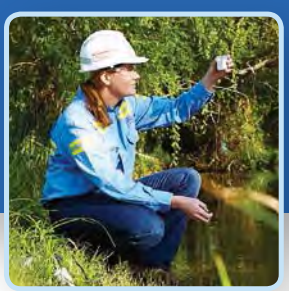
BENGALLA Mining Company

Bengalla Mine

February 2017

Biodiversity Offset Management Plan



Hansen Bailey
ENVIRONMENTAL CONSULTANTS

BENGALLA

Bengalla Mining Company Pty Limited

Biodiversity Offset Management Plan

Revision	Date	Description	Author	Reviewer	Approved
1	02/09/15	Draft Bengalla Biodiversity Offset Management Plan	Liam Hogg/ David Robertson Cumberland Ecology	Dianne Munro/ Jason Martin Hansen Bailey	Craig White Bengalla Mining Company (BMC)
2	09/02/16	Updated for regulatory comments **Approved by DP&E**	Liam Hogg Cumberland Ecology	Nicole Dobbins/ Dianne Munro Hansen Bailey	Craig White (BMC)
3	26/07/16	Updated with Department of Environment and Energy (DoEE) Comments and SSD-5170 MOD 1 & MOD 2	Liam Hogg Cumberland Ecology	Jason Martin Hansen Bailey	Craig White (BMC)
4	21/09/16	Updated to address new DoEE Comments	Katrina Wolf/ David Robertson Cumberland Ecology	Nicole Dobbins Hansen Bailey	Craig White (BMC)
5	19/12/2016	Updated to address new DoEE Comments	Katrina Wolf/ Cumberland Ecology	Nicole Dobbins Hansen Bailey	Craig White (BMC)
6	27/02/2017	Updated to include Declaration of Accuracy and further DoEE Comments	Katrina Wolf Cumberland Ecology	Dianne Munro Hansen Bailey	Craig White (BMC)

DECLARATION OF ACCURACY

In making this declaration, I am aware that section 491 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) makes it an offence in certain circumstances to knowingly provide false or misleading information or documents to specified persons who are known to be performing a duty or carrying out a function under the EPBC Act or the *Environment Protection and Biodiversity Conservation Regulations 2000* (Cth). The offence is punishable on conviction by imprisonment or a fine, or both. I am authorised to bind the approval holder to this declaration and that I have no knowledge of that authorisation being revoked at the time of making this declaration.

Signature	Cam Halfpenny
Name	Cam Halfpenny
Title	Chief Executive Officer (CEO)
Organisation	Bengalla Mining Company
Date	23.2.2017

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1.0 INTRODUCTION

This section briefly describes the background and history of Bengalla, the requirements, aims and objectives of this Biodiversity Offset Management Plan.

1.1 Background

Bengalla Mining Company (BMC) operates the Bengalla Mine (Bengalla) which is located approximately 4 km west of Muswellbrook in the Upper Hunter Valley, NSW. Bengalla is generally bound by Wybong Road to the north, Overton Road to the east, the Muswellbrook-Ulan Rail line to the south and Roxburgh Road to the west (see **Figure 1**). All land within the Project Boundary is mine owned and held by either BMC or Coal & Allied Operations. A current list of Lot/DPs within the Project Boundary is appended to SSD-5170 (as modified).

BMC was granted Development Consent for State Significant Development (SSD) 5170 on 3 March 2015 by the Secretary of Department of Planning and Environment (DP&E) for the Continuation of Bengalla Mine. SSD-5170 (as modified) enables BMC to continue open cut coal mining up to 15 Million tonnes per annum (Mtpa) of run of mine (ROM) coal until 2039.

This Biodiversity Offset Management Plan (BOMP) has been developed in accordance with the requirements of:

1. SSD-5170 (as modified) Schedule 5, Condition 29; and
2. *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Approval 2012/6378 Conditions 2 and 3.

This BOMP provides a framework for the implementation of the biodiversity impact mitigation and offset measures proposed for the Project in the *Bengalla Continuation of Mining Project Biodiversity Offset Strategy* (Cumberland Ecology, 2014).

This BOMP has been prepared in consideration of the generic structure and typical content within the document 'Hunter Valley Coal Mines Best Practice Guidelines for Biodiversity Offset Management Plans' (Ecological, 2013) (BOMP Guidelines).

A separate, approved Biodiversity Management Plan (BMP) provides the framework for the environmental management, reporting and auditing of ecological issues across all BMC owned land within the Project Boundary. Both documents combined meet the requirements of Schedule 5, Condition 29 of SSD-5170 (as modified) and Conditions 2 and 3 of EPBC Approval 2012/6378. **Section 1.3** shows which requirements are addressed in this BOMP and which are addressed in the BMP.

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BENGALLA MINE

Regional Locality

FIGURE 1

1.2 History of Operations

1.2.1 Introduction

BMC was originally granted development consent DA 211/93 in 1996, to construct and operate an open cut coal mine and associated activities in accordance with the supporting document *Bengalla Mine Environmental Impact Statement* (Bengalla EIS). Mining operations at Bengalla commenced in 1998 and have progressed according to DA 211/93 which was scheduled to expire in 2017.

1.2.2 State Significant Development 5170

In September 2013, BMC sought a new development consent under Division 4.1 of Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to enable mining operations to continue at Bengalla. The application was supported by the '*Continuation of Bengalla Mine Environmental Impact Statement*' (Bengalla EIS) (Hansen Bailey, 2013) as modified by the *'Continuation of Bengalla Mine Response to Submissions'* (RTS) (Hansen Bailey, 2014).

On 3 March 2015, the Secretary of DP&E (as delegate of the Minister for Planning) granted SSD-5170 which permits the following activities at Bengalla:

- Open cut mining towards the west at a rate of up to 15 Mtpa ROM coal until 2039;
- Continued use of the existing dragline, truck fleet and excavators;
- An out of pit Overburden Emplacement Area (OEA) to the west of Dry Creek which may be utilised for excess spoil material until it is intercepted by mining;
- Various upgrades, relocations or additional new infrastructure to support the Project;
- Processing, handling and transportation of coal via the (upgraded) Coal Handling and Preparation Plant (CHPP) and rail loop for export and domestic sale;
- Continued rejects and tailings co-disposal in the Main OEA and temporary in pit reject emplacement;
- Relocation of a 6 km section of Bengalla Link Road at approximately Year 15 near the existing mine access road to facilitate coal extraction;
- The diversion of Dry Creek via dams and pipe work with a later permanent alignment of Dry Creek through rehabilitation areas when emplacement areas are suitably advanced;
- Relocation of water storage infrastructure as mining progresses through existing dams (including the Staged Discharge Dam and Hunter River Raw Water Dam); and
- A workforce of approximately 900 full time equivalent personnel (plus contractors) at peak production.

The approved operations layout is presented in **Figure 2**.

1.2.3 Bengalla Development Consent – Modification 1

SSD-5170 was modified on 16 December 2015 by the Executive Director – Resource Assessments and Compliance for the DP&E (as delegate of the Minister for Planning) for the activities largely described in the '*Bengalla Mine Development Consent Modification Statement of Environmental Effects*' (Hansen Bailey, 2015a) (MOD 1 SEE). The MOD 1 SEE provides approval for the following:

- Alterations to various water management infrastructure components including:
  - Utilisation of the Satellite Pit as a temporary mine water catchment dam;
  - Relocation of the Staged Discharge Dam and the Hunter River Salinity Trading Scheme (HRSTS) staged discharge release point;
  - Construction of clean water diversion levees in locations other than those already approved; and
  - Revised locations for the proposed relocation of the Hunter River Raw Water Dam and Washery Dam;
- Additional locations for the siting of the Explosives Storage Facility; and
- Placement of fill from the excavation of the Dry Creek Clean Water Dam (CW1) adjacent to it.

No additional conditions pertaining to the management of biodiversity offsets were included in SSD-5170 as a result of the MOD 1 SEE.

1.2.4 Bengalla Development Consent – Modification 2

SSD-5170 was modified on 1 July 2016 by the Director – Resource Assessments for the DP&E (as delegate of the Minister for Planning) for the activities largely described in the '*Bengalla Mine Development Consent Modification Statement of Environmental Effects*' (Hansen Bailey, 2016) (MOD 2 SEE). The MOD 2 SEE provides approval for the following:

- Alterations to the approved height of the Main OEA to improve visual amenity from primary viewing locations in and surrounding the township of Muswellbrook and Denman Road, in two selected locations (Visual Relief Areas):
  - The Northern Relief Area constructed to a maximum height of Reduced Level (RL) 300; and
  - The Southern Relief Area constructed to a maximum height of RL 290.
- Establishment of a new gravel access road from Wybong Road to the Dry Creek Diversion Project Construction Site Office being a former homestead (Homestead Access).

No additional conditions pertaining to the management of biodiversity offsets were included in SSD-5170 as a result of the MOD 2 SEE. The development layout is presented in **Figure 2**.

1.3 Objectives

The objective of this BOMP is to provide for the management of biodiversity values within the Biodiversity Offset Areas (see **Section 5.0**). This BOMP sets out the procedures for the management, reporting and auditing of ecological assets within the Biodiversity Offset Areas over a 20 year period including provisions for:

- A comprehensive plan for the management of flora and fauna within Biodiversity Offset Areas that:
    - Minimises human disturbance to native flora and fauna;
    - Minimises vegetation disturbance or clearing;
    - Minimises impacts to threatened species and communities;
    - Controls threats to remnant native vegetation;
    - Manages the impacts of feral animals and weeds; and
    - Monitors responses to management actions to inform adaptive implementation of the plan and achievement of plan objectives.
- A comprehensive plan for the conservation management of the Biodiversity Offset Areas in order to:
    - Maintain and improve the ecological integrity of woodland and forest and to enhance the native vegetation they contain; and
    - Increase the area and quality of native vegetation by regenerating areas of Derived Native Grassland (DNG) to woodland through assisted natural regeneration.

The overall management objective for the Biodiversity Offset Areas is to maintain or enhance the long-term environmental outcomes through the protection, maintenance and enhancement of woodland and forest vegetation, and establishment of high quality ecological communities in degraded and cleared areas as habitat for a wide range of species.

Table 1 lists all biodiversity-related conditions from SSD-5170 (as modified) and EPBC Approval 2012/6378, and indicates where each requirement is addressed in this BOMP or the BMP. Commitments in relation to its supporting document including the Ecological Impact Assessment (Cumberland Ecology, 2013) have also been incorporated into this BOMP. This BOMP is also implemented within the 'Bengalla Biodiversity Offset Strategy' (Cumberland Ecology, 2014) (BOS) which was developed to compensate for the residual impacts of the Project and is applicable to the management of all Biodiversity Offset Areas.

Table 1
Biodiversity Requirements and Where Addressed

Requirement	Section
DA SSD-5170 (as modified)	
Schedule 3 – Environmental Performance Conditions	
Biodiversity Management Plan	
29. The Applicant must prepare and implement a Biodiversity Management Plan for the development to the satisfaction of the Secretary. This plan must:	-
a) be prepared in consultation with OEH, and submitted to the Secretary for approval within 6 months of the date of this consent;	BMP and BOMP
b) describe how the implementation of the offset strategy would be integrated with the overall rehabilitation of the site;	**5.3**
c) establish baseline data for the existing habitat in the biodiversity offset areas and on the site;	**4.0** and BMP
d) include: i) a description of the short, medium, and long term measures that would be implemented to:	-
• implement the biodiversity offset strategy; and	**6.0** and **7.0**
• manage the remnant vegetation and habitat on the site;	BMP
ii) include detailed performance and completion criteria for evaluating the performance of the biodiversity offset strategy and triggering remedial action (if necessary);	**9.3, 9.4** and **9.5**
iii) a detailed description of the measures that would be implemented over the next 3 years, including the procedures to be implemented for:	-
• enhancing the quality of existing vegetation and fauna habitat in the biodiversity offset areas;	**6.0** and **7.0**
• restoring native vegetation and fauna habitat on the biodiversity offset areas through focusing on assisted natural regeneration, targeted vegetation establishment and the introduction of naturally scarce habitat features (where necessary);	**6.2** and **7.0**
• collecting and propagating seed;	BMP
• protecting vegetation outside the disturbance area;	BMP
• managing salinity;	**7.1**
• undertaking pre-clearance surveys;	BMP
• managing impacts on fauna;	BMP
• salvaging and reusing material from the site for habitat enhancement;	BMP
• translocation of threatened flora from the site in accordance with the *Guidelines for the Translocation of Threatened Plants in Australia* (Vallee *et al.,* 2004);	BMP
• controlling weeds and feral pests;	**8.5, 8.6, Appendix B** and BMP
• managing grazing and agriculture;	**7.1 and 8.3**
• controlling access; and	**7.1**
• bushfire management;	**8.4**
iv) include a seasonally-based program to monitor and report on the effectiveness of these measures, and progress against the detailed performance and completion criteria;	**9.0** and BMP

Requirement	Section
v) identify the potential risks to the successful implementation of the biodiversity offset strategy, and include a description of the contingency measures that would be implemented to mitigate these risks; and	**8.8** and **Appendix C**
vi) include details of who would be responsible for monitoring, reviewing, and implementing the plan.	**11.0** and BMP
Schedule 5 – Environmental Management, Reporting and Auditing	
Management Plan Requirements	-
3. The Applicant shall ensure that the management plans required under this consent are prepared in accordance with any relevant guidelines, and include:	**3.0**
(a) detailed baseline data	**4.0** and BMP
(b) a description of: • the relevant statutory requirements (including any relevant approval, licence or lease conditions); • any relevant limits or performance measures/criteria; • the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;	**3.0, 9.3, 9.4, 9.7** and BMP
(c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;	**8.0** and BMP
(d) a program to monitor and report on the: • impacts and environmental performance of the development; • effectiveness of any management measures (see c above);	**9.0**, **10.0** and BMP
(e) a contingency plan to manage any unpredicted impacts and their consequences;	**8.8**, **Appendix B** and BMP
(f) a program to investigate and implement ways to improve the environmental performance of the development over time;	**10.1** and BMP
(g) a protocol for managing and reporting any: • incidents; • complaints; • non-compliances with statutory requirements; and • exceedances of the impact assessment criteria and/or performance criteria; and	BMP
(h) a protocol for periodic review of the plan.	**10.2** and BMP
EPBC Approval 2012/6378 Condition 3	
To compensate for the loss of 535 hectares of Box Gum Woodland ecological community and 272 hectares of habitat for the Grey Headed Flying Fox, Large-eared Pied Bat, South-eastern Long-eared Bat, Regent Honeyeater, Swift Parrot and the Spotted-tail Quoll, the approval holder must prepare and submit, by 3 September 2015, a Biodiversity Offset Management Plan (BOMP) for the Minister's written approval. The BOMP must**:**	This Document
Identify those lands described as the Offset Areas at Schedule 2 (Figures 1-6) of this notice. This must include offset attributes, shapefiles, textual descriptions and maps to clearly define the location and boundaries of the offset area(s)	**1.0** and **Appendix D**
Provide a survey and description of the current conditions (prior to any management activities) of the offset areas identified in Condition 3a	**5.0** and **Appendix D**

Requirement	Section
Detail management actions and regeneration and revegetation strategies to be undertaken on the offset areas to improve the ecological quality of these areas, including:	**6.0** and **7.0**
i) a description and timeframe of measures that would be implemented to improve the condition of Box Gum Woodland and habitat for the Grey Headed Flying Fox, Large-eared Pied Bat, South-eastern Long-eared Bat, Regent Honeyeater, Swift Parrot and the Spotted-tail Quoll on the offset site;	**5.2, 7.0** and **8.0**
ii) performance and completion criteria for evaluating the management of the offset areas, and criteria for triggering remedial action;	**9.0** and **9.2**
iii) a program to monitor and report on the effectiveness of these measures, and progress against the performance and completion criteria;	**9.0** and **10.0**
iv) a description of the potential risks to the successful implementation of the plan, a description of the measures that will be implemented to mitigate against these risks and a description of the contingency measures that will be implemented if defined triggers arise; and	**8.8** and **Appendix C**
v) details of who will be responsible for monitoring, reviewing and implementing the plan.	**11.0**
The approved BOMP must be implemented. The approved BOMP must be published on the approval holder's internet web site within 1 month of being approved. The most recently approved version of the BOMP must be published on the approval holders' internet website for a period of 5 years after it is approved.	**2.3**
Note: The Biodiversity Management Plan required under NSW approval condition 29 may be used to satisfy this condition if it meets the above content and submission requirements.	-

1.4 Environmental Management

Operations at Bengalla are conducted in accordance with Bengalla SSD-5170 (as modified), Environment Protection Licence (EPL) 6538 and environmental management plans to ensure BMC effectively manages its environmental issues, ensure compliance with regulatory requirements and satisfy the expectations of stakeholders.

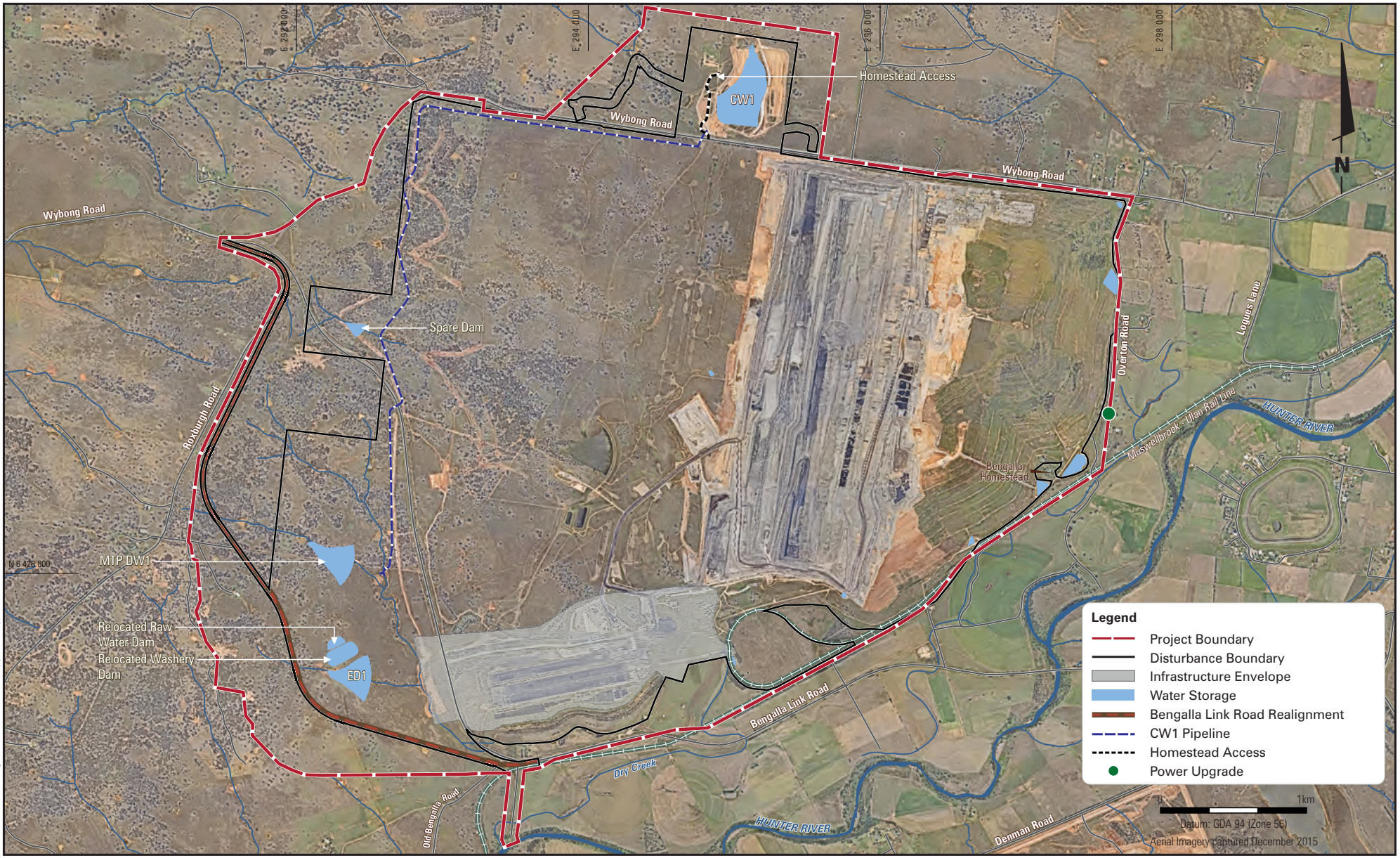
This document (and subsequent revisions) will form part of this management regime. BMC will continue to operate during and following mine closure to ensure all environmental (including monitoring and management) and social responsibilities are met.

Neither translocations of flora nor habitat augmentation is proposed in the Biodiversity Offset Areas and, as such, is not discussed further in this BOMP.

1.5 Document Structure

This document is structured as follows:

- **Section 1** provides an introduction to Bengalla including background, history of operations, BOMP objectives, environmental management and COMP structure;
- **Section 2** describes the stakeholder engagement undertaken during the development of this BOMP;
- **Section 3** summarises the statutory requirements associated with the BOMP;
- **Section 4** provides a summary of existing environment and context associated with future disturbance areas at Bengalla;
- **Section 5** provides a summary of Biodiversity Offset Areas associated with this BOMP including tenure and security;
- **Section 6** details the outcome objectives for the Biodiversity Offset Areas;
- **Section 7** describes the vegetation management strategy to maintain and enhance the Biodiversity Offset Areas;
- **Section 8** describes the conservation and land management strategies that will be adopted for the management of the Biodiversity Offset Areas;
- **Section 9** describes the monitoring program associated with this BOMP;
- **Section 10** provides a summary of the reporting, review and training requirements for this BOMP; and
- **Section 11.0** and **Section 12.0** provide a summary of roles and responsibilities and references, respectively.



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BENGALLA MINE

Development Layout

FIGURE 2

2.0 STAKEHOLDER CONSULTATION

This section provides a summary of stakeholder consultation undertaken as part of the development of this BOMP.

Schedule 3, Condition 29 of SSD-5170 (as modified) states that the management plan must be prepared in consultation with OEH and submitted to the Secretary for approval within 6 months of the date of approval of SSD-5170 (as modified), and set out). The management plan must provide management measures for both onsite and biodiversity offset areas. As discussed in **Section 1.3**, due to the separate nature of managing onsite and offsite components of this condition, a BMP (onsite) and BOMP (offset areas) have been developed to satisfy this requirement.

This BOMP has also been prepared in accordance with Condition 2 of EPBC Approval 2012/6378 which notes that BMC must prepare a BOMP for submission to the Commonwealth Department of the Environment and Energy (DoEE) for the Minister's written approval. Condition 3 of EPBC Approval 2012/6378 further notes that the Biodiversity Management Plan required under SSD-5170 (as modified) Schedule 3, Condition 29 may be used to satisfy this condition if it also meets the EPBC requirements. A copy of the draft BOMP was provided to OEH, DP&E and DoEE on 3 September 2015 for review and comment. A discussion in relation to the consultation completed with each agency is provided below. A copy of regulatory correspondence is provided in **Appendix A**.

2.1 Office of Environment and Heritage

OEH suggested a number of comments be incorporated into the plan in correspondence dated 16 October 2015 (see **Table A4**, **Appendix A**). These comments have been incorporated into the revised BOMP.

2.2 Department of Planning and Environment

A number of comments were received from DP&E (see **Table A4**, **Appendix A**) and have been incorporated into the revised BOMP. A copy of this BMP was provided to DP&E for approval. On 23 March 2016, DP&E provided approval of this BOMP (see **Appendix A**).

Subsequent to DP&E approval, the BOMP has since been revised to address further comments received from DoEE (see **Section 2.3**).

This BOMP has also been revised for minor project description amendments associated with SSD-5170 (MOD 1 and MOD 2), however no aspects of MOD 1 or MOD 2 affect the commitments in this BOMP.

A copy of the revised BOMP will be reissued to DP&E following approval of the final plan from DoEE.

2.3 Department of Environment and Energy

Comments were received from DoEE on 1 December 2015 (see **Table A4, Appendix A**) and 18 March 2016. Following a further phone conference held on 23 March 2016 in relation to the draft BOMP, DoEE provided a consolidated set of comments on 1 April 2016 (See **Table C, Appendix A**).

This third set of consolidated comments (including a response to each comment) is included in **Table A3, Appendix A** and is addressed in the revised BOMP.

A fourth set of comments were received by email 7 August 2016. The comments have been addressed in the BOMP and are summarised in **Table A2, Appendix A.**

Representatives from DoEE conducted a site visit to the offset areas, accompanied by Mr Craig White (BMC) and Ms Katrina Wolf (Cumberland Ecology) on 2 November 2016. During the site visit, DoEE suggested a number of further changes to the BOMP. These comments were outlined in an email received 16 November 2016. The fifth set of comments and reference to where each comment is addressed is included in **Table A1, Appendix A**.

Following approval, all actions detailed within this BOMP will be implemented. Within one month of receiving approval, this BOMP will be made available to the public on the BMC website.

3.0 STATUTORY REQUIREMENTS

A summary of the legislation relevant to this BOMP is provided below.

3.1 Environment Protection and Biodiversity Conservation Act 1999

Under the EPBC Act, approval from the Commonwealth Minister for the Environment is required for any action that may have a significant impact on matters of national environmental significance (MNES). These matters are:

- World heritage properties;
- National heritage places;
- Wetlands of international importance (listed under the Ramsar Convention);
- Listed species and ecological communities;
- Migratory species protected under international agreements;
- Commonwealth marine areas;
- The Great Barrier Reef Marine Park;
- Nuclear actions (including uranium mines); and
- A water resource, in relation to coal seam gas development and large coal mining development.

A number of listings for MNES have changed (either new listings or up-listings) since the Project was deemed a Controlled Action, some of which are relevant to the Project. For the purposes of this BOMP, we have noted and discussed MNES in accordance with the listings as they were at the time of the Project being deemed a Controlled Action on 7 June 2012.

In accordance with the EPBC Act, the Project has received conditions of approval from the DoEE for MNES on 27 May 2015 (EPBC No. 2012-6378). The DoEE approval placed 17 conditions on the development.

3.2 Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act 1995* (TSC Act) provides protection for threatened species native to NSW (excluding fish and marine vegetation). Species, populations and ecological communities listed under Schedule 1A (Critically Endangered), Schedule 1 (Endangered) and Schedule 2 (Vulnerable) of the TSC Act are termed as “threatened” in this document.

Protection is provided by integrating the conservation of threatened species, endangered populations and Threatened Ecological Communities (TECs) into development control processes under the *Environmental Planning and Assessment Act 1979*.

A number of listings for TECs and threatened species have changed (either new listings or up-listings) since the impact of the Project was assessed as part of the Bengalla EIS, some of which are relevant to the Project. For the purposes of this BOMP, we have noted and discussed TSC Act listed TECs and threatened species in accordance with the listings as they were at the time of the Project being assessed as part of the Bengalla Continuation of Mining EIS.

3.3 Rural Fires Act 1997

The NSW *Rural Fires Act 1997* regulates the management of bushfires and controlled burning in NSW. The *Rural Fires Act 1997* requires BMC to take all practical steps to prevent bushfires and to minimise the danger of the spread of bushfires on or from land under its control (including offset and revegetation areas).

4.0 EXISTING ENVIRONMENT AND BENGALLA MINE IMPACTS

This section briefly describes the existing environmental setting, biodiversity values in the Bengalla Project Boundary and provides context for the establishment of the Biodiversity Offset Areas.

4.1 Environmental Setting

4.1.1 Climate

The Upper Hunter region experiences a warm temperate climate, characterised by seasonal variations of hot, wet summers and mild, dry winters. In the winter months, high pressure systems alternate with cold fronts, combining to produce cool, dry conditions. Frosts and fog are prevalent in the cooler, drier months from mid-autumn to late spring. The warm and dry conditions during the summer months are produced by synoptic high pressure systems over the Great Australian Bight. Synoptic low pressure systems occur intermittently during summer, resulting in periods of heavy rain and thunderstorms.

The temperatures recorded at Jerrys Plains establish that the Upper Hunter region experiences warm temperatures during the summer and very cool temperatures during the winter. January is the warmest month, averaging a daily maximum temperature of 31.7°C. July is the coolest month of the year, with a mean daily maximum temperature of 17.4°C and a mean daily minimum temperature of 3.8°C.

Humidity levels from the BOM meteorological station at Scone exhibit variability and seasonal flux throughout the year. Mean morning humidity levels (at 9:00 am) range from 59% to 78%. Mean afternoon humidity levels (at 3:00 pm) range from 39% to 58%. The spring months generally experience lower humidity than the rest of the year.

In the Upper Hunter region, rainfall is substantially higher in the summer than in the winter. The monthly rainfall measured at Jerrys Plains varies from 36.5 mm in August to 76.8 mm in January. In 2011, Bengalla received 777 mm of rain, falling over 138 rain days. This was similar to the previous year, where the annual rainfall was 722 mm, distributed over 132 rain days. In summer, rainfall is generally due to low pressure troughs and an increased maritime influence, with onshore winds penetrating as far inland as Muswellbrook. This generates intense thunderstorms, accounting for the higher and more intense rainfall experienced in the summer months.

Winds prevail from the south-east during summer and from the north-west during winter. Maximum wind speeds are generally greater in the summer than in the winter. In 2011, February and September recorded the strongest winds, with a mean maximum wind speed of 11.0 metres per second (m/s). The lowest monthly mean maximum wind speed of 7.9 m/s was recorded in May.

4.1.2 Landform, Geology, Soils and Erosion

The Hunter subregion is characterised by rolling hills and wide valleys, with a meandering river system (the Hunter River) on a wide floodplain. River terraces are evident, the highest with silicified gravels. Streams can be brackish or saline at low flow, and numerous small swamps are present in the upper catchment, and extensive estuarine swamps occur near the coast behind the coastal barrier of beach and dunes (Morgan 2001).

Bengalla is located to the north west of the Hunter Coalfields. The stratigraphical sequence across the site is comprised of overburden and interburden layers of lithic sandstone, interbedded with siltstone, tuffaceous claystone and mudstone (Hansen Bailey 2007).

The soils in the Hunter subregion comprise a variety of harsh texture contrast soils on slopes and deep sandy loam alluvium on the valley floors. There are a small number of source bordering dunes on southern tributaries of the Hunter River. Deep sands with podsol profiles occur in dunes on the coastal barrier, and saline, organic muds are present in the Hunter River estuary. Soil salinity is common on some bedrocks in the upper catchment (Morgan 2001).

4.2 Ecological Setting

Bengalla is located in the Hunter subregion of the Sydney Basin Bioregion, a large and complex area that extends from Batemans Bay in the south to Nelson Bay in the north and includes parts of the Blue Mountains. The Hunter subregion is principally located in the Hunter Valley and incorporates all of the Hunter River Catchment.

The most significant river system in the sub-region is the Hunter River, which is a sizable watercourse that flows from north east to south west approximately 1 km south of Bengalla. Bengalla is dissected by Dry Creek, a third order ephemeral stream which drains in a general north – south direction to its confluence with the Hunter River. For the majority of the time this ephemeral watercourse is dry or with small stagnant pools of water, except during heavy and prolonged rainfall.

The area surrounding Bengalla consists largely of lands which had previously been extensively cleared and modified since European settlement. The original forest and woodland that dominated these lands prior to European settlement has now been largely cleared and replaced by grassland, primarily for cattle grazing. Despite the history of agricultural use, areas of forest and woodland remain and these provide some habitat for threatened species.

4.3 Impact Description

Bengalla will impact on approximately 881 hectares (ha) of native forest, woodland and grassland on previous farmland in the Upper Hunter Valley on land owned by BMC or another mining company (see **Table 2** and **Figure 3**). An additional 69 ha of exotic pasture and tree and shrub plantations will also be impacted as a result of Bengalla (totalling 950 ha of vegetation).

Most of the disturbance associated with Bengalla is within highly modified grassland areas used for grazing. Of the 881 ha of native vegetation that is predicted to be impacted, 621 ha is grassland, and 260 ha are native forest and woodland. Disturbance will occur progressively, as required to facilitate mining and associated operations over the 24 year life of Bengalla. During the life of operations, Bengalla will remove 73.2 ha of Box Gum Woodland (EPBC listed Critically Endangered Ecological Community (CEEC) and 462.1 ha Box Gum Woodland Derived Native Grassland (CEEC) as contained within the Disturbance Boundary presented on **Figure 6**.

BMC will also remove 9.7 ha of other TSC Act listed Endangered Ecological Communities (EECs) and 168 ha of non-endangered Narrow-leaved Ironbark Woodland. Although the 168 ha of Narrow-leaved Ironbark Woodland was not listed as an EEC at the time of assessment for Bengalla, this community may now meet the EPBC Act determination of the recently added Central Hunter Valley eucalypt forest and woodland CEEC.

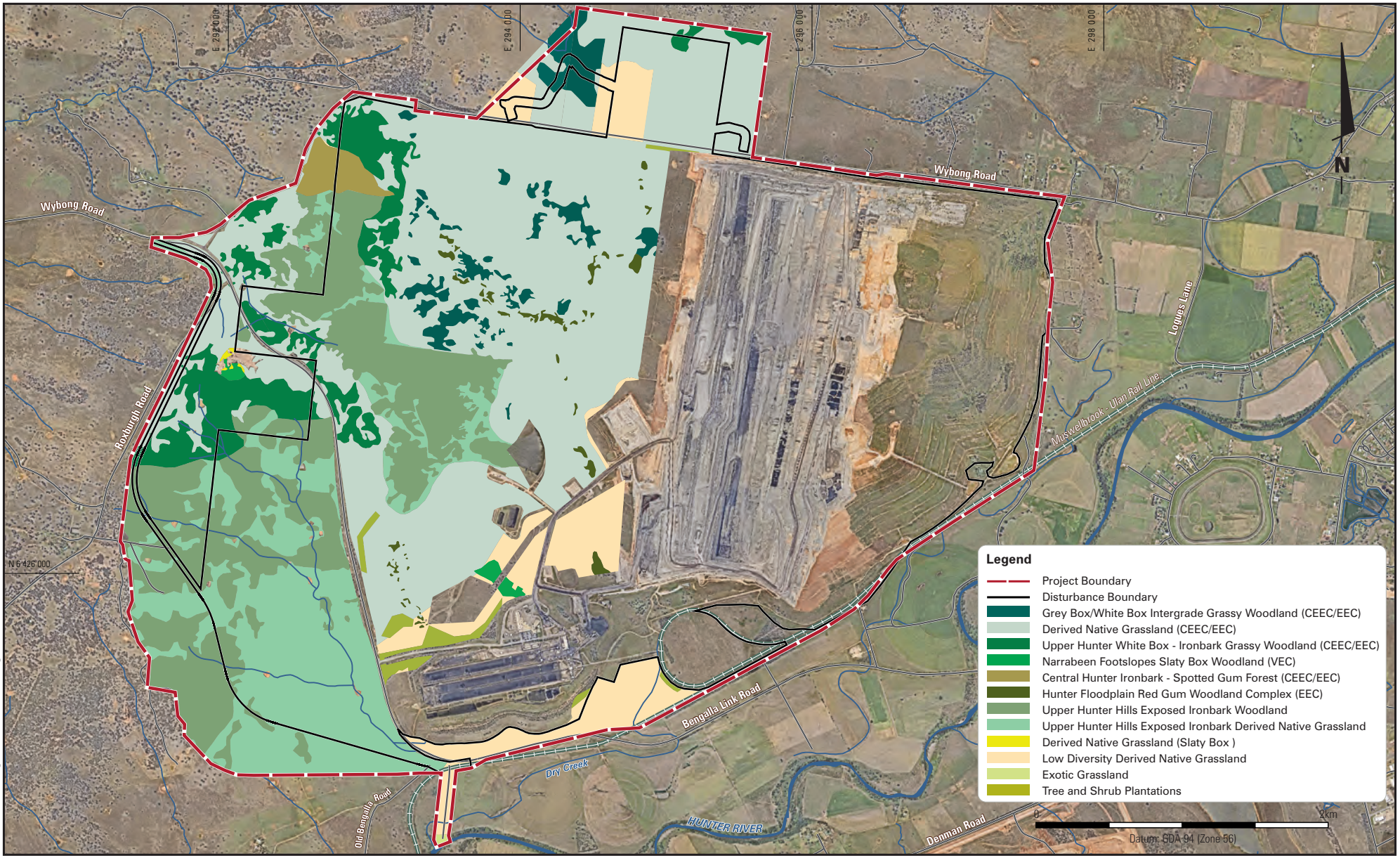
Table 2
Impacted Vegetation at Bengalla Mine

Vegetation Communities	EPBC/TSC Status	Area within Disturbance Boundary (ha)
Grey Box/White Box Intergrade Grassy Woodland (Box Gum Woodland) ^	C/EEC	27.9
Upper Hunter White Box - Ironbark Grassy Woodland (Box Gum Woodland) ^	C/EEC	45.3
Derived Native Grassland (Box Gum Woodland) ^	C/EEC	462.1
Central Hunter Ironbark - Spotted Gum Forest*	C/EEC	6.7
Narrabeen Footslopes Slaty Box Woodland	Vulnerable	2.9
Hunter Floodplain Red Gum Woodland	EEC	9.4
Upper Hunter Hills Exposed Ironbark Woodland	Not Listed	167.9
Derived Native Grassland (Upper Hunter Hills Exposed Ironbark)	Not Listed	159.2
Low Diversity Derived Native Grassland/Exotic Pasture	Not Listed	57.5
Tree and Shrub Plantation	Not Listed	11.4
Total Area**		**950.3**
Total C/EEC (EPBC Act and TSC Act)		**554.3**

** Central Hunter Ironbark – Spotted Gum Forest corresponds to the Central Hunter Valley eucalypt forest and woodland ecological community listed as 'critically endangered' under the EPBC Act on 7 May 2015.*

***The total area contains approximately 19 ha of cleared areas associated with the Bengalla Link Road, farm dams and infrastructure that have been excluded from vegetation calculations.*

^ Vegetation community contributes to the 535 ha of Box Gum Woodland approved for disturbance under EPBC 2012/6378.



HB BENGALLA Management Plans 1613 F3 Vegetation Communities 28 07 2016 Rev A

BENGALLA MINE

Vegetation Communities

FIGURE 3

4.4 Threatened Flora and Fauna

Most of the land within Bengalla is highly modified grassland areas. Despite the modified condition of the vegetation, it still supports threatened flora and fauna species as well as several ecological communities listed under the TSC Act and/or the EPBC Act. These are discussed below in subsequent sections with additional detail presented within the BMP.

4.4.1 Flora

Ecological Communities

Four ecological communities at Bengalla are listed under either the TSC Act and/or the EPBC Act:

- Box Gum Woodland and Derived Native Grassland C/EEC;
- Central Hunter Ironbark – Spotted Gum Forest C/EEC;
- Narrabeen Footslopes Slaty Box Woodland; and
- Hunter Floodplain Red Gum Woodland.

Threatened Flora Species

The Project Boundary supports vegetation containing a relatively low diversity of native species, mostly due to widespread degradation caused by past land clearance and grazing. The majority of the species recorded are understorey and ground layer species. The dominant plant families in the canopy and shrub layer are Myrtaceae and Fabaceae, represented mostly by the genera of Eucalyptus and Acacia. In the understorey, the dominant plant families are Asteraceae and Poaceae.

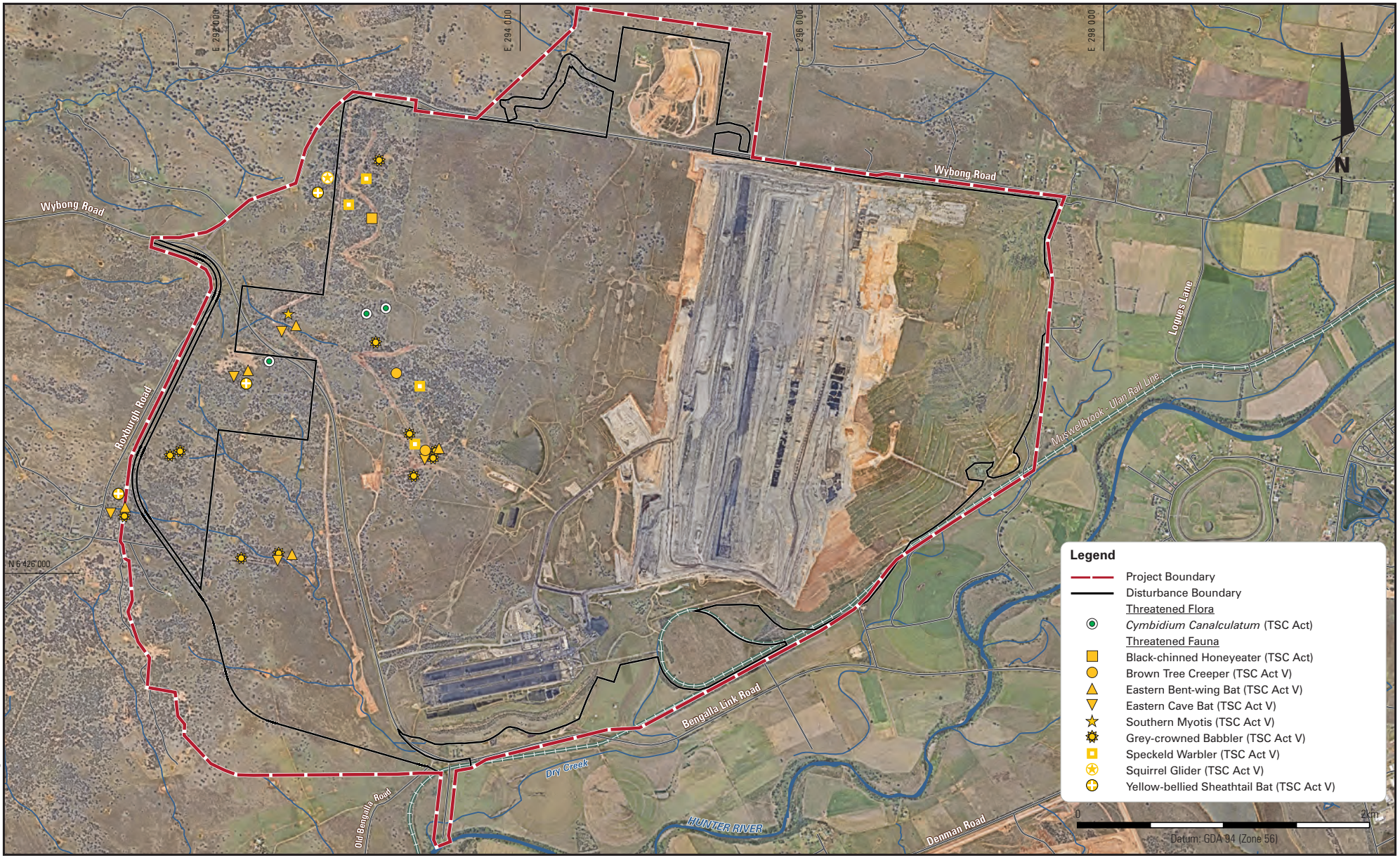
One threatened flora species population, namely the Tiger Orchid (*Cymbidium canaliculatum*) population in the Hunter Catchment, listed as endangered under the TSC Act, was recorded within the western area of the Project Boundary as shown in **Figure 4**.

4.4.2 Fauna Species

A total of 74 fauna species have been recorded during ecological surveys within the Project Boundary, comprising four amphibian species, five reptile species, 44 bird species, eight non-flying mammal species and 13 bat species.

Fauna Habitat Values

The types of fauna habitat within the Project Boundary largely comprises Derived Native Grasslands and to a lesser extent, regenerating woodland and open forest that have been partially cleared or thinned in the past. When the habitats are studied in a wider context, it becomes apparent that the vegetation contributes to a larger, diffuse patch of forest and woodland that extends south west away from Bengalla.



HB BENGALLA Management Plans 1613 F4 Threatened Flora and Fauna 28 07 2016

BENGALLA MINE

Threatened Flora and Fauna

FIGURE 4

The native species likely to utilise the habitat are mostly common species and those well-adapted to disturbed woodland and agricultural areas. Notwithstanding this, the land within the Disturbance Boundary also provides habitat for several threatened species including several woodland birds, bats and arboreal mammals.

Although the condition and nature of the habitats within the Disturbance Boundary have been greatly altered by existing and historical land uses, it is evident that they still retain some value for the resident and visiting native fauna that were recorded. The regrowth areas generally lack many habitat features but areas of more mature habitat, which retain valuable habitat features, are also present within the Disturbance Boundary.

