



WERRIS CREEK

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WHC_PLN_WC_BIODIVERSITY MANAGEMENT PLAN

WERRIS CREEK COAL MINE BIODIVERSITY MANAGEMENT PLAN

29th September 2016

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1 INTRODUCTION

1.1 BACKGROUND

The Werris Creek Coal Mine (WCCM) is located approximately 2.4km south of Werris Creek and 11km north-northwest of Quirindi (see **Figure 1**). The Mine is owned and operated by Werris Creek Coal Pty Limited (WCC) (a wholly owned subsidiary of Whitehaven Coal - WHC). The WCCM is currently operating under Project Approval (PA) 10_0059, granted by the Minister for Planning and Infrastructure under Section 3 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) on 25 October 2011.

WCCM has approval to mine in full the Werris Creek coal measures which occur as a synclinal (bowl-shaped) formation to the south of the town of Werris Creek. **Figure 2** outlines the layout of WCCM, as approved by PA 10_0059.

Overburden and interburden are progressively removed to expose coal seams and then placed behind the direction of mining within an overburden emplacement; infilling both the mined-out void of the open cut as well as an out of pit dump limited by PA 10_0059 MOD2 (**Figure 2**).

Coal mined is placed on a run of mine (ROM) coal stockpile to the west of the open cut where it is crushed, screened and blended as required before being transferred to the product coal stockpile adjacent to the Werris Creek Rail Siding. The majority of product coal is loaded into trains from a Rail Load-out Facility (RLF); with the train returning to the Werris Creek Rail Siding via a rail loop on WCCM. A small proportion of coal (<50,000tpa) is despatched from the ROM coal stockpile by road using road registered trucks.

In accordance with PA 10_0059, WCC is implementing a progressive rehabilitation strategy to establish the final landform for two principal uses.

- i. Re-establishing the following woodland vegetation communities.
 - a. Box Gum Woodland and Derived Native Grassland.
 - b. Brigalow-Belah Woodland (EEC equivalent).
 - c. Shrubby White Box Woodland.
- ii. Class III capable agricultural land¹.

The construction and rehabilitation of the final landform is described in the Mining Operations Plan (MOP) for the WCCM (RWC, 2015). **Figure 3** provides the conceptual final landform and land use of the WCCM (from Plan 4 of RWC, 2015).

¹ Equivalent to Class 3 Land and Soil Capability in accordance with *the land and soil capability assessment scheme - second approximation. A general rural land evaluation system for New South Wales* (OEH, 2012).



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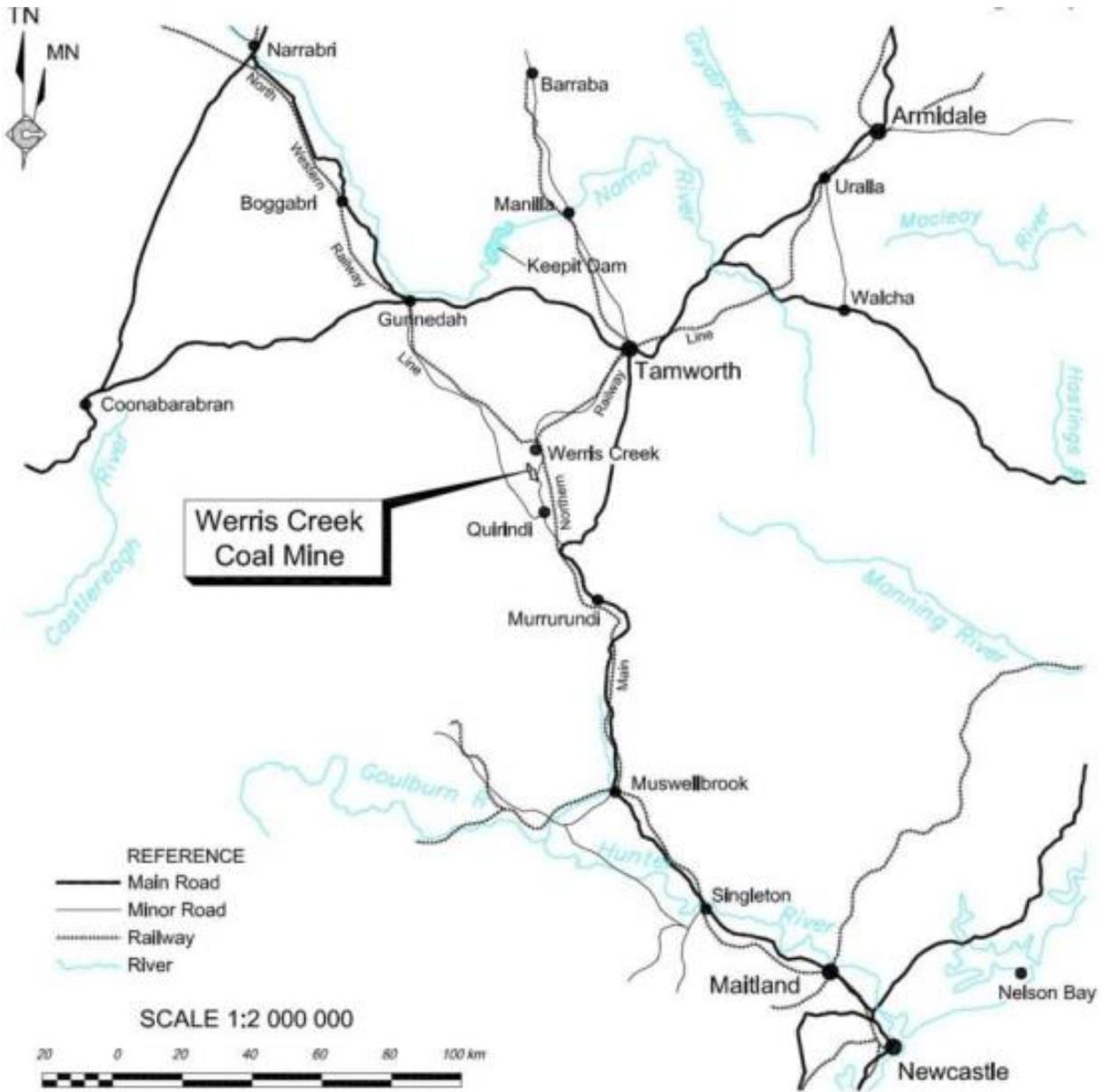


Figure 1: Regional Setting of the Werris Creek Coal Mine



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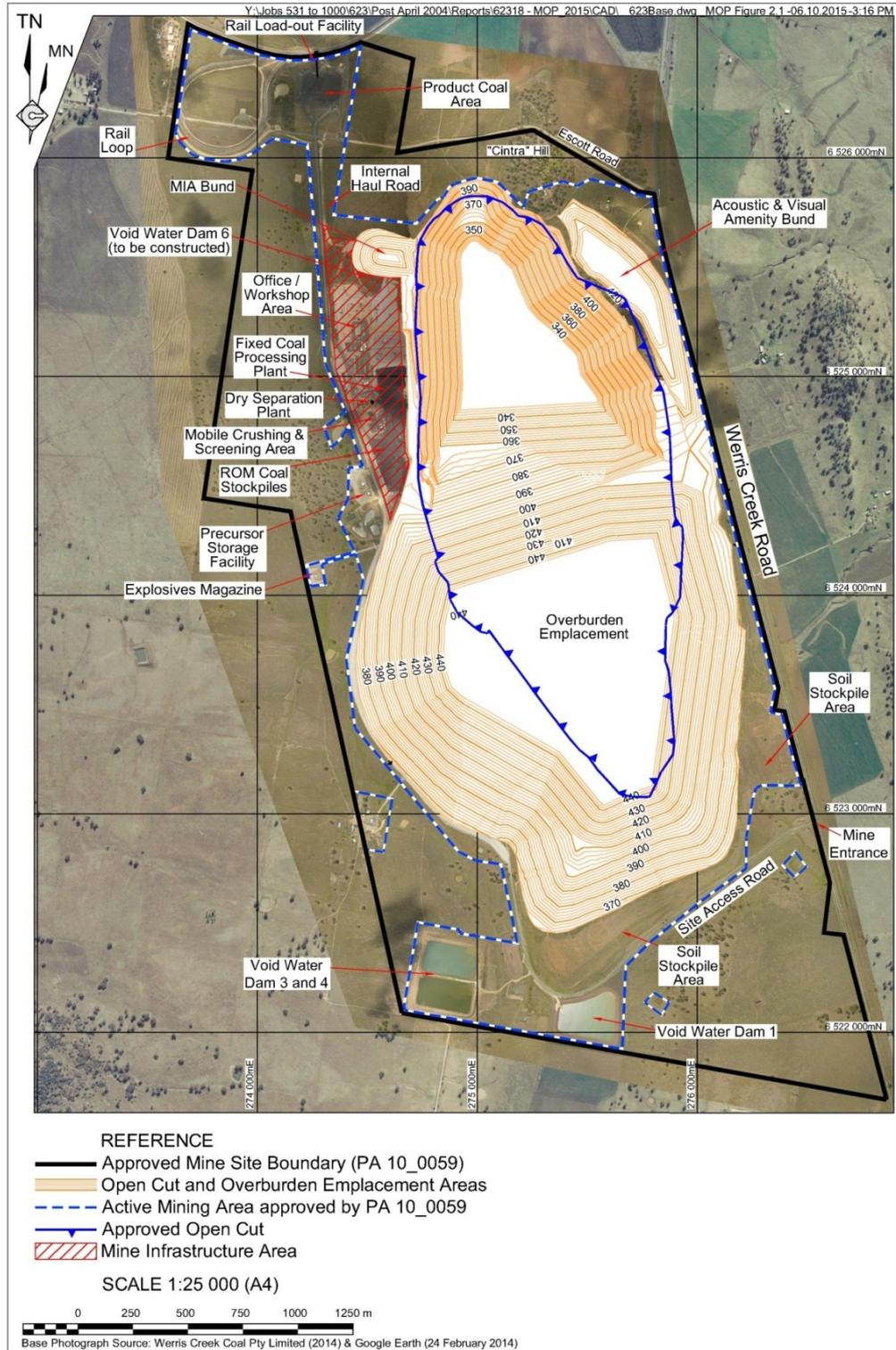


Figure 2: Werris Creek Coal Mine Layout



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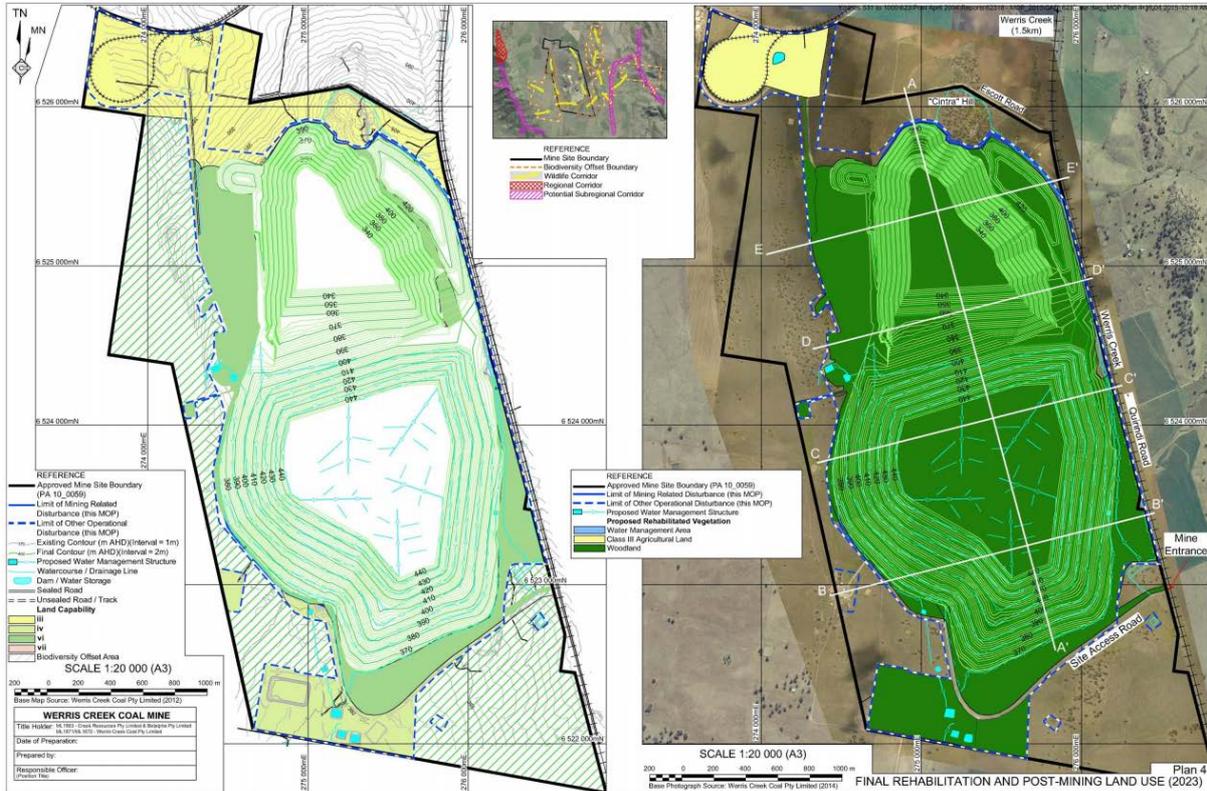


Figure 3: Werris Creek Coal Mine Conceptual Final Landform and Rehabilitation Plan

This *Biodiversity Offset Management Plan* (BOMP) has been revised three years after approval of the first BOMP under PA 10_0059. **Section 2** describes the legal requirements that are satisfied through preparation of this BOMP; noting that the second modification of PA 10_0059 to which approval was granted on 3 November 2015 did not materially change the biodiversity aspects of PA 10_0059.

1.2 SCOPE

The purpose of this BOMP is to provide a consolidated plan for the management of flora and fauna within the WCCM and the approved Biodiversity Offset Areas (BOA) in accordance with the relevant biodiversity requirements PA 10_0059 and EPBC Approval 2010/5571. The BOMP will provide WCC direction to:

- identify the land that will be required to be managed in accordance with this BOMP;
- outline the actions for managing biodiversity onsite at the WCCM (including the rehabilitation area) and within BOAs;
- identify and address approvals and legislative requirements relevant to biodiversity offset management of the WCCM and BOA;

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- provide a management framework that will lead to an improvement in the condition of biodiversity across WCCM and BOA;
- identify and minimise the impacts of key threats to biodiversity; and
- outline the monitoring, performance evaluation and reporting processes to be implemented by WCC and WHC personnel.

1.3 STRUCTURE OF THE BIODIVERSITY OFFSET MANAGEMENT PLAN

This BOMP is divided into two parts. Part A of this BOMP describes the management of biodiversity within the WCCM Mine Site and Part B of this BOMP describes the management of flora and fauna within the offset areas. The structure of this plan is as follows:

- Section 2 Requirements for this BOMP.
- Section 3 Description of the Existing Environment Relevant to the WCCM.
- Section 4 Description of the Management Actions to be undertaken at the WCCM.
- Section 5 Description of the Existing Environment Relevant to the WCC BOA.
- Section 6 Description of the Management Actions to be undertaken within the WCC BOA.
- Section 7 Description of Reporting and Review Requirements.

1.4 CONSULTATION

The following stakeholders are required to be consulted in the preparation of the previous Biodiversity and Offset Management Plan which preceded this BOMP.

- NSW Department of Planning & Environment (DP&E).
- NSW Office of Environment & Heritage (OEH).
- Commonwealth Department of the Environment (previously known as the Department of Sustainability, Environment, Water, Populations and Communities).

A draft revision of the BOMP (this document) was provided to the below stakeholders on 29 September 2016 for comment:

- DP&E.
- OEH.
- Commonwealth Department of the Environment and Energy (as currently known as DoEE).

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2 REQUIREMENTS FOR THE BIODIVERSITY MANAGEMENT PLAN

The BOMP for the WCCM has been prepared in accordance with the requirements established under various legislative and best practice instruments. The requirements established under these instruments are outlined in the following sections.

2.1 PROJECT APPROVAL 10_0059 (MOD2)

Specific conditions relating to the implementation of the Biodiversity Offset Strategy for the WCCM are outlined in PA 10_0059 originally approved on 25th October 2011. A recent modification to PA10_0059 (MOD2) was granted by the NSW Minister for Planning on 3 November 2015. **Table 1** summarises the requirements relating to biodiversity management from PA 10_0059, and identifies where these requirements are addressed within this management plan.

Table 1: Conditions established in Project Approval 10_0059 (MOD2)

SCHEDULE (CONDITION)	REQUIREMENT	SECTION																
BIODIVERSITY OFFSET STRATEGY																		
3(24)	<p>The Proponent shall implement the biodiversity offset strategy for the project described in the EA, summarised in Table 12 of the PA, and shown conceptually on the figure in Appendix 4 of the PA to the satisfaction of the Secretary.</p> <p style="text-align: center;">Table 12: Summary of the Biodiversity Offset Strategy</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;"><i>Offset Areas</i></th> <th style="text-align: center;"><i>Minimum Sizes (hectares)</i></th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Eurunderee</td> <td style="text-align: center;">363.93</td> </tr> <tr> <td style="text-align: center;">Hillview</td> <td style="text-align: center;">57.32</td> </tr> <tr> <td style="text-align: center;">Marengo</td> <td style="text-align: center;">284.12</td> </tr> <tr> <td style="text-align: center;">Railway View</td> <td style="text-align: center;">243.69</td> </tr> <tr> <td style="text-align: center;">Mine Site</td> <td style="text-align: center;">215.86</td> </tr> <tr> <td style="text-align: center;">Greenslopes/Banool</td> <td style="text-align: center;">123</td> </tr> <tr> <td style="text-align: center;">Total</td> <td style="text-align: center;">1,287.92</td> </tr> </tbody> </table> <p><i>Notes:</i></p> <ul style="list-style-type: none"> • To identify the areas referred to in Table 12, see the applicable figure in Appendix 4 (refers to PA10_0059, not this BOMP); • The strategy includes the enhancement of existing fauna habitat within these areas, and where necessary the targeted establishment of naturally scarce fauna habitat; and • Greenslopes/Banool must have at least 74 hectares of Box Gum Woodland EEC. 	<i>Offset Areas</i>	<i>Minimum Sizes (hectares)</i>	Eurunderee	363.93	Hillview	57.32	Marengo	284.12	Railway View	243.69	Mine Site	215.86	Greenslopes/Banool	123	Total	1,287.92	5.2
<i>Offset Areas</i>	<i>Minimum Sizes (hectares)</i>																	
Eurunderee	363.93																	
Hillview	57.32																	
Marengo	284.12																	
Railway View	243.69																	
Mine Site	215.86																	
Greenslopes/Banool	123																	
Total	1,287.92																	
3(25)	By the end of June 2012, unless the Secretary agrees otherwise, the Proponent shall update the biodiversity offset strategy for the project, in consultation with OEH, and to the satisfaction of the Secretary. The updated strategy must include the specific details of the Additional Offset Area (see Table 12 of the PA above).	Completed & 5.2																
3(26)	The Proponent shall ensure that the biodiversity offset strategy and/or	5.2																



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SCHEDULE (CONDITION)	REQUIREMENT	SECTION
	rehabilitation strategy is focused on the re-establishment and/or enhancement of: (a) the following endangered ecological communities: <ul style="list-style-type: none"> – White Box-Yellow Box-Blakely's Red Gum Woodland EEC – White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC 	6.5
	(b) habitat for threatened fauna species, including the: <ul style="list-style-type: none"> – Regent Honey Eater, Swift Parrot, Brown Treecreeper, Hooded Robin, Little Lorikeet, and Barking Owl – Eastern Bent-wing Bat, Eastern False Pipistrelle, Yellow-bellied Bent-wing Bat and Greater Broad-nosed Bat 	5.2 6.6
Long Term Security of Offsets		
3(27)	The Proponent shall make suitable arrangements to provide appropriate long-term security for the offset areas (excluding the rehabilitation areas) by December 2012, or other date agreed by the Secretary, to the satisfaction of the Secretary.	6.2
Biodiversity Offset Management Plan		
3(28)	The Proponent shall prepare and implement a Biodiversity Management Plan for the project to the satisfaction of the Secretary. This plan must: (a) be prepared in consultation with OEH, and submitted to the Secretary for approval by the end of December 2012	Completed
	(b) describe how the implementation of the biodiversity offset strategy would be integrated with the overall rehabilitation of the site	4.6
	(c) describe the short, medium, and long term measures that would be implemented to:	4.0 6.0
	– manage the remnant vegetation and habitat on the site and in the offset area/s (if and when applicable)	6.6
	– implement the biodiversity offset strategy (if and when applicable), including detailed performance and completion criteria	5.2 6.13
	(d) include detailed performance and completion criteria for evaluating the performance of the biodiversity offset strategy, and triggering remedial action (if necessary)	6.13
	(e) include a detailed description of the measures that would be implemented over the next 3 years, including the procedures to be implemented for:	6.0
	– enhancing the quality of existing vegetation and fauna habitat	6.6
	– restoring native vegetation and fauna habitat on the biodiversity areas and rehabilitation area through focusing on assisted natural regeneration, targeted vegetation establishment and the introduction of naturally scarce fauna habitat features (where necessary)	4.6 6.5

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SCHEDULE (CONDITION)	REQUIREMENT	SECTION
	– landscaping the land on site that faces public roads to minimise the visual and lighting impacts of the project	4.6
	– maximising the salvage of resources within the approved disturbance area – including vegetative, soil and cultural heritage resources – for beneficial reuse in the enhancement of the biodiversity areas or rehabilitation area	4.1 & 4.4 6.6
	– collecting and propagating seed	6.4
	– minimising the impacts on fauna on site, including undertaking pre-clearance surveys	4.1
	– managing any potential conflicts between the proposed restoration works in the biodiversity areas and any Aboriginal heritage values (both cultural and archaeological)	4.3 6.9
	– managing salinity	6.10
	– controlling weeds and feral pests	6.7 & 6.8
	– controlling erosion	6.10
	– managing grazing and agriculture on site	6.2 & 6.11
	– controlling access	6.2
	– bushfire management	6.12
	(f) include a seasonally-based program to monitor and report on the effectiveness of these measures, and progress against the detailed performance and completion criteria	6.15
	(g) identify the potential risks to the successful implementation of the biodiversity offset strategy, and include a description of the contingency measures that would be implemented to mitigate against these risks	6.16
	(h) include details of who would be responsible for monitoring, reviewing, and implementing the plan	1.6

Note: Figures and tables cited in the table are within the Project Approval

2.2 ENVIRONMENTAL ASSESSMENT MOD2 STATEMENT OF COMMITMENTS

A recent modification to PA10_0059 (MOD2) was granted by the NSW Minister for Planning on 3 November 2015. **Table 2** summarises the requirements relating to biodiversity management from PA 10_0059 (MOD2), and identifies where these requirements are addressed within this management plan.

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Table 2: Relevant Environmental Assessment Statement of Commitments - Biodiversity

DESIRED OUTCOME	ACTION	TIMING	SECTION
Avoid, minimise, mitigate or offset impacts (in that hierarchical order) on native vegetation (including the two identified EECs), native fauna (including threatened species) and/or habitat.	4.1 Implement the impact avoidance, minimisation, mitigation and offset measures of an approved Biodiversity Offset Strategy and Biodiversity and Offset Management Plan (BOMP) for the Mine in consultation with the OEH, DPE and DoE.	Ongoing	4.0 5.2 6.0
	4.2 Include detail on the following activities in the BOMP. <ul style="list-style-type: none"> • Identification and demarcation of areas to be cleared. • Retention of felled trees for subsequent use during rehabilitation activities • Identification of biological resources within the disturbance area including habitat resources such as hollows, stag trees and coarse woody debris, and the availability of endemic seed. • Seed collection. • Monitoring and inspection programs. • Noxious weed management. 	As defined within the BOMP	4.1 4.4 & 6.6 4.1, 4.5 & 6.4 6.4 6.15 4.2 & 6.7
Rehabilitate disturbed areas to create a final landform that maintains or improves biodiversity values of the Mine Site.	4.3 Complete rehabilitation in accordance with an approved Rehabilitation Management Plan (RMP) or Mining Operations Plan (MOP).	Ongoing	4.6

2.3 ENVIRONMENTAL PROTECTION AND BIODIVERSITY CONSERVATION ACT APPROVAL 2010/5571

The Assistant Secretary of the Environmental Assessment Branch of the DoEE (acting under delegation by the Commonwealth Minister for the Environment) granted Approval Decision EPBC 2010/5571 for the WCCM under the EPBC Act on 21 December 2011. The conditions that are relevant to this BOMP as per the latest modification are presented in **Table 3**.

