

LIDDELL

GLENCORE



Biodiversity Offset Management Plan

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Glossary of Terms

BOMP	Biodiversity Offset Management Plan
CEEC	Critically Endangered Ecological Community
DoEE	Department of the Environment and Energy (Commonwealth)
DNG	Derived native grassland
EEC	Endangered Ecological Community
EPA Act	<i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
Glencore Coal	Glencore Coal Pty Limited
GDP	Ground Disturbance Permit
ha	Hectares
LCO	Liddell Coal Operations
LCO biodiversity offset areas	Relates to the Mitchell Hills South, Mountain Block and Bowmans Creek Riparian Corridor biodiversity offset areas
LGA	Local Government Area
Mig	Migratory species (under the EPBC Act)
NSW	New South Wales
OEH	Office of Environment and Heritage (NSW)
P&E	Planning and Environment (NSW)
TEC	Threatened Ecological Community
BC Act	<i>Biodiversity Conservation Act 2016 (NSW)</i>
VEC	Vulnerable Ecological Community
PCT	Plant Community Type
PFC	Percent Foliage Cover

1 Introduction

1.1 Background

Liddell Coal Operations (LCO) is an established mining operation located approximately 25 kilometres north-west of Singleton in the Hunter Valley of New South Wales (refer to Figure 1-1). The LCO site is divided by the boundary between the Singleton and Muswellbrook local government areas (LGAs).

LCO is operated and managed by Liddell Coal Operations Pty Limited, a wholly owned subsidiary of Glencore Coal Pty Limited (Glencore Coal), on behalf of a joint venture between Glencore Coal (67.5 percent (%)) and Mitsui Matsushima Australia (32.5%).

LCO received approval for the extension of Liddell Open Cut coal mining operations under the State *Environmental Planning and Assessment Act 1979* (EPA Act) on 1 December 2014 (DA 305-11-01 Modification 5) and under the Commonwealth *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act) on 24 December 2014 (EPBC Approval 2013/6908).

The State and Commonwealth approvals for this modification both require preparation of a Biodiversity Offset Management Plan (BOMP) to guide ongoing management of the LCO biodiversity offset areas (BOAs) to maintain and enhance biodiversity values, particularly those relating to threatened species.

This document has been prepared to satisfy the State and Commonwealth conditions of approval relating to the BOMP, and its requirements apply to the three LCO BOAs being Bowmans Creek Riparian Corridor, Mountain Block and Mitchell Hills South in *Figure 1-2*. The former two BOAs are requirements under the State approval, while Mitchell Hills South is an additional BOA required under the Commonwealth approval only. This document should be read in conjunction with the LIDOC-90533967-3687 Biodiversity Management (LCO 2017) where the management of the onsite biodiversity values is documented, and LIDOC-90533967-3776 Indirect Offset (LCO, 2017) concerning Spotted-tailed Quoll recovery actions.

1.2 Objectives

The objectives of this BOMP are to provide direction for the short to long term management and enhancement of the biodiversity values of the LCO BOAs, as well as to provide a description of the measures to be implemented to achieve this over the next three years. The BOMP will be reviewed on a regular basis in relation to progress, actions completed, forward planning of remaining actions and any alterations/additions resulting from the adaptive management process (see Section 5). The BOMP areas will be implemented for the life of mine (as approved until 2028).

The specific requirements of the BOMP are to:

- Identify and describe the areas of land that will be managed in accordance with this BOMP;
- Provide clear and concise management measures for the BOMP to adhere to the State and Commonwealth approval conditions (Section 1.3) and to minimise the impacts of key threats;
- Provide a working schedule for the implementation of activities required in the BOMP; and
- Describe monitoring, performance evaluation and reporting procedures that are informative, practical and achievable.

1.3 Regulatory Requirements

This BOMP has been prepared to address the relevant components of Conditions 6, 7, 8 and 9 of the Commonwealth EPBC Act project approval 2013/6908 and Conditions 24, 25, 27 and 29 of Schedule 3

of the State EP&A Act approval DA 305-11-01 Modification 7. The details of these conditions and reference to where they are addressed in this BOMP are provided in **Table 1.1**.



FIGURE 1.1
Locality Map

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Figure 1-1 – Locality Map

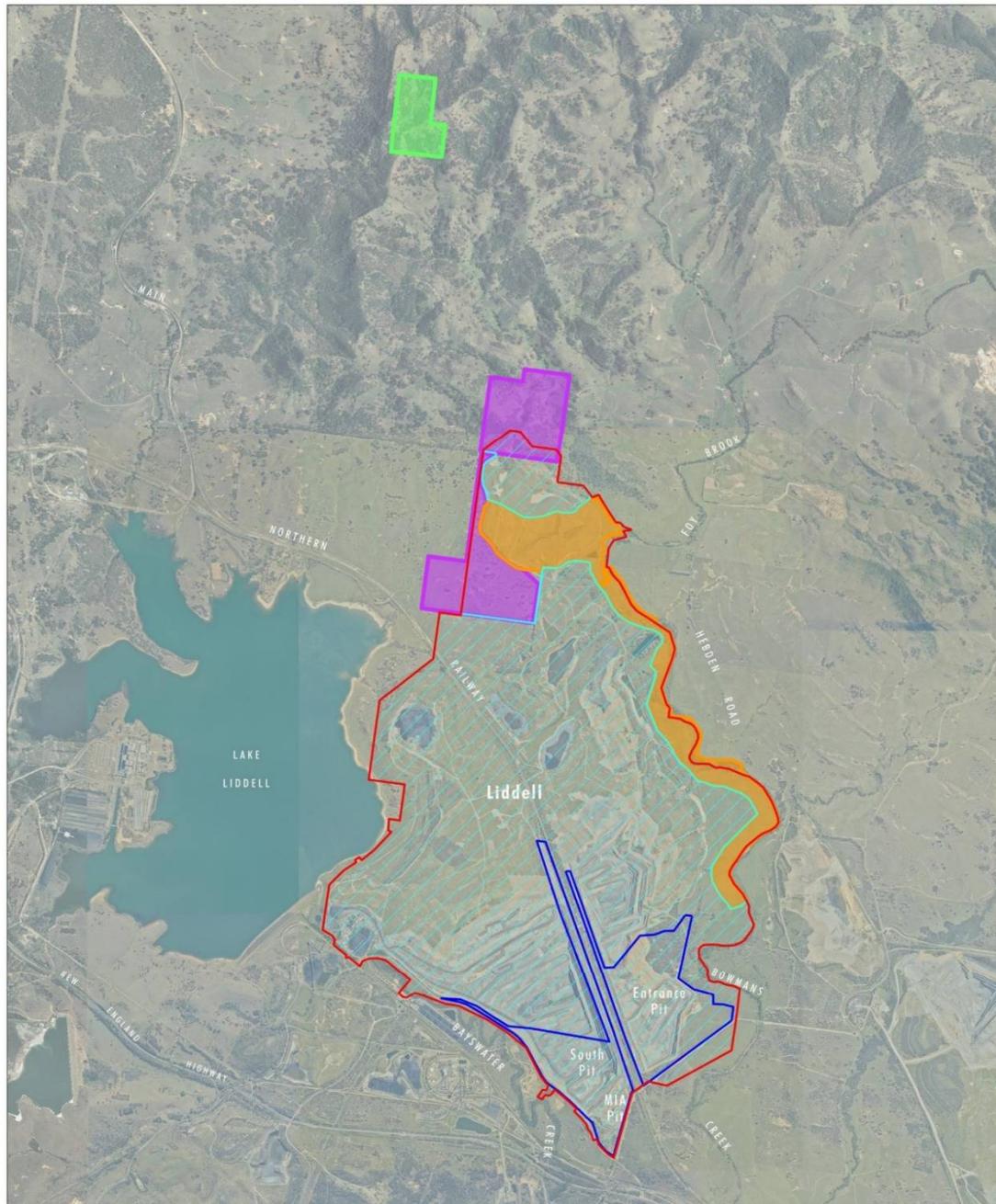


Image Source: Henderson (2019), Glencore (2018)
Data Source: Glencore (2019)

0 1.0 2.0 3.0km
1:60 000

- Legend**
- ▭ Liddell Coal Operations Approved DA Boundary
 - ▭ Approved Modification Area
 - ▭ Mountain Block Offset Area (State/Commonwealth Offset)
 - ▭ Bowman's Creek Riparian Corridor Offset Area (State/Commonwealth Offset)
 - ▭ Mitchell Hills South Offset Area (Commonwealth Offset)
 - ▭ Biodiversity Management Plan Area

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FIGURE 1.2
Liddell Coal Operations
Biodiversity Offset Areas

Figure 1-2 – Liddell Coal Operations Biodiversity Offset Areas

Table 1.1 – Project Approval Conditions Relevant to BOMP

Condition	Relevant Section of BOMP
EPBC Act Project Approval 2013/6908	
6. In order to compensate for residual significant impact on threatened species, the approval holder must protect the offset areas through a legal instrument under relevant conservation legislation prior to 30 June 2017 or on any other date agreed in writing by the Minister. The legal instrument must:	Section 2.2
a) Be registered on the title of the Offset;	
b) Provide for the protection and ongoing conservation management of the Offset areas in perpetuity;	
c) Prevent any future development activities or clearing of native vegetation on the Offset areas; and	
d) Require the approval of a State Planning or Environment Minister to be changed or revoked.	
7. The approval holder must provide the Department with detail of the offset areas, including offset attributes, shapefiles, textual descriptions and maps to clearly define the location and boundaries of the offset area, to be submitted to the Department prior to commencement of the action.	Provided separately.
8. To ensure management of the offset areas, the approval holder must submit an Offset Management Plan to the Minister for approval prior to 31 May 2015 to provide for the conservation and management in perpetuity of the offset areas. The Plan must include:	
<ul style="list-style-type: none"> • A detailed methodology, frequency, timing and duration of all Offset areas management measures proposed. The management measures must include: <ul style="list-style-type: none"> i. Weed and pest control; ii. Fencing; iii. Ecological monitoring; and iv. Assisted regeneration. 	Section 3
<ul style="list-style-type: none"> • Key milestones, performance indicators, corrective actions and timeframes for the completion of all actions outlined in the Plan; 	Section 3.6 and 3.7 Section 3.3 Section 4 Section 3.8
<ul style="list-style-type: none"> • A detailed methodology, timing goals and corrective actions for revegetation of: <ul style="list-style-type: none"> i. The Bowmans Creek Riparian Corridor, in accordance with Figure 8.3 (Annexure D); ii. The Mountain Block Offset Site, in accordance with Figure 8.4 (Annexure E); and 	Provided for each Management Action Section 5
	Sections 3.8 Section 5

Condition	Relevant Section of BOMP															
iii. Exotic grassland and derived grassland areas of Mitchell Hills South Offset Area, as depicted in Figure 3.1 of the letter from David Foster to the Department dated 29 October 2014 (Annexure F), with native woodland or forest communities that occur on the site.																
9. The approved Offset Management Plan required under Condition 8 must be implemented.																
EPA Act Approval DA 305-11-01 Modification 7																
24. The Applicant must implement the biodiversity offset strategy described in the EA, summarised in Table 7 and conceptually shown in Appendix 7.																
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="3" data-bbox="244 645 1257 685" style="text-align: center;">Table 7: Summary of the Biodiversity Offset Strategy</th> </tr> <tr> <th data-bbox="244 685 571 757">Area</th> <th data-bbox="571 685 1050 757">Offset Type</th> <th data-bbox="1050 685 1257 757">Minimum Size (ha)</th> </tr> </thead> <tbody> <tr> <td data-bbox="244 757 571 831">Mountain Block Offset</td> <td data-bbox="571 757 1050 831">Existing vegetation and vegetation to be established</td> <td data-bbox="1050 757 1257 831">168</td> </tr> <tr> <td data-bbox="244 831 571 904">Bowmans Creek Riparian Corridor</td> <td data-bbox="571 831 1050 904">Existing vegetation and vegetation to be established</td> <td data-bbox="1050 831 1257 904">185</td> </tr> <tr> <td data-bbox="244 904 571 954" style="text-align: center;">Total</td> <td data-bbox="571 904 1050 954"></td> <td data-bbox="1050 904 1257 954" style="text-align: center;">353</td> </tr> </tbody> </table>		Table 7: Summary of the Biodiversity Offset Strategy			Area	Offset Type	Minimum Size (ha)	Mountain Block Offset	Existing vegetation and vegetation to be established	168	Bowmans Creek Riparian Corridor	Existing vegetation and vegetation to be established	185	Total		353
Table 7: Summary of the Biodiversity Offset Strategy																
Area	Offset Type	Minimum Size (ha)														
Mountain Block Offset	Existing vegetation and vegetation to be established	168														
Bowmans Creek Riparian Corridor	Existing vegetation and vegetation to be established	185														
Total		353														
Note: To identify the areas referred to in Table 7 refer to the applicable figures in Appendix 7.																
25. The Applicant must ensure that the offset strategy and/or rehabilitation strategy is focused on the reestablishment of: <ul style="list-style-type: none"> (a) significant and/or threatened plant communities, including: <ul style="list-style-type: none"> • Central Hunter Box – Ironbark Woodland EEC; • Narrow-Leaved Ironbark – Spotted Gum Woodland EEC; • Narrow-Leaved Ironbark – Bullock Open Forest EEC; (b) significant and/or threatened plant species; and (c) habitat for significant and/or threatened animal species including the Spotted-tailed Quoll. 	Sections 3.8 Section 3.9.3															
27. By the end of December 2015, unless the Secretary agrees otherwise, the Applicant must make suitable arrangements to provide appropriate long term security for the land within the biodiversity offset strategy identified in Table 7, to the satisfaction of the Secretary.	Section 2.2															
29. The Applicant must prepare and implement a detailed Biodiversity Management Plan for the site to the satisfaction of the Secretary. This plan must:	This condition relates to the BMP, rather than the BOMP, however contains aspects required for the BOMP.															
a) be prepared in consultation with OEH and be submitted to the Secretary for approval by the end of May 2015, unless otherwise agreed by the Secretary;	Section 1.4															
b) describe how the implementation of the offset strategy would be integrated with the overall rehabilitation of the site (see below);																

Condition	Relevant Section of BOMP
c) include:	
i. a description of the short, medium and long term measures that would be implemented to:	
<ul style="list-style-type: none"> implement the offset strategy; and 	
<ul style="list-style-type: none"> manage the remnant vegetation and habitat on the site in the offset areas; 	Section 3
ii. detailed performance and completion criteria for the implementation of the offset strategy;	Section 3
iii. a detailed description of the measures that would be implemented over the next 3 years, including the procedures to be implemented for:	
<ul style="list-style-type: none"> implementing revegetation and regeneration with the disturbance areas and offset areas, including establishment of canopy, sub-canopy (if relevant), understorey and ground strata; 	Section 3.8
<ul style="list-style-type: none"> protecting vegetation and soil outside the disturbance areas; 	Section 3.3
<ul style="list-style-type: none"> rehabilitating creeks and drainage lines that occur on the site; 	Provided in BMP
<ul style="list-style-type: none"> managing salinity; 	Section 3.13
<ul style="list-style-type: none"> conserving and reusing topsoil; 	Provided in BMP
<ul style="list-style-type: none"> undertaking pre-clearance surveys; 	Provided in BMP
<ul style="list-style-type: none"> managing impacts on fauna; 	Provided in BMP
<ul style="list-style-type: none"> collecting and propagating seed; 	Section 3.12
<ul style="list-style-type: none"> salvaging and reusing material from the site for habitat enhancement; 	Section 3.9.2
<ul style="list-style-type: none"> salvaging, transplanting and/or propagating threatened flora in accordance with the Guidelines for the Translocation of Threatened Plants in Australia (Vallee et al., 2004); 	Section 3.10
<ul style="list-style-type: none"> controlling weeds and feral pests including investigating alternate technologies to reduce poisoning of non-target species 	Section 3.6 and 3.7
<ul style="list-style-type: none"> managing grazing and agriculture; 	Section 3.4
<ul style="list-style-type: none"> controlling access; 	Section 3.3
<ul style="list-style-type: none"> bushfire management; 	Section 3.14

Condition	Relevant Section of BOMP
<ul style="list-style-type: none"> habitat enhancement works; 	Section 3.9
<ul style="list-style-type: none"> seasonal monitoring of in-stream and riparian ecological condition; 	Provided in BMP
<ul style="list-style-type: none"> survey of stygofauna in Bowmans Creek alluvial aquifer (prior to predicted drawdown); and 	Provided in BMP
<ul style="list-style-type: none"> monitoring of stygofauna populations every 6 months following the occurrence of the predicted drawdown; 	Provided in BMP
iv. a seasonally-based program to monitor the effectiveness of these measures, and progress against the performance and completion criteria;	Section 4
v. a description of the potential risks to successful revegetation, and a description of the contingency measures that would be implemented to mitigate these risks; and	Section 5.4
vi. details of who would be responsible for monitoring, reviewing and implementing the plan.	Section 1.5

This BOMP is designed to support the overarching Biodiversity Management Plan for the LCO (LCO 2017). The BOMP follows (where appropriate) the NSW Department of Planning and Environment (DP&E) *Hunter Valley Coal Mines: Best Practice Guidelines for Biodiversity Offset Management Plans* (DP&E 2014).

1.4 Interaction of the BOMP and BMP

Condition 8 of EPBC Act Project Approval 2013/6908 requires the preparation of a BOMP; whereas, Schedule 3 Condition 29 (a) of EPA Act Approval DA 305-11-01 requires the preparation of a Biodiversity Management Plan (BMP) that integrates the requirements for offset management. For ease in addressing this, LCO prepared two separate management documents:

- the BMP – which directs the management of LCO lands (that are not required to offset mining impacts) within the approved DA boundary, and
- the BOMP – which directs management of the three offset areas.

1.5 Authority Consultation

In accordance with Schedule 3 Condition 29 (a), the BOMP was developed in consultation with The NSW Office of Environment and Heritage (OEH) and the Department of Planning, Industry and Environment (DPIE). Post July 2019, OEH consultation requirements have been replaced by consultation with the Biodiversity and Conservation Division (BCD, within the Department of Environment and Energy). Correspondence relating to this is contained in **Appendix A** and **Appendix B**.

1.6 Roles and Responsibility

Responsibility for the implementation of the BOMP lies with LCO, with input from external specialists and contractors as required. **Table 1.2** lists the key roles and responsibilities of specific LCO positions concerning the implementation of the BOMP.

Table 1.2 – BOMP Roles and Responsibilities

Role	Accountabilities for this Role
Operations Manager	Sufficient time and resources are allocated to allow for the implementation of biodiversity management and monitoring strategies as outlined in the BOMP.
Environment & Community Manager	<p>Allocate sufficient resources and time for the implementation of the BOMP management activities.</p> <p>Undertake biannual inspections of each biodiversity offset area.</p> <p>Analyse and collate documentation for inclusion in the Annual Review.</p> <p>Assess the effectiveness of the management strategies and instigate the adaptive management process, as required.</p> <p>Internal and external reporting requirements are met, including necessary revisions of the BOMP.</p> <p>All relevant records are effectively maintained.</p> <p>Periodically review progress against performance indicators and completion criteria.</p> <p>The results of the BOMP monitoring programs and research trials are utilised to refine closure criteria as well as to evaluate the effectiveness of biodiversity management practices to facilitate continual improvement.</p> <p>Personnel involved in the carrying out and monitoring of the BOMP activities and values are appropriately qualified, licensed and experienced to undertake the task.</p> <p>Manage/control access to the biodiversity offset areas.</p>
All Persons	<p>Receive training regarding controls on activities within the biodiversity offset areas.</p> <p>Observe boundaries of the biodiversity offset areas when undertaking work on site.</p> <p>Undertake activities in the biodiversity offset areas in accordance with this plan.</p>

1.7 Performance Indicators & Completion Criteria

The performance criteria listed in each section will be used to determine the success of the ongoing management of the site in accordance with the specified approval conditions and biodiversity management objectives.

In summary, preliminary performance indicators for the LCO BOAs are:

- an appropriate long-term land conservation mechanism for the BOAs is agreed upon in consultation with the relevant authorities;
- all boundary fences are in place and reports of unauthorised access and fence line compromises of the BOAs are addressed as soon as practical;
- there are no livestock grazing activities within the boundaries of the BOAs (except as required for ecological restoration purposes (such as weed management and bushfire management)
- monitoring indicates that natural regeneration of the DNG is occurring and that the regeneration areas:

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- Contain a flora species assemblage trending towards the target native woodland communities
- Include a range of flora species from each vegetation strata represented in target community (such as trees, shrubs, and groundcover forbs and grasses), even if only as seedlings/juvenile plants initially
- monitoring indicates that remnant woodland area are remaining similar to or increasing in flora and fauna species diversity
- there is no evidence of significant pest animal or weed infestation
- it can be demonstrated that accurate records are being maintained substantiating all activities and monitoring associated with the BOMP.

The performance indicators and completion criteria are intended to apply to years four, five and six of the BOMP implementation. After three years they will be assessed and redeveloped as appropriate in response to monitoring outcomes and the success of the management and improvement strategies. For further clarity, the years of the BOMP referred to in the proceeding management performance tables below commences are as below to align with previous approval of the BOMP by the DoEE and NSW DPIE:

- Year 4: August 2018 – August 2019
- Year 5: August 2019 – August 2020
- Year 6: August 2020 – August 2021.

2 Description of Biodiversity Offset Areas

The following sections provide a summary of the characteristics and biodiversity values of the LCO BOAs.

2.1 Location

The three LCO BOAs are located in the vicinity of the LCO (Figure 1.2). The Bowmans Creek Riparian Corridor runs in a north/south direction on the eastern boundary of LCO and is 185.52 hectares (ha) in size. Mountain Block is 168.34 ha (14.81 ha of which, as described in Modification 7, is being managed under the BMP until successful completion of remediation and subsequent revegetation activities as indicated in Section 2.6) in size and is located to the immediate north of the LCO. Mitchell Hills South is located approximately three kilometres north west of Mountain Block and is 40.5 ha in size.

While the LCO BOAs are not located in an identified priority area for the Great Eastern Ranges Initiative, they do fall on the southern foot slopes of the Mount Royal/Barrington Tops National Parks which are a recognised connectivity gap in the central Hunter region.

These BOAs lie within a cluster of other Glencore offset areas established for the Ravensworth and Mount Owen Operations (Figure 2.1). This cluster currently serves to protect existing vegetation in the highly cleared Lake Liddell area, and will assist in securing existing 'stepping-stone' habitat in this area that leads from the valley floor north into secure conservation areas. In addition to protecting existing vegetation, the management commitments for these areas will promote active and natural regeneration of native vegetation communities to further enhance this habitat connectivity.

LCO is located close to the northern border of the Sydney Basin Bioregion (OEH 2011), where it joins the boundary of the NSW North Coast Bioregion. The Sydney Basin Bioregion lies on the central east coast of NSW, covers an area of 3,624,008 hectares and is characterised by a temperate climate.

The LCO is within the Hunter subregion which is characterised by rolling hills, wide valleys, with the meandering Hunter River system on a wide floodplain. A diverse range of flora and fauna assemblages are likely to occur in the local area, with a mixture of coastal and inland influences. Due to the proximity to the NSW North Coast Bioregion, the LCO also displays environmental characteristics of this bioregion.

2.2 Land Tenure and Conservation Mechanism

Four Conservation Agreements (CAs) have been executed and registered on title for the BOAs. A CA is a legal agreement under section 69 of the NPW Act for an area of land with significant conservation value. These CAs are legally binding for both current and future landholders and is registered on the land title. The CAs document:

- conservation values present
- management arrangements and costings
- monitoring arrangements

The CA area naming conventions slightly differ from the BOAs but the overall areas are the same. The agreements are summarised in Table 2-1.

Table 2-1. LCO BOA Conservation Agreements

Agreement Name	Agreement No.	Date Executed	Date Registered on Title	Approx. Area
Mitchell Hills South Conservation Area	VC00505	7/05/2019	8/08/2019	40
Mountain Block Conservation Area	VC0525	13/05/2019	1/10/2019	168
Bowmans Creek Riparian Corridor	VC00506	7/05/2019	1/10/2019	183
Bowmans Creek Riparian Corridor East	VC00516	9/05/2019	6/08/2019	3

The performance and completion criteria for the Conservation Mechanism is complete and has been recorded in Appendix C.



- Legend**
- Liddell Coal Operations Approved DA Boundary
 - Approved Glencore Offsets
 - Modification 7 Area
 - National Park

FIGURE 2.1
Regional Setting

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Figure 2-1 - Regional Setting

2.3 Climatic Information

Table 2-2 provides the relevant average climactic conditions for the area collated from the St Heliers Weather Station (Muswellbrook) (BOM 2019) to provide local historic climate context as well as onsite data collated by the LCO meteorological station required under **EPL 2094**. This data can be considered when scheduling rehabilitation and revegetation works.

Table 2-2 Climatic Data

Month	Rainfall (mm)		Temperature (°C)					
	St Heliers	LCO	Singleton			LCO		
	Mean	Mean	Mean	Highest Monthly Mean	Lowest Monthly Mean	Mean	Mean High	Mean Low
January	60.0	90.0	32.1	36.0	28.9	32.8	32.8	19.4
February	60.7	47.5	30.7	34.8	26.4	31.0	31.0	18.2
March	62.8	100.3	28.3	30.3	26.1	28.4	28.4	17.3
April	35.6	18.9	24.9	27.5	22.5	25.3	25.3	14.4
May	41.8	27.0	21.6	23.3	19.9	21.6	21.6	11.1
June	51.9	43.8	18.1	19.7	16.2	17.7	17.7	9.4
July	37.1	19.4	18.0	19.9	16.5	18.1	18.1	8.0
August	40.3	36.5	19.9	22.1	17.7	19.6	19.6	8.5
September	44.2	35.0	23.5	26.6	21.5	23.2	23.2	10.9
October	44.9	34.4	26.3	29.3	23.1	27.1	27.1	13.2
November	74.3	74.6	28.8	32.1	26.3	28.9	28.9	15.6
December	64.0	79.7	30.3	34.8	25.2	31.4	31.4	17.8

Rainfall observations were taken from Muswellbrook (St Heliers Weather Station) (1992 to 2019) and Temperature Observations were from Singleton STP (2002 to 2019) (BOM 2019).

2.4 Physiography, Geology and Soils

LCO is situated centrally on the Hunter Valley floor, within the 22,000 km² Hunter catchment which is drained by the Hunter and Goulburn Rivers and their tributaries. It is situated approximately 100 kilometres from the coast and 140 kilometres from the western extremity of the Hunter catchment at the Great Dividing Range.

The central Hunter Valley is characterised by relatively gentle undulating hills, broad river valleys and floodplains. To the south are the dissected sandstone plateaux of Wollemi and Yengo National Parks, while to the north the foothills of the Barrington Tops and Mount Royal Range adjoin the Hunter Valley floor, which is bounded by the Hunter Thrust System (Peake 2006). To the east and west extend the highly eroded Permian lowlands of the floor of the Hunter Valley.

The central Hunter Valley lies at the intersection of the north-eastern margin of the Sydney Basin and the south-eastern margin of the New England Fold Belt. The Sydney Basin extends from the South Coast of NSW well into the central Queensland Coast (Hawley & Brunton 1995), and it mostly consists of a thick Permian-Triassic rock succession formed during early Permian rifting, and contains large reserves of coal.

The central Hunter Valley is primarily underlain by four major geological strata: Carboniferous; Permian; Triassic and Quaternary. To a lesser extent it is also underlain by Jurassic and Tertiary strata. Carboniferous rocks mostly underlie the areas in the north-east of the region and are a combination of erosion resistant marine, volcanic, conglomerate, and limestone sediments; these typically form steep-sided hills and valleys. Permian rocks make up the majority of the region and mostly consist of the moderately erosion resistant Singleton Coal Measures, conglomerate, sandstone, shale, tuff, and some lava beds which typically form low, undulating hills. The Triassic rock is mostly located in areas in the north-west, west, and south of the central Hunter Valley and consists of highly erosion resistant sandstone which tends to form infertile, rugged country. Quaternary sediments are mostly identified along and in proximity to the major rivers and creeks of the central Hunter Valley. The Jurassic rocks are typically in the form of Saxonvale volcanics and are mostly found around Bayswater, Fordwich and Lemington; and the Tertiary stratum are typically only found in the form of small basalt caps in several very small areas.