Fauna habitat features that will likely be removed by Bengalla include:

- **Understorey vegetation** – loss of shelter and foraging habitat for amphibians, reptiles, small birds and terrestrial mammals;
- **Fallen logs, woody debris and leaf litter** – loss of shelter habitat for amphibians, reptiles and terrestrial mammals, and forage habitat for woodland bird species;
- **Hollow-bearing living trees and stags** – loss of habitat for a range of fauna species which may rely on them for shelter, breeding or roosting. Loss of mature remnant hollow-bearing trees will have important implications for threatened species such as reptiles, birds, arboreal mammals and microbats;
- **Nectar-producing trees and shrubs** – loss of food resources for blossom-dependant birds, arboreal mammals and megachiropteran bats (flying-foxes);
- **Shrubs and grasses** – loss of food for a range of passerine birds and herbivorous mammals;
- **Ecotonal (edge) communities** – loss of foraging habitat for many species, particularly birds such as raptors;
- **Ephemeral drainage lines** – loss of limited foraging, shelter and breeding habitat for amphibians, aquatic reptiles, wetland birds and aquatic mammals; and
- **Constructed farm dams with limited aquatic vegetation** – loss of foraging and breeding habitat for amphibians, aquatic reptiles and wetland birds.

Threatened Fauna Species

Nine threatened fauna species listed under the TSC Act are known to be present within the Project Boundary, comprising four bird species and five mammal species (see **Figure 4**):

- Brown Treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*) (EPBC Act: not listed; TSC Act: Vulnerable);
- Speckled Warbler (*Chthonicola sagittatus*) (EPBC Act: not listed; TSC Act: Vulnerable);
- Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*) (EPBC Act: not listed; TSC Act: Vulnerable);
- Black-chinned Honeyeater (eastern subspecies) (*Melithreptus gularis gularis*) (EPBC Act: not listed; TSC Act: Vulnerable);
- Squirrel Glider (*Petaurus norfolcensis*) (EPBC Act: not listed; TSC Act: Vulnerable);
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*) (EPBC Act: not listed; TSC Act: Vulnerable);
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) (EPBC Act: not listed; TSC Act: Vulnerable);
- Southern Myotis (*Myotis macropus*) (EPBC Act: not listed; TSC Act: Vulnerable); and
- Eastern Cave Bat (*Vespadelus troughtoni*) (EPBC Act: not listed; TSC Act: Vulnerable).

No threatened fauna species listed under the EPBC Act were recorded within the Project Boundary. Despite the absence of records from within the Project Boundary, several threatened fauna species listed under the EPBC Act and/or the TSC Act are known to occur in the locality and considered to have the potential to occur within the Project Boundary. These are:

- Regent Honeyeater (*Anthochaera phrygia*) (EPBC Act: Critically Endangered; TSC Act: Critically Endangered);
- Swift Parrot (*Lathamus discolor*) (EPBC Act: Endangered; TSC Act: Endangered);
- Spotted Harrier (*Circus assimilis*) (EPBC Act: not listed; TSC Act: Vulnerable);
- Little Eagle (*Hieraaetus morphnoides*) (EPBC Act: not listed; TSC Act: Vulnerable);
- Barking Owl (*Ninox connivens*) (EPBC Act: not listed; TSC Act: Vulnerable);
- White-throated Needletail (*Hirundapus caudacutus*) (EPBC Act: Migratory and Marine; TSC Act: not listed);
- Fork-tailed Swift (*Apus pacificus*) (EPBC Act: Migratory and Marine; TSC Act: not listed);
- Rainbow Bee-eater (*Merops ornatus*) (EPBC Act: Migratory and Marine; TSC Act: not listed);

- Grey-headed Flying-fox (*Pteropus poliocephalus*) (EPBC Act: Vulnerable; TSC Act: Vulnerable);
- Eastern Freetail-bat (*Mormopterus norfolkensis*) (EPBC Act: not listed; TSC Act: Vulnerable);
- Large-eared Pied Bat (*Chalinolobus dwyeri*) (EPBC Act: Vulnerable; TSC Act: Vulnerable);
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) (EPBC Act: not listed; TSC Act: Vulnerable);
- Greater Broad-nosed Bat (*Scoteanax rueppellii*) (EPBC Act: not listed; TSC Act: Vulnerable);
- South-eastern Long-eared Bat (*Nyctophilus corbeni*) (EPBC Act: Vulnerable; TSC Act: Vulnerable); and
- Spotted-Tail Quoll (*Dasyurus maculatus*) (EPBC Act: Endangered; TSC Act: Vulnerable).

5.0 BIODIVERSITY OFFSET AREAS

This section describes the Biodiversity Offset Strategy developed as compensation for the residual impact of Bengalla Mine and mechanisms to secure these lands into the future.

5.1 Biodiversity Offset Strategy

In accordance with Schedule 3, Condition 26 of SSD-5170 (as modified), the BOS approved as part of the Project comprises 6,215 ha of land including broad areas of native forest and woodland and semi-natural grassland.

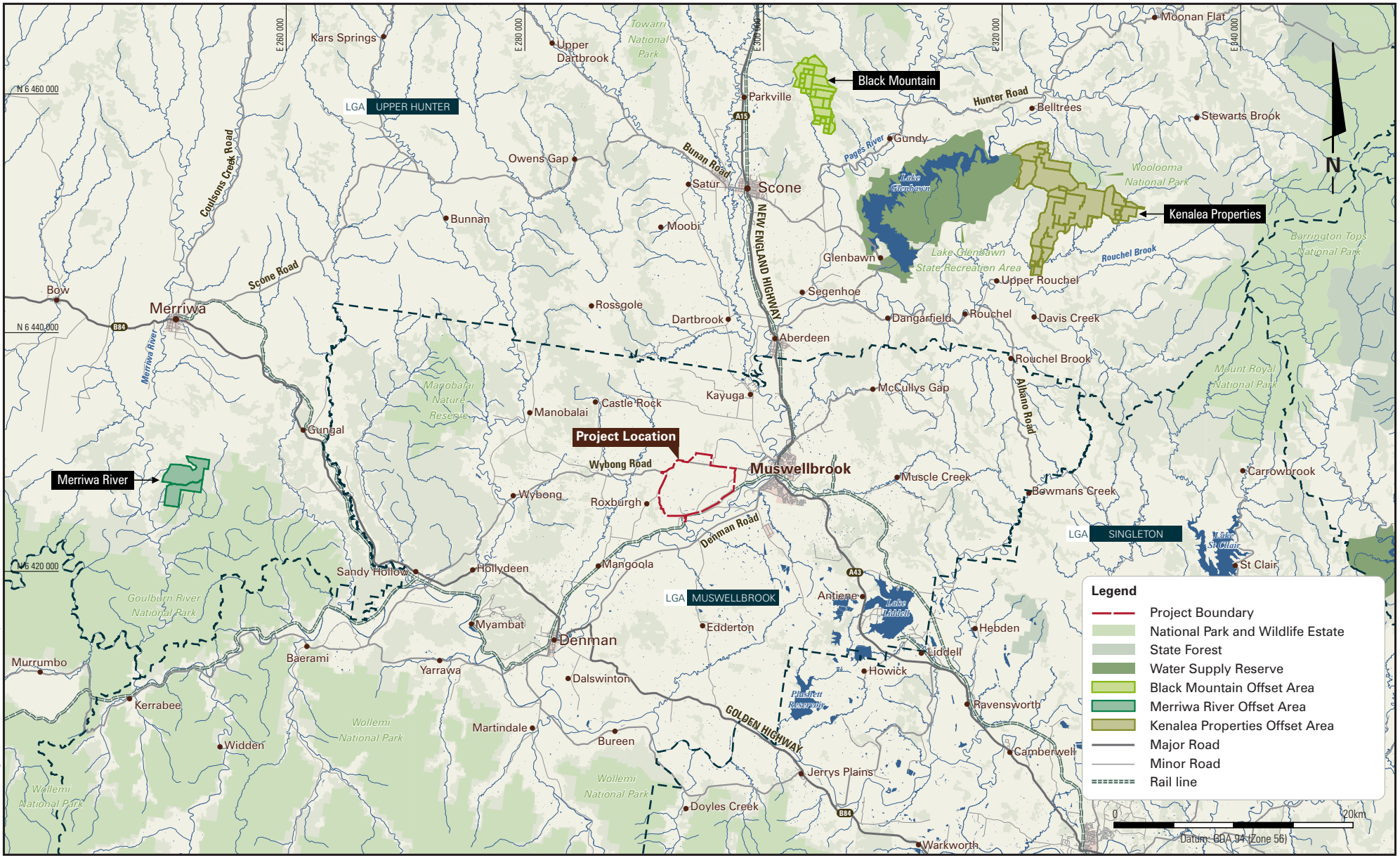
The BOS contains three distinct Biodiversity Offset Areas, described as follows:

- Kenalea Properties (4,097 ha): contains extensive areas of Box Gum Woodland and other forest, woodland and grassland and links to Mount Woolooma National Park. Contains broad areas of grassland and grassy woodland that can be regenerated in the long-term to provide for a substantial net gain;
- Black Mountain (1,222 ha): contains three variants of Box Gum Woodland and broad areas of Narrow-leaved Ironbark Forest, all in moderate to good condition. Large enough to be a conservation reserve in its own right; and
- Merriwa River (897 ha): contains broad areas of Ironbark forest and woodland, largely in moderate to good condition.

The locations of the Biodiversity Offset Areas are described in **Table 3** and shown in **Figure 5**. More detailed descriptions of the existing environments within each Biodiversity Offset Area can be found in **Section 4.0**.

Table 3
Location of Biodiversity Offset Areas

Biodiversity Offset Area	Area (ha)	Distance to Project Boundary	LGA	CMA	Bioregion	Subregion
Kenalea Properties	4,097	30 km north-east	Upper Hunter	Hunter/Central Rivers	NSW North Coast	Tomalla
Black Mountain	1,222	29 km north-east	Upper Hunter	Hunter/Central Rivers	NSW North Coast	Ellerston
Merriwa River	897	38 km west	Upper Hunter	Hunter/Central Rivers	Sydney Basin	Kerrabee



HB BENGALLA Management Plans 1613 F5 Biodiversity Offset Areas 27 07 2016

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Biodiversity Offset Areas

FIGURE 5

As identified in Condition 26 and Condition 27 of Schedule 3 of SSD-5170 (as modified) and Condition 3 of EPBC Approval 2012-6378, the Kenalea Properties, Black Mountain and Merriwa River Biodiversity Offset Areas are required for the re-establishment of:

- Significant and/or threatened ecological communities, including:
  - Box Gum Woodland and Derived Native Grassland;
  - Central Hunter Ironbark – Spotted Gum – Grey Box Woodland
  - Upper Hunter Hills Exposed Ironbark Woodland;
- Significant and/or threatened plant species, including:
  - Tiger Orchid (*Cymbidium canaliculatum*);
- Habitat for significant and/or threatened fauna species, including:
  - Brown Treecreeper;
  - Speckled Warbler;
  - Black-chinned Honeyeater;
  - Grey-crowned Babbler;
  - Regent Honeyeater;
  - Swift Parrot;
  - Squirrel Glider;
  - Spotted-tail Quoll;
  - Grey-headed Flying-fox;
  - Large-eared Pied Bat;
  - South-eastern Long-eared Bat;
  - Southern Myotis; and
  - Yellow-bellied Sheathtail-bat.

Management of these Biodiversity Offset Areas is discussed in **Section 7.0** and **Section 8.0**.

5.2 Land Security and Land Tenure / Use

Schedule 3, Condition 28 of SSD-5170 (as modified) requires BMC to make suitable arrangements to provide appropriate long term security for the Biodiversity Offset Areas within two years of the commencement of development under the consent, unless otherwise agreed to with the Secretary.

All Biodiversity Offset Areas are under the ownership and management of BMC.

All Biodiversity Offset Areas will be managed in accordance with this BOMP until an alternative arrangement is made to provide for the long term security for the Biodiversity Offset Areas.

Given the proximity to existing National Parks and/or the stand alone size of the Biodiversity Offset Areas it is anticipated that discussions with the NSW Office of Environment and Heritage (OEH) and NSW National Parks and Wildlife Service will be held regarding the potential for the transfer of title and management of the land to National Parks and Wildlife Service for conservation in perpetuity. This BOMP has been developed on this premise; however, all management procedures discussed in this BOMP are the actions that will be conducted by BMC to enhance the Biodiversity Offset Areas in readiness for long-term divestment of these properties.

Should any of the Biodiversity Offset Areas not be incorporated into National Parks, after the stakeholder discussions, in accordance with SSD-5170 (as modified) Schedule 3, Condition 28 the Biodiversity Offset Areas will be protected through a BioBanking Agreement under the TSC Act (or alternative mechanism as agreed with OEH) to the satisfaction of the Secretary.

There are no land uses adjacent to the Biodiversity Offset Areas which would have conflicting land uses. All Biodiversity Offset Areas are adjoined by either existing farm land or National Park. No mining or residential lands are within or adjacent to the Biodiversity Offset Areas.

5.3 Project Boundary Rehabilitation

The Biodiversity Offset Areas have been chosen to provide an immediate offset of the impacts of the Bengalla Continuation of Mining Project. The long term rehabilitation and management practices for land within the Project Boundary are described in the *Rehabilitation Management Plan* (Hansen Bailey, 2015).

6.0 OUTCOME OBJECTIVES OF THE BIODIVERSITY OFFSET AREAS

This section provides a description of each of the Biodiversity Offset Areas, including a brief summary of their existing biodiversity values.

6.1 Biodiversity Offset Area Descriptions

Existing Environment of Kenalea Properties Offset Area

Kenalea Properties Offset Area (Kenalea Properties) contains a steep ridge that runs in three directions through the property from a central point located on the north-east part of the property. On the lower slopes and valley areas, the vegetation consists of grassland, with scattered trees and small patches of open woodland, with riparian forest within the creek-flats and gullies. On the upper slopes, dense woodland and forest communities occur that are primarily grassy with shrubby areas.

A description of the current condition (Hansen Bailey, 2014) of the vegetation communities present on Kenalea Properties Offset Area (including listed threatened fauna species habitat) is provided in **Appendix D**.

Past Land Uses

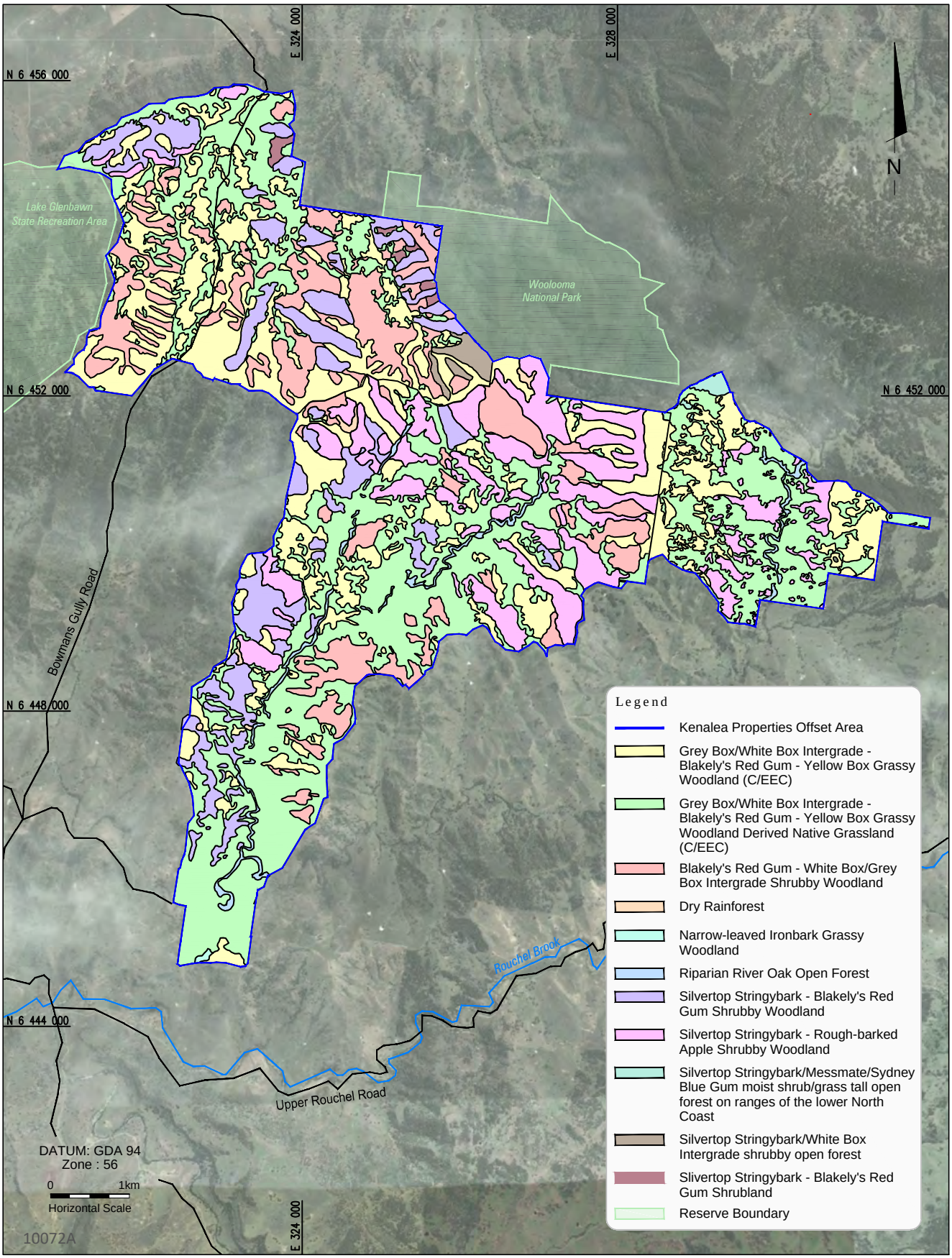
Kenalea Properties have historically been utilised for stocking of cattle and, as such, the lower slopes and valley areas are predominately grazed but continue to be formed of native vegetation. No additional remediation works are proposed in the grazed areas.

Vegetation Communities

Kenalea Properties contains a large area of Box Gum Woodland and Derived Native Grassland listed as a CEEC under the EPBC Act and an EEC under the TSC Act that will be the focus of assisted regeneration of the property. Vegetation Communities present in Kenalea Properties are shown in **Figure 6**.

Table 4 provides a breakdown of the vegetation communities present, associated Plant Community Type (PCT) and area.

Fourteen threatened fauna species, comprising 11 birds and three mammals have been identified within Kenalea Properties (see **Figure 7**). The vegetation communities present within the Kenalea Properties also provide potential habitat for a suite of species listed under the EPBC Act and/or TSC Act. The potential habitat provided for EPBC Act species is shown in **Figure 8**.



BENGALLA MINE

Vegetation Communities Recorded within the Kenalea Properties Offset Area

FIGURE 6

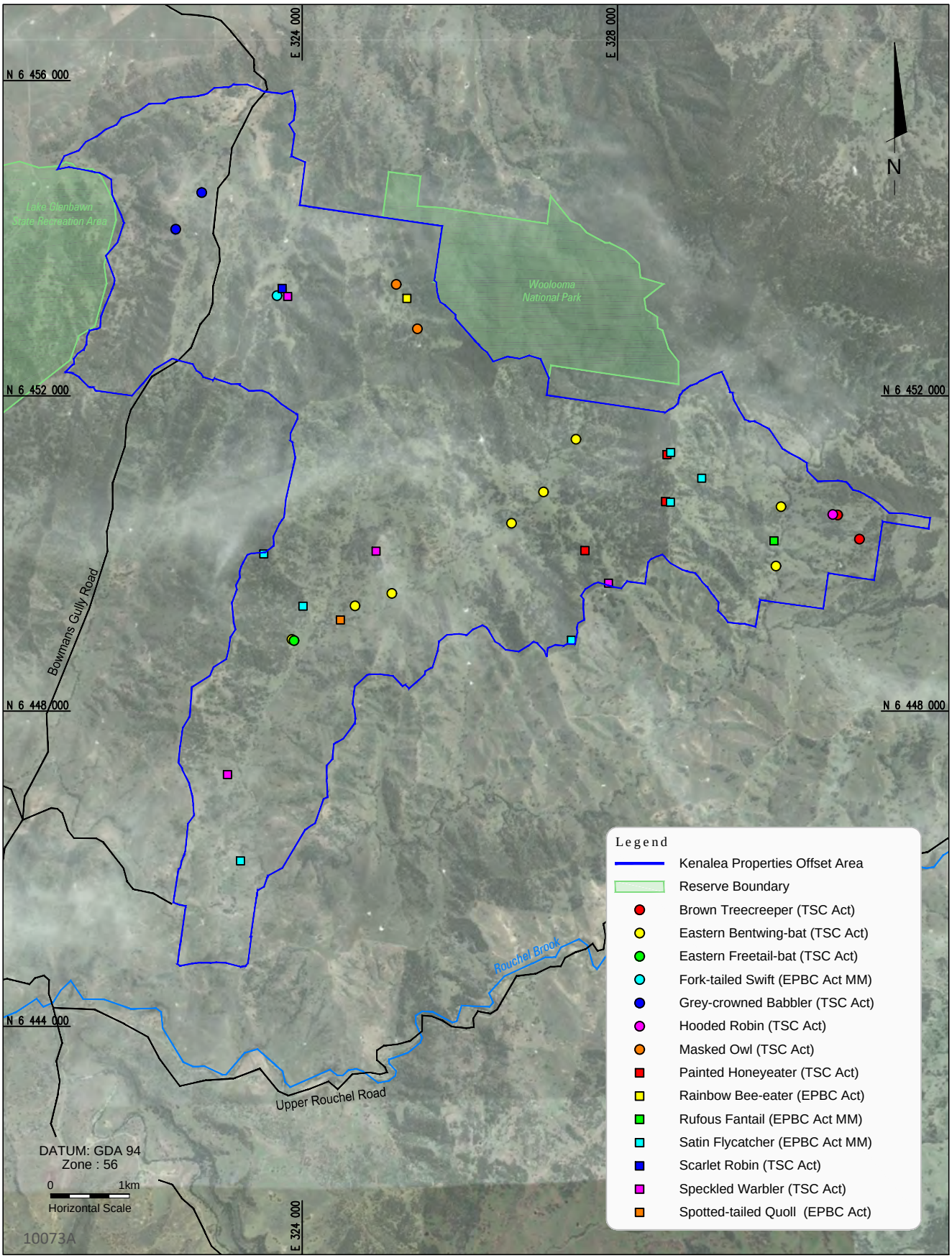
Table 4
Vegetation Communities Recorded within the Kenalea Properties Offset Area

Vegetation Community	Area (ha)*
HU654: Grey Box/White Box Intergrade - Blakely's Red Gum - Yellow Box Grassy Woodland (CEEC/EEC)	975
HU654: Grey Box/White Box Intergrade - Blakely's Red Gum - Yellow Box Grassy Woodland Derived Native Grassland (CEEC/EEC)	1,500
HU603: Blakely's Red Gum - White Box/Grey Box Intergrade Shrubby Woodland (non-CEEC/EEC)	566
HU603: Silvertop Stringybark - Blakely's Red Gum Shrubby Woodland (non-CEEC/EEC)	409
HU603: Silvertop Stringybark - Rough-barked Apple Shrubby Woodland (non-CEEC/EEC)	526
HU569: Silvertop Stringybark/ Mountain Gum/ Grey Gum moist shrub/grass tall open forest on ranges of the lower North Coast	10
HU653: Silvertop Stringybark/White Box Intergrade shrubby open forest	28
HU603: Silvertop Stringybark - Blakely's Red Gum Shrubland	16
HU653: Narrow-leaved Ironbark Grassy Woodland	2
HU613: Dry Rainforest	9
HU598: Riparian River Oak Open Forest	55
Total	**4,097**

** Area totals may differ slightly due to rounding.*

The following threatened and/or migratory fauna species have been recorded (either by the current or past surveys) in Kenalea Properties:

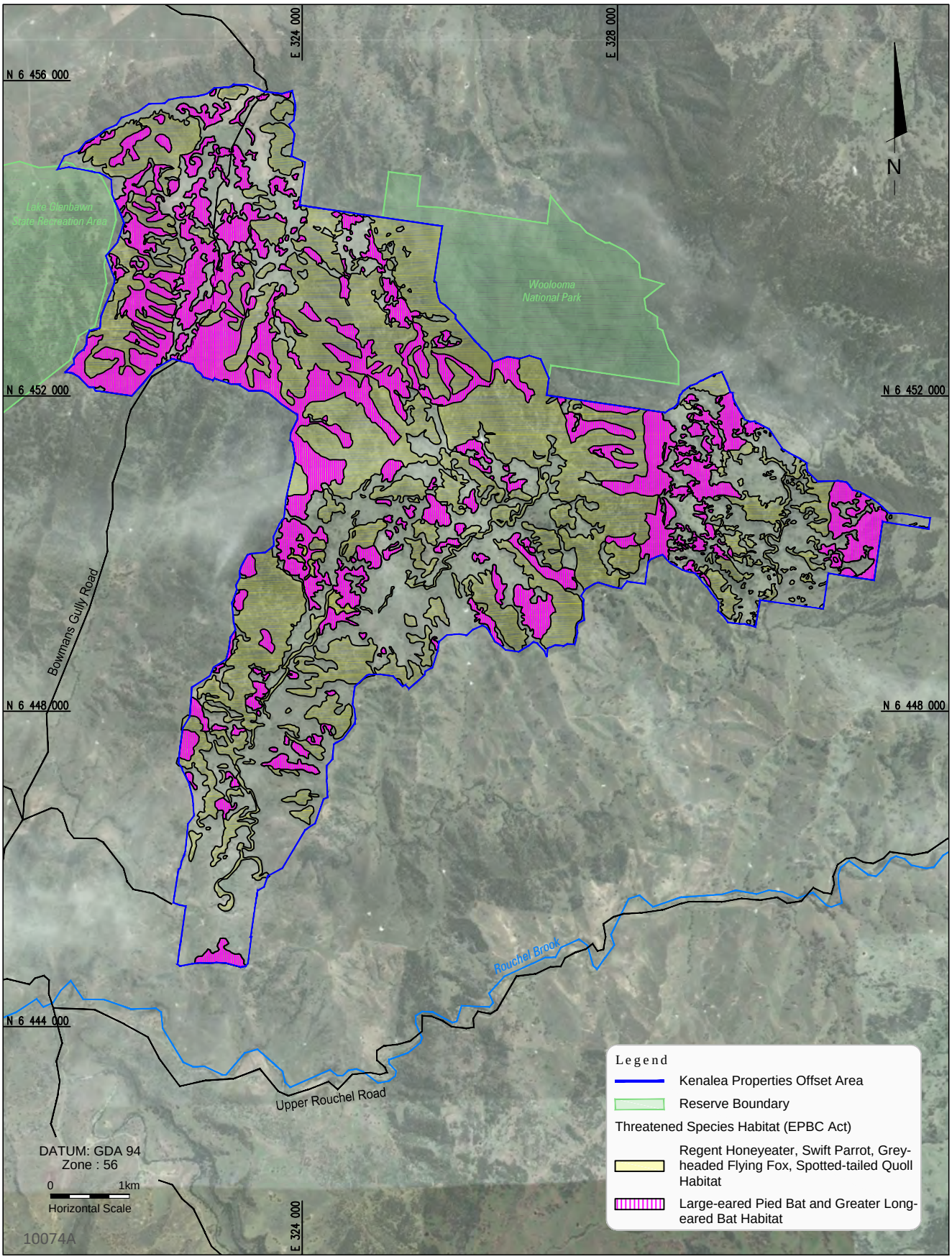
- Brown Treecreeper (EPBC Act: not listed; TSC Act: Vulnerable);
- Speckled Warbler (EPBC Act: not listed; TSC Act: Vulnerable);
- Grey-crowned Babbler (eastern subspecies) (EPBC Act: not listed; TSC Act: Vulnerable);
- Painted Honeyeater (*Grantiella picta*) (EPBC Act: not listed; TSC Act: Vulnerable);
- Scarlet Robin (*Petroica boodang*) (EPBC Act: not listed; TSC Act: Vulnerable);
- Hooded Robin (SE) (*Melanodryas cucullata cucullata*) (EPBC Act: not listed; TSC Act: Vulnerable);
- Masked Owl (*Tyto novaehollandiae*) (EPBC Act: not listed; TSC Act: Vulnerable);
- Rufous Fantail (*Rhipidura rufifrons*) (EPBC Act: Migratory and Marine; TSC Act: Not listed);
- Fork-tailed Swift (EPBC Act: Migratory and Marine; TSC Act: Not listed);
- Satin Flycatcher (*Myiagra cyanoleuca*) (EPBC Act: Migratory and Marine; TSC Act: Not listed);
- Rainbow Bee-eater (EPBC Act: Migratory and Marine; TSC Act: Not listed);
- Spotted-tailed Quoll (EPBC Act: Endangered; TSC Act: Vulnerable);
- Eastern Bentwing-bat (EPBC Act: not listed; TSC Act: Vulnerable); and
- Eastern Freetail-bat (EPBC Act: not listed; TSC Act: Vulnerable).



BENGALLA MINE

Threatened and Migratory Species Recorded within the Kenalea Properties Offset Area

FIGURE 7



BENGALLA MINE

EPBC Act Threatened Species Habitat within the Kenalea Properties Offset Area

FIGURE 8

Introduced Species

Introduced species identified at the Kenalea Properties to date include *Senecio madagascariensis* (Fireweed) and *Opuntia stricta* (Common Prickly Pear).

Existing Environment of Black Mountain Offset Area

The topography of Black Mountain Offset Area (Black Mountain) is a complex combination of ridges, spurs and incised valleys with elevation from 285 to 1,016 m. Drainage is east to west flowing into a main creek line, Glen Creek, running just inside the western boundary and flowing to the Pages River and on into the Hunter River.

A description of the current condition (Hansen Bailey, 2014) of the vegetation communities known on Black Mountain Offset Area (including listed threatened fauna species habitat) is provided in **Appendix D**.

Past Land Uses

The property has had a history of grazing with associated land clearing and while the majority of the land is now forested it is with relatively recent regrowth.

Vegetation Communities

Like Kenalea Properties, Black Mountain is dominated by Box Gum Woodland listed as a CEEC listed under the EPBC Act and an EEC under the TSC Act, see **Figure 9. Table 5** shows the area of the vegetation communities present within Black Mountain with their associated PCT and area.

Table 5
Vegetation Communities Recorded within the Black Mountain Offset Area

Vegetation Community	Area (ha)*
HU654: Upland Grassy Box Woodland (CEEC/EEC)	57
HU654: Midland Grassy Box Woodland (CEEC/EEC)	226
HU654: Lowland Grassy Box Woodland (CEEC/EEC)	438
Subtotal CEEC/EEC	***721***
HU616: Ribbon Gum - Pittosporum Forest	89
HU578: Socketwood Vine Thicket	2
HU636: Sydney Blue Gum Forest	8
HU575: Ironbark Grassy Woodland	135
HU653: Midland Shrubby Box Woodland	156
HU598: River Oak Forest	5
Subtotal Other Woodland	***395***
HU671: Derived grass and herblands	105
Total	**1,222**

** Area totals may differ slightly due to rounding.*

There were nine occurrences of the epiphytic orchid *Cymbidium canaliculatum* recorded on previous studies of Black Mountain. This species is listed as part of an endangered population, namely the *Cymbidium canaliculatum* population in the Hunter Catchment, listed under the TSC Act.

Five threatened fauna species, comprising four birds and one mammal have been recorded on Black Mountain (**Figure 10**). However, there is also suitable habitat for other threatened and/or migratory fauna species known from the locality to occur within the property, including threatened microbats, birds and mammals. The potential habitat provided for EPBC Act species is shown in **Figure 11**.

The following threatened fauna species have been recorded within the Black Mountain Offset Area:

- Speckled Warbler (EPBC Act: not listed; TSC Act: Vulnerable);
- Painted Honeyeater (EPBC Act: not listed; TSC Act: Vulnerable);
- Grey-crowned Babbler (eastern subspecies) (EPBC Act: not listed; TSC Act: Vulnerable);
- Glossy Black-cockatoo (*Calyptorhynchus lathami*) (EPBC Act: not listed; TSC Act: Vulnerable);
- Squirrel Glider (EPBC Act: not listed; TSC Act: Vulnerable).

Introduced Species

Introduced species identified at the Kenalea Properties to date include *Senecio madagascariensis* (Fireweed), *Opuntia stricta* (Common Prickly Pear) and *Rubus fruticosus* (Blackberry).

Existing Environment of Merriwa River Offset Area

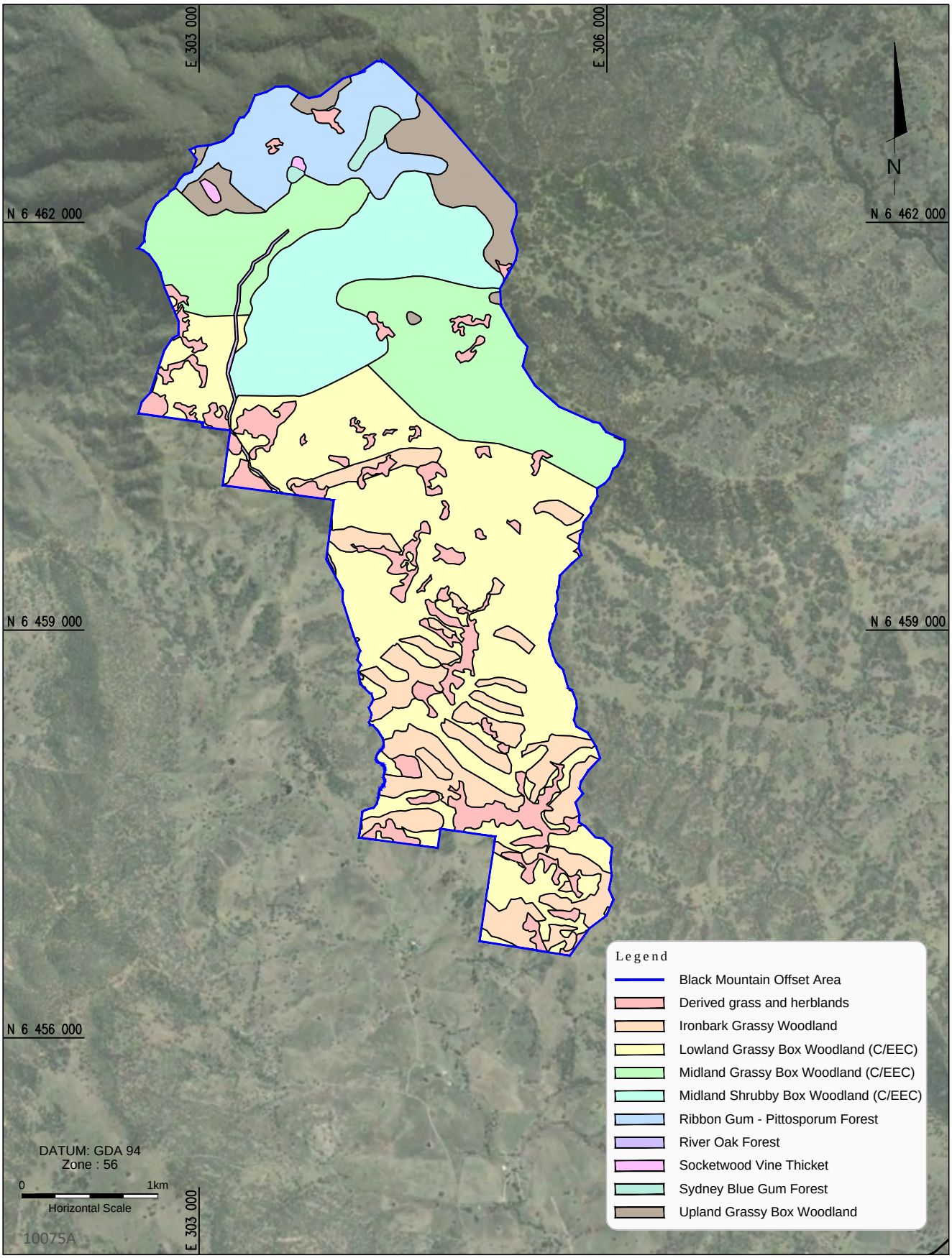
Merriwa River Offset Area (Merriwa River) has an area of 897 ha and is generally well-vegetated. However small areas have been cleared in the valley floors and on some elevated plateaus.

Most of the property is above 270 m AHD, although elevation ranges from 220 m AHD to 380 m AHD. The topography consists of complex undulating sandstone ridges with several sandstone escarpments. The main ridgeline is oriented north-east to south-west.

A description of the current condition (Hansen Bailey, 2014) of the vegetation communities present on Merriwa River Offset Area including listed threatened fauna species habitat is provided in **Appendix D**.

Past Land Uses

Merriwa River has been utilised for stocking of cattle on the lower slopes and alluvial areas. However, cattle were removed approximately 10 years ago leading to regeneration of vegetation across the property.



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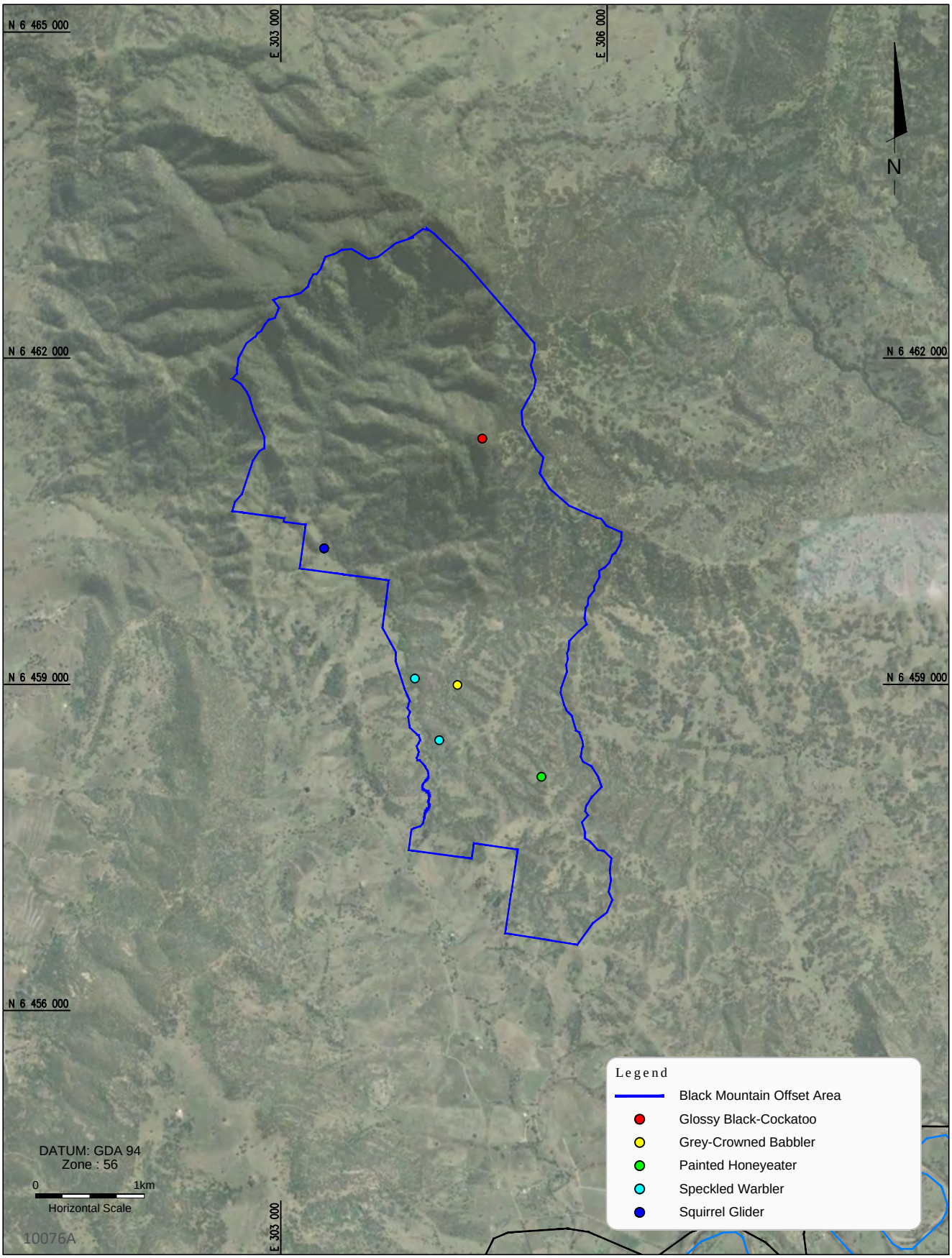
Vegetation Communities Recorded within the Black Mountain Offset Area

FIGURE 9



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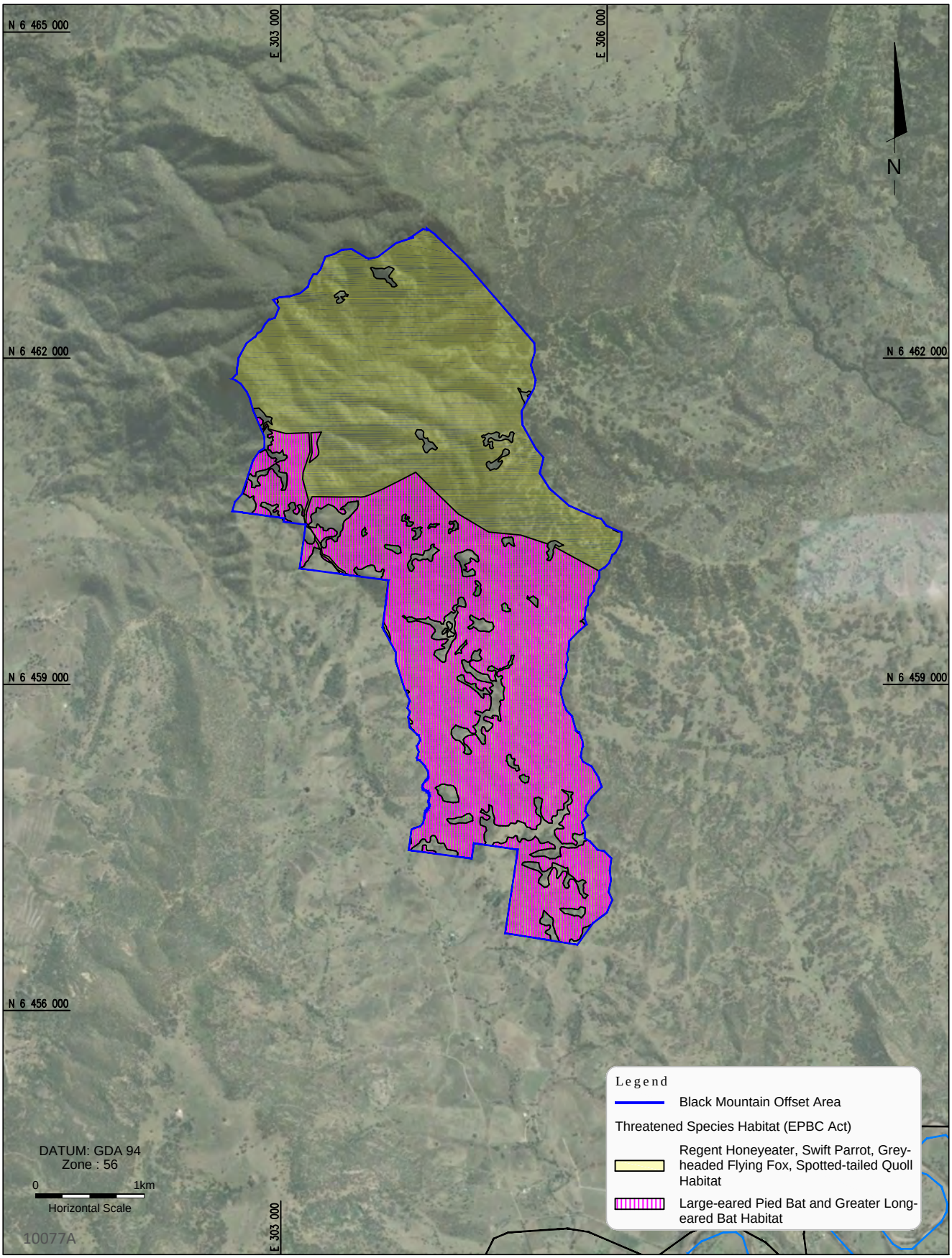
Threatened Species Recorded within the Black Mountain Offset Area

FIGURE 10



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EPBC Act Threatened Species Habitat within the Black Mountain Offset Area

FIGURE 11

Vegetation Communities

Merriwa River was specially selected as an offset for the Narrow-leaved Ironbark vegetation communities that are to be impacted as a result of the Project. A map of the vegetation communities present on Merriwa River Offset Area can be found on **Figure 12**.

Table 6 shows the vegetation communities present on Merriwa River with their PCT and area.