Table 3: DoEE approval conditions and relevant section in BOMP

CONDITION	CONDITION	SECTION
1.	To offset the impact to the White Box-Yellow Box-Blakely's Red Gum Grassy Wood land and Derived Native Grassland Ecological Community and foraging habitat of the Regent Honeyeater and Swift Parrot the person taking the action must register a legally binding conservation mechanism over the Werris Creek Life of Mine (LOM) Extension Project Biodiversity Offset Strategy (BOS) sites identified in the map at Appendix 1 and an additional area of at least 74 hectares of White Box-Yellow Box Blakely's Red Gum	6.2.1



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	<p>Grassy Woodland and Derived Native Grassland Ecological Community (together, the Offset Areas). The mechanism/s must provide enduring protection for the Offset Area and unless otherwise agreed to in writing by the Minister must be registered by 31 December 2016.</p> <p>Written notification of registration must be provided to the department within 2 weeks of registration of the Offset Areas</p>	
2.	<p>To offset the impacts to the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Ecological Community, Regent Honeyeater and Swift Parrot, the person taking the action must submit to the Minister for approval an Offset Management Plan for all of the Offset Areas within 12 months of the date of this approval. The Offset Management Plan must be implemented. The Offset Management Plan must include, at a minimum, the following information:</p> <ul style="list-style-type: none"> a) A textual description and map to clearly define the location and boundaries of all of the Offset Areas). This must be accompanied with the offset attributes and a shapefile. 5.3 & 5.4 b) details of management actions to protect and enhance the extent and condition of habitat values of the offset areas including but not limited to rehabilitation, weed control, fire management, erosion and sediment control, management of livestock and restrictions on access of no less than: <ul style="list-style-type: none"> i. 310.2 hectares of habitat for the Regent Honeyeater and Swift Parrot; and 4.6 ii. 731 hectares of White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Ecological Community; 4.2 & 6.7 c) the timing, responsibilities and performance criteria for management actions; 6.12 d) a monitoring plan including the undertaking of ecological surveys by a qualified ecologist to assess the success of the management actions against identified milestones and objectives; 6.10 e) a process to report, to the department, the management actions undertaken in the offset areas and the outcome of those actions, including identifying any need for improved management; 6.11 f) a description of the potential risks to successful management and rehabilitation in the offset areas, and a description of the contingency measures that would be implemented to mitigate these risks; and 6.2 g) details of parties responsible for management, monitoring and implementing the plan, including their position or status as a separate contractor. 6.14 <p>Note: For clarity the offset areas specified in condition 2 can accommodate offset requirements for more than one species habitat within the one area, if suitable habitat is verified as present and includes specific habitat requirements for the relevant species. 6.15</p>	<p>Complete</p>
		1.6



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3.	Within 14 days from the commencement of construction the person taking the action must advise the department in writing of the actual date of commencement of construction.	Complete
4.	Within three months of every 12 month anniversary of the commencement of construction, the person taking the action must publish a report on their website addressing compliance with each of the conditions of this approval, including implementation of any management plans as specified in the conditions, Documentary evidence providing proof of the date of publication and non-compliance with any of the conditions of this approval must be provided to the department at the same time as the compliance report is published.	7.0
5.	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 a report submitted to the Minister. The independent auditor must be approved by the Minister prior to the 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.	7.0
6.	If the person taking the action wishes to carry out any activity otherwise than in accordance with the management plan, as specified in the conditions , the person taking the action must submit to the department for the Minister's written approval a revised version of that management plan. The varied activity shall not commence until the Minister has approved the varied plan in writing. The Minister will not approve a varied management plan unless the revised plan would result in an equivalent or improved environmental outcome. If the Minister approves the revised plan, that management plan must be implemented in place of the management plan originally approved.	Not Applicable
7.	If the Minister believes that it is necessary or convenient for the better protection of listed threatened species and communities to do so, the Minister may request that the person taking the action make specified revisions to the plan referred to in condition 2 and submit the revised plan. The person taking the action must comply with any such request. The revised plan must be implemented. Unless the Minister has approved the revised plan then the person taking the action must continue to implement the original plan.	Not Applicable
8.	If at any time after 5 years from the date of this approval, the person taking the action has not substantially commenced the action, then the person taking the action must not substantially commence the action without the written agreement of the Minister.	Not Applicable
9.	The person taking the action must maintain accurate records substantiating all activities and outcomes associated with or relevant to the above conditions of approval, including measures taken to implement the management plans required by this	7.0

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	approval, and make them available upon request to the department.	
10.	Such records may be subject to audit by the department or an independent auditor in accordance with section 456 of the EPBC Act, or used to verify compliance with the conditions of approval. Summaries of audits will be posted on the department's web site. The results of audits may also be publicised through the general media.	7.0
11.	Unless otherwise agreed to in writing by the Minister, the person taking the action must publish all management plans referred to in these conditions of approval, on their website. Each management plan must be published on the website within 1 month of being approved.	7.0

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PART A
MINE SITE MANAGEMENT OF BIODIVERSITY

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3 EXISTING ENVIRONMENT RELEVANT TO THE MINE SITE

This section describes the existing environment relevant to the WCCM onsite. The description of the existing environment specific to the Offset Areas is provided in Section 5.

3.1 CLIMATIC INFORMATION

The closest long term meteorological station is Quirindi (11km southeast). The Quirindi area is influenced by a temperate weather system and experiences warm summer and mild winter temperatures. Summer maximum temperatures are experienced in January with an average maximum of 32.2°C (daily) and minimum of 16.3°C (nightly). Winter minimums are experienced in July with an average maximum of 15.9°C (daily) and minimum of 1.6°C (nightly). The average rainfall is 682.7 mm per year with the greatest average falls received in January (80.9 mm) and the lowest falls in April (42.2 mm).

3.2 LAND TENURE AND LAND USE HISTORY

The majority of the current WCCM site was part of the former Narrawolga property which had a long history of disturbance associated with agriculture. While much of the hill (focus of mining due to coal measures geology) would have been used for grazing; the flat areas of the Narrawolga property do have black and other fertile soils (basalt geology) and were subject to periodic cultivation. In early 1920s; a minable coal resource was identified in the hill just south of the town of Werris Creek. An underground coal mine operated between 1925 and 1963 on the north east slopes of the hill now being mined by the current WCCM mining operation. Between the 1970s and 2012; two gravel quarries operated from the top of the hill for both the former Parry and Quirindi Shire Councils. Neither of the quarries or former underground coal were rehabilitated prior to WCCM commencing operations in 2005.

3.3 VEGETATION CONDITION

The native vegetation of the WCCM was mapped as part of the Biodiversity Impact Assessment (ELA 2010) using the Biometric Vegetation Type (BVT) maintained by the NSW Vegetation Information System (VIS) of the NSW OEH. The condition of each vegetation community was assigned to one of four broad condition classes based on the presence/absence of a canopy layer and whether the ground cover was greater than or less than 50% native ground cover. The four condition classes were:

1. <50% native ground cover with no native canopy present (Cleared Land);
2. <50% native ground cover with a native canopy present (Scattered Trees/Paddock Trees in Poor Condition);
3. >50% native ground cover with no native canopy present (Derived Native Grasslands in Moderate-Good Condition). Sub condition classes have been assigned to Class 3 for the purposes of assigning EEC's under the TSC Act and EPBC Act;
 - Class 3a (high diversity): no native canopy cover, >11 native perennial understorey species (not including grasses) and at least 1 important

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species. Where Box-Gum Woodland canopy species are likely to have occurred in this class, this condition class equates to the EPBC Act and TSC Act definition of Box-Gum Woodland DNG

- Class 3b (low diversity): no native canopy cover, native grassy understorey with low diversity of herbs or other perennial understorey species. Where Box-Gum Woodland canopy species are likely to have occurred in this class, this condition class equates only to the TSC Act definition of Box-Gum Woodland DNG; and
4. >50% native ground cover with a native canopy present (Native Vegetation in Moderate –Good Condition).

Relevant areas of each condition class with respect to each vegetation community (BVT) are described in Section 3.4.

3.4 VEGETATION COMMUNITIES

3.4.1 Disturbed, Cropped/cultivated paddocks (Cleared Land)

To the north of Escott Road, an area of the WCCM surrounding the product coal stockpile and RLF has previously been cleared for cultivation and cropping and as such no longer represent a native vegetation community.

These areas have been modified from the natural state to the extent that native species are now uncommon and most of the cultivated areas were either cleared at the time of survey or dominated by planted introduced species such as *Medicago sativa* (Lucerne),

Although these paddocks are now either cleared or under cultivation, they would have previously been Box Gum Woodlands, as such have been mapped as 'Box-Gum Woodland DNG, Condition Class 1', i.e. <50% native groundcover with no native canopy.

3.4.2 White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions and Yellow Box- Blakely's Red Gum grassy woodland of the Nandewar Bioregion

These two BVT vegetation communities are further referenced in this BOMP as Box Gum Woodlands; ranging in condition from class 1 to 4. It generally has a sparse canopy dominated by *Eucalyptus albens* (White Box) with *E. melliodora* (Yellow Box) occasionally present. In some areas there is prolific regeneration of one or both of these overstorey species. The midstorey is absent with no shrubs observed at all. The understorey consists of a mix of native and introduced flora. The native understorey species include *Calotis lappulacea* (Yellow Burr-Daisy), *Einadia hastata* (Berry Saltbush), *Eremophila debilis* (Amulla) and *Wahlenbergia communis* (Tufted Bluebell), with native grasses dominating large areas including *Aristida ramosa* (Purple Wiregrass), *Austrostipa verticillata* (Slender Bamboo Grass), *Bothriochloa macra* (Red Grass), *Chloris truncata* (Windmill Grass), *Dichanthium sericeum* (Queensland Bluegrass), *Sporobolus elongatus* (Slender Rat's Tail Grass).

This community is representative of the endangered ecological community "White Box Yellow Box Blakely's Red Gum Woodland (as described in the final determination of the NSW

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Scientific Committee)" listed as an endangered ecological community on Schedule 1 Part 3 of the TSC Act and also meets the definition of the Commonwealth listed White Box – Yellow Box – Blakely’s Red Gum grassy woodlands and derived native grasslands endangered community listed on the EPBC Act.

Introduced flora recorded in this community includes *Carthamus lanatus* (Saffron Thistle), *Centaurea solstitialis* (St Barnaby’s Thistle), *Echium plantagineum* (Paterson’s Curse), *Hypericum perforatum* (St John’s Wort), *Hypochaeris radicata* (Cats Ear), *Marrubium vulgare* (Horehound) and *Opuntia* spp. (Prickly Pear). Box Gum Woodland has been further stratified into two DNG variants, 3a and 3b and are described as follows:

- Condition Class 3a (high diversity): no native canopy cover, >11 native perennial understorey species (not including grasses) and at least 1 important species. This condition class equates to the EPBC Act and TSC Act definition of Box-Gum Woodland DNG.
- Condition Class 3b (low diversity): no native canopy cover, native grassy understorey with low diversity of herbs or other perennial understorey species. This condition class equates only to the TSC Act definition of Box-Gum Woodland DNG.

Hereafter these vegetation units are referred to Box Gum Woodland DNG Class 3a or Class 3b (or collectively as Class 3).

3.4.3 Brigalow - Belah woodland on alluvial often gilgaied clay soil mainly in the Brigalow Belt South Bioregion

One small patch of 0.35ha was identified on the WCCM and has subsequently been cleared in accordance with PA 10_0059. Excluding the Brigalow (*Acacia harpophylla*), the remainder of the vegetation species found are consistent with the Box Gum Woodland vegetation communities.

3.5 THREATENED ECOLOGICAL COMMUNITIES, FLORA AND FAUNA

3.5.1 Threatened Ecological Communities

Two of the vegetation communities found at the WCCM are listed as Endangered Ecological Communities (EECs) under the NSW TSC Act and Commonwealth EPBC Act, one also being a Critically Endangered Ecological Community (CEEC) under the EPBC Act:

- *Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains bioregions* EEC, listed under TSC Act and Brigalow (*Acacia harpophylla*) dominant and co-dominant under the EPBC Act; and
- *White Box - Yellow Box - Blakely’s Red Gum Woodland* EEC, listed under TSC Act and the equivalent *White Box - Yellow Box - Blakely’s Red Gum Grassy Woodland and Derived Native Grassland* CEEC under the EPBC Act.

3.5.2 Threatened Fauna

Table 4 compiles the threatened fauna species recorded within the WCCM and BOA (ELA 2011a; ELA 2011b) given the potential for species to be present across both areas.



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Table 4: Recorded and Predicted Threatened fauna of the WCCM and BOA

SPECIES NAME	STATUS		HABITAT REQUIREMENTS	LIKELIHOOD
	TSC ACT	EPBC		
THREATENED BIRDS				
<i>Lathamus discolor</i> Swift Parrot	Endangered	Endangered and Migratory	<p><u>Foraging:</u> Feeds mostly on nectar from medium to large Eucalypts. Also forages on psyllid insects and lerps, seeds and fruit. Predominantly an arboreal forager, but sometimes feeds on the ground for seeds, fallen flowers, fruit and lerp. Semi nomadic; foraging predominately in dry woodlands between Victoria and NSW. High site fidelity; returning to sites on a cyclic basis (SEWPaC 2013).</p> <p><u>Breeding locations:</u> Migratory. Breeds in Tasmania (spring) and migrates to mainland Australia in autumn during non-breeding season (winter). Nests in vertical or horizontal tree hollows (SEWPaC 2013).</p> <p><u>Vegetation type and structure:</u> Dry sclerophyll eucalypt forests and woodlands, and occasional wet sclerophyll forests. Winter foraging grounds include box-ironbark forests and woodlands of Victoria, NSW and southern Queensland. Seeks medium to large Eucalypts to forage (SEWPaC 2013).</p> <p><u>Floristic composition:</u> Box-ironbark forests with Yellow Gum (<i>Eucalyptus leucoxylon</i>), Red Ironbark (<i>E. tricarpa</i>) and Grey Box (<i>E. microcarpa</i>) in Victoria, and with Mugga Ironbark (<i>E. sideroxylon</i>) and Grey Box on the western slopes of NSW. Common grassy woodland vegetation types utilised for foraging include, White Box (<i>E. albens</i>) woodlands, Grey Box woodlands and Grey Box/Yellow Gum woodlands. Narrow-leaved Red Ironbark (<i>E. crebra</i>), Forest Red Gum (<i>E. tereticornis</i>) forests and Yellow Box (<i>E. melliodora</i>) forests are utilised for foraging in northern NSW and south-eastern QLD. On the western slopes, Mugga Ironbark and Grey Box woodlands are used (SEWPaC 2013).</p> <p><u>Patch Size:</u> Usually in parties of 30 birds, or sometimes larger flocks of several hundred birds when food is abundant (SEWPaC 2013). Patch size information unavailable.</p> <p><u>Competition:</u> The introduced Common Starling (<i>Sturnus vulgaris</i>) competes with the Swift Parrot for nest hollows. The Noisy Miner (<i>Manorina melanocephala</i>) is an aggressive</p>	Potential



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SPECIES NAME	STATUS		HABITAT REQUIREMENTS	LIKELIHOOD
	TSC ACT	EPBC		
			<p>native bird that excludes other nectarivorous birds from sources of nectar (SEWPaC 2013).</p> <p><u>Connectivity:</u> Habitat is highly fragmented, although due to their high mobility their populations is not fragmented (SEWPaC 2013).</p> <p><u>Landscape position:</u> Information not available.</p>	
<p><i>Anthochaera phrygia</i> Regent Honeyeater</p>	Endangered	Endangered and Migratory	<p><u>Foraging:</u> The Regent Honeyeater primarily feeds on nectar from box and ironbark eucalypts and occasionally from banksias and mistletoes (NPWS 1995). They actively seek the largest trees to forage in. As such, it is reliant on locally abundant nectar sources with different flowering times to provide reliable supply of nectar (Environment Australia 2000). They are also known supplement nectar with invertebrates and occasionally fruit (SEWPaC 2013).</p> <p><u>Breeding locations:</u> Breeding activity is generally from September to November and appears to correspond with regional flowering patterns in preferable eucalypt and mistletoe species, including Mugga Ironbark, White Box, Yellow Box and Needle-leaf Mistletoe (<i>Amyema cambagei</i>) (SEWPaC 2013).</p> <p>In NSW, the Regent Honeyeater is most common on the Great Diving Range. They prefer to nest in Eucalypts, in the canopy of forests or woodlands and in the crown of tall trees. Nests are often constructed in mistletoes on trees as well. In riparian areas nests are placed in rough barked trees (e.g. ironbarks), and where rough-barked trees are unavailable, nests are found in smooth-barked species. They have also been known to nest in exotic trees, native shrubs, among flood debris, in fence posts or tree stumps and in open sheds (SEWPaC 2013).</p> <p>Nests are usually constructed on large, often horizontal branches, closer to the tip of the branch. Nests are frequently supported by vertical twigs and are sometimes in vertical forks (SEWPaC 2013).</p> <p><u>Vegetation type and structure:</u> Associated with temperate eucalypt woodland and open forest including forest edges, wooded farmland and urban areas with mature eucalypts and riparian forests of River Oak (<i>Casuarina cunninghamiana</i>)</p>	Potential



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SPECIES NAME	STATUS		HABITAT REQUIREMENTS	LIKELIHOOD
	TSC ACT	EPBC		
			<p>(Garnett 1993). Areas containing Swamp Mahogany (<i>Eucalyptus robusta</i>) or Spotted Gum (<i>Corymbia maculata</i>) in coastal areas have been observed to be utilised. Needle-leaf Mistletoes are also an important species for feeding and breeding (NPWS 1997).</p> <p><u>Floristic composition:</u> Important species include those that produce large amounts of nectar, including Mugga Ironbark, Yellow Box, White Box and Yellow Gum, but also in association with woodland species such as Grey, Red Box (<i>E. polyanthemos</i>), Blakely's Red Gum (<i>E. blakelyi</i>), River Red Gum (<i>E. camaldulensis</i>), Silver-leaved Ironbark (<i>E. melanophloia</i>), Narrow-leaved Ironbark, Caley's Ironbark (<i>E. caleyi</i>) and Rough-barked Apple (<i>Angophora floribunda</i>). May also utilise <i>Callitris</i> woodlands that are in association with Eucalypts (SEWPaC 2013).</p> <p><u>Patch Size:</u> Little data is available on home ranges. Nests are generally located up to 1 km from preferred feed trees. During the non-breeding season, foraging sites are up to 800 m from roosting sites (SEWPaC 2013).</p> <p><u>Competition:</u> Nest predation is a predominant cause of nest failure; Pied Currawongs (<i>Strepera graculina</i>) are known to take young and Pallid Cuckoos (<i>Cacomantis pallidus</i>) are known to parasitise nests (SEWPaC 2013).</p> <p><u>Connectivity:</u> Information not available.</p> <p><u>Landscape position:</u> Dry Box-Ironbark eucalypts woodland and dry sclerophyll forest associations in areas of low to moderate relief, wherein they prefer moister, more fertile sites, e.g. along creek flats, or in broad river valleys and foothills (SEWPaC 2013).</p>	
<p><i>Climacteris picumnus</i> Brown treecreeper</p>	Vulnerable		<p><u>Foraging:</u> Ants, beetles & larvae taken from ground, fallen logs and tree trunks (OEH 2013).</p> <p><u>Breeding locations:</u> Roosts in outer branches of mature trees. Nests in tree hollows 5-15 cm in size. Utilises a wide variety of tree species – not selective. It is sedentary and nests in permanent territories (NSW Scientific Committee 2001).</p> <p><u>Vegetation type and structure:</u> The Brown Treecreeper occupies eucalypt woodlands, particularly open woodland</p>	Recorded



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	TSC ACT	EPBC		
			<p>lacking a dense understory (NSW Scientific Committee 2001).</p> <p><u>Floristic composition:</u> Not critical</p> <p><u>Patch Size:</u> Unable to maintain viable populations in remnants less than 200 ha. Abundance decreases as patch decreases in size (OEH 2013).</p> <p><u>Competition:</u> Noisy Miners dominate fragmented woodlands and will exclude smaller species from territories. Habitat fragmentation has led to an increased competition with aggressive honeyeater species. Starlings compete for nesting hollows (OEH 2013).</p> <p><u>Connectivity:</u> Will use paddock trees for dispersal but are unable to cross gaps greater than 230m. Dispersal of females critical to maintain viable populations; females are unable to disperse to isolated fragments (OEH 2013).</p> <p><u>Landscape position:</u> Low to moderate relief, particularly fertile patches.</p>	
<p><i>Glossopsitta pusilla</i> Little Lorikeet</p>	Vulnerable		<p><u>Foraging:</u> They feed primarily on nectar and pollen in the tree canopy, particularly on profusely-flowering eucalypts, but also on a variety of other species including melaleucas and mistletoes (OEH 2013). They are also known to feed on fruits of mistletoes (NSW Scientific Committee 2007)</p> <p><u>Breeding locations:</u> Nests in hollow of approximately 3 cm in diameter at heights between 2 m and 15 m predominantly in living, smooth-barked eucalypts. Preferred species include Manna Gum (<i>E. viminalis</i>), Blakely's Red Gum and Tumbledown Gum (<i>E. dealbata</i>) (NSW Scientific Committee 2007).</p> <p><u>Vegetation type and structure:</u> Little Lorikeets mostly occur in dry, open eucalypt forests and woodlands. They have been recorded from both old-growth and logged forests in the eastern part of their range, and in remnant woodland patches and roadside vegetation on the western slopes (OEH 2013).</p> <p><u>Floristic composition:</u> White Box and Yellow Box are particularly important food sources, while preferred species to nest in include Manna Gum, Blakely's Red Gum and Tumbledown Gum (NSW Scientific Committee 2007).</p>	Recorded



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SPECIES NAME	STATUS		HABITAT REQUIREMENTS	LIKELIHOOD
	TSC ACT	EPBC		
			<p><u>Patch Size:</u> Not critical.</p> <p><u>Competition:</u> Noisy Miners dominate fragmented woodlands and will exclude smaller species from territories. Habitat fragmentation has led to an increased competition with aggressive honeyeater species (OEH 2013)</p> <p><u>Connectivity:</u> Not critical.</p> <p><u>Landscape position:</u> Information unavailable.</p>	
<p><i>Hieraaetus morphnoides</i> Little Eagle</p>	Vulnerable		<p><u>Foraging:</u> Preys on birds, reptiles and mammals, and occasionally feeds on large insects or carrion (OEH 2013). It inhabits eucalypts forest, woodland or open woodland that is rich in prey (Scientific Committee 2010).</p> <p><u>Breeding locations:</u> Generally utilises tall trees for nesting, with a large stick nest being built. Lays eggs in spring and young fledge in early summer (OEH 2013).</p> <p><u>Vegetation type and structure:</u> Utilises open eucalypt, sheoak and acacia forest, woodland or open woodland (OEH 2013).</p> <p><u>Floristic composition:</u> In the Armidale region, Little Eagles have been known to nest in all common Eucalypt species (Debus & Ley 2009).</p> <p><u>Patch Size:</u> In the Armidale region, inter-nest distances and density was observed to be 2-5km between neighbouring nests with one-breeding pair utilising an area of 1500-1600 ha (Debus & Ley 2009).</p> <p><u>Competition:</u> A reduction in breeding sites may increase interspecific competition with the dominant Wedge-tailed Eagle (<i>Aquila audax</i>) for breeding habitat and nest-sites (Scientific Committee 2010).</p> <p><u>Connectivity:</u> Habitat loss and urban expansion is thought to impact on breeding success (Debus & Ley 2009).</p> <p><u>Landscape position:</u> Little Eagles have been known to prefer large trees on slopes with a southerly component in the Armidale region (Debus & Ley 2009).</p>	Recorded
<p><i>Melanodryas cucullata</i> Hooded Robin</p>	Vulnerable		<p><u>Foraging:</u> Mostly feeds on invertebrates (mostly insects), some smaller vertebrates (skinks and frogs) and on occasion seeds off the ground, trunks, branches and in the air. Prey is</p>	Recorded