Within the Sydney Basin, LCO is located in the Hunter Coalfield. The coal-bearing sedimentary rocks within LCO include the Foybrook Formation, with the Vane Subgroup of the Whittingham Coal Measures, which form the lower part of the Singleton Supergroup.

2.5 Key Ecological Values

The three LCO BOAs provide protection to a variety of key ecological values, including:

- threatened ecological community (TEC) and endangered flora population habitat areas;
- habitat for threatened flora species;
- habitat for threatened fauna species; and
- are positioned strategically within the landscape.

A summary of the vegetation communities, TECs and threatened species recorded in the BOAs is provided in the sections below.

2.5.1 Vegetation Communities and Threatened Ecological Communities

A total of two endangered ecological communities (EECs) (being Central Hunter Ironbark – Spotted Gum – Grey Box Forest and Central Hunter Grey Box – Ironbark Woodland) have been recorded across the three LCO BOAs. Additionally, a vulnerable ecological community (VEC) has been recorded also, this being the Lower Hunter Valley Dry Rainforest. All of these are listed under the *Biodiversity Conservation Act 2016* (BC Act). A number of these communities (or components thereof) also comprise (or partially comprise) the Commonwealth Central Hunter Valley eucalypt forest and woodland critically endangered ecological community (CEEC) (listed under the EPBC Act) which was listed post project approval. The vegetation communities of the LCO BOAs are listed in Table 2-3. These communities are mapped in *Figure 2-5* for the Bowmans Creek Riparian Corridor, *Figure 2-6* for Mountain Block and *Figure 2-7* for Mitchell Hills South.

Table 2-3 Vegetation Communities of LCO Biodiversity Offset Areas

Vegetation Community	PCT*	BC Act	EPBC Act	Bowmans Creek Riparian Corridor (ha)	Mountain Block (ha)	Mitchell Hills South (ha)	Total (ha)
Central Hunter Ironbark-Spotted Gum-Grey Box Forest	1602 -Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the central and lower Hunter	EEC - Central Hunter Ironbark – Spotted Gum – Grey Box Forest	CEEC - Central Hunter Valley Eucalypt Forest and Woodland	0.49	0	0	0.49
Central Hunter Grey Box – Ironbark Woodland	1691 - Narrow-leaved Ironbark – Grey Box Grassy Woodland of the Central and Upper Hunter	EEC - Central Hunter Grey Box – Ironbark Woodland		0.28	0	0	0.28
Central Hunter Box – Ironbark DNG	1691 - Narrow-leaved Ironbark – Grey Box Grassy Woodland of the Central and Upper Hunter - Derived Native Grassland	-		10.12	0	0	10.12
Narrow-leaved Ironbark – Spotted Gum Woodland DNG	1602 -Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the central and lower Hunter DNG	-	A small component comprises CEEC - Central Hunter Valley Eucalypt Forest and Woodland	8.28	0	0	8.28
Hunter Valley River Oak Forest	485 - River Oak riparian grassy tall woodland of the western Hunter Valley (Brigalow Belt South Bioregion and Sydney Basin Bioregion)	-	-	20.15	0	0	20.15
Rehabilitation		-	-	12.47	0	0	12.47
Introduced Grassland		-	-	122.69	0	0.73	123.42

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Introduced Woodland		-	-	2.26	0	0	2.26
Narrow-leaved Ironbark – Spotted Gum Woodland	1602 -Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the central and lower Hunter	EEC - Central Hunter Ironbark – Spotted Gum – Grey Box Forest	A small component comprises CEEC - Central Hunter Valley Eucalypt Forest and Woodland	0	37.85 (3.10)*	0	37.85
Narrow-leaved Ironbark – Bulloak Open Forest	1691 - Narrow-leaved Ironbark – Grey Box Grassy Woodland of the Central and Upper Hunter	EEC - Central Hunter Grey Box – Ironbark Woodland	CEEC - Central Hunter Valley Eucalypt Forest and Woodland	0	21.24	0	21.24
Narrow-leaved Ironbark – Spotted Gum Woodland DNG	1602 -Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the central and lower Hunter DNG	-	A small component comprises CEEC - Central Hunter Valley Eucalypt Forest and Woodland	0	37.57 (3.20)*	0	37.57
Grey Myrtle – Kangaroo Vine Dry Rainforest and Rusty Fig Dry Rainforest	1614 - Grey Gum – Grey Myrtle – Narrow-leaved Stringybark – Rusty Fig open forest on ranges of the Upper Hunter	-	-	0	7.49 (5.32)*	0	7.49
Narrow-leaved Ironbark – Bulloak Open Forest DNG	1691 - Narrow-leaved Ironbark – Grey Box Grassy Woodland of the Central and Upper Hunter DNG	-	A small component comprises CEEC - Central Hunter Valley Eucalypt Forest and Woodland	0	56.87	0	56.87
Disturbed Land		-	-	4.03	6.76 (3.13)*	0	10.79
Water Body/Dam		-	-	4.75	0.56 (0.06)*	0	5.31
Spotted Gum Forest	1602 -Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the central and lower Hunter	-	-	0	0	16.74	16.74
Dry Rainforest	1614 - Grey Gum – Grey Myrtle – Narrow-leaved Stringybark – Rusty Fig open forest on ranges of the Upper Hunter	VEC – Lower Hunter Valley Dry Rainforest	-	0	0	8.15	8.15

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Status: Approved

Version: 9.0

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Sheltered Grey Gum – Rough-barked Apple Forest	621 Grey Gum - Rough- barked Apple Alluvial Flat Woodland in the Upper Hunter Valley, mainly Sydney Basin Bioregion	-		0	0	1.21	1.21
Regrowth		-	-	0	0	3.89	3.89
Derived Grassland		-	-	0	0	9.78	9.78
Total				185.52	168.34	40.50	394.36

Note: All values have been rounded up to the nearest two decimal places. All values subject to minor mapping/GIS-based variation.

PCT Plant Community Type, as defined by the BioNet Vegetation Classification database (OEH, 2018)

* Numbers in brackets indicate the extent of vegetation in Mountain Block BOA being temporarily transferred under the management of the BMP

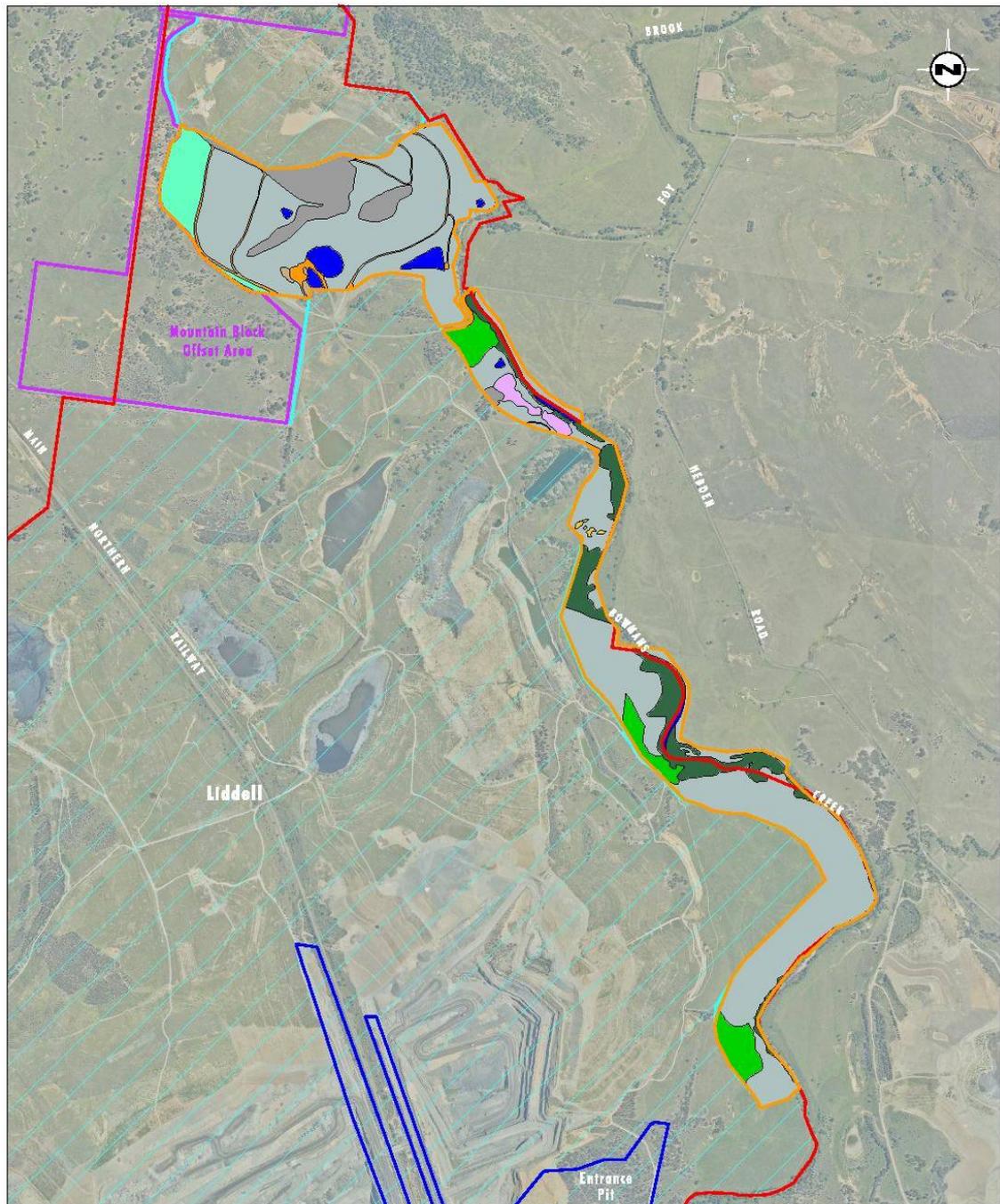


Image Source: Henderson (2019), Glencore (2018)
 Data Source: Glencore (2019)

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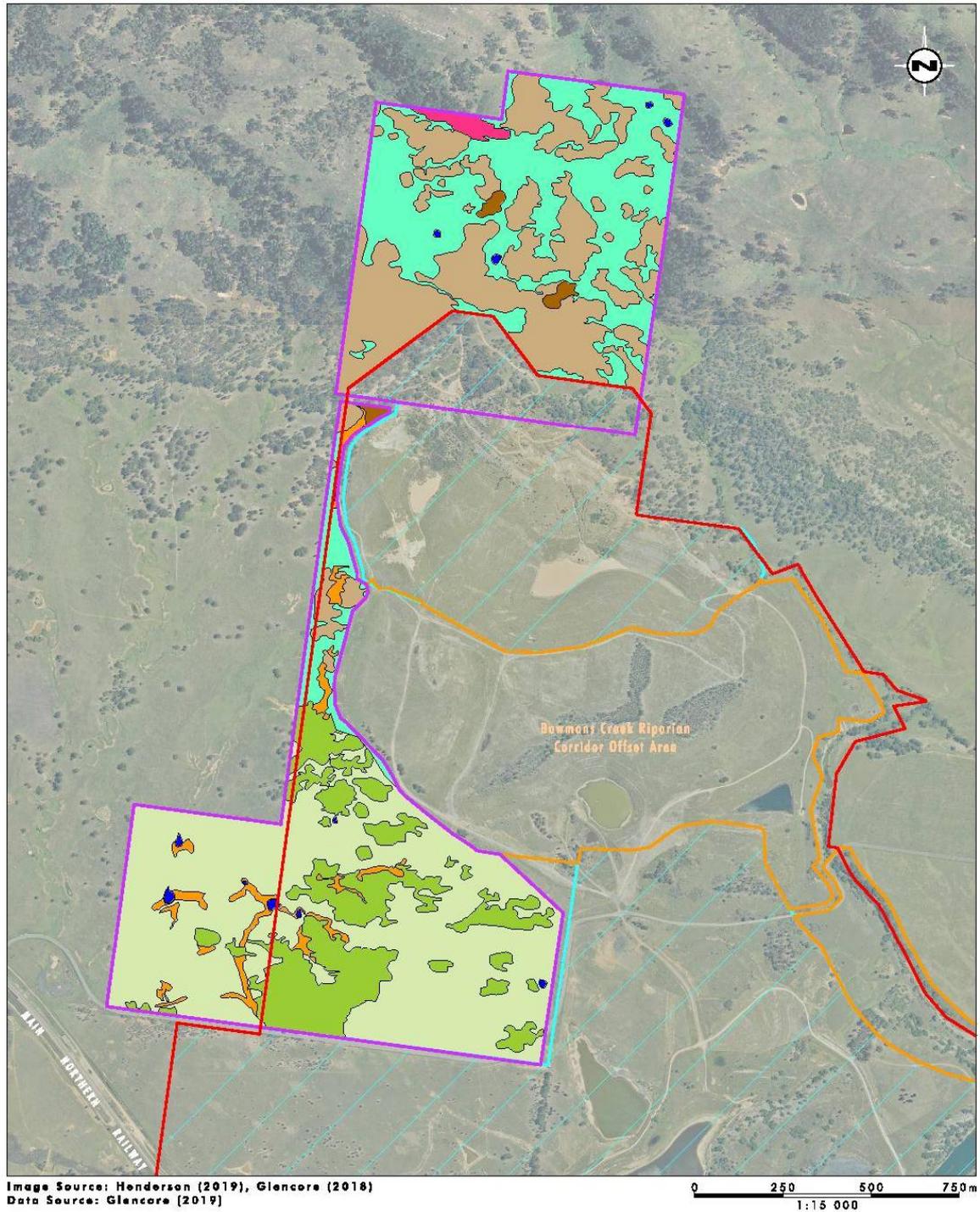
- ▬ Liddell Coal Operations Approved DA Boundary
- ▬ Approved Modification Area
- ▬ Mountain Block Offset Area
- ▬ Bowmans Creek Riparian Corridor Offset Area
- ▨ Biodiversity Management Plan Area
- ▬ Central Hunter Box - Ironbark DNG
- ▬ Central Hunter Box - Ironbark Woodland
- ▬ Dam/Water Body
- ▬ Disturbed Land
- ▬ Hunter Valley River Oak Forest
- ▬ Introduced Grassland
- ▬ Introduced Woodland
- ▬ Narrow-leaved Ironbark - Bullock Open Forest
- ▬ Narrow-leaved Ironbark - Bullock Open Forest DNG
- ▬ Narrow-leaved Ironbark - Spotted Gum Woodland
- ▬ Narrow-leaved Ironbark - Spotted Gum Woodland DNG
- ▬ Rehabilitation

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FIGURE 2.2

Bowmans Creek Riparian Corridor Existing Vegetation Communities

Figure 2-2 - Bowmans Creek Riparian Corridor Existing Vegetation Communities



Legend

- Liddell Coal Operations Approved DA Boundary
- Mountain Block Offset Area
- Bowmans Creek Riparian Corridor Offset Area
- Biodiversity Management Plan Area
- Dam/Water Body
- Disturbed Land
- Gray Myrtle - Kongaroo Vine Dry Rainforest
- Narrow-leaved Ironbark - Bullaak Open Forest
- Narrow Leaved Ironbark - Bullaak Open Forest DNG
- Narrow leaved Ironbark - Spotted Gum Woodland
- Narrow leaved Ironbark - Spotted Gum Woodland DNG
- Rusty Fig Dry Rainforest

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FIGURE 2.3
Mountain Block
Existing Vegetation Communities

Figure 2-3 - Mountain Block Existing Vegetation Communities

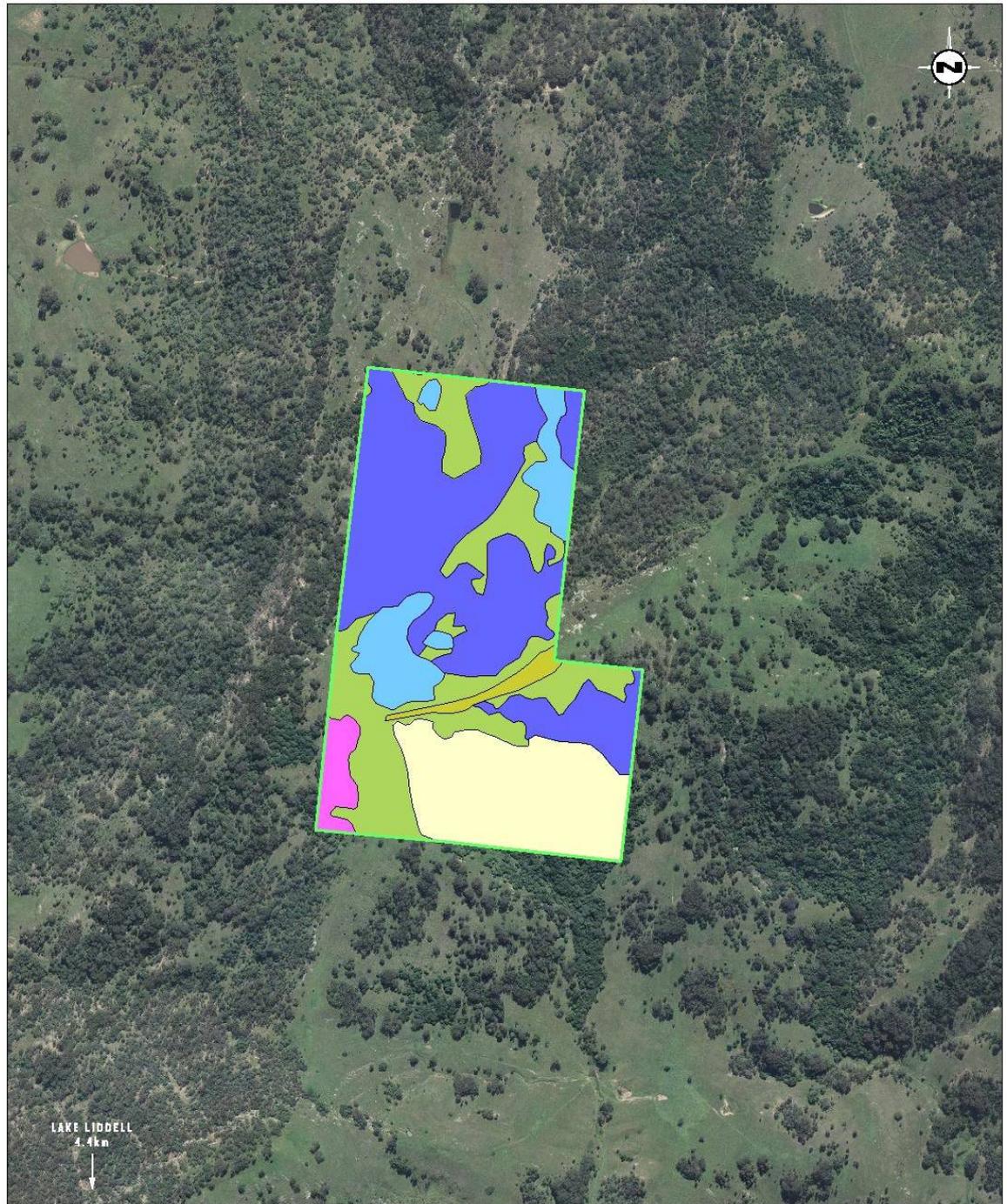


Image Source: Google Earth (2008)
Data Source: Glencore (2019)

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Legend

- ▭ Mitchell Hills South Offset Area
- ▭ Derived Grassland
- ▭ Dry Rainforest
- ▭ Exotic Grassland
- ▭ Ragrowth
- ▭ Sheltered Grey Gum - Rough-barked Apple Forest
- ▭ Spotted Gum Forest

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FIGURE 2.4
Mitchell Hills South
Existing Vegetation Communities

Figure 2-4 - Mitchell Hills South Existing Vegetation Communities

2.5.2 Fauna Habitats and Species

The broad fauna habitat types of grassland, riparian, woodland/forest, dry rainforest and aquatic habitat found within the LCO BOAs are representative of the habitat types occurring broadly across the Hunter Valley floor. All habitat types in the region have been extensively cleared or modified for agriculture, largely for cattle grazing, and mining. Communities occurring on floodplains and more fertile soils on the Hunter Valley floor have been most extensively cleared (Peake 2006). Because of the widespread clearing of habitats in the region, those remaining contain important refuges for a number of fauna species.

Woodland and forests are characterised by a dry environment with little or no standing water. Habitat is provided by a moderately open canopy and a sclerophyllous understorey that ranges from very dense to sparse, while the ground cover is generally sparse and dominated by grasses and forbs.

Dry rainforest/sheltered forest occurs on sheltered slopes and gullies. As a closed forest, dry rainforest contains a dense canopy of rainforest species with emergent mature eucalypts, spotted gums and angophoras. The mid storey is moderately dense to dense, comprising mesic species characteristic of rainforest communities and wet sclerophyll communities, and a sparse ground cover of ferns and grasses is present. Woody debris is relatively common and leaf litter is abundant. Emergent/canopy mature eucalypts contain tree hollows providing habitat for micro-bats, arboreal mammals and hollow-nesting and roosting birds. This resource is moderately common in the sheltered forest and vegetation fringing dry rainforest pockets. The occasional rocky slopes and cliff lines provide roost and nesting habitat for a variety of birds, micro-bats and mammals. Gullies are characteristically rocky and contain large boulders and small cliffs and caves. Cracks and fissures in rocks provide shelter for reptiles and micro-bats. Spaces between and underneath boulders provide shelter for larger mammals.

Alluvial forests generally provide denser vegetation cover than woodland and forest habitats. The relatively larger sizes of eucalypt trees supported by the alluvial soils often also provide larger-sized hollows than those found on surrounding, drier slopes and ridges. The alluvial sites also provide ephemeral standing and moving water, with farm dams occurring in some areas. Aquatic habitat provided by farm dams and ephemeral creek lines and drainage lines are found across the LCO BOAs.

Grassland habitats are dominated by a range of native and naturalised perennial grasses and forbs. The health and integrity of the vegetation largely corresponds with the grazing history, particularly grazing intensity with many grassland habitats formed as a result of the clearing of woodland well over 100 years ago. The grass and forb dominated groundcover includes log and stump cover that provides habitat for grassland mammals (small and large), birds and terrestrial reptile species. The highly scattered trees throughout the grassland provided nesting, roosting and perching habitat for bird species, roosting habitat for some micro-bat species and shade for larger grazing mammal species.

2.5.3 Threatened and Migratory Species

A number of threatened flora and fauna species have been recorded across the LCO BOAs. These are identified in

Table 2-4.

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Biodiversity Offset Management

Table 2-4 Threatened Species Recorded in LCO Biodiversity Offset Areas

Species	BC Act	EPBC Act	Bowmans Creek Riparian Corridor	Mountain Block	Mitchell Hills South
<i>Cymbidium canaliculatum</i>	Endangered Population	-		✓	
grey-crowned babbler <i>Pomatostomus temporalis temporalis</i>	V	-	✓	✓	
painted snipe <i>Rostratula australis</i>	E	E,MIG	✓		
speckled warbler <i>Chthonicola sagittata</i>	V	-	✓	✓	
turquoise parrot <i>Neophema pulchella</i>	V	-		✓	
spotted harrier <i>Circus assimilis</i>	V			✓	
white-bellied sea eagle <i>Haliaeetus leucogaster</i>	V	Mig	✓	✓	
dusky woodswallow <i>Artamus cyanopterus cyanopterus</i>			✓		
brush-tailed phascogale <i>Phascogale tapoatafa</i>	V			✓	✓
spotted-tailed quoll <i>Dasyurus maculatus maculatus</i>	V	E	✓	✓	✓
eastern bentwing-bat <i>Miniopterus schreibersii oceanensis</i>	V	-	✓	✓	✓
little bentwing-bat <i>Miniopterus australis</i>	V		✓	✓	
eastern freetail-bat <i>Mormopterus norfolkensis</i>	V		✓	✓	
large-eared pied bat <i>Chalinolobus dwyeri</i>	V	V	✓		
rainbow bee-eater <i>Merops ornatus</i>	-	Mig	✓		

2.5.4 Introduced Species

The introduced fauna species provided in Table 2-5 have been identified within the BOAs.

Table 2-5 Introduced Fauna Species Recorded within Biodiversity Offset Areas

Common Name	Scientific name
-------------	-----------------

Biodiversity Offset Management

house mouse	<i>Mus musculus</i>
black rat	<i>Rattus rattus</i>
pig	<i>Sus scrofa</i>
fox	<i>Vulpes vulpes</i>
dog/dingo	<i>Canis familiaris</i>
hare	<i>Lepus capensis</i>
rabbit	<i>Oryctolagus cuniculus</i>
common starling	<i>Sturnus vulgaris</i>
common myna	<i>Acridotheres tristis</i>
cat	<i>Felis catus</i>
deer	<i>Axis sp., Cervus sp., Dama dama</i>

The introduced flora species provided in Table 2-6 have been identified within the BOAs and have legislative status listed as a having a biosecurity duty under the *Biosecurity Act 2015* or as key threatening processes (KTPs) under the BC Act.

Table 2-6 Introduced Flora Species Recorded within Biodiversity Offset Areas

Common Name	Scientific name	Legislative Listing
African boxthorn	<i>Lycium ferocissimum</i>	General biosecurity duty
African lovegrass	<i>Eragrostis curvula</i>	General biosecurity duty
African olive	<i>Olea europaea</i> subsp. <i>cuspidata</i>	General biosecurity duty
		Regional Recommended Measure – Land Area 1
		Invasion of native communities by this species is listed as a KTP under the BC Act
Bathurst burr	<i>Xanthium spinosum</i>	General biosecurity duty
Blackberry	<i>Rubus fruticosus</i>	General biosecurity duty
		Must not be imported into the State or sold
		Land managers should mitigate the risk of new weeds being introduced to their land.
Blue heliotrope	<i>Heliotropium amplexicaule</i>	General biosecurity duty
Blue periwinkle	<i>Vinca major</i>	General biosecurity duty
Castor oil	<i>Ricinus Communis</i>	General biosecurity duty

Biodiversity Offset Management

Coolatai grass	<i>Hyparrhenia hirta</i>	General biosecurity duty
Fireweed	<i>Senecio madagascariensis</i>	General biosecurity duty
		Must not be imported into the State or sold
Flaxleaf fleabane	<i>Conyza bonariensis</i>	General biosecurity duty
Green cestrum	<i>Cestrum parquii</i>	General biosecurity duty
		Regional recommended measures for the Hunter Region
Galenia	<i>Galenia pubescens</i>	General biosecurity duty
Kei apple	<i>Dowalis caffra</i>	General biosecurity duty
Lantana	<i>Lantana camara</i>	General biosecurity duty
		Must not be imported into the State or sold
Madeira vine	<i>Anredera cordifolia</i>	General biosecurity duty
Paterson's curse	<i>Echium plantagineum</i>	General biosecurity duty
		Regional recommended measures for the Hunter Region
Peppercorn	<i>Schinus mole</i> var. <i>areira</i>	General biosecurity duty
Prickly pear	<i>Opuntia stricta</i> var. <i>stricta</i>	General biosecurity duty
		Must not be imported into the State or sold
Rhodes grass	<i>Chloris Gayana</i>	General biosecurity duty
Saffron thistle	<i>Carthamus lanatus</i>	General biosecurity duty
Spear thistle	<i>Cirsium vulgare</i>	General biosecurity duty
Spiny emex	<i>Emex australis</i>	General biosecurity duty
Tree-of-heaven	<i>Ailanthus altissima</i>	General biosecurity duty
Weeping willow	<i>Salix babylonica</i>	General biosecurity duty
		Must not be imported into the State or sold
		Must not be imported into the State or sold

KTP

key threatening process

BC Act

Biodiversity Conservation Act 2016

General biosecurity duty

All plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable

Land Area 1

Land managers should mitigate the risk of new weeds being introduced to their land. Land managers should mitigate spread from their land. Land Area 2: Land managers should mitigate spread from their land. Land managers should mitigate the risk of new weeds being introduced to their land. Plant should not be bought, sold, grown, carried or released into the environment.

While not having any specific legislative status golden wreath wattle (*Acacia saligna*) is likely to be highly problematic to rehabilitated areas if not appropriately managed.

2.6 Modification 7 Remediation Area

On 12 February 2019, Development Application (DA) 305-11-01 Modification 7 was approved. Modification 7 was for the minor amendment of the DA boundary to incorporate a portion of the Mountain Block BOA to facilitate required remediation and rehabilitation works. The extent of the Modification 7 boundary is provided on *Figure 1-2*.

