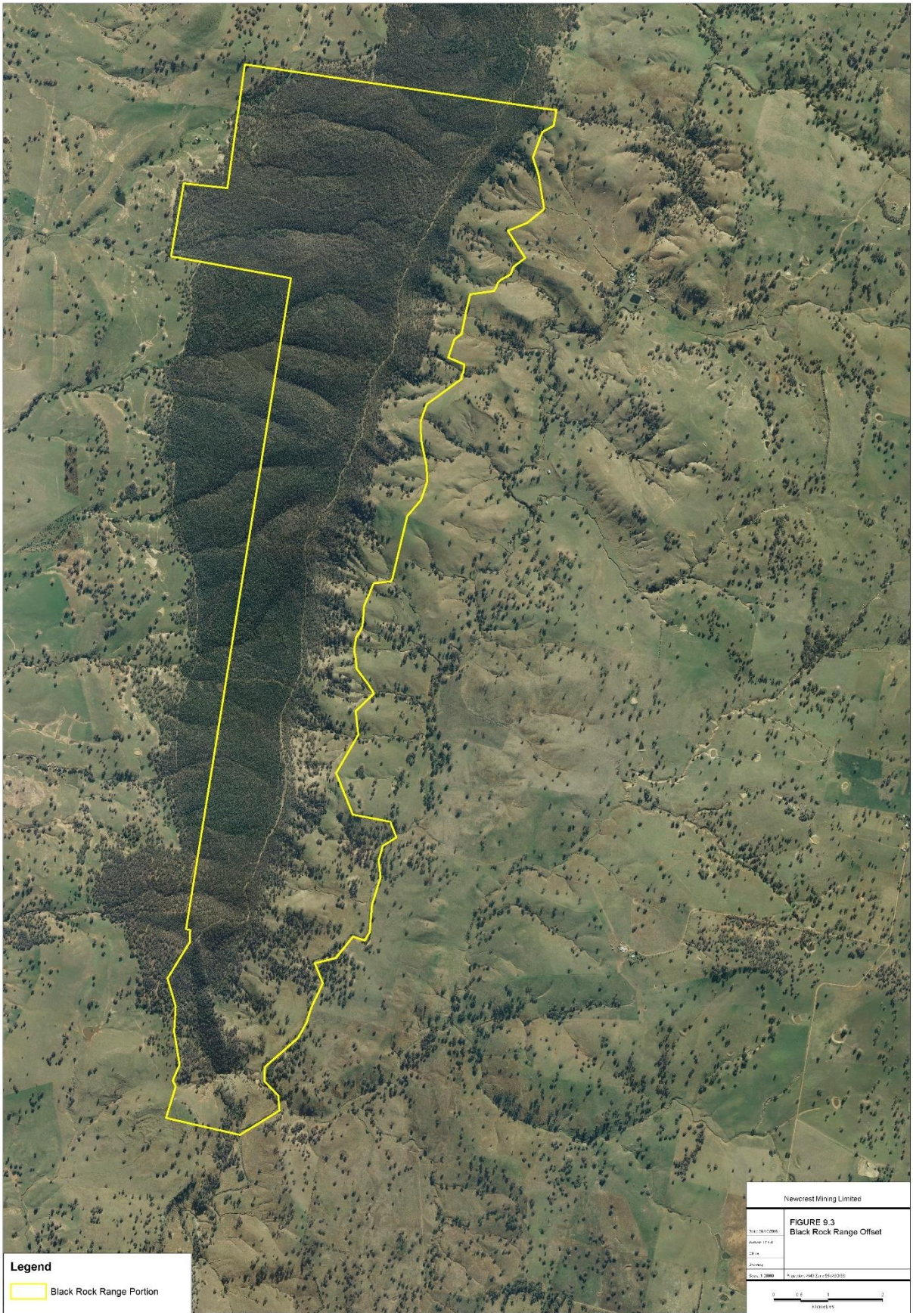


Figure 9-4: Flyers Creek and Stratton Vale offset areas

9.3 Background Information

The following section provides a general overview of the environmental context of the region surrounding Cadia and where appropriate specific to the conservation offset areas. The information has generally been sourced from the Cadia East Environmental Assessment (CHPL 2009) including associated studies.

9.3.1 Climate

Regional meteorological data are available from the Bureau of Meteorology (BoM) weather stations at Orange Agricultural Institute (BoM Station No. 063254), Orange Airport Comparison (BoM Station No. 063231) and the discontinued Blayney Post Office (BoM Station No. 063010).

Meteorological conditions are currently monitored at the Cadia at on-site meteorological stations within ML 1405 (Southern Lease Boundary (SLB) Station) and ML 1449 (Ridgeway Station).

9.3.1.1 Temperature

Regional temperatures are warmest from November to March and coolest from May to August. Average daily maximum temperatures peak in January with 26.2°C, (Orange Airport Comparison), while average daily minimum temperatures are lowest in July with 0.6°C, (Orange Airport Comparison).

9.3.1.2 Rainfall

The mean annual rainfall recorded at the Orange Airport Comparison site is 884mm / year, however this varies considerably with site-based weather stations where averages for SLB and Ridgeway stations are 593 and 659mm / year respectively. However the periods of records for SLB and Ridgeway Stations have coincided with a period where drought has been a feature of the climate

The months with the highest and lowest monthly average rainfalls at the SLB and Ridgeway Stations are February (71.4 mm and 83.3 mm) and April (25.7 mm and 24.6 mm), respectively.

9.3.1.3 Evaporation

Total mean annual evaporation based on Orange Agricultural Institute records was 1,461.0 mm per year. January (220.1 mm) had the highest monthly rates of evaporation while June (42.0 mm) had the lowest monthly rates.

9.3.1.4 Wind

Assessment of wind data indicates that at the Ridgeway Station, the most common winds are from the south-west and north-east. The area did not commonly experience low wind speeds with calm periods (i.e. winds less than or equal to 0.5 metres per second [m/s]) measured only 3.2% of the time.

At the SLB Station, the prevailing winds were generally from the north-eastern quadrant and from the west-southwest to the north-northwest. For the July 2007 to June 2008 period, this site recorded approximately 3.0% of calm periods (i.e. winds less than or equal to 0.5 m/s).

Annual average wind speeds for the SLB and Ridgeway Stations were 3.7 m/s and 3.5 m/s respectively for the July 2007 to June 2008 monitoring period.

9.3.2 Bushfire

The bushfire season experienced in the Cadia Valley area and Central West Region is generally from mid-November to mid-March.

Depending on factors such as weather, fuel loads (build-up of leaf litter and broken branches) and drought indices, this season can be extended from early September to late April.

CHPL-owned land, including conservation offset areas extends over four NSW Rural Fire Brigades brigade jurisdictions (i.e. Burnt Yards/Cadia, Panuara/Four Mile Creek, Springside and Cargo Brigades) which form part of the Canobolas Zone. CHPL operates the Cadia Emergency Response Team which provides emergency assistance to the NSW Rural Fire Brigade when required.

9.3.3 Physical environment

9.3.3.1 Landforms and Topography

The Orange region is located on the western side of the Great Dividing Range. Areas of higher elevation in the region include Mount Canobolas (1,396 m AHD) and Mount Towac (1,136 m AHD) located to the north of the Cadia Valley. In the Cadia Valley, elevations generally range from approximately 600 m AHD to 1,000 m AHD.

The region is predominantly characterised by gently undulating hills, cleared open grassland and vegetation consisting mainly of scattered paddock trees, with isolated patches of remnant woodland and shelterbelts. State Forests situated in the area include the Glenwood and Canobolas State Forests to the south-west of Orange.

9.3.3.2 Soils

The following soil types have been encountered in the area,

- alluvial soil;
- yellow podzolic;
- red podzolic;
- krasnozem;
- red earth;
- yellow earth;
- euchrozem;
- lithosol;
- yellow solodic soil.

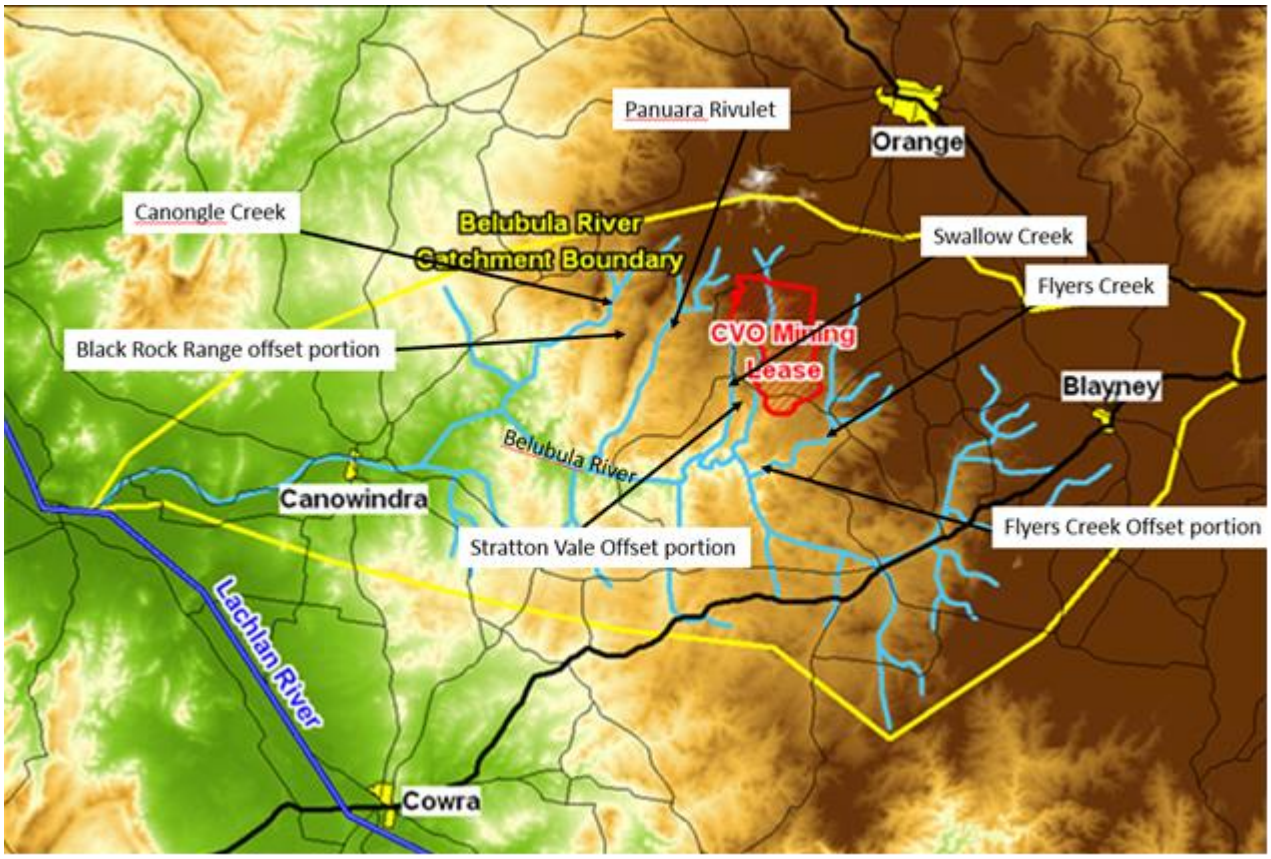
The following soil landscapes have been identified in the Cadia Valley Operations area:

- Borenore-Lyndhurst;
- Panuara;
- Quarry;
- Canobolas;
- Vittoria-Blayney; and
- Towac.

9.3.3.3 Hydrology

Conservation Offset areas have interaction with the surface water catchments of Flyers Creek, Swallow Creek, the Belubula River, Panuara Rivulet and Canongle Creek. These creek systems generally drain to the south into the Belubula River, which forms part of the Lachlan River catchment (Figure 9-5). At its confluence with the Lachlan River the Belubula drains a total catchment area of approximately 2,570 km2 and has an estimated mean annual flow of 97,400 ML. The Lachlan is a major inland river system in the NSW section of the Murray-Darling Basin.

Figure 9-5: Location of Cadia in Upper Lachlan Catchment



9.4 Baseline Information

The following is a brief summary of baseline features of conservation offset areas which is drawn from numerous studies leading to the Cadia East Project Approval and associated modifications. The relevant studies have been included as Appendices for future reference and include:

Appendix B	Black Rock Ridge Flora Assessment (Florasearch March 2006)
Appendix C	Flora and Fauna Habitat Survey of proposed changes to the Cadia Valley Operations Biodiversity Offset Areas (Florasearch April 2015)
Appendix D	Black Rock Range Vertebrate Fauna Survey (Western Research Institute March 2006)
Appendix E	An Assessment of the Bat Fauna at Black Rock Range, Cadia Valley NSW (Greg Richards & Associates (March 2006)

9.4.1 Flora and Fauna

9.4.1.1 Black Rock Range Portion

Flora

Five natural plant communities were defined on BRR, one of which had four distinct sub-communities. The following table provides a summary of the identified communities (corresponding maps are contained in Section 9.15).

Community Number	Common Names	Scientific Names	Landscape Position
1	White Box Woodland	*Eucalyptus albens*	Deep stony colluvial soils on upper slopes below the escarpment on the eastern side of the BRR and on deep sandy loam soils in the north western corner of the BRR Study Area on the footslopes of the range.
2	Yellow Box/Blakely's Red Gum Woodland	*E. melliodora/E. blakelyi*	Lower slopes and valleys on deep colluvial soils at the south end of the BRR and on colluvial/alluvial soils in the lower gullies and slopes draining to Panuara Creek. There is also a small occurrence in the north western corner of the BRR Study Area.
3	Red Stringybark/Red Box Forest	*E. macrorhyncha/E. polyanthemos*	This community occurs upslope of community 1 in the north west of the BRR Study Area on stony loam soils of moderate depth that may be wet for long periods in winter. It also occurs to the top of the BRR on the western side in the south.
4a	Red Stringybark/Bundy/Black Cypress Pine Forest	*E. macrorhyncha/E. goniocalyx/Callitris endlicheri*	This sub-community occurs on steep rocky slopes, often south or west facing, which afford some protection from the sun.
4b	Red Stringybark/Bundy/Black Cypress Pine/Rusty Spider Flower/Common Heath Myrtle Heathy Woodland	*E. macrorhyncha/E. goniocalyx/C. endlicheri / Grevillea floribunda / Calytrix tetragona*	Heathy woodlands are found on the upper western slopes and ridges of the BRR on shallow or skeletal soils, often where the sloping sandstone beds are exposed.
4c	Black Cypress Pine	*C. endlicheri*	Black Cypress Pine may form almost pure stands over relatively large areas on the upper slopes and ridgetops in the central and southern parts of the range.
4d	Currawang	*Acacia doratoxylon*	Currawang occurs in pure stands on slopes and ridges in the central parts of the range.
5	Gully Forest	Mixed Eucalyptus species	This community is characteristic of the lower ends of watercourses in the deeper gullies draining the western side of the BRR.
6	Cleared land	Many introduced and native species of grasses and herbs with scattered native trees.	Between the BRR and the Panuara Rivulet.

The 2006 vegetation survey recorded 312 vascular plant species on the study area, of which 223 are native (71.5%) and 89 introduced (28.5%). A complete list of recorded plant species is given according to vegetation community and sub-community in Appendix B.

The most prominent native plant families represented on the study area were the Daisies (Asteraceae) – 28 species, the Grasses (Poaceae) – 23 species, the Orchids (Orchidaceae) – 22 species, the Pea Flowers (Faboideae) – 11 species and the Eucalypts and allies (Myrtaceae) - 11 species.

The dominant families of introduced species were the Grasses (Poaceae) – 23 species, the Daisies (Asteraceae) – 14 species, the Pea Flowers (Faboideae) – 12 species and the Chickweeds and relatives (Caryophyllaceae) – 8 species. Introduced species were most prominent in communities dominated by White Box and Yellow Box on deep fertile soils at the margins of BRR, and were least evident in communities dominated by Red Stringybark, Bundy and Black Cypress Pine on low fertility skeletal soils on the upper slopes and ridges of BRR. 4 introduced species are declared noxious in the Cabonne Council area and have specific control requirements; namely Blackberry (*Rubus fruticosus* agg. spp.), St. John's Wort (*Hypericum perforatum*), Serrated Tussock (*Nassella trichotoma)* and Sweet Briar (*Rosa rubiginosa*)

No species listed as threatened under the NSW Threatened Species Conservation Act, 1995 or the Commonwealth Environment Protection and Biodiversity Conservation Act, 1999 were found during the surveys. Nor were any species listed as Rare or Poorly Known in Rare or Threatened Australian Plants (ROTAP) (Briggs and Leigh, 1995) identified.

The White Box, Yellow Box, Blakely's Red Gum Woodland EEC listed under the NSW TSC Act occurs within the BRR Study Area. This community is equivalent to the listed Grassy White Box Woodlands, together with the nominated Yellow Box/Red Gum Grassy Woodlands under the Commonwealth EPBC Act. This EEC is represented in the BRR Study Area by vegetation communities 1 and 2, which occur at the margins of the core wooded areas of BRR and as semi-cleared remnants in the agricultural land between BRR and the Panuara Rivulet. (Refer to Section 9.15)

The condition of the vegetation varies across the study area. In general, vegetation condition in the communities of the densely wooded parts of BRR is good to very good, despite the effects of the 1985 wildfire and high levels of macropod grazing. Patches of remnant vegetation in the heavily grazed agricultural areas are generally in poor condition due to dominance by weeds in the understorey, although tree health is good.

Fauna

A total of 138 species were identified in the 2006 survey of Black Rock Range including 129 native and 9 introduced species. A fully copy if the survey results is contained in Appendix D and E

Black Rock Range Study Area	
Amphibians	6
Reptiles	20
Birds	82
Mammals	10
Mammals (bats)	11
Introduced	7
Totals	125

Six threatened species were identified during the survey including:

Scientific Name	Common Name	Conservation Status	
		TSA	EPBC
Varanus rosenbergi	Heath Monitor	V	
Pyrrholaemus sagittatus	Speckled Warbler	V	
Climacteris picumnus	Brown Tree Creeper	V	
Stagonopleura guttata	Diamond Fire-tail Finch	V	
Polytelis swainsonii	Superb Parrot	V	V
Ninox connivens	Barking Owl	V	
Saccolaimus flaviventris	Yellow-bellied Sheathtail Bat	V	
Miniopterus schreibersii	the Large Bentwing Bat	V	

Nine introduced species were identified during the 2006 survey including:

- Common Blackbird,
- Common Starling,
- House Mouse,
- Fox,
- Cat,
- Rabbit,
- Brown Hare,
- Dog,
- House Sparrow,
- Common Myna
- European Cow

Habitat assessment indicated that forest/woodland types found in the study area had medium conservation value with some loss of resilience and mid to low levels of disturbance. Under current management practice (no grazing and little disturbance), the dynamics are towards an overall increase in conservation value. In a landscape context, the 1985 fire created a successional mosaic that in a pre-European context would have been balanced by greater areas of unburnt mature age communities elsewhere in the landscape. This 'balance' no longer exists. Hence in the current agricultural context, hot wild fire can be a degrading factor and lead to local loss of species diversity. Vegetation layers ranged from 7 (litter, rock, log, grass-herb, shrub, mid canopy, and mature tree canopy in a range of configurations from sparse to dense) through to bare ground. The habitat values are further modified by aspect, slope, soil depth, and terrain (e.g. drainage line). Little dieback was evident, weed invasion other than in the western box woodlands was relatively light. Stags without hollows were relatively common.

The unburnt woodlands were located either on the western slope near the ridge between the ridge fire trail and the escarpment, or on the eastern slopes. These ranged from woodland formation with dominants spaced at 20-40 m intervals through to open woodland or cleared areas with remnant scattered old growth trees 50 - 200 m apart. Hollows were

relatively common in these woodlands and were the major contributing factor to the presence of a much greater density of arboreal fauna in these woodlands compared to the expanse of hollow-limited mosaic communities on the greater proportion of the western slopes. Grazed areas, with their very modified understorey and continuing stock access, had diminished habitat value. Unburnt communities were assessed as reasonable examples of intact communities. However this assertion is not necessarily reflected in the vertebrate species diversity, given their relatively small areas. Rather, the overall habitat value of this landscape is very likely dependant on the structural and floristic variability within the landscape.