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SPECIES NAME	STATUS		HABITAT REQUIREMENTS	LIKELIHOOD
	TSC ACT	EPBC		
			<p>usually taken from logs and coarse woody debris on the ground (NSW Scientific Committee 2008).</p> <p><u>Breeding locations:</u> Builds a nest of plant fibres and cobweb, generally on low, live or dead forks or branches of trees or stumps. It may also occasionally utilise fallen trees or limbs (NSW Scientific Committee 2008).</p> <p><u>Vegetation type and structure:</u> Associated with a wide range of Eucalypt woodlands, Acacia shrubland and open forests (Blakers et al. 1984). In temperate woodlands, the species favours open areas adjoining large woodland blocks, with areas of dead timber and sparse shrub cover (NSW Scientific Committee 2001). Prefers an open understorey and a complex ground layer. It is sometimes found in grassland habitat (NSW Scientific Committee 2008).</p> <p><u>Floristic composition:</u> Not critical.</p> <p><u>Patch Size:</u> The occurrence of the Hooded Robin is correlated with patch size, habitat complexity (tree canopy cover, shrub cover and ground cover). Logs, fallen branches and litter (NSW Scientific Committee 2008). Hooded Robin home ranges in the non-breeding season are relatively large; their winter home range is approximately 18 ha and is sometimes up to 30-50 ha. However, during the breeding season nesting territories are about 6 ha (NSW Scientific Committee 2008).</p> <p><u>Competition:</u> High rates of nest predation, particularly by native birds (e.g. Pied Currawongs) and potentially cats and foxes. Noisy Miners are also known to exclude the robin from woodland patches, and is absent from patches dominated by Noisy Miners (NSW Scientific Committee 2008).</p> <p><u>Connectivity:</u> Hooded Robin is reactive to a reduction in patch size and habitat complexity. Even large fragments seem unable to sustain robin populations in the long term (NSW Scientific Committee 2008). In Victoria, It has been recommended that several patches of high quality vegetation of at least 25 ha in size and less than 1 km apart be conserved for the Hooded Robin (Platt & Lowe 2002).</p> <p><u>Landscape position:</u> Not critical.</p>	



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SPECIES NAME	STATUS		HABITAT REQUIREMENTS	LIKELIHOOD
	TSC ACT	EPBC		
<p><i>Stagonopleur a guttata</i> Diamond Firetail</p>	Vulnerable		<p><u>Foraging:</u> Forages on the ground, mostly feeding on grass seeds and other plant material, but has also been known to forage on insects (Scientific Committee 2010).</p> <p><u>Breeding locations:</u> Constructs bottle-shaped nests in trees and shrubs with dense foliage (Scientific Committee 2010).</p> <p><u>Vegetation type and structure:</u> Typically found in grassy eucalypt woodlands, but also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities (OEH 2013). It is often found in riparian areas and sometimes in lightly wooded farmland (OEH 2013). Most occur on the inland slopes of the GDR (Scientific Committee 2010).</p> <p><u>Floristic composition:</u> Not critical.</p> <p><u>Patch Size:</u> Appears to be sedentary, though some populations move locally, especially those in the south (OEH 2013).</p> <p><u>Competition:</u> Red-browed Finches (<i>Neochmia temporalis</i>) have expanded with the spread of exotic species, which may cause some disadvantages to the Diamond Firetail. The increase of Australian Ravens and Pied Currawongs may have increased nest predation of the Diamond Firetail (Scientific Committee 2010).</p> <p><u>Connectivity:</u> Seemingly unable to survive in areas which lack remnant native vegetation greater than 200 ha (Scientific Committee 2010). In north-central Victoria they were only recorded in woodland remnants more than 20 ha in size, which had a dense shrub and groundcover of native plants, and that were located within 1 km of other woodlands remnants. In the Boorowa River catchment of NSW, firetails were only recorded in remnants that were >5 ha in size, with a moderately complex understorey and that were at most 2.7 km from another woodland remnant > 10 ha in size (Chambers 2008).</p> <p><u>Landscape position:</u> Information unavailable.</p>	Recorded
<p><i>Oxyura australis</i></p>	Vulnerable		<p><u>Foraging:</u> Feed on aquatic insect larvae, as well as seeds and leaves of freshwater plants. During autumn and winter they migrate to permanent waters in flocks. They forage in</p>	Recorded



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SPECIES NAME	STATUS		HABITAT REQUIREMENTS	LIKELIHOOD
	TSC ACT	EPBC		
Blue-billed Duck			<p>permanent freshwater zones in clear water with minimal turbulence (NPWS 1999).</p> <p><u>Breeding locations:</u> Breeding occurs in the Murray-Darling Basin. Blue-billed Ducks are partly migratory, with short-distance movements between breeding swamps and over-wintering lakes, with some long-distance dispersal to breed during spring and early summer (OEH 2013). Known to nest in rushes, sedges, Lignum (<i>Muehlenbeckia cunninghamii</i>) and paperbark (<i>Melaleuca</i> spp.) (NPWS 1999). Young birds disperse in April-May from their breeding swamps in inland NSW to non-breeding areas on the Murray River system and coastal lakes (OEH 2013).</p> <p><u>Vegetation type and structure:</u> The Blue-billed Duck prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation (OEH 2013). Can be found on temperate, fresh to saline, terrestrial wetlands, including sewerage ponds, rivers, salt lakes and salt pans. This species is completely aquatic, swimming low in the water along the edge of dense cover (OEH 2013b).</p> <p><u>Floristic composition:</u> Known to nest in rushes, sedges, Lignum (<i>Muehlenbeckia cunninghamii</i>) and paperbark (<i>Melaleuca</i> spp.).</p> <p><u>Patch Size:</u> Relatively low densities. Non-breeding flocks of approximately several hundred individuals congregate in wetlands (NPWS 1999).</p> <p><u>Competition:</u> Information not available.</p> <p><u>Connectivity:</u> Regionally and seasonally nomadic (NPWS 1999). They generally have short-distance movements between breeding swamps and non-breeding lakes, with some long distance dispersal for the breeding season (OEH 2013).</p> <p><u>Landscape position:</u> Wetlands and other water bodies, as above (NPWS 1999).</p>	
Threatened Mammals				
<i>Phascolarctos cinereus</i> Koala	Vulnerable	Vulnerable	<p><u>Foraging:</u> Diet is largely restricted to foliage of particular Eucalypt species, and may also include <i>Corymbia</i> spp., <i>Angophora</i> spp. and <i>Lophostemon</i> spp. Supplementary</p>	Observed



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SPECIES NAME	STATUS		HABITAT REQUIREMENTS	LIKELIHOOD
	TSC ACT	EPBC		
			<p>species includes <i>Leptospermum</i> spp. and <i>Melaleuca</i> spp. Species preference varies between regions and seasons (SEWPaC 2013).</p> <p><u>Breeding locations:</u> The koala is not a territorial species, and thus its home range extensively overlaps</p> <p><u>Vegetation type and structure:</u> Associated with both wet and dry Eucalypt forest and woodland that contains a canopy cover of approximately 10 to 70% (Reed et al. 1990), with acceptable Eucalypt food trees.</p> <p><u>Floristic composition:</u> Some preferred Eucalyptus species are: White Box, Blakely's Red Gum, Ribbon Gum and Tumbledown Gum (OEH 2013).</p> <p><u>Patch Size:</u> The koala is not a territorial species, and thus its home range extensively overlaps. Home range is dependent on the availability of habitat; koalas in habitat of lower quality have a large home range and koalas in habitat of higher quality have smaller home ranges. Koalas move between trees a few times a day (SEWPaC 2013).</p> <p><u>Competition:</u> Population crashes in areas of over-abundant koalas are common (SEWPaC 2013).</p> <p><u>Connectivity:</u> Local koala extinction occurs in habitat patches that are too isolated or small to support viable populations (SEWPaC 2013).</p> <p><u>Landscape position:</u> Not critical.</p>	
Threatened Bats				
<p><i>Falsistrellus tasmaniensis</i> Eastern False Pipistrelle</p>	Vulnerable		<p><u>Foraging:</u> They eat large beetles, moths and some bugs, ants and flies (Churchill 2008).</p> <p><u>Breeding locations:</u> Roosts in tree hollows of Eucalypt trees, but has also been found roosting in buildings or under loose bark (OEH 2013).</p> <p><u>Vegetation type and structure:</u> Prefers moist habitats with trees taller than 20m (OEH 2013).</p> <p><u>Floristic composition:</u> Eucalypt trees for roosting (Churchill 2008).</p> <p><u>Patch Size:</u> Radio-tracked individuals moved between roosts almost every night. Between nights roosts were generally</p>	Recorded



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SPECIES NAME	STATUS		HABITAT REQUIREMENTS	LIKELIHOOD
	TSC ACT	EPBC		
			<p>less than 150 m apart. They have a home range of up to 136 ha (Churchill 2008).</p> <p><u>Competition:</u> Information unavailable.</p> <p><u>Connectivity:</u> Information unavailable.</p> <p><u>Landscape position:</u> Information unavailable.</p>	
<p><i>Miniopterus schreibersii oceanensis</i> Eastern Bentwing Bat</p>	Vulnerable		<p><u>Foraging:</u> It forages above and below the tree canopy on small insects (Dwyer 1995, Dwyer 1981). Prey items include moths, flies cockroaches and beetles (Churchill 2008).</p> <p><u>Breeding locations:</u> Generally cave dwellers but may also use man-made constructions, e.g. abandoned mines and road culverts (Churchill 2008).</p> <p><u>Vegetation type and structure:</u> Associated with a range of habitats such as rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grassland (Churchill 1998). Will utilise caves, old mines, and stormwater channels, under bridges and occasionally buildings for shelter (Environment Australia 2000, Dwyer 1995).</p> <p><u>Floristic composition:</u> Not critical.</p> <p><u>Patch Size:</u> Movement between territories is unusual, although one bat is recorded to have moved 1300 km. Females have been known to travel up to 65 km in one night (Churchill 2008).</p> <p><u>Competition:</u> Information unavailable.</p> <p><u>Connectivity:</u> Information unavailable.</p> <p><u>Landscape position:</u> Information unavailable.</p>	Recorded
<p><i>Saccolaimus flaviventris</i> Yellow-bellied Sheathtail Bat</p>	Vulnerable		<p><u>Foraging:</u> Predominantly feeds on beetles, but also grasshoppers, crickets, leafhoppers, shield bugs, wasps and a few flying ants (Churchill 2008).</p> <p><u>Breeding locations:</u> Roosts in tree hollows; may also use caves; has also been recorded in a tree hollow in a paddock (Environment Australia 2000) and in abandoned sugar glider nests (Churchill 1998).</p> <p><u>Vegetation type and structure:</u> Found in almost all habitats, from wet and dry sclerophyll forest, open woodland (Churchill</p>	Recorded



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SPECIES NAME	STATUS		HABITAT REQUIREMENTS	LIKELIHOOD
	TSC ACT	EPBC		
			<p>1998), open country, mallee, rainforests, heathland and waterbodies (SFNSW 1995).</p> <p><u>Floristic composition:</u> Not critical.</p> <p><u>Patch Size:</u> Information unavailable.</p> <p><u>Competition:</u> Information unavailable.</p> <p><u>Connectivity:</u> The Yellow-bellied Sheath-tail-bat is dependent on suitable hollow-bearing trees to provide roost sites, which may be a limiting factor on populations in cleared or fragmented habitats (Environment Australia 2000).</p> <p><u>Landscape position:</u> Information unavailable.</p>	
<p><i>Scoteanax rueppellii</i> Greater Broad-nosed Bat</p>	Vulnerable		<p><u>Foraging:</u> Within denser vegetation types use is made of natural and man made openings such as roads, creeks and small rivers, where it hawks backwards and forwards for prey (Hoye & Richards 1998). Beetles are their dominant food source, as well as moths, ants, spiders and large flies. It is also likely that bats form a part of their diet also (Churchill 2008).</p> <p><u>Breeding locations:</u> Roosts in tree hollows, cracks and fissures in trunks and dead branches, under bark, as well as in the roof of old buildings.</p> <p><u>Vegetation type and structure:</u> Associated with moist gullies in mature coastal forest, or rainforest, east of the Great Dividing Range (Churchill, 1998), tending to be more frequently located in more productive forests (Hoye & Richards 1998). Other habitats include cleared paddocks with remnant trees and tree-lined creeks in open areas (Churchill 2008).</p> <p><u>Floristic composition:</u> Not critical.</p> <p><u>Patch Size:</u> Information unavailable.</p> <p><u>Competition:</u> Information unavailable.</p> <p><u>Connectivity:</u> Information unavailable.</p> <p><u>Landscape position:</u> Usually located in gullies draining east (Hoye and Richards 1995).</p>	Recorded

3.5.3 Threatened Flora

No threatened flora has been identified on WCCM.

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3.6 INTRODUCED FLORA AND FAUNA

3.6.1 Introduced Flora / Weeds

Several weed species are known to occur on the WCCM and BOA. The most abundant weed species recorded across WCCM includes *Echium plantagineum* (Patterson’s Curse), *Carthamus lanatus* (Saffron Thistle) and *Hypericum perforatum* (St. Johns Wort). Other weed species of recorded include *Lycium ferocissimum* (African Boxthorn) and *Opuntia spp.* (Prickly Pear). These five weed species are listed as noxious weeds in the Liverpool Plains Shire Council under the NSW Noxious Weeds Act 1993 (**Table 5**).

Table 5: List of Noxious Weeds observed on the site

SPECIES NAME	COMMON NAME	NOXIOUS WEED CATEGORY
<i>Lycium ferocissimum</i>	African Boxthorn	4
<i>Echium plantagineum</i>	Patterson’s Curse	4
<i>Opuntia spp.</i>	Prickly Pear	4
<i>Xanthium spp.</i>	Noogoora Burr	4
<i>Hypericum perforatum</i>	St. Johns Wort	4

3.6.2 Introduced Fauna / Vertebrate Pests

Seven introduced mammals and two introduced birds have been recorded within WCCM and BOA.

- Black Rat (*Rattus rattus*).
- House Mouse (*Mus musculus*).
- European Red Fox (*Vulpes vulpes*).
- European Rabbit (*Oryctolagus cuniculus*).
- Domestic Cow (*Bos taurus*).
- Domestic Dog (*Canis lupus familiaris*).
- Feral Cat (*Felis catus*).
- Rock Dove (*Columba livia*).
- Crested Pigeon (*Ocyphaps lophotes*).

The European Red Fox and feral cat in particular are known to impact upon native species diversity through competition with native predators or through predation of native fauna. All introduced fauna have the potential to have detrimental effects on the biodiversity of the WCCM and BOA.

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4 MANAGEMENT OF BIODIVERSITY AT THE WCCM

This section outlines the actions to be taken at the WCCM to minimise impact on native flora and fauna species and to manage the impacts of exotic flora and fauna. This includes activities to be undertaken within clearing areas; prior to the removal of trees in order to minimise the impact to fauna species, and it also includes measures to control the potential impact of weeds and feral animals on the remaining biodiversity of the WCCM (not incorporated into the BOA).

4.1 VEGETATION CLEARING

4.1.1 Scheduling

Vegetation clearing must be undertaken for mining to occur; however, WCC implements the following processes to mitigate potential impacts to biodiversity from clearing activities.

- Clearing schedules are developed in conjunction with the mine plan to determine timing for clearing activities and identifies the minimum area to be disturbed at any given time, reducing the amount of mature vegetation (and habitat) cleared.
- The area identified for clearing activities is compared to the disturbance limits outlined within the MOP and is surveyed in the field with the boundaries clearly pegged prior to activities commencing.
- Where possible clearing activities will be scheduled outside of the main periods of fauna breeding or hibernation/torpor – typically late Summer and Autumn² to mitigate impacts on biodiversity.
- An ecologist will be engaged to complete Pre-Clearing, Clearing and Post Clearing Assessments of the area (refer to Sections 4.1.2 and 4.1.3).

4.1.2 Pre-Clearing Assessment

Threatened Flora

No threatened flora species have been identified or considered likely to occur within the WCCM. The identification of threatened flora during the pre-clearing assessment will be by opportunistic observation. In the unlikely event that a threatened plant species is identified, the location is to be marked with GPS and in the field (using flagging tape or similar). The location of the threatened plant species is to be retained in situ including a buffer of five metres until an assessment of significance has been undertaken in consultation with OEH and/or DoEE.

Threatened Fauna Habitat

The vegetation to be cleared provides known and/or potential habitat for a number of threatened birds and arboreal mammals. These species will be targeted during the Pre-Clearing Assessment.

² It is noted this does not apply to all fauna which varies based individual species ecology, prevailing climate and resource availability.

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In the week/s prior to vegetation clearing within the required clearing area, an Ecologist will undertake the following assessment:

1. Hollow bearing trees, hollow logs and other habitat features such as rocks are to be located and recorded by GPS, marked in the field by marking paint or similar and documented.
2. Evening/nocturnal surveys will be undertaken to gauge fauna activity within the proposed clearing area. The surveys include stag or hollow watching of as many trees as possible, microchiropteran bat call detection, call playback for owls and Koala (*Phascolarctos cinereus*) and spotlight traverses to detect any other fauna present.
3. The presence of seed for collection and salvageable habitat resources will be identified.
4. The presence environmental and noxious weeds will also be identified.

As required, the Environmental Officer will coordinate any seed collection or weed control prior to clearing.

4.1.3 Clearing and Post-clearing Assessment

At the time of clearing, an Ecologist or wildlife handler will be present to supervise the following clearing procedures³.

1. Prior to felling, each tree will be visually inspected for the presence of fauna. Each tree will be nudged and shaken immediately prior to felling to encourage any fauna, such as birds, to vacate the tree.
2. The dozer or excavator undertaking the clearing will implement “slow drop” techniques during the felling of each tree.
3. Once on the ground, each hollow will be inspected for the presence of fauna, with the aid of a burrow-scope if required.
4. Should injured or juvenile fauna be identified, they will be captured (if safe to do so) and transported to either WIRES or a veterinary hospital.
5. Other fauna captured but not requiring care will be released into the same habitat near the point of rescue. This will be done at dusk for nocturnal fauna⁴.
6. Hollow bearing trees will be left on the ground overnight to allow any unidentified fauna still residing in the tree to vacate.
7. Where practicable, the cleared timber and habitat features, particularly hollow bearing trees, logs and rocks, will be salvaged and placed in suitable locations out of the clearing area for reuse in the BOA or rehabilitation areas. The quantities of habitat material salvaged will be documented.

³ The open woodland vegetation structure at WCC does not have a significant shrub layer and the disturbance history of the site has resulted in limited regeneration. Therefore vegetation clearing procedures relate only to overstorey vegetation.

⁴ Separate management strategies is not required as this process would be acceptable for any threatened species encountered which would be threatened birds or microbats based on monitoring since 2004

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At the completion of clearing, an ecologist will prepare a report based on the results of the Pre-clearing, Clearing and Post-clearing Assessment.

4.2 WEED MANAGEMENT

See description of weed management in **Section 6.7**.

4.3 MANAGEMENT OF HERITAGE VALUES

There are no items of cultural heritage on the WCCM however there is potential for historical heritage items to be uncovered through the clearing and mining process (refer to the WCC Heritage Management Plan). The HMP outlines the actions to be followed if any unexpected heritage items are identified.

4.4 MAXIMISING SALVAGE OF HABITAT RESOURCES

As described in **Section 4.1**; any habitat resources identified during the pre-clearing will be salvaged if possible in accordance with **Section 6.6**.

4.5 SEED COLLECTION AND PROPAGATION

See description of seed management in **Section 6.4**.

4.6 REHABILITATION

The WCCM MOP⁵ incorporates the requirements of a Rehabilitation Management Plan (RMP) as required by *Condition 3(43)* of PA 10_0059. The MOP outlines the objectives, domains, completion criteria, methodology, targets, contingency management and conceptual decommissioning relating to rehabilitation management at WCC. WCC's rehabilitation objectives are consistent with this BOMP and focus on the restoration of native woodland vegetation, specifically the endangered ecological community Grassy White Box Woodland. Rehabilitation works aim to restore this woodland community similar to that which was present pre-mining and will eventually enhance the east west corridor with the adjacent BOA domain to the south of the rehabilitation area.

4.7 FERAL ANIMAL MANAGEMENT

See description of feral animal management in **Section 6.8**.

⁵ Approved by DRE on 14th January 2016.

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PART B
BIODIVERSITY OFFSET AREA MANAGEMENT

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5 EXISTING ENVIRONMENT RELEVANT TO THE OFFSET AREAS

This section describes the existing environment relevant to the BOA. The description of the existing environment specific to WCCM is provided in **Section 3**.

5.1 CLIMATIC INFORMATION

Climatic information was provided in **Section 3.1** is also relevant to the WCC BOA.

5.2 BIODIVERSITY OFFSET STRATEGY

In accordance with PA 10_0059 (Schedule 3 Condition 24) and EPBC Act Approval 2010/5571 (Condition 1 & 2); WCC has developed the following Biodiversity Offset Strategy (BOS) to be implemented across the BOA in perpetuity.

The LOM BOS has been designed to meet both Commonwealth and State offset principles (at the time of original approval). The package includes a range of direct (land protection and management) measures to offset the impacts of the LOM Project. The BOS package incorporates 'like for like' EEC vegetation including Box Gum (Grassy) Woodland and Derived Native Grasslands (DNG) and other woodland vegetation communities in good condition providing extensive habitat features not available in the DNG areas and mine rehabilitation. The intent of the BOA is to avoid, minimise and ameliorate the impacts of the WCCM to the maximum extent possible.

The key objectives of the BOS focus on the re-establishment and/or enhancement of:

- a) endangered ecological communities:
 - White Box-Yellow Box-Blakely's Red Gum Woodland EEC; and
 - White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC;

Collectively both ecological communities are referred to as Box Gum Woodland.

- b) habitat for threatened fauna species, including the:
 - Regent Honeyeater, Swift Parrot, Brown Treecreeper, Hooded Robin, Little Lorikeet, and Barking Owl; and
 - Eastern Bent-wing Bat, Eastern False Pipistrelle, Yellow-bellied Bent-wing Bat and Greater Broad-nosed Bat.

The key outcomes of the BOS include:

- Linking the BOA to Liverpool Plains Shire regional and sub-regional corridors and providing a cross catchment corridor (east to west);
- Overstorey (canopy) vegetation retention is to be 5:1 offset to impact ratio;
- All woodland vegetation types in good condition offset to impact ratio 5.5:1;
- Box Gum Woodland and DNG BOA meeting EPBC CEEC criteria offset to impact ratio 4.3:1;



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- Box Gum Woodland meeting TSC EEC criteria offset to impact ratio of 5.1:1;
- Box Gum Woodland DNG criteria offset to impact ratio of 4.9:1; and
- Potential existing foraging habitat for the Regent Honeyeater and Swift Parrot within BOA offset to impact ratio of 8.25:1.

The area and proportion of each vegetation type of the WCCM to be impacted, along with that contained within the BOA is shown in **Table 6**. **Figure 4** presents the approved BOS for the WCCM which would compensate for the mine-related disturbance by conserving vegetation and habitat of similar biodiversity value. In summary, the Biodiversity Offset Strategy provides for:

- rehabilitation of WCCM;
- a package of covenanted offset properties where existing biodiversity values would be enhanced and areas of degraded land revegetated;
- in perpetuity biodiversity management of these properties; and
- a 20 year monitoring plan for the offset properties and revegetation areas.

