Peabody ENERGY

APPENDIX E

BIODIVERSITY ASSESSMENT REPORT AND BIODIVERSITY OFFSET STRATEGY

WILPINJONG EXTENSION PROJECT

BIODIVERSITY ASSESSMENT REPORT AND BIODIVERSITY OFFSET STRATEGY

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EXECUTIVE SUMMARY

This Biodiversity Assessment Report and Biodiversity Offset Strategy was prepared by Dr Colin Driscoll (Hunter Eco) for the Wilpinjong Extension Project (the Project), a proposed extension of open cut operations at the Wilpinjong Coal Mine located approximately 40 kilometres (km) north-east of Mudgee, New South Wales (NSW).

Wilpinjong Coal Pty Limited (WCPL), a wholly owned subsidiary of Peabody Energy Australia Pty Limited, is seeking approval for the Project under Division 4.1 of Part 4 of the NSW *Environmental Planning and Assessment Act, 1979* and Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act).

This document was prepared in accordance with the NSW *Framework for Biodiversity Assessment* and the NSW *Biodiversity Offset Policy for Major Projects* (the NSW Offset Policy) which commenced on 1 October 2014 for a 12 to 18 month transitional period. Since Commonwealth matters will be assessed under the assessment bilateral agreement with NSW, this document also provides an assessment on the relevant EPBC Act listed threatened species and communities.

The NSW *Framework for Biodiversity Assessment* requires the use of an online program (the *Credit Calculator for Major Projects and BioBanking* [the Credit Calculator]) to assess biodiversity impacts and determine the biodiversity offset requirements for those impacts. There are three stages described in this document:

- Stage 1 involves summarising the biodiversity values of the disturbance area that are inputs into the Credit Calculator (e.g. landscape features, native vegetation and threatened species);
- Stage 2 involves assessing the potential impacts on biodiversity, describing impact avoidance and mitigation measures and determining the offset requirements; and
- Stage 3 involves describing how WCPL intends to offset the impacts of the Project on biodiversity (i.e. the Biodiversity Offset Strategy).

The EPBC *Act Offsets Assessments Guide* (i.e. the Commonwealth Offset Calculator) was also applied to the Project.

Stage 1 Biodiversity Assessment

The majority of the Project is situated in a wide valley floor between hills and escarpments of the Goulburn River National Park to the north and Munghorn Gap Nature Reserve to the south. The Biodiversity Assessment Report Development Site Footprint (BAR Footprint) is mostly (65 percent [%]) cleared land, though it also contains approximately 354 hectares (ha) of native vegetation, comprising dry sclerophyll forests and grassy woodlands in moderate to good condition.

The flora and fauna values of the BAR Footprint and surrounds have been comprehensively surveyed over the past 10 years. In 2014 and 2015, additional flora surveys were undertaken by Hunter Eco and additional fauna surveys were undertaken by Biodiversity Monitoring Services.

Targeted surveys were undertaken by Hunter Eco for potentially occurring threatened ecological communities listed under the NSW *Threatened Species Conservation Act, 1995* (TSC Act) and EPBC Act. One endangered ecological community listed under the TSC Act occurs in the BAR Footprint, namely approximately 9.5 ha of *White Box - Yellow Box - Blakely's Red Gum Woodland Endangered Ecological Community* (Box-Gum Woodland EEC) (it is also listed as the *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered Ecological Community* [Box-Gum Woodland CEEC] under the EPBC Act).

Hunter Eco also undertook targeted searches for potentially occurring threatened flora species and populations listed under the TSC Act and EPBC Act. A single threatened flora species listed under the TSC Act occurs in the BAR Footprint, being, *Ozothamnus tesselatus* (also listed under the EPBC Act).

Targeted surveys were also undertaken by Biodiversity Monitoring Services for all potentially occurring threatened fauna species listed under the TSC Act and EPBC Act, even though the NSW *Framework for Biodiversity Assessment* only requires certain threatened fauna species to be surveyed (i.e. threatened fauna species which are species credit species defined as species that cannot be predicted based on habitat and therefore generate separate offset requirements). A total of 26 threatened fauna species listed under the TSC Act have been recorded within or immediately surrounding the BAR Footprint during current and previous surveys, comprising 16 birds and 10 mammals, of which eight are bats. Two threatened fauna species listed under the EPBC Act (both listed as 'Vulnerable') have been recorded in the BAR Footprint, namely, Corben's Long-eared Bat (*Nyctophilus corbeni*) and Large-eared Pied Bat (*Chalinolobus dwyeri*).

No threatened fauna species which are species credit species have been recorded inside the BAR Footprint. Two threatened fauna species which are species credit species have been recorded outside the BAR Footprint but are assumed to have potential habitat in the BAR Footprint, namely, Regent Honeyeater (*Anthochaera phrygia*) and Koala (*Phascolarctos cinereus*) (both listed under the TSC Act and EPBC Act). No core Koala habitat (defined by *State Environmental Planning Policy No. 44*) occurs in the BAR Footprint.

Stage 2 Impact Assessment

The likely direct, indirect and cumulative impacts on biodiversity have been assessed and impact avoidance and mitigation measures have been identified and described. A number of measures to avoid and minimise impacts on biodiversity are currently implemented at the Wilpinjong Coal Mine and these would be continued for the Project (e.g. vegetation clearance protocols, weed management and progressive rehabilitation). Additional measures to avoid and minimise impacts on biodiversity are proposed (e.g. temporary fencing of *Ozothamnus tesselatus* during vegetation clearance near the known occurrences, subject to detailed design relocation of ancillary infrastructure (e.g. roads and pipelines).

The result of running the Credit Calculator is that the Project requires a Biodiversity Offset Strategy which accounts for a total of 15,314 ecosystem credits and a range of species credits for *Ozothamnus tesselatus,* Regent Honeyeater and Koala (Table ES-1).

Table ES-1
Project Credit Requirements

Credit Class		BAR Footprint	Credits
Ecosystem Credits		354 ha	15,314
Species Credits	*Ozothamnus tesselatus*	589 individuals	23,560
	Regent Honeyeater (*Anthochaera phrygia*)	273 ha potential habitat	21,021
	Koala (*Phascolarctos cinereus*)	165 ha potential habitat	4,290

Further consideration is given to potential impacts on Box-Gum Woodland EEC/CEEC, *Ozothamnus tesselatus* and Regent Honeyeater. It is concluded that with the proposed measures to avoid, mitigate and offset it is appropriate for these impacts to occur without further modifications to the Project.

Assessments of Significance in accordance with section 5A of the EP&A Act have been undertaken and it is concluded that the Project would not result in a significant impact to any listed threatened species or ecological community. Similarly, an assessment of impacts on the relevant threatened species and communities listed under the EPBC Act has been undertaken and it is concluded that none would be significantly impacted.

Stage 3 Biodiversity Offset Strategy

The existing Biodiversity Offset Strategy for the Wilpinjong Coal Mine would be augmented with an additional Biodiversity Offset Strategy for the Project, which comprises land-based offset areas and mine site rehabilitation.

Five land-based offsets comprising a total of 1,100 ha have been selected for the Project (Table ES-2). The offset areas are strategically located to adjoin Goulburn River National Park and Munghorn Gap Nature Reserve, with the potential to increase the extent of these existing protected areas.

Table ES-2
Offset Areas

Offset Area	Location Relative to the Project	Total Area (ha)[#]
1	Immediately south, adjoining Munghorn Gap Nature Reserve	201
2	Approximately 1.5 km south, adjoining Munghorn Gap Nature Reserve	441
3	Approximately 8.5 km east, adjoining Goulburn River National Park	164
4	Approximately 7.5 km east, adjoining Goulburn River National Park	39
5	Approximately 7 km east, adjoining Goulburn River National Park	255
	Total	**1,100**

[#] Includes native vegetation, pasture/cultivation, dams, rivers and existing infrastructure.

Flora surveys and fauna surveys were undertaken within the five offset areas, and identified Box-Gum Woodland EEC/CEEC and a number of threatened species (including a large population of *Ozothamnus tesselatus*).

In addition, approximately 610 ha of the BAR Footprint is proposed to be revegetated to woodland, and in the medium to long-term, this would lead to a greater area of woodland than would be cleared for the Project (354 ha). This would build on the gains and areas of woodland that would be rehabilitated due to the existing/approved Wilpinjong Coal Mine.

Conclusion

This document explains how current State and Commonwealth guidelines have been applied to assess the likely adverse direct, indirect and cumulative impacts on biodiversity from the Project.

There is likely to be a short to medium term impact on a number of threatened species due to the loss of woodland/forest habitat but there would be no net impact on any threatened species over the medium to long-term, when taking into consideration the measures proposed to mitigate and offset impacts.

Although the Project was declared a controlled action under the EPBC Act, this assessment provides more detailed information than was available at the time the Project was referred to the Commonwealth government. This assessment describes how the removal of limited potential habitat would not significantly impact any threatened species or communities listed under the EPBC Act. The potential impacts on protected matters would be localised and negligible on a regional, state and national scale.

The Biodiversity Offset Strategy for the Project includes commitments by WCPL to progressively rehabilitate parts of the post-mine landform to native woodland, as well as commitments to conserve and enhance significant areas of existing native vegetation, including habitat for a range of threatened flora and fauna species. It is concluded that the Project would improve the biodiversity values of the region in the medium to long-term.

1 INTRODUCTION

1.1 PROJECT OVERVIEW

The Wilpinjong Extension Project (the Project) is a proposed extension of open cut operations at the Wilpinjong Coal Mine for an additional operational life of approximately seven years (i.e. to 2033). The Wilpinjong Coal Mine is located approximately 40 kilometres (km) north-east of Mudgee, New South Wales (NSW), and is owned and operated by Wilpinjong Coal Pty Limited (WCPL), a wholly owned subsidiary of Peabody Energy Australia Pty Limited.

WCPL is seeking approval from the NSW Minister for Planning for a Development Consent under Division 4.1 of Part 4 of the NSW *Environmental Planning and Assessment Act, 1979* (EP&A Act) for the Project.

The Project would include the following activities:

- open cut mining of run-of-mine (ROM) coal from the Ulan Coal Seam and Moolarben Coal Member in Mining Lease (ML) 1573 and in new Mining Lease Application areas in Exploration Licence (EL) 6169 and EL 7091;
- approximately 800 hectares (ha) of open cut extensions including:
  - approximately 500 ha of incremental extensions to the existing open cut pits in areas of ML 1573 and EL 6169;
  - development of a new open cut pit of approximately 300 ha in EL 7091 (Pit 8);
- continued production of up to 16 million tonnes per annum (Mtpa) of ROM coal;
- continued use of the Wilpinjong Coal Mine Coal Handling and Preparation Plant and general coal handling and rail loading facilities and other existing and approved supporting mine infrastructure;
- rail transport of approximately 13 Mtpa of thermal product coal to domestic and export customers (within existing maximum and annual average daily rail limits);
- relocation of a section of the TransGrid Wollar to Wellington 330 kilovolt (kV) electricity transmission line (ETL) to facilitate mining in Pit 8;
- various local infrastructure relocations to facilitate the mining extensions (e.g. realignment of Ulan-Wollar Road and associated rail level crossing, relocation of local ETLs and services);
- construction and operation of additional mine access roads to service new mining facilities located in Pits 5 and 8;
- construction and operation of new ancillary infrastructure in support of mining including mine infrastructure areas, ROM pads, haul roads, electricity supply, communications installations, light vehicle roads, access tracks, remote crib huts, up-catchment diversions, dams, pipelines and other water management structures;
- extension of the approved mine life by approximately seven years (i.e. from approximately 2026 to 2033);
- a peak operational workforce of approximately 625 people;
- ongoing exploration activities; and
- other associated minor infrastructure, plant and activities.

The regional location of the Project is shown on Figure 1 and the general arrangement is shown on Figure 2.

On 12 February 2015, the Project was referred under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) (EPBC 2015/7431). The referred Action did not include the approved Wilpinjong Coal Mine that has either been previously referred and determined not to be a Controlled Action or previously determined not to require referral under the EPBC Act but has received all relevant State approvals.

On 12 March 2015, a delegate of the Commonwealth Minister for the Environment declared the action to be a 'controlled action' for the purpose of the EPBC Act due to potential adverse impacts on the following controlling provisions under Part 3 of the EPBC Act:

- sections 18 and 18A of the EPBC Act (listed threatened species and communities); and
- sections 24D and 24E of the EPBC Act (a water resource, in relation to coal seam gas development and large coal mining development).

The action is to be assessed under the assessment bilateral agreement with NSW. Accordingly, this document provides an assessment of those components of the Project which comprise the action on the relevant threatened species and communities listed under the EPBC Act.

1.2 GENERAL DESCRIPTION OF THE DEVELOPMENT SITE

The Biodiversity Assessment Report Development Site Footprint (BAR Footprint) (Figure 3) is referred to through-out this assessment and is defined as the development site construction and operational footprint for the purposes of this Biodiversity Assessment Report and Biodiversity Offset Strategy. The BAR Footprint is 1,022 ha in size comprising the proposed open cut extension area and associated infrastructure areas, and would involve clearing of 354 ha of native vegetation. It should also be noted that the BAR Footprint is indicative and may vary slightly following further detailed mine planning and particularly the detailed design of supporting infrastructure. While some changes to the BAR footprint would be expected over the life of the Project, any such changes are expected to be minor and therefore would have no material impact on biodiversity values.

1.3 ASSESSMENT REQUIREMENTS/APPROACH

This document was prepared in accordance with the Secretary's Environmental Assessment Requirements (SEARs) for the Environmental Impact Statement (EIS). In general, the objectives of this assessment were to:

- provide an overview, drawn from detailed reports, of the terrestrial flora and vertebrate fauna characteristics of the BAR Footprint and surrounds;
- provide an assessment of the likely adverse impacts of the Project on terrestrial flora and fauna, including listed threatened species, populations and ecological communities under the NSW *Threatened Species Conservation Act, 1995* (TSC Act) and EPBC Act;
- describe measures that would be implemented to avoid and mitigate impacts on terrestrial flora and fauna; and
- describe an additional Biodiversity Offset Strategy to maintain or improve biodiversity values of the region in the medium to long-term.

LEGEND

- Mining Lease Boundary
- Exploration Licence Boundary
- Authorisation Boundary
- Biodiversity Assessment Report
- Development Site Footprint
- Local Government Boundary
- NSW State Forest
- National Park, Nature Reserve or State Conservation Area
- Mining Operation

Source: NSW Land & Property Information (2015);
NSW Dept of Industry (2015; Geoscience Australia (2011)

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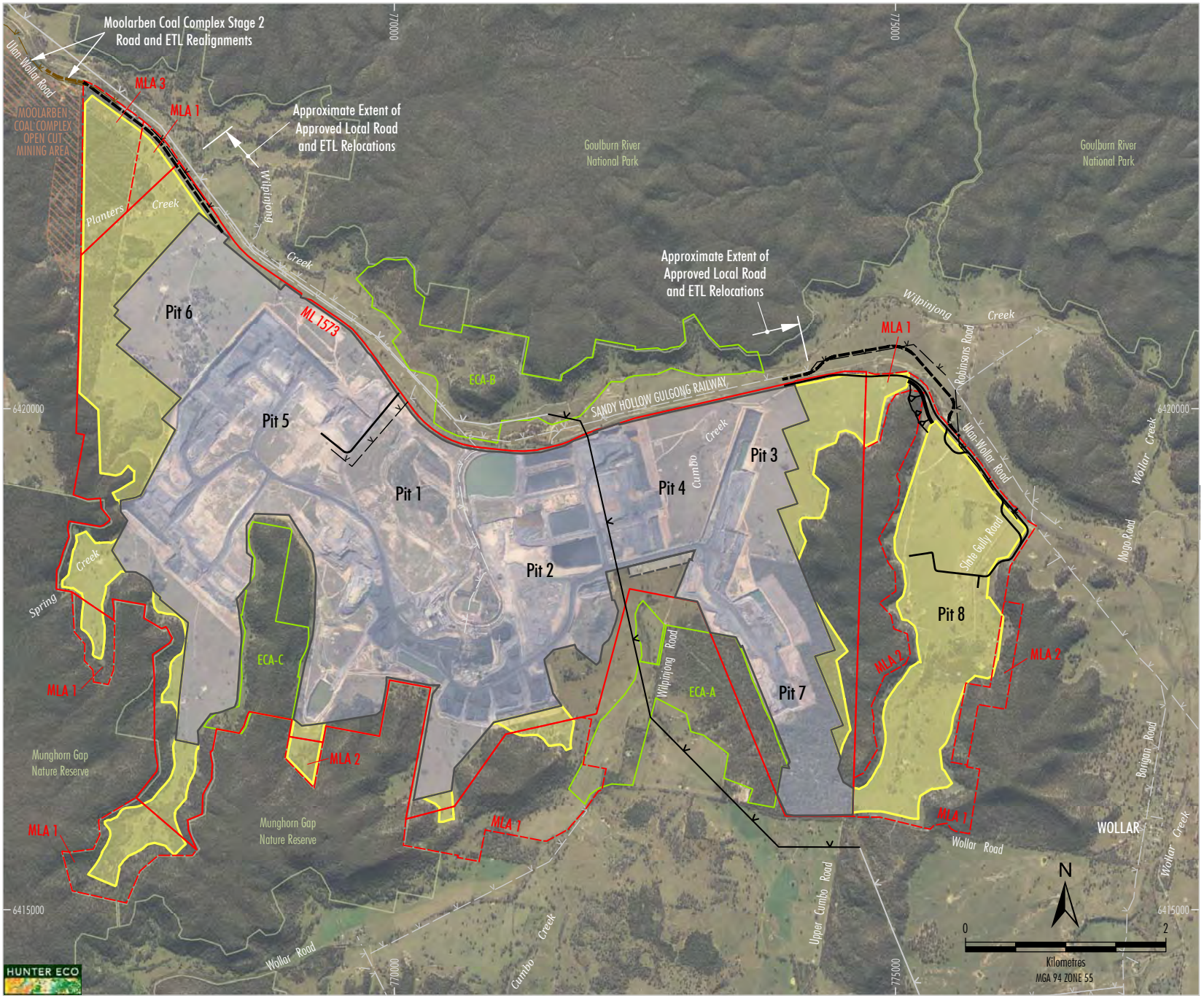
WILPINJONG EXTENSION PROJECT

Regional Location

Figure 1

WIL-12-12_WEP_EIS_BAR BOS_201A



LEGEND

- Mining Lease Boundary
- Mining Lease Application Boundary
- Approved/Existing Open Cut and Contained Infrastructure Area
- Relocated Block Bank and Cumbo Creek Disturbance Area
- Proposed Open Cut Extension Area
- Proposed Public Road Realignment
- Proposed Pit 3/8 Haul Road
- Proposed Service Road
- Proposed Local ETL Realignment/Relocation
- Proposed Relocated TransGrid 330 kV ETL
- Existing Local ETL
- Existing TransGrid 330 kV ETL
- Enhancement and Conservation Area

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (Jun 2015; Jun 2014)

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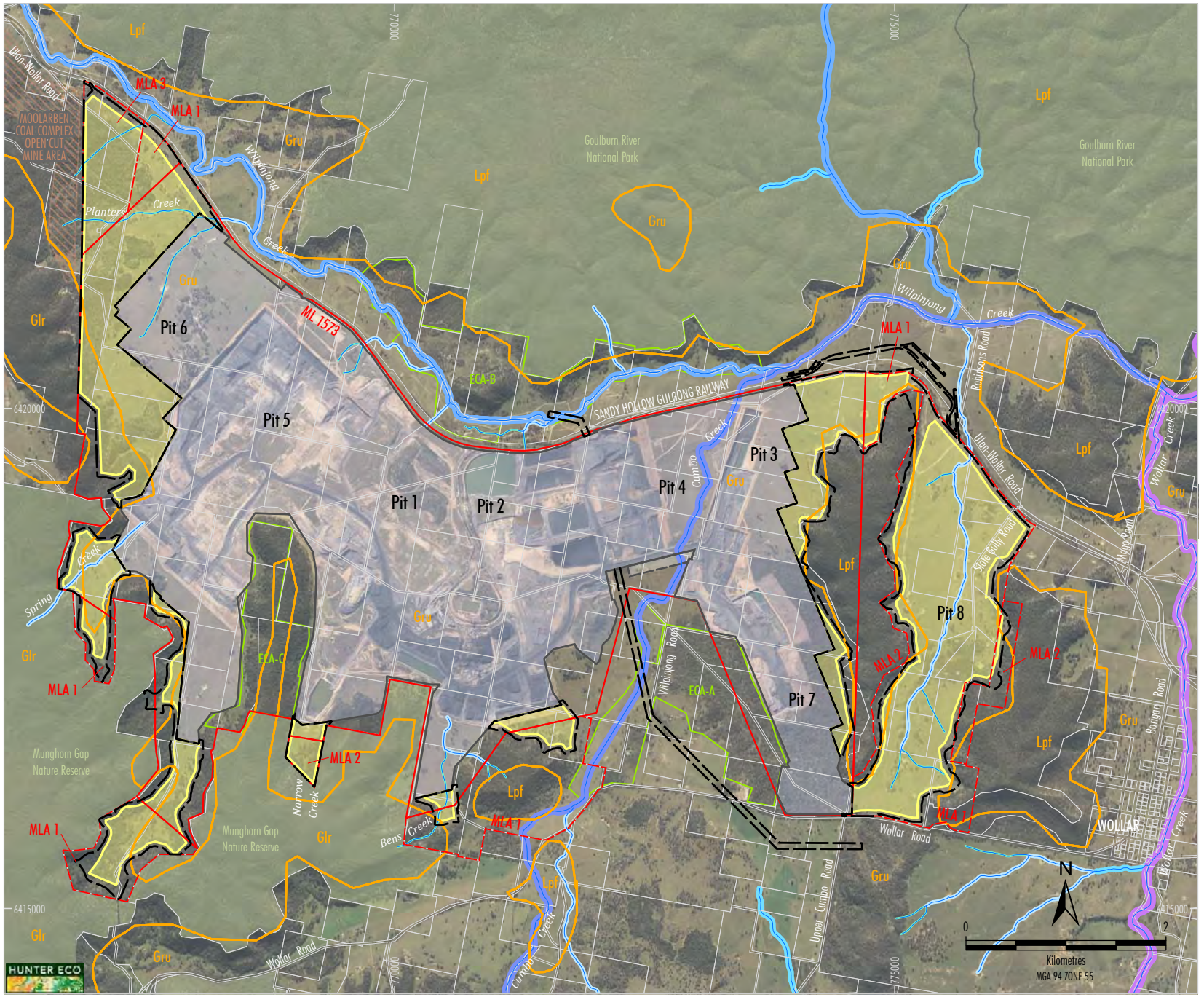
WILPINJONG EXTENSION PROJECT

Project General Arrangement

Figure 2

WIL-12-12_WEP_EIS_BAR BOS_218C



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WILPINJONG EXTENSION PROJECT

Site Map

Figure 3

WIL-12-12_WEP_EIS_BAR BOS_202C

The Office of Environment and Heritage (OEH) comments in the SEARs indicate the assessment of the impacts from the Project should be undertaken in accordance with the NSW *Framework for Biodiversity Assessment* (OEH, 2014a) which outlines the methodology which underpins the NSW *Biodiversity Offset Policy for Major Projects* (the NSW Offset Policy) (OEH, 2014b). The NSW Offset Policy commenced on 1 October 2014 for a 12 to 18 month transitional period (OEH, 2014c). During the transitional period, there is some flexibility in the policy's application to address any technical or administrative issues (OEH, 2014c). This Biodiversity Assessment Report and Biodiversity Offset Strategy was prepared by Dr Colin Driscoll (Hunter Eco), who is an accredited assessor according to section 142B(1)(c) of the TSC Act (assessor accreditation number 0011).

The NSW *Framework for Biodiversity Assessment* (OEH, 2014a) requires the use of an online program (calculator) to assess biodiversity impacts and determine the biodiversity offset requirements for those impacts. The *Credit Calculator for Major Projects and BioBanking (Version 4.1)* (the Credit Calculator) was used as part of this assessment.

Assessments of Significance in accordance with section 5A of the EP&A Act and the *Threatened Species Assessment Guidelines - the Assessment of Significance* (Department of Environment and Climate Change [DECC], 2007a) are also required under the EP&A Act (despite the new offset policy) and are therefore provided in Attachment A.

The Department of the Environment (DotE) comments in the SEARs for the EIS state that application of the Commonwealth offset package can meet the requirements of the *EPBC Act Environmental Offsets Policy* (Department of Sustainability, Environment, Water, Population and Communities [SEWPaC], 2012a) or an endorsed State policy (i.e. the NSW Offset Policy). WCPL has elected to use the *EPBC Act Environmental Offsets Policy* (SEWPaC, 2012a) rather than the NSW Offset Policy (OEH, 2014b) to identified suitable offset requirements to compensate for the residual significant impact on threatened species listed under the EPBC Act. Therefore, impacts, mitigation and offsets relevant to EPBC Act listed threatened species and communities are assessed separately in Stages 2 and 3 of this report. Attachment B also provides assessments on EPBC Act listed threatened species and communities.

In regard to aquatic ecology values, a separate report titled *Wilpinjong Extension Project Aquatic Ecology Assessment* has been prepared by Bio-Analysis (2015) (Appendix F of the EIS) and deals with the potential impacts of the Project on the aquatic ecology values (including aquatic threatened species and communities). Bio-Analysis (2015) conclude that potential impacts on aquatic ecology downstream of the Project are minimised with a number of existing mitigation measures currently implemented at the Wilpinjong Coal Mine.

1.4 STRUCTURE OF THIS ASSESSMENT

This document is structured as required by the NSW *Framework for Biodiversity Assessment* (OEH, 2014a). There are three stages described in this document:

- Stage 1 involves summarising the biodiversity values of the BAR Footprint that are inputs into the Credit Calculator (e.g. landscape features, native vegetation and threatened species);
- Stage 2 involves assessing the potential impacts on biodiversity, describing impact avoidance and mitigation measures and determining the offset requirements; and
- Stage 3 involves describing how WCPL intends to offset the impacts of the Project on biodiversity (i.e. the Biodiversity Offset Strategy).

1.5 INFORMATION SOURCES USED IN THE ASSESSMENT

This assessment uses the results of recent flora survey work undertaken by Hunter Eco (2015a) (Attachment C) and fauna survey work undertaken by Biodiversity Monitoring Services (2015a) (Attachment D). In addition, the flora and fauna of the BAR Footprint and surrounds have been comprehensively surveyed over the past 10 years and therefore there is a high level of certainty over the species present.

The following guidelines and policies were considered in the methodology of this assessment:

- *BioBanking Assessment Methodology and Credit Calculator Operational Manual* (Department of Environment, Climate Change and Water [DECCW], 2009);
- NSW *Biodiversity Offsets Policy for Major Projects* (OEH, 2014b);
- NSW *Framework for Biodiversity Assessment* (OEH, 2014a);
- *State Environmental Planning Policy No.44 – Koala Habitat Protection*;
- *Threatened Species Assessment Guidelines – the Assessment of Significance* (DECC, 2007a);
- *Biobanking Assessment Methodology 2014* (OEH, 2014d);
- *EPBC Act Environmental Offsets Policy* (SEWPaC, 2012a); and
- various Commonwealth guidelines and policies.

Other information sources used in this assessment are mostly described in Section 2 and listed in the reference list.

2 STAGE 1 – BIODIVERSITY ASSESSMENT

Stage 1 of the biodiversity assessment involves summarising the biodiversity values of the BAR Footprint that are inputs into the Credit Calculator. Landscape features are described in Section 2.1, native vegetation is described in Section 2.2, and threatened species relevant to the BAR Footprint are described in Section 2.3.

2.1 LANDSCAPE FEATURES

Landscape features relevant to the Project (such as regional setting and Mitchell Landscapes) are described in this sub-section.

2.1.1 Regional Setting

The Project is located approximately 40 km north-east of Mudgee (Figure 1). The majority of the Project is situated in a wide valley floor between hills and escarpments of the Goulburn River National Park to the north and Munghorn Gap Nature Reserve to the south (Figure 3). The Project is located within the following regions as identified on Figure 4:

- the western extent of the Hunter Local Land Service area (formally the Hunter Central Rivers Catchment Management Authority [CMA], Kerrabee CMA sub-region);
- the north western extent of the Sydney Basin (Interim Biogeographic Regionalisation for Australia (IBRA) Bioregion and Kerrabee IBRA sub-region; and
- the Mid-Western Regional Local Government Area.

2.1.2 Mitchell Landscapes

Mitchell Landscapes are mapped regions of NSW that collate areas having common attributes including an estimate of the amount cleared since 1750 (OEH, 2015a; Mitchell, 2002). Details of the Mitchell Landscapes within the BAR Footprint are provided in Table 1 and shown on Figures 3 and 4.

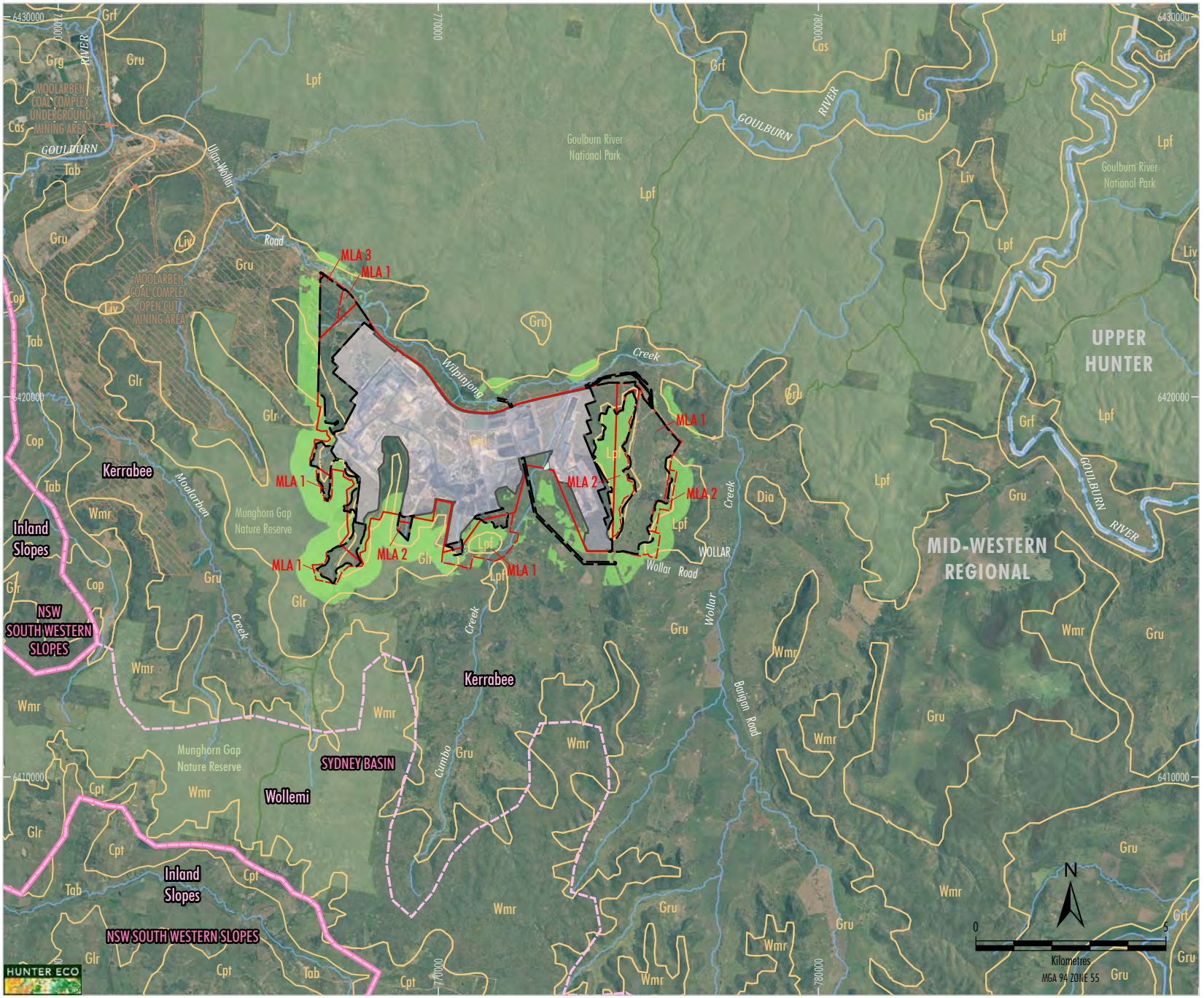
Table 1
Mitchell Landscapes in the BAR Footprint

Landscape Name	Percentage Cleared Estimate[1]	Percent (%) of BAR Footprint Covered by Landscape (Figures 3 and 4)
Upper Goulburn Valleys and Escarpment	57	83
Gulgong Ranges	81	12.4
Lees Pinch Foothills	28	4.6

[1] Sourced from the 'Over-cleared Landscapes Database' within the NSW Vegetation Information System (VIS) Classification Database (OEH, 2015a)

2.1.3 State or Regionally Significant Biodiversity Links

The Project is located at the south western extent of the Hunter Catchment. Water from across the mine area flows into Cumbo Creek and Wilpinjong Creek (Figure 4). Wilpinjong Creek connects to Wollar Creek that flows north into the upper reaches of Goulburn River (Figure 4).



LEGEND

- Mining Lease Boundary
- Mining Lease Application Boundary
- Approved/Existing Open Cut and Contained Infrastructure Area
- Biodiversity Assessment Report Development Site Footprint
- Local Government Boundary
- IBRA Region
- IBRA Subregion
- Vegetation within Buffer
- Mitchell Landscape

Cas	Cassilis Slopes
Cop	Cope Hills Granite
Cpt	Capertee Plateau
Dia	Sydney Basin Diatremes
Glr	Gulgong Ranges
Grf	Goulburn River Channels and Floodplains
Grg	Goulburn River Gorges
Gru	Upper Goulburn Valleys and Escarpment
Liv	Liverpool Range Valleys and Footslopes
Lpf	Lees Pinch Foothills
Tab	Talbragar - Upper Macquarie Terrace Sand
Wmr	Wollemi Ranges

Source: WCPL (2015); NSW DECC (2008); NSW Land & Property Information (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (Jun 2015, 2011)

Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Location Map

Figure 4

WIL-12-12_WEP_EIS_BAR BOS_208D

Figure 3 shows streams in the locality according to the Strahler stream ordering and relative riparian buffer distances in accordance with the NSW *Framework for Biodiversity Assessment* (OEH, 2014a).

Particular rivers, streams and wetlands in NSW are considered State or regionally significant biodiversity links. The Project would not impact on any State or regionally significant biodiversity links as described in the NSW *Framework for Biodiversity Assessment* (OEH, 2014a) because:

- the Project does not impact a riparian buffer 50 metres (m) either side of a 6th order stream;
- the Project does not impact a riparian buffer 20 m either side of a 4th or 5th order stream; and
- the Project does not impact a riparian buffer 50 m around an important wetland or an estuarine area.

Further, plans identifying State or regionally significant biodiversity links have not yet been developed (OEH, 2014a).

It is noted that the Wilpinjong Coal Mine is already approved to relocate the lower reaches of Cumbo Creek (a 5th order stream) and mine the current alignment, irrespective of the Project.

The relocated 330 kV ETL would span Wilpinjong Creek (a 4th order stream) and Cumbo Creek (a 5th order stream), however the towers for the ETL would be located outside of the creeks. Also, no clearing of riparian areas would be required.

There are no wetlands or estuaries within, adjacent to or downstream of the BAR Footprint which are relevant to this assessment.

2.1.4 Landscape Value Score

The linear based development landscape value assessment method in the Credit Calculator was used to assess the landscape value score for the Project in consideration of the NSW *Framework for Biodiversity Assessment* (OEH, 2014a) and *Framework for Biodiversity Assessment – Linear Module* (OEH, 2015b). A 550 m buffer from the outer edge of the Project footprint was created and changes due to the Project were assessed on the combined buffer and footprint areas.

The existing/approved Wilpinjong Coal Mine within the buffer area was excluded from the landscape assessment as it is under active development.

2.2 NATIVE VEGETATION

Native vegetation relevant to the Project is described in this sub-section.

2.2.1 Plant Community Types/Biometric Vegetation Types

Hunter Eco (2015a) (Attachment C) identified and mapped vegetation communities in a study area encompassing the BAR Footprint. The methodology used by Hunter Eco (2015a) (Attachment C) was as follows:

- At numerous points field data were collected on the dominant species present in the canopy, shrub and ground structural layers. These records are referred to as Rapid Data Points (RDP) and provide an understanding of floristic variation across the survey area.

- RDP were initially coded according to an assumed community type and that data extrapolated across the survey area to create a draft vegetation community map. Aerial Photo Interpretation was used to assist with determining likely community boundaries where changes in vegetation patterns are visible.
- Detailed data were then collected from standard 0.04 ha (generally 20 m x 20 m) plots. The presence and projected foliage cover of all vascular species in each plot were recorded using a modified Braun-Blanquet cover abundance scale: 1 = <1%, 2 = 1–5%, 3 = 5–25%, 4 = 25–50%, 5 = 50–75% and 6 = 75–100%. The overall study area covering the BAR Footprint was stratified according to the variation recorded in the RDP data and floristic plots randomly placed in these stratified units. The number of plots in each unit was as required by the NSW *Framework for Biodiversity Assessment* (OEH, 2014a).
- Similarity analysis (hierarchical agglomerative clustering and non-metric multi-dimensional scaling) was then used to place the floristic plots into groups having similar floristic content. Final community classification follows from the similarity analysis.

These procedures for ground-truthed vegetation mapping were first published by S. Bell and C. Driscoll in (DECC, 2008a) and further elaborated in Bell (2013).

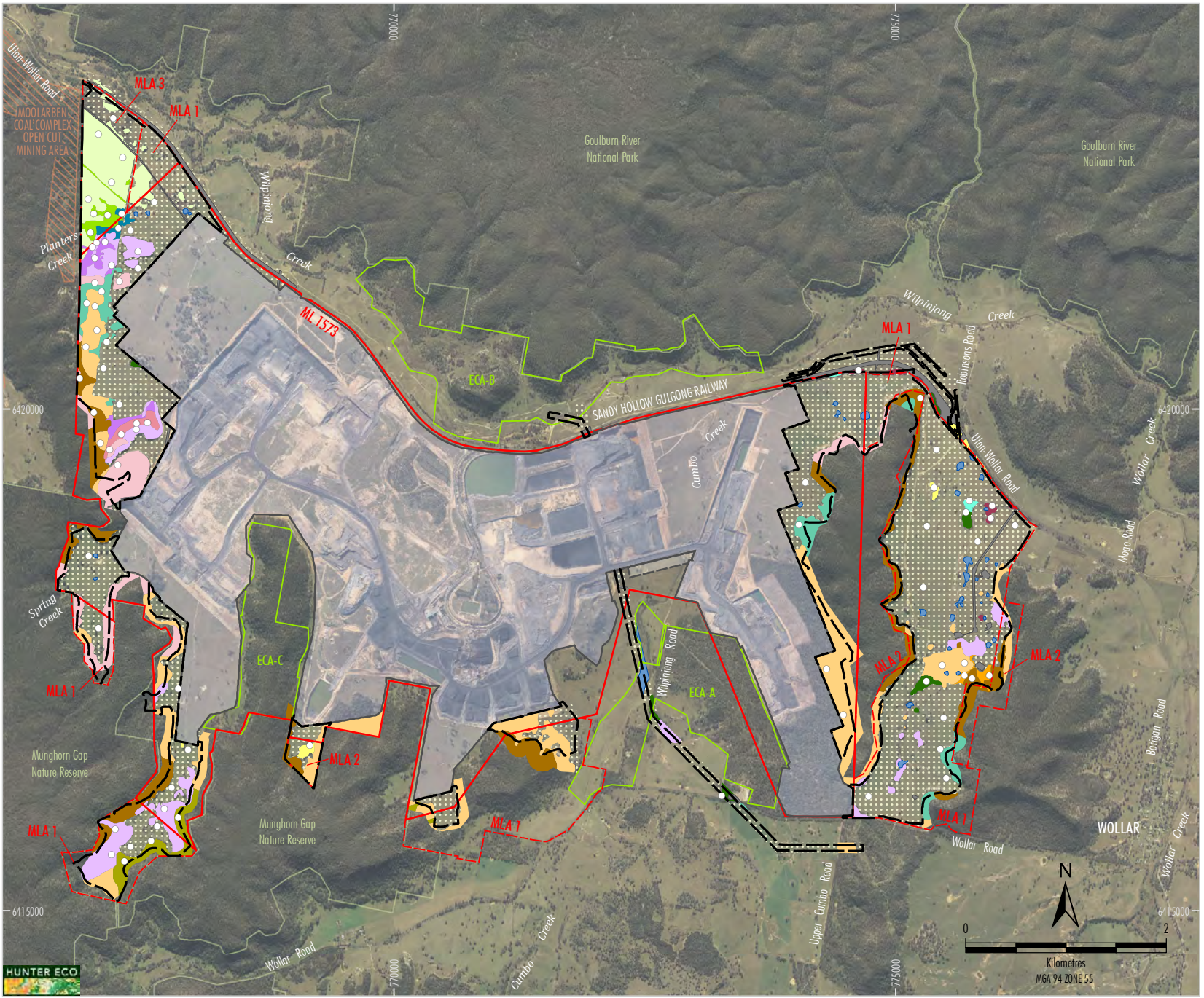
Using the results of similarity analyses, vegetation communities were first classified at the local level of the immediate region from which the sample data were drawn. Using the floristic composition of these communities, they were then matched to the NSW vegetation classification hierarchy as follows:

1. local classification by Hunter Eco;
2. NSW BioMetric Vegetation Types (BVTs);
3. NSW Plant Community Types (PCTs);
4. NSW Vegetation Classes (Keith, 2004); and
5. NSW Vegetation Formations (Keith, 2004).

Flora survey sites are shown on Figure 5.

The BAR Footprint is 1,022 ha in size comprising of 354 ha of native vegetation (Figures 5 and 6). The remaining 668 ha consists of pasture improved grassland, stubble field, slashed powerline easement, dams, Typha/Phragmites drainage line and existing infrastructure. Land without native vegetation is not required to be assessed (except in relation to threatened species habitat) (OEH, 2014a).

Hunter Eco (2015a) (Attachment C) provides detailed profiles of each vegetation community. The vegetation communities are herein referred to using the BVT number as the inputs and outputs of the Credit Calculator are required to be BVT not PCT (although the NSW *Framework for Biodiversity Assessment* [OEH, 2014a]) contains continuous references to PCTs). For this same reason, BVTs within the BAR Footprint (instead of PCTs) are shown on Figure 6. The area of each BVT and the percentage of the BVT cleared in NSW (from the NSW VIS Classification Database [OEH, 2015a]) is provided in Table 2.



LEGEND

- Mining Lease Boundary
- Mining Lease Application Boundary
- Approved/Existing Open Cut and Contained Infrastructure Area
- Relocated Block Bank and Cumbo Creek Disturbance Area
- Biodiversity Assessment Report Development Site Footprint
- Enhancement and Conservation Area

VEGETATION COMMUNITIES

Grassy Woodlands - Western Slopes Grassy Woodlands

- 1 Blakely's Red Gum Woodland (grassy) (HU681)
- 2 Fuzzy Box Woodland (HU547)
- 3a Rough-barked Apple - Black Cypress Pine Woodland (HU981)
- 3b Rough-barked Apple - Black Cypress Pine Woodland (HU981) - regen
- 4a Rough-barked Apple Woodland – alluvial (HU981)
- 4b Rough-barked Apple Woodland – alluvial (HU981) - regen
- 5 Yellow Box Woodland (grassy) (HU732)

Grassy Woodlands - Coastal Valley Grassy Woodlands

- 6 Blakely's Red Gum Woodland (shrubby) (HU910)

Dry Sclerophyll Forests (Shrubby Sub-formation) - Western Slopes Dry Sclerophyll Forests

- 7 Grey Gum - Narrow-leaved Stringybark Forest (HU843)
- 8a Red Ironbark Forest (HU886)
- 8b Red Ironbark Forest (HU886) - regen
- 9 Slaty Box Forest (HU618)
- 10a White Box Woodland (shrubby) (HU824)
- 10b White Box Woodland (shrubby) (HU824) - regen

Dry Sclerophyll Forests (Shrub/Grass Sub-formation) - North-west Slopes Dry Sclerophyll Woodlands

- 11 Western Grey Box Woodland (HU962)
- 12 Narrow-leaved Ironbark Forest (HU825)

Cleared Land

- Pasture Improved Grassland/Stubble Field/ Slashed Power Easement
- Existing Infrastructure
- Dam/Typha
- Flora Survey Site

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (Jun 2015; Jun 2014)

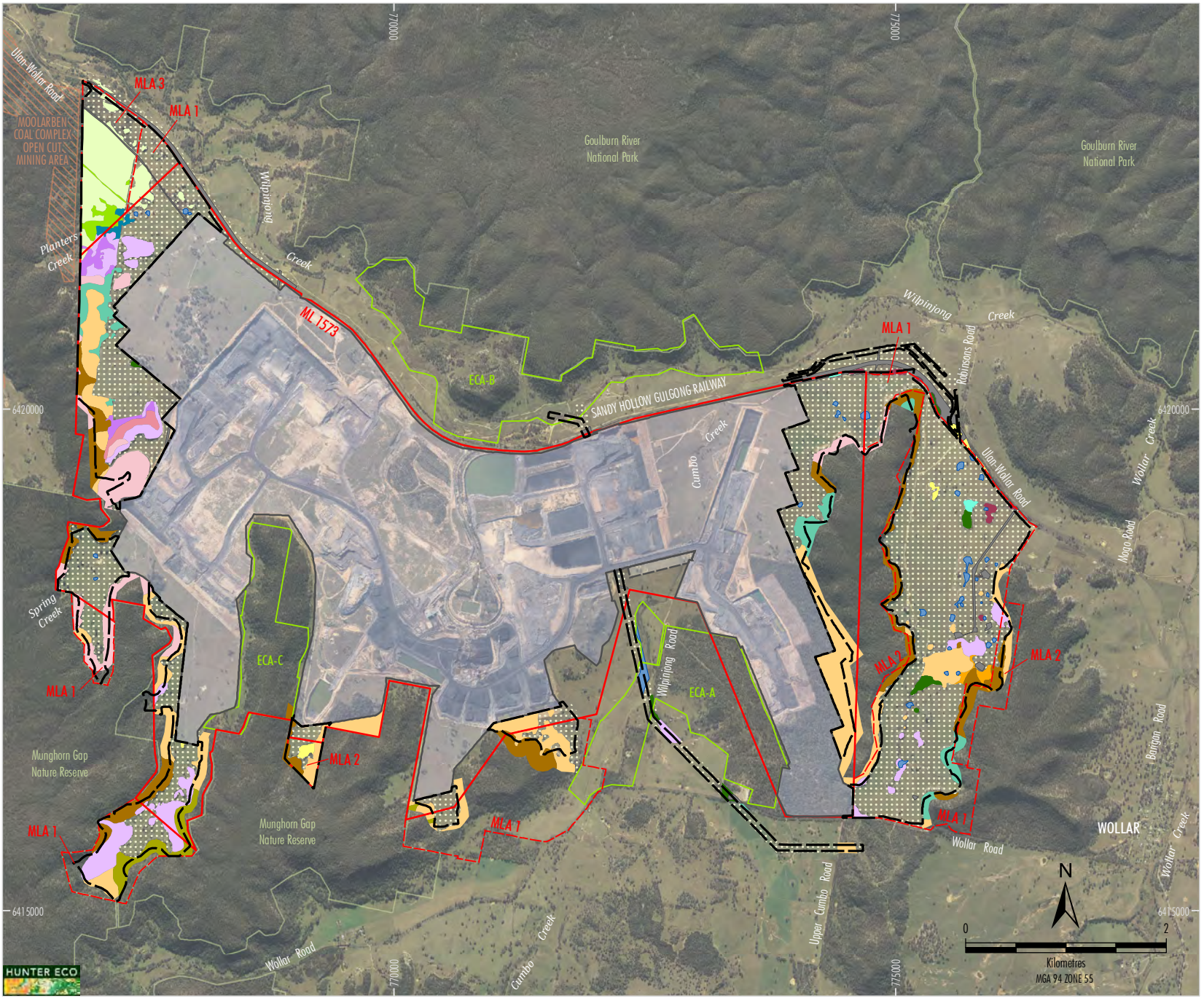
Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Flora Survey Sites

Figure 5

WIL-12-12_WEP_EIS_BAR BOS_209D



LEGEND

- Mining Lease Boundary
- Mining Lease Application Boundary
- Approved/Existing Open Cut and Contained Infrastructure Area
- Relocated Block Bank and Cumbo Creek Disturbance Area
- Biodiversity Assessment Report Development Site Footprint
- Enhancement and Conservation Area

VEGETATION COMMUNITIES

Grassy Woodlands - Western Slopes Grassy Woodlands

- 1 Blakely's Red Gum Woodland (grassy) (HU681)
- 2 Fuzzy Box Woodland (HU547)
- 3a Rough-barked Apple - Black Cypress Pine Woodland (HU981)
- 3b Rough-barked Apple - Black Cypress Pine Woodland (HU981) - regen
- 4a Rough-barked Apple Woodland – alluvial (HU981)
- 4b Rough-barked Apple Woodland – alluvial (HU981) - regen
- 5 Yellow Box Woodland (grassy) (HU732)

Grassy Woodlands - Coastal Valley Grassy Woodlands

- 6 Blakely's Red Gum Woodland (shrubby) (HU910)

Dry Sclerophyll Forests (Shrubby Sub-formation) - Western Slopes Dry Sclerophyll Forests

- 7 Grey Gum - Narrow-leaved Stringybark Forest (HU843)
- 8a Red Ironbark Forest (HU886)
- 8b Red Ironbark Forest (HU886) - regen
- 9 Slaty Box Forest (HU618)
- 10a White Box Woodland (shrubby) (HU824)
- 10b White Box Woodland (shrubby) (HU824) - regen

Dry Sclerophyll Forests (Shrub/Grass Sub-formation) - North-west Slopes Dry Sclerophyll Woodlands

- 11 Western Grey Box Woodland (HU962)
- 12 Narrow-leaved Ironbark Forest (HU825)

Cleared Land

- Pasture Improved Grassland/Stubble Field/ Slashed Power Easement
- Existing Infrastructure
- Dam/Typha

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (Jun 2015; Jun 2014)

Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Vegetation Communities

Figure 6

WIL-12-12_WEP_EIS_BAR BOS_203E

Table 2
Vegetation Communities in the BAR Footprint

	Community	Hunter Eco (2015a) (Attachment C)	BVT	PCT		Area (ha)	% Cleared in NSW*
Grassy Woodlands - Western Slopes Grassy Woodlands							
1	[1]Blakely's Red Gum Woodland (grassy)	MU1a	HU681	510	Blakely's Red Gum - Yellow Box grassy tall woodland of the New England Tableland Bioregion	6	80%
2	Fuzzy Box Woodland	MU2	HU547	201	Fuzzy Box woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	1.5	95%
3	Rough-barked Apple - Black Cypress Pine Woodland	MU6a	HU981	1767	Rough-barked Apple grassy tall woodlands of the Brigalow Belt South	126	ND
4	Rough-barked Apple Woodland – alluvial	MU6b					
5	[1]Yellow Box Woodland (grassy)	MU10	HU732	437	Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion	3.5	80%
Grassy Woodlands - Coastal Valley Grassy Woodlands							
6	Blakely's Red Gum Woodland (shrubby)	MU1b	HU910	1696	Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	4	46%
Dry Sclerophyll Forests (Shrubby sub-formation) - Western Slopes Dry Sclerophyll Forests							
7	Grey Gum - Narrow-leaved Stringybark Forest	MU3	HU843	1629	Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	42.5	1%
8	Red Ironbark Forest	MU5	HU886	1672	Red Ironbark - Grey Gum - Black Pine heathy woodland on sandstone ranges of the Sydney Basin	39.5	14%
9	[2]Slaty Box Forest	MU7	HU618	1176	Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	9.5	40%
10	White Box Woodland (shrubby)	MU9	HU824	1610	White Box - Black Cypress Pine shrubby woodland of the Western Slopes	98	67%
Dry Sclerophyll Forests (Shrub/grass sub-formation) - North-west Slopes Dry Sclerophyll Woodlands							
11	Western Grey Box Woodland	MU8	HU962	1748	Grey Box grassy open forest of the Central and Lower Hunter Valley	3	ND
12	Narrow-leaved Ironbark Forest	MU4	HU825	1611	Narrow-leaved Ironbark - Black Cypress Pine shrub - grass woodland upper Hunter and northern Wollemi	20.5	10%

[1] Box-Gum Woodland Endangered Ecological Community (EEC)/Critically Endangered Ecological Community (CEEC).

[2] Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion Vulnerable Ecological Community.

* OEH (2015a), ND = no data.

2.2.2 Threatened Ecological Communities

Hunter Eco (2015a) (Attachment C) identified and mapped threatened ecological communities in a study area encompassing the BAR Footprint. Identified threatened ecological communities in the BAR footprint are listed in Table 3 and shown on Figure 7. Figure 7 also shows the Box-Gum Woodland EEC in the surrounds which was mapped by FloraSearch (2005) prior to the listing of the Box-Gum Woodland CEEC.

Table 3
Threatened Ecological Communities in the BAR Footprint

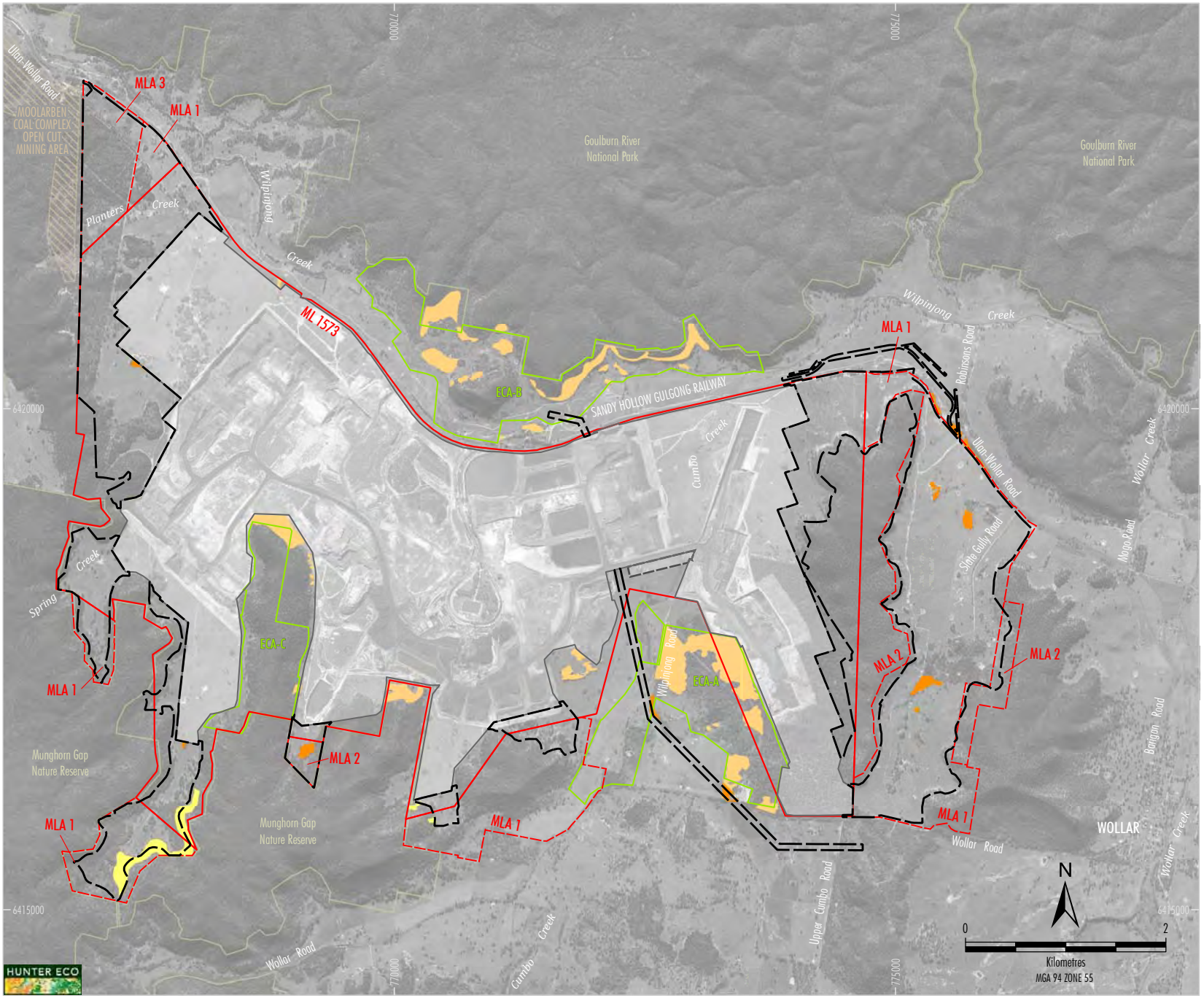
Community		BVT
Box-Gum Woodland EEC/CEEC		
1	Blakely's Red Gum Woodland (grassy)	HU681
5	Yellow Box Woodland (grassy)	HU732
Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion Vulnerable Ecological Community (VEC)		
9	Slaty Box Forest	HU618

Vegetation Community 1 Blakely's Red Gum Woodland – Grassy and *Vegetation Community 5 Yellow Box Woodland – Grassy* were assessed to be components of:

- the *White Box - Yellow Box - Blakely's Red Gum Woodland Endangered Ecological Community* (Box-Gum Woodland EEC) listed under the TSC Act; and
- the *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered Ecological Community* (Box-Gum Woodland CEEC) listed under the EPBC Act.

The Box-Gum Woodland EEC/CEEC was identified in accordance with relevant TSC Act and EPBC Act listings and guidelines (e.g. Department of Environment and Heritage, 2006; DECC, 2007b) (Hunter Eco [2015a] Attachment C). The main identifying characteristics were the presence of Blakely's Red Gum and Yellow Box with a predominantly grassy ground cover. Local communities *Vegetation Community 6 Blakely's Red Gum Woodland – shrubby* and *Vegetation Community 10 White Box Woodland – shrubby* were not considered to be part of the Box-Gum Woodland EEC because of the presence of a dominant and varied shrub layer. A detailed analysis of the grasslands is provided in Attachment C and it was concluded that none meet the relevant criteria for the derived native grassland type of Box-Gum Woodland EEC/CEEC.
Vegetation Community 7 Slaty Box Forest was confirmed to meet the description of *Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion Vulnerable Ecological Community* listed under the TSC Act. However, the NSW *Framework for Biodiversity Assessment* (OEH, 2014a) does not require the assessment of impacts on vulnerable ecological communities listed under the TSC Act. Vulnerable ecological communities listed under the TSC Act are also not required to be assessed under section 5A of the EP&A Act. The status of this vegetation community under the TSC Act is not considered further.

Vegetation Community 2 Fuzzy Box Woodland was assessed against the NSW EEC *Fuzzy Box Woodland on Alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions* because of the dominance of Fuzzy Box (*Eucalyptus conica*). However, while the NSW Scientific Committee determination (NSW Scientific Committee, 2011a) has similarities to the local community, the BAR Footprint lies in the Sydney Basin Bioregion and is thus outside of the geographic bounds of the determination.



LEGEND

- Mining Lease Boundary
- Mining Lease Application Boundary
- Approved/Existing Open Cut and Contained Infrastructure Area
- Relocated Block Bank and Cumbo Creek Disturbance Area
- Biodiversity Assessment Report Development Site Footprint
- Enhancement and Conservation Area

Threatened Ecological Communities

- Box-Gum Woodland Endangered Ecological Community/ Critically Endangered Ecological Community [14]
- Box-Gum Woodland Endangered Ecological Community [15]
- Slaty Gum Woodland Vulnerable Ecological Community [14]

Reference: *14 Hunter Eco (2015)*
15 FloraSearch (2005)

Note: There are no references 1 - 13 on this figure.

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (Jun 2015; Jun 2014)

Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Threatened Ecological Communities

Figure 7

WIL-12-12_WEP_EIS_BAR BOS_205F

Vegetation Community 11 Western Grey Box Woodland was assessed against the NSW EEC *Inland Grey Box Woodland in the Riverina,* NSW *South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions* because of the dominance of Inland or Western Grey Box (*Eucalyptus microcarpa*). However, while the NSW Scientific Committee determination (NSW Scientific Committee, 2011b) has similarities to the local community, the BAR Footprint lies in the Sydney Basin Bioregion and is thus outside of the geographic bounds of the determination. It should also be noted that there was no PCT/BVT available for the Kerrabee sub-region that specifically included Western Grey Box.

Vegetation Community 9 Slaty Box Forest and *Vegetation Community 12 Narrow-leaved Ironbark Forest* are probable components of the *Central Hunter Valley Eucalypt Forest and Woodland* CEEC listed under the EPBC Act the determination of which specifically includes the Goulburn Valley in the Kerrabee IBRA subregion. This community was listed 7 May 2015 after the controlled action decision (12 March 2015) and therefore the listing is not relevant to the action (refer section 158A of the EPBC Act).

2.2.3 Vegetation Zones

The vegetation communities described in Section 2.2.1 were grouped into vegetation zones according to their condition. Table 4 outlines the vegetation zones present in the BAR Footprint, the relevant BVT, condition, site value score (i.e. the quantitative measure of vegetation condition), area and patch size.

Table 4
Vegetation Zones

Vegetation Zone Number	Community	BVT	Condition Class and Sub-category	Site Value Score	Area (ha)	Patch Size
Grassy Woodlands - Western Slopes Grassy Woodlands						
1	[1]Blakely's Red Gum Woodland (grassy)	HU681	Moderate/Good	52.60	6	Greater than 1,001 ha
2	Fuzzy Box Woodland	HU547	Moderate/Good	46.8	1.5	4 ha
3	Rough-barked Apple Woodland	HU981	Moderate/Good	61.98	109.5	Greater than 1,001 ha
4	Rough-barked Apple Woodland – regeneration	HU981	Moderate/Good_Poor	36.46	16.5	
5	[1]Yellow Box Woodland (grassy)	HU732	Moderate/Good	40.62	3.5	
Grassy Woodlands - Coastal Valley Grassy Woodlands						
6	Blakely's Red Gum Woodland (shrubby)	HU910	Moderate/Good	60.94	4	Greater than 1,001 ha
Dry Sclerophyll Forests (Shrubby sub-formation) - Western Slopes Dry Sclerophyll Forests						
7	Grey Gum – Narrow-leaved Stringybark Forest	HU843	Moderate/Good	65.78	42.5	Greater than 1,001 ha
8.1	Red Ironbark Forest	HU886	Moderate/Good	80	33.5	
8.2	Red Ironbark Forest	HU886	Moderate/Good_Poor	35.33	6	
9	Slaty Box Forest	HU618	Moderate/Good	68	9.5	
10.1	White Box Woodland (shrubby)	HU824	Moderate/Good	58.67	95	
10.2	White Box Woodland (shrubby)	HU824	Moderate/Good_Poor	25.33	3	

Table 4 (Continued)
Vegetation Zones

Vegetation Zone Number	Community	BVT	Condition Class and Sub-category	Site Value Score	Area (ha)	Patch Size
Dry Sclerophyll Forests (Shrub/grass sub-formation) - North-west Slopes Dry Sclerophyll Woodlands						
11	Western Grey Box Woodland	HU962	Moderate/Good	48.44	3	4 ha
12	Narrow-leaved Ironbark Forest	HU825	Moderate/Good	42.19	20.5	Greater than 1,001 ha

[1] Box-Gum Woodland EEC/CEEC

The *Rough-barked Apple - Black Cypress Pine Woodland* (Vegetation Community 3) and *Rough-barked Apple Woodland – alluvial* (Vegetation Community 4) have been combined into a single vegetation zone for the purpose of the assessment. These map units are the same BVT (i.e. HU981). There are two conditions of HU981 mapped as separate vegetation zones for the purpose of the assessment.

The patch size for each vegetation zone was greater than 1,001 ha (i.e. connecting with vegetation outside of the BAR Footprint), other than for Fuzzy Box (Vegetation Community 2) and Western Grey Box (Vegetation Community 11) that were isolated patches of vegetation only connected to 4 ha (Table 4).

There are no vegetation zones with a current site value score of <17.

2.2.4 Vegetation Condition

In addition to collecting floristic cover abundance data, biometric data were collected by Hunter Eco (2015a) (Attachment C) at each plot location. Collecting biometric data includes an extension to the 20 m x 20 m floristic plot to form a 20 m x 50 m plot. Data collected are:

- Total number of native plant species — 20 m x 20 m plot
- Native overstorey cover % — 50 m transect
- Native mid-storey cover % — 50 m transect
- Native ground cover grasses % — 50 m transect
- Native ground cover shrubs % — 50 m transect
- Native ground cover other % — 50 m transect
- Exotic plant cover % — 50 m transect
- Number of trees with hollows — 20 m x 50 m plot
- Overstorey regeneration % — entire stratified unit
- Length of fallen logs — 20 m x 50 m plot

The plot and transect data are provided in Attachment C.

2.2.5 Vegetation Impacts That Require Further Consideration

The NSW *Framework for Biodiversity Assessment* (OEH, 2014a) describes that some threatened ecological communities require further consideration (by the NSW Government) in addition to the Credit Calculator. This includes communities potentially impacted by the Project which are either critically endangered (under the TSC or EPBC Acts) and/or are specifically nominated in the SEARs for the EIS.

The Box-Gum Woodland EEC/CEEC is specifically nominated in the OEH comments in the SEARs for the EIS and also critically endangered under the EPBC Act. Further consideration is given to the impacts on the Box-Gum Woodland EEC/CEEC in Section 3.2 and Attachment A.

2.3 THREATENED SPECIES

Threatened species relevant to the Project are identified in this sub-section. This sub-section refers to threatened species that are ecosystem credit species (i.e. species that can be predicted to be present based on a habitat assessment) and/or species credit species (i.e. species that cannot be predicted by habitat surrogates) (OEH, 2014a). Threatened species that are ecosystem credit species and/or species credit species are pre-determined by OEH in the Credit Calculator and *BioNet Threatened Species Profile Database* (OEH, 2015c).

2.3.1 Habitat Features for Particular Species Credit Species

The Credit Calculator identifies specific habitat features for particular species credit species and requires the assessor to evaluate if any of those habitat features occur on site. If a specific habitat feature is present then targeted surveys are required for the particular species credit species. Habitat features from the Credit Calculator are listed in Table 5, along with the relevance of the habitat features to the BAR Footprint.

Table 5
Threatened Species Habitat Features

Common Name	Scientific Name	Conservation Status[1]		Habitat Feature	Relevance
		TSC Act	EPBC Act		
Flora					
-	*Commersonia rosea*	E	E	Land within an 8 km radius of Sandy Hollow in Kerrabee CMA subregion	Not relevant. Not within 8 km radius of Sandy Hollow.
Pine Donkey Orchid population in the Muswellbrook LGA	*Diuris tricolor*	V	-	Geographic limits Muswellbrook LGA	The Project is not located in the Muswellbrook LGA.
Narrow Goodenia	*Goodenia macbarronii*	-	-	Seasonally wet/boggy sites (including table drains)	Not relevant. Species has been delisted.
Mount Vincent Mint-bush	*Prostanthera stricta*	V	V	Land containing Triassic sandstone outcroppings in Kerrabee CMA subregion	Not relevant. No suitable habitat within the BAR Footprint.

Table 5 (Continued)
Threatened Species Habitat Features

Common Name	Scientific Name	Conservation Status[1]		Habitat Feature	Relevance
		TSC Act	EPBC Act		
Amphibians					
Giant Burrowing Frog	*Heleioporus australiacus*	V	V	Land within 40 m of heath, woodland or forest with sandy or friable soils	Not relevant. No suitable habitat within the BAR Footprint.
Red-crowned Toadlet	*Pseudophryne australis*	V	-	Heath or eucalypt forest on sandstone with a build-up of litter or other debris and containing, or within 40 m of, ephemeral or intermittent drainage lines	Not relevant. No suitable habitat within the BAR Footprint.
Reptiles					
Pale-headed Snake	*Hoplocephalus bitorquatus*	V	-	Land within 40 m of watercourses, containing hollow-bearing trees, loose bark and/or fallen timber	Not relevant. No suitable habitat within the BAR Footprint.
Broad-headed Snake	*Hoplocephalus bungaroides*	E	V	Land within 50 m of sandstone escarpments with hollow-bearing trees, rock crevices or flat sandstone rocks on exposed cliff edges	Some potentially suitable habitat in the BAR Footprint.
Rosenberg's Goanna	*Varanus rosenbergi*	V	-	Land within 250 m of termite mounds or rock outcrops	Not relevant. No suitable habitat within the BAR Footprint.
Pink-tailed Legless Lizard	*Aprasia parapulchella*	V	V	Land containing surface rocks (embedded or loose)	Some potentially suitable habitat in Slate Gully (Pit 8).
Mammals					
Brush-tailed Rock-wallaby	*Petrogale penicillata*	E	V	Land within 1 km of rock outcrops or clifflines	Some potentially suitable habitat in the BAR Footprint.
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	V	Land containing escarpments, cliffs, caves, deep crevices, old mine shafts or tunnels	Some potentially suitable habitat outside the BAR Footprint.

Note: the highlighted cells are species and habitat features that are potentially relevant to the BAR Footprint.

[1] Threatened fauna species status under the TSC Act and/or EPBC Act (current at October 2015).
V = Vulnerable; E = Endangered

2.3.2 Targeted Surveys for Threatened Species

The NSW *Framework for Biodiversity Assessment* (OEH, 2014a) only requires targeted surveys for threatened fauna species which are species credit species because ecosystem credit species are predicted to occur based on habitat; all threatened flora species are species credit species. All potentially occurring threatened species listed under the EPBC Act were also targeted during the surveys.

A list of candidate species credit species (requiring survey) has been determined by the Credit Calculator (Table 6). The potential presence of these species within the BAR Footprint was determined by a review of database records, previous surveys and additional targeted surveys as discussed below.

Table 6
Threatened (Species Credit) Species Requiring Survey and Timing

Common Name	Scientific Name	Conservation Status[1]		Survey Timing											
		TSC Act	EPBC Act	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flora															
Mount Dangar Wattle	*Acacia dangarensis*	E	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ausfeld's Wattle	*Acacia ausfeldii*	V	-							Yes	Yes	Yes			
Capertee Stringybark	*Eucalyptus cannonii*	V	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clandulla Geebung	*Persoonia marginata*	V	V	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Denman Pomaderris	*Pomaderris reperta*	CE	CE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
-	*Homoranthus darwinioides*	V	V	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
-	*Kennedia retrorsa*	V	V	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Large-leafed Monotaxis	*Monotaxis macrophylla*	E	-						Yes	Yes	Yes	Yes	Yes	Yes	
-	*Lasiopetalum longistamineum*	V	V	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
-	*Ozothamnus tesselatus*	V	V	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pine Donkey Orchid	*Diuris tricolor*	V	-									Yes	Yes		
Pine Donkey Orchid population in the Muswellbrook LGA	*Diuris tricolor population in the Muswellbrook LGA*	EP	-									Yes	Yes		
-	*Prostanthera discolour*	V	V	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
-	*Rulingia procumbens* (also known as *Commersonia procumbens* or *Androcalva procumbens*)	V	V	Yes	Yes	Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes
Scant Pomaderris	*Pomaderris queenslandica*	E	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
-	*Senecio linearifolius* var. *dangarensis*	E	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 6 (Continued)
Threatened (Species Credit) Species Requiring Survey and Timing

Common Name	Scientific Name	Conservation Status		Survey Timing											
		TSC Act	EPBC Act	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Silky Pomaderris	*Pomaderris sericea*	E	V	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Small Snake Orchid	*Diuris pedunculata*	E	E									Yes	Yes	Yes	
Weeping Myall population in the Hunter catchment	*Weeping Myall population in the Hunter catchment*	EP	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
White-flowered Wax Plant	*Cynanchum elegans*	E	E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wollemi Mint-bush	*Prostanthera cryptandroides* subsp. *cryptandroides*	V	V	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Reptiles															
Pink-tailed Legless Lizard	*Aprasia parapulchella*	V	V	Yes	Yes							Yes	Yes	Yes	Yes
Broad-headed Snake	*Hoplocephalus bungaroides*	E	V			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Birds															
Regent Honeyeater	*Anthochaera phrygia*	CE	CE[2]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mammals															
Koala	*Phascolarctos cinereus*	V	V	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Brush-tailed Rock-wallaby	*Petrogale penicillata*	E	V	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
*Eastern Pygmy-possum	*Cercartetus nanus*	V	-												
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	V	Yes	Yes	Yes	Yes					Yes	Yes	Yes	Yes

Note: the Highlighted month is the month in which targeted surveys were undertaken for the relevant species.

[1] Threatened fauna species status under the TSC Act and/or EPBC Act (current at October 2015).
V = Vulnerable; E = Endangered; CE = Critically Endangered; EP = Endangered Population

[2] Listed as 'Endangered' under the EPBC Act at the time of the controlled action decision (12 March 2015) and therefore assessed under the Commonwealth offset policy as 'Endangered' not 'Critically Endangered' (refer section 158A of the EPBC Act).

* There is no survey timing for this species in the *BioNet Threatened Species Profile Database* (OEH, 2015a) and no nearby records of this species.

Targeted flora surveys were undertaken by Hunter Eco (2015a) (Attachment C) and targeted fauna surveys were undertaken by Biodiversity Monitoring Services (2015a) (Attachment D) within the survey timing prescribed in the Credit Calculator and *BioNet Threatened Species Profile Database* (OEH, 2015a).

While none were found in the BAR Footprint, a record of *Cymbidium canaliculatum* in land immediately adjoining the BAR Footprint indicated suitable habitat for the endangered population *Cymbidium canaliculatum* R. Br. in the Hunter Catchment. This endangered population does not appear in the Credit Calculator (Table 5) and was not recorded in the BAR Footprint. It is therefore not assessed further. Note this population was recorded in the offset areas (Section 4.4).

Database Records

Threatened species records from the following databases were considered in the assessment:

- NSW *BioNet Threatened Species Profile Database* (OEH, 2015c);
- NSW Flora Online (The Royal Botanic Gardens and Domain Trust, 2014);
- Australian Museum Database (Australian Museum, 2014);
- BirdLife Australia Database (BirdLife Australia, 2014); and
- Regent Honeyeater (*Anthochaera phrygia*) records (DECC, 2005 in Mount King Ecological Surveys [MKES], 2005).

Relevant threatened species records from the above database are shown on Figures 8 and 9. There were no records from the Royal Botanic Gardens and Domain Trust (2014) and Australian Museum, (2014) in the extent of Figures 8 and 9.

Previous Surveys

The flora and fauna of the BAR Footprint and surrounds have been comprehensively surveyed over the past 10 years. The various flora and fauna surveys that have been conducted within the BAR Footprint and surrounds are presented in Table 7.

Table 7
Flora and Fauna Studies Undertaken Within the BAR Footprint and Surrounds

Report	Report Title	Survey Type and Time
FloraSearch (2005)	*Wilpinjong Coal Project EIS Flora Assessment*	**Flora** 16-19 March 2004; late May - early June 2004; 25-29 October 2004; and 22-24 November 2004.
MKES (2005)	*Wilpinjong Coal Project EIS Terrestrial Fauna Assessment*	**Fauna** 19-28 April 2004; 15-27 May 2004; and 21-29 November 2004.
Greg Richards and Associates Pty Ltd (2005)	*Wilpinjong Coal Project EIS Bat Fauna Assessment*	**Fauna** 30 March – 3 April 2004; and 27-29 November 2004.
Hunter Eco (2013)	*Modification 5 Environmental Assessment Flora Assessment*	**Flora** 9-11 January 2013; 25 January 2013; and 9 May 2013.

Table 7 (Continued)
Flora and Fauna Studies Undertaken Within the BAR Footprint and Surrounds

Report	Report Title	Survey Type and Time
Biodiversity Monitoring Services (2013)	*Modification 5 Environmental Assessment Terrestrial Fauna Assessment*	**Fauna** 26 November – 1 December 2012.
Lesryk Environmental Consultants (2013)	*Biodiversity Survey of Slate Gully*	**Biodiversity Audit** May – December 2012.

Threatened fauna species records from the above previous surveys are shown on Figures 8 to 9.

Additional Targeted Flora Surveys

As described in Section 2.2, Hunter Eco (2015a) (Attachment C) undertook terrestrial flora surveys within a study area encompassing the BAR Footprint during 2014 and 2015. Flora surveys were undertaken in consideration of the following guidelines (Attachment C):

- *BioBanking Assessment Methodology and Credit Calculator Operational Manual* (DECCW, 2009);
- *Draft* NSW *Biodiversity Offsets Policy for Major Projects* (and underlying *Framework for Biodiversity Assessment*) (OEH 2014a, 2014b);
- *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities - Working Draft* (Department of Environment and Conservation [DEC], 2004a);
- NSW *State Groundwater Dependent Ecosystem Policy* (NSW Office of Water [NOW], 2012a);
- *State Environmental Planning Policy No.44 – Koala Habitat Protection*; and
- *EPBC Act Policy Statement - Draft Survey Guidelines for Australia's Threatened Orchids* (DotE, 2014a).

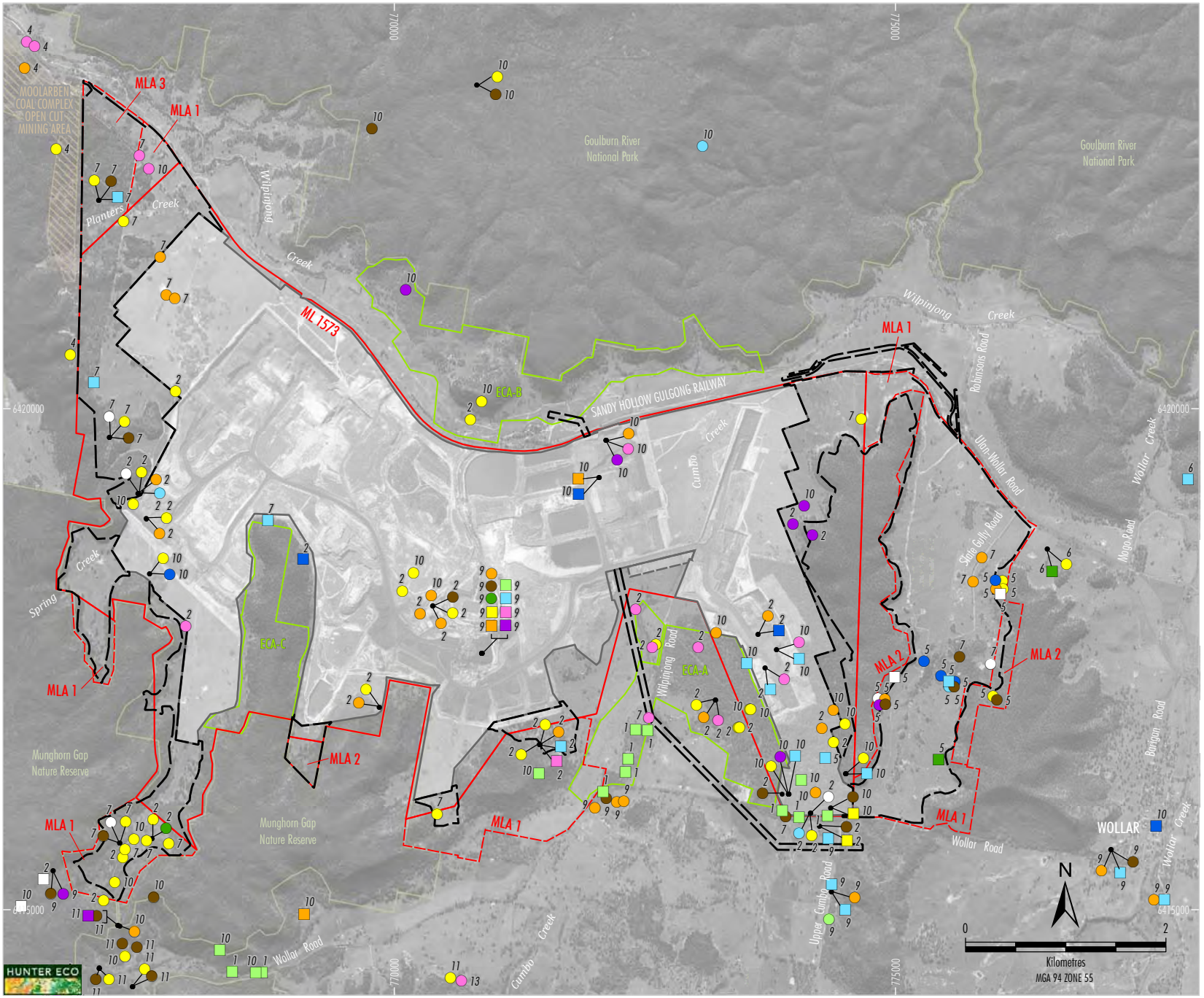
Targeted flora surveys were conducted by Hunter Eco (2015a) (Attachment C) for those threatened flora species listed in Table 6. However, surveys were also conducted with the possibility in mind of previously unrecorded threatened species being present (including species in Table 5).

Additional Targeted Fauna Surveys

Biodiversity Monitoring Services (2015a) (Attachment D) undertook fauna surveys within a study area encompassing the BAR Footprint during February 2014 with a targeted survey in April 2015.

The following documents and guidelines were considered by Biodiversity Monitoring Services (2015a) (Attachment D):

- *Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna - Amphibians* (DECC, 2009);
- *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities - Working Draft* (DEC, 2004a);
- *Survey Guidelines for Australia's Threatened Reptiles* (SEWPaC, 2011a);
- *Survey Guidelines for Australia's Threatened Bats* (Department of Environment, Water, Heritage and the Arts [DEWHA], 2010a);
- *Survey Guidelines for Australia's Threatened Birds* (DEWHA, 2010b);
- *Survey Guidelines for Australia's Threatened Mammals* (SEWPaC, 2011b); and
- *Survey Guidelines for Australia's Threatened Frogs* (DEWHA, 2010c).



LEGEND

- Mining Lease Boundary
- Mining Lease Application Boundary
- Approved/Existing Open Cut and Contained Infrastructure Area
- Relocated Block Bank and Cumbo Creek Disturbance Area
- Biodiversity Assessment Report Development Site Footprint
- Enhancement and Conservation Area

Threatened Birds

- Black-chinned Honeyeater (eastern subspecies)
- Brown Treecreeper (eastern subspecies)
- Diamond Firetail
- Flame Robin
- Gang-gang Cockatoo
- Glossy Black-Cockatoo
- Grey-crowned Babbler (eastern subspecies)
- Hooded Robin (south-eastern form)
- Little Eagle
- Little Lorikeet
- Masked Owl
- Painted Honeyeater
- Powerful Owl
- Regent Honeyeater
- Scarlet Robin
- Speckled Warbler
- Square-tailed Kite
- Turquoise Parrot
- Varied Sittella

Reference:

1 DECC (2005)
2 Mount King Ecological Surveys (2005)
4 EcoVision (2006)
5 Lesryk Environmental Consultants (2013)
6 Biodiversity Monitoring Services (2013)
7 Biodiversity Monitoring Services (2015a)
9 Birdlife (2014)
10 OEH (2015)
11 Biodiversity Monitoring Services (2015b)

Note: There are no references 3 or 8 on this figure.

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (Jun 2015; Jun 2014)

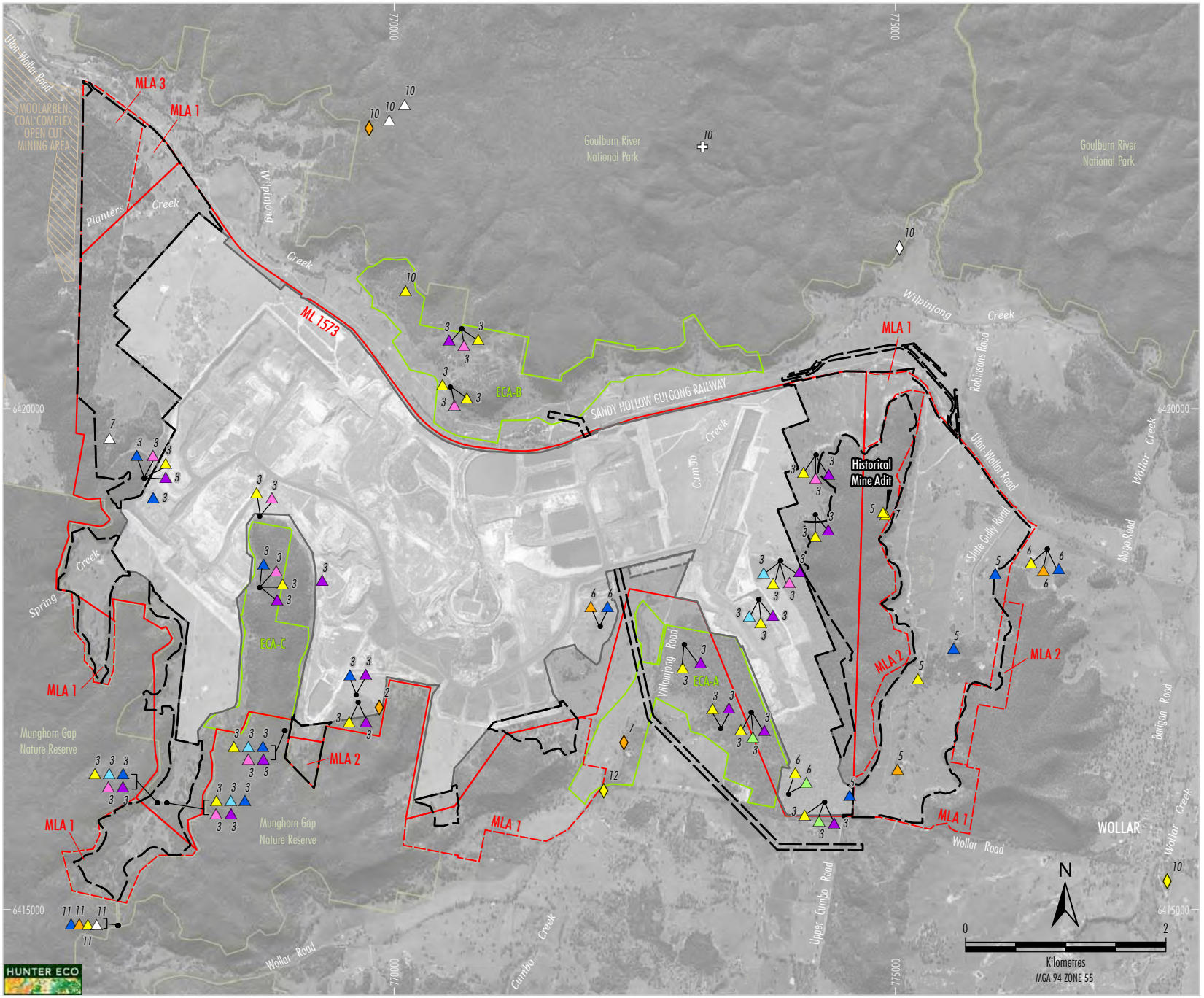
Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Threatened Birds

Figure 8

WIL-12-12_WEP_EIS_BAR BOS_210C



LEGEND

- Mining Lease Boundary
- Mining Lease Application Boundary
- Approved/Existing Open Cut and Contained Infrastructure Area
- Relocated Block Bank and Cumbo Creek Disturbance Area
- Biodiversity Assessment Report Development Site Footprint
- Enhancement and Conservation Area

Threatened Mammals

- Brush-tailed Rock-wallaby
- Koala
- Squirrel Glider
- Corben's Long-eared Bat
- Eastern Bentwing-bat
- Eastern Cave Bat
- Eastern False Pipistrelle
- Eastern Freetail-bat
- Large-eared Pied Bat
- Little Bentwing-bat
- Yellow-bellied Sheathtail-bat

Threatened Amphibian

- Giant Barred Frog

Reference:
2 Mount King Ecological Surveys (2005)
3 Greg Richards and Associates Pty Ltd (2005)
5 Lesryk Environmental Consultants (2013)
6 Biodiversity Monitoring Services (2013)
7 Biodiversity Monitoring Services (2015a)
10 OEH (2015)
11 Biodiversity Monitoring Services (2015b)
12 Incidental Sighting (2013)

Note: There are no references 1, 4, 8 or 9 on this figure.