The approved works are required in order to remediate extensive erosion, correct landform stability issues, and assist in achieving positive biodiversity outcomes within the BOA. These activities are required for the improvement of biodiversity values within the Mountain Block BOA in the medium to long term.

The Modification 7 Area is being managed under the provisions of the BMP until it has been fully stabilised and revegetated, following which management and monitoring obligations will be transferred back to the BOMP.

2.7 Biodiversity Management Targets

Biodiversity management targets form the basis of the BOMP. The proposed management and improvement strategies (section 3) will enable these biodiversity management targets and the conditions of approval to be met. Specific performance indicators and completion criteria will be used to track the success of the BOMP in reaching these targets.

The LCO BOAs will be managed to conserve existing ecological values, with a focus on weed and feral animal control, fencing and regeneration of grassland and disturbed areas to their benchmark communities. The three year targets for the management of the LCO BOAs are to:

- continued detailed rehabilitation works within the Bowmans Creek Riparian Corridor;
- continued establishment of woodland vegetation in grassland and disturbed areas in Mountain Block by way of natural regeneration;
- continued establishment of woodland vegetation in grassland and disturbed areas in Mitchell Hills South by way of natural and assisted regeneration;
- maintain fencing and signage (as necessary) to demarcate boundaries and protect existing vegetation and regeneration/rehabilitation areas from human-induced impacts and unplanned grazing;
- continue to exclude grazing from domestic stock until monitoring has determined land is suitable for grazing;
- manage weed and pest species;
- undertake (as required) and monitor success of habitat augmentation programs completed, with particular emphasis on the spotted-tailed quoll; and
- continued implementation of a monitoring program to assess the success of ongoing management and improvement strategies.

The long term biodiversity management targets for the LCO BOAs are to:

- establish an appropriate long-term conservation mechanism for the LCO BOAs which is agreed upon in consultation with the relevant authorities

- maintain or improve the existing biodiversity values of the remnant woodland communities in all three areas;
- complete rehabilitation works across the currently disturbed or grassland areas (totalling approximately 143 ha), within the Bowmans Creek Riparian Corridor;
- establish approximately 101 ha of benchmark native vegetation communities within the currently disturbed or grassland areas of Mountain Block through natural and assisted (if required) regeneration; and
- establish approximately 13 ha of benchmark native vegetation communities within Mitchell Hills South through natural and assisted (if required) regeneration.

Post-regeneration and revegetation vegetation communities are depicted in Figure 2-5 for the Bowmans Creek Riparian Corridor, Figure 2-6 for Mountain Block and Figure 2-7 for Mitchell Hills South. Due to the scale of works required in Bowmans Creek Riparian Corridor, this BOA has been divided into three different management zones: Zone 1, Zone 2 and Zone 3.

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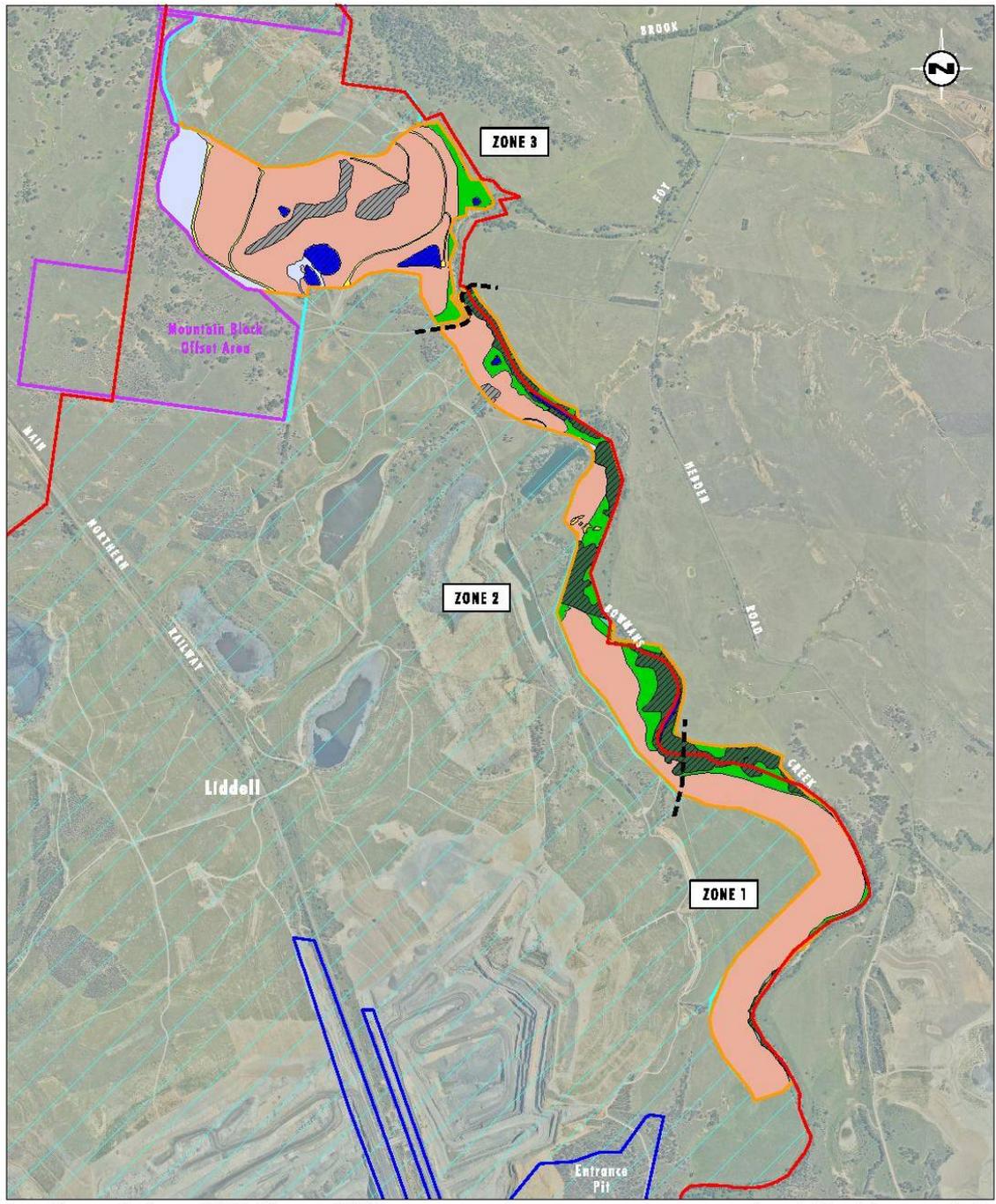


Image Source: Henderson (2019), Glencore (2018)
Data Source: Glencore (2019)
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- Legend**
- Liddell Coal Operations Approved DA Boundary
 - Approved Modification Area
 - Mountain Black Offset Area
 - Bowmans Creek Riparian Corridor Offset Area
 - Biodiversity Management Plan Area
 - Central Hunter Box - Ironbark - Angophora Dominated - Rehabilitation
 - Central Hunter Box - Ironbark -Ironbark Dominated - Rehabilitation
 - Central Hunter Box - Ironbark Woodland
 - Dam/Water Body
 - Hunter Valley River Oak Forest
 - Hunter Valley River Oak Forest - Revegetation
 - Narrow-leaved Ironbark - Spotted Gum Woodland - Rehabilitation
 - Rehabilitation

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FIGURE 3.1
Bowmans Creek Riparian Corridor
Post-regeneration and Rehabilitation
Vegetation Communities

Figure 2-5 – Bowmans Creek Riparian Corridor Post-regeneration and Rehabilitation Vegetation Communities

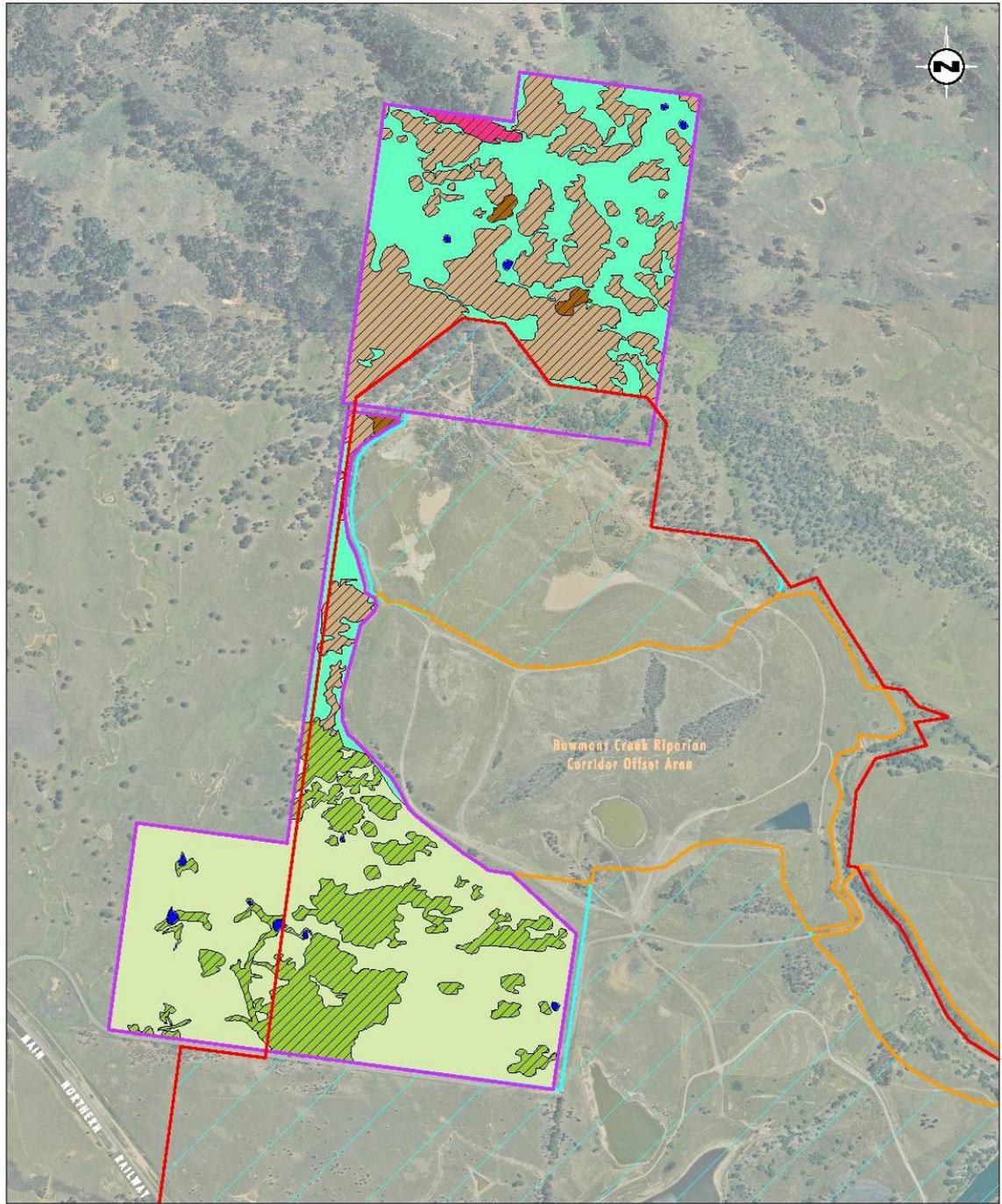


Image Source: Henderson (2019), Glencore (2018)
Data Source: Glencore (2019)

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Legend

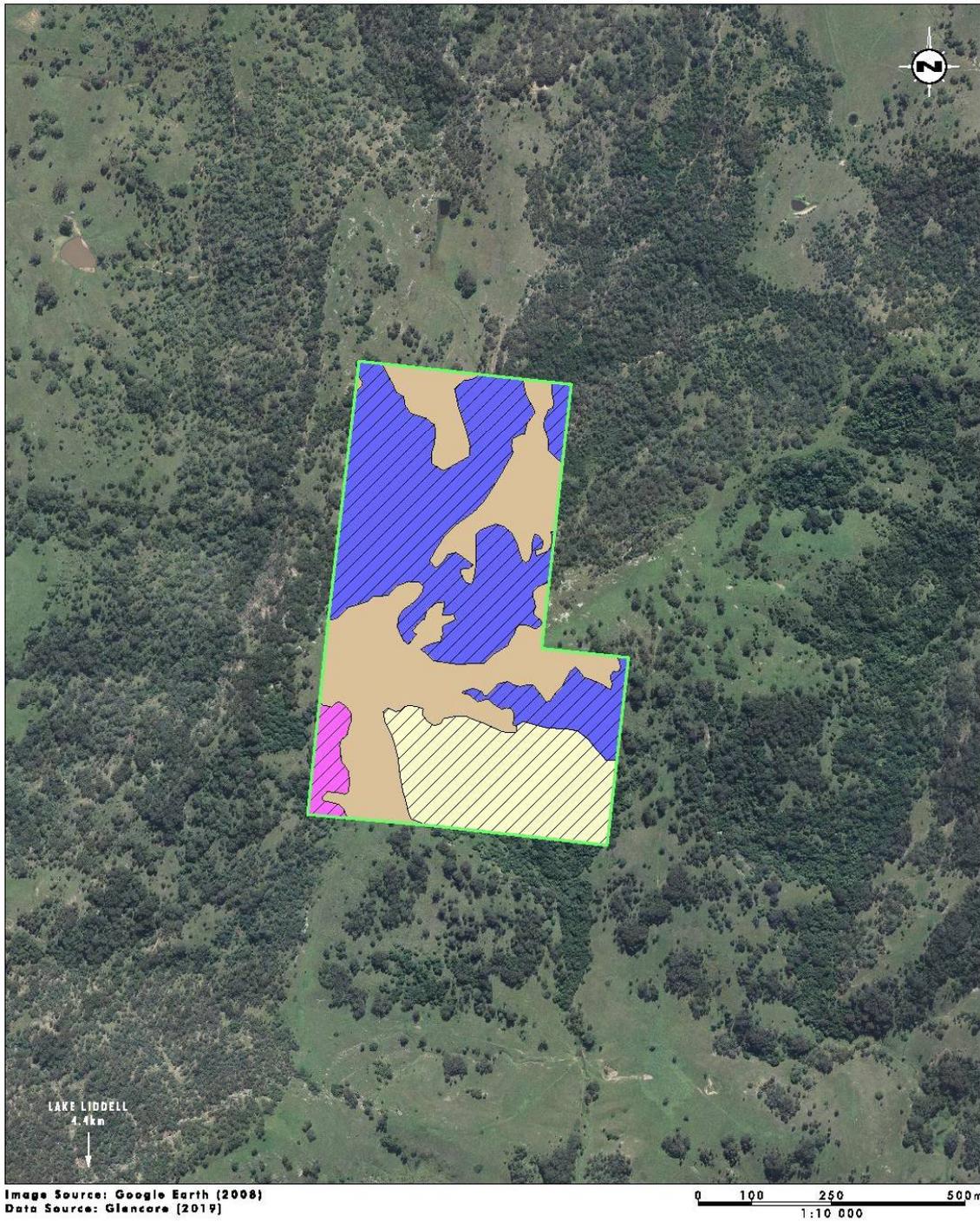
- Liddell Coal Operations Approved DA Boundary
- Mountain Block Offset Area
- Bowman's Creek Riparian Corridor Offset Area
- Biodiversity Management Plan Area
- Dam/Water Body
- Grey Myrtle - Kangaroo Vine Dry Rainforest
- Narrow-leaved Ironbark - Bullock Open Forest
- Narrow Leaved Ironbark - Bullock Open Forest - Revegetation
- Narrow leaved Ironbark - Spotted Gum Woodland
- Narrow leaved Ironbark - Spotted Gum Woodland - Revegetation
- Rusty Fig Dry Rainforest

FIGURE 3.2

Mountain Block Post-regeneration and Rehabilitation Vegetation Communities

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Figure 2-6 –Mountain Block Post-regeneration and Rehabilitation Vegetation Communities



- Legend**
- Mitchell Hills South Offset Area
 - Dry Rainforest
 - Sheltered Grey Gum - Rough-barked Apple Forest
 - Spotted Gum Forest
 - Spotted Gum Forest Revegetation

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FIGURE 3.3
Mitchell Hills South
Post-regeneration and
Rehabilitation Vegetation Communities

Figure 2-7 – Mitchell Hills South Post-regeneration and Rehabilitation Vegetation Communities

3 Management & Improvement Strategies

The following management and improvement strategies have been developed for the LCO BOAs to ensure that the BOMP objectives and targets are met. They will be employed across each of the BOAs, as required. The management actions will prove of benefit to all native flora and fauna species within the biodiversity offset areas, however many are tailored towards benefit for the spotted-tailed quoll, regent honeyeater and swift parrot also.

3.1 Pathogen Management

The three key pathogens of relevance to the BOAs include the root rot fungus (*Phytophthora cinnamomi*), myrtle rust (*Pucciniales*) and chytridiomycosis (infection by amphibian chytrid fungus). Each of these is listed as a key threatening process (KTP) under the BC Act. Infection of frogs by amphibian chytrid and dieback caused by the root-rot fungus *Phytophthora cinnamomi* are also KTPs under the EPBC Act.

None of these pathogens are known to occur nor has monitoring or other survey identified reasonable potential for these to be present in the BOAs. If reasonable potential for the presence of these pathogens is identified, the potential should be further investigated by way of targeted sampling/survey to determine if they are present.

The following information (including precautionary measures to minimise potential for their occurrence) should be considered in addressing this issue.

3.1.1 *Phytophthora cinnamomi*

Phytophthora cinnamomi is a soil fungus that attacks the root (and sometimes stem) systems of plants, destroying the ability of the plant to uptake water and nutrients (Commonwealth of Australia 2001). 'Infection of native plants by *Phytophthora cinnamomi*' is listed as a KTP under the BC Act and 'Dieback caused by the root-rot fungus *Phytophthora cinnamomi*' is also listed as a KTP under the EPBC Act.

Although not recorded within the BOAs, this pathogen has the potential to be spread onsite as a result of soil movement during earthworks or on infected vehicles. As a precautionary measure, vehicles and machinery should be washed before entering the LCO.

If any areas are reasonably suspected to be infected with this pathogen (areas of unexplained vegetation death, for example), a targeted sampling, diagnosis and management strategy will be designed to address impacts and further spread.

3.1.2 Myrtle Rust

Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae is a KTP under the BC Act. This fungus attacks young growth causing plants to become stunted, distorted or necrotic, consequently impacting the viability of the host plant (NSW Scientific Committee 2011).

Although not recorded within the BOAs, this fungi has the potential to be spread onsite as a result of introduction of infected plant material from offsite or other measures.

Presence of myrtle rust is assessed during BOA surveys. Particular attention is paid to the potential presence of this pathogen during biodiversity monitoring works. Myrtle rust is recognisable on the leaves of Myrtaceae species, which are most commonly found in areas mapped as *PCT 1614 Grey Gum - Grey Myrtle - Narrow-leaved Stringybark - Rusty Fig open forest*. Early identification on susceptible species, if any, will enable occurrences to be managed in order to reduce potential spread.

If myrtle rust is identified as being present, it will require immediate control using an appropriate fungicide.

If any areas of vegetation are reasonably suspected to be infected with this fungus, a targeted sampling, diagnosis and management strategy will be designed to address impacts and further spread.

3.1.3 Chytridiomycosis

Infection of frogs by amphibian chytrid causing the disease chytridiomycosis is listed as a KTP under the BC Act and the EPBC Act. This fungus is an infectious disease affecting amphibians globally and is caused by the amphibian chytrid fungus *Batrachochytrium dendrobatidis*. It is highly virulent and known to cause anything from erratic deaths of amphibian populations to 100 per cent mortality in other populations (Threatened Species Scientific Committee 2002 and NSW Scientific Committee 2003).

Although not known to occur within the BOAs, this fungus has the potential to be spread onsite as a result of inappropriate amphibian handling during ecological surveys and the transfer of infected amphibians and water containing the fungus between catchments.

Key to the prevention of spread of this pathogen is an appropriate amphibian handling strategy during ecological surveys. Handling amphibians should be avoided during ecological surveys and clearing works (where possible). If unavoidable, amphibians are only to be handled in accordance with *Hygiene Protocol for the Control of Disease in Frogs* (DECC 2008).

Table 3-1 outlines the performance and completion criteria for managing pathogens across all LCO BOAs.

Table 3-1 Pathogen Management Performance and Completion Criteria

Relevant Offset Area	Action	Performance Criteria			Completion Criteria
		Year 4	Year 5	Year 6	
All biodiversity offset areas	If reasonable potential for pathogens is identified in the biodiversity offset areas, appropriate pathogen monitoring and management protocols are developed and implemented.	If reasonable potential is identified, pathogens are considered in design and implementation of monitoring works. If identified (or potential identified), management actions for specific pathogens are developed and implemented.	If reasonable potential is identified, pathogens are considered in design and implementation of monitoring works. If identified (or potential identified), management actions for specific pathogens are developed and implemented.	If reasonable potential is identified, pathogens are considered in design and implementation of monitoring works. If identified (or potential identified), management actions for specific pathogens are developed and implemented.	Methods to identify potential pathogens are considered in monitoring program design (if reasonable potential of pathogen presence is identified onsite). Signs of pathogen presence (or potential presence) are immediately reported. If suspected to be onsite, detailed management actions are developed and implemented. There is no onsite infestation of <i>Phytophthora cinnamomi</i> , Myrtle

Relevant Offset Area	Action	Performance Criteria			Completion Criteria
		Year 4	Year 5	Year 6	
					rust or Chytridiomycosis.

3.2 Cultural Heritage Management

The potential for items of cultural heritage value to be present within the BOAs has been assessed as a component of due diligence program completed for all offset areas. Management strategies relating to Aboriginal cultural heritage sites and values within the BOAs are contained within the Liddell Aboriginal Cultural Heritage Management Plan (ACHMP) (LCO 2020) and any subsequent updates.

The ACHMP documents management strategies that enable the regeneration/revegetation within BOAs which contain Aboriginal cultural heritage sites that have been developed in consultation with the LCO Registered Aboriginal Parties (RAPs). The LCO ACHMP contains cultural heritage protocols will be developed to inform employees and contractors about how to identify and manage risk to cultural heritage values and to report potential finds.

A Ground Disturbance Permit (GDP) is required for all activities on previously undisturbed land and includes a review of cultural heritage impacts.

Table 3-2 outlines the performance and completion criteria for managing Cultural Heritage across all LCO BOAs.

Table 3-2 Cultural Heritage Management Performance and Completion Criteria

Relevant Offset Area	Action	Performance Criteria			Completion Criteria
		Year 4	Year 5	Year 6	
Bowmans Creek Riparian Corridor	Detailed rehabilitation planning for the Bowmans Creek Riparian Corridor managing outcomes of cultural heritage assessment.	Implement plan as required.	Implement plan as required.	Implement plan as required.	Cultural heritage is appropriately considered within rehabilitation works in Bowmans Creek Riparian Corridor.
All biodiversity offset areas	Implement protocols for identification of potential cultural heritage issues, including how to avoid or mitigate impacts.	Implement protocol.	Implement protocol.	Implement protocol.	Protocol developed and implemented.

3.3 Fencing and Signage

LCO will ensure that all BOAs have boundary fencing of appropriate design and condition. This will ensure that areas of remnant vegetation and rehabilitation/regeneration areas will be appropriately protected from human-induced impacts such as damage from vehicles or trampling, increased rubbish dumping, unplanned grazing and alteration to normal fauna behaviour patterns due to human presence.

Fencing and access control including deterrent methods such as locked gates will be used to protect existing vegetation from accidental disturbance and will clearly demarcate areas of vegetation to be protected. In areas where fencing is deemed as being unsuitable, appropriate signage will be used in its place. Signage will exclude access (where appropriate), instruct vehicles to remain on formed tracks only, or highlight sensitive ecological areas to be avoided.

Any new fencing will use no barbed wire on the upper strands, and as little barbed wire generally as possible. This will ensure as minimal impact on native species as possible. The minimal usage of barbed wire from fencing will minimise potential injury or death of fauna species, particularly macropods and gliding or flying mammals and threatened micro-bats. Fencing design will also consider the use of as few wire strands as practical to reduce potential for fauna entanglement.

In addition, any new fencing will use plain wire on the bottom strand and this strand will be of a height that allows faunal passage underneath. It is noted however, that this design will need to ensure that cattle cannot push underneath the bottom strand and thus gain access to the BOAs.

In the first year of the operation of this BOMP, LCO conducted an inspection of the BOAs to map existing fencing, assess condition and identify areas where new fencing is needed or repairs needed for existing fencing. This mapping also identified redundant fencing that required removal. Existing fencing that was deemed unnecessary has now been removed.

In onsite areas where road-based traffic is passing through or in proximity to known spotted-tailed quoll habitat, LCO has installed information signage indicating the potential presence of this species, these signs will be maintained for throughout the life of mine.

Table 3-3 outlines the performance and completion criteria for managing fencing and signage across all LCO BOAs.

Table 3-3 Fencing and Signage Performance and Completion Criteria

Relevant Offset Area	Action	Performance Criteria			Completion Criteria
		Year 4	Year 5	Year 6	
All biodiversity offset areas	Repair boundary fences, restricting unauthorised access to property and controlling livestock movements	All boundary fences in place and gates are secured.	All boundary fences in place and gates are secured.	All boundary fences in place and gates are secured.	All biodiversity offset areas will have boundary fencing of appropriate design and condition.
All biodiversity offset areas	Any new fencing does not have barbed wire on upper strands and as little barbed wire generally as	New fences are installed without barbed wire on upper strands and an elevated plain wire bottom strand.	New fences are installed without barbed wire on upper strands and an elevated plain wire bottom strand.	New fences are installed without barbed wire on upper strands and an elevated plain wire bottom	New fences are constructed with as little barbed wire as possible, with none on upper strands and an elevated

Relevant Offset Area	Action	Performance Criteria			Completion Criteria
		Year 4	Year 5	Year 6	
	possible. The bottom strand will be plain wire and elevated to allow faunal passage (while maintaining cattle exclusion).			strand.	plain wire bottom strand.
All biodiversity offset areas	Inspections of fences every two months to identify condition.	Inspections every two months. Damaged critical fences to be repaired within 1 week (temporary if needed), final repairs and non-critical repairs to be completed in 1 month.	Inspections undertaken every two months. Damaged critical fences to be repaired within 1 week (temporary if needed), final repairs and non-critical repairs to be completed in 1 month.	Inspections undertaken every two months. Damaged critical fences to be repaired within 1 week (temporary if needed), final repairs and non-critical repairs to be completed in 1 month.	All fences in functional condition.
All biodiversity offset areas	Information signage for the spotted-tailed quoll.	Informational signage is maintained.	Informational signage is maintained.	Informational signage is maintained.	Information signage for the spotted-tailed quoll is maintained.

3.4 Grazing Management

The majority of vegetation within the BOAs displays some level of impact from grazing, whether by domestic stock, feral animals (such as rabbits and pigs) or by native animals (such as macropods). The intensity of this impact varies throughout the BOAs, with the vegetation across the areas displaying grazing impacts ranging from slight to moderately severe. The grassland formation shows the highest level of impact, however all vegetation formations show some degree of disturbance from grazing.

In principle, LCO intends that grazing domestic stock within the BOAs will be avoided, however it is recognised that targeted strategic grazing may assist to manage key risks such as weeds and bushfire and help achieve desired ecological outcomes. These practices would occur only where they do not interfere with the required regeneration/rehabilitation of the BOAs, and would only occur for short periods of time, as necessary, following consideration of monitoring results. Fencing will be used to restrict grazing to target areas as required.

The following general grazing management principles will be adopted in areas suitable for grazing within the BOAs where monitoring information recommends grazing as a management tool:

- manage stocking rates and monitor grazing areas to ensure that overgrazing does not occur and that ecological values are not compromised;
- prevent stock access into regeneration/rehabilitation areas by fencing;

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- implement a stock rotation principles to ensure that adequate time is allowed for between grazing rotations to allow grasses to regenerate;
- regularly inspect and maintain shared boundary fences with grazing areas to minimise incidences of un-authorized stock access into offset areas;
- Active regeneration areas are monitored to determine the impacts of grazing and ground disturbance from native and feral pest species. Bi- monthly Biodiversity Inspections indicate the presence and impact of vertebrate pests on active regeneration. These inspections are used to schedule vertebrate pest management in rehabilitation and biodiversity offset areas (typically bi-annually). Kangaroo management activities are completed in consultation with NPWS.