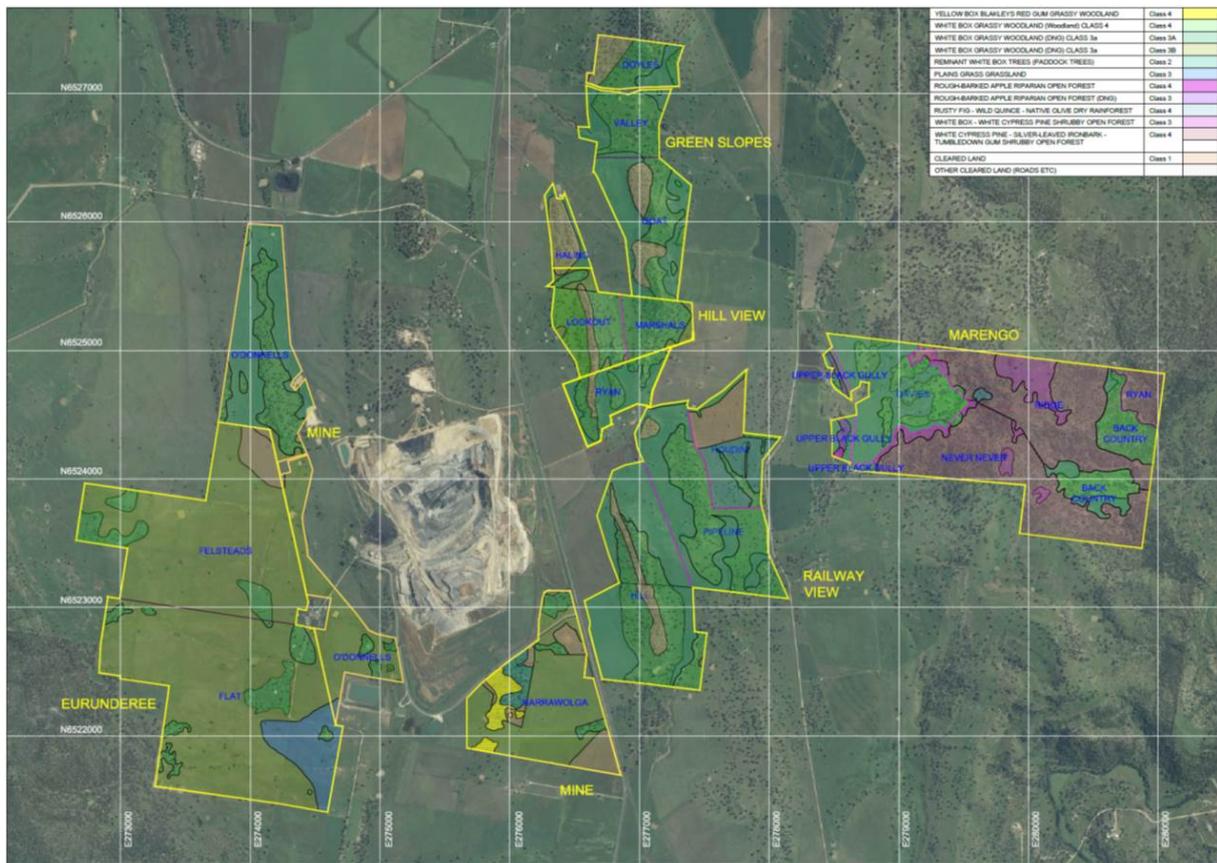


Figure 4: WCC BOS

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Table 6: Comparison of vegetation types within the WCCM and BOA.

Biometric Vegetation Communities	Condition	WCCM Impact	BOA Offset
Yellow Box – Blakely’s Red Gum grassy woodland of the Nandewar Bioregion	Class 4		8.50
Brigalow - Belah woodland on alluvial often gilgaied clay soil mainly in the Brigalow Belt South Bioregion	Class 4		
White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions	Class 4	0.35	326.28
	Class 3a	58.50	250.25
	Class 3b	74.60	408.52
	Class 2	60.70	26.35
Plains Grass grassland on basaltic black earth soils mainly on the Liverpool Plain in the Brigalow Belt South Bioregion	Class 3		25.33
Rough-barked Apple riparian forb/grass open forest of the Nandewar Bioregion	Class 4		1.28
	Class 3		3.05
Rusty Fig - Wild Quince - Native Olive dry rainforest of rocky areas of the Nandewar Bioregion	Class 4		1.00
White Box - White Cypress Pine shrubby open forest of the Nandewar and Brigalow Belt South Bioregions	Class 4		156.40
	Class 3		20.74
White Cypress Pine - Silver-leaved Ironbark - Tumbledown Gum shrubby open forest	Class 4		45.23
Total Extant Vegetation			1272.92
Cleared Land to be restored			18.87
Mine Site Rehabilitation			482.20
Other Cleared Land (incl. roads, dams, rubbish dump)		31.49	25.08
GRAND TOTAL		225.64	1799.08

5.3 LAND USE AND HISTORY

In order to achieve the BOS, WCC has purchased six properties adjacent to the mine site as individual BOAs to be incorporated into the broader WCC BOA. Each BOA property can be interchangeably described as a management domain (**Section 6.3**) for the purpose of this BOMP. The following describes the land use of each BOA.

5.3.1 Narrawolga BOA

This BOA incorporates two distinct areas to the west and south of the mine. The Narrawolga BOA contains three vegetation types, with all four condition classes present (Class 1 to Class 4). Class 4 vegetation condition offers seasonal inflorescence for foliavores and nectarivores, including winter season nectar and pollen that may be used by Regent Honeyeater and/or Swift Parrot.

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Hollows, bark exfoliations and fallen timber is also present within Class 4 vegetation and provides potential habitat respectively for hollow-obligate species (e.g. some microchiropteran bats, birds and arboreal mammals), reptiles, amphibians and terrestrial mammals. Grassland classes (i.e. Class 1 and 3) offer habitat for granivorous birds, generalist and some threatened woodland birds (i.e. *Climacteris picumnus* (Brown Treecreeper)) and reptiles, and *Macropus giganteus* (Eastern Grey Kangaroo). Aquatic habitat in the form of dams also provides habitat and resources for a range of fauna including for wetland birds, such as the *Tachybaptus novaehollandiae* (Australasian Grebe), *Aythya australis* (Australian Hard Head) and possibly intermittent use by *Oxyura australis* (Blue-billed Duck).

The area to the west of WCC Mine Infrastructure Area contains White Box grassy woodland in three classes, Class 4 Woodland, Class 3 DNG (3a and 3b) and Class 2; an area of Plains Grass Grassland DNG; and a small area of cleared land. Existing infrastructure within this area includes the main powerline to WCC along the eastern boundary with the Coal Haul Road, a smaller powerline to the Escott property and the main communication/optic fibre line into WCCM including a small structure at the connection with the external Telstra network. Dirty water management dams, the main site access road to WCC and to the Explosive Magazine also border this area. This area ceased being grazed in September 2012.

The area to the south of WCCM rehabilitation area contains Yellow Box - Blakely's Red Gum grassy woodland Class 4 Woodland; White Box grassy woodland in three classes, Class 4 Woodland, Class 3 DNG (3b) and Class 2; and an area of cleared land. A small portion of this area was agisted until September 2012 for agricultural activities of cultivation for lucerne hay and cattle grazing.

5.3.2 Eurunderee BOA

Eurunderee comprises two broad flat and open areas containing two vegetation types, with all four condition classes present (Class 1 to Class 4). Class 4 vegetation offers seasonal inflorescence for foliivores and nectarivores, including winter season nectar and pollen that may be used by Regent Honeyeater and/or Swift Parrot. Hollows, bark exfoliations and fallen timber is also present within Class 4 vegetation and provides potential habitat respectively for hollow-obligate species (e.g. some microchiropteran bats, birds and arboreal mammals), reptiles, amphibians and terrestrial mammals. Grassland classes (i.e. Class 1 and 3) offer habitat for granivorous birds, generalist woodland birds and reptiles, and *Macropus giganteus* (Eastern Grey Kangaroo). Several small dams offers habitat for avifauna such as Australasian Grebe, Australian Hard Head and on occasion Elseyonis melanops (Black-fronted Dotterel).

The southern area contains four vegetation types and classes, White Box grassy woodland Class 4, Class 3 (3b) and Class 2, and Plains Grass DNG Class 3. Old infrastructure in this area includes a gravel road (used for infrequent/emergency access for a neighbouring property), a couple of old hay sheds (now removal) and other agriculture related sheds and derelict agriculture related infrastructure and rubbish that have been partially removed. An old farm rubbish dump of mainly scrap metal and other non-putrescible waste was removed and rehabilitated in 2011. The south western boundary fence was relocated from the former "give

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and take” fence location onto the physical cadastral boundary in 2011. This area ceased being grazed in December 2010.

The northern area on Eurunderee contains three vegetation types and classes, White Box grassy woodland Class 4 and Class 3 (3b) and a cleared area. The north western boundary fence was relocated from the former “give and take” fence location onto the physical cadastral boundary in 2014. This BOA ceased being grazed in September 2012.

5.3.3 Railway View BOA

Railway View BOA contains two vegetation types, with all four condition classes present (Class 1 to Class 4). Class 4 White Box grassy woodland offers seasonal inflorescence for foliivores and nectarivores, including winter season nectar and pollen that may be used by Regent Honeyeater and/or Swift Parrot. Hollows, bark exfoliations and fallen timber is also present within Class 4 vegetation and provides potential habitat respectively for hollow-obligate species (e.g. some microchiropteran bats, birds and arboreal mammals), reptiles, amphibians and terrestrial mammals. Grassland classes (i.e. Class 1 and 3) offer habitat for granivorous birds, generalist woodland birds and reptiles, and *Macropus giganteus* (Eastern Grey Kangaroo). White Cypress Pine - Silver-leaved Ironbark - Tumbledown Gum shrubby open forest typically contains areas of exposed granite rock slabs with some rock exfoliations that provide habitat for geckos and other reptiles. Several small dams offer habitat for avifauna such as Australasian Grebe, Australian Hard Head and on occasion *Euseyornis melanops* (Black-fronted Dotterel).

Black Gully drains through the south portion of the property and is deeply incised. Ongoing monitoring of the stability of the gully with regard to the erosion will be implemented to inform whether additional stabilisation and rehabilitation is necessary.

The pipeline (and powerline) that provides Werris Creek with its drinking water from Quipolly Dam crosses this property. Additional powerlines that supply power to Marengo and other properties on Black Gully Road also cross this property.

Railway View BOA provides an east-west link with lands to the west on the southern portion of the WCCM (Narrawolga), through to a travelling stock route and reserve to the east which is situated between Railway View and Marengo properties.

The ridge lines of Railway View contains three vegetation types and classes, White Box grassy woodland Class 4 and Class 3 (3a) and White Cypress Pine – Silver-leaved Ironbark – Tumbledown Gum shrubby open forest Class 4. The majority of this area ceased being grazed in December 2010. The deeply incised section of Black Gully drains through this area.

The flatter land to the west of the ridge lines contains three vegetation types and classes, White Box grassy woodland Class 4 and Class 3 (3a) and White Cypress Pine – Silver-leaved Ironbark – Tumbledown Gum shrubby open forest Class 4. This area was under agistment until September 2012 for cattle grazing on native pastures.

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The land to the east of the ridge lines contains three vegetation types and classes, White Box grassy woodland Class 4, Class 3 (3a) and Class 2. This area was under agistment until September 2012 for agricultural activities of cultivation for annual oats and forage sorghum.

The area to the north of the Railway View house contains three vegetation types and classes, White Box grassy woodland Class 4, Class 3 (3a) and White Cypress Pine – Silver-leaved Ironbark – Tumbledown Gum shrubby open forest Class 4. This area was under agistment until September 2012 for agricultural activities of native pastures for cattle grazing.

5.3.4 Marengo BOA

Marengo BOA contains five distinct area with contains four vegetation types, with two condition classes present (Class 3 and 4). Class 4 White Box grassy woodland and White Box - White Cypress Pine shrubby open forest offers seasonal inflorescence for foliavores and nectarivores, including winter season nectar and pollen that may be used by Regent Honeyeater and/or Swift Parrot. Hollows, bark exfoliations in Eucalypts and Callitris and fallen timber is also present within Class 4 vegetation and provides potential habitat respectively for hollow-obligate species (e.g. some microchiropteran bats, birds and arboreal mammals), reptiles, amphibians and terrestrial mammals. Grassland classes (i.e. Class 1 and 3) offer habitat for granivorous birds, generalist woodland birds and reptiles, and *Macropus giganteus* (Eastern Grey Kangaroo). Areas of exposed granite rock slabs occur along the main central ridgeline with some rock exfoliations that provide habitat for geckos and other reptiles.

The inclusion of the Marengo BOA provides an increase in the size and continuity of the vegetated corridor between the two sub-regional corridors (ELA 2010b). The small rainforest remnant found on the “Marengo” property, ‘Rusty Fig – Wild Quince – Native Olive dry rainforest’ potentially provides important habitat for fauna including the locally endangered population of Australian Brush-turkey in the Nandewar and Brigalow Belt South bioregions, along with several other threatened species considered having potential occur across the entire BOA. Notably, a number threatened woodland birds, including *Melanodrya scucullata* (Hooded Robin) and *Stagonople uraguttata* (Diamond Firetail), are regularly observed on this property.

A powerline passes through the western part of the property supplying power to an adjoining neighbour. Grazing was removed from the property in January 2011 and no other land use has occurred since that time.

The riparian sections of Black Gully contains four vegetation types and classes, White Box grassy woodland Class 4 and 3 (3a) and Rough-barked Apple riparian open forest Class 3 and Class 4. Small amounts of residual agricultural rubbish were removed in 2015. While Black Gully is deeply incised in this area, it is largely stable except for a couple of minor gully heads that will require further monitoring.

The cleared flatter areas to the west of the central ridge contains three vegetation types and classes, White Box grassy woodland Class 4 and Class 3 (3a) and a small area of Class 4 White Box - White Cypress Pine shrubby open forest.

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The intact areas of vegetation on the southern half of the western slopes up to the central ridge contains three vegetation types and classes, White Box - White Cypress Pine shrubby open forest Class 4 and Class 3 and a small area of Class 4 White Box grassy woodland.

The crest of the central ridge contains three vegetation types and classes, Class 4 White Box grassy woodland, White Box - White Cypress Pine shrubby open forest Class 4 and Class 3, and Rusty Fig – Wild Quince – Native Olive dry rainforest.

Two previously cleared valleys on the eastern side of the central ridge contains one vegetation type of two classes, White Box grassy woodland Class 4 and Class 3 (3a).

5.3.5 Hillview BOA

Hillview BOA is geographically divided by two small parallel ridgelines that contains two vegetation types with two condition classes present (Class 3 and 4). Class 4 White Box grassy woodland offers seasonal inflorescence for foliivores and nectarivores, including winter season nectar and pollen that may be used by Regent Honeyeater and/or Swift Parrot. Hollows, bark exfoliations in Eucalypts and fallen timber is also present within Class 4 vegetation and provides potential habitat respectively for hollow-obligate species (e.g. some microchiropteran bats, birds and arboreal mammals), reptiles, amphibians and terrestrial mammals. Grassland classes offer habitat for granivorous birds, generalist woodland birds and reptiles, and *Macropus giganteus* (Eastern Grey Kangaroo). Areas of exposed granite rock slabs occur within the White Cypress Pine - Silver-leaved Ironbark - Tumbledown Gum shrubby open forest, with some rock exfoliations that provide habitat for geckos and other reptiles.

The addition of Hillview to the BOS enhances north to south connectivity of the vegetation types found between Railway View and Greenslopes and strengthens the sub-regional east to west corridor identified in ELA (2010b). The pipeline that provides Werris Creek with its drinking water from Quipolly Dam crosses this property. This BOA was under agistment until September 2012 for agricultural activities of cattle grazing on native pastures.

The eastern half of Hillview contains three vegetation types and classes, White Box grassy woodland Class 4 and Class 3 (3a and 3b) and White Cypress Pine – Silver-leaved Ironbark – Tumbledown Gum shrubby open forest Class 4. The western half of Hillview contains two vegetation types and classes, White Box grassy woodland Class 4 and Class 3 (3a).

5.3.6 Greenslopes BOA

Greenslopes BOA contains two vegetation types with two condition classes present (Class 3 and 4). Class 4 White Box grassy woodland offers seasonal inflorescence for foliivores and nectarivores, including winter season nectar and pollen that may be used by Regent Honeyeater and/or Swift Parrot. Hollows, bark exfoliations in Eucalypts and fallen timber is also present within Class 4 vegetation and provides potential habitat respectively for hollow-obligate species (e.g. some microchiropteran bats, birds and arboreal mammals), reptiles, amphibians and terrestrial mammals. Grassland classes offer habitat for granivorous birds, generalist woodland birds and reptiles, and *Macropus giganteus* (Eastern Grey Kangaroo). Areas of exposed granite rock slabs occur within the White Cypress Pine - Silver-leaved

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Ironbark - Tumbledown Gum shrubby open forest, with some rock exfoliations that provide habitat for geckos and other reptiles.

As mentioned above, the addition of both Hillview and Greenslopes to the BOS enhances north to south connectivity of the vegetation types found between Railway View and Greenslopes and strengthens the sub-regional east to west corridor identified in ELA 2010b. There is a gully that bisects the north/south ridge line that will require monitoring for erosion issues and intervention may be required. The pipeline that provides Werris Creek with its drinking water from Quipolly Dam crosses this property. This BOA was under agistment until September 2012 for agricultural activities of cultivation of oats and native pastures for cattle and goat grazing.

The area to the south of the Greenslopes house contains two vegetation types and classes, White Box grassy woodland Class 3 (3a) and White Cypress Pine – Silver-leaved Ironbark – Tumbledown Gum shrubby open forest Class 4. The northern paddock on the footslopes of Doyles Hill contains three vegetation types and classes, White Box grassy woodland Class 4 and Class 3 (3a) and White Cypress Pine – Silver-leaved Ironbark – Tumbledown Gum shrubby open forest Class 4. The gully line that bisects the north/south ridge contains two vegetation types and classes, White Box grassy woodland Class 4 and Class 3 (3a). The southern section of the ridge line adjoining Hillview contains three vegetation types and classes, White Box grassy woodland Class 4 and Class 3 (3a) and White Cypress Pine – Silver-leaved Ironbark – Tumbledown Gum shrubby open forest Class 4.

5.4 VEGETATION COMMUNITIES

Table 7 breaks down the quantity of each vegetation community and condition class per BOA described in **Section 5.3**. The section below discusses in detail the individual vegetation communities including the dominant species.

5.4.1 Disturbed, Cropped/cultivated paddocks (Cleared Land)

These areas have been modified from the natural state to the extent that native species are now uncommon and most of the cultivated areas were either cleared at the time of survey or dominated by planted introduced species such as *Medicago sativa* (Lucerne) or *Avena sativa* (Oats). Although these paddocks have previously been cleared and/or under cultivation, they would have previously been White Box Grassy Woodlands, as such have been mapped as 'Box-Gum Woodland DNG, Condition Class 1', i.e. <50% native groundcover with no native canopy.

5.4.2 Plains Grass grassland on basaltic black earth soils mainly on the Liverpool Plain in the Brigalow Belt South Bioregion

This community was represented by one condition class, Class 3, although it is a natural grassland community rather than a derived grassland (**Figure 5**). The canopy was very sparse and contained the occasional *Angophora floribunda* (Rough-barked Apple) and very occasionally on the edges of the community *E. albens*. Native understorey species included *C. lappulacea*, *E. hastata*, and *Oxalis perennans* (Wood Sorrel), while native grasses were dominated by *A. ramosa*, *Austrodanthonia tenuior* (Wallaby Grass), *A. aristiglumis* (Plains Grass), *A. verticillata* *C. truncata* and *D. sericeum*.

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Table 7: WCC BOS by vegetation community and condition class

BIOMETRIC VEGETATION COMMUNITIES	CONDITION	BIODIVERSITY OFFSET AREA						TOTAL
		EURUN DERE	HILL VIEW	GREEN SLOPES	MARENGO	NARRA WOLGA	RAILWAY VIEW	
Yellow Box - Blakely's Red Gum grassy woodland	Class 4					8.15		8.15
White Box grassy woodland (Woodland)	Class 4	34.78	46.40	44.60	53.56	38.72	105.50	323.56
White Box grassy woodland (DNG)	Class 3a		5.94	51.10	48.76	46.88	106.59	259.27
	Class 3b	304.76	0.56			103.35		408.67
Remnant White Box trees (Paddock Trees)	Class 2	0.12				6.10	19.64	25.86
Plains Grass grassland	Class 3	24.79				0.72		25.51
Rough-barked Apple riparian open forest	Class 4				0.45			0.45
Rough-barked Apple riparian open forest (DNG)	Class 3				2.78			2.78
Rusty Fig - Wild Quince - Native Olive dry rainforest	Class 4				1.00			1.00
White Box - White Cypress Pine shrubby open forest	Class 4				20.74			20.74
White Box - White Cypress Pine shrubby open forest (DNG)	Class 3				157.40			157.40
White Cypress Pine - Silver-leaved Ironbark - Tumbledown Gum shrubby open forest	Class 4		4.97	28.24			12.90	46.11
Total Extant BOA Vegetation		364.45	57.87	123.94	284.69	203.92	244.63	1,279.50
Cleared Land	Class 1	10.39				14.69	14.30	39.38
Other cleared land (internal roads, dams)						0.61		0.61
TOTAL BIODIVERSITY OFFSET AREA		374.84	57.87	123.94	284.69	219.22	258.93	1,319.49
PA10_0059 BOS		363.93	57.32	123.00	284.12	215.86	243.69	1,287.92

This community is representative of the endangered ecological community “Native Vegetation on Cracking Clay Soils of the Liverpool Plains (as described in the final determination of the NSW Scientific Committee)” listed as an endangered ecological community on Schedule 1 Part 3 of the TSC Act.

Introduced flora recorded in this vegetation community included *C. lanatus*, *E. plantagineum*, *H. perforatum*, *Lepidium bonariense* (Peppergrass) and *Lycium ferocissimum* (African Boxthorn).

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Figure 5: Plains Grass grassland on basaltic black earth soils mainly on the Liverpool Plains in the Brigalow Belt South Bioregion

5.4.3 White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions and Yellow Box- Blakely's Red Gum grassy woodland of the Nandewar Bioregion

This community ranges in condition from condition class 1 – 4 (**Figure 6**). It generally has a sparse canopy dominated by *Eucalyptus albens* (White Box) with *E. melliodora* (Yellow Box) occasionally present. In some areas there is prolific regeneration of one or both of these overstorey species. The midstorey is absent with no shrubs observed at all. The understorey consists of a mix of native and introduced flora. The native understorey species include *Calotis lappulacea* (Yellow Burr-Daisy), *Einadia hastata* (Berry Saltbush), *Eremophila debilis* (Amulla) and *Wahlenbergia communis* (Tufted Bluebell), with native grasses dominating large areas including *Aristida ramosa* (Purple Wiregrass), *Austrostipa verticillata* (Slender Bamboo Grass), *Bothriochloa macra* (Red Grass), *Chloris truncata* (Windmill Grass), *Dichanthium sericeum* (Queensland Bluegrass), *Sporobolus elongatus* (Slender Rat's Tail Grass).

This community is representative of the endangered ecological community “White Box Yellow Box Blakely's Red Gum Woodland (as described in the final determination of the NSW Scientific Committee)” listed as an endangered ecological community on Schedule 1 Part 3 of the TSC Act and also meets the definition of the Commonwealth listed White Box – Yellow Box – Blakely's Red Gum grassy woodlands and derived native grasslands endangered community listed on the EPBC Act.

Introduced flora recorded in this community includes *Carthamus lanatus* (Saffron Thistle), *Centaurea solstitialis* (St Barnaby's Thistle), *Echium plantagineum* (Paterson's Curse), *Hypericum perforatum* (St John's Wort), *Hypochaeris radicata* (Cats Ear), *Marrubium vulgare* (Horehound) and *Opuntia* spp. (Prickly Pear). White Box grassy woodland has been further stratified into two DNG variants, 3a and 3b and are described as follows:

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- Condition Class 3a (high diversity): no native canopy cover, >11 native perennial understorey species (not including grasses) and at least 1 important species. This condition class equates to the EPBC Act and TSC Act definition of Box-Gum Woodland DNG.
- Condition Class 3b (low diversity): no native canopy cover, native grassy understorey with low diversity of herbs or other perennial understorey species. This condition class equates only to the TSC Act definition of Box-Gum Woodland DNG.