The sandstone escarpment offers very specialised habitats, with its array of ledges, small caves, nooks and crannies, vine-clad sections, protection from predators, cliff-base undercuts and a rocky basal platform protruding 2-20 m from the cliff face. This is further enhanced by mostly intact vegetation communities to east and west of the escarpment.

9.4.1.2 Stratton Vale Portion

Flora

The vegetation of the Stratton Vale Offset portion comprises four vegetation communities:

- Yellow Box Woodland;
- White Box Woodland;
- Derived Grassland; and
- Exotic Grassland.

The original woodland vegetation on Stratton Vale has been thinned historically and now comprises mostly widely spaced trees separated by grassland dominated by exotic grasses and legumes. Some large areas of derived native grassland also occur. These are dominated by grazing-tolerant native species including Speargrass (*Austrostipa scabra*) on dry north-facing slopes and Red Grass (*Bothriochloa macra*) on south-facing slopes.

A total of 69 flora species were identified during April 2015 surveys comprising twenty three native (33.3%) and 46 introduced (66.7%) species. The results showed the presence of low numbers of native species and that introduced species greatly predominated.

Three introduced species are declared noxious weeds under the NSW Noxious Weeds Act, 1993 for the Upper Macquarie County Council Area and occur within the offset area including:

- Bathurst Burr (*Xanthium spinosum*);
- Blackberry (*Rubus fruticosus* agg. spp); and
- St. John's Wort (*Hypericum perforatum*).

All noxious weeds occurred only in low numbers indicating they have been well controlled.

Vegetation condition assessments concluded that that the vegetation was in relatively poor condition. The groundcover was in low condition with greater than 50% cover by exotic species. Despite this, the area does contain important features including groundcover containing native grasses/herbs/forbs, trees with hollows, fallen logs and a native overstory.

No threatened flora species were identified during the survey.

The vegetation assessment concluded that all Box-Gum Woodland remnants within the survey area conformed to the TSC Act EEC guidelines, but none conform to the EPBC Act CEEC guidelines owing to the very poor condition of the ground cover

The proposed Stratton Vale offset portion has relatively high fauna habitat values for the following reasons:

- Many of the remnant trees at Stratton Vale are very large and clearly pre-date European settlement. One tree hosts the nest of a Little Eagle (*Hieraaetus morphnoides*), listed as Vulnerable under the TSC Act. In addition, many of the White Box trees have hollows suitable for parrots and a nesting population of the Vulnerable Superb Parrot (*Polytelis swainsonii*) is present on and around the investigation area.
- While the groundcover is generally dominated by exotic species, there is a good representation of native perennial grasses, potentially providing habitat for granivorous birds favouring native grass seed, such as finches and the Superb Parrot.
- However, the Stratton Vale offset portion is lacking in tall and low shrubs that would provide cover and nesting habitat for many birds including finches, babblers, thornbills and others.
- There are limited opportunities for most reptiles owing to very dense exotic grass cover over much of the area and relatively few logs on the ground. However, areas of surface rock on ridges and rock outcrops along Swallow Creek provide reptile habitat.
- Swallow Creek provides water for wildlife and habitat for aquatic fauna.

9.4.1.3 Flyers Creek / Belubula River Portion

The Flyers Creek / Belubula River offset portion comprises 97 Hectares, of which approximately 23 Hectares meets the criteria for the NSW listed Box-Gum Woodland EEC and the Commonwealth listed Box-Gum Grassy Woodlands and Derived Native Grasslands CEEC. The offset area also includes frontage to approximately 600m of the Belubula River and 1370m to Flyers Creek (Figure 9-6).

Figure 9-6 Vegetation communities and locations within the Flyers Creek offset portion

Flora

Figure 9-6 shows the vegetation communities and locations within the Flyers Creek offset portion.

BioMetric data on vegetation condition in the Belubula River/Flyers Creek area indicated that the River Oak Forest and immediately adjacent Yellow Box Woodland were both in poor condition with their ground cover in 'low' condition owing to a high dominance of exotic species. Further away from riparian areas, in areas formally identified as EEC, the condition of the Yellow Box Woodland improves with a higher incidence of native grasses, herbs and forbs.

No threatened flora species were identified in the existing Belubula River/Flyers Creek offset area

Fauna

Fauna habitat value for offset area is relatively low for the following reasons:

The eucalypt canopy has been thinned. Nevertheless, the remaining canopy provides habitat for a range of open woodland bird species and foraging opportunities for possums and gliders. The often dense River Oak canopy in riparian areas provides shelter for a variety of bird species, especially those associated with aquatic habitats.

The open grassland areas dominated by exotic species have limited habitat value, except for macropods, granivorous birds such as finches and common insectivorous birds adapted to grasslands such as Yellow-tailed Thornbills and Magpies.

There are limited opportunities for reptiles with few logs on the ground or surface rocks for habitat.

The area contains old growth trees with hollows suitable for a variety of wildlife, but they are scattered in a cleared landscape with limited habitat available to denning or nesting species that depend on woodlands and forests. The area lacks patches of dense shrub cover required by some bird species for nesting and foraging.

9.5 Desired Outcome

The broad desired outcome of the management of the conservation offset portions is to improve the overall ecological health, value and connectivity of these areas. Focus and priority will be given to Endangered Ecological Community areas to return them to a condition that is equivalent or better than local reference site condition. The following broad objectives will be applied to all three offset portions:

- Overall, offset condition is equivalent or better than local reference site condition.
- Improving the health of native vegetation:
  - Revegetation of cleared areas.
  - Progressively reduce the prominence of introduced species and replace with locally occurring native species.
  - Encourage natural resilience, regeneration and recruitment processes.
  - Provide a range of habitat resources for native fauna.
- Improving the structural diversity
  - Provide a range of vegetation age classes.
  - Conserve vegetation strata within remnant areas.
  - Revegetation of cleared areas targeting the replacement of understory, mid story and over story species.
- Improving the species diversity
  - Conserve / manage vegetation diversity within remnant areas.
  - Revegetation of cleared areas targeting the replacement of a range of locally occurring native species from understory, mid story and over story classes.
- The active management of threatening processes including:
  - Grazing.
  - Clearing (removal of old, large habitat trees)
  - Removal of firewood / bushrock
  - Bushfire.
  - Unauthorised access.
- Increasing connectivity between remnant / offset areas:
  - Establish a series of patches / corridors to progressively link remnant / offset areas (addressed in Section 3.10)
- Provide for long term conservation:
  - Local government zoning.
  - Voluntary Planning Agreement.

While particular focus will be on the management of Endangered Ecological Communities, the above measures will generally and progressively apply to all areas within the offset portions.

9.6 Long Term Security of Offset Areas

This section outlines the efforts taken by CVO to secure biodiversity offset areas to meet obligations under approvals issued in accordance with the Environmental Protection and Biodiversity Conservation Act (Commonwealth) and the Planning and Assessment Act (NSW).

Securing conservation/biodiversity offsets is a requirement of condition 39, Schedule 3 of the NSW Project Approval (06_0295) dated 6 January 2010 and condition 1 of the Approval granted under the Commonwealth Environment Protection and Biodiversity Conservation Act, 1999 (EPBC 2006/3196) on 18 February 2010.

Condition 39 (Schedule 3) of PA 06_0295 reads:

39. Within 2 years of the date of this approval, the Proponent shall make suitable arrangements to provide appropriate long term security for the offset areas to the satisfaction of the Secretary.

Condition 1 of the EPBC approval 2006/3196 reads:

1. The person taking the action must prepare a plan to offset the loss of 23 ha of the White Box-Yellow Box-Blakely's Red Gum grassy woodland and derived native grassland ecological community.

The plan must include:

- *The desired outcomes of implementing the plan;*
- *The short (12 months from the date of the approval), medium (five years from the date of the approval) and long term measures that will be employed to implement the plan;*
- *Details of how the person taking the action will provide for the long term security of the offset areas and details of the timing of when this will occur;*
- *Detailed performance and completion criteria for the implementation of the plan, including details of methods to rehabilitate areas of the ecological community, and methods to control weeds, feral animals, grazing, access and bushfires;*

The plan must be submitted to the Minister within 18 months of the date of this approval and prior to any subsidence impacts on the White Box-Yellow Box-Blakely's Red Gum grassy woodland and derived native grassland ecological community. The plan must be approved by the Minister and the approved plan must be implemented.

(Note: The third dot point above is highlighted in red as it relates specifically to this section.)

The Plan (LBMP) was submitted to the Department of Environment, Water Heritage and the Arts and NSW Department of Planning on 30 June 2011.

The June 2011 LBMP presented — in the form of an "Action Plan" — the following details (among others) in respect of the long term security of the offset areas:

- within one year of approval of the June 2011 LBMP, CHPL will take the following action:

  Liaise with Cabonne Council and Blayney Shire Council regarding the re-zoning of Offset areas for conservation. Initiate process for rezoning. Consideration will be given to re-zoning as Zone E2 Environmental – Conservation or Zone E3 Environmental Management in liaison with Councils.

The "Performance measure" indicated for this action is stated to be:

Area re-zoned by the 6th of January 2012;

- within one year of approval of the June 2011 LBMP, CHPL will take the following action:

  Investigate options (such as voluntary conservation agreements, covenant etc) for the long term conservation (in perpetuity) of offset areas.

  The "Performance measure" indicated for this action is stated to be:

  Preferred option selected and implemented by the 6th of January 2012

- within one year of approval of the June 2011 LBMP, CHPL will take the following action:

  To ensure implementation of the plan, a security deposit will be lodged with I&I NSW.

  The "Performance measure" indicated for this action is stated to be:

  Security lodged within 6 months of approval of Land and Biodiversity Management Plan (Landscape Management Plan).

Measures taken since 2011 to implement these actions are addressed below.

The Department of Sustainability, Environment, Water, Population and Communities (DSEWP&C) wrote to CVO on 9 September 2011 expressing concerns regarding the details for the long-term security of the offset areas.

CVO replied to DSEWP&C on 23 September 2011 regarding its proposal to secure the required offset in part through use of a Voluntary Planning Agreement. CVO was advised that this met the requirements of DSEWP&C pending approval from NSW Department of Planning Infrastructure.

On 4 January 2012 CVO wrote to NSW Department of Planning and Infrastructure outlining its proposal to secure the offset required by condition 39 of the Project Approval.

On 9 March 2012 CVO advised the DOP by email of the reasoning behind the use of the VPA according to legal advice dated 24 February 2012 from Blake Dawson (now Ashurst Australia).

A VPA was considered in 2012 to be an appropriate mechanism to secure the biodiversity offset for the following reasons:

- the legal status and operation of a VPA is clear under the Environmental Planning & Assessment Act 1979 (EP&A Act);
- it has the ability to ensure the long-term protection of the offset through a number of different mechanisms including registration of the VPA on title and the use of terms requiring the registration of positive covenants;
- it is a NSW mechanism for securing biodiversity offsets which is accepted by the Federal Department of Sustainability, Environment, Water, Population and Communities (SEWPAC)
- notification requirements provide enhanced public accountability; and
- there has been considerable time, effort and expense already incurred in preparing the draft VPA.

9.7 Benefits of Using VPA to Secure Biodiversity Offsets

Benefits for using a VPA are considered to be:

- Legal status and operation of VPA
- Provision of long-term security
- VPA allows for dedication of lands
- Recognition and use by Department of Planning and Environment
- Approval of VPAs by the Federal Minister and Department of Environment and Energy (DE&E)
- Public accountability

These benefits are outlined below:

9.7.1 Legal status and operation of VPA

A VPA is a mechanism created under the EP&A Act which may be used for securing biodiversity offsets. It is a voluntary agreement between a planning authority and a developer under which a developer agrees to provide a material public benefit to be used for or applied for a public purpose. Relevantly a public benefit includes the conservation or enhancement of the natural environment.

One benefit of a VPA is that its legal status in the planning system is clear and there are statutory controls in relation to its content. For example, a VPA is required to provide the following information:

- the time by which the provision is to be made;
- the manner by which the provision is to be made;
- a mechanism for the resolution of disputes under the agreement; and
- the enforcement of the agreement by a suitable means in the event of a breach of the agreement by the developer.

These statutory requirements ensure that VPAs are clear in their operation and ensure the VPA fulfils the purpose for which it was created.

9.7.2 Provision of long-term security

The EP&A Act provides that a VPA can be registered on title so that it becomes binding on and enforceable against subsequent owners of the land as if each owner had entered into the VPA:

Section 93H of the Act is an important feature in the long-term protection of an offset as it ensures that even if the land the subject of the offset is sold the land is still subject to the requirements of the VPA. We note that the draft VPA we prepared provides for registration of the VPA on title.

Another benefit of a VPA is that it can be used together with other legal mechanisms to provide additional protection to the offset. For example, the draft VPA we prepared requires that a section 88E instrument under the Conveyancing Act 1919 be registered prior to the transfer of the Offset Areas which will restrict the use of the Offset Areas for conservation purposes only.

VPAs also offer the flexibility to include terms that further ensure the long-term protection of the offset area. For example, the draft VPA we prepared includes a clause stating that

the landowner will not transfer the Offset Areas without the written permission of the Minister. Further, it also sets out a mechanism for CHPL and the Minister to agree on a transferee within 12 months of mine closure. In the event that agreement cannot be reached the VPA provides that the Minister is to nominate the transferee. This ensures that the transferee is suitable and acceptable to the Minister.

The benefits of a covenant are that there is a strong legal framework to enforce conditions. For example the Minister can undertake the work required to be undertaken by the landowner and then recover costs; the Minister can seek a judgment and register a charge over the land, or have the land conveyed or transferred to the Minister; and the Minister can seek an injunction to prevent or rectify a breach and can obtain damages: Conveyancing Act 1919 sections 88F, 88H and 881.

9.7.3 VPA allows for dedication of lands

During the life of the Cadia East Project, CVO will actively manage the Offset Areas in accordance with the Landscape Management Plan and the Approval. However, after closure of the mine it is sensible that the Offset Areas be transferred to an appropriate party to act as the custodian of the Offset Areas.

A VPA allows for the dedication of the Offset Areas to be provided in the agreement itself, which is not the case for a Conservation Agreement for example.

9.7.4 Recognition and use by Department of Planning and Environment

The Department of Planning and Environment is party to a number of VPAs and is familiar with their negotiation and operation. Accordingly, in our view, the use of a VPA where the Department of Planning and Environment is a party results in a more efficient process for all involved.

9.7.5 Approval of VPAs by the Federal Minister and DE&E

The use of VPAs to secure biodiversity offsets required for projects in NSW is recognised by the Federal Minister and Department of Environment and Energy. For example, in the Federal Minister's approval for the Duralie Coal Extension Project, which he granted on 22 December 2010, a VPA was only one of the three mechanisms which he stipulated would be satisfactory for securing protection of a required offset area. The Federal Minister stipulated this in condition 16 of his approval. It states:

16. Within one year of the commencement of the action, the person taking the action must demonstrate in writing to the satisfaction of the Minister that a conservation covenant or similar instrument has been registered on the title/s of land containing the offset area required in Condition 12. This must provide for the protection of this offset area in perpetuity through one of the following means:

- *a Conservation Agreement under s 69 of the National Parks and Wildlife Act 1974 (NSW),*
- *placing a restrictive or public positive covenant over the offset land under s 888-E of the Conveyancing Act 1919 (NSW), or*
- *a Planning Agreement under s 93F(1l of the Environmental Planning and Assessment Act 1979 (NSW)*

9.7.6 Public accountability

A VPA increases public accountability as it cannot be entered into, or amended or revoked, unless public notice has been given of the proposed agreement, amendment or revocation

and a copy of the proposed agreement, amendment or revocation has been made available for inspection by the public for a period of not less than 28 days: s 93G.

Further, a planning authority proposing to enter into a VPA, or an agreement that revokes or amends a VPA, must prepare a written statement (explanatory note) that:

- summarises the objectives, nature and effect of the proposed agreement, amendment or revocation; and
- contains an assessment of the merits of the proposed agreement, amendment or revocation, including the impact (positive or negative) on the public or any relevant section of the public.

The explanatory note must be prepared jointly with the other parties proposing to enter into the VPA. A copy of the explanatory note must be exhibited with the copy of the proposed agreement, amendment or revocation when it is made available for inspection by the public.

The Black Rock range area was zoned E2 Environmental Conservation with 18 January 2013 commencement of the Cabonne Local Environmental Plan 2012

CVO received advice from DP&I on 5 June 2013 that the VPA was considered to be an appropriate means for securing the offset area where it was stated that “I see no reason why this should not be an appropriate mechanism for securing the offsets for the Cadia East Project.”

On 21 May 2013 DSEWP&C advised CVO that details and mechanisms for securing the long-term protection of the offset areas still remained unresolved/

CVO in response by letter dated 14 June 2013 advised DSEWP&C that it had become aware of discrepancies in areas of the offset areas as proposed in the offset plan.

CVO advised DoE on 14 June 2013 of progress with securing the offset and that the LBMP as posted on the Cadia Valley website was considered appropriate for reconsideration for the purposes of the EPBC approval.

On 14 March 2014 the Commonwealth Department of Environment (DoE) wrote to CVO alleging a breach of condition of 1 attached to the EPBC approval 2006/3196.

CVO responded on 7 April 2014 with the view that CVO had not contravened Condition 1 of the EPBC Approval, citing correspondence referenced above.

A security deposit was lodged with the Department of Planning on 14 May 2014 as required by condition 40, schedule 3 of the Project Approval (PA 06_0295).

An application to modify the Project Approval was lodged with DPE on 25 May 2015. The DoP assessment report on the application stated that:

In finalising in-perpetuity security arrangements for the biodiversity offset strategy CVO become aware that some small land parcels within the Black Rock Range and Belubula River/Flyers Creek offset areas are not able to be secured as planned due to a number of cadastral issues.

The modification proposed approximately:

- 14.2 ha being removed from the Belubula River/Flyers Creek offset area;
- 16.5 ha being removed from the Black Rock Range offset area; and
- 60.7 ha being added to the offset strategy from Cadia's 'Stratton Vale' property

The modification was approved on 4 August 2015 which adjusted the offset areas as follows:

Table 14: Biodiversity Offset Strategy

Area	Minimum Size*
Black Rock Range Offset Area – Enhancement Area	647 ha
Black Rock Range Offset Area – Revegetation Area	162 ha
Flyers Creek and Belubula River Offset Area	97 ha
Stratton Vale Offset Area	60 ha
Total	**966 ha**

**Subject to final survey constraints*

The Black Rock Range land (lot 21) was formally acquired on 26 April 2016. All offset areas are under the ownership of Contango Agricultural Company which is a related body corporate to Cadia Holding Pty Limited.

The Department of the Environment and Energy was advised of the modification in the Annual Report dated 19 May 2016.

In May 2016 CVO arranged for surveys of the other offset areas to be undertaken. Survey for the 'Stratton Vale' area was completed in August 2016. Record winter rainfalls have delayed surveys of the Belubula River frontage area for the Flyers Creek offset area. The subdivision plans for Black Rock range (lot 21 DP 1204782) and Stratton Vale (subdivision of are attached. The subdivision plan for the Belubula and Flyer Rivers offset area in the subdivision of lot 1422 DP 1168271 as generally indicated in the project approval will be attached once completed.

Once the plans of subdivision are finalised applications will be made to the relevant council to progress the E2 zoning for the 'Stratton Vale' and Belubula River/Flyers Creek offset areas, consistent with the zoning of the BRR area and for the VPA to progress through the NSW Department of Planning and Environment.