As part of the ongoing monitoring program, if a restricted level of barbed wire on fencing is shown to fail to exclude stock from sensitive areas, additional measures that pose minimal impact to native fauna will be investigated and implemented.

Table 3-4 outlines the performance and completion criteria for managing stock grazing across all LCO BOAs.

Table 3-4 Grazing Management Performance and Completion Criteria

Relevant Offset Area	Action	Performance Criteria			Completion Criteria
		Year 4	Year 5	Year 6	
All biodiversity offsets	All stock to be removed from biodiversity offset areas.	No stock grazing unless required based on monitoring results.	No stock grazing unless required based on monitoring results.	No stock grazing unless required based on monitoring results.	Grazing has not occurred in biodiversity offset areas unless determined as needed by monitoring results.
All biodiversity offsets	Minimum bi-monthly inspections to determine presence of rogue stock and assess condition of fences.	To be completed bi-monthly.	To be completed bi-monthly.	To be completed bi-monthly.	Completion of Stock Inspection Reports.
All biodiversity offsets	Remove reported rogue stock and repair damaged fences.	Action and remove reported rogue stock and repair damaged fences.	Action and remove reported rogue stock and repair damaged fences.	Action and remove reported rogue stock and repair damaged fences.	No rogue stock in biodiversity offset areas and fences in functional condition.

3.5 Track Maintenance

Where feasible, access to work areas will be confined to existing tracks. Prior to the construction of new access tracks / roads within the BOAs (including any works requiring additional ground disturbance), due diligence ecological inspections will be undertaken by a suitably qualified ecologist to search for threatened flora species, endangered populations and important habitat

for threatened fauna species, such as hollow-bearing trees and dams. Any ground disturbance will be carried out under the Ground Disturbance Permit process. Should these be identified, LCO will implement measures to minimise impacts on these features, including the redesign of the layout of access tracks/roads. The measures to be undertaken to minimise impacts on these features include:

- designing the access tracks for the minimisation of environmental impacts including:
 - minimising the length and width of the track;
- undertaking pre-clearance surveys (through the GDP process) in the proposed areas for track construction to determine constraints and avoidance options;
- where clearance of habitat trees is required, undertaking clearing activities in accordance with site procedures including the LCO Tree Felling and Topsoil Stripping Procedure; and
- topsoil stripped for the construction and maintenance of tracks will be stockpiled onsite for reuse (such as in rehabilitation areas).

In accordance with the *Rural Fires Act 1997*, in the event of a declared bushfire emergency, all efforts will be made to reduce and/or eliminate the fire hazard/risk. This may include the construction of emergency access tracks/roads to enable fire fighting personnel access to the fire front and/or the construction of fire breaks without undertaking a due diligence assessment prior to clearing activities.

Erosion and sediment control structures as outlined in Section 3.13 will, where necessary, be established in conjunction with any tracks constructed through the BOAs. Construction of erosion and sediment control structures will also be considered in the maintenance of access tracks.

The condition of tracks will be assessed during biannual (twice yearly) inspections, with maintenance works undertaken as necessary.

Table 3-5 outlines the performance and completion criteria for managing track maintenance across all LCO BOAs.

Table 3-5 Track Maintenance Performance and Completion Criteria

Relevant Offset Area	Action	Performance Criteria			Completion Criteria
		Year 4	Year 5	Year 6	
All biodiversity offset areas	New access tracks (only where necessary) are subject to due diligence assessments.	Complete due diligence assessments for new access tracks to minimise impact on biodiversity, where possible.	Complete due diligence assessments for new access tracks to minimise impact on biodiversity, where possible.	Complete due diligence assessments for new access tracks to minimise impact on biodiversity, where possible.	New access tracks are only constructed where necessary, and are subject to due diligence inspections
All biodiversity offset areas	Minimum twice yearly (nominally in March and September) inspections to identify track conditions.	Inspections undertaken nominally in March and September. Action and repair track damage.	Inspections undertaken nominally in March and September. Action and repair track damage.	Inspections undertaken nominally in March and September. Action and repair track damage.	Tracks maintained in good usable condition.

All biodiversity offset areas	Rehabilitation of unnecessary access tracks.	Tracks no longer required will be rehabilitated.	Tracks no longer required will be rehabilitated.	Tracks no longer required will be rehabilitated.	Unnecessary access tracks are rehabilitated.
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3.6 Pest Management

LCO will complete pest management activities across the LCO BOAs, with a particular focus on the Bowmans Creek Riparian Corridor. This area is more heavily disturbed than the Mountain Block and Mitchell Hills Offset Areas.

Known pest species from these areas are provided in Table 2-5. These species may impact on native fauna species through predation and competition for resources such as food, shelter, and breeding sites.

Foxes, feral cats and wild dogs represent a substantial threat to the ongoing persistence of the spotted-tailed quoll in the BOAs, as well as the broader Foy Brook area. Targeted and intensive control of such predators will be a key factor in mitigating current impacts on this species in the local area.

LCO currently implements feral animal control measures, including a combination of targeted shooting, trapping and baiting practices. Remote cameras are also used to collect information on presence/abundance of these species. These measures are generally implemented on a reactive basis, when monitoring or opportunistic sightings identify species requiring control.

Currently, baiting practices involve 1080 baits buried in mounds as well as free baiting (non-poisoned baits) in areas around known spotted-tailed quoll habitat. Bait mounds in areas of potential spotted-tailed quoll habitat are monitored by remote cameras to gather data on which species are accessing and taking the baits. This assists in gathering data on potential impacts to non-target species such as the spotted-tailed quoll. Thus far, this process has recorded spotted-tailed quolls investigating bait mounds on at least four occasions, however not taking any baits. The cameras also assist in attributing the tracks and digging signs at the mounds to particular species.

These measures serve to control most feral animal species relevant to general area, particularly foxes, feral dogs, feral cats, rabbits and pigs. The current frequency of these measures is responsive to monitoring results, opportunistic sightings and abundance.

LCO commit to completion of inspections for signs of feral animals in the Bowmans Creek Riparian Corridor every two months. Being less associated with human activities and having more intact vegetation, inspections of the Mitchell Hills South and Mountain Block offset areas will occur every four months. The implementation of control methods will be defined from the outcomes of these inspections, including target species, timing, duration and the most appropriate methods to be employed. The outcomes of these inspections will feed into the ongoing review and response process.

The feral animal control measures used are tailored based on the outcomes of this data. New feral animal control measures (particularly baiting techniques) are regularly considered, however will be included in the feral animal inspections every two months.

Current practices for the management of these species will be reconsidered with a specific focus on the protection of the spotted-tailed quoll population in this area. Particular focus will be paid to adopting feral animal control measures (particularly foxes and wild dogs) that have minimal direct or indirect impact on this species.

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Regular monitoring of revegetation and regeneration areas will be undertaken to determine the impact of feral animals, particularly on vegetation establishment. Feral animal control works will be undertaken periodically to ensure the suppression of feral animals, and will consider ecological impacts.

Vertebrate pest control will use best practice methods, and include follow-up monitoring and control as required. If monitoring shows a substantial increase in the density of any known feral fauna species or the occurrence of a previously unrecorded feral fauna species is discovered, LCO will seek expert advice on appropriate management and control options.

Table 3-6 outlines the performance and completion criteria for managing pest species across all LCO BOAs.

Table 3-6 Pest Management Performance and Completion Criteria

Relevant Offset Area	Action	Performance Criteria			Completion Criteria
		Year 4	Year 5	Year 6	
All biodiversity offset areas	Complete feral animal inspections of biodiversity offset areas every two months to document sighting and abundance records. This will then inform ongoing control actions (as needed), including timing, frequency, target species and methods to be used.	Inspections completed every two months, followed by implementation of required control methods, as required.	Inspections completed every two months, followed by implementation of required control methods, as required.	Inspections completed every two months, followed by implementation of required control methods, as required.	Biodiversity offset areas are inspected for feral animal diversity and abundance every two months. Control measures are implemented in response to outcomes of the inspections. Measures are being taken to control feral animals in the biodiversity offset areas.
All biodiversity offset areas	Develop and implement an annual pest animal action plan.	Develop and implement pest animal action plan. Stable or downward trend in population size recorded.	Develop and implement pest animal action plan. Stable or downward trend in population size recorded.	Develop and implement pest animal action plan. Stable or downward trend in population size recorded.	Strategies from action plans are implemented and targets are achieved. Stable or downward trend in population size recorded.

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Relevant Offset Area	Action	Performance Criteria			Completion Criteria
		Year 4	Year 5	Year 6	
All biodiversity offset areas	Particular action is paid to managing foxes, feral cats, feral dogs and pigs in order to protect the spotted-tailed quoll population in this area.	Implementation of favoured fox, feral cat, feral dog and pig control measures.	Implementation of favoured fox, feral cat, feral dog and pig control measures.	Implementation of favoured fox, feral cat, feral dog and pig control measures.	Monitoring demonstrates that fox, feral cat, feral dog and pig control methods are being effective in managing target species.
All biodiversity offset areas	Presence of pest animals	As evidenced by monitoring, pest animal presence in revegetation/rehabilitation areas does not pose a risk to establishment of vegetation.	As evidenced by monitoring, pest animal presence in revegetation/rehabilitation areas does not pose a risk to establishment of vegetation.	As evidenced by monitoring, pest animal presence in revegetation/rehabilitation areas does not pose a risk to establishment of vegetation.	Feral fauna diversity of revegetation/rehabilitation areas is commensurate with remnant vegetation
All biodiversity offset areas	Develop a vertebrate pest control register to document when and where each control method is implemented.	Update and maintain vertebrate pest control register.	Update and maintain vertebrate pest control register.	Update and maintain vertebrate pest control register.	Pest animal control register is maintained and up to date.

3.7 Weed Management

The presence of weed species has the potential to be a major hindrance to rehabilitation and regeneration activities and the potential to enhance edge effects on remnant vegetation within the BOAs. In addition to this, the presence of weed species has the potential to significantly decrease the value of vegetation to native species, particularly threatened species.

LCO commit to completion of weed inspections of the Bowmans Creek Riparian Corridor every two months to record the presence of noxious weed species. This area is known to contain the highest levels of weed infestations, requiring attention as part of the implementation of the BOMP. Inspections of Mitchell Hills South and Mountain Block offset areas will occur every four months as these areas are known to contain fewer weed species requiring management actions. The implementation of control methods will be defined from the outcomes of this inspection, including timing, duration and the most appropriate methods to be employed. The outcomes of this inspection will feed into the ongoing review and response process.

Weed control will be conducted in accordance with current LCO management practices, which require:

- regular site inspections to identify areas of weed infestation and type of weed species;
- for areas recently subjected to assisted regeneration works, site inspections should occur every quarter for the first two years and then triennially afterwards;
- for remnant vegetation site inspections should occur annually;
- development and implementation of a control plan applicable to the circumstances, which may include manual removal, spot spraying, boom spraying, aerial spraying or biological

control. These will be undertaken in target areas identified during site inspections and prioritise:

- treatment of entire infestations where possible;
- re-treatment of recurring infestations at regular intervals;
- annual monitoring of key weed infestations;
- annual monitoring for new infestations; and
- mapping of key weed infestations following monitoring to track progress and focus control activities where necessary;
- prompt rehabilitation of land post disturbance; and
- early establishment and maintenance of native species.

Vehicle movements have been identified as having particular potential to spread invasive weed species for which LCO implement the vehicle hygiene practices to manage. Vehicle hygiene practices include avoidance of vehicles or equipment trafficking on any vegetation. Where avoidance is not possible, the vegetation, works and potential for spread of weeds are assessed and appropriate controls, such as vehicle wash down, are implemented.

As part of ongoing task coordination, LCO will ensure that machinery movements throughout the BOAs do not prove a major source of weed spread or infestation. This issue will be considered as part of the existing ground disturbance permit and risk assessment processes and will ensure that this issue is regularly raised with staff.

In recognition of key species with particular potential to impact LCO and Greater Ravensworth sites, a number of strategies have been developed to target these undesired species including the Coolatai and African Lovegrass Strategy and Rhodes Grass Management Strategy.

If a substantial increase in the density of any known weed species or the occurrence of a previously unrecorded weed species is discovered, LCO will seek advice (from specialist consultants such as ecologists, agronomists, local land services etc. as appropriate) on the management and control options for that species and endeavour to minimise its impact on native flora and fauna. Where broad scale weed control has occurred, suitable native or pasture species will be sown to prevent weed regrowth.

Table 3-7 outlines the performance and completion criteria established for managing weeds across the LCO BOAs.

Table 3-7 Weed Management Performance and Completion Criteria

Relevant Offset Area	Action	Performance Criteria			Completion Criteria
		Year 4	Year 5	Year 6	
All BOA's	Complete weed inspections of every two months to document diversity and abundance of noxious weed records.	Inspections completed every two months, followed by implementation of required control methods, as required.	Inspections completed every two months, followed by implementation of required control methods, as required.	Inspections completed every two months, followed by implementation of required control methods, as required.	Weed densities in rehabilitation/regeneration areas are no worse than those in remnant vegetation (analogue) sites. There are no significant weed infestations that are identified as a risk to

Relevant Offset Area	Action	Performance Criteria			Completion Criteria
		Year 4	Year 5	Year 6	
					rehabilitation or regeneration areas. Regular inspections are undertaken for weed species inspections and outcomes are documented.

3.8 Revegetation Activities

A major focus of the BOMP is to return grasslands and disturbed lands to woodland vegetation. The broad objective is the replication of natural communities that are self-sustaining over the long term.

Three types of revegetation activities are used in the BOAs to achieve the objectives:

1. Natural regeneration
2. Assisted regeneration
3. Rehabilitation

The revegetation strategy used for each area is determined by the current condition and regenerative capacity of the areas to be returned to their benchmark communities. More disturbed areas require greater intervention. Each BOA uses a combination of at least two revegetation activities.

These works will serve to improve the current vegetated connectivity across each site, as well as to adjoining remnant vegetation in the local area. These works will also serve to increase existing fauna habitat in the area, with particular focus on the spotted-tailed quoll, however also providing increased habitat for a number of other threatened species as a result of increasing the amount of eucalypt-dominated woodlands.

A series of completion criteria have been developed for revegetation areas based on LCO monitoring data for remnant sites, which has been used as the revegetation benchmark. The local data provides a realistic expectation for recovered vegetation areas in the local area, in comparison to BioNet Vegetation Classification Plant Community Type (PCT) data (OEH 2018). The remnant monitoring dataset was collected over several years including different climate variations and will ensure that the revegetated areas reflect the biodiversity values of their remnant counterparts. The completion criteria are provided in Table 3-8.

The criteria generally follow the categories provided for the current BioNet Vegetation Classification Benchmarks. Areas which have been rehabilitated should aim to be within 50 percent compatibility of their relevant PCT benchmarks. PCT Benchmark vegetation is determined to be 100 percent representative of the relevant community types. Offset areas are scored using the BAM methodology in section 4.3.2. The nominal 50 percent compatibility is subject to revision succeeding the implementation of BAM monitoring methodology. Areas which are revegetated and regenerated should consider both PCT benchmarks as well as the use of more appropriate local data (MALD).

Table 3-8 PCT Completion Criteria for Revegetated Areas

Item	Values ¹		
	PCT 1691	PCT 1602	PCT 485
Benchmark Data			
Native Tree Richness ¹	5	5	4
Native Shrub Richness ¹	8	12	10
Grass and Grass-like Richness ¹	12	11	8
Forb Richness ¹	15	11	9
Fern Richness ¹	2	2	2
Other Richness ¹	5	5	4
Tree Cover (PFC) ¹	52	60	36
Shrub Cover (PFC) ¹	18	37	10
Grass and Grass-like Cover (PFC) ¹	61	68	37
Forb Cover (PFC) ¹	10	9	6
Fern Cover (PFC) ¹	1	1	1
Other Cover (PFC) ¹	5	5	1
Total Length Fallen Logs ¹	40	45	36
Litter Cover ¹	35	70	24
MALD			
Native Flora Species Richness ²	8 to 35	7 to 39	9 to 25
Introduced Species Richness ²	5 to 26	3 to 19	11 to 31
Native Overstorey (% Cover) ²	7.7 to 25	4.5 to 22	7 to 38.5
Native Mid Storey (>1m to <overstorey) (%) ²	0 to 13	0 to 12	0 to 1
Native Grass Cover (%) ²	2 to 68	16 to 66	0 to 66
Native Shrub Cover (%) ²	0 to 6	0 to 12	0 to 2
Native Other Cover (%) ²	2 to 22	10 to 36	0 to 10

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Item	Values ¹		
	PCT 1691	PCT 1602	PCT 485
Exotic Plant Cover (%) ²	0 to 86	0 to 52	70 to 88
Bare Ground/Rock (%) ²	1 to 86	5 to 24	0 to 12
Percentage of overstorey regenerating ²	100	100%	1 to 100
Number of hollow-bearing trees ²	0 to 7	0 to 2	2 to 4
For All Areas			
Indicative* Species present in canopy ³	Narrow-leaved ironbark (<i>Eucalyptus crebra</i>) and/or grey box (<i>Eucalyptus moluccana</i>) and/or rough-barked apple (<i>Angophora floribunda</i>)	Spotted gum (<i>Corymbia maculata</i>) and/or narrow-leaved ironbark (<i>Eucalyptus crebra</i>)	River oak (<i>Casuarina cunninghamiana</i>)
Indicative* species present in midstorey ³	Bulloak (<i>Allocasuarina luehmannii</i>)	Coffee bush (<i>Breynia oblongifolia</i>) Violet nightshade (<i>Solanum brownii</i>)	-
Indicative* species present in groundcover ³	Rock fern (<i>Cheilanthes sieberi</i>) <i>Lomandra filiformis</i> Speargrass (<i>Austrostipa scabra</i>) Barbed wire grass (<i>Cymbopogon refractus</i>) Couch (<i>Cynodon dactylon</i>) Blue trumpet (<i>Brunoniella australis</i>) Yellow-burr daisy (<i>Calotis lappulaceae</i>) Kidney weed (<i>Dichondra repens</i>) Amulla (<i>Eremophila debilis</i>)	Barbed wire grass (<i>Cymbopogon refractus</i>) Tussock grass (<i>Poa labillardierei</i> var. <i>labillardieri</i>) Kidney weed (<i>Dichondra repens</i>) Twining glycine (<i>Glycine clandestina</i>) Whiteroot (<i>Pratia purpurascens</i>) Maori bedstraw (<i>Galium propinquum</i>)	Slender bamboo grass (<i>Austrostipa verticillata</i>) Couch (<i>Cynodon dactylon</i>) Weeping grass (<i>Microlaena stipoides</i>) Stinging nettle (<i>Urtica incisa</i>) Swamp dock (<i>Rumex brownii</i>)
Soil stability	The soil is stable with no significant erosion concerns.		

Item	Values ¹		
	PCT 1691	PCT 1602	PCT 485
Weed Species	Weed species do not dominate any vegetation stratum.		
	There are no significant weed infestations that are identified as a risk to rehabilitation / regeneration.		
Tree Health	More than 75 % of trees are healthy and growing as indicated by long term monitoring		
Recruitment	Monitoring demonstrates second generation trees are present.		
Vegetation structure	Regeneration/ rehabilitation areas support a vegetation structure similar to that recorded for reference sites (i.e. distinct canopy, midstorey and groundcover layer)		
Native fauna presence	Rehabilitation monitoring confirms target native fauna species are recorded utilising habitats.		
Woodland Establishment	Survey confirms that 263.83 ha of woodland has been established		

Note:

PCT 1691- Narrow-leaved Ironbark – Grey Box Grassy Woodland of the Central and Upper Hunter

PCT 1602 – Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the central and lower Hunter

PCT 485 – River Oak riparian grassy tall woodland of the western Hunter Valley

¹ Ranges determined using benchmarks from VIS PCTs

² Whether completion criteria is met is to be determined using plot-based data BAM data

³ Whether completion criteria is met is can be determined over a larger area than a 20 m by 20 m plot

* species were considered indicators if they occurred in more than half of the remnant monitoring sites.

The above PCT completion criteria can be refined after the completion of this three year BOMP term to reflect ongoing monitoring data as required.

As interim performance criteria, monitoring undertaken at regeneration / revegetation / rehabilitation areas should be showing data trending towards the range of attributes of remnant reference sites.

3.8.1 Natural Regeneration

Natural regeneration will be used in some areas of the Mitchell Hills South and Mountain Block BOAs in order to return existing grassland and disturbed areas to their benchmark communities. This will relate to approximately 14.4 ha within Mitchell Hills South and 102.2 ha within Mountain Block.

The key actions proposed to facilitate natural regeneration are:

- weed control and pest management (more intensive management may be required in assisted natural regeneration areas until a stable and resilient ecosystem is established); and
- removal of all stock grazing activities.

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The current grassland areas within the BOAs have a high natural recovery potential and therefore assisted regeneration will be facilitated only where natural regeneration is deemed (through monitoring) to require assistance.

Areas of grassland and disturbance will be managed back to woodland consistent with the surrounding vegetation. Table 3-9 provides the anticipated outcomes of the regeneration activities in these BOAs.

Table 3-9 Target Passive Regeneration Communities

Vegetation Community	BC Act	EPBC Act	Mountain (ha)	Block	Mitchell South (ha)	Hills
Narrow-leaved Ironbark Spotted Gum Woodland	EEC	Possibly CEEC - Central Hunter Valley Eucalypt Forest and Woodland	+42.55		0	
Narrow-leaved Ironbark - Bullock Open Forest	EEC	Some components will possibly comprise CEEC - Central Hunter Valley Eucalypt Forest and Woodland	+59.61		0	
Narrow-leaved Ironbark Spotted Gum Woodland DNG	-	Some components will comprise CEEC - Central Hunter Valley Eucalypt Forest and Woodland	-37.57		0	
Narrow-leaved Ironbark - Bullock Open Forest DNG	-	Some components will possibly comprise CEEC - Central Hunter Valley Eucalypt Forest and Woodland	-56.87		0	
Rusty Fig Dray Rainforest/Grey Myrtle - Kangaroo Vine Dry Rainforest	-	-	-0.98		0	
Disturbed Land	-	-	-6.76		0	
Spotted Gum Forest	-	-	0		+14.36	
Derived Grassland	-	-	0		-9.78	
Exotic Grassland	-	-	0		-0.73	
Regrowth	-	-	0		-3.89	

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Note: All values have been rounded up to the nearest two decimal places. All values subject to minor mapping/GIS-based variation.

The existing mapping of the current extent of grassland and disturbed areas targeted for regeneration has been refined to assist in tracking the progress of the regeneration and to confirm the proposed target benchmark communities are appropriate and achievable.

In the event that monitoring results reveal that these actions alone are not resulting in the performance indicators and completion criteria being met (or trending towards being met), corrective actions will be imposed and implemented. Corrective actions are likely to involve assisted regeneration strategies as described in the following section.

Table 3-10 outlines the performance and completion criteria for natural regeneration across the LCO BOAs.

Table 3-10 Natural Regeneration Performance and Completion Criteria

Relevant Offset Area	Action	Performance Criteria			Completion Criteria
		Year 4	Year 5	Year 6	
Mountain Block and Mitchell Hills South	Mapping of areas naturally regenerating and subject to revegetation works to track if natural/assisted regeneration is on track to meet final hectare goals.	Revised ongoing monitoring works, as needed.	in as Revised ongoing monitoring works, as needed.	in as Revised ongoing monitoring works, as needed.	Accurate mapping of regeneration areas.
Mountain Block and Mitchell Hills South	Management of regeneration progress is responsive to monitoring outcomes.	Monitoring of regeneration areas.	Monitoring of regeneration areas.	Monitoring of regeneration areas.	Monitoring results are used to inform ongoing regeneration planning, including implementation of assisted regeneration if natural regeneration is not progressing sufficiently.

3.8.2 Assisted Regeneration

Where resilience is depleted or absent, assisted regeneration methods will be employed, in addition to natural regeneration, to facilitate the return of woodland communities to the grassland and disturbed areas. The need for assisted regeneration has been assessed after three years from the commencement of the BOMP implementation, drawing on results from monitoring and inspections. Annual monitoring of the offset areas has noted that drought conditions during year 2 and 3 have impacted the natural regeneration capacity of the BOAs due to lower than average rainfall and dry conditions.

Assisted regeneration methods to supplement species diversity in strata that are lacking biodiversity value may include:

- introducing tree, shrub and groundcover species by
- tubestock planting
- brush matting or
- direct seeding.
- thinning of excessively dense pioneer species such as *Acacia* sp. to allow a greater diversity of species to colonise

The selection of plant species used in the assisted regeneration strategy is vital to the process of creating a vegetation community that is consistent both structurally and floristically with the target benchmark communities. Selection of plant species used in revegetation activities should draw on the floristic results of monitoring in reference sites, in consultation with a qualified and experienced consultant.

Table 3-11 outlines the performance and completion criteria for managing assisted regeneration across the Mountain Block and Mitchell Hills South BOAs.

A list of recommended species for planting is provided in **Appendix C**.

Table 3-11 Assisted Regeneration Performance and Completion Criteria

Relevant Offset Area	Action	Performance Criteria			Completion Criteria
		Year 4	Year 5	Year 6	
Mountain Block and Mitchell Hills South	Review need for assisted regeneration where outcomes of natural regeneration is deemed lacking.	Assess progress/outcomes of natural regeneration and assess and implement assisted regeneration measures as required.	Assess progress/outcomes of natural regeneration and assess and implement assisted regeneration measures as required.	Assess progress/outcomes of natural regeneration and assess and implement assisted regeneration measures as required.	Assisted regeneration is implemented if natural regeneration is deemed lacking.

3.8.3 Rehabilitation Works

Due to its current high levels of weeds and other forms of disturbance, the Bowmans Creek Riparian Corridor and disturbed areas in the north of Mountain Block will require higher levels of effort to return the benchmark vegetation communities.

Rehabilitation activities in Bowmans Creek Riparian Corridor will target the establishment of a riparian strip that is predominantly consistent with **Figure 2-5**, **Figure 2-6** and **Figure 2-7**.

Due to the various previous land uses of this area and their associated land management requirements, the Bowmans Creek Riparian Corridor is split into three management zones (see Figure 2-5).

Rehabilitation works in all of the management zones for this corridor has been planned in detail, and updated based on on-going monitoring results. The rehabilitation works commenced in 2017. The works will also assist in preventing bank erosion along Bowmans Creek.

Zone 1 has been subjected to rehabilitation works (preparation, weeding and planting) in Year 2 and Year 3 of the operation of the BOMP. Zone 3 also commenced rehabilitation works in Year 2.

Works within Zone 2 will follow the completion of initial preparation and planting works in Zones 1 and 3.

Rehabilitation works will include a mixture of:

- earthworks,
- weed control and
- tree plantings adjacent to the creek line
- stabilisation.

The details of the required works will be developed in consideration of the following principles:

- all planting or seeding within rehabilitation areas will be designed with structural and floristic diversity suitable to meet the benchmark vegetation community targets;
- where practicable, rehabilitation will involve the use of local provenance seed that will either be utilised for direct seeding or for the propagation of tubestock for planting;
- rehabilitation areas will be subject to a formal care and maintenance program that will be developed to include the control of weeds, replacement of failed plantings, bushfire management etc.;
- rehabilitation areas will be subject to formal monitoring program (success/failure, as well as floristic monitoring) that will be developed to include a feedback loop to achieve continual improvement in the methodology and results.

Table 3-12 shows the rehabilitation targets for the Bowmans Creek Riparian Corridor. The program will be continually reviewed with the aim of achieving an effective, sustainable rehabilitation outcome. These indicative areas may therefore change as an outcome of this detailed rehabilitation program. These are depicted in Figure 3.1.

Table 3-12 Bowmans Creek Riparian Corridor Rehabilitation Targets

Vegetation Community	BC Act	EPBC Act	Bowmans Creek Riparian Corridor (ha)
Central Hunter Box – Ironbark Woodland	EEC	CEEC - Central Hunter Valley Eucalypt Forest and Woodland	+139.31
Narrow-leaved Ironbark Spotted Gum Woodland	EEC	CEEC - Central Hunter Valley Eucalypt Forest and Woodland	+9.26
Hunter Valley River Oak Forest	-	-	+2.04

Note: All values have been rounded up to the nearest two decimal places. All values subject to minor mapping/GIS-based variation.

Within each target vegetation community, the density of plantings will be varied to create a variegated landscape to increase the value of rehabilitation for local fauna species. The range of densities for each vegetation community will remain within the documented natural variation levels of each vegetation community.