Hereafter these vegetation units are referred to White Box Grassy woodland Class 3a or Class 3b (or collectively as Class 3).



Figure 6: White Box-Grassy Woodland of the Nandewar and Brigalow belt south bioregions

5.4.4 White Cypress Pine – Silver-leaved Ironbark – Tumbledown Gum shrubby open forest of the Nandewar and Brigalow belt south bioregions

This community is represented in condition class 4 and only occurs in the BOA (**Figure 7**). It consisted of a sparse canopy comprised of *Eucalyptus dealbata* (Tumbledown Red Gum) with the occasional *E. albens*. As the site has been subject to historical grazing by livestock, there are limited midstorey and understorey species present. The only midstorey species observed was *Brachychiton populneus* (Kurrajong), while understorey species included, *Wahlenbergia communis* and native grasses similar to the White Box Grassy Woodland community, including *Aristida ramosa*, *Bothriochloa macra*, *Chloris truncata* and *Sporobolus elongatus*.

Introduced flora recorded in this vegetation community includes *Carthamus lanatus*, *Centaurea solstitialis* and *Echium plantagineum*.

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Figure 7: White Cypress Pine – Silver-leaved Ironbark – Tumbledown Gum shrubby open forest of the Nandewar and Brigalow belt south bioregions

5.4.5 White Box - White Cypress Pine shrubby open forest of the Nandewar and Brigalow Belt South Bioregions

The most common and widespread vegetation community on the Marengo BOA is a shrubby open forest/woodland occurring in steeper areas less suitable for agriculture and occurring in two condition classes, Class 4 and Class 3 (**Figure 8**). The most abundant tree species is *Eucalyptus albens* (White Box) while other common trees include *Eucalyptus dealbata* (Tumbledown Red Gum), *Eucalyptus crebra* (Narrow-leaved Ironbark) and *Callitris glaucophylla* (White Cypress Pine). In the shallowest soils on the ridgetops Tumbledown Red Gum and Narrow-leaved Ironbark often dominate while White Box is always more common on the hillslopes. The shrub layer ranges from sparse to quite dense with the most common species being *Notelaea microcarpa* (Native Olive), *Bursaria spinosa* (Blackthorn), *Olearia elliptica s.l.* (Sticky Daisy Bush) and *Pimelea neo-anglica* (Poison Pimelea). The ground layer is particularly diverse with numerous native grasses and herbs such as *Bothriochloa macra* and *B. decipiens* (Red-leg Grass), *Dichanthium sericeum* (Queensland Bluegrass), *Aristida sp.* (Wire Grass), *Cymbopogon refractus* (Barb-wire Grass), *Sporobolus creber* (Slender Rat's-tail Grass), *Digitaria brownii* (Cotton Finger Grass), *Calotis lappulacea* (Burr Daisy) and *Desmodium brachypodum* (Large Tick Tre-foil). Note that some areas of cleared land adjacent to the timbered areas are mapped as a condition class of this community (i.e. “no native canopy present”) even though it could also be considered to be a separate derived grassland community.

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Figure 8: White Box – White Cypress Pine shrubby open forest on the Marengo Domain

5.4.6 Rough-barked Apple riparian forb/grass open forest of the Nandewar Bioregion

Along the major drainage lines in the far south-western section of Marengo domain are some small remnant patches occurring in two condition classes, Class 4 and Class 3 (**Figure 9**). This riparian woodland is dominated by *Angophora floribunda* (Rough-barked Apple). Shrubs are relatively uncommon except for the occasional Native Olive and scattered clumps of the introduced woody weed *Lycium ferocissimum* (African Boxthorn). The ground layer is a mixture of native grasses such as *Aristida leptopoda* and *Aristida* sp., *Bothriochloa macra* and *B. decipiens*, *Austrostipa verticillata* (Slender Bamboo Grass) and *Paspalum distichum* (Water Couch), and introduced grasses such as *Paspalum dilatatum* (Paspalum) and *Pennisetum clandestinum* (Kikuyu). The latter species often carpets the ground to the exclusion of all other species. Although this community is the weediest of all the vegetation types on the block the abundance of native groundcover species still slightly outweighs the introduced species and so the community is still in reasonable condition.

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Figure 9: Rough-barked Apple riparian open forest on the Marengo property.

5.4.7 Rusty Fig - Wild Quince - Native Olive dry rainforest of rocky areas of the Nandewar Bioregion

In the centre of the “Marengo” property of the BOA, along a minor drainage line, is a small patch of Dry Rainforest dominated by *Ficus rubiginosa* (Rusty Fig), *Canthium odoratum* (Lamboto), *Notelaea macrocarpa* (**Figure 10**). Shrubs are common beneath the stunted tree canopy with the most common species being *Phyllanthus subcrenulatus* (Spurge) and *Olearia elliptica* s.l.. Grasses are relatively uncommon in this dry rainforest type and are replaced by ground ferns such as *Adiantum aethiopicum* (Common Maidenhair Fern) and *Pellaea falcata* (Sickle Fern). Vines are uncommon with the exception of *Pandorea pandorana* (Wonga Vine) which is abundant throughout.

Although Wild Quince trees were not present the distribution and species composition of this community is still a good match for the biometric community known as “Rusty Fig - Wild Quince - Native Olive dry rainforest of rocky areas of the Nandewar Bioregion”. The patch present on ‘Marengo’ also has affinities with “Semi-evergreen Vine Thicket”, an Endangered Ecological Community (EEC), but there are too few tree species for the patch to be considered part of this EEC. In addition, the small patch of dry rainforest is also growing on a soil derived from conglomerate rock whilst true “Semi-evergreen Vine Thicket” nearly always occurs on basalt.

5.5 THREATENED ECOLOGICAL COMMUNITIES, FLORA AND FAUNA

Threatened Ecological Communities

Three of the vegetation communities found within the WCC BOA are listed as Endangered Ecological Communities (EECs) under the NSW TSC Act but only one under the Commonwealth EPBC Act as being a Critically Endangered Ecological Community (CEEC) under the EPBC Act:



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Figure 10: Rusty Fig – Wild Quince – Native Olive dry rainforest on the Marengo property

- *Rusty Fig - Wild Quince - Native Olive dry rainforest of rocky areas of the Nandewar Bioregion EEC*, listed under TSC Act;
- *Native Vegetation on Cracking Clay Soils of the Liverpool Plains EEC*, listed under TSC Act; and
- *White Box - Yellow Box - Blakely's Red Gum Woodland EEC*, listed under TSC Act and the equivalent *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC* under the EPBC Act.

Threatened Flora

Finger Panic Grass (*Digitaria porrecta*), listed as endangered on the NSW TSC Act, was identified on the Narrawolga BOA during biodiversity monitoring in 2012 at monitoring Site 5 (**Section 6.13**).

Threatened Fauna

Table 4 in **Section 3.5** compiles the introduced flora and fauna species recorded within the WCCM and BOA and is not repeated here.

5.6 INTRODUCED FLORA AND FAUNA

Table 5 in **Section 3.6** compiles the threatened fauna species recorded within the WCCM and BOA (ELA 2011a; ELA 2011b) and is not repeated here.

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6 MANAGEMENT OF THE BIODIVERSITY OFFSET AREAS

This section describes Whitehaven Coal's (WHC) short, medium and long-term approach to biodiversity management across all Biodiversity Offset Areas (BOA) that are owned and managed by WHC. Management measures and actions have been standardised (where practicable) and will be implemented in a consistent manner with the aim to deliver improved biodiversity outcomes both at the level of an individual BOA property, as well as at a landscape scale (these measures are described under sub-headings of "**WHC MANAGEMENT**"). Also addressed in this section is the Werris Creek Coal (WCC) specific biodiversity management measures and actions required to comply with Environmental Assessment commitments, Project Approval (PA) and EPBC Act Approval requirements and/or particular biodiversity aspects relevant to the WCC BOA (these are described under sub-headings of "**WCC MANAGEMENT**"). The management regime in the offset areas will be adaptive over time to achieve the ecological management objectives.

6.1 ECOLOGICAL MANAGEMENT OBJECTIVES

WHC MANAGEMENT

Each WHC mine site and relevant BOA will be managed to protect existing biodiversity values and enhance remnant vegetation communities through implementing ecological restoration practice, and in accordance with the conditions of the relevant Project and EPBC Act Approvals. Each WHC BMP/BOMP will describe the ecological management objective relevant to the specific BOA that guides biodiversity restoration and overall restoration aims.

WCC MANAGEMENT

The objective of the WCC mine site rehabilitation and BOA is to re-establish and enhance White Box-Yellow Box-Blakely's Red Gum Woodland endangered ecological communities (EEC) and White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered Ecological Communities (CEEC) (both herein referred to as Box Gum Woodland), to provide habitat for the threatened fauna species of the Regent Honeyeater, Swift Parrot, Brown Treecreeper, Hooded Robin, Little Lorikeet, Barking Owl, Eastern Bentwing Bat, Eastern False Pipistrelle Yellow-bellied Bent-wing Bat and Greater Broad-nosed Bat (PA 10_0059 MOD2 Schedule 3 Condition 26 and EPBC Approval 2010/5571 Condition 1).

6.2 BIODIVERSITY OFFSET AREA ESTABLISHMENT

WHC MANAGEMENT

WHC will employ a consistent approach in implementing the Biodiversity Offset Strategy (BOS) relevant to the each mine sites' specific BOA in accordance with the Project and EPBC Act Approvals including the methods for long term security, conservation bond and the use of infrastructure within, and the demarcation of the boundary for controlling access.

Tracks and Fences

Tracks and fence lines are to be located on or adjacent to the actual BOA boundary. The use of existing fences will be maximised in the first instance as the BOA boundary to reduce additional disturbance. This will secure the BOAs by minimising the likelihood of inadvertent grazing, unauthorised disturbance, or unauthorised access into the BOA. Where ever practical, new fencing



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will consider fauna friendly aspects (e.g. minimising the use of barbed wire depending on any adjacent grazing) in the design of a stock proof fence. Redundant internal former agricultural fencing within BOAs will be progressively removed overtime.

If new tracks and fences are required (e.g. for access and/or fire trails, fence maintenance or replacement), the location of any new tracks or fences will consider potential biodiversity constraints (e.g. threatened species) through due diligence inspections prior to any disturbance, and will be constructed in consideration of the limits specified for Routine Agricultural Management Activities for the Central Region under the NSW Native Vegetation Act, 2003 (or it's latest equivalent) and the 10/50 Vegetation Clearing rules under the NSW Rural Fire Act, 1997.

Signage

Signage will be installed on gates and/or other access points into BOAs that identifies the property/domain name as a "Biodiversity Offset Area", and that authorised access only is allowed. Fencing, gates, access tracks/fire trails and signage will be routinely inspected for maintenance issues (maximum of 4 occasions per year limited by health and safety considerations, resources, accessibility, weather and/or ground conditions). Maintenance of all access tracks, fire trails, fences and gates will be undertaken as required.

WCC MANAGEMENT

In accordance with PA 10_0059 (Schedule 3 Condition 24 to 26), and EPBC Act Approval 2010/5571 (Condition 1 & 2); WCC has established a BOS that describes a number of geographical domains (individual BOAs) generally based on the original properties acquired which have previously been described in **Section 5.3**.

6.2.1 Long Term Security

Both PA 10_0059 (Schedule 3 Condition 27) and EPBC Approval 2010/5571 (Condition 1) require WCC to make suitable arrangements to provide long term security of the BOAs.

The WCC BOAs are planned to be initially secured under a 'conservation covenant' (using a s88E instrument of the *Conveyancing Act 1919*) that will in perpetuity register on the title of the land the biodiversity management requirements for the BOA. The DPE (previously DoP) and DoEE (previously DSEWPAC) have agreed in concept with the use of this instrument to secure the BOA. Security of the WCC BOA is currently due by 21st December 2016 (PA 10_0059) and 31st December 2016 (EPBC Approval 2010/5571). WCC will seek extensions if the BOAs security cannot be obtained before the current due dates.

Longer term, WCC will consider transferring the security of the BOAs to conservation agreement/s contingent on OEH agreeing that areas of the WCC BOA would be considered suitable under the National Parks and Wildlife Act 1974. It is anticipated that a mix of conservation agreements and s88E covenants over the BOA landholdings will be held but over time transferred to conservation agreements pending the successful restoration of land.

6.2.2 Biodiversity Offset Area Conservation Bond

In accordance with PA 10_0059 (Schedule 3 Condition 29), WCC has an approved Conservation Bond that was prepared by a suitably qualified quantity surveyor. The bond was calculated by the cost of implementing the biodiversity offset strategy (other than land acquisition costs) based on the template in the Draft Hunter Valley Coal Mines Best Practice Guidelines for Biodiversity Offset Management Plans (DP&I, 2014).

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The conservation bond is required to be revised every three years; with the next revision due to be undertaken following submission of this BOMP in 2016. The sum of the revised bond will include all offset area management measures prescribed within this BOMP and include staff costs, fencing, fire management, weed management, feral animal control, seed collection, replanting/revegetation, monitoring, auditing and reporting.

6.2.3 Other Offset Infrastructure

Various items of infrastructure exist or are proposed to be installed on WCC owned properties as part of management of the BOA or the adjacent land that is still being utilised for agriculture. Existing infrastructure wholly or partly within the offset areas (e.g. electricity transmission lines, access tracks, windmills/water bores and pipes, homesteads and sheds) will be retained and managed as required by the relevant owners and/or managers/licensees. If any existing infrastructure is no longer required (former infrastructure for agriculture but not required for biodiversity management) will be progressively removed overtime based on budgets allocated each year.

The only section of the WCC BOA boundary that is not proposed to be fenced will be along the shared boundary with the WCC mine. This is due to minimal risk of stock grazing as well as unauthorised access.

6.3 MANAGEMENT DOMAINS

WHC MANAGEMENT

WHC BOAs will be generally divided into geographical domains commonly based upon the original property boundaries, but also may be based upon other natural, or anthropogenic, features that provide barriers to management such as paddocks, fences, topography or riparian areas. This approach to domain management is considered the most practicable for undertaking works on the ground across BOAs.

The *Hunter Valley Coal Mines - Best Practice Guidelines for Biodiversity Offset Management Plans* (DP&I, 2014) recommended approach is to segregate BOAs into management zone units of land that require similar ongoing management. WHC preferred approach is to map and manage BOAs by geographical domains; however each WHC BMP/BOMP will also prepare a map of each BOAs vegetation community and condition state aligned with the State and Transition Model presented in **Figure 11** from Rawlings et. al. (2010).



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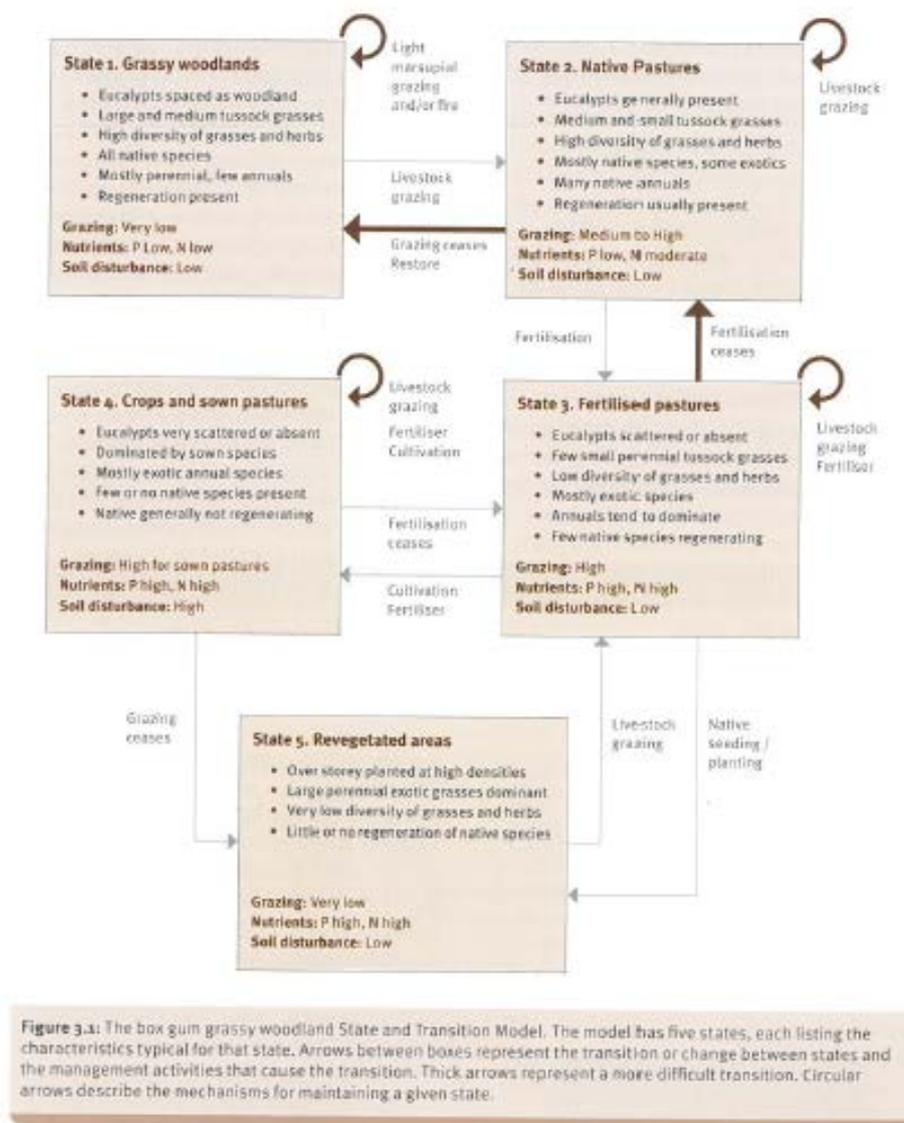


Figure 11: Box gum grassy woodland state and transition model (from Figure 3.1 of Rawlings et. al., 2010)

WCC MANAGEMENT

As described above; WCC BOAs are generally based on the original properties acquired as part of the BOS. **Figure 12** presents the different management zones across the WCC BOA aligned with the State and Transition Model based on the previously adopted vegetation condition class numbering (**Section 3.3**) described in previous versions of the WCC BOMP (Eco Logical, 2010 and WCC, 2013).



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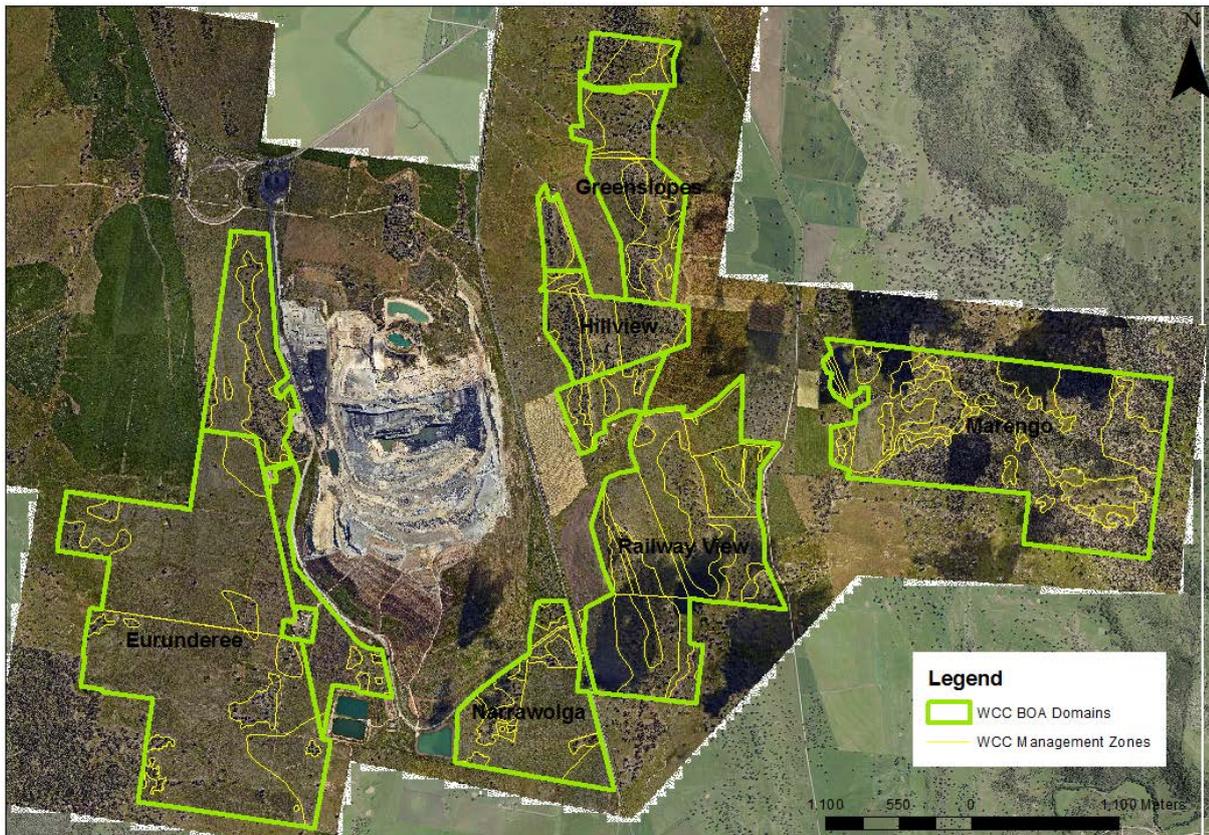


Figure 12: WCC BOA domains and management zones

6.4 SEED MANAGEMENT

WHC MANAGEMENT

Seed Assessment

WHC coordinates routine seed assessment programs designed to identify on a seasonal basis the life cycle stage and development of native plants across a range BOAs to identify what, where, when and how to target appropriate resources to collect seed for future revegetation programs (maximum 4 occasions per year limited by health and safety considerations, resources, accessibility, weather and/or ground conditions). The format of the seed assessments are to ensure that timely and prioritised seed collection is implemented with the reporting to include spatial information that can be directly given to seed collection contractors to undertake the required works.

Seed Collection and Propagation

Seed collection, management, storage, propagation and record keeping will be undertaken in consideration of the relevant Florabank guidelines (<http://www.florabank.org.au>) by appropriately experienced seed collection contractors, and nurseries with appropriate licensing and permissions where relevant. Seed collection will be based on seed assessment results and/or from other opportunistic observations, but the collection and propagation will only be undertaken as required depending on the revegetation needs (**Section 6.5**) determined across all WHC operations. As far as practicable, the location of seed collection will be selected based on a consideration of appropriate providence aspects relevant to the specific tree, shrub, grass or other groundcover species (i.e.

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similar to the proposed revegetation site), balanced with the need to increase genetic diversity (minimise genetically weak or inbred plants). If insufficient seed for revegetation requirements has been collected on behalf of WHC; seed will be sourced from commercial suppliers depending on availability and season. Propagation of plants will consider the timing of revegetation and allow time for the plants to germinate and grow to a size ready for planting.

WCC MANAGEMENT

PA 10_0059 was approved under the former Part 3A section of Environmental Planning and Assessment Act 1979 that exempt the requirements of certain legislation including Native Vegetation Act 1997 if the activity is described in this BOMP. Therefore WCC does not require a Scientific Licence for the management of EEC's and threatened species approved by PA 10_0059 such as native seed collection within WCC BOA or any other Whitehaven land subject to the former Part 3A or State Significant Development approval and relevant BMP/BOMP. Seed collection contractors will require a Scientific Licence and property permission for any seed collected from private land and/or meets an EEC listed vegetation community.

Figure 13 outlines the regional providence zone for the WCC BOA which is considered to be the Liverpool Plains/Gunnedah Basin sub-region within the NSW North West Slopes and Plains (Carr, 2014) from which seed can be sort for revegetation depending on species.