9.7.7 Proposed Actions

Action	Estimated timetable*
Completion of survey of the Flyers Creek and Belubula River offset area that meets the area requirements of Table 14 Cadia East Project Approval (06_0295).	November 2016
Subdivision Certificate Blayney Council	December 2016
Subdivision plan registration NSW LPI	February- March 2017
Resubmission of the updated VPA to the Department of Planning and Environment to incorporate the Stratton Vale offset area and include finalised survey plans	Resubmission of updated VPA to DP&E: November 2016 The final VPA was returned to DoPE on the 8 March 2018 including a draft explanatory note for public exhibition.

Action	Estimated timetable*
Submission of Flyers Creek and Stratton Vale offset areas following subdivision plan finalisation of these two areas to Blayney Council for rezoning consideration to Zone E2 Environmental Conservation.	March 2017

** Timeframes are subject to procedures by various agencies and as such are estimates only*

Correspondence between Cadia Valley Operations and the Federal Department of the Environment and Energy relating to the establishment of the Voluntary Planning Agreement and compliance with the federal project approval conditions are located in Appendix F

9.8 Conservation Bond

Schedule 3, Condition 40 of the Cadia East Project Approval requires that a conservation bond be lodged with the Department of Planning and Environment. A detailed and costed conservation estimate was submitted to the Department on 3 September 2013 and was subsequently accepted (email dated 29 November 2013). The bond dated 14 May 2014 provides for the full cost of management and restoration of offset areas over the life of the project.

9.9 Roles and Responsibilities

The following roles and responsibilities relate to the management of conservation offset areas and the implementation of this management plan.

Role	Responsibility
CVO General Manager	Compliance with project approval and EPBC requirements. Overall implementation of the Land and Biodiversity Management Plan. Ensure sufficient resources are allocated for the implementation of this plan
Manager – Health, Safety, Environment, Social Responsibility and Assurance (HSESRA)	High level endorsement of budgets, schedules and works. High level tracking of compliance with the Land and Biodiversity Management Plan. Internal approval of the Land and Biodiversity Management Plan. Escalate any risks of non-compliance. Ensure sufficient resources are allocated for the implementation of this plan Approve monitoring results / reports for publishing
Superintendent – Community Relations and Approvals	Facilitate / arrange and required project modifications. Arrange any formal compliance audits. Arrange long term security of offset areas. Escalate any risks of non-compliance
Superintendent – Environment	Approval of budgets, schedules and works. Periodically review compliance with the Land and Biodiversity Management Plan. Review and update of the Land and Biodiversity Management Plan. Escalate any risks of non-compliance Review and approve monitoring results and reports
Environmental Scientist (Land and Biodiversity (L&B))	Planning, Scheduling, costing and implementing the Land and Biodiversity Management Plan. Supervision of field works. Conducting field monitoring and recording of actions and progress against the Land and Biodiversity Management Plan. Reporting as required by the Land and Biodiversity Management Plan. Escalate any risks of non-compliance
Contractors	Undertake field-based works in accordance with directions provided and in accordance with the Land and Biodiversity Management Plan.

9.10 Action Plans

The following section provides a series of specific action plans for key operational aspects relating to the offset areas including:

1. Revegetation of cleared / grazed / riparian areas	**2. Management of remnant vegetation**
3. Bushfire Management	**4. Weed management**
5. Pest management	**6. Fauna Management**
7. Unauthorised access (including livestock grazing)	**8. Erosion**
9. European / Aboriginal Heritage	**10. Resource salvage**

The action plans:

- Outline the current state and the future desired state for each management aspect.
- Provide specific and measurable management actions, responsibilities and timeframes.
- Identifies performance measures and how the delivery of the plan will be monitored and reported.
- Provides a risk assessment for each management aspect, identifies corrective actions, contingencies, responsibilities and timing. (Refer to risk matrix – Section 4.1)

- Assesses a range of possible contingencies based on a 'worst case scenario' and justifies the preferred option to achieve the desired outcome (assessment matrix embedded in action tables).

9.10.1 Clarification of timing

Annual	Action to occur on an annual basis
1 year	Action to be undertaken within 1 year of the approval of the plan (approved by both the NSW Department of Planning and Environment and the Federal Department of the Environment and Energy)*.
2-5 years	Action to be undertaken within 2-5years of the approval of the plan (approved by both the NSW Department of Planning and Environment and the Federal Department of the Environment and Energy)*.
5-10 years	Action to be undertaken within 5-10 years of the approval of the plan (approved by both the NSW Department of Planning and Environment and the Federal Department of the Environment and Energy)*.
* Refer to 'Document Status and History" located inside the cover of this plan.	
# signifies a recurring action as per the specified frequency in the action plan.	

9.10.2 Acronyms

BRR = Black Rock Range

FC = Flyers Creek Portion

SV = Stratton Vale Portion

9.10.3 Annual reporting requirements

EPBC Annual Report (due before 22 May each year)

NSW Project Approval (AEMR) (nominally due before 31 October each year)

9.10.4 Management Aspect 1

Management Aspect: 1. Revegetation of cleared / grazed / riparian areas								
Current Situation Areas cleared for agricultural purposes are present within each conservation offset portion including the eastern portions of Black Rock Range and all of the Flyers Creek and Stratton Vale areas. These open areas have (in places) remnant canopy trees, an absent mid / shrub story and a highly disturbed understory dominated by introduced grasses and weeds.	**Desired Outcome** Areas of EEC are protected, enhanced and expanded (revegetation of suitable areas to an EEC woodland community) Areas are rehabilitated with locally occurring native species, suitable to the soil type, aspect and topography (through either direct seeding or tubestock planting) to reinstate species and structural diversity. Areas are similar (or are evolving towards) identified reference sites comprising the best local example of the same vegetation type.							
Management Actions / Schedule	**Applies to**			**Responsibility / Timing**				
	BRR	**FC**	**SV**	**Responsibility**	**Annual**	**1 year**	**2-5 years**	**5-10 years**
Assess and document the resilience of offset areas and the potential for natural regeneration. Areas assessed with high resilience are left to naturally regenerate, observed and monitored for response.	X	X	X	Environmental Scientist (L&B)				X
Implement an annual schedule of direct seeding and Tubestock planting (season dependent). Refer to section 9.15 for further explanation, species lists, methodology etc) Nominally >2000 tubestock planted or > 5ha direct seeded per year (season dependent)	X	X	X	Environmental Scientist (L&B)	X			
Implement a native seed collection program, to collect seed for future revegetation programs. Seed to be collected from within 20 kilometres of the Cadia mine lease boundary. Maintain a seed store database	X	X	X	Environmental Scientist (L&B)	X			
Annual inspection of tubestock success / seedling density	X	X	X	Environmental Scientist (L&B)	X			
Independent (consultant) annual assessment (representative sites) of revegetation success against reference site condition. refer to Section 8.1 for further explanation	X	X	X	Environmental Scientist (L&B)	X			
Fertilisers will not be used in any offset revegetation programmes	X	X	X	Environmental Scientist (L&B)	X			
# signifies a recurring action as per the specified frequency in the action plan.								

Management Aspect (Continued): 1. Revegetation of cleared / grazed / riparian areas

Performance Measures	Monitoring
- Demonstrated progression towards reference site condition (refer to Section 9.11). >2000 tubestock planted per reporting period (23 Feb to 22 Feb) (season dependent) or >5ha direct seeded per reporting period (23 Feb to 22 Feb) (season dependent) -Seed collection contract (active agreement / purchase order) in place each season. >50% tubestock survival rate after 1 year >3 direct seeded shrubs per 10 linear metres (after 2 years) >1 direct seeded eucalyptus per 10 linear metres (after 2 years)	Annual records of tubestock planted, hectares sown will be kept and reported annually. An annual inspection / assessment of tubestock survival and seedling density will be undertaken and reported annually. Annual assessment of representative revegetated sites against reference site condition. (Refer to Section 9.11 for further explanation) **Reporting** Annual records of tubestock planted, survival rates, hectares sown, seedling density will be kept and reported in the EPBC Annual report and the Cadia AEMR. Annual assessment of representative revegetated sites against reference site condition will be reported in EPBC Annual report and the Cadia AEMR

Risk Assessment

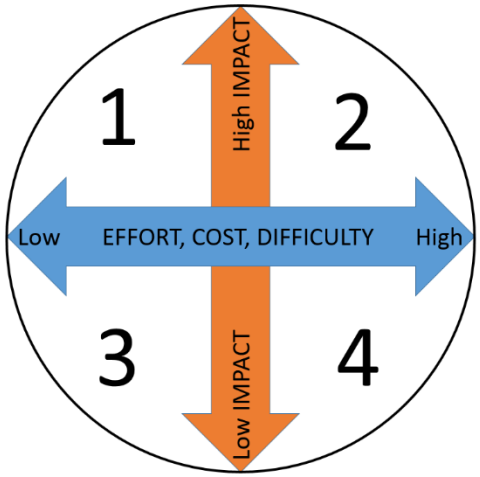
Unwanted Event	Inherent Risk			Mitigation and Corrective Actions	Responsibility	Timing	Final Risk		
	Consequence	Likelihood	Level				Consequence	Likelihood	Level
Failure of direct seeding	Minor	Occasional	Med	Defer direct seeding if seasonal conditions are poor. Re-seeding as required to meet targets	Environmental Scientist (L&B)	Annual	Minor	Unlikely	Low
Failure of tubestock	Minor	Occasional	Med	Defer tubestock planting if seasonal conditions are poor Re-planting as required to meet targets	Environmental Scientist (L&B)	Annual	Minor	Unlikely	Low
Rehabilitation monitoring not progressing towards reference site condition.	Minor	Occasional	Med	Assess individual factors from monitoring. Document improvement actions in annual report and implement.	Environmental Scientist (L&B)	Annual	Minor	Unlikely	Low
Insufficient local seed for revegetation.	Minor	Occasional	Med	Consider extending collection areas to >20km Source alternate contractor for seed collection.	Environmental Scientist (L&B)	Annual review of seed store	Minor	Unlikely	Low

Management Aspect (Continued): 1. Revegetation of cleared / grazed / riparian areas

Contingency Effectiveness Assessment

Scenario: Failure of revegetation works. Targets not met / no (or poor) progression towards reference site condition

Contingency Assessment Matrix. The following matrix is used to assess the likely success of the contingency measure. High Impact means that the contingency is likely to lead towards / deliver the desired outcome, while low impact is unlikely to meet the desired outcome.



Contingency Considered	Advantages	Disadvantages	Matrix	Priority
Plant during every season – even in poor conditions	Meet revegetation performance measures	High risk of failure	4	Low
Do nothing	Reduced cost / effort	No change in success	3	Low
Assess contributing factors and adjust revegetation techniques and processes	Higher chance of success	Additional effort and cost	2	High
Defer revegetation works if there are poor seasonal conditions.	Higher chance of success	Not meet revegetation performance measures	1	High
Allow natural regeneration to occur in areas of high resilience	Higher chance of revegetation success. Low cost and effort.	Progress can be slow; triggers may be required to stimulate regeneration	1	High
Replanting / re-seeding to meet targets	Meet revegetation performance measures	Additional effort and cost	2	High
Allow natural regeneration to occur in all cleared areas.	Reduced cost / effort	Not meet revegetation performance measures in low resilience areas.	3	Low

9.10.5 Management Aspect 2

Management Aspect: 2. Management of Remnant Vegetation								
Current Situation The vast majority of the Flyers Creek and Stratton Vale portions of the offset areas consist of remnant canopy eucalyptus spp. with little to no native shrub or understory species. These areas are subject to management aspect 1 – Revegetation of cleared / grazed / riparian areas. A large portion of Black Rock Range consists of healthy remnant bushland / woodland with intact groundcover, shrub and canopy strata and very few weeds.				**Desired Outcome** Areas of EEC are protected, enhanced and expanded Maintain the health and resilience of remnant areas.				
Management Actions / Schedule	**Applies to**			**Responsibility / Timing**				
	BRR	**FC**	**SV**	**Responsibility**	**Annual**	**1 year**	**2-5 years**	**5-10 years**
Undertake weed mapping of remnant areas, identifying weeds present, degree of infestation, priority areas. Areas re-mapped every 5 years.	X			Environmental Scientist (L&B)			X#	
Undertake annual inspection of remnant areas for weeds to determine priority control areas- focus on edges of remnant areas which are most susceptible to weed invasion.	X			Environmental Scientist (L&B)	X			
Implement low impact 'bush regeneration' principles for weeds in remnant areas. Ongoing on annual basis once commenced.	X			Environmental Scientist (L&B)			X#	
Use low impact, low intensity mosaic burning practices to promote a variety of vegetation age classes and structural diversity. Biennial program (season dependent) as per bushfire management plan (separate document).	X			Environmental Scientist (L&B)	Biennial			
Investigate wider weed sources, develop and implement controls to reduce future weed burden.	X			Environmental Scientist (L&B)			X	
Undertake vegetation mapping and assessment every 5 years (independent consultant) to determine structural / floristic changes, achievement / progression towards all desired outcomes and to make recommendations for future implementation.	X	X	X	Environmental Scientist (L&B)				X#
# signifies a recurring action as per the specified frequency in the action plan.								

Management Issue (Continued): 2. Management of Remnant Vegetation	
Performance Measures Annual inspection completed and documented. Biennial low intensity burning undertaken as per Bushfire Management Plan (season dependent) Weed mapping completed Contract bush regenerations specialists engaged (contract / purchase order) 5-year mapping and assessment completed – showing progress towards all desired outcomes	**Monitoring** Annual weed inspections documented. Any low intensity burns are documented (photographs). Monitoring program commenced. Internal monitoring of bush regeneration works and progress **Reporting** Annual inspections documented. Any key issues reported in EPBC Annual report. Any low intensity burns are documented (photographs) and reported in the EPBC Annual report and the Cadia AEMR. 5-year mapping and assessment completed – summary provided in the EPBC Annual report and the Cadia AEMR.

Risk Assessment

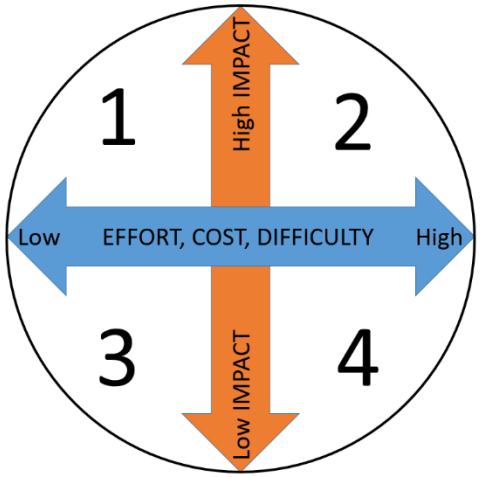
Unwanted Event	Inherent Risk			Mitigation and Corrective Actions	Responsibility	Timing	Final Risk		
	Consequence	Likelihood	Level				Consequence	Likelihood	Level
Remnant areas become weed infested resulting in loss of biodiversity.	Moderate	Likely	Med	Annual inspection, weed mapping. Bush regeneration / weed control Identification / control of weed sources 5-year assessment and implementation of recommendations	Environmental Scientist (L&B)	Annual	Minor	Unlikely	Low
Remnant areas loose structural and species diversity due to too frequent / infrequent / high intensity fire.	Moderate	Likely	Med	Low intensity burns (biennial). Conformance with Bushfire management plan and burn regime.	Environmental Scientist (L&B)	Biennial	Minor	Unlikely	Low

Management Issue (Continued): 2. Management of Remnant Vegetation

Contingency Effectiveness Assessment

Scenario: Degradation of remnant areas due to weeds, fire regime / intensity. Loss of structural / species diversity.

Contingency Assessment Matrix. The following matrix is used to assess the likely success of the contingency measure. High Impact means that the contingency is likely to lead towards / deliver the desired outcome, while low impact is unlikely to meet the desired outcome.



Contingency Considered	Advantages	Disadvantages	Matrix	Priority
Do nothing	Low cost / effort	Possible loss of biodiversity	3	Low
Implement higher intensity (controlled) fires	More thorough fuel / hazard reduction	Possible loss of biodiversity	4	Low
Implement no burning – increasing risk of uncontrolled wildfire.	Low cost / effort	High risk of loss of biodiversity / vegetation structure	3	Low
Use chemical weed (spray) control methods in remnant areas	Efficiency in application / result	Possible loss of biodiversity / non target damage.	3	Low
Implement low intensity burns	Promotes species and structural diversity.	Less thorough fuel reduction	2	High
Undertake inspections / weed mapping and adjust management actions	Allows management / seasonal adjustment.	Higher cost / effort	2	High
Implement low impact bush regeneration techniques	No non-target damage	Higher Cost / effort	2	High
Undertake 5 yearly vegetation mapping and assessment for all offset areas.	Demonstrates progression towards desired outcome / corrective actions. Independent assessment and advice	Higher Cost / effort	2	High
Do not undertake monitoring	Lower cost / effort	No independent advice / input Unknown performance of management measures	3	Low

9.10.6 Management Aspect 3

Management Aspect: 3. Bushfire Management								
Current Situation There is no current active bushfire management within / in the vicinity of offset portions. As the offset areas are generally un-grazed there is an annual (seasonal) risk of uncontrolled bushfire impact on the offset areas. 2 separate bushfire management plans have been developed; 1 addresses bushfires within the Black Rock Range Offset portion; the second addresses bushfire fuel management in the vicinity of the Flyers Creek and Stratton Vale offset portions.	**Desired Outcome** Implement the 2 bushfire management plans to reduce the risk of a high intensity uncontrolled bushfire from impacting the offset areas resulting in biodiversity loss. Use low intensity fire as a tool to increase structural and species diversity.							
Management Actions / Schedule	**Applies to**				**Responsibility / Timing**			
	BRR	**FC**	**SV**	**Responsibility**	**Annual**	**1 year**	**2-5 years**	**5-10 years**
Undertake bushfire fuel assessments to assist in identifying priority areas for low intensity burns. Assessment undertaken every 2-5 years.	X			Environmental Scientist (L&B)			X#	
Implement low intensity burns as per BRR bushfire management plan (season dependent) (currently scheduled every 2 years)	X			Environmental Scientist (L&B)	Biennial			
Implement fuel reduction regimes in vicinity of Flyers Creek and Stratton Vale offset portions as per bushfire fuel reduction plan (season dependent)		X	X	Environmental Scientist (L&B)	X			
Undertake a literature review on the use of low impact, low intensity mosaic burning practices to stimulate regeneration within cleared / grazed offset areas (season dependent)	X	X	X	Environmental Scientist (L&B)				X
Annual maintenance of fire trails. Contractor engaged to undertake prior to bushfire season in accordance with RFS guidelines.	X			Environmental Scientist (L&B)	X			
Upgrade fire trail signs as per RFS guidelines	X			Environmental Scientist (L&B)		X		
# signifies a recurring action as per the specified frequency in the action plan.								

Management Issue (Continued): 3. Bushfire Management	
Performance Measures Fuel assessment completed and documented. Low intensity burning undertaken (season dependent) as per bushfire management plan Annual fuel reduction works implemented in vicinity of Flyers Creek and Stratton Vale offset portions as per bushfire fuel reduction plan (season dependent) Annual fire trail maintenance completed (Contractor engaged) Literature review completed on the use of fire in cleared / grazed areas to stimulate regeneration.	Monitoring Any low intensity burns / fuel reduction work are documented (photographs). Fire trails checked prior to bushfire season Reporting Any low intensity burns are documented (photographs) and reported in the EPBC Annual report and the Cadia AEMR.