In addition to detailed works within the Bowmans Creek Riparian Corridor, there are areas within the northern section of the Mountain Block Offset Area which require rehabilitation works. These are generally located where the offset area interfaces with previous mine rehabilitation works (historical Mountain Block Mining Area) and areas of final landform instability have been

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identified. Therefore, in order to achieve a self-sustaining final landform and to meet the objectives of the offset area, minor vegetation clearing, earthworks, reshaping and stabilisation of steep slope areas will be required and will be likely to encroach into a small part of the Mountain Block Offset Area along this interface.

Areas subject to rehabilitation or assisted regeneration will be monitored on an annual basis. This monitoring will occur where seeding and/or planting occurs and will focus on the initial germination and establishment of seedlings, particularly in terms of survival, species diversity and abundance. This annual monitoring will also assess rehabilitation/active regeneration areas to identify early signs of other issues requiring management (such as weeds, pests and erosion). This frequency will be assessed at each review of the BOMP, and modified as appropriate.

Table 3-13 outlines the performance and completion criteria for managing rehabilitation that is specific to the Bowmans Creek Riparian Corridor and Mountain Block BOAs. Detailed completion criteria for rehabilitation areas are provided within the Mining Operations Plan 2018 – 2020 (MOP) ([LIDOC-90533967-5095](#)).

Table 3-13 Rehabilitation Works Performance and Completion Criteria

Relevant Offset Area	Action	Performance Criteria			Completion Criteria
		Year 4	Year 5	Year 6	
Mountain Block	Modification 7 Area transferred back under BOMP management	-	-	If remediation and revegetation has been completed, the Modification 7 Area transferred back under management of the BOMP.	Modification 7 Area is under control of the BOMP.
Bowmans Creek Riparian Corridor Mountain Block Offset Area	Develop detailed performance criteria for all management zone types.			Refine criteria developed based on annual monitoring of analogue sites if necessary.	Criteria developed
Bowmans Creek Riparian Corridor Mountain Block Offset Area	Implement rehabilitation/revegetation program.	Implementation of plan.	Implementation of plan.	Implementation of plan.	Rehabilitation and revegetation plan implemented.
Bowmans Creek Riparian Corridor	Positive feedback loop from monitoring results.	Feedback from monitoring is incorporated into ongoing review and improvement of plan.	Feedback from monitoring is incorporated into ongoing review and improvement of plan.	Feedback from monitoring is incorporated into ongoing review and improvement of plan.	Monitoring outcomes considered in continual review and improvement of plan.

3.9 Habitat Augmentation

Habitat enhancement works will be completed in order to increase habitat complexity for threatened fauna species, particularly the spotted-tailed quoll.

Activities include:

- installation of nest boxes
- habitat feature salvage
- spotted-tailed quoll habitat enhancement

The habitat augmentation activities have their own completion criteria.

These works are current planned primarily within Bowmans Creek Corridor as this area currently has reduced habitat value, as a result of its previous land uses and proximity to mining activities.

The current condition and habitat value of Mountain Block and Mitchell Hills South Offset Areas are much higher as these areas have been subject to much less disturbance and contain better quality and more diverse vegetation communities. These latter areas will be subject to habitat enhancement works if monitoring identifies a dearth of key habitat features

Habitat augmentation will be undertaken within the rehabilitation and regeneration areas (once of appropriate age), and within any areas of existing vegetation deemed lacking in critical habitat features. The aim of augmenting habitat within these areas is to increase the specific habitat features required by target threatened species and their prey (as necessary), thereby improving the quality of the habitat so it is able to support greater numbers of those species.

Specific habitat features are those that can be a limiting factor to population thresholds, and can include hollows, log/boulder piles, complex ground strata and specific foraging resources. Such features will be installed relative to the density within the remnant woodland areas. It is noted that the known spotted-tailed quoll breeding den located along Bowmans Creek is within one such constructed timber pile.

Native vegetation communities generated through revegetation activities are also likely to provide suitable habitat once of a suitable age.

3.9.1 Nest Boxes

Hollow-bearing trees are critical to the survival of several threatened species known to occur in the LCO area. The availability of suitable hollows within a landscape is a recognised limiting factor to the survival of hollow-dependent species. In particular, the loss of suitable hollows is a major factor contributing to the listing of many threatened species under the State and Commonwealth threatened species legislation.

To address the loss of hollows from onsite clearing activities, the following will be undertaken:

- accurate recording of hollows lost (including size ranges) during the pre-clearing process;
- staged mitigation of hollow loss by placing nest boxes (with characteristics informed by the pre-clearance process) in secure vegetation of the surrounding BOAs ; and
- placement of nest boxes within the regeneration and rehabilitation sections of the BOAs.

Nest boxes will be placed into rehabilitation and regeneration areas once they reach suitable maturity and where natural hollow or nesting structures are deemed lacking. Alternatively, nest boxes can be fixed to poles to expedite the return of hollow-dependent species to these areas. A range of hollow sizes and classes will be provided, thus increasing the quality of habitat for target

threatened species. The number and types of nest boxes to be established in the BOAs will be determined through monitoring and comparison to benchmark communities. Each tree hollow suitable for use by fauna species that is removed for mining will be replaced with a nest box in rehabilitation areas. Nest boxes will be regularly monitored and maintained to monitor usage by hollow-dependent species and their condition.

The timing of the nest box installation works will be progressive, based on staged clearing works within the approved modification area. This staged approach will safeguard the nest box program as being informed by the pre-clearing process, ensuring comparable number and sizes of nest boxes are installed in the BOAs and rehabilitation areas. Replacement of hollows lost (with nest boxes) will occur within six months of each discrete clearing event, to ensure that seasonal breeding opportunities are not lost.

3.9.2 Habitat Feature Salvage

The salvage and relocation of hollow logs, fallen timber and boulders will be undertaken to augment habitat complexity.

Habitat features such as boulders, hollow logs and hollow-bearing trees will be identified during pre-clearing surveys, and salvaged as part of the clearing process, where suitable and feasible to do so. Salvaged features will then be stockpiled for use in regeneration/rehabilitated areas to increase habitat value and complexity, thus making them more suitable for native fauna colonisation (particularly that of threatened species).

Habitat augmentation will focus on the provision of specific habitat features for key threatened species which require specific habitat features (other than tree hollows) to provide adequate foraging, roosting or breeding habitat. Examples of specific habitat features include, but are not limited to:

- hollow logs, fallen timber and boulders to provide shelter and foraging habitat which may be used by the spotted-tailed quoll for denning and latrines; and
- fallen timber and stumps to provide perch sites which may be used by the hooded robin (*Melanodryas cucullata cucullata*) and brown tree creeper (*Climacteris picumnus victoriae*).

When habitat features are being relocated, care should be taken not to damage the native vegetation at the location it is being relocated to.

The salvage process will be an ongoing one (as with nest box installation), as it relies on the progress of the clearing within the approved modification area. In a similar manner, the deployment of stockpiled habitat features will be dependent on the progress of rehabilitation/regeneration works. This will be completed progressively, once rehabilitation/regeneration works are completed within discrete areas.

3.9.3 Spotted-tailed Quoll Habitat Enhancement

Given the known presence of a spotted-tailed quoll population, the following habitat enhancement measures will be undertaken that are specific to assisting the persistence of this species in the Bowmans Creek Riparian Corridor, and broader local area:

- salvage of hollow-bearing trees (and non-hollow bearing trees if sufficient resources are lacking), hollow logs and stumps felled during construction works and placement as log piles within areas of regeneration and rehabilitation (particularly along drainage lines). This will increase the amount of potential foraging and denning habitat for this species throughout the BOAs. It is notable that the current breeding den is located in such a log pile;
- salvage and placement of large rocks and boulders into piles as further potential denning habitat; and

- installation of antechinus nest boxes within the Bowmans Creek Riparian Corridor to support prey for spotted-tailed quolls populations.

3.9.4 Completion Criteria

Table 3-14 outlines the performance and completion criteria for managing habitat augmentation across the LCO BOAs.

Table 3-14 Habitat Augmentation Performance and Completion Criteria

Relevant Offset Area	Action	Performance Criteria			Completion Criteria
		Year 4	Year 5	Year 6	
Bowmans Creek Riparian Corridor	Salvage of habitat features (particularly for the spotted-tailed quoll) such as hollow-bearing trees, logs, stumps, large rocks and boulders.	Suitable habitat features identified during the pre-clearing process are salvaged. Salvaged features are either re-instated into areas with low levels of habitat features or stockpiled appropriately for later use. Timber or boulder piles will be constructed in riparian areas and areas of regeneration, revegetation and/or rehabilitation (as appropriate) to provide potential quoll denning habitat.	Suitable habitat features identified during the pre-clearing process are salvaged. Salvaged features are either re-instated into areas with low levels of habitat features or stockpiled appropriately for later use. Timber or boulder piles will be constructed in riparian areas and areas of regeneration, revegetation and/or rehabilitation (as appropriate) to provide potential quoll denning habitat.	Suitable habitat features identified during the pre-clearing process are salvaged. Salvaged features are either re-instated into areas with low levels of habitat features or stockpiled appropriately for later use. Timber or boulder piles will be constructed in riparian areas and areas of regeneration, revegetation and/or rehabilitation (as appropriate) to provide potential quoll denning habitat.	Appropriate habitat features have been salvaged. Salvaged habitat features are re-instated into areas of remnant vegetation lacking in habitat features or into rehabilitated vegetation. Appropriate spotted-tailed quoll habitat has been salvaged and placed into onsite rehabilitation areas. Habitat features that have been salvaged and are yet to be re-instated are in appropriate storage. Appropriate documentation is available of any habitat features salvaged.
Bowmans Creek Riparian Corridor, Mitchell Hills and Mountain Block	Nest boxes present to improve habitat value for native fauna.	Established nest boxes are subject to regular monitoring as identified in Section 4.3.8	Established nest boxes are subject to regular monitoring as identified in Section 4.3.8	Established nest boxes are subject to regular monitoring as identified in Section 4.3.8	Nest boxes are monitored and maintained.

Relevant Offset Area	Action	Performance Criteria			Completion Criteria
		Year 4	Year 5	Year 6	
		and maintenance.	and maintenance.	and maintenance.	
All biodiversity offset areas	Habitat and hollow augmentation will occur in Mountain Block and Mitchell Hills South offset areas if monitoring identifies a dearth of key habitat features such as log piles or boulder piles.	Habitat augmentation, if required.	Habitat augmentation, if required.	Habitat augmentation, if required.	All biodiversity offset areas have suitable levels of key habitat features, when compared (through monitoring) to remnant vegetation features.

3.10 Translocation Works

The only threatened flora species recorded within the Approved Modification Area is the tiger orchid (*Cymbidium canaliculatum*). This species is listed as an endangered population in the Hunter catchment. A single tiger orchid has been recorded within the Approved Modification Area. This individual has been translocated into the secure Mountain Block BOA. Any other tiger orchids identified during the pre-clearing process are also translocated into secure BOAs in accordance with the LCO Salvage and Translocation Procedure.

The detailed salvage and translocation procedure has been developed from similar works occurring for this species elsewhere in the Hunter Valley, and from continued feedback and improvement recommendations. It has also considered the procedures and recommendations within Guidelines for the Translocation of Threatened Plants in Australia (Vallee et al., 2004). This is provided in detail within the BMP (LCO 2017), including selection criteria for the recipient site, the salvage and translocation process and monitoring requirements for translocated individuals. As such, the BMP should be referred to for detail in all related tasks.

No other threatened flora species are anticipated to occur at LCO, however in the event that they are identified during the pre-clearing procedure, LCO will liaise with suitably qualified personnel regarding appropriate strategies for their salvage/translocation or propagation.

Table 3-15 outlines the performance and completion criteria for managing translocation of tiger orchids or other threatened species across the LCO BOAs.

Table 3-15 Translocation Performance and Completion Criteria

Relevant Offset Area	Action	Performance Criteria			Completion Criteria
		Year 4	Year 5	Year 6	
All biodiversity offset areas	Translocation of tiger orchids or other	Tiger orchids are salvaged and	Tiger orchids are salvaged and translocated	Tiger orchids are salvaged and translocated	Tiger orchids (or other threatened flora species if

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	threatened flora species (if encountered during pre-clearing process) to biodiversity offset areas. Methods to be adopted are detailed within the Biodiversity Management Plan.	translocated according to the process in the BMP as needed.	according to the process in the BMP as needed.	according to the process in the BMP as needed.	encountered) are salvaged and translocated into biodiversity offset areas in accordance with the Biodiversity Management Plan.
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3.11 Creek and Drainage Line Protection

Creek line protection and rehabilitation works will be undertaken within the Bowmans Creek Riparian Corridor. Works that will be undertaken within the Bowmans Creek Riparian Corridor will include:

- fencing to prevent access by humans and livestock;
- rehabilitation and revegetation works;
- bank stabilisation works on the LCO side of the creek as required (noting that parts of the eastern side of the creek are under private ownership);
- bushfire management; and
- regular monitoring for biodiversity management and erosion issues attributable to anthropogenic activity.

Each of these actions will ensure that the biodiversity and environmental values (including water quality) are protected and enhanced.

Drainage values will be protected by way of regular inspections for erosion and will identify areas requiring reparation works. Reparation works should include, but not necessarily be limited to native vegetation plantings. Any remediation of areas of erosion should be subject to follow-up monitoring inspections as well as follow-up remediation as necessary.

Table 3-16 outlines the performance and completion criteria for managing creek and drainage line protection across the Bowmans Creek Riparian Corridor BOA.

Table 3-16 Creek and Drainage Line Protection Performance and Completion Criteria

Relevant Offset Area	Action	Performance Criteria			Completion Criteria
		Year 4	Year 5	Year 6	
Bowmans Creek Riparian Corridor	Fencing/protection of LCO controlled side of riparian corridor.	Riparian corridor will be fenced from human and livestock access.	Riparian corridors will be fenced from human and livestock access.	Riparian corridors will be fenced from human and livestock access.	Riparian areas are adequately fenced/protected against damage from uncontrolled human or livestock access.

Relevant Offset Area	Action	Performance Criteria			Completion Criteria
		Year 4	Year 5	Year 6	
Bowmans Creek Riparian Corridor	Rehabilitation works to address stabilisation and erosion issues, as necessary.	Implementation, as needed.	Implementation, as needed.	Implementation, as needed.	Creek bank is stable and erosion issues are addressed.

3.12 Seed Collection

A seed collection and handling program aimed at maximising the viability and diversity of local seed in the revegetation mix will be implemented as part of the rehabilitation and regeneration program. Where able, revegetation will involve the use of local provenance seed that will either be utilised for direct seeding or for the propagation of tubestock for planting. However, where adverse seasonal conditions (i.e. drought) or other factors may affect the availability of local provenance seed (such as lack of remnant vegetation as a seed source), supplementation with non-local provenance seed may be required.

The existing woodland vegetation of the LCO BOAs will provide a valuable source of native seed. If assisted revegetation activities are required, this seed resource will be utilised where practical and without causing damage the vegetation of these biodiversity offset areas.

Seeds will be harvested by suitably qualified personnel and stored in accordance with the FloraBank (2013) guidelines. These include recommended practices for native seed collection, drying, extraction, leaning and storing native seed in order to maximise its longevity and viability for revegetation practices. Record keeping should include (as per FloraBank Guideline 4) as a minimum:

- identification;
- collection date;
- collector;
- species;
- collection voucher;
- plants sampled;
- population origins;
- site name;
- location name; and
- map reference/coordinates.

Table 3-17 outlines the performance and completion criteria for managing seed collection across the LCO BOAs.

Table 3-17 Seed Collection Performance and Completion Criteria

Relevant Offset Area	Action	Performance Criteria			Completion Criteria
		Year 4	Year 5	Year 6	
All biodiversity offset areas	Where suitable remnant	Pre-clearing surveys identify	Pre-clearing surveys identify	Pre-clearing surveys identify	Rehabilitation/revegetation works

	vegetation is available, implementation of seed collection and handling program for use in revegetation/rehabilitation works.	potential seed sources. Seeds are collected, stored and handled according to appropriate program. Collected seed resources are used in revegetation/rehabilitation works.	potential seed sources. Seeds are collected, stored and handled according to appropriate program. Collected seed resources are used in revegetation/rehabilitation works.	potential seed sources. Seeds are collected, stored and handled according to appropriate program. Collected seed resources are used in revegetation/rehabilitation works.	use seeds collected onsite, thus maintaining as much genetic similarity (local provenance) as possible.
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3.13 Erosion, Sedimentation and Salinity

LCO currently completes erosion and sediment control works in the BOAs in accordance with the LCO Erosion and Sediment Control Plan (LCO 2018, included with the LCO Water Management Plan). These works prevent loss of valuable topsoil and sedimentation of local waterways.

Owing to a high vegetation cover across most of the LCO BOAs, erosion is not currently a significant management issue. Inspections of any areas of erosion concerns should be included in routine inspection surveys, targeting riparian areas and sites with limited vegetation cover.

If an area of significant erosion concern is identified, appropriate short term erosion and sediment controls will be implemented and longer term stabilisation actions such as vegetation establishment will be investigated.

Erosion issues identified to date are located in the gullies of southern paddocks of Mountain Block. Due to the presence/potential presence of artefacts in gullies, earthworks are not proposed, in their place trials using hydromulch will be undertaken.

The rehabilitation/revegetation process has the potential to create erosion issues through the removal of ground covering vegetation and disturbing the soil profile. Minimising the area of exposed soil and ripping along contours will limit the amount of erosion in revegetation areas. All revegetation areas and watercourses will be monitored for evidence of erosion and corrective actions (e.g. remedial earthworks, groundcover planting, and soil amelioration) will be implemented where required.

Erosion and sediment mitigation will be put in place by LCO prior to any rehabilitation/revegetation works, construction activities (such as access tracks), as well as for any areas of identified erosion concern. Controls will be developed in accordance with relevant guidelines for erosion and sediment control, including:

- Managing Urban Stormwater: Soils and Construction (the Blue Book) Volume 1 (Landcom 2004); and
- Managing Urban Stormwater: Soils and Construction (the Blue Book) Volume 2E Mines and Quarries (Landcom 2008).

Measures to be put in place will include, but not necessarily be limited to:

- catch drains to capture run-off from disturbed areas and direct runoff into sediment dams;
- clean water diversion banks and drains;
- sediment dams; and
- silt fences, hay bales or other sediment control structures.

The following general erosion and sediment management measures will additionally be implemented:

- rehabilitated areas will be of appropriate slope and have appropriate drainage structures;
- disturbed areas will be stabilised by progressive rehabilitation as soon as practicable;
- construction of drainage controls such as table drains at roadsides will be undertaken;
- erosion and sediment controls that are not performing adequately will be repaired or redesigned.

The measures related to land rehabilitation are detailed further in the LCO Mining Operations Plan (LCO 2017).

Salinity has not been identified as an issue of concern within the LCO BOAs to date. Given that these sites have high vegetation cover it is not likely to become a management issue. However, any evidence suggesting the land is affected by salinity should be documented and the appropriate management and remediation strategies implemented.

Table 3-18 outlines the performance and completion criteria for managing erosion, sedimentation and salinity across the Mountain Block BOA.

Table 3-18 Erosion, Sedimentation and Salinity Performance and Completion Criteria

Relevant Offset Area	Action	Performance Criteria			Completion Criteria
		Year 4	Year 5	Year 6	
Mountain Block	Control erosion of southern paddocks in	Commence hydromulch trials of gullies in southern paddocks.	Continue hydromulching of remainder of eroded areas if trials are successful.	Continue hydromulching of remainder of eroded areas if trials are successful.	Eroded southern gullies were controlled by way of hydromulch application.
Mountain Block	Monitor completed erosion works and action repairs if required.	Monitor completed erosion works and action repairs if required.	Monitor completed erosion works and action repairs if required.	Monitor completed erosion works and action repairs if required.	Erosion control works are stable and successful.

3.14 Bushfire Management

Bushfire management within the BOAs will be undertaken in accordance with the LCO Bushfire Management Plan (LIDOC-90533967-5406). Appropriate management of the LCO BOAs will ensure the protection of life and property while providing the necessary protection to the significant ecological features of the area. The Bushfire Management Plan contains details on:

- bushfire hazard assessment
- bushfire risk assessment
- bushfire risk management and
- an implementation plan.

Table 3-19 outlines the performance and completion criteria for bushfire management across the LCO BOAs.

Table 3-19 Bushfire Management Performance and Completion Criteria

Relevant Offset Area	Action	Performance Criteria			Completion Criteria
		Year 4	Year 5	Year 6	
All biodiversity offset areas	Bushfire Management Plan implementation	The current Bushfire Management Plan will be updated to address the approved modification. Implementation of requirements of updated Bushfire Management Plan.	Implementation of requirements of updated Bushfire Management Plan.	Implementation of requirements of updated Bushfire Management Plan.	Bushfire risk is managed according to an updated Bushfire Management Plan which allows for appropriate protection of life and property, as well as identified significant ecological features.

4 Offset Monitoring Program

4.1 Monitoring Objectives

In relation to the management of the LCO BOAs, the broad objectives of the ecological monitoring program are to:

- assess for compliance of remnant, rehabilitated and regenerating vegetation against preliminary and long-term performance indicators
- identify any potential loss of biodiversity values over the LCO BOAs
- document the ecological characteristics of remnant woodland vegetation in the BOAs to establish a baseline for developing accurate performance indicators and completion criteria for the regeneration/revegetation/rehabilitation of grassland and disturbed areas
- assess the recovery of grassland/disturbed areas
- assess the presence of threats such as significant populations of pest fauna species or weed infestations
- identify the need for additional or corrective management measures to achieve the performance indicators and completion criteria.

4.2 Monitoring Sites

The sites provided in Table 4-1 are proposed to continue to be monitored as permanent monitoring sites in the biodiversity offset areas. Figure 4-1 displays the locations of the existing monitoring sites within the BOAs. These sites will each be monitored at the frequencies and in the seasons identified in Table 4-1. It is intended that this monitoring will continue for the life of mine (being 2028) or until sites are deemed redundant. It is intended that the monitoring program is (essentially) split over two years, with monitoring of half of the sites occurring in alternate years. Monitoring works will include, floristic monitoring (comprising either BBAM or BAM monitoring), photo monitoring, fauna monitoring and landscape function analysis (LFA) monitoring.

Table 4-1 Permanent Monitoring Sites

Biodiversity Offset Area	Site Name	Descriptor	Monitoring Type	Monitoring Frequency	Monitoring Season
Mountain Block	W04	Remnant ¹ – Narrow-leaved Ironbark – Bulloak Open Forest	Flora (BBAM), General Fauna	Biennial – Year A	Spring/Summer
	W05	Remnant – Narrow-leaved Ironbark – Spotted Gum Woodland	Flora (BBAM), General Fauna	Biennial – Year B	Spring/Summer
	WR03	Regeneration – Narrow-leaved Ironbark – Bulloak Open Forest DNG	Flora (BBAM & BAM), General Fauna, LFA	Biennial – Year A	Spring/Summer
	WR04	Regeneration – Narrow-leaved Ironbark – Bulloak Open Forest DNG	Flora (BBAM & BAM), General Fauna, LFA	Biennial – Year B	Spring/Summer
	WR05	Regeneration – Narrow-leaved Ironbark – Spotted Gum Woodland DNG	Flora (BBAM & BAM), General Fauna, LFA	Biennial – Year A	Spring/Summer
Bowmans Creek Riparian Corridor	W06	Remnant - Narrow leaved Ironbark – Spotted Gum Woodland	Flora (BBAM), General Fauna	Biennial – Year B	Spring/Summer
	R02 (Existing site)	Remnant - Hunter Valley River Oak Forest	Flora (BBAM), General Fauna	Biennial – Year A	Spring/Summer
	W07	Remnant – Central Hunter Box – Ironbark Woodland	Flora (BBAM), General Fauna	Biennial – Year B	Spring/Summer
	WR06	Revegetation – Central Hunter Box - Ironbark DNG	Flora (BBAM & BAM), General Fauna, LFA	Biennial – Year A	Spring/Summer
	WR07	Revegetation – Narrow leaved Ironbark – Spotted Gum Woodland DNG	Flora (BBAM & BAM), General Fauna, LFA	Biennial – Year B	Spring/Summer
	WR08	Rehabilitation – Introduced Grassland	Flora (BBAM & BAM), General Fauna, LFA	Biennial – Year A	Spring/Summer
	WR09	Rehabilitation – Introduced Grassland	Flora (BBAM & BAM), General Fauna, LFA	Biennial – Year B	Spring/Summer

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Mitchell South Hills	W08	Remnant – Spotted Gum Forest	Flora (BBAM), General Fauna	Biennial – Year A	Spring/Summer
	W09	Remnant – Spotted Gum Forest	Flora (BBAM), General Fauna	Biennial – Year B	Spring/Summer
	WR10	Regeneration– Derived Grassland	Flora (BBAM & BAM), General Fauna, LFA	Biennial - Year A	Spring/Summer
	WR11	Regeneration – Regrowth	Flora (BBAM & BAM), General Fauna, LFA	Biennial – Year B	Spring/Summer
All	NA	Nest box locations – as installed	Nest Box Monitoring	Biennial - Year A and B	Spring/Summer

¹ Remnant monitoring sites refer to analogue or control sites within existing vegetation used as the baseline floristics and condition with which we will compare the rehabilitation/regeneration sites against.

Please note also that these sites have been named in a manner such as that they may be monitored in tandem with monitoring sites specified within the BMP.

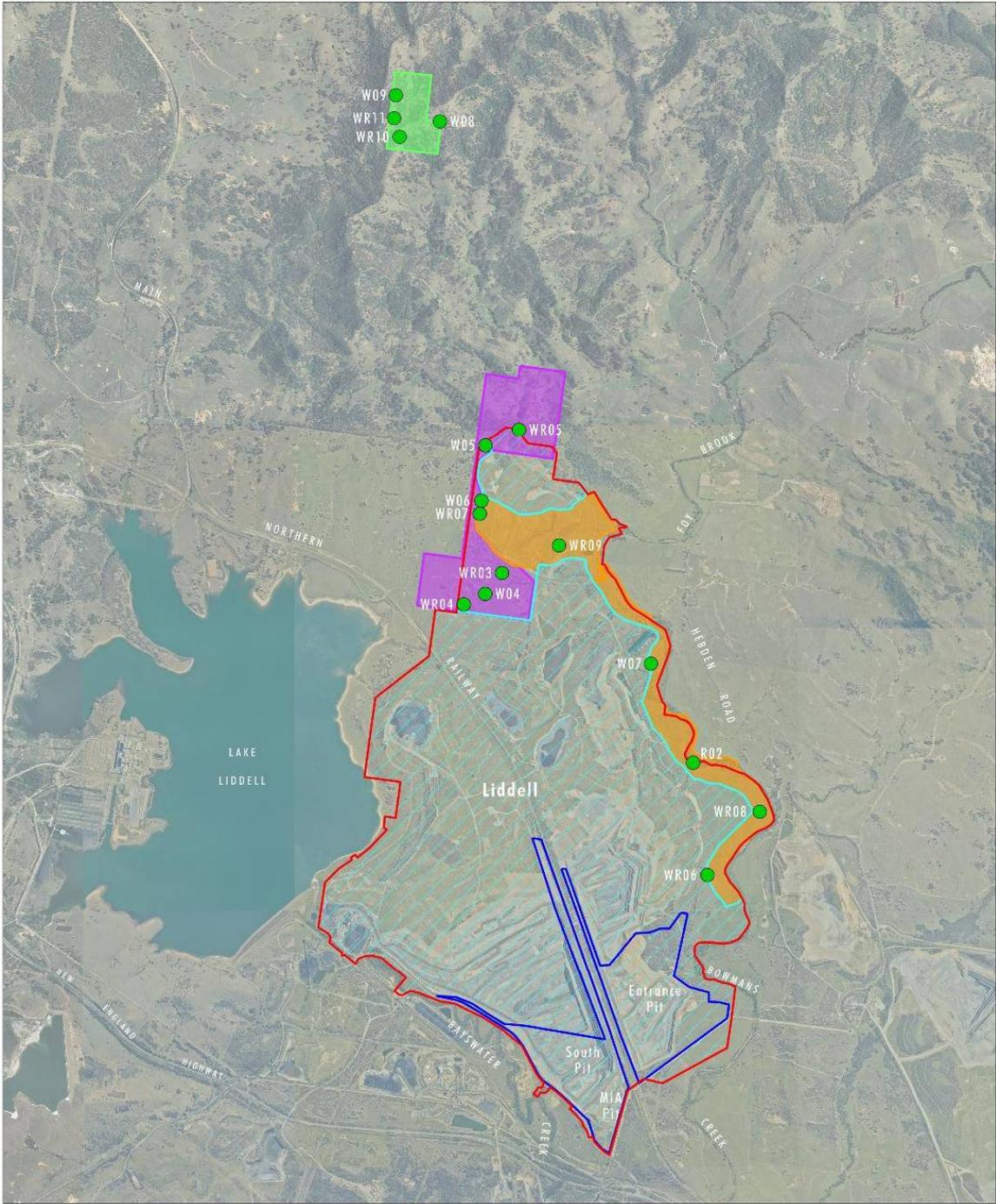


Image Source: Henderson (2019), Glencore (2018)
Data Source: Glencore (2019)

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- Legend**
- Liddell Coal Operations Approved DA Boundary
 - Approved Modification Area
 - Mountain Block Offset Area (State/Commonwealth Offset)
 - Bowman's Creek Riparian Corridor Offset Area (State/Commonwealth Offset)
 - Mitchell Hills South Offset Area (Commonwealth Offset)
 - Biodiversity Management Plan Area
 - Monitoring Location

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FIGURE 4.1
Offset Area Ecological
Monitoring Sites

Figure 4-1 – Offset Area Ecological Monitoring Sites

4.3 Flora Monitoring

Floristic monitoring will be undertaken at each of the permanent flora monitoring sites according to the frequency outlined in Table 4-1. This monitoring will be completed in a manner consistent with either the BioBanking Assessment Methodology (BBAM) (OEH 2014) or with the Biodiversity Assessment Methodology (BAM) (OEH 2017) as described in sections 4.3.1 and 4.3.2.