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (Jun 2015; Jun 2014)

Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Threatened Mammals and Amphibian

Figure 9

WIL-12-12_WEP_EIS_BAR BOS_211G

Targeted fauna surveys were conducted by Biodiversity Monitoring Services (2015a) (Attachment D) for those threatened fauna species listed in Table 6 as well as other threatened fauna species.

The New Holland Mouse (*Pseudomys novaehollandiae*) is listed under the EBPC Act (but not the TSC Act) and was specifically targeted by Biodiversity Monitoring Services (2015a) (Attachment D). The New Holland Mouse is not accounted for by the NSW *Framework for Biodiversity Assessment* (OEH, 2014a) because it is not listed under the TSC Act.

Results - Threatened Species Records

Table 8 provides a summary of the threatened species records in the locality from survey records or database records. Threatened species records are shown on Figures 8 to 10.

A total of 26 threatened fauna species listed under the TSC Act have been recorded within or immediately surrounding the BAR Footprint during current and previous surveys, comprising 16 birds and 10 mammals, of which eight are bats (Table 8). One threatened flora species has also been recorded.

As shown on Figures 8 to 10, 21 threatened species have been recorded within the BAR Footprint, namely:

- *Ozothamnus tesselatus*;
- Little Eagle (*Hieraaetus morphnoides*);
- Glossy Black-Cockatoo (*Calyptorhynchus lathami*);
- Gang-gang Cockatoo (*Callocephalon fimbriatum*);
- Little Lorikeet (*Glossopsitta pusilla*);
- Turquoise Parrot (*Neophema pulchella*);
- Masked Owl (*Tyto novaehollandiae*);
- Brown Treecreeper (eastern subspecies) (*Climacteris picumnus* subsp. *victoriae*);
- Speckled Warbler (*Chthonicola sagittata*);
- Black-chinned Honeyeater (eastern subspecies) (*Melithreptus gularis* subsp. *gularis*);
- Hooded Robin (south-eastern form) (*Melanodryas cucullata* subsp. *cucullata*);
- Scarlet Robin (*Petroica boodang*);
- Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis* subsp. *temporalis*);
- Diamond Firetail (*Stagonopleura guttata*);
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*);
- Eastern Freetail-bat (*Mormopterus norfolkensis*);
- Little Bentwing-bat (*Miniopterus australis*);
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*);
- Corben's Long-eared Bat (*Nyctophilus corbeni*);
- Large-eared Pied Bat (*Chalinolobus dwyeri*); and
- Eastern Cave Bat (*Vespadelus troughtoni*).

Table 8
Threatened Species Records in the Locality

Species	Conservation Status[1]		Survey Records on Figures 8 to 10	Database Records on Figures 8 to 10	Credit Type*
	TSC Act	EPBC Act			
Flora					
Ozothamnus tesselatus	V	V	This species was initially recorded by Lesryk Environmental Consultants (2013) and the extent further defined by Hunter Eco (2015a) (Attachment C) (Figure 10).	None.	Species Credit
Amphibians					
Giant Barred Frog (*Mixophyes iteratus*)	E	E	None.	There is a single database record of this species shown on Figure 9 within Goulburn River National Park (OEH, 2015d).	Not applicable as species is unlikely to occur.
Birds					
Square-tailed Kite (*Lophoictinia isura*)	V	-	This species was recorded by MKES (2005) adjacent to the BAR Footprint prior to the Wilpinjong Coal Mine (Figure 8).	There are database records of this species shown on Figure 8 (OEH, 2015d).	Ecosystem Credit
Little Eagle (*Hieraaetus morphnoides*)	V	-	There are several records of this species within and surrounding the BAR Footprint. This species was recorded by MKES (2005) and Lesryk Environmental Consultants (2013) (Figure 8). This species has also been recorded in the vicinity of the BAR Footprint by Biodiversity Monitoring Services (2013).	There are database records of this species shown on Figure 8 (BirdLife Australia, 2014; OEH, 2015d).	Ecosystem Credit
Glossy Black-Cockatoo (*Calyptorhynchus lathami*)	V	-	There are several records of this species within and surrounding the BAR Footprint. This species was recorded by Lesryk Environmental Consultants (2013) and MKES (2005) (Figure 8). This species has also been recorded in the vicinity of the BAR Footprint by Biodiversity Monitoring Services (2015a) (Attachment D).	There is a database record of this species shown on Figure 8 within Goulburn River National Park (OEH, 2015d).	Ecosystem Credit
Gang-gang Cockatoo (*Callocephalon fimbriatum*)	V	-	This species was recorded by MKES (2005) (Figure 8).	There is a database record of this species shown on Figure 8 (BirdLife Australia, 2014).	Ecosystem Credit

Table 8 (Continued)
Threatened Species Records in the Locality

Species	Conservation Status[1]		Survey Records on Figures 8 to 10	Database Records on Figures 8 to 10	Credit Type*
	TSC Act	EPBC Act			
Little Lorikeet (*Glossopsitta pusilla*)	V	-	There are several records of this species within and surrounding the BAR Footprint. This species was recorded by MKES (2005); Lesryk Environmental Consultants (2013) and Biodiversity Monitoring Services (2015a) (Attachment D) (Figure 8).	There are database records of this species shown on Figure 8 (BirdLife Australia, 2014; OEH, 2015d).	Ecosystem Credit
Turquoise Parrot (*Neophema pulchella*)	V	-	A single sighting of this species was made by MKES (2005) prior to the Wilpinjong Coal Mine (Figure 8).	There is a database record of this species shown on Figure 8 (BirdLife Australia, 2014).	Ecosystem Credit
Masked Owl (*Tyto novaehollandiae*)	V	-	This species was recorded by MKES (2005) and Lesryk Environmental Consultants (2013) (Figure 8).	There is a database record of this species shown on Figure 8 within Munghorn Gap Nature Reserve (OEH, 2015d).	Ecosystem Credit
Powerful Owl (*Ninox strenua*)	V	-	None.	There are database records of this species shown on Figure 8 (BirdLife Australia, 2014; OEH, 2015d).	Ecosystem Credit
Brown Treecreeper (eastern subspecies) (*Climacteris picumnus* subsp. *victoriae*)	V	-	There are several records of this species within and surrounding the BAR Footprint. This species was recorded by Ecovision Consulting (2006); MKES (2005); Biodiversity Monitoring Services (2013, 2015a) (Attachment D) and Lesryk Environmental Consultants (2013) (Figure 8).	There are database records of this species shown on Figure 8 (OEH, 2015d).	Ecosystem Credit
Speckled Warbler (*Chthonicola sagittata*)	V	-	There are several records of this species within and surrounding the BAR Footprint. This species was recorded by MKES (2005) Biodiversity Monitoring Services (2013, 2015a) (Attachment D) and Lesryk Environmental Consultants (2013) (Figure 8).	There are database records of this species shown on Figure 8 (BirdLife Australia, 2014; OEH, 2015d).	Ecosystem Credit
Black-chinned Honeyeater (eastern subspecies) (*Melithreptus gularis* subsp. *gularis*)	V	-	There are several records of this species within and surrounding the BAR Footprint. This species was recorded by MKES (2005); Lesryk Environmental Consultants (2013) and Biodiversity Monitoring Services (2015a) (Attachment D) (Figure 8).	None.	Ecosystem Credit
Regent Honeyeater (*Anthochaera phrygia*)	CE	CE[2]	Records of this species towards the south of the Wilpinjong Coal Mine (outside of the BAR Footprint) were provided by DECC (2005) (Figure 8).	There are database records of this species shown on Figure 8 (BirdLife Australia, 2014; OEH, 2015d).	Species Credit

Table 8 (Continued)
Threatened Species Records in the Locality

Species	Conservation Status[1]		Survey Records on Figures 8 to 10	Database Records on Figures 8 to 10	Credit Type*
	TSC Act	EPBC Act			
Painted Honeyeater (*Grantiella picta*)	V	V[3]	A single sighting of this species was made by MKES (2005) towards the south of the Wilpinjong Coal Mine (outside of the BAR Footprint) (Figure 8).	There are database records of this species shown on Figure 8 (BirdLife Australia, 2014; OEH, 2015d).	Ecosystem Credit
Hooded Robin (south-eastern form) (*Melanodryas cucullata* subsp. *cucullata*)	V	-	This species was recorded by MKES (2005); Ecovision Consulting (2006) and Biodiversity Monitoring Services (2015a) (Attachment D) (Figure 8).	There are database records of this species shown on Figure 8 (OEH, 2015d).	Ecosystem Credit
Scarlet Robin (*Petroica boodang*)	V	-	This species was recorded by Biodiversity Monitoring Services (2013) and Lesryk Environmental Consultants (2013) (Figure 8).	None.	Ecosystem Credit
Flame Robin (*Petroica phoenicea*)	V	-	None.	There is a database record of this species shown on Figure 8 (BirdLife Australia, 2014).	Ecosystem Credit
Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis* subsp. *temporalis*)	V	-	This species was recorded by Lesryk Environmental Consultants (2013) (Figure 8).	There is a database record of this species shown on Figure 8 (OEH, 2015d).	Ecosystem Credit
Varied Sittella (*Daphoenositta chrysoptera*)	V	-	This species was recorded by Biodiversity Monitoring Services (2015) (Figure 8).	There is a database record of this species shown on Figure 8 (BirdLife Australia, 2014).	Ecosystem Credit
Diamond Firetail (*Stagonopleura guttata*)	V	-	This species was recorded by MKES (2005); Ecovision Consulting (2006); Lesryk Environmental Consultants (2013) and Biodiversity Monitoring Services (2015a) (Attachment D) (Figure 8).	There are database records of this species shown on Figure 8 (BirdLife Australia, 2014; OEH, 2015d).	Ecosystem Credit
Mammals					
Koala (*Phascolarctos cinereus*)	V	V	A single incidental sighting of a Koala occurred in 2013 (Figure 9). This species has not been recorded during targeted field surveys from 2005 to 2015. It is considered that the Koala sighted in 2013 was an individual moving between areas (Biodiversity Monitoring Services, 2013).	There is a single database record of the Koala along Wollar Creek shown on Figure 9 (OEH, 2015d).	Species Credit
Brush-tailed Rock-wallaby (*Petrogale penicillata*)	E	V	None.	There is a single database record of this species shown on Figure 9 (OEH, 2015d).	N/A
Squirrel Glider (*Petaurus norfolcensis*)	V	-	This species was recorded by MKES (2005) and Biodiversity Monitoring Services (2015a) (Attachment D) (Figure 9).	There is a database record of this species shown on Figure 9 (OEH, 2015d).	Ecosystem Credit

Table 8 (Continued)
Threatened Species Records in the Locality

Species	Conservation Status[1]		Survey Records on Figures 8 to 10	Database Records on Figures 8 to 10	Credit Type*
	TSC Act	EPBC Act			
Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*)	V	-	This species was recorded by Greg Richards and Associates (2005) within the BAR Footprint and surrounds (Figure 9).	None.	Ecosystem Credit
Eastern Freetail-bat (*Mormopterus norfolkensis*)	V	-	This species was recorded by Greg Richards and Associates (2005) within the BAR Footprint and surrounds (Figure 9).	None.	Ecosystem Credit
Little Bentwing-bat (*Miniopterus australis*)	V	-	This species was recorded by Greg Richards and Associates (2005) within the BAR Footprint and surrounds (Figure 9).	None.	Ecosystem Credit[#]
Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*)	V	-	This species was recorded by Greg Richards and Associates (2005); Biodiversity Monitoring Services (2013, 2015a) (Attachment D), and Lesryk Environmental Consultants (2013) within the BAR Footprint and surrounds (Figure 9).	There is a database record of this species shown on Figure 9 (OEH, 2015d).	Ecosystem Credit[#]
Corben's Long-eared Bat (*Nyctophilus corbeni*)	V	V	This species was recorded by Biodiversity Monitoring Services (2015a,b) (Attachments D and H) (Figure 9).	There are database records of this species shown on Figure 9 (OEH, 2015d).	Ecosystem Credit
Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)	V	-	This species was recorded by Greg Richards and Associates (2005) and Biodiversity Monitoring Services (2013) within the BAR Footprint and surrounds (Figure 9).	None.	Ecosystem Credit
Large-eared Pied Bat (*Chalinolobus dwyeri*)	V	V	This species was recorded by Greg Richards and Associates (2005); Biodiversity Monitoring Services (2013) and Lesryk Environmental Consultants (2013) (Figure 9).	None.	Ecosystem Credit[#]
Eastern Cave Bat (*Vespadelus troughtoni*)	V	-	This species was recorded by Lesryk Environmental Consultants (2013) and Biodiversity Monitoring Services (2013, 2015b) (Attachment H) (Figure 9).	None.	Ecosystem Credit[#]

Note: the highlighted cells are the species credit species that are relevant to the BAR Footprint.

* *BioNet Threatened Species Profile Database* (OEH, 2015c).

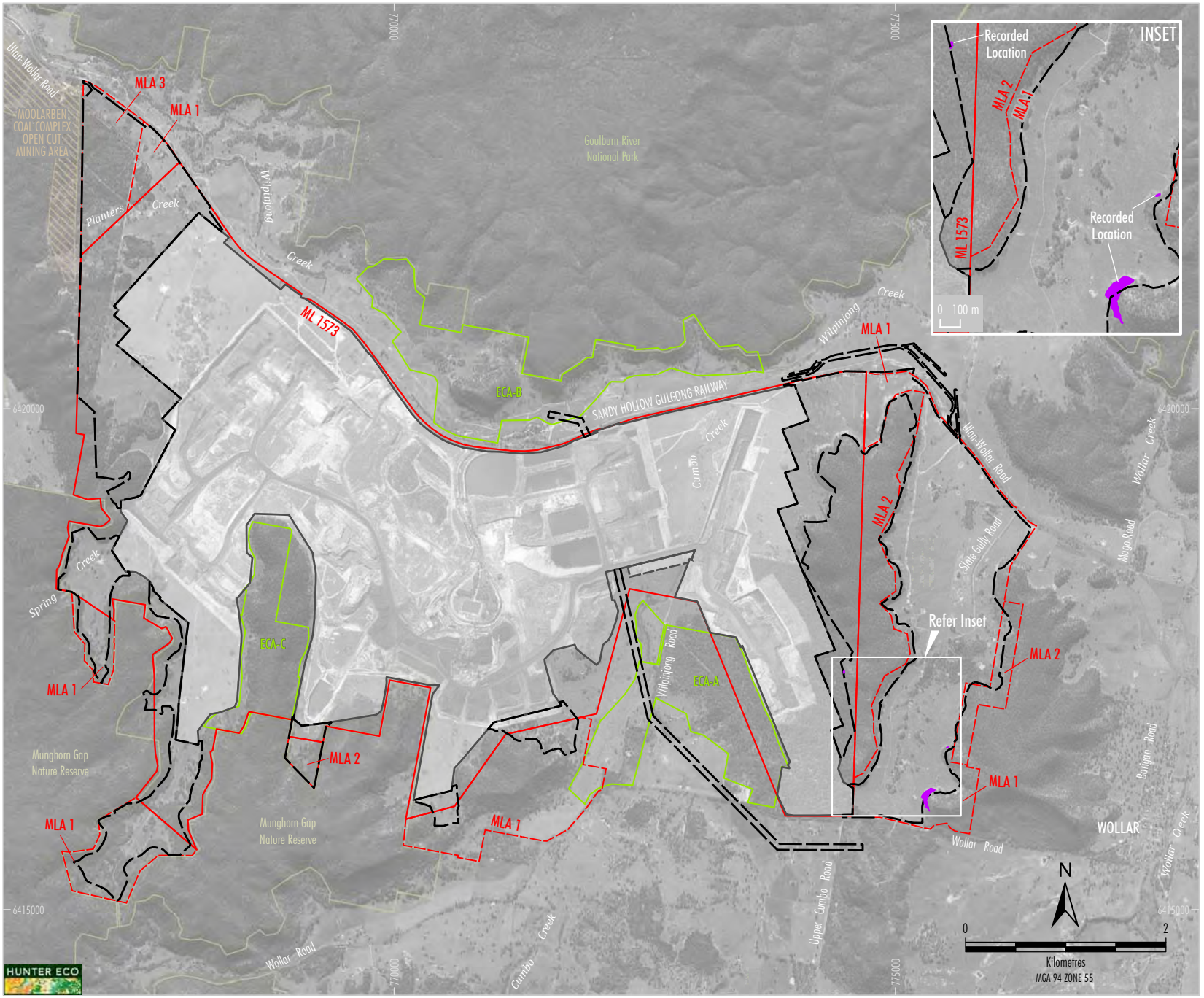
[1] Threatened fauna species status under the TSC Act and/or EPBC Act (current at October 2015).

V = Vulnerable; E = Endangered; CE = Critically Endangered.

[2] Listed as 'Endangered' under the EPBC Act at the time of the controlled action decision (12 March 2015) and therefore assessed under the Commonwealth offset policy as 'Endangered' not 'Critically Endangered' (refer section 158A of the EPBC Act).

[3] This species was not listed under the EPBC Act at the time of the controlled action decision (12 March 2015) and therefore the listing is not relevant to the Project (refer section 158A of the EPBC Act).

[#] It is recognised that breeding habitat for these species produces species credits, however, no breeding habitat (caves) would be adversely impacted by the Project.



LEGEND

- Mining Lease Boundary
- Mining Lease Application Boundary
- Approved/Existing Open Cut and Contained Infrastructure Area
- Relocated Block Bank and Cumbo Creek Disturbance Area
- Biodiversity Assessment Report Development Site Footprint
- Enhancement and Conservation Area

Threatened Flora Species

- *Ozothamnus tesselatus*

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (Jun 2015; Jun 2014)

Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Threatened Flora Species

Figure 10

WIL-12-12_WEP_EIS_BAR BOS_204D

2.3.3 Ecosystem Credit Species

A total of 31 ecosystem credit species are listed in Table 9 from the Credit Calculator, 16 of which have been recorded within the BAR Footprint or immediate surrounds. Table 9 also provides the occurrence of each species in accordance with the NSW *Framework for Biodiversity Assessment* (OEH, 2014a), along with reasons for any species being excluded from the assessment.

Table 9
Ecosystem Species from the Credit Calculator

Common Name	Scientific Name	Conservation Status[1]		TS Offset Multiplier	T_G Value*	Presence	Reasons for Exclusion
		TSC Act	EPBC Act				
Birds							
Malleefowl	*Leipoa ocellata*	E	V	2.6	0.375	NP	Predominantly a bird of floristically rich mallee communities. Can be found infrequently in woodlands with dense and diverse shrub and herb layers. Habitat within the BAR Footprint was unsuitable being woodland with a sparse shrub layer. The nearest record of the species is approximately 65 km north west of the BAR Footprint. Its occurrence within the BAR Footprint is therefore highly unlikely.
Square-tailed Kite	*Lophoictinia isura*	V	-	1.4	0.725	A	-
Little Eagle	*Hieraaetus morphnoides*	V	-	1.4	0.725	R	-
Bush Stone-curlew	*Burhinus grallarius*	E	-	2.6	0.375	A	-
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	V	-	1.8	0.575	R	-
Gang-gang Cockatoo	*Callocephalon fimbriatum*	V	-	2.0	0.5	R	-
Little Lorikeet	*Glossopsitta pusilla*	V	-	1.8	0.575	R	-
Turquoise Parrot	*Neophema pulchella*	V	-	1.8	0.575	R	-
Swift Parrot	*Lathamus discolor*	E	E	1.3	0.75	A	-
Barking Owl	*Ninox connivens*	V	-	3.0	0.325	A	
Masked Owl	*Tyto novaehollandiae*	V	-	3.0	0.325	R	-
Powerful Owl	*Ninox strenua*	V	-	3.0	0.325	A	-
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus* subsp. *victoriae*	V	-	2.0	0.5	R	-
Speckled Warbler	*Chthonicola sagittata*	V	-	2.6	0.375	R	-
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis* subsp. *gularis*	V	-	1.3	0.75	R	-
Painted Honeyeater	*Grantiella picta*	V	V[2]	1.3	0.75	A	-

Table 9 (Continued)
Ecosystem Species from the Credit Calculator

Common Name	Scientific Name	Conservation Status[1]		TS Offset Multiplier	T_G Value*	Presence	Reasons for Exclusion
		TSC Act	EPBC Act				
Painted Honeyeater	*Grantiella picta*	V	V[2]	1.3	0.75	A	-
Hooded Robin (south-eastern form)	*Melanodryas cucullata* subsp. *cucullata*	V	-	1.7	0.6	R	-
Scarlet Robin	*Petroica boodang*	V	-	1.3	0.75	R	-
Flame Robin	*Petroica phoenicea*	V	-	1.3	0.75	A	-
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis* subsp. *temporalis*	V	-	1.3	0.75	R	-
Varied Sittella	*Daphoenositta chrysoptera*	V	-	1.3	0.75	A	-
Diamond Firetail	*Stagonopleura guttata*	V	-	1.3	0.75	R	-
Mammals							
Spotted-tailed Quoll	*Dasyurus maculatus*	V	E	2.6	0.375	A	-
Squirrel Glider	*Petaurus norfolcensis*	V	-	2.2	0.45	A	-
Yellow-bellied Glider	*Petaurus australis*	V	-	2.3	0.425	NP	Generally found in tall mature eucalypt forest on nutrient rich soil in high rainfall areas. The BAR Footprint habitat is unlikely to be suitable for this glider. There are several records in the wider region with the nearest being 18 km to the east. Its occurrence in the BAR Footprint is unlikely.
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	V	-	2.2	0.45	R	-
Eastern Freetail-bat	*Mormopterus norfolkensis*	V	-	2.2	0.45	R	-
Corben's Long-eared Bat	*Nyctophilus corbeni*	V	V	2.1	0.475	R	-
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	V	-	2.2	0.45	A	-
Greater Broad-nosed Bat	*Scoteanax rueppellii*	V	-	2.2	0.45	NP	Most commonly occurs in tall wet forest. Mostly found in gullies and along river systems. The nearest record is 17 km east of the BAR Footprint with numerous records further east. The species is unlikely to occur in the BAR Footprint.

* *BioNet Threatened Species Profile Database* (OEH, 2015c).

[1] Threatened fauna species status under the TSC Act and/or EPBC Act (current at October 2015).
V = Vulnerable; E = Endangered

[2] This species was not listed under the EPBC Act at the time of the controlled action decision (12 March 2015) and therefore the listing is not relevant to the Project (refer section 158A of the EPBC Act).

Occurrence: NP = not present, A = assumed, R = recorded during surveys as described in Table 7.

The ecosystem credit species listed in Table 9 from the Credit Calculator do not list the following threatened bats which have been recorded at Wilpinjong Coal Mine:

- Little Bentwing-bat (*Miniopterus australis*) which was recorded by Greg Richards and Associates (2005) within the BAR Footprint and surrounds (Figure 9);
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) (foraging habitat) which was recorded by Greg Richards and Associates (2005); Biodiversity Monitoring Services (2013; 2015a) (Attachment D), and Lesryk Environmental Consultants (2013) within the BAR Footprint and surrounds (Figure 9);
- Large-eared Pied Bat (*Chalinolobus dwyeri*) was detected within the BAR Footprint and surrounds (likely foraging) (Greg Richards and Associates, 2005; Biodiversity Monitoring Services, 2013;Lesryk Environmental Consultants, 2013); and
- Eastern Cave Bat (*Vespadelus troughtoni*) (foraging habitat) was recorded by Biodiversity Monitoring Services (2013) and Lesryk Environmental Consultants (2013) (Attachment D) (Figure 9).

Despite this omission in the Credit Calculator, in this instance, these species would not influence the ecosystem credit amount as there are other species with lower T_G scores (that drive the offset requirement). The significance of potential impacts on these species is assessed in Attachment A.

Table 10 identifies the vegetation zones located within the BAR Footprint along with the associated ecosystem credit species that has been identified as having the lowest T_G value for that zone. The species with the lowest T_G value influences the offset multiplier designated to each vegetation zone.

Table 10
Vegetation Zones and Predicted Threatened Species which Influences the Offset Required for Each Vegetation Zone

	BVT Name	BVT	Predicted Threatened Species with Lowest T_G Value	Species T_G Value
Grassy Woodlands - Western Slopes Grassy Woodlands				
1	[1]Blakely's Red Gum - Yellow Box grassy tall woodland of the New England Tableland Bioregion	HU681	Turquoise Parrot	0.55
2	Fuzzy Box woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	HU547	Turquoise Parrot	0.55
3 and 4	Rough-barked Apple grassy tall woodlands of the Brigalow Belt South	HU981	Speckled Warbler	0.355
5	[1]Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion	HU732	Turquoise Parrot	0.55
Grassy Woodlands - Coastal Valley Grassy Woodlands				
6	Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	HU910	Speckled Warbler	0.375
Dry Sclerophyll Forests (Shrubby sub-formation) - Western Slopes Dry Sclerophyll Forests				
7	Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	HU843	Masked Owl	0.325
8	Red Ironbark - Grey Gum - Black Pine heathy woodland on sandstone ranges of the Sydney Basin	HU886	Masked Owl	0.325

Table 10 (Continued)
Vegetation Zones and Predicted Threatened Species which Influences the Offset Required for Each Vegetation Zone

	BVT Name	BVT	Predicted Threatened Species with Lowest T_G Value	Species T_G Value
Dry Sclerophyll Forests (Shrubby sub-formation) - Western Slopes Dry Sclerophyll Forests (Cont.)				
9	[2]Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	HU618	Masked Owl	0.325
10	White Box - Black Cypress Pine shrubby woodland of the Western Slopes	HU824	Speckled Warbler	0.375
Dry Sclerophyll Forests (Shrub/grass sub-formation) - North-west Slopes Dry Sclerophyll Woodlands				
11	Grey Box grassy open forest of the Central and Lower Hunter Valley	HU962	Turquoise Parrot	0.55
12	Narrow-leaved Ironbark - Black Cypress Pine shrub - grass woodland upper Hunter and northern Wollemi	HU825	Masked Owl	0.325

[1] Box-Gum Woodland EEC/CEEC.

2.3.4 Species Credit Species

There are three species credit species which are relevant to the Project. One species credit flora species was identified in the BAR Footprint, being *Ozothamnus tesselatus* (Table 11) (Plate 1). In addition, two species credit fauna species have been assumed to have potential habitat in the BAR Footprint, in accordance with the NSW *Framework for Biodiversity Assessment* (OEH, 2014a), namely, Regent Honeyeater and Koala (*Phascolarctos cinereus*) (Table 11). Neither of these two fauna species were recorded during targeted surveys although they have previously been recorded in the immediate vicinity of the BAR Footprint (Table 8).

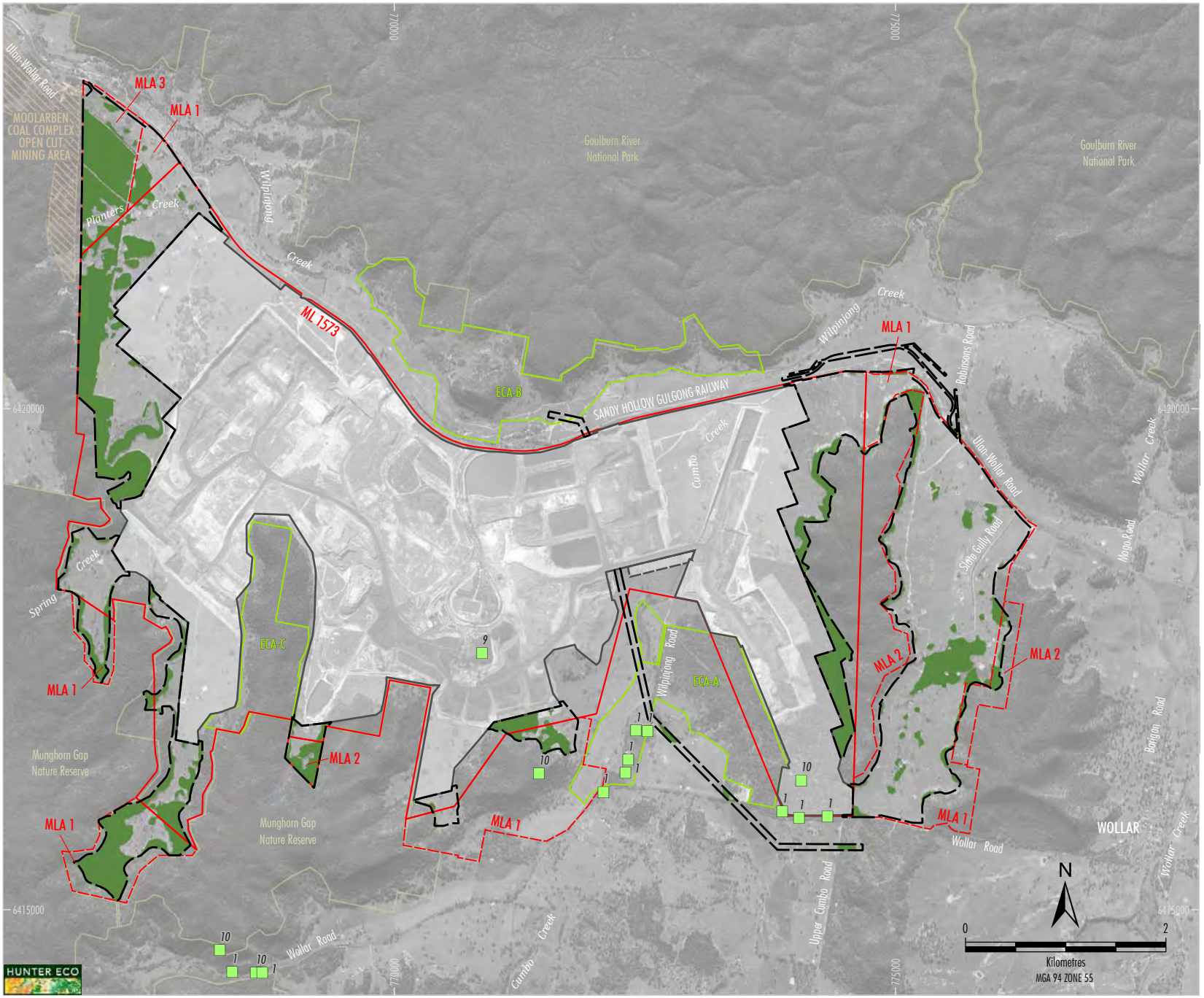
Table 11
Species Credit Species Recorded or Assumed to have Potential Habitat in the BAR Footprint

Species	Conservation Status[1]		Loss (individuals/ha)	Recorded?
	TSC Act	EPBC Act		
Flora				
Ozothamnus tesselatus	V	V	589 individuals (Figure 10)	Yes
Fauna				
Regent Honeyeater (*Anthochaera phrygia*)	CE	CE[2]	273 ha of potential habitat (Figure 11)	No
Koala (*Phascolarctos cinereus*)	V	V	165 ha of potential habitat (Figure 12)	No

[1] Threatened fauna species status under the TSC Act and/or EPBC Act (current at October 2015).

V = Vulnerable; E = Endangered; CE = Critically Endangered.

[2] Listed as 'Endangered' under the EPBC Act at the time of the controlled action decision (12 March 2015) and therefore assessed under the Commonwealth offset policy as 'Endangered' not 'Critically Endangered' (refer section 158A of the EPBC Act).



LEGEND

- Mining Lease Boundary
- Mining Lease Application Boundary
- Approved/Existing Open Cut and Contained Infrastructure Area
- Relocated Block Bank and Cumbo Creek Disturbance Area
- Biodiversity Assessment Report Development Site Footprint
- Enhancement and Conservation Area

Regent Honeyeater

- Recorded Location
- Potential Habitat

Reference: 1 DECC (2005)
9 Birdlife (2014)
10 OEH (2015)

Note: There are no references 2 - 8 on this figure.

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (Jun 2015; Jun 2014)

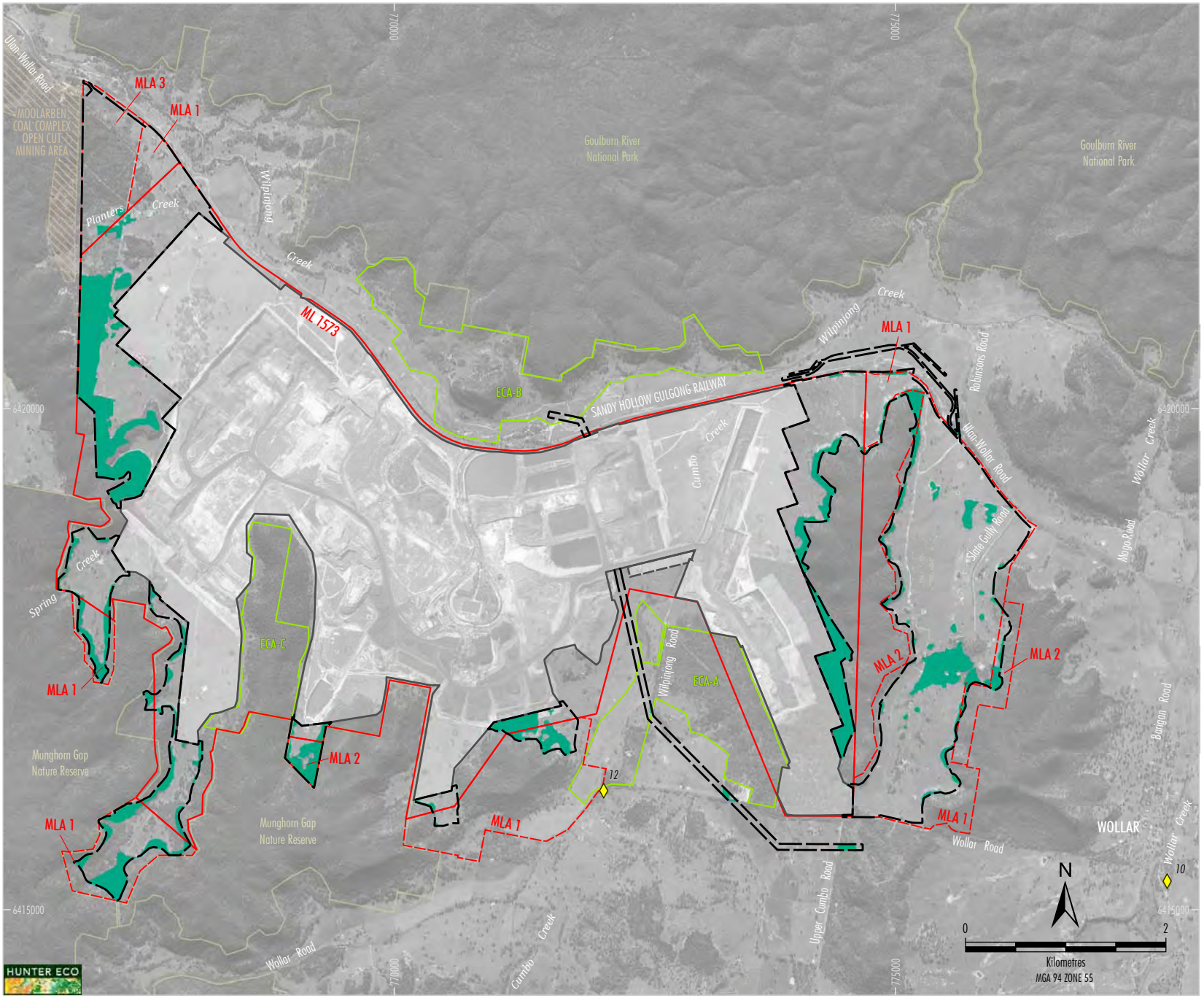
Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Regent Honeyeater Potential Habitat

Figure 11

WIL-12-12_WEP_EIS_BAR BOS_206D



LEGEND

- Mining Lease Boundary
- Mining Lease Application Boundary
- Approved/Existing Open Cut and Contained Infrastructure Area
- Relocated Block Bank and Cumbo Creek Disturbance Area
- Biodiversity Assessment Report Development Site Footprint
- Enhancement and Conservation Area

Koala

- Recorded Location
- Koala Potential Habitat

Reference: *10 OEH (2015)*
12 Incidental Sighting (2013)

Note: There are no references 1 - 9 or 11 on this figure.

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (Jun 2015; Jun 2014)

Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Koala Potential Habitat

Figure 12

WIL-12-12_WEP_EIS_BAR BOS_214B

Plate 1 *Ozothamnus tesselatus*

Species polygons (i.e. potential habitat extent) for the species credit species listed in Table 11 have been prepared in accordance with the NSW *Framework for Biodiversity Assessment* (OEH, 2014a) and are shown on Figures 10 to 12. Table 11 also details the number of individual plants and area of habitat for the fauna species in the BAR Footprint.

A 'glitch' with the *BioNet Threatened Species Profile Database* (OEH, 2015c) was identified during preparation of this assessment where many of the BVTs assigned to threatened species were missing from the database. WCPL raised this issue with OEH (14 October 2015). In absence of a complete list of relevant BVTs, the BVTs were evaluated based on various information sources as described below.

The potential habitat for each species is based on a review of:

- a Koala food tree assessment (Hunter Eco [2015a] Attachment C);
- the *BioNet Threatened Species Profile Database* (OEH, 2015c);
- recovery plans and guidance (DotE, 2015a and 2014b; DECC, 2008a; Menkhorst *et al.,* 1999); and
- scientific literature (e.g. Oliver, 2000).

Table 12 provides the BVTs associated with habitat for the Regent Honeyeater and Koala.

Regent Honeyeater

Key tree species for the Regent Honeyeater include the following that occur within the BAR Footprint: Yellow Box (*E. melliodora*), White Box (*E. albens*) and Blakely's Red Gum (*E. blakelyi*) (DotE, 2015a and OEH, 2015c). These trees are associated with:

- HU910 Blakely's Red Gum Woodland (shrubby);
- HU824 White Box Woodland (shrubby);
- HU732 Yellow Box Woodland (grassy); and
- HU681 Blakely's Red Gum Woodland (grassy).

Approximately 108.5 ha of vegetation with key foraging tree species occurs in the BAR Footprint. However, the NSW *Framework for Biodiversity Assessment* (OEH, 2014a) requires consideration of general habitat for a species (not only key habitat). Therefore, the additional areas of potential habitat have also been considered and included as outlined below.

Table 12
Vegetation Types Representing Potential Habitat for the Regent Honeyeater and Koala

Community		Hunter Eco (2015a)	BVT	Regent Honeyeater Potential Habitat (ha)	Koala Potential Habitat (ha)
Grassy Woodlands - Western Slopes Grassy Woodlands					
1	[1]Blakely's Red Gum Woodland (grassy)	MU1a	HU681	6	6
2	Fuzzy Box Woodland	MU2	HU547	-	1.5
3a	Rough-barked Apple - Black Cypress Pine Woodland	MU6a	HU981	51.5	-
3b	Rough-barked Apple - Black Cypress Pine Woodland – regeneration	MU6a		-	-
4a	Rough-barked Apple Woodland – alluvial	MU6b		58	-
4b	Rough-barked Apple Woodland – alluvial - regeneration	MU6b		-	-
5	[1]Yellow Box Woodland (grassy)	MU10	HU732	3.5	3.5
6	Blakely's Red Gum Woodland (shrubby)	MU1b	HU910	4	4
7	Grey Gum - Narrow-leaved Stringybark Forest	MU3	HU843	42.5	42.5
8a	Red Ironbark Forest	MU5a	HU886	-	-
8b	Red Ironbark Forest-regeneration	MU5b	HU886	-	-
9	Slaty Box Forest	MU7	HU618	9.5	9.5
10a	White Box Woodland (shrubby)	MU9	HU824	95	95
10b	White Box Woodland (shrubby) - regeneration	MU9		-	-
11	Western Grey Box Woodland	MU8	HU962	3	3
12	Narrow-leaved Ironbark Forest	MU4	HU825	-	-
			Total	**273**	**165**

[1] Box-Gum Woodland EEC/CEEC

The Regent Honeyeater records in Offset Area 1 (DECC, 2005) (south of the BAR Footprint) are within:

- HU910 Blakely's Red Gum - Rough-barked Apple Woodland (i.e. the same BVT as Blakely's Red Gum Woodland (shrubby) in the BAR Footprint); and
- HU843 Grey Gum - Narrow-leaved Stringybark Forest.

Given the local records of the species in HU843 (Grey Gum - Narrow-leaved Stringybark Forest) it is assumed that this BVT also provides potential habitat for the species. According to the *BioNet Threatened Species Profile Database* (OEH, 2015c), the Regent Honeyeater is known to use Grey Gum (*E. punctata*).

The *BioNet Threatened Species Profile Database* (OEH, 2015c) is intended to be a complete database of species habitat to be used in conjunction with the NSW *Framework for Biodiversity Assessment* (OEH, 2014a) but it does not recognise HU910 or HU843 as potential habitat for the Regent Honeyeater in the Hunter-Central Rivers CMA and does not include all of the BVTs associated with the species' key tree species (as listed above). Instead, OEH (2015c) lists Regent Honeyeater habitat as the following BVTs within the BAR Footprint:

- HU962 Western Grey Box Woodland;
- HU732 Yellow Box Woodland (grassy);
- HU681 Blakely's Red Gum Woodland (grassy); and
- HU618 Slaty Box Forest.

After a review of scientific literature, it is noted that the Regent Honeyeater can also use Rough-barked Apple (*Angophora floribunda*) (Oliver, 2000) which is associated with HU981 Rough-barked Apple - Black Cypress Pine Woodland and Rough-barked Apple Woodland (alluvial). The Regent Honeyeater was opportunistically recorded within Rough-barked Apple Woodland by Dr Colin Driscoll in 2012 whilst conducting field surveys in a locality approximately 18 km east (E229512, S6412798 MGA Zone 56). DotE (2015a) also notes that Rough-barked Apple can be used for breeding.

Conservatively, assuming that Regent Honeyeater habitat is the combination of the above based on a review of various information sources, the following BVTs within the BAR Footprint are considered to represent potential habitat for the Regent Honeyeater:

- HU981 Rough-barked Apple - Black Cypress Pine Woodland and Rough-barked Apple Woodland (alluvial);
- HU962 Western Grey Box Woodland;
- HU910 Blakely's Red Gum Woodland (shrubby);
- HU843 Grey Gum - Narrow-leaved Stringybark Forest;
- HU824 White Box Woodland (shrubby);
- HU732 Yellow Box Woodland (grassy);
- HU681 Blakely's Red Gum Woodland (grassy); and
- HU618 Slaty Box Forest.

The poorer condition occurrences of these BVTs (i.e. the regeneration areas) are not considered potential habitat for the species due to the lack of a suitable nectar source. Based on the above, there is approximately 273 ha of potential habitat for the Regent Honeyeater in the BAR Footprint.

Koala

According to the *BioNet Threatened Species Profile Database* (OEH, 2015c) the only BVT in the BAR Footprint which represents potential habitat for the Koala is HU618 Slaty Box Forest (9.5 ha). However, after consideration of the State Environment Planning Policy (SEPP) 44 – *Koala Habitat Protection* and the *Recovery Plan for the Koala (Phascolarctos cinereus)* (DECC, 2008b) the following range of BVTs are considered to represent potential habitat for the Koala:

- HU962 Western Grey Box Woodland;
- HU910 Blakely's Red Gum Woodland (shrubby);
- HU843 Grey Gum - Narrow-leaved Stringybark Forest;
- HU824 White Box Woodland (shrubby);
- HU732 Yellow Box Woodland (grassy);
- HU681 Blakely's Red Gum Woodland (grassy);
- HU618 Slaty Box Forest; and
- HU547 Fuzzy Box Woodland.

The poorer condition occurrences of these BVTs (i.e. the regeneration areas) are not considered potential habitat for the species because of a high proportion of immature trees. Based on the above, there is approximately 165 ha of potential habitat for the Koala in the BAR Footprint.

Other Species

No other species credit species are considered relevant to the Project.

Biodiversity Monitoring Services (2015a) (Attachment D) recorded a roost site of the Eastern Bentwing-bat in a historical mine adit adjacent to the western boundary of Pit 8 (Figure 9). Disturbance to breeding habitat of the Eastern Bentwing-bat can generate species credits (OEH, 2015a), however direct impacts would be avoided and indirect impacts would be mitigated (as described in Section 3.1.3) such that the Project would not need to offset species credits for this species.

The *BioNet Threatened Species Profile Database* (OEH, 2015c) also indicates that breeding habitat of the Large-eared Pied Bat (*Chalinolobus dwyeri*) generates species credits and foraging habitat generates ecosystem credits. No breeding habitat for this species was recorded in the BAR Footprint however this species was detected in the BAR Footprint (likely foraging) so this species is included in Section 2.3.3 as a relevant ecosystem credit species.

FloraSearch (2005) previously reported the presence of Capertee Stringybark (*Eucalyptus cannonii*) near the Wilpinjong Coal Mine. Two trees in the BAR Footprint were suspected to be Capertee Stringybark, however, samples from these trees were subsequently confirmed by the Sydney Herbarium to be hybrids of *Eucalyptus cannonii* and *Eucalyptus macrorhyncha*. This hybrid is not listed as a threatened species.

2.3.5 Threatened Species That Cannot Withstand Loss

Species are flagged as unable to withstand loss in the *BioNet Threatened Species Profile Database* (OEH, 2015c) if there are two or less populations in the relevant CMA or if the species is exceptionally rare or poorly understood. Such species are also assigned the number of individuals that could be lost with negligible impact. It is noted that species that cannot withstand further loss are not used in the decision making threshold for Major Projects being assessed in accordance with the NSW *Framework for Biodiversity Assessment* (OEH, 2014a), including this Project.

Ozothamnus tesselatus is identified as a species that cannot withstand further loss in accordance with the BioBanking Report available on the *BioNet Threatened Species Profile Database* (OEH, 2015c). *Ozothamnus tesselatus* has only been recorded in the Hunter-Central Rivers CMA where there are over 50 records. It is assumed that its status as being unable to withstand loss is because the species is poorly known. The number of individuals that could be lost with negligible impact is zero. A formal impact assessment (Attachment A) concludes that this species would withstand the loss associated with the Project due to much larger numbers recently recorded in the immediate region than were previously known.

2.3.6 Impacts on Biodiversity That Require Further Consideration

The OEH's comments in the SEARs for the EIS requested further consideration on the species/populations/ecological communities listed in Table 13. Of the items listed, only the Box-Gum Woodland EEC, *Ozothamnus tesselatus* and Regent Honeyeater are relevant to the BAR Footprint.

Table 13
Species/Populations/Ecological Communities Which May Require Further Consideration

Scientific Name	Common Name	Conservation Status[1]		Relevance to the BAR Footprint
		TSC Act	EPBC Act	
Endangered Ecological Communities				
Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions		E	-	Not present
Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions		E	-	Not present
Hunter Valley Weeping Myall Woodland of the Sydney Basin Bioregion		E	CE	Not present
White Box Yellow Box Blakely's Red Gum Woodland		E	CE	Present, refer to Section 3.2
Flora (Endangered Population)				
Acacia pendula	*Acacia pendula* population in the Hunter catchment	E	-	Not present
Eucalyptus camaldulensis	*Eucalyptus camaldulensis* population in the Hunter catchment	E	-	Not present
Cymbidium canaliculatum	*Cymbidium canaliculatum* population in the Hunter Catchment	E	-	Not present
Amphibians				
Mixophyes iteratus	Giant Barred Frog	E	E	Not present in the footprint or downstream
Birds				
Lophoictinia isura	Square-tailed Kite	V	-	Not present (see text below this table)
Anthochaera phrygia	Regent Honeyeater	CE	CE[2]	Potential habitat present, Refer to Section 3.2

Table 13 (Continued)
Species/Populations/Ecological Communities Which May Require Further Consideration

Scientific Name	Common Name	Conservation Status[1]		Relevance to the BAR Footprint
		TSC Act	EPBC Act	
Flora				
Ozothamnus tesselatus		V	V	Present, refer to Section 3.2
Acacia ausfeldii	Ausfeld's Wattle	V	-	Not present
Eucalyptus cannonii	Capertee Stringybark	V	-	Not present
Homoranthus darwinioides	-	V	V	Not present
Diuris tricolor	Pine Donkey Orchid	V	-	Not present
Prasophyllum sp. Wybong	-	-	CE	Not present

Source: OEH's comments in the SEARs for the EIS

[1] Threatened fauna species status under the TSC Act and/or EPBC Act (current at October 2015).
V = Vulnerable; E = Endangered; CE = Critically Endangered.

[2] Listed as 'Endangered' under the EPBC Act at the time of the controlled action decision (12 March 2015) and therefore assessed under the Commonwealth offset policy as 'Endangered' not 'Critically Endangered' (refer section 158A of the EPBC Act).

Note: the highlighted species are relevant to the BAR Footprint.

The OEH's comments in the SEARs for the EIS requested further consideration on the Square-tailed Kite (Table 13). However, OEH (2015c) consider this species to be an ecosystem credit species that can be predicted to be present based on a habitat assessment (Table 9). The Square-tailed Kite is a wide ranging bird and was recorded by MKES (2005) prior to the Wilpinjong Coal Mine (Figure 8). Biodiversity Monitoring Services (2015a) (Attachment D) did not record the species in the BAR Footprint. Breeding is from July to February and the bird was not recorded in that period. Nesting is also generally near watercourses none of which habitat is present in the BAR footprint. Thus, given that the bird has been recorded in the area, the BAR footprint would at best be part of a foraging range that takes up >100 km^2.

There is no land near the BAR Footprint that the Minister for the Environment has declared 'critical habitat' in accordance with section 47 of the TSC Act (listed on the Register of Critical Habitat in NSW).

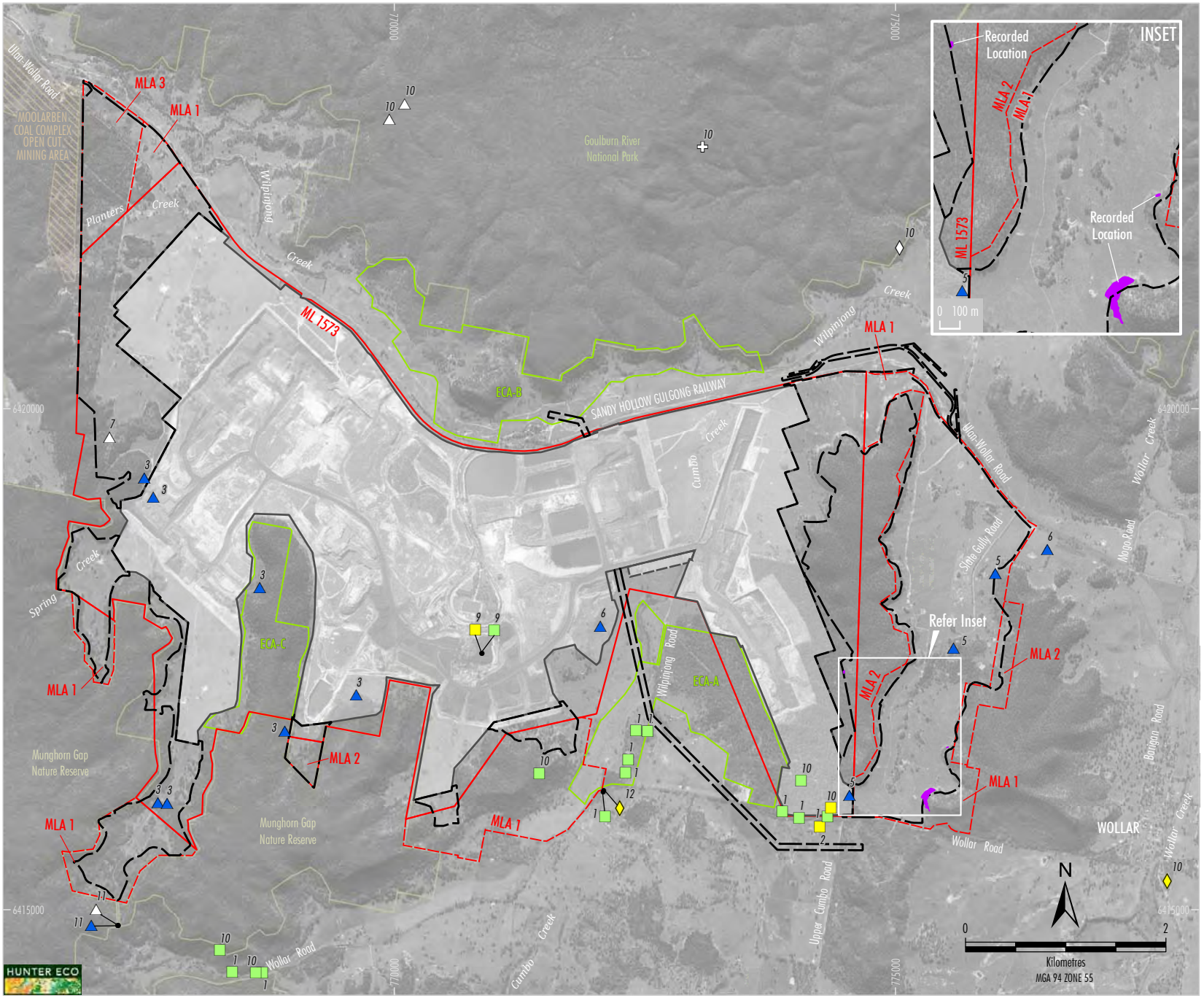
2.3.7 Threatened Species Listed under the EPBC Act

Figure 13 shows records of threatened species listed under the EPBC Act which have been recorded in the BAR Footprint or surrounds. Table 8 provides a summary of the threatened species records in the locality from survey records or database records.

One threatened flora species listed under the EPBC Act (as 'Vulnerable') has been recorded in the BAR Footprint, being *Ozothamnus tesselatus.* Two threatened fauna species listed under the EPBC Act (both listed as 'Vulnerable') have been recorded in the BAR Footprint, namely:

- Corben's Long-eared Bat (*Nyctophilus corbeni*) (Biodiversity Monitoring Services, 2015a) (Attachment D); and
- Large-eared Pied Bat (*Chalinolobus dwyeri*) (Greg Richards and Associates, 2005; Biodiversity Monitoring Services, 2013 and Lesryk Environmental Consultants, 2013).

The Regent Honeyeater was listed as 'Endangered' under the EPBC Act at the time of the controlled action decision (12 March 2015) and therefore assessed under the Commonwealth offset policy as 'Endangered' not 'Critically Endangered' (refer section 158A of the EPBC Act).



LEGEND

- Mining Lease Boundary
- Mining Lease Application Boundary
- Approved/Existing Open Cut and Contained Infrastructure Area
- Relocated Block Bank and Cumbo Creek Disturbance Area
- Biodiversity Assessment Report Development Site Footprint
- Enhancement and Conservation Area

Threatened Flora Species

- *Ozothamnus tesselatus*

Threatened Fauna Species

- Painted Honeyeater
- Regent Honeyeater
- Brush-tailed Rock-wallaby
- Koala
- Corben's Long-eared Bat
- Large-eared Pied Bat
- Giant Barred Frog

Reference:

1 DECC (2005)
2 Mount King Ecological Surveys (2005)
3 Greg Richards and Associates Pty Ltd (2005)
5 Lesryk Environmental Consultants (2013)
6 Biodiversity Monitoring Services (2013)
7 Biodiversity Monitoring Services (2015a)
9 Birdlife (2014)
10 OEH (2015)
11 Biodiversity Monitoring Services (2015b)
12 Incidental Sighting (2013)

Note: There are no references 4 or 8 on this figure.

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (Jun 2015; Jun 2014)

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Threatened Species under the EPBC Act

Figure 13

The Painted Honeyeater (*Grantiella picta*) was not listed under the EPBC Act at the time of the controlled action decision (12 March 2015) and therefore the listing is not relevant to the Project (refer section 158A of the EPBC Act). A single sighting of this species was made by MKES (2005) towards the south of the Wilpinjong Coal Mine, outside of the BAR Footprint (Figure 8). This species is considered as an ecosystem species (Table 9) and assessed in Attachment A.

3 STAGE 2 – IMPACT ASSESSMENT

Stage 2 involves assessing the potential direct and indirect impacts on biodiversity, describing impact avoidance and mitigation measures and determining the offset requirements. The OEH comments in the SEARs for the EIS direct the assessment of the impacts from the Project to be undertaken in accordance with the NSW *Framework for Biodiversity Assessment* (OEH, 2014a).

3.1 IMPACT ASSESSMENT AND MEASURES TO AVOID AND MINIMISE IMPACTS

This sub-section provides:

- a description of the existing Wilpinjong Coal Mine impact avoidance measures, mitigation measures and monitoring (Section 3.1.1);
- an assessment of the potential impacts and impact avoidance and mitigation measures relevant to those impacts (Sections 3.1.2 and 3.1.3);
- the potential cumulative impacts (Section 3.1.4); and
- a summary of additional impact avoidance and mitigation measures (Section 3.1.5).

3.1.1 Existing Impact Avoidance Measures, Mitigation Measures and Monitoring

There are a number of existing measures to avoid and minimise impacts on biodiversity at the Wilpinjong Coal Mine. A summary of the existing measures is provided in Table 14. These existing measures would be continued for the Project.

Table 14
Existing Impact Avoidance and Mitigation Measures

Measure	Description	Further Information
Progressive Site Rehabilitation	• Surface development areas are progressively rehabilitated and revegetated. • Revegetation of rehabilitation areas will aim to result in a combination of woodland, pasture and mixed woodland/pasture areas. • Revegetation will include the use of endemic plant species characteristic of the surrounding vegetation to produce a net increase in woodland vegetation. • Revegetation will aim to increase the continuity of woodland vegetation by establishing links between woodland vegetation in the rehabilitation areas, regeneration areas and existing remnant vegetation in the Munghorn Gap Nature Reserve, Goulburn River National Park and the Enhancement and Conservation Areas (ECAs). • Regeneration areas, which predominantly comprise cleared agricultural land, will be established to increase the continuity of existing native vegetation with the rehabilitation.	WCPL (2014a)
Creek Rehabilitation	• The banks of Wilpinjong and Cumbo Creeks in the rehabilitation areas and regeneration areas will be revegetated to increase the quantity of riparian vegetation along these creeks.	WCPL (2014a)

Table 14 (Continued)
Existing Impact Avoidance and Mitigation Measures

Measure	Description	Further Information
Vegetation Clearance Protocol (and Threatened Species Management Protocol)	• A Ground Disturbance Permit is completed prior to the commencement of new ground disturbance. • Areas to be cleared of native vegetation are delineated to prevent accidental damage during vegetation clearance activities or other works. • Pre-clearance habitat surveys are undertaken. • Impacts on fauna during clearance activities are managed.	WCPL (2014a)
Salvage and Re-Use of Material From The Mine Area for Habitat Enhancement	• Habitat features such as logs, fallen limbs and hollows are collected/salvaged where practicable to provide habitat features for fauna in rehabilitation areas, regeneration areas and ECAs.	WCPL (2014a)
Collection and Propagation of Seed for Rehabilitation Works	• Trees are examined for their provision of seed prior to vegetation clearance. • Native seed is collected from the local area to augment revegetation resources. • A seed inventory is maintained which records the amount of seed collected, species type and treatment and propagation specifications.	WCPL (2014a)
Feral Pest Control	• Regular property inspections are undertaken to assess the status of pest populations within WCPL-owned land. • Control of declared pests is undertaken (e.g. control feral pigs and rabbits).	WCPL (2014a and 2015c)
Weed Control	• Regular inspections of WCPL-owned lands to identify areas requiring the implementation of weed management measures. • Control of noxious weeds identified on WCPL-owned land is undertaken considering the relevant control category. • WCPL has completed a number of control programs to control large infestations of blackberry and other woody weeds along the Goulburn River (Landscape Constructions, 2014a and b).	WCPL (2014a and 2015c)
Erosion Control	• Minimising surface disturbance and restricting access to undisturbed areas. • Construction of suitable erosion and sediment controls such as drains and sediment dams to control, contain and manage sediment laden surface runoff.	WCPL (2015c)
Managing Grazing and Agriculture	• WCPL has currently excluded all domestic stock from the regeneration areas and woodland rehabilitation areas on site.	WCPL (2014a)
Restrictions On Site Access	• Rehabilitation areas will be fenced and signposted to limit access to authorised personnel only.	WCPL (2014a)
Bushfire Management	• The training of WCPL employees and contractors in general fire awareness and preventative measures. • The provision and maintenance of on-site firefighting equipment.	EcoLogical (2011)

WCPL has existing programs for monitoring:

- the flora and fauna in rehabilitation areas, regeneration areas and offset areas (WCPL, 2014a);
- stream health along creeks including Wilpinjong Creek (WCPL 2014c); and
- other environmental factors (soil geochemistry, meteorological conditions, noise, air quality, blasting, surface water and groundwater).

3.1.2 Direct Impacts and Measures to Avoid and/or Minimise Impacts

Vegetation Clearance

WCPL has evaluated the relative costs and environmental benefits of a number of alternative mechanisms to reduce the potential additional disturbance areas associated with the Project. In accordance with the NSW *Framework for Biodiversity Assessment* (OEH, 2014a), these avoidance and minimisation strategies are described below in relation to site selection/planning, construction and operation.

Site Selection and Planning

The location of the Project has been determined by the presence of coal seams able to be economically mined in the vicinity of the Wilpinjong Coal Mine and within WCPL's mining tenements. The continued development of coal resources in close proximity to WCPL's existing Coal Handling and Preparation Plant and other supporting facilities maximises the use of existing infrastructure. It also provides new mining areas that are largely contiguous with approved mining areas (i.e. thereby potentially minimising new disturbance areas).

The majority of the BAR Footprint is for the proposed open cut extension areas and therefore there are minimal opportunities to avoid direct impacts on threatened species habitat and threatened ecological communities. For example, the Box-Gum Woodland EEC/CEEC is largely located within the proposed open cut extension areas and therefore direct impacts on the majority of the community cannot be avoided.

The following refinements to the mine design have resulted in minimising additional land disturbance and associated impacts on flora, fauna and associated habitats:

- continued use of the existing infrastructure and services at the Wilpinjong Coal Mine for the life of the Project, with only the necessary infrastructure additions, upgrades and maintenance works;
- progressive backfilling of open cuts to minimise the overall mine footprint (i.e. to reduce the extent of out-of-pit emplacement);
- transporting waste rock material from the commencement of Pit 8 to other active open cut pits to avoid the need for an out-of-pit waste rock emplacement in Slate Gully;
- realignment of the TransGrid Wollar to Wellington 330 kV ETL over the backfilled waste rock emplacement of the Wilpinjong Coal Mine; and
- continued use of in-pit voids for operational water storage to avoid the need for additional specifically constructed storages outside the open cuts.

A section of the existing TransGrid Wollar to Wellington 330 kV ETL would be relocated to facilitate mining in Pit 8. The ETL is proposed to be predominantly constructed in cleared land (without threatened species habitat or the threatened ecological communities) (Figure 2). In order to minimise the potential land disturbance associated with the relocation it is proposed to realign the ETL over the backfilled waste rock emplacement of the Wilpinjong Coal Mine. The ETL would span Wilpinjong Creek (a 4th order stream) and Cumbo Creek (a 5th order stream), however the towers for the ETL would be located outside of the creekline, and there would be no clearing of riparian areas. There are no other route options for the relocated ETL that would further minimise impacts.

The ETL traverses over approximately 3 ha of land subject to a Voluntary Conservation Agreement (VCA). WCPL is currently working with OEH to modify these VCA areas to accommodate the ETL if approved (Section 4.1).

After consideration of the refinements above, the BAR Footprint (1,022 ha) is mostly (65%) cleared land though it also contains approximately 354 ha of native vegetation, comprising dry sclerophyll forests and grassy woodlands in moderate to good condition (Table 15; Figure 6). The remaining 668 ha consists of pasture improved grassland, stubble field, slashed powerline easement, dams, Typha/Phragmites drainage line and existing infrastructure. The Project would remove approximately 213 ha of dry sclerophyll forest and approximately 141 ha of grassy woodlands (Table 15).

Table 15
Vegetation Communities - Clearance

	Community	Hunter Eco (2015a) (Attachment C)	BVT	Clearance Area (ha)
Grassy Woodlands - Western Slopes Grassy Woodlands				
1	[1]Blakely's Red Gum Woodland (grassy)	MU1a	HU681	6
2	Fuzzy Box Woodland	MU2	HU547	1.5
3a	Rough-barked Apple – Black Cypress Pine Woodland	MU6a	HU981	51.5
3b	Rough-barked Apple – Black Cypress Pine Woodland – regeneration	MU6a	HU981	7.5
4a	Rough-barked Apple Woodland – alluvial	MU6b	HU981	58
4b	Rough-barked Apple Woodland – alluvial – regeneration	MU6b	HU981	9
5	[1]Yellow Box Woodland (grassy)	MU10	HU732	3.5
Grassy Woodlands - Coastal Valley Grassy Woodlands				
6	Blakely's Red Gum Woodland (shrubby)	MU1b	HU910	4
Dry Sclerophyll Forests (Shrubby sub-formation) - Western Slopes Dry Sclerophyll Forests				
7	Grey Gum – Narrow-leaved Stringybark Forest	MU3	HU843	42.5
8a	Red Ironbark Forest	MU5a	HU886	33.5
8b	Red Ironbark Forest – regeneration	MU5b	HU886	6
9	Slaty Box Forest	MU7	HU618	9.5
10a	White Box Woodland (shrubby)	MU9a	HU824	95
10b	White Box Woodland (shrubby) – regeneration	MU9b	HU824	3
Dry Sclerophyll Forests (Shrub/grass sub-formation) - North-west Slopes Dry Sclerophyll Woodlands				
11	Western Grey Box Woodland	MU8	HU962	3
12	Narrow-leaved Ironbark Forest	MU4	HU825	20.5
			Total	**354**

[1] Box-Gum Woodland EEC/CEEC

The Project would result in the clearance of 9.5 ha of Box-Gum Woodland EEC/CEEC (Table 16). The occurrences of these vegetation types throughout the BAR Footprint are currently fragmented and occur as 11 small patches (Figure 7). These patches of Box-Gum Woodland EEC are considered to be in *moderate/good* condition. The impact on the Box-Gum Woodland EEC is further assessed in Attachment A and the Box-Gum Woodland CEEC is further assessed in Attachment B.

Table 16
Box-Gum Woodland EEC/CEEC - Clearance

Community		BVT	Clearance Area (ha)
Box-Gum Woodland EEC/CEEC			
1	Blakely's Red Gum Woodland (grassy)	HU681	6
5	Yellow Box Woodland (grassy)	HU732	3.5
		Total	**9.5**

Construction

The NSW *Framework for Biodiversity Assessment* (OEH, 2014a), requires consideration of measures that minimise impacts on biodiversity during construction, including the method of clearing, clearing operations and timing of construction.

WCPL implement a Vegetation Clearance Protocol for the Wilpinjong Coal Mine which includes the requirement for a Ground Disturbance Permit to be completed prior to the commencement of new ground disturbance, delineation of disturbance areas, pre-clearance habitat surveys and management of impacts on fauna during clearance activities (WCPL, 2014a) (Table 14). Vegetation Clearance Protocols involving an experienced fauna handler and skilled machine operator can significantly increase the survival rate of vertebrate fauna during a vegetation-clearing program (Thompson and Thompson, 2015).

In addition to the existing impact avoidance and mitigation measures of the Wilpinjong Coal Mine, temporary fencing would be used during Project vegetation clearance near the known occurrences of *Ozothamnus tesselatus* to avoid accidental clearance.

Operation

The NSW *Framework for Biodiversity Assessment* (OEH, 2014a), requires consideration of measures that minimise impacts on biodiversity during operation.

As described in Table 14, surface development areas would be progressively rehabilitated and revegetated with native species characteristic of the local woodland (WCPL, 2014a). Habitat features such as logs, fallen limbs and hollows would be collected/salvaged where practicable to provide habitat features for fauna in rehabilitation areas, regeneration areas and ECAs (WCPL, 2014a).

Vehicle Strike

The NSW *Framework for Biodiversity Assessment* (OEH, 2014a) states that it does not account for direct impacts on fauna from vehicle strike. Although traffic would increase, the Project would involve similar potential impacts from vehicle strike as the existing/approved Wilpinjong Coal Mine.

Groundwater Dependent Ecosystems

The NSW *Framework for Biodiversity Assessment* (OEH, 2014a) does not account for impacts on groundwater dependent ecosystems (GDEs), however an assessment is provided below in consideration of the *NSW State Groundwater Dependent Ecosystem Policy* (NOW, 2012a) and *Risk Assessment Guidelines for Groundwater Dependent Ecosystems* (NOW, 2012b) (GDE guideline).

The *National Atlas of Groundwater Dependent Ecosystems* (Bureau of Meteorology [BOM], 2015) does not identify any potential GDEs in the vicinity of the Project. No woodland or forest vegetation communities exhibiting characteristics of groundwater dependency were identified during the flora surveys, all being dry sclerophyll woodland.

There is potential for GDEs to occur on the plateaus in the vicinity of the Wilpinjong Coal Mine. However, any GDEs on these plateaus would be accessing perched groundwater systems associated with the Narrabeen Group and would not be affected by mining in the deeper strata (HydroSimulations, 2015). Wilpinjong Creek is considered to be a GDE (i.e. the stream and associated riparian vegetation). Groundwater interaction between Wilpinjong Creek and the underlying alluvium varies based on rainfall conditions and effects of the existing/approved Wilpinjong Coal Mine (HydroSimulations, 2015).

The banks of Wilpinjong Creek have been subject to erosion, grazing by cattle and invasion by weeds such as Blackberry (*Rubus fruticosus*) and a Rush (*Juncus acutus*). Generally, the riparian trees are sparse and discontinuous. There are patches of Typha and Phragmites rushes, both water dependent species, within Wilpinjong Creek. Other than these species, the vegetation along these creeks has been substantially cleared.

In accordance with the GDE guideline (NOW, 2012b), Wilpinjong Creek is considered to be a low value GDE given:

- it is not reserved as a National Estate, listed wetland or SEPP 26 (Littoral Rainforests);
- exotic species occur in large populations and multiple species; and
- it has undergone major changes in physical structure and species composition due to historical agriculture in the region.

Drawdown in the aquifers of the shallow alluvial groundwater system along Wilpinjong Creek would be minimal (approximately 1 m) (HydroSimulations, 2015).

Loss of groundwater discharge (or baseflow capture) to Wilpinjong Creek due to the Wilpinjong Coal Mine (incorporating the Project) would be minimal. HydroSimulations (2015) predict that incremental baseflow impacts in Wilpinjong Creek due to the Project would be negligible. During mining, baseflow impacts would continue to be offset to varying extents by the approved water discharges from the Reverse Osmosis (RO) Plant in accordance with EPL 12425.

The Project is predicted to have negligible incremental impact on water quality in Wilpinjong Creek (HydroSimulations, 2015 and WRM Water & Environment, 2015).

On this basis, the Project would present a low risk to Wilpinjong Creek (as defined in the GDE guideline). WCPL would continue to conduct water quality and flow monitoring in Wilpinjong Creek. Also of note, a section of Wilpinjong Creek occurs in ECA-A and is conserved under a VCA.

3.1.3 Indirect Impacts and Measures to Avoid and/or Minimise Impacts

The following potential indirect impacts are assessed below:

- hydrology, sedimentation and runoff;
- introduced flora;
- feral animals;
- noise and vibration;
- dust;
- light spill;
- bush fire risk;
- final void;
- fragmentation;
- over-grazing; and
- exotic diseases and pathogens.

Hydrology, Sedimentation and Runoff

Wilpinjong Coal Mine is approved to relocate Cumbo Creek and mine the current alignment of the creek. It is also approved to remove the lower reaches of Spring Creek, Narrow Creek and Bens Creek (Figure 3). The lower reaches of these creeks are all ephemeral and provide poor aquatic habitat (Bio-Analysis, 2015), limited riparian vegetation and hence poor habitat for vertebrate terrestrial fauna. The Project would involve further removal of these creeks and unnamed drainage lines within the proposed open cut extensions area.

No threatened fauna species listed under the TSC Act, *Fisheries Management Act, 1994* or EPBC Act are known to occur in Wilpinjong Creek, despite aquatic ecology surveys and monitoring (Bio-Analysis, 2005, 2015; Roberts, 2006, 2008, 2009; Landline Consulting 2011, 2012, 2013) and targeted fauna surveys (MKES, 2005). Never-the-less the NSW *Framework for Biodiversity Assessment* (OEH, 2014a) does not account for impacts on downstream hydrology and environmental flows on surface vegetation and therefore an assessment is provided below.

An objective of the water management system at the Wilpinjong Coal Mine is to protect the integrity of local and regional water sources and a detailed description of the water management system is provided in the EIS (WCPL, 2015a). The Project water management system would generally be based on the existing water management system with augmentations undertaken progressively over the life of the Project, such as:

- additional up-catchment diversion structures to divert runoff from undisturbed areas around the open cuts;
- sediment dams to contain runoff from topsoiled/partially rehabilitated mine areas; and
- contained water storages managed and operated for no release to downstream watercourses.

The sum of potential incremental catchment excision and incremental baseflow losses after the cessation of mining would have no material impact on flows in Wilpinjong Creek (WRM Water & Environment, 2015). Potential incremental impacts to surface water quality in Wilpinjong Creek, Wollar Creek and the Goulburn River as a result of the Project are considered to be negligible with the continued application of the *Wilpinjong Coal Mine Water Management Plan* (WRM Water & Environment, 2015).

Based on the above, the Project would have no material impact on terrestrial ecosystems from changes to surface water.

Introduced Flora (Weeds)

Introduced flora can degrade native vegetation communities. The Project would involve the same potential impacts from introduced flora as the existing/approved Wilpinjong Coal Mine. Activities that could spread weeds during construction and operation include soil disturbance, vehicle movements and movement of soil. Disturbed areas (including those undergoing rehabilitation) provide a substrate in which weed species may grow. Five species of weeds declared in the Local Control Authority Area of Mid-Western Regional Council were recorded in the BAR Footprint (Table 17) with no extensive infestations.

Table 17
Weeds Declared in the Local Control Authority Area of Mid-Western Regional Council and Recorded in the Study Area

Scientific Name	Common Name	Class	Control
Xanthium spinosum	Burr - Bathurst Burr	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread
Xanthium occidentale	Burr - Noogoora Burr	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread
Opuntia stricta	Prickly Pear - Common Pear	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed
Hypericum perforatum	St. John's Wort	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed
Rosa rubiginosa	Sweet Briar	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread

Weeds would continue to be managed through weed prevention, control and monitoring measures. With the implementation of management measures, the potential impacts to surrounding native vegetation associated with introduced flora is likely to be low.

Feral Animals

Biodiversity Monitoring Services (2015a) (Attachment D) recorded the Red Fox (*Vulpes vulpes*), Goat (*Capra hircus*), Feral Pig (*Sus scrofa*), Brown Hare (*Lepus capensis*), Rabbit (*Oryctolagus cuniculus*), and Fallow Deer (*Dama dama*).

Feral animals can impact native flora and fauna by predation, competition for food and shelter, destroying habitat, and by spreading diseases. The Project would involve the same potential impacts from feral animals as the existing/approved Wilpinjong Coal Mine. Disturbed areas (including those undergoing rehabilitation) provide potential habitat for feral animals.

Feral animals would continue to be managed through prevention, control and monitoring measures. With the implementation of management measures, the potential impacts to native flora and fauna associated with feral animals is likely to be low. Secondary poisoning to native animals would be minimised by appropriate control methods.

Noise and Vibration

Noise and vibration from mine-related blasting generally has the potential to indirectly impact fauna species through disrupting routine activities. Blasting currently occurs at the Wilpinjong Coal Mine and it would continue as part of the Project at similar intervals and scale, though the extent of blasting would be extended into the pit extension areas (SLR, 2015). Biodiversity Monitoring Services (2013) assessed the potential impacts on fauna from the approved Wilpinjong Coal Mine and concluded that impacts on fauna from noise and vibration are likely to be minimal.

The potential indirect impact from blasting on adjacent vertebrate fauna is likely to be minimal because of the short duration of blasts and blasting would occur only temporarily in any one location (i.e. the blasts occur in different locations as mining progresses). This assessment is supported by the results of the fauna baseline surveys (Biodiversity Monitoring Services, 2015a) which show a wide range of fauna inhabiting the land surrounding the Wilpinjong Coal Mine where blasting is currently conducted for the approved mine.

Vibration from mine-related blasting also has the potential to indirectly impact a historical mine adit which is located west of proposed Pit 8 (Figure 9). As described in Section 2.3.4, Biodiversity Monitoring Services (2015a) recorded a roost site of the Eastern Bentwing-bat in the historical mine adit. The adit (and its entrance) is propped up with timber from original mine workings but the entrance shows signs of past rockfall (Plate 2). The adit is a mining-related man-made structure that will collapse at some stage, irrespective of the Project. Further, the current stability of the adit appears to be adversely affected by a large tree root which is breaking through the adit roof and causing rockfall around the entrance (Plate 2).

The historical mine adit is approximately 152 m west of proposed Pit 8 (Figure 9). At this distance, it is possible that the nearby blasting vibration may quicken the collapse of the adit or cause bats to exit the adit during the day. The Eastern Bentwing-bat in the locality is unlikely to be dependent on the man-made historical mine adit, since the local and regional geology lends itself to a wide variety of alternative natural caves and associated structures along the escarpments of the sandstone country. Notwithstanding, to mitigate the potential for future collapse of the entrance, a concrete or steel pipe at the entrance of the adit would be installed to help maintain an opening in the event of any further rockfall around the entrance.

Plate 2 Historical Mine Adit and the Tree Root Causing Collapse

Given that the potential impacts from blasting vibration on the structure of the adit entrance would be mitigated, the Project does not require species credits for the potential indirect impacts on the Eastern Bentwing-bat breeding habitat. This species, however, has also been recorded in the offset areas that also contain a range of cave structures (Section 4.4.4).

Dust

Atmospheric dust emissions produced by the existing/approved Wilpinjong Coal Mine would increase slightly as a result of the Project (Todoroski Air Sciences, 2015). This increase is primarily associated with mining activities, exposed areas, waste rock handling and stockpiling activities.

The existing/approved Wilpinjong Coal Mine currently operates with a dust monitoring program which would continue for the Project. From field observations, there is no evidence of dust from currently approved operations having impacted surrounding vegetation. It is unlikely that any flora species would be adversely impacted either directly or indirectly by any dust increase generated as a result of the Project.

Light Spill

Lighting is used at the existing Wilpinjong Coal Mine and would be used for the Project. Night-lighting of the Project surface facilities would be kept to a practicable minimum. The nature of the night-lighting for the Project would be similar to the existing night-lighting at the Wilpinjong Coal Mine and the change in potential night-lighting impacts would be minor (Marc&Co and Resource Strategies, 2015).

Bush Fire Risk

Alteration of fire frequency can disrupt the life cycle processes in plants and animals and result in the loss of vegetation structure and composition. Bushfire risk would continue to be managed through the existing Wilpinjong Coal Mine Bushfire Management Plan (EcoLogical, 2011, or its revision). With the implementation of management measures, the potential risk of bushfire resulting from the Project is likely to be low. Fire regimes associated with the Project would be managed in a way that native fauna would not be at risk of impacts associated with too-frequent fire.

Final Void

Final voids were approved as part of the existing Wilpinjong Coal Mine and are proposed as part of the Project (Figure 14). As described in Section 3.1.2, the final voids have been designed to reduce the surface catchment to a minimum through the progressive backfilling of open cut pits to the natural surface and the use of upslope diversions and contour drains around their perimeter.

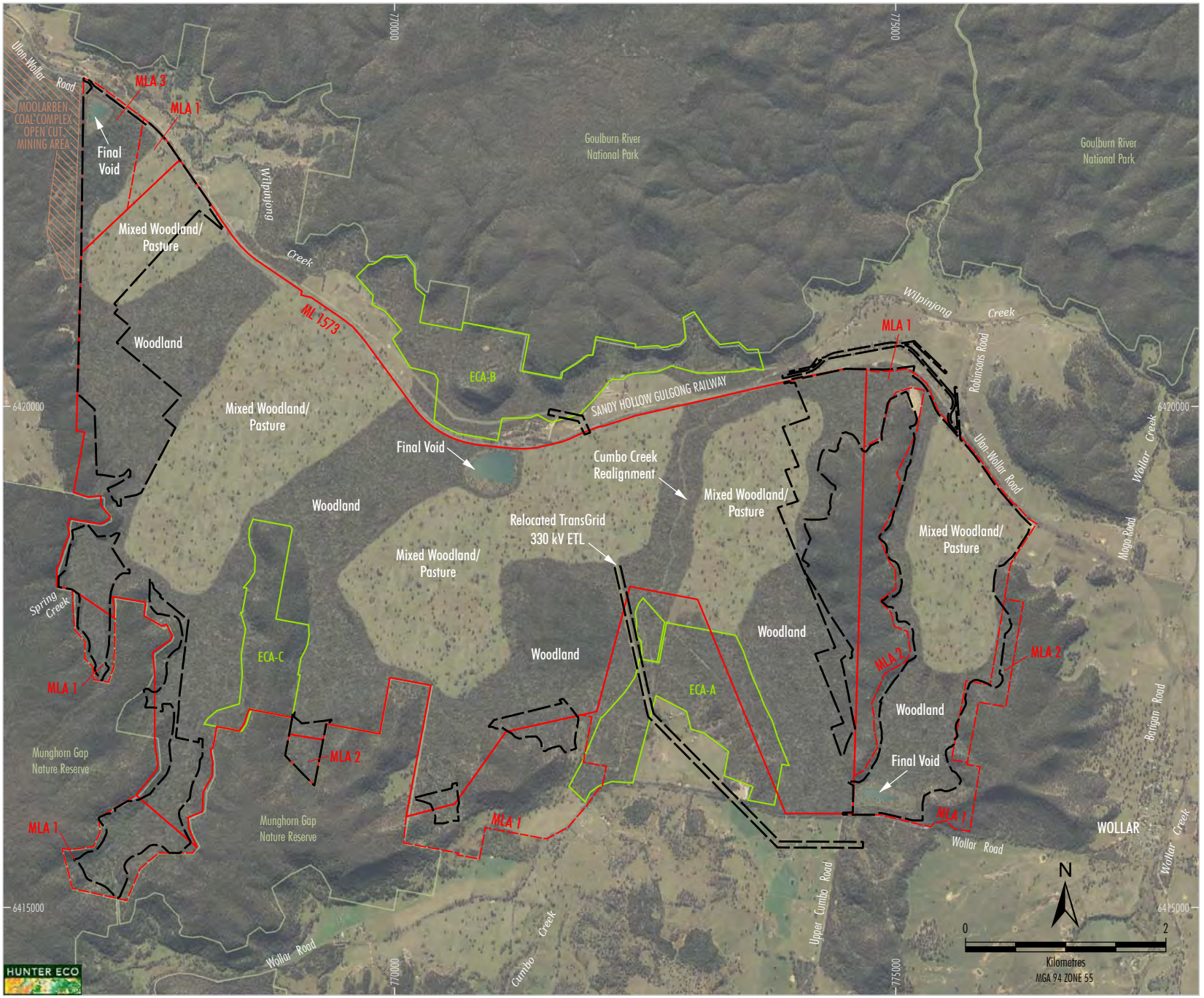
Fragmentation

A portion of the native vegetation within the BAR Footprint and surrounds is currently fragmented due to early land clearing for historical agricultural practices. The Goulburn River National Park and Munghorn Gap Nature Reserve are located adjacent to the BAR Footprint. The Project would result in minimal further fragmentation within the locality.

As described in Table 14, Revegetation will aim to increase the continuity of woodland vegetation by establishing links between woodland vegetation in the rehabilitation areas, regeneration areas and existing remnant vegetation in the Munghorn Gap Nature Reserve, Goulburn River National Park and the ECAs.

Over-grazing

Many of the species recorded within the BAR Footprint (Section 2.3) are vulnerable to impacts from habitat destruction associated with overgrazing.



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Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Conceptual Final Rehabilitation and Regeneration

Figure 14

WCPL has currently excluded all domestic stock from the regeneration areas and rehabilitation areas on site (WCPL, 2014a). Stock within the offset areas would be managed as described in the updates to the Biodiversity Management Plan for the Project.

Exotic Diseases and Pathogens

Some species potentially occurring within the BAR Footprint (Table 8) are at risk of population decline with the introduction of a disease or exotic pathogen (e.g. *Chlamydia* spp. in Koalas, Beak and Feather Disease in *Psittacine* species, or the White-nosed Fungus in microbat species).

The Project would not be likely to increase the risk of disease or exotic pathogen transfer to native fauna species. The Project is not inconsistent with the *EPBC Act Referral Guidelines for the Vulnerable Koala* (DotE, 2014b) or *Threat Abatement Plan for Beak and Feather Disease Affecting Endangered Psittacine Species* (Department of Environment and Heritage, 2005).

3.1.4 Cumulative Impacts

Cumulative impacts are considered to be the total impact on the environment that would result from the incremental impacts of the Project added to other existing impacts. They include direct and indirect impacts. Cumulative impacts from proposed (but not yet existing) developments in the local area are also considered in this assessment.

Clearing of habitat in the Mudgee/Wollar area commenced in the early 1800s, primarily for agricultural purposes such as grazing livestock. The two local protected areas (i.e. Goulburn River National Park and Munghorn Gap Nature Reserve) conserve 76,900 ha of native vegetation. There are also various crown reserves amounting to a further 17,000 ha.

The approved Wilpinjong Coal Mine was established in a widely cleared landscape. It was approved under the EP&A Act in February 2006 and has been modified on five previous occasions. At its full extent, the approved Wilpinjong Coal Mine will clear approximately 342 ha of native vegetation (of which approximately 318 ha is woodland/forest) and has an offset area of 691 ha (comprising 480 ha within the ECAs and 211 ha within the Biodiversity Offset Areas [BOAs]).

Relevant approved or proposed mining operations near the Project include:

- Moolarben Coal Complex, located adjacent to the Project to the west of the Wilpinjong Coal Mine;
- Ulan Mine Complex, located approximately 11 km to the north-west of the Wilpinjong Coal Mine;
- the proposed Bowdens Silver Project, located approximately 30 km to the south of the Wilpinjong Coal Mine; and
- the proposed Bylong Coal Project, located approximately 15 km east-southeast of the Wilpinjong Coal Mine.

In addition to potential cumulative impacts, these approved or proposed mining operations also have potential cumulative benefits in the form of offset areas (Table 18).

Table 18
Cumulative Disturbance and Offsets

Mine	Native Woodland/Forest Disturbance (ha)	Mine Rehabilitation to Native Woodland/Forest (ha)	Land-based Offset (ha)	Information Source
Wilpinjong Coal Mine	318	875	691	WCPL (2012; 2005)
Moolarben Coal Complex	Approximately 1,500	The Project Approval for Moolarben Coal Project Stage 2 requires rehabilitation of 1,502 ha of native woodland on the mine site.	7,237	Moolarben Coal Project Stage 2 Project Approval 08_0135 Moolarben Coal Project Stage 1 Project Approval 05_0117 (MOD 9 Consolidated Consent 2014)
Ulan Mine Complex	408 total native vegetation disturbance (unknown what portion is woodland/forest)	240	1,614	Ulan Coal Project Approval 08_0184 (MOD 2 Consolidated Consent 2012) Umwelt Environmental Consultants (2009)
Bowdens Silver Project	415 ha total disturbance (Unknown what portion is woodland/forest)	Unknown- detail to be included in EIS	Unknown - detail to be included in EIS	Kingsgate Bowdens Pty Limited (2012)
Bylong Coal Project	753 (comprising 228 ha woodland and 525 ha derived native grassland)	34	3,684	Cumberland Ecology (2015)
Wilpinjong Extension Project	354	610	996	This document
Total	**3,223**	**3,261**	**14,222**	-

The potential indirect cumulative impacts on Munghorn Gap Nature Reserve (from the Wilpinjong Coal Mine, the Project and the Moolarben Coal Complex) are discussed in Section 3.6.

The potential cumulative impact on threatened species and communities has been considered in Attachments A and B. The change in potential cumulative impacts on threatened species and communities arising from the Project is considered to be minimal because of the localised nature of the Project compared to the wider distribution of the species and communities.

The Project would result in the loss of 354 ha of native vegetation, though it includes an additional Biodiversity Offset Strategy to compensate for the loss (Section 4.2). The Biodiversity Offset Strategy would address the potential residual impacts on biodiversity values associated with the Project such that biodiversity values of the region are maintained and improved in the medium to long-term.

3.1.5 Summary of Additional Impact Avoidance and Mitigation Measures

Additional impact avoidance and mitigation measures associated with the Project (in addition to those already implemented at the Wilpinjong Coal Mine [Table 14]) and described in Sections 3.1.2 and 3.1.3 are summarised in Table 19.