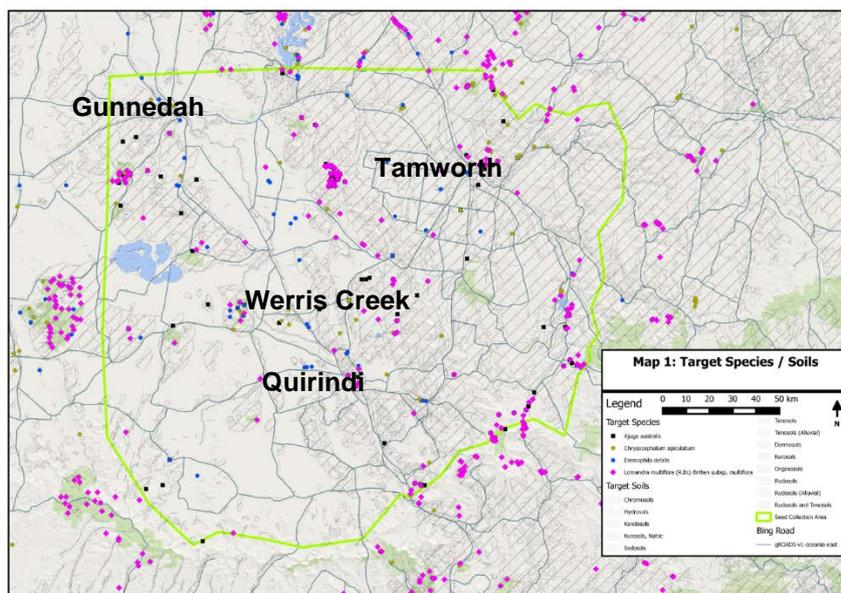


Figure 13: Liverpool Plains/Gunnedah Basin defined as the Regional Providence Area for WCC

Seed Production Area

For WCC BOA to achieve species richness comparable to Box Gum Woodlands; WCC will need to source seed from locally uncommon grasses (i.e. such as Kangaroo Grass which is grazing sensitive and has been removed from the BOA due to previous agricultural practices) as well as herbs and forbs. To address limited commercial availability of herbs and forb species in particular, WCC propose to develop Seed Production Areas (SPAs) within the Eurunderree BOA (**Figure 14**). The indicative design (**Figure 15**) of the SPA has been planned in detail by a Restoration Ecologist (Carr, 2014 & 2015) to collect, propagate and establish into production, selected forb species based on



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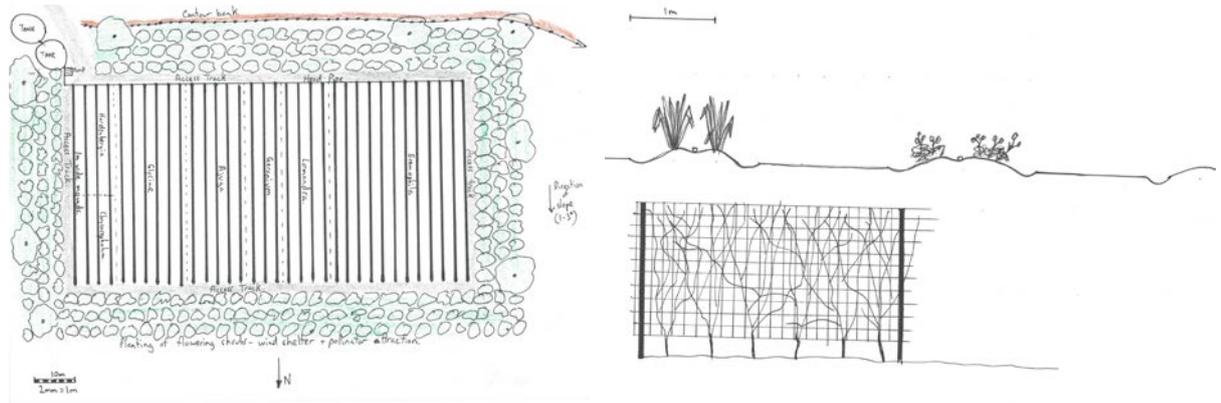
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their ease of collection, propagation and ultimately revegetation by direct seeding. A SPA operational plan (Carr, 2015) has been developed to cover the period prior to on ground works such as the wild collection of the forb species and propagation bulk up that must be completed before construction and operation of the SPA can commence.



Figure 14: Indicative location of proposed Seed Production Area on Eurunderee BOA



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Figure 15: Indicative plan (left) and cross section (right) design of a Seed Production Area

6.5 REVEGETATION

WHC MANAGEMENT

Revegetation Planning

WHC BOAs should specify a revegetation focus or target to guide the restoration strategy aligned with the Ecological Management Objective (**Section 6.1**).

By defining the revegetation focus, an indicative revegetation schedule will be developed specific to each WHC BOA for the period of the relevant BMP/BOMP. The revegetation schedule is indicative as it needs to be adaptive based on site planning; when new information becomes available or if issues become apparent with health and safety considerations, resources, accessibility, weather and/or ground conditions.

Each WHC BOA will coordinate detailed site planning of an area proposed for revegetation. Detailed site planning is undertaken to develop a program of works that provides direction and guidance for achieving the required revegetation outcomes, which may include the following considerations:

- desktop analysis (e.g. BMP/BOMP and/or other requirements, revegetation focus and schedule, define the revegetation area, weather conditions);
- site inspection of opportunities and constraints (e.g. on ground mapping of infrastructure and ground conditions, photo monitoring, soil sampling and/or other additional before/after type monitoring if required);
- other specialist assessments as required (e.g. ecology and heritage due diligence; identification of specific ecological condition, constraints or resilience of existing vegetation; specialist advice on ground preparation or revegetation method);
- site preparation requirements (e.g. ground treatment, weed control and nutrient levels);
- target vegetation community/communities for the revegetation area;
- flora species to be sown/planted (for each target vegetation community);
- sowing rates and/or planting densities (spacings) for plants; and
- specific revegetation methods/treatments or trials.

Maintenance of revegetation areas will be undertaken progressively as the revegetation success/survival of sown and planted flora becomes known. Other management measures will be considered within revegetation areas to address specific issues (e.g. poor survival or diversity of over/understorey, poor plant growth rates, excessive herbivory, weed competition, feral animal impacts and/or addressing other disturbances).

In some circumstances revegetation or natural regeneration is too successful and trees may compete with each other or outcompete ground layer for light, water and nutrients (Rawlings et al., 2010; DECCW, 2011). Dense overstorey and midstorey revegetation may require ecological thinning (through selective clearing). Ecological thinning will be undertaken in an adaptive fashion in selected areas where necessary to promote the floristic diversity and structural complexity within the areas undergoing revegetation.



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Given the early stages of restoration of Box Gum Woodlands across WHC BOA; no consideration of midstorey revegetation will be given at this time. This is consistent with benchmark midstorey cover of 0-5% for Box Gum Woodlands (i.e. White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions) and also allows overstorey and groundcover revegetation to grow and establish without competition from midstorey species. If additional habitat resources provided by midstorey species are required in time; this can be considered as part of future revegetation programs.

WCC MANAGEMENT

The previous six years of biodiversity management within the WCC BOA focused on encouraging natural regeneration (no grazing, weed control and fire management) with active revegetation focused on the rehabilitation area except for a small number of strategic buffer plantings linking remnant vegetation, riparian zones or in areas with low resilience on Eurunderree, Narrawolga, Railway View and Marengo BOAs. The focus of revegetation activities will change from passive to active revegetation over the next 3 years summarised as follows:

- Continuing to encourage natural regeneration by exclusion of grazing, weed control and undertaking ecological controlled burns;
- Active revegetation of areas of Box Gum Woodland DNG that have been subject to ecological controlled burns without or limited subsequent natural regeneration; and
- Active revegetation of Black Gully (Railway View and Marengo BOAs) and an unnamed gully (Greenslopes) riparian zones following erosion mitigation works.

Figure 16 presents the indicative revegetation schedule for the WCC BOA aligned with the revegetation focus (particularly dot points 2 and 3) for Box Gum Woodlands – the target vegetation community for revegetation. Each proposed revegetation program for WCC BOAs will be subject to detailed site planning; however the following general points will be applied between 2017 and 2019:

- **Overstorey Revegetation:** Species will be selected from White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Ecological Community Species List (DEH, 2006) and WCC Life of Mine Biodiversity Impact Assessment (Eco Logical, 2011) and subsequently updated monitoring reports. In general, White Box (*Eucalyptus Albens*) will be dominant with Yellow Box and Blakely's Red Gum as the sub-dominant plantings. Planting density will higher than 30-40 stems per hectare (Rawlings et. al., 2010) to allow for mortality. Ground preparation will be undertaken in advance of planting (Carr, 2010 in Lindenmayer, Bennett and Hobbs, 2010) to relieve soil compaction, allow soil moisture to build up and minimise weed/grass competition;
- **Understorey Revegetation:** WCC BOA is generally dominated by native grasses so revegetation would target increasing species richness using locally uncommon native grasses that should be dominant/common in Box Gum Woodlands (i.e. Kangaroo Grass) as well as herbs and forbs species. Ground preparation would focus on improving soil-seed contact by preparing the soil seed bed by harrowing/raking grass tussocks prior to and/or while sowing.

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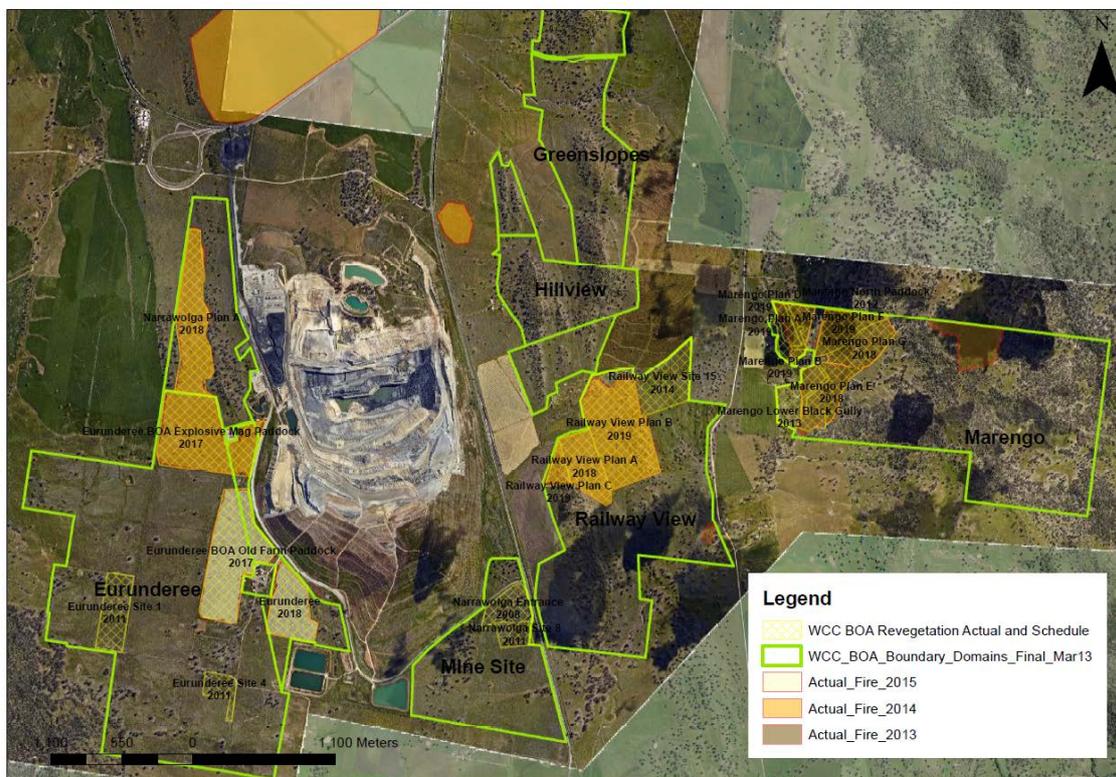


Figure 16: WCC BOA indicative revegetation schedule

6.6 HABITAT AUGMENTATION

WHC MANAGEMENT

Due to the time lag in establishing quality habitat within restoration areas, WHC propose to undertake habitat augmentation to improve habitat diversity and facilitate fauna recolonisation and to improve habitat connectivity across the BOAs where required. WHC will coordinate suitably experienced ecologists to undertake habitat needs assessments across all WHC BOAs specific to the individual BOAs known fauna assemblage and threatened species. The habitat needs assessment will also consider previously unidentified fauna species with the potential to occupy the known ecological communities as well as any commitments within Project Approvals and/or Environmental Assessments. The habitat needs assessment will need to be adaptive and updated over time following significant changes in vegetation condition (both positive but also negative i.e. following fire) no more than 10 years a part.

If the habitat needs assessment identifies that there are low habitat resources commensurate to the condition of the vegetation community (rather than biometric or local reference site benchmarks), then an action plan will be developed for each WHC BOA to allow budgeting for staged implementation overtime. Actions will not be limited to traditional augmentation of shelter type structures (nest boxes and/or the reintroduction of other novel natural habitat i.e. stag trees for arboreal/hollow dependent species) but could also consider other habitat functions such as additional revegetation to provide extra food sources directly for the target species or indirectly for prey, increase the diversity of other non-shelter type habitat that provide a range of niches occupied

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by the target species, and/or permanent/emphermal water points to replicate natural features in woodland ecological communities.

The habitat needs assessment will determine the required monitoring and maintenance regime of any habitat augmentation.

WCC MANAGEMENT

Project Approval 10_0059 (Schedule 3 Condition 26) and EPBC Approval 2010/5571 (Condition 2) specify that WCC must provide habitat for the threatened fauna species of the Regent Honeyeater, Swift Parrot, Brown Treecreeper, Hooded Robin, Little Lorikeet, Barking Owl, Eastern Bentwing Bat, Eastern False Pipistrelle Yellow-bellied Bent-wing Bat and Greater Broad-nosed Bat. In particular seasonal flowering eucalypt species, such as *Eucalyptus albens*, will provide winter inflorescence for winter migrants (i.e. Swift Parrot and Regent Honeyeater) as well as browse trees for other fauna such as Koala.

To date, WCC has undertaken a range of habitat augmentation of the Marengo, Eurunderree and rehabilitation areas (**Figure 17**) with rock piles, nest boxes, stag trees and coarse woody debris (**Figure 18**). WCC will coordinate a habitat needs assessment of its BOA following approval of this BOMP. Any subsequent action plan, monitoring and maintenance will be incorporated into annual budgets and will be progressively implemented overtime.

WCC will continue existing practices of salvaging timber where practicable from the clearing area to be placed on the rehabilitation area. The salvage of timber from the clearing area is not always practicable due to:

- excessive distances between the clearing and rehabilitation area (>2km);
- the location of active mining or other infrastructure areas preventing snigging timber from the clearing area through or around to the rehabilitation;
- timber or trees of a size, dimension or weight in excess of what is safe to snig to the rehabilitation or to install as augmented stag trees; and
- timber or trees too small, decomposed or weak to be snigged safely or of useful habitat for stag trees or coarse woody debris.

Nest boxes will be used in preference to harvesting hollows from habitat trees in the clearing area because of Whitehaven Coal Group Safety procedures prohibit the use of chainsaws and petrol powered devices at all open cuts. While bush rock could be salvaged from the clearing areas, given the extended history of disturbance by agricultural and extractive industries onsite there is limited bush rock habitat. However, the mining process generates rock material and this is readily available in the overburden emplacement to be selectively placed within rehabilitation areas to provide potential shelter and basking habitat.



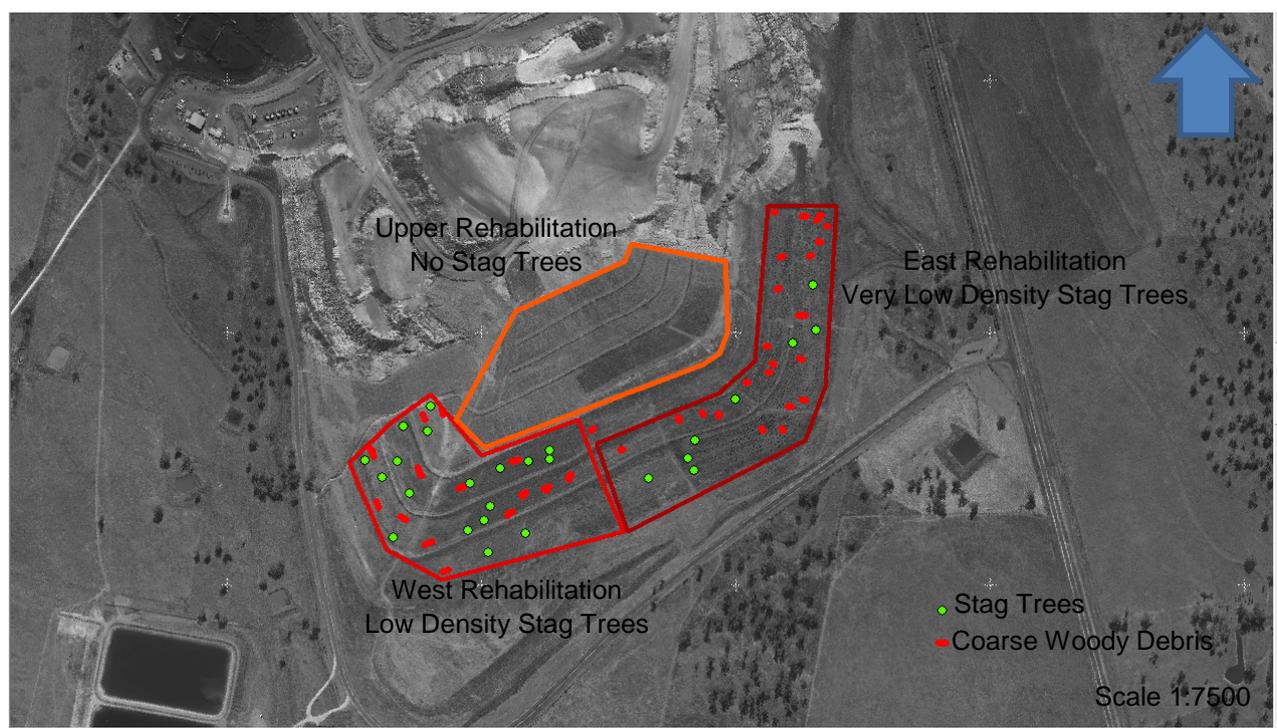
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Figure 17: Examples of Habitat Augmentation



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Figure 18: Location of stag trees and coarse woody debris augmented habitat at WCC

6.7 WEED MANAGEMENT

WHC MANAGEMENT

Environmental and noxious weeds can have detrimental effects on native remnant vegetation and have the potential to compromise revegetation efforts. Weed management of WHC BOAs will be aimed at controlling the occurrence and spread of environmental (e.g. WONS) and noxious weeds whilst encouraging native species.

Weed Inspections

WHC coordinates routine weed inspection programs designed to identify exotic plants across BOAs on a seasonal basis and/or life cycle stage/development as to what, where, when and how to target appropriate resources to control and prevent the further spread of weeds (maximum 4 occasions per year limited by health and safety considerations, resources, accessibility, weather and/or ground conditions). The format of the weed inspections are to ensure that timely and prioritised weed control is implemented with the reporting to include spatial information that can be directly given to weed spraying contractors to undertake the required works.

Weed Control

WHC utilises only qualified weed control contractors that hold appropriate herbicide accreditation in accordance with the Pesticides Act 1999 to undertake the required targeted weed control programs identified by the routine weed inspections specific to the individual BOAs. In accordance with the Noxious Weeds Act 1993 (or the Biosecurity Act when enacted), WHC will retain copies of the accreditation and daily records of weed control including the targeted weed, herbicide used (as directed by the label or any approved off-label permit by the Australian Pesticides and Veterinary Medicines Authority), location and prevailing weather conditions. WHC may also use non-chemical weed control practices such as manual removal, slashing, grazing and/or fire depending on the weed and the season.

WCC MANAGEMENT

To date, WCC weed management has targeted control works for both noxious and environmental weeds (**Table 8**). In addition to species listed below, Coolatai Grass (*Hyparrhenia hirta*) is particularly invasive and is a recognised threat to Box-Gum Woodland EEC/CEEC (DECCW, 2011), although it is not classed as noxious. In the event that Coolatai Grass is found in the BOA, it will be controlled in accordance with DPI (2014a).

Table 8: WCC Targeted Noxious and Environmental Weeds

WEED NAME	SCIENTIFIC NAME	STATUS
Spiny Burr Grass	<i>Cenchrus incertus</i>	W4
St John's Wort	<i>Hypericum perforatum</i>	W4
Prickly Pear	<i>Opuntia stricta</i>	W4
Noogoora Burr	<i>Xanthium pungens</i>	W4
Bathurst Burr	<i>Xanthium spinosum</i>	W4
Johnson Grass	<i>Sorghum Halepense</i>	W4
African Box Thorn	<i>Lycium ferocissimum</i>	W4
St Barnabys Thistle	<i>Centaurea solstitialis</i>	-



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WEED NAME	SCIENTIFIC NAME	STATUS
Tree of Heaven	<i>Ailanthus altissima</i>	-
Saffron Thistle	<i>Cathamus lanatus</i>	-

6.8 FERAL ANIMAL MANAGEMENT

WHC MANAGEMENT

The foundation of WHC's approach to feral animal management is the adoption of a "monitor, measure and manage" approach which will allow WHC to implement adaptive management in response to changes being measured through monitoring in feral animal populations specific to the different geographical regions of our BOAs. Feral (or pest) animals can have detrimental effects on native remnant vegetation and have the potential to compromise revegetation efforts. Feral animal management of WHC BOAs will aim to mitigate these impacts by implementing sustained and targeted control programs.

Feral Animal Monitoring

WHC coordinates routine feral animal monitoring designed to identify feral animals across BOAs on a seasonal basis and/or life cycle stage/migration as to what, where, when and how to target appropriate resources to control and minimise feral animal populations (maximum 4 occasions per year limited by health and safety considerations, resources, accessibility, weather and/or ground conditions). The format of the feral animal monitoring is to ensure that timely and prioritised feral animal control is implemented with the reporting to include spatial information collected directly by the contractor is used to inform subsequent required control works. Feral animal monitoring will adopt the relevant methodologies for specific feral animals generally in accordance with the NSW DPI Monitoring Techniques for Vertebrate Pests (Mitchell and Balogh, 2007) so that a range of methods can/cannot be used such as transects/spotlighting, sandpads, camera traps, etc. that will be determined where practicable and relevant to the specific offset areas/properties. Results and trends of monitoring results will determine the feral animal species targeted, the intensity and where over the preceding period.

Feral Animal Control

WHC utilises only qualified and experienced feral animal contractors that hold appropriate pesticide accreditation in accordance with the Pesticides Act 1999 or Fire Arm Licence to undertake the required targeted control programs identified by the routine feral animal monitoring specific to the individual BOAs. In accordance with the Biosecurity Act 2016 (when enacted), WHC will retain copies of the accreditation and records of feral animal control including the targeted species, pesticide used (if required) and location. WHC may also use non-chemical feral animal control practices such as trapping, mustering and shooting depending on the approved method in Vertebrate Pest Control Manual (DPI, 2014b) and the season.

WCC MANAGEMENT

To date, WCC feral animal management has targeted control works for those listed in **Table 9**.

Table 9: WCC Targeted Feral Animals



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WEED NAME	SCIENTIFIC NAME	STATUS
Wild Pig	<i>Sus scrofa</i>	Declared pest
European Red Fox	<i>Fox Vulpes</i>	Declared pest
European Rabbit	<i>Oryctolagus cuniculus</i>	Declared pest
Feral Cat	<i>Felis catus</i>	-
Wild Dog	<i>Canis familiaris</i>	Declared pest

6.9 MANAGEMENT OF HERITAGE

The management of cultural heritage values in the WCC BOA will be undertaken in accordance with the “NSW Minerals Industry Due Diligence Code of Practice for the Protection of Aboriginal Objects”, developed by the NSW Minerals Council in 2010. Any future disturbance will consider potential heritage constraints (e.g. threatened species) through the six step due diligence assessment process.