Risk Assessment

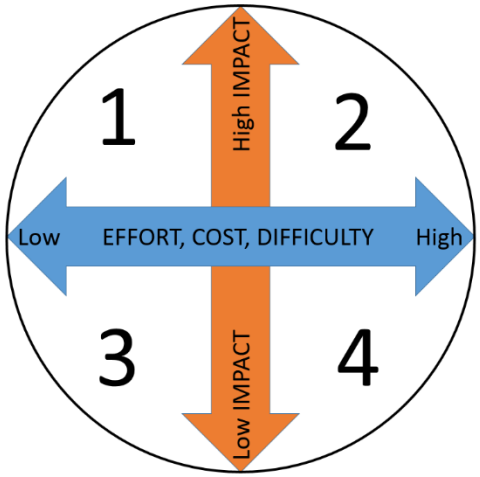
Unwanted Event	Inherent Risk			Mitigation and Corrective Actions	Responsibility	Timing	Final Risk		
	Consequence	Likelihood	Level				Consequence	Likelihood	Level
Uncontrolled wildfire resulting in loss of biodiversity.	Major	Occasional	High	Low intensity burns. Fuel reduction activities RFS / emergency response. Post wildfire- monitoring / assessment / weed control	Environmental Scientist (L&BM) RFS	Annual	Major	Unlikely	Med
Fire trails un-usable in event of a wildfire	Moderate	Occasional	Med	Annual maintenance of fire trails Annual inspection prior to fire season.	Environmental Scientist (L&BM)	Annual	Moderate	Unlikely	Med

Management Issue (Continued): 3. Bushfire Management

Contingency Effectiveness Assessment

Scenario: Uncontrolled wildfire resulting in widespread loss of vegetation and loss of biodiversity.

Contingency Assessment Matrix. The following matrix is used to assess the likely success of the contingency measure. High Impact means that the contingency is likely to lead towards / deliver the desired outcome, while low impact is unlikely to meet the desired outcome.



Contingency Considered	Advantages	Disadvantages	Matrix	Priority
Do nothing	Low cost / effort	Possible loss of diversity	3	Low
Implement higher intensity or higher frequency (controlled) fires. Better fuel / risk reduction	More thorough fuel reduction	Possible loss of structural and species diversity	4	Low
Implement no burning – increasing risk of uncontrolled wildfire.	Low cost / effort	High risk of uncontrolled wildfire / loss of biodiversity	3	Low
Implement low intensity burns	Promotes species and structural diversity.	Less thorough fuel reduction	2	High
Implement fuel reduction measures (Flyers Creek / Stratton Vale Portions).	Reduces risk of catastrophic fire.	Higher cost / effort	2	High
Following a catastrophic wildfire- do nothing	Low cost / effort	Possible loss of diversity	3	Low
Following a catastrophic wildfire- monitoring / assessment / weed control.	Promotes vegetation recovery	Higher cost / effort	2	High

9.10.7 Management Aspect 4

Management Aspect: 4. Weed Management								
Current Situation Weed management programs have been in place for many years for the three offset portions, as such the noxious weed burden is currently considered low. Remnant areas located on Black Rock Range are least prone to weed establishment due to the strong competition from native species; as such this area is most vulnerable to weed invasion on the bushland / woodland edges, however bird spread weed species have the opportunity to establish throughout the area. Previously cleared and grazed areas located within the three offset portions are most vulnerable to weed invasion and currently have a high incidence of introduced grass and broadleaf weeds with few native species.				Desired Outcome The ultimate aim is that weeds do not impact on biodiversity values of offset areas. Remnant areas are kept clean with a low weed incidence. Weeds are progressively replaced with desirable, native, competitive species. Noxious and high priority weeds are controlled through the implementation of annual weed management programmes to progressively reduce weed populations, the risk of spread and management costs. Literature reviews are conducted to determine methods to progressively reduce the incidence of grass and broadleaf weeds (in previously cleared and grazed areas) and to encourage native grasses, herbs and forbs.				
Management Actions / Schedule	**Applies to**			**Responsibility / Timing**				
	BRR	**FC**	**SV**	**Responsibility**	**Annual**	**1 year**	**2-5 years**	**5-10 years**
Undertake weed mapping of offset areas to determine areas, degree of infestation, weed species present. Mapping is used to determine priority locations. Areas re-mapped every 5 years.	X	X	X	Environmental Scientist (L&B)			X#	
Conduct annual inspection (nominally in August) to plan spring and summer weed control programmes	X	X	X	Environmental Scientist (L&B)	X			
Annual contract in place for the control of noxious and high priority weeds (refer to Section 9.12 for a list of weeds and control measures)	X	X	X	Environmental Scientist (L&B)	X			
Weeds are progressively replaced with native competitive species (through planting, seeding, selective weed control, encouraging native species) (refer to Management Aspect 1)	X	X	X	Environmental Scientist (L&B)	X			
Undertake literature reviews to determine methods of progressively reducing the incidence of grass and broadleaf weeds (in previously cleared and grazed areas) and to encourage native grasses, herbs and forbs.	X	X	X	Environmental Scientist (L&B)				X
# signifies a recurring action as per the specified frequency in the action plan.								

Management Issue (Continued): 4. Weed Management	
Performance Measures Weed mapping completed as per schedule (every 5 years). Ongoing weed mapping verifies reducing weed burden over time. Annual contracts in place for the control of noxious and high priority weeds (refer to Section 9.12). Works undertaken to replace weeds with desirable native plants (e.g. planting, seeding, selective weed control (bush regeneration principles), encouraging native species) (as per Management Aspect 1) Literature reviews conducted to determine methods of progressively reducing the incidence of grass and broadleaf weeds (in previously cleared and grazed areas) and to encourage native grasses, herbs and forbs.	Monitoring Field monitoring conducted on contract compliance – any non-conformances corrected. Monitoring of hours vs weed management budget. Ongoing weed mapping verifies reducing weed burden over time. Reporting A brief summary of weeds controlled and hours spent reported in the EPBC Annual report and the Cadia AEMR.

Risk Assessment

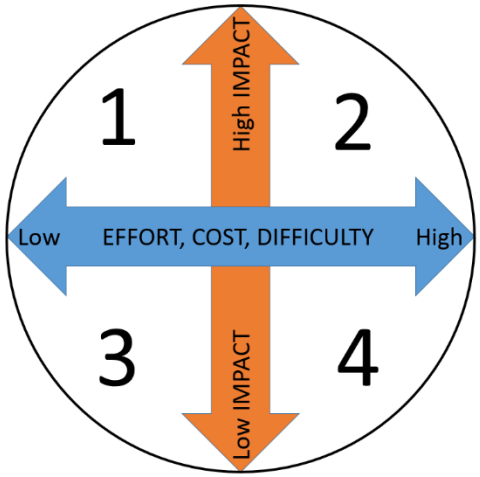
Unwanted Event	Inherent Risk			Mitigation and Corrective Actions	Responsibility	Timing	Final Risk		
	Consequence	Likelihood	Level				Consequence	Likelihood	Level
Uncontrolled weeds impact on biodiversity values of offset areas	Moderate	Likely	Med	Weed mapping and annual Inspections. Annual weed control contracts Checks to ensure contract compliance Long term encouragement / replacement with native species.	Environmental Scientist (L&B)	Annual	Minor	Unlikely	Low

Management Issue (Continued): 4. Weed Management

Contingency Effectiveness Assessment

Scenario: Uncontrolled weeds resulting in loss of biodiversity.

Contingency Assessment Matrix. The following matrix is used to assess the likely success of the contingency measure. High Impact means that the contingency is likely to lead towards / deliver the desired outcome, while low impact is unlikely to meet the desired outcome.



Contingency Considered	Advantages	Disadvantages	Matrix	Priority
Do nothing	Low cost / effort	Possible loss of biodiversity	3	Low
Weed mapping to verify long term weed reduction	Accurate assessment of performance.	Higher cost / effort	2	High
Annual inspections and weed control contracts in place and enforced	Effective weed control	Higher cost / effort	2	High
Rely solely on biological controls	Low cost / effort	Select weeds targeted only Possible loss of diversity	3	Low
Weed control without replacing with native species	Low cost / effort (short term)	Higher cost / effort (long term)	4	Low
Rely on native species to out-compete weed species	Low cost / effort	Likely unsuccessful. Possible loss of biodiversity	3	Low

9.10.8 Management Aspect 5

Management Aspect: 5. Pest Management								
Current Situation Pest management programs have been in place for many years for the three offset portions, as such the vertebrate pest burden is currently considered reasonably low. All offset areas are considered equally vulnerable to pest species impact due to the transient nature of vertebrate pests.				Desired Outcome The ultimate aim is that vertebrate pest species do not impact on biodiversity values and fauna populations of offset areas. Priority pest species are controlled through the implementation of annual pest management programmes to progressively reduce pest populations and harbor.				
Management Actions / Schedule	**Applies to**			**Responsibility / Timing**				
	BRR	**FC**	**SV**	**Responsibility**	**Annual**	**1 year**	**2-5 years**	**5-10 years**
Conduct annual fox baiting program in coordination with neighbouring landholders.	X	X	X	Environmental Scientist (L&B)	X			
Conduct annual inspection (nominally in March) to plan Autumn and winter rabbit, eastern grey kangaroo, pig, wild dog, fallow Deer control programmes. (Refer to Section 9.13 for a list of vertebrate pest and control options). Implement control programmes (as per Section 9.13) as required.	X	X	X	Environmental Scientist (L&B)	X			
# signifies a recurring action as per the specified frequency in the action plan.								

Management Issue (Continued): 5. Pest Management	
Performance Measures Annual fox control program conducted Annual inspection conducted and control programmes implemented as required.	Monitoring Annual inspection conducted to assess pest incidence and impact. Reporting A brief summary of pest management activities reported in the EPBC Annual report and the Cadia AEMR.

Risk Assessment

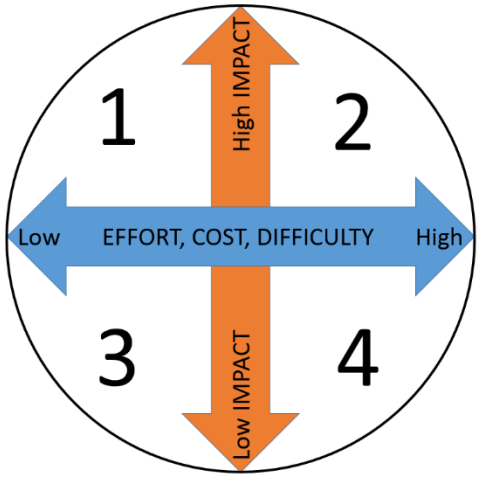
Unwanted Event	Inherent Risk			Mitigation and Corrective Actions	Responsibility	Timing	Final Risk		
	Consequence	Likelihood	Level				Consequence	Likelihood	Level
Uncontrolled pests impact on biodiversity values of offset areas	Moderate	Likely	Med	Annual fox control program Annual inspections for vertebrate pests and implement control programmes as required.	Environmental Scientist (L&B)	Annual	Minor	Unlikely	Low

Management Issue (Continued): 5. Pest Management

Contingency Effectiveness Assessment

Scenario: Uncontrolled Pests resulting in loss of biodiversity.

Contingency Assessment Matrix. The following matrix is used to assess the likely success of the contingency measure. High Impact means that the contingency is likely to lead towards / deliver the desired outcome, while low impact is unlikely to meet the desired outcome.



Contingency Considered	Advantages	Disadvantages	Matrix	Priority
Do nothing	Low cost / effort	Possible loss of diversity	3	Low
Annual fox control programme (to be run in conjunction with neighbouring properties)	Effective local / temporary reduction in fox numbers.	Higher cost / effort. Result is likely to be localised and temporary. Ongoing annual control required.	2	High
Annual inspections (for other vertebrate pests) and control programmes implemented as required	Effective pest control	Higher cost / effort	2	High
Rely solely on natural agents (Myxomatosis, Rabbit Calicivirus) and predation (e.g. foxes / dogs / cats preying on rabbits)	Low cost / effort	In-effective on carnivorous pests. Likely loss of biodiversity.	3	Low

9.10.9 Management Aspect 6

Management Aspect: 6. Native Fauna Management								
Current Situation A range of native fauna species occur within the offset areas (refer to Section 9.4.1 and Appendices D and E). Management to date has been 'passive' allowing for minimal disturbance. There have been no habitat enhancement works conducted within offset areas. Refer to Pest Management and Bushfire Management sections for other fauna management measures.				**Desired Outcome** The ultimate aim is that native fauna species are protected from major impacts that may severely impact on their population and viability. Native fauna habitat is considered and allowed for in all management works (with priority given to threatened species). Native fauna habitat is enhanced in areas with a history of clearing and grazing (with priority given to threatened species).				
Management Actions / Schedule	**Applies to**			**Responsibility / Timing**				
	BRR	**FC**	**SV**	**Responsibility**	**Annual**	**1 year**	**2-5 years**	**5-10 years**
Conduct fauna surveys every 5 years to determine fauna species, distribution and effectiveness of management regimes (including future recommendations). Commencing FY2018	X	X	X	Environmental Scientist (L&B)				X#
Develop and implement a procedural checklist to ensure that fauna considerations are incorporated into all field-based works (focussing on threatened species, recommendations from recovery plans and mitigation of key threatening processes (Refer to Section 9.14).	X	X	X	Environmental Scientist (L&B)		X		
No firewood collection or bush rock removal is permitted from within offset areas. No tree felling (or removal of stags) is permitted (with the exception of high-risk bushfire and safety considerations).	X	X	X	Environmental Scientist (L&B)	X			
Opportunistically retain / place additional habitat structures within previously cleared and grazed offset portions (sourced from nearby farming / offset areas).	X	X	X	Environmental Scientist (L&B)	X			
Undertake literature review on the success of man-made habitat boxes for arboreal species (in lieu of hollows). Implement in cleared areas to increase habitat availability.	X	X	X	Environmental Scientist (L&B)			X	
# signifies a recurring action as per the specified frequency in the action plan.								

Management Issue (Continued): 6. Native Fauna Management	
Performance Measures Fauna surveys conducted every 5 years. Checklist developed and utilised to assess potential impact from field-based works. Habitat structures opportunistically placed within previously cleared and grazed offset portions.	Monitoring Fauna surveys conducted every 5 years. Reporting A brief summary of fauna survey outcomes and recommendations reported in the EPBC Annual report and the Cadia AEMR.

Risk Assessment

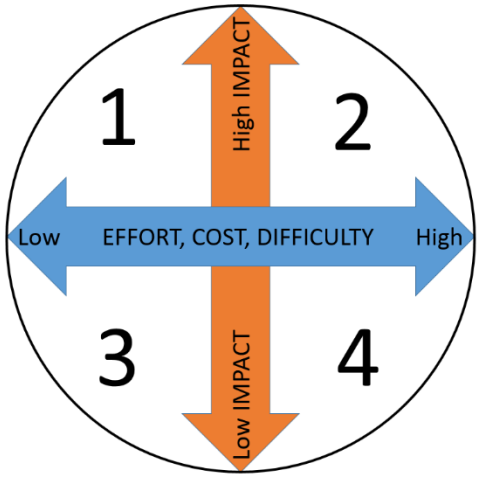
Unwanted Event	Inherent Risk			Mitigation and Corrective Actions	Responsibility	Timing	Final Risk		
	Consequence	Likelihood	Level				Consequence	Likelihood	Level
Field works impact on threatened fauna populations or habitat.	Moderate	Occasional	Med	Assessment of field works / risk prior to implementation.	Environmental Scientist (L&B)	Prior to field works being implemented.	Minor	Unlikely	Low
Unauthorised removal of firewood, bush rock, stags, habitat trees	Moderate	Occasional	Med	Removal of firewood, bush rock, stags, habitat trees not permitted. Additional resources placed within previously cleared / grazed areas	Environmental Scientist (L&B)	Ongoing policy	Minor	Rare	Low
Uncontrolled high intensity bushfire destroying habitat resources. (Refer to management aspect 3)	Major	Occasional	High	Low intensity burns. Fuel reduction activities RFS / emergency response. Post wildfire- monitoring / assessment / weed control	Environmental Scientist (L&B) RFS	Annual	Major	Unlikely	Med

Management Issue (Continued): 6. Native Fauna Management

Contingency Effectiveness Assessment

Scenario: Field works impact on threatened fauna populations or habitat. (For bushfires refer to Refer to Management Aspect 3)

Contingency Assessment Matrix. The following matrix is used to assess the likely success of the contingency measure. High Impact means that the contingency is likely to lead towards / deliver the desired outcome, while low impact is unlikely to meet the desired outcome.



Contingency Considered	Advantages	Disadvantages	Matrix	Priority
Do nothing	Low cost / effort	Possible loss of diversity	3	Low
Assess field works prior to implementation for the potential to impact upon threatened and native fauna species.	Effective in assessing risks to fauna impact.	Nil	1	High
No firewood collection, bush rock collection or tree felling permitted within offset areas.	Effective in retaining habitat	Nil	1	High
Key threatened species management actions incorporated into this management plan and implemented (Refer to Section 9.14)	Effective in protecting / facilitating the recovery of threatened species.	Nil	2	High
Detailed fauna surveys conducted every 5 years. Recommendations incorporated into management plan	Known performance of management actions. Corrective / improvement actions	Higher cost / difficulty	2	High

9.10.10 Management Aspect 7

Management Aspect: 7. Unauthorised access (including livestock grazing)								
Current Situation There is no open public access to any of the three conservation offset portions; access is via private property with standard agricultural gates. The three portions of the offset areas are fenced to exclude livestock and are excised from any neighbouring grazing rights agreement areas.				**Desired Outcome** The ultimate aim is that unauthorised access by people or livestock does not impact on biodiversity values and fauna populations of offset areas. Gates to remain un-locked for RFS access and the retrieval of livestock.				
Management Actions / Schedule	**Applies to**			**Responsibility / Timing**				
	BRR	**FC**	**SV**	**Responsibility**	**Annual**	**1 year**	**2-5 years**	**5-10 years**
Contract fencer to conduct annual inspection of offset boundary fences and undertake repairs. Ad-hoc inspections and repairs following severe storms (trees over fences / repair of floodgates).	X	X	X	Environmental Scientist (L&B)	X			
Remove internal fences from offset areas	X			Environmental Scientist (L&B)				X
Place signs at the entrances to each gate identifying the area as a conservation offset area and providing contact details.	X	X	X	Environmental Scientist (L&B)			X	
Undertake annual inspections for unauthorised access; devise actions and timeframes to increase security of offset areas as required.	X	X	X	Environmental Scientist (L&B)	X			
Replace boundary fences as required in consultation with neighbouring landholders. Fence design to consider fauna movements.	X	X		Environmental Scientist (L&B)	As required			
Use grazing as a strategic tool to improve biodiversity outcomes (remove litter, reduce seed set etc). Timing and intensity considered on an annual / ad-hoc basis (nominally high intensity / short duration). Applied in cleared areas (with dominant introduced pasture species) only.	X	X	X	Environmental Scientist (L&B)	X			
# signifies a recurring action as per the specified frequency in the action plan.								

Management Issue (Continued): 7. Unauthorised access (including livestock grazing)	
Performance Measures Annual boundary fence inspection and repair regime. Placement of signs at access points. No observed impact on biodiversity aspects due to unauthorised access.	**Monitoring** Annual inspection on unauthorised access and livestock impact. **Reporting** A brief summary of any observed unauthorised access / livestock damage reported in the EPBC Annual report and the Cadia AEMR.