Table 19
Additional Impact Avoidance and Mitigation Measures

Measure	Description
Avoidance	
Minimisation of disturbance to native vegetation	Refinements to the mine design have resulted in minimising additional land disturbance and associated impacts on flora, fauna and associated habitats (e.g. use of existing infrastructure).
Realignment of the TransGrid Wollar to Wellington 330 kV ETL	The ETL is proposed to be predominantly constructed in cleared land (without threatened species habitat or the threatened ecological communities). In order to minimise the potential land disturbance associated with the relocation it is proposed to realign the ETL over the backfilled waste rock emplacement of the Wilpinjong Coal Mine.
Mitigation	
Delineation of areas to be cleared near *Ozothamnus tesselatus* to avoid accidental clearance	Use of temporary fencing of *Ozothamnus tesselatus* during vegetation clearance near to the known occurrences to avoid accidental clearance.
Germination trials for *Ozothamnus tesselatus*	Collection of seed from *Ozothamnus tesselatus* for a trial of germination and (if successful) planting of viable seedlings on suitable final landforms.
Installation of pipe to help maintain opening of the historical mine adit (Eastern Bentwing-bat roost site)	A concrete or steel pipe would be installed to help maintain the opening of the historical mine adit in the event of any further rockfall around the entrance.

The conceptual final rehabilitation plan is shown on Figure 14. Figure 14 illustrates areas within the approved and proposed disturbance areas which would be rehabilitated to woodland and mixed woodland/pasture. The majority of the area would be rehabilitated and very limited areas of final void would remain (Figure 14). Mine site rehabilitation is discussed further in Section 4.4.5.

Woodland areas would adjoin the existing ECAs and Regeneration Areas (Figure 14). The Regeneration Areas are designed to link the mine rehabilitation areas to remnant vegetation associated with the Goulburn River National Park, Munghorn Gap Nature Reserve and ECAs.

3.2 IMPACTS ON BIODIVERSITY THAT REQUIRE FURTHER CONSIDERATION

The NSW *Framework for Biodiversity Assessment* (OEH, 2014a) indicates that some impacts on biodiversity (landscape features, native vegetation, species and populations) require further consideration in addition to the Credit Calculator. This includes native vegetation which is critically endangered (under the TSC or EPBC Acts) and/or species and populations that are specifically nominated in the SEARs for the EIS.

There are no impacts on landscape features that require further consideration (Section 2.1), however, further consideration is given to potential impacts on native vegetation and species below.

Native Vegetation

The OEH comments in the SEARs for the EIS detail further consideration on the Box-Gum Woodland EEC/CEEC. There are no other EECs that require further consideration nor are there any PCTs associated with threatened species habitat which has a site value score of <17.

Section 9.2.4.2 of the NSW *Framework for Biodiversity Assessment* (OEH, 2014a) requires this assessment to provide the following information:

(a) the area and condition of the CEEC or EEC to be impacted directly and indirectly by the proposed development

(b) the extent and overall condition of the CEEC or EEC within an area of 1000 ha and then 10,000 ha surrounding the proposed development footprint.

(c) an estimate of the extant area and overall condition of the CEEC or EEC remaining in the IBRA subregion after the impact of the proposed development has been taken into consideration

(d) the development proposal's impact on:

(i) abiotic factors critical to the long-term survival of the CEEC or EEC. For example, will the impact lead to a reduction of groundwater levels or substantial alteration of surface water patterns?

(ii) characteristic and functionally important species through impacts such as, but not limited to, inappropriate fire/flooding regimes, removal of understorey species or harvesting of plants

(iii) the quality and integrity of an occurrence of the CEEC or EEC through threats and indirect impacts including, but not limited to, assisting invasive flora and fauna species to become established or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants which may harm or inhibit growth of species in the CEEC or EEC.

(e) direct or indirect fragmentation and isolation of an important area of the CEEC or EEC.

(f) the measures proposed to contribute to the recovery of the CEEC or EEC in the IBRA subregion.

The information requested above has been included in the Assessments of Significance for Box-Gum Woodland EEC in Attachment A.

It is concluded that with the proposed measures to avoid, mitigate and offset it is appropriate for the impact on Box-Gum Woodland EEC/CEEC to occur without modifications to the Project or additional offsets. The Project would not cause the extinction of the Box-Gum Woodland EEC/CEEC from the IBRA subregion or significantly reduce its viability due to the minimal clearance of 9.5 ha of this community.

Species and Populations

The OEH comments in the SEARs for the EIS require further consideration of the threatened species listed in Table 13. Of the species listed, only *Ozothamnus tesselatus* and Regent Honeyeater (*Anthochaera phrygia*) are relevant to the BAR Footprint. There are no other threatened species that require further consideration nor are there any PCTs associated with threatened species habitat which has a site value score of <17. Notwithstanding, Attachment A provides Assessments of Significance in accordance with section 5A of the EP&A Act for all threatened species known or predicted to occur in the BAR Footprint.

Section 9.2.5.2 of the NSW *Framework for Biodiversity Assessment* (OEH, 2014a) requires this assessment to provide the following information:

(a) the size of the local population directly and indirectly impacted by the development

(b) the likely impact (including direct and indirect impacts) that the development will have on the habitat of the local population, including but not limited to:

(i) an estimate of the change in habitat available to the local population as a result of the proposed development

(ii) the proposed loss, modification, destruction or isolation of the available habitat used by the local population, and

(iii) modification of habitat required for the maintenance of processes important to the species' life cycle (such as in the case of a plant – pollination, seed set, seed dispersal, germination), genetic diversity and long-term evolutionary development.

Atlas records or other documented, quantifiable means must be used by the assessor to estimate what percentage of the species' population and habitat is likely to be lost in the long term within the IBRA subregion due to the direct and indirect impacts of the development

(c) the likely impact on the ecology of the local population. At a minimum, address the following:

(i) for fauna:

– breeding

– foraging

– roosting, and

– dispersal or movement pathways

(ii) for flora, address how the proposal is likely to affect the ecology and biology of any residual plant population that will remain post development including where information is available:

– pollination cycle

– seedbanks

– recruitment, and

– interactions with other species (e.g. pollinators, host species, mycorrhizal associations)

(d) a description of the extent to which the local population will become fragmented or isolated as a result of the proposed development

(e) the relationship of the local population to other population/populations of the species. This must include consideration of the interaction and importance of the local population to other population/populations for factors such as breeding, dispersal and genetic viability/diversity, and whether the local population is at the limit of the species' range

(f) the extent to which the proposed development will lead to an increase in threats and indirect impacts, including impacts from invasive flora and fauna, that may in turn lead to a decrease in the viability of the local population

(g) the measure/s proposed to contribute to the recovery of the species in the IBRA subregion.

The information requested above has been included in the Assessments of Significance for *Ozothamnus tesselatus* and Regent Honeyeater in Attachment A.

It is concluded that with the proposed measures to avoid, mitigate and offset it is appropriate for the impacts to *Ozothamnus tesselatus* and potential habitat for the Regent Honeyeater to occur without modifications to the Project or additional offsets. The Project would not cause the extinction of these species from an IBRA subregion or significantly reduce their viability.

3.3 ASSESSMENTS OF SIGNIFICANCE UNDER SECTION 5A OF THE EP&A ACT

Attachment A provides Assessments of Significance in accordance with section 5A of the EP&A Act and the *Threatened Species Assessment Guidelines - the Assessment of Significance* (DECC, 2007a) on the threatened species known or predicted to occur in the BAR Footprint.

In summary, the Project would not result in a significant impact to any listed threatened species or ecological community located within the BAR Footprint.

3.4 SEPP 44 – KOALA HABITAT PROTECTION

There are two relevant definitions that apply when considering Koala habitat under *State Environmental Planning Policy No. 44* (SEPP 44):

- 'core koala habitat' means an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population; and

- 'potential koala habitat' means areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component.

Of the SEPP 44 preferred feed trees, only Grey Gum (*Eucalyptus punctata*) and White Box (*Eucalyptus albens*) were present in the BAR Footprint in the following two communities:

- MU3 Grey Gum - Narrow-leaved Stringybark Forest (approximately 42.5 ha).
- MU9 White Box Woodland (shrubby) (approximately 98 ha).

Density of these feed trees in these communities would be variable but patches would meet or exceed the 15% nominated by SEPP 44. Based on the requirements of SEPP 44, potential Koala habitat occurs within the BAR Footprint, but core Koala habitat does not occur within the BAR Footprint because no Koalas have been recorded at the Wilpinjong Coal Mine during past or present surveys (Table 7).

A single incidental sighting of a Koala (outside of the BAR Footprint – Figure 12) occurred in 2013 indicating that this species does utilise the local area (Figure 9). This species has not been recorded during targeted field surveys from 2005 to 2015.

Biodiversity Monitoring Services (2013) describes that considering the dearth of sightings in the immediate and surrounding area it is unlikely that a viable population exists in or near Wilpinjong Coal Mine and that the single animal sighted was an individual moving between areas.

Notwithstanding, approximately 165 ha of potential Koala habitat is mapped on Figure 12 based on the SEPP 44 preferred feed trees as well as the tree species listed in the *Recovery Plan for the Koala* (*Phascolarctos cinereus*) (DECC, 2008b).

3.5 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

An analysis of the nature and extent of the likely impacts of the Project on threatened species and communities listed under the EPBC Act is provided in Attachment B in accordance with the *Significant Impact Guidelines 1.1 - Matters of National Environmental Significance* (DotE, 2013).

The analysis considers threatened species listed under the EPBC Act which have been recorded in the BAR Footprint or surrounds (Figure 13), as well as those listed in the DotE comments in the SEARs for the EIS. It is concluded that there is unlikely to be significant residual impact on any threatened species and communities listed under the EPBC Act as a result of the Project.

The Project is not inconsistent with any relevant recovery plans, conservation advice or agreements (Attachment B).

The impacts of the Project on a local scale would be minimal, therefore there would be no additional cumulative impacts compared to proposed disturbance from other agricultural and industrial activities, especially when considering the avoidance and mitigation measures and the positive benefits of the proposed Biodiversity Offset Strategy (Section 4.3).

The impacts on protected matters would be localised and negligible on a regional, state and national scale. The Project would not have a significant negative impact on the conservation status, condition or trend of any Matter of National Significance at a local or regional scale.

3.6 MUNGHORN GAP NATURE RESERVE

The NSW *Framework for Biodiversity Assessment* (OEH, 2014a) does not specifically require an assessment of the potential impacts on existing protected areas. For completeness, an assessment of potential impacts on Munghorn Gap Nature Reserve is provided below as requested by the OEH in their comments in the SEARs for the EIS.

The Wilpinjong Coal Mine is currently approved for mining along approximately 2.4 km of the Munghorn Gap Nature Reserve boundary (i.e. mining associated with Pits 1 and 2) (Figure 2). As part of the Project, Pit 1 would be extended along an additional 1.4 km of the nature reserve boundary, which is 10% of the perimeter of that eastern portion of the reserve (Figure 2). The Project would involve an extension of mining in Pit 5, with these extensions between zero and 370 m (average 84 m, median 64 m) from the Munghorn Gap Nature Reserve boundary (Figure 2) thus generally providing a buffer between the open cuts and the Nature Reserve.

The duration of this impact would be short to medium term. The pits would be progressively mined such that the extension of mining in Pit 1 would likely occur in the last three years of the mine life from Year 12 (2028) and be followed by rehabilitation. The extension of mining in Pit 5 would likely commence early in the mine life but it would also be progressively revegetated. A key objective of the rehabilitation is to increase the continuity of woodland vegetation by establishing links between woodland vegetation in the rehabilitation areas and existing vegetation in the Munghorn Gap Nature Reserve (i.e. an improvement in ecological connectivity) (Figure 14).

The Project would not directly impact the Munghorn Gap Nature Reserve and therefore the *Revocation, Recategorisation and Road Adjustment Policy* (OEH, 2012) is not relevant to the Project. The Project would involve clearing vegetation that adjoins the reserve. Accidental disturbance to the nature reserve would be avoided by detailed mine planning and delineation of areas to be cleared as part of the vegetation clearance protocol (including Ground Disturbance Permits) (Section 3.1.1).

There is a potential for indirect impacts to occur on the flora and/or fauna in Munghorn Gap Nature Reserve (because it is adjacent) so an assessment of the potential indirect impacts is provided below in consideration of the *Guidelines for Developments Adjoining Land and Water Managed by the Department of Environment, Climate Change and Water* (now Office of Environment and Heritage) (DECCW, 2010) and the objectives outlined in the *Goulburn River National Park and Munghorn Gap Nature Reserve Plan of Management* (NSW National Parks and Wildlife Service [NPWS], 2003).

There would not be any surface water quality impacts on the Munghorn Gap Nature Reserve (e.g. sedimentation, erosion or pollution) because the nature reserve is located upstream of the Project (WRM Water and Environment, 2015). As described in Section 3.1.2, the Project is unlikely to impact any groundwater-dependent ecosystems within the nature reserve as the Project is predicted to have no discernible effect on the perched groundwater systems they are associated with (HydroSimulations, 2015).

In relation to air quality, potential indirect dust impacts would be mitigated using a range of best practice dust mitigation measures, including real-time monitoring and reactive dust management (Todoroski Air Sciences, 2015). Operational noise levels in the Munghorn Gap Nature Reserve would be generally comparable to the approved Wilpinjong Coal Mine (SLR Consulting, 2015). Both noise and dust emissions would vary temporally according to the location of mining operations and would cease when the Project is complete.

It is recognised that there is a fire management plan for Munghorn Gap Nature Reserve (DEC, 2004b). The risk of bushfire occurring as a result of the Project is likely to be low with the implementation of standard fire prevention and response measures (e.g. identification of fire trails, employee/contractor awareness and provision of water carts).

Weeds and animal pests would continue to be managed during operations and as part of the rehabilitation program, as such, it is unlikely that Project would substantially increase the risk of weeds and animal pests in the nature reserve.

Clearing native vegetation along a boundary can generally cause other potential edge effects (changes in vegetation and/or fauna [DECCW, 2010]), however, other potential edge effects are unlikely to be substantial and mitigated by rehabilitation.

In regard to cumulative impacts, the Moolarben Coal Complex is approved for mining 50 m from the Munghorn Gap Nature Reserve boundary (Hansen Bailey, 2012). EcoVision Consulting (2008) conclude that the Moolarben Coal Complex would not directly contribute to impacts on the nature reserve. However, if it were assumed that indirect impacts could occur from the Moolarben Coal Complex, the cumulative impact from the two mines would still be minimal.

In conclusion, the Project would avoid direct impacts on the Munghorn Gap Nature Reserve and minimise potential indirect impacts that would be temporal in nature.

The potential for indirect impacts on the Goulburn River National Park would be generally comparable to the approved Wilpinjong Coal Mine because the Project would not extend significantly closer to the Goulburn River National Park and no consequential impacts on biodiversity are likely downstream of the Project.

3.7 IMPACT SUMMARY

The likely direct, indirect and cumulative impacts on biodiversity have been assessed and impact avoidance and mitigation measures are described. A number of measures to avoid and minimise impacts on biodiversity are currently implemented at the Wilpinjong Coal Mine and these would be continued for the Project (e.g. vegetation clearance protocols and weed management). Additional measures to avoid and minimise impacts on biodiversity are proposed (e.g. temporary fencing of *Ozothamnus tesselatus* populations during vegetation clearance near the known occurrences).

Table 4 identifies the site value score of each vegetation zone prior to vegetation clearance and after vegetation clearance these site value scores would become zero. Prior to development there was 46-50% native vegetation cover (actual 46%) in the linear assessment buffer and following development this would only reduce to 36-40% (actual 38%) because of the high proportion of cleared land in the BAR Footprint. The area/perimeter ratio of the native vegetation within the buffer would be essentially unchanged (130 to 129).

Further consideration has been given to the impacts on the Box-Gum Woodland EEC/CEEC, *Ozothamnus tesselatus* and Regent Honeyeater. It is concluded that with the proposed measures to avoid, mitigate and offset it is appropriate for these impacts to occur without further modifications to the Project.

Assessments of Significance in accordance with section 5A of the EP&A Act have been undertaken and it is concluded that the Project would not result in a significant impact to any listed threatened species or ecological community located within the BAR Footprint. Similarly, an assessment of impacts on the relevant threatened species and communities listed under the EPBC Act has been undertaken and it is concluded that none would be significantly impacted.

3.8 BIODIVERSITY CREDIT REPORT - SUMMARY OF CREDIT REQUIREMENTS

The credit report (output of the Credit Calculator) is provided in Attachment E. The credit report provides the credit profile for each ecosystem credit BVT. Table 20 summarises the ecosystem and species credits required to be offset by WCPL. The result of running the Credit Calculator is that the Project requires a Biodiversity Offset Strategy which accounts for a total of 15,314 ecosystem credits and a range of species credits for *Ozothamnus tesselatus,* Regent Honeyeater and Koala.

Table 20
Project Credit Requirements

	BVT Name	BVT	BAR Footprint	Credits
Ecosystem Credits				
Grassy Woodlands - Western Slopes Grassy Woodlands				
1	[1]Blakely's Red Gum - Yellow Box grassy tall woodland of the New England Tableland Bioregion	HU681	6 ha	254
2	Fuzzy Box woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	HU547	1.5 ha	36
3 and 4	Rough-barked Apple grassy tall woodlands of the Brigalow Belt South	HU981	126 ha	5,155
5	[1]Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion	HU732	3.5 ha	116
Grassy Woodlands - Coastal Valley Grassy Woodlands				
6	Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	HU910	4 ha	170
Dry Sclerophyll Forests (Shrubby sub-formation) - Western Slopes Dry Sclerophyll Forests				
7	Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	HU843	42.5 ha	2,216
8	Red Ironbark - Grey Gum - Black Pine heathy woodland on sandstone ranges of the Sydney Basin	HU886	39.5 ha	2,129
9	[2]Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	HU618	9.5 ha	511
10	White Box - Black Cypress Pine shrubby woodland of the Western Slopes	HU824	98 ha	3,947
Dry Sclerophyll Forests (Shrub/grass sub-formation) - North-west Slopes Dry Sclerophyll Woodlands				
11	Grey Box grassy open forest of the Central and Lower Hunter Valley	HU962	3 ha	74
12	Narrow-leaved Ironbark - Black Cypress Pine shrub - grass woodland upper Hunter and northern Wollemi	HU825	20.5 ha	706
		Total	**354 ha**	15,314
Species Credits				
Ozothamnus tesselatus			589 individuals	23,560
Regent Honeyeater (*Anthochaera phrygia*)			273 ha potential habitat	21,021
Koala (*Phascolarctos cinereus*)			165 ha potential habitat	4,290

[1] Box-Gum Woodland EEC/CEEC

[2] Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion VEC, not assessed as a threatened ecological community.

4 STAGE 3 – BIODIVERSITY OFFSET STRATEGY

This Biodiversity Offset Strategy outlines how WCPL intends to offset the impacts of the Project on biodiversity. The existing Biodiversity Offset Strategy for the Wilpinjong Coal Mine is described in Section 4.1 and the additional Biodiversity Offset Strategy for the Project is described in Section 4.2. Sections 4.3 and 4.4 describe how the additional Biodiversity Offset Strategy addresses both the Commonwealth and NSW biodiversity offset requirements, respectively.

4.1 EXISTING BIODIVERSITY OFFSET STRATEGY

The existing Biodiversity Offset Strategy for the Wilpinjong Coal Mine is outlined in Table 21. The Enhancement and Conservation Areas (ECAs) A to C were approved by the Department of Planning and Environment (DP&E) in February 2006 and BOAs D and E were approved by DP&E in February 2014 The existing offset areas cover a total of 691 ha. In addition, an area at Nullo Mountain was provided by WCPL to NPWS as an addition to Wollemi National Park in 2006.

Table 21
Existing Biodiversity Offset Strategy

Offset Area	Size (ha)	Location	General Description
Enhancement and Conservation Areas A to C	480	ECA B is located immediately north of the Wilpinjong Coal Mine adjoining Goulburn River National Park, and ECAs A and C are immediately to the south. ECA C adjoins Munghorn Gap Nature Reserve.	These offset areas comprise approximately 295 ha of native vegetation, including 80 ha of Box-Gum Woodland EEC. The remaining 185 ha was cleared land.
Biodiversity Offset Areas D and E	211	BOA D is approximately 3 km east of the site and BOA E is approximately 12 km northeast of the site, both adjoining Goulburn River National Park.	These offset areas comprise approximately 211 ha of native vegetation, including: • 193 ha of woodland (including 47.8 ha of Box-Gum Woodland EEC); • 13.6 ha of shrubby regeneration; and • 4.4 ha of derived native grassland.
Total	**691**		

The long-term security of the ECAs A to C has been established via a VCA under the *National Parks & Wildlife Act, 1974*. The proposed relocation of the TransGrid 330 kV ETL (Figure 2) requires short sections of easements through parts of two of the ECAs (i.e. ECA-A and ECA-B). The proposed ETL easements are through predominantly cleared land (Figure 6). WCPL is consulting with OEH in relation to a possible amendment of the VCA, so the total area of the ECAs (480 ha) would be maintained in accordance with the existing Project Approval (05-0021).

WCPL and NPWS are also finalising an agreement for BOAs D and E to be added to the adjoining Goulburn River National Park. These additions would increase the area of Goulburn River National Park by 211 ha.

A Biodiversity Management Plan has been prepared for the management of the existing Biodiversity Offset Strategy. The Biodiversity Management Plan (WCPL, 2015c) provides a description of measures that will be implemented in the existing offset areas, such as grazing and stock management, habitat augmentation, revegetation, weed management, vertebrate pest management and bushfire management.

4.2 ADDITIONAL BIODIVERSITY OFFSET STRATEGY

The existing Biodiversity Offset Strategy for the Wilpinjong Coal Mine would be augmented with an additional Biodiversity Offset Strategy for the Project, which comprises:

- land-based offset areas; and
- mine site rehabilitation (note: not relevant to Commonwealth offset requirements).

An overview of the additional Biodiversity Offset Strategy for the Project is provided below. Sections 4.3 and 4.4 describe how the additional Biodiversity Offset Strategy addresses both the Commonwealth and NSW biodiversity offset requirements, respectively.

Land-Based Offset Areas

Five offset areas have been evaluated as part of the Project (Offset Areas 1 to 5). Figures 15a and 15b show the location of offset areas relative to the BAR Footprint and relevant cadastral information. These offset areas are located on land owned by WCPL (Figure 15b). Table 22 provides the offset area size, a description of the offset area and relevant lot and DPs.

Table 22
Offset Area Identification

Offset Area	Total Area (ha)[#]	Location, General Description and Land Use History	Lot and DP
1	201	Offset Area 1 is located immediately south of the Project in a narrow valley surrounded on three sides by Munghorn Gap Nature Reserve. Approximately 86% of Offset Area 1 is vegetated with evidence of past timber harvesting. The valley floor has been mostly cleared with remnants indicating the vegetation would have been dominated by *Angophora floribunda* and *Eucalyptus blakelyi.* There are three unoccupied residences with associated sheds and access tracks. There are no signs of recent livestock grazing.	Lot 4 DP877688 Lot 5 DP877688 Lot 1 DP877688 Lot 2 DP877688
2	441	Offset Area 2 is located approximately 1.5 km south of the Project. The western boundary adjoins Munghorn Gap Nature Reserve. Approximately 55% of Offset Area 2 is vegetated, a large amount being advanced regeneration from prior clearing. There is one unoccupied dwelling and associated sheds as well as three dams. There are several natural springs. Offset Area 2 has been recently grazed by livestock.	Lot 24 DP755425 Lot 216 DP755425 Lot 209 DP755425 Lot 169 DP755425 Lot 115 DP755425 Lot 219 DP755425 Lot 181 DP755425 Lot 114 DP755425 Lot 2 DP602213 Lot 231 DP41892 Lot 20 DP755425 Lot 170 DP755425 Lot 69 DP755425 Lot 113 DP755425 Lot 220 DP755425 Lot 225 DP755425 Lot 159 DP755425 Lot 2 DP602226

Table 22 (Continued)
Offset Area Identification

Offset Area	Total Area (ha)[#]	Location, General Description and Land Use History	Lot and DP
3	164	Offset Area 3 is located approximately 8.5 km east of the Project. A mix of high ridges, steep sandstone escarpments with numerous caves and shelters, and incised gorges. This area is surrounded on three sides by Goulburn River National Park and is split by just over 2 km of the Goulburn River itself. Approximately 75% is vegetated most of which is largely undisturbed. There is an area of old growth dry rainforest dominated by Grey Myrtle. It is partially grazed by livestock in more cleared areas.	Lot 6 DP755422 Lot 81 DP750956 Lot 28 DP755422
4	39	Offset Area 4 is located approximately 7.5 km east north-east of the Project. This area is surrounded on three sides by Goulburn River National Park. Just over 7 ha has been partially cleared but still retains a grassy woodland character. The land is generally flat with a central incised gully system extending to the west. There are low sandstone escarpments along this system. There are two unoccupied dwellings and associated sheds. There are no signs of recent livestock grazing.	Lot 38 DP755422
5	255	Offset Area 5 is located approximately 7 km east of the Project. This area is surrounded on three sides by Goulburn River National Park. Over 80% is vegetated with evidence of some prior clearing and timber harvesting. This offset area consists of colluvial lower slopes surrounding an alluvial cultivated valley floor. It is partially grazed by livestock in more cleared areas.	Lot 221 DP755421 Lot 159 DP755421 Lot 222 DP755421
Total	**1,100**	-	-

[#] Includes native vegetation, pasture/cultivation, dams, rivers and existing infrastructure.

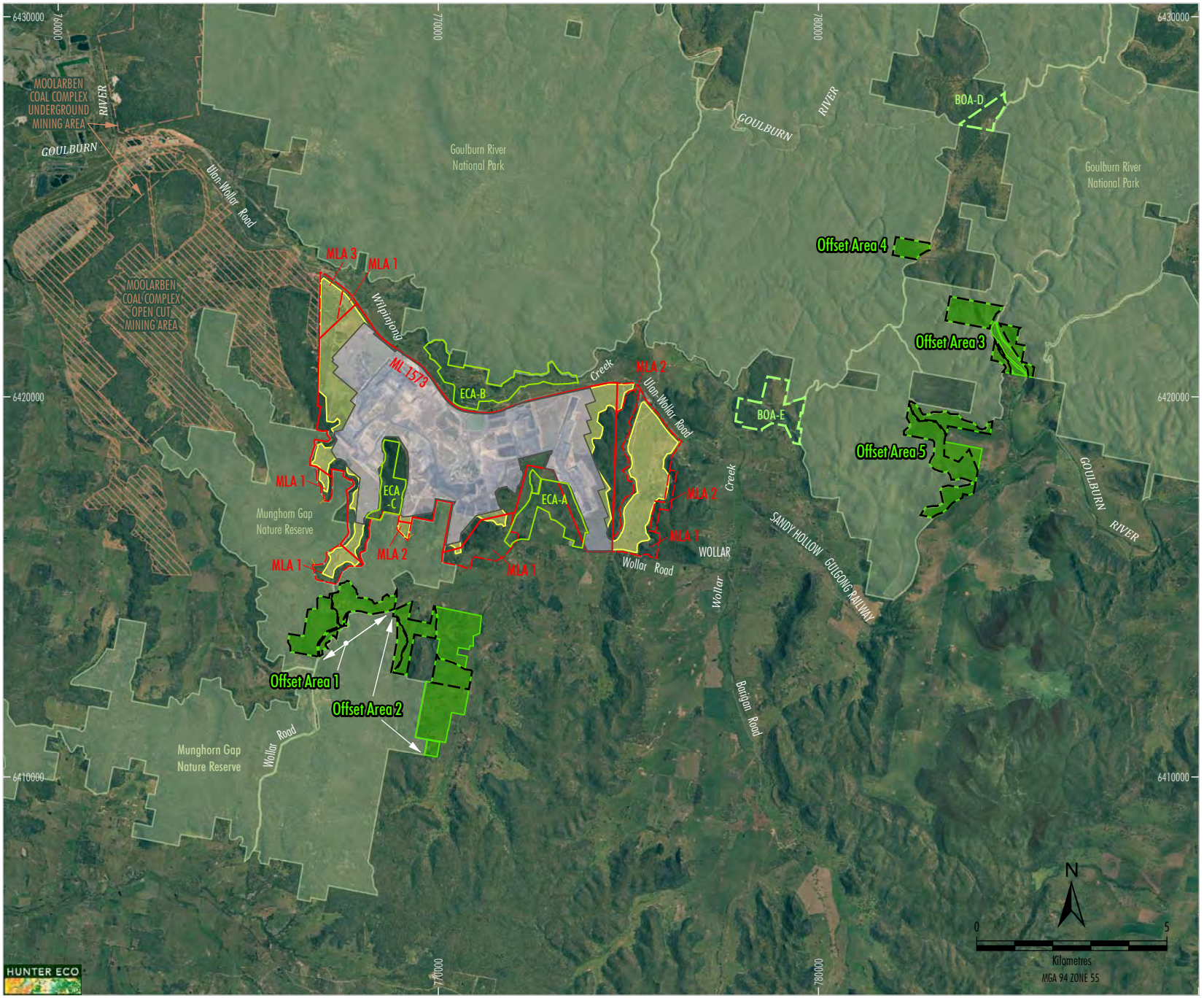
Flora surveys of the offset areas were undertaken by Hunter Eco (2015b) (Attachment G) and fauna surveys of the offset areas were undertaken by Biodiversity Monitoring Services (2015b) (Attachment H). The relevant findings are discussed in this document.

The offset areas have been strategically located to adjoin Goulburn River National Park and Munghorn Gap Nature Reserve, with the potential to increase the extent of these existing protected areas. Long-term security of the offset areas (with the exception of 72 ha of exotic pasture/cultivation in Offsets 3 and 5 as discussed below) would be arranged within three years of the Development Consent.

WCPL intends to reach an agreement with the NSW Government so that the offset areas could be permanently secured by augmenting the adjoining protected areas (Munghorn Gap Nature Reserve and Goulburn National Park), which is a logical outcome given the strategic location of the offset areas. As stated in Section 4.1, WCPL and NPWS are finalising an agreement for BOAs D and E to be added to the adjoining Goulburn River National Park.

There are approximately 72 ha of exotic pasture/cultivation within Offsets 3 and 5 which are under an existing pastoral lease until 2025. Long-term security of these areas would be arranged in 2026 via Registration of a “Positive Covenant” and a “Restriction on the Use of Land by a Prescribed Authority” under section 88E(3) of the NSW *Conveyancing Act, 1919*. Revegetation of these areas would follow. This anticipated time lag is not an issue as clearance for the Project would also be progressive (i.e. mining to 2033).

The Biodiversity Offset Strategy is proposed by WCPL to address the residual impacts from the Project. WCPL reserves the right to make further changes to the Biodiversity Offset Strategy prior to Project approval to the satisfaction of DP&E (NSW Offset Package) and DotE (Commonwealth Offset Package).



LEGEND

- Mining Lease Boundary
- Mining Lease Application Boundary
- Approved/Existing Open Cut and Contained Infrastructure Area
- Proposed Open Cut Extension Area
- Enhancement and Conservation Area
- Existing Biodiversity Offset Area
- Offset Area
- Commonwealth Offset Area
- National Park/Nature Reserve

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (Jun 2015, 2011)

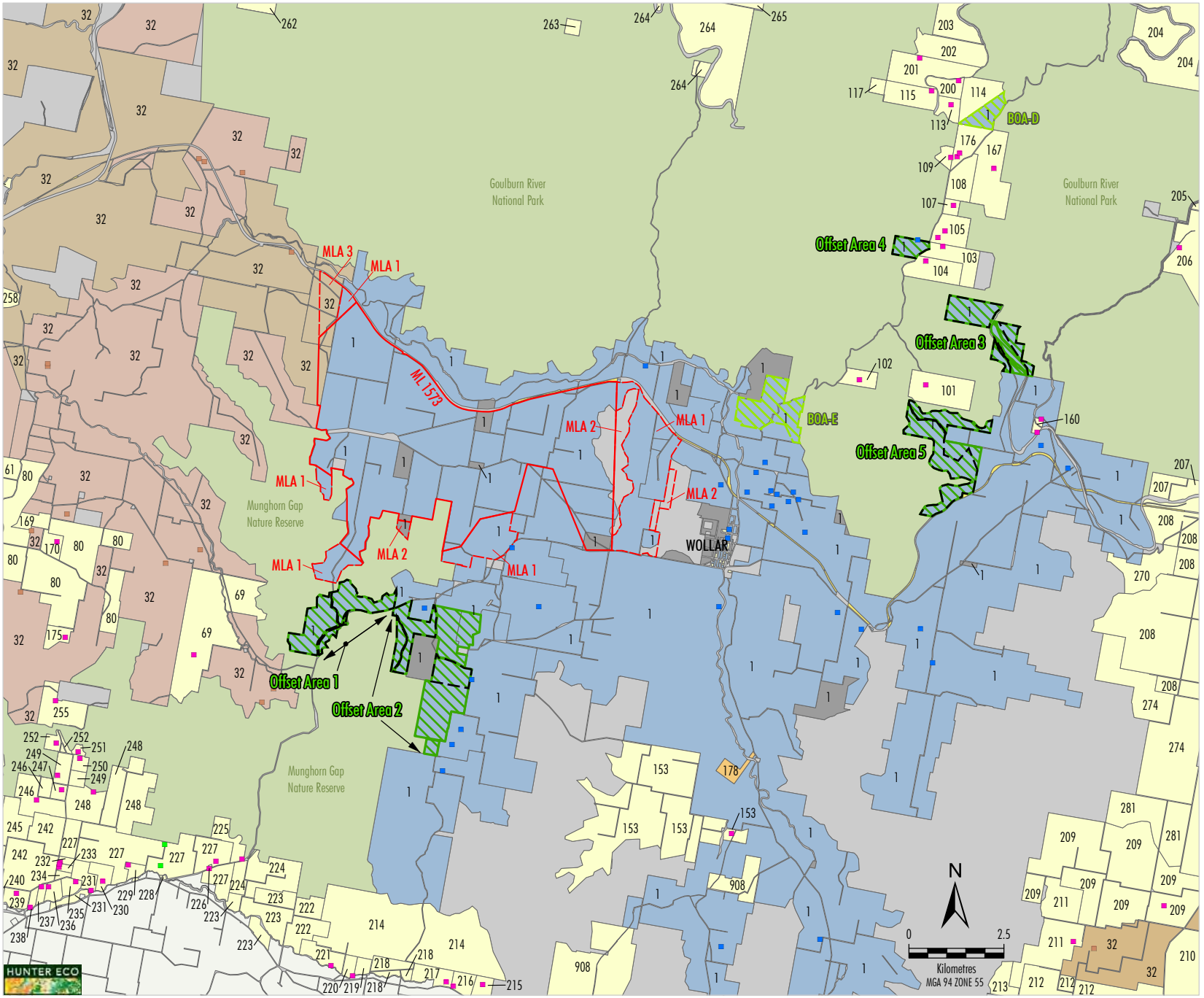
Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Offset Areas

Figure 15a

WIL-12-12_WEP_EIS_BAR BOS_212E



LEGEND

- Mining Lease Boundary
- Mining Lease Application Boundary
- Peabody Energy
- Bylong Coal Project
- Moolarben Coal Mine
- Ulan Coal Mine
- Crown Land (Special Lease)
- Crown Land
- TransGrid
- Railway Land
- Relevant Private Landholder
- Other Land (Ownership not identified)
- National Parks and Wildlife Service
- Existing Biodiversity Offset Area
- Offset Area
- Commonwealth Offset Area
- 1 Landholder Number *
- Peabody Energy Dwelling
- Ulan/Moolarben Dwelling
- Community Building
- Private Dwelling

* Refer Figure 1-5c of the EIS for List of Landholders.

Source: WCPL (2015); NSW Dept of Industry (2015); NSW Land & Property Information (2015)

Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Land Ownership Plan - Offset Areas

Figure 15b

WIL-12-12_WEP_EIS_BAR BOS_213D

Depending on the security mechanism, a management plan (or plans) may be prepared that describes the management of the proposed additional offset areas (e.g. if the offset areas are added to the Munghorn Gap Nature Reserve and Goulburn National Park then the offset areas would be managed by the NSW Government under the management plans for these protected areas). As a minimum, management of the offset areas would include:

- weed control;
- feral animal control;
- progressive removal of livestock grazing;
- removal of disused infrastructure; and
- revegetation of exotic pasture/cultivation.

WCPL has completed programs to control large infestations of blackberry and other woody weeds along the Goulburn River in Offset Area 3 (Landscape Constructions, 2014a and b).

Rehabilitation

Mine site rehabilitation would be used to satisfy part of the NSW offset requirements by progressively establishing woodland vegetation. Further detail is provided in Section 4.4.

4.3 COMMONWEALTH PROJECT BIODIVERSITY OFFSET

This section provides details of the biodiversity offset package proposed to be implemented to compensate for the residual significant impact of the Project on threatened species listed under the EPBC Act as well as an analysis about how the offset meets the *EPBC Act Environmental Offsets Policy* (SEWPaC, 2012a). The Commonwealth offset package comprises a subset of Offset Areas 1 to 5 as further described below.

4.3.1 Commonwealth Environmental Offsets Policy

The DotE comments in the SEARs for the EIS state that the Commonwealth offset package can comprise a combination of direct offsets and other compensatory measures, so long as it meets the requirements of the *EPBC Act Environmental Offsets Policy* (SEWPaC, 2012a) or an endorsed State policy. WCPL has elected to compensate for the residual significant impact of the project of threatened species listed under the EPBC Act in accordance with the *EPBC Act Environmental Offsets Policy* (SEWPaC, 2012a) (and supporting *EPBC Act Offsets Assessment Guide* [SEWPaC, 2012b]) rather than an endorsed State policy. Sections 4.3.2 and 4.3.3 provide a description of how the Commonwealth offset package satisfies this policy.

4.3.2 Commonwealth Offset Requirements

The significance of potential residual impacts on protected matters under the EPBC Act has been evaluated and it is concluded that none of the protected matters are likely to be significantly impacted after consideration of the *Significant Impact Guidelines 1.1 - Matters of National Environmental Significance* (DotE, 2013) and other relevant plans and agreements (Attachment B). Impact avoidance and mitigation measures specific to each protected matter are summarised in Attachment B.

Under the EPBC Act, an offset is only required if residual impacts on protected matters are significant (SEWPaC, 2012a). However, residual impacts on native vegetation are required to be offset under the NSW Offset Policy (OEH, 2014b) (Section 4.4) so this section describes how the Commonwealth Offset Areas 1 to 5 would provide positive benefits for protected matters under the EPBC Act (i.e. a Commonwealth offset package).

Table 23 identifies the protected matters which are known or considered likely to occur in the BAR Footprint and the associated area of habitat (Attachment A) to be impacted.

Table 23
Residual Impacts on Species and Communities Listed under the EPBC Act

Common Name	Scientific Name	Conservation Status[1]		Impact	Recorded
		TSC Act	EPBC Act		
Threatened Ecological Communities					
Box-Gum Woodland		E	CE	9.5 ha of woodland	Yes
Flora					
-	*Ozothamnus tesselatus*	V	V	589 individuals	Yes
Birds					
Regent Honeyeater	*Anthochaera phrygia*	CE	CE[2]	273 ha of potential foraging habitat (possibly breeding habitat).	No
Swift Parrot	*Lathamus discolor*	E	E	111 ha of potential foraging habitat.	No
Mammals					
Koala	*Phascolarctos cinereus*	V	V	165 ha of potential habitat	No
Corben's Long-eared Bat	*Nyctophilus corbeni*	V	V	328.5 ha of foraging habitat, of which a portion with tree hollows is potential breeding habitat.	Yes
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	V	273.5 ha of foraging habitat.	Yes

[1] Threatened fauna species status under the TSC Act and/or EPBC Act (current at October 2015).
V = Vulnerable; E = Endangered; CE = Critically Endangered.

[2] Listed as 'Endangered' under the EPBC Act at the time of the controlled action decision (12 March 2015) and therefore assessed under the Commonwealth offset policy as 'Endangered' not 'Critically Endangered' (refer section 158A of the EPBC Act).

4.3.3 Commonwealth Offset Package

The Commonwealth offset package comprises land-based offset areas which are a subset of Offset Areas 1 to 5. Commonwealth offset areas equate to Offset Area 1, 4 and a subset of Offset Areas 2, 3 and 5 (Table 24; Figures 15a and 15b). This section provides an analysis of how Commonwealth Offset Areas 1 to 5 meet the requirements of the *EPBC Act Environmental Offsets Policy* (SEWPaC, 2012a).

Table 24
Commonwealth Offset Area Size

Offset Area	Total Area (ha) [#]	Area of Native Vegetation (ha) *	
		Overall Offset Areas	Commonwealth Offset Areas
1	201	199	199
2	441	416.5	152
3	164	124.5	121.5
4	39	38	38
5	255	218	213.5
Total	**1,100**	**996**	**724**

[#] Includes native vegetation, pasture/cultivation, dams, the Goulburn River and existing infrastructure.

* Excludes dams, rivers, existing infrastructure and pasture/cultivation.

The Commonwealth offset package would involve conservation and enhancement of Commonwealth Offset Areas 1 to 5 through long-term security and management (Section 4.2).

The Commonwealth offset areas contain 724 ha of native vegetation (Table 24). Vegetation communities within the offset areas are shown on Figures 16a and 16b and listed in Table 25. The vegetation in the Commonwealth Offset Areas 1 to 5 comprises (Table 25):

- approximately 127.5 ha of grassy woodland;
- approximately 510.5 ha of dry sclerophyll forest;
- approximately 86 ha of derived grassland; and
- approximately 13.5 ha of exotic pasture/cultivation.

Table 25
Vegetation Communities in the Commonwealth Offset Areas

BVT	Vegetation Community
Grassy Woodlands – New England Grassy Woodlands	
HU681	5 ha of Blakely's Red Gum Woodland (grassy) [1]
Grassy Woodlands - Western Slopes Grassy Woodlands	
HU732	25 ha, comprising: • 1.5 ha of Yellow Box Woodland[1] • 23.5 ha of Yellow Box Woodland (derived native grassland) [1]
HU690	13.5 ha of White Box Grassy Woodland[1]
Grassy Woodlands - Coastal Valley Grassy Woodlands	
HU910	147.5 ha, comprising: • 107.5 ha of Blakely's Red Gum - Rough-barked Apple Woodland • 40 ha of Blakely's Red Gum - Rough-barked Apple Woodland (derived native grassland)
Dry Sclerophyll Forests (Shrubby sub-formation) - Western Slopes Dry Sclerophyll Forests	
HU843	82.5 ha, comprising: • 33.5 ha of Grey Gum - Blue-leaved Stringybark Forest • 49 ha of Grey Gum - Narrow-leaved Stringybark Forest
HU618	196 ha of Slaty Box Forest

Table 25 (Continued)
Vegetation Communities in the Commonwealth Offset Areas

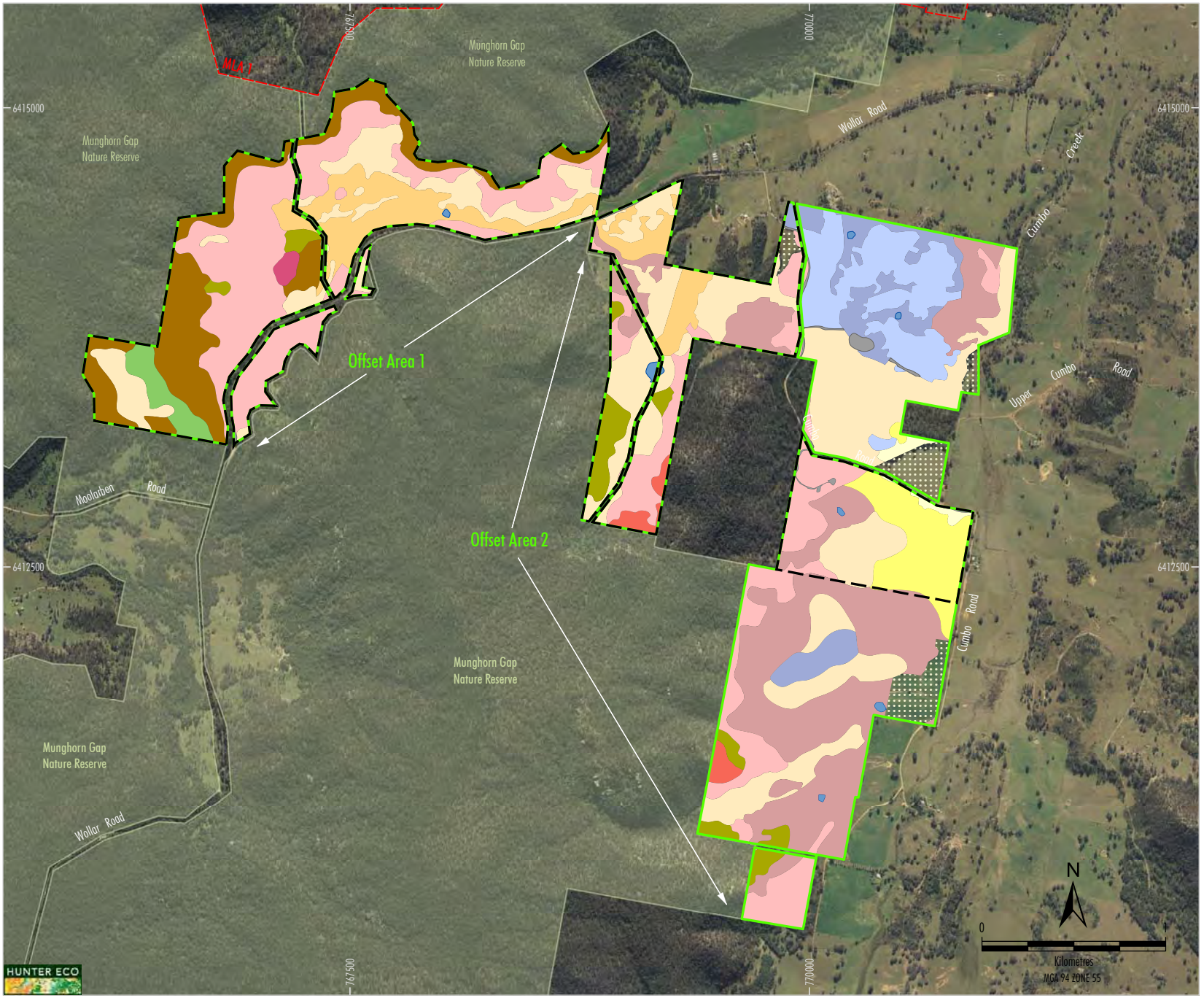
BVT	Vegetation Community
Dry Sclerophyll Forests (Shrubby sub-formation) - Western Slopes Dry Sclerophyll Forests (Cont.)	
HU891	0.5 ha, comprising: • <1 ha of Caley's Ironbark Woodland • 0.5 ha of Caley's Ironbark Woodland (derived native grassland)
HU697	1.5 ha of Mugga Ironbark Forest
HU888	76 ha Red Ironbark - Brown Bloodwood Forest
HU890	7.5 ha of Scribbly Gum Forest
HU877	1 ha of Spinifex Woodland
Dry Sclerophyll Forests (Shrub/grass sub-formation) - North-west Slopes Dry Sclerophyll Woodlands	
HU801	152 ha, comprising: • 130 ha of White Box Shrubby Woodland • 22 ha of White Box Shrubby Woodland (derived native grassland)
Dry Sclerophyll Forests (Shrubby sub-formation) – Sydney Hinterland Dry Sclerophyll Forests	
HU828	3.5 ha of Grey Myrtle Dry Rainforest
Dry Sclerophyll Forests (Shrub/grass sub-formation) – Hunter Macleay Dry Sclerophyll Forests	
HU962	1.5 ha of Western Grey Box Woodland
Total	**724 ha**

[1] Box-Gum Woodland EEC/CEEC

In accordance with the DotE comments in the SEARs for the EIS, the Commonwealth offset package aligns with conservation priorities for the relevant threatened species and is tailored specifically to the attribute of the species that is impacted by the Project. Table 26 provides the area of habitat for each relevant protected matter to be impacted by the Project and the area of habitat provided by Commonwealth Offset Areas 1 to 5.

Box-Gum Woodland CEEC occurs as Yellow Box Grassy Woodland and derived native grassland on Offset Area 2, White Box and Blakely's Red Gum Grassy Woodland on Offset Area 3 and White Box Grassy Woodland on Offset Area 4 (Figures 16a and 16b). On Offset Area 2 the Yellow Box Woodland and derived native grassland occurs on the lower slopes and flats (Figure 16a). There are patches of dense regeneration in the derived native grassland area. On Offset Area 3 the White Box occurs on basalt and has relatively dense shrubby regrowth following prior clearing and lack of fire. There is a grassy ground layer.

The Blakely's Red Gum is found on the alluvial flats adjoining Goulburn River and is mostly grassy. On Offset Area 4 the White Box occurs on Basalt and has been cleared but still retains the character of open grassy woodland with scattered canopy trees.



LEGEND

- Mining Lease Application Boundary
- Offset Area
- Commonwealth Offset Area
- Nature Reserve

VEGETATION COMMUNITIES

Grassy Woodlands - Western Slopes Grassy Woodlands

- 5a Yellow Box Woodland (HU732)
- 5b Yellow Box Woodland Derived Native Grassland (HU732)

Grassy Woodlands - Coastal Valley Grassy Woodlands

- 14a Blakely's Red Gum - Rough-barked Apple Woodland (HU910)
- 14b Blakely's Red Gum - Rough-barked Apple Woodland Derived Native Grassland (HU910)

Dry Sclerophyll Forests (Shrubby sub-formation) - Western Slopes Dry Sclerophyll Forests

- 7 Grey Gum - Narrow-leaved Stringybark Forest (HU843)
- 9 Slaty Box Forest (HU618)
- 16 Grey Gum - Blue-leaved Stringybark Forest (HU843)
- 17a Caley's Ironbark Woodland (HU891)
- 17b Caley's Ironbark Woodland Derived Native Grassland (HU891)
- 18 Mugga Ironbark Forest (HU697)
- 20 Scribbly Gum Forest (HU890)

Dry Sclerophyll Forests (Shrub/grass sub-formation) - North-west Slopes Dry Sclerophyll Woodlands

- 22a White Box Shrubby Woodland (HU801)
- 22b White Box Shrubby Woodland Derived Native Grassland (HU801)

Cleared Land

- Pasture Improved Grassland/Stubble Field
- Existing Infrastructure
- Dam/Typha

Source: WCPL (2015); Orthophoto: WCPL (June 2014)

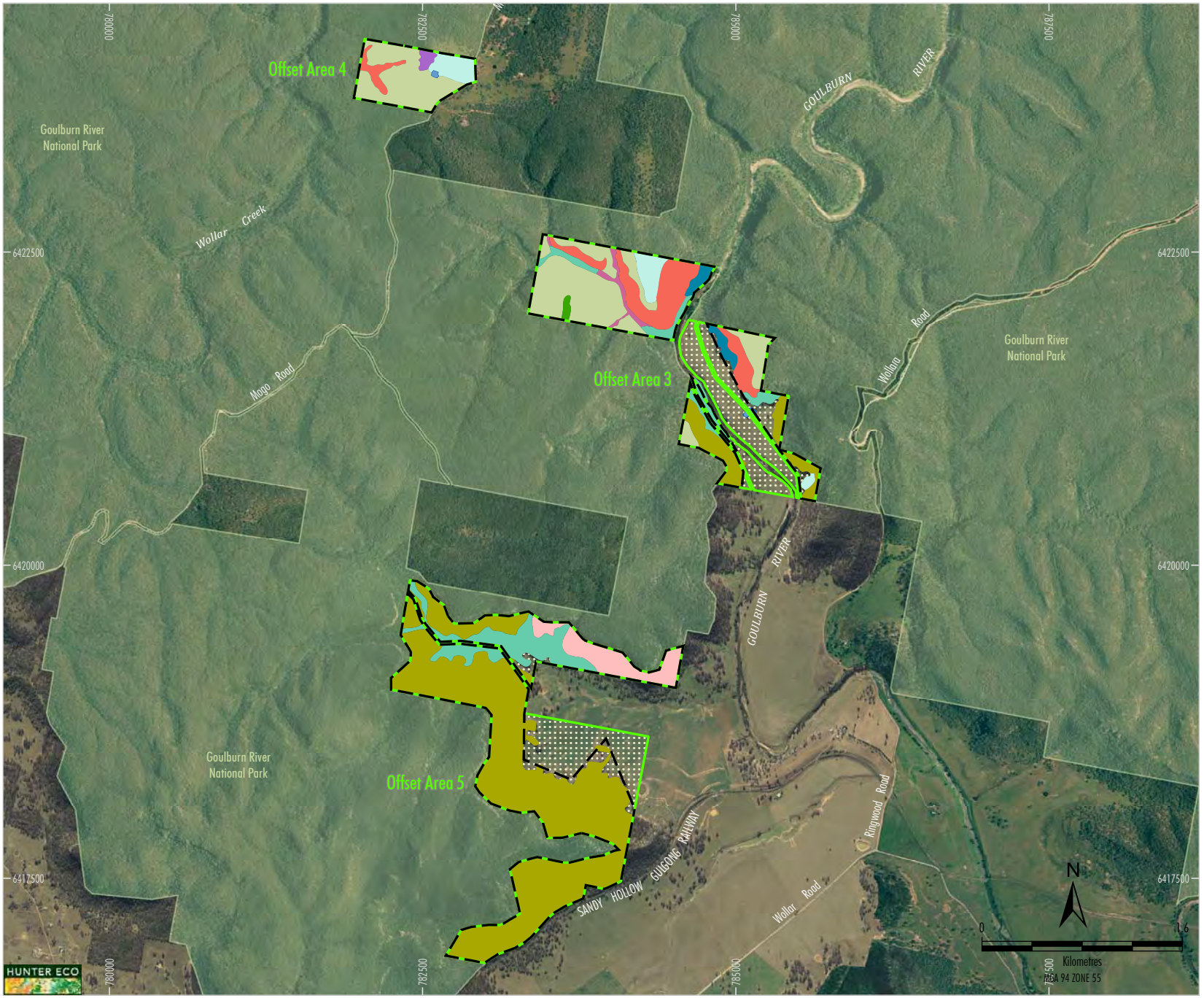
Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Offset Areas 1 and 2 - Vegetation Communities

Figure 16a

WIL-12-12_WEP_EIS_BAR BOS_216E



LEGEND

- Offset Area
- Commonwealth Offset Area
- National Park

VEGETATION COMMUNITIES

Grassy Woodlands - Western Slopes Grassy Woodlands

- 13 White Box Grassy Woodland (HU690)

Grassy Woodlands - Coastal Valley Grassy Woodlands

- 6 Blakely's Red Gum Woodland (HU910)
- 15 Rough-barked Apple Forest (HU910)

Dry Sclerophyll Forests (Shrubby sub-formation) - Western Slopes Dry Sclerophyll Forests

- 9 Slaty Box Forest (HU618)
- 16 Grey Gum - Blue-leaved Stringybark Forest (HU843)
- 19 Red Ironbark - Brown Bloodwood Forest (HU888)
- 21 Spinifex Woodland (HU877)

Dry Sclerophyll Forests (Shrub/grass sub-formation) - North-west Slopes Dry Sclerophyll Woodlands

- 22a White Box Shrubby Woodland (HU801)

Dry Sclerophyll Forests (Shrubby sub-formation) – Sydney Hinterland Dry Sclerophyll Forests

- 23 Grey Myrtle Dry Rainforest (HU828)

Dry Sclerophyll Forests (Shrub/grass sub-formation) – Hunter Macleay Dry Sclerophyll Forests

- 24 Western Grey Box Woodland (HU962)

Cleared Land

- Pasture Improved Grassland/Stubble Field
- Dam/Typha

Source: WCPL (2015); Orthophoto: WCPL (June 2014)

Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Offset Areas 3, 4 and 5 - Vegetation Communities

Figure 16b

WIL-12-12_WEP_EIS_BAR BOS_217E

Table 26
Commonwealth Biodiversity Offset Requirement Met by Commonwealth Offset Areas 1 to 5

Common Name	Scientific Name	Conservation Status[1]		Impact (ha)	Commonwealth Offset Areas 1 to 5					
		TSC Act	EPBC Act		Offset Area 1 (ha)	Offset Area 2 (ha)	Offset Area 3 (ha)	Offset Area 4 (ha)	Offset Area 5 (ha)	Total[2]
Box-Gum Woodland		E	CE	9.5 ha of woodland	0	25	12	6.5	0	43.5 ha (20 ha of woodland and 23.5 ha of derived native grassland)
-	*Ozothamnus tesselatus*	V	V	589 individuals	0	0	0	0	6,458	6,458 individuals
Regent Honeyeater	*Anthochaera phrygia*	CE	CE[3]	273 ha of potential foraging habitat	164	93.5	62.5	11.5	213.5	545 ha of existing potential foraging habitat
Swift Parrot	*Lathamus discolour*	E	E	111 ha of potential foraging habitat	81	41.5	24.5	6.5	187.5	341 ha of existing potential foraging habitat
Koala	*Phascolarctos cinereus*	V	V	165 ha of potential habitat	170	93.5	68.5	11.5	213.5	557 ha of existing potential foraging habitat
Corben's Long-eared Bat	*Nyctophilus corbeni*	V	V	328.5 ha of foraging habitat, of which a portion with tree hollows is breeding habitat	171.5	93.5	121.5	38	213.5	643 ha of existing foraging habitat, of which a portion with tree hollows is breeding habitat
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	V	273.5 ha of foraging habitat	171.5	93.5	121.5	38	213.5	643 of existing potential foraging habitat, including breeding habitat in caves

1 Threatened fauna species status under the TSC Act and/or EPBC Act (current at October 2015).

V = Vulnerable; E = Endangered; CE = Critically Endangered.

2 Additional habitat would also be created through revegetation of derived native grassland and cleared land.

3 Listed as 'Endangered' under the EPBC Act at the time of the controlled action decision (12 March 2015) and therefore assessed under the Commonwealth offset policy as 'Endangered' not 'Critically Endangered' (refer section 158A of the EPBC Act).

All offset areas have a range of mature nectar-bearing eucalypts suitable for Swift Parrots and Regent Honeyeaters, viz. *Eucalyptus albens, Eucalyptus blakelyi, Eucalyptus melliodora, Eucalyptus dawsonii, Eucalyptus microcarpa, Eucalyptus punctata* and *Eucalyptus sideroxylon.* The Regent Honeyeater has been recorded within Offset Area 1 (DECC, 2005). There are also database records of this species within Offset Area 1 (OEH, 2015a) (Figure 17a). Habitat for the Regent Honeyeater in the offset areas is shown on Figures 18a and 18b.

The Koala has been recorded by Biodiversity Monitoring Services (2015b) (Attachment H) within Offset Areas 2 and 3 (Figures 17a and 17b). It is likely that these offset areas contain critical habitat as defined by the *EPBC Act Referral Guidelines for the Vulnerable Koala* (DotE, 2014c) and core habitat as defined by SEPP 44. Habitat for the Koala in the offset areas is shown on Figures 19a and 19b.

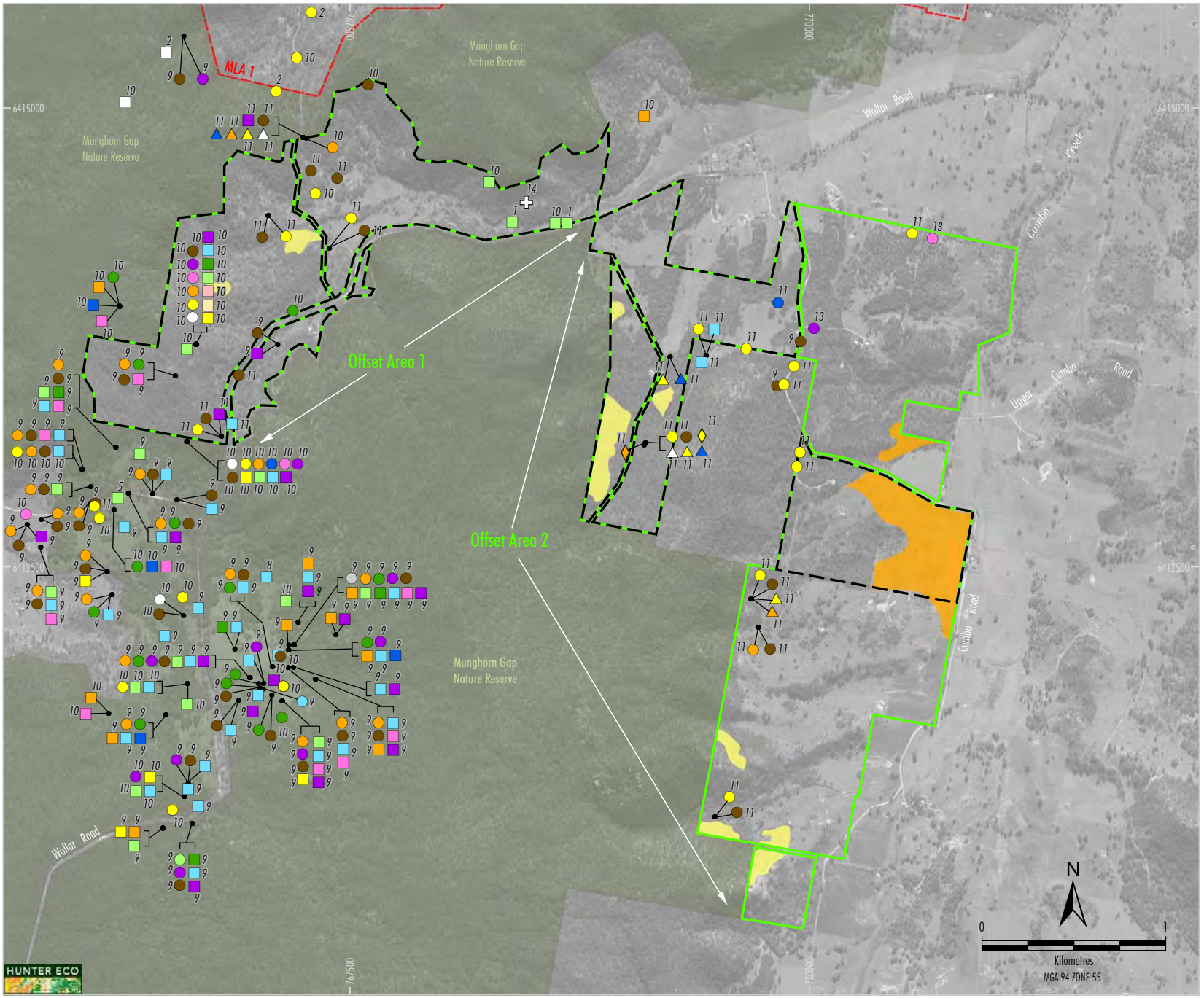
The majority of vegetation in Commonwealth Offset Areas 1 to 5 provides foraging habitat for the Large-eared Pied Bat and Corben's Long-eared Bat. Corben's Long-eared Bat has been recorded by Biodiversity Monitoring Services (2015b) (Attachment H) within Offset Areas 1, 2 and 5. The Large-eared Pied Bat utilises caves for roosting and breeding. Offset Area 3 in particular has over 2 km of sandstone escarpment with numerous caves. There are also a small number of caves in Offset Area 4. The Large-eared Pied Bat has been recorded by Biodiversity Monitoring Services (2015b) (Attachment H) within Offset Areas 1 to 4 and just outside Offset Area 5 (Figures 17a and 17b).

4.3.4 Justification for the Commonwealth Biodiversity Offset

The Commonwealth offset package is consistent with the principles of the *EPBC Act Environmental Offsets Policy* (SEWPaC, 2012a) (Section 4.3.5) and the *EPBC Act Offsets Assessment Guide* (SEWPaC, 2012b) was used to determine the appropriate size of the Commonwealth Offset Areas 1 to 5 in order to exceed 100% of the offset requirement.

The Commonwealth offset package is also justified on the basis that the Commonwealth offset areas:

- are strategically located to adjoin Goulburn River National Park and Munghorn Gap Nature Reserve, with the potential to increase the extent of these existing protected areas;
- contains a large population of *Ozothamnus tesselatus* in Offset Area 5 (6,458 individuals) (eleven times the number of plants proposed to be cleared) (Figure 17b);
- contains an additional threatened flora species listed under the EPBC Act (i.e. *Tylophora linearis* in Commonwealth Offset Area 5) (Figure 17b);
- contain approximately 43.5 ha of Box-Gum Woodland EEC/CEEC, comprising approximately 20 ha of woodland and 23.5 ha of derived native grassland;
- contain known records of the Regent Honeyeater and Koala (both of which have not been previously recorded within the BAR Footprint) (Figures 17a and 17b);
- contain known records of Corben's Long-eared Bat and Large-eared Pied Bat (Figures 17a and 17b) and extensive foraging habitat for these species;
- contain sandstone escarpment with numerous caves (breeding habitat for the Large-eared Pied Bat, which is not present in the BAR Footprint); and
- would provide new habitat through revegetation of derived grassland and exotic pasture/cultivation (Figures 16a and 16b).



LEGEND

- Mining Lease Application Boundary
- Offset Area
- Commonwealth Offset Area
- Nature Reserve

Threatened Ecological Communities

- Box-Gum Woodland Endangered Ecological Community/ Critically Endangered Ecological Community
- Slaty Gum Woodland Vulnerable Ecological Community

Threatened Populations

- *Cymbidium canaliculatum R. Br in the Hunter Catchment*

Threatened Birds

- Black Falcon
- Black-chinned Honeyeater (eastern subspecies)
- Brown Treecreeper (eastern subspecies)
- Diamond Firetail
- Flame Robin
- Gang-gang Cockatoo
- Glossy Black-Cockatoo
- Grey-crowned Babbler (eastern subspecies)
- Hooded Robin (south-eastern form)
- Little Eagle
- Little Lorikeet
- Masked Owl
- Painted Honeyeater
- Pied Honeyeater
- Pink Robin
- Powerful Owl
- Regent Honeyeater
- Scarlet Robin
- Speckled Warbler
- Square-tailed Kite
- Turquoise Parrot
- Varied Sittella

Threatened Mammals

- Koala
- Squirrel Glider
- Corben's Long-eared Bat
- Eastern Bentwing-bat
- Eastern Cave Bat
- Large-eared Pied Bat

Reference:

1 *DECC (2005)*
2 *Mount King Ecological Surveys (2005)*
5 *Lesryk Environmental Consultants (2013)*
8 *Australian Museum (2013)*
9 *Birdlife (2014)*
10 *OEH (2015)*
11 *Biodiversity Monitoring Services (2015)*
14 *Hunter Eco (2015)*

Note: There are no references 3, 4, 6, 7, 12 or 13 on this figure.

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (Jun 2014)

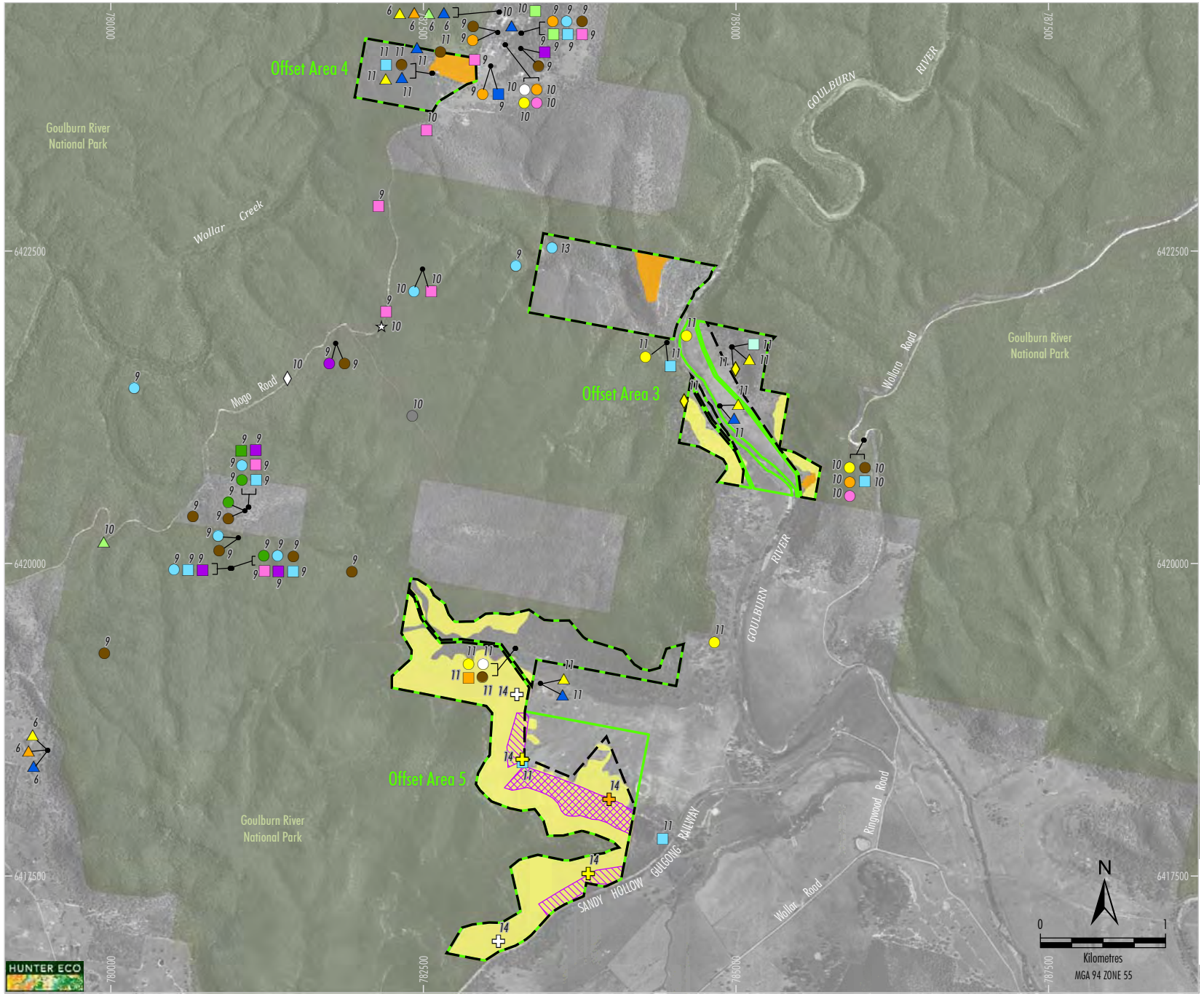
Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Offset Areas 1 and 2 - Threatened Species, Populations and Ecological Communities

Figure 17a

WIL-12-12_WEP_EIS_BAR BOS_223E



LEGEND

- Commonwealth Offset Area
- Offset Area
- National Park

Threatened Ecological Communities

- Box-Gum Woodland
- Endangered Ecological Community/ Critically Endangered Ecological Community
- Slaty Gum Woodland
- Vulnerable Ecological Community

Threatened Populations

- *Cymbidium canaliculatum R. Br*
- *Pomaderris queenslandica*
- *Tylophora linearis*

Threatened Flora

- *Ozothamus tesselatus* (Sporadic Occurence)
- *Ozothamus tesselatus* (Dense Occurence) *in the Hunter Catchment*

Threatened Birds

- Black-chinned Honeyeater (eastern subspecies)
- Brown Treecreeper (eastern subspecies)
- Diamond Firetail
- Gang-gang Cockatoo
- Glossy Black-Cockatoo
- Hooded Robin (south-eastern form)
- Little Eagle
- Little Lorikeet
- Malleefowl
- Powerful Owl
- Regent Honeyeater
- Scarlet Robin
- Sooty Owl
- Speckled Warbler
- Square-tailed Kite
- Turquoise Parrot
- Varied Sittella

Threatened Mammals

- Brush-tailed Rock-wallaby
- Koala
- Eastern Bentwing-bat
- Eastern Cave Bat
- Eastern False Pipistrelle
- Large-eared Pied Bat

Threatened Reptile

- Pink-tailed Legless Lizard

Reference:
6 Biodiversity Monitoring Services (2013)
9 Birdlife (2014)
10 OEH (2015)
11 Biodiversity Monitoring Services (2015b)
13 Incidental Sighting (Colin Driscoll) (2015)
14 Hunter Eco (2015)

Note: There are no references 1 - 5, 7, 8 or 12 on this figure.

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (2011)

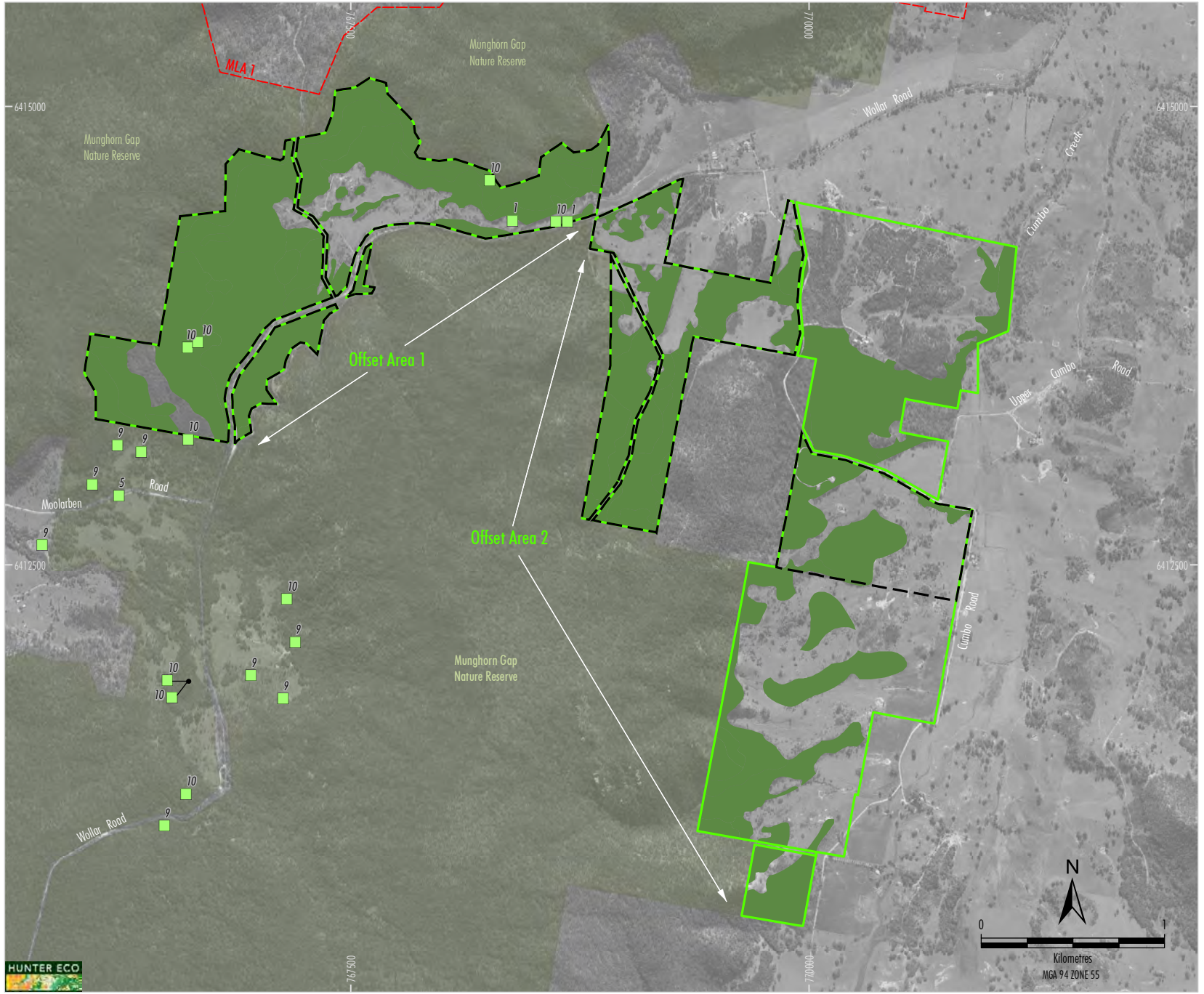
Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Offset Areas 3, 4 and 5 - Threatened Species and Ecological Communities

Figure 17b

WIL-12-12_WEP_EIS_BAR BOS_219D



LEGEND

- Mining Lease Application Boundary
- Offset Area
- Commonwealth Offset Area
- Nature Reserve

Regent Honeyeater

- Recorded Location
- Potential Habitat

Reference:
1 DECC (2005)
5 Lesryk Environmental Consultants (2013)
9 Birdlife (2014)
10 OEH (2015)

Note: There are no references 2 - 4, 6 - 8 on this figure.

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (Jun 2014)

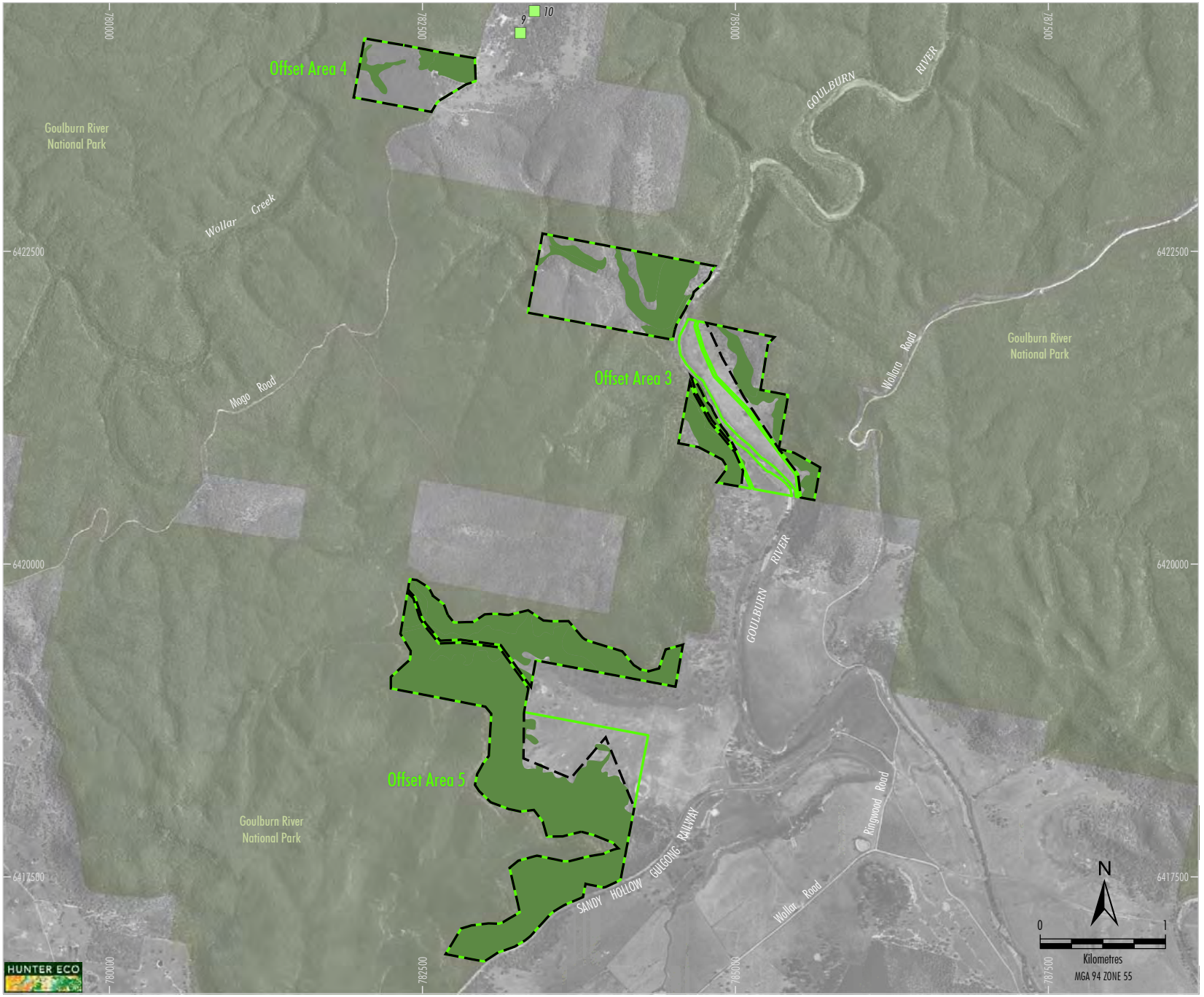
Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Offset Areas 1 and 2 - Regent Honeyeater Habitat

Figure 18a

WIL-12-12_WEP_EIS_BAR BOS_222C



LEGEND

- Offset Area
- Commonwealth Offset Area
- National Park

Regent Honeyeater

- Recorded Location
- Potential Habitat

Reference: *9 Birdlife (2014)*
10 OEH (2015)

Note: There are no references 1 - 8 on this figure.

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (2011)

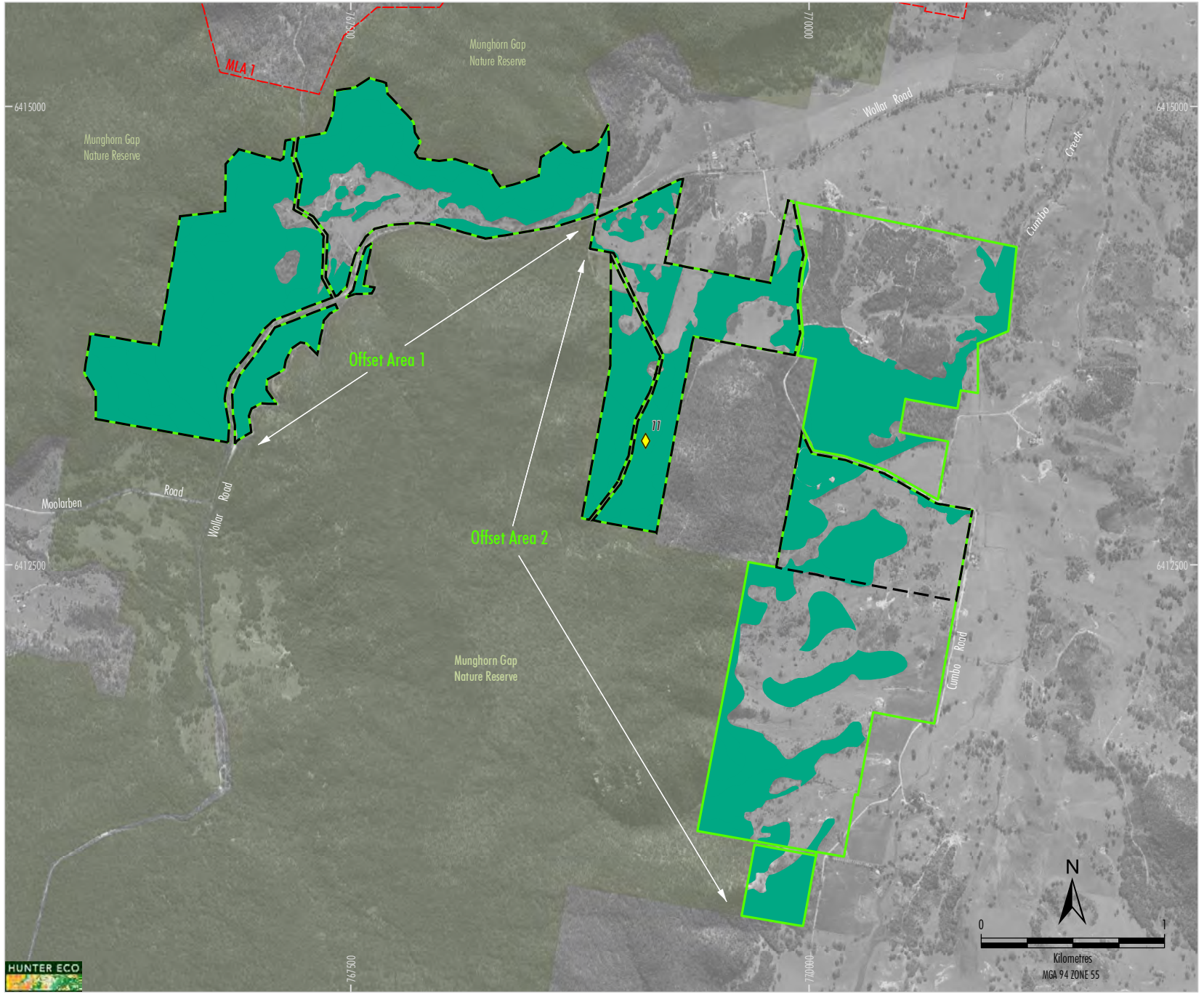
Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Offset Areas 3, 4 and 5 - Regent Honeyeater Habitat

Figure 18b

WIL-12-12_WEP_EIS_BAR BOS_221C



LEGEND

- Mining Lease Application Boundary
- Offset Area
- Commonwealth Offset Area
- Nature Reserve

Koala

- Recorded Location
- Potential Habitat

Reference: *11 Biodiversity Monitoring Services (2015b)*

Note: There are no references 1 - 10 on this figure.

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (Jun 2014)

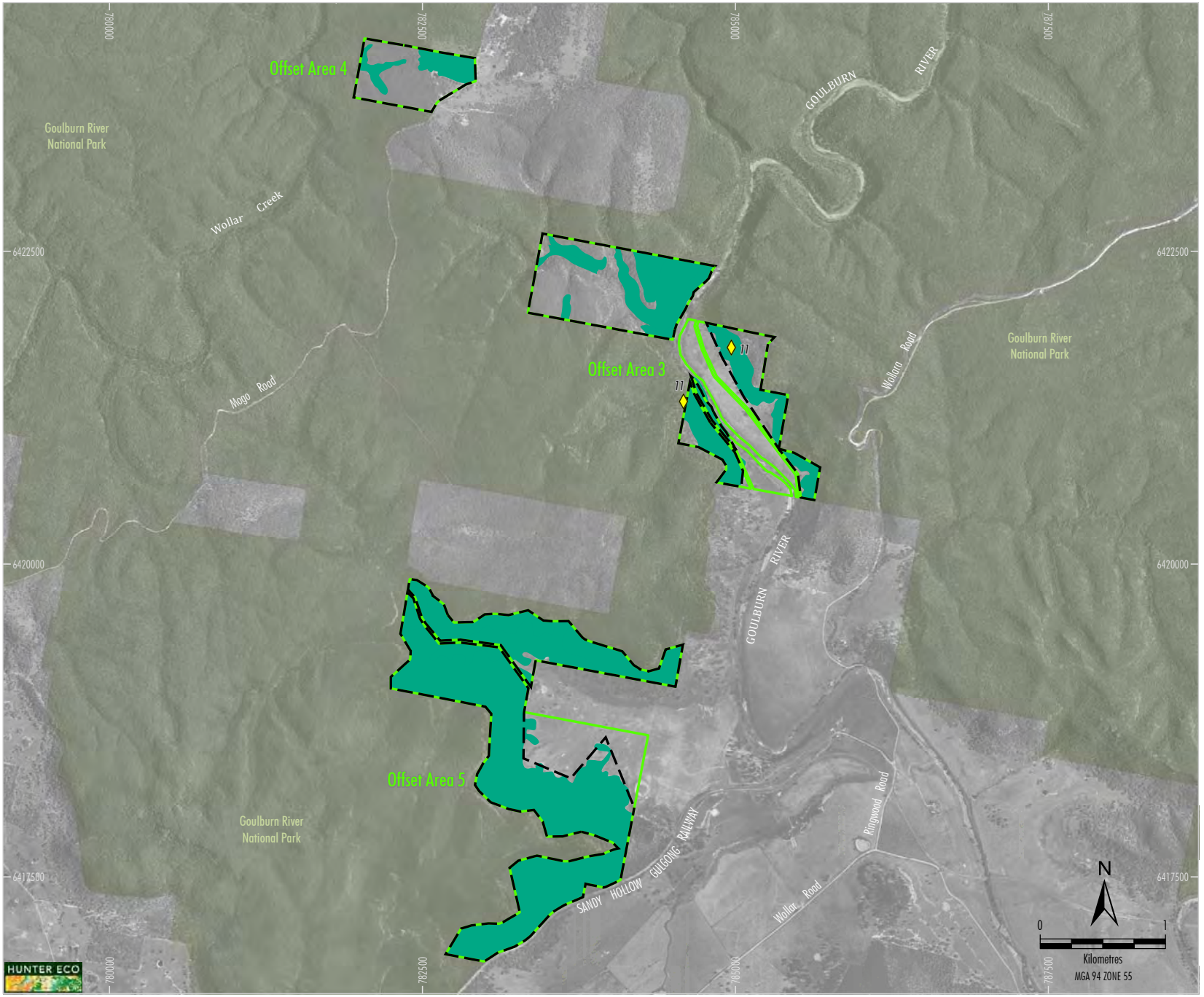
Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Offset Areas 1 and 2 - Koala Habitat

Figure 19a

WIL-12-12_WEP_EIS_BAR BOS_225B



LEGEND

- Offset Area
- Commonwealth Offset Area
- National Park

Koala

- Recorded Location
- Koala Habitat

Reference: *11 Biodiversity Monitoring Services (2015b)*

Note: There are no references 1 - 10 on this figure.