Table 6
Vegetation Communities Recorded within the Merriwa River Offset Area

Vegetation Community	Area (ha)
HU654: Box Woodland on Basalt (CEEC/EEC)	23
HU552: Callitris Open Forest	128
HU560: Ironbark Open Forest on Sandstone (Narrow-leaved Ironbark)	178
HU560: Ironbark Open Forest on Sandstone (Red Ironbark)	303
HU560: Low Open Forest - Scrub Complex on Sandstone Plateaus	113
HU552: Mallee Open Forest on Narrabeen Conglomerate	9
HU574: Sheltered Open Forest Complex in Sandstone Gullies	57
HU560: Narrow-leaved Ironbark Alluvial Open Forest	51
HU601: Redgum Alluvial Open Forest	35
Total	**897**

** Area totals may differ slightly due to rounding.*

The habitats available within the Merriwa River Offset Area are suitable for a suite of species listed under the EPBC Act and/or TSC Act. The potential habitat provided for EPBC Act species is shown in **Figure 14**. A total of 13 threatened and/or migratory fauna species, comprising seven birds and six mammals, have been recorded in the Merriwa River Offset Area and locations can be found on **Figure 13**:

- Brown Treecreeper (EPBC Act: not listed; TSC Act: Vulnerable);
- Speckled Warbler (EPBC Act: not listed; TSC Act: Vulnerable);
- Painted Honeyeater (EPBC Act: not listed; TSC Act: Vulnerable);
- Turquoise Parrot (*Neophema pulchella*) (EPBC Act: not listed; TSC Act: Vulnerable);
- Glossy Black-cockatoo (EPBC Act: not listed; TSC Act: Vulnerable);
- Grey-crowned Babbler (eastern subspecies) (EPBC Act: not listed; TSC Act: Vulnerable);
- Rainbow Bee-eater (EPBC Act: Migratory and Marine; TSC Act: Not listed);

- Brush-tailed Rock-wallaby (*Petrogale penicillata*) (EPBC Act: Vulnerable; TSC Act: Endangered);
- Squirrel Glider (EPBC Act: not listed; TSC Act: Vulnerable);
- South-eastern Long-eared Bat (EPBC Act: Vulnerable; TSC Act: Vulnerable);
- Eastern Bentwing-bat (EPBC Act: not listed; TSC Act: Vulnerable);
- Eastern Freetail-bat (EPBC Act: not listed; TSC Act: Vulnerable); and
- Large-eared Pied Bat (EPBC Act: Vulnerable; TSC Act: Vulnerable).

Introduced Species

Introduced species identified at the Merriwa River property to date include *Senecio madagascariensis* (Fireweed), *Opuntia stricta* (Common Prickly Pear), and *Opuntia aurantiaca* (Tiger Pear).

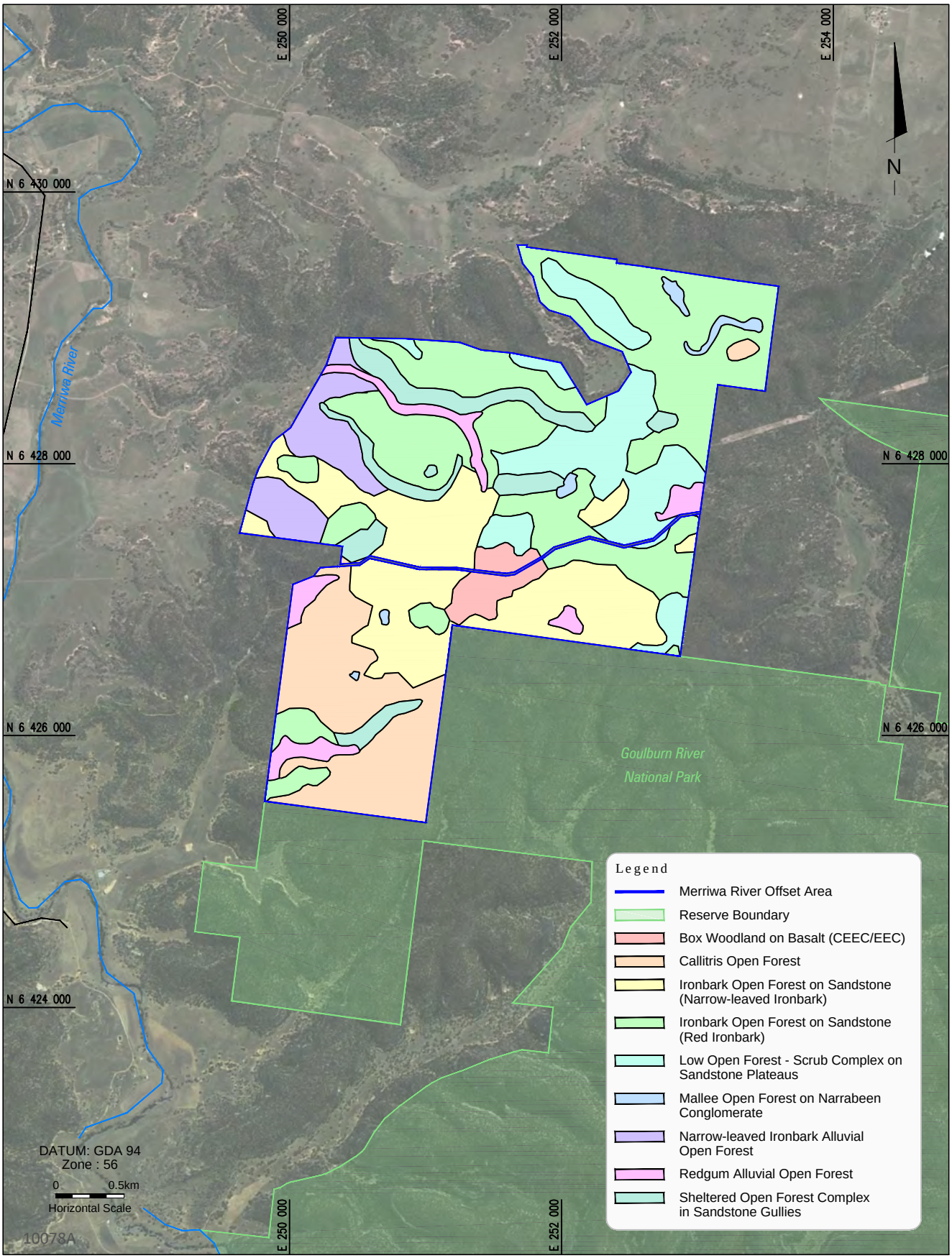
6.2 Outcome Objectives for Biodiversity Offset Areas

The National Recovery Plan for Box Gum Woodland and Derived Native Grassland (DECCW 2011) and other manuals on restoration of grassy woodlands (e.g. McIntyre *et al.* 2002, Rawlings *et al.* 2010) support the notion that it is feasible to recover and regenerate woodland from derived native grassland, with correct management.

Correct management can involve reductions, controls on or exclusion of grazing to promote recovery of vegetation, fencing, weeding and monitoring, as well as supplementary planting of canopy species. Restoration of forest and woodland to a structural complexity with diverse age classes comparable to the original community structure will take many decades; however, it is considered to be achievable given appropriate management.

The objectives for vegetation management within the Biodiversity Offset Areas are as follows:

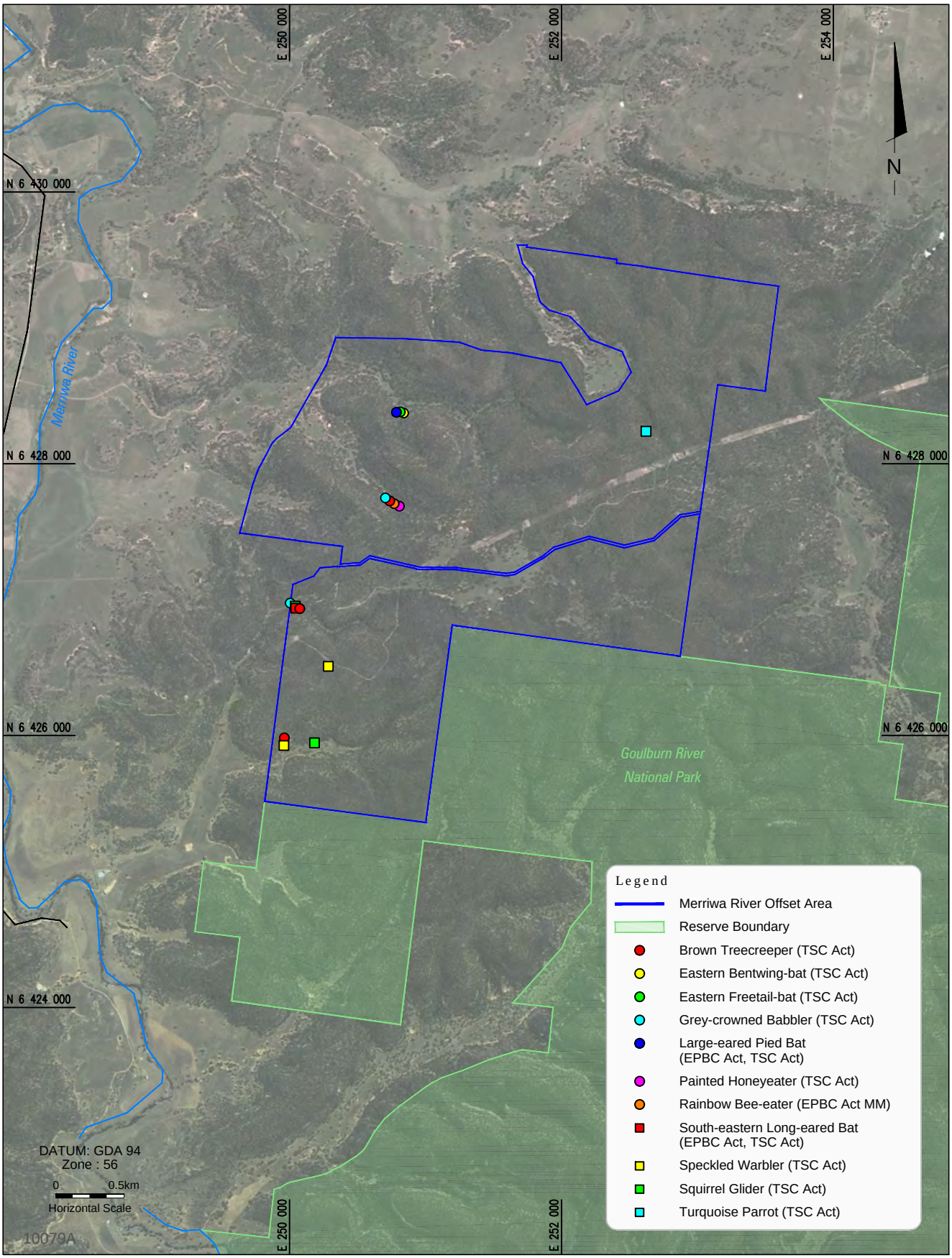
- Restore areas of vegetation, including Box Gum Woodland;
- Restore areas of habitat for the EPBC Act listed species impacted by Bengalla;
- Restore areas of habitat for the suite of TSC Act listed threatened species impacted by the Project;
- Promote natural succession of derived native grassland towards woodland and/or open forest;
- Establish linkages between patches of remnant vegetation; and
- Improve habitat connectivity across the Biodiversity Offset Areas, and from Biodiversity Offset Areas to adjacent native vegetation in order to improve wildlife movement in the long term.



BENGALLA MINE

Vegetation Communities Recorded within the Merriwa River Offset Area

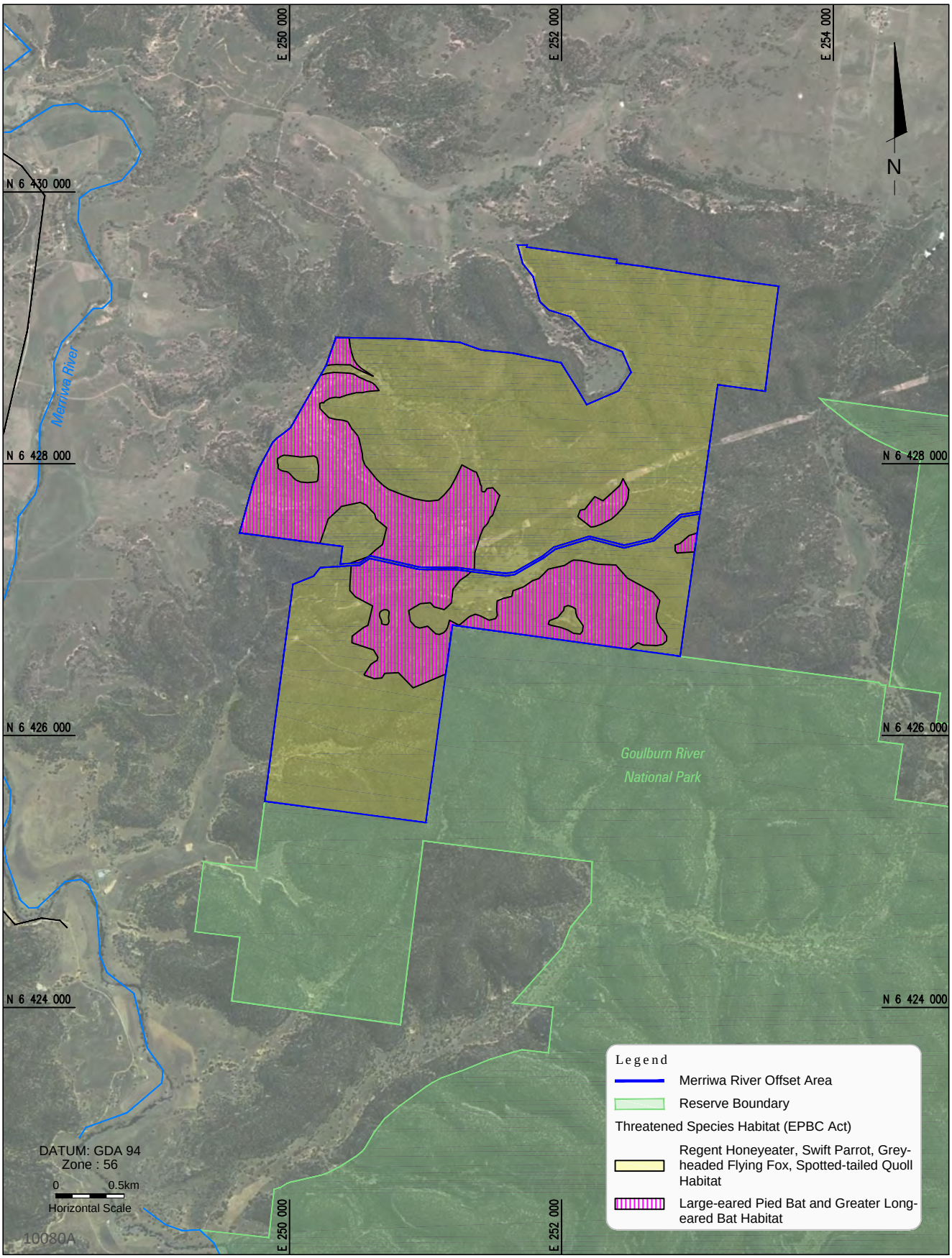
FIGURE 12



BENGALLA MINE

Threatened and Migratory Species Recorded within the Merriwa River Offset Area

FIGURE 13



BENGALLA MINE

EPBC ACT Threatened Species Habitat within the Merriwa River Offset Area

FIGURE 14

6.3 Vegetation Benchmark Data

In order to provide a science-based measureable system for monitoring achievement of vegetation management objectives, benchmark data from the NSW Biometric Vegetation Types database (as used in NSW regulatory processes including BioBanking and the Environmental Outcomes Assessment Methodology) are used to guide management of forest and woodland types on the Biodiversity Offset Areas.

Benchmarks are quantitative measures that describe the range of variability in condition of vegetation with relatively little evidence of alteration, disturbance or modification by humans since European settlement. Vegetation with relatively little evidence of modification generally has minimal timber harvesting (few stumps, coppicing, cut logs), minimal firewood collection, minimal exotic weed cover, minimal grazing and trampling by introduced herbivores or over-abundant herbivores, minimal soil disturbance, minimal canopy dieback, no evidence of recent fire or flood, not subject to high-frequency burning, and positive evidence of recruitment of native species. As such, benchmark data used for the purposes of this BOMP provide a measureable target for improvement of existing woodland and forest, regeneration of grasslands and improvement of fauna habitat on all Biodiversity Offset Areas.

Further discussion in relation to benchmark data gathered for the Biodiversity Offset Areas is provided in **Section 7.0**.

7.0 VEGETATION MANAGEMENT STRATEGY

This section outlines the specific management strategies for each of the Biodiversity Offset Areas. A brief outline of the management zones that have been identified within each Biodiversity Offset Area is provided, followed by a description of the management strategies to be employed in each management zone.

7.1 Management Zones

To manage the different kinds of vegetation across the Biodiversity Offset Areas, each has been divided into zones, according to the different strategies required to return the zones to high quality woodland and forest vegetation. The following management zones are proposed for the Biodiversity Offset Areas:

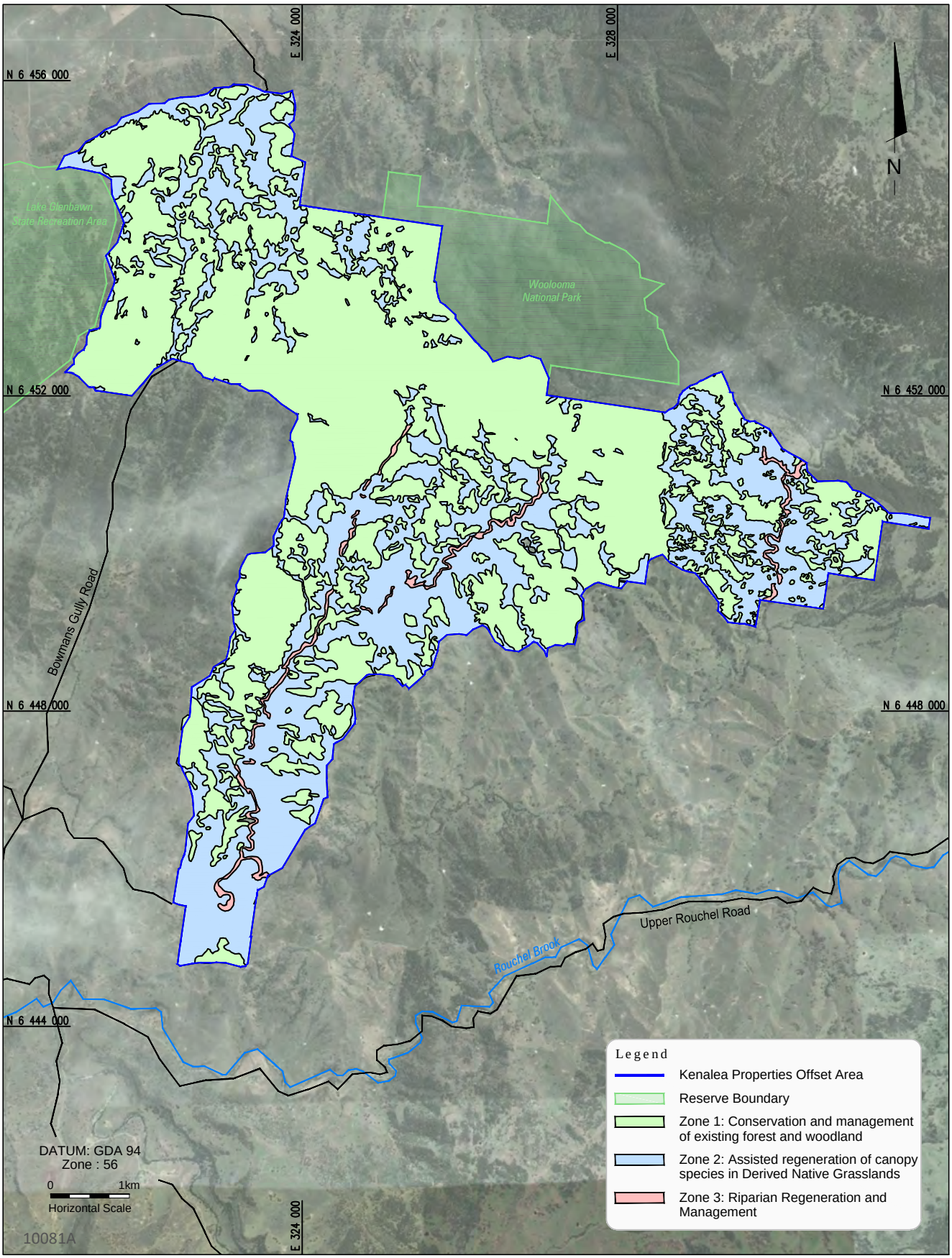
- Zone 1: Conservation and management of existing forest and woodland;
- Zone 2: Assisted regeneration of canopy species in Derived Native Grasslands; and
- Zone 3: Riparian regeneration and management.

The management zones within the Biodiversity Offset Areas are shown in **Figures 12** to **14**.

Broadly, existing woodland or forest vegetation that is in good condition will require minimal management in order to maintain or enhance its current position. While no revegetation is proposed to occur in these areas, conservation and management measures will be undertaken and will include control grazing, weed management, feral animal control and ongoing maintenance (e.g. fencing repair and fire trail maintenance).

Assisted regeneration of canopy species will be undertaken in areas without canopy trees and where the ground layer is relatively intact. In these areas, management via control grazing with the use of cattle stock (as defined in **Section 8.3**) is a long term strategy that may be utilised to promote regeneration, control weeds and reduce fire fuel loads (McIntyre, McIvor et al. 2002).

The management strategies to be implemented in each zone are outlined below. The performance of the management strategies will be underpinned by the gradual improvement over time from the current condition towards benchmark levels. This will provide a measurable, science-based comparison between the current condition of management zones and BOMP completion criteria.

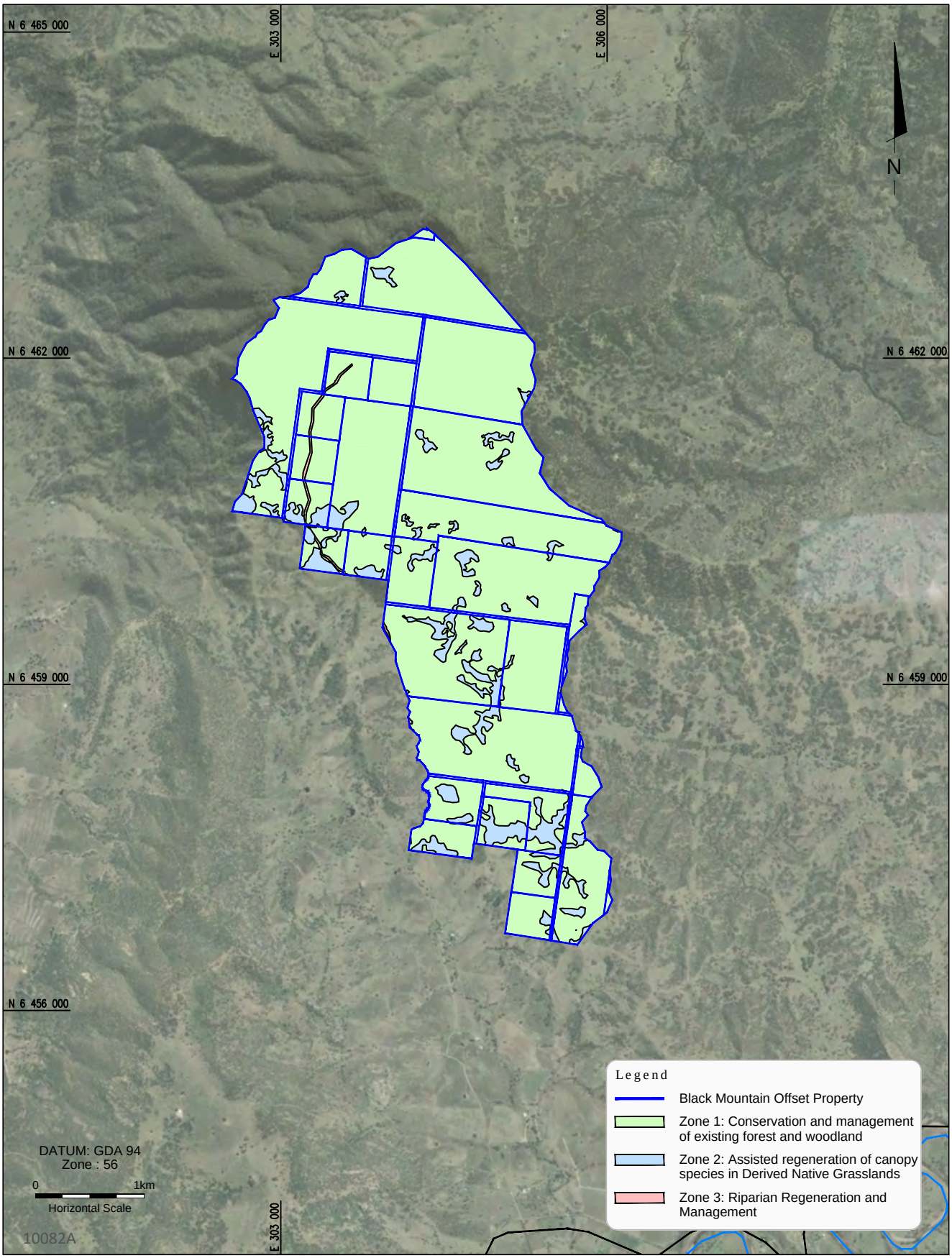


BENGALLA MINE

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

Kenalea Properties Offset Area Management Zones

FIGURE 15

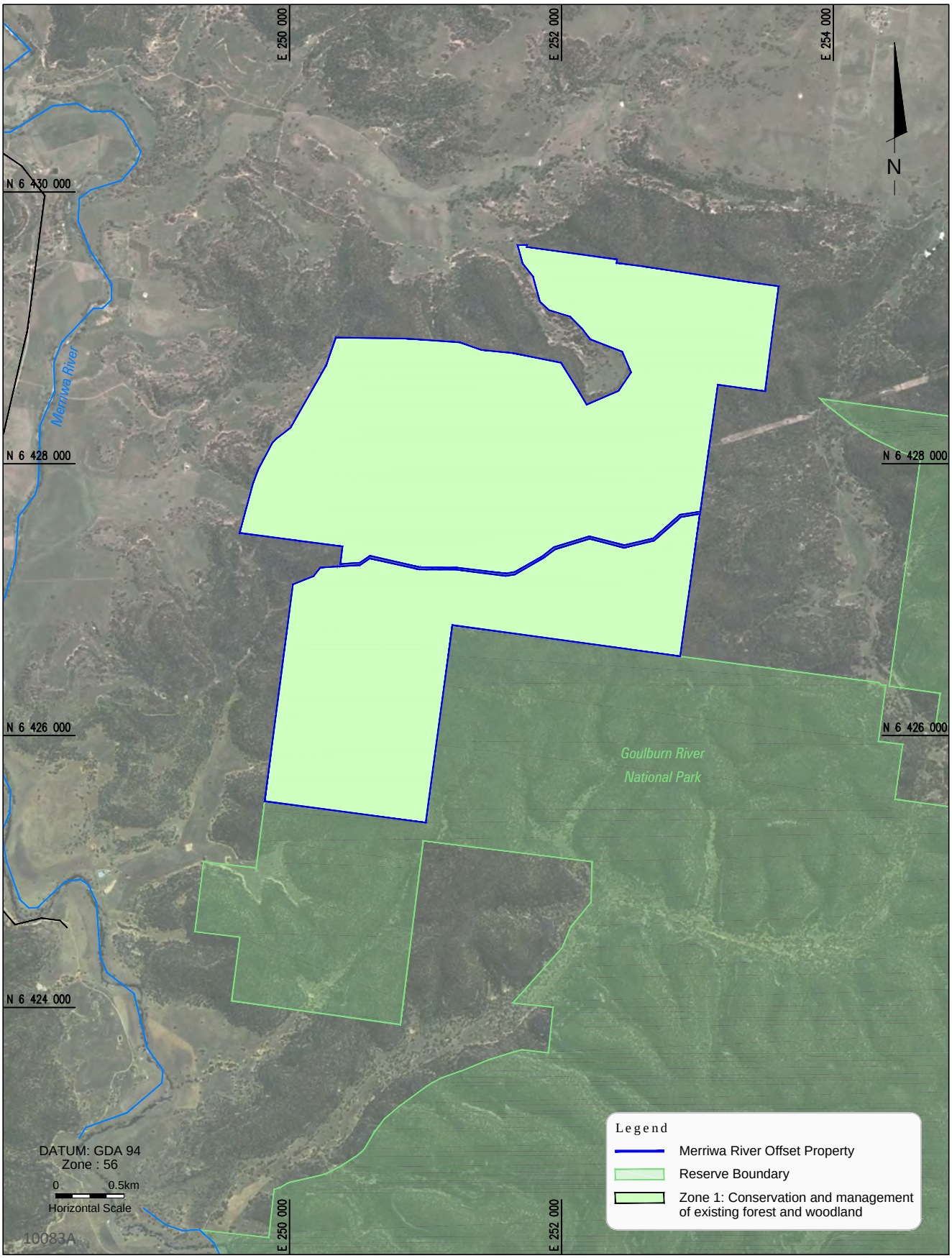


BENGALLA MINE

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

Black Mountain Offset Area Management Zones

FIGURE 16



BENGALLA MINE

Merriwa River Offset Area Management Zones

FIGURE 17

Zone 1: Conservation and Management of Existing Forest and Woodland

Present in Biodiversity Offset Areas:

- Kenalea Properties;
- Black Mountain; and
- Merriwa River (entire property classed Zone 1).

Areas of woodland and open forest in all the Biodiversity Offset Areas contain many biodiversity values and provide habitats for native plants and animals. In these areas, healthy, mature, seed producing trees are present and the understorey is dominated by native species; therefore little restoration effort is required.

Matters of National Environmental Significance:

Zone 1 across the Biodiversity Offset Areas currently provides 1,720 ha of Box Gum Woodland, 4,609 ha of habitat for the Regent Honeyeater, Swift Parrot, Grey-headed Flying-fox, Spotted-tail Quoll habitat and 1,778 ha of habitat for the Large-eared Pied Bat and South-eastern Long-eared Bat (Cumberland Ecology, 2014).

Objective

Specific objectives for the management of existing forest and woodland vegetation within the Zone 1 Biodiversity Offset Areas are to:

- Maintain or improve the condition of forest and woodland towards benchmark conditions for the relevant plant community types (see **Table 11**, **Table 12** and **Table 13**); and
- Increase the extent and condition of habitat for threatened flora and fauna.

Strategy

Conservation and ongoing management of existing forest and woodland vegetation will occur within the Biodiversity Offset Areas to improve their ecological value and regenerate native vegetation and associated fauna habitat. In general, due to the relatively good condition of these areas, management activities will mainly comprise actions to minimise threats and allow natural regenerative processes to occur.

Management activities will include maintenance of existing boundary fencing (where practicable), reduction of livestock, weed and feral animal control, and environmental management and condition monitoring. Weed invasion and over grazing by stock represent some of the most significant impacts to areas of existing bushland in the Biodiversity Offset Areas, and managing these two processes is expected to result in significant improvements in biodiversity.

To limit the fire fuel load on the ground, control grazing (see **Section 8.3**) may be conducted across Zone 1 as part of bushfire management strategies (see **Section 8.4**). Mandatory bushfire requirements for the Biodiversity Offset Areas are outlined within the Bushfire Management Plan.

Existing forest and woodland areas are mature, functioning examples of natural ecosystems, but their condition is expected to improve with time as further trees mature, tree hollows are generated, and as regeneration of the understorey takes place when livestock numbers are progressively lowered (McIntyre, McIvor et al. 2002). These areas of existing vegetation will form nuclei for natural regeneration of trees and shrubs into nearby areas of Derived Native Grassland that form Zone 2.

Zone 2: Assisted Regeneration of Canopy Species in Derived Native Grasslands

Present in Biodiversity Offset Areas:

- Kenalea Properties; and
- Black Mountain.

In areas of Derived Native Grassland, assisted natural regeneration of canopy trees will take place to return these areas to high quality forest and woodland. These areas typically comprise a relatively diverse native grassland community, but without trees due to previous clearing.

Matters of National Environmental Significance:

Zone 2 across the Biodiversity Offset Areas currently provides 1,500 ha of Box Gum Woodland Derived Native Grassland that will be regenerated to the woodland component over the life of this BOMP (Cumberland Ecology, 2014). This would also create up to an additional 1,500 ha of habitat for the Regent Honeyeater, Swift Parrot, Grey-headed Flying-fox, Spotted-tail Quoll, Large-eared Pied Bat and South-eastern Long-eared Bat across the Biodiversity Offset Areas.

Objective

The objectives for the replacement of canopy trees within this zone are:

- Transition of existing areas of derived native grassland to benchmark values for native overstorey cover of woodland (see **Table 11**, **Table 12** and **Table 13**);
- Increase connectivity between existing Zone 2 areas across all Biodiversity Offset Areas through to complete connectivity by Year 20; and
- Improvement of habitat for threatened flora and fauna with an increase in the condition and extent of habitat over 20 years.

Strategy

The Derived Native Grassland that forms Zone 2 typically occurs in close proximity to forest and woodland habitat (Zone 1). In the medium to long term, trees and shrubs are expected to regenerate into such areas as the condition of the Derived Native Grassland is improved through inclusion of control grazing and weed management (Lindenmayer, Bennett et al. 2010).

Control grazing (see **Section 8.3**) may be employed in areas lacking regenerating canopy species in order to reduce the numbers of weed species present. Follow-up weeding will target any remaining weeds (see **Section 8.5** and **Appendix B**). Areas where regenerating canopy species are present will not be grazed in order to sustain regeneration; however, maintenance weeding (see **Section 8.5** and **Appendix B**) will occur to promote further regeneration. **Appendix B** provides an indicative list of proposed weed and pest control strategies, which may be varied and enhanced should other control strategies be identified in the future.

Light grazing has been shown to maintain native tussock grasses and sensitive herbs (McIntyre and Lavorel, 2001) and may increase species diversity if managed appropriately to avoid overgrazing (Henderson and Keith, 2002; Tasker and Bradstock, 2006; Rawlings *et al*., 2010).

To limit the fire fuel load on the ground, control grazing (see **Section 8.3**) is included as part of a suite of methods that are to be considered for use in Zone 2 as part of bushfire management (see **Section 8.4**). If conducted, grazing will be timed to avoid periods when native plants are in flower and the grazing strategy can be amended or halted depending on the regeneration of native flora.

If control grazing is to be employed, a field assessment, in conjunction with the annual monitoring, will be conducted in the regeneration areas prior to grazing to assess whether native regeneration is occurring (see **Section 8.3**). The results of this assessment will dictate the approach for strategic grazing that may be used for that year and what areas are to be excluded from grazing.

Should control grazing of part of Zone 2 be shown to not be successful or not considered a preferred method to be employed by BMC, the control grazing activity will be reviewed and cattle will be excluded from the offset areas, where appropriate. These areas will be left to regenerate naturally with the aid of weed control and feral animal control actions.

Should monitoring results indicate that regeneration is not occurring naturally after Year 5, assisted revegetation (including replacement of canopy trees as well as understorey and ground layer vegetation) will take place in any areas that require this management action (see **Section 9.0**). In these areas, planting of a wide range of canopy trees, understorey species and ground layer vegetation will be conducted.

Control Grazing Rules and Triggers

If control grazing is required, the following measures will be adopted:

- Stocking rates will not exceed 4 Dry Sheep Equivalent (DSE) per hectare (Dorrough, Stol et al. 2008). A dry cow or steer at 350 kg to 450 kg is equivalent to 8.0 to 10.0 DSE, a cow with calf at foot (up to 8 months) is equivalent to 12.0 to 14.0 DSE and a Bull at 800 kg is equivalent to 14.0 DSE (AMLRNRM, 2010);
- Stocking rates will be reduced during winter when plant growth rates are slow; and
- Stocking rates will be reduced following good summer and autumn rains to allow plants to recover and encourage seedling establishment.

In addition, the following measures will be undertaken:

- Stock proof fencing will be placed around control grazing areas (where existing fences are absent) to protect sensitive riparian areas and areas of natural regeneration from cattle;
- Grazing will be carried out strategically so that competition and seed production from pasture weed species is reduced (e.g. reducing the biomass of large perennial grasses so as to promote opportunities for regeneration by eucalyptus and understorey species); and
- Grazing management will allow for rest periods to maintain adequate groundcover and litter, particularly at the time of season break of annual broad-leaved weeds to reduce the likelihood of germination and/or reduce seed set/competition of these weeds.

Zone 3: Riparian Regeneration and Management

Present in Biodiversity Offset Areas:

- Kenalea Properties; and
- Black Mountain.

Within Kenalea Properties and Black Mountain Biodiversity Offset Areas, riparian communities will be managed to maintain and improve the condition of the riparian corridors. On each of these properties the condition of the riparian areas is at a moderate to good level so only a low level of management is required.

Objective

Specific objectives for the management of existing riparian vegetation within the offsets are:

- Maintain or improve salinity levels in waterways;
- Maintain or improve riparian woodland to benchmark conditions (see **Table 11**, **Table 12** and **Table 13**);
- Protect creek lines from erosion (particularly through stock exclusion);

- Avoidance of grazing in Zone 3; and
- Maintain or improve habitat for threatened flora and fauna with an increase in the condition and extent of habitat over 20 years.

Strategy

Management of Zone 3 will target weed and feral animal control. The riparian corridors will be assessed annually for weed recruitment and subsequently treated.

Existing riparian communities areas are currently mature, functioning examples of natural ecosystems, but their condition is expected to improve with time as further trees mature, tree hollows are generated, and as regeneration of the understorey takes place when livestock are removed (McIntyre, McIvor et al. 2002). However, maintenance weed control (see **Section 8.5** and **Appendix B**) will be required annually in order to prevent the establishment of weed populations that would be a threat to the regeneration of the mid-storey and ground storey flora.

7.2 Conservation Objectives and Performance Indicators

Conservation Objectives

The primary conservation objective for this BOMP is to:

- Improve biodiversity values across all Biodiversity Offset Areas;
- Protect the Biodiversity Offset Areas under a legally binding mechanism, once the preferred method is confirmed with relevant regulators;
- Increase the total area, connectivity and condition of C/EECs and other woodlands;
- Enhance habitat for impacted threatened flora and fauna species (including MNES) that are being offset within the Biodiversity Offset Areas.

The conservation management strategies described in **Section 8.0** outline the management actions that are to be used within all the Biodiversity Offset Areas to achieve the conservation objectives of this BOMP.

The methods to monitor these management actions are described in **Section 9.0**.

Key Performance Indicators and Triggers

Key performance indicators are aligned with the key biodiversity values for vegetation and threatened species in the Biodiversity Offset Areas.

Section 8.0 details the key performance indicators for the Vegetation Management Zones and for threatened flora and fauna species, respectively. Should key performance indicators not be met, management actions for each Vegetation Management Zone will be reviewed to identify the necessary remedial actions.

If key performance indicators are not met, a number of factors will be considered including climate change, drought and bushfire to determine if the management actions were compromised by conditions out of the control of BMC. Remedial actions will then be identified and implemented in response to these external factors.

Baseline data presented in **Table 11**, **Table 12** and **Table 13** have been collected as part of the first year of the ecological monitoring program described in **Section 9.0.** Should the monitoring program identify that the key performance indicators for vegetation management are not reaching the targets set at the 10-year mark shown in **Table 12**, additional management measures as detailed in **Section 9.3** will be implemented to ensure achievement of the completion criteria prior to expiry of the period of approval.

8.0 CONSERVATION AND LAND MANAGEMENT MEASURES

This section outlines the conservation management measures that will be undertaken in each of the Biodiversity Offset Zones in Section 6.0. It focuses on addressing the key threatening processes identified in the following recovery plans:

- *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland National Recovery Plan (DECCW, 2010);*
- *National Recovery Plan for the Swift Parrot (Saunders and Tzaros, 2011);*
- *Regent Honeyeater Recovery Plan 1999-2003 (Menkhorst et al., 1999);*
- *Draft National Recovery Plan for the Spotted-tailed Quoll (Long and Nelson, 2010); and*
- *Draft National Recovery Plan for the South-eastern Long-eared Bat (Schulz and Lumsden, 2010).*

8.1 Fencing, Gates and Signage

Where it exists, boundary fencing will remain around all Biodiversity Offset Areas and will be inspected annually to identify areas that may require maintenance. Internal fencing within Kenalea Properties and Black Mountain will be maintained (where appropriate) to allow management of control grazing (see **Section 8.3**) in these properties. If control grazing is to be employed, stock proof fencing will be utilised where existing fences are absent to protect sensitive areas from cattle and to focus control grazing on target areas for bushfire fuel reduction (see **Section 8.3**).

Current gates for access to the Biodiversity Offset Areas will be retained and kept locked with the keys held by BMC. BMC will install signage at the entrances to the Biodiversity Offset Areas to inform the public of the restricted access to the properties.

8.2 Controlled Activities

All contractors, stakeholders and visitors to the Biodiversity Offset Areas will be inducted. The induction will include information on the following activities that are prohibited unless these activities are required as part of ongoing management practices:

- Fires;
- Removal of firewood;
- Removal of rocks, sand or gravel;
- Clearing of native vegetation;
- Recreational hunting;
- Baiting (unless permitted as part of the control of feral animals);
- Trapping or shooting (unless permitted as part of the control of feral animals);

- Use of fertilisers; and
- Grazing within Zone 3 Management Zones.

All vehicles that enter the site must be fit-for-task and should follow the designated tracks throughout the Biodiversity Offset Areas where possible. It will be necessary for equipment or vehicles to leave existing access tracks for maintenance and/or monitoring purposes. In addition, equipment may be required to conduct maintenance activities on tracks to maintain safe access and for bushfire management.

8.3 Control Grazing

Control grazing will be used to enhance native woodland and Derived Native Grasslands in offset areas. Control grazing will promote regeneration of understorey and canopy species, control weeds and reduce fire fuel loads. Control grazing will only be permitted in Zone 1 and Zone 2 management areas (see **Table 7**). Zone 3 management areas are defined as areas sensitive to grazing pressures and erosion and as a result no grazing will occur in this management zone.

Best practice guidelines for control grazing (DECCW, 2010) will be implemented wherever control grazing is employed. Best practice involves:

- Providing adequate rest periods and adjusting rest periods to suit the recovery needs and growth rates of the desirable plants in control grazing areas (e.g. rest over summer to allow summer-active grasses to grow, set seed and establish (McIntyre, McIvor et al. 2002));
- Targeting defined areas with high fuel loads or weed infestations that are outcompeting native regeneration (e.g. in areas that have a lot of weeds and some natives, grazing can be used to promote the growth of those natives (McIntyre, McIvor et al. 2002));
- Cattle stocking numbers are to be kept low (below 4 DSE) to avoid overstress on areas of regeneration;
- Ensuring cattle are kept within the defined control grazing areas with the use of fencing to protect sensitive areas;
- Pre-and post-grazing monitoring will be undertaken to ensure control methods are resulting in optimal vegetation floristic and structural characteristics;
- Periods of grazing must be kept as short as practical. High intensity, short-duration rotational grazing is considered to provide long recovery times for desired species, and is a good option if grasslands make up a significant portion of the control grazing areas (McIntyre, McIvor et al. 2002);
- Control grazing (if it is required) will not be conducted during declared drought periods; and
- Grazing controls that will increase native species diversity in grazing areas over time.

Kenalea Properties and Black Mountain have a history of grazing and will require careful management to avoid negative impacts on biodiversity values. The biodiversity monitoring program (see **Section 9.0**) will observe the impact on indicators such as native plant recruitment and weed abundance.

Table 7 provides the performance criteria for monitoring the success of control grazing. Any drop below performance criteria will trigger the removal of cattle from that part of the Biodiversity Offset Area. Presentation and commentary on the results of the biodiversity monitoring program will be detailed in the Annual Review as outlined in **Section 10.3**.

BMC (via its leaseholder) will determine areas for control grazing through visual inspections and having regard to patterns of regeneration of eucalyptus and other native plants. All grazing areas will be adequately fenced to enable dynamic grazing by cattle.

Table 7
Control Grazing Trigger and Performance Criteria

Management Zone	Control Grazing Trigger Point	5-Year Performance Criteria	10-Year Performance Criteria	20-Year Completion Criteria
Management Zone 1	Natural regeneration absent Sward greater than 40cm in height Observed ground cover condition in Spring has an annual exotic grass or weed component of greater than 15% of ground cover and perennial native grasses less than 40% of ground cover	Fire fuel reduction No decrease against flora and fauna monitoring performance criteria	Fire fuel reduction No decrease against flora and fauna monitoring performance criteria	Fire fuel reduction No decrease against flora and fauna monitoring performance criteria
Management Zone 2	Natural regeneration of canopy species absent Average grass height greater than 40cm Observed ground cover condition in Spring has an annual exotic grass or weed component of greater than 15% of ground cover and perennial native grasses less than 40% of ground cover	Fire fuel reduction Increase in regeneration of eucalypts and native forbs No decrease against flora and fauna monitoring performance criteria Net decrease in weed density	Fire fuel reduction Eucalypt regeneration to performance criteria. If not met replanting regime to be implemented Net decrease in weed density	Fire fuel reduction No decrease against flora and fauna monitoring performance criteria Net decrease in weed density
Management Zone 3	No control grazing permitted	No control grazing permitted	No control grazing permitted	No control grazing permitted

Grazing areas will generally be delineated by existing fencelines, however some temporary fencing may also be utilised. Stock will be excluded from riparian areas and will access water primarily from farm dams or water troughs. Control grazing trigger levels presented in **Table 7** are based on an adapted dry matter per hectare using the Meat and Livestock Australia Pasture Ruler (Lodge, 2011). Should all control grazing trigger points be identified then control grazing will be implemented in accordance with the above guidelines (DECCW, 2010).