Any known or unknown sites that become identified and/or disturbed, during activities with the WCC BOA will be managed in accordance with the approved Heritage Management Plan.

6.10 CONTROL OF EROSION AND SOIL

WHC MANAGEMENT

Soil erosion occurs when native vegetation has been removed exposing bare soils, making them susceptible to erosion where water flow is able to mechanically remove or disperse the soil. This often occurs along creek lines but can occur in bare paddocks where vegetation clearing, or over grazing, exposes bare soils. Bare soils in locations where high volumes of water occur can lead to severe soil erosion. WHC will maintain a list by BOA of areas affected by erosion, and implement routine photo monitoring (maximum 4 occasions per year limited by health and safety considerations, resources, accessibility, weather and/or ground conditions). Stock exclusion from areas of erosion must be considered in the first instance. If monitoring determines that the affected area are not self-healing towards stabilisation i.e. erosion is continuing, then WHC will undertake any required works in consideration of relevant legislation (i.e. Water Management Act 2000), any due diligence inspections prior to implementing more intensive works like earthworks and/or revegetation.

WCC MANAGEMENT

There are a number of potential erosion issues across the WCC BOA, in particular Black Gully on Railway View and Marengo BOAs and another unnamed gully on Greenslopes BOA which both are deeply incised (**Figure 19**). Black Gully on Railway View BOA drainage channel was four to five metres deep and up to 20 metres wide in some areas prior to stabilisation works. Continued stock exclusion and routine monitoring will determine the effectiveness of soil erosion management for these gullies, and if observation identifies that more active management or treatments are required, these will be implemented at that time.

Overburden and soil analysis undertaken as part of the Environmental Impact Statement and Environmental Assessments at WCC have not identified any saline material that would limit plant growth and development. If saline material is encountered then soil amelioration options would be considered.

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Figure 19: Black Gully (Railway BOA) prior to (left) and after stabilisation works (right).

6.11 MANAGEMENT OF LIVESTOCK GRAZING

WHC MANAGEMENT

The use of grazing for biodiversity management will only be considered in WHC BOAs where expressly approved in either the relevant Project Approval and/or Environmental Assessment commitment. WHC acknowledges that grazing can suppress competition from ground layer vegetation, and control weeds when used strategically (i.e. crash and/or rotational grazing methods); however grazing can impact natural regeneration in particular overstorey species as well as limit groundcover diversity, leading to vegetation structural issues (i.e. dense grass swards), soil compaction, excess nutrients and land degradation in sensitive areas (i.e. riparian). Ultimately WHC BOAs will be managed primarily for the purposes of compensating for biodiversity impacts and improving regional biodiversity outcomes, therefore if required, livestock grazing will only be considered where appropriate infrastructure exists and a grazing management plan outlines appropriate strategies leading to biodiversity improvement rather than impacts.

WCC MANAGEMENT

Stock grazing will be excluded from the WCC BOA by maintaining stock proof fencing around the boundary. Stock grazing will not be permitted on any of the WCC BOA at any time.

6.12 FIRE MANAGEMENT

WHC MANAGEMENT

The exclusion of grazing and agriculture from WHC BOAs will aid restoration of the woodland vegetation communities, however, if not adequately managed, increasing biomass and fuel loads may create a fire hazard and an imbalance between fire tolerant and fire sensitive species. The objectives of fire management across WHC BOA are:

- the protection of human life and safety;
- WCC mining operation asset protection and business continuity;
- other infrastructure and rural asset protection on WHC owned land and adjacent private property; and
- protection and maintenance of biodiversity within WHC BOAs.



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To achieve these objectives, each WHC BOA must balance the minimisation of fuel loads (to reduce risk of bushfire) while promoting ecological restoration of the BOA and increasing biomass by:

- assessing bushfire management;
- undertaking hazard reduction activities;
- consideration of controlled (ecological) burns; and
- determining firefighting resources and capabilities.

Bushfire Management Assessments

WHC coordinates routine assessments of bushfire management across the BOAs (maximum 4 occasions per year limited by health and safety considerations, resources, accessibility, weather and/or ground conditions) that will periodically include measurement of fuel loads and regular inspection of access trails and fire breaks.

An outcome of biodiversity management will be increased fuel loads due to increasing biomass within BOAs. In cases with areas assessed with medium to high fuel loads; management will focus on strategies that aim to mitigate fire from burning into or out of these areas.

Hazard Reduction Activities

Fire risk can be mitigated through undertaking particular hazard reduction activities that does not involve fire. A range of hazard reduction activities that may be considered by WHC include fire break construction and/or maintenance, other low fuel zones, asset protection zones and water source points.

WHC will construct and routinely maintain access tracks, in particular fire breaks, where practicable and generally along or adjacent to the perimeter of property/offset boundaries specifically to mitigate fire spreading onto or off the BOA. Fire breaks can also be established strategically within the properties/offsets utilising internal infrastructure boundaries (such as access trails and/or existing or old fence lines). The location of any fire breaks will be in consideration of the limits specified for Routine Agricultural Management Activities for the Central Region under the NSW Native Vegetation Act, 2003 (or it's latest equivalent) and the 10/50 Vegetation Clearing rules under the NSW Rural Fire Act, 1997. Fire breaks ideally will be zero fuel barriers acknowledging that in between maintenance periods that some fuel accumulation will occur.

The management of low fuel zones (through slashing or grazing), asset protection zones and water source points will be undertaken as required specific each WHC BOA, and the fire risk. WHC may consult with the Rural Fire Service and/or people with expertise in fire management in relation to appropriate hazard reduction activities.

Controlled Ecological Burns

Fire is an integral part of the Australian landscape and Australia's flora is adapted to be able to withstand and respond to the impact of fire. Controlled ecological burns involve the use of fire to control exotic species and/or promote native flora species diversity, with fire being an important and often beneficial form of disturbance in box gum grassy woodland (Rawlings et al. 2010). Ecological burns are cool, low intensity fires that remove dry material but do not scorch native grasses and trees (NSW Rural Fire Services, 2006). This type of controlled fire is easier to control because the fire burns slower and less intense when ignited downwind and allowed to burn into the wind.



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WHC may use controlled burns for ecological restoration depending on each individual BOA and health and safety considerations, resources, accessibility, weather and/or ground conditions. Typically WHC will consider undertaking controlled ecological burns between autumn and early spring depending on prevailing weather conditions and ideally between when native grasses and herbs/forbs are flowering/seeding. Spring burns can be useful for reducing the mass of exotic annual grasses while autumn burns can be useful for reducing biomass and increasing native species diversity (Prober et al. 2004; Rawlings et al. 2010).

Each WHC BOA will coordinate detailed site planning of an area proposed for controlled ecological burn. Detailed site planning is undertaken to develop a program of works that provides direction and guidance for achieving the required ecological outcomes; which may include the following considerations:

- field and desktop analysis and mapping of discrete areas proposed for controlled burn/s including consideration of the fire perimeter, fire break locations, known environmental sensitive areas, mosaic or refuge areas within and adjacent to the burn site; habitat features to protect etc;
- fire frequency consideration (previous fire; reported fire frequencies in Rawlings et al. 2010; Narrabri/Moree Bush Fire Management Committee 2010; Liverpool Range Bush Fire Management Committee 2010 and Tamworth Bush Fire Management Committee 2011);
- other specialist assessments or advise as required (e.g. Rural Fire Service and/or people with expertise in fire management);
- site preparation requirements (e.g. redundant fences removed, slashed or brush cut breaks, water or access considerations, other barriers);

The *Protection of the Environment Operations (Clean Air) Regulation 2010* (Clean Air Regulation) specifies that the burning of vegetation requires approval in the certain Local Government Areas (Schedule 8 Part 2). While the Clean Air Regulation has an exemption for bushfire hazard reduction work, the Rural Fire Service (RFS) has indicated that they will not issue a hazard reduction certificate for controlled burns within BOAs due to concerns over the RFS's liability for impacts to biodiversity. The RFS considers WHC does not require any approvals under the *Rural Fires Act 1997* as long as the activity is approved by the relevant PA 10_0059 and EPBC Act Approval BMP/BOMP. The exception to this is if controlled burns are undertaken during a fire permit period (typically September to March) when a Fire Permit would be required.

WCC MANAGEMENT

WCC will obtain an *Approval to Burn Vegetation* from Liverpool Plains Shire Council to comply with the Clean Air Regulation prior to undertaking any controlled burns. WCC will also notify the neighbours to the proposed burn. WCC will consult with the RFS during the planning of any burns and afford the opportunity for local volunteer RFS brigades to be involved. If the RFS agree to be involved in the controlled burn, the RFS will appoint an incident controller and take over responsibility and management of the burn site.

To date, WCC fire management has completed a number of controlled burns across the BOA with **Figure 20** outlining the indicative controlled burn schedule.

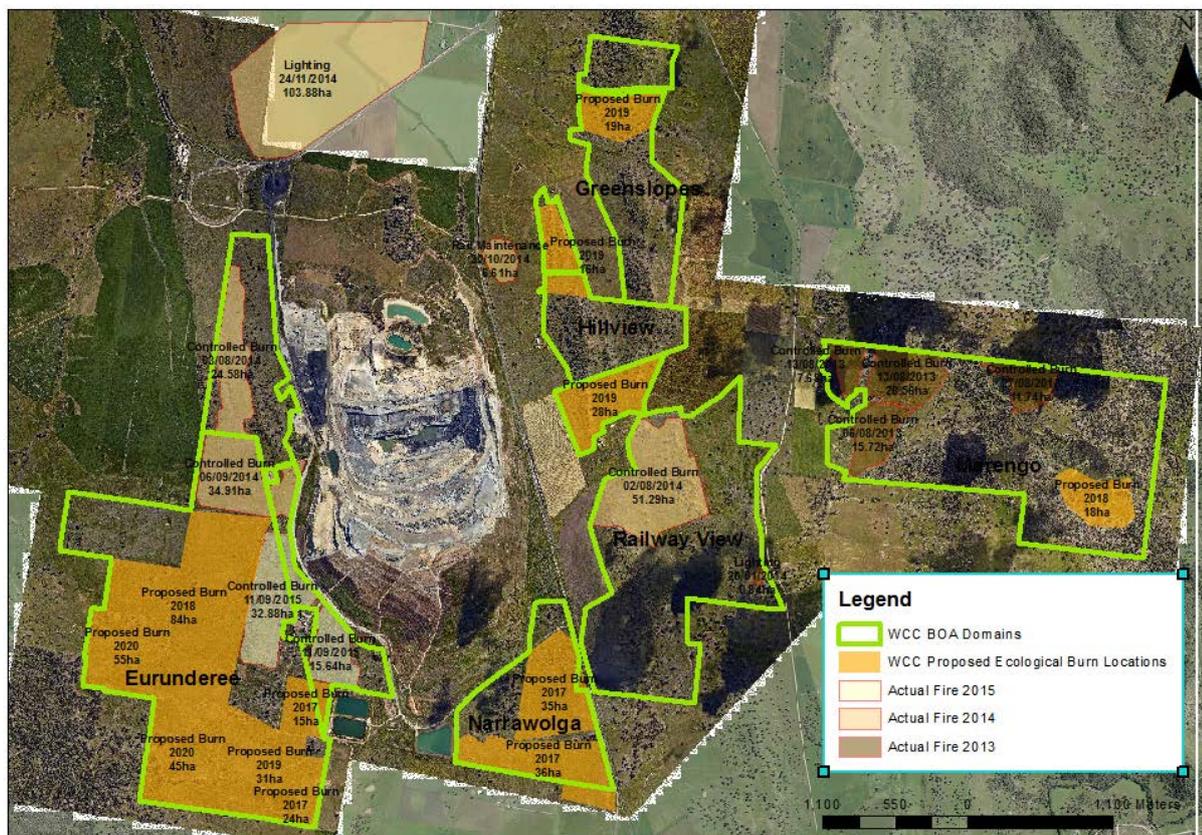


Figure 20: WCC BOA Actual Fire and Controlled Burn Schedule

Firefighting Resources and Capabilities

Controlled burns initiated by local RFS brigades will utilise RFS resources to manage and control fire. WCC will maintain adequate fire fighting capabilities to address and control any fire outbreaks in conjunction with and assist the Rural Fire Service and emergency services as required (*Condition 40* of Schedule 3 to PA 10_0059). In particular:

- A provision of fire equipment will be kept on-site in accordance with the requirements of NSW *Coal Mines Health and Safety Regulation 2008*; and
- All fire fighting equipment will be kept in operational condition and routinely inspected to ensure that equipment is operational.

Permanent water carts at WCC all are maintained with directional cannons and fire fighting hoses. The WCCM mine rescue team train regularly in emergency response including fires. A Whitehaven Coal requirement is that all vehicles approved to work onsite are as a minimum fitted with 9kg fire extinguishers, and that staff are trained in the use of fire extinguishers as required.

Any bushfires that do occur in the BOA will be co-ordinated with the RFS to extinguish or contain the spread of the fire. WCC will annually liaise with the RFS regarding proposed controlled burns within the BOA which increases awareness of the site and improve fire management strategies.



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6.13 MANAGEMENT OF THREATENED FLORA SPECIES *DIGITARIA PORRECTA*

The threatened flora species (*Digitaria porrecta* Finger Grass) has been identified at one site within the WCC BOA (**Figure 21**). The NSW Threatened Species website discusses known threats to *Digitaria porrecta* including grazing, tramping, fire, exotic grass competition and other disturbances but little is known how this actually impacts the species or how it recovers. Current management strategies implemented by WCC would appear adequate to manage the threats to *Digitaria porrecta* including the removal of grazing, limiting access to the BOA and weed control. WCC will install additional signs in the vicinity of the known population to further persuade access into the BOA. WCC will ensure Annual Floristic and Biometric Monitoring will continue at Site 5 to monitor progress of the species.



Figure 21: Digitaria Porrecta

Note: photo sourced from ausgrass2.myspecies.info



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6.14 PERFORMANCE AND COMPLETION CRITERIA

Quantitative performance criteria for vegetation monitoring are provided for Box Gum Woodlands of different vegetation condition states in **Table 10** and for fauna monitoring in **Table 11**.

Table 10: WCC Vegetation Monitoring Performance and Completion Criteria

Biometric Vegetation Type (BVT)	Management State (Condition and Class)	Sites	Performance Criteria Description	Specific Performance Criteria at end of BOMP (2018)							COMPLETION CRITERIA
				Native plant species (NPS)	Native overstorey cover (NOS)	Native midstorey cover (NMS)	Native groundcover (NGC)			Exotic plant cover	
							Grass (G)	Shrubs (S)	Other (O)		
Yellow Box - Blakely's Red Gum AND White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions	1 (Good 4)	5 3,11,13,17,24	>90% of sites are at least 80% of lower benchmark for specific site attributes	18	5	0	24	0	2	20	All sites achieve lower biometric benchmark or local/regional benchmark based on reference sites for the six specific site attributes listed in this table.
White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions	2 (Moderate 3 - Derived Native Grass Land)	1,2,8,12,19,21	>70% of sites are at least 60% of lower benchmark for specific site attributes	14	4	0	18	0	2	40	All sites trending towards biometric benchmark or local/regional benchmark based on reference sites for the six specific site attributes listed in this table.
White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions	4 (Low 1 & 2 - Cleared)	7,16,9,15 6,14,26	>50% of sites are at least 40% of lower benchmark for specific site attributes	9	2	0	12	0	1	60	All sites trending towards biometric benchmark or local/regional benchmark based on reference sites for the six specific site attributes listed in this table.
White Cypress Pine - Silver-leaved Ironbark - Tumbledown Red Gum shrubby open forest of the Nandewar and Brigalow Belt South Bioregions	1 (Good 4)	10,18	>90% of sites are at least 80% of lower benchmark for specific site attributes	24	20	5	16	2	2	20	All sites achieve lower biometric benchmark or local/regional benchmark based on reference sites for the six specific site attributes listed in this table.
White Box - White Cypress Pine shrubby open forest of the Nandewar and Brigalow Belt South Bioregions	1 (Good 4)	22	>90% of sites are at least 80% of lower benchmark for specific site attributes	21	5	5	16	2	2	20	All sites achieve lower biometric benchmark or local/regional benchmark based on reference sites for the six specific site attributes listed in this table.



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Biometric Vegetation Type (BVT)	Management State (Condition and Class)	Sites	Performance Criteria Description	Specific Performance Criteria at end of BOMP (2018)							COMPLETION CRITERIA
				Native plant species (NPS)	Native overstorey cover (NOS)	Native midstorey cover (NMS)	Native groundcover (NGC)			Exotic plant cover	
							Grasses (G)	Shrubs (S)	Other (O)		
White Box - White Cypress Pine shrubby open forest of the Nandewar and Brigalow Belt South Bioregions	2 (Moderate 3 - Derived Native Grass Land)	23	>70% of sites are at least 60% of lower benchmark for specific site attributes	16	4	4	12	2	2	40	All sites trending towards biometric benchmark or local/regional benchmark based on reference sites for the six specific site attributes listed in this table.
Plains Grass grassland on basaltic black earth soils mainly on the Liverpool Plains in the Brigalow Belt South Bioregion	2 (Moderate 3 - Derived Native Grass Land)	25	>70% of sites are at least 60% of lower benchmark for specific site attributes	10	0	0	21	0	2	40	All sites trending towards biometric benchmark or local/regional benchmark based on reference sites for the six specific site attributes listed in this table.
Rough-barked Apple riparian forb/grass open forest of the Nandewar Bioregion	3 (Moderate 3 - Derived Native Grass Land)	20	>70% of sites are at least 60% of lower benchmark for specific site attributes	15	4	0	18	2	2	40	All sites trending towards biometric benchmark or local/regional benchmark based on reference sites for the six specific site attributes listed in this table.

Table 11: WCC Fauna Monitoring Performance and Completion Criteria

Target Species	Management State (Condition and Class)	Sites	Performance Criteria at end of BOMP (2018)		COMPLETION CRITERIA
			Annual Spring Monitoring Completed (Y/N)	Monitor and analyse trends in key species indicative of change (Y/N)	
Woodland Birds	All	5 3,11,13,17,24 1,2,8,12,19,21 7,16,9,15 6,14,26 10,18 22 23 25 20	Yes	Yes	All annual monitoring completed, trends identified and recommendations implemented
Winter Migratory Birds	1 (Good 4)	5 3,11,13,17,24 10,18 22	Yes	Yes	All annual monitoring completed, trends identified and recommendations implemented



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6.15 MONITORING PROGRAM

This section of the BOMP provides an overview of the vegetation and fauna monitoring requirements for the BOA and rehabilitation areas at WCC. The monitoring program is based on sound statistical principals and is guided by aspects of the flora and fauna assessment guidelines (DEC 2004). Suitably qualified and licence personnel will be engaged to undertake the monitoring program.

6.15.1 Vegetation Monitoring

Purpose

This BOMP 2016 has revised the vegetation monitoring program to adopt a design that will measure changes in vegetation condition of the WCC BOA in response to management measures specifically targeting restoration of grassy Box Gum Woodlands. The previous monitoring design (BOMP, 2013) located monitoring plots based on vegetation community types and condition of an uneven number of replicates. The revised vegetation monitoring program retains the previous monitoring sites to maintain continuity with the historical biometric data collected since 2010 respectively. The aim of the revised vegetation monitoring program is to evaluate the restoration progress of grassy Box Gum Woodlands towards achieving the performance and completion criteria specified in **Section 6.14**.

Monitoring Design

The monitoring design aims to systematically sample the various management measures to be implemented across the grassy Box Gum Woodland vegetation communities within WCC BOA including:

- native vegetation enhancement through predominantly natural regeneration (i.e. Grassy Woodland State);
- degraded native vegetation which will be subject to restoration management activities (i.e. Native Pastures State); and
- in cleared areas subject to active revegetation and other management activities (i.e. the Revegetation State).

The vegetation monitoring program also includes observational and photo monitoring through-out the offset areas. At each vegetation monitoring site; there is one monitoring plot which could be one of three plot types as outlined in **Table 13**.

Table 12: Monitoring Site Plot Types

Monitoring Site Plot Type	Management State/Condition	Definition
Action Plots	3 and 4 (Moderate to Low - Class 1,2 & 3)	Action plots will be located in areas that are subject to management activities.
Control Plots	1 (Good - Class 4)	Control plots will be located in areas that are not subject to active management activities.
Reference Plots	Reference/ Analogue	Reference plots will be external to the Offset Area and not subject to any management activities.

Table 14 outlines how the existing monitoring site of Box Gum Woodland communities fit within the revised design of the monitoring program. For monitoring sites in the revegetated domains, additional action plots will be progressively established to monitor the progress of revegetation and/or fire

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management actions as well as potentially for testing specific management techniques in an adaptive management framework (e.g. testing a management technique and revising the technique based on a monitoring outcome).

Table 13: Number of Vegetation Monitoring Sites per Domain

Management State/Condition	Site Plot Type	General Description	Objective	Total Number of Plots	Site Number and Vegetation Community
3 and 4 (Low - Class 1&2)	Action	Low Diversity Native Grassland, Pasture Improved and/or Cultivated Land	Additional native vegetation to be established targeted restoration of self-sustaining vegetation communities in low diversity derived native grassland, pasture improved and cultivated land.	7 Note 1	White Box Grassy Woodland 6,7,9,14,15,16,26
2 (Moderate - Class 3)	Action	Derived Native Grassland	Additional native e vegetation to be established with the restoration of self-sustaining vegetation communities within derived native grassland.	8 Note 1	White Box Grassy Woodland 1,2,4,8,12,19,21 White Box-White Cypress Pine shrubby open forest 23
1 (Good - Class 4)	Control	Semi-cleared Woodland/Forest	Semi-cleared woodland/forest to be protected and enhanced.	6	White Box Grassy Woodland 3,11,13,17,24 White Box-White Cypress Pine shrubby open forest 22
Reference	Reference	Woodland/Forest	Local/Regional woodland/forest of reference condition.	Note 2	
Total Plots				21	

Note 1 Monitoring plots will be progressively established in the Revegetation and Restoration Domains to monitor the progress of active management actions.

Note 2 Whitehaven Coal will review and implement a regionally based Box Gum grassy woodland reference sites across Offset Areas in the Gunnedah Basin region.

Location of Monitoring Sites

Vegetation monitoring sites are located on the WCC BOA properties of WCC Rehabilitation, Narrawolga, Eurunderee, Railway View, Greenslopes and Hillview. The revised monitoring program is not to sample every vegetation community, but rather the aim is to adequately sample different condition states of grassy Box Gum Woodland vegetation to detect trends and changes in the vegetation condition as to whether it is a response a management action. Monitoring sites proposed under this revised monitoring program are only located in grassy Box Gum Woodland vegetation communities (**Table 14**). For this three year BOMP period, the previous monitoring plots 10, 18 (White Cypress Pine - Silver-leaved Ironbark - Tumbledown Red Gum shrubby open forest of the Nandewar and Brigalow Belt South Bioregions), 20 (Rough-barked Apple riparian forb/grass open forest of the Nandewar Bioregion), 25 (Plains Grass grassland on basaltic black earth soils mainly on the Liverpool Plains in the Brigalow Belt South Bioregion) will not be undertaken annually as monitoring will be focussing on measuring management actions within Box Gum grassy woodland

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communities. EcoPlanning (2016b) demonstrated that these vegetation types were not sufficiently replicated and therefore it was not statistically possible to conclude scientifically the cause of changes in condition (either improvement or degradation) over time. However the historical data from these sites (plus Site 4 which has not been monitored since 2012) will be retained as a baseline for potential inclusion in future monitoring program revisions to demonstrate progress of restoration for these other vegetation types. The location of monitoring sites is shown on **Figure 22**.