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (2011)

Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Offset Areas 3, 4 and 5 - Koala Habitat

Figure 19b

WIL-12-12_WEP_EIS_BAR BOS_226B

4.3.5 EPBC Act Environmental Offsets Policy Offset Principles

Table 27 provides a reconciliation of the Commonwealth offset package against the offset principles from the *EPBC Act Environmental Offsets Policy* (SEWPaC, 2012a).

The DotE comments in the SEARs for the EIS requested a discussion on the workings of the *EPBC Act Offsets Assessment Guide* (SEWPaC, 2012b) (i.e. the Commonwealth Offset Calculator).

As described in Section 4.2, an arrangement would be made for the enduring protection and management of the offset area (e.g. permanently secured by augmenting the adjoining protected areas [Munghorn Gap Nature Reserve and Goulburn National Park]). An ecological benefit in the offset areas is expected to occur within 5 years once livestock grazing is removed and a weed and feral animal control program is implemented.

The average quality of the habitat in the offset area is moderate with a long history of disturbance and grazing. Without creating an offset, continued agricultural use would mean habitat in the areas would not improve and potentially would slightly decline (since the management focus is not conservation). A 20% risk of loss of the habitat is possible since the land is freehold and there are no specific conservation protection measures in place.

The future quality of the habitat would be substantially improved with the conservation and enhancement measures proposed as part of the offset (e.g. removal of grazing, weed control and feral animal control). It is anticipated that the conservation and management measures (e.g. removal of grazing, weed control and feral animal control) would be effective in improving the habitat relevant to the protected matters and there is a high level of confidence in the result. WCPL are conserving and managing the offset areas that are part of the existing Biodiversity Offset Strategy for the Wilpinjong Coal Mine.

Table 27
Reconciliation of the Commonwealth Offset Package against the Commonwealth Offset Principles

Offset Principles[1]	Elements of the Project Offset that address these Requirements
Deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is protected by national environmental law and affected by the action.	The offset areas are specifically tailored to the relevant protected matters listed in Table 23 and to deliver an overall conservation outcome that improves or maintains the viability of the protected matters.
Be built around direct offsets but may include other compensatory measures.	The *EPBC Act Offsets Assessment Guide* (SEWPaC, 2012b) was used to assess the offset areas against the Commonwealth biodiversity offset requirements (Section 4.3.2). The offset areas are direct offsets which satisfies 100% of the offset requirements under the EPBC Act. The offset areas are owned by Peabody Energy (Figure 15b). WCPL intends to reach an agreement with the NSW Government so that the offset areas could be permanently secured by augmenting the adjoining protected areas (Munghorn Gap Nature Reserve and Goulburn National Park).
Be in proportion to the level of statutory protection that applies to protected matter.	The *EPBC Act Offsets Assessment Guide* (SEWPaC, 2012b), which was used for the Project, accounts for the level of statutory protection (vulnerable to critically endangered [Table 23]) of the relevant protected matters in calculating the offset requirement.

Table 27 (Continued)
Reconciliation of the Commonwealth Offset Package against the Commonwealth Offset Principles

Offset Principles[1]	Elements of the Project Offset that address these Requirements
Be of a size and scale proportionate to the impacts on the protected matter.	The size and scale of the offset was determined using the *EPBC Act Offsets Assessment Guide* (SEWPaC, 2012b). The following was considered: • the level of statutory protection (vulnerable to critically endangered [Table 23]); • specific attributes of the relevant protected matters and its habitat (Table 23); • the quality and importance of the habitat; • the level of risk to the habitat in the offset area without the Project (grazing); and • the time it would likely take for a conservation gain for each relevant protected matter; and • the risk of the conservation gain not occurring. With reference to the *EPBC Act Environmental Offsets Policy* (SEWPaC, 2012a), the impacts are conservatively assumed to be permanent for the purpose of the offset requirement, but in reality the BAR Footprint would be rehabilitated and revegetated.
Effectively account for and manage the risks of the offset not succeeding.	The Project would result in residual impacts on the protected matters in Table 23 (loss of habitat). The potential impacts on the protected matters have been evaluated and it is concluded that none of the protected matters are likely to be significantly impacted (Attachment E). However, the offset areas would compensate for the impacts on the protected matters and help maintain the viability of the protected matters. The *EPBC Act Offsets Assessment Guide* (SEWPaC, 2012b), which was used for the Project, accounts for the risks of the offset area not succeeding in calculating the offset requirement.
Be additional to what is already required, determined by law or planning regulations or agreed to under other schemes or programs.	The offset areas are beyond existing requirements, in that it is not part of any private conservation reserve system. The offset areas are new and additional under duty of care or any environmental planning laws.
Be efficient, effective, transparent, proportionate, scientifically robust and reasonable.	The offset areas would efficiently and effectively compensate for the impacts on the protected matters and help maintain the viability of the protected matters. Flora surveys of the offset areas were undertaken by Hunter Eco (2015b) (Attachment G) and fauna surveys of the offset areas were undertaken by Biodiversity Monitoring Services (2015b) (Attachment H).
Have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced.	WCPL intends to reach an agreement with the NSW Government so that the offset areas could be permanently secured by augmenting the adjoining protected areas (Munghorn Gap Nature Reserve and Goulburn National Park) (Section 4.2).

[1] SEWPaC, 2012a

4.4 NSW PROJECT BIODIVERSITY OFFSET

4.4.1 NSW Major Project Offset Policy

The NSW Offset Policy (OEH, 2014b) commenced on 1 October 2014 for a 12 to 18 month transitional period (OEH, 2014c). During the transitional period, there is some flexibility in the policy's application to address any technical or administrative issues (OEH, 2014c).

The NSW Offset Policy (OEH, 2014b) includes four options to meet biodiversity offset requirements These options include:

- offsetting through a land based offset area;
- rehabilitation of mine sites;
- contributing money to supplementary measures (e.g. funds towards research); and
- contributing money to a fund that is proposed to be managed by OEH.

4.4.2 NSW Offset Requirements

An assessment of the potential impacts from the Project on biodiversity is provided in Section 3. The Biodiversity Credit Reports produced by the Credit Calculator (Attachment E) indicate that ecosystem and species credits are required to offset the potential residual impacts of the Project. The NSW biodiversity offset (credit) requirements are summarised in Table 20.

4.4.3 NSW Biodiversity Offset Strategy

WCPL has elected to address the NSW offset requirements by offsetting through land based offset areas (Section 4.4.4) and rehabilitation of the additional disturbance associated with the Project (Section 4.4.5).

4.4.4 Land-based Offset Areas

The *Biobanking Assessment Methodology 2014* (OEH, 2014d) and Credit Calculator were used to assess the biodiversity values of the land-based offset areas (Offset Areas 1 to 5). The Commonwealth offset areas (described in Section 4.3) are a subset of Offset Areas 1 to 5.

The offset areas are 1,100 ha in size, comprising approximately 996 ha of native vegetation (Table 24). Vegetation communities within the offset areas are shown on Figures 16a and 16b and listed in Table 28. The vegetation in Offset Areas 1 to 5 comprises:

- approximately 209.5 ha of grassy woodland (approximately 82 ha more than the Commonwealth offset areas);
- approximately 581 ha of dry sclerophyll forest (approximately 70.5 ha more than the Commonwealth offset areas);
- approximately 205.5 ha of derived grassland (approximately 119.5 ha more than the Commonwealth offset areas); and
- approximately 101.5 ha of exotic pasture/cultivation (approximately 88 ha more than the Commonwealth offset areas).

The non-vegetation areas in the offset areas (farm dams, Goulburn River and infrastructure) comprise approximately 2.5 ha.

Table 28
Vegetation Communities in the Offset Areas

BVT	Vegetation Community
Grassy Woodlands – New England Grassy Woodlands	
HU681	5 ha of Blakely's Red Gum Woodland (grassy) [1]
Grassy Woodlands - Western Slopes Grassy Woodlands	
HU732	29 ha, comprising: • 3 ha of Yellow Box Woodland[1] • 26 ha of Yellow Box Woodland (derived native grassland) [1]
HU690	13.5 ha of White Box Grassy Woodland[1]
HU981	13 ha of Rough-barked Apple Forest
Grassy Woodlands - Coastal Valley Grassy Woodlands	
HU910	215 ha, comprising: • 175 ha of Blakely's Red Gum - Rough-barked Apple Woodland • 40 ha of Blakely's Red Gum - Rough-barked Apple Woodland (derived native grassland)

Table 28 (Continued)
Vegetation Communities in the Offset Areas

BVT	Vegetation Community
Dry Sclerophyll Forests (Shrubby sub-formation) - Western Slopes Dry Sclerophyll Forests	
HU843	85.5 ha, comprising: • 36.5 ha of Grey Gum - Blue-leaved Stringybark Forest • 49 ha of Grey Gum - Narrow-leaved Stringybark Forest
HU618	206 ha of Slaty Box Forest[2]
HU891	66.5 ha, comprising: • 40.5 ha of Caley's Ironbark Woodland • 26 ha of Caley's Ironbark Woodland (derived native grassland)
HU697	1.5 ha of Mugga Ironbark
HU888	76 ha Red Ironbark/Brown Bloodwood Forest
HU890	7.5 ha of Scribbly Gum Forest
HU877	1 ha of Spinifex Woodland
Dry Sclerophyll Forests (Shrub/grass sub-formation) - North-west Slopes Dry Sclerophyll Woodlands	
HU801	271.5 ha, comprising: • 158 ha of White Box Shrubby Woodland • 113.5 ha of White Box Shrubby Woodland (derived native grassland)
Dry Sclerophyll Forests (Shrubby sub-formation) – Sydney Hinterland Dry Sclerophyll Forests	
HU828	3.5 ha of Grey Myrtle Dry Rainforest
Dry Sclerophyll Forests (Shrub/grass sub-formation) – Hunter Macleay Dry Sclerophyll Forests	
HU962	1.5 ha of Western Grey Box Woodland
Total	**996 ha**

[1] The occurrence of the BVT in the offset areas equates to the Box-Gum Woodland EEC/CEEC.

[2] The occurrence of the BVT in the offset areas equates to the Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion Vulnerable Ecological Community.

A description of each offset area is provided below.

Offset Area 1

A narrow valley surrounded on three sides by Munghorn Gap Nature Reserve. Approximately 86% vegetated with evidence of past timber harvesting and clearing. The valley floor has been mostly cleared with remnants indicating the vegetation would have been dominated by Rough-barked Apple and Blakely's Red Gum. This habitat remains on the lower slopes, merging into shrubby White Box on the mid-slopes and Grey Gum - Stringybark on the upper slopes. At the southern end there is a wide colluvial basin with Rough-barked Apple and Blakely's Redgum and adjoining Scribbly Gum. There are also small patches of Slaty Box and Mugga Ironbark.

Offset Area 2

The western boundary of Offset Area 2 adjoins Munghorn Gap Nature Reserve with 55% of the area vegetated, a large amount being advanced regeneration from prior clearing. Caley's Ironbark mixed with Red Stringybark occurs in the north eastern section where abundant Black Cypress Pine indicates previous clearing. A long alluvial valley to the west is dominated by Rough-barked Apple and Blakely's Red Gum that continues up the lower slopes, merging into shrubby White Box on the mid-slopes and Grey Gum - Stringybark on the upper slopes. The central eastern part contains a small amount of Yellow Box Woodland with a larger area of Yellow Box Woodland derived native grassland (equivalent to the Box-Gum Woodland EEC/CEEC). Elsewhere on the side slopes are patches of Slaty Box merging into Grey Gum - Stringybark on the upper slopes.

Offset Area 3

Offset Area 3 is surrounded on three sides by Goulburn River National Park and is split by just over 2 km of the Goulburn River itself. The area is approximately 75% vegetated most of which is largely undisturbed. There is an area of old growth dry rainforest dominated by Grey Myrtle in the deep central sheltered gorge. The ridge tops and upper side slopes contain predominantly Red Ironbark - Brown Bloodwood with Grey Gum - Stringybark in the more sheltered upper slopes. There is a small area (1 ha) of Tumbledown Red Gum - Spinifex woodland in the south eastern portion. A wide alluvial flat on the eastern side of the Goulburn River has been fully cleared and pasture improved and is dominated by exotic species. A northern ridge has remnant White Box Grassy Woodland on basalt with evidence of past clearing resulting in a dominant shrub layer of *Bursaria spinosa* and *Beyeria viscosa* which has flourished due to lack of fire.

Offset Area 4

Offset Area 4 is surrounded on three sides by Goulburn River National Park. Just over 7 ha has been partially cleared but still retains characteristics of White Box Grassy Woodland. The land is generally flat with a central incised gully system extending to the west dominated by Grey Gum - Stringybark. The flat areas are dominated by Red Ironbark - Brown Bloodwood with a small area (1.5 ha) of Western Grey Box.

Offset Area 5

Offset Area 5 is surrounded on three sides by Goulburn River National Park. Over 80% vegetated with evidence of some prior clearing and timber harvesting. Consists of colluvial lower slopes surrounding an alluvial cultivated valley floor. The dominant community is Slaty Box forest with White Box mixed to varying degrees. White Box shrubby woodland is present on the northern slopes and a central alluvial valley contains Rough-barked Apple and Blakely's Red Gum.

Threatened Species and their Habitat

Flora surveys of the offset areas were undertaken by Hunter Eco (2015b) (Attachment G) and three threatened flora species were recorded in Offset Area 5, namely, *Ozothamnus tesselatus*, Scant Pomaderris (*Pomaderris queenslandica*) and *Tylophora linearis*. Of these species, only *Ozothamnus tesselatus* occurs in the area to be cleared for the Project.

The new NSW Offset Policy (OEH, 2014b) (and associated NSW *Framework for Biodiversity Assessment* (OEH, 2014a) does not require threatened fauna species that are ecosystem credit species to be located within an offset area because they are assumed to be present if potential habitat is present.

Fauna surveys of an offset area are only required to generate credits for species credit species (i.e. specific threatened fauna species are targeted). Fauna surveys of the offset areas were undertaken by Biodiversity Monitoring Services (2015b) (Attachment H) targeting all potentially occurring threatened fauna species ecosystem credit species and species credit species).

Biodiversity Monitoring Services (2015b) (Attachment H) recorded 16 threatened fauna species within Offset Areas 1 to 5 (Table 29). An additional three fauna species were opportunistically recorded by Hunter Eco (2015b) (Attachment G) during the flora survey work (Table 29). Table 29 also lists a further five fauna species with database records within the offset areas. So, in total, there are records of 24 threatened fauna species within Offset Areas 1 to 5.

Table 29
Threatened Species Recorded within the Offset Areas

Species	Conservation Status^		Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Credit Type*
	TSC Act	EPBC Act						
Flora								
Ozothamnus tesselatus	V	V	-	-	-	-	6,458 indi.	Species Credit
Scant Pomaderris (*Pomaderris queenslandica*)	E	-	-	-	-	-	50 indi.	Species Credit
Tylophora linearis	V	E	-	-	-	-	2 indi.	Species Credit
Birds								
Little Eagle (*Hieraaetus morphnoides*)	V	-	One database record[1]	One survey record[5]	-	-	-	Ecosystem Credit
Glossy Black-Cockatoo (*Calyptorhynchus lathami*)	V	-	-	-	One survey record[5]	-	-	Ecosystem Credit
Gang-gang Cockatoo (*Callocephalon fimbriatum*)	V	-	Multiple database records[1,2]	-	-	-	-	Ecosystem Credit
Little Lorikeet (*Glossopsitta pusilla*)	V	-	Multiple survey records[3] and multiple database records[1,2]	Multiple survey records[3] and one database record[2]	-	Multiple survey records[3]	One survey record[2]	Ecosystem Credit
Turquoise Parrot (*Neophema pulchella*)	V	-	One database record[2]	-	-	One database record[2]	-	Ecosystem Credit
Sooty Owl (*Tyto tenebricosa*)	V	-	-	-	One survey record[3]	-	-	-
Powerful Owl (*Ninox strenua*)	V	-	-	-	-	-	One survey record[3]	Ecosystem Credit
Brown Treecreeper (eastern subspecies) (*Climacteris picumnus* subsp. *victoriae*)	V	-	Multiple survey records[3] and one database record[1]	Multiple survey records[3]	One survey record[3]	-	One survey record[3]	Ecosystem Credit

Table 29 (Continued)
Threatened Species Recorded in the Project Area and also within the Offset Areas

Species	Conservation Status^		Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Credit Type*
	TSC Act	EPBC Act						
Birds (Cont.)								
Speckled Warbler (*Chthonicola sagittata*)	V	-	One survey record[3] and one database record[1]	-	-	One survey record[3]	One survey record[3]	Ecosystem Credit
Black-chinned Honeyeater (eastern subspecies) (*Melithreptus gularis* subsp. *gularis*)	V	-	One database record[1]	-	-	-	One survey record[3]	Ecosystem Credit
Regent Honeyeater (*Anthochaera phrygia*)	CE	CE	Multiple survey records[4] and multiple database records[1]	-	-	-	-	Species Credit
Painted Honeyeater (*Grantiella picta*)	V	V	One database record[1]	-	-	-	-	Ecosystem Credit
Pied Honeyeater (*Certhionyx variegatus*)	V	-	One database record[1]	-	-	-	-	-
Hooded Robin (south-eastern form) (*Melanodryas cucullata* subsp. *cucullata*)	V	-	One database record[1]	One survey record[5]	-	-	-	Ecosystem Credit
Pink Robin (*Petroica rodinogaster*)	V	-	One database record[1]	-	-	-	-	-
Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis* subsp. *temporalis*)	V	-	-	One survey record[3]	-	-	-	Ecosystem Credit
Varied Sittella (*Daphoenositta chrysoptera*)	V	-	Multiple survey records[3] and multiple database records[1,2]	-	-	-	-	Ecosystem Credit
Diamond Firetail (*Stagonopleura guttata*)	V	-	Multiple database records[1,2]	One survey record[3]	-	-	-	Ecosystem Credit

Table 29 (Continued)
Threatened Species Recorded in the Project Area and also within the Offset Areas

Species	Conservation Status^		Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Credit Type*
	TSC Act	EPBC Act						
Mammals								
Koala (*Phascolarctos cinereus*)	V	V	-	One survey record[3]	One survey record[3]	-	-	Species Credit
Squirrel Glider (*Petaurus norfolcensis*)	V	-	-	One survey record[3]	-	-	-	Ecosystem Credit
Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*)	V	-	One survey record[3]	Multiple survey records[3]	Multiple survey records[3]	One survey record[3]	-	Ecosystem Credit[#]
Corben's Long-eared Bat (*Nyctophilus corbeni*)	V	V	One survey record[3]	One survey record[3]	-	-	-	Ecosystem Credit
Large-eared Pied Bat (*Chalinolobus dwyeri*)	V	V	One survey record[3]	Multiple survey records[3]	One survey record[3]	Multiple survey records[3]	-	Ecosystem Credit[#]
Eastern Cave Bat (*Vespadelus troughtoni*)	V	-	One survey record[3]	One survey record[3]	-	-	-	Ecosystem Credit[#]

* *BioNet Threatened Species Profile Database* (OEH, 2015a).

^ Threatened fauna species status under the TSC Act and/or EPBC Act (current at October 2015).
V = Vulnerable; E = Endangered; CE = Critically Endangered.

[#] It is recognised that breeding habitat for this species produces species credits, however, no breeding habitat would be adversely impacted by the Project.

1 OEH (2015).

2 BirdLife Australia (2014).

3 Biodiversity Monitoring Services (2015b) (Attachment H).

4 DECC (2005).

5 Hunter Eco (2015a) incidental sighting.

The habitat in the offsets consists of woodland and forest with varying degrees of past disturbance, all with large amounts of fallen timber as a consequence of lack of fire. In addition, Offset Area 3 has over 2 km of sandstone escarpment with numerous caves (Plate 3). There are also a small number of caves in Offset Area 4.

Plate 3 An Example of Caves in Offset Area 3

Of the 21 threatened species recorded in the BAR Footprint (Section 2.3.2), the following four threatened fauna species have not been recorded in the offset areas:

- Masked Owl (*Tyto novaehollandiae*);
- Scarlet Robin (*Petroica boodang*);
- Eastern Freetail Bat (*Mormopterus norfolkensis*); and
- Little Bentwing-bat (*Miniopterus australis*).

The Masked Owl and Scarlet Robin have been recorded in adjoining habitat (Figures 17a and 17b) and therefore it is considered likely that these species may also use habitat in the offset areas. The Eastern Freetail Bat and Little Bentwing-bat have not been recorded in adjoining habitat but are known to occur in the wider locality.

4.4.4.1 Site and Landscape Values

Table 30 identifies the change in site value score of each vegetation zone located in the proposed additional offset areas.

Table 30
Change in Site Value Scores Relevant to the Offset Areas

Vegetation Zone	BVT Name	Condition	Current Site Value	Future Site Value	Gain In Site Value
Offset Area 1					
1	Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	Moderate/Good	48.00	79.33	31.33
2	Mugga Ironbark - Black Cypress Pine shrub/grass open forest of the upper Hunter Valley, mainly Sydney Basin Bioregion	Moderate/Good	51.78	79.67	27.89
3	White Box - Blackthorn shrubby woodland on sandstone ranges of the Sydney Basin	Moderate/Good	50.00	71.18	21.18
4	Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	Moderate/Good	45.33	67.22	21.89
5	Grey Gum - Scribbly Gum - Black Pine heathy open forest on sandstone ranges of the Sydney Basin	Moderate/Good	70.00	84.44	14.44
6	Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	Moderate/Good_ Derived grassland	9.38	22.92	13.54
7	Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	Moderate/Good	51.56	65.97	14.41
Offset Area 2					
1	Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	Moderate/Good	52.67	66.11	13.44
2	Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion	Moderate/Good_ Medium	53.12	66.84	13.72
3	Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion	Moderate/Good_ Derived grassland	50.00	76.30	26.30
4	White Box - Blackthorn shrubby woodland on sandstone ranges of the Sydney Basin	Moderate/Good	49.48	70.31	20.83
5	White Box - Blackthorn shrubby woodland on sandstone ranges of the Sydney Basin	Moderate/Good_ Derived grassland	28.12	55.64	27.52
6	Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	Moderate/Good	61.33	79.33	18.00
7	Caley's Ironbark - Red Ironbark - Currawang shrubby woodland on sandstone ranges of the Sydney Basin	Moderate/Good_ Medium	52.67	66.11	13.44
8	Caley's Ironbark - Red Ironbark - Currawang shrubby woodland on sandstone ranges of the Sydney Basin	Moderate/Good_ Derived grassland	19.33	42.33	23.00
9	Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	Moderate/Good	45.83	65.97	20.14
10	Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	Moderate/Good_ Derived grassland	8.33	22.05	13.72

Table 30 (Continued)
Change in Site Value Scores Relevant to the Offset Areas

Vegetation Zone	BVT Name	Condition	Current Site Value	Future Site Value	Gain In Site Value
Offset Area 3					
1	Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	Moderate/Good_ Medium	68.67	82.22	13.55
2	Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	Moderate/Good_ Medium	57.81	71.88	14.07
3	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Moderate/Good_ Medium	55.21	71.44	16.23
4	Grey Gum - Grey Myrtle - Narrow-leaved Stringybark - Rusty Fig open forest on ranges of the Upper Hunter	Moderate/Good	39.41	67.10	27.69
5	Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	Moderate/Good	55.56	82.89	27.33
6	Tumbledown Red Gum - Spinifex grass heathy low open woodland on sandstone slopes of the Sydney Basin	Moderate/Good	56.00	75.33	19.33
7	Red Ironbark - Brown Bloodwood - Black Pine heathy open forest on sandstone ranges of the Sydney Basin	Moderate/Good	60.00	80.44	20.44
8	Rough-barked Apple grassy tall woodlands of the Brigalow Belt South	Moderate/Good_ Medium	34.90	55.47	20.57
Offset Area 4					
1	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Moderate/Good_ Medium	33.33	43.66	10.33
2	Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	Moderate/Good	66.22	82.67	16.45
3	Red Ironbark - Brown Bloodwood - Black Pine heathy open forest on sandstone ranges of the Sydney Basin	Moderate/Good	71.11	88.67	17.56
4	Grey Box grassy open forest of the Central and Lower Hunter Valley	Moderate/Good_ Medium	57.81	64.58	6.77
Offset Area 5					
1	Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	Moderate/Good	64.67	82.89	18.22
2	White Box - Blackthorn shrubby woodland on sandstone ranges of the Sydney Basin	Moderate/Good	43.75	65.97	22.22
3	Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	Moderate/Good	56.25	75.17	18.92

4.4.4.2 Management of the Proposed Offset Areas

As described in Section 4.2, depending on the ultimate security mechanism, a management plan (or plans) may be prepared that describes the management of the proposed additional offset areas (e.g. if the offset areas are added to the Munghorn Gap Nature Reserve and Goulburn National Park then the offset areas would be managed by the NSW Government under the management plans for these protected areas).

As a minimum, management of the offset areas would include:

- weed control;
- feral animal control;
- progressive removal of livestock grazing;
- maintenance of access for farm infrastructure (e.g. water pipelines); and

- revegetation of exotic pasture/cultivation.

The credit reports produced by the Biobanking Credit Calculator (Attachment F) list the following additional management actions required to be undertaken in Offset Areas 1 to 5:

- exclude commercial apiaries;
- exclude miscellaneous species;
- feral and/or over-abundant native herbivore control;
- fox control; and
- slashing.

4.4.4.3 Ecosystem and Species Credits Generated

Table 31 identifies the ecosystem and species credits generated for the proposed additional offset areas.

Table 31
Credits Generated at the Offset Areas

Credit Type	Number of Credits Generated						Total Individuals/Area
	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Total Credits	
Species Credits							
Ozothamnus tesselatus	-	-	-	-	45,852	**45,852**	**6,458 indi.**
Scant Pomaderris (*Pomaderris queenslandica*)	-	-	-	-	355	**355**	**50 indi.**
Tylophora linearis	-	-	-	-	14	**14**	**2 indi.**
Regent Honeyeater (*Anthochaera phrygia*)	1,164	1,406	408	82	1,353	**4,413**	**621.5 ha**
Koala (*Phascolarctos cinereus*)	1,154	1,406	408	82	1,548	**4,598**	**647.5 ha**
Ecosystem Credits							
Grassy Woodlands – New England Grassy Woodlands							
HU681[1]	-	-	68	-	-	**68**	**5 ha**
Grassy Woodlands - Western Slopes Grassy Woodlands							
HU732[1]	-	319	-	-	-	**319**	**29 ha**
HU690[1]	-	-	95	47	-	**142**	**13.5 ha**
HU981			176			**176**	**13 ha**
Grassy Woodlands - Coastal Valley Grassy Woodlands							
HU910	508	1360	-	-	280	**2,148**	**215 ha**
Dry Sclerophyll Forests (Shrubby sub-formation) - Western Slopes Dry Sclerophyll Forests							
HU843	527	57	437	33	-	**1,054**	**85.5 ha**
HU618[2]	33	132	261	-	1806	**2,232**	**206 ha**
HU891	-	622	-	-	-	**622**	**66.5 ha**
HU697	19	-	-	-	-	**19**	**1.5 ha**
HU888	-	-	750	284	-	**1,034**	**76 ha**
HU890	76	-	-	-	-	**76**	**7.5 ha**
HU877	-	-	15	-	-	**15**	**1 ha**

Table 31 (Continued)
Credits Generated at the Offset Areas

Credit Type	Number of Credits Generated						Total Individuals/Area
	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5	Total Credits	
Dry Sclerophyll Forests (Shrub/grass sub-formation) - North-west Slopes Dry Sclerophyll Woodlands							
HU801	803	1,914	-	-	204	**2,921**	**271.5 ha**
Dry Sclerophyll Forests (Shrubby sub-formation) – Sydney Hinterland Dry Sclerophyll Forests							
HU828	-	-	55	-	-	**55**	**3.5 ha**
Dry Sclerophyll Forests (Shrub/grass sub-formation) – Hunter Macleay Dry Sclerophyll Forests							
HU962	-	-	-	12	-	**12**	**1.5 ha**
Total	**1,966**	**4,404**	**1,857**	**376**	**2,290**	**10,893**	**996 ha**

[1] The occurrence of the BVT in the offset areas equates to the Box-Gum Woodland EEC/CEEC

[2] The occurrence of the BVT in the offset areas equates to the Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion Vulnerable Ecological Community

Species Credits

Table 32 provides a reconciliation of the Project 'species credit' requirements (sourced from Table 20) against the credits generated for the proposed additional offset areas and development site rehabilitation (sourced from Table 31).

Table 32
Reconciliation of Species Credits Required from the BAR Footprint and Credits Generated by the Offset Areas and Rehabilitation

Species Credits	Project Area		Offset Areas 1 to 5			Credits Generated Through Rehabilitation	Credit Met
	Impact	Credits Required	Credits Generated Through Offset Areas	Credits Match Credit Profile	Credits Additonal to Credit Profile		
Ozothamnus tesselatus	589 individuals	23,560	45,852	23,560	22,292	-	Yes
Scant Pomaderris (*Pomaderris queenslandica*)	0	0	355	N/A	355	-	N/A
Tylophora linearis	0	0	14	N/A	14	-	N/A
Regent Honeyeater (*Anthochaera phrygia*)	273 ha of potential foraging habitat	21,021	4,413	4,413	0	3,230	No (less 13,378 [refer to following text])
Koala (*Phascolarctos cinereus*)	165 ha of potential habitat	4,290	4,598	4,290	308	-	Yes
Total	**-**	**48,871**	**55,232**	**32,263**	**22,969**	**3,230**	**-**

Species Credits Additional to Credit Profile

If the offset areas were secured via a Biobanking Agreement, the species credits additional to the credit profile (Table 32) could be used as an offset for a separate development under the Biobanking Scheme (e.g. sold on the Biobanking Credit market). However, as described in Section 4.2, WCPL intends to reach an agreement with the NSW Government so that the offset areas could be permanently secured by augmenting the adjoining protected areas (Munghorn Gap Nature Reserve and Goulburn National Park). Further, the excess species credits occur within the extent of the Commonwealth offset areas (Section 4.3.3). Therefore, the species credits in Table 32 would be utilised as part of this Project's offset.

Regent Honeyeater

The Regent Honeyeater is the only species in Table 32 for which the offset areas do not generate enough credits according to the NSW *Framework for Biodiversity Assessment* (OEH, 2014a), however, the Project credit requirement for the Regent Honeyeater is very large considering the area of habitat to be disturbed. This is the result of very high offset multiplier values that are not reflective of a realistic biodiversity offset requirement. This is especially the case where the credit requirements are converted to area requirements and compared with recently approved biodiversity offsets.

The new NSW Offset Policy (OEH, 2014b) (and associated NSW *Framework for Biodiversity Assessment* (OEH, 2014a) requires a higher ratio than previously required, and in some cases, significantly more. For example, certain species (e.g. Regent Honeyeater) have very low T_G scores which are driving high offset multipliers (perverse outcomes), i.e. greater than 10.8:1 compared with previous policies.

It is considered that Offset Areas 1 to 5 provide an adequate offset for the Regent Honeyeater because:

- the habitat in the offset areas is twice as large as that in the BAR Footprint;
- Offset Area 1 contains multiple records of the Regent Honeyeater;
- the NSW *Framework for Biodiversity Assessment* (OEH, 2014a) does not give consideration to the quality of the habitat being impacted or offset and instead treats all habitat the same (the habitat in the offset areas is known to be used by the Regent Honeyeater whereas the habitat in the BAR Footprint is only potential habitat);
- the NSW *Framework for Biodiversity Assessment* (OEH, 2014a) does not give consideration to the strategic location of proposed offset areas (which are suitably located to augment the NPWS estate and include approximately 2 km of riparian land along the Goulburn River); and
- the Project is not located in a key breeding area for the species (after DotE, 2015a).

Habitat for the Regent Honeyeater in the offset areas is shown on Figures 18a and 18b. Habitat for the Regent Honeyeater in the offset areas was evaluated based on a number of sources. Approximately 330.5 ha of vegetation with key tree foraging species for the Regent Honeyeater occurs in the offset areas, associated with (DotE, 2015a and OEH, 2015c):

- HU910 Blakely's Red Gum - Rough-barked Apple Woodland/Blakely's Red Gum Woodland/Rough-barked Apple Forest;
- HU801 White Box Shrubby Woodland;

- HU732 Yellow Box Woodland (Plate 4);
- HU730 White Box Grassy Woodland;
- HU697 Mugga Ironbark; and
- HU690 White Box Grassy Woodland.

Plate 4 Yellow Box Woodland in Offset Area 2

As described in Section 2.3.4, the Regent Honeyeater was recorded in Offset Area 1 (DECC, 2005) (south of the BAR Footprint) within HU910 and HU843 Grey Gum - Narrow-leaved Stringybark Forest. Therefore, both of these BVTs are recognised as potential habitat.

Further, OEH (2015c) lists Regent Honeyeater habitat as associated with the following BVTs within the offset areas:

- HU962 Western Grey Box Woodland;
- HU732 Yellow Box Woodland;
- HU730 White Box Grassy Woodland;
- HU697 Mugga Ironbark Forest;
- HU690 White Box Grassy Woodland; and
- HU618 Slaty Box Forest.

As described in Section 2.3.4, the Regent Honeyeater can also use Rough-barked Apple (*Angophora floribunda*) (Oliver, 2000) which is associated with HU981.

In summary, the following BVTs within the offset areas represent potential habitat for the Regent Honeyeater:

- HU981 Rough-barked Apple Forest;
- HU962 Western Grey Box Woodland;
- HU910 Blakely's Red Gum - Rough-barked Apple Woodland/Blakely's Red Gum Woodland/Rough-barked Apple Forest;
- HU843 Grey Gum - Narrow-leaved Stringybark Forest;
- HU801 White Box Shrubby Woodland;
- HU732 Yellow Box Woodland;
- HU730 White Box Grassy Woodland;
- HU697 Mugga Ironbark Forest;
- HU690 White Box Grassy Woodland; and
- HU618 Slaty Box Forest.

Based on the above, there is approximately 662 ha of existing potential habitat for the Regent Honeyeater in the offset areas (Figures 18a and 18b). The derived native grassland occurrences of these BVTs are not currently potential habitat for the species but could be with revegetation.

Dr Martin Denny (Biodiversity Monitoring Services) is of the opinion that the majority of the woodland/forest habitat in the offset areas provides habitat for the Regent Honeyeater and that the species is likely to utilise Offset Areas 1 to 5 (Attachment H) (Figures 18a and 18b).

Koala

After consideration of SEPP 44 and the *Recovery Plan for the Koala* (*Phascolarctos cinereus*) (DECC, 2008b) the following BVTs are considered to represent potential habitat for the Koala:

- HU981 Rough-barked Apple Forest;
- HU962 Western Grey Box Woodland;
- HU910 Blakely's Red Gum - Rough-barked Apple Woodland;
- HU890 Scribbly Gum Forest;
- HU877 Spinifex Woodland;
- HU843 Grey Gum - Narrow-leaved Stringybark Forest/ Grey Gum - Blue-leaved Stringybark Forest;
- HU801 White Box Shrubby Woodland;
- HU732 Yellow Box Woodland;
- HU690 White Box Grassy Woodland;
- HU681 Blakely's Red Gum Woodland; and
- HU618 Slaty Box Forest.

Based on the above, there is approximately 647.5 ha of existing potential habitat for the Koala in the offset areas (Figures 19a and 19b).

There was evidence of the Koala within Offset Areas 2 and 3. The Koala was not recorded in Offset Areas 1, 4 or 5 (despite the targeted survey), however habitat for the species is abundant within these areas. Dr Martin Denny (Biodiversity Monitoring Services) is of the opinion that large areas of the woodland/forest habitat in the offset areas provides habitat for the Koala and that the species is likely to also be present in Offset Areas 1, 4 and 5 (Figures 19a and 19b).

Ecosystem Credits

Table 33 provides a reconciliation of the Project ecosystem credit requirements (sourced from Table 20) against the credits generated for the proposed additional offset areas (sourced from Table 31). Attachment I provides a comparison of vegetation communities in the BAR Footprint and offset areas.

Table 33
Reconciliation of Ecosystem Credits Required from the BAR Footprint and Credits Generated by the Offset Areas

Project Area					Offset Areas 1 to 5			
	BVT Name	**BVT**	**Clearance Area**	**Credits Required**	**Offset Credits which Match the Credit Profile**	**Remaining Credits Required after Matching the Credit Profile**	**Offset Credits Subject to Variation Rules**	**Remaining Credits Required after Matching the Credit Profile and Variation Rules**
Formation = Grassy Woodlands								
1	[1]Blakely's Red Gum - Yellow Box grassy tall woodland of the New England Tableland Bioregion	HU681	6 ha	254	68 (HU681)	186	186 (HU732)	0
2	Fuzzy Box woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	HU547	1.5 ha	36	0	36	N/A	36
3	Rough-barked Apple grassy tall woodlands of the Brigalow Belt South	HU981	126 ha	5,155	176 (HU981) 17 (HU732) 142 (HU690)	4,820	1,978 (HU910)	2,842
4	[1]Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion	HU732	3.5 ha	116	116 (HU732)	0	N/A	0
5	Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	HU910	4 ha	170	170 (HU910)	0	N/A	0

Table 33 (Continued)
Reconciliation of Ecosystem Credits Required from the BAR Footprint and Credits Generated by the Offset Areas

Project Area					Offset Areas 1 to 5			
BVT Name		**BVT**	**Clearance Area**	**Credits Required**	**Offset Credits which Match the Credit Profile**	**Remaining Credits Required after Matching the Credit Profile**	**Offset Credits Subject to Variation Rules**	**Remaining Credits Required after Matching the Credit Profile and Variation Rules**
Formation = Dry Sclerophyll Forests (Shrubby sub-formation)								
6	Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	HU843	42.5 ha	2,216	1,054 (HU843) 1,162 (HU618)	0	N/A	0
7	Red Ironbark - Grey Gum - Black Pine heathy woodland on sandstone ranges of the Sydney Basin	HU886	39.5 ha	2,129	559 (HU618) 1,034 (HU888) 76 (HU890) 15 (HU877) 19 (HU697)	426	426 (HU891)	0
8	[2]Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	HU618	9.5 ha	511	511 (HU618)	0	N/A	0
9	White Box - Black Cypress Pine shrubby woodland of the Western Slopes	HU824	98 ha	3,947	0	3,947	196 (HU891) 55 (HU828)	3,696
Formation = Dry Sclerophyll Forests (Shrub/grass sub-formation)								
10	Grey Box grassy open forest of the Central and Lower Hunter Valley	HU962	3 ha	74	12 (HU962)	62	62 (HU801)	0
11	Narrow-leaved Ironbark - Black Cypress Pine shrub - grass woodland upper Hunter and northern Wollemi	HU825	20.5 ha	706	706 (HU801)	0	N/A	0
		Total	**354**	**15,314**	**5,837**	**9,477**	**2,903**	**6,574**

[1] The occurrence of the BVT in the offset areas equates to Box-Gum Woodland EEC/CEEC

[2] The occurrence of the BVT in the offset areas equates to Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion Vulnerable Ecological Community

A total of 15,314 credits are required to be retired for the BAR Footprint. Offset Areas 1 to 5 generate 10,893 ecosystem credits (Attachment F), of which 5,837 credits directly satisfy the credit profile requirements in the credit report (Attachment E), leaving 9,477 (Table 33).

The new NSW Offset Policy (OEH, 2014b) (and associated NSW *Framework for Biodiversity Assessment* (OEH, 2014a) contain variation rules that enables different vegetation types to be used to offset if they are in the same formation. A total of 2,903 credits further reduce the offset liability using the variation rules, leaving a liability of 6,574 (Table 33).

WCPL placed an expression of interest for the credits required on the OEH Biobanking public register in September 2015. No response has been received for the required ecosystem credits and there are no credits available on the Biobanking public register for the relevant BVTs (HU681, HU981, HU886, HU824 and HU962).

The additional credits required after variation rules (6,574 credits) have been met through inclusion of HU801 (see below) and mine site rehabilitation (Section 4.4.5).

HU801 White Box Shrubby Woodland

As a result of using the credits in Table 33, 2,153 credits remain (generated by HU801) which do not match the development credit profile (Table 34). A description is provided below on how these additional credits are used to offset the impacts from the Project.

White Box Shrubby Woodland is assigned to HU824 in the Project clearance area because it occurs primarily on low rises on a sandy substrate with a mix of White Box and Black Cypress Pine, and shrubs are predominantly *Acacia* and *Dodonaea* species. However, White Box Shrubby Woodland is assigned to HU801 in the offset areas (Table 34) because it occurs on rocky mid slopes with negligible Black Cypress Pine and the shrub layer is clearly dominated by Blackthorn (*Bursaria spinosa*). HU824 belongs to Dry Sclerophyll Forests (Shrubby sub-formation) and HU801 to Dry Sclerophyll Forests (Shrub/grass sub-formation) with the latter assigment seemingly inconsistent with the heavy shrubby structure of that community in the offsets.

Table 34
Ecosystem Credits

Credit Type	Number of Credits					
	Offset Area 1	**Offset Area 2**	**Offset Area 3**	**Offset Area 4**	**Offset Area 5**	**Total Credits**
Dry Sclerophyll Forests (Shrub/grass sub-formation) - North-west Slopes Dry Sclerophyll Woodlands						
HU801 White Box Shrubby Woodland	35	1,914	-	-	204	**2,153**

These two BVTs fall into different vegetation formations, even though both are dry sclerophyll forests. The NSW *Framework for Biodiversity Assessment* (OEH, 2014a) explains that vegetation types in different formations cannot be used as an offset. However, in this situation the differences between HU801 and HU824 are slight (Plates 5a and 5b).

Plate 5a White Box Shrubby Woodland (HU824)

Plate 5b White Box Shrubby Woodland (HU801)

HU801 White Box Shrubby Woodland is, therefore, included in the NSW Biodiversity Offset Strategy for the Project. It is considered that not including HU801 in the offset would lead to a suboptimal outcome because:

- HU824 is comparable to HU801 as the canopy of both is dominated by White Box with the major differences being in the shrub layer.
- White Box is abundant within the White Box Shrubby Woodland (HU801) and is a key foraging species for the Regent Honeyeater (DotE, 2015a and OEH, 2015c), noting that the new NSW Offset Policy (OEH, 2014b) (and associated NSW *Framework for Biodiversity Assessment* (OEH, 2014a) has a higher offset requirement for the Regent Honeyeater above other relevant matters.
- If a BioBanking site was established, putting the HU801 credits on the Biobanking public register has the potential to significantly delay management of the offset because management measures/OEH payments do not commence until over 80% of the credits in the Biobanking Site are retired.
- Not including HU801 within the offset areas would reduce the area proposed to be included in the NPWS estate as an offset for the Project.

HU547 Fuzzy Box Woodland

A small patch of Fuzzy Box Woodland (1.5 ha) would be cleared for the Project (0.4% of the total native vegetation to be cleared). Fuzzy Box Woodland (HU547) is not present in the offset areas. The Fuzzy Box Woodland is located within the proposed open cut extension areas and therefore direct impacts on the community cannot be avoided. Similar areas of Fuzzy Box Woodland occur in the wider locality (e.g. Fuzzy Box occurs in ECA-A). It is considered reasonable for the offset areas not to contain Fuzzy Box Woodland given the small area cleared and that areas of this community are already conserved at the Wilpinjong Coal Mine. Further, Fuzzy Box (*Eucalyptus conica*) would be used in the mine rehabilitation.

Revegetation of Cleared Land

The 101.5 ha of exotic pasture/cultivation in the offset areas would be revegetated. The Credit Calculator has been run including the exotic pasture/cultivation as likely low condition vegetation types. A total of 1,056 ecosystem credits would be generated by revegetating this cleared land.

4.4.5 Rehabilitation

The new NSW Offset Policy (OEH, 2014b) (and associated NSW *Framework for Biodiversity Assessment* (OEH, 2014a) enable credits to be generated through mine site rehabilitation. WCPL intend to generate ecosystem credits and species credits from rehabilitation of the post mine landforms associated with the BAR Footprint as described below. Committing to re-establishing woodland on the post mine landforms is a good outcome for locally occurring flora and fauna.

Ecosystem Credits

As described in Section 3.1.5, the post-mining land uses for the Project would include areas suitable for agriculture production and woodland areas where agricultural production is excluded. Approximately 610 ha of the BAR Footprint is proposed to be revegetated to one or more woodland vegetation types that occur in the surrounding sub-region and are the same vegetation class as the vegetation types listed in the BAR Footprint (Table 20). This woodland is of greater quantity than that which would be cleared (354 ha) and has been located to provide increased connectivity (Figure 14).

The woodland would be a recognisable vegetation type that is self-sustaining and listed in the NSW *Vegetation Information System: Classification* (OEH, 2015a). Native species to be planted in revegetation areas would be selected on a site by site basis depending on pre-existing vegetation, nearby remnant vegetation associations, soil types, aspect and site conditions. The final landform has been designed to be generally consistent with the current topography of the BAR Footprint and surrounds.

Rehabilitation of 610 ha of the BAR Footprint to woodland would produce approximately 3,415 ecosystem credits calculated in accordance with the NSW *Framework for Biodiversity Assessment* (OEH, 2014a) and the OEH *Calculator for "Framework for Biodiversity Assessment (FBA) section 12.2: Generating biodiversity credits for ecological rehabilitation of previously mined land*". The maximum increases in site values were applied (except no increase for tree hollows and a 1.5 increase in species richness as additional species would be added to the seed mix/tubestock list).

The onus is on WPCL to achieve the increases in site values and a 1.5 site value increase is considered reasonable (compared to a default maximum site value increase of 1 as described in the NSW *Framework for Biodiversity Assessment* [OEH, 2014a]). Rehabilitation would consist of Grassy Woodland formation communities including Fuzzy Box (*Eucalyptus conica*).

The number of credits produced for mine rehabilitation does not vary according to the vegetation type proposed to be established. This rehabilitation could also in the future be considered for long-term security (e.g. via a Biobanking Agreement which would generate additional credits) or inclusion in NPWS estate.

It is feasible to establish woodland on the post mine landform because rehabilitation has progressively been undertaken at the Wilpinjong Coal Mine since 2008 and approximately 221 ha of completed landforms for woodland and mixed woodland/ grazing land uses have been rehabilitated (WCPL, 2015b) (Plate 6). An additional 79 ha is scheduled to be rehabilitated in 2015 (WCPL, 2015b).

Plate 6 Existing Wilpinjong Coal Mine Rehabilitation (Woodland)

WCPL has also developed the Rehabilitation Knowledge Base in conjunction with the University of Queensland to assist with the planning and implementation of rehabilitation activities at the Wilpinjong Coal Mine. The Rehabilitation Knowledge Base includes (WCPL, 2015b):

- a summary of the rehabilitation and closure commitments and obligations;
- details of rehabilitation works, monitoring and trials undertaken at Wilpinjong Coal Mine; and
- collation of rehabilitation-related reports and other resources (e.g. monitoring, results of trials, surveys and studies).

The most recent Independent Environmental Audit (AECOM Australia Pty Ltd, 2015), conducted in accordance with Condition 9, Schedule 5 of Project Approval (05-0021), included a review of the adequacy of rehabilitation activities at the Wilpinjong Coal Mine and it concluded that:

- rehabilitation has noticeably progressed since the commencement of rehabilitation activities;
- erosion was well controlled in the rehabilitation areas;
- weed management in regenerating and rehabilitating pasture areas could be improved; and
- overall rehabilitation that has been completed to date is of a high standard.

Regent Honeyeater Credits

Approximately 75% of the woodland areas proposed to be established on the post mine landform (455 ha) would be revegetated to woodland vegetation characteristic of habitat for the Regent Honeyeater (e.g. with key feed species [White Box Blakely's Red Gum and Yellow Box]). Rehabilitation of 455 ha of the BAR Footprint to habitat for the Regent Honeyeater would produce approximately 3,230 species credits for the Regent Honeyeater calculated in accordance with the NSW *Framework for Biodiversity Assessment* (OEH, 2014a) (i.e. 455 x 7.1). This woodland is of greater quantity than the habitat which would be cleared (273 ha) and has been planned to provide increased connectivity.

It is feasible to establish habitat for the Regent Honeyeater on the post mine landform because the trees within the revegetation would provide a nectar source for the species. As established earlier, the Regent Honeyeater occurs in the vicinity of the Project and is listed in the *BioNet Threatened Species Profile Database* (OEH, 2015c) as a species credit species for the Kerrabee IBRA sub-region. Further, Blakely's Red Gum and Yellow Box (key feed trees) are being established as part of the existing mine site rehabilitation.

Further Considerations

The rehabilitation objectives for the Project are provided in Section 5 of the EIS (WCPL, 2015a). The mine rehabilitation would be undertaken in accordance with an approved mining operations plan (MOP) under the NSW *Mining Act, 1992* which would be revised to include:

- the vegetation types proposed to be targeted on the mine site (that occur in the surrounding sub-region and are the same vegetation class as the vegetation types listed in Table 20);
- a list of suitable native plant species to be used in the revegetation of the post-mine landforms; and
- completion/relinquishment criteria.

The MOP would be updated to include the Project in consultation with the relevant government agencies, and in accordance with the relevant DRE rehabilitation and mine closure guidelines.

In accordance with the NSW *Framework for Biodiversity Assessment* (OEH, 2014a), if rehabilitation is deemed unsuccessful then WCPL would need to retire the credits via other means (e.g. additional land-based offset areas or contribution towards the fund).

4.4.6 Summary of the NSW Biodiversity Offset

Table 35 provides a summary of the proposed NSW Biodiversity Offset Strategy for the Project and demonstrates that the Project offset produces credits that are generally consistent with the type and number of credits required by the Credit Calculator for the BAR Footprint.

Table 35
Summary of the NSW Biodiversity Offset Strategy

Offset Component	Credits Generated	Number of Credits Generated from the Biodiversity Offset Strategy	Number of Credits Required from the Project Area
Species Credits			
Land-based Offset Areas 1 – 5	Species Credits (Match Credit Profile) (Table 32)	32,263	
	Species Credits (Additional to Credit Profile) (Table 32)	22,969	
Rehabilitation	Species Credits for Regent Honeyeater (Section 4.4.5)	3,230	
	Total	**58,462**	**48,871**
Ecosystem Credits			
Land-based Offset Areas 1 – 5	Ecosystem Credits (Match Credit Profile) (Table 33)	5,837	
	Ecosystem Credits (Match Same Formation – Variation Rules) (Table 33)	2,903	
	Ecosystem Credits (HU801 Additional to Credit Profile) (Table 34)	2,153	
	Ecosystem Credits (revegetation of cleared land)	1,056	
Rehabilitation	Ecosystem Credits (Section 4.4.5)	3,415	
	Total	**15,364**	**15,314**

All species credit requirements would be met by the Biodiversity Offset Strategy (except the excessive credit requirements for the Regent Honeyeater – see Section 4.4.4.3). The offset areas produce 22,969 species credits (for *Ozothamnus tesselatus*, Scant Pomaderris, *Tylophora linearis* and Koala) which are not specifically required for the Project (Table 35). Under this Offset Strategy, these excess species credits would be retired for the Project, which would otherwise have not been included in the offset package under the NSW *Framework for Biodiversity Assessment* (OEH, 2014a).

NSW Offset Policy (OEH, 2014b) requires a total of 15,314 ecosystem credits to be retired for the Project. The offset areas and rehabilitation produce 15,364 ecosystem credits (an excess of 50 credits which would be surrendered for the Project) (Table 35).

4.4.7 Justification for the NSW Biodiversity Offset

It is concluded that the Project would improve the biodiversity values of the region in the medium to long-term with the implementation of the proposed Biodiversity Offset Strategy. The Project NSW Biodiversity Offset is justified on the basis that the offset areas:

- are strategically located to adjoin Goulburn River National Park and Munghorn Gap Nature Reserve, with the potential to increase the extent of these existing protected areas[1];
- are freehold land owned by Peabody Energy which can be used as offsets in a timely manner;
- contain approximately 47.5 ha of Box-Gum Woodland EEC/CEEC, comprising approximately 21.5 ha of woodland and 26 ha of derived native grassland (Figures 16a and 16b; Plate 4);
- include 206 ha of Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion Vulnerable Ecological Community (Figures 17a and 17b);

[1] No credit is given for strategically located offsets under the NSW *Framework for Biodiversity Assessment* (OEH, 2014a).

- include records of 24 threatened fauna species within the offset areas and many more surrounding the offset areas (Figures 17a and 17b; Table 29);
- include a large population (6,458 individuals) of *Ozothamnus tesselatus* (Offset Area 5) (Figure 17b);
- contain two additional threatened plants which are not proposed to be disturbed by the Project, namely Scant Pomaderris (*Pomaderris queenslandica*) and *Tylophora linearis* (Figure 17b);
- contain the endangered population *Cymbidium canaliculatum* R. Br. in the Hunter Catchment (despite the endangered population not being impacted by the Project);
- include over 2 km of sandstone escarpment with numerous caves (Offset Area 3) (Plate 3) (despite no similar caves being impacted by the Project)[2]; and
- include approximately 2 km of riparian land along the Goulburn River (Offset Area 3) (Plate 7) (despite no similar rivers being impacted by the Project)[3].

Source: Landscape Constructions (2014b)

Plate 7 Goulburn River within Offset Area 3

4.4.8 NSW Offset Policy Principles

Table 36 provides a reconciliation of the Biodiversity Offset Strategy against the offset principles from the NSW Offset Policy (OEH, 2014b).

[2] No credit is given for these habitat features under the NSW *Framework for Biodiversity Assessment* (OEH, 2014a).

[3] No credit is given for inclusion of features such as the Goulburn River under the NSW *Framework for Biodiversity Assessment* (OEH, 2014a).

Table 36
Reconciliation of the Offset Areas against the NSW Offset Policy Principles

NSW Offset Policy Principles	Elements of the Project Offset that address these Requirements
Principle 1: Before offsets are considered, impacts must first be avoided and unavoidable impacts minimised through mitigation measures. Only then should offsets be considered for the remaining impacts.+	Impacts have been avoided and mitigated as described in Section 3.1.
Principle 2: Offset requirements should be based on a reliable and transparent assessment of losses and gains.	A reliable and transparent assessment of losses and gains has been provided in this assessment with reference to the *NSW Framework for Biodiversity Assessment* (OEH, 2014a).
Principle 3: Offsets must be targeted to the biodiversity values being lost or to higher conservation priorities.	Offset Area 1 to 5 were targeted to offset the biodiversity values that would be lost as a result of the Project, and are strategically located to adjoin Goulburn River National Park and Munghorn Gap Nature Reserve.
Principle 4: Offsets must be additional to other legal requirements.	The offset areas are on freehold land owned by Peabody Energy and have not been used previously as offsets. There are no existing encumbrances on the title of the land.
Principle 5: Offsets must be enduring, enforceable and auditable.	The offset areas would be secured as described in Section 4.2, or as otherwise enforced by DP&E or DotE through conditions.
Principle 6: Supplementary measures can be used in lieu of offsets.	Supplementary measures are not proposed to be used in lieu of offsets.

5 CONCLUSION

This document explains how current State and Commonwealth guidelines have been applied to assess the likely adverse direct, indirect and cumulative impacts on biodiversity arising from the Project. A number of measures to avoid and minimise impacts on biodiversity are currently implemented at the Wilpinjong Coal Mine and these would be continued for the Project (e.g. vegetation clearance protocols, weed management and progressive rehabilitation). Additional measures to avoid and minimise impacts on biodiversity are proposed (e.g. temporary fencing of *Ozothamnus tesselatus* during vegetation clearance near the known occurrences and installation of a concrete or steel pipe at the entrance of the historical mine adit to mitigate indirect impacts on the Eastern Bentwing-bat).

There is likely to be a short to medium impact on a number of threatened species due to the loss of woodland/forest habitat but there would be no net impact on any threatened species over the medium to long-term when taking into consideration the measures proposed to mitigate and offset impacts.

Although the Project was declared a controlled action under the EPBC Act, this assessment provides more detailed information than available at the time the Project was referred to the Commonwealth government. This assessment describes how the removal of limited potential habitat would not significantly impact any threatened species or communities listed under the EPBC Act. The impacts on protected matters would be localised and negligible on a regional, state and national scale.

The Biodiversity Offset Strategy for the Project includes commitments by WCPL to progressively rehabilitate parts of the post-mine landform to native woodland as well as commitments to conserve and enhance significant areas of existing native vegetation that are strategically located to adjoin the Goulburn River National Park. It is concluded that the Project would improve the biodiversity values of the region in the medium to long-term.

6 REFERENCES

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ATTACHMENT A

THREATENED SPECIES ASSESSMENT OF SIGNFICANCE

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A1 INTRODUCTION

The purpose of this document is to assess whether the Project is likely to significantly affect threatened species, populations or ecological communities or their habitats listed under the New South Wales (NSW) *Threatened Species Conservation Act, 1995* (TSC Act) in accordance with section 5A of the NSW *Environmental Planning and Assessment Act, 1979* (EP&A Act). Tables referred to throughout this attachment are included in the Attachment text (unless otherwise indicated), however, figures referred to throughout this attachment are included within the main text of the Biodiversity Assessment Report and Biodiversity Offset Strategy.

The Project would involve the modification/removal of approximately 354 hectares (ha) of native vegetation. The impacts associated with the Project on the species and communities listed in Table A1 have been assessed in the following sections under the Assessments of Significance as listed in section 5A of the EP&A Act.

Table A1
Threatened Species and Communities Subject to the Assessments of Significance

Species	Conservation Status[1]		Recorded within the BAR Footprint
	TSC Act	EPBC Act	
Ecological Community			
White Box - Yellow Box - Blakely's Red Gum Woodland[2]	E	CE	✓
Flora			
Ozothamnus tesselatus[2]	V	V	✓
Birds of Prey			
Square-tailed Kite (*Lophoictinia isura*)[2]	V	-	-
Little Eagle (*Hieraaetus morphnoides*)	V	-	✓
Parrots			
Glossy Black-Cockatoo (*Calyptorhynchus lathami*)	V	-	✓
Gang-gang Cockatoo (*Callocephalon fimbriatum*)	V	-	✓
Little Lorikeet (*Glossopsitta pusilla*)	V	-	✓
Swift Parrot (*Lathamus discolor*)	E	E	-
Turquoise Parrot (*Neophema pulchella*)	V	-	✓
Owls			
Masked Owl (*Tyto novaehollandiae*)	V	-	✓
Powerful Owl (*Ninox strenua*)	V	-	-
Woodland Birds			
Brown Treecreeper (eastern subspecies) (*Climacteris picumnus* subsp. *victoriae*)	V	-	✓
Speckled Warbler (*Chthonicola sagittata*)	V	-	✓
Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis* subsp. *temporalis*)	V	-	✓
Varied Sittella (*Daphoenositta chrysoptera*)	V	-	-
Diamond Firetail (*Stagonopleura guttata*)	V	-	✓
Honeyeaters			
Black-chinned Honeyeater (eastern subspecies) (*Melithreptus gularis* subsp. *gularis*)	V	-	✓
Regent Honeyeater (*Anthochaera phrygia*)[2]	CE	CE	-
Painted Honeyeater (*Grantiella picta*)	V	V	-

Table A1 (Continued)
Threatened Species and Communities Subject to the Assessments of Significance

Species	Conservation Status[1]		Recorded within the BAR Footprint
	TSC Act	EPBC Act	
Robins			
Hooded Robin (south-eastern form) (*Melanodryas cucullata* subsp. *cucullata*)	V	-	✓
Scarlet Robin (*Petroica boodang*)	V	-	✓
Flame Robin (*Petroica phoenicea*)	V	-	-
Mammals (Excluding Bats)			
Koala (*Phascolarctos cinereus*)	V	V	-
Brush-tailed Rock-wallaby (*Petrogale penicillata*)	E	V	-
Spotted-tailed Quoll (*Dasyurus maculatus*)	V	E	-
Squirrel Glider (*Petaurus norfolcensis*)	V	-	-
Tree-dwelling Bats			
Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*)	V	-	✓
Eastern Freetail-bat (*Mormopterus norfolkensis*)	V	-	✓
Corben's Long-eared Bat (*Nyctophilus corbeni*)	V	V	✓
Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)	V	-	-
Cave-dwelling Bats			
Little Bentwing-bat (*Miniopterus australis*)	V	-	✓
Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*)	V	-	✓
Large-eared Pied Bat (*Chalinolobus dwyeri*)	V	V	✓
Eastern Cave Bat (*Vespadelus troughtoni*)	V	-	✓

[1] Threatened fauna species status under the TSC Act and/or EPBC Act (current at October 2015).

[2] Nominated in the Secretary's Environmental Assessment Requirements (SEARS) as requiring further consideration under Section 9.2 of the NSW *Framework for Biodiversity Assessment* (Office of Environment and Heritage [OEH], 2014).

V = Vulnerable; E = Endangered; CE = Critically Endangered.

A total of 26 threatened fauna species listed under the TSC Act and/or the *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) have been recorded within or immediately surrounding the Biodiversity Assessment Report Development Site Footprint (BAR Footprint) during current and previous surveys, comprising 16 birds and 10 mammals, of which eight are bats. One threatened flora species has also been recorded. 21 threatened flora and fauna species have been recorded within the BAR Footprint (Figures 8 to 10; Table A1).

As detailed in Section 3.2 of the Biodiversity Assessment Report and Biodiversity Offset Strategy, addressing the Assessments of Significance also fulfils the requirements of Section 9.2 of the NSW *Framework for Biodiversity Assessment* (OEH, 2014) for considering impacts on species and communities that require further consideration.

A2 ECOLOGICAL COMMUNITY

A2.1 Box-Gum Woodland

The *White Box - Yellow Box - Blakely's Red Gum Woodland* (Box-Gum Woodland) in the BAR Footprint is listed under the TSC Act as 'Endangered' and EPBC Act as 'Critically Endangered'.

Box-Gum Woodland is specifically nominated in the Project SEARs and therefore, within the assessment below, further consideration is given to the impacts on the Box-Gum Woodland in accordance with the NSW *Framework for Biodiversity Assessment* (OEH, 2014).

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable to the consideration of an Endangered Ecological Community (EEC).

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the lifecycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable to the consideration of an EEC.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Box-Gum Woodland EEC has been mapped within the BAR Footprint, in the form of vegetation types MU10 Yellow Box Woodland - grassy (3.5 ha) and MU1a Blakely's Red Gum Woodland - grassy (6 ha). The occurrences of these vegetation types throughout the BAR Footprint are currently fragmented and occur as 11 small patches (Figure 5a). These patches of Box-Gum Woodland EEC are considered to be in *moderate/good* condition.

Table A2 summarises the known areas of Box-Gum Woodland EEC in the immediate region in which the Project is located (excluding areas proposed to be cleared at Moolarben Coal Project Stage 1, Moolarben Coal Project Stage 2 and Ulan Consolidation Project area).

The 9.5 ha of Box-Gum Woodland EEC within the BAR Footprint represents less than 0.02 percent of the total Box-Gum Woodland community in the region (Table A3).

The Box-Gum Woodland EEC which has been mapped outside of the BAR Footprint (Table A2, Figure 6) is not expected to be impacted by the Project through indirect impacts such as fragmentation, edge effects, increases in dust or introduced flora and fauna. The small patches of Box-Gum Woodland to be cleared by the Project are highly fragmented and are not considered to contribute to the connectivity of this EEC throughout the region.

Table A2
Areas of Box-Gum Woodland Mapped in the Wilpinjong-Ulan Region

Source	Locality	Area of Box-Gum Woodland (ha)
FloraSearch (2005)	Wilpinjong Coal Mine Enhancement and Conservation Areas and Biodiversity Offset Areas	127
Wells Environmental Services (2007)	Moolarben Coal Project Stage 1 (net of approved clearing)	722
Ecovision Consulting (2008) Cumberland Ecology (2012)	Moolarben Coal Project Stage 2 (net of approved clearing)	754
Umwelt (2009)	Ulan Consolidation Project area (not cleared)	2,201
Hill (1999)	Goulburn River National Park	132
Total		**3,936**

Table A3
Extent of Box-Gum Woodland

Area in 1,000 ha	Area in 10,000 ha	Extant Area in the Kerrabee Sub-region	Area in the Hunter-Central Rivers Region
42 ha	200 ha	5,590 ha	43,528

Source: Sivertsen *et al*. (2011).

The existing/approved Wilpinjong Coal Mine currently produces atmospheric dust emissions and operates with a dust monitoring program which would continue for the Project. It is unlikely that this EEC would be adversely impacted either directly or indirectly by any slight increase in dust generated as a result of the Project. There is no evidence of dust from currently approved operations having impacted surrounding vegetation.

The Project would involve the same potential impacts from introduced flora and feral animals as the existing/approved Wilpinjong Coal Mine. Weeds and feral animals would continue to be managed through prevention, control and monitoring measures. With the implementation of management measures, the potential impacts to the Box-Gum Woodland EEC associated with weeds and feral animals is likely to remain under control.

Box-Gum Woodland EEC within the locality of the Project is not expected to be impacted by any changes in abiotic factors as a result of the Project. For example, the Project would include mitigation and management measures to minimise and avoid impacts to groundwater and surface water within the locality.

The Box-Gum Woodland EEC which will remain surrounding the BAR Footprint is not expected to be subject to any further indirect impacts.

Approximately 9.5 ha of the Box-Gum Woodland EEC within the BAR Footprint would be cleared as a result of the Project (Figure 6). However, the removal/modification of a portion of Box-Gum Woodland EEC is unlikely have an adverse effect on the extent of this ecological community such that its local occurrence would be placed at risk of extinction given:

- the limited area of Box-Gum Woodland EEC within the BAR Footprint (9.5 ha);
- the occurrences of Box-Gum Woodland EEC within the BAR Footprint are highly fragmented (i.e. 11 small patches ranging from 0.04 ha to 2.5 ha in size);

- the localised nature of the habitat in the BAR Footprint compared to the wider distribution of the community; and
- the occurrence of this community in the areas surrounding the BAR Footprint in the Enhancement and Conservation Areas (ECAs) (FloraSearch, 2005) and Biodiversity Offset Areas (BOAs) (Hunter Eco, 2013) and nearby Goulburn National Park (Hill, 1999).

The existing Biodiversity Offset Strategy for the Wilpinjong Coal Mine includes conservation of Box-Gum Woodland EEC (i.e. three ECAs containing 80 ha of existing Box-Gum Woodland EEC and a further 50 ha of Box-Gum Woodland EEC to be re-established as well as two BOAs containing 47.8 ha of Box-Gum Woodland EEC).

The Project is unlikely to substantially and adversely modify the composition of the Box-Gum Woodland EEC such that its local occurrence would be at risk of extinction. In addition, the Project would not cause the extinction of the EEC from the Interim Biogeographic Regionalisation for Australia (IBRA) subregion, or significantly reduce the viability of the EEC (Section 9 of the NSW *Framework for Biodiversity Assessment* [OEH, 2014]).

Further, the Project would include an offset which provides for the disturbance of 9.5 ha of Box-Gum Woodland EEC. Approximately 43.5 ha of Box-Gum Woodland EEC would be included in the offset package. Management measures in this area of Box-Gum Woodland EEC would be consistent with those in the existing Biodiversity Offset Strategy.

(d) In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed;

Approximately 9.5 ha of the Box-Gum Woodland EEC within the BAR Footprint would be cleared as a result of the Project.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action; and

The Box-Gum Woodland EEC within the BAR Footprint and immediate surrounds is in small fragments, each located on one side against continuous woodland of a different type and on the other, open grazing land. Thus fragmentation has already occurred as a consequence of early land clearing practises for agricultural purposes. The Project would not result in material further fragmentation.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

The Box-Gum Woodland EEC within the BAR Footprint is highly fragmented and is not at the limits of its range. Large areas of undisturbed Box-Gum Woodland have been mapped in the locality, such as within the Wilpinjong ECAs and BOAs (FloraSearch, 2005) and in the nearby Goulburn River National Park (Hill, 1999). The areas of this ecological community within the BAR Footprint are therefore not considered necessary to the long-term survival of this ecological community within the locality.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No critical habitat is present within the BAR Footprint according to any databases or registers.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

The *National Recovery Plan for White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland* (Department of Environment, Climate Change and Water, 2010) recommends recovery actions for this ecological community. The Project, including offset provisions, is not inconsistent with the actions listed in this plan.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Key threatening processes are dealt with in Section A13.

Conclusion

The Box-Gum Woodland EEC is unlikely to be significantly impacted by the Project given:

- the limited area of Box-Gum Woodland EEC within the BAR Footprint (9.5 ha, represents less than 0.02 percent of the total Box-Gum Woodland community in the region); and
- the occurrences of Box-Gum Woodland EEC within the BAR Footprint are highly fragmented (i.e. 11 small patches ranging from 0.04 ha to 2.5 ha in size).

It is concluded that with the proposed measures to avoid, mitigate and offset it is appropriate for the impact on the Box-Gum Woodland EEC to occur without modifications to the Project or additional offsets. The Project would not cause the extinction of the Box-Gum Woodland EEC from the IBRA subregion or significantly reduce its viability.

*A*3 FLORA

A3.1 *Ozothamnus tesselatus*

Ozothamnus tesselatus is listed as Vulnerable under both the TSC Act and EPBC Act, and has been recorded within the BAR Footprint. *Ozothamnus tesselatus* is specifically nominated in the Project SEARs and therefore, within the assessment below, further consideration is given to the impacts on this species in accordance with Section 9.2 of the NSW *Framework for Biodiversity Assessment* (OEH, 2014). Similarly, further consideration is given to the impacts on *Ozothamnus tesselatus* in Attachment F.

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Three populations of *Ozothamnus tesselatus* were found within or partly within the BAR Footprint as follows:

- at the central eastern edge of Pit 7, 244 plants (Hunter Eco, 2015a);
- at the south-eastern edge of Pit 8, 30 plants (Hunter Eco, 2015a); and
- at the south-eastern corner of Pit 8, 816 plants (Lesryk Environmental Consultants, 2013; Hunter Eco, 2015a).

The Pit 7 population was found within ML 1573 in White Box Woodland (shrubby) and the Pit 8 populations within ML 1573 in Narrow-leaved Ironbark Forest. All individuals were flagged (Hunter Eco, 2015a) and subsequently it was determined that of the total 1,090 individuals, 589 would be lost due to the Project.

The next-nearest known occurrence is approximately 7 kilometres (km) east-northeast of the Pit 8 populations, with the number of individuals in this occurrence unknown. Approximately 8 km north-east a very large population was found in proposed Offset Area 3. A physical count of 3,908 individuals was extrapolated over the bounds of the surveyed area resulting in an estimate of 6,458 individuals. Following subsequent meanders it was discovered that this was only part of an even more extensive population, potentially >10,000 individuals that extends within and outside Offset Area 5. A population also estimated at >10,000 plants was recently found on Peabody-owned land, approximately 9 km to the east of the BAR Footprint. There is also a record of 1,967 individuals approximately 9 km south-west of the BAR Footprint within Munghorn Gap Nature Reserve; this is the most westerly record for the species. In the foothills surrounding Bylong Valley, approximately 15 km south-east of the BAR Footprint, fewer than 20,000 plants have been recorded from 26 locations. It is clear that the species is abundant in the region.

Within the approximately 8 km gap between the known populations there are large areas of potential habitat that have not been searched. It is reasonable to assume that other populations are present that could then form a network of genetic stepping stones between them. It is therefore expected that the known populations are all parts of a regional metapopulation with occasional transfer of genetic material between subpopulations in the form of pollen carried by insect pollinators. *Ozothamnus* are known to be pollinated by flies, bees, butterflies and beetles (Hingston and Quillan, 2000) many of which can cross large distances.

The loss of 589 plants due to the Project would not place the presumed viable local metapopulation at risk of extinction.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the lifecycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

No populations of this species have been listed as endangered.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable.

(d) In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed;

The amount of occupied habitat to be removed is small, in the order of a few hundred square metres divided amongst the three locations in or near the BAR Footprint.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action; and

There would be no fragmentation. All habitat to be removed is situated at the edge of extensive vegetated areas.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

It is clear that the species is plentiful in the immediate region so the loss of habitat associated with the Project would not be critical to the survival of the species. Therefore, the habitat to be removed as a result of the Project is not considered necessary for the long-term survival of the species.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No critical habitat is present within the BAR Footprint according to any databases or registers.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

There is no recovery plan for this species, however minimising the loss through planning and including a substantial offset aligns with recovery and threat abatement plan principles.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Key threatening processes are dealt with in Section A13.

Conclusion

In conclusion, *Ozothamnus tesselatus* is unlikely to be significantly impacted by the Project given that the sub-populations within the BAR Footprint are expected to be part of a substantial metapopulation. The Project would not cause the extinction of *Ozothamnus tesselatus* from the IBRA subregion, or significantly reduce the viability of the species.

A4 BIRDS OF PREY

Two threatened birds of prey, both listed as 'Vulnerable' under the TSC Act, have been recorded in the locality, namely, the Square-tailed Kite (*Lophoictinia isura*) and Little Eagle (*Hieraaetus morphnoides*) (Figure 8). The following section assesses the potential impacts of the Project on these two species.

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Square-tailed Kite has been recorded within the Wilpinjong Coal Mine Mining Lease (ML) boundary by Mount King Ecological Surveys (MKES) (2005) approximately 750 metres (m) from the BAR Footprint (Figure 8). This species is also considered to occur in the locality based on a sighting in 2001 (OEH, 2015a) (Figure 8). Little Eagle have been recorded within the BAR Footprint by MKES (2005) and in the surrounds by Lesryk Environmental Consultants (2013) and Biodiversity Monitoring Services (2013) (Figure 8). There are multiple database records for this species surrounding the BAR Footprint ranging from 2001 to 2012 (BirdLife Australia, 2014; OEH, 2015a) (Figure 8).

The Project would result in the removal/modification of a portion of potential foraging, roosting and breeding habitat resources for Square-tailed Kite and Little Eagle (approximately 354 ha) consisting of forest and woodland.

The Project is unlikely to disrupt the lifecycle such that a local viable population of these species would be placed at risk of extinction given:

- the localised nature of the habitat in the BAR Footprint compared to the wider distribution of the species;
- lack of breeding records for these species within the BAR Footprint (although it is possible individuals of these species could breed in the extant habitat from time to time);
- the high mobility of these species (with home ranges of up to 100 square kilometres [km^2]); and
- the greater extent of habitat in the locality known to be used by these species (including protected areas such as Munghorn Gap Nature Reserve, Goulburn River National Park and the existing Biodiversity Offset Strategy for the Wilpinjong Coal Mine).

These species are unlikely to be indirectly impacted as a result of the Project. Potential indirect impacts on these species (e.g. weeds, secondary poisoning, bushfire risk [OEH, 2015b]) have been considered.

The change in cumulative impact on these species as a result of the Project (considering impacts from other surrounding developments [Section 3.1.4]) is considered to be minimal because of the localised nature of the Project compared to the wider distribution of the species, especially when considering the Biodiversity Offset Strategy (Section 4 of the main report) and the offsets which have been (or would be) provided for the surrounding developments (Table 18 of the main report). Both species have been recorded during fauna surveys in the closest mining developments. Square-tailed Kite and Little Eagle have been recorded at the Moolarben Coal Complex (Moolarben Coal Mines Pty Limited, 2006) and Ulan Mine Complex (Umwelt, 2015). Little Eagle have also been recorded by Cumberland Ecology (2015) at the nearby proposed Bylong Coal Project.

A number of measures would be implemented for the Project to minimise potential impacts on flora and fauna which would be relevant to occurrences of these species within the BAR Footprint and adjacent park and reserve areas including progressive site rehabilitation, the vegetation clearance protocol as well as weed and feral animal management (Table 14 of the main report) (Wilpinjong Coal Pty Limited [WCPL], 2015).

Also of note, the existing Biodiversity Offset Strategy for the Wilpinjong Coal Mine would be augmented with an additional Biodiversity Offset Strategy for the Project, which comprises land-based offset areas and mine site rehabilitation. The Little Eagle has been recorded within Offset Area 2 by Hunter Eco (2015b). There is also a database record of this species within Offset Area 1 (OEH, 2015a).

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the lifecycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

No populations of these species have been listed as endangered.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable.

(d) In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed;

The Project would result in the removal/modification of approximately 354 ha of potential habitat resources for the Square-tailed Kite and Little Eagle.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action; and

The Project is unlikely to result in additional fragmentation of these species' habitat given the large home ranges of these species. Further, habitat exists for these species within nearby Goulburn River National Park and the Munghorn Gap Nature Reserve. These habitats would not be fragmented as a result of the Project

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

Approximately 354 ha of potential habitat has been mapped within the BAR Footprint. In relation to the regional distribution of known or potential habitat for these species, it is considered that the area to be removed/modified for the Project does not constitute a significant area given the small scale of the habitat removal/modification required for the Project compared to the greater quantity and quality of such habitat in the surrounding landscape.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No critical habitat is present within the BAR Footprint according to any databases or registers.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

The *Action Plan for Australian Birds* (Garnett *et al*., 2011) recommends recovery actions for these species. The Project is not inconsistent with the actions listed in this plan.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Key threatening processes are dealt with in Section A13.

Conclusion

In conclusion, these birds of prey are unlikely to be significantly impacted by the Project given:

- the localised nature of the habitat in the BAR Footprint compared to the wider distribution of the species;
- lack of breeding records for these species within the BAR Footprint (although it is possible individuals of these species could breed in the extant habitat from time to time);
- the high mobility of these species (with home ranges of up to 100 km^2); and
- the greater extent of habitat in the locality known to be used by these species.

A5 PARROTS

Five threatened parrots have potential to occur within the BAR Footprint, namely:

- Glossy Black-Cockatoo (*Calyptorhynchus lathami*) (listed as 'Vulnerable' under the TSC Act);
- Gang-gang Cockatoo (*Callocephalon fimbriatum*) (listed as 'Vulnerable' under the TSC Act);
- Little Lorikeet (*Glossopsitta pusilla*) (listed as 'Vulnerable' under the TSC Act);
- Swift Parrot (*Lathamus discolor*) (listed as 'Endangered' under both the TSC Act and EPBC Act); and
- Turquoise Parrot (*Neophema pulchella*) (listed as 'Vulnerable' under the TSC Act).

Glossy Black-Cockatoo, Gang-gang Cockatoo, Little Lorikeet and Turquoise Parrot have been recorded within the BAR Footprint during current or previous surveys (Figure 8). The five above listed parrots are nomadic (or partially nomadic) when searching for suitable habitat resources. The following section assesses the potential impacts of the Project on these five species. Since it is listed under the EPBC Act, further consideration is given to the potential impacts on Swift Parrot in Attachment F.

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Glossy Black-Cockatoo have been recorded by MKES (2005) and Lesryk Environmental Consultants (2013) within the BAR Footprint, and by Biodiversity Monitoring Services (2015a) in the surrounds (Figure 8). This species is also mapped within the OEH database as occurring within the nearby Goulburn River National Park (OEH, 2015a) (Figure 8).

Gang-gang Cockatoo were recorded by MKES (2005) within the BAR Footprint, and a database record from 2004 of this species exists within ML 1573 (BirdLife Australia, 2014) (Figure 8).

Little Lorikeet have been recorded by Lesryk Environmental Consultants (2013) and Biodiversity Monitoring Services (2015a) within the BAR Footprint, and by MKES (2005) and Biodiversity Monitoring Services (2015b) in the immediate surrounds (Figure 8). There are several database records of this species in the locality (BirdLife Australia, 2014; OEH, 2015a) (Figure 8).

There are no field-validated records of Swift Parrot from within the BAR Footprint or immediate surrounds. An OEH database record from 2014 for this species exists approximately 3.5 km north-west of the BAR Footprint (OEH, 2015a) (Figure 8). The BAR Footprint provides potential foraging and roosting habitat for this species, however no breeding habitat for this species exists within the BAR Footprint as this species migrates to Tasmania to breed.

A single sighting of a Turquoise Parrot was made by MKES (2005) within the BAR Footprint prior to the operation of the Wilpinjong Coal Mine (Figure 8). There is a database record for this species within ML 1573 from 2004 (BirdLife Australia, 2014) (Figure 8).

The Project would result in the removal/modification of a portion of potential habitat resources for Glossy Black-Cockatoo, Gang-gang Cockatoo, Little Lorikeet, Swift Parrot and Turquoise Parrot (approximately 354 ha) and may disrupt foraging, roosting and breeding for some species (were these species to occur).

The Project is unlikely to disrupt the lifecycle such that a local viable population of these species would be placed at risk of extinction given:

- the localised nature of the habitat in the BAR Footprint compared to the wider distribution of the species;
- lack of breeding records for these species within the BAR Footprint (although it is possible individuals of these species could breed in the extant habitat from time to time [with the exception of the Swift Parrot]);
- the nomadic (or partially nomadic) nature of these species; and
- the greater extent of habitat in the locality known to be used by the species (e.g. Glossy Black-Cockatoo and Little Lorikeet both have database records within the nearby Munghorn Gap Nature Reserve [OEH, 2015a] [Figure 8]).

These species are unlikely to be indirectly impacted as a result of the Project. Potential indirect impacts on these species (e.g. weeds, feral animals, bushfire risk, fragmentation, loss of hollow-bearing trees, firewood collection, over-grazing and disease [Department of the Environment {DotE}, 2015; OEH, 2015c]) have been considered.

The change in cumulative impact on these species as a result of the Project (considering impacts from other surrounding developments [Section 3.1.4]) is considered to be minimal because of the localised nature of the Project compared to the wider distribution of these species, especially when considering the Biodiversity Offset Strategy (Section 4) and the offsets which have been (or would be) provided for the surrounding developments (Table 18 of the main report). All five parrot species have been recorded during fauna surveys in the closest mining developments. Glossy Black-Cockatoo, Gang-gang Cockatoo, Little Lorikeet and Turquoise Parrot have been recorded at Moolarben Coal Complex (Moolarben Coal Mines Pty Limited, 2006), Ulan Mine Complex (Umwelt, 2015) and by Cumberland Ecology (2015) for the proposed Bylong Coal Project. Glossy Black-Cockatoo has also been recorded at the Moolarben Coal Complex by EMGA Mitchell McLennan (2013). Gang-gang Cockatoo and Little Lorikeet have been recorded within the proposed project area for the nearby Bowdens Silver Project (Kingsgate Bowdens Pty Limited, 2012). Umwelt (2015) recently recorded Swift Parrot at the Ulan Mine Complex.

A number of measures would be implemented for the Project to minimise potential impacts on flora and fauna which would be relevant to occurrences of these species within the BAR Footprint and adjacent park and reserve areas including progressive site rehabilitation, the vegetation clearance protocol as well as weed and feral animal management (Table 14 of the main report) (WCPL, 2015).

Also of note, the existing Biodiversity Offset Strategy for Wilpinjong Coal Mine would be augmented with an additional Biodiversity Offset Strategy for the Project, which comprises land-based offset areas and mine site rehabilitation. Gang-gang Cockatoo occur within Offset Area 1 (BirdLife Australia, 2014; OEH, 2015a). Little Lorikeet have been recorded by Biodiversity Monitoring Services (2015b) (Attachment G) within Offset Areas 1, 2, 4 and 5. There are also database records of this species within Offset Areas 1 (BirdLife Australia, 2014; OEH, 2015a) and 2 (BirdLife Australia, 2014). Turquoise Parrot have been recorded by Biodiversity Monitoring Services (2015b) (Attachment G) within Offset Area 4. There is also a database record of this species within Offset Area 1 (BirdLife Australia, 2014).

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the lifecycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

No endangered populations of these species have been listed within the locality of the Project.

An endangered population of Gang-gang Cockatoo has been identified approximately 200 km south-east of the BAR Footprint. In addition, an endangered population of Glossy Black-Cockatoo exists approximately 350 km west of the BAR Footprint.

The Project would not have an adverse effect on these endangered populations such that a viable local population of the species is likely to be placed at risk of extinction.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable.

(d) In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed;

The Project would result in the removal/modification of approximately 354 ha of potential habitat resources for these parrot species.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action; and

The Project is unlikely to result in additional fragmentation of these species' habitat given the localised nature of the clearance associated with the Project compared to the wider distribution of the species. Further, habitat exists for these species within nearby Goulburn River National Park and Munghorn Gap Nature Reserve. These habitats would not be fragmented as a result of the Project.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

Approximately 354 ha of potential habitat has been mapped within the BAR Footprint. In relation to the regional distribution of known or potential habitat for these parrot species, it is considered that the area to be removed/modified for the Project does not constitute a significant area given the small scale of the habitat removal/modification required for the Project compared to the greater quantity and quality of such habitat in the surrounding landscape.

The habitat to be removed/modified within the BAR Footprint is not considered necessary to the persistence and long-term survival of Glossy Black-Cockatoo, Gang-gang Cockatoo, Little Lorikeet, Swift Parrot or Turquoise Parrot.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No critical habitat is present within the BAR Footprint according to any databases or registers.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

The *Action Plan for Australian Birds* (Garnett *et al*., 2011) recommends recovery actions for these parrot species. Additionally, the *National Recovery Plan for the Swift Parrot Lathamus discolor* (Saunders and Tzaros, 2011) lists recovery actions specific to the Swift Parrot. The Project is not inconsistent with the actions listed in these plans.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Key threatening processes are dealt with in Section A13.

Conclusion

In conclusion, these parrots are unlikely to be significantly impacted by the Project given:

- the localised nature of the habitat in the BAR Footprint compared to the wider distribution of the species;
- lack of breeding records for these species within the BAR Footprint (although it is possible individuals of these species could breed in the extant habitat from time to time [with exception of the Swift Parrot]);
- the nomadic (or partially nomadic) nature of these species; and
- the greater extent of habitat in the locality known to be used by the species.

A6 OWLS

Two threatened owls, both listed as 'Vulnerable' under the TSC Act, are predicted or known to occur in the locality (Table 8), namely, Masked Owl (*Tyto novaehollandiae*) and Powerful Owl (*Ninox strenua*). The following section assesses the potential impacts of the Project on these two species.

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Masked Owl have been recorded by Lesryk Environmental Consultants (2013) within the BAR Footprint, and by MKES (2005) approximately 150 m south-west of the BAR Footprint within the Munghorn Gap Nature Reserve (Figure 8). There is no known breeding of this species within the BAR Footprint. A database record of the Powerful Owl from 2004 exists within the surrounds of the BAR Footprint (BirdLife Australia, 2014) (Figure 8), although there are no survey records of this species.

The Project would result in the removal/modification of a portion of potential habitat resources for Masked Owl and Powerful Owl (approximately 354 ha) and may disrupt foraging, roosting and breeding (were these species to occur).

The Project is unlikely to disrupt the lifecycle such that a local viable population of these species would be placed at risk of extinction given:

- the localised nature of the habitat in the BAR Footprint compared to the wider distribution of the species;
- the lack of breeding records for these species within the BAR Footprint (although it is possible individuals of these species could breed in the extant habitat from time to time);
- the high mobility of these species; and
- the greater extent of habitat in the locality known to be used by the species (the Masked Owl has previously been identified within the nearby Munghorn Gap Nature Reserve [MKES, 2005; OEH, 2015a] [Figure 8]).

These species are unlikely to be indirectly impacted as a result of the Project. Potential indirect impacts on these species (e.g. Powerful Owl may be impacted by feral animals, bushfire risk, high frequency fire, and both species may be impacted by secondary poisoning and loss of hollow-bearing trees [OEH, 2015c]) have been considered.

The change in cumulative impact on these species as a result of the Project (considering impacts from other surrounding developments [Section 3.1.4]) is considered to be minimal because of the localised nature of the Project compared to the wider distribution of the species, especially when considering the Biodiversity Offset Strategy (Section 4) and the offsets which have been (or would be) provided for the surrounding developments (Table 18 of the main report). Both owl species have been recorded during fauna surveys in nearby mining developments. The Masked Owl has been recorded at the nearby Moolarben Coal Complex (EMGA Mitchell McLennan, 2013), and Powerful Owl have been recorded at the Moolarben Coal Complex (Moolarben Coal Mines Pty Limited, 2006; EMGA Mitchell McLennan, 2013), Ulan Mine Complex (Umwelt, 2015) and proposed site for the Bowdens Silver Project (Kingsgate Bowdens Pty Limited, 2012).