Monitoring

Control grazing monitoring will be undertaken pre- and post-grazing with the use of photo-reference points in the area of grazing. The photo-referencing will be used to provide an indication of the fuel loads present in the areas before and after control grazing. In addition, areas subject to control grazing will be monitored as part of annual monitoring program to measure its effectiveness against the vegetation performance and completion criteria for weeds and natural regeneration (see **Section 9.0**). The annual monitoring results will be used to inform adaptive management/restoration practices.

8.4 Bushfire Management

BMC as the owner of the land will take practicable steps to prevent the occurrence of bushfires on the land and to minimise the spread of bushfire. The quick identification of a threatening bushfire, notification of the Rural Fire Service (RFS) and suppression is the primary goal. BMC will provide maps and contact details of the properties to the RFS. An appropriate controlled burning regime can be a useful tool to enhance the condition of Box Gum Grassy Woodlands.

Management Objective

To protect lives, long-term biodiversity values and infrastructure assets from the impacts of bushfires.

Methods

Key control measures will focus on:

- Documentation and maintenance of selected access tracks and selected water supply points for suppression activities;
- Use of control grazing to reduce fuel build-up of potential exposed ignition sources, prior to the fire season;
- Use of controlled burns when deemed necessary (with any required approvals and/or permits from the RFS) to reduce fuel build-up and to protect biodiversity and conservation values;
- Establishment of asset protection zones around priority infrastructure;
- Appropriate investment in fire suppression assets; and
- Communication of BMC Bushfire Management Plan and response procedures to key stakeholders, including land managers, neighbours, consultants, contractors and employees.

Any fuel hazard reduction burns will be conducted in accordance with the *Bush Fire Environmental Assessment Code for New South Wales* (Rural Fire Service, February 2006) and the guidelines contained in the *Threatened Species Hazard Reduction Lists for the Bush Fire Environmental Assessment Code*.

Current recommendations under the Code are:

- In woodland vegetation, fire should not occur within 5 years of a previous fire and consideration should be given to burning within 40 years of any previous fire; and
- In grassland vegetation derived from the woodland vegetation, the recommended fire intervals are the same as woodland vegetation.

8.5 Weed Control

Weeds represent a significant risk to biodiversity in the Biodiversity Offset Areas. Weed management actions will target Weeds of National Significance (WoNs) and Noxious Weeds across the Biodiversity Offset Areas. Particular attention will be given to weed control at the interface between grassland areas and adjacent native woodland and forest vegetation. Weed control actions are documented in the Annual Review (see **Section 10.3**).

Weed control will focus on species that exclude or have the potential to exclude, native species, disrupt recruitment of native species or impede ecological processes. **Table 8** lists the noxious weeds under the *Noxious Weeds Act 1993* that have been recorded within the Biodiversity Offset Areas and will be the focus of weed management in these areas. In addition, African Olive (*Olea europaea* subsp *cuspidata)* will also be targeted.

Details of the methods of weed control can be found in **Appendix B**.

Table 8
WoNS and Noxious Weeds Present in the Biodiversity Offset Areas

Scientific Name	Common Name	Weed Status	Weeds of National Significance	Class (if noxious)*
Centaurea calcitrapa	Star Thistle	Y	-	4
Hypericum perforatum	St. John's Wort	Y	-	4
Rosa rubiginosa	Sweet Briar	Y	-	4
Rubus fruticosus	Blackberry	Y	Y	4
Senecio madagascariensis	Fireweed	Y	Y	4
Opuntia aurantiaca	Tiger Pear	Y	Y	4
Opuntia stricta	Common Prickly Pear	Y	-	4
Xanthium spinosum	Bathurst Burr	Y	-	4

**Listed in regional weed strategy for Upper Hunter 2010 - 2015. Not listed by DP&E.*

Objectives

The Biodiversity Offset Areas contain areas of native forest and woodland vegetation (Zone 1 and Zone 3 Management zones) with significant biodiversity values, therefore it is important to ensure that vegetation and habitat degradation due to weeds is not introduced or exacerbated in these areas. The goal of weed management in Zone 1 areas will be to enhance their existing ecological value by removing any existing weeds and to limit and control potential weed incursion from surrounding disturbed areas.

Zone 2 Management zones contain relatively few weeds and are dominated by native species. However, on-going maintenance weed control will be undertaken (potentially in conjunction with control grazing) in these areas to maintain low levels of weeds and to prevent significant incursions of weeds. Localised areas of weeds occur in Zone 2, particularly around remnant trees and old cattle camps, which will be targeted during weed control.

The overall objective is to eradicate or reduce the weed population and diversity across the Biodiversity Offset Areas over a period of 10 years and to maintain this for the remaining life of this BOMP.

Weed Control Strategy

The proposed weed strategy for the Biodiversity Offset Areas is described in **Table 9**.

Table 9
Weed Control Strategy, Objectives and Frequency

Task	Strategy	Objective	Frequency
Initial inspection	Walkover inspection and weed mapping	Identification of primary weeding areas and weed species to target, identification of sensitive areas to avoid and identify appropriate weeding techniques (see **Appendix B**).	At the commencement of management practices as part of this BOMP.
Primary Weeding	Selective spraying of weeds. Where practical: • Cutting or scraping of Blackberry and Sweet Briar thickets with hand tools, chainsaws and brush cutters and painting stumps with Glyphosate or Picloram; • Drilling and injecting large tree weeds like Prickly Pear with Glyphosate and a Garlon/diesel mix;	Reducing the population and diversity of weeds (including weeds in Table 8) within all Biodiversity Offset Areas.	In the first year of this BOMP.

Task	Strategy	Objective	Frequency
	• Hand removal of any weeds that are in close proximity to native plants or in sensitive areas; and • Spot spraying with herbicides. Any plant material removed will be stockpiled away from regeneration areas and disposed in an environmentally safe manner.		
Follow-up Weeding	Selective removal or treatment of target weeds in areas where initial weeding is undertaken (primary weeding areas).	Control any infestations that persist following initial weeding.	At least every 2 years or until target weeds are eradicated or occur in reduced populations.
Maintenance Weeding	Selective removal or treatment of weeds that are encountered in all areas of the Biodiversity Offset Areas.	Control any infestations that may occur as a result of weed seeds and propagules being established through the soil seed bank, wind, overland water flow and bird droppings.	Annually - Adaptive management/restoration practices will be adopted where monitoring indicates an increase in weed incidence.

Weed Management Practice

Weed removal will be undertaken in accordance with the following principles to minimise impacts upon existing vegetation and habitats:

- Avoid over-clearing and remove only weed species;
- Limit spread of weeds from disturbance areas or off-site areas by washing down vehicles and machinery where appropriate, prior to moving them out of designated disturbance/clearance areas;
- Employ minimal disturbance techniques e.g. spot spraying to avoid soil and surrounding vegetation disturbance, and replacement of disturbed mulch/leaf-litter;
- Remove fruiting/seeding parts of weeds carefully, to minimise spread of plant propagules. Dispose of fruiting bodies etc off-site;
- Use of chemicals and sprays only during suitable weather conditions (i.e. not during wet or windy conditions), and only during appropriate seasons when weeds are receptive to chemical control; and
- Avoid disturbance of native fauna or nesting/breeding sites.

Monitoring

Weed monitoring will be undertaken as part of the annual Biodiversity Monitoring Program (**Section 9.0**). The monitoring results will be used to inform adaptive management/restoration practices.

Potential Corrective Actions

If weed control is found to be inadequate and monitoring results indicate an increase in weeds or no measurable decrease in the size and density of patches, then corrective actions will be considered. Additional efforts to control target species or methods extended to cover newly occurring weed species could include;

- Increasing frequency of control; and
- Use of alternative methods.

Documentation

The results and outcomes of weed management will be documented and analysed for each year in the Annual Review (see **Section 10.3**). This will include documentation of areas subject to weeding, techniques used, target species controlled, new species identified, chemicals used and revised approaches to weed control in light of learnings during the previous performance period. Based on data from annual monitoring reports, management actions will be summarised on maps of the relevant management areas annually, or more frequently if necessary. Weed control is anticipated to be one of the major management activities. Weed infestation maps will be updated annually and annotated as required with information about previously implemented weed controls (e.g. spraying). Such maps will be used to adaptively improve ongoing weed management and related activities.

8.6 Feral Animal Management

Feral animal activity on all Biodiversity Offset Areas is currently low due to historic farming activities including feral animal management. Feral animal management will be conducted (as required to minimise the impacts of competition or predation of native fauna by feral fauna within the Biodiversity Offset Areas. The feral animal control strategy for the Biodiversity Offset Areas is outlined in **Table 10** with further details provided in **Appendix B**.

The management of feral fauna is intended to be adaptive and will be informed/reviewed based on the findings and recommendations of the Feral Animal Monitoring Program. Further control above the routine annual control will be informed by the results of the monitoring survey.

Table 10
Feral Animal Control Strategy, Objectives and Frequency

Feral Animal	Strategy	Objective	Frequency
Feral Cat	An initial survey will be conducted to establish if any significant populations of feral cats are present on any of the Biodiversity Offset Areas. Control strategies may also include setting ground baits laced with poison or targeted trapping programs. Should ground baiting program be undertaken, baits will be buried to a minimum depth of 10 cm and spaced a minimum 200 m apart so to avoid native fauna poisoning.	Prevent any populations of Feral Cat becoming established within the Biodiversity Offset Areas.	Annual monitoring – Control will be undertaken as required following feral animal monitoring results
Feral Pig	An initial population survey followed by an appropriate 1080 baited poisoning, trapping or shooting program, whichever is more suitable. 1080 baiting will be conducted in accordance with the PCO 2010.	To reduce population of the feral pigs on the Biodiversity Offset Areas and to reduce impacts to the regenerating vegetation.	Annually - Further follow-up control will be undertaken as required following feral animal monitoring results.
Wild Dog/Foxes	BMC will bait and/or trap in the Biodiversity Offset Areas. Control strategies may also include setting baits laced with 1080 poison or targeted trapping programs. The Biodiversity Offset Areas will be subject to aerial baiting as proposed by the Local Land Services. When conducting hand baiting, baits will be buried to a minimum depth of 10 cm and spaced a minimum of 200 m apart so to avoid native fauna poisoning.	To reduce the populations of Wild Dog and/or European Fox within the Biodiversity Offset Areas and to reduce predation on native fauna.	Aerial wild dog baiting is conducted annually by the Local Land Services. Further follow-up control will be undertaken as required following feral animal monitoring.
European Rabbit	An initial population survey will be conducted to establish if any significant populations of rabbits are present on any of the Biodiversity Offset Areas.	Prevent any populations of European Rabbit becoming established within the Biodiversity Offset Areas.	Annual monitoring – Control will be undertaken as required following feral animal monitoring results.

Method

An annual feral animal control program will be conducted by BMC along with current practices provided by the Local Land Services (annual aerial wild dog baiting) for all Biodiversity Offset Areas. The target feral animal species will include feral cats, pigs, dogs/foxes and rabbits. The use of 1080 (or other similar chemical) as a means of poisoning can be an effective feral animal control method. Other methods including trapping, shooting and fencing could also be applied dependent on the target feral species and anticipated success (see **Appendix B**). Control methods can be utilised provided that they are:

- Species specific;
- Cause no or little damage to the natural environment;
- Do not poison native fauna (e.g. 1080 is used in accordance with the *Pesticide Control (1080 Liquid Concentrate and Bait Products) Order 2010* (PCO 2010));
- Humane;
- Compliant with relevant Work, Health, Safety and Environment regulatory requirements; and
- Regularly monitored.

Monitoring

Monitoring of the feral animal population in the Biodiversity Offset Areas will be undertaken as part of the annual Biodiversity Monitoring Program (see **Section 9.5**). The monitoring results will be used to inform ongoing feral fauna management. As part of feral animal monitoring, a record of incidents of non-target fauna deaths will be kept. Should any native fauna deaths be recorded during 1080 baiting and if sufficient carcass is available, the animal will be sent to a veterinarian to provide a cause of death.

Potential Corrective Actions

If feral animal control is found to be inadequate, and monitoring results indicate an increase in feral animal numbers, or no measurable decrease then the following corrective actions will be implemented:

- Increase frequency of control and monitoring;
- Re-focus feral animal controls when threatened species of concern are breeding or migrating/ moving to minimise the damage; and
- Additional efforts to control target species or methods extended to cover new feral species.

As hand laid 1080 poison baits are to be buried to a minimum depth of 10 cm and bait stations will be spread to a minimum of 200 m apart it is unlikely that any poisoning of native mammals, particularly Spotted-tail Quoll, will occur (TSSC, 2004).

Should there be any evidence of poisoning of native mammals after a baiting period, the baiting program will be reviewed against the latest best practice guidelines and/or operational policies for the use of 1080.

The regional annual wild dog aerial baiting program conducted by the Local Land Services will continue on the Biodiversity Offset Areas as required. The annual feral animal monitoring program will also be utilised as a measure to identify the success of the wild dog baiting program and determine if further control methods will be implemented (see **Appendix B**).

Further information of corrective action trigger levels as a result of feral animal monitoring can be found in **Table 17** in **Section 9.0**.

Documentation

The results and outcomes of feral animal management will be documented for each year in the Annual Review (see **Section 10.3**). This will include documentation of the techniques used for each feral species, the quantity of bait material purchased and deployed, the areas subject to control, estimates of the numbers of animals culled, new species identified (if any) and any other chemicals used. Where necessary, management actions will be summarised on maps of the relevant management areas.

All personnel involved in feral management must hold relevant and valid licences/permits, including any relevant chemical licences for pesticide use or a firearms licence for shooting. Note that only an Authorised Control Officer who has received proper accreditation can use 1080 liquid concentrate products.

8.7 Maintenance Track Improvement and Additional Infrastructure

Maintenance of existing tracks and installation of additional infrastructure will be required to provide safe access for BMC personnel, land managers, consultants and contractors, RFS personnel and to enable management actions to be implemented. Construction activities may cause localised site disturbance.

Objectives

The following are permitted actions for the maintenance of existing tracks and the installation of additional infrastructure within the Biodiversity Offset Areas:

- Vegetation clearing is permitted for:
    - Installation of a permanent boundary fence;
    - Installation of permanent internal fencing;
    - Installation of temporary fencing; or
    - Establishment of new maintenance/access tracks.
- Constructed fences will be stock-proof;

- Fallen timber and any other obstructions can be removed from maintenance tracks;
- Standing trees that pose a safety risk can be felled; and
- Old fences that are not required for control grazing can be removed and unwanted tracks can be closed.

Documentation

BMC will ensure compliance with all legal and environmental protection measures prior to any significant disturbance.

All relevant information and revised geographic information related to improvements and additional infrastructure will be recorded and stored by BMC.

Routine inspections and maintenance of infrastructure (e.g. tracks, fencelines and gates) will be undertaken to ensure that they are fit for purpose.

8.8 Contingency Measures

Adaptive management includes amending management actions and frequency in response to the findings of monitoring as well as unplanned or unanticipated events. Contingency measures are required to manage any unplanned or unanticipated events and their consequences. Such events and their impacts can be identified within during the monitoring and reporting process.

Contingency measure will be utilised should monitoring indicate that performance measures or contingency measure are not being met. Contingency measures that have been considered include:

- Increased frequency of monitoring and management of weeds and feral animals;
- Implementation of alternative weed management and feral animal management techniques;
- Increased frequency of monitoring and management of fuel loads;
- Removal of controlled grazing following extreme weather events; and
- Use of assisted regeneration within Zone 2.

This BOMP and the associated monitoring program will be reviewed and updated as appropriate following use of any contingency measures.

9.0 BIODIVERSITY MONITORING PROGRAM

This section presents the monitoring program that will be implemented under this BOMP and is developed in accordance of the requirements of Schedule 3, Condition 29 of DA SSD-5170 (as modified) and Condition 3 of EPBC 2012/6378.

9.1 Objectives

The purpose of the monitoring program is to monitor the ongoing status and health of flora and fauna in the Biodiversity Offset Areas to ensure the 'maintain and enhance' objective is being achieved. Monitoring will focus on both vegetation and threatened species monitoring to indicate when management actions are required.

The monitoring program will monitor the condition of native vegetation and quantify abundance of native fauna. In order to do this, a range of permanent monitoring sites will be established in areas of native vegetation within the Biodiversity Offset Areas. Progress of ecological restoration and management of the Biodiversity Offsets will be evaluated against key performance indicators during the life of this BOMP so as to provide feedback that can be used to guide and improve management of the Biodiversity Offset Areas. Appropriate data management procedures will be implemented to ensure that all data is collected and stored using appropriate techniques and able to be retrieved and suitably analysed to allow meaningful spatial and temporal comparisons to be made.

Monitoring of exotic weeds and feral animals will also be undertaken. This will quantify the abundance, investigate risks posed by weeds and feral animals and will inform management procedures designed to control these species.

Monitoring of control grazing areas will be conducted to gauge the success of control grazing in reducing fuel loads and achieving biodiversity outcomes.

The monitoring program includes but is not limited to the following:

- Monitoring to verify that the relevant threatened species recorded from the Project Boundary, or with potential to occur, are using offsets and increasing in numbers within the offsets;
- Monitoring of vegetation to verify that TECs and other vegetation communities are maintained and improved by reference to baseline and reference data, including tracking progress towards reference data;
- Monitoring of control grazing when it is used;
- Monitoring of weeds to verify that significant weeds are eradicated, or reduced to low levels that do not pose a threat to the biodiversity offsets; and
- Monitoring of feral animals to verify that significant feral pests (e.g. wild dogs, foxes, cats, pigs and rabbits) are declining or maintained at sustainable levels.

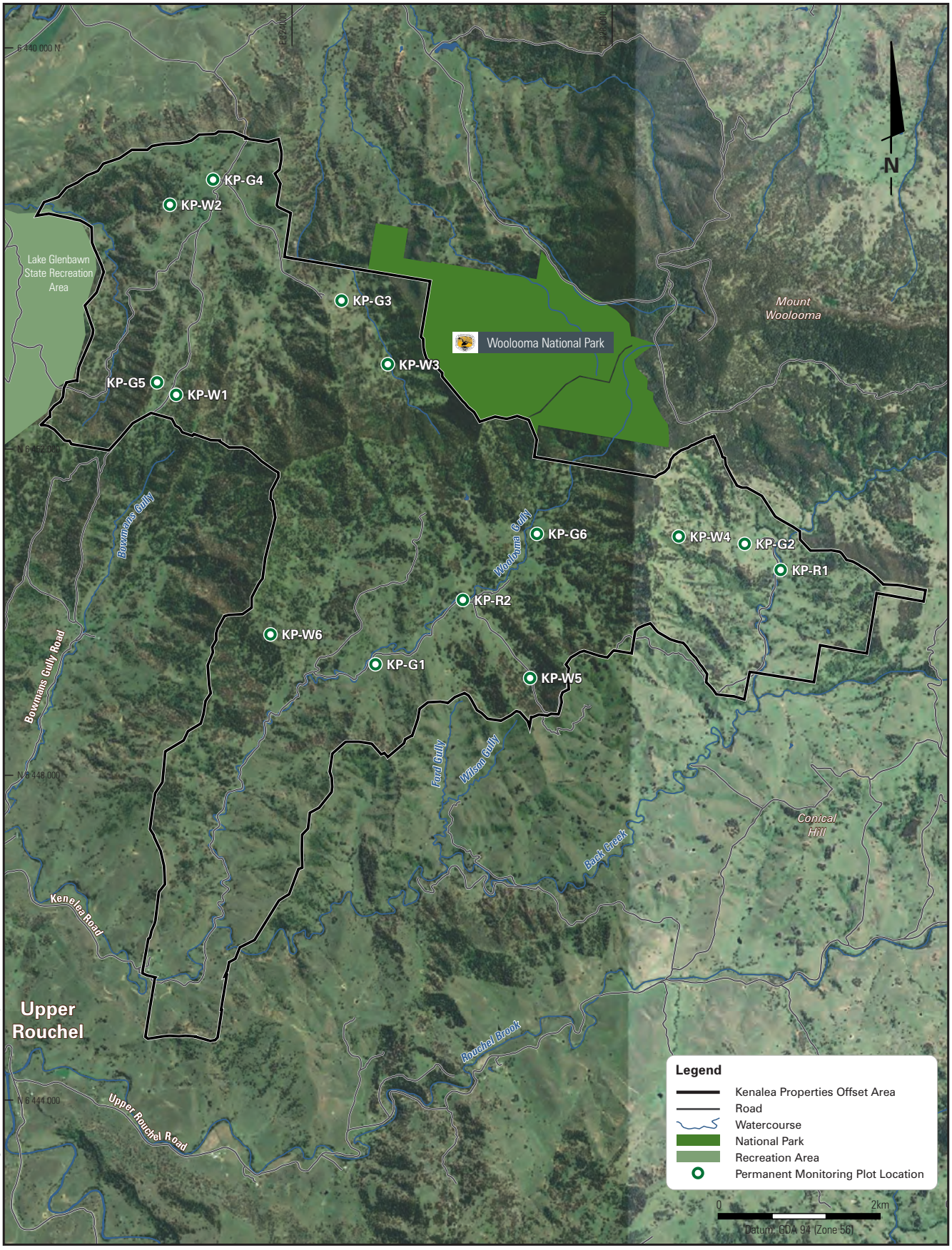
The first year of the Biodiversity Monitoring Program will represent the baseline data against which subsequent years monitoring will be compared in order to monitor the Key Performance Indicators and trigger any remedial actions, if necessary.

9.2 Permanent Monitoring Sites

A total of 28 permanent monitoring sites will be established across all the offsets, with six grassland, six woodland and two riparian sites on Kenalea Properties, eight woodland sites on Black Mountain, and six woodland sites on Merriwa River. Vegetation communities that will be monitored are as follows:

- Kenalea Properties (14 sites, **Figure 18**):
    - 6 sites: Box Gum Woodland;
    - 6 sites: Box Gum Woodland Derived Native Grassland; and
    - 2 sites: Riparian River Oak Open Forest;
- Black Mountain (8 Sites, **Figure 19**):
    - 2 sites: Upland Grassy Box Woodland;
    - 2 sites: Midland Grassy Box Woodland;
    - 2 sites: Lowland Grassy Box Woodland;
    - 1 site: Ironbark Grassy Woodland; and
    - 1 site: River Oak Forest;
- Merriwa River (6 sites, **Figure 20**):
    - 2 sites: Ironbark Open Forest on Sandstone (Narrow-leaved Ironbark);
    - 2 sites: Box Woodland on Basalt (CEEC/EEC);
    - 1 site: Narrow-leaved Ironbark Alluvial Open Forest; and
    - 1 site: Redgum Alluvial Open Woodland.

Permanent monitoring sites have been established in areas that are the focus of the regeneration of the Biodiversity Offset Areas and will provide the best indication of performance against the key performance indicators. A discussion in relation to the monitoring data to be gathered is described in the following sections.

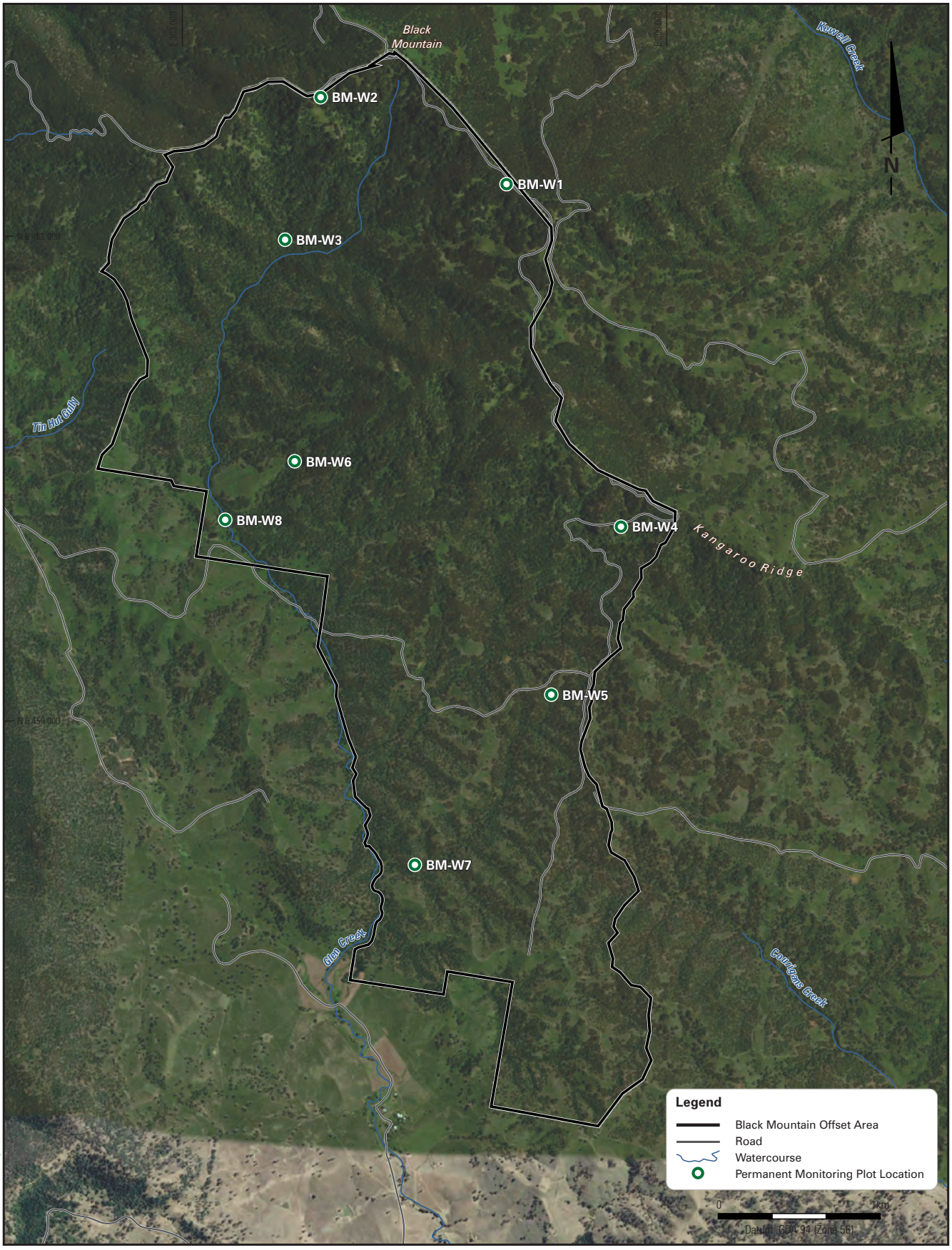


HB BENGALLA Managment Plans 1428 F18 Kenalea Properties Offset Area 05 02 2016

BENGALLA MINE

Kenalea Properties Offset Area
Permanent Monitoring Plot Locations

FIGURE 18

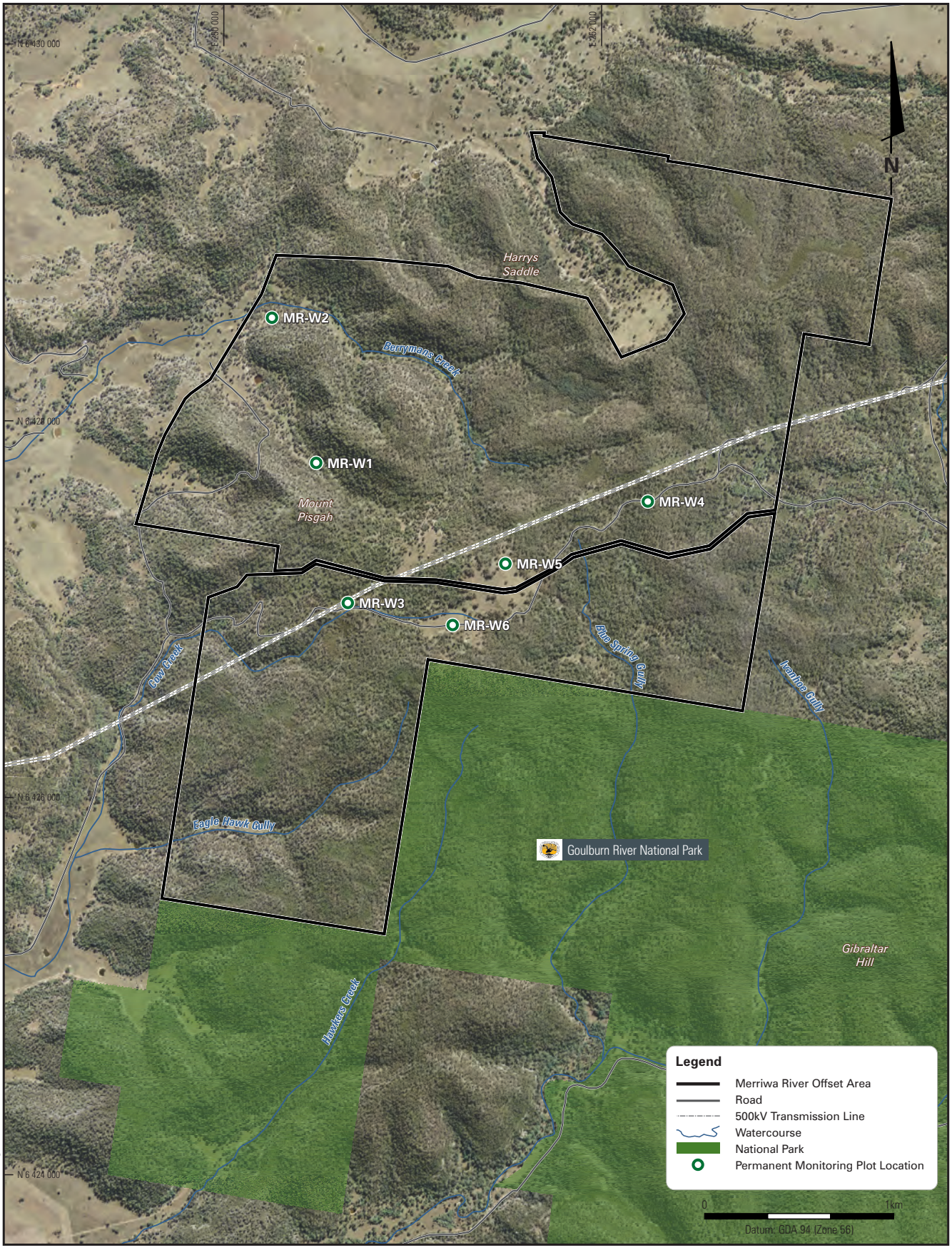


HB BENGALLA Managment Plans 1428 F19 Black Mountain Offset Area 05 02 2016

BENGALLA MINE

Black Mountain Offset Area
Permanent Monitoring Plot Locations

FIGURE 19



HB BENGALLA Managment Plans 1428 F20 Merriwa River Offset Area 01 02 2017

BENGALLA MINE

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

Merriwa River Offset Area
Permanent Monitoring Plot Locations

FIGURE 20

9.3 Flora

Flora monitoring plots

Monitoring of natural regeneration and assisted natural regeneration activities will be supported through permanent monitoring sites, and designed to inform achievement of the following target criteria:

- Evidence of natural regeneration (canopy, shrub and groundlayer seedlings);
- Decrease in weeds to less than 10% ground cover; and
- No evidence that feral animals are significantly affecting regeneration (using visual assessment).

At each permanent monitoring site, a plot of 20 x 50 m has been permanently marked by placement of a star picket at the upslope and downslope mid points of each plot and by recording the location of pickets using GPS. This plot includes a 50 m transect line which is marked by the two star pickets. Within the plot a subplot has been established, measuring 20 m x 20 m at the upslope end. Data collected from each permanent monitoring site is guided by the Native Vegetation Interim Type Standard (Sivertsen, 2009).

At each fixed monitoring plot the following measurements will be collected and recorded from within the base plot:

- The relative frequency of occurrence of each plant species in each stratum within a 20 m x 20 m subplot;
- Regeneration of canopy/shrubs species;
- Evidence of disturbance by pest animals;
- Number and sizes of hollows and the species of tree in which the hollow occurs;
- Standing dead timber and cumulative length of fallen logs;
- Proximity to water, rocks, caves and overhangs;
- A waypoint to mark the location of the quadrat, using a handheld GPS;
- Photographs of the quadrat from a fixed point and in a fixed direction and angle; and
- General comments especially on seasonal conditions, past management, etc.

Within the 20m x 20m subplot, full-floristic measurements will be collected and recorded for:

- All vascular flora species present;
- The stratum in which each species occurred;
- A measure or estimate of the appropriate cover measure for each recorded species; and
- An abundance rating for each of the species within the subplot.

Within the 20m x 20m subplot, four 10m x 10m plots to measure:

- Native groundcover plants (< 1m) % cover;
- Mosses and lichens % cover;
- Total weeds % cover;
- Organic litter % cover; and
- Rock/bare ground % cover.

The relative abundance and cover of each species within each quadrat will be recorded following guidelines of the Native Vegetation Interim Type Standard (Sivertsen, 2009) with a measure or estimate of the appropriate cover measure for each recorded species; recorded from 1–5% and then to the nearest 5%. If the cover of a species is less than 1% and the species is considered important, then the estimated cover will be entered (e.g. 0.4).

In addition, an abundance measure of the number of individuals or shoots of a species within the subplot will be made. The following abundance values will be used; 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 20, 50, 100, 500, or 1,000, or specify a number greater than 1,000 if required. Note that numbers above about 20 are estimates only. Along the 50m transect line, data collected at 1m intervals will include:

- Presence of weeds, native grasses, native shrubs, and other native vascular plants;

In addition, along the 50m transect line, data collected at 5m intervals will include:

- Native canopy (tree) projective foliage cover;
- Native mid-storey (i.e. cover of native shrubs/small trees >1m); and
- Weed canopy/mid-storey cover (i.e. cover of weeds >1m).

Performance Indicators

Progress of ecological restoration and management of the Biodiversity Offset Areas will be evaluated against key performance indicators. Vegetative biometric data will be collected annually from permanent monitoring sites that will be established in the first year of implementation of this BOMP. Permanent monitoring sites will be established in each Vegetation Management Zone in all of the Biodiversity Offset Areas. The biometric data collected from the permanent monitoring sites in the first year of the Biodiversity Monitoring Program will form the baseline values (shown **Table 11**, **Table 12** and **Table 13**) that will be used to assess the progress of vegetation management and revegetation works that are in the Biodiversity Offset Areas. Performance indicators will be measured against benchmark data for the vegetation community in the management zone.

Table 11, **Table 12** and **Table 13** provide the baseline data of each permanent monitoring plot from surveys conducted in February 2016 and benchmark data from the VIS Classification Database for each management zone in each Biodiversity Offset Area as at December 2012.

For biometric data related to percent cover of native species, performance indicators relate to lower benchmark values. Performance indicators for the remaining biometric data relate to a single benchmark value, with the exception of exotic plant cover and overstorey regeneration which have no defined benchmarks).

Table 14 provides a guide to the expected success of regeneration. If regeneration is less than the key performance indicator, as indicated by vegetation monitoring, then this will trigger management actions including replanting and undertaking further measures to increase the survival rates of future plantings.

Table 14 summarises the vegetation management performance and completion criteria for each management zone covered in this BOMP. The performance and completion criteria will trigger remedial actions, where required. An assessment of these performance and completion criteria in relation to the Box Gum Woodland and Derived Native Grassland assessed under the Commonwealth *Offsets Assessment Guide* is provided in **Table 15**. Changes to condition scores have been linked to changes against benchmark values. Implementation of the BOMP is considered to increase the condition scores from 6/10 to 7/10 for the woodland component of the community and from 4/10 to 6/10 for the grassland component.

Potential Corrective Actions

In some instances, particularly within existing woodland and forest, baseline data indicates that sites are currently at or above the lower benchmark values. As a result, vegetation management actions for these sites are considered to be minimal. Ongoing monitoring of these sites will determine over time whether management actions are maintaining values at or above lower benchmark. For grassland areas, **Table 11a** to **c** indicates that sites are below benchmark for most values. As such, vegetation management actions will focus on these areas.

If vegetation management is found to be inadequate and monitoring results indicate a likely failure to achieve completion targets after 10 years then the following corrective actions will be considered:

- Removal of all control grazing;
- Review of control burns and/or introduction of ecological burns;
- Implementation of a revegetation scheme across all Zone 2 areas that are not likely to meet Year 10 performance criteria (see **Table 12**). This revegetation scheme will be produced in conjunction with a suitably qualified bush regeneration contractor and will target the specific stratum of vegetation that is not meeting performance criteria.

Data Storage and Analysis

All data will be collected and entered electronically (e.g. on spreadsheet or database) and stored for later use and analysis. Data will be added annually so that it will form a data matrix that is amenable to analysis using a range of statistics.

Table 11
Kenalea Properties – Vegetation Management Zone, Benchmark and Baseline Values

Permanent Monitoring Plot	Management Zone Indicators									
	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL
Zone 1										
HU654	**23**	**10-45**	**5-60**	**5-45**	**2-10**	**5-35**	**-**	**2**	**-**	**50**
KP-W1	39	7	4	86	10	24	4.7	3	1	52
KP-W2	20	21	0	74	2	34	2.7	1	1	12.5
KP-W3	28	14.5	16	88	4	32	2	0	1	11
KP-W4	39	21.5	0	70	12	28	0	0	0	2.5
KP-W5	35	24	0	94	2	22	0.7	1	1	2
KP-W6	19	13	0	78	32	26	0	2	0	0
Zone 2										
HU654	**23**	**10-45**	**5-60**	**5-45**	**2-10**	**5-35**	**-**	**2**	**-**	**50**
KP-G1	14	0	0	86	0	6	16.7	0	0	0
KP-G2	18	0	0	88	4	4	7.3	0	0	1.5
KP-G3	15	0	0	96	0	20	8	0	0	0
KP-G4	16	0	0	98	0	14	2.7	0	0	0
KP-G5	20	0	0	90	0	12	15.3	0	0	17
KP-G6	14	0	0	96	0	12	12	0	0	0.5
Zone 3										
HU598*	**38**	**10-50**	**10-50**	**20-60**	**1-5**	**10-30**	**-**	**0.1**	**-**	**10**
KP-R1	31	25.5	0	76	8	24	12	2	0	8.5
KP-R2	20	33	0	74	12	36	13.3	3	0	0

NPS = Total Native Species Richness; NOS = % Native Over-storey Cover; NMS = % Native Mid-storey Cover; NGCG = % Native Ground Cover (Grasses); NGCS = % Native Ground Cover(Shrubs); NGCO = % Native Ground Cover (Other Natives); EPC = % Exotic Plant Cover; NTH = Number of Trees with Hollows; OR = Over-storey Regeneration; FL = Fallen Logs (m).
Benchmark data provided by NSW Office of Environment and Heritage VIS Classification 2.1 (December 2012). Benchmark values are shown in red.
** No benchmark data currently held in VIS Classification 2.1. Values taken from Benchmark Data spreadsheet downloaded from NSW Office of Environment and Heritage website.*

Table 12
Black Mountain – Vegetation Management Zone, Benchmark and Baseline Values

Permanent Monitoring Plot	Management Zone Indicators									
	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL
Zone 1										
HU654	**23**	**10-45**	**5-60**	**5-45**	**2-10**	**5-35**	**-**	**2**	**-**	**50**
BM-W1	55	17	3	84	2	36	8	0	0.5	6.5
BM-W2	58	29.5	0	66	6	52	2.7	1	1	13
BM-W3	53	20	1	54	2	74	10	1	1	7.5
BM-W4	44	23	0	58	10	26	2.7	1	0.3	8.5
BM-W5	40	27.5	0	58	8	34	0.7	0	1	2.5
BM-W6	39	21	6	66	30	22	0.7	2	0.5	0
Zone 3										
HU598*	**38**	**10-50**	**10-50**	**20-60**	**1-5**	**10-30**	**-**	**0.1**	**-**	**10**
BM-R1	25	21	0	94	2	20	30.7	2	0	0
Zone 1										
HU575	**35**	**25-40**	**11-50**	**5-45**	**5-30**	**5-20**		**3**		**73**
BM-W7	49	22.5	0	60	8	62	4.7	2	0	12.5

NPS = Total Native Species Richness; NOS = % Native Over-storey Cover; NMS = % Native Mid-storey Cover; NGCG = % Native Ground Cover (Grasses); NGCS = % Native Ground Cover(Shrubs); NGCO = % Native Ground Cover (Other Natives); EPC = % Exotic Plant Cover; NTH = Number of Trees with Hollows; OR = Over-storey Regeneration; FL = Fallen Logs (m).
Benchmark data provided by NSW Office of Environment and Heritage VIS Classification 2.1 (December 2012). Benchmark values are shown in red.
** No benchmark data currently held in VIS Classification 2.1. Values taken from Benchmark Data spreadsheet downloaded from NSW Office of Environment and Heritage website.*

Table 13
Merriwa River – Vegetation Management Zone, Benchmark and Baseline Values

Permanent Monitoring Plot	Management Zone Indicators									
	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL
Zone 1										
HU654	**23**	**10-45**	**5-60**	**5-45**	**2-10**	**5-35**	**-**	**2**	**-**	**50**
MR-W5	37	21	0	74	0	34	3.3	2	1	27.5
MR-W6	36	27	0	70	12	32	1.3	2	0.5	21.5
Zone 1										
HU560	**25**	**20-50**	**10-60**	**5-15**	**5-10**	**5-15**	**-**	**0.8**	**-**	**66**
MR-W1	42	37	0	66	0	36	0.7	1	1	38.5
MR-W3	29	33.5	2	26	34	16	0	0	0.5	126
MR-W4	23	23.5	4.5	10	28	4	0	2	1	66.5
Zone 1										
HU601	**51**	**22-45**	**5-40**	**5-25**	**10-20**	**5-20**	**-**	**1**	**-**	**20**
MR-W2	29	24	11	42	12	24	0	1	0	11

NPS = Total Native Species Richness; NOS = % Native Over-storey Cover; NMS = % Native Mid-storey Cover; NGCG = % Native Ground Cover (Grasses); NGCS = % Native Ground Cover(Shrubs); NGCO = % Native Ground Cover (Other Natives); EPC = % Exotic Plant Cover; NTH = Number of Trees with Hollows; OR = Over-storey Regeneration; FL = Fallen Logs (m).

Benchmark data provided by NSW Office of Environment and Heritage VIS Classification 2.1 (December 2012). Benchmark values are shown in red

** No benchmark data currently held in VIS Classification 2.1. Values taken from Benchmark Data spreadsheet downloaded from NSW Office of Environment and Heritage website.*

Table 14
Vegetation Management Zone Measurable Indicators and Completion Criteria

Description	Current Overall Condition	Management Zone Objective	Measurable Indicators	Year 5 Performance Criteria	Year 10 Performance Criteria	Year 20 Completion Criteria
Zone 1 - Existing Forest and Woodland						
Existing native bushland. Not in zones of active farming.	Moderate to Good quality vegetation and habitats in benchmark condition	Maintain condition of vegetation within benchmark.	Total native species richness (NPS)	Maintenance or increase in native species richness		
			% Native over-storey cover (NOS)	Maintenance of current cover	Increase to at least 20% of lower benchmark	Increase to at least lower benchmark
			% Native mid-storey cover (NMS)	Maintenance of current cover	Increase to at least 20% of lower benchmark	Increase to at least lower benchmark
			% Native ground cover (grasses) (NGCG)	Maintenance of cover above lower benchmark		
			% Native ground cover (shrubs) (NGCS)	Maintenance of current cover	Increase to at least lower benchmark	Increase to at least lower benchmark
			% Native ground cover (other natives) (NGCO)	Maintenance of current cover above lower benchmark		
			% Exotic plant cover	Weed cover not increased above baseline		
			% overstorey regeneration (OR)	100%		
			Number of trees with hollows (NTH)	Maintenance of number of trees with hollows	Maintenance of number of trees with hollows	Maintenance or increase in number of trees with hollows
			Total length (m) of fallen logs (FL)	Maintenance of length (m) of fallen logs	Maintenance or increase in length (m) of fallen logs	Maintenance or increase in length (m) of fallen logs
Zone 2 - Derived Native Grasslands						
Derived native grassland and woodland remnants	Variable, but generally low/moderate quality vegetation and habitats.	Maintain and improve through assisted natural regeneration. Aim	Total native species richness (NPS)	Increase to at least 50% of lower benchmark.	Increase to at least 80% of lower benchmark.	Increase to at least lower benchmark.
			% Native over-storey cover (NOS)	No change expected in 5 years	Increase to at least 20% of lower benchmark.	Increase to at least lower benchmark.