Data collected will be analysed in order to identify changes in floristic diversity and abundance over time. Analyses will also be completed to compare rehabilitation/regeneration sites to their suitable benchmark/analogue sites. This will assist in tracking the progression of rehabilitation/regeneration sites in relation to performance criteria.

4.3.1 BioBanking Assessment Methodology (BBAM)

For the BBAM plots, the following will be assessed

- 50 metre transect
- 50 metre by 20 metre plot with a
 - 20 metre by 20 metre sub-plot

Floristic monitoring will include documentation of the following:

- Along the 50 metre transect
 - Native overstorey percent foliage cover at 5 metre increments
 - Native mid storey percent foliage cover at 5 metre increments
 - Native shrub percent foliage cover at 1 metre increments
 - Native grass percent foliage cover at 1 metre increments
 - Native other percent foliage cover at 1 metre increments
 - Exotic percent foliage cover at 1 metre increments
 - Bare ground percent cover at 1 metre increments
- In the whole vegetation zone (50 metre by 20 metre area):
 - Hollow-bearing tree count
 - Log length count
 - Evidence of natural recruitment
- In the 20 metre by 20 metre plot:
 - Full floristic diversity, including cover and abundance for all vascular flora
 - Occurrence and abundance of weeds.

In addition to BBAM methodology, an assessment will be made of:

- percent cover of cryptogam cover and leaf litter along the transect
- general vegetation health

- estimate of the number of healthy trees present (in this instance “healthy” is defined as having 0-5% canopy foliage dead/absent or brown with dieback not apparent)
- Signs of disturbance by stock or humans
- Evidence of feral animals
- Impacts from mining.

4.3.2 Biodiversity Assessment Methodology (BAM)

BAM monitoring will consist of a 50 metre transect, 50 metre by 20 metre plot, with a 20 metre by 20 metre sub-plot and five 1 metre by 1 metre sub-plots.

At each plot/transect, roughly 45 to 60 minutes will be spent searching for all vascular flora species present within the 20 x 20 m plot. Searches of each 20 x 20 m plot will be generally undertaken through parallel transects from one side of the plot to another. Most effort will be spent on examining the groundcover, which usually supports well over half of the species present, however the composition of any shrub, mid-storey, canopy and emergent layers will also be thoroughly examined.

For each flora species recorded in the plot, the following data will be collected in accordance with Table 2 of the BAM (OEH 2017):

- Stratum/layer in which the species occurs
- Growth form
- Scientific name and common name
- Cover and
- Abundance.

The following attributes will be recorded at each floristic plot, in accordance with the BAM (OEH 2017) to determine the condition of the vegetation zone:

- Composition - native plant species richness by growth form (within the 20 x 20 m plot)
- Structure – estimate foliage cover of native and exotic species by growth form (within the 20 x 20 m plot)
- Function - (within the 20 x 50 m plot) including, number of large trees, presence or otherwise of tree stem size classes, presence or otherwise of canopy species regeneration, length of fallen logs, percentage cover for litter (recorded from five 1 x 1 m plots), number of trees with hollows and high threat exotic cover.

In addition to BAM methodology, an assessment will be made of percent cover of bare ground/rock cover of the plot, as well as an estimate of the number of healthy trees present (in this instance “healthy” is defined as having 0-5% canopy foliage dead/absent or brown with dieback not apparent).

4.4 Habitat Assessment

Habitat assessment will also be undertaken in each 50 metre by 20 metre plot. Habitat features recorded at each site will include:

- general vegetation health;
- evidence of natural seedling recruitment;
- occurrence and abundance of weed species;
- structure and floristics of vegetation cover;
- signs of disturbance (by stock, people or feral animals);
- nature and extent of erosion;
- evidence of fire;
- characteristic of ground cover (e.g. leaf litter, rocks, logs and soil);
- nectar or fruit resources and perch sites;
- water resources; and
- secondary evidence of fauna use such as scats, tree scratches or diggings.

4.5 Photo Monitoring

Photo monitoring will be undertaken at each permanent flora monitoring location facing left, centre and right at the start of the 50 metre transect.

4.6 Fauna Monitoring

Fauna monitoring will be undertaken at each of the 16 permanent monitoring locations, according to the frequency outline in Table 4-1. Fauna monitoring to be undertaken at each of the 16 permanent fauna monitoring sites will include:

- minimum of 20 minutes diurnal bird survey (species-time approach);
- targeted winter bird surveys (for the regent honeyeater and swift parrot);
- four full night Anabat surveys (micro-bats);
- one person hour of diurnal herpetofauna surveys;
- one person hour of spotlighting surveys;
- one call-playback session; and
- baited remote camera traps to be deployed for two weeks (targeted to spotted-tailed quoll).

Each of these is described in greater detail below.

4.6.1 Diurnal Woodland Bird Surveys

Diurnal woodland bird surveys will consist of slow walking transects over an approximate 2 hectare area surrounding the site. These surveys will take place within the first four hours/ last four hours of sunlight and will be in accordance with the species-time curve approach (DEC 2004). Surveys will be undertaken for a minimum of 20 minutes; after which every new species that is recorded triggers a further 5 minutes of survey.

All bird species identified during this time will be recorded as well as detailed on whether the bird identified was within, outside or flying over the site.

4.6.2 Targeted Winter Bird Surveys

Targeted winter bird surveys will be undertaken at monitoring sites with appropriate feed tree species for the regent honeyeater (*Anthochaera phrygia*) and swift parrot (*Lathamus discolor*). These surveys will consist of an initial call playback session followed by a slow walking transect.

Calls will be broadcast using a directional loud hailer and commence with a quiet listening period of approximately five minutes. Each species call will then be played for a minimum of four minutes followed by a listening period of two minutes before the beginning of the next species call.

The slow walking transect will then be undertaken in the same manner as that for the diurnal woodland bird surveys.

4.6.3 Micro-Bat Surveys

Micro-bat surveys will be undertaken with Anabat devices equipped with a ZCAIM recording device for each permanent monitoring location and will be placed along a flyway over a riparian body. Micro-bat surveys will comprise four full survey nights of Anabat surveys for each site. Anabats will be set to record all micro-bat calls prior to dusk until after dawn.

4.6.4 Diurnal Herpetofauna Surveys

Targeted diurnal searches will be conducted for reptile and amphibian species (herpetofauna) within an approximate 2 hectare area of each of the seven monitoring sites as well as at blue-billed duck monitoring sites. One person hour of diurnal herpetofauna surveys will be undertaken for each site. Searches will comprise a slow walking meander searching areas of likely habitat such as under rocks and logs, in bark at the base of trees, around water resources and in man-made features.

4.6.5 Spotlighting Surveys

Spotlighting will target nocturnal mammal, birds and herpetofauna. One person hour of spotlighting surveys will be conducted at each of the seven monitoring sites within an approximate 2 hectare area of each site. Spotlighting will consist of slow walking meanders undertaken after sunset.

4.6.6 Call Playback Surveys

Call playback sessions will be undertaken at each of the seven monitoring locations using a directional loud hailer. Calls will be broadcast for the powerful owl (*Ninox strenua*), masked owl (*Tyto novaehollandiae*), grass owl (*Tyto longimembris*), koala (*Phascolarctos cinereus*) and squirrel glider (*Petaurus norfolcensis*).

Call playback sessions will commence with a quiet listening period of five minutes. Each call was played for a minimum of two minutes followed by a listening period of two minutes. If a response or unclear noise was heard the call was repeated.

4.6.7 Baited Remote Camera Traps (Including Spotted-tailed Quoll) Monitoring

Spotted-tailed quoll monitoring is to be undertaken at each monitoring site and will consist of baited motion sensing remote cameras. At each of the sixteen monitoring sites, single baited remote camera stations will be positioned in an area of high fauna activity. The camera will be set to record five photographs each time it is triggered. These sites will be situated in areas including but not limited to:

- remnant vegetation;
- rehabilitated/regenerated vegetation;
- areas of known spotted-tailed quoll activity;
- known spotted-tailed quoll denning locations; and
- established log and boulder piles.

All baited remote camera stations will be left in-situ for a two week period. Baited remote cameras will be downloaded and analysed at the completion of the two weeks.

4.6.8 Nest Box Monitoring

All nest boxes installed within the BOMP area are subject to monitoring for condition and content. This occurs biennially over alternate years (i.e. half of all nest boxes installed at LCO are monitored one year and the second half are monitored the subsequent year). Details recorded for nest box monitoring is as follows:

- Content, including:
 - whether they are being used by target species;
 - signs of presence such as nesting material or feathers;
 - predator use;
 - presence of native fauna; and
 - presence of non-target species such as bees, wasps and introduced birds.
- Condition, including:
 - collapsing joints;
 - missing lids;
 - bowing timber;
 - perishing timber; and
 - tree attachment.

Additional nest box monitoring surveys will be undertaken where new nest boxes are installed as habitat enhancement measures. These will be undertaken annually commencing the year after installation.

4.7 Landscape Function Analysis Monitoring

Landscape function analysis (LFA) is a technique used to monitor the health of landscapes, particularly in areas of disturbance. LFA uses simple visual assessment of both physical and biological landscape components (mostly in relation to surface hydrology) that can be readily replicated over time in order to determine any changes to the quality of the landscape within a site.

LFA monitoring will be undertaken at the permanent rehabilitation monitoring sites in accordance with LFA methodology (Tongway and Hindley 2005). This monitoring will be undertaken along the 50 metre transect utilised for the floristic monitoring.

LFA monitoring will comprise dividing the transect into patches/interpatches based on ground cover types, and for each ground cover type undertaking five replicates of the following 11 key soil condition features:

- rain splash protection;
- perennial vegetation cover;
- litter cover, origin and degree of decomposition;
- cryptogam (non seed-bearing plants) cover;
- crust brokenness;
- erosion features;
- deposited materials;
- microtopography;

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- surface resistance to erosion;
- soil texture; and
- slaking characteristics.

The data collected from the above soil condition features will then be entered into a spreadsheet that calculates the critical values for stability, infiltration and nutrient functions for each site.

Table 4-2 Ecological Monitoring Performance and Completion Criteria

Relevant Offset Area	Action	Performance Criteria			Completion Criteria
		Year 4	Year 5	Year 6	
All biodiversity offset areas	Undertake floristic, fauna, LFA and nest box monitoring program	Monitoring program completed and reported	Monitoring program completed and reported	Monitoring program completed and reported	Monitoring programs completed and results reported.
All biodiversity offset areas	Undertake annual inspections of LCO rehabilitation and active regeneration areas	Annual inspections completed	Annual inspections completed	Annual inspections completed	Annual inspections completed
All biodiversity offset areas	Native fauna presence in rehabilitation/regeneration areas	Fauna monitoring completed	Fauna monitoring completed	Fauna monitoring completed	Fauna monitoring confirms that native fauna species are recorded within rehabilitation/regeneration areas.

5 Adaptive Management

5.1 Adaptive Management Process

Adaptive management of the BOMP will be responsive to any new and relevant data that may arise through the monitoring described in Section 0, legislative change or any other studies completed across the LCO BOAs. This will enable a flexible approach to management commitments, allowing ongoing feedback and refinement of the BOMP. Adaptive management will be a key mechanism to address the risks to the successful implementation of the BOMP. Adaptive management steps include regular review of the BOMP, including adaptation of targets and performance indicators, recognising potential risks to the successful implementation of the BOMP and having a frame work in place for corrective actions.

5.2 Review of BOMP

As per the requirements of Schedule 5 Condition 10 of DA 305-11-01 Mod 7, the BOMP is to undergo an internal review and revision (if necessary) within 3 months of the submission of the Annual Review, an incident report, audit or modification to the conditions of consent. Where the BOMP is revised, it must be submitted to the Secretary for approval within 2 months, unless an alternative timeframe is agreed.

Each review will seek opportunities to improve the management strategies and further develop and forecast the longer term performance indicators and completion criteria.

6 Progressive Development of Targets and Performance Indicators

The performance indicators and completion criteria in Section 1.7 are preliminary and apply to management years 4, 5 and 6 of the BOMP implementation (2018 - 2020). The targets and performance indicators will need to adapt and change as targets are met and new management challenges arise. Each three years, they will be assessed and redeveloped as appropriate in response to monitoring outcomes and the success or otherwise of the management and improvement strategies. Modifications to the targets and performance indicators will be recorded in a revised BOMP.

The completion criteria which have been fulfilled are provided in **Appendix D**.

6.1 Potential Risks and Corrective Actions

There are a number of potential risks, or situations where performance indicators and completion criteria may not be achieved. A list of potential situations where biodiversity conservation objectives of this BOMP may not be met is provided in Table 6-1, along with potential corrective actions. This list is adapted from Rawlings et al (2010).

Table 6-1 Biodiversity Trigger, Action and Response Plan

Management Aspect	Key Element	Trigger	Potential Corrective Action
General Management	Protection of Remnant Vegetation	Unauthorised stock access.	Identify access points and repair fences appropriately. Communicate with agricultural managers and adjacent landholders to emphasise areas where stock are not permitted.
	Weed Management	Infestations of noxious and environmental weeds are increasing or new species detected.	Adapt weed management plan and modify strategies accordingly.
	Feral Fauna Management	Infestations of pest animals are increasing or new species detected.	Adapt pest management plan and modify strategies accordingly.
Revegetation Success	Species composition	No regeneration of plants, or indicator species missing.	Assess fencing and ensure there is no un-authorized stock access or native fauna (i.e. grazing kangaroos). Control exotic weeds and pest animals to reduce competition. If deemed necessary, instigate active revegetation techniques including direct seeding or tubestock planting, following appropriate ground preparation.
	Native flora diversity	Flora species diversity is not on a trajectory consistent with target community.	Targeted weed control. Instigate active revegetation techniques including direct seeding or tubestock planting, following

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			appropriate ground preparation such as weed control, ripping and auguring. Revegetate with high diversity patches. Assesses adequacy of soil present as an appropriate growth medium.
	Native fauna diversity	Fauna species diversity of rehabilitated areas is inconsistent with reference communities.	Control feral predators. Increase habitat features of target fauna species (i.e. nest boxes, specific foraging resources, log and rock piles etc).
	Tree cover	Low or no tree cover.	Plant/direct seed trees at appropriate rate using minimal ground disturbance.
	Survivorship	Tree dieback (from insect pressure, herbicide drift, water stress/adverse climatic conditions).	Revegetate with dense shrubs to increase diversity and insectivorous birds. Avoid using defoliant near woodlands when windy. Increase patch size through revegetation. Do not fertilise and prevent fertiliser drift. Review active regeneration techniques and consider adjustment of preparation techniques. Consider need for additional infill planting to meet active regeneration targets. Assess requirement for intervention such as watering.
	Weed management	Patches of exotic annual and perennial grasses occur.	Spot spray small clumps. Investigate suitability to undertake a spring burn. Monitor and maintain control.
	Weed management	Exotic broadleaf weeds abundant or dominant.	Use bush regeneration principles to manage. Use broadleaf herbicides in accordance with best practice guidelines. Hand weed if appropriate.
	Weed management	Tree and shrubs present but dense exotic ground cover.	Densely plant trees and shrubs to outcompete with the exotic ground covers. Spot spray small clumps or hand remove exotic ground covers around native ground covers.
	Native flora diversity	Dense stands of colonising tree or shrub species dominate regeneration or revegetation areas.	Assess whether thinning is necessary. Leave if patches are small and plants are native. Thin manually if appropriate. Leave woody debris in-situ to enhance habitat value.

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Habitat Enhancement	Habitat Enhancement	Scarcity of key habitat features present in relation to reference sites.	Add habitat features such as logs or branches. Increase the number of vegetation layers in the patch. Establish nesting boxes for target species.
	Habitat salvage	Habitat features salvaged are damaged during salvage or during stockpiling.	Investigate machinery and equipment currently being used to salvage and translocate habitat features. Update protocols based on findings. Investigate adequacy of storage emplacement areas of features. Revise locations if necessary.
Bushfire Management	Bushfire Management	Unplanned bushfire event occurs.	Review procedures in place and update Bushfire Management Plan based on findings. Monitor plant succession after bushfire event.

DRAFT

7 Reporting and Documentation Requirements

LCO will prepare an Annual Ecological Monitoring Report (AEMR) which will document the monitoring methods and results from the winter monitoring period through to the autumn monitoring period. The intent of this report will be to provide a comparison of the data collected with previous monitoring events and to provide (where necessary) ongoing management recommendations and ameliorative methods to ensure the biodiversity management within the BOAs are subject to a positive feedback loop.

The outcomes of the AEMR will be incorporated into the LCO Annual Review, which will be submitted to DPIE and NSW DRE for review. Monitoring data will be tabulated for simple presentation, with the relevant performance criteria in one column, and the results in the next column. All other reporting will be undertaken in accordance with the requirements of the LCO Environmental Management Strategy.

The reporting requirements for the various management strategies of the BMP, including reporting frequency and timing, are identified in Error! Reference source not found..

Table 7-1 BOMP Reporting Requirements

Report	Frequency	Requirements	Personnel
Biodiversity offset area inspection records	Records from bi-monthly inspections (Bowmans Creek Riparian Corridor) and four-monthly (Mountain Block and Mitchell Hills)	Complete a drive over and inspection, investigating aspects such as fence and gate condition, signage, access track condition, weeds, rubbish dumping, erosion and sedimentation, observations of stock and any other general observations	Competent site personnel
Weed management report	Annually	Report on areas worked, timing of works, techniques used, any issues encountered, recommendations and the control program for the subsequent year.	LCO/Weed management contractor
Feral animal management report	Annually	Report on timing of works, techniques used, data on kills or bait update, any issues encountered, maps and data on the areas of impact and population estimates per species, recommendations and the control program for the subsequent year/s. In the report, monitoring results of area of impact and population size estimates should be compared to previous years of monitoring to identify any trends in vertebrate pest control performance.	LCO/Feral animal management contractor
Biodiversity monitoring reporting	Annually	Consultant to compile and analyse results of flora and fauna monitoring completed each year and to compare against performance criteria for this strategy.	Prepared by consultant
LCO 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,	Prepared by consultant or competent site personnel

		comprehensive monitoring results and complaints information.	
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8 Conservation Bond and Implementation Costs

A Conservation Bond for the LCO BOAs is required by DPIE in accordance with DA 305-11-10 Schedule 3 Condition 30 of the project approval. The purpose of this bond is to cover the cost of the management of land required to be set aside as an offset area, should the mine consent holder be unable or unwilling to continue management of the land. The Conservation Bond value is based on all the activities identified in the approved BOMP, for a period of three years, being the life of the plan.

The Conservation Bond will be calculated and submitted in accordance with the *Draft Hunter Valley Coal Mines – Best Practice Guidelines for Biodiversity Offset Management Plans* (DPE, 2014).

9 BOMP Checklist and Implementation Schedule

A checklist summarising the BOMP actions required across the LCO BOAs and their schedule for implementation for the first 3 years is provided in Table 9-1. This is a snapshot of the key actions required in the first 3 years of implementation of the BOMP. Reference to the relevant sections of this BOMP should be made for more detail of the actions required.

Table 9-1 Checklist and Implementation Schedule for the LCO BOMP (Years 4, 5 and 6)

Actions/Targets	Timeframe
Management and Improvement Actions	
Establish an appropriate long-term conservation mechanism for the LCO biodiversity offset areas.	To be formalised by end of Year 4 .
Routine inspection and maintenance of tracks and fences.	Biannual (twice yearly) inspections. Maintenance is required throughout the life of the BOMP.
Establish an effective annual weed control program across all LCO biodiversity offset areas, as necessary.	Year 4, Year 5 and Year 6 . Annually review and revise.
Establish an effective annual pest control program across all LCO biodiversity offset areas, as necessary.	Year 4, Year 5 and Year 6 . Annually review and revise.
Undertake weed and pest control activities across all LCO biodiversity offset areas, as necessary.	Year 4, Year 5 and Year 6 . Concentrate efforts in DNG areas to assist natural regeneration.
Remove non-strategic stock grazing activities from across all LCO biodiversity offset areas.	Unauthorised stock access to be continually managed.
Establish woodland vegetation in areas of derived native grassland (DNG) through assisted natural regeneration.	Implement assisted natural regeneration activities (weed and pest control, stock removal etc.) in Years 4-6 . Assess progress towards performance indicators and completion criteria during the Year 6 review of the BOMP (incorporating results of inspections and monitoring).

	Review the need for further active revegetation methods after Year 6 if natural regeneration is not progressing appropriately.
Enhance habitat features in regeneration and remnant vegetation areas	To commence after first monitoring report is received which will identify scope of works required.
Active revegetation activities	Will only commence if necessary after Year 6 . The need for active revegetation will be assessed at each 3 year revision of the BOMP.
Offset rehabilitation areas	Implement for Bowmans Creek Corridor and specific portion of Mountain Block in Years 4-6 .
Monitoring Actions	
Ecological Monitoring	Continue annual surveys in spring from Year 4 , and undertaken as per Table 4-1. Winter migratory bird monitoring to continue annually from winter of Year 4 .
General inspections across all biodiversity offset areas	Bi-monthly for Bowmans Creek Riparian Corridor and every four months for Mountain Block and Mitchell Hills Offset Areas each year from Year 1 .
Reporting and Documentation Actions	
Accurate records are being maintained substantiating all activities and monitoring relating to implementation of the BOMP.	Ongoing from Year 1 .
Collate data on actions implemented and results of inspections and monitoring into the Annual Review.	Annually from Year 1 .
Ecological Monitoring Report	Following completion of each monitoring period, within 3 months of each monitoring survey event, commencing Year 1 .
Update BOMP, including a revision of management actions, performance indicators and completion criteria.	Every 3 years from commencement (earlier if deemed necessary).

10 Document Information

10.1 Related Documents

Related documents, listed in Error! Reference source not found., are internal documents directly related to or referenced from this document.

Table 10-1 Related documents

Number	Title
LIDOC-90533967-3687	Biodiversity Management

<u>LIDOC-90533967-3776</u>	Indirect Offset
<u>LIDOC-90533967-5059</u>	Rehabilitation Management Plan (Mining Operations Plan 2018 – 2020)
<u>LIDOC-90533967-3694</u>	Water Management
<u>LIDOC-90533967-506</u>	Tree Felling and Topsoil Stripping Procedure
<u>LIDOC-90533967-3607</u>	Aboriginal Cultural Heritage Management Plan
<u>LIDOC-90533967-5406</u>	Bushfire Management Plan
<u>LIDOC-90533967-3944</u>	Biodiversity Monitoring Inspection
<u>GCAA-625378177-10598</u>	11.16 Rehabilitation establishment and methodology record form.

10.2 References

Reference information, listed in Table 10-10-2, is information that is directly related to the development of this document or referenced from within this document.

Table 10-10-2 – Reference information

Reference	Title
Commonwealth of Australia 2001	Commonwealth of Australia 2001. Threat Abatement Plan for Dieback Caused by the Root-rot Fungus <i>Phytophthora cinnamomi</i> .
DEC 2004	Department of Environment Conservation (DEC) 2004. Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities. Working Draft, November 2004.
DP&E 2014	Department of Planning and Environment 2014. <i>Hunter Valley Coal Mines: Best Practice Guidelines for Biodiversity Offset Management Plans</i> .
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10.3 Change Information

Table 10-3 – Change information

Version	Date	Review team (consultation)	Change Summary
1.0	March 2015	Umwelt, LCO	New document to meet conditions of consent for DA305-11-01 and EPBC Approval 2013/6908.

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Version	Date	Review team (consultation)	Change Summary
2.0	November 2015	Umwelt/LCO	Update to address OEH and DoE comments.
3.0	December 2015	Umwelt/LCO	Minor updates to Section 3.3, 3.14 & 3.15 as per NSW DPE review comments.
4.0	23/12/ 2015	B de Somer, H Simms	Update varied EPBC Approval Condition 6 details in Section 1.3 and Section 2.2.
5.0	21/01/2016	L Barben, H Simms	Update to include Appendix C – DPE Correspondence and inclusion of approval letter dated 20.01.2016
6.0	October 2016		Document migration to new SharePoint.
7.0	11/07/2017	B de Somer, J Young	Update Bowmans Ck Riparian Corridor boundary, affecting multiple sections; append DPE approval.
8.0	18/07/2018	Umwelt, J Young, M Henderson	Updated to reflect changes associated with Conservation Agreement preparation, repealment of TSC Act, repealment of the Noxious Weeds Act, and refinement of performance and completion criteria. H Simms – transferred to current template.
9.0	June 2019	B de Somer, H Frazer, Umwelt	<p>Reviewed against section 8.1.4 of DA 305-11-01 Modification 7 Environmental Assessment and modified DA conditions. Updated as per 2019 Independent Environmental Audit recommendations specifically:</p> <ul style="list-style-type: none"> • Updated Section 2.5.4 to include introduced species identified in 2018; • Update Section 3.4 to discuss potential management strategies for overabundant native species • Update Section 3.7 to include discussion of vehicle hygiene management; and • Reviewed and updated flora monitoring methodology in Section 4; and <p>Updated Section 4.6.8 Nest Box Monitoring to include biannual monitoring</p> <p>Updated Section 10.2 with additional related documents.</p> <p>Included new Section 2.6 on implications of the Modification 7 approval.</p> <p>Update to climate data in Section 2.3.</p> <p>Updates to table 6.1.</p>
10.0	June 2020	L Depczynski	<ul style="list-style-type: none"> • Export to new template • Changes to document structure • Heading wording changes • Conservation Agreement details (executed since last plan) • Recent monitoring results included • Completion criteria achieved • Revegetation activity descriptions clarified and split out for clarity

Biodiversity Offset Management

Version	Date	Review team (consultation)	Change Summary
			<ul style="list-style-type: none">Detail added on habitat augmentation

DRAFT

Appendix A - BOMP Consultation

Approval of Management Plans



Your reference: DA 305-11-01 MOD5
 Our reference: DOC15/197497-01
 Contact: Robert Gibson, 4927 3154

Mr Ben de Somer
 Environment & Community Manager
 Liddell Coal Operations Pty Ltd
 PO Box 7
 SINGLETON NSW 2330

Dear Mr de Somer

RE: BIODIVERSITY OFFSET MANAGEMENT PLAN - LIDDELL COAL OPERATIONS

I refer to your email dated 29 May 2015 seeking comment on the Biodiversity Offset Management Plan Liddell Coal Operations. The Office of Environment and Heritage (OEH) encourages the development of such plans to ensure that proponents have determined how they will meet their statutory obligations and designated environmental objectives. However, OEH does not approve or endorse these documents as our role is to set environmental objectives for environmental/conservation management, not to be directly involved in the development of strategies to achieve those objectives. In this instance, OEH has provided some additional advice for Liddell Coal Operations in relation to their stated monitoring approach to revegetation where there is a risk that it may lead to Liddell requiring more resources to achieve required outcomes.