A number of measures would be implemented for the Project to minimise potential impacts on flora and fauna which would be relevant to occurrences of these species within the BAR Footprint and adjacent park and reserve areas including progressive site rehabilitation, the vegetation clearance protocol as well as weed and feral animal management (Table 14 of the main report) (WCPL, 2015).

Also of note, the existing Biodiversity Offset Strategy for Wilpinjong Coal Mine would be augmented with an additional Biodiversity Offset Strategy for the Project, which comprises land-based offset areas and mine site rehabilitation. The Powerful Owl has been recorded by Biodiversity Monitoring Services (2015b) (Attachment G) within Offset Area 5.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the lifecycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

No populations of these species have been listed as endangered.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable.

(d) In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed;

The Project would result in the removal/modification of approximately 354 ha of potential habitat resources for Masked Owl and Powerful Owl.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action; and

The Project is unlikely to result in additional fragmentation of these species' habitat given the large home ranges of these species. Further, habitat exists for these species within nearby Goulburn River National Park and Munghorn Gap Nature Reserve. These habitats would not be fragmented as a result of the Project.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

Approximately 354 ha of potential habitat has been mapped within the BAR Footprint. In relation to the regional distribution of known or potential habitat for these species, it is considered that the area to be removed/modified for the Project does not constitute a significant area given the small scale of the habitat removal/modification required for the Project compared to the greater quantity and quality of such habitat in the surrounding landscape.

The habitat to be removed/modified within the BAR Footprint is not considered necessary to the persistence and long-term survival of Powerful Owl or Masked Owl.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No critical habitat is present within the BAR Footprint according to any databases or registers.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

The *Action Plan for Australian Birds* (Garnett *et al*., 2011) and *Recovery Plan for Large Forest Owls: Powerful Owl (Ninox strenua), Sooty Owl (Tyto tenebricosa) and Masked Owl (Tyto novaehollandiae)* (Department of Environment and Conservation, 2006) recommend recovery actions for the Masked Owl and Powerful Owl. The Project is not inconsistent with the actions listed in these plans.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Key threatening processes are dealt with in Section A13.

Conclusion

In conclusion, these owls are unlikely to be significantly impacted by the Project given:

- the localised nature of the habitat in the BAR Footprint compared to the wider distribution of the species;
- lack of breeding records for these species within the BAR Footprint (although it is possible individuals of these species could breed in the extant habitat from time to time);
- the high mobility of these species; and
- the greater extent of habitat in the locality known to be used by the species.

A7 WOODLAND BIRDS

Five threatened woodland birds listed as 'Vulnerable' under the TSC Act have potential to occur within the BAR Footprint (Table 8), namely:

- Brown Treecreeper (eastern subspecies) (*Climacteris picumnus* subsp*. victoriae*);
- Speckled Warbler (*Chthonicola sagittata*);
- Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis* subsp*. temporalis*);
- Varied Sittella (*Daphoenositta chrysoptera*); and
- Diamond Firetail (*Stagonopleura guttata*).

Brown Treecreeper (eastern subspecies), Speckled Warbler, Grey-crowned Babbler (eastern subspecies) and Diamond Firetail have been recorded within the BAR Footprint during current or previous surveys (Figure 8). There are no field records of Varied Sittella within the BAR Footprint, however, there are database records of this species within the locality (Figure 8). The following section assesses the potential impacts of the Project on these five species.

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Brown Treecreeper (eastern subspecies) have been recorded by Biodiversity Monitoring Services (2015a) and MKES (2005) within the BAR Footprint (Figure 8). This species has also been recorded by Biodiversity Monitoring Services (2013, 2015b) immediately east and south of the BAR Footprint (respectively), by Lesryk Environmental Consultants (2013) immediately east of the BAR Footprint, and by Ecovision Consulting (2006) immediately west of the BAR Footprint (Figure 8). Database records for this species exist within the BAR Footprint (OEH, 2015a) (Figure 8).

Speckled Warbler have been recorded within the BAR Footprint by Biodiversity Monitoring Services (2015a), Lesryk Environmental Consultants (2013) and MKES (2005) (Figure 8). This species has also been recorded in the surrounds (east of the BAR Footprint) by Biodiversity Monitoring Services (2013) (Figure 8). Database records for this species exist within ML 1573, outside of the BAR Footprint (BirdLife Australia, 2014; OEH, 2015a) (Figure 8).

Grey-crowned Babbler (eastern subspecies) have been recorded within the BAR Footprint by Lesryk Environmental Consultants (2013) (Figure 8). A database record for this species exists within ML 1573 (OEH, 2015a) (Figure 8).

Varied Sittella have not been recorded within the BAR Footprint, however, it has been recorded in the surrounds immediately south of the Project by Biodiversity Monitoring Services (2015b) (Attachment G) (Figure 8). There is a database record of the Varied Sittella within ML 1573 (BirdLife Australia, 2014) (Figure 8).

Diamond Firetail have been recorded within the BAR Footprint by Biodiversity Monitoring Services (2015a), Lesryk Environmental Consultants (2013) and MKES (2005) (Figure 8). Ecovision Consulting (2006) recorded this species immediately north-west of the Project (Figure 8). Database records for this species exist within ML 1573 (BirdLife, 2014; OEH, 2015a) (Figure 8).

The Project would result in the removal/modification of a portion of potential habitat resources for Brown Treecreeper (eastern subspecies), Speckled Warbler, Grey-crowned Babbler (eastern subspecies), Varied Sittella and Diamond Firetail (approximately 354 ha) and may disrupt foraging, roosting and breeding for some of these species (were these species to occur).

The Project is unlikely to disrupt the lifecycle such that a local viable population of these species would be placed at risk of extinction given:

- the localised nature of the habitat in the BAR Footprint compared to the wider distribution of the species; and
- the greater extent of habitat in the locality known to be used by these species (e.g. the Brown Treecreeper [eastern subspecies] has previously been identified within the nearby Goulburn National Park and Munghorn Gap Nature Reserve [MKES, 2005; OEH, 2015a] [Figure 8]).

These species are unlikely to be indirectly impacted as a result of the Project. Potential indirect impacts on these species (e.g. weeds, feral animals, bushfire risk, too frequent fires, fragmentation, firewood collection and over-grazing [OEH, 2015c]) have been considered.

The change in cumulative impact on these species as a result of the Project (considering impacts from other surrounding developments [Section 3.1.4]) is considered to be minimal because of the localised nature of the Project compared to the wider distribution of the species, especially when considering the Biodiversity Offset Strategy (Section 4) and the offsets which have been (or would be) provided for the surrounding developments (Table 18 of the main report). All five woodland bird species have been recorded during fauna surveys in the closest mining developments. Brown Treecreeper (eastern subspecies), Speckled Warbler, and Grey-crowned Babbler (eastern subspecies) have all been recorded at the Moolarben Coal Complex (Moolarben Coal Mines Pty Limited, 2006; EMGA Mitchell McLennan, 2013) and Ulan Mine Complex (Umwelt, 2015), and at the proposed sites for the Bowdens Silver Project (Kingsgate Bowdens Pty Limited, 2012) and Bylong Coal Project (Eastcoast Flora Survey, 2014; Cumberland Ecology, 2015). Varied Sittella have been recorded at the Moolarben Coal Complex (Moolarben Coal Mines Pty Limited, 2006) and Ulan Mine Complex (Umwelt, 2015). Diamond Firetail have been recorded at the Moolarben Coal Complex (Moolarben Coal Mines Pty Limited, 2006; EMGA Mitchell McLennan, 2013) and Ulan Mine Complex (Umwelt, 2015), and at the proposed site for the Bylong Coal Project (Eastcoast Flora Survey, 2014; Cumberland Ecology, 2015).

A number of measures would be implemented for the Project to minimise potential impacts on flora and fauna which would be relevant to occurrences of these species within the BAR Footprint and adjacent park and reserve areas including progressive site rehabilitation, vegetation clearance protocol as well as weed and feral animal management (Table 14 of the main report) (WCPL, 2015).

Also of note, the existing Biodiversity Offset Strategy for Wilpinjong Coal Mine would be augmented with an additional Biodiversity Offset Strategy for the Project, which comprises land-based offset areas and mine site rehabilitation. Brown Treecreeper (eastern subspecies) have been recorded by Biodiversity Monitoring Services (2015b) (Attachment G) within Offset Areas 1, 2, 3 and 5. There is also a database record of this species within Offset Area 1 (OEH, 2015a). Speckled Warbler have been recorded by Biodiversity Monitoring Services (2015b) (Attachment G) within Offset Areas 1, 4 and 5. There is also a database record of this species within Offset Area 1 (OEH, 2015a). Grey-crowned Babbler (eastern subspecies) have been recorded by Biodiversity Monitoring Services (2015b) (Attachment G) within Offset Areas 2 and 5. Varied Sittella have been recorded by Biodiversity Monitoring Services (2015b) (Attachment G) within Offset Areas 1 and 5. There are also database records for this species within Offset Area 1 (BirdLife Australia, 2014; OEH, 2015a). Diamond Firetail have been recorded by Biodiversity Monitoring Services (2015b) (Attachment G) within Offset Areas 2 and 5. There are also database records for this species within Offset Area 1 (BirdLife Australia, 2014; OEH, 2015a).

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the lifecycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

No populations of these species have been listed as endangered.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable.

(d) In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed;

The Project would result in the removal/modification of approximately 354 ha of potential habitat resources for these woodland bird species.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action; and

The Project is unlikely to result in additional fragmentation of these species' habitat given the localised nature of the clearance associated with the Project compared to the wider distribution of the species. Further, habitat exists for these species within nearby Goulburn River National Park and Munghorn Gap Nature Reserve. These habitats would not be fragmented as a result of the Project.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

Approximately 354 ha of potential habitat has been mapped within the BAR Footprint. In relation to the regional distribution of known or potential habitat for these woodland bird species, it is considered that the area to be removed/modified for the Project does not constitute a significant area given the small scale of the habitat removal/modification required for the Project compared to the greater quantity and quality of such habitat in the surrounding landscape.

The habitat to be removed/modified within the BAR Footprint is not considered necessary to the persistence and long-term survival of Brown Treecreeper (eastern subspecies), Speckled Warbler, Grey-crowned Babbler (eastern subspecies), Varied Sittella or Diamond Firetail.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No critical habitat is present within the BAR Footprint according to any databases or registers.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

The *Action Plan for Australian Birds* (Garnett *et al*., 2011) recommends recovery actions for these woodland bird species. The Project is not inconsistent with the actions listed in this plan.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Key threatening processes are dealt with in Section A13.

Conclusion

In conclusion, these woodland birds are unlikely to be significantly impacted by the Project given:

- the localised nature of the habitat in the BAR Footprint compared to the wider distribution of the species; and
- the greater extent of habitat in the locality known to be used by the species.

A8 HONEYEATERS

Three threatened honeyeaters have potential to occur within the BAR Footprint, namely:

- Black-chinned Honeyeater (eastern subspecies) (*Melithreptus gularis gularis*) (listed as Vulnerable under the TSC Act);
- Regent Honeyeater (*Anthochaera phrygia*) (listed as 'Critically Endangered' under both the TSC Act and EPBC Act); and
- Painted Honeyeater (*Grantiella picta*) (listed as Vulnerable under both the TSC Act and EPBC Act).

Black-chinned Honeyeater (eastern subspecies) have been recorded within the BAR Footprint during current and previous surveys (Figure 8). There are no field records of Regent Honeyeater or Painted Honeyeater within the BAR Footprint, however, these species have been recorded within the locality (Figure 8). These three honeyeaters are known to occupy large feeding territories.

The following section assesses the potential impacts of the Project on these three threatened honeyeaters.

A8.1 Regent Honeyeater

The Regent Honeyeater is specifically nominated in the Project SEARs as a protected matter relating to a controlling provision and therefore, within the assessment below, further consideration is given to the impacts on the Regent Honeyeater in accordance with Section 9.2.5 of the NSW *Framework for Biodiversity Assessment* (OEH, 2014). Further consideration is given to the impacts on the Regent Honeyeater in Attachment F in relation to the EPBC Act.

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Regent Honeyeater have not been recorded within the BAR Footprint. However, Department of Environment and Climate Change (2005) have provided records for this species within ML 1573, outside the area of disturbance for the Project (Figure 8). There are also database records for this species within ML 1573 (BirdLife Australia, 2014; OEH, 2015a) (Figure 8). The Project would disrupt potential habitat for Regent Honeyeater (Figure 11). The closest known key breeding area for this species is approximately 100 km south of the Project at Capertee Valley (OEH, 2015c), although Mudgee-Munghorn Gap-Wollar is recognised as a subsidiary breeding area (DotE, 2015).

The Project would result in removal/modification of a portion of potential habitat resources for Regent Honeyeater (approximately 273 ha). There are no records of Regent Honeyeater breeding in the BAR Footprint so it is considered unlikely that the Project would impact breeding.

The Project is unlikely to disrupt the lifecycle such that a local viable population of this species would be placed at risk of extinction given:

- the localised nature of the habitat in the BAR Footprint compared to the wider distribution of the species;
- lack of breeding records for this species within the BAR Footprint (although it is possible individuals of this species could breed in the extant habitat from time to time); and
- the greater extent of habitat in the locality (including protected areas such as Munghorn Gap Nature Reserve, Goulburn River National Park and the existing Biodiversity Offset Strategy for the Wilpinjong Coal Mine).

Regent Honeyeater are unlikely to be indirectly impacted as a result of the Project. Potential indirect impacts on this species (e.g. feral animals, over-grazing [DotE, 2015; OEH, 2015c]) have been considered.

The change in cumulative impact on this species as a result of the Project (considering impacts from other surrounding developments [Section 3.1.4]) is considered to be minimal because of the localised nature of the Project compared to the wider distribution of the species, especially when considering the Biodiversity Offset Strategy (Section 4) and the offsets which have been (or would be) provided for the surrounding developments (Table 18 of the main report). The Regent Honeyeater has been recorded during fauna surveys undertaken for the proposed Bylong Coal Project (Eastcoast Flora Survey, 2014).

A number of measures would be implemented for the Project to minimise potential impacts on flora and fauna which would be relevant to occurrences of this species within the BAR Footprint and adjacent park and reserve areas including progressive site rehabilitation, the vegetation clearance protocol as well as weed and feral animal management (Table 14 of the main report) (WCPL, 2015).

The existing Biodiversity Offset Strategy for Wilpinjong Coal Mine would be augmented with an additional Biodiversity Offset Strategy for the Project, which comprises land-based offset areas and mine site rehabilitation. Regent Honeyeater have been recorded within Offset Area 1 (DECC, 2005). There are also database records of this species within Offset Area 1 (OEH, 2015a).

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the lifecycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

No populations of this species have been listed as endangered.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable.

(d) In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed;

The Project would result in the removal/modification of approximately 273 ha of potential habitat resources for the Regent Honeyeater.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action; and

The Project is unlikely to result in additional fragmentation of this species' habitat given the localised nature of the clearance associated with the Project compared to the wider distribution of the species. Further, habitat exists for this species within nearby Goulburn River National Park and Munghorn Gap Nature Reserve. These habitats would not be fragmented as a result of the Project.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

Approximately 273 ha of potential habitat has been mapped within the BAR Footprint. In relation to the regional distribution of known or potential habitat for this honeyeater species, it is considered that the area to be removed/modified for the Project does not constitute a significant area given the small scale of the habitat removal/modification required for the Project compared to the greater quantity and quality of such habitat in the surrounding landscape.

The habitat to be removed/modified within the BAR Footprint is not considered necessary to the persistence and long-term survival of the Regent Honeyeater.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No critical habitat is present within the BAR Footprint according to any databases or registers.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

The *Regent Honeyeater (Xanthomyza phrygia) Recovery Plan 1999 - 2003* (Menkhorst *et al.*, 1999) and the *Draft National Recovery Plan for the Regent Honeyeater (Anthochaera phrygia) – July 2015* (DotE, 2015) lists recovery actions specific to the Regent Honeyeater. The Project is not inconsistent with the actions listed in these plans.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Key threatening processes are dealt with in Section A13.

Conclusion

In conclusion, the Regent Honeyeater is unlikely to be significantly impacted by the Project given:

- the localised nature of the habitat in the BAR Footprint compared to the wider distribution of the species;
- the lack of breeding records for this species within the BAR Footprint (although it is possible individuals of this species could breed in the extant habitat from time to time); and
- the greater extent of habitat in the locality.

It is concluded that with the proposed measures to avoid, mitigate and offset it is appropriate for the impacts to potential habitat for the Regent Honeyeater to occur without modifications to the Project or additional offsets. The Project would not cause the extinction of this species from the IBRA subregion or significantly reduce its viability.

A8.2 Black-chinned Honeyeater (eastern subspecies) and Painted Honeyeater

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The Black-chinned Honeyeater (eastern subspecies) has been recorded within the BAR Footprint by Biodiversity Monitoring Services (2015a) and MKES (2005) (Figure 8). Lesryk Environmental Consultants (2013) recorded this species within ML 1573, on the boundary of the BAR Footprint (Figure 8). There are no database records for this species in the BAR Footprint or surrounds.

The Painted Honeyeater has not been recorded within the BAR Footprint, however, MKES (2005) recorded this species immediately adjacent to the BAR Footprint (Figure 8). There are also database records from 2004 for this species within ML 1573 (BirdLife Australia, 2014; OEH, 2015a) (Figure 8).

The Project would result in the removal/modification of a portion of potential habitat resources for these two threatened honeyeaters (approximately 273 ha) and may disrupt foraging and roosting (were these species to occur). There are no known breeding sites within the BAR Footprint.

The Project is unlikely to disrupt the lifecycle such that a local viable population of these species would be placed at risk of extinction given:

- the localised nature of the habitat in the BAR Footprint (only known to be used by the Black-chinned Honeyeater [eastern subspecies]) compared to the wider distribution of the species;
- the lack of breeding records for these species within the BAR Footprint (although it is possible individuals of these species could breed in the extant habitat from time to time); and
- the greater extent of habitat in the locality (including protected areas such as Munghorn Gap Nature Reserve, Goulburn River National Park and the existing Biodiversity Offset Strategy for the Wilpinjong Coal Mine).

These species are unlikely to be indirectly impacted as a result of the Project. Potential indirect impacts on these species (e.g. weeds, feral animals, bushfire risk, over-grazing [OEH, 2015c]) have been considered.

The change in cumulative impact on these species as a result of the Project (considering impacts from other surrounding developments [Section 3.1.4]) is considered to be minimal because of the localised nature of the Project compared to the wider distribution of the species, especially when considering the Biodiversity Offset Strategy (Section 4) and the offsets which have been (or would be) provided for the surrounding developments (Table 18 of the main report). The Black-chinned Honeyeater (eastern subspecies) and Painted Honeyeater have been recorded during fauna surveys in the closest mining developments. Both species have been recorded at the Moolarben Coal Complex (Moolarben Coal Mines Pty Limited, 2006) and Ulan Mine Complex (Umwelt, 2015). The Black-chinned Honeyeater (eastern subspecies) has also been recorded at the proposed site for the Bylong Coal Project (Cumberland Ecology, 2015).

A number of measures would be implemented for the Project to minimise potential impacts on flora and fauna which would be relevant to occurrences of these species within the BAR Footprint and adjacent park and reserve areas including progressive site rehabilitation, the vegetation clearance protocol as well as weed and feral animal management (Table 14 of the main report) (WCPL, 2015).

The existing Biodiversity Offset Strategy for the Wilpinjong Coal Mine would be augmented with an additional Biodiversity Offset Strategy for the Project, which comprises land-based offset areas and mine site rehabilitation. The Black-chinned Honeyeater (eastern subspecies) has been recorded by Biodiversity Monitoring Services (2015b) (Attachment G) within Offset Area 5. There is also a database record of this species within Offset Area 1 (OEH, 2015a). There is a single database record of the Painted Honeyeater within Offset Area 1 (OEH, 2015a).

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the lifecycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

No populations of these species have been listed as endangered.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable.

(d) In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed;

The Project would result in the removal/modification of approximately 273 ha of potential habitat resources for these honeyeater species.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action; and

The Project is unlikely to result in additional fragmentation of these species' habitat given the localised nature of the clearance associated with the Project compared to the wider distribution of the species. Further, habitat exists for these species within nearby Goulburn River National Park and the Munghorn Gap Nature Reserve. These habitats would not be fragmented as a result of the Project.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

Approximately 273 ha of potential habitat has been mapped within the BAR Footprint. In relation to the regional distribution of known or potential habitat for these honeyeater species, it is considered that the area to be removed/modified for the Project does not constitute a significant area given the small scale of the habitat removal/modification required for the Project compared to the greater quantity and quality of such habitat in the surrounding landscape.

The habitat to be removed/modified within the BAR Footprint is not considered necessary to the persistence and long-term survival of the Black-chinned Honeyeater (eastern subspecies) and Painted Honeyeater.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No critical habitat is present within the BAR Footprint according to any databases or registers.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

The *Action Plan for Australian Birds* (Garnett *et al*., 2011) recommends recovery actions for these woodland bird species. The Project is not inconsistent with the actions listed in this plan.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Key threatening processes are dealt with in Section A13.

Conclusion

In conclusion, the Black-chinned Honeyeater (eastern subspecies) and Painted Honeyeater are unlikely to be significantly impacted by the Project given:

- the localised nature of the habitat in the BAR Footprint compared to the wider distribution of the species;
- the lack of breeding records for these species within the BAR Footprint (although it is possible individuals of these species could breed in the extant habitat from time to time); and
- the greater extent of habitat in the locality.

A9 ROBINS

Three threatened robins listed as 'Vulnerable' under the TSC Act have potential to occur within the BAR Footprint (Table 8), namely:

- Hooded Robin (south-eastern form) (*Melanodryas cucullata subsp. cucullata*);
- Scarlet Robin (*Petroica boodang*); and
- Flame Robin (*Petroica phoenicea*).

The Hooded Robin (south-eastern form) and Scarlet Robin have been recorded within the BAR Footprint during current or previous surveys (Figure 8). There are no field records of Flame Robin within the BAR Footprint. These robins are known to occupy large home ranges. The following section assesses the potential impacts of the Project on these three species.

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Hooded Robin have been recorded within the BAR Footprint by Biodiversity Monitoring Services (2015a) and MKES (2005) (Figure 8). Ecovision Consulting (2006) also recorded this species to the north-east of the BAR Footprint (Figure 8). Database records for this species are mapped within the BAR Footprint and surrounds (OEH, 2015a) (Figure 8).

Scarlet Robin have been recorded within the BAR Footprint by Lesryk Environmental Consultants (2013) (Figure 8). Biodiversity Monitoring Services (2013) also recorded this species immediately east of the BAR Footprint (Figure 8). There are no database records for this species in the locality.

Flame Robin have not been recorded within the BAR Footprint or immediate surrounds. A single database record for this species from 2001 exists to the south of the BAR Footprint (BirdLife Australia, 2014) (Figure 8).

The Project would result in the removal/modification of a portion of potential habitat resources for Hooded Robin (south-eastern form), Scarlet Robin or Flame Robin (approximately 354 ha) and may disrupt foraging, roosting and breeding (were these species to occur).

The Project is unlikely to disrupt the lifecycle such that a local viable population of these species would be placed at risk of extinction given:

- the localised nature of the habitat in the BAR Footprint compared to the wider distribution of the species;
- lack of breeding records for these species within the BAR Footprint (although it is possible individuals of these species could breed in the extant habitat from time to time);
- the mobility of these species; and
- the greater extent of habitat in the locality (including protected areas such as Munghorn Gap Nature Reserve, Goulburn River National Park and the existing Biodiversity Offset Strategy for Wilpinjong Coal Mine).

These species are unlikely to be indirectly impacted as a result of the Project. Potential indirect impacts on these species (e.g. weeds, feral animals, bushfire risk, too frequent fires, fragmentation, firewood collection and over-grazing [OEH, 2015c]) have been considered.

The change in cumulative impact on these species as a result of the Project (considering impacts from other surrounding developments [Section 3.1.4]) is considered to be minimal because of the localised nature of the Project compared to the wider distribution of the species, especially when considering the Biodiversity Offset Strategy (Section 4) and the offsets which have been (or would be) provided for the surrounding developments (Table 18 of the main report). All four robin species have been recorded during fauna surveys in the closest mining developments. Hooded Robin (south-eastern form) and Scarlet Robin have both been recorded at the Moolarben Coal Complex (Moolarben Coal Mines Pty Limited, 2006) and Ulan Mine Complex (Umwelt, 2015), and at the proposed site for the Bowdens Silver Project (Kingsgate Bowdens Pty Limited, 2012). Surveys at the proposed site for the Bylong Coal Project recorded the Hooded Robin (south-eastern form) (Eastcoast Flora Survey, 2014; Cumberland Ecology, 2015). The Flame Robin has been recorded at the Ulan Coal Complex (Umwelt, 2015).

A number of measures would be implemented for the Project to minimise potential impacts on flora and fauna which would be relevant to occurrences of these species within the BAR Footprint and adjacent park and reserve areas including progressive site rehabilitation, vegetation clearance protocol as well as weed and feral animal management (Table 14 of the main report) (WCPL, 2015).

Also of note, the existing Biodiversity Offset Strategy for Wilpinjong Coal Mine would be augmented with an additional Biodiversity Offset Strategy for the Project, which comprises land-based offset areas and mine site rehabilitation. Hooded Robin (south-eastern form) have been recorded within Offset Area 2 by Hunter Eco (2015b). There is also a single database record of this species within Offset Area 1 (OEH, 2015a).

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the lifecycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

No populations of these species have been listed as endangered.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- ***(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or***
- ***(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.***

Not applicable.

(d) In relation to the habitat of a threatened species, population or ecological community:

- ***(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed;***

The Project would result in the removal/modification of approximately 354 ha of potential habitat resources for these robin species.

- ***(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action; and***

The Project is unlikely to result in additional fragmentation of these species' habitat given the localised nature of the clearance associated with the Project compared to the wider distribution of the species. Further, habitat exists for these species within nearby Goulburn River National Park and Munghorn Gap Nature Reserve. These habitats would not be fragmented as a result of the Project.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

Approximately 354 ha of potential habitat has been mapped within the BAR Footprint. In relation to the regional distribution of known or potential habitat for these robin species, it is considered that the area to be removed/modified for the Project does not constitute a significant area given the small scale of the habitat removal/modification required for the Project compared to the greater quantity and quality of such habitat in the surrounding landscape.

The habitat to be removed/modified within the BAR Footprint is not considered necessary to the persistence and long-term survival of the Hooded Robin (south-eastern form), Scarlet Robin and Flame Robin.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No critical habitat is present within the BAR Footprint according to any databases or registers.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

The *Action Plan for Australian Birds* (Garnett *et al*., 2011) recommends recovery actions for these robin species. The Project is not inconsistent with the actions listed in these plans.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Key threatening processes are dealt with in Section A13.

Conclusion

In conclusion, these robins are unlikely to be significantly impacted by the Project given:

- the localised nature of the habitat in the BAR Footprint compared to the wider distribution of the species;
- the lack of breeding records for these species within the BAR Footprint (although it is possible individuals of these species could breed in the extant habitat from time to time); and
- the greater extent of habitat in the locality.

A10 MAMMALS (EXCLUDING BATS)

Four threatened mammals (excluding bats) have potential to occur within the BAR Footprint, namely:

- Koala (*Phascolarctos cinereus*) (listed as 'Vulnerable' under both the TSC Act and EPBC Act),
- Brush-tailed Rock-wallaby (*Petrogale penicillata*) (listed as 'Endangered' under the TSC Act and 'Vulnerable' under the EPBC Act);
- Spotted-tailed Quoll (*Dasyurus maculatus*) (listed as 'Vulnerable' under the TSC Act and 'Endangered' under the EPBC Act); and
- Squirrel Glider (*Petaurus norfolcensis*) (listed as 'Vulnerable' under the TSC Act).

None of these species have been recorded within the BAR Footprint during current or previous surveys. However, the Squirrel Glider has been recorded in the locality (Figure 9). A single sighting of a Koala outside of the BAR Footprint along Wollar Road occurred in 2013 (Figure 9), however, this species has not been recorded during targeted surveys. The following section assesses the potential impacts of the Project on these four species.

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Koala have not been recorded within the BAR Footprint, but one was sighted on one occasion in 2013 in the surrounds along Wollar Road (Figure 9). This species has not been recorded during the targeted field surveys from 2005 to 2015. It is considered that the Koala sighted in 2013 was an individual moving between areas. There is a single database record for this species from 1957 along Wollar Creek (OEH, 2015a) (Figure 9). There are no recent database records. There is no evidence of Koala breeding within the locality.

Brush-tailed Rock-wallaby have not been recorded within the BAR Footprint or immediate surrounds. There is a single database record for this species from 2009 within the nearby Goulburn River National Park (OEH, 2015a) (Figure 9). This wallaby is found in structurally complex rocky escarpments (OEH, 2015c). Although not the preferred habitat for this species, there are some areas within the BAR Footprint which provide potential foraging habitat for this species. There is no evidence of Brush-tailed Rock-wallaby breeding within the BAR Footprint or immediate surrounds. Further, the habitat within the BAR Footprint is not considered to contain the structural complexity required for breeding for this species.

There are no records of Spotted-tailed Quoll from within the BAR Footprint or surrounds. However, there are several records from within approximately 15 km of the BAR Footprint (OEH, 2015a). Potential habitat for this species exists within the BAR Footprint and would be impacted by the Project.

Squirrel Glider have not been recorded within the BAR Footprint. However, Biodiversity Monitoring Services (2015a) and MKES (2005) have recorded this species in the immediate surrounds (Figure 9). A single database record for this species from 2000 occurs within the nearby Goulburn River National Park (OEH, 2015a) (Figure 9).

The Project would result in the removal/modification of approximately 165 ha of potential habitat resources for Koala (Figure 10b), and approximately 354 ha of potential habitat resources for Brush-tailed Rock-wallaby, Spotted-tailed Quoll and Squirrel Glider, and may disrupt foraging habitat for Brush-tailed Rock-wallaby and Spotted-tailed Quoll, foraging, denning and breeding habitat for the Squirrel Glider, and foraging and shelter for Koala (were these species to occur).

The Project is unlikely to disrupt the lifecycle such that a local viable population of these species would be placed at risk of extinction given:

- the localised nature of the habitat in the BAR Footprint compared to the wider distribution of the species;
- lack of records for these species within the BAR Footprint (including breeding records, although it is possible individuals of these species could breed in the extant habitat from time to time); and
- the greater extent of habitat in the locality known to be used by the species (e.g. database records exist for Brush-tailed Rock Wallaby and Squirrel Glider within nearby Goulburn National Park [OEH, 2015a] [Figure 9]).

These species are unlikely to be indirectly impacted as a result of the Project. Potential indirect impacts on these species have been considered (e.g. the Brush-tailed Rock-wallaby may be impacted by weeds, feral animals, bushfire risk and fragmentation; Koala may be impacted by feral animals, bushfire risk, fragmentation and disease; Spotted-tailed Quoll may be impacted by feral animals, bushfire risk and fragmentation; and Squirrel Glider may be impacted by feral animals, bushfire risk, fragmentation and loss of hollow-bearing trees [DotE, 2015; OEH, 2015c]).

The change in cumulative impact on these species as a result of the Project (considering impacts from other surrounding developments [Section 3.1.4]) is considered to be minimal because of the localised nature of the Project compared to the wider distribution of the species, especially when considering the Biodiversity Offset Strategy (Section 4) and the offsets which have been (or would be) provided for the surrounding developments (Table 18 of the main report). Koala, Brush-tailed Rock-wallaby and Squirrel Glider have been recorded during fauna surveys in the closest mining developments. Three of the mammal species (excluding bats) have been recorded at the Ulan Mine Complex, namely the Koala, Brush-tailed Rock-wallaby and Squirrel Glider (Umwelt, 2015). Brush-tailed Rock-wallaby have also been recorded at the proposed site for the Bylong Coal Project (Eastcoast Flora Survey, 2014) and Squirrel Glider have also been recorded at Moolarben Coal Complex (Moolarben Coal Mines Pty Limited, 2006).

A number of measures would be implemented for the Project to minimise potential impacts on flora and fauna which would be relevant to occurrences of these species within the BAR Footprint and adjacent park and reserve areas including progressive site rehabilitation, the vegetation clearance protocol as well as weed and feral animal management (Table 14 of the main report) (WCPL, 2015).

Also of note, the existing Biodiversity Offset Strategy for the Wilpinjong Coal Mine would be augmented with an additional Biodiversity Offset Strategy for the Project, which comprises land-based offset areas and mine site rehabilitation. Koala have been recorded by Biodiversity Monitoring Services (2015b) (Attachment H) within Offset Areas 2, 3 and 5. Squirrel Glider have been recorded by Biodiversity Monitoring Services (2015b) (Attachment H) within Offset Areas 2 and 5.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the lifecycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

No endangered populations of these species have been listed for the BAR Footprint or surrounds.

Two endangered populations of the Koala exist in NSW, one within the Pittwater LGA and one within the Hawks Nest and Tea Gardens area, both of which are over 200 km from the BAR Footprint.

The Squirrel Glider population within the Wagga Wagga LGA is listed as an endangered population, however, is over 300 km south of the Project. The Squirrel Glider population on the Barrenjoey

Peninsula, north of Bushrangers Hill, is also listed as endangered, however, is over 200 km south-east of the Project.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable.

(d) In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed;

The Project would result in the removal/modification of approximately 165 ha of potential habitat for the Koala and the removal/modification of approximately 354 ha of potential habitat for the Brush-tailed Rock-wallaby, Spotted-tailed Quoll and Squirrel Glider.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action; and

The Project is unlikely to result in additional fragmentation of these species' habitat given the localised nature of the clearance associated with the Project compared to the wider distribution of the species. Further, habitat exists for these species within nearby Goulburn River National Park and the Munghorn Gap Nature Reserve. These habitats would not be fragmented as a result of the Project.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

Approximately 165 ha of potential habitat for the Koala and approximately 354 ha of potential habitat for the Brush-tailed Rock-wallaby, Spotted-tailed Quoll and Squirrel Glider has been mapped within the BAR Footprint. In relation to the regional distribution of known or potential habitat for these mammal species, it is considered that the area to be removed/modified for the Project does not constitute a significant area given the small scale of the habitat removal/modification required for the Project compared to the greater quantity and quality of such habitat in the surrounding landscape.

The habitat to be removed/modified within the BAR Footprint is not considered necessary to the persistence and long-term survival of the Koala, Brush-tailed Rock-wallaby, Spotted-tailed Quoll and Squirrel Glider.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No critical habitat is present within the BAR Footprint according to any databases or registers.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

The *Recovery Plan for the Koala (Phascolarctos cinereus)* (DECC, 2008a), *Recovery Plan for the Brush-tailed Rock-wallaby (Petrogale penicillata)* (DECC, 2008b) and the *Action Plan for Australian Marsupials and Monotremes* (Wildlife Australia, 1996) are relevant to these mammal species. The Project is not inconsistent with the actions listed in these plans.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Key threatening processes are dealt with in Section A13.

Conclusion

In conclusion, these mammals are unlikely to be significantly impacted by the Project given:

- the localised nature of the habitat in the BAR Footprint compared to the wider distribution of the species;
- the lack of records for these species within the BAR Footprint (although it is possible individuals of these species could occur in the extant habitat from time to time); and
- the greater extent of habitat in the locality known to be used by the species.

A11 TREE-DWELLING BATS

Four threatened tree-dwelling bats have potential to occur within the BAR Footprint, namely:

- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*) (listed as 'Vulnerable' under the TSC Act);
- Eastern Freetail-bat (*Mormopterus norfolkensis*) (listed as 'Vulnerable' under the TSC Act);
- Corben's Long-eared Bat (*Nyctophilus corbeni*) (listed as 'Vulnerable' under both the TSC Act and EPBC Act); and
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) (listed as 'Vulnerable' under the TSC Act).

These species have all been recorded within the BAR Footprint during current or previous surveys (Figure 9). These tree-dwelling bats are known to occupy large feeding territories. The following section assesses the potential impacts of the Project on these four species. Since it is listed under the EPBC Act, further consideration is given to the impacts on Corben's Long-eared Bat in Attachment F.

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Yellow-bellied Sheathtail-bat, Eastern Freetail-bat and Eastern False Pipistrelle have been recorded within the BAR Footprint by Greg Richards and Associates (2005) (Figure 9). Biodiversity Monitoring Services (2013) have also recorded Eastern False Pipistrelle in the immediate surrounds of the BAR Footprint (Figure 9). There are no database records of these species within the BAR Footprint or immediate surrounds.

Corben's Long-eared Bat has been recorded within the BAR Footprint by Biodiversity Monitoring Services (2015a) (Figure 9). Biodiversity Monitoring Services (2015b) (Attachment H) also recorded this species in nearby Munghorn Gap Nature Reserve (Figure 9). Two database records for this species exist in the surrounds of the BAR Footprint in Goulburn River National Park (OEH, 2015a) (Figure 9).

The Project would result in the removal/modification of a portion of potential habitat resources for Yellow-bellied Sheathtail-bat, Eastern Freetail-bat, Corben's Long-eared Bat and Eastern False Pipistrelle (approximately 354 ha) and may disrupt foraging and roosting.

The Project is unlikely to disrupt the lifecycle such that a local viable population of these species would be placed at risk of extinction given:

- the localised nature of the habitat in the BAR Footprint compared to the wider distribution of the species;
- lack of breeding records for these species within the BAR Footprint (although it is possible individuals of these species could breed in the extant habitat from time to time); and
- the greater extent of habitat in the locality known to be used by the species (e.g. there are database records for Corben's Long-eared Bat within Goulburn National Park [OEH, 2015a] and this species has previously been identified within the Munghorn Gap Nature Reserve [Biodiversity Monitoring Services, 2015b] [Figure 9]).

These species are unlikely to be indirectly impacted as a result of the Project. Potential indirect impacts on this species have been considered (e.g. Yellow-bellied Sheathtail-bat may be impacted by secondary poisoning, fragmentation and loss of hollow-bearing trees; Eastern Freetail-bat may be impacted by secondary poisoning, artificial light, bushfire risk and loss of hollow-bearing trees; Eastern False Pipistrelle may be impacted by fragmentation and loss of hollow-bearing trees; and Corben's Long-eared Bat may be impacted by secondary poisoning, fragmentation, feral animals, bushfire risk and loss of hollow-bearing trees [DotE, 2015; OEH, 2015c]).

The change in cumulative impact on these species as a result of the Project (considering impacts from other surrounding developments [Section 3.1.4]) is considered to be minimal because of the localised nature of the Project compared to the wider distribution of the species, especially when considering the Biodiversity Offset Strategy (Section 4) and the offsets which have been (or would be) provided for the surrounding developments (Table 18 of the main report). The Yellow-bellied Sheathtail-bat, Corben's Long-eared Bat and Eastern False Pipistrelle have been recorded during fauna surveys in the closest mining developments. The Yellow-bellied Sheathtail-bat has been recorded at the Moolarben Coal Complex (Moolarben Coal Mines Pty Limited, 2006), Ulan Mine Complex (Umwelt, 2015) and proposed site for the Bylong Coal Project (Cumberland Ecology, 2015). Corben's Long-eared Bat has been recorded at the Moolarben Coal Complex (Moolarben Coal Mines Pty Limited, 2006) and Ulan Mine Complex (Umwelt, 2015). The Eastern False Pipistrelle has been recorded at the Ulan Mine Complex (Umwelt, 2015).

A number of measures would be implemented for the Project to minimise potential impacts on flora and fauna which would be relevant to occurrences of these species within the BAR Footprint and adjacent park and reserve areas including progressive site rehabilitation, vegetation clearance protocol as well as weed and feral animal management (Table 14 of the main report) (WCPL, 2015).

Also of note, the existing Biodiversity Offset Strategy for the Wilpinjong Coal Mine would be augmented with an additional Biodiversity Offset Strategy for the Project, which comprises land-based offset areas and mine site rehabilitation. Corben's Long-eared Bat has been recorded by Biodiversity Monitoring Services (2015b) (Attachment H) within Offset Areas 1, 2 and 5.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the lifecycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

No populations of these species have been listed as endangered.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- ***(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or***
- ***(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.***

Not applicable.

(d) In relation to the habitat of a threatened species, population or ecological community:

- ***(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed;***

The Project would result in the removal/modification of approximately 354 ha of potential habitat resources for these tree-dwelling bat species.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action; and

The Project is unlikely to result in additional fragmentation of these species' habitat given the localised nature of the clearance associated with the Project compared to the wider distribution of the species. Further, habitat exists for these species within nearby Goulburn River National Park and the Munghorn Gap Nature Reserve. These habitats would not be fragmented as a result of the Project.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

Approximately 354 ha of potential habitat has been mapped within the BAR Footprint. In relation to the regional distribution of known or potential habitat for these tree-dwelling species, it is considered that the area to be removed/modified for the Project does not constitute a significant area given the small scale of the habitat removal/modification required for the Project compared to the greater quantity and quality of such habitat in the surrounding landscape.

The habitat to be removed/modified within the BAR Footprint is not considered necessary to the persistence and long-term survival of the Yellow-bellied Sheathtail-bat, Eastern Freetail-bat, Corben's Long-eared Bat and Eastern False Pipistrelle.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No critical habitat is present within the BAR Footprint according to any databases or registers.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

The *Action Plan for Australian Bats* (Environment Australia, 1999) recommends recovery actions for these tree-dwelling bat species. The Project is not inconsistent with the actions listed in these plans.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Key threatening processes are dealt with in Section A13.

Conclusion

In conclusion, these tree-dwelling bats are unlikely to be significantly impacted by the Project given:

- the localised nature of the habitat in the BAR Footprint compared to the wider distribution of the species;
- the lack of records for these species within the BAR Footprint (although it is possible individuals of these species could occur in the extant habitat from time to time); and
- the greater extent of habitat in the locality known to be used by the species.

A12 CAVE-DWELLING BATS

Four threatened cave-dwelling bats listed as 'Vulnerable' under the TSC Act have potential to occur within the BAR Footprint (Table 8), namely:

- Little Bentwing-bat (*Miniopterus australis*);
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*);
- Large-eared Pied Bat (*Chalinolobus dwyeri*) (also listed as 'Vulnerable' under the EPBC Act); and
- Eastern Cave Bat (*Vespadelus troughtoni*).

These species have all been recorded within the BAR Footprint during current or previous surveys (Figure 9). These cave-dwelling bats are known to occupy large feeding territories. The following section assesses the potential impacts of the Project on these four species. Since it is listed under the EPBC Act, further consideration is given to the impacts on the Large-eared Pied Bat in Attachment F.

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Little Bentwing-bat have been recorded within the BAR Footprint and surrounds by Greg Richards and Associates (2005) (Figure 9). No breeding colonies of this species have been recorded in or near the BAR Footprint. There are no database records for this species within the BAR Footprint and surrounds.

Eastern Bentwing-bat have been recorded within the BAR Footprint and surrounds by Greg Richards and Associates (2005) and Lesryk Environmental Consultants (2013) (Figure 9). Biodiversity Monitoring Services (2015a, 2015b) have also recorded this species in the immediate surrounds. No breeding colonies of this species have been recorded in the BAR Footprint. There is a database record for this species near the BAR Footprint (OEH, 2015a) (Figure 9).

Large-eared Pied Bat have been recorded within the BAR Footprint by Greg Richards and Associates (2005) and Lesryk Environmental Consultants (2013) (Figure 9). Biodiversity Monitoring Services (2013) have also recorded this species in the immediate surrounds (Figure 9). No breeding colonies of this species have been recorded in or near the BAR Footprint. There are no database records for this species within the BAR Footprint and surrounds.

Eastern Cave Bat have been recorded within the BAR Footprint by Lesryk Environmental Consultants (2013) (Figure 9). Biodiversity Monitoring Services (2013) have also recorded this species in the immediate surrounds (Figure 9). No breeding colonies of this species have been recorded in or near the BAR Footprint. There are no database records for this species within the BAR Footprint and surrounds.

The Project would result in the removal/modification of a portion of potential habitat resources for Little Bentwing-bat, Eastern Bentwing-bat, Large-eared Pied Bat and Eastern Cave Bat (approximately 354 ha) and may disrupt foraging for some of these species (were these species to occur).

Waterbodies and remnant vegetation which occur within the BAR Footprint and surrounds offers potential foraging habitat resources for these species. There are no breeding resources for these species within the BAR Footprint. However, a historical mine adit which provides roosting and breeding habitat for the Eastern Bentwing-bat is located just outside the BAR Footprint, adjacent to the western boundary of Pit 8. The historical mine adit is approximately 152 m west of proposed Pit 8. At this distance, it is possible that vibration from nearby blasting may quicken the collapse of the adit or cause bats to exit the adit during the day. Eastern Bentwing-bat in the locality are unlikely to be dependent on the man-made historical mine adit, since the local and regional geology lends itself to a wide variety of alternative natural caves and associated structures along the escarpments of the sandstone country. Notwithstanding, to mitigate the potential for future collapse of the entrance, a concrete or steel pipe would be installed to help maintain an opening in the event of any further rockfall around the entrance.

The Project is unlikely to disrupt the lifecycle such that a local viable population of these species would be placed at risk of extinction given:

- the localised nature of the foraging habitat in the BAR Footprint compared to the wider distribution of the species;
- absence of breeding habitat in the BAR Footprint;
- records from in and near the BAR Footprint are not at the limits of the species' range; and
- the greater extent of habitat in the locality known to be used by the species (these cave-dwelling bats are unlikely to be dependent on the structures within or near the BAR Footprint, since the local and regional geology lends itself to a wide variety of alternative natural caves and associated structures along the escarpments of the sandstone country).

These species are unlikely to be indirectly impacted as a result of the Project. Potential indirect impacts on these species (e.g. Little Bentwing-bat may be impacted by secondary poisoning, feral animals, bushfire risk, exotic pathogens; Eastern Bentwing-bat may be impacted by bushfire risk and exotic pathogens; Large-eared Pied Bat may be impacted by secondary poisoning, feral animals and bushfire risk; and Eastern Cave Bat may be impacted by secondary poisoning, and feral animals [DotE, 2015; OEH, 2015c]) have been considered.

The change in cumulative impact on these species as a result of the Project (considering impacts from other surrounding developments [Section 3.1.4]) is considered to be minimal because of the localised nature of the Project compared to the wider distribution of the species, especially when considering the Biodiversity Offset Strategy (Section 4) and the offsets which have been (or would be) provided for the surrounding developments (Table 18 of the main report). All four cave-dwelling bat species have been recorded during fauna surveys in the closest mining developments. Little Bentwing-bat have been recorded at the Ulan Mine Complex (Umwelt, 2015). Eastern Bentwing-bat and Large-eared Pied Bat have both been recorded at the Moolarben Coal Complex (Moolarben Coal Mines Pty Limited, 2006; EMGA Mitchell McLennan, 2013), Ulan Mine Complex (Umwelt, 2015) and the proposed site for the Bylong Coal Project (Cumberland Ecology, 2015). Eastern Cave Bat has been recorded at the Moolarben Coal Complex (Moolarben Coal Mines Pty Limited, 2006) and the Ulan Mine Complex (Umwelt, 2015).

A number of measures would be implemented for the Project to minimise potential impacts on flora and fauna which would be relevant to occurrences of these species within the BAR Footprint and adjacent park and reserve areas including progressive site rehabilitation, the vegetation clearance protocol as well as weed and feral animal management (Table 14 of the main report) (WCPL, 2015).

Also of note, the existing Biodiversity Offset Strategy for the Wilpinjong Coal Mine would be augmented with an additional Biodiversity Offset Strategy for the Project, which comprises land-based offset areas and mine site rehabilitation. Eastern Bentwing-bat and Large-eared Pied Bat have both been recorded by Biodiversity Monitoring Services (2015b) (Attachment H) within all Offset Areas (1 to 5). Eastern Cave Bat have been recorded by Biodiversity Monitoring Services (2015b) (Attachment H) within Offset Areas 1, 2 and 5.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the lifecycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

No populations of these species have been listed as endangered.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable.

(d) In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed;

The Project would result in the removal/modification of approximately 354 ha of forest/woodland habitat providing potential foraging habitat resources for these cave-dwelling bat species. An additional 663 ha of cleared land would be removed by the Project which may currently provide foraging habitat for these species. There is no roosting or breeding habitat for these species within the BAR Footprint.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action; and

The Project is unlikely to result in additional fragmentation of these species' habitat given the localised nature of the clearance associated with the Project compared to the wider distribution of the species. Further, habitat exists for these species within nearby Goulburn River National Park and Munghorn Gap Nature Reserve. These habitats would not be fragmented as a result of the Project.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

Approximately 354 ha of potential foraging habitat has been mapped within the BAR Footprint. In relation to the regional distribution of known or potential habitat for these cave-dwelling species, it is considered that the area to be removed/modified for the Project does not constitute a significant area given the small scale of the habitat removal/modification required for the Project compared to the greater quantity and quality of such habitat in the surrounding landscape.

The habitat to be removed/modified within the BAR Footprint is not considered necessary to the persistence and long-term survival of the Little Bentwing-bat, Eastern Bentwing-bat, Large-eared Pied Bat and Eastern Cave Bat.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No critical habitat is present within the BAR Footprint according to any databases or registers.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

The *National Recovery Plan for the Large-eared Pied Bat Chalinolobus dwyeri* (Department of Environment and Resource Management, 2011) and *Action Plan for Australian Bats* (Environment Australia, 1999) recommend recovery actions for these cave-dwelling bat species. The Project is not inconsistent with the actions listed in these plans.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Key threatening processes are dealt with in Section A13.

Conclusion

In conclusion, these cave-dwelling bats are unlikely to be significantly impacted by the Project given:

- the localised nature of the foraging habitat in the BAR Footprint compared to the wider distribution of the species;
- the absence of breeding habitat in the BAR Footprint;
- records from in and near the BAR Footprint are not at the limits of the species' range; and
- the greater extent of habitat in the locality known to be used by the species.

A13 KEY THREATENING PROCESSES

Table A4 outlines the key threatening processes relevant to the Project in accordance with the processes listed on the OEH website (OEH, 2015d).

Table A4
Key Threatening Processes

Key Threatening Process	Relevance
Bushrock removal	Pre-clearing protocols in the Wilpinjong Coal Biodiversity Management Plan provide for transfer of habitat assets such as this to the surrounding potential habitat (e.g. Rehabilitation Areas, Regeneration Areas and ECAs).
Clearing of native vegetation	Approximately 354 ha of native vegetation would be cleared for the Project. However, this loss would be offset, resulting in a net gain in habitat as a consequence of the Project.
Competition and grazing by the feral European Rabbit, *Oryctolagus cuniculus* (L.)	These processes would be managed under the vertebrate pest management provisions in the Wilpinjong Coal Biodiversity Management Plan. Feral animal control measures would be implemented by WCPL throughout the life of the Project.
Predation and hybridisation by Feral Dogs, *Canis lupus familiaris*	
Predation by feral cats	
Predation by the European Red Fox	
Predation, habitat degradation, competition and disease transmission by Feral Pigs (*Sus scrofa*)	
Herbivory and environmental degradation caused by feral deer	
Invasion and establishment of exotic vines and scramblers	These processes would be managed under the weed management provisions in the Wilpinjong Coal Biodiversity Management Plan. Weed control measures would be implemented by WCPL throughout the life of the Project.
Invasion of native plant communities by exotic perennial grasses	
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants	
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition	The Wilpinjong Coal Bushfire Management Plan provides fire management controls to lower the risk of high frequency fire.
Loss of Hollow-bearing Trees	Pre-clearing protocols in the Wilpinjong Coal Biodiversity Management Plan provide for preliminary habitat assessment to identify any habitat features present within approved clearance areas and secondary habitat assessment which involves further surveys of areas deemed as containing fauna habitat (e.g. trees with hollows and bat presence).
Removal of dead wood and dead trees	Pre-clearing protocols in the Wilpinjong Coal Biodiversity Management Plan provide for transfer of habitat assets such as this to the surrounding undisturbed habitat (e.g. Rehabilitation Areas, Regeneration Areas and ECAs).

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ATTACHMENT B

MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

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B1 INTRODUCTION

Wilpinjong Coal Mine, originally approved by the New South Wales (NSW) state government, was determined not to be a Controlled Action under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) in 2005 (EPBC 2005/2309).

On 12 February 2015, the Wilpinjong Extension Project (the Project) was referred under the EPBC Act (EPBC 2015/7431). The Project does not include the approved Wilpinjong Coal Mine that has either been previously referred and determined not to be a Controlled Action or previously determined not to require referral under the EPBC Act but has received all relevant State approvals.

On 12 March 2015, a delegate of the Commonwealth Minister for the Environment declared the Project to be a 'controlled action' for the purpose of the EPBC Act due to potential adverse impacts on the following controlling provisions under Part 3 of the EPBC Act:

- sections 18 and 18A of the EPBC Act (listed threatened species and communities); and
- sections 24D and 24E of the EPBC Act (a water resource, in relation to coal seam gas development and large coal mining development).

The action is to be assessed under the assessment bilateral agreement with NSW. Accordingly, this document provides an assessment on the relevant EPBC Act listed threatened species and communities. Tables referred to throughout this attachment are included in the Attachment text, however, figures referred to throughout this attachment are included within the main text of the Biodiversity Assessment Report and Biodiversity Offset Strategy.

The Department of the Environment (DotE) comments in the Secretary's Environmental Assessment Requirements (SEARs) for the Environmental Impact Statement (EIS) relevant to threatened species and communities listed under the EPBC Act have been considered as outlined in Table B1. A full reconciliation of the DotE comments in the SEARs is provided in the EIS.

Table B1
EPBC Act Assessment Requirements (Supplementary SEARs) – Reference Summary

Assessment Requirement	Reference
2 ***The environment including matters of national environmental significance (MNES)[1]***	
The Assessment Documentation must include a description of the environment and management practices of the proposal site and the surrounding areas and other areas that may be affected by the action. Include all relevant MNES protected by controlling provisions of Part 3 of the EPBC Act (see Attachment 2 for MNES specific to the project): *(d) Listed threatened species and communities (including suitable habitat that are or are likely to be present in the vicinity of the site), including the following details:* *i. Details of the scope, timing/effort (survey season/s) and methodology for studies or surveys used to provide information on the listed species/community/habitat at the site (and in areas that may be impacted by the project). Include details of:* o *best practice survey guidelines are applied; and* o *how they are consistent with (or a justification for divergence from) published Australian Government guidelines and policy statements.* *ii. Include any relevant plans/agreements*	Section B2

Table B1 (Continued)
EPBC Act Assessment Requirements (Supplementary SEARs) – Reference Summary

Assessment Requirement	Reference
3 *Impacts*	
(a) The Assessment Documentation must include a description of all of the relevant impacts of the action on MNES (identified in Section 2). Impacts during the construction, operational and (if relevant) the decommissioning phases of the project must be addressed, and the following information provided: *i. a description of the relevant impacts of the action;* *ii. a detailed analysis of the nature and extent of the likely direct, indirect and consequential impacts relevant to MNES, including likely short-term and long-term impacts – refer to the Significant Impact Guidelines 1.1 - Matters of National Environmental Significance for guidance on the various types of impact that need to be considered;* *iii. a statement whether any relevant impacts are likely to be unknown, unpredictable or irreversible;* *any technical data and other information used or needed to make a detailed assessment of the relevant impacts;*	Section B3; Section 3 of the main text
(b) The Assessment Documentation should identify and address cumulative impacts, where potential project impacts are in addition to existing impacts of other activities (including known potential future expansions or developments by the proponent and other proponents in the region and vicinity).	Section B3; Section 3.1.4 of the main text
(c) The Assessment Documentation should also provide a detailed assessment of any likely impact that this proposed action may facilitate on the relevant MNES at the local, regional, state and national scale.	Section B3
4 *Avoidance and mitigation measures/alternatives*	
The Assessment Documentation also must take into account relevant agreements and plans that cover impacts on MNES including but not limited to: • *any recovery plan, conservation advice for the species or community;* • *any threat abatement plan for a process that threatens the species;* • *any wildlife conservation plan for the species;*	Sections B2 and B3
The Assessment Documentation must include, and substantiate, specific and detailed descriptions of the proposed avoidance and mitigation measures, based on best available practices and must include the following elements: *(a) A consolidated list of avoidance and mitigation measures proposed to be undertaken to prevent or minimise the relevant impacts of the action on MNES, including:* • *a description of proposed avoidance and mitigation measures to deal with relevant impacts of the action, including mitigation measures proposed to be taken by State/Territory governments, local governments or the proponent;* • *assessment of the expected or predicted effectiveness of the mitigation measures, including the scale and intensity of impacts of the proposed action and the on-ground benefits to be gained through each of these measures;* • *a description of the outcomes that the avoidance and mitigation measures will achieve;* • *any statutory or policy basis for the mitigation measures; and* • *the cost of the mitigation measures.*	Section B4, Table B13

Table B1 (Continued)
EPBC Act Assessment Requirements (Supplementary SEARs) – Reference Summary

Assessment Requirement	Reference
(b) A detailed outline of a plan for the continuing management, mitigation and monitoring of relevant MNES impacts of the action, including a description of the outcomes that will be achieved and any provisions for independent environmental auditing. *Where appropriate, each project phase (construction, operation, decommission) must be addressed separately. It must state the environmental outcomes, performance criteria, monitoring, reporting, corrective action, contingencies, responsibility and timing for each environmental issue.*	As above.
(c) The name of the agency responsible for endorsing or approving each mitigation measure or monitoring program.	Section B4
5 *Residual impacts/offsets*	Section B5; Section 4 of the main text

B2 RELEVANT THREATENED SPECIES AND COMMUNITIES

Table B2 provides a list of threatened species listed under the *Threatened Species Conservation Act, 1995* (TSC Act) and the EPBC Act which are known from the wider locality from various sources (DotE, 2015a) as well as an evaluation as to whether the species or its habitat could be potentially impacted by the action.

Table B2
Threatened Species Listed Under the EPBC Act

Common Name	Scientific Name	Conservation Status[1]		Is the Species or its Habitat Potentially Impacted by the Action?
		TSC Act	EPBC Act	
Flora				
-	*Ozothamnus tesselatus*	V	V	Yes, species is present in the Biodiversity Assessment Report Development Site Footprint (BAR Footprint).
Amphibians				
Giant Burrowing Frog	*Heleioporus australiacus*	V	V	The action is unlikely to impact this species given the absence of records in proximity to the BAR Footprint and lack of preferred habitat.
Booroolong Frog	*Litoria booroolongensis*	E	E	The action is unlikely to impact this species given the absence of records in proximity to the BAR Footprint and lack of preferred habitat.
Reptiles				
Pink-tailed Legless Lizard	*Aprasia parapulchella*	V	V	This species has a moderate likelihood of occurrence within the BAR Footprint, and targeted searches did not identify the species. It is therefore considered that the action is unlikely to impact this species.
Broad-headed Snake	*Hoplocephalus bungaroides*	E	V	The action is unlikely to impact this species given the absence of records in proximity to the BAR Footprint and lack of preferred habitat.
Birds				
Australasian Bittern	*Botaurus poiciloptilus*	E	E	The action is unlikely to impact this species given the absence of records in proximity to the BAR Footprint and lack of preferred habitat.
Australian Painted Snipe	*Rostratula australis*	E	E	The action is unlikely to impact this species given the absence of records in proximity to the BAR Footprint and lack of preferred habitat.
Malleefowl	*Leipoa ocellata*	E	V	This species has a low likelihood of occurrence within the BAR Footprint, and targeted searches did not identify the species. It is therefore considered that the action is unlikely to impact this species.
Swift Parrot	*Lathamus discolor*	E	E	Potential habitat for this species would be impacted.
Superb Parrot	*Polytelis swainsonii*	V	V	This species has a low likelihood of occurrence within the BAR Footprint, and targeted searches did not identify the species. It is therefore considered that the action is unlikely to impact this species.

Table B2 (Continued)
Threatened Species Listed Under the EPBC Act

Common Name	Scientific Name	Conservation Status[1]		Is the Species or its Habitat Potentially Impacted by the Action?
		TSC Act	EPBC Act	
Regent Honeyeater	*Anthochaera phrygia*	CE	CE	Potential habitat for this species would be impacted. Listed as 'Endangered' under the EPBC Act at the time of the controlled action decision (12 March 2015) and therefore assessed under the Commonwealth offset policy as 'Endangered' not 'Critically Endangered' (refer section 158A of the EPBC Act).
Painted Honeyeater	*Grantiella picta*	V	V	This species was not listed under the EPBC Act at the time of the controlled action decision (12 March 2015) and therefore the listing is not relevant to the action (refer section 158A of the EPBC Act).
Mammals				
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory)	*Phascolarctos cinereus*	V	V	Potential habitat for this species would be impacted.
Brush-tailed Rock-wallaby	*Petrogale penicillata*	E	V	The action is unlikely to impact this species given the absence of records in proximity to the BAR Footprint.
Spotted-tailed Quoll	*Dasyurus maculatus*	V	E	Potential habitat for this species would be impacted.
Grey-headed Flying-fox	*Pteropus poliocephalus*	V	V	The action is unlikely to impact this species given the absence of records in proximity to the BAR Footprint and lack of preferred habitat.
New Holland Mouse	*Pseudomys novaehollandiae*	-	V	This species has a low likelihood of occurrence within the BAR Footprint, and targeted searches did not identify the species. It is therefore considered that the action is unlikely to impact this species.
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	V	Potential habitat for this species would be impacted.
Corben's Long-eared Bat	*Nyctophilus corbeni*	V	V	Potential habitat for this species would be impacted.

[1] Threatened fauna species status under the TSC Act and/or EPBC Act (current at October 2015).
V = Vulnerable; E = Endangered; CE = Critically Endangered.

The DotE comments in the SEARs for the EIS state that the following community and six threatened species may be potentially impacted by the action:

- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered Ecological Community [Box-Gum Woodland CEEC] under the EPBC Act);
- *Ozothamnus tesselatus*;
- Swift Parrot (*Lathamus discolour*);
- Regent Honeyeater (*Anthochaera phrygia*);
- Spotted-tailed Quoll (*Dasyurus maculatus*);
- Large-eared Pied Bat (*Chalinolobus dwyeri*); and
- Corben's Long-eared Bat (*Nyctophilus corbeni*).

In addition to the threatened species listed above, the action would also impact potential habitat for the Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory).

Targeted Surveys

Hunter Eco (2015a) (Attachment C) undertook terrestrial flora surveys within a study area encompassing the BAR Footprint during 2014 and 2015. Flora surveys were undertaken in consideration of the *EPBC Act Policy Statement - Draft Survey Guidelines for Australia's Threatened Orchids* (DotE, 2014a).

Biodiversity Monitoring Services (2015a) (Attachment D) undertook fauna surveys within a study area encompassing the BAR Footprint during February 2014 with a targeted survey in April 2015. The following best practice survey guidelines published by the Commonwealth Government were applied:

- *Survey Guidelines for Australia's Threatened Reptiles* (Department of Environment, Water, Heritage and the Arts [DEWHA], 2011a);
- *Survey Guidelines for Australia's Threatened Bats* (DEWHA, 2010a);
- *Survey Guidelines for Australia's Threatened Birds* (DEWHA, 2010b);
- *Survey Guidelines for Australia's Threatened Mammals* (DEWHA, 2011b); and
- *Survey Guidelines for Australia's Threatened Frogs* (DEWHA, 2010c).

Targeted fauna surveys were conducted by Biodiversity Monitoring Services (2015a) (Attachment D) for those threatened fauna species listed in Table B2. For the seven threatened fauna species which may be potentially impacted by the action, Table B3 demonstrates how the surveys undertaken at the Wilpinjong Coal Mine are consistent with the best practice survey guidelines published by the Commonwealth Government. Threatened fauna were also opportunistically recorded by Hunter Eco (2015a) (Attachment C) during the flora surveys.

Table B3
Relevant Threatened Species and Communities Action Area Survey Effort

Common Name	Scientific Name	Conservation Status[1]		Commonwealth Survey Guidelines Requirements	Survey Effort Undertaken	Consistent with the Guideline?
		TSC Act	EPBC Act			
Birds						
Regent Honeyeater	*Anthochaera phrygia*	CE	CE	Area searches (20 hours over 10 days) and targeted searches of suitable flowering trees (20 hours over 5 days) (DEWHA, 2010b).	Area searches and targeted searches of heavily flowering trees (20 sites over 16 days). A 30 minute search was used where the observer walked around each site, as well as observing and listening for calls from a single point (point surveys). Where possible, up to four periods of observation were undertaken (two in the morning and two in the late afternoon) at each site.	✓
Swift Parrot	*Lathamus discolor*	E	E	Surveys between March and July and include area searches (20 hours over 8 days) (DEWHA, 2010b).	As above.	✓
Mammals						
Koala	*Phascolarctos cinereus*	V	V	Surveys include direct observation methods (e.g. strip transects, spotlighting, call playback, remote cameras) and indirect methods (e.g. scats, scratches etc.) (DotE, 2014b).	Vehicle and foot-based spotlighting was undertaken across Survey Areas. Call playback for the Koala through a megaphone for approximately five minutes, with a 10 minute listening time at detailed survey sites. At least two remote infrared cameras were set up at each of the four detailed sites and run for five days (for a total of 40 trap nights). Sand plots were inspected for evidence of animal movement. Paw prints and other animal signs e.g. scratches, were identified and recorded. Any scats encountered throughout surveys were collected and identified, and their contents analysed.	✓

Table B3 (Continued)
Relevant Threatened Species and Communities Action Area Survey Effort

Common Name	Scientific Name	Conservation Status[1]		Commonwealth Survey Guidelines Requirements	Survey Effort Undertaken	Consistent with the Guideline?
		TSC Act	EPBC Act			
Mammals (Cont.)						
Brush-tailed Rock-wallaby	*Petrogale penicillata*	E	V	Surveys include diurnal searches for suitable habitat resources (e.g. caves, rock boulders, rock ledges, rocky escarpments and cliff-lines), and for signs of activity (e.g. tracks, scats and rock shelters worn smooth from resting) (Department of Sustainability, Environment, Water, Population and Communities [SEWPaC], 2011).	Point surveys were conducted. Any scats were collected and identified, and their contents analysed. Sand plots were inspected for evidence of animal movement. Paw prints and other animal signs e.g. scratches, were identified and recorded. Observational surveys were conducted across the site over 28 person days.	✓
Spotted-tailed Quoll	*Dasyurus maculatus*	V	E	Surveys include daytime searches for potentially suitable habitat resources, and signs of activity (including community consultation, tracks, scats and latrines) (SEWPaC, 2011). Also baited hair funnels and baited camera traps (SEWPaC, 2011).	As above. In addition, five baited hair funnels were set out at each detailed survey site for four nights.	✓
Corben's Long-eared Bat	*Nyctophilus corbeni*	V	V	Surveys include 20 harp traps (over minimum five nights) and 20 mist nets (over minimum of five nights) (DEWHA, 2010a).	During recent surveys (Biodiversity Monitoring Services 2015a), harp traps were placed within all four detailed sites and at the historical mine adit for a total of 10 trap nights. Previous surveys also conducted harp trapping. Surveys by Biodiversity Monitoring Services (2013) included a total of two harp trap nights, and surveys by Greg Richards and Associates (2005) included 4 harp trap nights.	✓

Table B3 (Continued)
Relevant Threatened Species and Communities Action Area Survey Effort

Common Name	Scientific Name	Conservation Status[1]		Commonwealth Survey Guidelines Requirements	Survey Effort Undertaken	Consistent with the Guideline?
		TSC Act	EPBC Act			
Mammals (Cont.)						
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	V	Surveys include 16 unattended bat detectors (over a minimum of four nights), attended bat detectors (6 detector hours over a minimum of three nights) and harp traps and/or mist nets (16 trap/net nights over minimum four nights) (DEWHA, 2010a).	As above. In addition, during recent surveys (Biodiversity Monitoring Services, 2015a) an Anabat II Bat Detector was placed at all four detailed sites for one to two nights (for a total of six trap nights). Greg Richards and Associates (2005) also conducted Anabat surveys across 28 survey sites, with a total of 56 recording nights.	✓

[1] Threatened fauna species status under the TSC Act and/or EPBC Act (current at October 2015).
V = Vulnerable; E = Endangered; CE = Critically Endangered.

[2] Listed as 'Endangered' under the EPBC Act at the time of the controlled action decision (12 March 2015) and therefore assessed under the Commonwealth offset policy as 'Endangered' not 'Critically Endangered' (refer section 158A of the EPBC Act).

[3] This species was not listed under the EPBC Act at the time of the controlled action decision (12 March 2015) and therefore the listing is not relevant to the action (refer section 158A of the EPBC Act).

Relevant Plan/Agreements

Relevant plan/agreements are as follows:

- *National Recovery Plan for the Swift Parrot (Lathamus discolor)* (Birds Australia, 2011).
- *EPBC Act Referral Guidelines for the Vulnerable Koala* (DotE, 2014b).
- *Threat Abatement Plan for Competition and Land Degradation by Rabbits* (DEWHA, 2008a).
- *Threat Abatement Plan for Predation by the European Red Fox* (DEWHA, 2008b).
- *Threat Abatement Plan for Predation by Feral Cats* (DEWHA, 2008c).
- *EPBC Act Administrative Guidelines on Significance - Supplement for the Tiger Quoll (Southeastern Mainland Population) and the Use of 1080* (Department of the Environment and Heritage [DEH], 2004).
- *Threat Abatement Plan for Beak and Feather Disease Affecting Endangered Psittacine Species* (DEH, 2005).
- *National Recovery Plan for the Large-eared Pied Bat Chalinolobus dwyeri* (Department of Environment and Resource Management, 2011).
- *Draft EPBC Act Policy Statement 3.4 - Significant Impact Guidelines for the Endangered Spot-tailed Quoll Dasyurus maculatus maculatus (Southeastern Mainland Population) and the Use of 1080* (DEWHA, 2009).
- *Regent Honeyeater Recovery Plan - 1999-2003* (as *Xanthomyza phrygia*) (Menkhorst *et al.*, 1999) and *Draft National Recovery Plan for the Regent Honeyeater (Anthochaera phrygia) – July 2015* (DotE, 2015c).
- *Commonwealth Listing Advice on Ten Species of Bats* (Threatened Species Scientific Committee, 2001).
- *Commonwealth Listing Advice on Dasyurus maculatus maculatus (Spot-tailed Quoll, Spotted-tailed Quoll, Tiger Quoll)* (Threatened Species Scientific Committee, 2004).
- *Commonwealth Conservation Advice on Ozothamnus tesselatus* (Threatened Species Scientific Committee, 2008).
- *Commonwealth Listing Advice on Lathamus discolour (Swift Parrot)* (Threatened Species Scientific Committee, 2012a).
- *Commonwealth Conservation Advice on Phascolarctos cinereus (Combined Population in Queensland, New South Wales and the Australian Capital Territory)* (Threatened Species Scientific Committee, 2012b).
- *Listing Advice for Phascolarctos cinereus (Koala)* (Threatened Species Scientific Committee, 2012c).
- *Commonwealth Listing Advice on Chalinolobus dwyeri (Large-eared Pied Bat)* (Threatened Species Scientific Committee, 2012d).
- *Approved Conservation Advice for Anthochaera phrygia (Regent Honeyeater)* (Threatened Species Scientific Committee, 2015a).
- *Approved Conservation Advice for Nyctophilus corbeni (south-eastern long-eared bat)* (Threatened Species Scientific Committee, 2015b).
- *Commonwealth Listing Advice on White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* (Threatened Species Scientific Committee, 2006).

The action is not inconsistent with any relevant recovery plans, conservation advice or agreements.

B3 IMPACTS ON THREATENED SPECIES AND COMMUNITIES LISTED UNDER THE EPBC ACT

A description of all relevant impacts of the action (construction, operation and decommissioning) on flora and fauna are described in Section 3. Cumulative impacts are described in Section 3.1.4.

This section provides a detailed analysis of the nature and extent of the likely direct, indirect and consequential impacts relevant to specific protected matters, including likely short-term and long-term impacts. The assessments are in accordance with DotE (2013) *Significant Impact Guidelines 1.1: Matters of National Environmental Significance*.

The impacts of the action on protected matters are not unknown or unpredictable. The BAR Footprint would be rehabilitated and revegetated as described in Sections 3.1.1, 3.1.5 and 4.4.5. Final voids were approved as part of the existing Wilpinjong Coal Mine and are proposed as part of the action (Figure 14). As described in Section 3.1.2, the final voids have been designed to reduce the surface catchment to a minimum through the progressive backfilling of open cut pits to the natural surface and the use of upslope diversions and contour drains around their perimeter.

The impacts on protected matters would be localised and negligible on a regional, state and national scale.

Table B4 provides an assessment of adverse impacts on Box-Gum Woodland CEEC in accordance with DotE (2013) *Significant Impact Guidelines 1.1: Matters of National Environmental Significance*. The Box-Gum Woodland EEC is unlikely to be significantly impacted by the action given:

- the limited area of Box-Gum Woodland CEEC within the BAR Footprint (9.5 hectares [ha]); and
- occurrences of Box-Gum Woodland CEEC within the BAR Footprint are highly fragmented (i.e. 11 small patches ranging from 0.04 ha to 2.5 ha in size).

Table B4
Likelihood of a Significant Adverse Impact on Box-Gum Woodland CEEC

EPBC Act Assessment Criteria[1] Is the action likely to:	**Assessment**
Reduce the extent of an ecological community?	Box-Gum Woodland has a wide distribution from Victoria through NSW to south-eastern Queensland, with large amounts having been cleared for agricultural purposes. In NSW the community generally occurs west of the Great Divide, although there are substantial areas in the central and upper Hunter. Box-Gum Woodland CEEC has been mapped within the BAR Footprint, in the form of vegetation types MU10 *Yellow Box Woodland - grassy* (3.5 ha) and MU1a *Blakely's Red Gum Woodland - grassy* (6 ha). The occurrences of these vegetation types throughout the BAR Footprint are currently fragmented and occur as 11 small patches (Figure 7). These patches of Box-Gum Woodland CEEC are considered to be in *moderate/good* condition. The Box-Gum Woodland EEC within the BAR Footprint represents approximately 0.02 percent of the total Box-Gum Woodland community confirmed in the region (Table A3). Approximately 9.5 ha of the Box-Gum Woodland CEEC within the BAR Footprint would be cleared as a result of the action. However, the removal/modification of a portion of Box-Gum Woodland CEEC is unlikely have an adverse effect on the extent of this ecological community such that its local occurrence would be placed at risk of extinction given: • the limited area of Box-Gum Woodland CEEC within the BAR Footprint (9.5 ha); • the occurrences of Box-Gum Woodland CEEC within the BAR Footprint are highly fragmented (i.e. 11 small patches ranging from 0.04 ha to 2.49 ha in size); • the localised nature of the BAR Footprint disturbance compared to the wider distribution of the community; and

Table B4 (Continued)
Likelihood of a Significant Adverse Impact on Box-Gum Woodland CEEC

EPBC Act Assessment Criteria[1] Is the action likely to:	Assessment
Reduce the extent of an ecological community? (Cont.)	• the occurrence of this community in the areas surrounding the BAR Footprint the Wilpinjong Enhancement and Conservation Areas (ECAs) and Biodiversity Offset Areas (BOAs) (Wilpinjong Coal Pty Limited [WCPL], 2015) and in nearby Goulburn National Park (Hill, 1999).
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines?	Box-Gum Woodland CEEC within the BAR Footprint and immediate surrounds is in small fragments (i.e. 11 small patches ranging from 0.04 ha to 2.5 ha in size), each located on one side against continuous woodland of a different type and on the other, open grazing land. Thus fragmentation has already occurred as a consequence of early land clearing practises for agricultural purposes. The action would not result in material further fragmentation.
Adversely affect habitat critical to the survival of an ecological community?	The action would have no adverse effect on habitat critical to the survival of Box-Gum Woodland CEEC in the immediate region.
Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns?	Because the Box-Gum Woodland CEEC in the BAR Footprint consists of small and isolated remnant fragments there would be no impact on any remaining Box-Gum Woodland CEEC adjoining the BAR Footprint.
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting?	The isolated Box-Gum Woodland CEEC fragments in the BAR Footprint would be destroyed by the action. There would be no modification to remaining Box-Gum Woodland CEEC that would cause a decline in condition.
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: - assisting invasive species, that are harmful to the listed ecological community, to become established, or - causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or	The Box-Gum Woodland CEEC fragments within the BAR Footprint are isolated occurrences that would be lost due to the action proceeding. There would be no remaining Box-Gum Woodland CEEC in the immediate vicinity that might be impacted in the ways described.
Interfere with the recovery of an ecological community?	Agricultural land use (in particular grazing) adjoining Box-Gum Woodland CEEC fragments within the BAR Footprint means that under current conditions there was no opportunity for recovery of any pre-existing Box-Gum Woodland CEEC. Therefore the action would not interfere with recovery of this community.

[1] As defined by the *Matters of National Environmental Significance Significant Impact Guidelines 1.1* (DotE, 2013).

Table B5 provides an assessment of adverse impacts on *Ozothamnus tesselatus* in accordance with DotE (2013) *Significant Impact Guidelines 1.1: Matters of National Environmental Significance*. In conclusion, *Ozothamnus tesselatus* is unlikely to be significantly impacted by the action given that the sub-populations within the BAR Footprint are part of a substantial metapopulation.

Table B5
Likelihood of a Significant Adverse Impact on *Ozothamnus tesselatus*

EPBC Act Assessment Criteria[1] Is the action likely to:	**Assessment**
Lead to a long-term decrease in the size of an important population of a species?	*Ozothamnus tesselatus* is listed as 'Vulnerable' under both the TSC Act and EPBC Act, and has been recorded within the BAR Footprint. This plant is a member of the daisy family (Asteraceae) and is a low spindly shrub to approximately one metre tall, generally growing in isolated groups of a few to several thousand plants. Three populations of *Ozothamnus tesselatus* were found within or partly within the BAR Footprint as follows: • At the central eastern edge of Pit 7, 244 plants (Hunter Eco, 2015); • At the south-eastern edge of Pit 8, 30 plants (Hunter Eco, 2015); • At the south-eastern corner of Pit 8, 816 plants (Lesryk Environmental Consultants, 2013; Hunter Eco, 2015). The Pit 7 population was found within MU10a White Box Woodland (shrubby) and the Pit 8 populations within MU12 Narrow-leaved Ironbark Forest. All individuals were flagged (Hunter Eco, 2015) and subsequently it was determined that of the total 1090 individuals, 589 would be lost due to the action. The next-nearest known occurrence is approximately seven kilometres east-northeast of the Pit 8 populations with the number of individuals unknown. Approximately eight kilometres northeast a very large population was found in proposed Offset 3. A physical count of 3908 individuals was extrapolated over the bounds of the surveyed area resulting in an estimate of 6458 individuals. Following subsequent meanders it was discovered that this was only part of an even more extensive population, potentially >10,000 individuals. There is also a record from 1967 approximately 9 kilometres (km) south-west of the BAR Footprint within Munghorn Gap Nature Reserve; this is the most westerly record for the species. In the foothills surrounding Bylong Valley, approximately 15 km south-east of the BAR Footprint, just under 20,000 plants have been recorded from 26 locations. Within the approximately 8 kilometre gap between the known populations there are large areas of potential habitat that have not been searched. It is reasonable to assume that other populations are present that could then form a network of genetic stepping stones between them. It is therefore conceivable that the known populations are all parts of a regional metapopulation with occasional transfer of genetic material between subpopulations in the form of pollen carried by insect pollinators. *Ozothamnus tesselatus* are known to be pollinated by flies, bees, butterflies and beetles (Hingston and Quillan, 2000) many of which can cross large distances. The loss of 589 plants due to the action would not place the presumed viable local metapopulation at risk of extinction.
Reduce the area of occupancy of an important population?	The *Ozothamnus tesselatus* to be cleared as part of the action do not comprise an important population.
Fragment an existing important population into two or more populations?	The *Ozothamnus tesselatus* to be cleared as part of the action do not comprise an important population.
Adversely affect habitat critical to the survival of a species?	It is clear that the species is plentiful in the immediate region so the loss of habitat associated with the action would not be critical to the survival of the species.
Disrupt the breeding cycle of an important population?	The *Ozothamnus tesselatus* to be cleared as part of the action do not comprise an important population.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	The action would have no impact on the habitat of the species to the extent that the species would be likely to decline.

Table B5 (Continued)
Likelihood of a Significant Adverse Impact on *Ozothamnus tesselatus*

EPBC Act Assessment Criteria[1] Is the action likely to:	**Assessment**
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?	The action would not result in invasive species becoming established in *Ozothamnus tesselatus* habitat.
Introduce disease that may cause the species to decline?	There are no known diseases that might affect *Ozothamnus tesselatus*.
Interfere substantially with the recovery of the species?	The NSW *Priority Action Statement for Ozothamnus tesselatus* (Department of Environment and Climate Change [DECC], 2005) lists recovery actions for this species, and the *Goulburn River National Park and Munghorn Gap Nature Reserve – Plan of Management* (NSW National Parks and Wildlife Service, 2003) is also relevant to this species. The action is not inconsistent with the actions listed in this plan.

[1] As defined by the *Matters of National Environmental Significance Significant Impact Guidelines 1.1* (DotE, 2013).

Table B6 provides an assessment of adverse impacts on Regent Honeyeater in accordance with DotE (2013) *Significant Impact Guidelines 1.1: Matters of National Environmental Significance*. In conclusion, the Regent Honeyeater is unlikely to be significantly impacted by the action given:

- the localised nature of the potential habitat in the BAR Footprint compared to the wider distribution of the species;
- the lack of breeding records for this species within the BAR Footprint (although it is possible individuals of this species could breed in the extant habitat from time to time); and
- the greater extent of habitat in the locality.

Table B6
Likelihood of a Significant Adverse Impact on the Regent Honeyeater

EPBC Act Assessment Criteria[1] Is the action likely to:	**Assessment**
Lead to a long-term decrease in the size of a population of a species?	The Regent Honeyeater (*Anthochaera phrygia*) is listed as 'Critically Endangered' under both the TSC Act and EPBC Act. These birds are itinerant, generally following the flowering of a variety of eucalypts and other species, with their main food source being nectar, supplemented by various insects and arthropods. Distribution is patchy across eastern NSW and inland, to northern Victoria. The species is not at the limit of its range in or near the BAR Footprint. In NSW there are two main breeding areas, being Capertee Valley and the Bundarra-Barraba regions (Office of the Environment and Heritage [OEH] 2015a). The Regent Honeyeater has not been recorded within the BAR Footprint. However, DECC (2005) have provided records for this species within ML 1573, outside the area of disturbance for the action. There are also database records for this species within ML 1573 (BirdLife Australia, 2014; OEH, 2015b). There are no known breeding sites within the BAR Footprint. The closest known breeding area for this species is approximately 100 km south of the action at Capertee Valley (OEH, 2015a). Primary eucalypt resources occurring in the Wilpinjong area are Mugga Ironbark, Yellow Box, Blakely's Red Gum and White Box. The latter three being components of the threatened ecological community Box-Gum Woodland. However, there are also several other species utilised by the Regent Honeyeater (OEH, 2015a) that are abundant in the area (Driscoll and Bell in progress): *Eucalyptus microcarpa, E. punctata, E. polyanthemos, E. moluccana, E. crebra, E. caleyi, E. macrorhyncha, E. laevopinea, Angophora floribunda* and mistletoe species. Within approximately 10 km of the BAR Footprint there is approximately 30,000 ha of forest/woodland, a high proportion of which contains suitable resources for this bird.

Table B6 (Continued)
Likelihood of a Significant Adverse Impact on the Regent Honeyeater

EPBC Act Assessment Criteria[1] Is the action likely to:	**Assessment**
Lead to a long-term decrease in the size of a population of a species? (Cont.)	The action would result in the removal/modification of approximately 273 ha of potential general foraging habitat for the Regent Honeyeater (9.5 ha of which is Box-Gum Woodland EEC/CEEC). Considering the above, it is possible that a local population of this species could occur within the BAR Footprint, given the occurrence of potential habitat resources and records of the species within the footprint. However, the removal/modification of a portion of habitat for this species is unlikely to lead to a long-term decrease in the size of a local viable population of this species given: • the localised nature of the BAR Footprint disturbance compared to the wider distribution of the species; • the lack of breeding habitat for this species within the BAR Footprint (although it is possible individuals of this species could breed in the extant habitat from time to time); and • the greater extent of habitat in the locality. A number of measures would be implemented for the action to minimise potential impacts on flora and fauna which would be relevant to occurrences of this species within the BAR Footprint and adjacent park and reserve areas including: • Vegetation clearance protocol. • Progressive rehabilitation. • Weed and pest management. Therefore, removal/modification of these areas of habitat would have negligible impact on resources for this bird and would not lead to a decrease in the size of a population.
Reduce the area of occupancy of a population?	It is probable that Regent Honeyeater recorded in the Wilpinjong area dispersed from the Capertee Valley breeding population, approximately 100 km to the south. The action would not reduce the area of occupancy of this population.
Fragment an existing important population into two or more populations?	Vegetation lost due to the action is in isolated patches, on one side against open grazing land and the other against large areas of remnant vegetation. The loss of these patches would not fragment the wider Regent Honeyeater population.
Adversely affect habitat critical to the survival of a species?	The *Draft National Recovery Plan for the Regent Honeyeater (Anthochaera phrygia) – July 2015* (DotE, 2015d) defines critical habitat for the species as *"Any 'breeding areas' or regions where the species is 'likely' to occur"* and *"Any newly discovered 'breeding' or foraging locations that extend the 'likely' range of the regent honeyeater*". Despite the modification/removal of a small area of potential habitat within the BAR Footprint, the action is not considered to have a significant impact on critical habitat for the Regent Honeyeater, as an abundance of similar vegetation occurs within the surrounding Goulburn River National Park and Munghorn Gap Nature Reserve, and would not be impacted by the action.
Disrupt the breeding cycle of a population?	There is no record of breeding in the Wilpinjong area, with a key breeding area in the Capertee Valley (DotE, 2015d). The action would not disrupt the breeding cycle of the wider Regent Honeyeater population.

Table B6 (Continued)
Likelihood of a Significant Adverse Impact on the Regent Honeyeater

EPBC Act Assessment Criteria[1] Is the action likely to:	**Assessment**
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	The habitat which would be removed/modified as a result of the action is expected to have a negligible impact on resources for this bird and would not lead the species declining.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat?	The NSW Scientific Committee has determined that Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners (*Manorina melanocephala*) constitutes a key threatening process. Noisy Miners are found along eastern Australia and inland and inhabit fragmented, sparsely vegetated habitat. Increased clearing has resulted in increased numbers of this highly territorial and aggressive bird. The Scientific Committee determination lists the Regent Honeyeater as being driven away from normally suitable habitat by Noisy Miners. Recent bird surveys in and around the BAR Footprint (Biodiversity Monitoring Services, 2013) show that while Noisy Miners are present, there is also good representation of birds such as honeyeaters, pardalotes and thornbills. This indicates that Noisy Miners in and around the BAR Footprint do not dominate. The action would not result in habitat fragmentation or clearing that would result in an increase in the Noisy Miner population.
Introduce disease that may cause the species to decline?	There are no known diseases that could be introduced by the action that would affect the Regent Honeyeater.
Interfere with the recovery of the species?	The action would not have a negative impact on Regent Honeyeater numbers, or significantly reduce available resources in the immediate region. Thus the action would not interfere with the recovery of the species.

[1] As defined by the *Matters of National Environmental Significance Significant Impact Guidelines 1.1* (DotE, 2013).

Table B7 provides an assessment of adverse impacts on Swift Parrot in accordance with DotE (2013) *Significant Impact Guidelines 1.1: Matters of National Environmental Significance*. In conclusion, the Swift Parrot unlikely to be significantly impacted by the action given:

- the localised nature of the potential habitat in the BAR Footprint compared to the wider distribution of the species;
- this species does not breed in NSW;
- the nomadic (or partially nomadic) nature of this species; and
- the greater extent of habitat in the locality.