Description	Current Overall Condition	Management Zone Objective	Measurable Indicators	Year 5 Performance Criteria	Year 10 Performance Criteria	Year 20 Completion Criteria
	While some benchmark values are met (e.g. numbers of native plant species), other structural variables are not (e.g. understorey cover, number of fallen logs, hollows, etc.).	to increase to benchmark condition.	% Native mid-storey cover (NMS)	Increase to at least 50% of lower benchmark.	Increase to at least 80% of lower benchmark.	Increase to at least lower benchmark.
			% Native ground cover (grasses) (NGCG)	Maintenance of cover within benchmark range.	Maintenance of cover within benchmark range.	Maintenance of cover within benchmark range.
			% Native ground cover (shrubs) (NGCS)	Increase to at least 50% of lower benchmark.	Increase to at least 80% of lower benchmark.	Increase to at least lower benchmark.
			% Native ground cover (other natives) (NGCO)	Increase to at least 50% of lower benchmark.	Increase to at least 80% of lower benchmark.	Increase to at least lower benchmark.
			% Exotic plant cover	Weed cover not increased above baseline	50% reduction in baseline EPC value	75% reduction in baseline EPC value
			% overstorey regeneration (OR)	No change expected in 5 years	Increase to 50%	Increase to 100%
			Number of trees with hollows (NTH)	No change expected in 5 years. Maintenance of trees with hollows.	No increase expected in 10 years. Maintenance of trees with hollows, and increase in trees that can eventually produce hollows.	No significant increase expected in 20 years. Maintenance of trees with hollows, and increase in trees that can eventually produce hollows.
			Total length (m) of fallen logs (FL)	No change expected in 5 years	Maintenance or increase in length (m) of fallen logs	Maintenance or increase in length (m) of fallen logs
Zone 3 - Riparian						
Vegetated or future vegetated land buffering creeks.	Variable, but generally moderate quality vegetation and habitats. While some benchmark values are met (e.g. numbers of native plant species), other structural	Rebuild/improve riparian corridors; protect waterways. Aim to increase to benchmark condition.	Total native species richness (NPS)	Increase to at least 50% of lower benchmark.	Increase to at least 80% of lower benchmark.	Increase to at least lower benchmark.
			% Native over-storey cover (NOS)	No change expected in 5 years	Increase to at least 20% of lower benchmark.	Increase to at least lower benchmark.
			% Native mid-storey cover (NMS)	Increase to at least 50% of lower benchmark.	Increase to at least 80% of lower benchmark.	Increase to at least lower benchmark.
			% Native ground cover (grasses) (NGCG)	Increase to at least 50% of lower benchmark.	Increase to at least 80% of lower benchmark.	Increase to at least lower benchmark.

Description	Current Overall Condition	Management Zone Objective	Measurable Indicators	Year 5 Performance Criteria	Year 10 Performance Criteria	Year 20 Completion Criteria
	variables are not (e.g. understorey cover, number of fallen logs, hollows, etc.).		% Native ground cover (shrubs) (NGCS)	Increase to at least 50% of lower benchmark.	Increase to at least 80% of lower benchmark.	Increase to at least lower benchmark.
			% Native ground cover (other natives) (NGCO)	Increase to at least 50% of lower benchmark.	Increase to at least 80% of lower benchmark.	Increase to at least lower benchmark.
			% Exotic plant cover	Weed cover not increased above baseline	50% reduction in baseline EPC value	75% reduction in baseline EPC value
			% overstorey regeneration (OR)	No change expected in 5 years	Increase to 50%	Increase to 100%
			Number of trees with hollows (NTH)	No change expected in 5 years. Maintenance of trees with hollows,	No increase expected in 10 years. Maintenance of trees with hollows, and increase in trees that can eventually produce hollows.	No significant increase expected in 20 years. Maintenance of trees with hollows, and increase in trees that can eventually produce hollows.
			Total length (m) of fallen logs (FL)	No change expected in 5 years	Maintenance or increase in length (m) of fallen logs	Maintenance or increase in length (m) of fallen logs

NPS = Total Native Species Richness; NOS = % Native Over-storey Cover; NMS = % Native Mid-storey Cover; NGCG = % Native Ground Cover (Grasses); NGCS = % Native Ground Cover(Shrubs); NGCO = % Native Ground Cover (Other Natives); EPC = % Exotic Plant Cover; NTH = Number of Trees with Hollows; OR = Over-storey Regeneration; FL = Fallen Logs (m).

Table 15
Box Gum Assessment Guide Scores, Performance and Completion Criteria

Component^	Timeframe	Scores			Site Condition Baseline Description (Current) and Predicted Changes (at 5 Years, 10 Years and 20 Years)	Site Context Baseline Description (Current) and Predicted Changes (at 5 Years, 10 Years and 20 Years)
		Condition^	Context^	Final*		
Box Gum Woodland	Current	6.4/10	6.5/10	6/10	• Native species richness is predominantly above benchmark value. • Native over-storey cover is predominately within benchmark values. • Native mid-storey cover is predominantly below the lower benchmark value. • Native ground cover (grasses) is predominantly higher than upper benchmark value. • Native ground cover (shrubs) is variable with covers both lower and higher than benchmark values. • Native ground cover (other) is within benchmark values. • Exotic plant cover is at low levels. • Over-storey regeneration is variable. • Number of trees with hollows is predominantly lower than benchmark value.	• Variable connectivity within biodiversity offset areas, with some areas having high edge to area ratios. • Variable connectivity to other occurrences of the community in the locality. • Within known distribution of the community.
	5 Year Performance Criteria	6.4/10	6.5/10	6/10	• - No change predicted.	• No change predicted.
	10 Year Performance Criteria	6.9/10	6.8/10	7/10	• - Native over-storey cover to increase to at least 20% of lower benchmark. - Native mid-storey cover to increase to at least 20% of lower benchmark. - Native ground cover (shrubs) to increase to at least lower benchmark.	• Connectivity within biodiversity offset areas increased as a result of management activities. • Increased security of biodiversity offset areas through formal conservation arrangement.

Component^	Timeframe	Scores			Site Condition Baseline Description (Current) and Predicted Changes (at 5 Years, 10 Years and 20 Years)	Site Context Baseline Description (Current) and Predicted Changes (at 5 Years, 10 Years and 20 Years)
		Condition^	Context^	Final*		
	20 Year Performance Criteria	7.4/10	7.4/10	7/10	• Native over-storey cover to increase to at least lower benchmark. • Native mid-storey cover to increase to at least lower benchmark. • Potential increase in number of trees with hollows. • Potential increase in total length of fallen logs.	• Connectivity within biodiversity offset areas increased as a result of management activities. • Connectivity to other occurrences of the community adjacent to the biodiversity offset areas increased.
Derived Native Grassland	Current	3/10	5.5/10	4/10	• - Native species richness is below benchmark value. • Native over-storey cover is below lower benchmark value. • Native mid-storey cover is below lower benchmark value. • Native ground cover (grasses) is higher than upper benchmark value. • Native ground cover (shrubs) is predominantly below the lower benchmark value. • Native ground cover (other) is predominantly within benchmark values. • Exotic plant cover is at moderate levels. • Over-storey regeneration is variable. • Number of trees with hollows is predominantly lower than benchmark value.	• Variable connectivity within biodiversity offset areas, with existing agricultural practices fragmenting habitat. • Variable connectivity to other occurrences of the community in the locality. • Within known distribution of the community.
	5 Year Performance Criteria	3.5/10	5.5/10	5/10	• Native species richness to increase to at least 50% of lower benchmark. • Native ground cover (shrubs) to increase to at least 50% of lower benchmark. • Native ground cover (other natives) to increase to at least 50% of lower benchmark.	• No change predicted.

Component^	Timeframe	Scores			Site Condition Baseline Description (Current) and Predicted Changes (at 5 Years, 10 Years and 20 Years)	Site Context Baseline Description (Current) and Predicted Changes (at 5 Years, 10 Years and 20 Years)
		Condition^	Context^	Final*		
	10 Year Performance Criteria	4/10	6/10	5/10	• Native species richness to increase to at least 80% of lower benchmark. • Native over-storey cover to increase to at least 20% of lower benchmark. • Native mid-storey cover to increase to at least 50% of lower benchmark. • Native ground cover (shrubs) to increase to at least 80% of lower benchmark. • Native ground cover (other natives) to increase to at least 80% of lower benchmark. • Reduction in exotic plant cover by 50%. • Over-storey regeneration increased to 50%. • Potential increase in total length of fallen logs.	• Connectivity within biodiversity offset areas increased as a result of management activities. • Increased security of biodiversity offset areas through formal conservation arrangement.
	20 Year Performance Criteria	5/10	7/10	6/10	• - Native species richness to increase to at least lower benchmark. • Native over-storey cover to increase to at least lower benchmark. • Native mid-storey cover to increase to at least lower benchmark. • Native ground cover (shrubs) to increase to at least lower benchmark. • Native ground cover (other natives) to increase to at least lower benchmark. • Reduction in exotic plant cover by 75%. • Over-storey regeneration increased to 100%. • Potential increase in number of trees with hollows. • Potential increase in total length of fallen logs.	• - Connectivity within biodiversity offset areas increased as a result of management activities. • Connectivity to other occurrences of the community adjacent to the biodiversity offset areas increased.

^ Condition and context scores are weighted by the total area contribution of each biodiversity offset area.

** Final score is based on an 80% contribution of site condition and a 20% contribution of site context.*

^Generally as per the Biodiversity Offsets Strategy (March, 2014)'.

9.4 Threatened Species

Monitoring will be undertaken annually on selected threatened species of flora and fauna to determine whether populations are remaining stable or improving within the Biodiversity Offset Areas.

Threatened species monitoring will:

- Identify changes in population numbers over time;
- Determine the success of conservation measures; and
- Highlight areas for improvement if these measures are found to be inadequate.

Targeted searches will be undertaken in the Biodiversity Offset Areas for threatened species known to occur within the Disturbance Boundary and Biodiversity Offset Areas. This will include:

- Opportunistic searches for Tiger Orchid in suitable habitat;
- Woodland bird surveys;
- Winter bird surveys for Regent Honeyeater and Swift Parrot;
- Ultrasonic bat detectors for threatened micro-bats; and
- Infrared Cameras for Spotted-tailed Quoll and Squirrel Glider.

Woodland Birds

At each permanent monitoring site, bird species will be surveyed for one visit during Spring/Summer. All species seen or heard will be recorded. Evidence of species, including nests and droppings will also be recorded for each monitoring site. The focus of the bird surveys will be on the threatened birds listed under the EPBC Act and/or the TSC Act that have been recorded within the Project Boundary or which have potential to occur. These include the following:

- Brown Treecreeper;
- Speckled Warbler;
- Grey-crowned Babbler (eastern subspecies); and
- Black-chinned Honeyeater (eastern subspecies).

Wintering Birds

At 6 woodland/forest sites per Biodiversity Offset Area winter resident bird species will be surveyed during a suitable period (generally between June and August). All species seen or heard will be recorded. The focus of the wintering bird surveys will be on the threatened birds listed under the EPBC Act and TSC Act whose habitat has been offset due to these species having the potential to occur within the Project Boundary.

These include the following MNES species:

- Regent Honeyeater; and
- Swift Parrot.

Bats

Bats will be surveyed using Anabat (or equivalent) ultrasonic call detectors in areas where suitable habitat for bats occurs outside of the permanent monitoring sites (e.g. dams, creeks). Two Anabat™ or Song Meter units will be installed at each Biodiversity Offset Area and left in place for at least two nights during Spring/Summer monitoring and all species detected via calls will be recorded.

The focus of the bat surveys will be on the bat species listed as Vulnerable under the EPBC Act and/or the TSC Act that have been recorded within the Project Boundary or which have potential to occur. These include the following:

- Yellow-bellied Sheathtail-bat;
- Eastern Bentwing-bat;
- Southern Myotis;
- Eastern Cave Bat;
- Large-eared Pied Bat; and
- South-eastern Long-eared Bat.

Spotted-tail Quolls and other terrestrial Fauna

Motion-detection cameras will be utilised to target Spotted-tail Quolls and other terrestrial fauna. Three motion-detection cameras will be set out on the trunks of trees near signs of animal activity (i.e. Trails, wallows, diggings etc.) within woodland areas during the Spring/Summer monitoring session and left *in situ* until they are collected during the winter monitoring session. Results from the terrestrial fauna motion-detection cameras will also be used as part of the feral animal monitoring as described in **Section 8.5**.

Arboreal Mammals

Motion-detection cameras will be utilised during the Spring/Summer monitoring to target Squirrel Gliders and other arboreal mammals. Two motion-detection cameras will be set out for two nights at each Biodiversity Offset Area and will be mounted on a nectar bait station attached to the trunk of a tree. Survey locations will be chosen in the first year monitoring and will be based on the availability of hollow-bearing trees in the area.

Monitoring of Threatened Species

Table 16 summarises a schedule of monitoring tasks that are to be completed annually each year as part of the biodiversity offset monitoring program.

Table 16
Annual Survey Tasks within each Biodiversity Offset Area

Task	Spring/Summer Survey (October - February)	Interim Period	Winter Survey (June - August)	Responsibility
Targeted searches for Swift Parrot and Regent Honeyeater		-	6 woodland/forest sites per Biodiversity Offset Area	BMC Environmental Specialist Ecology Specialist
IR Camera targeting Spotted-tailed Quoll and feral mammals	Three motion-detection cameras per Biodiversity Offset Area	Three motion-detection cameras per Biodiversity Offset Area	Three motion-detection cameras per Biodiversity Offset Area	BMC Environmental Specialist Ecology Specialist
Flora census at permanent monitoring sites	14 sites at Kenalea Properties 8 sites at Black Mountain 6 sites at Merriwa River	-	-	BMC Environmental Specialist Ecology Specialist
Targeted searches for Tiger Orchid	Opportunistic searches within suitable habitat	-	-	BMC Environmental Specialist Ecology Specialist
Bird census and habitat assessment	14 sites at Kenalea Properties 8 sites at Black Mountain 6 sites at Merriwa River	-	-	BMC Environmental Specialist Ecology Specialist
Control Grazing Monitoring	Conducted pre- and post- control grazing event			BMC Environmental Specialist Ecology Specialist
Weed mapping	Continuous throughout all Biodiversity Offset Areas	-	-	BMC Environmental Specialist Ecology Specialist
Arboreal IR Camera for Squirrel Glider	2 sites opportunistically selected each year	-	-	BMC Environmental Specialist Ecology Specialist
Ultrasonic call detection for threatened micro-bats	2 sites opportunistically selected each year	-	-	BMC Environmental Specialist Ecology Specialist

Performance Indicators

The success of the ecological management and restoration of threatened species and habitat will be evaluated against key performance indicators. Where resident threatened species currently occur in the Biodiversity Offset Areas, continued detection of the species in the future will be a primary measurable indicator, and the completion criteria for these species include consistent or increasing detection of species across offsets.

Another completion criterion is the maintenance and increases in actual and potential habitat for threatened species including woodland and open forest. For example, the Speckled Warbler, a threatened woodland bird, is currently resident in many woodland areas of the offsets but does not occur in open grassland areas.

The measureable indicators for this species include measureable increases in grassy woodland area, as woodland habitats will be created in areas that currently contain grassland. Ideally, this will result in an increased number of detections of threatened species across a wider range of land than at the beginning of the Project.

For some threatened species, such as Regent Honeyeater and Swift Parrot, there are no records within either the Disturbance Boundary or the Biodiversity Offset Areas. Rather, there are potential habitats within these areas. The major measureable indicators of success for these species will be measurements that show increased areas of potential habitat, as the presence of these species may never be recorded during the life of the Project. **Table 17** summarises the threatened species completion criteria and measurable indicators for the purpose of this BOMP.

Table 17
Performance and Completion Criteria for Threatened Species

Species	Species Objective	Performance Criteria	Completion Criteria
Tiger Orchid	Maintenance of resident species populations and existing habitat for species. Increase in suitable habitat and increase in species populations and area of occupancy.	Increase in the extent and condition of habitat	Increase in the extent and condition of habitat
Squirrel Glider	Maintenance of resident species populations and existing habitat for species. Increase in suitable habitat and increase in species populations and area of occupancy.	Increase in the extent and condition of habitat Continued detection of the species	Increase in the extent and condition of habitat Continued detection of the species
Spotted-tailed Quoll	Maintenance of resident species populations and existing habitat for species. Increase in suitable habitat and increase in species populations and area of occupancy.	Increase in the extent and condition of habitat Continued detection of the species	Increase in the extent and condition of habitat Continued detection of the species
Threatened Microbats	Maintenance of resident species populations and existing habitat for species. Increase in suitable habitat and increase in species populations and area of occupancy.	Increase in the extent and condition of habitat Continued detection of the species	Increase in the extent and condition of habitat Continued detection of the species

Species	Species Objective	Performance Criteria	Completion Criteria
Woodland Birds	Maintenance of resident species populations and existing habitat for species. Increase in suitable habitat and increase in species populations and area of occupancy.	Increase in the extent and condition of habitat Continued detection of the species	Increase in the extent and condition of habitat Continued detection of the species
Regent Honeyeater and Swift Parrot	Maintenance of resident species populations and existing habitat for species. Increase in suitable habitat and increase in species populations and area of occupancy.	Increase in the extent and condition of habitat	Increase in the extent and condition of habitat

Data Storage and Analysis

All data will be collected and entered electronically (e.g. on spreadsheet or database) and stored for later use and analysis. Data will be added annually so that it will form a data matrix that is amenable to analysis using a range of statistics. A number of analysis approaches will be considered to be used, for example Analysis of Similarity (ANOSIM), in order to assess changes in plant species composition over time.

A database of flora and fauna species will be maintained to provide a baseline of all species known to occur across the Biodiversity Offset Properties. New species detected during annual surveys will be added to the database and reported within the annual report. This database will be made available to regulatory stakeholders upon request to allow more efficient sharing of management approaches that may be applied to other projects.

9.5 Control Grazing Monitoring

Control Grazing Assessments

Control grazing assessments will be undertaken to establish the trigger points for when control grazing is to be used. For each assessment, the date and name of control grazing area will be recorded. Using a quadrat of at least 0.5m x 0.5m internal dimensions, the following steps will be undertaken:

- Walk a random path within each grazing area to be assessed, and throw the quadrat a short distance;
- For each throw, look only at the area within the quadrat and assess and record the following:
    - The percentage of total pasture cover (Living and dead);
    - The percentage cover of live native plants;
    - The percentage cover of live weeds; and
    - Measure the height of the sward;
- Take at least 10 random samples in each paddock proposed for control grazing; and

- Divide each measurable by the number of samples taken to achieve the average value for each criteria.

Should the average results of the random samples meet or exceed the trigger levels defined in **Table 7**, control grazing of that paddock will be conducted.

Following completion of the control grazing, the control grazing assessment will be repeated with the same number of samples to provide before and after control grazing measurable for monitoring the success of the grazing.

Photo-reference Points

Should bushfire fuel loads or weed densities reach trigger values as described in **Table 7**, control grazing will be implemented within that area, as appropriate. Prior to commencement of grazing, photo-reference points will be established in the control grazing area. From each point, a photograph will be taken towards the centre of the control grazing area showing the following:

- Vegetation structure;
- Presence of bushfire fuel loads; and
- Weed infestations.

After the control grazing event, photographs at each photo-reference point will be taken towards the centre of the control grazing area to show the changes to the area as a result of the grazing and the effect on the fuel loads and/or weed infestation in that area.

Any control grazing event will be documented with the results of the control grazing assessment and the photo-reference photographs presented and analysed for the success of the control grazing in that area.

9.6 Weed Monitoring

Weeds are a threat to the integrity of forest and woodland within the Biodiversity Offset Areas. As such, weeds pose a threat to regeneration areas as they can out-compete native seedlings and reduce the success of assisted regeneration measures. For these reasons, weed monitoring will be undertaken annually at the monitoring sites of the Biodiversity Offset Areas.

The target weed species are all Weeds of National Significance and Noxious Weeds that have been recorded within the Biodiversity Offset Areas. Weed monitoring will be undertaken in all monitoring sites within the Biodiversity Offset Areas.

Data Collection

Weed monitoring will be conducted within quadrats that are monitored for vegetation condition. From the quadrat data collected for vegetation condition monitoring (see **Section 9.2**), the percentages of exotic weeds will be calculated and the identity of the main weeds present will be recorded.

In addition to surveying within the quadrats, annual quadrats will be completed in areas of native vegetation subject to control grazing in the Biodiversity Offset Areas to search for and monitor weed species, in particular Noxious Weeds or Weeds of National Significance. These will focus on areas of Zone 2 regeneration, as these are where additional weed species are likely to colonise. This information will be used to inform the management actions and trigger control activities.

These additional quadrats will be recorded via GPS and photographs of fixed location, direction, and angle taken. These quadrats will be revisited in subsequent monitoring periods, including following the cessation of control grazing, to track the progress and efficacy of control grazing activities. The results of the annual monitoring will be reported in the Annual Review as outlined in **Section 10.3**.

Performance Indicators

Exotic plant cover (EPC) has not been established in the current benchmark data for the management zones. Targets using baseline data will be utilised until this benchmark becomes available. The baseline EPC values are shown in **Table 11.**

Performance indicators for effective weed control include the following:

- Measurable decline in weed density and distribution;
- Measurable decline in weed diversity; and
- No new significant infestations of target weed species.

Completion criteria and monitoring actions for weeds are summarised in **Table 18**.

Table 18
Performance and Completion Criteria for Weeds

KPI	5-Year Performance Criteria	10-Year Performance Criteria	20-Year Completion Criteria
Weed density and distribution	Weed cover not increased above baseline	50% reduction in baseline EPC value	75% reduction in baseline EPC value
Weed diversity	Weed diversity not increased above baseline	Downward trend in weed diversity	Weed diversity to minimal levels that do not cause measureable impacts to native vegetation
Significant target weed infestations	Significant target weed infestations not increased above baseline	Downward trend in abundance and distribution of significant target weed infestations	No records of new significant infestations of target weed species

9.7 Feral Animal Monitoring

Feral animals, particularly Wild Dogs/European Foxes and feral pigs, are a threat to the integrity of forest and woodland habitats within the Biodiversity Offset Areas. Feral animals may change in distribution and abundance seasonally and there is potential for additional species to become established in the Biodiversity Offset Areas as a result of reduced human activity in the areas.

Monitoring of feral animal control allows comparison of records from before control activities with those collected during and after control to determine the effectiveness of the control strategy and allow it to be adapted to achieve this plan's objectives.

For these reasons, feral animal monitoring will be undertaken within the Biodiversity Offset Areas to provide the necessary information to trigger management action and to determine the efficacy of management actions undertaken.

Due to the remote access and steep terrain of many parts of the Biodiversity Offset Areas, nocturnal monitoring can only be conducted with the use of infra-red motion cameras. Monitoring actions for feral animals are summarised in **Table 19** and described in **Sections 8.5.1** to **8.5.3**.

Table 19
Monitoring and Additional Control Actions for Feral Animals

Feral Animal	Strategy	Action	Frequency
Feral Cat	Presence/Absence surveys	Motion detector cameras placed as part of the Feral Pig monitoring will also be used to detect the presence of feral cats. Should feral cats be detected on the motion detector cameras, a trapping program will be implemented for control of feral cats in the area.	Annually
Wild Dog	Presence/Absence surveys	Motion detector cameras placed as part of the Feral Pig monitoring will also be used to detect the presence of wild dogs. Areas where wild dogs are encountered will be included as 1080 baited areas.	Annually
Feral pig	Activity surveys	First year baseline meander survey to establish areas where there is pig activity. Where pig activity is encountered, a monitoring plot will be established in a representative location and a motion detector camera will be placed for a period up to 3 months to monitor feral pig activity in the monitoring plot.	Annually
European Fox	Presence/Absence surveys	A monitoring plot will be established in a representative location and a motion detector camera will be placed for a period up to 3 months to monitor European Fox activity. Areas where foxes are encountered will be included as 1080 baited areas.	Annually
European Rabbit	Presence/Absence surveys and inspections of known warrens (if detected).	A monitoring plot will be established in a representative location of the Biodiversity Offset Areas and a motion detector camera will be placed for a period up to 3 months to monitor European Rabbit activity. If individuals or warrens detected during monitoring activities, ripping and fumigating could be undertaken in conjunction with the use of 1080/Pindone bait.	Annually

Target Fauna

The main feral animal species to be targeted for monitoring include feral cats, feral pigs, wild dogs, foxes and rabbits. Further details of the proposed Monitoring Program for feral animals are presented below.

Feral Cat/Feral Dog Monitoring

Feral cats and feral dogs are best monitored with the use of motion detection cameras. In conjunction with the feral pig monitoring, motion detection cameras will be left in a representative location for up to 3 months prior to the commencement of control actions for feral cats and feral dogs.

This qualitative method is appropriate as feral cats and feral dogs are not considered likely to present a significant problem at the early stage of management. These techniques will allow an estimation of the number of these species present and will allow numbers to be compared between monitoring events. If feral cat numbers are found to be increasing, the control measures (described previously) will be implemented.

Feral Pig Monitoring

Several techniques are commonly used to monitor feral pig abundance. However many of these are labour intensive and relatively difficult such as aerial spotting and cage trapping. A simpler technique that is applicable for this Project involves determining feral pig abundance using motion detection cameras in conjunction with the Spotted-tail Quoll survey (see **Section 9.3.4**) in areas where animal activity is encountered.

A meander survey of the Biodiversity Offset Areas will be conducted looking for signs of feral pig dung, wallowing, diggings and scratchings. In areas where feral pig activity is encountered, a motion detector camera will be positioned to monitor for activity. The cameras will be left in a representative location for up to 3 months prior to the commencement of control actions for feral pigs. This is a relatively qualitative method, but it is appropriate for Bengalla, as the feral pig is not considered likely to present a significant problem.

This technique will allow an estimation of the number of feral pigs present and will allow numbers to be compared between monitoring events. Indirect indicators of feral pig numbers such as amount of wallows recorded, or damage to native vegetation will also be recorded during monitoring and factored into the results. If feral pig numbers are found to be increasing, then the control measures (described previously) will be implemented.

Feral Fox and Rabbit Monitoring

Infra-red motion camera monitoring is considered a practical tool for monitoring the relative size of the rabbit and fox population, especially where the habitat is open grassland or open woodland where trees are sparse.

In conjunction with monitoring for other feral species, motion detection cameras will be left in a representative location for up to 3 months prior to the commencement of control actions for foxes and rabbits. Foxes and rabbits can also be incidentally recorded during daytime surveys, including identification of rabbit warrens.

Frequency

Monitoring for feral animals will be conducted every 12 months using the methods identified above. If levels of feral animals are considered to present a significant threat then it will be necessary to monitor more often to determine the results of un-programmed control activities.

In order for monitoring programs to be effective and efficient, reliable estimates of changes in population need to be obtained, and, therefore, monitoring will be conducted prior to any control activities and subsequently monitored annually. Monitoring will be conducted during the life of the Project to determine how feral animal control is operating against set objectives and will provide an opportunity to change the management program if required. This adaptive management process will ensure that measurable outcomes are produced within timeframes and budgets. Monitoring after the management program will determine if the management program objectives have been achieved.

Any areas of feral animal damage to vegetation within permanent monitoring plots will be calculated and monitored annually. Feral animal occurrences (or damage from feral animals) will also be routinely noted and any potential new occurrences mapped.

Performance Indicators

Performance indicators for feral animals are summarised in **Table 20** and include the following:

- Measurable decline in feral fauna abundance; and
- Observable reduction in habitat disturbance by feral animals.

Table 20
Performance and Completion Criteria for Feral Animals

KPI	5-Year Performance Criteria	10-Year Performance Criteria	15-Year Performance Criteria	20-Year Completion Criteria
Feral animal abundance	No increase from the baseline feral animal abundances	Downward trend in feral animal abundances	Feral animal abundances to minimal levels that do not cause measureable damage to woodland or threatened fauna species.	Feral animal abundances to minimal levels that do not cause measureable damage to woodland or threatened fauna species.
Habitat disturbance by feral animals	No increase from the baseline feral animal disturbance levels	Downward trend in habitat disturbance by feral animals	Habitat disturbance to minimal levels that do not cause measureable damage to woodland or threatened fauna species.	Habitat disturbance to minimal levels that do not cause measureable damage to woodland or threatened fauna species.

Biodiversity Offset Management Plan Annual Report

A Biodiversity Offset Management Plan Annual Report (BOMP Annual Report) will be prepared annually in order to track and assess the performance of the biodiversity management measures contained in this BOMP over the preceding 12 month period. Results from the BOMP Annual Report will be included within the Annual Review.

The BOMP Annual Report will be created following the completion of annual monitoring and will provide the results of the year's surveys, and compare them to those of previous years. The BOMP Annual Report will contain details of all the vegetation monitoring, threatened species monitoring, weed monitoring and feral animal monitoring that has been conducted during the preceding year. This report will describe the works undertaken, present the findings of the monitoring activities, discuss any problems encountered in implementing this BOMP, and will recommend any adaptations or additions to this BOMP. Recommendations will be made which will feed into the management of each area during the coming year.

The BOMP Annual Report will assess the performance of management rehabilitation and restoration actions within the Biodiversity Offset Areas, and identify any measures that should be implemented to improve the performance of these actions.

The BOMP Annual Report will critically review the efficacy of all methods used and all data collected and provide recommendations to fine tune methods as required.

The BOMP Annual Report will form a long term record of the flora and fauna management on the Biodiversity Offset Areas and will help determine what the overall impact of the Project has been and will determine the efficacy of the mitigation measures implemented. It is expected that this information will form a valuable data set that will inform future management activities.

10.0 REPORTING, REVIEW AND CONTINUOUS IMPROVEMENT

This section describes BMC's continuous improvement techniques, review of plans and reporting requirements.

10.1 Continual Improvement

BMC continually strives to improve Bengalla's environmental performance by applying the principles of best practice through its environmental management plans.

Reasonable and feasible new best practice technologies will be investigated and adopted where relevant and progress will continue to be monitored using the performance indicators detailed in this BOMP.

10.2 Management Plan Revision

In accordance with SSD-5170 (as modified) Schedule 5, Condition 4, BMC shall review and if necessary, revise the Biodiversity Management Plans, to the satisfaction of the Secretary. Where the review leads to a revision of the BOMP, then within four weeks of the review the revised document must be submitted to the Secretary for approval, unless otherwise agreed with the Secretary.

If no changes to this BOMP are as a result of the above then BMC will review and, if necessary, revised (in consultation with relevant government agencies and landholders) on at least a three yearly basis (or as otherwise directed by the Secretary of DP&E).

10.3 Annual Review

By the end of March each calendar year, BMC will provide an Annual Review to the Secretary, which will review the environmental performance of the Project for the previous year.

The Annual Review will include the presentation of and commentary on the biodiversity offset monitoring results (see **Section 10.3**), complaints and any management actions implemented at Bengalla over the reporting period to address conditions of SSD-5170 (as modified) Schedule 5, Condition 4 and EPBC 2012/6378 Condition 12.

The Annual Review will be made publicly available through placement on BMC's website, and will be provided to the Bengalla Community Consultative Committee.

10.4 Independent Audit

Within 1 year of the commencement of development under this consent and every 3 years thereafter, unless the Secretary directs otherwise, BMC will commission and pay the full cost of an Independent Environmental Audit of the Project.

This audit will include a review of commitments, actions and responsibilities stipulated in this BOMP.

10.5 Reporting

BOMP reporting requirements for each management strategy and BOMP audit is provided in **Table 21**.

Table 21
BOMP Reporting Requirements

Report	Frequency	Requirements	Responsibility
Control Grazing Monitoring	Annually	Monitoring results of fire fuel loads. Meeting of weed monitoring performance criteria. Monitoring results of flora and fauna performance criteria.	BMC via its Leaseholder
Weed Monitoring and Control	Annually	Results of weed monitoring performance criteria including analysis of weed densities at weed monitoring plots. Details of any control actions conducted.	BMC utilising specialist contractor
Feral Animal Monitoring and Control	Annually	Monitoring results of population size estimates and impact areas. Details of any feral animal controls conducted.	BMC utilising specialist contractor
Flora and Fauna Monitoring Program	Annually	Compile and analyse results of flora and fauna monitoring and compare against performance criteria.	BMC utilising specialist contractor
Annual Review	Annually	Summary of management actions for biodiversity offset properties over previous reporting period.	BMC
Independent Audit Report	As required	Consistent with consent condition.	Independent auditor as per SSD-5170 (as modified)
BOMP Revision	As required	Revised versions of this BOMP to be published on the BMC website within one month of approval.	BMC

11.0 ROLES AND RESPONSIBILITIES

Specific roles and responsibilities for the implementation of this BOMP are provided in **Table 22**.

Table 22
Roles and Responsibilities

Role	Responsibilities
Bengalla General Manager	• To authorise the BOMP.
Bengalla Technical Services Manager	• Comply with the requirements of the BOMP. • Ensure all personnel have received the appropriate training for their responsibilities.
Bengalla Environmental Specialist	• Ensure that the BOMP is publically available on the BMC website. • Implement the procedures contained in the BOMP. • Confirm personnel and contractors carry out work in accordance with the BOMP. • Ensure sufficient resources and time is allocated to implement the BOMP monitoring programs. • Ensure the results of the BOMP monitoring programs are utilised to refine completion criteria as well as to evaluate the effectiveness of rehabilitation/revegetation practices so as to facilitate continual improvement. • Organise revisions to the BOMP. • Arrange any required rehabilitation works required on Biodiversity Offset Areas. • Develop strategies to prevent or reduce environmental impacts. • Receive and respond to community complaints. • Ensure all internal and external reporting requirements are met; • Ensure all relevant records are effectively maintained; and • Ensure all personnel involved in the carrying out and monitoring of BOMP activities and values are appropriately qualified, licensed and experienced to undertake the task.
All Bengalla employees and other contractors	• Ensure the implementation of the BOMP with respect to their specific work practices. • Act in accordance with the management procedures or protocols outlined in this plan. • Ensure any potential or actual issues, including environmental incidents, are reported to the immediate supervisor or Environmental Specialist/Advisor

12.0 REFERENCES

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13.0 ABBREVIATIONS

Abbreviation	Description
ANOSIM	Analysis of Similarity
BMP	Biodiversity Management Plan
BOMP	Biodiversity Offset Management Plan
BOS	Biodiversity Offsets Strategy
CEEC	Critically Endangered Ecological Community
CHPP	Coal Handling and Preparation Plant
CW1	Dry Creek Clean Water Dam
DNG	Derived Native Grassland
DoEE	Commonwealth Department of the Environment and Energy
DP&E	NSW Department of Planning and Environment
DSE	Dry Sheep Equivalent
EEC	Endangered Ecological Community
EIA	Ecological Impact Assessment
EIS	Environmental Impact Statement
EP&A Act	NSW Environmental Planning and Assessment Act 1979
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
EPC	% Exotic Plant Cover
EPL	Environment Protection Licence 6538
FL	Fallen Logs (m)
GPS	Global Positioning System
Ha	Hectare
IR camera	Infra-red camera
LGA	Local Government Area
MNES	'Matters of National Environmental Significance' that are listed by the EPBC Act
MOD1	Bengalla Development Consent SSD-5170 Modification 1 (16 December 2015)
MOD 2	Bengalla Development Consent SSD-5170 Modification 2 (1 July 2016)
Mtpa	Million tonnes per annum
NGCG	% Native ground cover (grasses)
NGCO	% Native Ground Cover (Other Natives)
NSW	New South Wales
NTH	Number of Trees with Hollows
OEA	Overburden Emplacement Area
OEH	NSW Office of Environment and Heritage

Abbreviation	Description
OR	Over-storey Regeneration
PCO	Pesticide Control Order 2010
PCT	Plant Community Type
RDP	Rapid Data Point
ROM	Run of Mine
SSD	State Significant Development
TEC	'Threatened Ecological Community' as listed under the TSC Act and/or EPBC Act
TSC Act	NSW Threatened Species Conservation Act 1995
WoNs	Weeds of National Significance
Zone 1	Conservation and management of existing forest and woodland
Zone 2	Assisted regeneration of canopy species in Derived Native Grasslands
Zone 3	Riparian regeneration and management

APPENDIX A
REGULATORY CORRESPONDENCE

Planning Services
Resource Assessments
Contact: Jessie Evans
Phone: 9274 6419
Email: jessie.evans@planning.nsw.gov.au

Craig White
Environment and Approval Specialist
Bengalla Mining Company
Locked Bag 5
Muswellbrook NSW 2333

Dear Mr White

Bengalla Coal Mine (SSD 5170)
Management Plans

I refer to Dianne Munro's correspondence from late April and early May 2017 submitting various revised management plans for Bengalla Coal Mine (SSD 5170). I note that the Department recently approved these plans on 3 March 2016. However, Bengalla Mining Company has since revised the plans to address the new activities and requirements approved under modifications 2 and 3, the recommendations from the 2016 Independent Environmental Audit and further adjustments to account for its interactions with Mount Pleasant Coal Mine. Bengalla Mining Company is now seeking the Secretary's approval of the revised plans.

The Department has reviewed the following plans and is satisfied that they meet the relevant requirements under SSD 5170:

- Noise Management Plan version 4 (condition 7 of Schedule 3);
- Blast Management Plan version 5 (condition 15 of Schedule 3);
- Air Quality Management Plan version 4 (condition 20 of Schedule 3);
- Water Management Plan version 6 (condition 25 of Schedule 3);
- Biodiversity Management Plan version 3 and Biodiversity Offset Management Plan version 6 (condition 29 of Schedule 3);
- Aboriginal Cultural Heritage Management Plan version 7 (condition 31 of Schedule 3);
- Historic Heritage Management Plan version 7 (condition 32 of Schedule 3); and
- Rehabilitation Management Plan version 4 (condition 46 of Schedule 3).

Consequently, I wish to advise that the Secretary approves the above plans. Please provide final (untracked) versions of these plans to the Department at your earliest convenience and place a copy of them on your website.

Should you have any questions in relation to this matter, please contact Jessie Evans on the above details.

Yours sincerely

18/08/2017

Matthew Sprott
A/Director Resource Assessments
as nominee of the Secretary

Australian Government
Department of the Environment and Energy

Mr Craig White
Approvals and Environmental Specialist
Bengalla Mining Company Pty Limited
Bengalla Road
MUSWELLBROOK NSW 2333

Dear Mr White

Continuation of Bengalla Mine, Upper Hunter Valley, NSW (EPBC 2012/6378)

I refer to the email dated 27 February 2017, from Hansen Bailey, to the Department, seeking approval of the Biodiversity Offset Management Plan required by condition 3 of the approval for this project under the *Environmental Protection and Biodiversity Conservation Act 1999*.

Officers of this Department have advised me on the Biodiversity Offset Management Plan and on the requirements of Condition 3 of approval for EPBC 2012/6378. On this basis, and as a delegate of the Minister for the Environment and Energy, I have decided to approve the *Bengalla Mine Biodiversity Offset Management Plan* (Revision 6), dated 27 February 2017. This plan must now be implemented.

In accordance with Condition 15 of EPBC 2012/6378 approval, if Bengalla Mining Company, as the approval holder, wishes to carry out any activity other than in accordance with the approved plan, Bengalla Mining Company must submit to the Department for the Minister's written approval a revised version of the plan. Bengalla Mining Company must not commence the varied activity until the Minister has approved in writing the revised plan.

Should you require any further information please contact Tim Kaminskas on 02 6275 9516 or by email (post.approvals@environment.gov.au).

Yours sincerely

Monica Collins
Assistant Secretary
Compliance & Enforcement Branch
Environment Standards Division

8 March 2017

Cc: Dianne Munroe, Hansen Bailey

Table A0
DoEE Comments (4 January 2017)

DoEE Comment	Response by Proponent to DoEE comments/issues
Replace DoE with DoEE throughout document	Complete
Include Glossary of Terms	Refer to **Section 13.0** Abbreviations
Update version control	Version control revised and document revised to reflect 2017 updates
Include a signed Declaration of Accuracy	Refer to Page ii
I note that there is still much uncertainty regarding BMC's management approach, and that triggers for management are not yet refined. This point should be addressed in the planned three-year revision of the BOMP, and based on the results of the monitoring program.	Noted

Table A1
DoEE Comments (13 November 2016)

DoEE Comment	Response by Proponent to DoEE comments/issues
Summarise in the BOMP the EPBC Offset Policy start condition and future condition with offset commitments for the listed EC and species habitats (see attached calculations), and timeframes (possibly as an Appendix, including values used in the offset calculations);	Refer to changes in Table 12 which summarises the vegetation management performance and completion criteria for each management zone covered in this BOMP. Table 13 added to link the condition / context scores used in the Offsets Assessment Guide to the performance and completion criteria for Box Gum Woodland and Derived Native Grassland. Refer to Table below for original values and updated values for habitat improvements
Describe/characterise the EC condition classes used in the calculations, and make clear the difference in condition that will be attained through management interventions over the coming ~20 years (being the period to ecological benefit). The calculations indicate BMC will improve derived grassland in the offset areas from an average condition class 4 to 6, and woodland from class 6 to 7;	
Seek to align these condition classes for woodland and derived grassland to the NSW benchmark conditions (OEH VIS classification 2.1) in the BOMP? It would be ideal to be able to use this/these metrics; and	
Propose measurable targets and monitoring intervals to demonstrate these outcomes are likely to be achieved (performance criteria), or have been achieved (completion criteria).	
There are listed threatened species for which the future condition with offset is linked to improving listed woodland and/or derived grassland condition. I note one condition class improvement delivers well in excess of the minimum 100% direct offset requirement. I therefore propose for each listed species:	Threatened species calculations have been amended to change the future condition to the start quality as directed. Based on the results shown in the table below, no further action is required in relation to threatened species as a condition class improvement is not required to achieve the minimum 100% direct offset. Refer to Table below for threatened species calculations. The calculations were provided by Cumberland Ecology.
Repeating the calculations using the start quality for future condition to test whether any improvement is required to achieve the 100% direct offset (it may be that avoided loss has delivered the 100% direct offset). If condition class improvement is not required to achieve a minimum 100% direct offset, then no more on this;	
If condition class improvement is required to achieve a minimum 100% direct offset, specify the measurable habitat improvements (as a result of improved woodland and/or derived grassland condition) to achieve the desired habitat condition class for the listed species. For example, what planned improvement in EC condition will be achieved (and can be measured in 20 yrs) that will improve RH habitat quality from condition class 5 to 6?	

<table>
<tr><th>DoEE Comment</th><th>Response by Proponent to DoEE comments/issues</th></tr>
<tr><td>Did Hansen Bailey do these calculations? If not, please let me know and I will repeat the calculations, and advise you of the outcome. I would be happy to discuss/comment on draft condition classifications/descriptions.</td><td>
<table>
<tr><td></td><td colspan="3">ORIGINAL Values</td></tr>
<tr><td>MNES</td><td>Total Quantum of Impact (Adjusted ha)</td><td>Total Quantum of Offsets (Adjusted ha)</td><td>% of impact offset</td></tr>
<tr><td>Regent Honeyeater</td><td>108.8</td><td>507.9</td><td>466.8</td></tr>
<tr><td>Swift Parrot</td><td>108.8</td><td>507.9</td><td>466.8</td></tr>
<tr><td>Spotted-tailed Quoll</td><td>108.8</td><td>507.9</td><td>466.8</td></tr>
<tr><td>Grey-headed Flying-fox</td><td>108.8</td><td>996.0</td><td>915.4</td></tr>
<tr><td>Large-eared Pied Bat</td><td>136.0</td><td>353.9</td><td>260.3</td></tr>
<tr><td>Greater Long-eared Bat</td><td>136.0</td><td>384.2</td><td>282.5</td></tr>
<tr><td></td><td colspan="3">UPDATED Values</td></tr>
<tr><td>MNES</td><td>Total Quantum of Impact (Adjusted ha)</td><td>Total Quantum of Offsets (Adjusted ha)</td><td>% of impact offset</td></tr>
<tr><td>Regent Honeyeater</td><td>108.8</td><td>322.0</td><td>295.9</td></tr>
<tr><td>Swift Parrot</td><td>108.8</td><td>322.0</td><td>295.9</td></tr>
<tr><td>Spotted-tailed Quoll</td><td>108.8</td><td>322.0</td><td>295.9</td></tr>
<tr><td>Grey-headed Flying-fox</td><td>108.8</td><td>641.0</td><td>589.2</td></tr>
<tr><td>Large-eared Pied Bat</td><td>136.0</td><td>235.6</td><td>173.3</td></tr>
<tr><td>Greater Long-eared Bat</td><td>136.0</td><td>247.3</td><td>181.8</td></tr>
</table>
</td></tr>
<tr><td>Contingency measures, condition 3c(iv). Suggest Table C1: Ecological Risk Assessment include a column to record contingency measures, with those contingency measure described in relevant sections of the body of the document. Contingencies follow the ‘further investigation’ process, and are what will be done in response to, for example, failure to achieve a performance or completion criteria. The purpose of this is to give confidence to the Minister’s delegate that there are feasible responses to unplanned/unanticipated events/circumstances;</td><td>Additional column added to Table C1. Additional wording also added in Section 8.8.</td></tr>
<tr><td>Where there is reference to DSE stocking rates please convert to cattle stocking rates and give the reference (e.g. p56), otherwise there is not confidence this will be understood/undertaken by managers;</td><td>Conversion rates for cattle and associated reference added to Cattle stocking rate in Section 7.</td></tr>
</table>

DoEE Comment	Response by Proponent to DoEE comments/issues
Find all 'should', 'may' etc type management commitments and replace with 'will' (eg 'should' in cat management, Table 16); and	Minimal changes from 'should'/'may' to 'will'. Some uses of 'should' is considered appropriate (e.g. Should monitoring results indicate that regeneration is not occurring naturally by Year 10, assisted revegetation (including replacement of canopy trees as well as understorey and ground layer vegetation) will take place in any areas that require this management action)
Replace 24yrs plan period with 20yrs, which is the period to ecological benefit under the offsets policy. If the completion criteria are achieved in 20 years great outcome, if not, the plan can be reviewed and renewed for an additional period until completion criteria are achieved.	Project length unchanged at 24 years, however performance/completion criteria now only relates to a 20 year period.
Feel free to remove the yellow and blue shading in the next draft.	Noted
I have also attached a review/comment document sent you on 18 March 2016 by Tim Kaminskas (and cleared by me for transmittal). Did you reflect these comments, and include your response, in Appendix A of the September 2016 version? If not, please see what you can do.	Comments addressed in Appendix A, Table C.