Risk Assessment

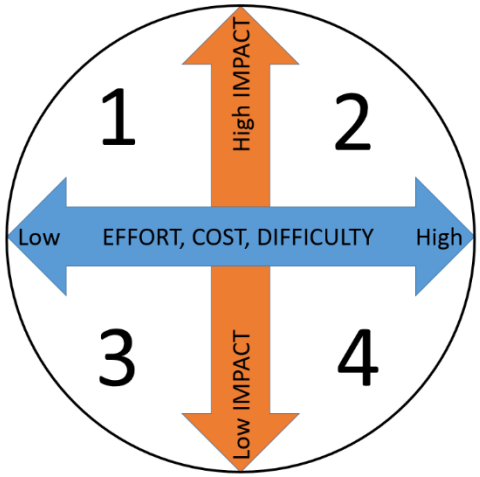
Unwanted Event	Inherent Risk			Mitigation and Corrective Actions	Responsibility	Timing	Final Risk		
	Consequence	Likelihood	Level				Consequence	Likelihood	Level
Unauthorised people, vehicle / livestock access. Impacts upon flora, fauna or EEC's.	Moderate	Unlikely	Med	Offsets located on private land with no nearby public access. Annual inspections to identity unauthorised access / correction as required. Annual fence inspection and maintenance regime.	Environmental Scientist (L&B)	Annual	Minor	Rare	Low
Use of strategic grazing impacts upon biodiversity values.	Moderate	Unlikely	Med	Inspection and assessment of grazing as a strategic tool – undertaken on a conservative basis. Applied in cleared areas (with dominant introduced pasture species) only	Environmental Scientist (L&B)	Annual	Minor	Rare	Low

Management Issue (Continued): 7. Unauthorised access (including livestock grazing)

Contingency Effectiveness Assessment

Scenario: Unauthorised people / vehicle / livestock access impacting upon flora, fauna or EEC's.

Contingency Assessment Matrix. The following matrix is used to assess the likely success of the contingency measure. High Impact means that the contingency is likely to lead towards / deliver the desired outcome, while low impact is unlikely to meet the desired outcome.



Contingency Considered	Advantages	Disadvantages	Matrix	Priority
Do nothing	Low cost / effort	Likely livestock access and impact upon biodiversity	3	Low
Annual boundary fence inspection and repair regime	Effective in maintaining boundary fence condition.	Cost / access difficulties	2	High
Annual inspections for unauthorised people / vehicle / livestock access and correction as required.	Effective in identifying / correcting any issues	Nil	1	High
Signs installed at boundary gates	Effective in identifying a change in land-use / ownership.	Not effective in restricting access.	3	Low
Removal of internal fences to facilitate fauna movement	Facilitates fauna movement	Cost / access difficulties	2	High
Access gates to remain unlocked	Allows RFS and neighbour access for management purposes. Reduced risk of damage for forced access.	Not effective in restricting access.	3	Low
Undertake strategic grazing to improve biodiversity outcomes (nominally high intensity / short duration).	Low cost / effort. Effective in removal of litter, reducing seed set of introduced palatable species.	Detailed inspections and assessments to avoid damage	2	High
Restrict all grazing	Low cost / effort.	Litter and seed from introduced (palatable) species continues to dominate.	3	Low

9.10.11 Management Aspect 8

Management Aspect: 8. Erosion								
Current Situation The Flyers Creek and Stratton Vale offset portion have no significant erosion and are deemed quite stable due to persistent vegetation cover. The eastern portions of Black Rock Range have the highest potential for erosion due to 'light' soil type, steep slope, existing eroded gullies and annual vegetation cover due to prolonged grazing pressure.				Desired Outcome Eastern gullies on Black Rock Range are slowly and progressively stabilised through erosion control measures.				
Management Actions / Schedule	**Applies to**			**Responsibility / Timing**				
	BRR	**FC**	**SV**	**Responsibility**	**Annual**	**1 year**	**2-5 years**	**5-10 years**
Inspect and assess active eroding gullies for the purpose of identifying priority locations for remedial works	X			Environmental Scientist (L&B)			X	
Design and implement remediation works (will be specific to each individual gully) to reduce soil erosion. Steep slopes: nominally, minimise mechanical engineering solutions due to steepness of the terrain and focus on establishing perennial, deep rooted vegetation, slowing and retaining water / nutrient within the landscape (leaky weir / natural sequence/ LFA concepts) Flat areas: Mechanical engineering solutions plus establishing perennial, deep rooted vegetation, slowing and retaining water / nutrient within the landscape (leaky weir / natural sequence/ LFA concepts) 1 campaign undertaken every 2-5 years	X			Environmental Scientist (L&B)			#	X
Exclude strategic grazing from steep areas with a high risk of erosion.	X			Environmental Scientist (L&B)	X			
# signifies a recurring action as per the specified frequency in the action plan.								

Management Issue (Continued): 8. Erosion	
Performance Measures Inspections undertake and priority gully's identified Works programme implemented every 2-5 years.	Monitoring Inspection / photography (before and after) of erosion control works / progress. Reporting A brief summary of any erosion control works reported in the EPBC Annual report and the CVO AEMR.

Risk Assessment

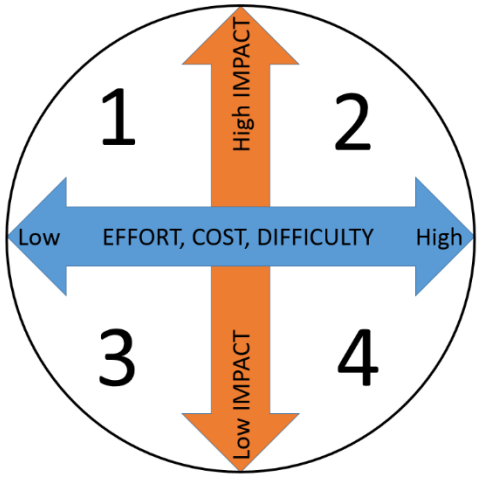
Unwanted Event	Inherent Risk			Mitigation and Corrective Actions	Responsibility	Timing	Final Risk		
	Consequence	Likelihood	Level				Consequence	Likelihood	Level
Uncontrolled erosion impacts upon biodiversity values of offset areas.	Major	Occasional	High	Design and implement erosion mitigation works	Environmental Scientist (L&B)	Every 2 years	Moderate	Occasional	Med

Management Issue (Continued): 8. Erosion

Contingency Effectiveness Assessment

Scenario: Uncontrolled erosion impacts upon biodiversity values of offset areas.

Contingency Assessment Matrix. The following matrix is used to assess the likely success of the contingency measure. High Impact means that the contingency is likely to lead towards / deliver the desired outcome, while low impact is unlikely to meet the desired outcome.



Contingency Considered	Advantages	Disadvantages	Matrix	Priority
Do nothing	Low cost / effort	Continued erosion / degradation of eastern gully's	3	Low
Design and implement mechanical / highly engineered erosion control works on steep slopes		High Cost. High risk of failure due to extreme slope of eastern portions.	4	Low
Design and implement mechanical / engineered erosion control works on flat areas	Effective in managing erosion on flatter, lower slope areas.	High Cost.	2	High
Design and implement – low impact mitigation works such as leaky weir / natural sequence/ LFA concepts / perennial deep rooted vegetation	Potentially effective in managing erosion.	Slow / gradual progress, open to setbacks following storms.	2	High

9.10.12 Management Aspect 9

Management Aspect: 9. European / Aboriginal Heritage								
Current Situation European and Aboriginal heritage aspects of the conservation offset portion has not been assessed and remains unknown.				**Desired Outcome** Develop an understanding of European and Aboriginal heritage aspects of the offset areas and implement management actions for assessment / conservation.				
Management Actions / Schedule	**Applies to**			**Responsibility / Timing**				
	BRR	**FC**	**SV**	**Responsibility**	**Annual**	**1 year**	**2-5 years**	**5-10 years**
Undertake European and Aboriginal heritage surveys of offset areas. Incorporate heritage survey findings into future revisions of this management plan	X	X	X	Environmental Scientist (L&B)				X
# signifies a recurring action as per the specified frequency in the action plan.								

Management Issue (Continued): 9. European / Aboriginal Heritage	
Performance Measures European and Aboriginal heritage surveys undertaken Management Plan updated.	**Monitoring** Nil – pending completion of heritage surveys. **Reporting** Any ad-hoc heritage findings will be reported in the EPBC Annual report and the Cadia AEMR. A summary will also be included following the completion of the heritage surveys.

Risk Assessment

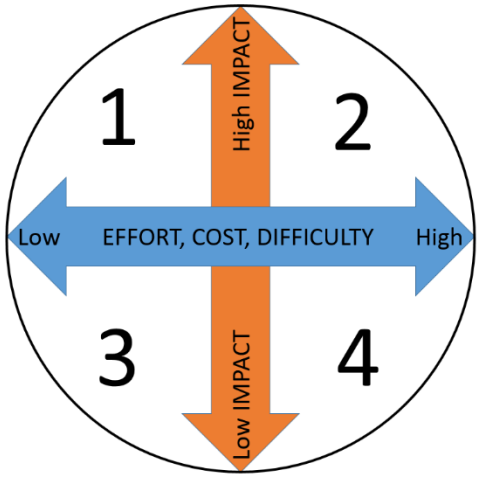
Unwanted Event	Inherent Risk			Mitigation and Corrective Actions	Responsibility	Timing	Final Risk		
	Consequence	Likelihood	Level				Consequence	Likelihood	Level
Damage / loss of heritage items due to lack of information / assessment.	Minor	Unlikely	Low	Undertake survey to assess heritage items / significance Report / assess any ad-hoc heritage findings	Environmental Scientist (L&B)	Annual	Minor	Unlikely	Low

Management Issue (Continued): 9. European / Aboriginal Heritage

Contingency Effectiveness Assessment

Scenario: Damage / loss of heritage items due to lack of information / assessment.

Contingency Assessment Matrix. The following matrix is used to assess the likely success of the contingency measure. High Impact means that the contingency is likely to lead towards / deliver the desired outcome, while low impact is unlikely to meet the desired outcome.



Contingency Considered	Advantages	Disadvantages	Matrix	Priority
Do nothing	Low cost / effort	Potential loss of heritage items	3	Low
Undertake heritage survey of European and Aboriginal heritage	Known location and significance of heritage items.	Cost. Potential land management conflicts.	2	High
Following survey, update management plan	Management measures in place for the conservation of heritage items	Cost. Potential land management conflicts.	2	High

9.10.13 Management Aspect 10

Management Aspect: 10. Resource Salvage								
Current Situation Currently, no habitat salvage is undertaken to relocate items from the Cadia East Subsidence zone to offset areas. Offset areas currently have significant remnant trees, trees with hollows, fallen timber and intact soil resources due to the previous management of these areas.				Desired Outcome Schedule 3, Condition 38b of the Cadia East Project Approval requires that investigation be undertake into the beneficial use of resources (timber, fauna habitat, seed and soil) from the Cadia East Subsidence Zone (as far as is reasonable and feasible). Offset areas currently have significant remnant trees, trees with hollows, fallen timber and intact soil resources due to the previous management of these areas. As such it is considered that the best use of these resources from the Cadia East Subsidence Zone is to place these resources onto mine site rehabilitation areas where these assets are scarce. The site-based rehabilitation areas are also much closer to facilitate ease and efficiency of placement. Resources salvageable from the Cadia East Subsidence Zone that are suitable for offset areas is restricted to seed for revegetation purposes.				
Management Actions / Schedule	**Applies to**			**Responsibility / Timing**				
	BRR	**FC**	**SV**	**Responsibility**	**Annual**	**1 year**	**2-5 years**	**5-10 years**
Annual seed collection contracts to include potential collection from the Cadia East Subsidence Zone	X	X	X	Environmental Scientist (L&B)	X			
Habitat resources (with the exception of seed) from the Cadia East Subsidence zone will be used exclusively in the rehabilitation of mine disturbed areas. Considered annually based on availability.				Environmental Scientist (L&B)	X			
Relocate / redistribute habitat from within offset areas / adjacent farming areas to offset areas that have been previously cleared and grazed. Nominal program every 2-5 years pending availability of resources.	X	X	X	Environmental Scientist (L&B)			X#	
# signifies a recurring action as per the specified frequency in the action plan.								

Management Issue (Continued): 10. Resource Salvage	
Performance Measures Annual seed collection contracts to include potential collection from Cadia East Subsidence Zone Habitat resources from the Cadia East Subsidence zone used in the rehabilitation of mine disturbed areas. Habitat from within offset areas / adjacent farming areas are placed within previously cleared and grazed offset areas.	Monitoring Internal monitoring of habitat resource relocation, seed stocks and provenance. Reporting Any habitat relocation and placement undertaken within the mine disturbed landscape will be reported in the Cadia AEMR. Any habitat relocation and placement undertaken within the conservation offset landscape will be reported in the EPBC Annual report and the Cadia AEMR.

Risk Assessment

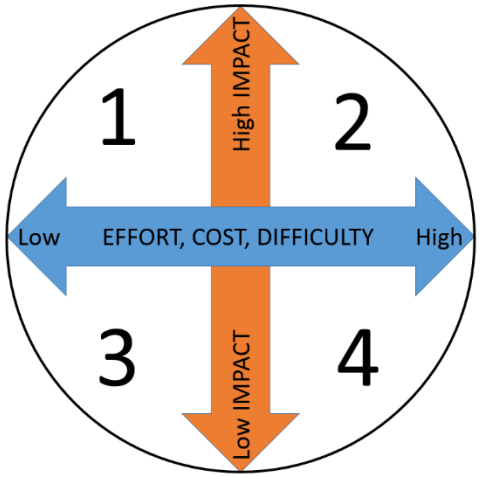
Unwanted Event	Inherent Risk			Mitigation and Corrective Actions	Responsibility	Timing	Final Risk		
	Consequence	Likelihood	Level				Consequence	Likelihood	Level
Loss of potential resources from the Cadia East Subsidence Zone.	Minor	Likely	Med	Habitat resources utilised in the rehabilitation of mine disturbed areas Seed collection undertaken from the Cadia East Subsidence Zone used in site-based rehabilitation and also offset revegetation works.	Environmental Scientist (L&B)	Annual	Minor	Occasional	Med
Lack of habitat resources located within previously cleared / grazed offset areas.	Minor	Unlikely	Med	Habitat from within offset areas / adjacent farming areas to are placed within previously cleared and grazed offset areas	Environmental Scientist (L&B)	Program every 2-5 years	Minor	Rare	Low

Management Issue (Continued): 10. Resource Salvage

Contingency Effectiveness Assessment

Scenario: Loss of potential resources from the Cadia East Subsidence Zone.

Contingency Assessment Matrix. The following matrix is used to assess the likely success of the contingency measure. High Impact means that the contingency is likely to lead towards / deliver the desired outcome, while low impact is unlikely to meet the desired outcome.



Contingency Considered	Advantages	Disadvantages	Matrix	Priority
Do nothing	Low cost / effort	Loss of habitat resources	3	Low
Utilise habitat resources from Cadia East Subsidence Zone in offset areas	Meet compliance condition. Add some limited value to offset areas	Significant cost and difficulty in relocating large and bulky items. Limited value to offset areas due to existing trees, fallen timber, habitat items etc	4	Low
Utilise habitat resources from Cadia East Subsidence Zone in site rehabilitation areas	Relative to above – significantly reduced cost and difficulty. Adds significant habitat value to site-based rehabilitation areas.	Nil	2	High
Utilise seed from Cadia East Subsidence Zone in offset areas.	Provides local seed for revegetation programmes. Considered local provenance for offset areas	Nil	1	High
Relocate / redistribute habitat from within offset areas to areas previously cleared and grazed	Relative to above – significantly reduced cost and difficulty. Adds habitat value to previously cleared and grazed areas.	Nil	1	High

9.11 Performance Monitoring Against Reference Sites

As described in Section 8.1, Cadia has been monitoring selected local reference sites since 2008 to define 'success criteria' for mine site rehabilitation. Monitoring of rehabilitation sites is undertaken in an identical manner to the reference sites (at the same time of the year, having experienced similar climatic conditions) with the results compared against those of the reference site. If measured parameters of the rehabilitated site are progressing (or showing trajectory) towards those of the reference site, the rehabilitation is showing signs of success. If rehabilitation sites are not steadily progressing towards those of the reference site, there may be a fundamental issue with the rehabilitation process. The large range of detailed parameters measured and assessed can be used to highlight areas that require further consideration and correction.

Cadia propose to use a similar methodology to assess the success of revegetation works on areas that were previously cleared and grazed (refer to Management Aspect 1).

The methodology adopted by Cadia involves the selection and monitoring of a series of reference sites that are representative of the target vegetation community (such as a woodland community) (refer to Section 8). A large number of parameters are measures as indicated in the following table:

Hierarchy of ecosystem succession	Aspect or ecosystem component	Completion criteria	Performance Indicators	Completion Performance Indicators
Landform establishment and stability	Ecosystem function	Landform is functional and performing as it was designed to do	LFA Stability	Based on key physical, biological and chemical characteristics the LFA stability index provides an indication of the sites stability and that it is comparable to or trending towards that of the local remnant vegetation
			LFA Infiltration	Based on key physical, biological and chemical characteristics the LFA infiltration index provides an indication of the sites infiltration capacity and that it is comparable to or trending towards that of the local remnant vegetation
			LFA Nutrient recycling	Based on key physical, biological and chemical characteristics the LFA nutrient recycling index provides an indication of the sites ability to recycle nutrient and that it is comparable to or trending towards that of the local remnant vegetation
			LFA Landscape organisation	The Landscape Organisation Index provides a measure of the ability of the site to retain resources and that it is comparable to that of the local remnant vegetation
Growth medium development	Soil chemical, physical properties and amelioration	Soil properties are suitable for the establishment and maintenance of	pH	pH is typical of that of the surrounding landscape or falls within desirable ranges provided by the agricultural industry

Hierarchy of ecosystem succession	Aspect or ecosystem component	Completion criteria	Performance Indicators	Completion Performance Indicators
		selected vegetation species	Organic Matter	Organic Carbon levels are typical of that of the surrounding landscape, increasing or fall within desirable ranges provided by the agricultural industry
			Phosphorous	Available Phosphorus is typical of that of the surrounding landscape or fall within desirable ranges provided by the agricultural industry
Ecosystem establishment, development and habitat complexity	Vegetation diversity	Vegetation contains a diversity of species comparable to that of the local remnant vegetation	Total species richness	The total number of live plant species provides an indication of the floristic diversity of the site and is comparable to the local remnant vegetation
			Native understorey abundance	The abundance of native species per square metre averaged across the site provides an indication of the heterogeneity of the site and that it is has more than or an equal number of native species as the local remnant vegetation
	Protective ground cover	Ground layer contains protective ground cover and habitat structure comparable with the local remnant vegetation	Perennial plant cover (< 0.5m)	Percent ground cover provided by live perennial vegetation (less than 50cm in height) is comparable to that of the local remnant vegetation
Ecosystem establishment, development and habitat complexity	Protective ground cover		Total Ground Cover	Total groundcover is the sum of protective ground cover components (as described above) and that it is comparable to that of the local remnant vegetation
	Vegetation density		Density of shrubs and juvenile trees	The density of shrubs or juvenile trees with a stem diameter < 5cm is comparable to that of the local remnant vegetation
			Tree density	The density of shrubs or trees with a stem diameter > 5cm is comparable to that of the local remnant vegetation
	Ecosystem growth and natural recruitment	The vegetation is maturing and/or natural recruitment is occurring at rates similar to those of the local remnant vegetation	Shrubs and juvenile trees 0 - 0.5m in height	The number of shrubs or juvenile trees less than 0.5m in height provides an indication of establishment success and/or natural ecosystem recruitment and that it is comparable to that of the local remnant vegetation
			Shrubs and juvenile trees 1.5 - 2m in height	The number of shrubs or juvenile trees less than 1.5-2m in height provides an indication of establishment success, growth and/or natural ecosystem recruitment and that it is comparable to that of the local remnant vegetation
Ecological stability	Ecosystem health	The vegetation is in a condition comparable to that of the local remnant vegetation.	Healthy trees	The percentage of the tree population which are in healthy condition and that the percentage is comparable to the local remnant vegetation

Hierarchy of ecosystem succession	Aspect or ecosystem component	Completion criteria	Performance Indicators	Completion Performance Indicators
			Flowers/fruit: Trees	The presence of reproductive structures such as buds, flowers or fruit provides evidence that the ecosystem is maturing, capable of recruitment and can provide habitat resources comparable to that of the local remnant vegetation
	Ecosystem structure	The vegetation is developing in structure and complexity comparable to that of the local remnant vegetation	Foliage cover 0.5 - 2 m	Projected foliage cover provided by perennial plants in the 0.5 - 2m vertical height stratum indicates the community structure is comparable to that of the local remnant vegetation
			Foliage cover 2 - 4m	Projected foliage cover provided by perennial plants in the 2 - 4m vertical height stratum indicates the community structure is comparable to that of the local remnant vegetation
	Ecosystem composition	The vegetation is comprised by a range of growth forms comparable to that of the local remnant vegetation	Trees	The number of tree species regardless of age comprising the vegetation community is comparable to that of the local remnant vegetation
			Shrubs	The number of shrub species regardless of age comprising the vegetation community is comparable to that of the local remnant vegetation
			Grasses	The number of grass species comprising the vegetation community is comparable to that of the local remnant vegetation

9.11.1 Selection of reference sites

Selecting suitable reference sites is essential to this model as they ultimately set the benchmark for revegetation targets and indications of success. Reference sites chosen for Cadia were sites that were typical of the local environment, including those considered to be in the best condition within the local context, and as such are a true representation of the 'current condition' of remnant woodland and riparian communities. The reference sites were spread out where possible to maximise the spatial distribution and subsequent variations in community composition. It is acknowledged that reference sites chosen, while they are the best that could be found in a local context are still subject to impact and change due to (for example) occasional grazing, fire, drought, physical disturbance etc.