Table B7
Likelihood of a Significant Adverse Impact on the Swift Parrot

EPBC Act Assessment Criteria[1] Is the action likely to:	**Assessment**
Lead to a long-term decrease in the size of a population of a species?	The Swift Parrot (*Lathamus discolour*) is listed as 'Endangered' under both the TSC Act and EPBC Act. This species is specifically nominated in the action SEARs as a protected matter relating to a controlling provision. Within the assessment below, further consideration is given to the impacts on the Swift Parrot. This bird breeds in Tasmania and migrates to the Australian mainland for Autumn and Winter. In NSW, the Swift Parrot mostly occurs on the coast and the south west slopes. This species forages on flowering eucalypts and lerp infestations (OEH, 2015a). There are no field-validated records of the Swift Parrot from within the BAR Footprint or immediate surrounds. An OEH database record from 2014 for this species exists approximately 3.5 km north west of the BAR Footprint (OEH, 2015b) (Figure 8). The BAR Footprint provides potential foraging and roosting habitat for this species, however no breeding habitat for this species exists within the BAR Footprint as this species migrates to Tasmania to breed. There are several flowering eucalypt species utilised by the Swift Parrot (OEH, 2015a) that are abundant in the area. More broadly, ecological data provided in the Swift Parrot's species profile in the NSW Atlas of NSW Wildlife (OEH, 2015a) indicates that the Swift Parrot utilises a large number of vegetation communities occurring within the BAR Footprint. Within approximately 10 km of the action Area there is approximately 30,000 ha of forest/woodland, a high proportion of which contains suitable resources for this species. The action would result in the removal/modification of approximately 354 ha of potential foraging habitat for the Swift Parrot. Considering the above, it is possible that members of the Swift Parrot population could occur within the BAR Footprint, given the occurrence of potential habitat resources and records of the species within the footprint. However, the removal/modification of a portion of habitat for this species is unlikely to lead to a long-term decrease in the size of the Swift Parrot population given: • the localised nature of the BAR Footprint disturbance compared to the wider distribution of the species; • this species does not breed in NSW; • the nomadic (or partially nomadic) nature of this species; and • the greater extent of habitat in the locality. A number of measures would be implemented for the action to minimise potential impacts on flora and fauna which would be relevant to occurrences of this species within the BAR Footprint and adjacent park and reserve areas including: • Vegetation clearance protocol. • Progressive rehabilitation. • Weed and pest management. Therefore, removal/modification of these areas of habitat would have negligible impact on resources for this bird and would not lead to a decrease in the size of the population.
Reduce the area of occupancy of a population?	The Swift Parrot breeds during summer within Tasmania and migrates in Autumn and Winter to mainland Australia as far north as the Queensland border. The action would not reduce the area of occupancy of the population.
Fragment an existing important population into two or more populations?	Vegetation lost due to the action is in isolated patches, on one side against open grazing land and the other against large areas of remnant vegetation. The loss of these patches would not fragment the wider Swift Parrot population.
Adversely affect habitat critical to the survival of a species?	As records across this bird's distribution indicate, along with its nomadic habit following nectar resources in particular, there is a broad geographic range of available habitat. The only habitat critical to the survival of the species would be that in known breeding areas. Such habitat does not occur in or near the BAR Footprint.
Disrupt the breeding cycle of a population?	There is no record of breeding in the Wilpinjong area, as breeding for this species is limited to Tasmania. The action would not disrupt the breeding cycle of the Swift Parrot population.

Table B7 (Continued)
Likelihood of a Significant Adverse Impact on the Swift Parrot

EPBC Act Assessment Criteria[1] Is the action likely to:	Assessment
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	The habitat which would be removed/modified as a result of the action is expected to have a negligible impact on resources for this bird and would not lead to the species declining.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat?	The NSW Scientific Committee has determined that aggressive exclusion of birds from known foraging sites by abundant Noisy Miners (*Manorina melanocephala*) constitutes a threat to the Swift Parrot. Noisy Miners are found along eastern Australia and inland and inhabit fragmented, sparsely vegetated habitat. Increased clearing has resulted in increased numbers of this highly territorial and aggressive bird. Recent bird surveys in and around the BAR Footprint (Biodiversity Monitoring Services, 2013) show that while Noisy Miners are present, there is also good representation of birds such as honeyeaters, pardalotes and thornbills. This indicates that Noisy Miners and Common Starlings in and around the BAR Footprint do not dominate. The action would not result in habitat fragmentation or clearing that would result in an increase in the Noisy Miner populations. Feral animals would continue to be managed through weed prevention, control and monitoring measures. With the implementation of management measures, the potential impacts to native flora and fauna associated with feral animals is likely to be low.
Introduce disease that may cause the species to decline?	Beak and feather disease is an infectious disease affecting parrots, caused by the beak and feather disease circovirus. The beak and feather disease virus can be introduced to endangered populations of parrots via the movements of common species carrying the disease. Lesions suggestive of the virus have been reported in the Swift Parrot (DotE, 2015b). The action is not inconsistent with the actions listed in the *Threat Abatement Plan for Beak and Feather Disease Affecting Endangered Psittacine Species* (DEH, 2005). The action is not likely to introduce beak and feather disease to the Swift Parrot population.
Interfere with the recovery of the species?	The action would not have a negative impact on Swift Parrot numbers, or significantly reduce available resources in the immediate region. Recovery actions for the Swift Parrot are listed in the *National Recovery Plan for the Swift Parrot (Lathamus discolor)* (Birds Australia, 2011). The action is not inconsistent with the actions listed in this plan. Thus the action would not interfere with the recovery of the species.

[1] As defined by the *Matters of National Environmental Significance Significant Impact Guidelines 1.1* (DotE, 2013).

Table B8 provides an assessment of adverse impacts on Koala in accordance with DotE (2013) *Significant Impact Guidelines 1.1: Matters of National Environmental Significance*. In conclusion, the Koala is unlikely to be significantly impacted by the action given:

- the localised nature of the potential habitat in the BAR Footprint compared to the wider distribution of the species;
- the lack of records for this species within the BAR Footprint (although it is possible individuals of this species could move through the area from time to time); and
- the greater extent of habitat in the locality known to be used by the species.

Table B8
Likelihood of a Significant Adverse Impact on the Koala

EPBC Act Assessment Criteria[1] Is the action likely to:	**Assessment**
Lead to a long-term decrease in the size of an important population of a species?	The Koala (*Phascolarctos cinereus*) is listed as 'Vulnerable' under both the TSC Act and EPBC Act. This species is specifically nominated in the action SEARs as a protected matter relating to a controlling provision. Within the assessment below, further consideration is given to the impacts on the Koala. Koalas are widespread across most of NSW, and eastern and southern Australia. The animal browses on eucalypt leaves, with known species preferences. Preferred feed trees are listed in the NSW Koala Approved Recovery Plan (Department of Environment and Climate Change, 2008) and include *Eucalyptus blakelyi*, *Eucalyptus melliodora*, *Eucalyptus albens*, all of which occur in the BAR Footprint. A Koala was sighted in March 2013 (Figure 9) just south of the BAR Footprint along Wollar Road. It is likely that this was an itinerate animal because despite many hours of targeted field surveys in accordance with the *EPBC Act Referral Guidelines for the Vulnerable Koala* (DotE, 2014b) from 2005 to 2015, no other Koalas have been sighted. There is a single database record for this species from 1957 along Wollar Creek (OEH, 2015b) (Figure 9). There are no recent database records. There is no evidence of Koala breeding within the locality. The action would result in the removal/modification of approximately 354 ha of potential habitat resources for the Koala (Figure 12) and may disrupt foraging and shelter for the Koala (were this species to occur). Considering the above, it is possible (but unlikely)for a local population of this species to occur within the BAR Footprint, given the occurrence of potential habitat resources and records of the species within the proximity the BAR Footprint. However, the removal/modification of a portion of habitat for the Koala is unlikely to disrupt the lifecycle such that a local viable population of this species would be placed at risk of extinction given: • the localised nature of the potential habitat in the BAR Footprint compared to the wider distribution of the species; • the lack of records for this species within the BAR Footprint (although it is possible individuals of this species could move through the area from time to time); and • the greater extent of habitat in the locality known to be used by the species. A number of measures would be implemented for the action to minimise potential impacts on flora and fauna which would be relevant to occurrences of this species within the BAR Footprint and adjacent park and reserve areas including progressive site rehabilitation, vegetation clearance protocol as well as weed and feral animal management (WCPL, 2015).
Reduce the area of occupancy of an important population?	There is no evidence of Koala breeding within the locality. The action would not reduce the area of occupancy of a population.
Fragment an existing important population into two or more populations?	Vegetation lost due to the action is in isolated patches, on one side against open grazing land and the other against large areas of remnant vegetation. The loss of these patches would not fragment the wider Koala population.
Adversely affect habitat critical to the survival of a species?	No critical habitat for the Koala has been mapped within the BAR Footprint or immediate surrounds.
Disrupt the breeding cycle of an important population?	There is no evidence of Koala breeding within the locality. The action would not disrupt the breeding cycle of the wider Koala population.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	The habitat which would be removed/modified as a result of the action is expected to have a negligible impact on resources for this species and would not lead the species declining.

Table B8 (Continued)
Likelihood of a Significant Adverse Impact on the Koala

EPBC Act Assessment Criteria[1] Is the action likely to:	**Assessment**
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?	Bell Miners (*Manorina melanophrys*) and the European Red Fox (*Vulpes vulpes*) are considered threats to the Koala (DECC, 2008b). The Bell Miner was not recorded during the recent surveys by Biodiversity Monitoring Services (2015a) (Attachment D), however, surveys did record the European Red Fox. The action would involve the same potential impacts from feral animals as the existing/approved Wilpinjong Coal Mine. Feral animals would continue to be managed through prevention, control and monitoring measures. With the implementation of management measures, the potential impacts to Koala associated with feral animals is likely to be low. The action is not inconsistent with the *Threat Abatement Plan for Predation by the European Red Fox* (DEWHA, 2008b).
Introduce disease that may cause the species to decline?	Koalas in NSW carry the pathogens *Chlamydia* spp. However, clinical signs of this infection, chlamydiosis, are expressed when animals are exposed to environmental stresses such as loss of habitat, harassment by predators, nutritional stress or overcrowding. Reduced fertility as a result of chlamydiosis is thought to naturally regulate populations to prevent them from exceeding the carrying capacity of their habitat, thus preventing overbrowsing (DECC, 2008b). However, some of the more harmful strains of Chlamydia are not natural infections of koalas, but recently derived from cows and sheep (DECC, 2008b). Therefore, Chlamydial disease should still be considered a threat to Koala populations in spite of the popular belief that the long-term survival of koalas is not threatened by Chlamydia. The action is not likely to introduce unnatural Chlamydial infections into the NSW Koala population, nor is it likely to exacerbate the existing Chlamydial disease of any local Koala populations (should they occur).
Interfere substantially with the recovery of the species?	The action would not have a negative impact on Koala numbers, or significantly reduce available resources in the immediate region. Recovery actions for the Koala are listed in the DECC *Recovery Plan for the Koala (Phascolarctos cinereus)* (DECC, 2008b). The action is not inconsistent with the actions listed in this plan. Thus the action would not interfere with the recovery of the species.

[1] As defined by the *Matters of National Environmental Significance Significant Impact Guidelines 1.1* (DotE, 2013).

Table B9 provides an assessment of adverse impacts on Brush-tailed Rock-wallaby in accordance with DotE (2013) *Significant Impact Guidelines 1.1: Matters of National Environmental Significance*. In conclusion, the Brushed-tailed Rock-wallaby is unlikely to be significantly impacted by the action given:

- the localised nature of the potential habitat in the BAR Footprint compared to the wider distribution of the species;
- lack of records for this species within the BAR Footprint (although it is possible individuals of this species could move through the area from time to time); and
- the greater extent of habitat in the locality known to be used by the species.

Table B9
Likelihood of a Significant Adverse Impact on the Brush-tailed Rock-wallaby

EPBC Act Assessment Criteria[1] Is the action likely to:	**Assessment**
Lead to a long-term decrease in the size of an important population of a species?	The Brush-tailed Rock-wallaby (*Petrogale penicillata*) is listed as 'Endangered' under the TSC Act and 'Vulnerable' under the EPBC Act. Distributed from coastal NSW, inland to the central west, this wallaby is found in structurally complex rocky escarpments, often facing north (OEH, 2015a). The Brush-tailed Rock-wallaby has not been recorded within the BAR Footprint or immediate surrounds. There is a single database record for this species from 2009 within the nearby Goulburn River National Park (OEH, 2015b) (Figure 9). There are some areas within the BAR Footprint which provide potential foraging habitat for this species. There is no evidence of Brush-tailed Rock-wallaby breeding within the BAR Footprint or immediate surrounds. Further, the habitat within the BAR Footprint is not considered to contain the structural complexity required for breeding for this species. Considering the above, it is possible (but unlikely) that a local population of this species could occur within the BAR Footprint, given the occurrence of potential habitat resources and database records of the species near the footprint. However, the removal/modification of a portion of habitat for this species is unlikely to disrupt the lifecycle such that a local viable population of this species would be placed at risk of extinction given: • the localised nature of the potential habitat in the BAR Footprint compared to the wider distribution of the species; • the lack of records for this species within the BAR Footprint (although it is possible individuals of this species could move through the area from time to time); and • the greater extent of habitat in the locality known to be used by the species (a database record exists for the Brush-tailed Rock Wallaby within the nearby Goulburn National Park [OEH, 2015b] [Figure 9]). A number of measures would be implemented for the action to minimise potential impacts on flora and fauna which would be relevant to occurrences of this species within the BAR Footprint and adjacent park and reserve areas including progressive site rehabilitation, vegetation clearance protocol as well as weed and feral animal management (WCPL, 2015).
Reduce the area of occupancy of an important population?	There is no evidence of Brush-tailed Rock-wallaby breeding within the BAR Footprint or immediate surrounds. Further, the habitat within the BAR Footprint is not considered to contain the structural complexity required for breeding for this species. The action would not reduce the area of occupancy of a population.
Fragment an existing important population into two or more populations?	Vegetation lost due to the action is in isolated patches, on one side against open grazing land and the other against large areas of remnant vegetation. The loss of these patches would not fragment the wider Brush-tailed Rock-wallaby population.
Adversely affect habitat critical to the survival of a species?	No critical habitat for this species has been identified (DotE, 2015b). Further, the habitat within the BAR Footprint is not considered to contain the structural complexity required for breeding for this species. The action would not adversely affect habitat critical to the survival of the Brush-tailed Rock-wallaby.
Disrupt the breeding cycle of an important population?	There is no evidence of Brush-tailed Rock-wallaby breeding within the BAR Footprint or immediate surrounds. Further, the habitat within the BAR Footprint is not considered to contain the structural complexity required for breeding for this species. The action would not disrupt the breeding cycle of the wider Brush-tailed Rock-wallaby population.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	The habitat which would be removed/modified as a result of the action is expected to have a negligible impact on resources for this species and would not lead the species declining.

Table B9 (Continued)
Likelihood of a Significant Adverse Impact on the Brush-tailed Rock-wallaby

EPBC Act Assessment Criteria[1] Is the action likely to:	Assessment
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?	Invasive species can pose a threat to the Brush-tailed Rock-wallaby through predation (e.g. foxes, cats, dogs), competition (e.g. goats, rabbits) and disease susceptibility (e.g. sheep, feral cats) (DotE, 2015b). Biodiversity Monitoring Services (2015a) (Attachment D) recorded the European Red Fox, European Rabbit (*Oryctolagus cuniculus*) and Sheep (*Ovis aries*). The Feral Cat was not recorded during surveys (Biodiversity Monitoring Services, 2015a). The action would involve the same potential impacts from feral animals as the existing/approved Wilpinjong Coal Mine. Feral animals would continue to be managed through control and monitoring measures. With the implementation of management measures, the potential impacts to native flora and fauna associated with feral animals is likely to be low. The action is not inconsistent with the *Threat Abatement Plan for Predation by the European Red Fox* (DEWHA, 2008b), *Threat Abatement Plan for Competition and Land Degradation by Rabbits* (DEWHA, 2008a) or *Threat Abatement Plan for Predation by Feral Cats* (DEWHA, 2008c).
Introduce disease that may cause the species to decline?	Little is known about disease in wild populations of Brush-tailed Rock-wallaby (DotE, 2015b). It is possible that Sheep can infect Brush-tailed Rock-wallabies with hydatidosis (DotE, 2015b). Feral Cats also potentially carry diseases problematic to rock-wallabies such as toxoplasmosis and hydatidosis (DotE, 2015b). Biodiversity Monitoring Services (2015a) (Attachment D) recorded the Sheep (*Ovis aries*). The Feral Cat was not recorded during surveys (Biodiversity Monitoring Services, 2015a). Feral animals would continue to be managed through control and monitoring measures. With the implementation of management measures, the potential impacts to native flora and fauna associated with feral animals is likely to be low. The action is not likely to introduce diseases to the wider Brush-tailed Rock-wallaby population such that the species is likely to decline.
Interfere substantially with the recovery of the species?	The action would not have a negative impact on Brush-tailed Rock-wallaby numbers, or significantly reduce available resources in the immediate region. Thus, the action would not interfere with the recovery of the species.

[1] As defined by the *Matters of National Environmental Significance Significant Impact Guidelines 1.1* (DotE, 2013).

Table B10 provides an assessment of adverse impacts on Spotted-tailed Quoll in accordance with DotE (2013) *Significant Impact Guidelines 1.1: Matters of National Environmental Significance*. In conclusion, the Spotted-tailed Quoll is unlikely to be significantly impacted by the action given:

- the localised nature of the potential habitat in the BAR Footprint compared to the wider distribution of the species;
- lack of records for this species within the BAR Footprint (although it is possible individuals of this species could move through the area from time to time); and
- the greater extent of habitat in the locality.

Table B10
Likelihood of a Significant Adverse Impact on the Spotted-tailed Quoll

EPBC Act Assessment Criteria[1] Is the action likely to:	**Assessment**
Lead to a long-term decrease in the size of a population of a species?	The Spotted-tailed Quoll (*Dasyurus maculatus*) is listed as 'Vulnerable' under the EPBC Act. This species is a habitat generalist using anything from wet forest to open dry woodland. Females have a home range of around 750 ha and males up to 3,500 ha (OEH, 2015a). There are no records of this species from within the BAR Footprint or surrounds. However, there are several records from within approximately 15 km of the BAR Footprint (OEH, 2015b). Potential habitat for this species exists within the BAR Footprint and would be impacted by the action. Considering the above, it is possible that the BAR Footprint forms part of a home range for the species, given the occurrence of potential habitat resources and database records of the species in the locality. However, the removal/modification of a portion of habitat for this species is unlikely to disrupt the lifecycle such that a local viable population of this species would be placed at risk of extinction given: • the localised nature of the potential habitat in the BAR Footprint compared to the wider distribution of the species; • the lack of records for this species within the BAR Footprint; and • the greater extent of habitat in the locality. A number of measures would be implemented for the action to minimise potential impacts on flora and fauna which would be relevant to occurrences of this species within the BAR Footprint and adjacent park and reserve areas including progressive site rehabilitation, vegetation clearance protocol as well as weed and feral animal management (WCPL, 2015).
Reduce the area of occupancy of a population?	There are no records of the Spotted-tailed Quoll within the BAR Footprint or immediate surrounds, and no evidence of breeding of this species. The action would not reduce the area of occupancy of a population.
Fragment an existing important population into two or more populations?	Vegetation lost due to the action is in isolated patches, on one side against open grazing land and the other against large areas of remnant vegetation. The loss of these patches would not fragment any wider Spotted-tailed Quoll population.
Adversely affect habitat critical to the survival of a species?	No critical habitat for the Spotted-tailed Quoll has been mapped within the BAR Footprint or immediate surrounds.
Disrupt the breeding cycle of a population?	There are no records of the Spotted-tailed Quoll within the BAR Footprint or immediate surrounds, and no evidence of breeding of this species. The action would not disrupt the breeding cycle of any wider Spotted-tailed Quoll population.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	The habitat which would be removed/modified as a result of the action is expected to have a negligible impact on resources for this species and would not lead the species declining.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat?	Invasive species can pose a threat to the Spotted-tailed Quoll through predation (e.g. foxes, dingos, dogs), competition (e.g. cats, foxes) and poisoning (e.g. Cane Toad [*Bufo marinus*]) (DotE, 2015b). Biodiversity Monitoring Services (2015a) (Attachment D) recorded the European Red Fox. The Dingo (*Canis lupus dingo*), Domestic Dog (*Canis lupus familiaris*), Feral Cat (*Felis catus*) and Cane Toad were not recorded during surveys (Biodiversity Monitoring Services, 2015a). The action would involve the same potential impacts from feral animals as the existing/approved Wilpinjong Coal Mine. Feral animals would continue to be managed through control and monitoring measures. With the implementation of management measures, the potential impacts to native flora and fauna associated with feral animals is likely to be low. The action is not inconsistent with the *Threat Abatement Plan for Predation by the European Red Fox* (DEWHA, 2008b), or *Threat Abatement Plan for Predation by Feral Cats* (DEWHA, 2008c).
Introduce disease that may cause the species to decline?	There are no known diseases that could be introduced by the action that would affect the Spotted-tailed Quoll.
Interfere with the recovery of the species?	The action would not have a negative impact on Spotted-tailed Quoll numbers, or significantly reduce available resources in the immediate region. Thus the action would not interfere with the recovery of the species.

[1] As defined by the *Matters of National Environmental Significance Significant Impact Guidelines 1.1* (DotE, 2013).

Table B11 provides an assessment of adverse impacts on Corben's Long-eared Bat in accordance with DotE (2013) *Significant Impact Guidelines 1.1: Matters of National Environmental Significance*. In conclusion, this Corben's Long-eared Bat is unlikely to be significantly impacted by the action given:

- the localised nature of the habitat in the BAR Footprint compared to the wider distribution of the species; and
- the greater extent of habitat in the locality known to be used by the species.

Table B11
Likelihood of a Significant Adverse Impact on the Corben's Long-eared Bat

EPBC Act Assessment Criteria[1] Is the action likely to:	**Assessment**
Lead to a long-term decrease in the size of an important population of a species?	Corben's Long-eared Bat (*Nyctophilus corbeni*) is listed as 'Vulnerable' under the EPBC Act. This bat is widespread across central western NSW, inhabiting a variety of woodland vegetation. It hunts non-flying prey such as caterpillars and beetles (OEH, 2015a). Corben's Long-eared Bat has been recorded within the BAR Footprint by Biodiversity Monitoring Services (2015a) (Figure 9). Biodiversity Monitoring Services (2015b) (Attachment H) also recorded this species in nearby Munghorn Gap Nature Reserve (Figure 9). Two database records for this species exist in the surrounds of the BAR Footprint in Goulburn River National Park (OEH, 2015b) (Figure 9). Suitable habitat for this species exists within the BAR Footprint. Considering the above, it is possible that a local population of this species could use the BAR Footprint as part of a foraging range, given the occurrence of potential habitat resources and database records of the species in the locality. However, the removal/modification of a portion of habitat for this species is unlikely to disrupt the lifecycle such that a local viable population of this species would be placed at risk of extinction given: • the localised nature of the habitat in the BAR Footprint compared to the wider distribution of the species; • the greater extent of habitat in the locality known to be used by the species (Corben's Long-eared Bat has been recorded within nearby Munghorn Gap Nature Reserve [Biodiversity Monitoring Services, 2015b] [Figure 9]. A number of measures would be implemented for the action to minimise potential impacts on flora and fauna which would be relevant to occurrences of this species within the BAR Footprint and adjacent park and reserve areas including progressive site rehabilitation, vegetation clearance protocol as well as weed and feral animal management (Table 14 of the main report) (WCPL, 2015)
Reduce the area of occupancy of an important population?	There is no evidence of Corben's Long-eared Bat breeding within the BAR Footprint. The action would not reduce the area of occupancy of a population.
Fragment an existing important population into two or more populations?	Vegetation lost due to the action is in isolated patches, on one side against open grazing land and the other against large areas of remnant vegetation. The loss of these patches would not fragment the wider Corben's Long-eared Bat population.
Adversely affect habitat critical to the survival of a species?	No critical habitat for Corben's Long-eared Bat has been mapped within the BAR Footprint or immediate surrounds.
Disrupt the breeding cycle of an important population?	There is no evidence of Corben's Long-eared Bat breeding within the BAR Footprint. The action would not disrupt the breeding cycle of the wider Corben's Long-eared Bat population.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	The habitat which would be removed/modified as a result of the action is expected to have a negligible impact on resources for this species and would not lead the species declining.

Table B11 (Continued)
Likelihood of a Significant Adverse Impact on the Corben's Long-eared Bat

EPBC Act Assessment Criteria[1] Is the action likely to:	**Assessment**
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?	The impact of feral predation is unknown but has been documented as a threat for bat species closely related to Corben's Long-eared Bat (DotE, 2015b). Bats have been recorded being evicted from tree hollows by feral species, including the Common Starling (DotE, 2015b). Recent bird surveys in and around the BAR Footprint (Biodiversity Monitoring Services, 2013) show that while Common Starlings are present, there is also good representation of native bird and tree-dwelling bat species. This indicates that Common Starlings in and around the BAR Footprint do not dominate tree hollows. The action would not result in habitat fragmentation or clearing that would result in an increase in the Common Starling populations. Feral animals would continue to be managed through, control and monitoring measures. With the implementation of management measures, the potential impacts to native flora and fauna associated with feral animals is likely to be low.
Introduce disease that may cause the species to decline?	There are no known diseases that could be introduced by the action that would affect Corben's Long-eared Bat.
Interfere substantially with the recovery of the species?	The action would not have a negative impact on Corben's Long-eared Bat numbers, or significantly reduce available resources in the immediate region. Thus the action would not interfere with the recovery of the species.

[1] As defined by the *Matters of National Environmental Significance Significant Impact Guidelines 1.1* (DotE, 2013).

Table B12 provides an assessment of adverse impacts on Large-eared Pied Bat in accordance with DotE (2013) *Significant Impact Guidelines 1.1: Matters of National Environmental Significance*. In conclusion, the Large-eared Pied Bat is unlikely to be significantly impacted by the action given:

- the localised nature of the habitat in the BAR Footprint compared to the wider distribution of the species;
- the absence of breeding habitat in the BAR Footprint; and
- the greater extent of habitat in the locality known to be used by the species.

Table B12
Likelihood of a Significant Adverse Impact on the Large-eared Pied Bat

EPBC Act Assessment Criteria[1] Is the action likely to:	**Assessment**
Lead to a long-term decrease in the size of an important population of a species?	The Large-eared Pied Bat (*Chalinolobus dwyeri*) is listed as 'Vulnerable' under the EPBC Act. This is an insectivorous bat assumed to forage below the forest canopy. It roosts in caves, crevices and in disused Bottle Swallow (*Petrochelidon ariel*) nests in the roofs of culverts and rock shelters. It is distributed from the central coast of Queensland to southern NSW and inland to central NSW (OEH 2015a). There are over 1000 records for this bat from across NSW with over half concentrated in the area from the Hunter Valley south to Nowra (OEH 2015b), including the BAR Footprint. Thus, the species in and around the BAR Footprint is not at the limits of its range. Large-eared Pied Bat have been recorded within the BAR Footprint by Greg Richards and Associates (2005) and Lesryk Environmental Consultants (2013) (Figure 9). Biodiversity Monitoring Services (2013) have also recorded this species in the immediate surrounds (Figure 9). No breeding colonies of this species have been recorded in or near the BAR Footprint. There are no database records for this species within the BAR Footprint and Surrounds. Waterbodies and remnant vegetation which occurs within the BAR Footprint and surrounds offers potential foraging habitat resources for this species. There are no breeding resources for this species within the BAR Footprint.

Table B12 (Continued)
Likelihood of a Significant Adverse Impact on the Large-eared Pied Bat

EPBC Act Assessment Criteria[1] Is the action likely to:	**Assessment**
Lead to a long-term decrease in the size of an important population of a species? (Cont.)	Considering the above, it is possible that local populations of this species could use the BAR Footprint as part of a foraging range, given the occurrence of potential habitat resources and records of the species within the footprint. The action is unlikely to disrupt the lifecycle such that a local viable population of this species would be placed at risk of extinction given: • the localised nature of the habitat in the BAR Footprint compared to the wider distribution of the species; • absence of breeding habitat in the BAR Footprint; • NSW State records for this species show that the occurrences in and around the BAR Footprint would be part of a large metapopulation and would therefore not constitute a key source population for breeding or dispersal; • foraging and roosting resources and survey records from in and near the BAR Footprint are not at the limits of the species' range, and connectivity supported by records across this range indicate that the species would be able to disperse widely with diversity maintained across the metapopulation; and • the greater extent of habitat in the locality known to be used by the species. This cave-dwelling bat is unlikely to be dependent on the structures within or near the BAR Footprint, since the local and regional geology lends itself to a wide variety of alternative natural caves and associated structures along the escarpments of the sandstone country. A number of measures would be implemented for the action to minimise potential impacts on flora and fauna which would be relevant to occurrences of this species within the BAR Footprint and adjacent park and reserve areas including progressive site rehabilitation, vegetation clearance protocol as well as weed and feral animal management (Table 14 of the main report) (WCPL, 2015).
Reduce the area of occupancy of an important population?	There is no evidence of the Large-eared Pied Bat breeding within the BAR Footprint. The action would not reduce the area of occupancy of a population.
Fragment an existing important population into two or more populations?	Vegetation lost due to the action is in isolated patches, on one side against open grazing land and the other against large areas of remnant vegetation. The loss of these patches would not fragment the wider Large-eared Pied Bat population.
Adversely affect habitat critical to the survival of a species?	No critical habitat for Large-eared Pied Bat has been mapped within the BAR Footprint or immediate surrounds.
Disrupt the breeding cycle of an important population?	There is no evidence of Large-eared Pied Bat breeding within the BAR Footprint. The action would not disrupt the breeding cycle of the wider Large-eared Pied Bat population.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	The habitat which would be removed/modified as a result of the action is expected to have a negligible impact on resources for this species and would not lead the species declining.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?	The European Red Fox poses a potential predatory threat to the Large-eared Pied Bat (DotE, 2015b). The action would involve the same potential impacts from feral animals as the existing/approved Wilpinjong Coal Mine. Feral animals would continue to be managed through, control and monitoring measures. With the implementation of management measures, the potential impacts to native flora and fauna associated with feral animals is likely to be low. The action is not inconsistent with the *Threat Abatement Plan for Predation by the European Red Fox* (DEWHA, 2008b).
Introduce disease that may cause the species to decline?	There are no known diseases that could be introduced by the action that would affect Large-eared Pied Bat.
Interfere substantially with the recovery of the species?	The action would not have a negative impact on Large-eared Pied Bat numbers, or significantly reduce available resources in the immediate region. The *National Recovery Plan for the Large-eared Pied Bat Chalinolobus dwyeri* (Department of Environment and Resource Management, 2011) lists recovery actions for this species. The action is not inconsistent with the actions listed in this plan. Thus the action would not interfere with the recovery of the species.

[1] As defined by the *Matters of National Environmental Significance Significant Impact Guidelines 1.1* (DotE, 2013).

B4 IMPACT AVOIDANCE AND MITIGATION

Table B13 provides a consolidated list of avoidance and mitigation measures proposed to be undertaken to prevent or minimise the relevant impacts of the action on protected matters, including:

- a description of proposed avoidance and mitigation measures to deal with relevant impacts of the action;
- assessment of the expected or predicted effectiveness of the mitigation measures;
- a description of the outcomes that the avoidance and mitigation measures are likely to achieve;
- statutory or policy basis for the proposed mitigation measures;

The management and mitigation measures proposed as part of the action are considered consistent with current best practice in the mining industry. The majority of these matters have substantial evidence of success over a long period of time (e.g. weed and erosion management measures).

WCPL is the proponent for the action and will be responsible for undertaking and funding the management measures.

B5 COMMONWEALTH OFFSET PACKAGE

Under the EPBC Act, an offset is only required if residual impacts on protected matters are significant (SEWPaC, 2012a). However, residual impacts on native vegetation are required to be offset under the NSW Offset Policy (OEH, 2014b) so Section 4.3 describes how the Commonwealth Offset Areas 1 to 5 would provide positive benefits for protected matters under the EPBC Act (i.e. a Commonwealth offset package). Section 4.3 provides an analysis about how the offset meets the *EPBC Act Environmental Offsets Policy* (SEWPaC, 2012).

Table B13
Protected Matters and Mitigation Measures

Common Name	Conservation Status[1]		List of Avoidance and Mitigation Measures	Description	Predicted Effectiveness	Outcome	Statutory Or Policy Basis
	TSC Act	EPBC Act					
Box-Gum Woodland	E	CE	• vegetation clearance protocol	Minimises the potential for accidental clearance outside proposed disturbance areas.	There is a high likelihood that this measure would effectively minimise clearance of this community.	No more than 9.5 ha of Box-Gum Woodland EEC/CEEC would be cleared by the action.	*National Recovery Plan for White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland* (Department of Environment,, Climate Change and Water, 2010) *Threat Abatement Plan for Competition and Land Degradation by Rabbits* (DEWHA, 2008a) *Threat Abatement Plan for Predation by the European Red Fox* (DEWHA, 2008b) *Threat Abatement Plan for Predation by Feral Cats* (DEWHA, 2008c) *Commonwealth Listing Advice on White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* (Threatened Species Scientific Committee, 2006)
			• weed control	Provides the potential for mitigation of potential impacts as a result of weeds.	There is a high likelihood that this measure would effectively mitigate potential impacts as a result of exotic plants.	Impacts from exotic flora (e.g. decline in native species composition) to the patches of Box-Gum Woodland surrounding the BAR Footprint which would not be cleared by the action would be minimised.	
			• feral pest control	Provides the potential for mitigation of potential erosion and grazing impacts as a result of feral animals.	There is a high likelihood that this measure would effectively mitigate potential impacts as a result of feral animals.	Impacts from exotic fauna (e.g. erosion and grazing) to the patches of Box-Gum Woodland surrounding the BAR Footprint which would not be cleared by the action would be minimised.	

Table B13 (Continued)
Protected Matters and Mitigation Measures

Common Name	Conservation Status[1]		List of Avoidance and Mitigation Measures	Description	Predicted Effectiveness	Outcome	Statutory Or Policy Basis
Ozothamnus tesselatus	V	V	• delineation of areas to be cleared near *Ozothamnus tesselatus* to avoid accidental clearance	Provides for the avoidance of impacts on *Ozothamnus tesselatus* at known locations.	There is a high likelihood that this measure would effectively minimise clearance of this species.	No more than the *Ozothamnus tesselatus* within the BAR Footprint would be cleared by the action.	*Commonwealth Conservation Advice on Ozothamnus tesselatus* (Threatened Species Scientific Committee, 2008)
			• germination trials for *Ozothamnus tesselatus*	Provides the potential to minimise the impacts to the local extent of this species through planting exercises.	There is a moderate likelihood that this measure would effectively minimise the impacts to the local extent of this species over the long-term.	Additional *Ozothamnus tesselatus* plants are available to be planted, minimising the impacts to the local extent of this species.	
Regent Honeyeater	CE	CE[2]	• progressive site rehabilitation	Revegetation of the post-mine landforms with flowering eucalypt species used as foraging habitat for this species.	There is a high likelihood that this measure would effectively minimise impacts to habitat for this species over the long-term.	Approximately 455 ha of potential foraging habitat on the post-mine landforms.	*Regent Honeyeater Recovery Plan - 1999-2003* (Menkhorst *et al*., 1999) *Threat Abatement Plan For Competition And Land Degradation By Rabbits* (DEWHA, 2008a) *Threat Abatement Plan for Predation by Feral Cats* (DEWHA, 2008c) *Draft National Recovery Plan for the Regent Honeyeater (Anthochaera phrygia)* (DotE, 2015c) *Approved Conservation Advice for Anthochaera phrygia (Regent Honeyeater)* (Threatened Species Scientific Committee, 2015).
			• vegetation clearance protocol	Provides for the avoidance of impacts on individuals of this species which may be present at the time of clearance.	There is a moderate to high likelihood that this measure would effectively minimise direct impacts to this species.	Impacts to Regent Honeyeaters on site at the time of clearance (should they occur) would be avoided.	
			• feral pest control	Provides for the avoidance of impacts from nest predation or competition to the Regent Honeyeater.	There is a high likelihood that this measure would effectively mitigate potential impacts as a result of feral animals.	Impacts from exotic fauna (e.g. nest predation and competition) to the Regent Honeyeater (should it occur) would be minimised.	

Table B13 (Continued)
Protected Matters and Mitigation Measures

Common Name	Conservation Status[1]		List of Avoidance and Mitigation Measures	Description	Predicted Effectiveness	Outcome	Statutory Or Policy Basis
Swift Parrot	E	E	• progressive site rehabilitation	Revegetation of the post-mine landforms with eucalypt species used as foraging habitat for this species.	There is a high likelihood that this measure would effectively minimise impacts to habitat for this species over the long-term.	Foraging habitat on the post-mine landforms.	*National Recovery Plan for the Swift Parrot (Lathamus discolor)* (Birds Australia, 2011). *Threat Abatement Plan for Predation by Feral Cats* (DEWHA, 2008c) *Commonwealth Listing Advice on Lathamus discolour (Swift Parrot)* (Threatened Species Scientific Committee, 2012a).
			• vegetation clearance protocol	Provides for the avoidance of impacts on individuals of this species which may be present at the time of clearance.	There is a moderate to high likelihood that this measure would effectively minimise direct impacts to this species.	Impacts to Swift Parrots on site at the time of clearance (should they occur) would be avoided.	
			• feral pest control	Provides for the avoidance of impacts from predation or competition to the Swift Parrot.	There is a high likelihood that this measure would effectively mitigate potential impacts as a result of feral animals.	Impacts from exotic fauna (e.g. predation and competition) to the Swift Parrot (should it occur) would be minimised.	
Koala	V	V	• progressive site rehabilitation	Revegetation of the post-mine landforms with eucalypt species used as foraging habitat for this species.	There is a high likelihood that this measure would effectively minimise impacts to habitat for this species over the long-term.	Foraging habitat on the post-mine landforms.	*EPBC Act Referral Guidelines for the Vulnerable Koala* (DotE, 2014b) *Listing Advice for Phascolarctos cinereus (Koala)* (Threatened Species Scientific Committee, 2012c).
			• vegetation clearance protocol	Provides for the avoidance of impacts on individuals of this species which may be present at the time of clearance.	There is a moderate to high likelihood that this measure would effectively minimise direct impacts to this species.	Impacts to Koalas on site at the time of clearance (should they occur) would be avoided.	

Table B13 (Continued)
Protected Matters and Mitigation Measures

Common Name	Conservation Status[1]		List of Avoidance and Mitigation Measures	Description	Predicted Effectiveness	Outcome	Statutory Or Policy Basis
Koala (Cont.)	V	V	• feral pest control	Provides for the avoidance of impacts from predation or competition to the Koala.	There is a high likelihood that this measure would effectively mitigate potential impacts as a result of feral animals.	Impacts from exotic fauna (e.g. predation and competition) to the Koala (should it occur) would be minimised.	
Corben's Long-eared Bat	V	V	• progressive site rehabilitation	Revegetation of the post-mine landforms with flora species used as foraging habitat for this species, such as box, ironbark and cypress pine species.	There is a high likelihood that this measure would effectively minimise impacts to habitat for this species over the long-term.	Foraging habitat on the post-mine landforms.	*Commonwealth Listing Advice on Ten Species of Bats* (Threatened Species Scientific Committee, 2001). *Approved Conservation Advice for Nyctophilus corbeni (south-eastern long-eared bat)* (Threatened Species Scientific Committee, 2015b)
			• vegetation clearance protocol	Provides for the avoidance of impacts on individuals of this species which may be present at the time of clearance.	There is a moderate to high likelihood that this measure would effectively minimise direct impacts to this species.	Impacts to Corben's Long-eared Bats on site at the time of clearance (should they occur) would be avoided.	
			• feral pest control	Provides for the avoidance of impacts from predation or competition to Corben's Long-eared Bat.	There is a high likelihood that this measure would effectively mitigate potential impacts as a result of feral animals.	Impacts from exotic fauna (e.g. predation and competition) to Corben's Long-eared Bat (should it occur) would be minimised.	

Table B13 (Continued)
Protected Matters and Mitigation Measures

Common Name	Conservation Status[1]		List of Avoidance and Mitigation Measures	Description	Predicted Effectiveness	Outcome	Statutory Or Policy Basis
Large-eared Pied Bat	V	V	• progressive site rehabilitation	Revegetation of the post-mine landforms with flora species used as foraging habitat for this species, such as eucalypt, acacia and cypress pine species.	There is a high likelihood that this measure would effectively minimise impacts to habitat for this species over the long-term.	Foraging habitat on the post-mine landforms.	*Commonwealth Listing Advice on Ten Species of Bats* (Threatened Species Scientific Committee, 2001). *Commonwealth Listing Advice on Chalinolobus dwyeri (Large-eared Pied Bat)* (Threatened Species Scientific Committee, 2012d).
			• vegetation clearance protocol	Provides for the avoidance of impacts on individuals of this species which may be present at the time of clearance.	There is a moderate to high likelihood that this measure would effectively minimise direct impacts to this species.	Impacts to Large-eared Pied Bats on site at the time of clearance (should they occur) would be avoided.	
			• feral pest control	Provides for the avoidance of impacts from predation or competition to the Large-eared Pied Bat.	There is a high likelihood that this measure would effectively mitigate potential impacts as a result of feral animals.	Impacts from exotic fauna (e.g. predation and competition) to the Large-eared Pied Bat (should it occur) would be minimised.	

[1] Threatened fauna species status under the TSC Act and/or EPBC Act (current at October 2015).

V = Vulnerable; E = Endangered; CE = Critically Endangered.

[2] Listed as 'Endangered' under the EPBC Act at the time of the controlled action decision (12 March 2015) and therefore assessed under the Commonwealth offset policy as 'Endangered' not 'Critically Endangered' (refer section 158A of the EPBC Act).

B6 CONCLUSION

Although the Project was declared a controlled action, this assessment provides more detailed information than available at the time the Project was referred to the Commonwealth government. This assessment describes how the removal of limited potential habitat would not significantly impact any threatened species or communities listed under the EPBC Act (Table B14).

Table B14
Assessment Summary

Common Name	Scientific Name	Conservation Status[1]		Assessment Summary
		TSC Act	EPBC Act	
Flora				
Box-Gum Woodland		E	CE	The Box-Gum Woodland EEC is unlikely to be significantly impacted by the action given the: • limited area of Box-Gum Woodland EEC within the BAR Footprint (9.5 ha); and • occurrences of Box-Gum Woodland EEC within the BAR Footprint are highly fragmented (i.e. 11 small patches ranging from 0.04 ha to 2.5 ha in size).
-	*Ozothamnus tesselatus*	V	V	*Ozothamnus tesselatus* is unlikely to be significantly impacted by the action given that the sub-populations within the BAR Footprint are part of a substantial metapopulation.
Birds				
Swift Parrot	*Lathamus discolor*	E	E	Swift Parrot are unlikely to be significantly impacted by the action given the: • localised nature of the potential habitat in the BAR Footprint compared to the wider distribution of the species; • species does not breed in NSW; • nomadic (or partially nomadic) nature of this species; and • greater extent of habitat in the locality.
Regent Honeyeater	*Anthochaera phrygia*	CE	CE	Regent Honeyeater are unlikely to be significantly impacted by the action given the: • localised nature of the potential habitat in the BAR Footprint compared to the wider distribution of the species; • lack of breeding records for this species within the BAR Footprint (although it is possible individuals of this species could breed in the extant habitat from time to time); and • greater extent of suitable habitat in the locality.
Mammals				
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory)	*Phascolarctos cinereus*	V	V	Koala are unlikely to be significantly impacted by the action given the: • localised nature of the potential habitat in the BAR Footprint compared to the wider distribution of the species; • lack of records for this species within the BAR Footprint (although it is possible individuals of this species could move through the area from time to time); and • greater extent of habitat in the locality known to be used by the species.

Table B14 (Continued)
Assessment Summary

Common Name	Scientific Name	Conservation Status[1]		Assessment Summary
		TSC Act	EPBC Act	
Mammals (Cont.)				
Brush-tailed Rock-wallaby	*Petrogale penicillata*	E	V	Brush-tailed Rock-wallaby are unlikely to be significantly impacted by the action given the: • localised nature of the potential habitat in the BAR Footprint compared to the wider distribution of the species; • lack of records for this species within the BAR Footprint (although it is possible individuals of this species could move through the area from time to time); and • greater extent of habitat in the locality known to be used by the species.
Spotted-tailed Quoll	*Dasyurus maculatus*	V	E	Spotted-tailed Quoll are unlikely to be significantly impacted by the action given the: • localised nature of the potential habitat in the BAR Footprint compared to the wider distribution of the species; • lack of records for this species within the BAR Footprint (although it is possible individuals of this species could move through the area from time to time); and • greater extent of habitat in the locality.
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	V	Large-eared Pied Bat are unlikely to be significantly impacted by the action given the: • localised nature of the habitat in the BAR Footprint compared to the wider distribution of the species; and • greater extent of habitat in the locality known to be used by the species.
Corben's Long-eared Bat	*Nyctophilus corbeni*	V	V	Corben's Long-eared Bat are unlikely to be significantly impacted by the action given the: • localised nature of the habitat in the BAR Footprint compared to the wider distribution of the species; and • greater extent of habitat in the locality known to be used by the species.

[1] Threatened fauna species status under the TSC Act and/or EPBC Act (current at October 2015).
V = Vulnerable; E = Endangered; CE = Critically Endangered.

The action is not inconsistent with any relevant recovery plans, conservation advice or agreements.

The impacts of the action at a local scale would be minimal, therefore there would be no additional cumulative impacts compared to previous proposed disturbance from other agricultural and industrial activities, especially when considering the avoidance and mitigation measures and the positive benefits of the proposed Biodiversity Offset Strategy (Section 4.3).

Impacts on protected matters would be localised and negligible on a regional, state and national scale. The action would not have a significant negative impact on the conservation status, condition or trend of any Matter of National Significance at a local or regional scale.

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ATTACHMENT C
WILPINJONG EXTENSION PROJECT TERRESTRIAL FLORA BASELINE REPORT (DEVELOPMENT SITE)

WILPINJONG EXTENSION PROJECT

TERRESTRIAL FLORA BASELINE REPORT (DEVELOPMENT SITE)

November 2015

PREPARED BY
HUNTER ECO

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EXECUTIVE SUMMARY

The Wilpinjong Extension Project (the Project) is a proposed extension of open cut operations at the Wilpinjong Coal Mine for an additional operational life of approximately seven years.

The Project will be assessed under the *NSW Biodiversity Offsets Policy for Major Projects*. The overall objective of this report is to provide the necessary flora inputs to the Project Biodiversity Assessment Report (being prepared separately by Hunter Eco). The Project will also be assessed under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) via the bilateral agreement between the Commonwealth and New South Wales (NSW). This report therefore also provides information on potentially occurring threatened flora listed under the EPBC Act.

Objectives of the flora surveys were to:

- document plant species growing across the Study area by drawing on the results of all past surveys and augmenting this information with that from current surveys;
- classify and map the distribution of vegetation communities across the Study area; and
- target species, communities and populations listed as threatened in either the NSW *Threatened Species Conservation Act 1995* (TSC Act) or the EPBC Act.

The flora surveys were undertaken in November 2013, March 2014, May 2014, June 2014, July 2015, September 2015 and October 2015. The surveys included classification and mapping of vegetation (with sampling of Rapid Data Points, sampling of floristic plots and analysis), collection of Biometric data, identification of potential groundwater dependent vegetation, identification of threatened ecological communities, targeted surveys for potentially occurring threatened flora and identification of potential koala habitat. The surveys were undertaken over a number of seasons to target potentially occurring threatened flora.

Ten vegetation communities were mapped across the Study area, among which three are listed threatened communities. *MU1a Blakely's Red Gum Woodland – grassy* and *MU10 Yellow Box Woodland – grassy* were assessed to be:

- White Box Yellow Box Blakely's Red Gum Woodland, endangered under the TSC Act; and
- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland, critically endangered under the EPBC Act.

Local community *MU7 Slaty Box Forest* was assessed as meeting the description of the NSW listed vulnerable ecological community *Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion.*

One threatened flora species was recorded in and near the Study area, being *Ozothamnus tesselatus,* vulnerable under the TSC Act and EPBC Act.

One individual of the endangered population *Cymbidium canaliculatum R. Br. in the Hunter Catchment* was recorded just outside the Study area boundary indicating suitable habitat for this population within the Study area.

1 INTRODUCTION

1.1 Background

The Wilpinjong Extension Project (the Project) is a proposed extension of open cut operations at the Wilpinjong Coal Mine for an additional operational life of approximately seven years.

Wilpinjong Coal Pty Ltd (WCPL) is seeking approval from the New South Wales (NSW) Minister for Planning for a Development Consent under Division 4.1 of Part 4 of the NSW *Environmental Planning and Assessment Act, 1979* (EP&A Act) for the Project. The application also includes the existing approved operations of the Wilpinjong Coal Mine.

The Project would include the following activities:

- open cut mining of run-of-mine (ROM) coal from the Ulan Coal Seam and Moolarben Coal Member in Mining Lease (ML) 1573 and in new Mining Lease Application areas in Exploration Licence (EL) 6169 and EL 7091;
- approximately 800 hectares (ha) of open cut extensions including:
  - approximately 500 ha of incremental extensions to the existing open cut pits in areas of ML 1573 and EL 6169;
  - development of a new open cut pit of approximately 300 ha in EL 7091 (Pit 8);
- production of up to 16 million tonnes per annum (Mtpa) of ROM coal;
- continued use of the Wilpinjong Coal Mine Coal Handling and Preparation Plant (CHPP) and general coal handling and rail loading facilities and other existing and approved supporting mine infrastructure;
- rail transport of approximately 13 Mtpa of thermal product coal to domestic and export customers (within existing maximum and annual average daily rail limits);
- relocation of a section of the TransGrid Wollar to Wellington 330 kilovolt (kV) electricity transmission line (ETL) to facilitate mining in Pit 8;
- various local infrastructure relocations to facilitate the mining extensions (e.g. realignment of Ulan-Wollar Road and associated rail level crossings, relocation of local ETLs and services);
- construction and operation of additional mine access roads from Ulan-Wollar Road to service new mining facilities located in Pits 5 and 8;
- construction and operation of new ancillary infrastructure in support of mining including mine infrastructure areas, ROM pads, haul roads, electricity supply, communications installations, light vehicle roads, access tracks, remote crib huts, upslope diversions, dams, pipelines and other water management structures;

- extension of the approved mine life by approximately seven years (i.e. from approximately 2026 to 2033);
- a peak operational workforce of approximately 625 people;
- ongoing exploration activities; and
- other associated minor infrastructure, plant and activities.

The regional location of the Project is shown on **Figure 1** and the general arrangement is shown on **Figure 2**.

1.2 Flora and Vegetation Survey Objectives

The Project will be assessed under the *NSW Biodiversity Offsets Policy for Major Projects* (Office of Environment and Heritage [OEH], 2014a). This policy prescribes biodiversity impact assessment requirements for State Significant Developments in NSW. The overall objective of this report is to provide the necessary flora inputs to the Project Biodiversity Assessment Report (being prepared separately by Hunter Eco).

The Project will also be assessed under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) via the bilateral agreement between the Commonwealth and NSW. This report therefore also provides information on potentially occurring threatened flora species listed under the EPBC Act.

Other objectives of these flora surveys are to:

- document plant species growing across the Study area by drawing on the results of all past surveys and augmenting this information with that from current surveys;
- classify and map the distribution of vegetation communities across the Study area; and
- target species, communities and populations listed as threatened both in the NSW *Threatened Species Conservation Act 1995* (TSC Act) and the EPBC Act.

The following guidelines and policies will inform the methodology and outcomes of the flora surveys:

- *NSW Biodiversity Offsets Policy for Major Projects* (OEH, 2014a) and *Framework for Biodiversity Assessment* (OEH, 2014b);
- *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities - Working Draft* (Department of Environment and Conservation [DEC], 2004);
- *EPBC Act Policy Statement - Draft Survey Guidelines for Australia's Threatened Orchids* (Department of the Environment [DotE], 2014); and
- Profiles and guidelines specific to threatened species and communities (e.g. BioNet [OEH, 2015a] and the Vegetation Information System Classification 2.1 [OEH, 2015b]).

LEGEND

- Mining Lease Boundary
- Exploration Licence Boundary
- Authorisation Boundary
- Local Government Boundary
- NSW State Forest
- National Park, Nature Reserve or State Conservation Area
- Mining Operation

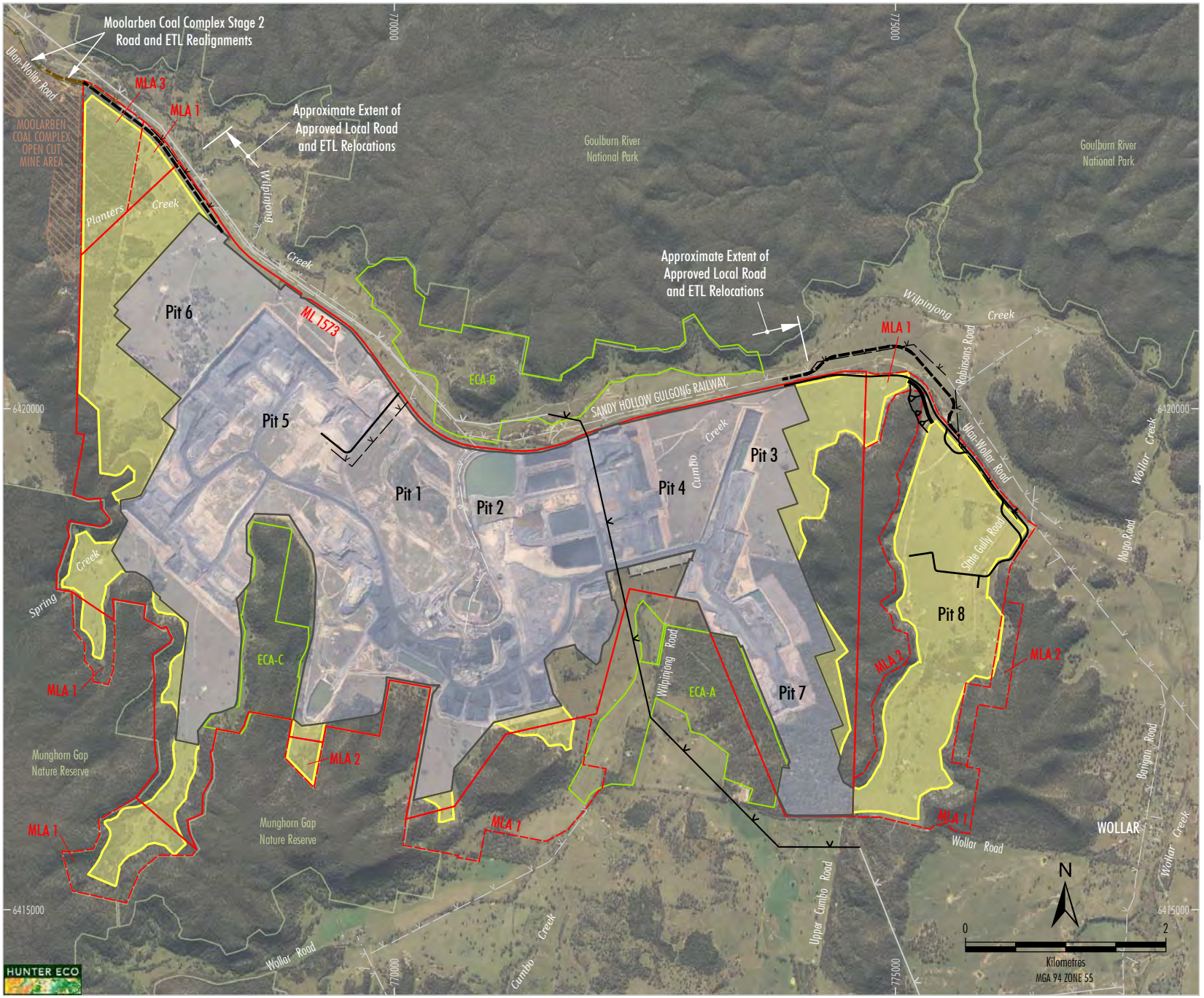
Source: NSW Land & Property Information (2015); NSW Dept of Industry (2015; Geoscience Australia (2011)

Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Regional Location

Figure 1



LEGEND

- Mining Lease Boundary
- Mining Lease Application Boundary
- Approved/Existing Open Cut and Contained Infrastructure Area
- Relocated Block Bank and Cumbo Creek Disturbance Area
- Proposed Open Cut Extension Area
- Proposed Public Road Realignment
- Proposed Pit 3/8 Haul Road
- Proposed Service Road
- Proposed Local ETL Realignment/Relocation
- Proposed Relocated TransGrid 330 kV ETL
- Existing Local ETL
- Existing TransGrid 330 kV ETL
- Enhancement and Conservation Area

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (Jun 2015, Jun 2014)

Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Project General Arrangement

Figure 2

WIL-12-12_WEP_EIS_Flora_202A

2 DESCRIPTION OF THE STUDY AREA AND SURROUNDS

2.1 Regional Setting

The Wilpinjong Coal Mine is located approximately 40 kilometres (km) north-east of Mudgee. Two other coal mining operations are present in the locality: Moolarben Coal Complex is approximately 5 km to the west, and Ulan Mine Complex is approximately 11 km north-west of Wilpinjong Coal Mine.

Wilpinjong Coal Mine is located at or in:

- the western extent of the Hunter Local Land Service area (formerly the Hunter Central Rivers Catchment Management Authority [CMA], Kerrabee CMA sub-region);
- the north western extent of the Sydney Basin Interim Biogeographic Regionalisation for Australia (IBRA) Bioregion, Kerrabee sub-region and approximately 20 km south of the Brigalow Belt South Bioregion;
- the Central Western Slopes Botanical Division; and
- the Mid Western Local Government Area.

2.2 Topography and Drainage

The majority of the Study area is situated in a wide valley floor between hills and escarpments of the Goulburn River National Park to the north and Munghorn Gap Nature Reserve to the south (**Figure 3**).

The Study area is located at the south western extent of the Hunter Catchment. Water from across the Study area flows into Cumbo and Wilpinjong Creeks. Wilpinjong Creek connects to Wollar Creek that flows north into the upper reaches of Goulburn River.

Elevation across the Study area is between 350 metres (m) to a few ridges immediately south of the Study area rising to 610 m. Average elevation of the Study areas ranges from 400 m to 470 m (**Figure 3**). Landform analysis (**Figure 4**) shows that the Study area is predominately made up of plains, open slopes and some valleys.

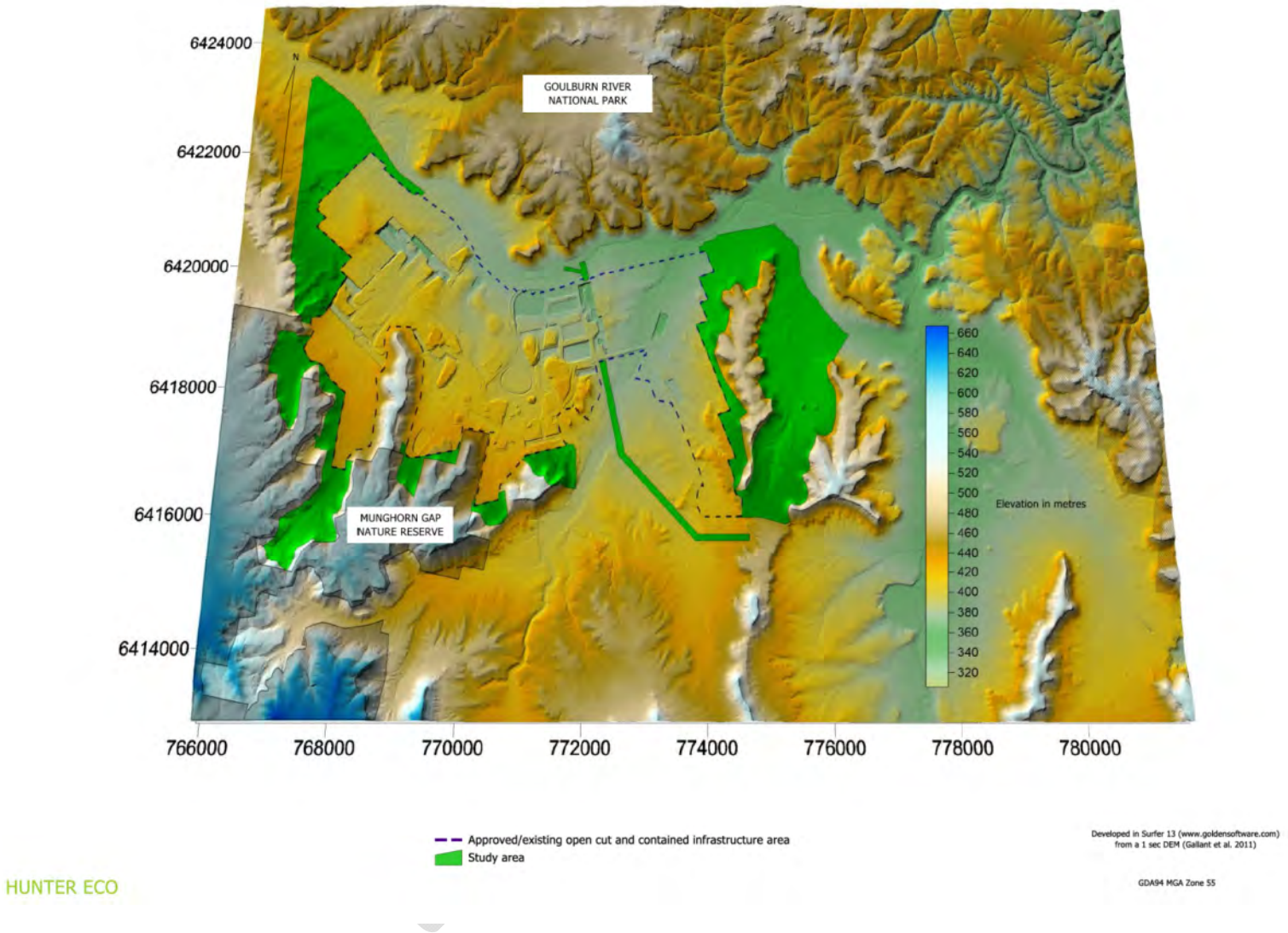


Figure 3 Location of Wilpinjong Coal Mine and Study Area in a Local Context

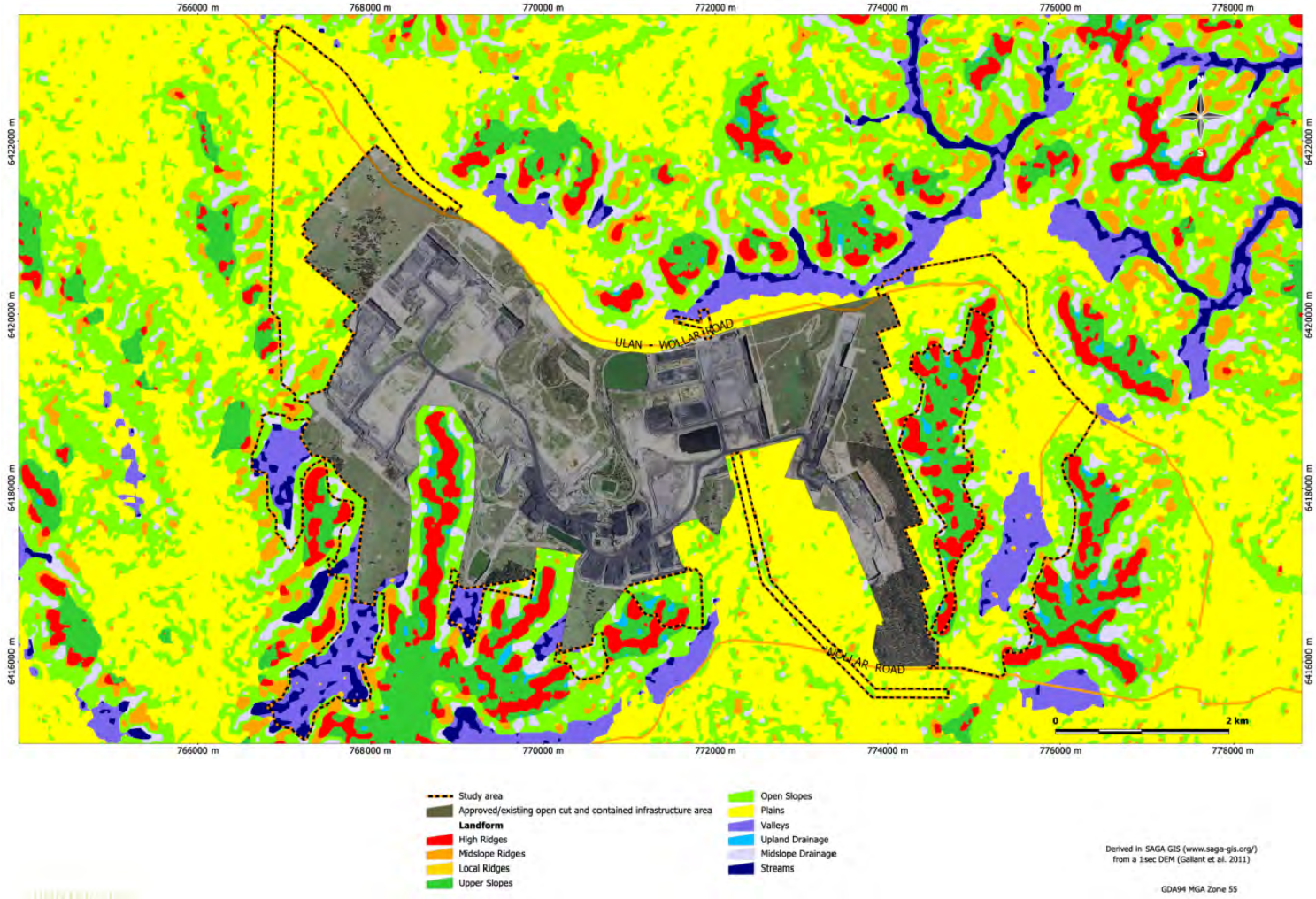


Figure 4 Landform Types in the Study Area and Surrounds

2.3 Geology and Soils

Geological information for the Study area was sourced from the *Gulgong 1:100 000 Geological Map* (Department of Industry Resources and Energy, 2013).

Geology across the low lying areas of the Study area is Permian, Sydney Basin, Illawarra Coal Measures expressed on the surface as quartz-lithic sandstone. This takes up the majority of the Study area.

An exception is a narrow band of Quaternary sediments along the course of Cumbo Creek in the eastern part of the Study area and Wilpinjong Creek to the north. A small portion of the extension is contained within this Quaternary geology.

The elevated ridges within and outside of the Study area are Triassic, Sydney Basin, Narrabeen group. At the south-east is a small area of Permian, Sydney Basin Shoalhaven group.

The main soil types in the Study area comprise Rudosols (31 percent [%]), Chromosols (20%) and Sodosols (18%), while lesser areas of Dermosols (10%), Kurosols (10%), Kandosols (7%) and Tenosols (5%) were also observed (McKenzie Soil Management, 2015).

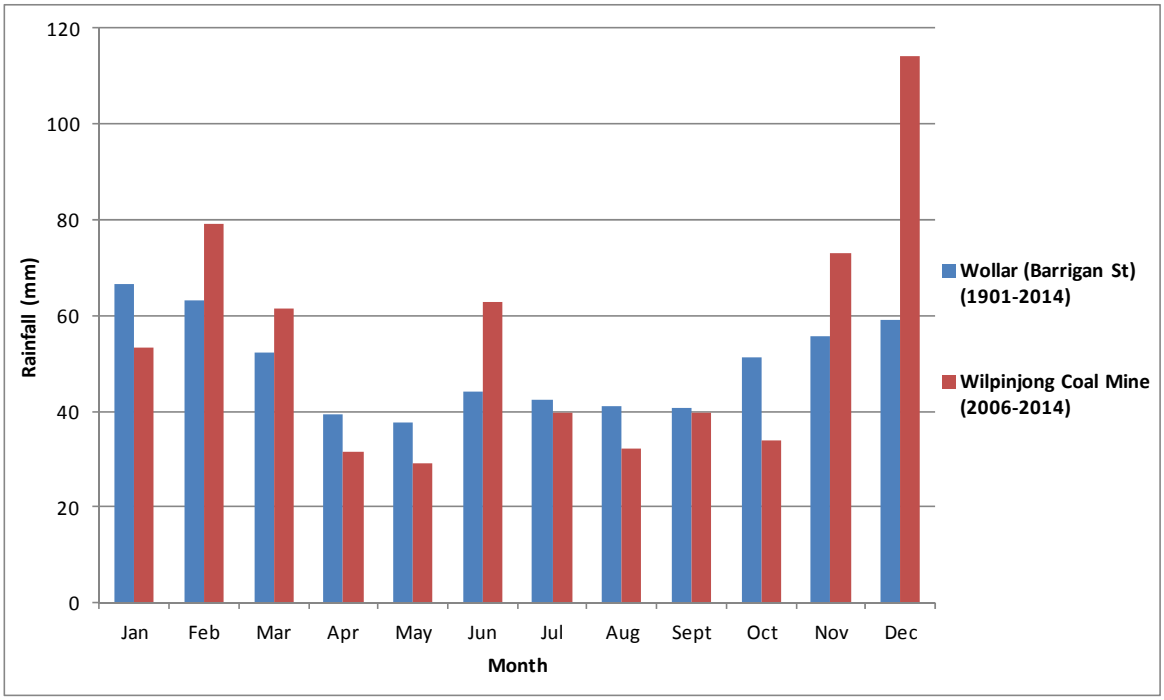
2.4 Land Use and Vegetation

Prior to the Wilpinjong Coal Mine in 2006, the Wollar area was typical of early (around the 1800s) European settlement where lands deemed arable were cleared of most vegetation primarily for grazing purposes.

The overall Study area is 1,029 ha consisting of 361 ha of woodland/forest/ shrubland, 668 ha of improved pasture grazing land/former cropping land. The wooded areas fringe the lowland open cleared grassland and cropping areas.

2.5 Climate

Long-term rainfall data were sourced from a Bureau of Meteorology (BoM) weather station in Wollar (Barrigan St) (Site No.62032). The Wilpinjong area experiences a temperate climate with an average annual rainfall of approximately 600 millimetres (mm) (BoM, 2015a). The data from Wollar indicate that January is the wettest month, with an average rainfall of 66.7 mm and May is the driest month, with an average rainfall of 37.7 mm. The months of April to September are the driest with a consistent monthly mean of around 40 mm, with rain then increasing from October to January, then decreasing to April (BoM, 2015a). The long-term average (1901 - 2014) monthly rainfall data sourced from the Wollar (Barrigan St) station are compared to short-term (2006 – 2014) average monthly rainfall data recorded by the Wilpinjong Coal Mine Weather Station on **Figure 5**.

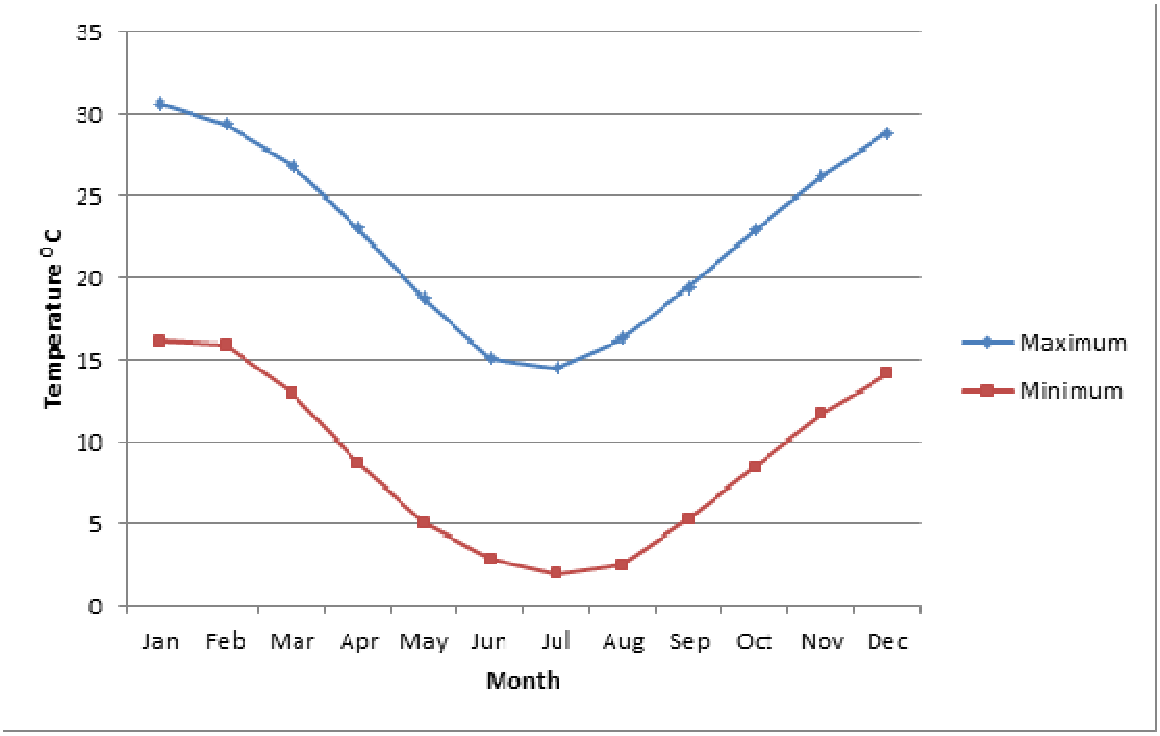


Source: BoM (2015a).

Figure 5 Monthly Average Rainfall Records from Wollar (Barrigan St) Compared to Monthly Average Rainfall Records from the Wilpinjong Coal Mine Automatic Weather Station

The nearest available long-term temperature data were from Gulgong Post Office, approximately 30 km to the west (Site No.62013). The data from Gulgong indicates the warmest month is January, with a mean maximum daily temperature of 31.0 degrees Celsius (°C) and the coldest month is July, with a mean daily minimum temperature of 2.6°C (BoM, 2015a).

The long-term average (1970 – 2014) monthly minimum and maximum temperature data sourced from the Gulgong Post Office station are shown on **Figure 6**.



Source: BoM (2015a).

Figure 6 Monthly Average Minimum and Maximum Temperature Records from Gulgong Post Office

2.6 Fire History

Information regarding fires was provided by Mr Lloyd Coleman a long-time local resident and property manager for WCPL:

- 1950/1960 two large fires at the lower end of Mogo Road east of Wilpinjong;
- 1979 a large fire from north of Gulgong through Ulan but stopped short of what is now WCPL owned land adjoining land associated with the Moolarben Coal Complex;
- 1980s the Havilah fire (from near Mudgee) burnt close to Wollar and another caused by lightning strike burned in Goulburn River National Park; and
- early 2000s a large fire burnt from the east of Wollar through to Cortina.

There have been no recent fires in the Study area as was evident by the condition of the habitat during field surveys, with considerable amounts of dead wood and litter.

3 BACKGROUND INFORMATION

3.1 Regional Flora Surveys

Regional flora surveys are listed in **Table 1**.

Table 1 Flora Surveys Undertaken in the Wilpinjong-Ulan Region

Report	Survey	Relevance
Moolarben Biota (2006)	Moolarben Coal Project Stage 1 Environmental Impact Statement. Appendix 11 Flora, Fauna and Aquatic Ecology Assessment.	An assessment of the ecological impacts of the Moolarben Coal Project Stage 1. Vegetation mapping and floristic lists for an area immediately west of the Study area.
Ecovision Consulting (2008)	Moolarben Coal Project Stage 2 Environmental Assessment Report. Appendix 7 Ecological Impact Assessment.	An assessment of the ecological impacts of the Moolarben Coal Project Stage 2. Vegetation mapping and floristic lists for an area immediately west of and abutting the Study area.
Umwelt (2009)	Ulan Coal Continued Operations Environmental Assessment Volume 3 Appendix 8 Ecological Assessment.	An assessment of the ecological impacts of the Ulan West underground mine and open cut extension Vegetation mapping and floristic lists for an area approximately 15 km north west of the Wilpinjong Coal Mine
EMGA Mitchell McLennan (2013)	Moolarben Coal Project – Stage 1 Optimisation Modification. Appendix E Ecological Assessment.	An impact assessment of a proposal to expand previously approved operations for Open Cuts 1 and 2.
Hill (1999)	Vegetation Survey of Goulburn River National Park and Munghorn Gap Nature Reserve for Fire Management Purposes.	A comprehensive vegetation survey of Goulburn River National Park and Munghorn Gap Nature Reserve. Vegetation mapping in areas abutting parts of the Study area.
Sivertsen *et al*. (2011)	Draft Greater Hunter Native Vegetation Mapping (Version 4) - VIS Map ID 3855.	Classification and mapping of native vegetation communities across the greater Hunter region, including Hawkesbury Nepean CMA. The classification is intended to be integrated into the NSW Plant Community Type Classification for use in NSW assessment and regulatory tools. Version 4 of the map and classification should be regarded as draft, and may undergo minor changes as it is integrated into the NSW Plant Community Type (PCT) and subsequent tools. The mapping takes in the Study area and surrounds

3.2 Local Flora Surveys

Flora surveys undertaken locally are listed in **Table 2**.

Table 2 Flora Surveys Conducted within Wilpinjong EL

Report	Survey	Survey Type and Time
FloraSearch (2005)	Wilpinjong Coal Project EIS Flora Assessment	Flora – 16-19 March 2004; late May to early June 2004; 25-29 October 2004; 22-24 November 2004
Hunter Eco (2013)	Modification 5 Environmental Assessment Flora Assessment	Flora – 9-11 January 2013; 25 January 2013; 9 May 2013
Lesryk Environmental Consultants (2013)	Biodiversity Audit of Slate Gully	Biodiversity audit – May – December 2012

4 METHODS

4.1 Data Preparation and Analysis

Spatial data and maps were prepared using Manifold System geographic information system (GIS: www.manifold.net) and Surfer 12 (www.goldensoftware.com). Statistical analysis was conducted using Minitab 17 (www.minitab.com.au). Similarity analysis of floristic plots (hierarchical agglomerative clustering and non-metric multi-dimensional scaling [nMDS]) was conducted using Primer 7 (Clarke and Gorley, 2015). Primer 7 was also used for similarity percentage analysis (SIMPER) which calculates the relative contributions of species to a community.

4.2 Vegetation Classification and Mapping

Broadly speaking, a map of vegetation communities can be created by modelling against environmental (e.g. geology, soil, elevation, aspect) and climate variables (e.g. rainfall, humidity, temperature) using samples taken at random from across the area being mapped, or by ground-truthing whereby numerous samples are taken. Modelling will often be the only option where access is restricted, but where the target area is accessible ground-truthing is the preferred option.

Several processes are involved in preparing a ground-truthed vegetation community classification and map and these were used to prepare the community classification and map for this study:

- Collection of field data at numerous points on the dominant species present in the canopy, shrub and ground structural layers. These records are referred to as Rapid Data Points (RDP) and provide an understanding of floristic variation across the survey area.
- RDP are initially coded according to an assumed community type and that data extrapolated across the survey area to create a draft vegetation community map. Aerial Photo Interpretation is used to assist with determining likely community boundaries where changes in vegetation patterns are visible.
- Detailed data are then collected from standard 0.04 ha (generally 20 m x 20 m) plots. The presence and projected foliage cover of all vascular species in each plot were recorded using a modified Braun-Blanquet cover abundance scale: 1 = <1%, 2 = 1–5%, 3 = 5–25%, 4 = 25–50%, 5 = 50–75% and 6 = 75–100%. The overall Study area is stratified according to the variation recorded in the RDP data and floristic plots are randomly placed in these stratified units. The number of plots in each unit is determined in accordance with the requirements of the *Framework for Biodiversity Assessment* (OEH, 2014b).

- Similarity analysis (hierarchical agglomerative clustering and non-metric multi-dimensional scaling) is then used to place the floristic plots into groups having similar floristic content. Final community classification follows from the similarity analysis.

These procedures for ground-truthed vegetation mapping were first published by S. Bell and C. Driscoll in (Department of Environment and Climate Change [DECC], 2008a) and further elaborated in Bell (2013).

Using the results of similarity analyses, vegetation communities were first classified at the local level of the immediate region from which the sample data were drawn. Using the floristic composition of these communities, they were then matched to the NSW vegetation classification hierarchy as follows:

1. Local Classification.
2. NSW BioMetric Vegetation Types (BVTs).
3. NSW Plant Community Types (PCTs).
4. NSW Vegetation Classes (Keith, 2004).
5. NSW Vegetation Formations (Keith, 2004).

Where appropriate, classified communities were further stratified into condition classes.

4.2.1 BioMetric Data

In addition to collecting floristic cover abundance data, biometric data were collected at each plot location. Biometric data provides input into the NSW BioBanking credit calculator, output from which will form part of the Project Biodiversity Assessment Report (being prepared separately by Hunter Eco). Collecting biometric data includes an extension to the 20 m x 20 m floristic plot to form a 20 m x 50 m plot. Data collected are:

- Total number of native plant species — 20 m x 20 m plot
- Native overstorey cover % — 50 m transect
- Native mid-storey cover % — 50 m transect
- Native ground cover grasses % — 50 m transect
- Native ground cover shrubs % — 50 m transect
- Native ground cover other % — 50 m transect
- Exotic plant cover % — 50 m transect
- Number of trees with hollows — 20 m x 50 m plot
- Overstorey regeneration % — entire stratified unit
- Length of fallen logs — 20 m x 50 m plot

4.3 Identification of Groundwater Dependent Ecosystems

The *NSW State Groundwater Dependent Ecosystem Policy* (Department of Land and Water Conservation, 2002) describes three types of Groundwater Dependent Ecosystems (GDEs) relating to flora in NSW:

- terrestrial vegetation that are dependent in whole or in part on water reserves held in the ground;
- streams (and associated vegetation) receiving base flows from groundwater; and
- wetlands (and associated vegetation) dependent on the surface expression of groundwater.

Vegetation making up a GDE, termed phreatophytic and consisting of phreatophytes, can have varying degrees of dependency on the groundwater. Obligate GDEs are made up of species that depend entirely on the groundwater and are capable of living with their roots continually wet or at least for seasonal periods of inundation. Facultative GDEs contain species that access the groundwater via the capillary fringe and also take up water from within the soil matrix above this area (Hatton and Evans, 1998). These plants cannot cope with having their roots inundated with water.

Depth to water is an important consideration for identifying potential GDE and in this context plant rooting depth is relevant. While some plants are capable of sending roots tens of metres into the soil, generally the plants in dry sclerophyll woodland, including trees, would have maximum root depth of approximately 5 m (Canadell *et al*., 1996).

Initially the *National Atlas of Groundwater Dependent Ecosystems* (BoM, 2015b), which provides a model of potential GDEs across Australia, was consulted. The final determination of GDE presence was based on an assessment of whether species within each mapped vegetation community are known to be typically groundwater dependent.

4.4 Threatened Ecological Communities

Threatened ecological communities (TECs) likely to occur in the region were extracted from BioNet (OEH, 2015a) and the Commonwealth Protected Matters search tool (DotE, 2015) (**Table 3**). Following vegetation community classification and mapping from field survey results, the floristic content of communities was compared with descriptions in the listed community determinations.

Table 3 Threatened Ecological Communities Recorded or Predicted to Occur within the Region of the Study Area

Community	Conservation Status[1]		Presence[2]
	TSC Act	EPBC Act	
Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions	E	-	P
Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	E	-	P
Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions	E	-	P
Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion	V	-	P
Hunter Valley Vine Thicket in the NSW North Coast and Sydney Basin Bioregions	E	-	P
Hunter Valley Weeping Myall Woodland of the Sydney Basin Bioregion	E	CE	P
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E	-	P
White Box Yellow Box Blakely's Red Gum Woodland	E	CE	R[3]

[1] Conservation status under the TSC Act and/or EPBC Act (current at September 2015).
V = Vulnerable; E = Endangered; CE = Critically Endangered.

[2] P = Predicted, R = Recorded.

[3] FloraSearch (2005).

4.5 Targeted Searches for Endangered Populations

The following endangered populations are known to occur in the Hunter Catchment and therefore could occur in the Study Area:

- *Acacia pendula* population in the Hunter Catchment.
- *Cymbidium canaliculatum* population in the Hunter Catchment.

Surveying for these populations involves observing and recording the key indicator species (i.e. *Acacia pendula* and *Cymbidium canaliculatum* respectively), neither of which are cryptic species. *Acacia pendula* is a small tree with distinctive pendulous foliage and *Cymbidium canaliculatum* is an arboreal orchid with dense long foliage.

4.6 Targeted Searches for Threatened Flora Species

Known and predicted threatened flora species were extracted from BioNet (OEH, 2015a) and the Atlas of Living Australia (2015) for the Hunter Central Rivers – Kerrabee IBRA subzone; this extract also included all Commonwealth listed threatened species (**Table 4**). Following initial field habitat assessment these species were evaluated for their likelihood of occurring based on known habitat preferences. Targeted surveys were conducted for those species for which suitable habitat was considered to be present. However, surveys were also conducted with the possibility in mind of previously unrecorded threatened species being present. All flora species encountered were positively identified so an unexpected occurrence was unlikely to be missed.

Table 4 Threatened Flora Species Recorded or Predicted from within the Hunter Central Rivers – Kerrabee Subzone

Family Name	Scientific Name	Common Name	Conservation Status*		Presence^
			TSC Act	EPBC Act	
Apocynaceae	*Cynanchum elegans*[1]	White-flowered Wax Plant	E	E	P
Apocynaceae	*Tylophora linearis*[2]	Slender Tylophora	V	E	P
Asteraceae	*Leucochrysum albicans var. tricolor*[1]	Hoary Sunray	-	E	P
Asteraceae	*Ozothamnus tesselatus*[1,2]		V	V	P
Asteraceae	*Senecio linearifolius var. dangarensis*[1]		E	-	P
Euphorbiaceae	*Monotaxis macrophylla*[1]	Large-leafed Monotaxis	E	-	P
Fabaceae (Faboideae)	*Kennedia retrorsa*[1]		V	V	P
Fabaceae (Faboideae)	*Swainsona sericea*[1,2]	Silky Swainson-pea	V	-	P
Fabaceae (Mimosoideae)	*Acacia ausfeldii*[1,2]	Ausfeld's Wattle	V	-	P
Fabaceae (Mimosoideae)	*Acacia dangarensis*	Mount Dangar Wattle	E	-	P
Fabaceae (Mimosoideae)	*Acacia flocktoniae*[1]	Flockton Wattle	V	V	P
Fabaceae (Mimosoideae)	*Acacia pendula*[3]	Weeping Myall	E	-	P
Lamiaceae	*Prostanthera cryptandroides* subsp. *cryptandroides*[1]	Wollemi Mint-bush	V	V	P
Lamiaceae	*Prostanthera discolor*[1]		V	V	P
Lamiaceae	*Prostanthera stricta*[1]	Mount Vincent Mint-bush	V	V	P
Malvaceae	*Commersonia procumbens*[1,#]		V	V	P
Malvaceae	*Commersonia rosea*[2,#]		E	E	P
Malvaceae	*Lasiopetalum longistamineum*[1]		V	V	P
Myrtaceae	*Eucalyptus cannonii*[1,2]	Capertee Stringybark	V	-	P
Myrtaceae	*Homoranthus darwinioides*[1,2]		V	V	P

Family Name	Scientific Name	Common Name	Conservation Status*		Presence^
			TSC Act	EPBC Act	
Orchidaceae	*Diuris pedunculata*	Small Snake Orchid	E	E	P
Orchidaceae	*Diuris tricolor*[1,2]	Pine Donkey Orchid	E	-	P
Orchidaceae	*Prasophyllum* sp. *Wybong*[1]	Prasophyllum sp. Wybong	-	CE	P
Proteaceae	*Persoonia marginata*	Clandula Geebung	V	V	P
Rhamnaceae	*Pomaderris queenslandica*[1,2]	Scant Pomaderris	E	-	P
Rhamnaceae	*Pomaderris reperta*[1,2]	Denman Pomaderris	CE	CE	P
Rhamnaceae	*Pomaderris sericea*[1]	Silky Pomaderris	E	V	P
Rutaceae	*Philotheca ericifolia*[1]		-	V	P

Source: [1] OEH (2015a)
[2] Atlas of Living Australia (2015)
[3] *Acacia pendula* population in the Hunter Catchment
[4] FloraSearch (2005)

* Conservation status under the TSC Act and/or EPBC Act (current at September 2015).
V = Vulnerable; E = Endangered; CE = Critically Endangered.

Listed in the genus *Androcalva* under the EPBC Act.