Table A2
DoEE Comments (7 August 2016)

Relevant Section of BOMP	DoEE Comment	Response by Proponent to DoEE comments/issues
Table 2	Please indicate, perhaps through an additional following footnote, which of these items contributes to the 535 hectares in the EPBC approval conditions.	Footnote added to Table 2 showing vegetation communities that contribute to the 535 ha of Box Gum Woodland approved for disturbance under EPBC 2012/6378.
7.1	please be specific, what DoEEs this include in addition to control grazing and weed control	Second reference to feral animal control removed.
7.1	Why are you not considering shrub layer? As you remove briar - which can be important to small birds if thats all in the shrub layer - will you be replacing this with native shrubs and why not	Areas being revegetated to grassy woodlands, which typically have a sparse shrub layer. Weed management will not remove significant areas of shrub habitat in the form of Briar.
7.1	Please reference the evidence that control grazing will promote natural regeneration	Reference added
7.1	Not sure why you are including this when baseline presence is 'not detected' or very low, and there may be significant seasonal variation etc. And how will this possibly unreliable information inform management? Unless NSW requires this I would suggest delete.	Edit made in May 2016 in response to previous round of DoEE comments. Now removed to reflect latest comment.
7.1	Please include information here or as appropriate on the mandatory bushfire management requirements for the property. Cattle grazing for hazard reduction is a contested matter, however there are likely fire management obligations on Bengalla, and how will these be provided for whilst achieving ecological outcomes? Altered fire regimes is a key threatening process.	Bushfire Management Plan referenced as a separate document.
7.1	A counter argument to grazing for regen purposes	Reference added. The reference advocates the use of controlled grazing as a management technique.
7.1	Not sure why you are including this when baseline presence is 'not detected' or very low, and there may be significant seasonal variation etc. And how will this possibly unreliable information inform management? Unless NSW requires this I would suggest delete.	Deleted
7.1	Do you require bush regenerators for a natural regen activity? Weed and vertebrate pest control may be the only requirement?	Bush regenerators required when natural regeneration is not occurring

Relevant Section of BOMP	DoEE Comment	Response by Proponent to DoEE comments/issues
7.1	I have included wetlands to account for any groundwater discharge zones that are seasonally inundated or waterlogged and where cattle can 'pug' the soil, counter to good land and soil management.	There are no wetlands on the properties. The mapped riparian areas cover the sensitive habitats. Wording left unchanged.
7.1	Please provide an example of how this might be done. Which weed species, which season and how will this avoid/minimise impacts on native species/represent a net benefit?	Additional dot points added under “Control Grazing Rules and Triggers” to address
7.1	Suggested wording - reduce germination or reduce seed set/competition?	Added to dot points for additional measures to be undertaken
7.2	Are there instances where failure to achieve the KPI would not trigger any remedial action?	Removed “if any” to indicate management actions will be undertaken.
7.2	This suggests that an act of god might preclude the need for remedial actions? The purpose of remedial/contingency measures is to respond to anticipated risks that have realised, eg catastrophic bushfire, for which management is not planned for at this point. Good risk management will have identified prospective contingency measures in response to drought and bushfire (climate chage?).	Sentence added to reflect that actions will still be undertaken even if the impact was outside the control of BMC.
8.3	How is excessive defined? What is preventing ‘excessive’ load intended to achieve by way of bushfire control? Is the term defined in bushfire prevention obligations on landholders in the area?	Reference to excessive removed. Reducing fire fuel loads as part of controlled grazing relates to management of biomass.
8.3	Please give an example of how this guideline would be applied so that the reader/delegate better understands the management outcome	Added as requested
8.3	Please provide an example of an excessive weed infestations and how this guideline might be applied	Dense weed infestations. Example added as requested.
8.3	What is the conversion rate for cattle?	DSE is used as a standard unit for various stock. Equivalent rate for beef cattle varies, includes different rates for dry cows, bullocks, pregnant cows and cows with calves. Land manager will need to consider these varying values when determining stocking rates.
8.3	Please convert these grazing control actions rather than preparation of a grazing plan. For example, implement control grazing to achieve pre-determined condition targets and weekly monitoring by a trained professional etc …. ie the consequences of implementing a best practice plan	Change to actions.

Relevant Section of BOMP	DoEE Comment	Response by Proponent to DoEE comments/issues
8.3	Pease outline how this is achieved? Does it mean stocking rates for control grazing areas should be calculated to minimise stocking period to achieve conditon outcomes?	Added as requested.
8.3	A necessary commitment, rather than an ambiguous intention	Changed as requested.
8.3	This is the first that sheep and horses have been mentioned. Under what circumstances will horses be grazed?	Reference to sheep and horses removed. BMC to confirm.
8.4	How will you delineate the area of land that will be control grazed? Who makes the call and how do they do this, eg visual inspection by vehicle along existing tracks?	Control grazing generally in existing paddocks (or potential paddocks with new temporary fencing). Visual inspections will generally be by vehicle. Detail added as requested.
8.5	As you are using fire for fuel hazard reduction and ecosystem protection/enhancement what do you propose as an ecologically sustainable fire return interval? Do you have a fire history or the properties on which to plan future control burns? What are your commitments to average/range of return intervals?	Fire will be used for fuel hazard reduction, rather than for ecosystem protection/enhancement. Requirement for fuel hazard reduction determined within the Bushfire management Plan.
8.5	Do you mean control grazed areas or adjacent grazing properties? Preventing and controlling incursions is recognized good practice, however are there also weed infestations within the property that should be targeted (eg blackberry), or patches of st johns wort that could be eradicated with repeat controls over say 10 years? There would be briar throughout these properties?	Commitment added that weed management will target Weeds of National Significance and Noxious Weeds across the Biodiversity Offset Areas.
Table 8	Please give a commitment in the plan to mapping the location of these key weed species and relative abundance, and report on an analyse weed control efforts to reduce and in some instances eradicate them from portions of the properties. You should be able to eradicate blackberry, burr and some wort during the long management period.	A new commitment has been made to collect this level of detail.
8.5	By way of exemplary practice, why would you choose to reduce and maintain rather than where achievable eradicate certain species in high asset value areas given relatively low soil seed bank viability? Given the period you have available (21 years) you should be able eradicate some species from some areas.	Weed management will target Weeds of National Significance (WONS) and Noxious Weeds. Noted there will be some species that can't be eradicated from the site (e.g. thistles); however a commitment added that some WONS could be eradicated.
8.5	Careful knapsack spot spraying is more efficient. Hand removal (grubbing) has potential to disturb the soil and introduce seed weeds.	Dot point added to Table 9 for spot spraying with herbicides.

Relevant Section of BOMP	DoEE Comment	Response by Proponent to DoEE comments/issues
8.5	Replace with a weed control objective	Changed as requested.
8.5	Please define	Changed as requested.
8.5	Do you mean when weeds are receptive to chemical control and prior to seed set?	Dot point 5 changed as requested
8.5	It is very likely you will see a reduction, however please explain how will be evidenced. Size and density of patches (eg wort)? Number of plants treated in an area (briar)? Chemical usage in a zone?	Further detail added to *Potential Corrective Actions*.
8.5	Please provide an example for each.	Further detail added to *Potential Corrective Actions*
8.5	When would this be necessary? Suggest you provide details of what, where, when how, who and inputs to weed control. This information should be captured in your data management system – weed control is possibly the major management activity, and considerable learnings should be gained from this project.	Further detail added in *Documentation.*
9.1	What are the 'sustainable' levels for Table 8 weed species?	"Sustainable" deleted from text. Dot point added "*weeds are eradicated, or reduced to low levels that do not pose a threat to the biodiversity of offsets*.."
9.1	Need to track that there is improvement and that you are on track to achieving the improvement outcomes/targets. This will also provide an early indication of success/failure and need for contingencies.	Further detail added to reflect tracking progress towards reference data.
9.2	Permanent Monitoring sites - These are distributed as per Zone 1 (19, 4,609ha), Zone 2 (6, 1,500ha) and Zone 3 (3, ha?). Zones 2 and 3 will see most management intervention and the need to track performance/completion criteria. Suggest that you consider redistributing monitoring zones to target monitoring the effectiveness of broadacre management interventions ie correlated with the level of management intervention.	Monitoring sites have already been established based on the numbers presented in this report. Sites were selected to sample different vegetation types and conditions and were constrained by access.
9.3	Please explain how the 28 sites have been determined (#) and will be located to ensure the sites are representative of the variability of the offset area (aspect, native groundlayer, canopy etc) and its weediness and weed species.	Monitoring sites have already been established based on the numbers presented in this report. Sites were selected to sample different vegetation types and conditions. The sites represent a spread across the accessible portions of the properties and occur on various aspects. Reference added to section 9.3 which guided the selection of permanent monitoring sites.
9.3	What is the measure of significance? Detectable?	Greater than 50% of regeneration is being affected.

Relevant Section of BOMP	DoEE Comment	Response by Proponent to DoEE comments/issues
9.3	Please reference the vegetation monitoring guidelines issued by a state authority that underpins the design and implementation of this monitoring program.	Reference to Silvertsen (2009) added.
9.3	Please reference the source of this benchmark data in addition to the reference attached to Table 11.	Reference to benchmark data from the VIS Classification Database added to *Performance Indicators.*
9.3	Other management levers include burns?	Noted
9.3	Tables 11 and 12 - These tables are central to performance and review of this plan and should be easier to use and explained. Lots of padding. Please: - delete duplication; - explain implications for management where baseline exceeds benchmark value; - identify, highlight, explain implications and priorities for management where baseline does not meet benchmark value. Management should be targeted at closing this gap. Ensure that the management strategies/measures set out in the body of the document address the condition gaps. I have highlighted a few to start with.	Noted. Explanation of Tables 11 and 12 already included in Section 9.3 (bottom of page 75 and top of page 76). Tables reformatted as suggested to reduce duplication.
9.3	Table 12 - Delete management zone, description and current overall description as these are in the body of the document or able to be referenced. For Zones 2 and 3 order columns as objective, indicators, 5yr, 10yr and 21 year criteria, so that the reader/delegate has visibility across time.	Table reorganized and amended. Text amended elsewhere to reflect these edits.
9.6	Does this mean all weeds will be monitored/controlled, including introduced grass species? Please list all weed species recorded in the offset areas or commit to establishing a list (or is this in an appendix). Perhaps a more achievable approach would be to actively monitor and treat noxious – WON - invasive species, and list these, and seek to reduce total weed cover through grazing, broad-leaf spraying etc, and not bother monitoring the extent etc of lesser weeds? If that is your intent then it not clear from the text.	Noted. Text amended to reflect this comment.
9.6	How can the reader/delegate be confident the monitoring quadrats are representative of the weediness of the offset area/zone, or that changes in weediness of the quadrat following control treatments is representative of changes in weediness across the area/zone from comprehensive weed control activities. How do we know a less weedy quadrat has not been selected and is not disproportionately targeted?	Recommendation in previous DoEE comment to do detailed mapping of weeds. Monitoring of such areas will provide further data to provide the confidence mentioned.
9.6	Suggest it be clear that control grazed areas will be monitored for several years following grazing to account for seed viability	Text amended in *Data Collection* to reflect this comment.

Relevant Section of BOMP	DoEE Comment	Response by Proponent to DoEE comments/issues
Table 15	Please review this table in light of above statements. Suggest KPI, 5yr, 10yr, 21year criteria only. The frequency of treatments etc should be reported and sufficient to be on track to interim performance and long term completion criteria	Noted – Table 15 amended as suggested.
9.6	What do you mean by limited? Is one new species acceptable?	Text changed to "*No new significant infestations of target weed species."*
Table 16	This table combines monitoring and control activities. Suggest retitle or avoid duplication with control commitments elsewhere.	Table 16 title changed to "*Monitoring and Additional Control Actions for Feral Animals"*
Table 16	The action does not speak to nocturnal surveys.	Noted – deleted
Table 16	Please reference the evidence/guidelines that indicate this is a reliable means of detecting presence. There is commitment elsewhere to treating warrens. Please include.	Table 16 updated
9.7	Please consider whether it is misleading to suggest the following text is relevant to wild dogs. Foxes have a home range, their presence should/could be detected and reported as you go about normal, periodic, management activity.	Text amended in *Target Fauna* to reflect this comment.
9.7	Spotlighting is useful as well as monitoring/reporting on active warrens/entrances and reduced control effort over time. Suggest you consider adopting a metric of active entrances per hectare as a control target.	
9.7	The objective should be irrespective of abundance, ie to eradicate (wild dog?) or reduce to an ecological sustainable population size (rabbits?). You have set them out below anyway. You have suggested performance indicators below. Do you mean establishing measures of success/completion criteria for these KPIs?	Sentence removed in *Frequency* to avoid confusion.
9.7	A general concern about how these are measured. Then we need to see a line item for each KPI in Table 17.	Noted. Table 17 reorganized and amended.
9.7	How is this measured without eradicating a feral animal species from an offset area?	Dot points under *Performance Indicators* edited to reflect this comment.
9.7	How will you measure this with statistical confidence, and the baseline available to you? Suggest delete if unable to do this.	Dot points under *Performance Indicators* edited to reflect this comment.
9.7	Not sure what is meant/intended here.	Deleted. No new species from performance criteria.

Relevant Section of BOMP	DoEE Comment	Response by Proponent to DoEE comments/issues
Table 17	Completion criteria are not about management activity, rather measureable environmental outcomes/condition? Please advise or fix table.	Table amended to reflect this comment
A.1	Careful spot spraying or daubing (not high volume quickspary unit) can be very effective and more efficient than hand weeding/manual removal	Spot spraying included in the list of actions that could be undertaken.
A2.3	Have you walked the properties to check for evidence eg active warrens, rabbit activity? Unlikely, better to identify warrens nearby and maintain an active fumigation and baiting program? Over the period of this plan you should compile a comprehensive map of treated rabbit warrens and inspect and treat these annually. Otherwise please explain why you would not do this either (a) as a responsible landowner (b) for biodiversity outcomes.	Paragraph 1 deleted. Text revised to add warren ripping and fumigation.
Table C.1	This risk table is too long and variously duplicative. Should be Zone 'blind'. Suggest revised format, with little effort to make user/delegate friendly. Suggest A3 size.	Table reformatted and additional column added. Noted that a change to zone blind would leave risk assessment too generic as impacts differ within the three different zones.

Table A3
Consolidated DoEE Comments (18 March to 1 April 2016)

Cond	Requirement	Original Comments	Relevant Sections	Response by Proponent to comments/issues	Secondary comments	Secondary Response
3	To compensate for the loss of 535 hectares of Box Gum Woodland ecological community and 272 hectares of habitat for the Grey Headed Flying Fox, Large-eared Pied Bat, South-eastern Long-eared Bat, Regent Honeyeater, Swift Parrot and the Spotted-tail Quoll, the **approval holder** must prepare and submit, by 3 September 2015, a Biodiversity Offset Management Plan (**BOMP**) for **the Minister**'s written approval. The **BOMP** must:			Table 1 updated and wording updated to confirm publication		**No action required**
a	Identify those lands described as the Offset Areas at Schedule 2 (Figures 1-6) of this notice. This must include offset attributes, shapefiles, textual descriptions and maps to clearly define the location and boundaries of the offset area(s)	**Not Met** The BOMP provides maps showing vegetation communities on the offset areas. It is difficult to distinguish which vegetation communities make up the EPBC TEC to be offset. **ACTION** Please provide a clear map and description of EPBC Threatened Ecological Communities required to be offset; Box Gum Woodland EC. Please provide a map and textual descriptions to clearly define the location and boundary of offsets for	1.0	Additional text and figures added to section 6.1	Please submit Shapefiles ('.shp', '.shx' and '.dbf' files) and offset attributes ('.xls')	Will provide to DoEE immediately following approval of the BOMP

Cond	Requirement	Original Comments	Relevant Sections	Response by Proponent to comments/issues	Secondary comments	Secondary Response
		listed species required to be offset under this condition.				
b	Provide a survey and description of the current conditions (prior to any management activities) of the offset areas identified in Condition 3a	**Not Met** A survey and description of the current condition (prior to management activities) has not been provided in this section. This approval condition requires surveys and descriptions in order to provide the baseline condition and habitat quality for the TECs and Listed Species to be offset. This will ensure that any changes in environmental condition can be accurately monitored. **ACTION** Please provide a survey and description of the current condition of the offset areas, including listed fauna species habitat.	5.0	A Summary of results from the BOS survey have been included as Appendix D	The rating scale used for vegetation condition included in appendix D is ambiguous, and information provided not sufficient to provide a baseline assessment of the condition of the offset properties. **Please provide** quantitative survey data and information on the methodology used.	Additional context referring to has been added to Section 6.3 to incorporate benchmark data monitoring into the BOMP. Incorporated throughout Section 7.0, 9.3 and 9.6. Benchmark (target) vegetation condition value for the target zone vegetation included in **Table 11**. Current baseline results following methodology proposed in BOMP for attaining current condition value for each permanent monitoring plot also included in **Table 11**. Listed fauna species habitat already provided in Appendix D.
c	Detail management actions and regeneration and revegetation strategies to be undertaken on the offset areas	**Not Met** Management actions have been proposed on all three offset sites and management zones have been		Additional wording has been added to Section 8.6. Corrective actions for the proposed 1080	Original comments requested that more detailed information be provided on the 'three conservation zone' strategy	All proposed management actions are aimed at improving the quality

Cond	Requirement	Original Comments	Relevant Sections	Response by Proponent to comments/issues	Secondary comments	Secondary Response
	to improve the ecological quality of these areas, including:	nominated as three separate strategies. As below: Zone 1: Conservation and management of existing forest and woodland; Zone 2: Assisted regeneration of canopy species in Derived Native Grasslands; and Zone 3: Riparian regeneration and management. **ACTION** Please provide more information regarding how these approaches are suitable for species habitat management, particularly how the application of feral animal control (i.e. 1080 baiting) will be managed in relation to listed fauna species impacts.		program have been added into Section 8.6.2	described in sections 6 and 7, as well as concerns in section 8 be addressed. **Management Zones:** **Please provide** specific scientific evidence-based information about the management strategies that are intended to improve the quality of listed fauna species habitat. Guidelines found in these species' recovery plans can be used to inform this. Management measures should be described in clear, measurable terms; including how the management strategies proposed will benefit listed fauna species habitat and the environmental condition of the properties; specific details of what will be conducted and how; and how the success of the strategies will be measured. Management techniques can be adaptive, so long as the triggers for adaptive measures and the proposed adapting measure are clearly stated.	of fauna habitat over time. Improvement of fauna habitat is incorporated with the improvement and natural regeneration of vegetation. Performance criteria and completion criteria for all management actions and triggers. have been incorporated throughout section 8.0 and 9.0.
					Grazing: Please provide information on the specific circumstances when grazing will be used as a control measure. The Department understands that this technique will only be employed under certain circumstances. Please provide detail on the circumstances of when it will and will not be used, how it will be controlled and monitored when used, and provide scientific justification for why it is considered a suitable management technique.	Removal of reference excluding control grazing on Merriwa River Offset Area (Sections 7.1 and 8.3) Further details added to section 8.3 for control grazing including further triggers added to Table 7 and additional section on control grazing monitoring

Cond	Requirement	Original Comments	Relevant Sections	Response by Proponent to comments/issues	Secondary comments	Secondary Response
						included in Section 8.3.1.
					Feral Animal Control: Stopping a baiting program once a listed species casualty has occurred is not considered an adequate mitigation measure. **Please provide** information on how deaths of native wildlife will be avoided. Note that it is not sufficient justification for asserting that no quoll deaths will occur during pig baiting to state that none occurred during dog baiting programs as. The bait with a lethal dose of 1080 for a dog should not kill a quoll, but baits with a lethal dose for a pig will.	Feral animal control will be conducted on an annual basis (see Section 8.6). Should the use of 1080 be required then this method will be used to avoid non target species (see Section 8.6) Should a ground baiting program be utilised baits will be buried to a minimum depth of 10 cm and spaced a minimum 200 m apart so to avoid native fauna poisoning. Further information based on species recovery plans for placement of bait stations included in Section 8.6 as well as risk assessment in Appendix C.
(i)	A description and timeframe of measures that would be implemented to improve the	**Not Met** Section 8.0 provides information regarding conservation and land	5.2, 6.0 and 7.0	This information is included in table 14 and table 16. Please	Please provide further detail. Please provide specific detail about actions to be carried out, with clear and	Weed performance and completion criteria provided in

Cond	Requirement	Original Comments	Relevant Sections	Response by Proponent to comments/issues	Secondary comments	Secondary Response
	condition of Box Gum Woodland and habitat for the Grey Headed Flying Fox, Large-eared Pied Bat, South-eastern Long-eared Bat, Regent Honeyeater, Swift Parrot and the Spotted-tail Quoll on the offsets sites;	management strategies for the offset areas including fencing, controlled activities, control grazing, bushfire management, weed control and feral animal management. Management actions should be specific, measurable and timely. **ACTION** Please propose specific and measurable management actions and performance criteria in order to accurately measure the success of management actions (for example, proposing percentage of weed cover reduction and feral species removal within a nominated timeframe).		clarify if additional detail is required.	measurable performance criteria and time frames for deploying strategies. Management strategies can be adaptable and include conditional measures so long as the specific situations in which they will be used is clearly stated (i.e. triggers and proposed corrective actions).	**Table 15**. Feral animal performance and completion criteria provided in **Table 17**. Timescales for when effecting annual aerial wild dog baiting may occur will be developed in consultation with the Local Land Services (see Section 8.6.1).
(ii)	performance and completion criteria for evaluating the management of the offset areas, and criteria for triggering remedial action	**Not Met** Table 12 outlines the measurable indicators and completion criteria for vegetative management zones. Section 9 outlines the monitoring objectives, permanent monitoring sites, performance indicators and data storage and analysis of the Biodiversity Monitoring Program. Section 9.3.3 data storage and analysis states that data will be added annually so that it will form a data matrix that is amenable to analysis using a range of statistics. The frequency of biodiversity monitoring is not clear. **ACTION**	6.2 and 8.2	A Commitment of annual monitoring is included in Sections 9.3.2, 9.4.6 and Table 13. Please clarify if additional detail is required A new summery table has been added to Section 9.3 outlining available benchmark data. A reference has been included in Section 7.2.2 for review of management actions should key	Performance and **Completion criteria:** Criteria should be measurable and clearly defined. For example, in Table 15, simply completing the annual monitoring is not a suitable performance criterion for weed density, distribution or diversity	Table 15 updated
(iii)	a program to monitor and report on the effectiveness of these measures, and progress against the performance and completion criteria;				**Table 11 in section 9.3:** **Please provide** an interpretation/explanation for the values and abbreviations used in this table. It is not clear what information is provided in this table and how it relates to completion criteria in table 12.	Additional context and links provided in Section 9.3 and linking to the completion criteria in Table 12
					Section 7.2.2:	Additional text added to link to the location

Cond	Requirement	Original Comments	Relevant Sections	Response by Proponent to comments/issues	Secondary comments	Secondary Response
		Please specify the monitoring frequency for the Biodiversity Monitoring Program. **Not Met** Table 12: please provide further information on the completion criteria to apply where lower benchmarks are used (e.g. increase to at least 50% of lower benchmark). It is not clear if the benchmark is the baseline survey or if the benchmarks are those modified from the Braun-Blanquet scoring system. If benchmarks are based on the Braun-Blanquet scoring system, please provide these values in an appendix. Please clarify the use of "lower Benchmarks" as completion criteria. **ACTION** Please propose criteria for triggering remedial action relevant to the completion criteria for the biodiversity monitoring program and for those management actions provided in Tables 14, 15, 16 and 17. **ACTION** Please propose monitoring for impacts to non-target species in relation to feral fauna species control (1080), specifically for the Spotted Quoll.		performance indicators not be met. Non-target Species monitoring is described in Section 8.6.1	Trigger referenced is not defined and remedial actions not clearly referenced. **Please provide specifics**.	of all management action triggers.
					Monitoring: Annual monitoring of controlled grazing should be complemented with monitoring immediately before, during and after every grazing event. Please consider use of photo point monitoring: http://www.depi.vic.gov.au/__data/assets/pdf_file/0016/205054/BB-info-19-photopoint.pdf. Also, use of cattle exclusion plots is an objective technique of monitoring impacts of cattle on vegetation.	Control grazing monitoring added in 8.3.1 using phot-reference points. Section 9.5 added to include photo reference point monitoring description.
					Section 8.6.1: **Please provide** more detail on how monitoring of non-target species will occur. Stating that monitoring will occur does not constitute a monitoring plan.	Section 8.6.1 updated to discuss how risk to non-target species have been eliminated according to advice detailed in the species recovery plans then no specific non-target species monitoring is required.
(iv)	A description of potential risks to the successful implementation of the plan, a description of the measures	**Not Met** An ecological risk assessment has been provided in Appendix C.	Appendix C	Risk has already been considered, with clarification controls as defined in Appendix B.	The following risks have not been addressed: unintentional poisoning of native animals during baiting program; grazing livestock straying from 'controlled	Addressed in Appendix C. Control/Remedial Trigger added to Risk Assessment.

Cond	Requirement	Original Comments	Relevant Sections	Response by Proponent to comments/issues	Secondary comments	Secondary Response
	that will be implemented to mitigate against these risks and a description of the contingency measures that will be implemented if defined triggers arise; and	The risk factor (hazard) for grazing by feral pigs and/or rabbits has an action or mitigation measure where a feral control program will be implemented. It is not clear how these controls differ from the actions proposed in the management plan, and how the implementation of these controls will increase the mitigation of these impacts. The same applies for the following risk factors: Feral foxes, Existing environmental weeds and New environmental weeds. Risk factors are provided for existing woodland and forest, derived native grassland and riparian areas. **ACTION** Please propose risk associated with the habitat and populations of listed fauna species that are required to be offset. Please clarify how controls differ from the actions proposed in the management plan, and how the implementation of these controls will increase the mitigation of these impacts.		The subsequent reduction in risk (mitigation outcome) is shown in 'residual Likelihood' and 'residual risk' columns	grazing' areas; vehicles or animals entering site carrying seeds of invasive species; trampling of listed native flora species by livestock, vehicles or personnel on site. Please provide a more detailed risk assessment, and clearly define the triggers for implementation of the contingency or remedial measures.	
(v)	Details of who would be responsible for monitoring, reviewing, and implementing the plan.	**Not Met** Table 19 outlines the roles and responsibilities for those actions and monitoring to be implemented under this BOMP. **ACTION** Please provide the parties (people/companies/roles) that will be	9.0	Clarification on this action is included in Table 18. Comment has been added to publish within one month.	This condition has now been met.	No action required

Cond	Requirement	Original Comments	Relevant Sections	Response by Proponent to comments/issues	Secondary comments	Secondary Response
		responsible for the implementation of specific management actions and monitoring, particularly for weeds, ferals and the biodiversity monitoring program.				
	The approved BOMP must be implemented. The approved BOMP must be published on the approval holder's internet web site within 1 month of being approved. The most recently approved version of the BOMP must be published on the approval holders' internet web site for a period of 5 years after it is approved.	NA		NA	NA	No action required

Table A4
DoEE, OEH and DP&E Comments (December 2015)

Ref	Detail	Response
DoEE –1 December 2015		
1.1	General Comment Please correct Table 1, page 7 to reflect the final EPBC approval conditions for the project. Specifically replace the second last row in the table with the following paragraph: The approved BOMP must be implemented. The approved BOMP must be published on the approval holder's internet web site within 1 month of being approved. The most recently approved version of the BOMP must be published on the approval holders' internet web site for a period of 5 years after it is approved.	Table 1 updated and wording updated to confirm publication of the BOMP within one month of approval
1.2	Condition 3a The BOMP provides maps showing vegetation communities on the offset areas. It is difficult to distinguish which vegetation communities make up the EPBC TEC to be offset. Action: Please provide a clear map and description of EPBC Threatened Ecological Communities required to be offset; Box Gum Woodland EC. Please provide a map and textual descriptions to clearly define the location and boundary of offsets for listed species required to be offset under this condition.	Additional text and figures included in Section 6.1.
1.3	Condition 3b A survey and description of the current condition (prior to management activities) has not been provided in this section. This approval condition requires surveys and descriptions in order to provide the baseline condition and habitat quality for the TECs and Listed Species to be offset. This will ensure that any changes in environmental condition can be accurately monitored. Action: Please provide a survey and description of the current condition of the offset areas, including listed fauna species habitat.	A summary of results from the BOS surveys have been included as Appendix D.
1.4	Condition 3c Management actions have been proposed on all three offset sites and management zones have been nominated as three separate strategies. As below: Zone 1: Conservation and management of existing forest and woodland; Zone 2: Assisted regeneration of canopy species in Derived Native Grasslands; and Zone 3: Riparian regeneration and management. Action: Please provide more information regarding how these approaches are suitable for species habitat management, particularly how the application of feral animal control (i.e. 1080 baiting) will be managed in relation to listed fauna species impacts.	Additional wording has been added to Section 8.6. Corrective actions for the proposed 1080 program have been added into Section 8.6.2.
1.5	Condition 3c(i) Section 8.0 provides information regarding conservation and land management strategies for the offset	This information is included in Table 14 and Table 16. Please clarify if additional detail is required.

Ref	Detail	Response
	areas including fencing, controlled activities, control grazing, bushfire management, weed control and feral animal management. Management actions should be specific, measurable and timely. Action: Please propose specific and measurable management actions and performance criteria in order to accurately measure the success of management actions (for example, proposing percentage of weed cover reduction and feral species removal within a nominated timeframe).	
1.6	Condition 3c(ii-iii) Table 12 outlines the measurable indicators and completion criteria for vegetative management zones. Section 9 outlines the monitoring objectives, permanent monitoring sites, performance indicators and data storage and analysis of the Biodiversity Monitoring Program. Section 9.3.3 data storage and analysis states that data will be added annually so that it will form a data matrix that is amenable to analysis using a range of statistics. The frequency of biodiversity monitoring is not clear. Action: Please specify the monitoring frequency for the Biodiversity Monitoring Program. Table 12: please provide further information on the completion criteria to apply where lower benchmarks are used (e.g. increase to at least 50% of lower benchmark). It is not clear if the benchmark is the baseline survey or if the benchmarks are those modified from the Braun-Blanquet scoring system. If benchmarks are based on the Braun-Blanquet scoring system, please provide these values in an appendix. Please clarify the use of "lower Benchmarks" as completion criteria. Action: Please propose criteria for triggering remedial action relevant to the completion criteria for the biodiversity monitoring program and for those management actions provided in Tables 14, 15, 16 and 17. Action: Please propose monitoring for impacts to non-target species in relation to feral fauna species control (1080), specifically for the Spotted Quoll.	A commitment to annual monitoring is included in Sections 9.3.2, 9.4, 9.4.6 and Table 13. Please clarify if additional detail is required. A new summary table has been added to Section 9.3, outlining available benchmark data. A reference has been included in Section 7.2.2 for review of management actions should key performance indicators not be met. Non-target species monitoring is described in Section 8.6.1
1.7	Condition 3c(iv) An ecological risk assessment has been provided in Appendix C. The risk factor (hazard) for grazing by feral pigs and/or rabbits has an action or mitigation measure where a feral control program will be implemented. It is not clear how these controls differ from the actions proposed in the management plan, and how the implementation of these controls will increase the mitigation of these impacts. The same applies for the following risk factors: Feral foxes, Existing environmental weeds and New environmental weeds. Risk factors are provided for existing woodland and forest, derived native grassland and riparian areas. Action: Please propose risk associated with the habitat and populations of listed fauna species that are required to be offset. Please clarify how controls differ from the actions proposed in the management plan, and how the implementation of these controls will increase the mitigation of these impacts.	Risk has already been considered, with clarified controls as defined in Appendix B. The subsequent reduction in risk (mitigation outcome) is shown in 'Residual Likelihood' and 'Residual Risk' columns.

Ref	Detail	Response
1.8	Condition 3(v) Table 19 outlines the roles and responsibilities for those actions and monitoring to be implemented under this BOMP. Action: Please provide the parties (people/companies/roles) that will be responsible for the implementation of specific management actions and monitoring, particularly for weeds, ferals and the biodiversity monitoring program. Section 2.3 commits to implementing this plan, once approved, and that the plan will be published on the Bengalla Mining Company website for public view. Action: Please consider amending this section to commit to the approved plan being published within 1 month of being approved.	Clarification on this action is included in Table 18. Commitment has been added to publish within one month of approval.
OEH (16 October 2015)		
2.1	Page 8: OEH recommends rewording of"…*Neither translocations of flora nor habitat augmentation is not proposed in the BOAs and is not discussed further in this report"* by removing the double negative in this sentence for clarity. Although in this case OEH would encourage that the Tiger Orchids from the development site were translocated – see point 3 below	Amended
2.2	Page 15: The 168 ha of 'non-endangered Narrow-leaved Ironbark Woodland' may now meet the definition of the recently-determined 'Central Hunter Valley eucalypt forest and woodland ecological community' as a Critically Endangered Ecological Community under the Australian Government *Environment Protection and Biodiversity Conservation Act 1999.* As stated in OEH's letter dated 4 June 2015, it is useful to note the change in status of this vegetation community even though this new listing has no bearing on current consent conditions for this project	Added
2.3	Page 18: Plants of the Endangered Population of Tiger Orchid (*Cymbidium canaliculatum*) in the Hunter catchment that have a high propensity for successful translocation given their epiphytic nature. OEH recommends that consideration is given too translocate the plants from the development site. Bengalla may wish to tap into the translocation work of this species done on the Mangoola Coal Mine (SLR Consulting, 2015)	Translocation of Cymbidium has been addressed in the approved site BMP (Section 4.0). Translocating individuals from the site to the Offsets are unlikely to be successful and, as such, have not been included in the BOMP (Cumberland Ecology, pers comm 11 November 2015).
2.4	Given that biometric data indices against are being suggested as a way of measuring success of management of the vegetation on the offset lands, OEH recommends that the lists of vegetation communities (Tables 4, 5, and 6) and maps of vegetation communities (Figures 6, 8, and 10) include the Plant Community Type (PCT) code and somewhere in the document (perhaps the tables) that the vegetation formation for each PCT is provided. These steps will make it easier to see the benchmark conditions for each vegetation community	PCT codes added to vegetation communities in Tables 4, 5 and 6.
2.5	Page 54: Proposed controlled grazing by cattle. This process will require monitoring and periodic auditing, and the provision of results in the annual reports for the project	Table 7 provides the performance criteria in which to monitor the success of control grazing, if it is to be implemented. Any drop below performance criteria would trigger the removal of cattle from that part of the Biodiversity Offset area. Section 8.3 has been updated to refer to monitoring results being presented in the Annual Review.

Ref	Detail	Response
2.6	Page 58: Grazing by sheep in the offset areas may be problematic, given their wider diet than cattle and horses so they could remove saplings of canopy species	Table 7 provides the performance criteria in which to monitor the success of controlled grazing. Section 8.3 has been updated to refer to monitoring results being presented in the Annual Review.
2.7	Pages 60-61: Not all local problematic environmental weeds are listed as Noxious under the Noxious Weeds Act 1993. The case in point is African Olive (*Olea europaea subsp. cuspidate*). OEH recommends that African Olive is also controlled on the offset properties otherwise it would compromise rehabilitation goals and biodiversity values by changing the composition and structure of local woodlands and the types of animals that the vegetation can support	This species has been added and will be targeted for weed control.
2.8	Page 63: Weed Management. OEH recommends that good hygiene procedures are established to help reduce the spread of weeds or pathogens on and between offset properties. The 'Arrive Clean, Leave Clean' guidelines prepared by the Department of the Environment (2015) are an excellent guide for site hygiene practices	Updated to include reference to this Guideline.
2.9	Page 72: Vegetation Monitoring. OEH recommends that cover and abundance, rather than just frequency of plant taxa per monitoring plot is recorded as this provides a more valuable dataset. Further, OEH recommends that the datasheet found in the Native Vegetation Interim Type Standard (Sivertsen, 2009: see pages 59-65) is used with an emphasis on 'Module 2'. The collection of finer scale data than the modified 8-point Braun-Blanquet scale suggested in the BOMP would require very little extra effort. It would provide a more powerful dataset that, particularly after the application of appropriate statistical analysis, would be a powerful resource for adaptive management that would enable rehabilitation progress to be better tracked and, where necessary, corrective actions to be undertaken early to enable required coals to be met with minimal resources and time	Extra details added for full floristics to be collected as per Sivertsen, 2009.
2.10	Page 74: Biometric indices have their use, but the reduction of native vegetation richness of the entire site, or selected strata or growth forms can also be uninformative. OEH recommends that plant cover and abundance data is collected throughout the life of this project to help describe what changes are occurring (as suggested in Point 9, above)	Plant cover and abundance measures added to replace braun-blanquet
2.11	Page 86: Data Storage and Analysis: Appropriate statistical analysis of the monitoring data is to be encouraged as this will help identify trends before they necessarily become obvious on the ground, and can allow for early implementation of adaptive management. For example, the Analysis of Similarity ('ANOSIM') has often been used to assess changes in plant species composition in space and time (e.g. Brown, 2006; Wevill and Florentine, 2014; and Wilkins *et al.*, 2013). OEH recommends consideration of this type of analysis in the monitoring project; if appropriate in relation to the type of data gathered, the questions being asked and underlying assumptions. Further, OEH recommends that the results of any such monitoring, analysis and underlying assumptions are made publically available to allow more efficient sharing of lessons learnt that may be applied to other projects.	Section 9.4.8 amended to reflect this
DP&E		
3.1	Section 1.3 – Is this plan set up to cover both the NSW Approval Conditions under Schedule 3 Condition 29 and the EPBC Conditions? If this is the case the NSW Approval of the offset areas and on the site.	Condition 29 requires the provision of a BMP that covers the management of both onsite and offset lands. Due to the separate

Ref	Detail	Response
		nature of managing onsite and offset components it was decided that two management plans would be developed to provide clarity to the management. This is stated in section 1.3 and section 2.0, paragraph 2. Further detail has been added to the BOMP to reflect this.
3.2	Table 1 – The sections indicated in this column are incorrect. Please revise.	This section has been updated with the correct section references.
3.3	Section 2.0 – Schedule 3 Condition 29 requires a Biodiversity Management Plan (BMP) not a Biodiversity Offset Management Plan (BOMP). The BOMP is a requirement of EPBC Approval.	Condition 29 requires the provision of a BMP that covers the management of both onsite and offset lands. This has been approved by both DoEE and DP&E (NSW). Due to the separate nature of managing onsite and offset components it was deemed appropriate that two management plans would be developed to provide clarity and to better assist with the management of the lands. This is stated in section 1.3 and section 2.0, paragraph 2. Further detail has been added to section 2.0 to reflect this.
3.4	Section 2.0 – As stated in the EPBC Approval, Conditions 2 and 3 Note that the Biodiversity Management Plan required under NSW Approval condition 29 may be used to satisfy this condition if it meets the above content and submission requirements.	Noted
3.5	Section 6.2 – Table 1 shows that this section and 8.2 addresses the requirements in schedule 3 Condition 29(d) (ii). These sections do not contain the required information.	Amended Sections 9.3, 9.4 and 9.5 which correspond to requirements in Condition 29(d)(ii)
3.6	Section 8.2 – Table 1 shows that this section and 6.2 addresses the requirements in schedule 3 Condition 29(d) (ii). These sections do not contain the required information.	Amended Sections 9.3, 9.4 and 9.5 which correspond to requirements in Condition 29(d)(ii)
3.7	Section 10.2 – As previously mentioned the SSD-5170 Approval Conditions require a BMP.	Amended to Biodiversity Management Plans

APPENDIX B

INDICATIVE WEED AND FERAL ANIMAL CONTROL

B.1 INDICATIVE WEED CONTROL MEASURES

In riparian areas, hand weeding or manual removal will be undertaken in preference to herbicide application. In other areas, herbicide application should be limited to backpack sprayers or hand application (including from a vehicle). No high disturbance manual removal of woody weeds will be undertaken near native trees. The following sections provide guidelines for the use of the most common weed control measures. These may be modified or adapted as other preferred or more appropriate methods are identified over time.

B1.1 FOLIAR SPRAY APPLICATION

- Suitable for shrubs, grasses and dense vines less than 6 m tall and perennial weeds with a small root system and simple stem;
- Herbicide is diluted with water or diesel at a specific rate, and sprayed over the foliage to point of runoff (until every leaf is wetted, but not dripping); and
- Techniques differ depending on size of weed plant or infestation.

B1.2 STEM INJECTION

- Suitable for woody weeds and trees;
- Drill or cut through bark into live sapwood;
- Where low branches are encountered place a cut immediately below the branch;
- Immediately apply herbicide (within 15 seconds) for active uptake by plant;
- Remove plant once dead; and
- Do not treat trees with poor sap flow that occurs when plants are stressed.

B1.3 CUT STUMP APPLICATION

- Suitable for woody weeds, saplings and trees;
- Cut plant off completely at base (no higher than 15 cm from ground);
- Use a chainsaw, axe, brush cutter or machete depending on the thickness of the stem/trunk;
- Apply herbicide using knapsack, paint brush, drench gun or a hand-spray bottle;
- Spray or paint herbicide immediately onto the exposed surface of the cut stump (within 15 seconds for water-based herbicides and 1 minute for diesel-soluble herbicides); and
- For trees with large circumferences, it is only necessary to place the solution around the edge of the stump in the living tissue. The stump circumference should be bruised with the back of an axe and each successive blow treated with herbicide.

B1.4 CUT AND SWAB

- Suitable for vines and multi-stemmed shrubs;
- Similar to cut stump method;
- Herbicide applied via spray or brush; and
- In the case of vines with aerial tubers, both ends of the cut stems must be treated with herbicide. Hold both 'bunches' of cut stems in a container of herbicide for 15 seconds after cutting, so that maximum translocation occurs to both ground and aerial tubers.

B1.5 STEM SCRAPE

- Suitable for plants and vines with aerial tubers;
- Sharp knife used to scrape a very thin layer of bark from a 10 cm section of stem; and
- Herbicide immediately applied to the exposed soft underlying green tissue.

B1.6 BASAL BARK APPLICATION

- Suitable for thin-barked woody weeds, saplings, regrowth and multi-stemmed shrubs and trees;
- Mix an oil soluble herbicide with diesel;
- Spray (saturate) the full circumference of the trunk or stem of the plant from ground level to 30 cm height; and
- Best undertaken by contractors.

B1.7 PELLET OR GRANULAR SOIL APPLICATION

- Suitable for woody weeds with extensive fine stems and root-suckering plants to 3 m in height; and apply herbicide pellets evenly to root area (soil under canopy from root crown or stems to 30cm beyond dripline) prior to spring or summer rains.

B.2 FERAL ANIMAL CONTROL METHODS

B2.1 WILD DOG AND EUROPEAN RED FOX

A range of control measures are appropriate to control Wild Dog and European Red Fox. Government agencies mostly recommend the use of poisons such as strychnine or 1080 to reduce fox populations. Poisons are typically placed into meat baits, or carcasses, for subsequent consumption by dogs and foxes. Other control measures include the following:

- Shooting;
- Electric fencing;
- Trapping;
- Fumigation; and

- Fertility control/Biological control.

B2.2 FERAL PIG

Effective feral pig control strategies are underpinned by an understanding of the dynamics of the feral pig problem, such as the population density, movement, habitat conditions, food water resources, and the severity and type of damage that inform the types of techniques that should be used. Various control techniques are best used together in a strategic fashion to manage feral pig populations. In Australia, the most successful efforts to manage feral pigs and the damage they cause have tended to involve the lethal techniques of poisoning, trapping, shooting and hunting.