Reference sites have been selected based on the following target vegetation communities (for revegetation):

9.11.2 Woodland Reference Sites

- Woodland (refer to Figure 9-7– predominantly areas on better soil types on the lower eastern and western slopes of Black Rock Range, non-riparian areas of the Flyers Creek and Stratton Vale offset portions.)
  - RfWood01
  - RfWood02
  - RfWood04
  - RfWood05

9.11.2.1 General description

The grassy woodland reference sites are comprised of low various densities of *E. albens* (White Box) or *E. melliodora* trees but *E. blakelyi* (Blakely's Red Gum), *E. macrorhyncha* (Red Stringybark), *E. bridgesiana* (Apple Box) or *E. goniocalyx* (Bundy Box) may also have been present. Scattered old growth trees are present as well as younger regrowth and some relatively recent natural eucalypt recruitment was present in all sites. There was an absence of a shrub layer in two sites however in the other two woodland sites, shrubs including *Cassinia arcuata* and *Acacia dealbata* and *A. implexa* were more common and eucalypt regeneration was present. There may also have been the occasional *Rubus fruticosus* (Blackberry) or *Rosa rubiginosa* (Sweet Briar), exotic shrubs and declared noxious weeds in some woodland areas. The understoreys were usually dominated by native perennial grasses and common native forbs and all sites contained a high cover of leaf litter. There were also scattered exotic annuals and pockets of exotic grasses or weeds in previously disturbed areas.

9.11.2.2 Specific descriptions

Site	Reference	Description	Plate
Woodland Ashleigh Park	RfWood01	*E. melliodora* woodland with mixed native grasses, introduced annuals and forbs.	
Woodland Bundarra	RfWood02	*E. albens* remnant on the side of a rocky hill behind cattle yards. Improved pastures (Phalaris) dominate the paddock clearings but *Bothriochloa* and *Microlaena* persist within the rocky areas. Mixture of large old growth trees and regrowth trees. There was no regeneration or shrub understorey however large rocks and fallen branches were common. There were large patches of native grasses and scattered forbs but exotic species were more abundant.	

Woodland CVO Access	RWood04	Young regrowth woodland containing several mature eucalypts including *E. melliodora, E. bridgesiana* and *E. macrorhyncha* on a slope. Nice scattering of eucalypt, *Cassinia* and *Acacia dealbata* regeneration. The grassy understorey was grazed very low by wildlife and dominated by *Austrodanthonia, Microlaena* and *Bothriochloa*	
Woodland Cadiangullong Dam	RWood05	Remnant woodland dominated by *E. melliodora and E. goniocalyx* with an understorey of *Acacia dealbata (A. implexa, Cassinia* sp.). Predominantly regrowth but few old growth trees and some shrub regeneration occurring. Understorey contained scattered grasses and herbs. Many scattered logs and branches. In 2011 and 2012 there was improved growth of native grasses and shrubs	

9.11.3 Riparian Reference Sites

- Riparian (Refer to Figure 9-7- riparian areas located along Panuara Rivulet (Black Rock Range), Flyers Creek / Belubula River (Flyers Creek portion) and Swallow Creek (Stratton Vale portion))
  - RrRip02
  - RrRip03

9.11.3.1 General description

The two riparian woodland sites were quite different to each other, but both were characteristically open grassy woodland. One site was comprised of scattered old growth trees of *E. camaldulensis* (River Red Gum), *E. melliodora* and *E. bridgesiana* (Apple Box) and had an understorey dominated by *Phalaris aquatica* and *Dactylis glomerata* with patches of introduced annual grasses and native grass and herbs. The second was also comprised of scattered old growth trees dominated by *E. viminalis, E. melliodora* and *E. bridgesiana* and a relatively intact native and diverse understorey and contained some patches of shrubs including *Acacia melanoxylon* and *A. dealbata*. Both sites however contained various noxious weeds and floods waters continue to alter the stream morphology.

9.11.3.2 Specific descriptions

Site	Reference	Description	Plate
Riparian Bakers Shaft Reserve	RrRip02	Open woodland dominated by *E. camaldulensis, E. melliodora* and *E. bridgesiana*. Understorey dominated by *Phalaris aquatica* and *Dactylis glomerata* with patches of introduced annual grasses and native grass and herbs. Some *E. camaldulensis* regeneration occurring along the rocky banks	
Riparian Cadiangullong Creek	RrRip03	Cadiangullong Creek CVO. Open woodland dominated by *E. viminalis, E. melliodora* and *E. bridgesiana* and a relatively intact native understorey. Large old growth trees and midstorey shrubs including *Acacia melanoxylon* and *A. dealbata*.	

Figure 9-7 Location of Reference and Current Rehabilitation Monitoring Sites (Source DNA Environmental 2020)

9.11.4 Determining success

Revegetation success criteria (as at 2020) are presented in the following table (DNA Environmental 2019, DNA Environmental 2020). Each parameter measured (on a

Biennial basis) has a desirable range (based on the minimum and maximum values determined from reference sites). Revegetation sites have met the closure criteria parameter if the measurement falls within or exceeds this range.

A range of representative revegetation sites (nominally a total of 6-10 covering woodland and riparian revegetation within the three offset portions) will be chosen for ongoing monitoring. Revegetation monitoring and assessment against closure criteria will be undertaken on an annual basis (nominally April / May each year) by an external independent consultant. A detailed report is produced following annual monitoring which assesses the revegetation performance against reference site condition. A summary will be placed in the EPBC Annual Report

Reference site condition and therefore success criteria are dynamic and will change from year to year based on annual monitoring, therefore the relevant success criteria at any time will be contained in the most recent AEMR (and will be used / repeated in the corresponding EPBC Annual Report)

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Description of performance indicators	Primary Performance Indicators	Secondary Performance Indicators	Unit of measurement	2020 Woodland ecosystem range		2019 Riparian ecosystem range	
Performance indicators are quantified by the range of values obtained from replicated reference sites assessed in 2016								Lower KPI	Upper KPI	Lower KPI	Upper KPI
Phase 2: Landform establishment and stability	Landform slope, gradient	Landform suitable for final landuse and generally compatible with surrounding topography	Slope	Landform is generally compatible within the context of the local topography and final landform design.	✓		< Degrees (18°)	10	14	10	14
	Active erosion	Areas of active erosion are limited	No. Rills/Gullies	Number of gullies or rills >0.3m in width or depth in a 50m transect are limited and stabilising	✓		No.	0	4	0	0
			Cross-sectional area of rills	Provides an assessment of the extent of soil loss due to gully and rill erosion and that it is limited and/or is stabilising		✓	m2	0	0.9	0	0
Phase 3: Growth medium development	Soil chemical, physical properties and amelioration	Soil properties are suitable for the establishment and maintenance of selected vegetation species	pH	pH is typical of that of the surrounding landscape or falls within desirable ranges provided by the agricultural industry	✓		pH (5.6-7.3)	6.1	7	6.2	6.5
			EC	Electrical Conductivity is typical of that of the surrounding landscape or fall within desirable ranges provided by the agricultural industry		✓	< dS/m (<0.150)	0.055	0.142	0.060	0.055
			Organic Matter	Organic Carbon levels are typical of that of the surrounding landscape, increasing or fall within desirable ranges provided by the agricultural industry	✓		% (>4.5)	7.6	10.2	5.0	6.0
			Phosphorous	Available Phosphorus is typical of that of the surrounding landscape or fall within desirable ranges provided by the agricultural industry	✓		mg/kg (50)	15.4	36.7	16.7	18.7
			Nitrate	Nitrate levels are typical of that of the surrounding landscape or fall within desirable ranges provided by the agricultural industry		✓	mg/kg (>12.5)	2.1	37.7	7.4	4.9
			CEC	Cation Exchange Capacity is typical of that of the surrounding landscape or fall within desirable ranges provided by the agricultural industry		✓	Cmol+/kg (>14)	13.2	29.9	12.5	20.1
			ESP	Exchangeable Sodium Percentage (a measure of sodicity) is typical of that of the surrounding landscape or fall within desirable ranges provided by the agricultural industry		✓	% (<5)	0.3	0.6	0.9	0.2
Phase 4: Ecosystem &	Landscape Function Analysis	Landform is stable and performing as it was designed to do	LFA Stability	The LFA stability index provides an indication of the sites stability and is comparable to or	✓		%	61.8	67.5	75.8	76.0

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Description of performance indicators	Primary Performance Indicators	Secondary Performance Indicators	Unit of measurement	2020 Woodland ecosystem range		2019 Riparian ecosystem range	
Landuse Establishment	(LFA): Landform stability and organisation			trending towards that of the local remnant vegetation							
			LFA Landscape organisation	The Landscape Organisation Index provides a measure of the ability of the site to retain resources and that it is comparable to that of the local remnant vegetation	✓		%	64	100	95	100
	Vegetation diversity	Vegetation contains a diversity of species comparable to that of the local remnant vegetation	Diversity of shrubs and juvenile trees	The diversity of shrubs and juvenile trees with a stem diameter less than 5cm is comparable to that of the local remnant vegetation.		✓	species/area	0	7	5	7
				The percentage of shrubs and juvenile trees with a stem diameter less than 5cm dbh which are local endemic species and these percentages are comparable to the local remnant vegetation	✓		% population	0	100	46	46
			Total species richness	The total number of live plant species provides an indication of the floristic diversity of the site and is comparable to the local remnant vegetation	✓		No./area	19	41	45	56
			Native species richness	The total number of live native plant species provides an indication of the native plant diversity of the site and that it is greater than or comparable to the local remnant vegetation		✓	>No./area	7	31	14	31
			Exotic species richness	The total number of live exotic plant species provides an indication of the exotic plant diversity of the site and that it is less than or comparable to the local remnant vegetation		✓	<No./area	10	12	25	31
			Ratio of native to exotic species	The ratio of live native species compared to live exotic plant species provides an indication of the relative native species richness of the site and that it is more than or comparable to the local remnant vegetation		✓	>	0.6	3.1	0.5	1
	Vegetation density	Vegetation contains a density of species comparable to that of the local remnant vegetation	Density of shrubs and juvenile trees	The total density of shrubs or juvenile trees with a stem diameter < 5cm is comparable to that of the local remnant vegetation		✓	No./area	0	75	13	294
				The density of endemic shrubs or juvenile trees with a stem diameter < 5cm is comparable to that of the local remnant vegetation	✓		No./area	1	3	3	6

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Description of performance indicators	Primary Performance Indicators	Secondary Performance Indicators	Unit of measurement	2020 Woodland ecosystem range		2019 Riparian ecosystem range	
	Ecosystem composition	The vegetation is comprised by a range of growth forms comparable to that of the local remnant vegetation	Trees	The number of tree species regardless of age comprising the vegetation community is comparable to that of the local remnant vegetation	✓		No./area	1	3	3	6
			Shrubs	The number of shrub species regardless of age comprising the vegetation community is comparable to that of the local remnant vegetation	✓		No./area	0	6	2	8
			Sub-shrubs	The number of sub-shrub species comprising the vegetation community is comparable to that of the local remnant vegetation		✓	No./area	0	0	0	1
			Herbs	The number of herbs or forb species comprising the vegetation community is comparable to that of the local remnant vegetation		✓	No./area	13	24	22	31
		The vegetation is comprised by a range of growth forms comparable to that of the local remnant vegetation	Grasses	The number of grass species comprising the vegetation community is comparable to that of the local remnant vegetation	✓		No./area	5	7	10	12
			Reeds	The number of reed, sedge or rush species comprising the vegetation community is comparable to that of the local remnant vegetation		✓	No./area	0	1	1	3
			Vines	The number of vines or climbing species comprising the vegetation community is comparable to that of the local remnant vegetation		✓	No./area	0	0	0	1
			Ferns	The number of ferns comprising the vegetation community is comparable to that of the local remnant vegetation		✓	No./area	0	0	0	1
			Aquatic	The number of aquatic plants comprising the vegetation community is comparable to that of the local remnant vegetation		✓	No./area	0	0	0	0
Phase 5: Ecosystem & Landuse Development	Landscape Function Analysis (LFA): Landform function and ecological performance	Landform is ecologically functional and performing as it was designed to do	LFA Infiltration	LFA infiltration index provides an indication of the sites infiltration capacity and is comparable to or trending towards that of the local remnant vegetation	✓		%	52.9	62.2	55.4	61.2
			LFA Nutrient recycling	LFA nutrient recycling index provides an indication of the sites ability to recycle nutrient and is comparable to or trending towards that of the local remnant vegetation	✓		%	48.5	61.5	51.4	59.8

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Description of performance indicators	Primary Performance Indicators	Secondary Performance Indicators	Unit of measurement	2020 Woodland ecosystem range		2019 Riparian ecosystem range	
	Protective ground cover	Ground layer contains protective ground cover and habitat structure comparable with the local remnant vegetation	Litter cover	Percent ground cover provided by dead plant material is comparable to that of the local remnant vegetation		✓	%	65	94.5	46	54.5
			Annual plants	Percent ground cover provided by live annual plants is comparable to that of the local remnant vegetation		✓	<%	0	5.5	1	4
			Cryptogam cover	Percent ground cover provided by cryptogams (e.g. mosses, lichens) is comparable to that of the local remnant vegetation		✓	%	0	0	0	0.5
			Rock	Percent ground cover provided by stones or rocks (> 5cm diameter) is comparable to that of the local remnant vegetation		✓	%	0	7	0.5	5.5
			Log	Percent ground cover provided by fallen branches and logs (>5cm) is comparable to that of the local remnant vegetation		✓	%	1	4.5	0	11
			Bare ground	Percentage of bare ground is less than or comparable to that of the local remnant vegetation		✓	< %	2	7.5	1.5	6
			Perennial plant cover (< 0.5m)	Percent ground cover provided by live perennial vegetation (<0.5m in height) is comparable to that of the local remnant vegetation	✓		%	1	15	28.5	41
			Total Ground Cover	Total groundcover is the sum of protective ground cover components (as described above) and that it is comparable to that of the local remnant vegetation	✓		%	92.5	98	94	98.5
	Ground cover diversity	Vegetation contains a diversity of species per square meter comparable to that of the local remnant vegetation	Native understorey abundance	The abundance of native species per square metre averaged across the site provides an indication of the heterogeneity of the site and that it is has more than or an equal number of native species as the local remnant vegetation	✓		> species/m^2	0.4	3	1	6.2
			Exotic understorey abundance	The abundance of exotic species per square metre averaged across the site provides an indication of the heterogeneity of the site and that it is has less than or an equal number of native species as the local remnant vegetation		✓	< species/m^2	0.4	2.8	1.6	4.8
	Native ground cover abundance	Native ground cover abundance is comparable to that of	Percent ground cover provided by native	The percent ground cover abundance of native species (<0.5m) compared to exotic species is comparable to that of the local remnant vegetation	✓		%	7.1	85.0	18.3	83.6

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Description of performance indicators	Primary Performance Indicators	Secondary Performance Indicators	Unit of measurement	2020 Woodland ecosystem range		2019 Riparian ecosystem range	
		the local remnant vegetation	vegetation <0.5m tall								
	Ecosystem growth and natural recruitment	The vegetation is maturing and/or natural recruitment is occurring at rates similar to those of the local remnant vegetation	shrubs and juvenile trees 0 - 0.5m in height	The number of shrubs or juvenile trees <0.5m in height provides an indication of establishment success and/or natural ecosystem recruitment and that it is comparable to that of the local remnant vegetation	✓		No./area	0	68	5	231
			shrubs and juvenile trees 0.5 - 1m in height	The number of shrubs or juvenile trees 0.5-1m in height provides an indication of establishment success, growth and/or natural ecosystem recruitment and that it is comparable to that of the local remnant vegetation		✓	No./area	0	5	5	62
			shrubs and juvenile trees 1 - 1.5m in height	The number of shrubs or juvenile trees 1-1.5m in height provides an indication of establishment success, growth and/or natural ecosystem recruitment and that it is comparable to that of the local remnant vegetation		✓	No./area	0	0	0	0
			shrubs and juvenile trees 1.5 - 2m in height	The number of shrubs or juvenile trees 1.5-2m in height provides an indication of establishment success, growth and/or natural ecosystem recruitment and that it is comparable to that of the local remnant vegetation	✓		No./area	0	0	0	1
			shrubs and juvenile trees >2m in height	The number of shrubs or juvenile trees >2m in height provides an indication of establishment success, growth and/or natural ecosystem recruitment and that it is comparable to that of the local remnant vegetation		✓	No./area	0	2	0	3
	Ecosystem structure	The vegetation is developing in structure and complexity comparable to that of	Foliage cover 0.5 - 2 m	Projected foliage cover provided by perennial plants in the 0.5 - 2m vertical height stratum indicates the community structure is comparable to that of the local remnant vegetation	✓		% cover	0	0	0	0

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Description of performance indicators	Primary Performance Indicators	Secondary Performance Indicators	Unit of measurement	2020 Woodland ecosystem range		2019 Riparian ecosystem range	
		the local remnant vegetation	Foliage cover 2 - 4m	Projected foliage cover provided by perennial plants in the 2 - 4m vertical height stratum indicates the community structure is comparable to that of the local remnant vegetation	✓		% cover	0	2	0	6
			Foliage cover 4 - 6m	Projected foliage cover provided by perennial plants in the 4 -6m vertical height stratum indicates the community structure is comparable to that of the local remnant vegetation		✓	% cover	**3**	**6**	**9**	**22**
			Foliage cover >6m	Projected foliage cover provided by perennial plants >6m vertical height stratum indicates the community structure is comparable to that of the local remnant vegetation	✓		% cover	37	42	47	49
	Tree diversity	Vegetation contains a diversity of maturing tree and shrubs species comparable to that of the local remnant vegetation	Tree diversity	The diversity of trees or shrubs with a stem diameter greater than 5cm is comparable to the local remnant vegetation		✓	species/area	1	4	4	5
				The percentage of maturing trees and shrubs with a stem diameter greater than 5cm dbh which are local endemic species and these percentages are comparable to the local remnant vegetation	✓		%	100	100	100	100
	Tree density	Vegetation contains a density of maturing tree and shrubs species comparable to that of the local remnant vegetation	Tree density	The density of shrubs or trees with a stem diameter > 5cm is comparable to that of the local remnant vegetation	✓		No./area	9	48	8	28
			Average dbh	Average tree diameter of the tree population provides a measure of age, (height) and growth rate and that it is trending towards that of the local remnant vegetation.		✓	cm	25	68	32	62
	Ecosystem health	The vegetation is in a condition comparable to that of the local remnant vegetation.	Live trees	The percentage of the tree population which are live individuals and that the percentage is comparable to the local remnant vegetation		✓	% population	85.4	95.8	86	88
			Healthy trees	The percentage of the tree population which are in healthy condition and that the percentage is comparable to the local remnant vegetation	✓		% population	8.3	11.1	25	32
			Medium health	The percentage of the tree population which are in a medium health condition and that the percentage is comparable to the local remnant vegetation		✓	% population	56.3	79.2	46	63

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Description of performance indicators	Primary Performance Indicators	Secondary Performance Indicators	Unit of measurement	2020 Woodland ecosystem range		2019 Riparian ecosystem range	
			Advanced dieback	The percentage of the tree population which are in a state of advanced dieback and that the percentage is comparable to the local remnant vegetation		✓	% population	0	18.8	0	7
			Dead Trees	The percentage of the tree population which are dead (stags) and that the percentage is comparable to the local remnant vegetation		✓	% population	0	14.6	13	14
			Mistletoe	The percentage of the tree population which have mistletoe provides an indication of community health and habitat value and that the percentage is comparable to the local remnant vegetation		✓	% population	0	0	0	0
			Flowers/fruit: Trees	The presence of reproductive structures such as buds, flowers or fruit provides evidence that the ecosystem is maturing, capable of recruitment and can provide habitat resources comparable to that of the local remnant vegetation	✓		% population	16.7	88.9	50	54
			Hollows	The presence of hollows provides evidence that the ecosystem is maturing and can provide habitat resources comparable to that of the local remnant vegetation		✓	% population	0	44.4	7.7	37.5

9.12 Weed Control Measures

The following table provides a list of known noxious and priority weeds that occur within the region of the three offset portions (drawn from vegetation surveys, management experience and regional observations). Weeds have been prioritised based on noxious weed declarations, known invasiveness, known impact on biodiversity and means / risk of rapidly spreading. The list of priorities will be used to assist in the preparation and execution of field-based weed control.