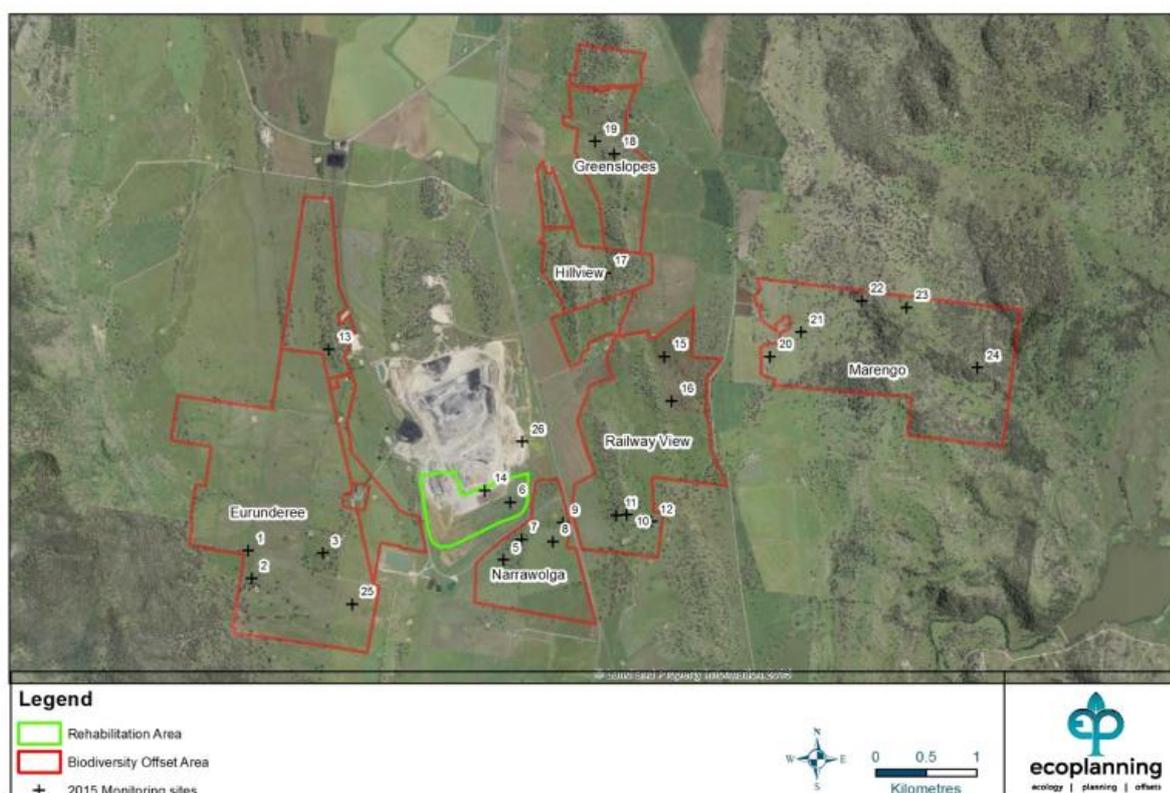


Figure 22: WCC BOA Biodiversity Monitoring Locations (from EcoPlanning, 2016a).

Timing and Frequency

Vegetation will be monitored on an annual basis in spring, when the highest diversity of plants is expected to be present (Rawlings et al., 2010).

Methodology

WCC will engage qualified ecologists to undertake vegetation monitoring incorporating the following methodologies:

- fixed monitoring plots;
- landscape function assessment;
- photographic monitoring; and
- general observations.

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Monitoring for the presence of the threatened species *Ditigaria Porrecta* will continue to occur at Site 5 where it was originally identified in 2012.

Fixed Monitoring Plots

One fixed monitoring plot measuring 20 x 50 m will be established at each monitoring site and permanently marked with a star picket and within each plot, a 20 x 20 m quadrat will be established to sample flora. The methodology includes monitoring vegetation structural parameters, flora species and a range of parameters such as habitat and vegetation cover (**Table 15**).

Table 14: Field Survey Parameters to be recorded in each 20 x 20 m Quadrat

	Parameter	Assessment Technique	Activity
1	Structural Assessment: Canopy	Average within 20 x 20 m quadrat	Record percentage cover of canopy species. Canopy species are classified as vegetation >8 m.
2	Structural Assessment: Midstorey	Average within 20 x 20 m quadrat	Record percentage cover of midstorey species.
3	Structural Assessment: Ground layer	Average within 20 x 20 m quadrat	Record percentage cover of living ground layer species. The ground layer is classified as vegetation <1 m.
4	Flora Species Richness	Count within 20 x 20 m quadrat	Record presence of all flora species within plots. Record with sample identification and field name where applicable. Identify specimens using floristic keys. Canopy species richness should be recorded across the whole plot.
5	Habitat Feature: Tree Hollows	Count 20 x 50 m plot	Count all hollows >10 cm occurring in plot. Consistent with BioBanking methodology. Record comments where applicable. If absent record as zero.
6	Habitat Feature: Fallen logs	Count 20 x 50 m plot	Count all fallen logs >10 cm diameter and >50 cm in length occurring in plot. Record comments where applicable. If absent record as zero.
7	Presence of flowering Eucalypts	Observation 20 x 50 m plot	Record presence or absence of flowering Eucalypts. If absent record as zero.
8	Regeneration of canopy species	Observation 20 x 50 m plot	Record presence or absence of canopy species regeneration. If absent record as zero.
9	Overall vegetation condition (Resilience)	Observation 20 x 50 m plot	Record vegetation condition on a scale of 1-4, where 1 is Very Poor and 4 is Good. Classify based on BioBanking descriptions (e.g. Good: <10% weed and/or healthy strata and high assemblage diversity. Moderate: 10 to 33% weed and/or minor stratum dieback and moderate assemblage diversity. Poor: 33 to 66% weed and/or moderate stratum dieback and low assemblage diversity. Very Poor: >66% weed and/or extensive stratum dieback/extremely reduced diversity).
10	Native overstorey cover (NOS)	At 10 points along a 50 m transect	Record height of highest layer in metres. Record projected foliage cover directly over the selected point and within the boundaries of a confined shape.
11	Native midstorey cover (NMS)	At 10 points along a 50 m transect	Record height of highest layer in metres. Record projected foliage cover directly over the selected point and within the boundaries of a confined shape.
12	Exotic overstorey and midstorey cover	At 10 points along a 50 m transect	Record height of highest layer in metres. Record projected foliage cover directly over the selected point and within the boundaries of a confined shape.
13	Native ground cover (grasses)	At 50 points along a 50 m transect	Record occurrences or hit at each point. Record only occurrence, even if multiple "hits" of native grasses occur at the point. Consistent with BioBanking methodology.



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	Parameter	Assessment Technique	Activity
14	Native ground cover (forb)	At 50 points along a 50 m transect	Record occurrences or hit at each point. Record only occurrence, even if multiple "hits" of native forbs occur at the point. Consistent with Biobanking methodology.
15	Native ground cover (other)	At 50 points along a 50 m transect	Record occurrences or hit at each point. Record only occurrence, even if multiple "hits" of native ground covers occur at the point. Include cryptogams. Consistent with Biobanking methodology.
16	Exotic ground cover	At 50 points along a 50 m transect	Record occurrences or hit at each point. Record only occurrence, even if multiple "hits" of exotic species occur at the point. Consistent with Biobanking methodology.

Landscape Function Assessment

The Landscape Function Analysis (LFA) method was developed by the CSIRO specifically for monitoring soil surface condition within rangeland environments and more recently has been adapted to mine rehabilitation projects. The LFA method will be implemented within the WCC rehabilitation area, as LFA has been proven to be informative when applied to these degraded landscapes that are being restored. LFA analysis will be undertaken using the same rehabilitation monitoring sites (6, 14, 26 and as additional sites are added) established for vegetation monitoring. Comparative LFA analysis will be undertaken at two Enhancement (Good Condition - formerly Class 4) vegetation monitoring sites (11 and 17) for comparison to demonstrate the status and progress of rehabilitation towards the higher condition vegetation.

The LFA methodology consists of the LFA tool that enables assessment of the landscape's ability to retain water and nutrients within the system. In terms of LFA, a soil landscape that is on a trajectory toward self sustainability (in context of vegetative cover and soil stability) would have:

- A high Landscape Organisation Index (LOI) i.e. a low number of bare soil patches (referred to as inter-patches) between obstruction components (referred to as patches) in the soil landscape, which would affect wind and water movement and the introduction and transportation of resources into and out of the system
- High Soil Surface Assessment indices, indicating that the site had favourable Nutrient, Infiltration and Stability characteristics

LFA components implemented at WCC include:

- Geographic setting of the site
- Landscape Organisation, and
- Soil Surface Assessment

Geographic Setting of the Site

A description of each site is to be recorded, including position in the landscape, GPS coordinates (GDA94 Zone 55), transect bearing, slope, aspect, vegetation type and land use. The following topographic classification was also used:

- Crest
- Upper slope

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- Mid slope
- Lower slope
- Closed depression, or lake
- Flat
- Open depression or stream channel

Landscape Organisation

Landscape organisation characterises and maps the spatial patterns of resource loss or accumulation at a site. The procedure is as follows:

- The transect was located directly down slope using a 50 m tape within the 20x50m quadrat, bends and kinks were needed in some cases to ensure the tape was orientated down slope. The tape measure was made taut prior to recording measurements
- Along the 50m tape, the transect was divided into patches and inter-patches, with patch/inter-patch metrics for length and width recorded

According to the LFA, patches are long-lived/term features that obstruct or divert water flow and/or collect/filter out material from runoff (such as perennial grass plants, rocks > 10 cm, tree branches in contact with the soil) and where there is evidence of resource accumulation. Inter-patches are zones where resources such as water, soil materials and litter may be mobilised and freely transported either down slope when water is the active motive agent or down-wind when aeolian processes are active.

The following data was recorded for each patch/inter-patch along each transect:

- The distance and interval along the tape
- The patch width (only necessary for patches)
- The patch/inter-patch identification

Rill survey was only completed where rills occurred, with the following recorded:

- Rill base (eg Rocky, alluvium or gravel)
- Start of rill along the tape
- Finish of rill along the tape
- Rill width
- Rill depth

All data are to be entered into the LFA spreadsheets and used to calculate the results of the landscape organisation index.

Soil Surface Assessment

Each patch/inter-patch type identified in the landscape organisation data log is to be subject to soil surface property assessment according to the Soil Surface Assessment (SSA) Method, via a set of query zones located within examples of each patch and inter-patch type. In selecting query zones the following guidelines are to be observed:



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- The transect data log is used to select 'query zones' along the same 50m tape measure. With query zones distributed along the full length of the transect
- The assessment aims for a minimum of five replicate query zones of each patch/inter-patch type (where possible) to improve statistical reliability. Sampling of five replicates is not always possible due to paucity of a given patch/inter-patch type, with a common example being "log" patches that once along a given transect
- Each query zone is sited symmetrically within the selected patch/inter-patch
- The standard query zone length is 1 metre. If the patch/inter-patch length is insufficient, for a 1 m query zone, simple fractions of a metre are to be used
- The boundaries between two patch/inter-patches are to be avoided where possible. The boundary should only be used where the start and/or end of the zone is very distinct

Within each query zone the appropriate score (refer to LFA manual) for each SSA indicator is to be recorded, indicators included:

- Rainsplash protection
- Perennial vegetation cover
- Litter cover, origin and decomposition
- Cryptogram cover
- Crust brokenness
- Soil erosion type and severity
- Deposited materials
- Soil surface roughness
- Surface nature (resistance to disturbance)
- Slake test
- Soil surface nature

Photographic Monitoring

Photo monitoring will be undertaken at fixed plots in the offset areas.

General Observations

General observations outside monitoring sites will also be made during monitoring activities.

Data Analysis and Storage

The monitoring program includes measurement of a number of indicators (parameters) that will enable changes to grassy Box-Gum Woodland EEC/CEEC to be detected (e.g. floristics, recruitment). The monitoring program also includes measurement of a number of indicators (parameters) that will enable changes to the habitat (for the Regent Honeyeater, Swift Parrot, Brown Treecreeper, Hooded Robin, Little Lorikeet, Barking Owl, Eastern Bent-wing Bat, Eastern False pipistrelle, Yellow-bellied Bent-wing Bat and Greater Broad-nosed Bat) to be detected.

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All quadrat data will be entered in databases and stored for later use and analysis. Data will be added to annually so that it will form a data matrix that is amenable to analysis using classification and ordination techniques, and parametric statistics.

Data collected will be analysed and compared with the performance criteria (**Section 6.14**).

6.15.2 Fauna Monitoring

Purpose

WCC will engage qualified ecologists to monitor woodland bird and bats species in response to improvement in vegetation in the offset areas and to demonstrate progress towards completion criteria (**Section 6.14**). This BOMP 2016 has revised the fauna monitoring program at WCC to focus on woodland birds and bats as an indicator of Box Gum restoration because an increase in the species richness is anticipated as the quantity and/or quality of habitat resources increases over time. These two fauna groups are highly mobile able to recolonise areas as indicator of restoration as well as being the two groups that represent the majority of threatened fauna species previously identified by WCC. This is compared to the previous design of monitoring all fauna species which has provided a baseline of a minimum of 5 years data at each monitoring site and will be retained for future reference. Ecoplanning (2016b) demonstrated that previous monitoring data collected was not scientifically robust to determine if any changes were statistically significant. Resources previously deployed for other fauna groups will be utilised to increase the statistical relevance of the avifauna data collection.

Monitoring Design

The numbers of fauna monitoring sites are listed in **Table 16**. Monitoring sites will be progressively established in the Revegetation Domain monitor cleared areas subject to active revegetation. Similarly, monitoring sites will be progressively established in the Restoration Domains to monitor derived grassland areas subject to natural regeneration.

Table 15: Number of Fauna Monitoring Sites per Domain

Management State (Condition and Class)	Plot Type	General Description	Objective	Total Number of Plots	Plot Site
3 and 4 (Low - Class 1&2)	Action	Low Diversity Native Grassland, Pasture Improved and/or Cultivated Land	Additional native vegetation to be established targeted restoration of self-sustaining vegetation communities in low diversity derived native grassland, pasture improved and cultivated land.	7 Note 1	6,7,9,14,15,16,26
2 (Moderate - Class 3)	Action	Derived Native Grassland	Additional native vegetation to be established with the restoration of self-sustaining vegetation communities within derived native grassland.	8 Note 1	1,2,4,8,12,19,21,23
1 (Good - Class 4)	Control	Semi-cleared Woodland/Forest	Existing woodland/forest to be protected and enhanced.	7	3,11,13,17,24,5,,22
Total Plots				22	

Note 1 Monitoring sites will be progressively established in the Revegetation and Restoration Domains to monitor the fauna usage of revegetation.

Location of Monitoring Sites

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Monitoring sites are located across all of the offset areas at WCC. The location of monitoring sites is shown on **Figure 22**.

Frequency

Bird surveys will be undertaken in winter and spring each year. This frequency is appropriate to detect woodland bird species changes due to improvement in vegetation and habitat in the offset areas. Microbat monitoring will be undertaken annually in spring.

Target Fauna

All birds (including nectarivorous woodland birds, arboreal insectivorous woodland birds, ground-dwelling insectivorous woodland birds and bark-gleaning woodland birds) and microbats will be targeted.

Methodology

Fauna monitoring methods are outlined in **Table 17**.

Table 16: Fauna Monitoring Methods

Group	Location	Method	Description	Relevant Survey Period	Method Source
Diurnal Birds	All monitoring sites.	Area Search	20 minute standard search within 3 hours of dawn, each site will surveyed twice. All birds observed or heard will be recorded.	Spring and Winter	DEC (2004)
Nocturnal Birds	Selected sites per stratification unit.	Call Playback (Owls)	Targeting Masked Owl and Barking broadcast for 5 minutes followed by 5 minutes of listening then a 10 minute spotlighting session following the final listening period.	Spring	DEC (2004)
	All monitoring sites.	Habitat Search	Opportunistic observations of signs of nocturnal birds throughout the study area.	Spring	DEC (2004)
	Selected sites per stratification unit.	Spotlighting	Active searches for nocturnal species, including nocturnal birds will be performed for 60 person minutes at each site, twice.	Spring	DEC (2004)
Bats	All monitoring sites.	Anabat Detectors	Two Anabat units left overnight for 2 nights at each site.	Spring	DEC (2004); DEWHA (2010a)

The methodology outlined in Table 17 will enable detection of threatened woodland bird and microbat species for the Regent Honeyeater, Swift Parrot, Brown Treecreeper, Hooded Robin, Little Lorikeet, Barking Owl, Eastern Bent-wing Bat, Eastern False pipistrelle, Yellow-bellied Bent-wing Bat and Greater Broad-nosed Bat.

Data Analysis and Storage



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All fauna data will be entered in a database and stored for later use and analysis. Data will be added to annually so that it will form a data matrix that is amenable to analysis using classification and ordination techniques, and parametric statistics.

6.16 POTENTIAL RISKS AND CONTINGENCY MEASURES

A summary of the key risks for biodiversity is outlined in **Table 18** with the hazards identified, risk ranking, the existing controls and proposed additional management actions to be implemented to further mitigate potential impacts.

Table 17: WCCM Biodiversity Management Risk Assessment Summary

HAZARD	CAUSE	CURRENT MANAGEMENT CONTROL	RISK	ADDITIONAL MANAGEMENT ACTION
Native vegetation	1. Rehabilitation / regeneration success	<ul style="list-style-type: none"> ▪ Existing land management plan and biodiversity management plan. 	H	<ul style="list-style-type: none"> ▪ Implementation of BOMP management strategies relevant to regeneration (i.e. weed management; seed collection; rehabilitation; revegetation) ▪ Monitoring and reporting ▪ Contingency plan
Endangered Ecological Communities	<ol style="list-style-type: none"> 1. Vegetation clearing for mine footprint and ancillary works 2. Introduction of weeds from vehicle movements and operations 	<ul style="list-style-type: none"> ▪ Avoiding clearing where possible ▪ Existing BOS, rehabilitation and offset management to mitigate the loss of vegetation ▪ Pre-clearing and pre-start clearing inspections ▪ Annual flora and fauna monitoring ▪ Periodic inspections ▪ Weed control program 	H	<ul style="list-style-type: none"> ▪ LOM BOS increase in BOA managed and restored woodland
Koala	<ol style="list-style-type: none"> 1. Habitat removal for mine footprint and ancillary works 2. Traffic collisions 	<ul style="list-style-type: none"> ▪ Existing BOS, rehabilitation and offset management to mitigate the loss of vegetation ▪ Pre-clearing and pre-start clearing inspections ▪ Staged clearing in Autumn (outside active breeding season) 	M	<ul style="list-style-type: none"> ▪ Include targeted Koala monitoring techniques into the offset flora and fauna monitoring ▪ LOM BOS increase in BOA managed and restored woodland



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Microchiropteran bats	<ol style="list-style-type: none"> Habitat removal for mine footprint and ancillary works Disturbance of foraging patterns due to lighting 	<ul style="list-style-type: none"> Existing BOS, rehabilitation and offset management to mitigate the loss of vegetation Pre-clearing and pre-start clearing inspections Staged clearing in Autumn (outside of breeding and over-wintering periods) Annual flora and fauna monitoring 	H	<ul style="list-style-type: none"> Installation of Microchiropteran bat boxes within offset area and incorporate in to monitoring Stag tree habitat augmentation in rehabilitation areas LOM BOS increase in BOA managed and restored woodland
Woodland birds	<ol style="list-style-type: none"> Habitat removal for mine footprint and ancillary works Disruption of home ranges and behavioural patterns due to noise and disturbance 	<ul style="list-style-type: none"> Existing BOS, rehabilitation and offset management to mitigate the loss of vegetation Pre-clearing and pre-start clearing inspections Staged clearing in Autumn (outside of migration periods for winter migrants) Annual flora and fauna monitoring 	M	<ul style="list-style-type: none"> Surveys for threatened winter migrant birds (Swift Parrot and Regent Honeyeater) Planting known food species into BOA and rehabilitation LOM BOS increase in BOA managed and restored woodland
Threatened Raptors	<ol style="list-style-type: none"> Habitat removal for mine footprint and ancillary works Disruption of home ranges and behavioural patterns due to noise and disturbance 	<ul style="list-style-type: none"> Existing BOS, rehabilitation and offset management to mitigate the loss of vegetation Pre-clearing and pre-start clearing inspections Staged clearing in Autumn (outside of migration periods for winter migrants) Annual flora and fauna monitoring 	M	<ul style="list-style-type: none"> Stag tree habitat augmentation in rehabilitation areas LOM BOS increase in BOA managed and restored woodland



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7 REPORTING AND REVIEW

7.1 REPORTING

Reporting of monitoring and management information is an integral component of the WCC EMS. This section outlines the internal and external biodiversity monitoring and management reporting processes implemented at WCC. **Table 19** outlines the types of reports that include information; the reporting frequency, requirements, distribution and timing.

Table 18: Reporting schedules for Biodiversity Monitoring and Management

Report	Frequency	Requirements	Distribution	Timing
Biodiversity Non-Compliance or Incident	As required	Complete Whitehaven Coal Incident Report Form. Notification of biodiversity non-compliance or incident. Meet PA 10_0059 Schedule 5 Condition 6; EPL 12290 Condition R2 & R3 and Section 148 (Part 5.7) of the Protection of the Environment Operations Act 1997.	Whitehaven OEH/EPA DoEE DPE NSW Health Workcover LPSC Fire&Rescue	Immediate Earliest Opportunity (Material Harm) otherwise as soon as practicable
		Detailed report of biodiversity non-compliance/incident including cause/nature, date, time, duration and location of event; contact details of WCC representatives or witnesses; action taken and measures to prevent recurrence. <i>Meet PA 10_0059 Schedule 5 Condition 6 and EPL 12290 Condition R2 & R3.</i>	OEH/EPA DPE	Within 7 working days of incident*
Complaints	As required	Complete Whitehaven Coal/WCC Complaints Form including complainant, complaint reported date & time, date & time of compliant event, complaint method, complainant details, complaint nature, actions taken and follow up contact.	WCC Complainant DPE/EPA (if requested)	As soon as practicable Within 7 days of complaint
	Monthly	Update Complaints Register with a summary of complaints received.	Website	Within 14 days of month end
Annual Review	Annually	Summarise operational and environmental activities for the previous year including annual review requirements, review of compliance with MOP, PA, DoEE and other approvals and description of non-compliance/exceedances, rehabilitation progress, comprehensive monitoring results and complaints information	DPE DRE DoEE WCC Website	Due by 28 th February May (unless extension approved). DoEE report within 3 months of every 12 month anniversary

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7.2 REVIEW

A key component of this BOMP (as part of WCC EMS) is that WCC is able to review the effectiveness and performance of biodiversity management onsite. WCC will implement a number of review processes to ensure that there is continuous improvement of biodiversity management including:

- Biodiversity Annual Review;
- Independent Environmental Audit; and
- Revision of Biodiversity Offset Management Plan

Any of these review mechanisms may trigger a revision of the BOMP in **Section 7.2.3** below.

7.2.1 Biodiversity Annual Review

WCC will annually review its biodiversity performance and management as a part of writing the Annual Return in accordance with PA 10_0059 (Schedule 5 Condition 3). The Biodiversity Annual Review will include a comprehensive review of the biodiversity monitoring results and complaints over the reporting period.

7.2.2 Independent Environmental Audit

WCC is required to undertake an Independent Environmental Audit (IEA) every three years in accordance with the PA 10_0059 (Schedule 5 Condition 8; and EPBC 2010/5571 Condition 4). The first IEA was undertaken in 2014 and will be held every three years after. The IEA will:

- Be conducted by a suitably qualified, experienced and independent team of experts whose appointment will be endorsed by DPE;
- Include consultation with the relevant agencies;
- Assess the environmental performance of the project;
- Assess whether WCC is complying with the requirements of the PA 10_0059 and including any assessment, plan or program required under these approvals; and
- Recommend appropriate measures or actions to improve environmental performance and rehabilitation at WCC.

7.2.3 Revision of Biodiversity Offset Management Plan

The BOMP is planned to be revised after three years. However, in accordance with PA 10_0059, WCC will revise the BOMP following:

- The AEMR Annual Review (including the BOMP Review), where this review recommends a revision of the BOMP;
- A non-compliance incident report recommending a revision of the BOMP;
- IEA recommending a revision of the BOMP; or
- Modification of PA 10_0059 or Variation recommending a revision of the BOMP.

WCC would be required to submit the revised BOMP in consultation with the EPA for DPE's approval within 3 months of any triggering event listed above.



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