The main control measure for feral pigs is poisoning, primarily using 1080 poison in grain or meat baits. The fast-acting and more humane poison sodium nitrite, otherwise known as HOG-GONE™, a common human food preservative, is highly lethal to pigs and is currently undergoing registration in Australia. This new toxicant was expected to be available from 2013 (Invasive Animals CRC 2011) but is still undergoing testing. Other control measures include the following (Carritt 1999):

- Trapping;
- Ground shooting and hunting with dogs;
- Aerial shooting; and
- Fence exclusion.

Currently, the most effective control technique for the feral pig is baiting with “1080” poison or HOG-GONE™ (once it is available for use). It requires appropriate free-feeding with non-toxic bait to attract pigs before the poison bait is used and also helps to reduce the risk of loss to non-target animals. This will need to be done separately to wild dog and fox control however, as slightly different methods are used, including application of a higher concentration of monosodium fluoroacetate per bait. Ground baiting is a multistep process as follows:

1. When feral pig control is required, an area of feral pig activity will be located based on observation of fresh signs such as wallows, faeces, rooting, tracks, watering point activity, and sightings;
2. Bait stations will be established in these areas by placing small piles of grain, fruit or several un-poisoned pre-feed baits every 50 to 100 m for about three to ten days. This free-feeding step, although taking time and effort, is essential for attracting the local feral pig population and increasing bait consumption. Earth or sand pads around bait stations should be swept to allow the prints of animals approaching and consuming baits to be determined. The bait stations should be checked regularly over several days for evidence confirming pig activity and the non-toxic feed replaced with new material at sites where free-feed was taken;

3. Once baits are taken, the number of feeding points will be gradually reduced to draw feral pigs into 'cluster bait' stations or 'feeding hot spots'. This ensures that toxic baits can then be presented across the smallest possible area;
4. Toxic baits will be introduced to cluster bait stations once free-feed bait uptake levels off, and this is continued until toxic bait uptake ceases (1–3 nights). Feral pigs are often killed within the first few nights of the lethal baiting phase; and
5. Follow-up monitoring will be undertaken to determine if pigs remain in the area and whether further baiting is needed.

Feral pig poisoning with 1080 is regulated in NSW by the Pesticides Act 1999 and can be carried out only under the conditions specified in the *Pesticide Control (1080 Liquid Concentrate and Bait Products) Order 2010* (PCO 2010). After baiting is complete, all untaken baits and carcasses must be recovered and disposed of in accordance with Condition 4.8 of Schedule 3 of the PCO 2010.

B2.3 EUROPEAN RABBIT

The most effective way of controlling rabbits is through a combination of activities such as warren ripping, fumigation, and fencing, poisoning and shooting. If rabbits cause a significant problem in rehabilitating areas then warren ripping and fumigation, as well as poisoning should be considered first. The two most common poisons are "1080" and oats coated with Pindone (marketed as RABBAIT®). Usually a trail of poisoned grain is created away from warrens (as rabbits do not usually eat near the warren). It is advantageous to disturb the soil nearby, as rabbits are known to investigate disturbed soil. Pindone is most effective when administered to rabbits in three doses about four days apart over a 10-12 day period.

APPENDIX C

ECOLOGICAL RISK ASSESSMENT

An ecological hazard and risk assessment is provided in **Table C1** and has been completed for forest, woodland and riparian land. The risk matrix presented in **Figure C1** and the associated descriptors were utilised to determine the consequence and likelihood of each hazard.

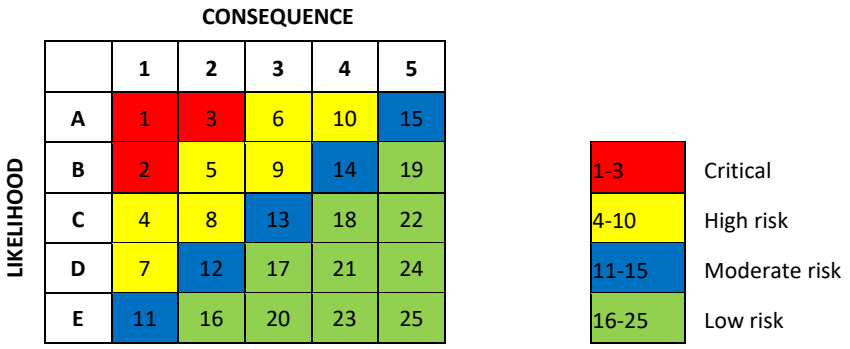

Figure B1 Risk Matrix

Consequence	Descriptor	Description
1	Severe	Loss of species, populations or communities in an area
2	Major	Major damage/reduction of species, populations or communities in an area
3	Moderate	Moderate damage to species, populations or communities in an area
4	Minor	Minor damage to individuals/small area
5	Insignificant	Unlikely to affect species, populations or communities

Likelihood	Descriptor	Description
A	Almost certain	Almost certain to happen
B	Likely	Likely to happen at some time
C	Possible	Could potentially happen
D	Unlikely	Not likely to happen
E	Rare	Practically impossible

Table C1
Ecological Risk Assessment

Hazard	Impact	Likelihood	Consequence	Risk Level	Controls	Residual Likelihood	Residual Consequence	Residual Risk Level	Remedial Trigger	Method of Detection	Contingency Measures
ZONE 1											
Drought	Dieback of plant species	B	3	9	No controls recommended.	B	3	9	No controls recommended.	Vegetation monitoring plots.	• Increased frequency of monitoring and management of fuel loads; • Increased frequency of monitoring and management of feral animals; and • Removal of controlled grazing if drought conditions identified.
	Increase in severity of bushfire	C	2	8	Reduce fuel loads as per Bushfire Management Plan.	D	2	12	Occurrence of unplanned/out of control bushfire within the Biodiversity Offset Area.	Surveillance of property generally and monitoring plots, mapping and reporting of bushfires.	
	Erosion post-drought	C	2	8	• Control numbers of feral animals to reduce net grazing pressure; and • Maintain ground cover of native vegetation (note: livestock should be excluded from riparian areas).	D	2	12	Declaration of severe drought in the locality.	Vegetation monitoring plots.	
Bushfire	Loss of tree hollows	B	3	9	Reduce fuel loads as per Bushfire Management Plan.	C	3	13	Once trigger as described in Table 7 has been reached.	Surveillance of property generally and monitoring plots,	• Increased frequency of monitoring and

Hazard	Impact	Likelihood	Consequence	Risk Level	Controls	Residual Likelihood	Residual Consequence	Residual Risk Level	Remedial Trigger	Method of Detection	Contingency Measures
										mapping and reporting of bushfires.	management of fuel loads.
	Plant mortality	B	2	5	Reduce fuel loads as per Bushfire Management Plan.	C	2	8	Once trigger as described in Table 7 has been reached.	Surveillance of property generally and monitoring plots, mapping and reporting of bushfires.	
	Fauna mortality	B	2	5	Reduce fuel loads as per Bushfire Management Plan.	C	2	8	Once trigger as described in Table 7 has been reached.	Surveillance of property generally and monitoring plots, mapping and reporting of bushfires.	
Flood/major rainfall	Major erosion	C	2	8	• Control numbers of feral animals to reduce net grazing pressure; and • Maintain ground cover of native vegetation (note: livestock must be excluded from riparian areas.	D	2	12	Following major rainfall/flood events in the Biodiversity Offset Area.	Vegetation monitoring plots.	• Increased frequency of monitoring and management of feral animals; and • Removal of controlled grazing if flood/major rainfall event identified.
	Loss or decline of plant species	C	3	13	No controls required.	C	3	13	Following major rainfall/flood events in the	Vegetation monitoring plots.	

Hazard	Impact	Likelihood	Consequence	Risk Level	Controls	Residual Likelihood	Residual Consequence	Residual Risk Level	Remedial Trigger	Method of Detection	Contingency Measures
									Biodiversity Offset Area.		
Grazing by Feral pigs and/or rabbits	Failure to recruit new plants	C	2	5	Implement feral animal control program following methods proposed in Appendix B.	D	2	12	Measurable increase of feral pig or rabbit populations above baseline level.	• Vegetation monitoring plots; and • Population monitoring of feral animals.	• Increased frequency of monitoring and management of feral animals; and • Use of alternative methods of feral animal management.
	Soil disturbance	B	2	5	Implement feral animal control program following methods proposed in Appendix B.	C	2	8	Measurable increase of feral pig or rabbit populations above baseline level.	• Vegetation monitoring plots; and • Population monitoring of feral animals.	
	Loss or decline of plant species due to herbivory	B	2	5	Implement feral animal control program following methods proposed in Appendix B.	D	2	12	Measurable increase of feral pig or rabbit populations above baseline level.	Vegetation monitoring plots.	
	Introduction of plant diseases	C	2	5	Implement feral animal control program following methods proposed in Appendix B.	D	2	12	Measurable increase of feral pig or rabbit populations above baseline level.	• Vegetation monitoring plots; and • Population monitoring of feral animals.	

Hazard	Impact	Likelihood	Consequence	Risk Level	Controls	Residual Likelihood	Residual Consequence	Residual Risk Level	Remedial Trigger	Method of Detection	Contingency Measures
Wild Dogs/Foxes and Feral Cats	Predation on critical weight-range animals	B	1	2	Implement feral animal control program following methods proposed in Appendix B.	C	1	4	Measurable increase of wild dog/fox or feral cat populations above baseline levels.	Population monitoring of native and feral animals.	• Increased frequency of monitoring and management of feral animals; and • Use of alternative methods of feral animal management.
Use of 1080 poison (or other chemical) to control feral animals	Unintentional poisoning of native animals	C	2	8	1080 baiting will be conducted in accordance with the PCO 2010. All use will be developed to be feral animal specific and avoid non target species Remove all residual poison baits from area and enact trapping program for feral animal	D	2	12	Confirmed poisoning of native animals.	Monitoring of any occurrences of native animal deaths.	• Use of alternative methods of feral animal management.
Existing environmental weeds	Loss or decline of native plant species	C	2	8	Implement weed control program following methods proposed in Appendix B.	D	2	12	Not meeting performance criteria for weeds.	Surveillance of property generally and monitoring plots.	• Increased frequency of monitoring and management of weeds; and • Use of alternative methods of weed management.
	Loss of fauna habitat	C	2	8	Implement weed control program following methods proposed in Appendix B.	D	2	12	Not meeting performance criteria for weeds.	Surveillance of property generally and monitoring plots.	

Hazard	Impact	Likelihood	Consequence	Risk Level	Controls	Residual Likelihood	Residual Consequence	Residual Risk Level	Remedial Trigger	Method of Detection	Contingency Measures
New environmental weeds from livestock or vehicles entering site	Loss or decline of native plant species	C	2	8	Implement weed control program following methods proposed in Appendix B.	D	2	12	Occurrence of new weed species. Not meeting performance criteria.	Surveillance of property generally and monitoring plots.	• Use of alternative methods of management suitable for the new environmental weeds.
	Loss of fauna habitat	C	2	8	Implement weed control program following methods proposed in Appendix B.	D	2	12	Occurrence of new weed species. Not meeting performance criteria.	Surveillance of property generally and monitoring plots.	
Escaped livestock from control grazing areas	Loss or decline of native plant species and/or regeneration	C	3	13	Ensure fencing is suitable to restrict cattle movement and that all site personnel are aware of risks with use of signage.	D	3	17	Incident of escaped livestock during control grazing period.	Surveillance of property generally and control grazing areas.	• Removal of controlled grazing.
Edge effects from agriculture areas	Weed invasion	B	2	5	Implement weed control program following methods proposed in Appendix B.	D	2	12	Not meeting weed performance criteria for weeds.	• Visual inspection; and • Monitoring plots.	• Increased frequency of monitoring and management of weeds; and • Use of alternative methods of feral animal management.
	Feral animal invasion	B	2	5	• Check fencing and restrict access; and • Implement feral controls.	D	2	12	Measurable increase of feral animal populations above baseline level.	Surveillance of property generally and monitoring plots.	

Hazard	Impact	Likelihood	Consequence	Risk Level	Controls	Residual Likelihood	Residual Consequence	Residual Risk Level	Remedial Trigger	Method of Detection	Contingency Measures
	Stock access/grazing	B	2	5	Check fencing and restrict access to zone 3 areas.	D	2	12	Incident of escaped livestock during control grazing period.	Surveillance of property generally and monitoring plots.	• Removal of controlled grazing.
ZONE 2											
Drought	Loss or decline of native plant species	B	2	5	Increase frequency of monitoring and surveillance. If density of woody plants fall below threshold levels, supplementary plant and water where possible to maintain density.	C	2	8	Condition drop below baseline levels or not meeting performance criteria for vegetation.	Surveillance of property generally and monitoring plots.	• Increased frequency of monitoring and management of fuel loads; • Increased frequency of monitoring and management of feral animals; and • Removal of controlled grazing if drought conditions identified; and • Assisted revegetation.
	Increase in severity of bushfire	C	2	8	Reduce fuel loads as per Bushfire Management Plan.	D	2	12	Once trigger as described in Table 7 has been reached.	Surveillance of property generally and monitoring plots, mapping and reporting of bushfires.	
	Fail to establish plants	B	1	1	Additional planting as required; consider alternative planting methods	D	1	7	Failure to meet Year 10 performance criteria for Zone 2.	Surveillance and monitoring.	

Hazard	Impact	Likelihood	Consequence	Risk Level	Controls	Residual Likelihood	Residual Consequence	Residual Risk Level	Remedial Trigger	Method of Detection	Contingency Measures
	Erosion post-drought	B	2	5	• Remove stock to reduce net grazing pressure; • Control feral fauna to reduce net grazing pressure; and • Maintain ground cover of native vegetation.	D	2	12	Declaration of severe drought in the locality.	Surveillance of property generally and monitoring plots.	
Bushfire	Loss of tree hollows	C	2	8	Reduce fuel loads as per Bushfire Management Plan.	D	2	12	Once trigger as described in Table 7 has been reached.	Surveillance of property generally and monitoring plots, mapping and reporting of bushfires.	• Increased frequency of monitoring and management of fuel loads.
	Plant mortality	B	2	5	Reduce fuel loads as per Bushfire Management Plan.	C	2	8	Once trigger as described in Table 7 has been reached.	Surveillance of property generally and monitoring plots, mapping and reporting of bushfires.	
	Fauna mortality	B	2	5	Reduce fuel loads as per Bushfire Management Plan.	C	2	8	Once trigger as described in Table 7 has been reached.	Surveillance of property generally and monitoring plots, mapping and reporting of bushfires.	

Hazard	Impact	Likelihood	Consequence	Risk Level	Controls	Residual Likelihood	Residual Consequence	Residual Risk Level	Remedial Trigger	Method of Detection	Contingency Measures
Flood/major rainfall	Major erosion	C	2	8	• Remove stock to reduce net grazing pressure; • Control feral fauna to reduce net grazing pressure; and • Maintain ground cover of native vegetation.	D	2	12	Following major rainfall/flood events in the Biodiversity Offset Area.	Surveillance of property generally and monitoring plots.	• Increased frequency of monitoring and management of feral animals; • Removal of controlled grazing if flood/major rainfall event identified; and • Assisted revegetation.
	Loss or decline of plant species	C	3	13	• Supplementary plantings to maintain population numbers; and • Exclude stock for a period to limit disturbance and allow plants to recover.	D	3	17	Following major rainfall/flood events in the Biodiversity Offset Area.	Vegetation monitoring plots.	
Grazing by Feral pigs and/or Rabbits	Failure to recruit new plants	C	2	5	Implement feral animal control program following methods proposed in Appendix B.	D	2	12	Measurable increase of feral pig or rabbit populations above baseline level.	• Vegetation monitoring plots; and • Population monitoring of feral animals.	• Increased frequency of monitoring and management of feral animals; • Use of alternative methods of feral animal management; and • Assisted revegetation.
	Soil disturbance	B	2	5	Implement feral animal control program following methods proposed in Appendix B.	C	2	8	Measurable increase of feral pig or rabbit	• Vegetation monitoring plots; and	

Hazard	Impact	Likelihood	Consequence	Risk Level	Controls	Residual Likelihood	Residual Consequence	Residual Risk Level	Remedial Trigger	Method of Detection	Contingency Measures
									populations above baseline level.	• Population monitoring of feral animals.	
	Loss or decline of plant species due to herbivory	B	2	5	Implement feral animal control program following methods proposed in Appendix B.	D	2	12	Measurable increase of feral pig or rabbit populations above baseline level.	Vegetation monitoring plots.	
	Introduction of plant diseases	C	2	5	Implement feral animal control program following methods proposed in Appendix B.	D	2	12	Measurable increase of feral pig or rabbit populations above baseline level.	• Vegetation monitoring plots; and • Population monitoring of feral animals.	
Wild Dog/Foxes and Feral Cats	Predation on critical weight-range animals	B	1	2	Implement feral animal control program following methods proposed in Appendix B.	C	1	4	Measurable increase of wild dog/fox or feral cat populations above baseline level.	Population monitoring of native animals.	• Increased frequency of monitoring and management of feral animals; and • Use of alternative methods of feral animal management.

Hazard	Impact	Likelihood	Consequence	Risk Level	Controls	Residual Likelihood	Residual Consequence	Residual Risk Level	Remedial Trigger	Method of Detection	Contingency Measures
Use of 1080 poison (or other chemical) to control feral animals	Unintentional poisoning of native animals	C	2	8	Remove all residual poison baits from area and enact trapping program for feral animals	D	2	12	Native animal confirmed poisoning.	1080 baiting will be conducted in accordance with the PCO 2010. All use will be developed to be feral animal specific and avoid non target species. Monitoring of any occurrences of native animal deaths.	• Use of alternative methods of feral animal management.
Existing environmental weeds	Loss or decline of native plant species	C	2	8	Implement weed control program following methods proposed in Appendix B.	D	2	12	Not meeting performance criteria for weeds.	Surveillance of property generally and monitoring plots.	• Increased frequency of monitoring and management of weeds; and • Use of alternative methods of weed management.
	Loss of fauna habitat	C	2	8	Implement weed control program following methods proposed in Appendix B.	D	2	12	Not meeting performance criteria for weeds.	Surveillance of property generally and monitoring plots.	
New environmental weeds from livestock or	Loss or decline of native plant species	C	2	8	Implement weed control program following methods proposed in Appendix B.	D	2	12	Occurrence of new weed species. Not meeting performance criteria for weeds.	Surveillance of property generally and monitoring plots.	• Use of alternative methods of management suitable for the new

Hazard	Impact	Likelihood	Consequence	Risk Level	Controls	Residual Likelihood	Residual Consequence	Residual Risk Level	Remedial Trigger	Method of Detection	Contingency Measures
vehicles entering site	Loss of fauna habitat	C	2	8	Implement weed control program following methods proposed in Appendix B.	D	2	12	Occurrence of new weed species. Not meeting performance criteria for weeds.	Surveillance of property generally and monitoring plots.	environmental weeds.
Escaped livestock from control grazing areas	Loss or decline of native plant species and/or regeneration	C	3	13	Ensure fencing is suitable to restrict cattle movement to within Zone 2 areas only. Ensure all site personnel are aware of risks and strategy as to the use of control grazing. Ensure appropriate signage clearly identifying area currently being used for control grazing.	D	3	17	Incident of escaped livestock during control grazing period.	Surveillance of property generally and control grazing areas.	• Removal of controlled grazing.
Edge effects from agriculture areas	Weed invasion	B	2	5	Control weeds in grazing areas	D	2	12	Not meeting weed performance criteria.	• Visual inspection; and • Monitoring plots.	• Increased frequency of monitoring and management of weeds; and • Use of alternative methods of feral animal management. • Removal of controlled grazing.
	Feral animal invasion	B	2	5	• Check fencing and restrict access to conservation areas; and • Implement feral controls.	D	2	12	Increase of feral animal populations above baseline level.	Surveillance of property generally and monitoring plots.	

Hazard	Impact	Likelihood	Consequence	Risk Level	Controls	Residual Likelihood	Residual Consequence	Residual Risk Level	Remedial Trigger	Method of Detection	Contingency Measures
	Uncontrolled stock access/grazing	B	2	5	Check fencing and restrict access to conservation areas.	D	2	12	Incident of escaped livestock during control grazing period.	Surveillance of property generally and monitoring plots.	
ZONE 3											
Drought	Loss or decline of native plant species	B	3	9	Increase frequency of monitoring and surveillance. If density of woody plants fall below threshold levels, supplementary plant and water where possible to maintain density.	C	3	13	No controls recommended.	Surveillance of property generally and monitoring plots.	• Increased frequency of monitoring and management of fuel loads; • Increased frequency of monitoring and management of feral animals; and • Removal of controlled grazing if drought conditions identified.
	Increase severity of bushfire	C	2	8	Reduce fuel loads as per bushfire management plan.	D	2	12	Occurrence of unplanned/out of control bushfire within the Biodiversity Offset Area.	Surveillance of property generally and monitoring plots, mapping and reporting of bushfires.	
	Erosion post-drought	A	2	3	• Control numbers of feral animals to reduce net grazing pressure; and • Maintain ground cover of native vegetation (note:	C	2	8	Declaration of severe drought in the locality.	Surveillance of property generally and monitoring plots.	

Hazard	Impact	Likelihood	Consequence	Risk Level	Controls	Residual Likelihood	Residual Consequence	Residual Risk Level	Remedial Trigger	Method of Detection	Contingency Measures
					livestock excluded from riparian areas).						
Bushfire	Loss of tree hollows	B	2	5	Reduce fuel loads as per bushfire management plan.	C	2	8	Once trigger as described in Table 7 has been reached.	Surveillance of property generally and monitoring plots, mapping and reporting of bushfires.	• Increased frequency of monitoring and management of fuel loads.
	Plant mortality	B	2	5	Reduce fuel loads as per bushfire management plan.	C	2	8	Once trigger as described in Table 7 has been reached.	Surveillance of property generally and monitoring plots, mapping and reporting of bushfires.	
	Fauna mortality	B	2	5	Reduce fuel loads as per bushfire management plan.	C	2	8	Once trigger as described in Table 7 has been reached.	Surveillance of property generally and monitoring plots, mapping and reporting of bushfires.	

Hazard	Impact	Likelihood	Consequence	Risk Level	Controls	Residual Likelihood	Residual Consequence	Residual Risk Level	Remedial Trigger	Method of Detection	Contingency Measures
Flood/major rainfall	Major erosion	A	2	3	• Control numbers of feral animals to reduce net grazing pressure; • Maintain ground cover of native vegetation (note: livestock should be excluded from riparian areas); and • Stabilise slopes and creek banks.	C	2	8	Following major rainfall/flood events in the Biodiversity Offset Area.	Visual inspection after major rainfall or flood events.	• Increased frequency of monitoring and management of feral animals; and • Removal of controlled grazing if flood/major rainfall event identified.
	Loss or decline of plant species	C	3	13	Supplementary plantings to maintain population numbers.	D	3	17	Following major rainfall/flood events in the Biodiversity Offset Area.	Vegetation monitoring plots.	
Grazing by Feral pigs and/or Rabbits	Failure to recruit new plants/failure to establish new plantings	C	2	5	Implement feral control program following methods proposed in Appendix B.	D	2	12	Measurable increase of feral pig or rabbit populations above baseline level.	• Vegetation monitoring plots; and • Population monitoring of native and feral animals.	• Increased frequency of monitoring and management of feral animals; and

Hazard	Impact	Likelihood	Consequence	Risk Level	Controls	Residual Likelihood	Residual Consequence	Residual Risk Level	Remedial Trigger	Method of Detection	Contingency Measures
	Soil disturbance	B	2	5	Implement feral control program following methods proposed in Appendix B.	C	2	8	Measurable increase of feral pig or rabbit populations above baseline level.	• Vegetation monitoring plots; and • Population monitoring of native and feral animals.	• Use of alternative methods of feral animal management.
	Erosion of creek banks and sedimentation of stream	B	2	5	• Control numbers of feral animals to reduce net grazing pressure; • Maintain ground cover of native vegetation (note: livestock must be excluded from riparian areas); and • Stabilise slopes and creek banks.	C	2	8	Measurable increase of feral pig or rabbit populations above baseline level.	Surveillance of property generally and monitoring plots.	
	Loss or decline of plant species due to herbivory	B	2	5	Implement feral control program following methods proposed in Appendix B.	D	2	12	Measurable increase of feral pig or rabbit populations above baseline level.	Vegetation monitoring plots.	
	Introduction of plant diseases	C	2	5	Implement feral control program following methods proposed in Appendix B.	D	2	12	Measurable increase of feral pig or rabbit	• Vegetation monitoring plots; and	

Hazard	Impact	Likelihood	Consequence	Risk Level	Controls	Residual Likelihood	Residual Consequence	Residual Risk Level	Remedial Trigger	Method of Detection	Contingency Measures
									populations above baseline level.	• Population monitoring of native and feral animals.	
Wild Dog/Foxes and Feral Cats	Predation on critical weight-range animals	B	1	2	Implement feral control program following methods proposed in Appendix B.	C	1	4	Measurable increase of wild dog/fox or feral cat populations above baseline level.	Population monitoring of native and feral animals.	• Increased frequency of monitoring and management of feral animals; and • Use of alternative methods of management.
Use of 1080 poison (or other chemical) to control feral animals	Unintentional poisoning of native animals	C	2	8	Remove all residual poison baits from area and enact trapping program for feral animals	D	2	12	Native animal confirmed poisoning.	1080 baiting will be conducted in accordance with the PCO 2010. All use will be developed to be feral animal specific and avoid non target species. Monitoring of any occurrences of native animal deaths.	• Use of alternative methods of feral animal management.
Existing environmental weeds	Loss or decline of native plant species	C	2	8	Implement weed control program following methods proposed in Appendix B.	D	2	12	Not meeting performance criteria for vegetation.	Surveillance of property generally and monitoring plots.	• Increased frequency of monitoring and

Hazard	Impact	Likelihood	Consequence	Risk Level	Controls	Residual Likelihood	Residual Consequence	Residual Risk Level	Remedial Trigger	Method of Detection	Contingency Measures
	Loss of fauna habitat	C	2	8	Implement weed control program following methods proposed in Appendix B.	D	2	12	Not meeting performance criteria for fauna.	Surveillance of property generally and monitoring plots.	management of weeds; and • Use of alternative methods of weed management.
New environmental weeds from livestock or vehicles entering	Loss or decline of native plant species	C	2	8	Implement weed control program following methods proposed in Appendix B.	D	2	12	Occurrence of new weed species. Not meeting performance criteria for weeds.	Surveillance of property generally and monitoring plots.	• Use of alternative methods of management suitable for the new environmental weeds.
	Loss of fauna habitat	C	2	8	Implement weed control program following methods proposed in Appendix B.	D	2	12	Occurrence of new weed species. Not meeting performance criteria for weeds.	Surveillance of property generally and monitoring plots.	
Escaped livestock from control grazing areas	Loss or decline of native plant species and/or regeneration	C	3	13	Ensure fencing is suitable to restrict cattle movement and that all site personnel are aware of risks with use of signage.	D	3	17	Incident of escaped livestock during control grazing period.	Surveillance of property generally and control grazing areas.	• Removal of controlled grazing.
Edge effects from commercial areas	Elevated soil nutrients	B	2	5	• Limit use of fertilisers in commercial areas; and • Apply in areas with low potential for run-	C	2	8	Not meeting weed performance criteria.	• Visual inspection; and • Monitoring plots.	• Increased frequency of monitoring and management of weeds; and

Hazard	Impact	Likelihood	Consequence	Risk Level	Controls	Residual Likelihood	Residual Consequence	Residual Risk Level	Remedial Trigger	Method of Detection	Contingency Measures
					off and away from riparian areas.						• Use of alternative methods of feral animal management. • Removal of controlled grazing.
	Weed invasion	B	2	5	Control weeds in all infested areas	D	2	12	Not meeting weed performance criteria.	• Visual inspection; and • Monitoring plots.	
	Feral animal invasion	B	2	5	• Check fencing and restrict access to riparian areas; and • Implement feral controls.	D	2	12	Measurable increase of feral animal populations above baseline level.	Surveillance of property generally and monitoring plots.	
	Stock access/grazing	B	2	5	Check fencing and restrict access to riparian areas.	D	2	12	Incident of escaped livestock during control grazing period.	Surveillance of property generally and monitoring plots.	

APPENDIX D

BIODIVERSITY OFFSET AREAS CURRENT CONDITION

D.1 Kenalea Properties Offset Area

The Kenalea Properties Offset Area supports vegetation containing a low diversity of native species, due mostly to widespread degradation caused by past land clearance and grazing. The majority of the species recorded are understorey and ground layer species. The dominant plant families in the canopy and shrub layer are Myrtaceae and Fabaceae, represented mostly by the genera of Eucalyptus. In the understorey, the dominant plant families are Asteraceae and Poaceae.

Grey Box Intergrade – Blakely's Red Gum – Yellow Box Grassy Woodland

EPBC Act Status: White Box, Yellow Box, Blakely's Red Gum Grassy Woodland and Derived Native Grassland (CEEC)

TSC Act Status: White Box Yellow Box Blakely's Red Gum Woodland (EEC)

Biometric Vegetation Type: White Box – Yellow Box grassy woodland on basalt slopes in the upper Hunter Valley, Brigalow Belt South (HU654)

Condition: Moderate/Good

Grey Box/White Box Intergrade – Blakely's Red Gum - Yellow Box Grassy Woodland occurs along slopes, rolling hills and ridgetops on exposed aspects of the property. The canopy is generally characterised by *Eucalyptus moluccana x E. albens* (Grey Box/White Box Intergrade), *Eucalyptus blakelyi* and occasional *E. melliodora*. The understorey is open with a sparse to absent shrub cover of predominantly Cassinia quinquefaria and Notolaea microcarpa. The ground cover contains *Acaena* sp., *Dichondra repens*, *Veronica plebia*, *Aperula conferta*, *Microlaena stipoides* and *Poa labillardieri*.

On Easterly slopes of the site, the canopy of the community is predominantly *E. blakelyi* with occasional *E. moluccana x E. albens*, *Eucalyptus laveopinea* and *Hymenanthera dentata* in the shrub layer. On Westerly slopes, this community features a canopy of equal proportions of *E. moluccana x E. albens*, and *E. blakelyi*. *E. Meliodora* (Yellow Box) is also more frequent on these Westerly slopes.

Grey Box Intergrade – Blakely's Red Gum – Yellow Box Derived Native Grassland

EPBC Act Status: White Box, Yellow Box, Blakely's Red Gum Grassy Woodland and Derived Native Grassland (CEEC)

TSC Act Status: White Box Yellow Box Blakely's Red Gum Woodland (EEC)

Biometric Vegetation Type: White Box – Yellow Box grassy woodland on basalt slopes in the upper Hunter Valley, Brigalow Belt South (HU654)

Condition: Low

Native grasslands within the property that are derived from the clearing of Box Gum Woodland have been identified White Box/Grey Box Intergrade – Blakely's Red Gum – Yellow Box Woodland Derived Native Grasslands. Species present are characterised by those included in the understorey of Grey Box/White Box Intergrade – Blakely's Red Gum - Yellow Box Grassy Woodland.

Dry Rainforest

EPBC Act Status: Not listed

TSC Act Status: Dry Rainforest (EEC)

Biometric Vegetation Type: Shatterwood – Giant Stinging Tree – Yellow Tulipwood dry rainforest of the North Coast and northern Sydney Basin (HU613)

Condition: Moderate/Good

Small pockets of Dry Rainforest occur on the property in very sheltered gullies on deeper soils. This community is characterised by canopy species *Angophora floribunda* (Rough-barked Apple) and *Daphnandra micrantha* being co-dominant. The shrub species includes *Hymenanthera dentata*, *Pittosporum undulatum*, and *Ficus coronata* (Sandpaper Fig), and dense vine thickets of *Cissus antarctica* (Water Vine) and *Eustrephus latifolia* (Wombat Berry).

Blakely's Red Gum - White Box/Grey Box Intergrade Shrubby Woodland

EPBC Act Status: Not listed

TSC Act Status: Not listed

Biometric Vegetation Type: Rough-barked Apple – Silvertop Stringybark – Red Stringybark grassy open forest on hills of the upper Hunter Valley, southern North Coast (HU603)

Condition: Moderate/Good

Blakely's Red Gum - White Box x Grey Box Intergrade Shrubby Woodland occurs on the mid and upper slopes. The canopy is dominated by Eucalyptus albens (White Box) and E. blakelyi. The understorey is dense and shrubby. This community differentiates from the grassy variant by the dense and continual shrub cover of Cassinia quinquefaria, Dodenaea viscosa ssp. angustifolia and Myoproum montanum (Western Boobialla). The ground layer contains a mixture of grasses and herbs such as, Aristida ramosa, Bothriochloa spp (B. macra and B. decipiens), Scleria mackaviensis, Whalenbergia gracilis, Einadia polygaonoides, Plantago debilis and Rumex brownii.

This community does not qualify for listing under the EPBC Act or TSC Act due to the shrub cover being more than 30% over the entire patch.

Silvertop Stringybark - Blakely's Red Gum Shrubby Woodland

EPBC Act Status: Not listed

TSC Act Status: Not listed

Biometric Vegetation Type: Rough-barked Apple – Silvertop Stringybark – Red Stringybark grassy open forest on hills of the upper Hunter Valley, southern North Coast (HU603)

Condition: Moderate/Good

Silvertop Stringybark – Blakely's Red Gum Shrubby Woodland occurs on moderately sheltered Easterly slopes throughout the property, particularly towards the Southern end. The canopy layer in this community is dominated by Eucalyptus laveopinea, with Eucalyptus blakelyi occurring as either a co-dominant or occasional species depending on aspect (being less frequent on more sheltered slopes).

The shrub layer is typically dense to very dense and is dominated by *Cassinia quinquefaria*, with occasional *Hymenanthera dentata* and *Notolaea microcarpa*. The ground layer features a variety of herb and grass species including *Microlaena stipoides*, *Dichondra repens*, *Desmodium varians*, *Geranium solanderii*, *Hydrocotyle laxiflora* and *Poa labillardieri*.

Silvertop Stringybark - Rough-barked Apple Shrubby Woodland

EPBC Act Status: Not listed

TSC Act Status: Not listed

Biometric Vegetation Type: Rough-barked Apple – Silvertop Stringybark – Red Stringybark grassy open forest on hills of the upper Hunter Valley, southern North Coast (HU603)

Condition: Moderate/Good

Silvertop Stringybark – Rough-barked Apple Shrubby Woodland occurs on sheltered slopes of the Kenalea property, particularly in the Northern section. The canopy in this community is predominantly *Eucalyptus laveopinea*, with occasional *Angophora floribunda* occurring throughout. Towards the North-Eastern section of the property *Eucalyptus bridgesiana* and *Eucalyptus punctata* (Grey Gum) are also present in this community.

The shrub layer in this community is typically dense, featuring *Hymenanthera dentata*, *Olearia viscidula*, *Acacia paradoxa* and *Cassinia quinquefaria*. Ground layer species include *Microaena stipoides*, *Poa labillardieri*, *Ajuga australis*, *Acaena novea-zealandiae* and *Galium gaudichaudi*.

Silvertop Stringybark/ Mountain Gum/ Grey Gum moist shrub/grass tall open forest on ranges of the lower North Coast

EPBC Act Status: Not listed

TSC Act Status: Not listed

Biometric Vegetation Type: Messmate open forest of the tableland edge of the North Coast and New England Tablelands (HU569)

Condition: Moderate/Good

This vegetation community occurs on the far northern boundary of the previously named 'Echo' property. The canopy layer is co-dominated by *Eucalyptus laveopinea* (Silvertop Stringybark), *Eucalyptus cypellocarpa* (Mountain Gum), *Eucalyptus blakelyi* and *Eucalyptus caniculata* (Grey Gum).

The shrubby layer contains only three equally occurring species which are *Bursaria spinosa* (Blackthrorn), *Olearia viscidula* (Wallaby Weed) and *Cassinia quinquefaria*.

The ground flora is more diverse and it dominated by dicotolydons. The most frequently occurring species of these are *Acaena novae-zelandiae* (Bidgee-widgee), *Asperula conferta* (Common Woodruff), *Daucus glochidiatus* (Native carrot), *Dichondra repens*, *Geranium solanderi*, *Mentha satureioides* (Creeping mint) and *Pittosporum undulatum* (Native Daphne). Grasses were much less represented with *Microlaena stipoides* (Weeping Grass), *Poa labillardierei* and *Rytidosperma penicillatum* (Slender Wallaby Grass).

Silvertop Stringybark/White Box Intergrade shrubby open forest

EPBC Act Status: Not listed

TSC Act Status: Not listed

Biometric Vegetation Type: White Box – Narrow-leaved Ironbark shrubby open forest on the hills of the central Hunter Valley Sydney Basin (HU653)

Condition: Moderate/Good

The Silvertop Stringybark – White Box Intergrade shrubby open forest occurs on the southeast boundary of what used to be known as the Echo property. The canopy layer in this community is dominated by *Eucalyptus laveopinea*, with *Eucalyptus alba* occurring as either a co-dominant in some areas.

The shrub layer is relatively dense and is dominated by *Notelaea microcarpa* (Native Olive), *Olearia elliptica subsp. elliptica* and *Pittosporum undulatum*. Also occurring occasionally is *Bursaria spinosa* and *Melicytus dentatus* (Tree Violet). The ground layer features a variety of herb and grass species including *Microlaena stipoides*, *Dichondra repens*, *Desmodium varians, Geranium solanderii*, *Hydrocotyle laxiflora* and *Poa labillardieri*.

Silvertop Stringybark - Blakely's Red Gum Shrubland

EPBC Act Status: Not listed

TSC Act Status: Not listed

Biometric Vegetation Type: Rough-barked Apple – Silvertop Stringybark – Red Stringybark grassy open forest on hills of the upper Hunter Valley, southern North Coast (HU603)

Condition: Moderate/Good

Silvertop Stringybark – Blakely's Red Gum Shrubland occurs on moderately sheltered Easterly slopes throughout the property, particularly towards the Southern end. The canopy layer in this community is dominated by *Eucalyptus laveopinea*, with *Eucalyptus blakelyi* occurring as either a co-dominant or occasional species depending on aspect (being less frequent on more sheltered slopes).

The shrub layer is typically dense to very dense and is dominated by *Cassinia quinquefaria*, with occasional *Hymenanthera dentata* and *Notolaea microcarpa*. The ground layer features a variety of herb and grass species including *Microlaena stipoides*, *Dichondra repens*, *Desmodium varians*, *Geranium solanderii*, *Hydrocotyle laxiflora* and *Poa labillardieri*.

Narrow-leaved Ironbark Grassy Woodland

EPBC Act Status: Not listed (Closely related to Central Hunter Grey Box – Ironbark Woodland CEEC)

TSC Act Status: Not listed (Closely related to Central Hunter Grey Box – Ironbark Woodland CEEC)

Biometric Vegetation Type: White Box – Narrow-leaved Ironbark shrubby open forest on the hills of the central Hunter Valley Sydney Basin (HU653)

Condition: Moderate/Good

Narrow-leaved Ironbark Grassy Woodland occurs in one small area in the south east of the property. The canopy includes *Eucalyptus crebra* (Narrow-leaved Ironbark) and *Callitris glaucophylla* (White Cypress Pine) more common in the gully. The understorey is open and contains low densities of *Notelaea microcarpa* (Native Olive) and juvenile *Callitris glaucophylla.* The ground stratum is grassy and contains species such as *Cymbopogon refractus* (Barbwire Grass), *Aristida ramosa*, *Chloris ventricosa*, and *Vittidinia cuneata*.

Floristically, this community has close affinities with CEEC Central Hunter Grey Box – Ironbark Woodland; however it occurs beyond the known distribution of the listed CEEC.

Riparian River Oak Open Forest

EPBC Act Status: Not listed

TSC Act Status: Not listed

Biometric Vegetation Type: River Oak riparian woodland of the North Coast and northern Sydney Basin (HU598)

Riparian River Oak Open Forest is confined to permanent creeks within the property. This community is characterised by the dominant Casuarina cunninghamiana with Angophora floribunda also common. A small tree layer of *Callistemon sieberi* (River Bottlebrush) occurs as an occasional species towards the upper reaches of the main creek lines on the property. The understorey structure is open and modified from its original composition. Common species recorded in the ground stratum include *Pennisetum clandestinum* (Kikuyu), *Hordeum leporinum* (Barley Grass) and *Urtica urens*.

This community is heavily altered and degraded by farming practices along the valley floor as cattle have access to the creeks.

Fauna Habitat

The majority of the Kenalea Properties Offset Area comprises moderate/good quality remnant woodland, dissected by cleared and grazed gullies. Significant areas of woodland and forest exist across the offset, which have a high strategic value due to their proximity to the adjacent to the Mount Woolooma Nature Reserve. These areas of woodland and forest have a high diversity of habitat values, with vegetation comprising of dry rainforest, grassy woodland, riparian woodland, open Stringybark forest and shrubland. Furthermore, the diversity of vegetation types creates suitable roost, forage and nesting habitat for numerous threatened and non-threatened species known from the impact area and broader locality.

There are a number of small riparian corridors that dissect the property lined with River Oak that have mistletoe present on the branches providing feeding and commuting opportunities to threatened bird and bat species. Canopy species across the site comprise a mixture of smooth barked and rough barked species, with Stringybark, Box and Red Gum species being present, in addition to numerous mistletoes especially within the Box species present on the site. These species flower during different periods, providing a foraging resource for nectivorous species over a broad time period.

Topography and geology across the site are variable, with the gullies occurring on enriched soils and containing low slope angles, surrounded by steep hills derived from sandstone geology, typically with steep sides and ridges. Cliffs and boulders are present at the crests of these ridges, and talus beneath the steepest cliffs forms suitable habitat for small mammals and reptiles. Areas containing the highest proportion and largest hollows were the Box-Gum woodland vegetation communities.

Key habitat features within the Kenalea Properties Offset Area include:

- Ground cover, leaf litter, coarse woody debris and extensive rocky outcrops suitable as shelter for small terrestrial fauna species;
- Hollow-bearing trees and stags (including hollows of various sizes) suitable as shelter and breeding habitat for a range of hollow-dependent fauna;
- Blossom-producing trees and mistletoes suitable as forage for a range of nectarivores;
- Caves and rocky crevices and other suitable shelter or breeding habitat for a range of cave-dependent fauna;
- Dry Rainforest key foraging habitat for Spotted-tailed Quoll; and
- Connectivity within the site is maintained by existing patches of remnant woodland and open forest connected to extensive protected areas (i.e. Mount Woolooma Nature Reserve) outside the site.

Fauna Species

The habitats available within the Kenalea Properties Offset Area provide potential habitat for a suite of species listed under the TSC Act and/or EPBC Act. The following threatened and/or migratory fauna species have been recorded (either by the current or past surveys) the Kenalea Properties Offset Area:

- Brown Treecreeper (*Climacteris picumnus victoriae*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Speckled Warbler (*Chthonicola sagittatus*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Painted Honeyeater (*Grantiella picta*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Scarlet Robin (*Petroica boodang*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Hooded Robin (*Melanodryas cucullata*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Masked Owl (T*yto novaehollandiae*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Rufous Fantail (*Rhipidura rufifrons*) (TSC Act: Not listed; EPBC Act: Migratory);
- Fork-tailed Swift (*Apus pacificus*) (TSC Act: Not listed; EPBC Act: Migratory);
- Rainbow Bee-eater (*Merops ornatus*) (TSC Act: Not listed; EPBC Act: Migratory); and
- Spotted-tailed Quoll (*Dasyurus maculatus*) (TSC Act: Endangered; EPBC Act: Vulnerable).

There is also the potential for other threatened and/or migratory fauna species known from the locality to occur within the property, including threatened microbats, birds and mammals. An assessment of the habitat values provided by the Kenalea Properties Offset Area for threatened fauna assessed to be potentially impacted by the Project is provided in **Table D1**. The habitats provided by the Kenalea Properties Offset Area are currently in moderate to good condition.

Table D1 Habitat Features Present within Kenalea Properties for other Threatened Species Considered to be Impacted within the Disturbance Boundary

Common Name	Scientific Name	TSC Act Status	EPBC Act Status	Habitat Features Present
Birds				
Speckled Warbler	*Chthonicola sagittatus*	V		Foraging habitat present, particularly in areas with a grassy understorey. Breeding/nesting habitat present in the form of ground layer vegetation, fallen branches and leaf litter.
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis*	V		Extensive foraging habitat present in the form of blossom and nectar-producing trees, particularly in areas of *Eucalyptus albens*, *E. melliodora*, *E. blakelyi* and Ironbarks. Breeding/nesting habitat present in the form of eucalypts, particularly Box species.
White-throated Needletail	*Hirundapus caudacutus*		M	Potential to forage aerially above the site in summer. No breeding habitat present as breeding occurs outside of Australia.
Spotted Harrier	*Circus assimilis*	V		Foraging habitat present, particularly in areas of Box Gum Woodland and grassland. Breeding/nesting habitat present in the form of woodland vegetation in proximity to grassland.
Little Eagle	*Hieraaetus morphnoides*	V		Foraging habitat present, particularly in areas of open forest, woodland and grassland. Breeding/nesting habitat present in the form of tall living trees.
Barking Owl	*Ninox connivens*	V		Foraging habitat present within open forest and woodland areas. Breeding/nesting habitat present in the form of large tree hollows, particularly in riparian vegetation.
Mammals				
Squirrel Glider	*Petaurus norfolcensis*	V		Potential habitat in Box-dominated and Ironbark open forest and woodland. Nesting habitat in the form of hollow-bearing trees.
Bats				
Grey-headed Flying-fox	*Pteropus poliocephalus*	V	V	Extensive areas of foraging habitat within open forest and woodland vegetation with an abundance of fruiting trees.
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	V		Extensive areas of foraging habitat across the site in the form of open forest, woodland and grassland. Breeding/roosting habitat present in the form of hollow-bearing trees (of varying sizes), particularly within Manna Gum Riparian Woodland.
Eastern Freetail-bat	*Mormopterus norfolkensis*	V		Extensive areas of foraging habitat within open forest and woodland vegetation. Breeding/roosting habitat present in the form of tree hollows of various sizes.