^ P = Predicted.

Discovery of a threatened flora species would trigger a process of determining the size and extent of the population. The locality of the initial discovery would be searched in an ever widening pattern to determine the number and extent of the plants. A habitat assessment would be made and areas of similar habitat searched. If the species was restricted to a small area all individuals would be counted. If the species was more widespread transect searches would be conducted in a way that overall distribution and density could be estimated.

Flora surveys were undertaken in consideration of the following guidelines:

- *BioBanking Assessment Methodology and Credit Calculator Operational Manual* (DECCW, 2009);
- *NSW Biodiversity Offsets Policy for Major Projects* (and underlying *Framework for Biodiversity Assessment*) (OEH 2014a, 2014b);
- *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities - Working Draft* (DEC, 2004);
- *Threatened species survey and assessment guidelines* (OEH, 2015c); and
- *EPBC Act Policy Statement - Draft Survey Guidelines for Australia's Threatened Orchids* (DotE, 2014).

4.7 Potential Koala Habitat

Protection of the Koala is controlled by State Environment Planning Policy (SEPP) 44 – *Koala habitat protection* (Department of Planning [DoP] 1995). Schedule 2 of SEPP 44 provides a list of Koala food tree species (**Table 5**). Initial assessment involves determining whether *potential* Koala habitat is present, defined as:

> *'areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component'.* Where potential Koala habitat has been identified further investigation is required to determine whether *core* Koala habitat is present, defined as *'an area of land with a resident breeding population of koalas, evidenced by attributes such as breeding females and recent sightings and historical records of a population'*.

Table 5 SEPP 44 Schedule 2 Koala Feed Trees

Scientific Name	Common Name
Eucalyptus tereticornis	Forest Red Gum
Eucalyptus microcorys	Tallowwood
Eucalyptus punctata	Grey Gum
Eucalyptus viminalis	Ribbon or Manna Gum
Eucalyptus camaldulensis	River Red Gum
Eucalyptus haemastoma	Broad-leaved Scribbly Gum
Eucalyptus signata	Scribbly Gum
Eucalyptus albens	White Box
Eucalyptus populnea	Bimble Box or Poplar Box
Eucalyptus robusta	Swamp Mahogany

The task of this flora assessment is to indicate whether and where potential Koala habitat might occur across the Study area.

Since SEPP 44 was gazetted in 1995 research has indicated that Koala have regional preferences for feed trees as well as having other important uses for trees. In keeping with the intent of SEPP 44 of preserving Koala habitat, this more recent information is also included in this habitat assessment. These data are available in the *Recovery Plan for the Koala (Phascolarctos cinereus)* (DECC, 2008b).

4.8 Summary of Survey Effort

Table 6 provides a summary of the field survey effort.

Table 6 Summary of Field Survey Effort

Task	Date
Preliminary vegetation data (RDP) collection	14 – 21 March 2014
Floristic plot data collection	5 – 9 May 2014 11 – 13 June 2014 25 and 26 July 2015
Targeted search for *Thesium australe* at the location of the Lesryk (2013) record and elsewhere in Slate Gully.	November 2013, March-May 2014 and July 2015
Count of *Ozothamnus tesselatus*	1 July 2015 2 July 2015
Ground orchid survey targeting *Diuris tricolor* and *Prassophyllum* sp. Wybong	30 September 2015 and 1 October 2015

Data were collected from 498 RDP and 79 floristic plots.

The ground orchid survey covered almost 50 km of potentially suitable habitat.

5 RESULTS

5.1 Vegetation Communities/Vegetation Types

Initial similarity analysis of all floristic plots showed clear separation of grassland from forest/woodland plots. Consequently, grassland and forest/woodland were analysed separately. The nMDS for forest/woodland plots (**Figure 7**) shows that plots from the 16 assigned local communities group somewhat together but not widely separated from each other.

The reason for the close grouping of these communities becomes apparent in the field. The forest/woodland vegetation mostly consists of a narrow strip against cleared grazing land, and is situated at the lower slopes of surrounding ridges. As such a lot of the vegetation is ecotonal (where one community merges into another) or is subject to disturbance and edge effects.

Figure 7 Similarity Analysis of the Project Forest/Woodland Plots

Table 7 provides the vegetation community hierarchy (as described in Section 4.2) and threatened community status. A map of local communities is shown in **Figure 8** and community profiles can be found in **Appendix 1**.

Table 7 Vegetation Community Hierarchy

Community	PCT	BVT	PCT Name	Formation	Class	Status
MU4 Narrow-leaved Ironbark Forest	1611	HU825	Narrow-leaved Ironbark - Black Cypress Pine shrub - grass woodland upper Hunter and northern Wollemi	Dry Sclerophyll Forests (Shrub/grass sub-formation)	North-west Slopes Dry Sclerophyll Woodlands	None
MU3 Grey Gum – Narrow-leaved Stringybark Forest	1629	HU843	Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	Dry Sclerophyll Forests (Shrubby sub-formation)	Western Slopes Dry Sclerophyll Forests	None
MU7 Slaty Box Forest	1176	HU618	Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	Dry Sclerophyll Forests (Shrubby sub-formation)	Western Slopes Dry Sclerophyll Forests	Listed TSC Act, V: Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion
MU8 Western Grey Box Woodland	1748	HU962	Grey Box grassy open forest of the Central and Lower Hunter Valley	Dry Sclerophyll Forests (Shrubby sub-formation)	Western Slopes Dry Sclerophyll Forests	None
MU9 White Box Woodland (shrubby)	1610	HU824	White Box - Black Cypress Pine shrubby woodland of the Western Slopes	Dry Sclerophyll Forests (Shrubby sub-formation)	Western Slopes Dry Sclerophyll Forests	None
MU5 Red Ironbark Forest	1672	HU886	Red Ironbark - Grey Gum - Black Pine heathy woodland on sandstone ranges of the Sydney Basin	Dry Sclerophyll Forests (Shrubby sub-formation);	Western Slopes Dry Sclerophyll Forests	None
MU1b Blakely's Red Gum Woodland (shrubby)	1696	HU910	Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	Grassy Woodlands	Coastal Valley Grassy Woodlands	None
MU10 Yellow Box Woodland (grassy)	437	HU732	Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion	Grassy Woodlands	Western Slopes Grassy Woodlands	Listed EPBC Act, CE: White Box Yellow Box Blakely's Red Gum Woodland Listed TSC Act, E: White Box Yellow Box Blakely's Red Gum Woodland

Community	PCT	BVT	PCT Name	Formation	Class	Status
MU1a Blakely's Red Gum Woodland (grassy)	510	HU681	Blakely's Red Gum - Yellow Box grassy tall woodland of the New England Tableland Bioregion	Grassy Woodlands	Western Slopes Grassy Woodlands	Listed EPBC Act, CE: White Box Yellow Box Blakely's Red Gum Woodland Listed TSC Act, E: White Box Yellow Box Blakely's Red Gum Woodland
MU2 Fuzzy Box Woodland	201	HU547	Fuzzy Box woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	Grassy Woodlands	Western Slopes Grassy Woodlands	None
MU6a Rough-barked Apple - Black Cypress Pine Woodland	1767	HU981	Rough-barked Apple grassy tall woodlands of the Brigalow Belt South	Grassy Woodlands	Western Slopes Grassy Woodlands	None
MU6b Rough-barked Apple Woodland - alluvial	1767	HU981	Rough-barked Apple grassy tall woodlands of the Brigalow Belt South	Grassy Woodlands	Western Slopes Grassy Woodlands	None

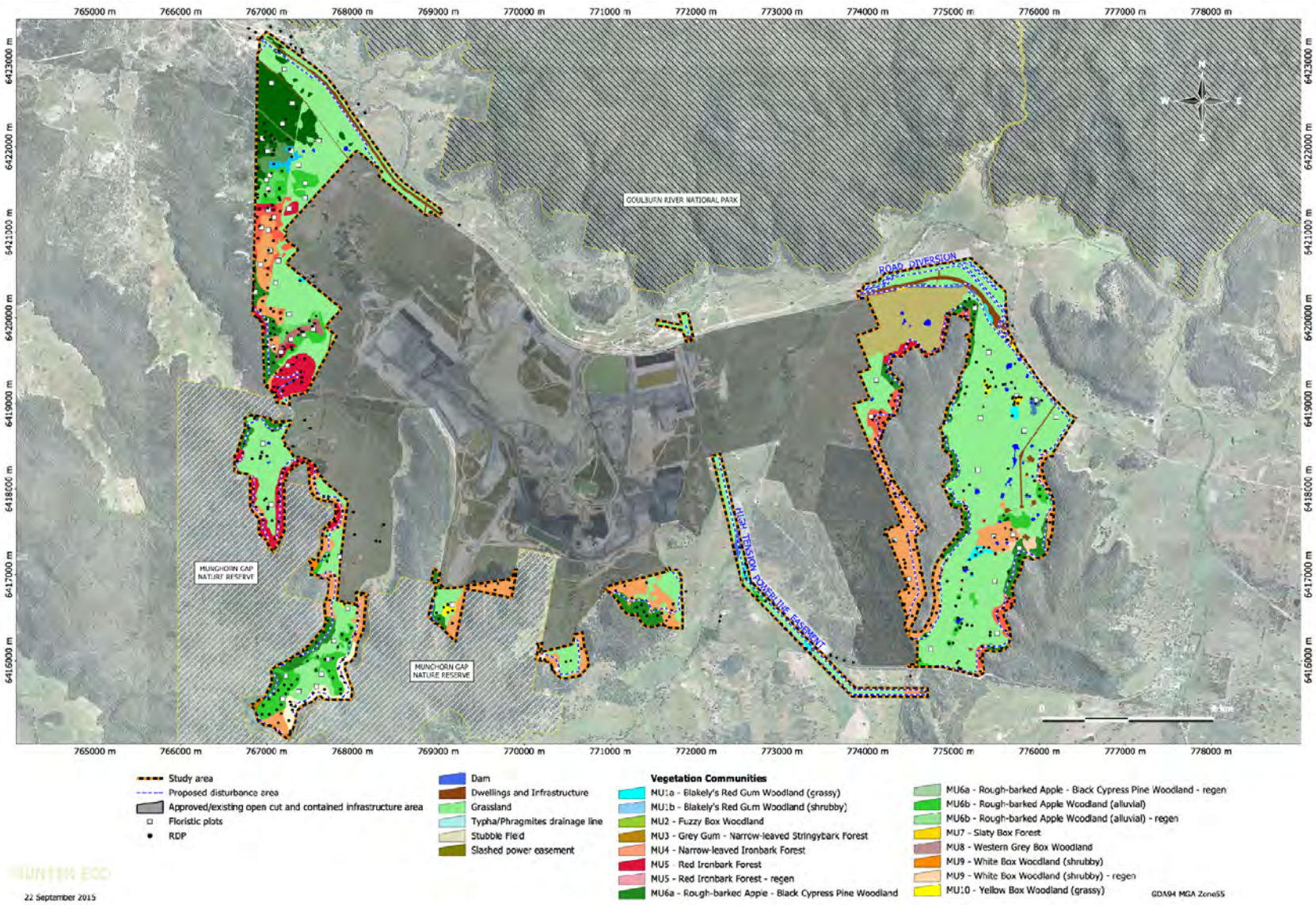


Figure 8 Local Vegetation Communities Mapped across the Study Area

5.1.1 Box-Gum Woodland

Woodland dominated by White Box (*Eucalyptus albens*), Yellow Box (*Eucalyptus melliodora)* or Blakely's Red Gum (*Eucalyptus blakelyi*) where the ground cover is dominated by native grasses can form part of the:

- White Box Yellow Box Blakely's Red Gum Woodland Endangered Ecological Community (Box Gum Woodland Endangered and Ecological Community [EEC]) under the TSC Act; or
- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered Ecological Community (Box Gum Woodland Critically Endangered Ecological Community [CEEC]) under the EPBC Act.

Shrubby forms of the woodland are excluded from the Box-Gum Woodland EEC/CEEC. Distinguishing between the grassy or alternate shrubby and non-threatened form is often difficult due to the presence of shrubby regrowth from disturbance. However, from field observation and sample plot floristic content, the White Box woodland in the Study area (MU9) was assessed as belonging to the shrubby form. This assessment was tested by similarity analysis of 21 floristic plots combined from the current survey and surveys conducted by Hunter Eco (2013) for the *Wilpinjong Coal Mine Modification Terrestrial Flora Assessment*. The resulting nMDS (**Figure 9**) shows that the plots from the Study area group with other shrubby woodland plots and clearly away from grassy woodland plots sampled by Hunter Eco (2013).

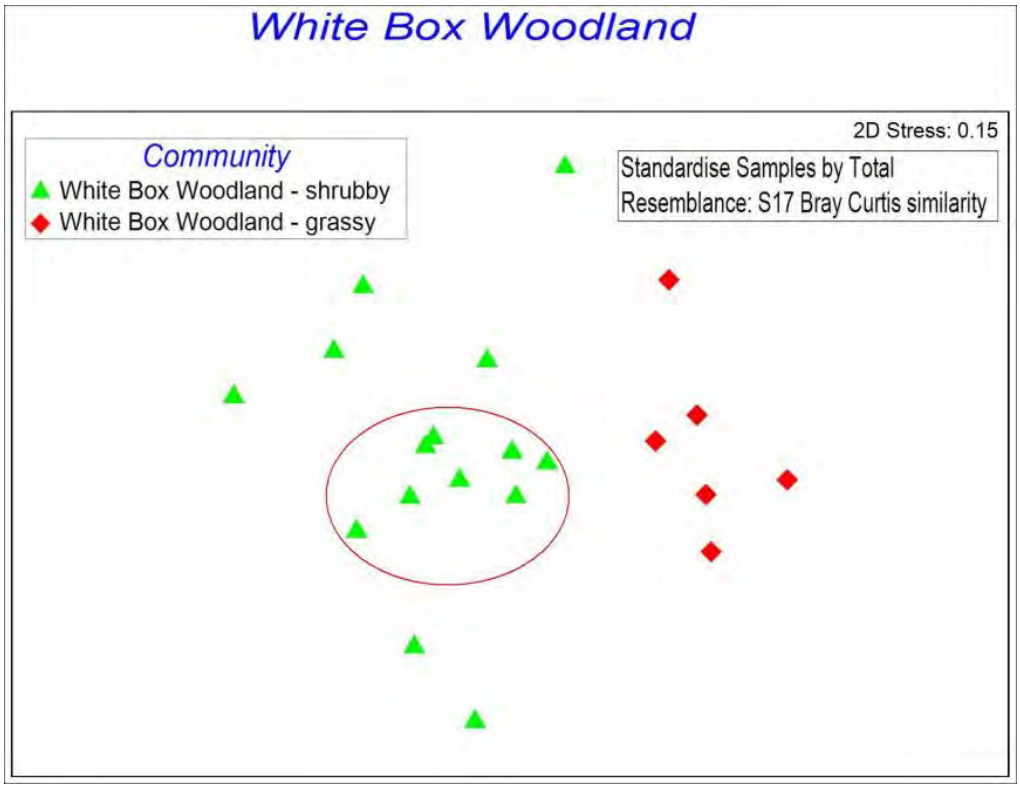


Figure 9 Similarity Analysis of the Floristic Plots in the Study Area (Ellipse) and the Floristic Plots from Hunter Eco (2013) (Plots Outside the Ellipse)

Although the White Box Woodland (shrubby) (MU9) in the Study area does not meet the definition of Box-Gum Woodland EEC/CEEC, the Blakely's Red Gum Woodland (grassy) (MU1a) and Yellow Box Woodland (grassy) (MU10) do represent Box-Gum Woodland EEC/CEEC (**Sections 5.6** and **5.7**).

5.1.2 Grassland

There are approximately 606 ha of cleared grassland in the Study area which is dominated by exotic species. Data from 23 floristic plots were collected from across this grassland, including Biometric data, in order to assess its condition and determine whether the grassland is not native. Further, it is recognised that native grassland growing on land that once supported intact Box-Gum woodland TEC can form part of the Box-Gum Woodland EEC/CEEC and therefore an assessment is provided below.

Guidelines for identification of the Commonwealth Box-Gum Woodland CEEC are provided (Department of Environment and Heritage [DEH], 2006). In relation to grassland the relevant components are:

- That there are 12 or more native understorey species other than grasses, or if not.
- Is the patch 2 ha or greater in size with an average of 20 or more mature trees per hectare?
- There must also be at least one important species from the list also available at DEH (2006).

Guidelines for the identification of the Box-Gum Woodland EEC are less precise as well as being more inclusive of grassland with low native species content (DECC, 2007):

> *The definition of the Box-Gum Woodland explicitly recognises that some remnants are degraded. Highly disturbed sites that have few if any native species in the understorey are specifically included in the community provided vegetation, either understorey or overstorey or both, would, under appropriate management, respond to assisted natural regeneration, such as where the natural soil and associated seed bank are still at least partially intact.*

The guidelines also state:

> *Sites where there is unlikely to be sufficient seed remaining in the soil for the understorey or overstorey to regenerate are not part of the EEC.*

Data from the 23 grassland plots are summarised in **Table 8**, and the first observation is that mean and median are either the same or very close to the same indicating that the mean was not influenced by extreme values.

Table 8 Summary of Data from 23 Grassland Plots

	20x20 m Plot					50 m Transect		
	Total Species	**Weeds**	**Weeds %**	**Grasses Native**	**Other Native**	**Grasses %**	**Other %**	**Weeds %**
Mean	27	10	39	9	7	40	4	54
Median	26	10	38	9	7	40	0	52

The number of canopy trees per hectare across the cleared grassland was determined by count using a GIS and the result was 0.3 trees per hectare.

Because of the sparseness of canopy trees, and the fact that the grassland bordered footslopes of mostly different vegetation, it was difficult to determine with certainty how much, if any, of the grassland once supported the Box-Gum Woodland EEC/CEEC. To be conservative, all of the grassland was treated as having supported Box-Gum Woodland EEC/CEEC and the present condition was compared to the appropriate guidelines.

Commonwealth Box-Gum Woodland CEEC

The guidelines for identification of the Box-Gum Woodland CEEC (DEH, 2006) requires 12 or more native species other than grasses to be included in the understorey and the grassland in the Study area had on average seven. Therefore, the grassland does not represent Box-Gum Woodland CEEC.

NSW Box-Gum Woodland EEC

In regard to the Box-Gum Woodland EEC, the core consideration is whether under assisted natural regeneration the grassland could return to its pre-cleared state.

Assisted natural regeneration is described as the removal of threats to regeneration such as grazing (including native macropods), fire management, feral animal control and weed control. It does not include direct seeding or planting (OEH, 2011).

Assisted natural regeneration primarily relies on native species growing from the seed bank.

Within the grassland in the Study area, there was very little evidence of native species regeneration and the near absence of canopy trees and shrubs over many years means that any seed bank would have been exhausted some time ago. Examination of a 1955 aerial photograph shows that grassland in the extension disturbance area was almost devoid of trees 60 years ago, with the exception of the western part where significant reduction has occurred since that time. It is reasonable to assume that these lands have been cleared and grazed for in excess of 100 years.

Gross and Vary (2014) provide an introductory literature review of spontaneous recovery of vegetation communities following disturbance. Their conclusion is that "*The spontaneous recovery of habitats to pre-disturbance species' assemblages rarely occurs following major disturbances such as land clearing."* They provide a detailed study that showed the lack of a rich seed bank was a primary factor.

Analysis was conducted by examining the floristic similarity of sample plots collected by Hunter Eco (2013) for the *Wilpinjong Coal Mine Modification Terrestrial Flora Assessment* and the current study using non-metric multidimensional scaling. The grassland in the Hunter Eco (2013) study area was predominantly native and had little if any pasture improvement. **Figure 10** shows that the Hunter Eco (2013) and current study plots grouped separately indicating that they were floristically different.

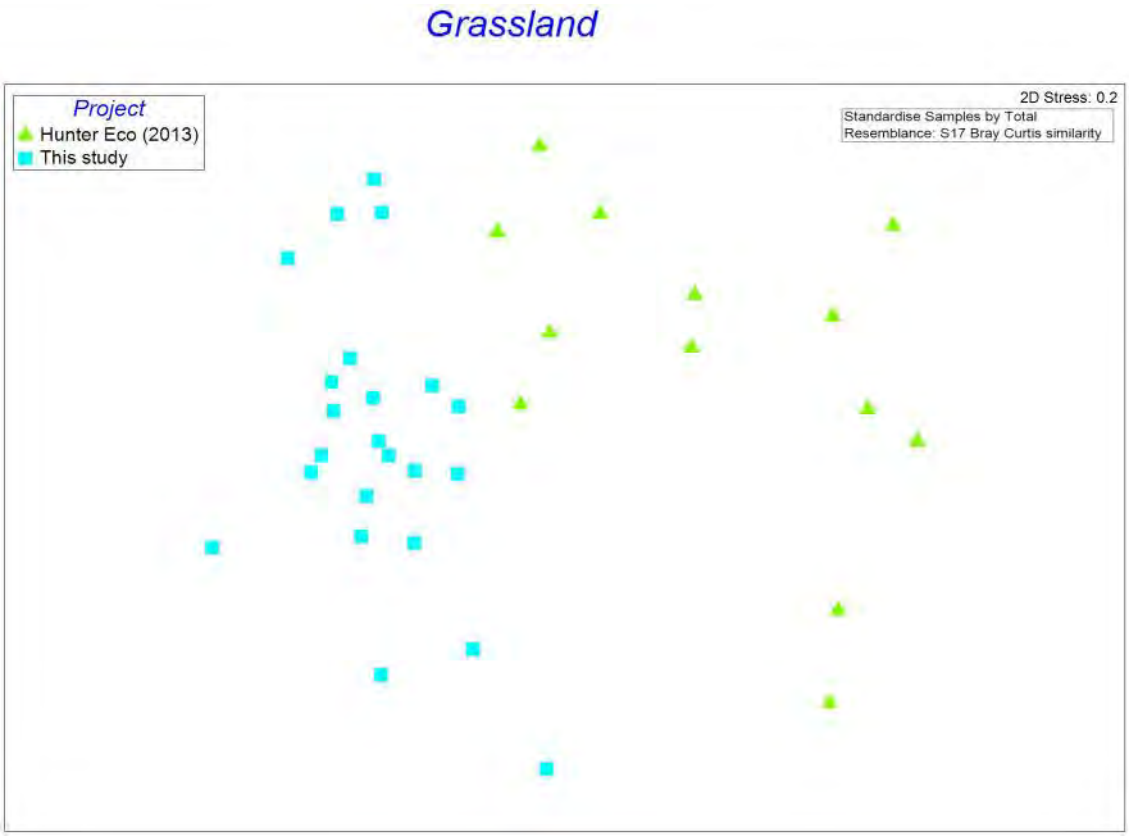


Figure 10 Similarity Analysis of Floristic Plots in the Study Area and the Floristic Plots from Hunter Eco (2013)

It is concluded that the grassland in the Study area is unlikely to respond to assisted natural regeneration, thus it would not meet the standard required of the derived grassland component of the Box-Gum Woodland EEC. Further, it should also be noted that if the Project were not to proceed, the grassland in the Study area would continue in its current state of regular grazing and pasture management. In other words there would be no assisted regeneration.

5.2 Vegetation Condition

There were three main vegetation conditions across the Study area:

- Woodland/forest primarily occurring at the edges of wider cleared land, with some isolated patches within the cleared land. The condition of this vegetation was moderate/good.
- Shrubby regeneration consisting of areas that had previously been cleared of most canopy trees and was regenerating. This type was assigned to the most likely original forest/woodland community. The condition of this vegetation was moderate/good.
- Improved pasture made up nearly half of the Study area and as shown above, consisted of mostly introduced grasses and herbs such as clovers and a variety of weed species.

5.3 Flora Species

Appendix 2 provides a list of all flora species recorded. In summary, 282 species were recorded which included 61 weed species. There were 169 genera from 58 families.

5.4 Introduced Species and Weeds

Weeds were considerably more abundant in the improved pasture grassland (37% of species) than in the other communities (average 3.5% of species) (**Appendix 3**). The most abundant introduced species were clovers (*Trifolium* species) consistent with improved pasture.

5.5 Threatened Flora Species

Table 4 (**Section 4**) provided a list of threatened flora species known or predicted to occur within 30 km of the study area. **Table 9** provides an assessment of the likelihood of occurrence of these species within the Study area based on preferred habitat compared with habitat recorded during surveys and the location of known records with information sourced from BioNet (OEH, 2015a).

Table 9 Assessment of Likelihood of Threatened Flora Species Occurring in the Study Area

Scientific Name	Habitat suitability	BioNet (OEH, 2015a) records and likelihood of occurring
Cynanchum elegans	Occurs at the edge of dry rainforest. No suitable habitat present.	Nearest record 50 km north-east. Unlikely to be present.
Tylophora linearis	Occurs in a variety of shrubby dry sclerophyll communities. Suitable habitat present.	Recorded from Bylong 40 km east of the Project. Possible but not recorded despite targeted searches.
Leucochrysum albicans var. tricolor	Occurs in a variety of grassland to forest habitats generally on heavy soils. No suitable habitat.	9 km west. Unlikely to be present, no heavy soils.
Ozothamnus tesselatus	Occurs in a variety of shrubby dry sclerophyll communities. Suitable habitat present.	Recorded.
Senecio linearifolius var. dangarensis	Grow on an open scree slope in woodland and rainforest on basalt. No suitable habitat.	Only known from one population in Goulburn River National Park, 50 km east. Unlikely to be present.
Monotaxis macrophylla	Recorded from a wide range of habitat types. While suitable habitat may be present in the Study area, the species is a short-lived (approximately 6 months) fire ephemeral. With no records or evidence of fire in the Study area the species would not be present.	One record 60 km east. Unlikely to be present.
Kennedia retrorsa	Recorded from a wide range of habitat types. Suitable habitat present.	50 km east. Unlikely to be present.
Swainsona sericea	Found in natural grassland and woodland including Box-Gum woodland. Suitable habitat present.	20 km west. Possible but not recorded despite targeted searches.
Acacia ausfeldii	Found in shrubby woodland such as White Box or Blakely's Red Gum. Germination is stimulated by fire and the long absence of fire in the Study area reduces the likelihood of the species being present. Suitable habitat present.	1 km west. Possible but not recorded despite targeted searches.
Acacia dangarensis	Grows on basalt. No suitable habitat.	50 km east. Would not be present.
Acacia flocktoniae	Recorded from dry sclerophyll forest on sandstone. Very little suitable habitat present.	One record 140 km north-west. Unlikely to be present.
Prostanthera cryptandroides subsp. *cryptandroides*	Occurs on Narrabeen sandstone often in association with *Eucalyptus fibrosa*. Very little suitable habitat present.	140 km south-east and north-east. Unlikely to be present.
Prostanthera discolor	Grows in side gullies of main creeklines in rocky or alluvial substrates. No suitable habitat present.	140 km south-east and north-east. Unlikely to be present.
Prostanthera stricta	Grows in a variety of shrubby dry sclerophyll communities. Suitable habitat present.	140 km south-east. Unlikely to be present.
Commersonia procumbens	Grows in sandy woodland habitat. Suitable habitat present.	60 km east and 70 km north west. Unlikely to be present.

Scientific Name	Habitat suitability	BioNet (OEH, 2015a) records and likelihood of occurring
Commersonia rosea	Occurs on skeletal sandy soil in scrub or heath vegetation. No suitable habitat present.	55 km east. Unlikely to be present.
Lasiopetalum longistamineum	Grows on rich alluvial soils. No suitable habitat present.	50 km east. Unlikely to be present.
Homoranthus darwinioides	Recorded from a variety of habitats and communities, particularly on gravelly sandy soils. Suitable habitat present.	5 km north and east. Possible but not recorded despite targeted searches.
Diuris pedunculata	In sclerophyll forest in moist grassy areas. No suitable habitat.	160 km north east. Unlikely to be present.
Diuris tricolor	Suitable habitat. Grows in grassy woodland and open native grassland.	7 km south-east. Possible but not recorded despite targeted surveys.
Prasophyllum sp. *Wybong*	Suitable habitat. Found in open forest and native grassland.	70 km east. Unlikely to be present and not recorded during targeted surveys.
Persoonia marginata	Dry sclerophyll forest in the Capertee district.	85 km south. Would not be present.
Pomaderris queenslandica	Generally in moist eucalypt forest in damp areas, particularly along creeks. No suitable habitat present.	11 km east. Unlikely to be present.
Pomaderris reperta	Occurs in woodland in association with *Eucalyptus crebra*, *E. blakelyi*, *Notelaea microcarpa* and *Allocasuarina littoralis.* Generally in sandy loam on sandstone or conglomerate. Possible suitable habitat present.	65 km east. Unlikely to be present.
Pomaderris sericea	Open forest on sandstone. Possible suitable habitat present.	30 km south-east. Unlikely to be present.
Philotheca ericifolia	Grows in dry sclerophyll forest and heath on damp sandy flats and gullies. No suitable habitat present.	20 km south. Unlikely to be present.

One threatened flora species has been recorded in or near the Study area (**Figure 11**), being *Ozothamnus tesselatus*.

Ozothamnus tesselatus is a member of the Asteraceae family (daisies) and is listed as vulnerable in both the TSC Act and the EPBC Act. It is a multi-stemmed spindly shrub to about 1 m tall, generally growing in groups of a few to several thousand in a variety of dry eucalypt woodland habitat. Two groups of plants were present in Pit 7, one of 34 plants located in the previously approved pit area and another group in the Project ancillary disturbance area. Lesryk (2013) recorded an estimated 380 plants at the south eastern end of Pit 8. On 1 July 2015 all individuals in the Pit 7 population were counted with 244 being recorded. On 2 July 2015 all individuals in the Pit 8 population were counted with 816 being recorded, not all of which were located in the Project disturbance area. On 30 September 2015 an additional small population of 30 plants was recorded at the edge of Pit 8.

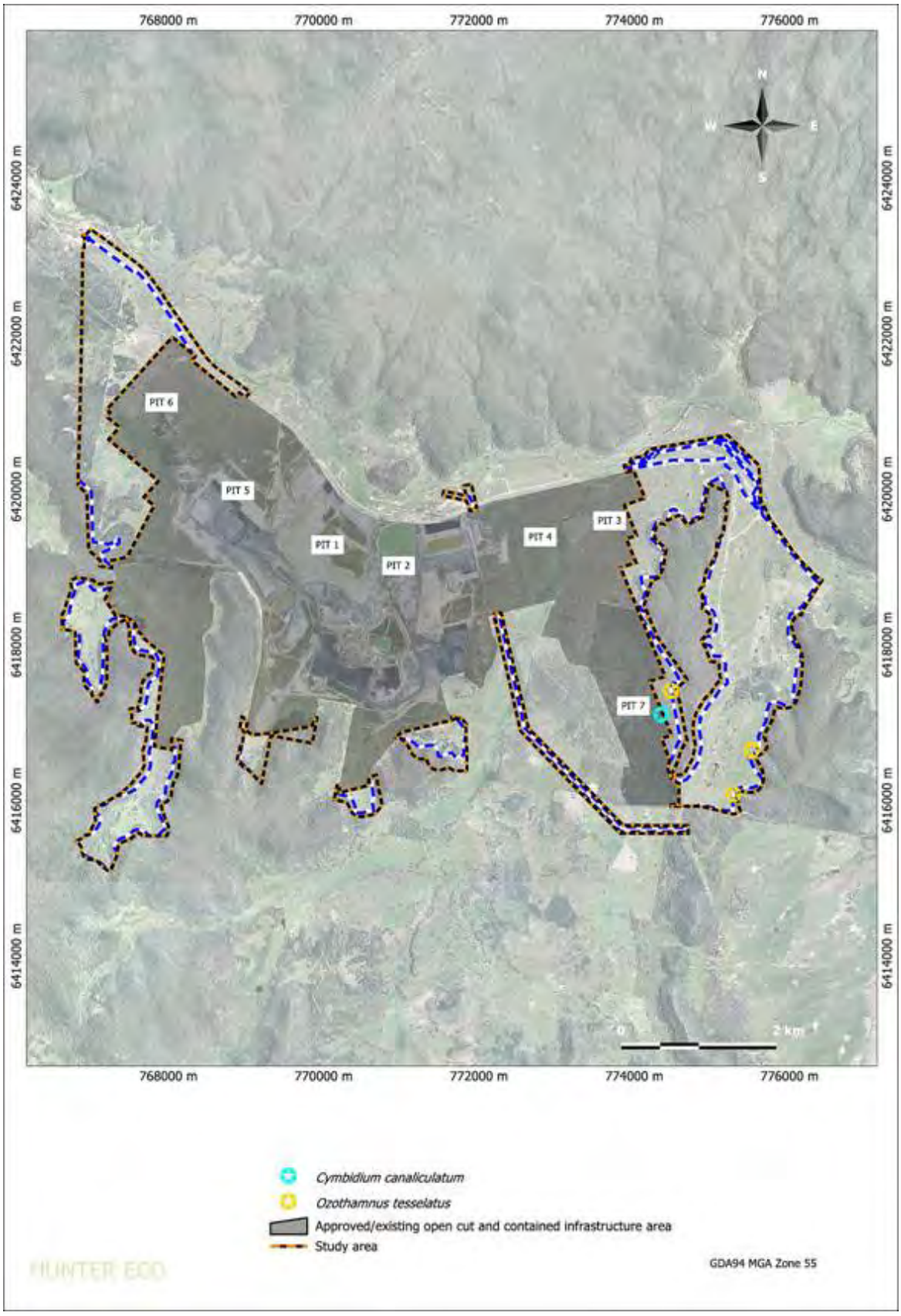


Figure 11 Threatened Flora Species Recorded across the Study Area

A third threatened flora species, *Thesium australe,* was reported to occur. *Thesium australe* is a low spreading herb generally growing in association with Kangaroo Grass (*Themeda triandra*). It is listed as vulnerable in both the TSC Act and the EPBC Act. Lesryk Environmental Consultants (2013) reported an occurrence in the centre of Pit 8. However, subsequent targeted searches by Hunter Eco of the same area (November 2013, March and May 2014 and June 2015) did not locate any plants. Targeted searches of patches of Kangaroo Grass elsewhere in Pit 8 were also unproductive. BioNet (OEH, 2015a) shows one *Thesium australe* record approximately 15 km south of the Study area. However this appears to be a location error since the location description is quite specific placing the record north of Coolah, approximately 100 km north of Wilpinjong. The nearest valid record is near Cassilis, approximately 30 km north of Wilpinjong. It appears that Lesryk did not lodge a specimen with the Sydney Herbarium or place the record on BioNet (OEH, 2015a). This along with the lack of any other records in the region places the Lesryk (2013) record as doubtful or at least unconfirmed. All evidence indicates that the species is unlikely to be present in Pit 8, or elsewhere in the Study area, thus it is not included in impact assessments.

FloraSearch (2005) previously reported the presence of Capertee Stringybark (*Eucalyptus cannonii*) near the Wilpinjong Coal Mine. During current surveys of the same area, two trees were suspected to be Capertee Stringybark. Samples were subsequently confirmed by the Sydney Herbarium to be hybrids of *Eucalyptus cannonii* and *Eucalyptus macrorhyncha*. This hybrid is not listed as a threatened species.

5.6 Threatened Ecological Communities Listed Under the TSC Act

Local communities *MU1a Blakely's Red Gum Woodland – grassy* and *MU10 Yellow Box Woodland – grassy* were assessed to be components of the Box-Gum Woodland EEC (and CEEC – see **Section 5.7**). The main identifying characteristics were the presence of Blakely's Red Gum and Yellow Box with a predominantly grassy ground cover. Local communities *MU1b Blakely's Red Gum Woodland – shrubby* and *MU9 White Box Woodland – shrubby* were not considered to be part of the Box-Gum Woodland EEC because of the presence of a dominant and varied shrub layer.

Local community *MU7 Slaty Box Forest* was assessed as meeting the description of the NSW listed vulnerable ecological community *Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion.* The main identifying characteristics were the occurrence in the Sydney Basin Bioregion, dominance of Slaty Gum (*Eucalyptus dawsonii*) and a moderately dense shrub layer.

Local community *MU2 Fuzzy Box Woodland* was assessed against the NSW EEC *Fuzzy Box Woodland on alluvial soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions* because of the dominance of Fuzzy Box (*Eucalyptus conica*). However, while the NSW Scientific Committee determination has similarities to the local community, the Study area lies in the Sydney Basin Bioregion and is thus outside of the geographic bounds of the determination.

Local community *MU8 Western Grey Box Woodland* was assessed against the NSW EEC *Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions* because of the dominance of Inland or Western Grey Box (*Eucalyptus microcarpa*). However, while the NSW Scientific Committee determination has similarities to the local community, the Study area lies in the Sydney Basin Bioregion and is thus outside of the geographic bounds of the determination.

None of the remaining local community profiles were indicative of any TSC Act listed TECs.

5.7 Threatened Ecological Communities Listed Under the EPBC Act

Local communities *MU1a Blakely's Red Gum Woodland – grassy* and *MU10 Yellow Box Woodland – grassy* were assessed as Box-Gum Woodland CEEC. The main identifying characteristics were the presence of Blakely's Red Gum and Yellow Box with a predominantly grassy ground cover. Local communities *MU1b Blakely's Red Gum Woodland – shrubby* and *MU9 White Box Woodland – shrubby* were not considered to be part of the Box-Gum Woodland CEEC because of the presence of a dominant and varied shrub layer.

Local community *MU8 Western Grey Box Woodland* was assessed against the Commonwealth listed endangered ecological community *Grey* Box (*E. microcarpa*) *Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia* because of the dominance of Inland or Western Grey Box (*E. microcarpa*). While there are similarities between the community occurring on the Study area and the Commonwealth Grey Box Listing Advice, the distribution in the listing advice does not include the Sydney Basin Bioregion and is thus outside of the geographic bounds of the determination.

None of the remaining local community profiles were indicative of any EPBC Act listed TECs.

5.8 Endangered Populations Listed under the TSC Act

Cymbidium canaliculatum R. Br. in the Hunter Catchment is a listed endangered population of the arboreal Tiger Orchid (*Cymbidium canaliculatum*). During pre-clearing surveys for Pit 7 in May 2015 a single Tiger Orchid was found near the Study area boundary (**Figure 11**) indicating the presence of this endangered population. Despite extensive searching of woodland within the Study area no other occurrences were recorded. There are a number of BioNet (OEH, 2015a) records in the Bylong region east of Wilpinjong and several recent unpublished records in the Wilpinjong/Wollar region three or more kilometres from the Study area.

No Weeping Myall (*Acacia pendula*) were recorded so the endangered population *Acacia pendula population in the Hunter catchment* was not present.

5.9 Groundwater Dependent Ecosystems

The *National Atlas of Groundwater Dependent Ecosystems* (BoM, 2015b), does not identify any potential GDEs in the study area or surrounds. No woodland or forest vegetation communities exhibiting characteristics of groundwater dependency were identified in the study area during the surveys, with all being dry sclerophyll woodland.

The only areas with potential surface expression of groundwater were the main creeks which receive base flow from surrounding catchments, i.e. Cumbo Creek and Wilpinjong Creek. Cumbo Creek flows from the south into Wilpinjong Creek with the southern section flowing through cleared grazing land. WCPL are approved to relocate the lower sections of Cumbo Creek as a component of the approved mining operations.

The banks of Wilpinjong Creek have been subject to erosion, grazing by cattle and invasion by weeds such as Blackberry (*Rubus fruticosus*) and a Rush (*Juncus acutus*). Generally, the riparian trees are sparse and discontinuous. There are patches of Typha and Phragmites rushes, both water dependent species, along Cumbo and Wilpinjong Creeks (**Figure 12**). Other than these species the vegetation along these creeks has been substantially cleared.

5.10 Potential Koala Habitat

Of the SEPP 44 preferred feed trees listed in **Table 5**, only Grey Gum (*Eucalyptus punctata*) and White Box (*Eucalyptus albens*) were present in the Study area in the following two communities:

- MU3 Grey Gum - Narrow-leaved Stringybark Forest.
- MU9 White Box Woodland (shrubby).

Density of these feed trees in these communities would be variable but patches would meet or exceed the 15% nominated by SEPP 44.

The *Recovery Plan for the Koala (Phascolarctos cinereus)* (DECC 2008b) places the Project location in *Koala Management Area 2: Central Coast* and lists food tree species for the area. From that list Fuzzy Box (*Eucalyptus conica*), Western Grey Box (*Eucalyptus microcarpa*) (incorrectly named *E. macrocarpa*), Grey Gum (*Eucalyptus punctata*) and Narrow-leaved Stringybark (*Eucalyptus sparsifolia*) occur within the Study area. Additional species that occur in the Study area listed for the adjoining Area 6: Western Slopes and Plains are White Box (*Eucalyptus albens*), Blakely's Red Gum (*Eucalyptus blakelyi*), Yellow Box (*Eucalyptus melliodora*) and Red Stringybark (*Eucalyptus macrorhyncha*). Additional information is available from the threatened species profiles search tool on the BioNet website. In addition to the aforementioned species, Slaty Box (*Eucalyptus dawsonii*) is listed as suitable.

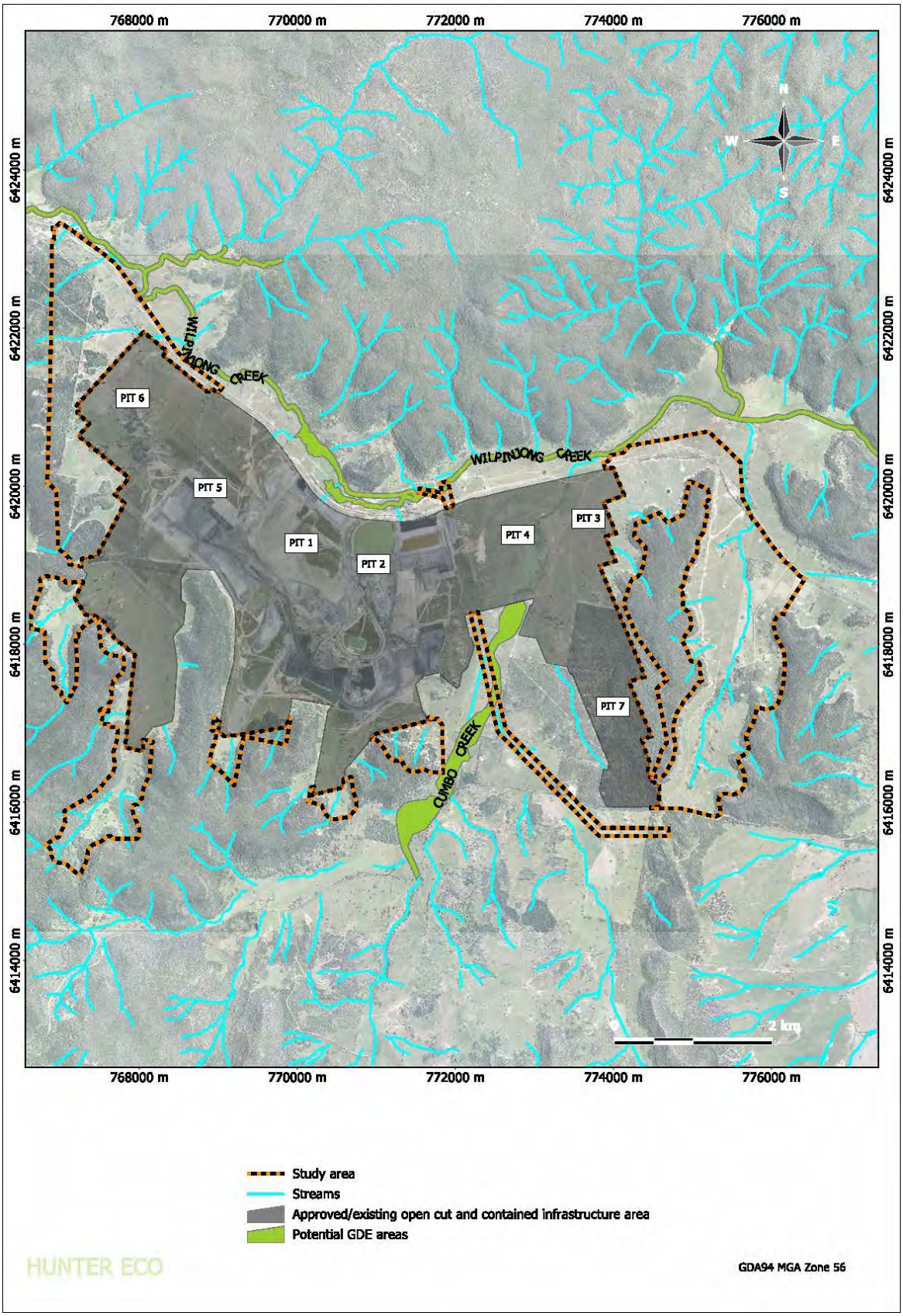


Figure 12 Potential Groundwater Dependent Ecosystem Areas in and Around the Study Area

The *Recovery Plan for the Koala (Phascolarctos cinereus)* (DECC, 2008b) notes that the use of these trees by Koala is independent of their density (as opposed to the SEPP 44 condition of 15% of the canopy). These species indicate that the following Study area communities would provide potential Koala habitat:

- MU1a Blakely's Red Gum Woodland (grassy).
- MU1b Blakely's Red Gum Woodland (shrubby).
- MU2 Fuzzy Box Woodland.
- MU3 Grey Gum - Narrow-leaved Stringybark Forest.
- MU8 Western Grey Box Woodland.
- MU7 Slaty Box Forest.
- MU9 White Box Woodland (shrubby).
- MU10 Yellow Box Woodland (grassy).

6 CONCLUSION

Ten vegetation communities were mapped across the Study area, among which three are listed threatened communities. *MU1a Blakely's Red Gum Woodland – grassy* and *MU10 Yellow Box Woodland – grassy* were assessed to be the Box-Gum Woodland EEC/CEEC listed under the TSC Act and EPBC Act. Local community *MU7 Slaty Box Forest* was assessed as meeting the description of the NSW listed vulnerable ecological community *Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion.*

The surveys were undertaken over a number of seasons to target potentially occurring threatened flora. One threatened flora species was recorded in and near the Study area, namely *Ozothamnus tesselatus,* vulnerable under the TSC Act and EPBC Act.

One individual of the endangered population *Cymbidium canaliculatum R. Br. in the Hunter Catchment* was recorded just outside the Study area boundary indicating suitable habitat for this population within the Study area.

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APPENDIX 1 VEGETATION COMMUNITY PROFILES

MU1a Blakely's Red Gum Woodland (grassy)

Status

TSC Act: a component of *White Box Yellow Box Blakely's Red Gum Woodland* EEC

EPBC Act: A component of *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* CEEC

General Description

Location: in scattered remnants on open flats and drainage lines.

Canopy: contained tall but young *Eucalyptus blakelyi* along with juveniles.

Shrubs: a dense woody weed cover of *Cassinia arcuata* indicative of past clearing.

Ground: comprised of seven native grass species including *Microlaena stipoides, Aristida ramosa* and *Aristida vagans.*

Species Richness

Total species	49
Plots	3
Mean species/plot ± SD	18±9.29
Weeds	13%

Key Diagnostic Species

Group MU1a - Blakely's Red Gum Woodland (grassy)

Average similarity: 21.78

Growth Form	Species	Av.Abund	Av.Sim	Sim/SD	Contrib%
Tree	*Eucalyptus blakelyi*	3.54	8.31	5.95	38.14
Shrub	*Cassinia arcuata*	2.98	5.43	2.25	24.91
	Acacia decora	1.11	1.11	0.58	5.11
Grass					
	Aristida ramosa	1.55	1.11	0.58	5.11
	Aristida vagans	1.55	1.11	0.58	5.11
Graminoid					
	Lomandra bracteata	1.11	1.11	0.58	5.11
Herb					
	Dichondra repens	1.31	1.36	0.58	6.25
	Einadia hastata	1.71	1.12	0.58	5.16
Vine					
	Desmodium varians	1.11	1.11	0.58	5.11

MU1b Blakely's Red Gum Woodland (shrubby)

Status

Not a TEC under the TSC Act or EPBC Act

General Description

Location: on the western side of the Study area in drainage basins and low slopes.
Canopy: dominated by *Eucalyptus blakelyi* along with a few *Eucalyptus microcarpa*.
Shrubs: dominated by *Melaleuca thymifolia*, along with scattered *Daviesia genistifolia*.
Ground: dominated by the grass *Arundinella nepalensis*, along with low numbers of *Aristida vagans, Bothriochloa decipiens, Aristida ramosa* and *Cymbopogon refractus*.
Sedges *Carex inversa* and *Carex incomitata* were widespread.

Species Richness

Total species	27
Plots	3
Mean species/plot ± SD	18±9.19
Weeds	3%

Key Diagnostic Species

Group MU1b - Blakely's Red Gum Woodland (shrubby)

Average similarity: 52.03

Growth Form	Species	Av.Abund	Av.Sim	Sim/SD	Contrib%
Tree	*Eucalyptus blakelyi*	4.1	8.99	SD=0!	17.28
Shrub	*Melaleuca thymifolia*	3.28	6.96	SD=0!	13.38
Grass	*Arundinella nepalensis*	3.5	6.96	SD=0!	13.38
	Aristida vagans	2.47	5.69	SD=0!	10.93
	Aristida ramose	1.75	4.02	SD=0!	7.73
Graminoid	*Lomandra confertifolia subsp. rubiginosa*	2.47	5.69	SD=0!	10.93
Sedge	*Carex incomitata*	2.77	5.69	SD=0!	10.93
Herb	*Dianella longifolia*	2.14	4.02	SD=0!	7.73
Fern	*Cheilanthes sieberi*	1.75	4.02	SD=0!	7.73

MU2 Fuzzy Box Woodland

Status

Not a TEC under the TSC Act or EPBC Act

General Description

Location: one location only at the north-eastern end of the study area.
Canopy: Fuzzy Box (*Eucalyptus microcarpa*).
Shrubs: sparse cover of *Cassinia arcuata* along with *Hibbertia obtusifolia, Daviesia genistifolia* and *Bossiaea buxifolia*.
Ground: also sparse with *Aristida personata*, *Microlaena stipoides* and *Aristida vagans*, along with scattered herbs and sedges.

Species Richness

Total species	21
Plots	1
Mean species/plot ± SD	-
Weeds	5%

Key Diagnostic Species

Insufficient plots to generate Simper data

MU3 Grey Gum - Narrow-leaved Stringybark Forest

Status

Not a TEC under the TSC Act or EPBC Act

General Description

Location: on many of the side slopes rising from the valley floor.
Canopy: dominated by *Eucalyptus punctata* along *with Eucalyptus sparsifolia, Eucalyptus tenella, Eucalyptus macrorhyncha* and *Callitris endlicheri*.
Shrubs: sparse and dominated by *Goodenia ovata, Cassinia decipiens, Leucopogon muticus, Phebalium squamulosum subsp. lineare* and *Acacia linearifolia*. Ground: also sparse with the main species being the herbs *Dichondra repens* and *Phyllanthus hirtellus*, graminoids *Lomandra glauca, Lomandra bracteata* and *Lomandra multiflora* and grasses *Cleistochloa rigida* and *Aristida vagans*.

Species Richness

Total species	64
Plots	4
Mean species/plot ± SD	26±3.87
Weeds	1%

Key Diagnostic Species

Group Grey Gum - Narrow-leaved Stringybark Forest

Average similarity: 34.57

Growth Form	Species	Av.Abund	Av.Sim	Sim/SD	Contrib%
Tree	*Eucalyptus punctata*	8.08	6.28	4.47	18.17
	Callitris endlicheri	5.63	1.67	0.41	4.82
Shrub	*Leucopogon muticus*	3.27	2.61	12.52	7.55
	Acacia linearifolia	2.65	1.36	0.91	3.93
	Cassinia arcuata	2.65	1.36	0.91	3.93
	Cassinia decipiens	3.44	1.01	0.41	2.92
	Astroloma humifusum	1.89	0.43	0.41	1.24
	Persoonia linearis	1.4	0.43	0.41	1.24
	Podolobium ilicifolium	1.4	0.43	0.41	1.24
	Dodonaea viscosa subsp. cuneata	1.38	0.42	0.41	1.21
Grass	*Microlaena stipoides*	2.52	1.26	0.91	3.65
Graminoid	*Lomandra bracteata*	2.02	1.26	0.91	3.65
Herb	*Dichondra repens*	3.78	2.5	0.91	7.23
	Phyllanthus hirtellus	2.66	1.34	0.91	3.87
	Calotis cuneifolia	2.02	1.26	0.91	3.65
	Lagenophora stipitata	1.89	1.25	0.91	3.62
	Einadia hastata	1.38	0.42	0.41	1.21
	Hydrocotyle laxiflora	1.25	0.42	0.41	1.21
	Veronica plebeia	1.25	0.42	0.41	1.21
	Goodenia hederacea	1.27	0.42	0.41	1.21
	Pomax umbellata	1.27	0.42	0.41	1.21
Sedge	*Gahnia aspera*	2.65	2.51	95.94	7.26
Fern	*Cheilanthes sieberi*	3.27	2.61	12.52	7.55
Vine	*Glycine clandestina*	2.65	2.51	95.94	7.26

MU4 Narrow-leaved Ironbark Forest

Status

Not a TEC under the TSC Act or EPBC Act

General Description

Location: mostly on lower slopes although crosses the ridge to the north between Pit 7 and proposed Pit 8.

Canopy: dominated by *Eucalyptus crebra* along with *Callitris endlicheri*, Eucalyptus albens and *Eucalyptus punctata*.

Shrubs: *Cassinia arcuata, Exocarpos cupressiformis, Acrotriche rigida, Leucopogon muticus* and *Astroloma humifusum*.

Ground: herbs *Hydrocotyle laxiflora*, *Hibbertia monogyna, Dichondra repens* and *Hydrocotyle laxiflora*, and grasses *Austrostipa scabra* subsp. *scabra, Microlaena stipoides, Aristida vagans* and *Rytidosperma erianthum*.

Species Richness

Total species	91
Plots	4
Mean species/plot ± SD	28±7.41
Weeds	0%

Key Diagnostic Species

Group Narrow-leaved Ironbark Forest

Average similarity: 40.35

Growth Form	Species	Av.Abund	Av.Sim	Sim/SD	Contrib%
Tree	*Eucalyptus crebra*	2.64	3.47	2.84	8.61
	Callitris endlicheri	1.42	1.3	0.88	3.23
	Eucalyptus macrorhyncha	0.95	0.35	0.41	0.86
Shrub	*Cassinia arcuata*	2.2	2.91	4.14	7.21
	Hibbertia monogyna	1.32	1.24	0.9	3.06
	Dodonaea triangularis	1.06	1.17	0.91	2.9
	Astroloma humifusum	1.17	1.14	0.91	2.83
	Acacia uncinata	1.18	1.1	0.91	2.73
	Persoonia linearis	1.03	1.1	0.91	2.73
	Bursaria spinosa	1.03	1.06	0.91	2.63
	Acacia implexa	0.7	0.39	0.41	0.96
	Bossiaea buxifolia	0.68	0.35	0.41	0.86
	Daviesia ulicifolia	0.68	0.35	0.41	0.86
	Hibbertia obtusifolia	0.68	0.35	0.41	0.86
	Leucopogon muticus	0.95	0.35	0.41	0.86
	Styphelia triflora	0.68	0.35	0.41	0.86
Grass	*Microlaena stipoides*	1.87	2.57	4.55	6.38
	Aristida vagans	1.66	2.46	8.26	6.09
	Austrostipa scabra subsp. *scabra*	0.97	0.4	0.41	0.98
	Aristida ramosa	0.81	0.36	0.41	0.88
	Rytidosperma pallidum	0.68	0.35	0.41	0.86
	Eragrostis leptostachya	0.67	0.34	0.41	0.83
Graminoid	*Lomandra multiflora*	1.06	1.17	0.91	2.9
	Lomandra glauca	0.68	0.35	0.41	0.86
Herb	*Dichondra repens*	1.66	2.46	8.26	6.09
	Einadia polygonoides	1.38	2.21	14.29	5.47
	Einadia hastata	1.16	1.08	0.91	2.69
	Wahlenbergia communis	1.02	1.08	0.91	2.68
	Calotis cuneifolia	1.03	1.06	0.91	2.63
	Hydrocotyle laxiflora	0.95	0.47	0.41	1.18
	Calotis lappulacea	0.67	0.34	0.41	0.83
Sedge	*Gahnia aspera*	1.64	2.23	11.56	5.53
Fern	*Cheilanthes sieberi*	1.51	2.32	33.46	5.74
Vine	*Desmodium varians*	1.02	1.08	0.91	2.68
	Glycine clandestina	0.68	0.35	0.41	0.86
Wees (Herb)	**Anagallis arvensis*	0.7	0.39	0.41	0.96

MU5 Red Ironbark Forest

Status

Not a TEC under the TSC Act or EPBC Act

General Description

Location: on upper slopes and ridges on the western side of the Study area.
Canopy: dominated by *Eucalyptus fibrosa* and *Callitris endlicheri* along with *Eucalyptus macrorhyncha* and *Eucalyptus crebra*.
Shrubs: sparse consisting of *Daviesia ulicifolia, Cassinia arcuata, Brachyloma daphnoides, Cassinia decipiens*, *Leucopogon muticus* and *Dodonaea triangularis*.
Ground: grasses *Rytidosperma pallidum*, *Microlaena stipoides* and *Aristida vagans* and sedges *Lepidosperma laterale* and *Gahnia aspera*.

Species Richness

Total species	62
Plots	4
Mean species/plot ± SD	28±7.41
Weeds	0%

Key Diagnostic Species

Group Red Ironbark Forest

Average similarity: 40.37

Growth Form	Species	Av.Abund	Av.Sim	Sim/SD	Contrib%
Tree	*Eucalyptus fibrosa*	9.77	7.86	4.72	19.47
	Callitris endlicheri	10.16	7.34	3.32	18.17
	Eucalyptus crebra	1.76	0.45	0.41	1.12
Shrub	*Cassinia decipiens*	3.24	1.8	0.89	4.46
	Cassinia quinquefaria	2.68	1.23	0.87	3.05
	Acacia linearifolia	2	1.14	0.9	2.84
	Leucopogon muticus	2.28	1.14	0.9	2.84
	Cassinia arcuata	2.68	1.06	0.91	2.62
	Astroloma humifusum	1.74	1.06	0.91	2.62
	Daviesia ulicifolia	2.96	0.9	0.41	2.23
	Bursaria spinosa	1.59	0.36	0.41	0.9
	Persoonia linearis	1.22	0.36	0.41	0.9
	Phebalium squamulosum subsp. lineare	1.06	0.35	0.41	0.86
Grass	*Microlaena stipoides*	4.16	1.77	0.7	4.38
	Rytidosperma pallidum	2.96	1.23	0.87	3.05
	Aristida ramosa	1.06	0.35	0.41	0.86
	Aristida vagans	1.61	0.35	0.41	0.86
Graminoid	*Lepidosperma laterale*	3.46	1.63	0.76	4.03
	Lomandra confertifolia subsp. rubiginosa	1.74	1.06	0.91	2.62
	Lomandra bracteata	1.22	0.36	0.41	0.9
Herb	*Goodenia bellidifolia*	2.55	2.22	9.15	5.49
	Phyllanthus hirtellus	1.74	1.06	0.91	2.62
	Hibbertia obtusifolia	1.35	0.36	0.41	0.9
	Pterostylis revoluta	1.35	0.36	0.41	0.9
	Calotis cuneifolia	1.33	0.35	0.41	0.86
	Solanum sp.	1.33	0.35	0.41	0.86
Sedge	*Gahnia aspera*	2.42	1.06	0.91	2.62
Fern	*Cheilanthes sieberi*	3.09	2.48	5.22	6.14

MU5 Red Ironbark Forest - regen

Status

Not a TEC under the TSC Act or EPBC Act

General Description

Location: on upper slopes and ridges on the western side of the Study area.
Canopy: no canopy.
Shrubs: sparse consisting of *Cassinia arcuata, Astroloma humifusum, Acacia implexa and Bursaria spinosa.*
Ground: grasses *Bothriochloa decipiens, Microlaena stipoides, Panicum effusum and Aristida species*. Herbs *Sida corrugata, Sida cunninghamii, Stackhousia muricata.*

Species Richness

Total species	57
Plots	3
Mean species/plot ± SD	30±3.51
Weeds	2%

Key Diagnostic Species

Group MU5 - Red Ironbark Forest - regen

Average similarity: 41.94

Growth Form	Species	Av.Abund	Av.Sim	Sim/SD	Contrib%
Shrub	*Cassinia arcuata*	2.32	2.19	0.58	5.21
	Astroloma humifusum	1.6	1.28	0.58	3.05
	Acacia implexa	1.13	0.9	0.58	2.15
	Bursaria spinosa	1.13	0.9	0.58	2.15
Grass	*Bothriochloa decipiens*	1.81	3.14	4.03	7.5
	Microlaena stipoides	1.49	1.26	0.58	3.01
	Panicum effusum	1.15	0.97	0.58	2.32
	Aristida ramose	1.14	0.92	0.58	2.19
	Aristida vagans	1.14	0.92	0.58	2.19
	Digitaria diffusa	1.15	0.89	0.58	2.13
Herb	*Sida corrugate*	1.81	3.17	5.48	7.56
	Sida cunninghamii	1.81	3.17	5.48	7.56
	Stackhousia muricata	1.81	3.14	4.03	7.5
	Calotis cuneifolia	1.61	2.77	21.06	6.6
	Calotis lappulacea	1.49	1.3	0.58	3.1
	Dichondra repens	1.48	1.29	0.58	3.08
	Hydrocotyle laxiflora	1.14	0.92	0.58	2.19
	Ajuga australis	0.95	0.89	0.58	2.13
	Lagenophora stipitata	1.15	0.89	0.58	2.13
	Wahlenbergia communis	1.15	0.89	0.58	2.13
Fern	*Cheilanthes sieberi*	2.31	4.18	10.41	9.98
Vine	*Desmodium varians*	1.81	3.17	5.48	7.56
	Glycine clandestina	1.61	2.77	21.06	6.6

MU6a Rough-barked Apple - Black Cypress Pine Woodland

Status

Not a TEC under the TSC Act or EPBC Act

General Description

Location: found only at the north western side of the Study area.
Canopy: consisting of *Angophora floribunda* and *Callitris endlicheri*.
Shrubs: *Leucopogon muticus* was the dominant shrub along with *Brachyloma daphnoides*, *Astroloma humifusum*, *Acacia linearis*, *Cassinia arcuata* and *Persoonia linearis.*
Ground: sparse with the fern *Cheilanthes sieberi* being most abundant along with the grasses *Microlaena stipoides* and *Aristida ramosa*.

Species Richness

Total species	55
Plots	4
Mean species/plot ± SD	29±7.41
Weeds	0%

Key Diagnostic Species

Group Rough-barked Apple - Black Cypress Pine Woodland

Average similarity: 53.08

Growth Form	Species	Av.Abund	Av.Sim	Sim/SD	Contrib%
Tree	*Angophora floribunda*	9.65	9.07	12.94	17.08
	Callitris endlicheri	9.14	6.87	2.73	12.95
Shrub	*Leucopogon muticus*	6.3	3.61	0.91	6.8
	Brachyloma daphnoides	5.5	3.1	1.62	5.85
	Astroloma humifusum	3.07	2.27	12.94	4.27
	Acacia linearifolia	2.29	1.2	0.91	2.27
	Cassinia arcuata	2.34	1.14	0.91	2.14
	Persoonia linearis	2.34	1.14	0.91	2.14
	Daviesia ulicifolia	1.94	0.44	0.41	0.83
	Acacia uncinata	1.96	0.43	0.41	0.81
	Bossiaea buxifolia	1.96	0.43	0.41	0.81
	Acrotriche rigida	1.69	0.35	0.41	0.67
Grass	*Aristida ramosa*	2.99	2.36	9.33	4.44
	Cymbopogon refractus	1.24	0.39	0.41	0.73
	Austrostipa scabra subsp. falcata	1.69	0.35	0.41	0.67
	Digitaria diffusa	1.11	0.35	0.41	0.67
	Dichelachne micrantha	1.19	0.35	0.41	0.67
Graminoid	*Lepidosperma laterale*	1.77	1.1	0.91	2.07
	Lomandra glauca	1.77	1.1	0.91	2.07
	Lomandra confertifolia subsp. rubiginosa	1.85	0.35	0.41	0.67
Herb	*Goodenia bellidifolia*	2.94	2.46	16.93	4.63
	Dianella longifolia	2.41	2.27	12.94	4.27
	Hibbertia obtusifolia	1.75	1.1	0.91	2.07
	Wahlenbergia stricta	1.75	1.1	0.91	2.07
	Epilobium hirtigerum	1.3	0.43	0.41	0.81
	Chrysocephalum semipapposum	1.19	0.35	0.41	0.67
	Dichondra repens	1.19	0.35	0.41	0.67
	Pomax umbellata	1.17	0.35	0.41	0.67
Sedge	*Cyperus fulvus*	1.22	0.39	0.41	0.73
Fern	*Cheilanthes sieberi*	5.36	4.91	16.93	9.25
Vine	*Glycine clandestina*	2.41	2.27	12.94	4.27
	Desmodium varians	1.17	0.35	0.41	0.67

MU6a Rough-barked Apple - Black Cypress Pine Woodland - regen

Status

Not a TEC under the TSC Act or EPBC Act

General Description

Location: found only at the north western side of the Study area.

Canopy: No canopy.

Shrubs: Varying densities of *Cassinia arcuat*a, *Astroloma humifusum* and *Kunzea parvifolia*.

Ground: *Aristida vagans, Aristida ramosa, Microlaena stipoides* and others.

Species Richness

Total species	55
Plots	3
Mean species/plot ± SD	30±4.93
Weeds	2%

Key Diagnostic Species

Group MU6a - Rough-barked Apple - Black Cypress Pine Woodland - regen

Average similarity: 39.51

Growth Form	Species	Av.Abund	Av.Sim	Sim/SD	Contrib%
Shrub	*Cassinia arcuata*	2.3	4.05	9.33	10.24
	Astroloma humifusum	1.55	1.43	0.58	3.63
	Kunzea parvifolia	1.83	1.26	0.58	3.19
	Lissanthe strigosa	0.99	0.89	0.58	2.25
	Styphelia triflora	0.99	0.89	0.58	2.25
Grass	*Aristida vagans*	2.59	4.51	23.78	11.41
	Aristida ramosa	2.61	4.37	4.44	11.05
	Microlaena stipoides	1.26	1.07	0.58	2.71
	Eulalia aurea	1.33	1.01	0.58	2.57
	Sporobolus creber	1.2	0.9	0.58	2.28
	Echinopogon caespitosus	0.99	0.89	0.58	2.25
Graminoid	*Lomandra longifolia*	2.44	4.03	10.04	10.2
	Lomandra filiformis subsp. *filiformis*	1.51	2.85	10.04	7.21
	Lomandra glauca	1.39	1.27	0.58	3.22
	Lomandra bracteata	0.99	0.89	0.58	2.25
	Lomandra multiflora	0.99	0.89	0.58	2.25
Sedge	*Fimbristylis dichotoma*	0.98	0.9	0.58	2.28
Herb	*Hydrocotyle laxiflora*	1.26	1.07	0.58	2.71
	Dichondra repens	0.98	0.9	0.58	2.28
	Oxalis exilis	0.98	0.9	0.58	2.28
Fern	*Cheilanthes sieberi*	2.06	3.52	5.16	8.91
Weed (Herb)	**Taraxacum officinale*	1.32	1.01	0.58	2.57

MU6b Rough-barked Apple Woodland (alluvial)

Status

Not a TEC under the TSC Act or EPBC Act

General Description

Location: predominately located at the western side of the Study area with a remnant also present in Slate Gully (proposed Pit 8). Found on alluvial substrates on the valley floor but can extend 50 m or so up the side slopes.
Canopy: clearly dominated by *Angophora floribunda* along with the occasional *Eucalyptus blakelyi*, *Callitris endlicheri* and *Brachychiton populneus*.
Shrubs: *Acacia implexa, Astroloma humifusum, Bursaria spinosa, Cassinia arcuata* and *Acrotriche rigida* were the main shrubs.
Ground: the grass *Microlaena stipoides* was dominant, along with *Aristida ramosa* and *Aristida vagans*. Herbs consisted primarily of *Hydrocotyle laxiflora* and Dichondra repens.

Species Richness

Total species	83
Plots	7
Mean species/plot ± SD	28±4.95
Weeds	4%

Key Diagnostic Species

Group Rough-barked Apple Woodland - alluvial

Average similarity: 45.23

Growth Form	Species	Av.Abund	Av.Sim	Sim/SD	Contrib%
Tree	*Angophora floribunda*	11.68	9.72	6.88	21.49
	Callitris endlicheri	2.59	0.4	0.36	0.89
	Eucalyptus blakelyi	2.64	0.34	0.22	0.75
	Brachychiton populneus	1.3	0.12	0.22	0.26
Shrub	*Acacia implexa*	2.03	1.55	1.53	3.43
	Astroloma humifusum	2.22	1.18	0.9	2.61
	Bursaria spinosa	3.23	1.02	0.55	2.25
	Cassinia arcuata	1.88	0.75	0.6	1.65
	Acrotriche rigida	1.29	0.61	0.61	1.35
	Acacia linearifolia	1.65	0.43	0.37	0.95
	Cassinia quinquefaria	1.46	0.37	0.39	0.81
	Styphelia triflora	0.66	0.11	0.22	0.24
Grass	*Microlaena stipoides*	8.9	5.64	1.27	12.48
	Aristida ramosa	1.91	1.11	0.93	2.45
	Aristida vagans	1.98	0.82	0.6	1.8
	Echinopogon caespitosus	1	0.33	0.4	0.72
	Rytidosperma erianthum	0.67	0.11	0.22	0.24
	Enneapogon nigricans	0.66	0.11	0.22	0.24
	Digitaria ramularis	0.65	0.11	0.22	0.23
Graminoid	*Lomandra multiflora*	2.04	1.56	1.53	3.44
	Lomandra bracteata	1.38	0.61	0.61	1.35
Herb	*Hydrocotyle laxiflora*	4.76	3.86	3.4	8.54
	Dichondra repens	4.52	3.27	3.11	7.24
	Lagenophora stipitata	1.38	0.61	0.61	1.34
	Dianella longifolia	1.59	0.61	0.61	1.34
	Oxalis sp.	1.28	0.6	0.61	1.33
	Calotis lappulacea	1.1	0.33	0.4	0.72
	Wahlenbergia communis	0.97	0.32	0.4	0.71
	Dysphania pumilio	0.68	0.11	0.22	0.24
	Geranium potentilloides var. potentilloides	0.97	0.11	0.22	0.24
	Stellaria media	0.65	0.11	0.22	0.23
	Sida corrugata	0.67	0.11	0.22	0.23
	Cheilanthes sieberi	4.08	3.28	3.2	7.25
	Desmodium varians	2.04	1.56	1.53	3.44
	Gahnia aspera	2.5	1.16	0.85	2.56
Vine	*Clematis glycinoides*	2.04	0.78	0.57	1.73
	Glycine clandestina	0.96	0.3	0.4	0.66
Weed (herb)	**Anagallis arvensis*	2.04	0.78	0.57	1.73

MU6b Rough-barked Apple Woodland (alluvial) - regen

Status

Not a TEC under the TSC Act or EPBC Act

General Description

Location: predominately located at the western side of the Study area.
Canopy: scattered *Angophora floribunda*.
Shrubs: a dense woody weed cover of *Cassinia arcuata*.
Ground: comprised of seven native grass species including *Microlaena stipoides, Aristida ramosa* and *Aristida vagans.*

Species Richness

Total species	56
Plots	3
Mean species/plot ± SD	25±8.66
Weeds	5%

Key Diagnostic Species

Group MU6b - Rough-barked Apple Woodland (alluvial) - regen

Average similarity: 35.49

Growth Form	Species	Av.Abund	Av.Sim	Sim/SD	Contrib%
Tree	*Angophora floribunda*	1.07	1.15	0.58	3.24
Shrub	*Cassinia arcuata*	3.33	6.33	12.19	17.85
	Astroloma humifusum	2.15	3.64	2.38	10.25
Grass	*Aristida vagans*	2.48	4.4	5.06	12.4
	Microlaena stipoides	1.79	1.32	0.58	3.71
	Aristida ramosa	1.55	1.28	0.58	3.61
	Eragrostis sp.	1.28	1.27	0.58	3.59
	Panicum effusum	1.03	0.93	0.58	2.62
	Sporobolus creber	1.03	0.93	0.58	2.62
Graminoid	*Lomandra multiflora*	1.17	0.98	0.58	2.75
	Lomandra glauca	1.19	0.91	0.58	2.55
Herb	*Hydrocotyle laxiflora*	2.18	4.22	7.46	11.9
	Calotis lappulacea	1.45	0.93	0.58	2.62
Fern	*Cheilanthes sieberi*	2.34	4.4	5.06	12.4
Vine	*Desmodium varians*	1.03	0.93	0.58	2.62
	Glycine clandestina	1.03	0.93	0.58	2.62
Weed (Herb)	**Hypericum perforatum*	1.03	0.93	0.58	2.62

MU7 Slaty Box Forest

Status

TSC Act: *Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion* vulnerable ecological community

General Description

Location: on side slopes at the south eastern side of the Study area.
Canopy: entirely *Eucalyptus dawsonii*.
Shrubs: dominated by *Acacia ixiophylla* and *Bursaria spinosa* along with *Dodonaea triangularis*, Cassinia quinquefaria and *Persoonia linearis*.
Ground: dominated by the sedge *Gahnia aspera*.

Species Richness

Total species	50
Plots	3
Mean species/plot ± SD	25±5.29
Weeds	1%

Key Diagnostic Species

MU7 Slaty Box Forest

Growth Form	Species	Av.Abund	Av.Sim	Sim/SD	Contrib%
Tree	*Eucalyptus dawsonii*	3.48	6.79	6.1	14.98
Shrub	*Bursaria spinosa*	2.78	5.09	109	11.23
	Dodonaea triangularis	2.69	4.8	6.66	10.58
	Acacia ixiophylla	2.3	4.1	4.7	9.04
	Persoonia linearis	1.77	3.26	10.58	7.2
	Leucopogon muticus	1.83	1.86	0.58	4.1
	Astroloma humifusum	1.06	1.07	0.58	2.37
	Cassinia quinquefaria	1.21	0.98	0.58	2.17
Grass	*Digitaria ramularis*	1.01	0.98	0.58	2.17
Graminoid	*Lomandra multiflora*	1.01	0.98	0.58	2.17
	Lomandra bracteata	1.56	3.15	17.64	6.95
Herb	*Pomax umbellata*	1.56	3.15	17.64	6.95
	Dichondra repens	1.06	1.09	0.58	2.41
	Opercularia hispida	1.01	0.98	0.58	2.17
Sedge	*Gahnia aspera*	1.74	1.7	0.58	3.75
Fern	*Cheilanthes sieberi*	1.56	3.15	17.64	6.95
Vine	*Clematis glycinoides*	1.27	1.21	0.58	2.67
	Glycine clandestina	1.01	0.98	0.58	2.17

MU8 Western Grey Box Woodland

Status

Not a TEC under the TSC Act or EPBC Act

General Description

Location: One location on lowland at the northern end of Slate Gully, proposed Pit 8 as well as along Wollar Road reserve.
Canopy: *Eucalyptus microcarpa*
Shrubs: *Astroloma humifusum, Daviesia genistifolia, Cassinia arcuata*
Ground: Scattered *Rytidosperma racemosum* var. *obtusatum, Themeda triandra, Desmodium varians* plus small herbs and sedges.

Species Richness

Total species	48
Plots	3
Mean species/plot ± SD	22±3.06
Weeds	7%

Key Diagnostic Species

Group MU8 - Western Grey Box Woodland

Average similarity: 40.08

Growth Form	Species	Av.Abund	Av.Sim	Sim/SD	Contrib%
Tree	*Eucalyptus microcarpa*	2.03	2	0.58	4.98
Shrub	*Cassinia arcuata*	3.29	6.66	7	16.62
	Daviesia genistifolia	2.12	3.87	2.76	9.65
Grass	*Aristida ramosa*	2.56	4.72	6.85	11.78
	Aristida vagans	1.93	3.91	20.6	9.75
	Microlaena stipoides	2.14	3.27	7.75	8.15
	Themeda triandra	1.66	1.76	0.58	4.38
Graminoid	*Lomandra bracteata*	1.07	1.04	0.58	2.6
Herb	*Calotis lappulacea*	1.4	1.3	0.58	3.24
	Desmodium varians	1.29	1.05	0.58	2.63
	Wahlenbergia communis	1.05	1.05	0.58	2.63
	Dichondra repens	1.07	1.04	0.58	2.6
	Sida corrugata	1.07	1.04	0.58	2.6
	Oxalis exilis	0.96	0.97	0.58	2.41
Fern	*Cheilanthes sieberi*	1.73	3.34	6.85	8.33
Weeds (Herb)	**Hypericum perforatum*	1.54	3.06	21.84	7.64

MU9 White Box Woodland (shrubby)

Status

Not a TEC under the TSC Act or EPBC Act

General Description

Location: at several locations across the Study area on lower slopes.
Canopy: dominated by *Eucalyptus albens* along with *Callitris endlicheri*.
Shrubs: a wide range of shrubs dominated by *Cassinia arcuata* along with *Astroloma humifusum*, *Acacia implexa*, *Leucopogon muticus* and *Dodonaea triangularis*.
Ground: the main grasses were *Microlaena stipoides*, *Aristida vagans* and *Aristida ramosa,* herbs were *Hydrocotyle laxiflora, Dichondra repens, Lagenophora stipitata*, *Calotis lappulacea* and *Calotis cuneifolia*, sedge *Gahnia aspera*, fern *Cheilanthes sieberi* and vine *Desmodium varians*.

Species Richness

Total species	90
Plots	8
Mean species/plot ± SD	28±4.44
Weeds	4%

Key Diagnostic Species

Group White Box Woodland - shrubby

Average similarity: 46.87

Growth Form	Species	Av.Abund	Av.Sim	Sim/SD	Contrib%
Tree	*Eucalyptus albens*	9.84	7.91	3.29	16.87
	Callitris endlicheri	5.34	2.02	0.58	4.3
	Eucalyptus crebra	0.98	0.07	0.19	0.16
Shrub	*Cassinia arcuata*	7.23	5.94	12.89	12.68
	Astroloma humifusum	2.48	1.3	1.02	2.78
	Acacia implexa	1.14	0.43	0.51	0.92
	Leucopogon muticus	1.67	0.25	0.34	0.54
	Dodonaea triangularis	0.78	0.21	0.34	0.46
	Melichrus urceolatus	0.64	0.09	0.19	0.19
	Acacia decora	0.58	0.08	0.19	0.17
	Acacia linearifolia	0.75	0.08	0.19	0.16
	Acacia uncinata	0.75	0.08	0.19	0.16
	Acrotriche rigida	0.6	0.08	0.19	0.16
	Bursaria spinosa	0.56	0.08	0.19	0.16
Grass	*Microlaena stipoides*	5.99	4.05	1.63	8.65
	Aristida vagans	2.26	1.22	1.02	2.6
	Aristida ramosa	2.83	0.96	0.6	2.05
	Eragrostis leptostachya	1.08	0.43	0.51	0.92
	Austrostipa scabra subsp. falcata	1.19	0.27	0.34	0.58
	Bothriochloa decipiens	0.81	0.21	0.34	0.45
	Austrostipa scabra subsp. scabra	0.64	0.09	0.19	0.19
	Rytidosperma erianthum	0.64	0.09	0.19	0.19
	Eragrostis alveiformis	0.58	0.08	0.19	0.17
Graminoid	*Lomandra multiflora*	1.77	0.73	0.73	1.55
	Lomandra glauca	0.98	0.25	0.34	0.54
Herb	*Hydrocotyle laxiflora*	5.33	3.93	1.57	8.38
	Dichondra repens	4.85	3.71	2.8	7.92
	Lagenophora stipitata	2.03	1.25	1.04	2.67
	Calotis cuneifolia	1.47	0.75	0.73	1.59
	Calotis lappulacea	1.44	0.74	0.73	1.58
	Wahlenbergia communis	0.83	0.23	0.34	0.48
	Eremophila debilis	0.87	0.21	0.34	0.45
	Pterostylis truncata	0.87	0.1	0.19	0.21
	Hypericum gramineum	0.64	0.09	0.19	0.19
	Dianella longifolia	0.57	0.08	0.19	0.17
	Goodenia bellidifolia	0.6	0.08	0.19	0.16
	Asperula conferta	0.56	0.07	0.19	0.16

Group White Box Woodland - shrubby					
Average similarity: 46.87					
Sedge	*Gahnia aspera*	2.59	2.26	10.05	4.83
Fern	*Cheilanthes sieberi*	2.87	2.37	5.08	5.05
Vine	*Desmodium varians*	2.68	2.15	9.64	4.59
	Glycine clandestina	1.85	1.22	1.05	2.6
Weed (herb)	**Anagallis arvensis*	1.39	0.24	0.33	0.52

MU9 White Box Woodland (shrubby) - regen

Status

Not a TEC under the TSC Act or EPBC Act

General Description

Location: at several locations across the Study area on lower slopes below the uncleared woodland.
Canopy: scattered *Eucalyptus albens*.
Shrubs: a dense woody weed cover of *Cassinia arcuata* indicative of past clearing.
Ground: sparse due to the dense shrub cover but contained grasses *Aristida ramosa* and *Panicum effusum* along with a small number of herbs.

Species Richness

Total species	26
Plots	2
Mean species/plot ± SD	17±0.71
Weeds	3%

Key Diagnostic Species

Group MU9 - White Box Woodland (shrubby) - regen

Average similarity: 51.16

Growth Form	Species	Av.Abund	Av.Sim	Sim/SD	Contrib%
Shrub	*Cassinia arcuata*	4.2	10.54	SD=0!	20.59
	Acacia decora	2.33	4.43	SD=0!	8.66
Grass	*Aristida ramosa*	3.2	7.67	SD=0!	15
	Panicum effusum	2.07	4.43	SD=0!	8.66
Herb	*Cymbonotus lawsonianus*	2.69	6.26	SD=0!	12.24
	Hydrocotyle laxiflora	2.7	6.08	SD=0!	11.89
	Glossocardia bidens	1.72	4.3	SD=0!	8.41
Fern	*Cheilanthes sieberi*	2.97	7.45	SD=0!	14.56

MU10 Yellow Box Woodland (grassy)

Status

TSC Act: a component of *White Box Yellow Box Blakely's Red Gum Woodland* EEC

EPBC Act: A component of *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* CEEC

General Description

Location: scattered remnants on the valley floor.

Canopy: *Eucalyptus melliodora* only.

Shrubs: dominated by *Cassinia quinquefaria* along with sparse *Astroloma humifusum* and *Acrotriche rigida*.

Ground: nine grass species dominated by *Microlaena stipoides* along with *Bothriochloa macra, Digitaria brownii*, *Aristida vagans*, *Chloris ventricosa* and *Paspalidium distans*. Dominant herbs were *Hydrocotyle laxiflora, Sida cunninghamii,* and *Dichondra repens*.

Species Richness

Total species	51
Plots	2
Mean species/plot ± SD	27±0.71
Weeds	7%

Key Diagnostic Species

Group Yellow Box Woodland (grassy)

Average similarity: 21.08

Growth Form	Species	Av.Abund	Av.Sim	Sim/SD	Contrib%
Tree	*Eucalyptus melliodora*	3.13	5.66	SD=0!	26.86
Grass	*Microlaena stipoides*	2.68	4.09	SD=0!	19.41
	Aristida vagans	1.78	2.83	SD=0!	13.43
	Digitaria brownii	1.47	2.83	SD=0!	13.43
Herb	*Sida corrugata*	1.47	2.83	SD=0!	13.43
Fern	*Cheilanthes sieberi*	1.78	2.83	SD=0!	13.43

Grassland

Status

Not a TEC under the TSC Act or EPBC Act

General Description

Location: across the majority of valley floors and lower side slopes.
Canopy: no canopy species other than very scattered trees (0.3 trees per hectare).
Shrubs: occasional instances of *Cassinia arcuata*.
Ground: thirty three native grass species dominated by *Bothriochloa decipiens*, *Sporobolus creber*, *Aristida ramosa*, *Microlaena stipoides* and *Digitaria brownii*.
Few native herb species consisting of *Rumex brownii, Calotis lappulacea, Lepidium pseudohyssopifolium* and *Dysphania pumilio*.
Fifty eight weed species dominated by *Trifolium* sp. (clovers) along with *Hypochaeris radicata, Anagallis arvensis, Carthamus lanatus, Plantago lanceolata* and *Verbena bonariensis*.