OEH notes Liddell's intent to use BioBanking Methodology (OEH, 2014) for monitoring of the seven vegetation quadrats to be established to monitor revegetation on the mine site even though the proposed offsets are not being secured by way of a BioBanking Agreement. In following the BioBanking site assessment methodology full floristic details are collected using projected foliage cover to the nearest 5% increment. That is, it uses a more precise measurement than the Modified Braun-Blanquet Crown Cover Abundance Scale that is described in Table 5.2 of the draft BMP and appears to be the scheme planned to be used in the monitoring sites. OEH's preference is that site data is collected at a finer scale, preferably following Sivertsen (2009: see pages 59-65) because finer scale data collection will enable trends to be detected before they may be obvious, particularly where for little additional effort the data collected is analysed by appropriate statistical analysis. OEH notes Liddell's plans in section 5 of the draft Plan to use adaptive management process to trigger the use of any corrective actions, if needed, to enable more efficient use of resources to achieve desired outcomes. However, OEH has concerns that floristic data collected using modified Braun-Blanquet Crown Cover Abundance Scale (if indeed that is the intent) will be so coarse that it may hide problems that are then create added expense and require more time to rectify.

OEH notes Liddell's plan for rehabilitated vegetation to be produced and managed that fall within benchmark ranges for the targeted vegetation communities identified for this project. This will require the generation of values of each of the ten site values required under BioBanking assessment methodology (OEH, 2014). However, these site indices have limited value in relation to demonstrating the floristic details of the vegetation sampled. Given that full floristic details must be collected anyway, as per BioBanking assessment methodology, a way that Liddell could demonstrate this by the inclusion of copies of the field data sheets in their monitoring reports.

Locked Bag 1002 Dangar NSW 2309
 Level 4/26 Honeysuckle Drive Newcastle NSW 2300
 ABN 30 841 387 271
www.environment.nsw.gov.au

There appears to be no reference in the Biodiversity Offset Management plan in relation to Schedule 3, Condition 25 (re-establishment of habitat) and Condition 26 (Spotted-tail Quoll Contribution for recovery actions); instead the plan provided for review appears to be largely based on Schedule 3 conditions 28 and 29. OEH is concerned that the current piecemeal approach in the preparation of separate management plans for this project may result in less effective conservation measures being adopted, due to earlier decisions being made in relation to conservation and biodiversity offset strategies. In this case it is not clear what recovery actions are planned on being proposed for Spotted-tail Quolls nor whether they will be able to be effectively implemented in the context of earlier agreed biodiversity conservation actions.

All records of threatened flora and fauna observed during survey work for this project will need to be submitted to OEH as required by the consent conditions of the scientific licences issued under section 132C of the *National Parks and Wildlife Act 1974* under which the work was conducted. This applies to observations made during annual monitoring programmes.

If you require any further information regarding this matter please contact Mr Robert Gibson, Regional Biodiversity Conservation Officer, on 4927 3154.

Yours sincerely

 5 JUN 2015

RICHARD BATH
Senior Team Leader Planning, Hunter Central Coast Region
Regional Operations

References:

OEH (2014) BioBanking Assessment Methodology 2014. September 2014. OEH, Sydney.
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DRAFT



Ben de Somer
Environment and Community Manager
Liddell Coal Operations Pty Ltd
PO Box 7
SINGLETON NSW 2330

Contact: Chris Knight
Phone: (02) 6575 3404
Fax: (02) 6575 3415
Email: christopher.knight@planning.nsw.gov.au
Our ref: DA 305-11-01

Dear Ben,

Liddell Coal Operations – Approval of the Water Management Plan, and Biodiversity Offset Management Plan.

Thank you for forwarding the Liddell Coal Operations Water Management Plan and Biodiversity Offset Management Plan to the Department of Planning & Environment (the Department or DP&E), as required by Condition 29, Schedule 3 of DA 305-11-01.

The Department has conducted a review and wishes to advise that the Secretary has approved the Water Management Plan, and Biodiversity Offset Management Plan (dated 18/12/2015 and 7/1/2016 respectively).

This approval of the Water Management Plan and Biodiversity Offset Management Plan replaces all previous approvals of these plans.

Please note that the requirements of the Water Management and Biodiversity Offset Management Plans come into force on the 1st February 2016. All plans remain in force until replaced by any future updated approved Plans.

Could you please place a copy of the two approved plans on your website and forward a finalised copy of the plans (preferably in PDF format with a copy of this approval letter appended) for the Department's records by the 1st February 2016.

Should you have any queries on this matter, please do not hesitate to contact Chris Knight, Senior Compliance Officer, on (02) 6570 3404 or email christopher.knight@planning.nsw.gov.au.

Yours sincerely,

A handwritten signature in blue ink that reads 'W Jones 20/1/16'.

Wayne Jones
Investigations (lead) Compliance Northern Region
as the Secretary's Nominee



Resource Assessments

Contact: Megan Dawson

Phone: 9274 6489

Email: megan.dawson@planning.nsw.gov.au

Mr Ben de Somer
Environment and Community Manager
Liddell Coal Operations Pty Ltd
PO Box 7
SINGLETON NSW 2330

A handwritten signature in blue ink that reads 'Ben'.

Dear Mr de Somer

**Liddell Colliery (DA 305-11-01)
Biodiversity Offset Management Plan**

I refer to your letter dated 13 April 2017 submitting a revised Biodiversity Offset Management Plan for Liddell Colliery (DA 305-11-01).

The Department has reviewed the revised plan and is satisfied that it meets the relevant requirements of condition 29 of Schedule 3 of the above consent. As such, I wish to advise that the Secretary approves this plan. Please provide a final (untracked) version of this plan to the Department at your earliest convenience.

Following this approval, the Department also requests that you review the conservation bond in accordance with condition 30 of Schedule 3 of the above consent. I note that the bond was recently recalculated in October 2016 and new bank guarantees were received by the Department in November 2016. However, in light of the recent amendments to the Bowmans Creek Riparian Corridor offset area, another review of the sufficiency of the bond is now appropriate.

Should you have any enquiries in relation to this matter, please contact Megan Dawson at the details above.

Yours sincerely,

A handwritten signature in blue ink that reads 'Howard Reed' with the date '11.7.17' written below it.
Howard Reed
Director Resource Assessments
as the Secretary's nominee

Department of Planning and Environment

320 Pitt Street Sydney NSW 2000 | GPO Box 39 Sydney NSW 2001 | www.planning.nsw.gov.au



Planning Services
Resource Assessments
Name: Ingrid Berzins
Phone: 9373 2885
Email: Ingrid.Berzins@planning.nsw.gov.au

Ben de Somer
Environment & Community Manager
Liddell Coal Operations
PO Box 7
Singleton NSW 2330

Dear Mr de Somer,

**Liddell Colliery (DA 305-11-01)
Approval of Management Plans**

I refer to your emails dated 16 October and 19 October 2018 submitting revised management plans for Liddell Colliery. The Department has reviewed the following revised management plans and is satisfied that they address the relevant conditions of consent:

- Biodiversity Management Plan v8.3 and Biodiversity Offset Management Plan v7 (condition 29 of Schedule 3).

The Secretary therefore approves the Biodiversity Management Plan and the Biodiversity Offset Management Plan.

Please provide final (untracked) versions of these plans to the Department at your earliest convenience and place a copy of them on your company website.

If you have any enquiries about this matter, please contact Ingrid Berzins on the details above.

Yours sincerely

A handwritten signature in blue ink, appearing to read 'MJD', followed by the date '19/10/18'.

Megan Dawson
Acting Director
Resource Assessments
as the Secretary's nominee



Planning,
Industry &
Environment

Planning and Assessments
Energy and Resource Assessments
Contact: Anthony Barnes
Phone: 8289 6709
Email: anthony.barnes@planning.nsw.gov.au

Ms Hayley Frazer
Environment and Community Coordinator
Liddell Coal Operations – Glencore
PO Box 7
Singleton NSW 2330

Dear Ms Frazer

**Liddell Colliery Continued Operations (DA 305-11-01)
Approval of Biodiversity Offsets Management Plan**

I refer to your email dated 9 May 2019, submitting the revised Biodiversity Offsets Management Plan (BOMP) for approval in accordance with Liddell Colliery Continued Operations' development consent.

The Department has reviewed the BOMP and considers that it is consistent with the relevant consent conditions. Therefore, the Secretary has approved the plan.

Please ensure that the BOMP is published on Liddell Colliery's website at your earliest convenience.

Please contact Anthony Barnes if you have any enquiries.

Yours sincerely

A handwritten signature in blue ink that reads 'Howard Reed'.

Howard Reed 21.8.19
Director, Resource Assessments
Energy and Resource Assessments
as nominee of the Secretary

<p>Steven Cox Biodiversity and Conservation Division Level 4, 26 Honeysuckle Drive Newcastle NSW 2330</p>	<p>Senior Team Leader Planning Hunter Central Coast Branch</p>	
<p>Letter/email via NSW Major Projects Portal – 2020 BOMP submitted for consultation</p> <p>6/11/2020</p>	<p style="text-align: center;">BCD Recommendations</p> <p>Section 3.1.2 'Myrtle Rust'</p> <p>BCD recommends that surveys of the offset lands for Myrtle Rust includes steps to note and map occurrences of Rainforest Myrtaceae species that are most susceptible to this pathogen. <i>Backhousia myrtifolia</i> is a common component of gallery and dry rainforests fringing the Hunter Valley, and the Critically Endangered <i>Rhodamnia rubescens</i> could also occur in rainforest patches in the central Hunter Valley. That way vegetation more susceptible to Myrtle Rust could be more effectively monitored and managed.</p>	<p style="text-align: center;">LCO Response</p> <p><i>PCT 1614 Grey Gum - Grey Myrtle - Narrow-leaved Stringybark - Rusty Fig open forest</i> has been mapped previously in the offsets at LCO. This PCT is the most likely to contain Myrtaceae species. There are a number of existing monitoring points within or adjacent these areas (W08, WR10, VCAQ1, VCAQ2, VCAP8, VCAP12). <i>Backhousia myrtifolia</i> has been identified in previous monitoring at W08.</p> <p>Additional time will be allocated for future monitoring rounds to assess presence of myrtle rust in PCT 1614 mapped areas. Section 3.1.2 updated to reflect this.</p>
	<p>Section 3.8 Completion Criteria</p> <p>The proposed Completion Criteria presented in Table 3-8 include tallies of plant species in particular strata or of certain growth forms, for each of the targeted Plant Community Types (PCTs) being regenerated. However, the presentation of the monitoring data to show which species are present in vegetation quadrats would add more value to the monitoring results. It would also provide an opportunity to predict the structure, function and likely resilience of the vegetation communities in each of the three targeted PCTs.</p> <p>BCD recommends that the proponent provides copies of the vegetation quadrat monitoring data, on the mine's webpage or in the Annual Ecological Monitoring Report (described in Chapter 7 of the BOMP), to show the species recorded in each quadrat. This may become a trigger for adaptive management if species composition</p>	<p>Performance indicators and completion criteria for the offsets are due for re-assessment in Year 7 (August 2021). These comments will be incorporated in the review.</p> <p>Currently the BOMP annual monitoring report is available on LCO's website.</p> <ul style="list-style-type: none"> • The <i>Results</i> section includes floristic monitoring results (abundance, percentage cover, transect per structure category, etc). • The summarized statistical analysis lists individual species contributing to PCT dissimilarity at each monitoring site. It also has as a summary table of future floristic planting/management recommendations for rehabilitated areas per PCT type (based on the comparison of species found during monitoring to completion criteria). • Site specific vegetation descriptions are included in Appendix 1.

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	suggests that PCT targets may not be met.	<ul style="list-style-type: none">• A listed summary of floral species found in each offset area / monitoring point is in Appendix 2.
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Appendix B - Recommended Planting List

The following list contains native vascular flora recommended for planting in rehabilitation and revegetation areas as indicated in the Offset Management Plan (OMP). This list includes recommended species plantings as per recommendations in State and Commonwealth Consent Conditions and Approvals as well as native plant species that are currently known to occur within the biodiversity areas.

Names of classes and families follow a modified Cronquist (1981) System.

The following abbreviations or symbols are used in the list:

subsp. subspecies; and

var. variety.

All vascular plants recorded or collected were identified using keys and nomenclature in Harden (1992, 1993, 2000 & 2002) and Wheeler *et al.* (2002). Where known, changes to nomenclature and classification have been incorporated into the results, as derived from *PlantNET* (Botanic Gardens Trust 2015), the online plant name database maintained by the National Herbarium of New South Wales. Common names used follow Harden (1992, 1993, 2000 & 2002) where available, and draw on other sources.

It should be noted that approval DA 3015-11-01 Mod 5 also indicates that rehabilitation works should include establishment of Narrow-leaved Ironbark - Bulloak Open Forest endangered ecological community (EEC). However as this EEC is not listed under the *Biodiversity Conservation Act 2016* (BC Act) or listed as a Plant Community Type, it has been assumed that plantings for this community will primarily comprise those in the final determination for *Central Hunter Grey Box – Ironbark Woodland* EEC, with supplementary plantings from the species currently known to occur on site.

Table 1 – Recommended Species for Areas Proposed for Return to Central Hunter Box- Ironbark Woodland and Narrow-leaved Ironbark Spotted Gum Woodland

Family	Scientific Name	Common Name	Groundcover (G), Midstorey (M), Sub-Canopy (S) Canopy (C) or Wetland (W) Species	Species Previously Recorded at LCO or in biodiversity offset areas	Central Hunter Box – Ironbark Woodland EEC ^{1, 2, 3}	–	Narrow-Leaved Ironbark – Spotted Gum Woodland EEC ¹	–	Spotted Gum Woodland EEC ¹
Cyperaceae	<i>Lepidosperma laterala</i>	flat sedge	G				X		
Poaceae	<i>Microlaena stipoides</i>	weeping grass	G	X	X				X
Poaceae	<i>Microlaena stipoides</i> var. <i>stipoides</i>	weeping grass	G			X	X	X	
Poaceae	<i>Oplismenus aemulus</i>	basket grass	G	X					
Poaceae	<i>Paspalum distichum</i>	water couch	G	X					
Poaceae	<i>Phragmites australis</i>	common reed	W	X					
Polygonaceae	<i>Rumex brownii</i>	swamp dock	G		X				

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Typhaceae	<i>Typha orientalis</i>	broad-leaved cumbungi	W	X						
Juncaceae	<i>Juncus usitatus</i>		G	X						
Cyperaceae	<i>Schoenoplectus mucronatus</i>		G	X						
Scrophulariaceae	<i>Gratiola pedunculata</i>		G	X						
Hydrocharitaceae	<i>Ottelia ovalifolia</i>	swamp lily	W	X						
Marsileaceae	<i>Marsilea mutica</i>	nardoo	W	X						
Boraginaceae	<i>Cynoglossum suaveolens</i>		G	X						
Casuarinaceae	<i>Casuarina cunninghamiana</i>	river oak	C	X						
Casuarinaceae	<i>Casuarina glauca</i>	swamp oak	C	X						
Adiantaceae	<i>Cheilanthes distans</i>	bristly cloak fern	G	X	X	X		X		
Adiantaceae	<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>	poison rock fern	G	X	X	X	X	X	X	X
Anthericaceae	<i>Arthropodium milleflorum</i>	pale vanilla- lily	G		X			X		
Anthericaceae	<i>Laxmannia compacta</i>		G		X					
Anthericaceae	<i>Laxmannia gracilis</i>	slender wire lily						X	X	

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Asphodelaceae	<i>Bulbine bulbosa</i>	native leek	G		X				
Commelinaceae	<i>Commelina cyanea</i>	native wandering Jew	G	X	X			X	
Lomandraceae	<i>Lomandra bracteata</i>		G		X				
Lomandraceae	<i>Lomandra confertifolia</i>	mat-rush	G		X				
Lomandraceae	<i>Lomandra filliformis</i>	wattle matt-rush	G	X	X			X	
Lomandraceae	<i>Lomandra longifolia</i>	honey reed	G					X	
Lomandraceae	<i>Lomandra multiflora</i>	many-flowered mat-rush	G	X			X		X
Lomandraceae	<i>Lomandra multiflora</i> subsp. <i>multiflora</i>		G	X	X	X		X	X
Orchidaceae	<i>Diuris punctata</i> var. <i>punctata</i>	purple donkey orchid	G					X	
Orchidaceae	<i>Microtis unifolia</i>	common onion orchid	G		X				
Orchidaceae	<i>Pterostylis curta</i>	blunt greenhood	G		X				
Orchidaceae	<i>Pterostylis cycnocephala</i>	swan greenhood	G					X	
Poaceae	<i>Aristida leichhardtiana</i>		G	X					

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Poaceae	<i>Aristida lignosa</i>		G					X		
Poaceae	<i>Aristida ramosa</i>	purple wiregrass	G	X	X	X	X	X		X
Poaceae	<i>Aristida vagans</i>	threeawn speargrass	G	X	X			X		
Poaceae	<i>Rytidosperma bipartita</i>	wallaby grass	G		X					
Poaceae	<i>Rytidosperma carphoides</i>	short wallaby grass	G	X						
Poaceae	<i>Rytidosperma fulvum</i>	wallaby grass	G	X	X			X		X
Poaceae	<i>Rytidosperma racemosa</i>		G	X	X					
Poaceae	<i>Rytidosperma tenuior</i>		G	X				X		
Poaceae	<i>Austrostipa aristiglumis</i>		G		X					
Poaceae	<i>Austrostipa scabra</i>	speargrass	G	X	X	X				
Poaceae	<i>Austrostipa verticillata</i>	slender bamboo grass	G	X	X					
Poaceae	<i>Bothriochloa biloba</i>	lobed bluegrass	G		X					
Poaceae	<i>Bothriochloa decipiens</i>	red grass	G	X	X	X				
Poaceae	<i>Bothriochloa macra</i>	red grass	G	X	X			X		
Poaceae	<i>Chloris truncata</i>	wndmill grass	G	X	X					

Number: LIDOC-2051682306-10

Owner: Environment & Community Officer

Status: Approved

Version: 9.0

Effective: 05/09/2019

Review: 05/09/2020

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Poaceae	<i>Chloris ventricosa</i>	tall chloris	G	X	X	X				
Poaceae	<i>Cymbopogon refractus</i>	barbed wire grass	G	X	X	X	X	X	X	X
Poaceae	<i>Cynodon dactylon</i>	common couch	G	X	X					
Poaceae	<i>Dichanthium sericeum</i> subsp. <i>Sericeum</i>	Queensland bluegrass	G		X					
Poaceae	<i>Dichelachne micrantha</i>	shorthair plumegrass	G		X			X		
Poaceae	<i>Digitaria brownii</i>	cotton panic grass	G		X					
Poaceae	<i>Digitaria diffusa</i>	open summer grass	G	X	X					
Poaceae	<i>Echinopogon caespitosus</i> var. <i>caespitosus</i>	tufted hedgehog grass	G					X	X	
Poaceae	<i>Echinopogon ovatus</i>	hedgehog grass	G		X			X		
Poaceae	<i>Enteropogon acicularis</i>		G	X						
Poaceae	<i>Entolasia marginata</i>	bordered panic	G					X		
Poaceae	<i>Entolasia stricta</i>	wiry panic	G					X	X	
Poaceae	<i>Eragrostis brownii</i>	Brown's lovegrass	G	X	X					

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Poaceae	<i>Eragrostis leptocarpa</i>	drooping lovegrass	G					X		
Poaceae	<i>Eragrostis leptostachya</i>	paddock lovegrass	G	X	X	X		X		
Poaceae	<i>Eragrostis molybdea</i>		G		X					
Poaceae	<i>Eriochloa pseudoacrotricha</i>	early spring grass	G	X						
Poaceae	<i>Heteropogon contortus</i>	bunch speargrass	G		X					
Poaceae	<i>Notodanthonia longifolia</i>		G		X					
Poaceae	<i>Panicum effusum</i>	poison panic	G	X	X					
Poaceae	<i>Panicum simile</i>	two-colour panic	G	X						
Poaceae	<i>Panicum subxerophilum</i>		G		X					
Poaceae	<i>Paspalidium gracile</i>	slender panic	G		X					
Poaceae	<i>Paspalidium distans</i>		G					X	X	
Poaceae	<i>Poa sieberiana</i>	tussock poa	G	X						
Poaceae	<i>Sporobolus creber</i>	slender rat's tail grass	G	X	X	X				
Poaceae	<i>Sporobolus elongatus</i>	slender rats tail grass	G					X		

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Poaceae	<i>Themeda triandra</i>	kangaroo grass	G		X		X	X	X	
Poaceae	<i>Tragus australianus</i>		G		X					
Xanthorrhaceae	<i>Xanthorrhoea acaulis</i>		M		X					
Zygophyllaceae	<i>Zygophyllum glaucum</i>	pale twinleaf	G		X					
Acanthaceae	<i>Brunoniella australis</i>	blue trumpet	G	X	X	X				X
Acanthaceae	<i>Rostellularia adscendens subsp. adscendens</i>		G		X					
Amaranthaceae	<i>Alternanthera denticulata</i>	lesser joyweed	G	X						
Apiaceae	<i>Centella asiatica</i>	pennnywort	G	X						
Apiaceae	<i>Daucus glochidiautus</i>	native carrot	G					X		
Apiaceae	<i>Hydrocotyle laxiflora</i>	stinking pennywort	G		X					
Apocynaceae	<i>Sarcostemma brunonianum</i>		G							
Asteraceae	<i>Brachyscome multifida</i>	rocky daisy	G					X	X	
Asteraceae	<i>Calocephalus citreus</i>	lemon beauty-heads	G	X	X					

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Asteraceae	<i>Calotis cuneata</i>	mountain Burr-daisy	G	X						
Asteraceae	<i>Calotis cuneifolia</i>	purple burr-daisy	G		X			X	X	
Asteraceae	<i>Calotis lappulacea</i>	yellow burr-daisy	G	X	X	X		X		
Asteraceae	<i>Cassinia aculeata</i>	dolly bush	M	X				X		
Asteraceae	<i>Cassinia quinquefaria</i>		M		X	X				
Asteraceae	<i>Chrysocephalum apiculatum</i>	common everlasting	G	X	X	X		X	X	
Asteraceae	<i>Cotula australis</i>	common cotula	G		X					
Asteraceae	<i>Cymbonotus lawsonianus</i>	bear's ear	G	X						
Asteraceae	<i>Epaltes australis</i>	spreading nut-heads	G					X		
Asteraceae	<i>Euchiton involucratus</i>	star cudweed	G	X						
Asteraceae	<i>Euchiton sphaericus</i>		G	X				X		
Asteraceae	<i>Glossocardia bidens</i>	cobblers tack	G		X			X		
Asteraceae	<i>Lagenifera gracilis</i>		G		X					
Asteraceae	<i>Lagenifera stipitata</i>	blue bottle-daisy	G	X						

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Asteraceae	<i>Leiocarpa leptolepis</i>	pale plove-daisy	G		X					
Asteraceae	<i>Olearia elliptica</i> subsp. <i>elliptica</i>	sticky daisy-bush	M		X					X
Asteraceae	<i>Ozothamnus diosmifolius</i>	rice flower	M					X		
Asteraceae	<i>Pseudognaphalium leteo-album</i>	Jersey cudweed	G					X		
Asteraceae	<i>Sigesbeckia orientalis</i> subsp. <i>orientalis</i>	Indian weed	G		X					
Asteraceae	<i>Solenogyne bellioides</i>		G		X					
Asteraceae	<i>Triptilodiscus pygmaeus</i>	common sunray	G		X					
Asteraceae	<i>Vernonia cinerea</i> var. <i>cinerea</i>		G		X			X	X	
Asteraceae	<i>Vittadinia cuneata</i>	Fuzzweed	G	X	X	X				
Asteraceae	<i>Vittadinia muelleri</i>	Fuzzweed	G	X						
Asteraceae	<i>Vittadinia pterochaeta</i>		G	X						
Campanulaceae	<i>Wahlenbergia communis</i>	Tufted Bluebell	G	X	X			X	X	
Campanulaceae	<i>Wahlenbergia gracilentia</i>	Annual Bluebell	G	X						
Campanulaceae	<i>Wahlenbergia gracilis</i>	Australian Bluebell	G	X	X			X	X	

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Campanulaceae	<i>Wahlenbergia luteola</i>		G		X					
Casuarinaceae	<i>Allocasuarina luehmannii</i>	Bulloak	S	X	X	X	X	X	X	
Celastraceae	<i>Denhamia silvestris</i>		M					X		
Chenopodiaceae	<i>Chenopodium melanocarpum</i>	black crumbweed	G		X					
Chenopodiaceae	<i>Einadia hastata</i>	berry saltbush	G		X					
Chenopodiaceae	<i>Einadia nutans</i>	climbing saltbush	G	X	X	X				
Chenopodiaceae	<i>Einadia polygonoides</i>		G		X					
Chenopodiaceae	<i>Einadia trigonos</i>	fishweed	G	X	X					
Chenopodiaceae	<i>Enchylaena tomentosa</i>	ruby saltbush	M	X	X					
Chenopodiaceae	<i>Maireana enchylaenoides</i>	wingless bluebush	G		X					
Chenopodiaceae	<i>Maireana microphylla</i>		M	X	X					
Clusiaceae	<i>Hypericum gramineum</i>	small St John's wort	G	X	X			X	X	
Clusiaceae	<i>Hypericum perforatum</i>	St. Johns wort	G	X						
Convolvulaceae	<i>Convolvulus erubescens</i>	blushing bindweed	G		X					

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Convolvulaceae	<i>Dichondra repens</i>	kidney weed	G	X	X	X		X	X	
Convolvulaceae	<i>Dichondra sp. A</i>		G				X			
Crassulaceae	<i>Crassula sieberiana</i>	Australian stonecrop	G		X					
Cupressaceae	<i>Callitris endlicheri</i>	black cypress pine	C		X	X				
Cyperaceae	<i>Carex fascicularis</i>	tassel sedge	G		X					
Cyperaceae	<i>Carex inversa</i>	knob sedge	G	X	X					
Cyperaceae	<i>Cyperus gracilis</i>	slender flat-sedge	G	X	X	X				
Cyperaceae	<i>Fimbristylis dichotoma</i>	common fringe-sedge	G	X	X			X		
Cyperaceae	<i>Gahnia aspera</i>		G		X					
Cyperaceae	<i>Scleria mackaviensis</i>		G		X					
Dilleniaceae	<i>Hibbertia diffusa</i>	wedge guinea flower	M					X		
Dilleniaceae	<i>Hibbertia fasciculata</i>		M					X		
Dilleniaceae	<i>Hibbertia linearis</i>		M					X		
Dilleniaceae	<i>Hibbertia obtusifolia</i>	hoary guinea flower	M		X			X		
Droseraceae	<i>Drosera pygmaea</i>	pygmy sundew	G					X		

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Epacridaceae	<i>Melichrus urceolatus</i>	Urn Heath	G	X		X		X	X	
Ericaceae	<i>Acrotriche rigida</i>		M		X					
Ericaceae	<i>Leucopogon juniperinus</i>	prickly beard heath	M					X		
Ericaceae	<i>Lissanthe strigosa</i>	peach heath	M					X	X	
Euphorbiaceae	<i>Chamaesyce drummondii</i>	caustic weed	G	X	X					
Euphorbiaceae	<i>Euphorbia planiticola</i>	plains spurge	G		X					
Euphorbiaceae	<i>Phyllanthus hirtellus</i>	thyme spurge	M					X		
Euphorbiaceae	<i>Phyllanthus virgatus</i>		G	X	X	X		X		
Fabaceae (Caesalpinioideae)	<i>Cassia aciphylla</i>	sprawling cassia	M	X						
Fabaceae (Caesalpinioideae)	<i>Senna artemisioides form taxon 'zygophylla'</i>		M		X					
Fabaceae (Faboideae)	<i>Chorizema parviflorum</i>	eastern flame pea	M							
Fabaceae (Faboideae)	<i>Daviesia genistifolia</i>	Broom bitter Pea	M	X						
Fabaceae (Faboideae)	<i>Daviesia ulicifolia</i>	gorse bitter pea	M	X					X	
Fabaceae (Faboideae)	<i>Daviesia ulicifolia</i> subsp. <i>ulicifolia</i>		M					X		