Table D1 Habitat Features Present within Kenalea Properties for other Threatened Species Considered to be Impacted within the Disturbance Boundary

Common Name	Scientific Name	TSC Act Status	EPBC Act Status	Habitat Features Present
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	V	Extensive areas of foraging habitat within open forest and woodland vegetation. Breeding/roosting habitat present in the form of caves, rock crevices and cliff lines.
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	V		Extensive areas of foraging habitat within open forest and woodland vegetation. Breeding/roosting habitat present in the form of caves, rock crevices and cliff lines.
Eastern Bent-wing Bat	*Miniopterus orianae (f*ormerly *schreibersii) oceanensis*	V		Extensive areas of foraging habitat within open forest and woodland vegetation. Breeding/roosting habitat present in the form of caves, rock crevices and cliff lines.
Large-footed Myotis	*Myotis macropus*	V		Areas of foraging habitat on dams and creeks. Breeding/roosting habitat present in the form of caves, rock crevices and cliff lines.
Greater Broad-nosed Bat	*Scoteanax rueppellii*	V		Extensive areas of foraging habitat within open forest and woodland vegetation. Breeding/roosting habitat present in the form of caves, rock crevices and cliff lines.
Greater Long-eared Bat	*Nyctophilus corbeni (*formerly *N. timoriensis)*	V	V	Extensive areas of foraging habitat within open forest and woodland vegetation. Breeding/roosting habitat present in the form of tree hollows of various sizes.
Eastern Cave Bat	*Vespadelus troughtoni*	V		Extensive areas of foraging habitat within open forest and woodland vegetation. Breeding/roosting habitat present in the form of caves, rock crevices and cliff lines.

D.2 Black Mountain Offset Area

Over 250 flora species have been recorded within the Black Mountain Offset Area. The dominant plant families encountered have consistently been represented by the Poaceae, Asteraceae and Fabaceae families. Non-grass herbaceous groundcovers have the highest diversity.

There were 9 occurances of the epiphytic orchid Cymbidium canaliculatum. This is listed as Vulnerable under the *NSW Threatened Species Conservation Act 1995*.

Upland Grassy Box Woodland

EPBC Act Status: White Box, Yellow Box, Blakely's Red Gum Grassy Woodland and Derived Native Grassland (CEEC)

TSC Act Status: White box Yellow box Blakely's Red Gum Woodland (EEC)

Biometric Vegetation Type: White Box – Yellow Box grassy woodland on basalt slopes in the upper Hunter Valley, Brigalow Belt South (HU654)

Condition: Moderate/Good

This community occurs in the highest elevations to the north of the property. A suite of canopy species occur within this community including *Eucalyptus melliodora* (Yellow Box), *Eucalyptus laevopinea* (Silver Top Stringybark), *Eucalyptus blakelyi* (Blakely's Red Gum), *Eucalyptus bridgesiana* (Apple Box) and *Eucalyptus cypellocarpa* (Monkey Gum). The shrub layer is sparse and includes *Pittosporum undulatum* (Native Daphne), *Cassinia quinquefaria* and *Melicytus dentatus* (Tree Violet). Common grasses include *Poa labillardierei var. labillardierei* (Tussock), *Rytidosperma racemosum var. racemosum, Echinopogon ovatus* (Forest Hedgehog Grass) and *Elymus scaber*. Other native species in the ground layer include *Acaena novae-zelandiae* (Bidgee-widgee), *Dichondra repens* (Kidney Weed), *Geranium solanderi var. solanderi* (Austral Cranesbill), *Galium propinquum* (Maori Bedstraw) and *Pteridium esculentum* (Common Bracken). Exotic species commonly recorded include *Bidens pilosa* (Cobblers Pegs), *Conyza bonariensis* (Flaxleaf Fleabane) and *Taraxacum officinale* (Dandelion). Native climbers occurring in this community include *Glycine tabacina, Glycine clandestina, Clematis glycinoides var. glycinoides* (Headache Vine) and *Eustrephus latifolius* (Wombat Berry).

Midland Grassy Box Woodland

EPBC Act Status: White Box, Yellow Box, Blakely's Red Gum Grassy Woodland and Derived Native Grassland (CEEC)

TSC Act Status: White box Yellow box Blakely's Red Gum Woodland (EEC)

Biometric Vegetation Type: White Box – Yellow Box grassy woodland on basalt slopes in the upper Hunter Valley, Brigalow Belt South (HU654)

Condition: Moderate/Good

This community occurs in high elevations in the northwest and east of the property. The canopy is dominated by *Eucalyptus albens x moluccana* (White Box x Grey Box), *Eucalyptus melliodora* (Yellow Box) and *Eucalyptus blakelyi* (Blakely's Red Gum). Other species occurring in the canopy include *Eucalyptus laevopinea* (Silver Top Stringybark) and *Eucalyptus bridgesiana* (Apple Box).

Shrubs occurring in this community include *Swainsona galegifolia* (Smooth Darling-pea), *Cassinia quinquefaria* and *Solanum brownii* (Violet Nightshade).

A diversity of native herbs occur within this community. Grasses include *Rytidosperma racemosum var. racemosum*, *Aristida ramosa* (Purple Wiregrass), *Cymbopogon refractus* (Barbed Wire Grass) and *Microlaena stipoides var. stipoides*. Other native species in the ground layer include *Sigesbeckia orientalis subsp. orientalis* (Indian Weed) , *Dichondra repens* (Kidney Weed), *Plantago debilis, Galium propinquum* (Maori Bedstraw), *Geranium solanderi var. solanderi* (Austral Cranesbill), *Oxalis perennans, Ajuga australis* (Austral Bugle), *Arthropodium sp. B* and *Lomandra confertifolia subsp. pallida*. The exotic *Bidens pilosa* (Cobblers Pegs) was frequently recorded within this community. Native climbers occurring in this community *include Glycine tabacina, Clematis glycinoides var. glycinoides* (Headache Vine) and *Eustrephus latifolius* (Wombat Berry).

Lowland Grassy Box Woodland

EPBC Act Status: White Box, Yellow Box, Blakely's Red Gum Grassy Woodland and Derived Native Grassland (CEEC)

TSC Act Status: White box Yellow box Blakely's Red Gum Woodland (EEC)

Biometric Vegetation Type: White Box – Yellow Box grassy woodland on basalt slopes in the upper Hunter Valley, Brigalow Belt South (HU654)

Condition: Moderate/Good

This community occurs extensively across the southern half of the property. The canopy is dominated by *Eucalyptus albens x moluccana* (White Box x Grey Box), with *Eucalyptus crebra* (Narrow-leaved Ironbark), *Eucalyptus melliodora* (Yellow Box) and *Eucalyptus blakelyi* (Blakely's Red Gum) also occurring.

Species occurring in the small tree layer include regenerating canopy species and *Acacia implexa* (Hickory Wattle) and *Brachychiton populneus subsp. populneus* (Kurrajong).

The shrub layer is sparse and includes *Notelaea microcarpa var. macrocarpa* (Velvet Mock Olive), *Cassinia quinquefaria, Solanum brownii* (Violet Nightshade) and the exotic *Opuntia stricta var. stricta* (Common Prickly Pear).

A diversity of native species occurs in the ground layer. Grasses include *Aristida ramosa* (Purple Wiregrass), *Cymbopogon refractus* (Barbed Wire Grass), *Elymus scaber, Austrostipa scabra* (Speargrass), *Bothriochloa macra* (Red Grass) and *Chloris truncata* (Windmill Grass).

Other native herbs in the ground layer include *Dichondra repens* (Kidney Weed), *Asperula conferta* (Common Woodruff), *Calotis lappulacea* (Yellow Burr-daisy), *Desmodium brachypodum* (Large Tick-trefoil), *Einadia hastata* (Berry Saltbush), *Carex inversa, Lomandra multiflora subsp. multiflora* (Many-flowered Mat-rush), *Arthropodium milleflorum* (Pale Vanilla-lily) and *Cyperus gracilis* (Slender Flat-sedge). The exotic *Bidens pilosa* (Cobblers Pegs) was frequently recorded within this community. Native climbers occurring in this community include *Glycine tabacina, Glycine clandestina* and *Desmodium varians* (Slender Tick-trefoil).

Ribbon Gum - Pittosporum Forest

EPBC Act Status: Not listed

TSC Act Status: Not listed

Biometric Vegetation Type: Silvertop Stringybark grass/herb forest on hills of the upper Hunter Valley, Brigalow Belt South (HU616)

Condition: Moderate/Good

This community occurs exclusively in the far north of the property. The canopy is dominated by *Eucalyptus nobilis* (Ribbon Gum) and *Eucalyptus laevopinea* (Silvertop Stringybark). Other species occurring in the tree layer include *Eucalyptus cypellocarpa* (Monkey Gum), *Eucalyptus melliodora* (Yellow Box) and *Eucalyptus blakelyi* (Blakely's Red Gum).

The midstorey of this community is characterised by the presence of *Pittosporum undulatum* (Native Daphne). Other species recorded in the midstorey include *Acacia implexa* (Hickory Wattle) and *Allocasuarina torulosa* (Forest Oak).

A diversity of native species occur in the ground layer. Common grasses include *Poa labillardierei var. labillardierei* (Tussock), *Echinopogon ovatus* (Forest Hedgehog Grass) and *Microlaena stipoides var. stipoides*. Other species occurring in the ground layer include *Arthropodium sp. B, Lomandra confertifolia subsp. pallida, Pteridium esculentum* (Common Bracken), *Dichondra repens* (Kidney Weed), *Galium propinquum* (Maori Bedstraw), *Acaena novae-zelandiae* (Bidgee-widgee), *Plantago debilis, Desmodium gunnii* (Slender Tick Trefoil) and *Senecio hispidulus* (Hill Fireweed). Exotic species were recorded at low densities within this community and species include *Senecio madagascariensis* (Fireweed), *Sonchus oleraceus* (Common Sowthistle) and *Taraxacum officinale* (Dandelion). Native climbers occurring in this community include *Clematis glycinoides var. glycinoides* (Headache Vine) and *Eustrephus latifolius* (Wombat Berry).

Socketwood Vine Thicket

EPBC Act Status: Not listed

TSC Act Status: Not listed

Biometric Vegetation Type: Native Olive – Rusty Fig semi-evergreen vine thicket of the upper Hunter Valley, Sydney Basin (HU578)

Condition: Moderate/Good

This community occurs in two small pockets in the north of the property. The dominant emergent species within this community is *Daphnandra apatela*. Other emergent species include *Eupomatia laurina* (Bolwarra), *Acmena smithii* (Lilly Pilly), *Alectryon subcinereus* (Native Quince), *Pittosporum undulatum* (Native Daphne) and *Melicytus dentatus* (Tree Violet). Vines occurring in this community include *Cissus antarctica* (Kangaroo Vine), *Cissus hypoglauca* (Water Vine), *Pandorea pandorana* (Wonga Wonga Vine), *Aphanopetalum resinosum* (Gum Vine), *Eustrephus latifolius* (Wombat Berry), *Geitonoplesium cymosum* (Scrambling Lily), *Stephania japonica var. discolor* (Snake Vine) and *Tylophora barbata* (Bearded Tylophora). Species in the ground layer include *Pellaea falcata* (Sickle Fern), *Calochlaena dubia* (Rainbow Fern), *Stellaria flaccida* and *Urtica incisa* (Stinging Nettle).

Sydney Blue Gum Forest

EPBC Act Status: Not listed

TSC Act Status: Not listed

Biometric Vegetation Type: Sydney Blue Gum - New England Blackbutt tall moist forest in the Barrington area of the North Coast (HU636)

Condition: Moderate/Good

This community occurs in two small areas in the northern portion of the property. The canopy is dominated by *Eucalyptus saligna* (Sydney Blue Gum) and *Angophora floribunda* (Rough-barked Apple). Species recorded within the midstorey include *Acmena smithii* (Lilly Pilly), *Alectryon subcinereus* (Native Quince), *Daphnandra apatela* and *Pittosporum undulatum* (Native Daphne).

Shrubs recorded within this community include *Melicytus dentatus* (Tree Violet), *Breynia oblongifolia* (Coffee Bush), *Claoxylon australe* (Bittlewood) and *Plectranthus parviflorus* (Cockspur Flower).

Species occurring in the ground layer include *Adiantum formosum* (Black Stem Maidenhair), *Doodia aspera* (Prickly Rasp Fern), *Urtica incisa* (Stinging Nettle), *Viola hederacea* (Ivy-leaved Violet), *Oplismenus imbecillis* (Creeping Beard Grass) and *Microlaena stipoides var. stipoides*. A suite of climbers occur within this community including *Cissus antarctica* (Kangaroo Vine), *Clematis glycinoides var. glycinoides* (Headache Vine) and *Eustrephus latifolius* (Wombat Berry).

Ironbark Grassy Woodland

EPBC Act Status: Close affinities with CEEC Central Hunter Grey Box – Ironbark Woodland

TSC Act Status: Close affinities with CEEC Central Hunter Grey Box – Ironbark Woodland

Biometric Vegetation Type: Narrow-leaved Ironbark shrubby open forest on hills of the central Hunter Valley, Sydney Basin (HU575)

Condition: Moderate/Good

This community occurs on the slopes within the Lowland Grassy Box Woodland in the Southern half of the property. The canopy is dominated by *Eucalyptus crebra* (Narrow-leaved Ironbark). Species occurring in the small tree layer include regenerating canopy species and *Acacia implexa* (Hickory Wattle) and *Brachychiton populneus subsp. populneus* (Kurrajong).

Shrubs recorded within this community include the native *Cassinia quinquefaria, Notelaea microcarpa var. macrocarpa* (Velvet Mock Olive) and *Acacia paradoxa* (Kangaroo Thorn), and the exotic *Opuntia stricta var. stricta* (Common Prickly Pear).

Grasses occurring in this community include *Aristida ramosa* (Purple Wiregrass), *Cymbopogon refractus* (Barbed Wire Grass), *Austrostipa scabra subsp. falcata, Chloris truncata* (Windmill Grass), *Panicum effusum* (Hairy Panic) and *Sporobolus creber* (Western Rat-tail Grass). Other native species occurring in the ground layer include *Desmodium brachypodum* (Large Tick-trefoil), *Dichondra repens* (Kidney Weed), *Calotis lappulacea* (Yellow Burr-daisy), *Euchiton sphaericus, Plantago debilis, Lomandra multiflora subsp. multiflora* (Many-flowered Mat-rush) and *Cyperus gracilis* (Slender Flat-sedge). A number of exotic species were recorded within the ground layer including *Senecio madagascariensis* (Fireweed), *Conyza bonariensis* (Flaxleaf Fleabane), *Lepidium africanum* and *Paronychia brasiliana* (Chilean Whitlow Wort). The native climber, *Glycine tabacina*, occurs within this community.

Midland Shrubby Box Woodland

EPBC Act Status: Not listed

TSC Act Status: Not listed

Biometric Vegetation Type: White Box – Narrow-leaved Ironbark shrubby open forest on the hills of the central Hunter Valley, Sydney Basin (HU653)

Condition: Moderate/Good

This community occurs in one patch in the centre of the northern proportion of the property. The canopy is dominated by *Eucalyptus albens x moluccana* (White Box x Grey Box), with *Eucalyptus melliodora* (Yellow Box) and *Angophora floribunda* (Rough-barked Apple) occurring less frequently. Species in the small tree layer include *Acacia implexa* (Hickory Wattle) and *Brachychiton populneus subsp. populneus* (Kurrajong). This community is characterised by a dense layer of *Cassinia quinquefaria*.

Other species recorded within the shrub layer include the native *Notelaea microcarpa var. macrocarpa* (Velvet Mock Olive), *Hibbertia rufa* (Brown Guinea Flower) and *Swainsona galegifolia* (Smooth Darling-pea), and the exotic *Opuntia stricta var. stricta* (Common Prickly Pear).

A diversity of native species occurs in the ground layer. Grasses include *Aristida ramosa* (Purple Wiregrass), *Cymbopogon refractus* (Barbed Wire Grass) and *Poa labillardierei var. labillardierei* (Tussock). Other herbs include *Sigesbeckia orientalis subsp. orientalis* (Indian Weed), *Sigesbeckia australiensis, Geranium solanderi var. solanderi* (Austral Cranesbill), *Dichondra repens* (Kidney Weed), *Cheilanthes sieberi subsp. sieberi* (Poison Rock Fern), *Arthropodium sp. B* and *Lomandra confertifolia subsp. pallida*. The exotic *Bidens pilosa* (Cobblers Pegs) was frequently recorded within this community. Native climbers occurring in this community include *Glycine tabacina, Clematis glycinoides var. glycinoides* (Headache Vine) and *Glycine clandestina*.

River Oak Forest

EPBC Act Status: Not listed

TSC Act Status: Not listed

Biometric Vegetation Type: River Oak Riparian woodland of the North Coast and northern Sydney Basin (HU598)

Condition: Moderate/Good

This community occurs in one riparian corridor that runs from the north to the western boundary. The canopy is characterised by the presence of *Casuarina cunninghamiana subsp. cunninghamiana* (River Oak), however other canopy species also occur including *Angophora floribunda* (Rough-barked Apple). Native species recorded in the ground layer include *Microlaena stipoides var. stipoides, Poa labillardierei var. labillardierei* (Tussock), *Dichondra repens* (Kidney Weed), *Rumex brownii* (Swamp Dock), *Urtica incisa* (Stinging Nettle), *Commelina cyanea* (Native Wandering Jew) and *Adiantum aethiopicum* (Common Maidenhair). Exotic species are common within this community and include *Bidens pilosa* (Cobblers Pegs), *Bidens subalternans* (Greater Beggar's Ticks), *Verbena bonariensis* (Purpletop) and *Conyza bonariensis* (Flaxleaf Fleabane).

Derived Grassland and Herblands

EPBC Act Status: Not listed

TSC Act Status: Not listed

Biometric Vegetation Type: Derived grasslands of the slopes on the Merriwa Plateau (HU671)

Condition: Low

This community occurs in numerous small, cleared patches across all sections of the property. These have previously been cleared for grazing purposes which has altered the composition of species. A suite of native and exotic species occur within this community and form a matrix of derived grasslands and herblands. Native grasses occurring within this community include *Aristida ramosa* (Purple Wiregrass), *Eragrostis leptostachya* (Paddock Lovegrass) and *Poa labillardierei var. labillardierei* (Tussock).

Exotic grasses recorded include *Pennisetum clandestinum* (Kikuyu Grass) and *Urochloa panicoides* (Urochloa Grass). Native herbs occurring within this community include *Calotis lappulacea* (Yellow Burr-daisy), *Einadia hastata* (Berry Saltbush), *Geranium solanderi var. solanderi* (Austral Cranesbill) and *Dichondra repens* (Kidney Weed). Common exotic herbs include *Bidens pilosa* (Cobbler's Pegs), *Senecio madagascariensis* (Fireweed), *Carthamus lanatus* (Saffron Thistle), *Conyza bonariensis* (Flaxleaf Fleabane) and *Lepidium africanum*.

Fauna Habitat

Habitat on Black Mountain can be divided into three broad regions across a north – south altitude gradient. The majority of the property is vegetated, and the entire property consists of steep topography with ephemeral stony creeks separating valleys.

The northern region of the property has the highest altitude is mostly comprised of Ribbon Gum Forest. Along this northern ridgeline there is a mature canopy with a diverse mid-storey, and frequent fallen timber and dense native ground cover. The mid regions of the property are comprised of Shrubby Box Woodland – and Midland Grassy Box Woodland. This region has had substantial logging and grazing pressure and as a result the mid-storey is absent. Whilst lacking habitat complexity, this area provides key feed species such as E. albens and E. crebra for threatened fauna such as the Swift Parrot and Regent Honeyeater; known to migrate through the region. There are several areas of dry rainforest along scree slopes, which are foraging and latrine habitats for Spotted-tailed Quolls. The southern half of the property is comprised of a mosaic of open derived grassland and Lowland Grassy Box Woodland; and offers a large area of feeding habitat for migratory nectivorous birds when in blossom. There is a riparian corridor along the south – western boundary of the property which is dominated by Casuarina sp. although water flow is limited to localised rainfall events due to the steep topography and subsequent small catchment.

Excepting the northern ridgeline, the property offers limited fallen logs and old timber for hollow roosting species; however, the majority of canopy species are approaching maturity and will offer suitable habitat in coming years. There are no major cliffs on the property and only one small rocky outcrop.

Key habitat features within Black Mountain Offset Area include:

- Ground cover, leaf litter, and some coarse woody debris suitable as shelter for small terrestrial fauna species;
- Hollow-bearing trees and stags (including hollows of various sizes) suitable as shelter and breeding habitat for a range of hollow-dependent fauna;
- Blossom-producing trees and mistletoes suitable as forage for a range of nectarivores; and
- Key foraging habitat for Spotted-tailed Quoll.

Species

The habitats available within the Black Mountain Offset Area provide potential habitat for a suite of species listed under the TSC Act and/or EPBC Act. The following threatened and/or migratory fauna species have been recorded (either by the current or past surveys) within the Black Mountain Offset Area:

- Speckled Warbler (*Chthonicola sagittatus*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Painted Honeyeater (*Grantiella picta*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Grey-crowned Babbler (*Pomatostomus temporalis*) (TSC Act: Vulnerable; EPBC Act: not listed); and
- Squirrel Glider (*Petaurus norfolcensis*) (TSC Act: Vulnerable; EPBC Act: not listed).

There is also the potential for other threatened and/or migratory fauna species known from the locality to occur within the property, including threatened microbats, birds and mammals. An assessment of the habitat values provided by the Black Mountain Offset Area for threatened fauna assessed to be potentially impacted by the Project is provided in **Table D2**. The habitats provided by the Black Mountain Offset Area are currently in moderate condition.

Table D2
Habitat Features Present within Black Mountain for other Threatened Species Considered to be Impacted within the Disturbance Boundary

Common Name	Scientific Name	TSC Act Status	EPBC Act Status	Habitat Features Present
Birds				
Brown Treecreeper	*Climacteris picumnus victoriae*	V		Abundant foraging habitat present, particularly in Box-dominated vegetation and where fallen logs and branches abundant. Breeding/nesting habitat present in the form of tree hollows of a suitable size.
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis gularis*	V		Extensive foraging habitat present in the form of blossom and nectar-producing trees, particularly in areas of Eucalyptus albens, E. melliodora, E. blakelyi and Ironbarks. Breeding/nesting habitat present in the form of eucalypts, particularly Box species.
White-throated Needletail	*Hirundapus caudacutus*		M	Potential to forage aerially above the site in summer. No breeding habitat present as breeding occurs outside of Australia.
Fork-tailed Swift	*Apus pacificus*		M	
Spotted Harrier	*Circus assimilis*	V		Foraging habitat present, particularly in areas of Box Gum Woodland and grassland. Breeding/nesting habitat present in the form of woodland vegetation in proximity to grassland.
Little Eagle	*Hieraaetus morphnoides*	V		Foraging habitat present, particularly in areas of open forest, woodland and grassland. Breeding/nesting habitat present in the form of tall living trees.
Barking Owl	*Ninox connivens*	V		Foraging habitat present within open forest and woodland areas. Breeding/nesting habitat present in the form of large tree hollows, particularly in riparian vegetation.
Rainbow Bee-eater	*Merops ornatus*		M	Foraging habitat present in the form of open forest and woodlands. Breeding/nesting habitat in proximity to watercourses.
Mammals				
Spotted-tailed Quoll	*Dasyurus maculatus*	V	E	Extensive areas of suitable habitat in the form of open forest and woodland vegetation. Potential den sites present in the form of hollow-bearing trees, fallen logs, small caves, rock crevices and rocky cliff faces.

Table D2
Habitat Features Present within Black Mountain for other Threatened Species Considered to be Impacted within the Disturbance Boundary

Common Name	Scientific Name	TSC Act Status	EPBC Act Status	Habitat Features Present
Bats				
Grey-headed Flying-fox	*Pteropus poliocephalus*	V	V	Extensive areas of foraging habitat within open forest and woodland vegetation with an abundance of fruiting trees.
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	V		Extensive areas of foraging habitat across the site in the form of open forest, woodland and grassland. Breeding/roosting habitat present in the form of hollow-bearing trees (of varying sizes), particularly within Manna Gum Riparian Woodland.
Eastern Freetail-bat	*Mormopterus norfolkensis*	V		Extensive areas of foraging habitat within open forest and woodland vegetation. Breeding/roosting habitat present in the form of tree hollows of various sizes.
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	V	Extensive areas of foraging habitat within open forest and woodland vegetation. Breeding/roosting habitat present in the form of caves, rock crevices and cliff lines.
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	V		Extensive areas of foraging habitat within open forest and woodland vegetation. Breeding/roosting habitat present in the form of caves, rock crevices and cliff lines.
Eastern Bent-wing Bat	*Miniopterus orianae (formerly schreibersii) oceanensis*	V		Extensive areas of foraging habitat within open forest and woodland vegetation. Breeding/roosting habitat present in the form of caves, rock crevices and cliff lines.
Large-footed Myotis	*Myotis macropus*	V		Areas of foraging habitat on dams and creeks. Breeding/roosting habitat present in the form of caves, rock crevices and cliff lines.
Greater Broad-nosed Bat	*Scoteanax rueppellii*	V		Extensive areas of foraging habitat within open forest and woodland vegetation. Breeding/roosting habitat present in the form of caves, rock crevices and cliff lines.
Greater Long-eared Bat	*Nyctophilus corbeni (formerly N. timoriensis)*	V	V	Extensive areas of foraging habitat within open forest and woodland vegetation. Breeding/roosting habitat present in the form of tree hollows of various sizes.
Eastern Cave Bat	*Vespadelus troughtoni*	V		Extensive areas of foraging habitat within open forest and woodland vegetation. Breeding/roosting habitat present in the form of caves, rock crevices and cliff lines.

D.3 Merriwa River Offset Area

Over 300 flora species have been recorded within the Merriwa Offset Area. The dominant plant families encountered have consistently been represented by the Poaceae, Asteraceae, Myrtaceae and Fabaceae (Faboideae) families. Non-grass herbaceous groundcovers have the highest diversity. There is a relatively high density of exotic species occur within the Merriwa River Offset Area, primarily Common Prickly Pear and Tiger Pear. These were primarily confined to areas containing stock, within or in close proximity and along drainage lines and dams.

No threatened flora species were found on the Merriwa River Offset Area; however, suitable habitat is present for the two threatened species known or likely to be within the Disturbance Area.

Box Woodland on Basalt

EPBC Act Status: White Box, Yellow Box, Blakely's Red Gum Grassy Woodland and Derived Native Grassland (CEEC)

TSC Act Status: White box Yellow box Blakely's Red Gum Woodland (EEC)

Biometric Vegetation Type: White Box - Yellow Box grassy woodland on basalt slopes in the upper Hunter Valley, Brigalow Belt South (HU654)

Condition: Moderate/Good

This community occurs in a single patch in the centre of the property. The canopy is dominated by *Eucalyptus albens* (White Box) with *Eucalyptus nubila* (Blue-leaved Ironbark) occurring frequently. Species occurring in the small tree layer varied with regenerating *E. Albens*, *Acacia doratoxylon* (Currawang) and *Acacia parramattensis* (Parramatta Wattle).

The shrub layer was sparse and predominately represented by occurrences of native species *Acrotriche rigida* and *Notelaea microcarpa var. macrocarpa* (Velvet Mock Olive). Within this community there was also presence of the exotic *Opuntia stricta var. stricta* (Common Prickly Pear) and *Opuntia aurantiaca* (Tiger Pear).

Grasses occurring in this community include *Aristida vagans* (Threeawn Speargrass), *Chloris ventricosa* (Plump Windmill Grass), *Dichanthium sericeum subsp. Sericeum* (Queensland Bluegrass) and *Microlaena stipoides var. Stipoides*. Other native species occurring in the ground layer include *Oxalis perennans*, *Brunoniella australis* (Blue Trumpet), *Calotis lappulacea* (Yellow Burr-daisy), *Geranium solanderi var. Solanderi*, *Goodenia rotundifolia*, *Plantago debilis* and *Cheilanthes sieberi subsp. sieberi* (Poison Rock Fern).

Callitris Shrubby Open Forest

EPBC Act Status: Not listed

TSC Act Status: Not listed

Biometric Vegetation Type: Grey Gum - Narrow-leaved Stringybark - ironbark woodland on ridges of the upper Hunter Valley, Sydney Basin (HU552) – Variant

Condition: Moderate/Good

This community occurs mainly in the southern section of the property and in one small pocket in the northeast. The canopy is co-dominated by *Eucalyptus fibrosa* (Red Ironbark) and *Callitris endlicheri* (Black Cypress Pine). The small tree layer is sparsely vegetated with *Allocasuarina gymnanthera* and juvenile *C. endlicheri*.

The more densely vegetated shrub layer is dominated by *Acrotriche rigida* and *Leucopogon muticus* (Blunt Beard-heath) with frequent occurrences of *Persoonia linearis* (Narrow-leaved Geebung) and *Choretrum glomeratum* (Berry Broombush).

The ground layer comprises *Pomax umbellata*, *G. rotundifolia*, *Cleistochloa rigida*, *Digitaria ramularis* and *Entolasia stricta* (Wiry Panic). Other monocots occurring in the ground layer include Lepidosperma gunnii, *Lomandra multiflora subsp. multiflora* (Many-flowered Mat-rush) and *Gahnia aspera* (Rough Saw-sedge).

Ironbark Shrubby Open Forest on Sandstone (Narrow-leaved Ironbark)

EPBC Act Status: Not listed - close affinities with CEEC Central Hunter Grey Box – Ironbark Woodland

TSC Act Status: Not listed - close affinities with CEEC Central Hunter Grey Box – Ironbark Woodland

Biometric Vegetation Type: Ironbark - Grey Gum shrubby woodland of sandy gullies in the upper Hunter Valley, Sydney Basin (HU560)

Condition: Moderate/Good

This community occurs extensively through the central portion of the property. The canopy is dominated by *Eucalyptus crebra* (Narrow-leaved Ironbark) with frequent occurances of *E. fibrosa* and occasional *E. nubila*. Species occurring in the small tree layer include regenerating canopy species and Allocasuarina gymnanthera.

Shrubs dominate the mid-layer and species recorded within this community include the native *L. muticus*, *P. linearis*, *Hibbertia circumdans* and Acacia *A. rigida*, and the exotic *O. aurantiaca.*

Grasses occurring in this community include *Aristida ramosa* (Purple Wiregrass), *A. vagans*, *Austrostipa scabra subsp. falcata*, *Cleistochloa rigida*, *Eragrostis lacunaria* and *Digitaria ramularis*. Other native species occurring in the ground layer include *C. sieberi subsp. sieberi*, *Cheilanthes distans*, *G. rotundifolia*, *Pomax umbellata* and *Dianella revoluta var. revoluta.*

Ironbark Shrubby Open Forest on Sandstone (Red Ironbark)

EPBC Act Status: Not listed

TSC Act Status: Not listed

Biometric Vegetation Type: Ironbark - Grey Gum shrubby woodland of sandy gullies in the upper Hunter Valley, Sydney Basin (HU560) – Variant

Condition: Moderate/Good

This community occurs across all sections of the property but primarily in the north and north-eastern parts. The canopy is dominated by *E. fibrosa* with occasional of *E. crebra*. The small tree layer was sparse with the presence of Eucalyptus aenea and A. doratoxylon.

The shrub layer was varied with *Leucopogon muticus*, *Acrotriche rigida*, *Dodonaea viscosa subsp. cuneata*, *Cassinia quinquefaria*, *Hibbertia acicularis* and *Hibbertia circumdans* dominating. There is also the frequent occurance of the exotic *Opuntia stricta var. stricta*.

The fern *Cheilanthes sieberi subsp. sieberi*; dicots *Goodenia rotundifolia, Pomax umbellata, Einadia hastata* and grasses *Austrostipa scabra subsp. falcata, Aristida ramosa, Aristida vagans, Digitaria ramularis* and *Microlaena stipoides var. stipoides* dominated the sparsely vegetated ground layer.

Low Open Forest - Scrub Complex on Sandstone Plateaus

EPBC Act Status: Not listed

TSC Act Status: Not listed

Biometric Vegetation Type: Ironbark - Grey Gum shrubby woodland of sandy gullies in the upper Hunter Valley, Sydney Basin (HU560)

Condition: Moderate/Good

This community occurs mainly in the eastern half of the property. This community's canopy layer was dominated by regenerating *Allocasuarina gymnanthera* and *Corymbia trachyphloia subsp. amphistomatica* with scattered canopy species made up of *Eucalyptus fibrosa*.

The shrub layer was extensive dominated by *Acrotriche rigida, Leucopogon muticus, Persoonia linearis, Dodonaea viscosa subsp. cuneata* and *Platysace ericoides*.

The ground layer is more sparsely vegetated dominated by dicots *Goodenia rotundifolia, Pomax umbellata, Oxalis perennans, Phyllanthus hirtellus, Solanum campanulatum* and the fern *Cheilanthes sieberi subsp. sieberi*. Grasses that occur occasionally were *Aristida ramosa, Aristida vagans* and *Microlaena stipoides var. stipoides*.

Mallee Grassy Open Forest on Narrabeen Conglomerate

EPBC Act Status: Not listed

TSC Act Status: Not listed

Biometric Vegetation Type: Grey Gum - Narrow-leaved Stringybark - ironbark woodland on ridges of the upper Hunter Valley, Sydney Basin (HU552)

Condition: Moderate/Good

This community occurs in five small pockets spread across the property and was formed of occasional mallee *Eucalyptus nubila*. Other canopy species included *Eucalyptus albens*, *Eucalyptus crebra* and *Eucalyptus punctata*. Few emergent trees were present.

Shrubs were more numerous but with less than 25% cover and included frequent *Acacia verniciflua, Dodonaea viscosa subsp. cuneata, Choretrum sp., Hibbertia acicularis, Bursaria spinosa* and *Dillwynia sieberi*. Exotic species *Opuntia aurantiaca* and *Opuntia stricta var. stricta* were also present within this community.

The ground flora was dominated by monocots *Lepidosperma laterale, Lomandra multiflora subsp. multiflora, Gahnia aspera* and *Lomandra filiformis subsp. coriacea*.

Narrow-leaved Ironbark Alluvial Grassy Open Forest

EPBC Act Status: Not listed

TSC Act Status: Not listed

Biometric Vegetation Type: Ironbark - Grey Gum shrubby woodland of sandy gullies in the upper Hunter Valley, Sydney Basin (HU560)

Condition: Moderate/Good

This community occurs in two areas on the western boundary. The tree layer was entirely Eucalyptus crebra in mature and regenerating forms.

The shrub layer was sparse consisting of exotics *Opuntia aurantiaca* and *Opuntia stricta var. stricta* and *Cassinia quinquefaria*.

The ground flora diversity was more extensive dominated by *Cheilanthes sieberi subsp. sieberi, Vittadinia sp., Wahlenbergia gracilis, Dichondra repens, Ajuga australis, Oxalis perennans, Glycine tabacina* and *Microlaena stipoides var. stipoides* all in equal abundance.

Redgum Alluvial Grassy Open Forest

EPBC Act Status: Not listed

TSC Act Status: Not listed

Biometric Vegetation Type: Rough-barked Apple - Grey Gum grassy open forest of the hinterland hills of the Central Coast, Sydney Basin (HU601)

Condition: Moderate/Good

This community occurs on the valley floors of three communities on the western boundary and one on the eastern boundary. The canopy is dominated by a variety of trees including *Eucalyptus blakelyi* (Blakely's Red Gum), *Angophora floribunda* (Rough-barked Apple), *Eucalyptus punctata* (Grey Gum) and *Corymbia trachyphloia subsp. amphistomatica*.

Shrub diversity was numerous in this community with *Acrotriche rigida, Leucopogon muticus, Cassinia quinquefaria, Persoonia linearis, Choretrum glomeratum* (Berry Broombush) and *Dodonaea viscosa subsp. cuneata* dominated. The exotic shrub *Opuntia stricta var. stricta* was also present within this layer.

Grasses dominate the ground layer with *Microlaena stipoides var. stipoides, Panicum simile, Aristida ramosa, Aristida vagans, Digitaria ramularis* and *Eragrostis lacunaria* occurring frequently. *Cheilanthes sieberi subsp. sieberi* and *Pomax umbellata* also dominated.

Sheltered Shrubby Open Forest Complex in Sandstone Gullies

EPBC Act Status: Not listed

TSC Act Status: Not listed

Biometric Vegetation Type: Narrow-leaved Ironbark - Grey Gum shrubby woodland on footslopes on the upper Hunter Valley, Sydney Basin (HU574)

Condition: Moderate/Good

This community is co-dominated by Eucalyptus punctata and Eucalyptus fibrosa. Regenerating trees are few with rare occurances of Acacia doratoxylon and Acacia parramattensis.

Shrubs were numerous and included the commonly occurring species of *Acrotriche rigida, Leucopogon muticus, Persoonia linearis, Platysace ericoides, Styphelia triflora, Podolobium ilicifolium* and *Bursaria longisepala*. As with much of the Merriwa River Offset Area, *Opuntia stricta var. stricta* occurred regularly in this community.

Herbs were the more dominating ground flora with *Solanum campanulatum, Goodenia rotundifolia, Oxalis perennans, Pomax umbellata, Brachyscome multifida var. multifida* (Cut-leaf Daisy), *Taraxacum officinale* (Dandelion), *Wahlenbergia gracilis* (Sprawling Bluebell), *Einadia hastata* and *Veronica plebeia* (Trailing Speedwell) all occurring. Grasses were sparsely present with *Microlaena stipoides var. stipoides* the only species of note.

Fauna Habitat

Merriwa River Offset Area is a lowland area reaching 350m at its highest point. The area contains vast amounts of sandstone outcropping with numerous caves. It also contains a number of small dams and several creeks. Significant areas of woodland and forest exist across the offset, which have a high strategic value due to their proximity to the adjacent to the Goulburn River National Park.

Canopy species across the site comprise a mixture of smooth barked and rough barked species, with Ironbark, Box and Red Gum species being present, in addition to numerous mistletoes especially within the Box species present on the site. Furthermore, these species flower during different periods, providing a foraging resource for nectivorous species over a broad time period.

Key habitat features within the Merriwa River Offset Area include:

- Ground cover, leaf litter, coarse woody debris and extensive rocky outcrops suitable as shelter for small terrestrial fauna species;
- Suitable Spotted-tailed Quoll foraging habitat;
- Blossom-producing trees and mistletoes suitable as forage for a range of nectarivores;
- Extensive caves and rocky crevices and other suitable shelter or breeding habitat for a range of cave-dependent fauna;
- Extensive rocky outcrops suitable for Brush-tailed Rock-wallaby;
- Numerous water bodies suitable for feeding bats including Large-footed Myotis;
- Box and Ironbark Woodlands containing numerous hollows suitable for arboreal mammals and large owls; and
- Connectivity within the site is maintained by existing patches of remnant woodland and open forest connected to extensive protected areas (i.e. Goulburn River National Park) outside the site.

Species

The habitats available within the Merriwa River Offset Area provide potential habitat for a suite of species listed under the TSC Act and/or EPBC Act. The following threatened and/or migratory fauna species have been recorded (either by the current or past surveys) the Merriwa River Offset Area:

- Brown Treecreeper (*Climacteris picumnus victoriae*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Speckled Warbler (*Chthonicola sagittatus*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Painted Honeyeater (*Grantiella picta*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Turquoise Parrot (*Neophema pulchella*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Glossy Black-cockatoo (*Calyptorhynchus lathami*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Grey-crowned Babbler (*Pomatostomus temporalis*) (TSC Act: Vulnerable; EPBC Act: not listed);
- Rainbow Bee-eater (*Merops ornatus*) (TSC Act: Not listed; EPBC Act: Migratory);
- Brush-tailed Rock-wallaby (*Petrogale penicillata*) (TSC Act: Endangered; EPBC Act: Vulnerable);
- Squirrel Glider (*Petaurus norfolcensis*) (TSC Act: Vulnerable; EPBC Act: not listed); and
- South-eastern Long-eared Bat (*Nyctophilus corbeni*) (TSC Act: Vulnerable; EPBC Act: Vulnerable).

There is also the potential for other threatened and/or migratory fauna species known from the locality to occur within the property, including threatened microbats, birds and mammals. An assessment of the habitat values provided by the Merriwa River Offset Area for threatened fauna assessed to be potentially impacted by the Project is provided in **Table D3**. The habitats provided by the Merriwa River Offset Area are currently in moderate to good condition.

Table D3
Habitat Features Present within Merriwa River for other Threatened Species Considered to be Impacted within the Disturbance Boundary

Common Name	Scientific Name	TSC Act Status	EPBC Act Status	Habitat Features Present
Birds				
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis*	V		Extensive foraging habitat present in the form of blossom and nectar-producing trees, particularly in areas of Eucalyptus albens, E. melliodora, E. blakelyi and Ironbarks. Breeding/nesting habitat present in the form of eucalypts, particularly Box species.
White-throated Needletail	*Hirundapus caudacutus*		M	Potential to forage aerially above the site in summer. No breeding habitat present as breeding occurs outside of Australia.
Fork-tailed Swift	*Apus pacificus*		M	
Spotted Harrier	*Circus assimilis*	V		Foraging habitat present, particularly in areas of Box Gum Woodland and grassland. Breeding/nesting habitat present in the form of woodland vegetation in proximity to grassland.
Little Eagle	*Hieraaetus morphnoides*	V		Foraging habitat present, particularly in areas of open forest, woodland and grassland. Breeding/nesting habitat present in the form of tall living trees.
Barking Owl	*Ninox connivens*	V		Foraging habitat present within open forest and woodland areas. Breeding/nesting habitat present in the form of large tree hollows, particularly in riparian vegetation.
Mammals				
Spotted-tailed Quoll	*Dasyurus maculatus*	V	E	Extensive areas of suitable habitat in the form of open forest and woodland vegetation. Potential den sites present in the form of hollow-bearing trees, fallen logs, small caves, rock crevices and rocky cliff faces.
Bats				
Grey-headed Flying-fox	*Pteropus poliocephalus*	V	V	Extensive areas of foraging habitat within open forest and woodland vegetation with an abundance of fruiting trees.
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	V		Extensive areas of foraging habitat across the site in the form of open forest, woodland and grassland. Breeding/roosting habitat present in the form of hollow-bearing trees (of varying sizes), particularly within Manna Gum Riparian Woodland.
Eastern Freetail-bat	*Mormopterus norfolkensis*	V		Extensive areas of foraging habitat within open forest and woodland vegetation. Breeding/roosting habitat present in the form of tree hollows of various sizes.
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	V	Extensive areas of foraging habitat within open forest and woodland vegetation. Breeding/roosting habitat present in the form of caves, rock crevices and cliff lines.

Table D3
Habitat Features Present within Merriwa River for other Threatened Species Considered to be Impacted within the Disturbance Boundary

Common Name	Scientific Name	TSC Act Status	EPBC Act Status	Habitat Features Present
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	V		Extensive areas of foraging habitat within open forest and woodland vegetation. Breeding/roosting habitat present in the form of caves, rock crevices and cliff lines.
Eastern Bent-wing Bat	*Miniopterus orianae (formerly schreibersii) oceanensis*	V		Extensive areas of foraging habitat within open forest and woodland vegetation. Breeding/roosting habitat present in the form of caves, rock crevices and cliff lines.
Large-footed Myotis	*Myotis macropus*	V		Areas of foraging habitat on dams and creeks. Breeding/roosting habitat present in the form of caves, rock crevices and cliff lines.
Greater Broad-nosed Bat	*Scoteanax rueppellii*	V		Extensive areas of foraging habitat within open forest and woodland vegetation. Breeding/roosting habitat present in the form of caves, rock crevices and cliff lines.
Eastern Cave Bat	*Vespadelus troughtoni*	V		Extensive areas of foraging habitat within open forest and woodland vegetation. Breeding/roosting habitat present in the form of caves, rock crevices and cliff lines.