The control of weeds will be undertaken using an integrated approach that reduce the prevalence of the weed (including preventing seed set, spread etc) and increases the presence of desirable species that will eventually occupy the space or niche of the weed and outcompete future establishing weeds. Control means will include:

- Chemical (undertaken in accordance with NSW DPI - Noxious and Environmental Weed control handbook, product labels and SDS).
- Mechanical (slashing, physical removal, low impact bush regeneration techniques)
- Biological (biological control agents, livestock grazing)

Methods of replacing the weed with desirable species will include:

- Planting
- Seeding
- Selective weed control
- Other practices that may stimulate native species regeneration (for example low intensity burning, soil disturbance etc)

Weed control will be undertaken by local specialist weed contractors and / or bush regeneration companies (remnant areas)

9.12.1 Acronyms

NOX = Declared Noxious (either within Cabonne Council or Upper Macquarie County Council areas)

WONS = Weed of National Significance

9.12.2 Definitions

Known = known to occur within the region / offset areas

Potential = not currently known to occur, has potential to become established in the area.

Weed	NOX	WONS	Known	Potential	Control Options	Timing	Priority
Blackberry ***(Rubus fruticosus* agg. Spp.)**	X	X	X		Selective herbicide (spray) Strong competition to reduce establishment. Biological control options available.	Spring / early summer prior to seed set.	High
St Johns Wort ***(Hypericum perforatum)***	X		X		Selective herbicide (spray) Strategic grazing where possible to reduce seed set Strong competition to reduce establishment. Biological control options available.	Spring / early summer prior to seed set.	High
Bathurst Burr ***(Xanthium spinosum)***	X		X		Selective herbicide (spray) Mechanical / chipping for isolated plants / small patches. Strong competition to reduce establishment.	Following summer rains and before seed set.	High
Sweet Briar ***(Rosa rubiginosa)***	X		X		Selective herbicide (spray / cut stem method) Strong competition to reduce establishment.	Spring / early summer prior to seed set.	High
Hawthorn ***(Crataegus* spp.)**				X	Selective herbicide (spray / cut stem / injection method) Strong competition to reduce establishment.	Spring / early summer prior to seed set.	Medium
Serrated Tussock ***(Nassella trichotoma)***	X	X	X		Semi-selective herbicide (spray) Strong competition to reduce establishment Mechanical / chipping for isolated plants / small patches	Late winter / early spring prior to seed set	High
Chilean needle grass ***(Nassella neesiana)***	X	X	X		Semi-selective herbicide (spray) Strong competition to reduce establishment Mechanical / chipping for isolated plants / small patches. Strategic grazing where possible to reduce seed set (young growth only)	Late winter / early spring prior to seed set	High
Phalaris ***(Phalaris aquatica)***			X		Non-selective herbicide (spray) Strong competition to reduce establishment Strategic grazing where possible to reduce seed set	Late winter / early spring prior to seed set	Low
Cocksfoot ***(Dactylis glomerata)***			X		Non-selective herbicide (spray) Strong competition to reduce establishment Strategic grazing where possible to reduce seed set	Late winter / early spring prior to seed set	Low
Scotch thistle ***(Onopordum* spp.)**	X		X		Selective herbicide (spray) Strong competition to reduce establishment. Biological control options available.	Late winter / early spring prior to seed set	High
Nodding Thistle ***(Carduus nutans)***	X			X	Selective herbicide (spray) Strong competition to reduce establishment. Biological control options available.	Late winter / early spring prior to seed set	High

Weed	NOX	WONS	Known	Potential	Control Options	Timing	Priority
Sticky Nightshade ***(Solanum Sisymbriifolium)***			X		Selective herbicide (spray) Strong competition to reduce establishment.	Spring / early summer prior to seed set.	Medium
Other thistles **(Asteraceae family)**			X		Selective herbicide (spray) Strategic grazing (spray graze) where possible to reduce seed set Strong competition to reduce establishment. Biological control options available (species specific).	Late winter / early spring prior to seed set	Low
Basket Willow ***(Salix viminalis)***		X	X		Non-selective herbicide (Spray / cut stump / injection methods) Mechanical removal	Spring / summer while actively growing.	High
Brome grass ***(Bromus* spp.)**			X		Semi-selective herbicide (spray) Strong competition to reduce establishment Strategic grazing where possible to reduce seed set (young growth only)	Spring / early summer prior to seed set.	Low
Horehound ***(Marrubium vilgare)***			X		Selective herbicide (spray) Strong competition to reduce establishment. Biological control options available.	Spring / early summer prior to seed set.	Medium
Sifton bush ***(Cassina arcuate)***	X		X		Native colonising species: will only be controlled where dominant and excluding the regeneration / establishment of other native species. Selective herbicide (spray) Mechanical ripping / slashing Strong competition to reduce establishment.	Spring / early summer prior to seed set.	Low
Paterson's Curse ***(Echium plantagineum)***			X		Selective herbicide Strategic grazing (spray graze) where possible to reduce seed set Strong competition to reduce establishment. Biological control options available.	Late winter / early spring prior to seed set	Low
Hemlock ***(Conium maculatum)***				X	Selective herbicide (spray) Strong competition to reduce establishment.	Late winter / early spring prior to seed set	Low
Fleabane ***(Conyza spp.)***			X		Selective herbicide (spray) Strong competition to reduce establishment.	Late winter / early spring prior to seed set	Low
Capeweed ***(Arctotheca calendula)***			X		Selective herbicide (spray) Strong competition to reduce establishment.	Late winter / early spring prior to seed set	Low
Blackberry nightshade ***(Solanum nigrum)***			X		Selective herbicide (spray) Strong competition to reduce establishment.	Spring / early summer prior to seed set.	High

Weed	NOX	WONS	Known	Potential	Control Options	Timing	Priority
Barley Grass ***(Hordeum leporinum)***			X		Semi-selective herbicide (spray) Strong competition to reduce establishment Strategic grazing where possible to reduce seed set (young growth only)	Late winter / early spring prior to seed set	Low
Ryegrass ***(Lolium* spp.*)***			X		Semi-selective herbicide (spray) Strong competition to reduce establishment Strategic grazing where possible to reduce seed set (young growth only)	Late winter / early spring prior to seed set	Low
Privet ***(Ligustrum* spp.*)***	X			X	Selective herbicide (Spray / cut stump / injection methods) Mechanical removal	Spring / early summer prior to seed set.	High
English / scotch Broom ***(Cytisus* spp.*)***	X	X		X	Selective herbicide (Spray / cut stump / injection methods) Strong competition to reduce establishment. Biological control options available.	Spring / early summer prior to seed set.	High
Heliotrope ***(Heliotropium* spp.*)***			X		Selective herbicide (spray) Strong competition to reduce establishment. Biological control options available.	Late winter / early spring prior to seed set	Medium
Fireweed **(*Senecio madagascariensis*)**				X	Selective herbicide (spray) Strong competition to reduce establishment.	Late winter / early spring prior to seed set	Medium

9.13 Pests and Pest Control Measures

The following table provides a list of known pests that occur within the region of the three offset portions (drawn from fauna surveys, management experience and regional observations). Pests have been prioritised based on their potential to impact on biodiversity / desired outcomes. The list of priorities will be used to assist in the preparation and execution of field-based pest control.

The control of pests will be undertaken using an integrated approach that reduce the prevalence (and impact) of the pest and include destruction of the pest / removal of harbor / habitat where possible.

Where poisoning is identified as a potential control option, works will be conducted in conjunction with Central Tablelands Local Land Services. Works will be implemented by local qualified pest control contractors.

Pest	Status	Known / Potential	Control Options.	Priority
Feral Pig (sus scrofa)	NSW declared pest species	Known	Trapping Shooting 1080 poisoning	High
Fox (Vulpes vuples)	NSW declared pest species	Known	Shooting 1080 poisoning	High
Rabbit (Oryctolagus cuniculus)	NSW declared pest species	Known	Pindone / 1080 poisoning Harbor / burrow destruction	High
Wild Dog (Canis lupus)	NSW declared pest species	Potential	Shooting 1080 poisoning	High
Feral cat (Felis catus)		Known	Trapping Shooting	High
Brown Hare (Lepus europaeus)		Known	No current proposed control options. Control options will only be considered where population numbers are impacting on biodiversity outcomes.	Low
Eastern Grey Kangaroo (Macropus giganteus)		Known	Will only be controlled where population numbers are impacting on biodiversity outcomes. Shooting / commercial harvesting. (Pending approval / issue of tags by NPWS)	Medium
Fallow Deer		Known	Shooting	Medium
Livestock (Sheep, cattle, goats)		Known	Round-up, trapping, removal from offset areas. Exclusion through fencing. Shooting (feral goats)	Medium
Introduced birds: **Common Blackbird** **Common Starling** **Common Myna** **House Sparrow**		Known	No current proposed control options. Control options will only be considered where population numbers are impacting on biodiversity outcomes.	Low
Rodents: **House mouse** **Black rat**		Known	No current proposed control options. Control options will only be considered where population numbers are impacting on biodiversity outcomes.	Low

9.14 Threatened Species Recovery Assistance

The following table provides a summary of key considerations for known threatened species and Endangered Ecological Communities that occur within the offset portions. Information where available is drawn from draft or final recovery plans, threatened species profiles etc. for the relevant species. Each management requirement has been included in the action plans (above) or other section within the plan and is referenced accordingly.

Species / Community	Reference	Key Management Requirements	Action Plan
Heath Monitor (*Varanus rosenbergi*)	NSW Dept of Environment and Heritage website – species profile.	Regeneration works (correct species selection, density of planting)	1 & 2
		Maintain / improve structural diversity	1 & 2
		Use appropriate burning regimes and intensity	3
		Control pest species	5
		Cease firewood collection / tidying up / removal of logs etc	6
		Cease bush rock removal.	6
Speckled Warbler (*Pyrrholaemus sagittatus*)	NSW Dept of Environment and Heritage website – species profile.	Regeneration works (correct species selection, density of planting (open woodland)	1 & 2
		Maintain / improve structural diversity (Patches of dense shrubs for nesting)	1 & 2
		Use appropriate burning regimes and intensity	3
		Control pest species and weeds	4 & 5
		Cease firewood collection / tidying up / removal of logs etc.	6
Brown Tree Creeper (*Climacteris picumnus*)	NSW Dept of Environment and Heritage website – species profile.	Retention / regeneration of woodland habitat (open woodland)	1 & 6
		Conservation of habitat trees (including large / old / dead trees with hollows)	6
		Regeneration works (correct species selection, density of planting)	1 & 2
		Cease firewood collection / tidying up / removal of logs etc	6
		Control pest species and weeds	4 & 5
		Low frequency burning.	3
Diamond Fire-tail Finch (*Stagonopleura guttata*)	NSW Dept of Environment and Heritage website – species profile.	Regeneration works (correct species selection, density of planting (open woodland)	1 & 2
		Diverse native understory	1 & 2
		Maintain / improve structural diversity (Patches of dense shrubs for nesting)	1 & 2
		Use appropriate burning regimes and intensity	3
		Control pest species and weeds	4 & 5
		Cease firewood collection / tidying up / removal of logs etc.	6
		Reduce grazing by domestic stock.	7
Superb Parrot (*Polytelis swainsonii*)	National Recovery Plan for the Superb Parrot Polytelis swainsonii	Retention / regeneration of woodland habitat	1 & 6
		Conservation of habitat trees (including large / old / dead trees with hollows)	6
		Regeneration works (correct species selection, density of planting)	1 & 2
		Cease firewood collection.	6
		Control pest species and weeds	4 & 5
Barking Owl (*Ninox connivens*)	DRAFT Recovery Plan for the Barking Owl Ninox connivens	Retention / regeneration of woodland habitat	1 & 6
		Conservation of habitat trees (including large / old / dead trees with hollows)	6
		Regeneration works (correct species selection, density of planting (open woodland))	1 & 2
		Cease firewood collection.	6

Species / Community	Reference	Key Management Requirements	Action Plan
Little Eagle (*Hieraaetus morphnoides*),	NSW Dept of Environment and Heritage website – species profile.	Retention / regeneration of woodland habitat	1 & 6
		Conservation of large habitat trees for nesting)	6
		Regeneration works (correct species selection, density of planting)	1 & 2
		Cease firewood collection.	6
		Control pest species and weeds	4 & 5
		Risk on non-target damage through fox and rabbit poisoning programmes	6
Yellow-bellied Sheathtail Bat *(Saccolaimus flaviventris)*	NSW Dept of Environment and Heritage website – species profile.	Retention / regeneration of woodland habitat	1 & 6
		Conservation of habitat trees (including large / old / dead trees with hollows)	6
		Regeneration works (correct species selection, density of planting)	1 & 2
		Cease firewood collection.	6
		Control pest species and weeds	4 & 5
Large Bentwing Bat *(Miniopterus schreibersii)*	NSW Dept of Environment and Heritage website – species profile.	Retention / regeneration of woodland habitat in vicinity of cave locations.	1 & 2
		Conservation of bush rock / rock escarpments / caves	6
		Regeneration works (correct species selection, density of planting)	1 & 2
		Cease firewood collection	6
		Control pest species and weeds	4 & 5
Squirrel Glider *(Petaurus norfolcensis)	NSW Dept of Environment and Heritage website – species profile.	Retention / regeneration of bushland habitat with shrub / acacia mid-story.	2
		Conservation of habitat trees (including large / old / dead trees with hollows)	6
		Regeneration works (correct species selection, density of planting)	1 & 2
		Cease firewood collection.	6
		Control pest species and weeds	4 & 5
White Box, Yellow Box, Blakely's Red Gum Woodland. **Grassy White Box Woodlands.** **Yellow Box/Red Gum Grassy Woodlands.**	National Recovery Plan: White Box- Yellow Box-Blakely's Red Gum Grassy Woodland and Derives Native Grassland.	**Objectives**	
		Achieve no net loss in extent and condition of the EEC	1 & 2
		Increasing protection of sites in good condition	1 & 2
		Increasing landscape function of the EEC through management and restoration	1 & 2 Section 9.10
		Increasing transitional areas around remnants and linkages between remnants.	Section 3.10
		Management Practices	
		Avoid fertiliser use	1
		Control weeds	4
		Regeneration works (correct species selection, density of planting)	1 & 2
		Maintain / improve connectivity	Section 3.10
		Maintain / improve structural diversity	1 & 2
		Use strategic grazing / otherwise exclude	7
		Use appropriate burning regimes and intensity	3
		Control pest species	5
		Cease firewood collection / tidying up / removal of logs etc	6
*Identified in 2008 survey of Black Rock Range: not identified during 2006 survey.			

9.15 Revegetation of Cleared Areas

The following figures show areas within the Cadia East Offset (Black Rock Range (Figure 9-8), Flyers Creek (

Figure 9-9) and Stratton Vale (Figure 9-10) portions that require rehabilitation. The vegetation community proposed (either 1a or 2b) has been selected to mirror the adjacent vegetation type suitable to the location (based on soil and topography). The vegetation types have been described by FloraSearch (FloraSearch 2005)

A priority for offset areas will be to manage the site to reinstate ecological functionality (in line with the principles of Landscape Function Analysis) particularly on the upper eastern slopes of Black Rock Range. Works may include:

- Seeding / encouragement of perennial (native) grasses on degraded slope areas to trap sediment, nutrient and water. This may initially be undertaken in strips across the contour and encouraged / expanded to cover more of the slope areas. Seeding other species (in line with target vegetation community) as the slopes stabilise.
- In line with Natural Sequence Farming principles, installation of 'leaky weir' structures (rock boulders / logs etc) in upper slope drainage lines to trap sediment, nutrient and water.
- Management to encourage the build-up of organic matter and improvement in soil health / structure. Intermittent disturbance may be used (such as occasional grazing) to assist in the process.

Prior to undertaking additional rehabilitation works an assessment will be carried out on the resilience of the area and whether the native vegetation community is capable of 'self or assisted' repair, back to a functional community. If the area has good resilience the area will be encouraged to return without intensive rehabilitation works. Several tools may be trialled and used to assist the recovery including targeted grazing, scarification, fire, brush matting and seed broadcast.

The following methods will be applied to areas with low resilience:

- Direct seeding (restricted to trafficable / arable areas)
  - Site preparation (2-3 knockdown sprays applied in 2m bands along the contour at a suitable spacing – nominally 5 metres apart)
  - Selection of appropriate native species seed consistent with the target community
  - Direct seeding (along the contour in prepared areas)
  - Monitoring of representative sites
  - Maintenance (including re-sowing if required)
- Planting of tubestock (all other areas).
  - Site preparation (knockdown spray)
  - Ripping (across the contour)
  - Site preparation (2nd knockdown spray)
  - Planting tubestock consistent with the target community
  - Knockdown spray (around planted tubestock)
  - Monitoring of representative sites
  - Maintenance (including weed control and replanting if required)

Species selection for revegetation will be based on the following lists (for Communities 1a, 2b and gully / riparian areas) which have been extracted from the FloraSearch survey (FloraSearch 2005) conducted as part of the Cadia East Environmental Assessment or from baseline vegetation assessments. From the survey lists, the following native species (Table 9-1) have been selected due to the potential for the collection and germination of

seed to produce tubestock and / or for direct seeding purposes. The actual species sown / planted will depend on the availability of seed at the time of conducting rehabilitation works.

During implementation of the above rehabilitation techniques, species lists, numbers of tubestock for each species and seeding rates will be adjusted in an attempt to provide the structural diversity for the target vegetation community. Relevant reference sites used in the Cadia annual rehabilitation monitoring program will also be used to determine appropriate species and densities. For example for woodland community 1a, Cadia will attempt to rehabilitate the area with a eucalypt canopy with a relatively sparse mid-story and an under-story dominated by native grasses and herbs.

At Black Rock Range, a large proportion of the target vegetation community exists as a degraded native grassland and therefore rehabilitation efforts will largely focus on reinstating 'missing' structural elements and species which are primarily tree and shrub species. A reduction in grazing pressure initially followed by planned intermittent grazing is likely to assist the recovery of ground flora. Regular monitoring and comparison to reference sites will determine the need for assisted regeneration.

At Flyers Creek, the understory is dominated by introduced perennial grasses and there are few native ground cover species. In these sites, the aim will be to increase the tree and shrub cover.