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Fabaceae (Faboideae)	<i>Desmodium brachypodum</i>	large tick-trefoil	G	X	X			X		
Fabaceae (Faboideae)	<i>Desmodium varians</i>	slender tick-trefoil	G	X	X	X		X	X	
Fabaceae (Faboideae)	<i>Glycine clandestina</i>		G	X	X			X	X	
Fabaceae (Faboideae)	<i>Glycine stenophita</i>		G		X					
Fabaceae (Faboideae)	<i>Glycine tabacina</i>	glycine	G	X	X	X		X	X	
Fabaceae (Faboideae)	<i>Hardenbergia violacea</i>	false sarsaparilla	G	X	X			X		
Fabaceae (Faboideae)	<i>Hovea longipes</i>		M		X					
Fabaceae (Faboideae)	<i>Indigofera australis</i>	Australian indigo	M					X		
Fabaceae (Faboideae)	<i>Jacksonia scoparia</i>	dogwood	M		X					
Fabaceae (Faboideae)	<i>Pultenaea microphylla</i>		M	X				X		
Fabaceae (Faboideae)	<i>Pultenaea spinosa</i>	spiny bush-pea	M					X	X	
Fabaceae (Faboideae)	<i>Rhynchosia minima</i>		G		X					
Fabaceae (Faboideae)	<i>Swainsona galegifolia</i>	smooth-darling pea	G		X					

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Fabaceae (Faboideae)	<i>Templetonia stenophylla</i>	leafy templetonia	M	X	X					
Fabaceae (Faboideae)	<i>Zornia dyctiocarpa</i>	zornia	G	X						
Fabaceae (Mimosoideae)	<i>Acacia amblygona</i>	fan wattle	M		X			X		
Fabaceae (Mimosoideae)	<i>Acacia bulgaensis</i>	Bulga wattle	M			X				
Fabaceae (Mimosoideae)	<i>Acacia decora</i>	western golden wattle	M	X	X					
Fabaceae (Mimosoideae)	<i>Acacia falcata</i>	hickory wattle	M	X	X			X	X	
Fabaceae (Mimosoideae)	<i>Acacia gunnii</i>	ploughshare wattle	M		X					
Fabaceae (Mimosoideae)	<i>Acacia implexa</i>	hickory wattle	M	X	X					
Fabaceae (Mimosoideae)	<i>Acacia melvillei</i>	myall	M		X					
Fabaceae (Mimosoideae)	<i>Acacia paradoxa</i>	kangaroo-thorn	M		X					
Fabaceae (Mimosoideae)	<i>Acacia parvipinnula</i>	silver-stemmed wattle	M					X	X	
Fabaceae (Mimosoideae)	<i>Acacia pendula</i>	weeping myall	M		X	X				
Fabaceae (Mimosoideae)	<i>Acacia pravifolia</i>	coil-pod wattle	M							

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Fabaceae (Mimosoideae)	<i>Acacia salicina</i>	cooba	M	X					
Geraniaceae	<i>Geranium homeanum</i>		G	X					
Geraniaceae	<i>Geranium solanderi</i>	native geranium	G	X					
Goodeniaceae	<i>Goodenia hederacea</i> subsp. <i>hederacea</i>	forest goodenia	G					X	
Goodeniaceae	<i>Goodenia rotundifolia</i>		G					X	
Goodeniaceae	<i>Brunonia australis</i>	blue pincushion	G	X				X	X
Haloragaceae	<i>Haloragis serra</i>		G		X				
Lamiaceae	<i>Ajuga australis</i>	Austral bugle	G		X	X		X	
Lamiaceae	<i>Mentha satureioides</i>	native pennyroyal	G	X					
Lamiaceae	<i>Salvia plebeia</i>	Austral sage	G		X				
Lamiaceae	<i>Spartothamnella juncea</i>	bead bush	M		X				
Lobeliaceae	<i>Pratia purpurascens</i>	whiteroot	G	X	X			X	X
Loganiaceae	<i>Mitrasacme alsinoides</i>		G					X	
Malvaceae	<i>Melhania oblongifolia</i>		M		X				

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Malvaceae	<i>Sida corrugata</i>	corrugated sida	G	X	X					
Malvaceae	<i>Malvastrum coromandelianum</i>	prickly malvastrum	G		X					
Meliaceae	<i>Melia azedarach</i>	white cedar	S	X						
Myoporaceae	<i>Eremophila debilis</i>	Amulla	G	X	X	X	X	X	X	X
Myrtaceae	<i>Angophora floribunda</i>	rough-barked apple	C	X	X	X				
Myrtaceae	<i>Corymbia maculata</i>	spotted gum	C					X	X	X
Myrtaceae	<i>Eucalyptus canaliculata</i>	grey gum	C					X		
Myrtaceae	<i>Eucalyptus crebra</i>	narrow-leaved ironbark	C	X	X	X	X	X	X	X
Myrtaceae	<i>Eucalyptus fibrosa</i>	red ironbark	C					X	X	
Myrtaceae	<i>Eucalyptus glaucina</i>	slaty red gum	C						X	
Myrtaceae	<i>Eucalyptus moluccana</i>	grey box	C	X	X	X	X	X	X	X
Myrtaceae	<i>Eucalyptus tereticornis</i>	forest red gum	C	X				X	X	
Myrtaceae	<i>Kunzea ambigua</i>	tick bush	M					X		
Nyctaginaceae	<i>Boerhavia dominii</i>	tarvine	V		X					
Oleaceae	<i>Notelaea microcarpa</i> var. <i>microcarpa</i>	mock olive	M		X	X				

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Oxalidaceae	<i>Oxalis chnoodes</i>		G					X		
Oxalidaceae	<i>Oxalis exilis</i>		G					X		
Oxalidaceae	<i>Oxalis radicata</i>		G		X					
Oxalidaceae	<i>Oxalis rubens</i>		G					X		
Oxalidaceae	<i>Oxalis perennans</i>		G	X				X		
Phormiaceae	<i>Dianella caerulea</i>	blue flax-lily	G		X			X		
Phormiaceae	<i>Dianella longifolia</i>	blueberry lily	G	X	X			X		
Phormiaceae	<i>Dianella revoluta</i>	blue flax-lily	G	X						
Phormiaceae	<i>Dianella revoluta</i> var. <i>revoluta</i>	blue flax-lily	G		X			X	X	
Phyllanthaceae	<i>Breynia oblongifolia</i>	coffee bush	M		X	X	X	X	X	
Pittosporaceae	<i>Bursaria spinosa</i>	blackthorn	M		X	X	X	X	X	X
Plantaginaceae	<i>Plantago debilis</i>		G	X	X			X		
Plantaginaceae	<i>Plantago gaudichaudii</i>	narrow plantain	G					X		
Plantaginaceae	<i>Plantago hispida</i>		G		X					
Proteaceae	<i>Grevillea montana</i>		G					X		
Proteaceae	<i>Hakea sericea</i>	needlebush	M					X	X	
Proteaceae	<i>Persoonia linearis</i>	narrow-leaved geebung	M					X		

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Proteaceae	<i>Persoonia pauciflora</i>	North Rothbury persoonia	M					X		
Rubiaceae	<i>Asperula conferta</i>	common woodruff	G	X	X			X		
Rubiaceae	<i>Opercularia diphylla</i>		G					X	X	
Rubiaceae	<i>Pomax umbellata</i>		G				X	X	X	
Rubiaceae	<i>Psydrax odorata</i>	shiny-leaved canthium	M		X					
Santalaceae	<i>Santalum lanceolatum</i>	northern sandalwood	M		X					
Sapindaceae	<i>Dodonaea viscosa</i>	sticky hop bush	M		X	X				
Scrophulariaceae	<i>Myoporum montanum</i>	water bush	M		X					
Scrophulariaceae	<i>Veronica plebeia</i>	trailing speedwell	G	X	X			X		
Solanaceae	<i>Nicotiana megalosiphon</i> subsp. <i>megalosiphon</i>		M		X					
Solanaceae	<i>Solanum cinereum</i>	Narrawa burr	G		X	X				
Solanaceae	<i>Solanum elegans</i>		G		X					
Solanaceae	<i>Solanum papaverifolium</i>		M					X		

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Solanaceae	<i>Solanum prinophyllum</i>	forest nighshade	G					X	X	
Stackhousiaceae	<i>Stackhousia muricata</i>	western stackhousia	G		X					
Stackhousiaceae	<i>Stackhousia viminea</i>	slender stackhousia	G	X	X			X	X	
Sterculeaceae	<i>Brachychiton populneus</i> subsp. <i>populneus</i>	kurrajong	S	X	X	X				
Thymeleaceae	<i>Pimelea curviflora</i>	rice flower	M		X					
Thymeleaceae	<i>Pimelea curviflora</i> var. <i>sericea</i>	rice flower	M		X					
Verbenaceae	<i>Clerodendrum tomentosum</i>	hairy Clerodendrum	M	X						
Verbenaceae	<i>Verbena gaudichaudii</i>		G		X					

¹ Requirement for rehabilitation from DA 305-11-01

² Requirement for rehabilitation under 2013-6908 Approval

³ This includes requirements for *Central Hunter Box – Ironbark – Angophora Dominated Rehabilitation*, *Central Hunter Box – Ironbark – Ironbark Dominated Rehabilitation* and *Narrow-leaved Ironbark – Bulloak Open Forest*. However in each of those instances, greater emphasis should be placed on presence of rough-barked apple (*Angophora floribunda*), narrow-leaved ironbark (*Eucalyptus crebra*) and bulloak (*Allocasuarina luehmannii*) respectively in the canopy species.

Note this species list excludes mistletoes and vines

Species in **Bold** print are recommended by OEH

Table 2 – Recommended Planting List for Areas Proposed for Return to Spotted Gum Forest

Family	Scientific Name	Common Name	Groundcover (G), Midstorey (M), Canopy (C) or Wetland Species	Sub-Canopy (S) or (W)	Species Previously Recorded at LCO or in Offset Areas	Barrington Dry Forest	Footslopes Spotted Gum
						Peake (2006)	
Cyperaceae	<i>Cyperus laevis</i>		G			X	
Cyperaceae	<i>Fimbristylis dichotoma</i>	common fringe-sedge	G			X	
Cyperaceae	<i>Gahnia aspera</i>		M			X	
Cyperaceae	<i>Lepidosperma laterale</i>	flat sedge	G			X	
Cyperaceae	<i>Scleria mackaviensis</i>		G			X	
Poaceae	<i>Microlaena stipoides</i> var. <i>stipoides</i>	weeping grass	G			X	
Poaceae	<i>Oplismenus aemulus</i>	basket grass	G			X	
	<i>Arthropodium species B</i>		G			X	
Orchidaceae	<i>Diuris sulphurea</i>		G			X	
Orchidaceae	<i>Microtis unifolia</i>		G			X	
Orchidaceae	<i>Pterostylis cycnocephala</i>		G			X	
Orchidaceae	<i>Pterostylis obtusa</i>		G			X	
Phormiaceae	<i>Dianella caerulea</i>	blue flax lily	G		X		X

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Phormiaceae	<i>Dianella revoluta</i> var. <i>revoluta</i>		G		X
Adiantaceae	<i>Adiantum aethiopicum</i>		G		X
Adiantaceae	<i>Adiantum hispidulum</i> var. <i>Hispidulum</i>		G		X
Adiantaceae	<i>Pellaea paradoxa</i>		G		X
Adiantaceae	<i>Pellaea calidirupium</i>		G		X
Adiantaceae	<i>Cheilanthes distans</i>	bristly cloak fern	G		X
Adiantaceae	<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>	poison rock fern	G		X
Commelinaceae	<i>Commelina cyanea</i>	native wandering Jew	G		X
Hypoxidaceae	<i>Hypoxis hygrometrica</i>	Golden weather grass	G		X
Lomandraceae	<i>Lomandra multiflora</i> subsp. <i>multiflora</i>		G		X
Lomandraceae	<i>Lomandra longifolia</i>		G		X
Poaceae	<i>Aristida ramosa</i>	purple wiregrass	G	X	X
Poaceae	<i>Bothriochloa decipiens</i>		G		X
Poaceae	<i>Capillipedium spicigerum</i>		G		X
Poaceae	<i>Cymbopogon refractus</i>	barbed wire grass	G	X	X
Poaceae	<i>Echinopogon ovatus</i>	hedgehog grass	G		X
Poaceae	<i>Dichelachne micrantha</i>	shorthair plume grass	G		X
Poaceae	<i>Eragrostis leptostachya</i>		G		X
Poaceae	<i>Entolasia marginata</i>		G		X

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Poaceae	<i>Entolasia stricta</i>		G		X
Poaceae	<i>Imperata cylindrica</i>	blady grass	G		X
Poaceae	<i>Panicum simile</i>		G		X
Poaceae	<i>Paspalidium distans</i>		G		X
Poaceae	<i>Poa labillardierei</i>	tussock	G	X	X
Poaceae	<i>Sorghum leiocladum</i>	wild sorghum	G	X	X
Poaceae	<i>Sporobolus creber</i>	slender rats tail grass	G		X
Poaceae	<i>Themeda australis</i>	kangaroo grass	G	X	X
Acanthaceae	<i>Brunoniella australis</i>	blue trumpet	G		X
Acanthaceae	<i>Brunoniella pumilio</i>		G		X
Acanthaceae	<i>Pseuderanthemum variabile</i>	pastel flower	G		X
Apiaceae	<i>Daucus glochidiatus</i>	native carrot	G		X
Apiaceae	<i>Hydrocotyle peduncularis</i>		G		X
Araliaceae	<i>Polyscias sambucifolia</i>	Elderberry ash	S		X
Asteraceae	<i>Cassinia aculeata</i>	dolly bush	M		X
Asteraceae	<i>Craspedia variabilis</i>	common Billy buttons	G		X
Asteraceae	<i>Brachyscome multifida</i>	rocky daisy	G		X
Asteraceae	<i>Euchiton sphaericus</i>		G		X
Asteraceae	<i>Glossogyne tannensis</i>		G		X

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Asteraceae	<i>Lagenifera stipitata</i>	blue bottle-daisy	G		X
Asteraceae	<i>Ozothamnus diosmifolius</i>	rice flower	M		X
Asteraceae	<i>Senecio hispidus</i>		M		X
Asteraceae	<i>Sigesbeckia orientalis</i> subsp. <i>orientalis</i>	Indian weed	G		X
Asteraceae	<i>Vernonia cinerea</i> var. <i>cinerea</i>		G	X	X
Asteraceae	<i>Vittadinia hispidula</i>		G		X
Campanulaceae	<i>Wahlenbergia communis</i>	tufted bluebell	G		X
Campanulaceae	<i>Wahlenbergia gracilis</i>		G		X
Casuarinaceae	<i>Allocasuarina torulosa</i>	forest oak	S		X
Celastraceae	<i>Denhamia silvestris</i>	orange bark	S		X
Clusiaceae	<i>Hypericum gramineum</i>	small St John's wort	G		X
Convolvulaceae	<i>Dichondra repens</i>	kidney weed	G	X	X
Dilleniaceae	<i>Hibbertia aspera</i> subsp. <i>aspera</i>		G		X
Dilleniaceae	<i>Hibbertia diffusa</i>		M		X
Dilleniaceae	<i>Hibbertia obtusifolia</i>	hoary guinea flower	M	X	X
Dilleniaceae	<i>Hibbertia scandens</i>		M		X
Ericaceae (Styphelioideae)	<i>Leucopogon juniperinus</i>	prickly beard heath	M		X
Fabaceae (Faboideae)	<i>Desmodium brachypodum</i>	large tick-trefoil	M	X	X
Fabaceae (Faboideae)	<i>Desmodium rhytidophyllum</i>		G		X

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Fabaceae (Faboideae)	<i>Desmodium varians</i>		G		X
Fabaceae (Faboideae)	<i>Glycine clandestina</i>		G		X
Fabaceae (Faboideae)	<i>Glycine microphylla</i>		G		X
Fabaceae (Faboideae)	<i>Glycine tabacina</i>		G	X	X
Fabaceae (Faboideae)	<i>Hardenbergia violacea</i>	false sarsaparilla	G		X
Fabaceae (Faboideae)	<i>Jacksonia scoparia</i>	dogwood	M		X
Fabaceae (Faboideae)	<i>Kennedia rubicunda</i>		M		X
Fabaceae (Faboideae)	<i>Podolobium ilicifolium</i>	prickly shaggy pea	M		X
Fabaceae (Faboideae)	<i>Pultenaea rosmarinifolia</i>		M		X
Fabaceae (Faboideae)	<i>Pultenaea spinosa</i>	spiny bush-pea	M		X
Fabaceae (Faboideae)	<i>Viminaria juncea</i>	native broom	M		X
Fabaceae (Mimosoideae)	<i>Acacia implexa</i>	hickory wattle	M	X	X
Fabaceae (Mimosoideae)	<i>Acacia irrorata</i> subsp. <i>irrorata</i>	green wattle	M		X
Fabaceae (Mimosoideae)	<i>Acacia parvipinnula</i>	silver stemmed wattle	M		X
Fabaceae (Mimosoideae)	<i>Acacia stricta</i>		M		X
Fabaceae (Mimosoideae)	<i>Acacia ulicifolia</i>		M		X
Fabaceae (Faboideae)	<i>Indigofera australis</i>	Australian indigo	M		X
Goodeniaceae	<i>Scaevola albida</i> var. <i>albida</i>		G		X
Lamiaceae	<i>Ajuga australis</i>	Austral bugle	G		X

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Lamiaceae	<i>Clerodendrum tomentosum</i>	downy chance tree	M		X
Lamiaceae	<i>Plectranthus graveolens</i>		G		X
Lamiaceae	<i>Plectranthus parviflorus</i>	cockspur flower	G		X
Lamiaceae	<i>Scutellaria humilis</i>	dwarf skullcap	G		X
Malvaceae	<i>Brachychiton populneus</i> subsp. <i>populneus</i>	kurrajong	S		X
Lobeliaceae	<i>Pratia purpurascens</i>	whiteroot	G	X	X
Menispermaceae	<i>Stephania japonica</i> var. <i>japonica</i>	snake vine	M		X
Myoporaceae	<i>Eremophila debilis</i>	Amulla	G		X
Myrsinaceae	<i>Rapanea variabilis</i>	muttonwood	S		X
Myrtaceae	<i>Angophora floribunda</i>	rough-barked apple	C	X	X
Myrtaceae	<i>Corymbia maculata</i>	spotted gum	C	X	
Myrtaceae	<i>Eucalyptus acmenioides</i>	white mahogany	C		X
Myrtaceae	<i>Eucalyptus blakelyi</i>	Blakely's red gum	C	X	
Myrtaceae	<i>Eucalyptus canaliculata</i>	grey gum	C		X
Myrtaceae	<i>Eucalyptus crebra</i>	narrow-leaved ironbark	C		X
Myrtaceae	<i>Eucalyptus eugenioides</i>	thin-leaved stringybark	C		X
Myrtaceae	<i>Eucalyptus globoidea</i>	white stringybark	C		X
Myrtaceae	<i>Eucalyptus moluccana</i>	grey box	C	X	
Myrtaceae	<i>Eucalyptus punctata</i>	grey gum	C	X	

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Myrtaceae	<i>Eucalyptus tereticornis</i>	forest red gum	C	X	X
Myrtaceae	<i>Eucalyptus siderophloia</i>	grey ironbark	C		X
Myrtaceae	<i>Eucalyptus sparsifolia</i>	narrow-leaved stringybark	C	X	
Oleaceae	<i>Notelaea longifolia</i>	large mock-olive	M		X
Oleaceae	<i>Notelaea microcarpa</i> var. <i>microcarpa</i>	native olive	M	X	X
Oxalidaceae	<i>Oxalis perennans</i>		G		X
Phyllanthaceae	<i>Breynia oblongifolia</i>	coffee bush	M	X	X
Phyllanthaceae	<i>Phyllanthus gunnii</i>		M		X
Phyllanthaceae	<i>Phyllanthus virgatus</i>		M		X
Phyllanthaceae	<i>Poranthera microphylla</i>		G		X
Pittosporaceae	<i>Billardiera scandens</i>	hairy apple berry	G		X
Pittosporaceae	<i>Bursaria spinosa</i>	native blackthorn	M		X
Pittosporaceae	<i>Pittosporum revolutum</i>	wild yellow jasmine	M		X
Pittosporaceae	<i>Pittosporum undulatum</i>	mock orange	M	X	X
Plantaginaceae	<i>Plantago debilis</i>		G		X
Proteaceae	<i>Persoonia linearis</i>	narrow-leaved geebung	M		X
Rhamnaceae	<i>Pomaderris lanigera</i>	woolly pomaderris	M		X
Rubiaceae	<i>Opercularia diphylla</i>		G		X
Rubiaceae	<i>Opercularia hispida</i>		G		X

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Rubiaceae	<i>Pomax umbellata</i>		G		G
Rubiaceae	<i>Galium propinquum</i>	Maori bedstraw	G		X
Rubiaceae	<i>Galium binifolium</i>		G		X
Santalaceae	<i>Exocarpos cupressiformis</i>	native cherry	M		X
Sapindaceae	<i>Dodonaea viscosa</i> subsp. <i>spatulata</i>	sticky hop bush	M	X	
Sapindaceae	<i>Dodonaea viscosa</i> subsp. <i>viscosa</i>	sticky hop bush	M	X	
Scrophulariaceae	<i>Veronica plebeia</i>	trailing speedwell	G		X
Solanaceae	<i>Solanum brownii</i>	violet nightshade	M	X	
Solanaceae	<i>Solanum prinophyllum</i>	forest nighshade	G		X
Solanaceae	<i>Solanum stelligerum</i>		M		X
Stackhousiaceae	<i>Stackhousia viminea</i>	slender stackhousia	G		X
Ulmaceae	<i>Aphananthe phillippinensis</i>	native elm	S		X
Ulmaceae	<i>Trema tomentosa</i> var. <i>aspera</i>	poison peach	S		X

Table 3 – Recommended Planting List for Areas Proposed for Return to Hunter Valley River Oak Forest

Family	Scientific Name	Common Name	Groundcover (G), Midstorey (M), Sub-Canopy (C) or Wetland Species (W)	Species Previously Recorded at LCO or in Offset Areas	Hunter Valley River Oak Forest	
					Peake (2006)	VIS Classification (2014)
Cyperaceae	<i>Carex appressa</i>	tall sedge	G		X	
Cyperaceae	<i>Schoenus apogon</i>		G		X	
Poaceae	<i>Microlaena stipoides</i> var. <i>stipoides</i>	weeping grass	G		X	X
Poaceae	<i>Oplismenus aemulus</i>	basket grass	G	X	X	
Polygonaceae	<i>Persicaria decipiens</i>	slender knotweed	G		X	
Boraginaceae	<i>Cynoglossum australe</i>		G	X	X	
Adiantaceae	<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>	poison rock fern	G	X	X	
Commelinaceae	<i>Commelina cyanea</i>	native wandering Jew	G	X	X	
Lomandraceae	<i>Lomandra longifolia</i>		G		X	
Poaceae	<i>Austrostipa verticillata</i>	slender grass bamboo	G	X	X	
Poaceae	<i>Bothriochloa macra</i>	red grass	G	X		X
Poaceae	<i>Cynodon dactylon</i>	common couch	G	X	X	

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Poaceae	<i>Echinochloa telmatophila</i>		G		X	
Poaceae	<i>Echinopogon ovatus</i>	hedgehog grass	G		X	
Poaceae	<i>Elymus scaber</i>		G			X
Amaranthaceae	<i>Nyssanthes diffusa</i>		G		X	
Asteraceae	<i>Cotula australis</i>	common cotula	G		X	
Asteraceae	<i>Sigesbeckia orientalis</i> subsp. <i>orientalis</i>	Indian weed	G		X	
Asteraceae	<i>Solenogyne bellioides</i>		G		X	
Caryophyllaceae	<i>Stellaria pungens</i>	prickly starwort	G		X	
Casuarinaceae	<i>Casuarina cunninghamiana</i> subsp. <i>cunninghamiana</i>	river oak	C	C		X
Casuarinaceae	<i>Casuarina glauca</i>	swamp oak	C		X	
Chenopodiaceae	<i>Einadia hastata</i>		G		X	
Convolvulaceae	<i>Convolvulus erubescens</i>	blushing bindweed	G		X	
Convolvulaceae	<i>Dichondra repens</i>	kidney weed	G		X	
Fabaceae (Mimosoideae)	<i>Acacia falcata</i>	sickle wattle	M	X	X	
Fabaceae (Mimosoideae)	<i>Acacia longifolia</i>	Sydney golden wattle	M		X	
Fabaceae (Mimosoideae)	<i>Acacia paradoxa</i>	kangaroo thorn	M		X	

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Geraniaceae	<i>Geranium solanderi</i>	native geranium	G	X	X	
Lamiaceae	<i>Clerodendrum tomentosum</i>	downy chance tree	M			X
Lamiaceae	<i>Plectranthus parviflorus</i>	cockspur flower	G		X	
Lobeliaceae	<i>Pratia purpurascens</i>	whiteroot	G	X	X	
Moraceae	<i>Ficus coronata</i>	sandpaper fig	S		X	X
Myrsinaceae	<i>Rapanea variabilis</i>	muttonwood	S		X	
Myrtaceae	<i>Backhousia myrtifolia</i>	ironwood	C		X	
Myrtaceae	<i>Angophora floribunda</i>	rough-barked apple	C	X	X	X
Myrtaceae	<i>Eucalyptus tereticornis</i>	forest red gum	C	X	X	
Myrtaceae	<i>Eucalyptus viminalis</i>	ribbon gum	C			X
Oleaceae	<i>Notelaea venosa</i>	velvet mock-olive	M		X	
Phyllanthaceae	<i>Breynia oblongifolia</i>	coffee bush	M			X
Pittosporaceae	<i>Pittosporum undulatum</i>	mock orange	M			X
Plantaginaceae	<i>Plantago debilis</i>		G	X	X	
Plantaginaceae	<i>Plantago gaudichaudii</i>	narrow plantain	G		X	
Rubiaceae	<i>Galium propinquum</i>	Maori bedstraw	G		X	
Scrophulariaceae	<i>Myoporum montanum</i>	water bush	M		X	
Solanaceae	<i>Solanum prinophyllum</i>	forest nighshade	G		X	

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Ulmaceae	<i>Trema tomentosa</i>	native peach	S		X	
Urticaceae	<i>Urtica incisa</i>	stinging nettle	G		X	X
Violaceae	<i>Melicytus dentatus</i>	tree violet	M			X

Appendix C - Fulfilled Completion Criteria

The following Completion Criteria have been fulfilled as a result of management actions undertaken.

Relevant Area	Offset	Action	Completion Criteria	Year Completed	Action
Fencing and Signage					
All biodiversity offset areas		Install or repair boundary fences restricting unauthorised access to property and controlling livestock movements	All biodiversity offset areas will have boundary fencing of appropriate design and condition.	Main fencing completed during year 1 (2015) with minor boundary change rectification work completed in year 3 (2017)	
All biodiversity offset areas		Removal of redundant fences.	Redundant fences removed.	Mapping of redundant fences completed in year 1 (2015), with removal commencing during year 1 and being completed in year 3 (2017)	
All biodiversity offset areas		Information signage for the spotted-tailed quoll.	Information signage for the spotted-tailed quoll has been installed and maintained.	Signage installation completed during year 1 (2015)	
Creek and Drainage Line Protection					
Bowmans Creek Riparian Corridor		Fencing/protection of LCO controlled side of riparian corridor.	Riparian areas are adequately fenced/protected against damage from uncontrolled human or livestock access.	Bowmans Creek Riparian Corridor fenced during 2015	
Regeneration and Revegetation Establishment					
All biodiversity offset areas		Mapping of appropriateness of target community for regeneration/revegetation and rehabilitation areas.	Target vegetation communities are appropriate to position in landscape and substrate.	Completed during year 2 (2016)	
Bushfire Management					
All biodiversity offset areas		The bushfire management plan will be updated as a result of the modification*	The bushfire management plan was updated as a result of the modification*	The bushfire management plan was updated in 2016 to reflect the outcomes of Modification 5.	
Conservation Mechanism					
All biodiversity offset areas		Establish an appropriate long-term conservation	A Conservation Agreement for each BOA	Agreements executed in May 2019 and	

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Relevant Area	Offset	Action	Completion Criteria	Year Completed	Action
		mechanism for the LCO BOAs	is approved and registered on land title.	registered on title by October 2019.	

* Refers to Modification 5