At Stratton vale portion is open White Box remnant with improved pastures (Phalaris) which dominate the paddock clearings but *Bothriochloa* and *Microlaena* persist within the rocky areas. Mixture of large old growth trees and regrowth trees.

Rehabilitation success will be determined as described in Section 9.11.4

Table 9-1 Potential species for rehabilitation

Scientific Name	Common Name	Vegetation Community		
		1a	2b	Gully /Riparian
Cupressaceae				
Callitris endlicheri	Black Cypress Pine	•		•
Casuarinaceae				
Casuarina cunninghamiana	River she-oak			•
Allocasuarina diminuta				•
Dillenaceae				
Hibbertia obtusifolia	Grey Guinea Flower	•	•	•
Epacridaceae				
Brachyloma daphnoides	Daphne Heath			•
Styphelia triflora	Five Corners	•		•
Fabaceae: Faboideae				
Dillwynia phylicoides				•
Glycine clandestina	Twining Glycine	•		•
Hardenbergia violacea	False Sarsaparila	•		•

Scientific Name	Common Name	Vegetation Community		
		1a	2b	Gully /Riparian
Indigofera australis	Austral Indigo	•		•
Pultenaea procumbens	Heathy Bush-pea			•
Fabaceae: Mimosoideae				
Acacia buxifolia	Box-leaf Wattle			•
Acacia dealbata	Silver Wattle	•	•	•
Acacia decora	Western Golden Wattle	•	•	
Acacia doratoxylon	Currawang	•		•
Acacia implexa	Hickory	•		•
Acacis leucolada		•	•	
Acacia melanoxylon	Blackwood wattle			•
Acacia paradoxa	Kangaroo Thorn		•	•
Acacia pennivervis	Mountain Hickory			•
Acacia ulicifolia	Prickly Moses			•
Acacia vestita	Boree wattle	•	•	•
Goodeniaceae				
Goodenia hederacea			•	•
Goodenia pinnatifida	Ivy Goodenia		•	
Myrtaceae				
Calytrix tetragona	Fringe-myrtle			•
Eucalyptus albens	White Box	•	•	•
Eucalyptus blakelyi	Blakely's Red Gum		•	•
Eucalyptus bridgesiana	Apple Box		•	•
Eucalyptus dealbata	Tumbledown Red Gum			•
Eucalyptus goniocalyx	Bundy		•	•
Eucalyptus melliodora	Yellow Box		•	•
Eucalyptus macrorhyncha	Red Stringybark	•	•	•
Eucalyptus polyanthemos	Red Box	•	•	•
Eucalyptus viminalis	Ribbon Gum		•	•
Leptospermum multicaule	Silver Teatree			•
Pittosporaceae				
Bursaria spinosa		•	•	•

Scientific Name	Common Name	Vegetation Community		
		1a	2b	Gully /Riparian
Proteaceae				
Grevillea floribunda ssp. *floribunda*	Seven Dwarfs Grevillea			•
Grevillea ramosissima ssp. *ramosissima*	Fan Grevillea			•
Sapindaceae				
Dodonaea viscosa ssp. *spatulata*	Sticky Hop-bush	•		•
Santalaceae				
Exocarpus cupressiformis	Native Cherry			•
Sterculiaceae				
Brachychiton populneus	Kurrajong	•	•	
Cyperaceae				
Carex appressa				•
Carex inversa	Knob Sedge	•	•	•
Isolepis hookeriana				•
Lepidosperma laterale	Broad Sword-sedge	•		•
Luzula meridionalis	Field Woodrush	•	•	•
Schoenus apogon			•	
Juncaceae				
Juncus homalocaulis	A Rush	•	•	
Juncus remotiflorus				•
Juncus subsecundus	A Rush	•	•	•
Lomandraceae				
Lomandra filiformis ssp. *coriacea*	Wattle Matrush	•	•	•
Lomandra filiformis ssp. *filiformis*	Iron Grass			•
Lomandra glauca	Pale Matrush			•
Lomandra multiflora	Many-flowered Mat-rush	•		•
Phormiaceae				
Dianella caerulea				•
Dianella longifolia			•	
Dianella revoluta		•	•	•
Stypandra glauca	Nodding Blue Lily			•

Scientific Name	Common Name	Vegetation Community		
		1a	2b	Gully /Riparian
Poaceae				
Agrostis avenacea		•		
Aristida behriana	Bunch Wiregrass		•	
Aristida ramosa var. *speciosa*			•	•
Aristida vagans			•	
Austrodanthonia auriculata	Lobed Wallaby Grass	•		
Austrodanthonia caespitosa	Ringed Wallaby Grass		•	
Austrodanthonia eriantha	Hill Wallaby Grass	•	•	•
Austrodanthonia laevis		•		
Austrodanthonia racemosa var. *racemosa*	A Wallaby Grass	•	•	
Austrostipa densiflora				•
Austrostipa scabra ssp. *falcata*	Speargrass	•	•	
Bothriochloa macra	Red Grass	•	•	
Dichelachne hirtella	A Plumegrass		•	•
Dichelachne sieberiana	A Plumegrass			•
Echinopogon caespitosus				•
Echinopogon ovatus	Forest Hedgehog Grass	•		•
Eleocharys acuta	Spike rush			•
Elymus scaber	Wheat Grass	•	•	
Microlaena stipoides var. *stipoides*	Weeping Grass	•	•	•
Phragmites australia	common reed			•
Poa labillardieri	Tussock	•	•	•
Poa sieberiana var. *sieberiana*	Fine-leaved Tussock Grass	•	•	
Typha spp.	cumbungi / bullrush			•
Xanthorrhoeaceae				
Xanthorrhoea glauca ssp. *angustifolia*	A Grass Tree		•	•

Figure 9-8: Proposed Vegetation Communities of Black Rock Range Cleared Areas.

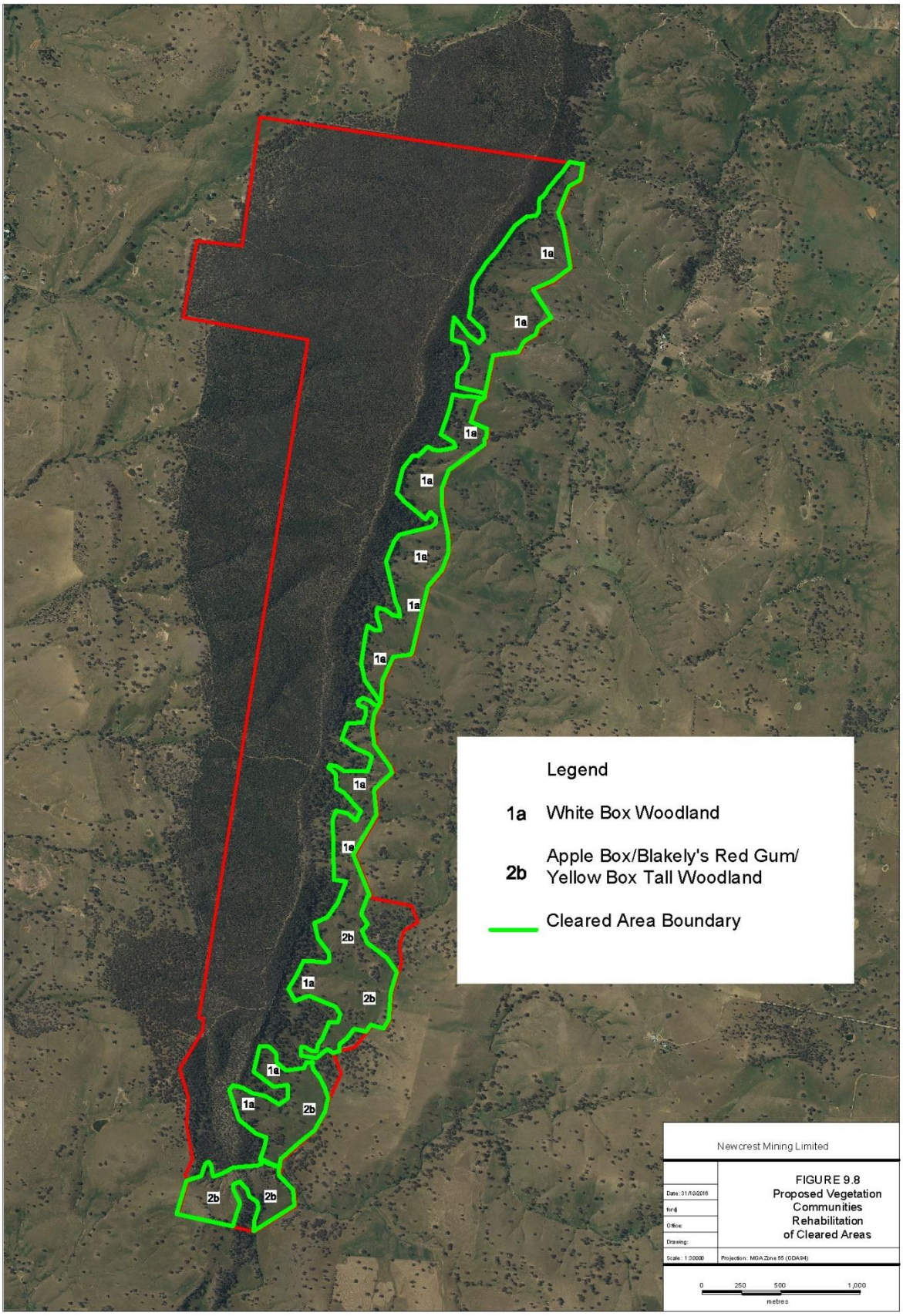


Figure 9-9: Proposed Vegetation Communities of Flyers Creek.

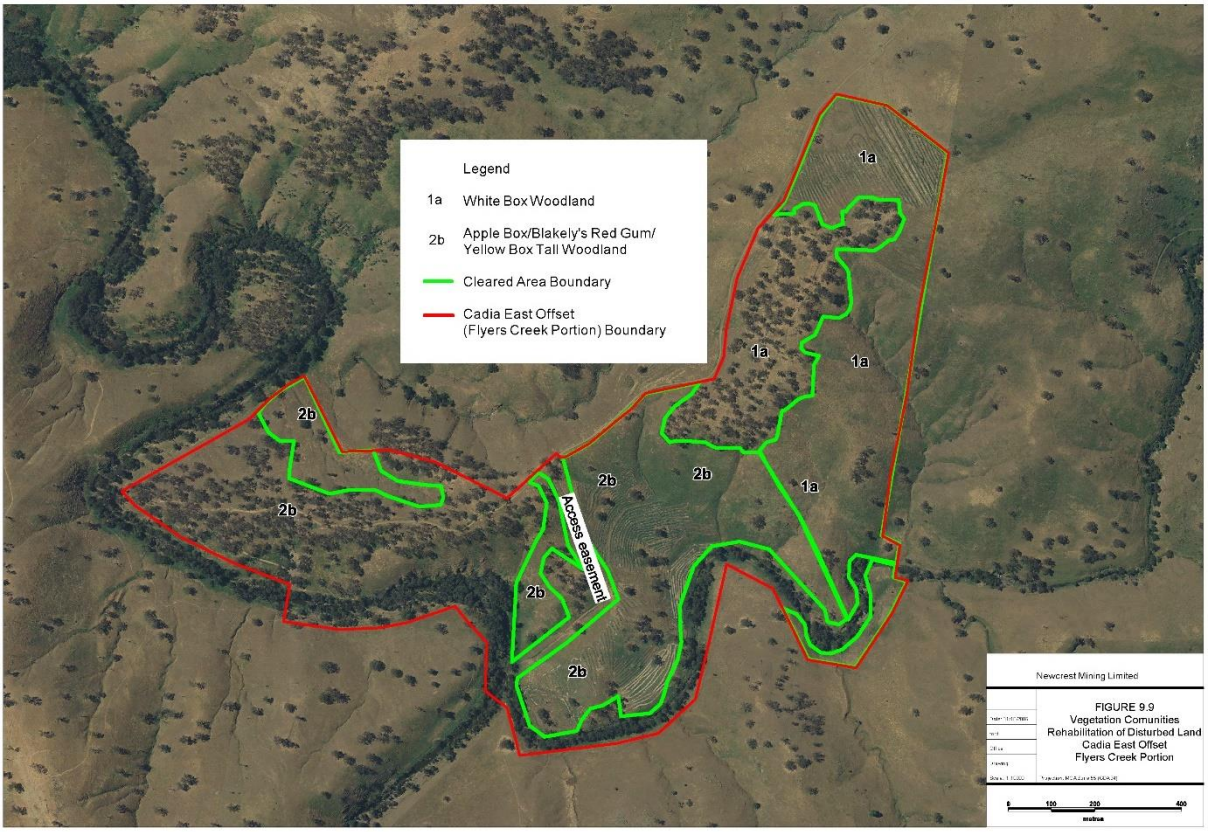
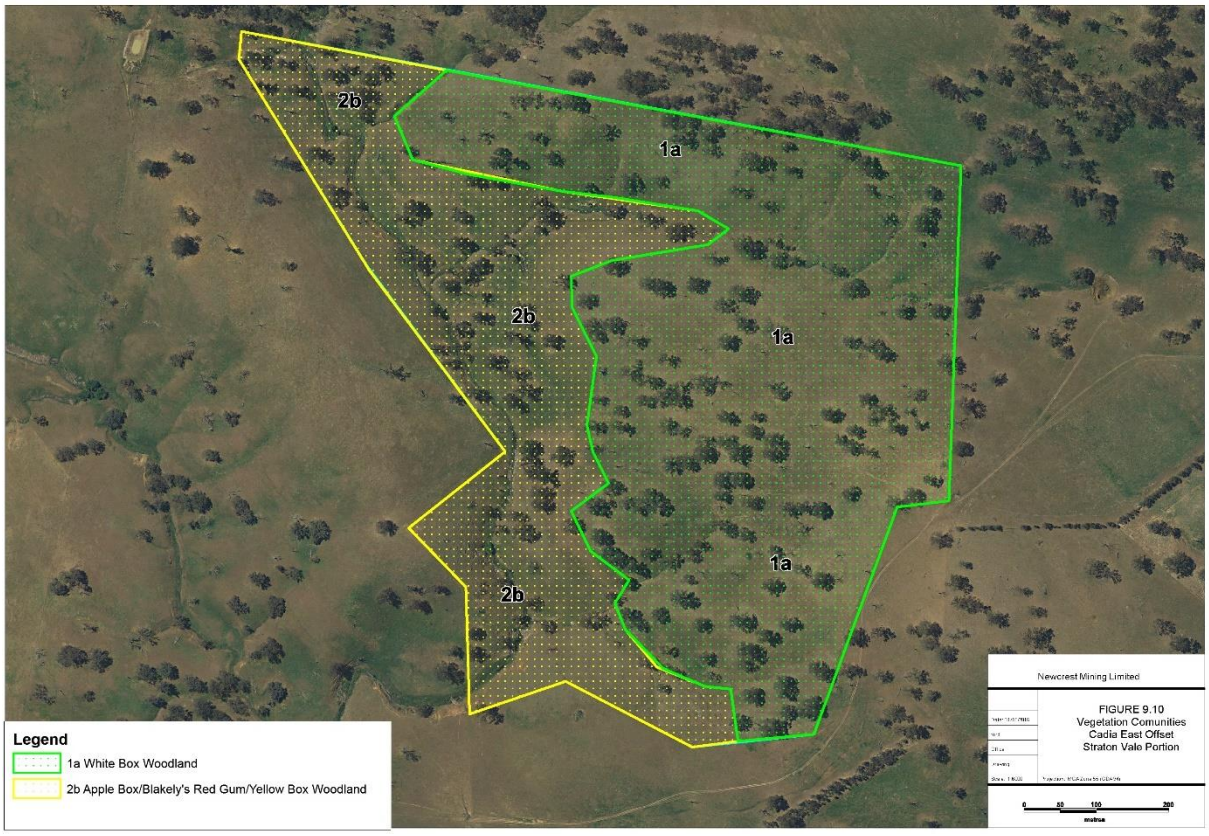


Figure 9-10: Proposed Vegetation Communities of Stratton Vale



10. REVIEW OF THE LAND AND BIODIVERSITY PLAN

This Management Plan will be reviewed every five years, or as required, to ensure the currency and usefulness of the document. The review will include an assessment of the effectiveness of the established system and its performance against the objectives and targets.

11. CONSULTATION

As per project approval requirements, Cadia has consulted with regulatory bodies, including NSW Office of Environment and Heritage (OEH) (formally NSW Department of Environment, Climate Change and Water), NSW Department of Trade and Investment and NSW Office of Water (NOW)), NSW Department of Planning and Environment (formally NSW Department of Planning and Infrastructure) and Councils. In addition Cadia has consulted with the expert panel engaged during the preparation of the Rehabilitation Strategy to ensure the Land and Biodiversity Management Pan is consistent with the Strategy. The expert panel comprised the following members*:

- Dr David Goldney (CenWest Environmental Consulting)
- Dr Donna Johnston (DnA Environmental)
- Martin Haege (Geolyse)
- Dr Guy Fitzhardinge (Thring Pastoral Company)

Cadia has also consulted with the members of the Community Consultative Committee (CCC) which contains a range of members including representatives of local government and residents. The CCC is chaired by an independent chairperson and meets on a quarterly basis.

NSW Trade and Investment has also been consulted, particularly regarding the development of mine closure criteria. This has been undertaken through reviews of AEMRs since 2007-08.

Version 1 of the Plan was approved by the Department of Planning and Infrastructure on 19 March 2012.

Version 2 of the Plan was approved by the Department of Planning and Infrastructure on 16 May 2013.

In late 2014 CHPL discovered that there were some small land parcels within the CVO biodiversity offset area nominated in PA 06_0295 that are unable to be secured in perpetuity due to several cadastral issues. 30.7ha was excised from the offset areas identified in the NSW Project Approval 06_0295 and replaced with approximately 60.7Ha. Further areas were investigated to make up the difference in areas. The application to modify Project Approval 06_0295 was made on 25 May 2015 and determined 4 August 2015.

The Land and Biodiversity Management Plan (LBMP) was subsequently amended to incorporate the modifications and submitted to the Department of Environment, and the NSW Department of Planning and Environment on 22 April 2016.

Following feedback from the Federal Department of Environment, a number of changes were made to the plan including providing additional detail on:

- Actions (more specific and measurable),
- measuring rehabilitation success,

- risk management,
- long term security of the offset
- contingencies and
- measuring that the plan is being delivered.

The plan was re-submitted to the Department and approved on 20 December 2016.

The amended plan was then sent to the NSW Department of Planning and Environment (DoPE) for approval. Feedback was received (email dated 26 April 2017), the plan has been modified and was re-submitted to the DoPE on 17 May 2017. Key amendments to the plan included:

- Proving specific information regarding consultation and changes to the plan
- Further inclusion / clarification of actions regarding salinity and the management of voids
- Refining the methodology for measuring rehabilitation success.
- Minor formatting corrections to ensure consistency

The plan was reviewed and amended with minor changes and submitted to the NSW Department Planning of Industry & Environment and the Federal Department of Environment for review in October 2020. As no material changes to the Plan had been made no other stakeholders were consulted.

** The expert panel was approved by the Director General – NSW Department of Planning and Infrastructure on the 28th of October 2010*

12. REFERENCES

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13. APPENDICES

Appendix A – Deposited Plan Maps

Appendix B – Black Rock Ridge Flora Assessment (Flora Search March 2006)

Appendix C – Flora and Fauna Habitat Survey of Proposed Changes to the Cadia Valley Operations Biodiversity Offset Areas (Flora Search, April 2015)

Appendix D – Black Rock Range Vertebrate Fauna Survey (Western Research Institute, March 2006)

Appendix E – An Assessment of the Bat Fauna at Black Rock Range, Cadia Valley NSW (Greg Richards & Associates (March 2006))

Appendix F – Correspondence between the Federal Dept of Environment and CVO Regarding Security of Offset Areas

Appendix G – Rehabilitation Monitoring Methodology

Appendix I – Biodiversity Action Plan