Species Richness

Total species	141
Plots	23
Mean species/plot ± SD	27±6.71
Weeds	39%

Key Diagnostic Species

Group Grassland

Average similarity: 33.14

Growth Form	Species	Av.Abund	Av.Sim	Sim/SD	Contrib%
Shrub	*Cassinia arcuata*	0.73	0.13	0.25	0.4
Grass	*Bothriochloa decipiens*	6.08	3.68	1.17	11.09
	Sporobolus creber	4.56	3.01	1.56	9.08
	Aristida ramosa	4.69	2.94	1.28	8.86
	Microlaena stipoides	3.89	1.68	0.69	5.07
	Digitaria brownii	2.55	1.29	0.78	3.89
	Panicum effusum	1.46	0.6	0.58	1.82
	Chloris truncata	2.02	0.57	0.42	1.73
	Eragrostis elongata	1.29	0.45	0.46	1.37
	Rytidosperma fulvum	1.12	0.25	0.29	0.76
	Dichelachne rara	0.87	0.2	0.3	0.6
	Eragrostis leptostachya	0.78	0.14	0.25	0.43
	Aristida vagans	0.82	0.13	0.24	0.4
	Eragrostis brownii	0.78	0.09	0.15	0.27
	Austrostipa scabra subsp. scabra	0.53	0.09	0.2	0.26
	Digitaria diffusa	0.52	0.08	0.2	0.25
	Eragrostis alveiformis	0.64	0.06	0.14	0.19
	Panicum queenslandicum	1.11	0.06	0.15	0.19
	Rytidosperma caespitosum	0.73	0.06	0.15	0.19
	Themeda triandra	0.47	0.05	0.15	0.16
	Chloris ventricosa	0.35	0.03	0.11	0.08
Graminoid	*Lomandra multiflora*	0.64	0.06	0.15	0.19
Herb	*Rumex brownii*	1.72	0.78	0.65	2.34
	Calotis lappulacea	1.47	0.54	0.51	1.64
	Lepidium pseudohyssopifolium	1.23	0.35	0.39	1.07
	Dysphania pumilio	0.89	0.26	0.35	0.77
	Chenopodium carinatum	0.66	0.14	0.25	0.41
	Oxalis sp.	0.58	0.12	0.25	0.36
	Erodium crinitum	0.97	0.11	0.18	0.32
	Geranium solanderi var. solanderi	0.76	0.1	0.2	0.29
	Wahlenbergia stricta	0.54	0.08	0.2	0.25
	Acaena ovina	0.45	0.05	0.16	0.16
	Einadia trigonos subsp. stellulata	0.43	0.05	0.16	0.16
	Solanum sp.	0.41	0.05	0.16	0.16
Sedge	*Carex inversa*	1.22	0.35	0.4	1.05
	Cyperus gracilis	0.41	0.05	0.15	0.14
	Juncus filicaulis	0.34	0.03	0.11	0.08
	Fimbristylis dichotoma	0.63	0.12	0.25	0.38

Group Grassland

Average similarity: 33.14

Fern	*Cheilanthes sieberi*	2.11	0.66	0.51	1.99
Vine	*Glycine clandestina*	0.57	0.09	0.2	0.28
Weed (grass)	**Eleusine tristachya*	0.76	0.14	0.25	0.43
	**Paspalum dilatatum*	0.8	0.14	0.24	0.41
	**Eragrostis minor*	0.39	0.05	0.16	0.15
Weed (herb)	**Trifolium sp.*	6.47	4.56	1.81	13.77
	**Hypochaeris radicata*	4.37	2.56	1.02	7.74
	**Anagallis arvensis*	2.83	1.33	0.82	4.01
	**Carthamus lanatus*	2.47	1.09	0.69	3.29
	**Plantago lanceolata*	1.96	0.74	0.55	2.23
	**Verbena bonariensis*	2.03	0.44	0.38	1.33
	**Conyza bonariensis*	1.12	0.41	0.46	1.23
	**Erodium cicutarium*	1.12	0.31	0.39	0.93
	**Modiola caroliniana*	1.44	0.27	0.27	0.83
	**Malva parviflora*	0.79	0.19	0.3	0.56
	**Hypericum perforatum*	0.92	0.17	0.24	0.51
	**Cirsium vulgare*	0.69	0.14	0.25	0.41
	**Arctotheca calendula*	1.64	0.12	0.2	0.38
	**Taraxacum officinale*	0.85	0.11	0.2	0.34
	**Tolpis barbata*	0.63	0.1	0.2	0.31
	**Amaranthus powellii*	0.54	0.09	0.2	0.26
	**Sonchus oleraceus*	0.52	0.08	0.2	0.26
	**Paronychia brasiliana*	0.4	0.05	0.15	0.14
	**Echium plantagineum*	0.87	0.04	0.11	0.13
	**Trifolium angustifolium*	0.55	0.04	0.1	0.11
	**Bidens pilosa*	0.34	0.03	0.11	0.09
	**Verbascum thapsus subsp. thapsus*	0.33	0.03	0.11	0.08

APPENDIX 2 FLORA SPECIES RECORDED

Family and Scientific Name
Acanthaceae
Brunoniella australis
Adiantaceae
Cheilanthes sieberi
Amaranthaceae
**Amaranthus powellii*
Alternanthera species A
Anthericaceae
Laxmannia gracilis
Apiaceae
Hydrocotyle laxiflora
Hydrocotyle tripartita
Asclepiadaceae
**Gomphocarpus fruticosus*
Asteraceae
**Arctotheca calendula*
**Bidens pilosa*
**Carthamus lanatus*
**Centaurea solstitialis*
**Chondrilla juncea*
**Cirsium vulgare*
**Conyza bonariensis*
**Facelis retusa*
**Hypochaeris radicata*
**Schkuhria pinnata* var. *abrotanoides*
**Sonchus oleraceus*
**Tagetes minuta*
**Taraxacum officinale*
**Tolpis barbata*
**Xanthium occidentale*
**Xanthium spinosum*
Calotis cuneifolia
Calotis lappulacea
Cassinia arcuata
Cassinia decipiens
Cassinia quinquefaria
Chrysocephalum semipapposum
Cotula australis
Cymbonotus lawsonianus
Glossocardia bidens
Lagenophora stipitata
Pseudognaphalium luteoalbum
Sigesbeckia australiensis

Family and Scientific Name
Vittadinia cervicularis var. *subcervicularis*
Vittadinia cuneata var. *cuneata*
Vittadinia gracilis
Vittadinia muelleri
Vittadinia sp.
Boraginaceae
**Echium plantagineum*
**Heliotropium amplexicaule*
Cynoglossum australe
Cynoglossum suaveolens
Brassicaceae
**Brassica rapa*
**Capsella bursa-pastoris*
**Lepidium bonariense*
Lepidium pseudohyssopifolium
Cactaceae
**Opuntia stricta*
Campanulaceae
Wahlenbergia communis
Wahlenbergia luteola
Wahlenbergia planiflora
Wahlenbergia stricta
Caryophyllaceae
**Paronychia brasiliana*
**Silene gallica* var. *gallica*
Stellaria media
Casuarinaceae
Allocasuarina luehmannii
Chenopodiaceae
Chenopodium carinatum
Dysphania pumilio
Einadia hastata
Einadia nutans
Einadia polygonoides
Einadia trigonos subsp. *stellulata*
Clusiaceae
**Hypericum perforatum*
Hypericum gramineum
Convolvulaceae
Convolvulus arvensis
Dichondra repens
Dichondra species A
Polymeria calycina

Family and Scientific Name
Cucurbitaceae
**Cucumis myriocarpus* subsp. *leptodermis*
Cupressaceae
Callitris endlicheri
Cyperaceae
Carex appressa
Carex incomitata
Carex inversa
Cyperus fulvus
Cyperus gracilis
Fimbristylis dichotoma
Gahnia aspera
Lepidosperma gunnii
Lepidosperma laterale
Dilleniaceae
Hibbertia acicularis
Hibbertia monogyna
Hibbertia obtusifolia
Ericaceae
Acrotriche rigida
Astroloma humifusum
Brachyloma daphnoides
Leucopogon fraseri
Leucopogon muticus
Lissanthe strigosa
Melichrus urceolatus
Styphelia triflora
Euphorbiaceae
Chamaesyce drummondii
Phyllanthus hirtellus
Poranthera corymbosa
Fabaceae (Faboideae)
**Medicago sativa*
**Medicago* sp.
**Trifolium angustifolium*
**Trifolium campestre*
**Trifolium hirtum*
**Trifolium repens*
**Trifolium* sp.
Bossiaea buxifolia
Cullen cinereum
Daviesia genistifolia
Daviesia ulicifolia

Family and Scientific Name
Desmodium brachypodum
Desmodium varians
Glycine clandestina
Gompholobium virgatum
Indigofera australis
Podolobium ilicifolium
Swainsona reticulata
Templetonia stenophylla
Zornia dyctiocarpa
Fabaceae (Mimosoideae)
Acacia decora
Acacia doratoxylon
Acacia echinula
Acacia implexa
Acacia ixiophylla
Acacia linearifolia
Acacia maidenii
Acacia paradoxa
Acacia uncinata
Geraniaceae
**Erodium cicutarium*
Erodium crinitum
Geranium potentilloides var. *potentilloides*
Geranium solanderi var. *solanderi*
Goodeniaceae
Goodenia bellidifolia
Goodenia glabra
Goodenia hederacea
Goodenia macbarronii
Goodenia ovata
Goodenia pinnatifida
Haloragaceae
Haloragis heterophylla
Juncaceae
**Juncus bufonius*
Juncus filicaulis
Juncus bufonius
Lamiaceae
**Lamium amplexicaule*
**Marrubium vulgare*
Ajuga australis
Mentha satureioides
Lomandraceae

Family and Scientific Name
Lomandra bracteata
Lomandra confertifolia subsp. *rubiginosa*
Lomandra filiformis subsp. *filiformis*
Lomandra glauca
Lomandra longifolia
Lomandra multiflora
Malvaceae
**Malva parviflora*
**Modiola caroliniana*
Sida corrugata
Sida cunninghamii
Myrtaceae
Angophora floribunda
Eucalyptus albens
Eucalyptus blakelyi
Eucalyptus cannonii x Eucalyptus macrorhyncha
Eucalyptus crebra
Eucalyptus dawsonii
Eucalyptus fibrosa
Eucalyptus cannonii
Eucalyptus melliodora
Eucalyptus microcarpa
Eucalyptus moluccana
Eucalyptus punctata
Eucalyptus sparsifolia
Eucalyptus tenella
Kunzea parvifolia
Kunzea sp. Mt Kaputar
Melaleuca thymifolia
Sannantha cunninghamii
Onagraceae
**Oenothera indecora* subsp. *bonariensis*
**Oenothera stricta*
Epilobium hirtigerum
Orchidaceae
Acianthus sp.
Chiloglottis sp.
Diuris sulphurea
Eriochilus cucullatus
Glossodia major
Pterostylis bicolor
Pterostylis reflexa

Family and Scientific Name
Pterostylis revoluta
Pterostylis truncata
Oxalidaceae
Oxalis exilis
Oxalis sp.
Phormiaceae
Dianella longifolia
Pittosporaceae
Billardiera scandens
Bursaria spinosa
Plantaginaceae
**Plantago lanceolata*
Plantago gaudichaudii
Poaceae
**Andropogon virginicus*
**Chloris gayana*
**Cynodon dactylon*
**Digitaria ciliaris*
**Digitaria sanguinalis*
**Eleusine tristachya*
**Eragrostis cilianensis*
**Eragrostis curvula*
**Eragrostis minor*
**Panicum capillare* var. *capillare*
**Paspalum dilatatum*
**Setaria parviflora*
Aristida benthamii var. *benthamii*
Aristida calycina var. *calycina*
Aristida contorta
Aristida leichhardtiana
Aristida personata
Aristida ramosa
Aristida vagans
Arundinella nepalensis
Austrostipa scabra
Austrostipa scabra subsp. *falcata*
Austrostipa scabra subsp. *scabra*
Austrostipa verticillata
Bothriochloa decipiens
Bothriochloa macra
Chloris truncata
Chloris ventricosa
Cleistochloa rigida

Family and Scientific Name
Cymbopogon refractus
Dichelachne micrantha
Dichelachne rara
Digitaria brownii
Digitaria diffusa
Digitaria ramularis
Echinopogon caespitosus
Echinopogon ovatus
Enneapogon nigricans
Eragrostis alveiformis
Eragrostis brownii
Eragrostis elongata
Eragrostis leptostachya
Eriochloa pseudoacrotricha
Eulalia aurea
Microlaena stipoides
Panicum effusum
Panicum queenslandicum
Paspalidium distans
Rytidosperma caespitosum
Rytidosperma erianthum
Rytidosperma fulvum
Rytidosperma pallidum
Rytidosperma racemosum
Rytidosperma racemosum var. *obtusatum*
Rytidosperma racemosum var. *racemosum*
Rytidosperma setaceum
Rytidosperma sp.
Rytidosperma tenuius
Sporobolus creber
Themeda triandra
Polygalaceae
Polygala japonica
Polygonaceae
Rumex brownie
Rumex sp.
Primulaceae
**Anagallis arvensis*
Proteaceae
Banksia marginata
Persoonia linearis
Ranunculaceae
Clematis glycinoides

Family and Scientific Name
Rhamnaceae
Cryptandra spinescens
Rosaceae
**Rosa rubiginosa*
Acaena ovina
Acaena sp.
Rubus parvifolius
Rubiaceae
Asperula conferta
Galium liratum
Opercularia hispida
Pomax umbellata
Rutaceae
Phebalium squamulosum subsp. *lineare*
Santalaceae
Exocarpos cupressiformis
Sapindaceae
Dodonaea triangularis
Dodonaea viscosa subsp. *angustifolia*
Dodonaea viscosa subsp. *cuneata*
Scrophulariaceae
**Verbascum thapsus* subsp. *thapsus*
Eremophila debilis
Veronica calycina
Veronica plebeia
Solanaceae
**Solanum nigrum*
Solanum cinereum
Solanum sp.
Stackhousiaceae
Stackhousia monogyna
Stackhousia muricata
Sterculiaceae
Brachychiton populneus
Thymelaeaceae
Pimelea curviflora var. *gracilis*
Pimelea curviflora var. *sericea*
Pimelea linifolia
Verbenaceae
**Verbena bonariensis*
Xanthorrhoeaceae
Xanthorrhoea acaulis
Zamiaceae
Macrozamia reducta

APPENDIX 3 BIOMETRIC DATA

Local Community	BVT	MasterPlotID	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Easting	Northing	Zone
Grassland - pasture improved		140611P2	13	0	0	36	0	0	62	0	0.00	0	775410	6419594	55
Grassland - pasture improved		140611P3	13	0	0	52	0	0	48	0	0.00	0	775310	6418829	55
Grassland - pasture improved		140611P4	21	0	0	28	0	0	72	0	0.00	0	775281	6418220	55
Grassland - pasture improved		140611P5	19	0	0	36	0	0	64	0	0.00	0	774731	6416132	55
Grassland - pasture improved		140611P6	22	0	0	20	0	0	80	0	0.00	0	775509	6416315	55
Grassland - pasture improved		140611P7	15	0	0	38	0	0	60	0	0.00	0	775478	6416921	55
Grassland - pasture improved		140612P1	23	0	0	60	0	0	40	0	0.00	0	767373	6415635	55
Grassland - pasture improved		140612P2	19	0	0	64	0	12	24	0	0.00	0	767637	6415834	55
Grassland - pasture improved		140612P3	16	0	0	54	0	0	46	0	0.00	0	767782	6416225	55
Grassland - pasture improved		140612P4	14	0	0	58	0	0	42	0	0.00	0	767944	6416603	55
Grassland - pasture improved		140612P5	16	0	0	40	0	12	48	0	0.00	0	767848	6417210	55
Grassland - pasture improved		140612P6	11	0	0	34	0	0	66	0	0.00	0	767052	6417815	55
Grassland - pasture improved		140612P7	18	0	0	50	0	2	48	0	0.00	0	766957	6418530	55
Grassland - pasture improved		140612P8	10	0	0	46	0	0	54	0	0.00	0	776190	6418839	55
Grassland - pasture improved		140613P1	22	0	0	48	0	0	52	0	0.00	0	775818	6418679	55
Grassland - pasture improved		140613P2	28	0	0	30	0	10	58	0	0.00	0	767611	6422068	55
Grassland - pasture improved		140613P3	22	0	0	38	0	2	60	0	0.00	0	767372	6421780	55
Grassland - pasture improved		140613P4	15	0	0	4	0	2	94	0	0.00	0	767450	6421400	55
Grassland - pasture improved		140613P6	7	0	0	6	0	0	94	0	0.00	0	767136	6420667	55
Grassland - pasture improved		140613P7	7	0	0	8	0	0	52	0	0.00	0	767105	6420406	55
Grassland - pasture improved		140613P8	18	0	0	56	0	38	6	0	0.00	0	767260	6420040	55
Grassland - pasture improved		140613P9	14	0	0	50	0	14	36	0	0.00	0	767203	6422900	55
Grassland - pasture improved		140613P10	11	0	0	62	0	0	38	0	0.00	0	774100	6419271	55
MU10 - Yellow Box Woodland (grassy)	HU732	140508P1	27	15	0	68	60	36	0	0	0.50	0	769161	6416646	55
MU10 - Yellow Box Woodland (grassy)	HU732	150629P1	26	13.5	0	50	8	10	0	0	0.50	1	775388	6419215	55

Local Community	BVT	MasterPlotID	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Easting	Northing	Zone
MU1a - Blakely's Red Gum Woodland (grassy)	HU681	150629P1	15	12.5	0	36	8	6	0	0	0.50	2	775704	6418973	55
MU1a - Blakely's Red Gum Woodland (grassy)	HU681	140508P4	28	9	0	52	75	24	0	0	0.50	2	775308	6417282	55
MU1a - Blakely's Red Gum Woodland (grassy)	HU681	150629P2	10	2.5	0	36	2.4	22	0	0	0.50	0	773268	6416144	55
MU1b - Blakely's Red Gum Woodland (shrubby)	HU910	140505P5	24	7	0	30	0	36	0	3	1.00	79	767286	6421952	55
MU1b - Blakely's Red Gum Woodland (shrubby)	HU910	150630P4	11	13	0	32	43	22	0	3	1.00	30	767252	6421805	55
MU2 - Fuzzy Box Woodland	HU547	140508P7	20	28.5	0	22	8.5	2	0	0	1.00	0	775735	6419089	55
MU3 - Grey Gum - Narrow-leaved Stringybark Forest	HU842	140506P5	28	29	1.7	6	4.5	18	0	1	0.28	70	766866	6420301	55
MU3 - Grey Gum - Narrow-leaved Stringybark Forest	HU842	140611P1	22	24.5	0	0	0.7	8	0	0	0.28	76	775249	6420113	55
MU3 - Grey Gum - Narrow-leaved Stringybark Forest	HU842	140611P8	29	7.5	5.5	0	5	4	0	0	0.28	61	775762	6417311	55
MU3 - Grey Gum - Narrow-leaved Stringybark Forest	HU842	140506P6	26	13.5	0	12	3.3	20	0	0	0.28	65	767005	6419967	55
MU3 - Grey Gum - Narrow-leaved Stringybark Forest - regen	HU842	150629P3	16	0	0	44	90	70	2	0	0.00	0	775936	6417340	55
MU4 - Narrow-leaved Ironbark Forest	HU825	150629P5	31	14.5	1.5	34	32	30	0	0	0.40	93	775448	6416607	55
MU4 - Narrow-leaved Ironbark Forest	HU825	140506P2	37	11	0	22	4.4	24	0	0	0.40	35	766936	6421053	55
MU4 - Narrow-leaved Ironbark Forest	HU825	140506P1	42	7	0.7	48	5.3	34	0	0	0.40	41	767086	6421172	55
MU4 - Narrow-leaved Ironbark Forest	HU825	140509P1	40	17	0	60	0	28	0	0	0.40	61	774038	6418845	55
MU5 - Red Ironbark Forest	HU886	140507P6	37	17	0	6	0.4	16	0	0	0.70	64	767166	6419598	55
MU5 - Red Ironbark Forest	HU886	140507P7	24	21.5	0.1	12	20.7	4	0	0	0.70	72	767243	6419443	55
MU5 - Red Ironbark Forest	HU886	140505P8	30	12.5	1.7	6	1.8	4	0	0	0.70	43	767016	6421259	55
MU5 - Red Ironbark Forest	HU886	140507P8	20	10.5	8.5	4	0.4	6	0	0	0.70	104	767261	6421271	55
MU5 - Red Ironbark Forest - regen	HU886	140506P8	27	0	0	0	75	100	25	0	0.00	0	767281	6419745	55
MU5 - Red Ironbark Forest - regen	HU886	140506P10	30	0	0	28	33.5	68	0	0	0.00	0	767541	6419863	55
MU5 - Red Ironbark Forest - regen	HU886	150701P2	34	50	0	0	0	100	100	1	0.00	92	767434	6419854	55
MU6a - Rough-barked Apple - Black Cypress Pine Woodland	HU981	140505P2	29	4	1.7	12	8	22	0	0	1.00	4	767051	6422738	55

Local Community	BVT	MasterPlotID	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Easting	Northing	Zone
MU6a - Rough-barked Apple - Black Cypress Pine Woodland	HU981	140505P1	36	17.5	0	16	0	16	0	0	1.00	18	767296	6422507	55
MU6a - Rough-barked Apple - Black Cypress Pine Woodland	HU981	140505P3	26	4.5	3	6	5	8	0	0	1.00	5	767181	6422261	55
MU6a - Rough-barked Apple - Black Cypress Pine Woodland	HU981	140505P4	23	8	0	10	5	36	0	0	1.00	51	766948	6422095	55
MU6a - Rough-barked Apple - Black Cypress Pine Woodland - regen	HU981	140509P4	27	23	2.5	64	1.5	12	0	0	1.00	0	767008	6421946	55
MU6a - Rough-barked Apple - Black Cypress Pine Woodland - regen	HU981	150630P1	28	0	0	56	0	48	8	0	0.00	0	767146	6421933	55
MU6a - Rough-barked Apple - Black Cypress Pine Woodland - regen	HU981	150630P2	19	0	0	80	0	32	14	0	0.00	0	766974	6421759	55
MU6b - Rough-barked Apple Woodland (alluvial)	HU981	140509P2	27	19.5	8.5	64	0	6	0	0	0.86	31	767447	6421570	55
MU6b - Rough-barked Apple Woodland (alluvial)	HU981	140507P3	26	29.5	0	30	12	28	0	0	0.86	45	767222	6415814	55
MU6b - Rough-barked Apple Woodland (alluvial)	HU981	140507P1	28	14.5	1.5	52	1.2	46	0	0	0.86	12	767182	6415550	55
MU6b - Rough-barked Apple Woodland (alluvial)	HU981	140507P5	17	50	0	22	0	18	0	0	0.86	2	767710	6416011	55
MU6b - Rough-barked Apple Woodland (alluvial)	HU981	140506P9	35	20.5	0	34	2.2	30	0	0	0.86	5	767427	6419800	55
MU6b - Rough-barked Apple Woodland (alluvial)	HU981	140505P6	29	5.5	3.7	24	2.2	14	0	0	0.86	4	767035	6421659	55
MU6b - Rough-barked Apple Woodland (alluvial)	HU981	140509P3	28	23	2.5	64	1.5	12	0	0	0.86	0	766994	6421611	55
MU6b - Rough-barked Apple Woodland (alluvial) - regen	HU981	150630P5	20	0	0	68	37	30	0	0	0.00	0	767182	6421435	55
MU6b - Rough-barked Apple Woodland (alluvial) - regen	HU981	140505P7	35	1.5	0	76	39	12	0	0	0.00	0	767017	6421503	55
MU6b - Rough-barked Apple Woodland (alluvial) - regen	HU981	150630P3	20	0	0	82	35	40	2	0	0.00	0	767116	6421662	55
MU7 - Slaty Box Forest	HU618	150701P1	19	28	3	0	50	32	0	0	0.67	145	767847	6415926	55
MU7 - Slaty Box Forest	HU618	140507P2	29	11	0	4	48	28	0	0	0.67	60	767314	6415486	55
MU7 - Slaty Box Forest	HU618	140507P4	27	29	0	2	69.5	8	0	0	0.67	16	767579	6415693	55
MU8 - Western Grey Box Woodland	HU962	150629P7	25	16	0	80	12.5	6	0	0	1.00	9	775948	6418911	55
MU8 - Western Grey Box Woodland	HU962	150629P8	23	7	0	66	58.5	26	0	0	1.00	0	774631	6420385	55

Local Community	BVT	MasterPlotID	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Easting	Northing	Zone
MU8 - Western Grey Box Woodland	HU962	140508P8	19	24	0	44	3.3	8	0	0	1.00	0	775961	6419034	55
MU9 - White Box Woodland (shrubby)	HU824	140508P2	26	20	2	24	4.4	72	0	0	0.30	75	774479	6416948	55
MU9 - White Box Woodland (shrubby)	HU824	140508P5	22	20.5	0	42	25.5	42	0	0	0.30	0	775466	6417448	55
MU9 - White Box Woodland (shrubby)	HU824	140506P7	33	0.5	3	16	10	44	0	0	0.30	45	767073	6419659	55
MU9 - White Box Woodland (shrubby)	HU824	140508P3	24	7.5	2.6	26	6.9	32	0	2	0.30	141	774312	6417403	55
MU9 - White Box Woodland (shrubby)	HU824	140508P6	33	10.5	6.5	20	5.5	24	0	1	0.30	47	775690	6417466	55
MU9 - White Box Woodland (shrubby)	HU824	140506P3	31	12.5	0	66	4.3	16	0	0	0.30	28	767019	6421024	55
MU9 - White Box Woodland (shrubby)	HU824	140506P4	28	15.5	0	64	3	34	0	0	0.30	0	766926	6420622	55
MU9 - White Box Woodland (shrubby)	HU824	140613P5	23	12	0	60	0	24	0	0	0.30	18	767040	6420784	55
MU9 - White Box Woodland (shrubby) - regen	HU824	150629P4	17	0	0	50	75	40	0	0	0.00	0	775687	6417340	55

Key:
BVT = BioMetric Vegetation Type
NPS = Number of native plant species
NOS = % overstorey cover
NMS = % midstorey cover
NGCG = % native ground cover grasses
NGCS = % native ground cover shrubs
NGCO = % native ground cover others
EPC = % exotic plant cover
NTH = Number of trees with hollows
OR = proportion of regeneration overstorey species
FL = length of fallen logs

ATTACHMENT D
WILPINJONG EXTENSION PROJECT TERRESTRIAL FAUNA BASELINE REPORT (DEVELOPMENT SITE)

WILPINJONG EXTENSION PROJECT

TERRESTRIAL FAUNA BASELINE REPORT (Development Site)

A report by Biodiversity Monitoring Services, November 2015

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EXECUTIVE SUMMARY

The Wilpinjong Extension Project (the Project) is a proposed extension of open cut operations at the Wilpinjong Coal Mine, located approximately 40 kilometres north-east of Mudgee, New South Wales (NSW). The Wilpinjong Coal Mine is owned and operated by Wilpinjong Coal Pty Limited (WPCL).

Biodiversity Monitoring Services was commissioned by WPCL to undertake terrestrial fauna baseline surveys in the Project area and surrounds. Eight areas of varying sizes were surveyed for terrestrial vertebrate fauna. Four detailed survey sites and 15 observational sites were established within the Survey Areas.

The surveys were mostly undertaken during February 2014 (summer) in mild weather and little rain with a targeted survey in May 2015. A total of 28 person-days, 22 hours of spotlighting, 8 nights of call playback/ detection and 825 trap-nights were spent undertaking surveys.

A total of 108 bird, 19 native and eight introduced mammal, 12 reptile and four amphibian species were located during the surveys. A total of 10 threatened fauna species listed under the NSW *Threatened Species Conservation Act, 1995* were located within the Survey Areas. These were:

- Black-chinned Honeyeater (eastern subspecies) (*Melithreptus gularis gularis*);
- Brown Treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*);
- Diamond Firetail (*Stagonopleura guttata*);
- Glossy Black-cockatoo (*Calyptorhynchus lathami*);
- Hooded Robin (south-eastern form) (*Melanodryas cucullata cucullata*);
- Little Lorikeet (*Glossopsitta pusilla*);
- Speckled Warbler (*Chthonicola sagittata*);
- Squirrel Glider (*Petaurus norfolcensis*);
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*); and
- Corben’s/South-eastern Long-eared Bat (*Nyctophilus corbeni*).

The Corben’s/South-eastern Long-eared Bat is also listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999*.

All threatened fauna species were recorded within woodland habitats, with exception of the Eastern Bentwing-bat. An adit associated with the Historical Shale Oil Mine Complex in Slate Gully (historical mine adit) was investigated and found to contain numbers of Eastern Bentwing-bats. Some of the bats emerging from the adit were lactating or young, indicating that the adit is a potential maternity roost site.

1 INTRODUCTION

1.1 Background

The Wilpinjong Extension Project (the Project) is a proposed extension of open cut operations at the Wilpinjong Coal Mine for an additional operational life of approximately seven years. The Wilpinjong Coal Mine is located approximately 40 kilometres (km) north-east of Mudgee, New South Wales (NSW), and is owned and operated by Wilpinjong Coal Pty Limited (WCPL), a wholly owned subsidiary of Peabody Energy Australia Pty Limited.

WCPL is seeking approval from the NSW Minister for Planning for a Development Consent under Division 4.1 of Part 4 of the *Environmental Planning and Assessment Act, 1979* (EP&A Act) for the Project.

The Project would include the following activities:

- open cut mining of run-of-mine (ROM) coal from the Ulan Coal Seam and Moolarben Coal Member in Mining Lease (ML) 1573 and in new Mining Lease Application areas in Exploration Licence (EL) 6169 and EL 7091;
- approximately 800 hectares (ha) of open cut extensions including:
  - approximately 500 ha of incremental extensions to the existing open cut pits in areas of ML 1573 and EL 6169;
  - development of a new open cut pit of approximately 300 ha in EL 7091 (Pit 8);
- continued production of up to 16 million tonnes per annum (Mtpa) of ROM coal;
- continued use of the Wilpinjong Coal Mine Coal Handling and Preparation Plant and general coal handling and rail loading facilities and other existing and approved supporting mine infrastructure;
- rail transport of approximately 13 Mtpa of thermal product coal to domestic and export customers (within existing maximum and annual average daily rail limits);
- relocation of a section of the TransGrid Wollar to Wellington 330 kilovolt electricity transmission line (ETL) to facilitate mining in Pit 8;
- various local infrastructure relocations to facilitate the mining extensions (e.g. realignment of Ulan-Wollar Road and associated rail level crossings, relocation of local ETLs and services);
- construction and operation of additional mine access roads to service new mining facilities located in Pits 5 and 8;

- construction and operation of new ancillary infrastructure in support of mining including mine infrastructure areas, ROM pads, haul roads, electricity supply, communications installations, light vehicle roads, access tracks, remote crib huts, upslope diversions, dams, pipelines and other water management structures;
- extension of the approved mine life by approximately seven years (i.e. from approximately 2026 to 2033);
- a peak operational workforce of approximately 625 people;
- ongoing exploration activities; and
- other associated minor infrastructure, plant and activities.

The regional location of the Project is shown on **Figure 1** and the general arrangement is shown on **Figure 2**.

1.2 Scope of this Report

The Project will be assessed under the NSW Biodiversity Offsets Policy for Major Projects (Office of Environment and Heritage [OEH], 2014). This policy prescribes biodiversity impact assessment requirements for State Significant Developments in NSW. The primary objective of this report is to provide the results of threatened fauna species targeted surveys undertaken for the Project Biodiversity Assessment Report (being prepared separately by Hunter Eco). Under this assessment process, only targeted surveys for select threatened fauna species listed under the NSW *Threatened Species Conservation Act, 1995* (TSC Act) (i.e. species credits species) are required. However, this report provides information on all threatened fauna species listed under the TSC Act relevant to the Project.

The Project will also be assessed under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) via the bilateral agreement between the Commonwealth and NSW. This report therefore also provides information on threatened fauna species listed under the EPBC Act.

Although the emphasis is on those species listed as threatened under the TSC Act and EPBC Act, populations of all observed terrestrial vertebrates are also documented and biodiversity values for each fauna group described. However it should be noted that neither the State nor the Commonwealth assessment process requires populations of all terrestrial vertebrates to be documented.

WIL-12-12_WEP_EIS_Fauna_201A

Biodiversity Monitoring Services

LEGEND

- Mining Lease Boundary
- Exploration Licence Boundary
- Authorisation Boundary
- Local Government Boundary
- NSW State Forest
- National Park, Nature Reserve or State Conservation Area
- Mining Operation

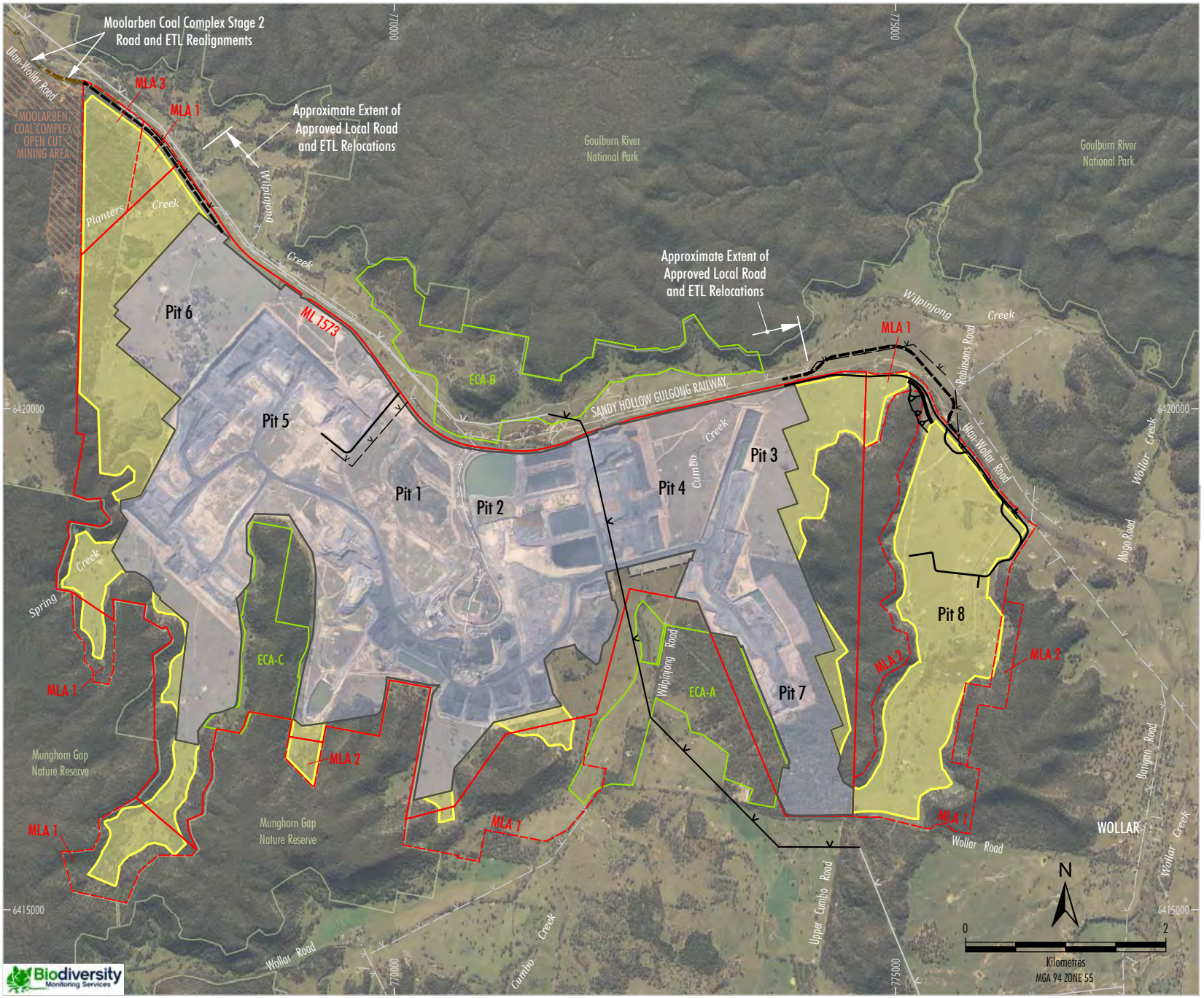
Source: NSW Land & Property Information (2015); NSW Dept of Industry (2015; Geoscience Australia (2011)

Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Regional Location

Figure 1



LEGEND

- Mining Lease Boundary
- Mining Lease Application Boundary
- Approved/Existing Open Cut and Contained Infrastructure Area
- Relocated Block Bank and Cumbo Creek Disturbance Area
- Proposed Open Cut Extension Area
- Proposed Public Road Realignment
- Proposed Pit 3/8 Haul Road
- Proposed Service Road
- Proposed Local ETL Realignment/Relocation
- Proposed Relocated TransGrid 330 kV ETL
- Existing Local ETL
- Existing TransGrid 330 kV ETL
- Enhancement and Conservation Area

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (Jun 2015, Jun 2014)

Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Project General Arrangement

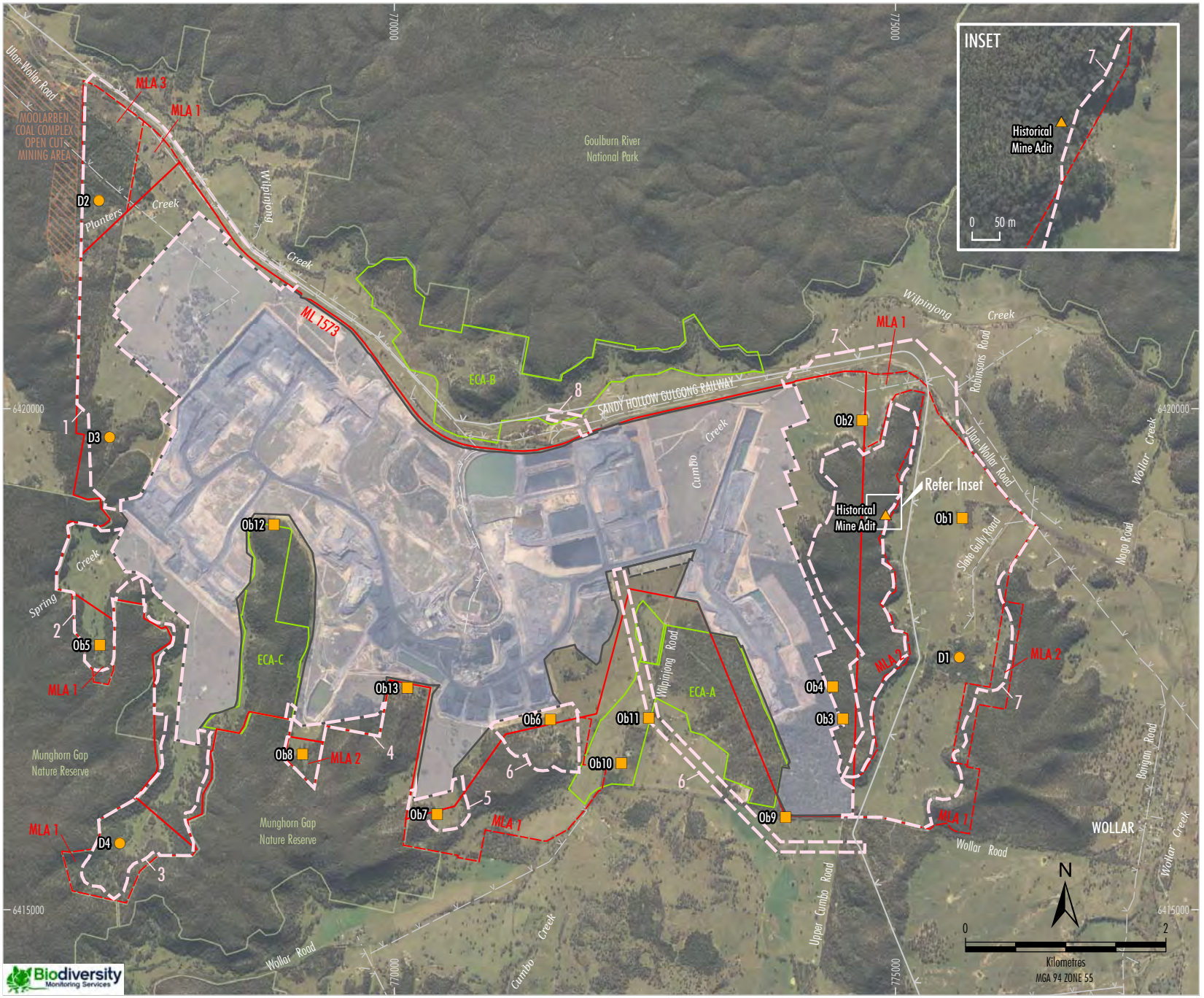
Figure 2

WIL-12-12_WEP_EIS_Fauna_202B

This report provides information about fauna use within and surrounding the existing Wilpinjong Coal Mine, with a particular emphasis on the terrestrial vertebrate fauna located within eight Survey Areas (covering the Project area and surrounds) during a detailed survey in February 2014 and targeted survey in May 2015. The locations of the eight Survey Areas are shown on **Figure 3**.

This report also draws upon a number of previous fauna surveys that have occurred within and surrounding the Wilpinjong Coal Mine. Previous surveys occurred in 2004 (Mount King Ecological Surveys [MKES], 2005; Greg Richards and Associates Pty Ltd, 2005) and 2012 (Biodiversity Monitoring Services, 2013; Lesryk Environmental Consultants [Lesryk], 2013) and the data from these surveys is used to compare the biodiversity values of the Survey Areas with those previously recorded at the Wilpinjong Coal Mine and surrounds.

This report also provides a description of the existing environment of the Survey Areas within a regional context. Survey methodology and survey effort are described within the body of the report, with detailed information provided as appendices. In addition, there are quantitative descriptions of the structural characteristics of habitats occurring within the Survey Areas as well as documentation of the presence of any threatened species within the Survey Areas, Wilpinjong Coal Mine and immediate surrounds.


INSET
Historical Mine Adit
0 50 m
LEGEND
Mining Lease Boundary
Mining Lease Application Boundary
Approved/Existing Open Cut and Contained Infrastructure Area
Relocated Block Bank and Cumbo Creek Disturbance Area
Survey Area
Existing Local ETL
Existing TransGrid 330 kV ETL
Enhancement and Conservation Area
Detailed Survey Site
Observational Survey Site
Historical Mine Adit
Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (Jun 2015, Jun 2014)
Uarr-Wollar Road
MOOLARBEN COAL COMPLEX OPEN CUT MINING AREA
MLA 3
MLA 1
Goulburn River National Park
Wilpinjong Creek
Planters Creek
D2
D3
ML 1573
ECA-B
SANDY HOLLOW GULGONG RAILWAY
Cumbo Creek
Wilpinjong Creek
Robinsons Road
Uarr-Wollar Road
Ob2
Refer Inset
Historical Mine Adit
Ob1
Slate Gully Road
Nogo Road
Wollar Creek
Ob12
Spring Creek
Ob5
ECA-C
Ob13
Ob8
MLA 2
Ob6
Ob11
Ob10
Wilpinjong Road
ECA-A
Ob4
Ob3
D1
MLA 2
Munghorn Gap Nature Reserve
Ob7
Ob9
MLA 1
D4
WOLLAR
Wollar Road
Boriyan Road
Upper Cumbo Creek
Cumbo Creek
Wollar Road
6420000
6415000
770000
775000
N
0
2
Kilometres
MGA 94 ZONE 55
Biodiversity Monitoring Services
Peabody ENERGY
WILPINJONG EXTENSION PROJECT
Fauna Survey Sites
Figure 3
WIL-12-12_WEP_EIS_Fauna_203F

2 EXISTING ENVIRONMENT

2.1 Regional Setting

The Survey Areas are located approximately 40 km north-east of Mudgee and 20 km west of Bylong (**Figure 1**). Two other coal mining operations are present in the locality: the Moolarben Coal Complex is located immediately to the west, and the Ulan Mine Complex is about 8 km north-west of Wilpinjong Coal Mine.

The Project is located at or in:

- the western extent of the Hunter Local Land Services area (formerly the *Hunter Central Rivers Catchment Management Authority* [CMA], Kerrabee CMA sub-region);
- the north-western extent of the *Sydney Basin* (Interim Biogeographic Regionalisation for Australia (IBRA) Bioregion, Kerrabee IBRA sub-region (Thackway and Cresswell, 1995; Commonwealth Department of the Environment [DotE], 2015a); and
- the *Central Western Slopes* Botanical Division.

2.2 Climate

Long-term rainfall data were sourced from a Bureau of Meteorology (BoM) weather station in Wollar (Barrigan St) (Site No.62032). The Wilpinjong area experiences a temperate climate with an average annual rainfall of approximately 600 millimetres (mm) (BoM, 2015).

The data from Wollar indicates January is the wettest month, with an average rainfall of 66.7 mm and May is the driest month, with an average rainfall of 37.7 mm. The months of April to September are the driest with a consistent monthly mean of around 40 mm, with rain then increasing from October to January, then decreasing to April (BoM, 2015).

The long-term average (1901 – 2014) monthly rainfall data sourced from the Wollar (Barrigan St) station were compared to short-term (2006 – 2014) average monthly rainfall data recorded by the Wilpinjong Coal Mine Weather Station.

The nearest available long-term temperature data were from Gulgong Post Office, approximately 30 km to the west (Site No.62013).

The data from Gulgong indicates the warmest month is January, with a mean maximum daily temperature of 31.0°C and the coldest month is July, with a mean daily minimum temperature of 2.6°C (BoM, 2015).

The long-term average (1970 – 2014) monthly minimum and maximum temperature data were sourced from the Gulgong Post Office station.

Rainfall and temperature records during the surveys were taken from the Wilpinjong Coal Mine Automatic Weather Station (**Table 1**). It can be seen that during the February surveys, the temperatures ranged from a minimum of just under 11°C to a maximum of just under 31°C. During the May survey, the temperature dropped as low as 1.4°C and reached a maximum of 18.8°C. Some rain fell prior to and at the beginning of the survey, but it was relatively dry for the remainder of the survey period.

Table 1: Weather Records during Survey Period

Date	Minimum Temperature (°C)	Maximum Temperature (°C)	Rainfall (mm)
14/02/2014	19.7	23.5	5.2
15/02/2014	19.8	30.3	3
16/02/2014	19.2	24.8	26.8
17/02/2014	17.6	23.5	0
18/02/2014	18.4	29	0
19/02/2014	20.8	24.8	33.6
20/02/2014	17.4	25	0
21/02/2014	10.7	28.5	0
22/02/2014	16.8	27	0
23/02/2014	15.9	23.9	0
24/02/2014	14.5	27.7	0
25/02/2014	16	30.9	0
26/02/2014	16.1	30.3	0
27/02/2014	18.7	30.9	0
28/02/2014	16.9	21.4	24.4
15/05/2015	1.4	18.8	0

Source: WCPL (2015).

2.3 Geology and Soils

Geological information for the Wilpinjong Coal Mine area was sourced from the *Gulgong 1:100 000 Geological Map* (Watkins *et al.,* 2000). Geology across the low lying areas of the Wilpinjong Coal Mine lease is Permian, Sydney Basin, Illawarra Coal Measures expressed on the surface as quartz-lithic sandstone. This takes up the majority of the lease area and includes most of the Project. An exception is a narrow band of Quaternary sediments along the course of Cumbo Creek in the eastern part of the existing mining lease and Wilpinjong Creek to the north. The elevated ridges within and outside of the lease are Triassic, Sydney Basin, Narrabeen group. Small areas of Permian, Sydney Basin Shoalhaven group are located to the south-west and east of the Project site.

Soil information was obtained from the *Soil Landscapes of the Dubbo 1:250,000 Sheet*. The low lying areas of the mine lease consist of yellow podzolic soils, primarily as part of the Ulan Soil Landscape Unit. The elevated ridges consist of shallow Lees Pinch Soil Landscape Unit, which consists of shallow sandy soils with extensive rock outcrop, boulder debris slopes and sandstone cliffs.

The main soil types in the Project Area comprise Rudosols (31%), Chromosols (20%) and Sodosols (18%), while lesser areas of Dermosols (10%), Kurosols (10%), Kandosols (7%) and Tenosols (5%) were also observed (McKenzie, 2015).

2.4 Landform and Hydrology

The Survey Areas are located within flat valleys associated with Wilpinjong Creek and its local tributaries (**Figure 3**). There are steep hills in the south-west (Munghorn Gap Nature Reserve), in the east (Crown land ridges) and in the north (Goulburn River National Park).

The flat valley lands have been extensively cleared and grazed by cattle and sheep. Most natural vegetation is restricted to the steep hills and slopes outside the current mine area. There are some small uncleared areas of remnant vegetation scattered throughout the Survey Areas and these are mainly associated with stony outcrops. The vegetation along all the watercourses in the Survey Areas has been cleared in the past.

The Project is located at the west-south-western extent of the Hunter Catchment. Water from across the Project extension areas flows (via tributaries including Cumbo Creek) to Wilpinjong Creek. Wilpinjong Creek connects to Wollar Creek, which flows north into the Goulburn River.

The elevations of the Project open cut extension areas range from approximately 360 metres (m) Australian Height Datum (AHD) in the north of Pit 8 to approximately 510 m AHD in the south of Pit 5, with the majority of the mine lease being level to gently inclined. Slopes on the ridges vary from moderately inclined to steep.

2.5 Land Use

The current land use in the Survey Areas and surrounds is mining and grazing. The Survey Areas are located immediately adjacent to existing mining areas associated with the approved Wilpinjong Coal Mine. Historically, the land use within the Survey Areas would have been stock grazing on pastures comprising a mix of native and introduced grasses (FloraSearch, 2005).

2.6 Vegetation

The Wilpinjong Coal Mine lies almost entirely in the *Upper Goulburn Valleys and Escarpment* Mitchell Landscape, designated as 57 percent (%) cleared. Areas of remnant forest are generally restricted to sandstone hills and escarpments that were historically difficult to clear. Due to the low annual rainfall, dry sclerophyll eucalypt forest is the dominant vegetation form. A detailed description of the vegetation present at the Project is provided in the *Wilpinjong Extension Project Terrestrial Flora Baseline Report* (Hunter Eco, 2015).

3 METHODS

The Survey Areas were surveyed for terrestrial vertebrate fauna at varying degrees of intensity, ranging from indirect observations to detailed trapping studies. The surveys were undertaken by Dr Martin Denny, Andrew Lothian and Thomas Staff from Biodiversity Monitoring Services between 17 and 28 February 2014 and 15 May 2015 using National Parks and Wildlife Service (NPWS) Scientific Licence No. S10282 and Animal Care and Ethics Committee (ACEC) Approval No. AW96/033.

3.1 Desktop Review

A desktop investigation was carried out to identify terrestrial fauna and preferred habitats that may be present within the Survey Areas and surrounds. A review of existing data was undertaken and a list of potential threatened fauna species that could occur within the Survey Areas was developed. The databases reviewed included:

- previous fauna survey investigations undertaken within the Survey Areas and surrounds for the *Wilpinjong Coal Project Environmental Impact Statement* (WCPL, 2005) conducted by MKES (2005);
- previous bat survey investigation undertaken within the Survey Areas and surrounds conducted by Greg Richards and Associates Pty Ltd (2005);
- previous fauna surveys conducted for the Wilpinjong Coal Mine Modification (Biodiversity Monitoring Services, 2013) in areas directly adjoining or near the Survey Areas;
- ecological surveys conducted in the eastern-most proposed open cut extension area (Pit 8), 'Slate Gully', by Lesryk as part of a biodiversity audit (Lesryk, 2013);
- ecological surveys conducted for the Moolarben Coal Project Stage 1 and Stage 2, located directly to the west of the Project (Ecovision Consulting, 2008; Moolarben Coal Pty Ltd and EMGA Mitchell McLennan Pty Limited, 2013);
- a search of the NSW OEH (2015a) BioNet Atlas of NSW Wildlife Database for records of threatened fauna within the locality;
- a search of the DotE (2015b) Protected Matters database for matters of national environmental significance within the locality;
- a search of the Australian Museum (2014) database for records of threatened fauna species within the locality; and

- a search of the Atlas of Living Australia Search Tool using a circle of 10 km radius around Wilpinjong (www.biocache.ala.org.au, accessed March 2015). The Atlas of Living Australia is a national database of all of Australia's flora and fauna supervised by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and utilising data from 17 organisations. The relevant organisations for providing data on fauna distribution are; Australian National Wildlife Collection, OEH Atlas of NSW Wildlife, BirdLife Australia, Birdata, Online Zoological Collections of Australian Museums (OZCAM), Australian Museum Arachnology Collection, Centre for Australian National Biodiversity Research, Commonwealth Scientific and Industrial Research Organisation and Australian Museum Herpetology Collection.

The desktop review resulted in a list of threatened species that could potentially be present in the vicinity of the Project based on previous records (i.e. previous surveys and database results) and potential habitat within the Survey Areas (Attachment A). Habitat requirements of threatened species listed in the database results were reviewed and if habitat resources for the species were present within the Survey Areas then this species was also considered to possibly occur within the Survey Areas/surrounds for the purpose of the surveys. These threatened species were targeted during field surveys in areas of suitable habitat (Section 3.2) and are discussed in Section 3.3.

3.2 Field Surveys

3.2.1 Survey Areas

The eight Survey Areas are shown on **Figure 3**. Two additional woodland assessment areas (OB12 and OB13) were established within and adjacent to an Enhancement and Conservation Area, and in Munghorn Gap Nature Reserve, adjacent to the existing mine site, respectively. Because of the disjunct nature of the open cut extensions and infrastructure areas, each are treated as separate Survey Areas, with the results from the surveys at each area amalgamated to form an overall description of fauna and habitats within the Project Survey Areas. Each Survey Area is described in Section 3.2.2.

3.2.2 Survey Sites

Survey sites were established within each of the ten areas at Wilpinjong Coal Mine (eight Survey Areas plus two woodland assessment areas). However, observational data were obtained from each area to complement that obtained from each site. The locations of each survey sites are shown on **Figure 3** and the grid references are in **Table 2**.

Table 2: Locations of Survey Sites

Site		Easting	Northing
Detailed Survey Sites	D1	775640	6417519
	D2	767052	6422077
	D3	767159	6419715
	D4	767261	6415664
Observational Survey Sites	OB1	775669	6418907
	OB2	774668	6419883
	OB3	774477	6416905
	OB4	774375	6417225
	OB5	767062	6417641
	OB6	771557	6416896
	OB7	770426	6415954
	OB8	769082	6416551
	OB9	773905	6415922
	OB10	772265	6416459
	OB11	772541	6416912
	OB12	768798	6418842
	OB13	770131	6417213
	Historical Mine Adit	774904	6418946

Individual Survey Areas, and whether Detailed or Observational surveys were conducted, are described below.

SURVEY AREA 1:

Area 1 is located at the north-western corner of the Wilpinjong Coal Mine beside the approved Stage 2 area of the Moolarben Coal Complex. Most of the area retains woodland vegetation, with the eastern edge merging into cleared and grazed grassland. The water courses within the area are ephemeral and form shallow basins within gently sloping land. Two Detailed survey sites were established within Area 1 (D2 and D3). Although no formal Observational survey sites were established, the entire area was traversed on two occasions and any fauna sighted was recorded.

SURVEY AREA 2:

Area 2 is mainly cleared with some patches of woodland habitat at its southern end. An Observational survey site was established in the woodland habitat (OB5).

SURVEY AREA 3:

An elongated area at the south-western extent of the Project, beside Munghorn Gap Nature Reserve. Patches of woodland habitat occur at the southern end of the area where a Detailed survey site was established (D4). The water courses are ephemeral and form shallow basins in a gently sloping landscape.

SURVEY AREA 4:

A small area close to the existing mine workings mainly containing cleared grassland with some patches of woodland habitat retained in the southern end. There is an ephemeral creek and a dam (dry during surveys) in the area. An Observational survey site was established in this area (OB8).

SURVEY AREA 5:

A small area close to Bens Creek and the existing mine workings. Mainly comprising cleared grassland with some scattered trees. An Observational survey site was established within the area (OB7).

SURVEY AREA 6:

A mine extension area and a corridor set aside for the proposed relocation of a transmission line. There is scattered woodland habitat within Area 6, including a strip of trees beside Wollar Road that forms a corridor. Four Observational survey sites were established in or close to this area (OB6, OB9, OB10 and OB11).

SURVEY AREA 7:

Area 7 comprises two sub-areas, Slate Gully in the eastern section and open grazed land close to the approved mine workings in the west. A steep wooded ridge separates the two sub-areas. The eastern sub-area (Slate Gully) had previously been surveyed by Lesryk in 2013 but was surveyed again in 2014. This sub-area comprises a broad valley surrounded by steep ridges, with much of the habitat being cleared grazed grassland with some residences (owned by WCPL). There is a patch of woodland in the central area where a Detailed survey site was established (D1). An Observational site (OB1) was also established as well as a harp trap site at an adit associated with the Historical Shale Oil Mine Complex in Slate Gully (historical mine adit).

The western sub-area is close to the current mine workings and comprises primarily cleared grassland with some woodland habitat at the southern end. Three Observational survey sites were established in this sub-area (OB2, OB3 and OB4).

SURVEY AREA 8:

A very small area of grazed grassland between Ulan-Wollar Road and Wilpinjong Creek was considered for the proposed relocation of a transmission line. This area was surveyed visually from the road on numerous occasions.

SITES OB12 and OB13:

OB12 and OB13 are located on the sides of steep hills that are directly adjacent to the current Wilpinjong Coal Mine operational area. The western-most Observation site (OB12) is also partially within an existing Enhancement and Conservation Area (**Figure 3**). Both support woodland habitat as well as escarpment environments. Both sites were walked thoroughly.

3.2.3 Survey Approach

Because of the disjunct nature of the extensions, it was necessary to approach each area as a separate entity. As described in Sections 3.2.1 and 3.2.2, Detailed and/or Observational sites were established in each area. However, because of their small sizes it was also possible to cover each Survey Area on foot and to record any fauna located, directly (visual) or indirectly (scats, burrows, nests, etc.).

Four Detailed survey sites were established in those areas that contained the greatest amount of woodland habitat and have the greatest potential to support threatened species. Observational sites and/or direct on-foot observations were completed within each area and complemented the data collected from the Detailed survey sites and opportunistic observations.

Habitat data was gathered by Hunter Eco (2015) as part of the *Wilpinjong Extension Project Terrestrial Flora Baseline Report* and the Project Biodiversity Assessment Report (being prepared separately by Hunter Eco).

3.2.4 Survey Methodology

The survey methods followed the guidelines developed and issued by the OEH (previously the NSW Department of Environment and Conservation [DEC] and the NSW Department of Environment and Climate Change [DECC]) and by DotE (previously the Department of Sustainability, Environment, Water, Population and Communities [SEWPaC]) including:

- *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities Working Draft* (DEC, 2004);
- *Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna Amphibians* (DECC, 2009);
- *Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999* (SEWPaC, 2010a);
- *Survey guidelines for Australia's threatened bats: Guidelines for detecting bats listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999* (SEWPaC, 2010b);
- *Survey guidelines for Australia's threatened frogs: Guidelines for detecting frogs listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999* (SEWPaC, 2010c);
- *Survey guidelines for Australia's threatened mammals: Guidelines for detecting mammals listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999* (SEWPaC, 2011a); and
- *Survey guidelines for Australia's threatened reptiles: Guidelines for detecting reptiles listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999* (SEWPaC, 2011b).

A desktop review (Section 3.1) and field surveys (Section 3.2) were conducted to determine the fauna species and habitat present within the Survey Areas and surrounds. A summary of the various techniques used in each Survey Area is given in **Table 3**.

Table 3: Survey Techniques used at each Survey Site

Site	Survey Techniques																							
	GE	TE	Cage	Hair	GT	Pit	Spot	Cam	Harp	Ana	Call1	Call2	Hab	BP	BA	Opp	Scat1	Scat2	Herp	Sc	SP	VE	BN	AT	DO
AREA 1																									
D2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
D3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Obs							X				X	X		X	X	X	X	X	X	X	X	X	X	X	X
AREA 2																									
OB5													X	X	X	X	X	X	X	X	X	X	X	X	X
AREA 3																									
D4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Obs							X				X	X		X	X	X	X	X	X	X	X	X	X	X	X
AREA 4																									
OB8													X	X	X	X	X	X	X	X	X	X	X	X	X
AREA 5																									
OB7													X	X	X	X	X	X	X	X	X	X	X	X	X
AREA 6																									
OB6													X	X	X	X	X	X	X	X	X	X	X	X	X
OB9							X						X	X	X	X	X	X	X	X	X	X	X	X	X
OB10							X						X	X	X	X	X	X	X	X	X	X	X	X	X
OB11							X						X	X	X	X	X	X	X	X	X	X	X	X	X
AREA 7																									
D1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
OB1													X	X	X	X	X	X	X	X	X	X	X	X	X
OB2													X	X	X	X	X	X	X	X	X	X	X	X	X
OB3														X	X	X	X	X	X	X	X	X	X	X	X
OB4														X	X	X	X	X	X	X	X	X	X	X	X
Historical Mine Adit							X		X																
Obs													X	X	X	X	X	X	X	X	X	X	X	X	X
AREA 8																									
Obs														X	X	X	X	X	X	X	X	X	X	X	X

Table 3: Survey Techniques used at each Survey Site (Continued)

Site	Survey Techniques																							
	GE	TE	Cage	Hair	GT	Pit	Spot	Cam	Harp	Ana	Call1	Call2	Hab	BP	BA	Opp	Scat1	Scat2	Herp	Sc	SP	VE	BN	AT	DO
WOODLAND ASSESSMENT AREAS																									
OB12														X	X	X	X	X	X	X	X	X	X	X	X
OB13														X	X	X	X	X	X	X	X	X	X	X	X

CODE:

GE: Ground Elliotts; TE: Tree-mounted Elliotts; Cage: Cage Traps; Hair: Hair Funnels; GT: Glider Tubes; Pit: Pit Traps; Spot: Spotlighting Transects; Cam: Remote Camera Traps; Harp: Harp Traps; Ana: Bat Call Recording with Anabat; Call1: Call Broadcast for Marsupials; Call2: Call Broadcasting for Nocturnal Birds; Hab: Habitat Structural Analysis; BP: Bird Point Count; BA: Bird Area Search; Opp: Opportunistic Sightings; Scat1: Scat Recognition; Scat2: Scat Analysis; Herp: Searches for Reptiles and Amphibians; Sc: Scratch Recognition; SP: Sand Plots; VE: Visual Encounter; BN: Burrows and Nests Recognition; AT: Animal Track Recognition; DO: Direct Observation.

The following sections describe the techniques used in detail.

Elliott Trapping

At each Detailed survey site 25 small (8 x 10 x 33 centimetre [cm]) Elliott traps were laid in straight lines for five days throughout the available habitats. This is equivalent to 100 trap nights over four consecutive nights at each site. The traps were baited with a mixture of rolled oats, peanut butter and bacon fat, and a small piece of Dacron was placed within each trap (as protection against the cold). A freezer bag was placed over the end of each trap to prevent the contents becoming wet from rain. At each trap site a description of the physical characteristics of the habitat within a 1 m radius was noted. This information is used in the analysis of habitat values. Two large Elliott traps were placed at each site (totalling eight trap nights per night for the four sites). The large Elliott traps were baited with chicken, apple and a muesli bar.

Tree-mounted Elliott Traps

To sample any small arboreal mammals, five small Elliott traps were mounted on trees at equal distances along each transect (20 trap nights over five consecutive days at each site). Aluminium tree mounts were attached to trees and a baited Elliott trap attached to the mount. The tree trunk and trap were sprayed with a honey-water mixture to assist in attracting any nectar or sap feeding arboreal mammals. Again, Dacron and freezer bags were used to combat cold and wet conditions.

Cage Traps

Three Tomahawk cage traps were laid on the ground and three Tomahawk traps were mounted on trees at each site (24 trap-nights). The Tomahawk traps were baited with apple, muesli bar and chicken.

Hair Funnels

Hair funnels (from Faunatech) were used instead of large and small hair tubes. The design of the tapered hair funnels is such that both large and small animals can be detected by a single funnel. Five hair funnels were set out at each Detailed survey site for four nights and baited with a mixture of rolled oats, peanut butter and bacon fat. Where possible, some of the hair funnels were set onto ‘habitat trees’ (these are considered to be trees that showed signs of use by arboreal marsupials and have obvious hollows).

Glider Traps

Tree-mounted plastic tubes were used to capture small arboreal mammals (e.g. Squirrel Glider [*Petaurus norfolkensis*]). These act as vertically mounted pit traps and were baited with a mixture of rolled oats, peanut butter and honey. Two traps were placed at each Detailed survey site over four consecutive nights (8 trap nights at each site).

Pitfall Traps

Pit traps were constructed from a 20 litre bucket and combined with a 20 m drift fence made from fly-screen wire mesh. These were used where the ground could be dug to a depth to accommodate the buckets. Three or four pit traps were established at the four Detailed sites (Areas D1 to D4) and used for five days.

Spotlighting

Spotlighting from a moving vehicle was undertaken along tracks within the Survey Areas. Spotlighting on foot was also undertaken at some fauna survey sites, (D1, D2, D3, D4, OB9, OB10, OB11 and the historical mine adit).

Remote Cameras

Two digital Scouting Cameras with infrared illumination were set up at Detailed sites D1 to D4 and run for five days. In addition, a remote camera was set up at a small bait station to record any fauna attracted to the bait.

Bird Surveys

In addition to the results obtained from general observations and spotlighting, listening and observing periods were undertaken at all sites. A 30 minute search was used where the observer walked around each site, as well as observing and listening for calls from a single point (point surveys). Where possible, up to four periods of observation were undertaken (two in the morning and two in the late afternoon) at each site.

Call Detection and Playback

Calls of several species of arboreal marsupials and nocturnal birds were broadcast during the night at Detailed survey sites D1 to D4. Calls were broadcast through a megaphone for approximately five minutes, with a 10 minute listening time.

Calls from the Koala (*Phascolarctos cinereus*), Sugar Glider (*Petaurus breviceps*), Squirrel Glider (*Petaurus norfolcensis*), Yellow-bellied Glider (*Petaurus australis*), Bush Stone-curlew (*Burhinus grallarius*), Powerful Owl (*Ninox strenua*), Masked Owl (*Tyto novaehollandiae*), Tawny Frogmouth (*Podargus strigoides*), Barking Owl (*Ninox connivens*), Eastern Grass Owl (*Tyto longimembris*), Australian Owlet-nightjar (*Aegotheles cristatus*), Barn Owl (*Tyto alba*), Southern Boobook (*Ninox boobook*) and the Spotted Nightjar (*Eurostopodus argus*) were broadcast.

Herpetological Searches

Systematic searches for reptiles and amphibians were undertaken within each habitat type at each survey site. Litter was raked and rocks and logs turned over. One hundred logs and/or rocks were turned over in sites D1 to D4 and OB1. Loose bark was prised from the trunks of dead trees. Each search took approximately 30 minutes and was repeated at each site.

A targeted search was undertaken for the Broad-headed Snake on the borders of Slate Gully in May 2015. Although this species had been thoroughly surveyed during February 2014 there was the possibility that it may have been missed during the warm months when this snake seeks shelter in tree hollows. A further search was undertaken during the colder months when it shelters under exfoliated rocks and can be more readily located. Two persons walked along the eastern edge of Slate Gully and inspected any potential shelter sites for one day.

Searches for amphibians took place at night using spotlights (particularly after the one day of rain) and recognition of characteristic calls. Spotlighting searches were also undertaken for reptiles, particularly in areas of rock.

Bat Call Detection

An Anabat II Bat Detector with a Compact Flash Storage ZCAIM was placed at Detailed sites D1, D2, D3 and D4 for one or two nights and recorded any bat calls. Bat calls were analysed by Glenn Hoye, FBN Bat Surveys PL.

Harp Traps

Harp traps consisting of a 1.8 m square frame made of aluminium mounted on adjustable legs. Monofilament fishing line is strung vertically in the frame in two banks, with the lines c. 2.5 cm apart and the banks separated by c. 10 cm, and with the lines of each bank offset. Below the bottom of the frame is a canvas catch bag lined with plastic. Traps are usually placed in vegetation corridors, over water tanks, and at cave or mine entrances.

Bats fly into the fishing lines and slide down into the catch bag from which they cannot escape. Harp traps were placed within Detailed sites D1, D2, D3, D4 and at the historical mine adit in Area 7.

Animal Track Recognition

Areas of sand on tracks (sand plots) were inspected for evidence of animal movement. Paw prints and other animal signs e.g. scratches, were identified and recorded. Sand plots were used where the ground surface permitted.

Opportunistic Observations and Scat Analysis

Any sightings of fauna were recorded whilst moving throughout the Survey Areas (Visual Encounter/Direct Observation) and located using a Global Positioning System. Any scats and owl casts were collected and identified, and their contents analysed. Burrows and nests observed were noted and identified, where possible. Point surveys were conducted within all sites except in Area 8 and the historical mine adit.

3.2.5 Survey Effort

A total of 28 person-days were spent surveying for fauna within the Survey Areas. Table 4 provides the survey efforts for each site and each technique used.

Table 4: Survey Effort for each Site in the Survey Areas

Site	Survey Techniques												Observational
	GE	TE	Cage	Hair	GT	Pit	Spot	Cam	Harp	Ana	Call1	Call2	
AREA 1													
D2	108	20	24	20	8	12	4	8	2	2	2	2	28 person days total throughout the Survey Areas
D3	108	20	24	20	8	12	4	8	2	2	2	2	
Obs													
AREA 2													
OB5													
AREA 3													
D4	108	20	24	20	8	16	4	8	2	1	2	2	
Obs													
AREA 4													
OB8													
AREA 5													
OB7													
AREA 6													
OB6													
OB9							2						
OB10							2						
OB11							2						
AREA 7													
D1	108	20	24	20	8	12	4	16	1	1	2	2	
OB1													
OB2													
OB3													
OB4													
Historical Mine Adit							*		3				
Obs													
AREA 8													
Obs													

Table 4: Survey Effort for each Site in the Survey Areas (Continued)

Site	Survey Techniques												Observational
	GE	TE	Cage	Hair	GT	Pit	Spot	Cam	Harp	Ana	Call1	Call2	
WOODLAND ASSESSMENT AREAS													28 person days total throughout the Survey Areas.
OB12													
OB13													
Total	432 TN	80 TN	96 TN	80 TN	32 TN	52 TN	22 hrs	40 TN	10 TN	6 TN	8 nights	8 nights	

CODE:

GE: Ground Elliotts; TE: Tree-mounted Elliotts; Cage: Cage Traps; Hair: Hair Funnels; GT: Glider Tubes; Pit: Pit Traps; Spot: Spotlighting Transects; Cam: Remote Camera Traps; Harp: Harp Traps; Ana: Bat Call Recording with Anabat; Call1: Call Broadcast for Marsupials; Call2: Call Broadcasting for Nocturnal Birds; Hab: Habitat Structural Analysis; BP: Bird Point Count; BA: Bird Area Search; Opp: Opportunistic Sightings; Scat1: Scat Recognition; Scat2: Scat Analysis; Herp: Searches for Reptiles and Amphibians; Sc: Scratch Recognition; SP: Sand Plots; VE: Visual Encounter; BN: Burrows and Nests Recognition; AT: Animal Track Recognition; DO: Direct Observation; TN: Number of Trap Nights.

- Number of hours spotlighting at Adit Site not recorded

3.3 Targeted Surveys for Threatened Species

Records were extracted from the NSW Wildlife Atlas (OEH, 2015a), BirdLife Australia (2014), Australian Museum (2014), Atlas of Living Australia (2015) and the EPBC Act Protected Matters search tool (DotE, 2015b), as described in Section 3.1, for threatened fauna species and populations recorded within a 30 x 30 km search area centred on the Survey Areas. The results of these database searches are presented in Attachment A.

The database results and threatened species records of species previously recorded within or surrounding the Survey Areas (Attachment A) were used as a guide to determine which threatened populations or species (or their habitats) might be present within the Survey Areas and surrounds. Habitat requirements of threatened species listed in the database results were reviewed and if habitat resources for the species were present within the Survey Areas then this species was also considered to possibly occur within the Survey Areas/surrounds for the purpose of the surveys.

Attachment A lists a total of 44 threatened and migratory fauna species which have the potential to occur within the Survey Areas. The likelihood of occurrence of the threatened fauna species within the Survey Areas and surrounds is provided in **Table 5**.

A select few species were listed in Attachment A as they or their habitat were predicted to occur in the 30 x 30 km EPBC Act Protected Matters search area (DotE, 2015b), but were excluded from assessment in **Table 5** due to a lack of necessary habitat components within the Survey Areas (i.e. wetland habitat), namely the: Murray Cod (*Maccullochella peelii*), Australasian Bittern (*Botaurus poiciloptilus*) and Australian Painted Snipe (*Rostratula australis*). These species are not discussed further in this report.

All of the field survey techniques listed in Section 3.2 were considered appropriate to identify all threatened species listed in **Table 5**.

Table 5: Threatened Fauna Likelihood of Occurrence

Scientific Name	Common Name	Conservation Status[1]		Habitat Preference	Species Previously Recorded within the Survey Areas or Surrounds?	Likelihood of Occurrence
		TSC Act	EPBC Act			
Amphibians						
Mixophyes iteratus	Giant Barred Frog	E	E	Deep, damp leaf litter in rainforests, moist eucalypt forest and nearby dry eucalypt forest, at elevations below 1,000 m (OEH, 2015b).	No. This species is predicted to occur in the EPBC Act Protected Matters search (DotE, 2015b) and there is only one database record in the database search area (OEH, 2015a).	Unlikely to occur in the Survey Areas due to a lack of records within the Survey Areas or immediate surrounds, and the occurrence of only marginal potential habitat resources.
Litoria booroolongensis	Booroolong Frog	E	E	Permanent streams with some fringing vegetation cover (OEH, 2015b).	No. This species is predicted to occur in the EPBC Act Protected Matters search only (DotE, 2015b).	Unlikely to occur in the Survey Areas due to a lack of records within the Survey Areas or immediate surrounds, and the occurrence of only marginal potential habitat resources.
Reptiles						
Aprasia parapulchella	Pink-tailed Worm-lizard	V	V	Under small rocks embedded in the soil.	No. This species has not been recorded within the Survey Areas or immediate surrounds. This species is predicted to occur in the EPBC Act Protected Matters search (DotE, 2015b) and there is only one database record in the database search area which is not near the Survey Areas (OEH, 2015a).	Unlikely to occur due to a lack of records within the Survey Areas or immediate surrounds.
Hoplocephalus bungaroides	Broad-headed Snake	E	V	Rocky outcrops and adjacent sclerophyll forest and woodland.	No. This species has not been recorded within the Survey Areas or immediate surrounds. This species is predicted to occur in the EPBC Act Protected Matters search only (DotE, 2015b).	Unlikely due to a lack of records within the Survey Areas or immediate surrounds, and the occurrence of only marginal potential habitat resources.
Birds						
Leipoa ocellata	Malleefowl	E	V	Semi-arid to arid shrublands and low woodlands (DotE, 2014c).	No. This species is predicted to occur in the EPBC Act Protected Matters search (DotE, 2015b) and there is only one database record in the database search area which is not near the Survey Areas (OEH, 2015a).	Unlikely due to lack of suitable preferred habitat. The record for Goulburn River National Park is considered inaccurate (D. Priddle pers. comm.).

Table 5: Threatened Fauna Likelihood of Occurrence (Continued)

Scientific Name	Common Name	Conservation Status[1]		Habitat Preference	Species Previously Recorded within the Survey Areas or Surrounds?	Likelihood of Occurrence
		TSC Act	EPBC Act			
Birds (Continued)						
Lophoictinia isura	Square-tailed Kite	V	-	Eucalypt woodland, open forest and heath-woodland (Morcombe, 2004).	Yes. There are records of this species within Wilpinjong ML boundary (MKES, 2005) and it is listed as occurring in database results (OEH, 2015a; BirdLife Australia, 2014).	Possible to occur in the Survey Areas given that the species was recorded near the Survey Areas during past surveys and the presence of potential habitat resources.
Hieraaetus morphnoides	Little Eagle	V	–	Woodland, forest, farmland, grasslands, crops, treeless dune fields, and recently logged areas (OEH, 2015b).	Yes. There are several records for this species within and surrounding the Survey Areas (MKES, 2005; Lesryk, 2013; Biodiversity Monitoring Services, 2013) and it is listed as occurring in database results (OEH, 2015a; BirdLife Australia, 2014).	Known from the Survey Areas, located during previous surveys.
Calyptorhynchus lathami	Glossy Black-cockatoo	V	-	Forest and woodland with abundant Casuarina trees (Morcombe, 2004).	Yes. There are several records for this species within and surrounding the Survey Areas (MKES, 2005 and Lesryk, 2013) and it is listed as occurring in database results (OEH, 2015a; BirdLife Australia, 2014).	Known from the Survey Areas, located during previous surveys.
Callocephalon fimbriatum	Gang-gang Cockatoo	V	-	Alpine woodland and dense, tall, wet forests of mountains and gullies (Morcombe, 2004).	Yes. Recorded within the Survey Areas during previous surveys (MKES, 2005) and listed as occurring in database results (OEH, 2015a; BirdLife Australia, 2014).	Known from the Survey Areas, located during previous surveys.
Glossopsitta pusilla	Little Lorikeet	V	-	Open eucalypt forests and woodlands (OEH, 2015b).	Yes. There are several records of this species within the Survey Areas and surrounds (MKES, 2005; Lesryk, 2013), and it is listed as occurring in database results (OEH, 2015a; BirdLife Australia, 2014; Australian Museum, 2014).	Known from the Survey Areas, located during previous surveys.
Neophema pulchella	Turquoise Parrot	V	-	Open woodlands and eucalypt forests with a ground cover of grasses and under storey of low shrubs (OEH, 2015b).	Yes. Recorded in the Survey Areas during previous surveys (MKES, 2005) and listed as occurring in database results (OEH, 2015a; BirdLife Australia, 2014).	Known from the Survey Areas, located during previous surveys.

Table 5: Threatened Fauna Likelihood of Occurrence (Continued)

Scientific Name	Common Name	Conservation Status[1]		Habitat Preference	Species Previously Recorded within the Survey Areas or Surrounds?	Likelihood of Occurrence
		TSC Act	EPBC Act			
Birds (Continued)						
Lathamus discolor	Swift Parrot	E	E	Dry sclerophyll eucalypt forests and woodlands (DotE, 2015c).	No. Two records occurring in the locality from database results (OEH, 2015a; BirdLife Australia, 2014) and it is predicted to occur in the EPBC Act Protected Matters search (DotE, 2015b).	Possible to occur in the Survey Areas given that records of this species exist in the database search area and the presence of potential habitat resources. However, previous surveys at the Project site did not find this species.
Polytelis swainsonii	Superb Parrot	V	V	Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest (OEH, 2015b).	No. This species and/or its habitat is only predicted to occur in the EPBC Act Protected Matters search of the Survey Areas and surrounds (DotE, 2015b).	Possible to occur in the Survey Areas due to presence of woodland habitats. However, there are no records from immediate area.
Ninox connivens	Barking Owl	V		Woodland and open forest, including fragmented remnants (OEH, 2015b).	No. Only recorded in the greater surrounds from database records (OEH, 2015a; Birdlife Australia, 2014).	Unlikely to occur given this species has not been recorded within the Survey Areas or immediate surrounds.
Tyto novaehollandiae	Masked Owl	V	-	Diverse range of wooded habitat (OEH, 2015b).	Yes. Recorded once within the Survey Areas during previous surveys (Lesryk, 2013) and in the nearby surrounds (MKES, 2005) and listed as occurring in database results (OEH, 2015a).	Known from the Survey Areas, located during previous surveys.
Ninox strenua	Powerful Owl	V	-	Forests and woodlands (DEC, 2006).	No. Only recorded in the greater surrounds from database records (OEH, 2015a; Birdlife Australia, 2014).	Unlikely to occur given this species has not been recorded within the Survey Areas or immediate surrounds.
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V	-	Eucalypt woodlands (including Box-Gum Woodland) and dry open forest (OEH, 2015b).	Yes. Recorded within the Survey Areas by previous surveys (MKES, 2005; Lesryk, 2013; Biodiversity Monitoring Services, 2013) and in greater surrounds by database records (OEH, 2015a; BirdLife Australia, 2014).	Known from the Survey Areas, located during previous surveys.
Chthonicola sagittata	Speckled Warbler	V	-	Eucalyptus dominated communities that have a grassy understorey (OEH, 2015b).	Yes. Recorded previously within the Survey Areas (MKES, 2005; Lesryk, 2013; Biodiversity Monitoring Services, 2013) and surrounds (OEH, 2015a; BirdLife Australia, 2014; Australian Museum, 2014).	Known from the Survey Areas, located during previous surveys.

Table 5: Threatened Fauna Likelihood of Occurrence (Continued)

Scientific Name	Common Name	Conservation Status[1]		Habitat Preference	Species Previously Recorded within the Survey Areas or Surrounds?	Likelihood of Occurrence
		TSC Act	EPBC Act			
Birds (Continued)						
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V	-	Drier open forests or woodlands dominated by box and ironbark eucalypts. Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks and tea-trees (OEH, 2015b).	Yes. There are records of this species from near the Survey Areas (MKES, 2005) and in the greater surrounds (BirdLife Australia, 2014; OEH, 2015a; Australian Museum, 2014).	Known from the Survey Areas, located during previous surveys.
Anthochaera Phrygia	Regent Honeyeater	CE	CE	Temperate eucalypt woodlands and open forests (OEH, 2015b).	Yes. This species was previously recorded adjacent to the Survey Areas (DECC, 2005 in MKES, 2005). Also recorded in the locality (OEH, 2015a; BirdLife Australia, 2014) and is predicted in the EPBC Act Protected Matters search (DotE, 2015b).	Likely to occur in the Survey Areas due to adjacent records from previous surveys and presence of potential habitat resources.
Grantiella picta	Painted Honeyeater	V	V	Forest, dry scrub and woodland (often with abundant mistletoe) (Morcombe, 2004).	Yes. Recorded adjacent to Survey Areas during previous surveys (MKES, 2005) and listed as occurring in database results (OEH, 2015a; BirdLife Australia, 2014).	Likely to occur in the Survey Areas due to adjacent records from previous surveys.
Certhionyx variegatus	Pied Honeyeater	V	-	Arid woodland, mallee, acacia scrub, spinifex and drier heath (Morcombe, 2004).	No. Recorded once in the greater surrounds in the OEH (2015a) database results.	Unlikely to occur in the Survey Areas, as range is to the west and utilises Acacia woodlands which are not available in the Survey Areas. Further, there are no records in the Survey Areas or immediate surrounds.
Epthianura albifrons	White-fronted Chat	V	-	Salt marsh and other damp areas with low vegetation (BirdLife Australia, 2014).	No. Recorded in the greater surrounds in the OEH (2015a) and BirdLife Australia (2014) database results.	Unlikely to occur in the Survey Areas, as there are no records from the immediate area and preferred habitat either not available or severely disturbed by grazing and clearing.
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	V	-	Lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee (OEH, 2015b).	Yes. There are records of this species from within the Survey Areas and surrounds (MKES, 2005). There are database records in the greater surrounds (BirdLife Australia, 2014; OEH, 2015a).	Known from the Survey Areas, located during previous surveys.

Table 5: Threatened Fauna Likelihood of Occurrence (Continued)

Scientific Name	Common Name	Conservation Status[1]		Habitat Preference	Species Previously Recorded within the Survey Areas or Surrounds?	Likelihood of Occurrence
		TSC Act	EPBC Act			
Birds (Continued)						
Petroica rodinogaster	Pink Robin	V	-	Rainforest, wet eucalypt forest, tree-fern gullies of ranges and more open country when it winters (Morcombe, 2004).	No. Recorded at one location surrounding the Survey Areas in the OEH (2015a) database results.	Unlikely to occur in the Survey Areas as it is located out of the species' range and preferred habitat of rainforest is not available.
Petroica boodang	Scarlet Robin	V	-	Forests, woodlands; and heavier vegetation when breeding (OEH, 2015b).	Yes. Recorded within the Survey Areas and surrounds by previous surveys (Lesryk, 2013; Biodiversity Monitoring Services, 2013). Database records in greater surrounds (BirdLife Australia, 2014; OEH, 2015a).	Known from the Survey Areas, located during previous surveys. Preferred habitat is known from immediate area.
Petroica phoenicea	Flame Robin	V	-	Rainforest, wet eucalypt forest, woodland and more open woodland and farmland when it winters (Morcombe, 2004).	Yes. Recorded surrounding the Survey Areas in the BirdLife Australia (2014) and OEH (2015a) database results.	Likely to occur in the Survey Areas, due to presence of preferred habitats and known records from immediate area.
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V	-	Open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands (OEH, 2015b).	Yes. Recorded within and adjacent to the Survey Areas by previous surveys (Lesryk, 2013; Biodiversity Monitoring Services, 2013) and in the greater surrounds (OEH, 2015a).	Known from the Survey Areas, located during previous surveys.
Daphoenositta chrysoptera	Varied Sittella	V	-	Eucalypt forests and woodlands (OEH, 2015b).	Yes. Recorded once in the surrounds of the Survey Areas (Biodiversity Monitoring Services, 2013) and in the OEH (2015a), BirdLife Australia (2014) and Australian Museum (2014) database results.	Likely to occur in the Survey Areas, due to presence of preferred habitats and known records from immediate area.
Stagonopleura guttata	Diamond Firetail	V	-	Grassy eucalypt woodlands, open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities (OEH, 2015b).	Yes. Numerous records within and surrounding the Survey Areas from previous surveys (MKES, 2005; Lesryk, 2013; Biodiversity Monitoring Services, 2013) and from database records in the greater surrounds (OEH, 2015a; Australian Museum, 2014; BirdLife Australia, 2014).	Known from the Survey Areas, located during previous surveys.

Table 5: Threatened Fauna Likelihood of Occurrence (Continued)

Scientific Name	Common Name	Conservation Status[1]		Habitat Preference	Species Previously Recorded within the Survey Areas or Surrounds?	Likelihood of Occurrence
		TSC Act	EPBC Act			
Birds (Continued)						
Circus assimilis	Spotted Harrier	V	-	Grassy open woodland (OEH, 2015b).	No. Not recorded during previous surveys. Database records from the greater surrounds (OEH, 2015a; BirdLife Australia, 2014).	Unlikely to occur as no records within the Survey Areas or immediate surrounds, despite previous surveys.
Falco hypoleucos	Grey Falcon	E	-	Shrubland, grassland and wooded watercourses (OEH, 2015b)	No. Not recorded during previous surveys. Database records from the greater surrounds (BirdLife Australia, 2014).	Unlikely to occur as no records within the Survey Areas or immediate surrounds, despite previous surveys.
Falco subniger	Black Falcon	V	-	Watercourses and isolated woodlands (OEH, 2015b).	No. Not recorded during previous surveys. Database records from the greater surrounds (OEH, 2015a; BirdLife Australia, 2014).	Unlikely to occur as no records within the Survey Areas or immediate surrounds, despite previous surveys.
Mammals						
Dasyurus maculatus	Spotted-tailed Quoll	V	E	Rainforest, open forest, woodland, coastal heath and inland riparian forest (OEH, 2015b).	No. Species and/or its habitat is predicted to occur in the EPBC Act Protected Matters search (DotE, 2015b) and is listed as occurring in database results (OEH, 2015a).	Unlikely to occur in the Survey Areas due to a lack of records within or near the Survey Areas.
Phascolarctos cinereus	Koala	V	V	Eucalypt forests and woodlands (OEH, 2015b).	Yes. Recorded surrounding the Survey Areas in the OEH (2015a) database results and is predicted to occur in the EPBC Act Protected Matters search (DotE, 2015b).	Possible to occur in the Survey Areas due to recent sighting in the surrounds of the Survey Areas and presence of potential habitat resources.
Petaurus norfolcensis	Squirrel Glider	V	-	Forest and woodland with habitat hollows and nectar resources (Van Dyck and Strahan, 2008).	Yes. Recorded within the Survey Areas during previous surveys (Greg Richards and Associates, 2005) and listed as occurring in database results (OEH, 2015a).	Known from the Survey Areas, located during previous surveys.
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V	Rocky escarpments (OEH, 2015b).	Yes. Recorded from the greater region surrounding the Survey Areas in the OEH (2015a) database results. This species and/or its habitat is predicted to occur in the EPBC Act Protected Matters search (DotE, 2015b).	Unlikely to occur in the Survey Areas due to a lack of records within the Survey Areas or immediate surrounds. No preferred habitat in Survey Areas.

Table 5: Threatened Fauna Likelihood of Occurrence (Continued)

Scientific Name	Common Name	Conservation Status[1]		Habitat Preference	Species Previously Recorded within the Survey Areas or Surrounds?	Likelihood of Occurrence
		TSC Act	EPBC Act			
Mammals (Continued)						
Pteropus poliocephalus	Grey-headed Flying Fox	V	V	Mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest (OEH, 2015b).	No. Species and/or its habitat is predicted to occur in the EPBC Act Protected Matters search only (DotE, 2015b). The closest known camp site is approximately 120 km east (Singleton).	Unlikely to occur in the Survey Areas due to a lack of records within the Survey Areas or immediate surrounds, although likely to pass through area whilst foraging (recorded from Ulan Mine Complex, M. Denny pers. comm.)
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-	Wet and dry forests, grasslands, shrublands, Mallee and open woodlands (Churchill, 2008).	Yes. Recorded within the Survey Areas during previous surveys (Greg Richards and Associates, 2005) and recorded surrounding the Survey Areas in database results (OEH, 2015a).	Known from the Survey Areas, located during previous surveys.
Mormopterus norfolkensis	Eastern Freetail-bat	V	-	Rainforest, Melaleuca forest, monsoon forest, tall open forest, River Red Gum and Yellow Box woodlands, riparian open forest and dry sclerophyll forest (Churchill, 2008).	Yes. Recorded in Survey Areas during previous surveys (Greg Richards and Associates, 2005).	Known from the Survey Areas, located during previous surveys.
Miniopterus australis	Little Bentwing-bat	V	-	Moist eucalypt forest, rainforest or dense coastal Banksia scrub (OEH, 2015b).	Yes. Recorded in Survey Areas during previous surveys (Greg Richards and Associates, 2005) and in the greater surrounds (OEH, 2015a).	Known from the Survey Areas, located during previous surveys.
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	-	Rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, Melaleuca forests and open grasslands (Churchill, 2008).	Yes. Numerous records from the Survey Areas and surrounds (Greg Richards and Associates, 2005; Lesryk, 2013), and from database records (OEH, 2015a).	Known from the Survey Areas, located during previous surveys.
Nyctophilus corbeni	Corben's/ South-eastern Long-eared Bat	V	V	Rainforest, wet and dry sclerophyll forest, paperbark forest and open grasslands (OEH, 2015b).	Yes. Recorded surrounding the Survey Areas in the OEH (2015a) database results and is predicted to occur in the EPBC Act Protected Matters search (DotE, 2015b).	Likely to occur in the Survey Areas, due to known records from immediate area.

Table 5: Threatened Fauna Likelihood of Occurrence (Continued)

Scientific Name	Common Name	Conservation Status[1]		Habitat Preference	Species Previously Recorded within the Survey Areas or Surrounds?	Likelihood of Occurrence
		TSC Act	EPBC Act			
Mammals (Continued)						
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Dry sclerophyll forests and woodlands, sub-alpine woodland, the edge of rainforest, wet sclerophyll forest and sandstone outcrop country (Churchill, 2008).	Yes. Recorded within the Survey Areas during previous surveys (Greg Richards and Associates, 2005; Lesryk, 2013; Biodiversity Monitoring Services, 2013). Also recorded in the greater surrounds from database records (OEH, 2014).	Known from the Survey Areas, located during previous surveys.
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	Wet sclerophyll and coastal mallee, tall and wet forests where trees are more than 20 m high (Churchill, 2008).	Yes. Recorded surrounding the Survey Areas during previous surveys (Greg Richards and Associates, 2005; Biodiversity Monitoring Services, 2013) and listed as occurring in database results (OEH, 2015a).	Likely to occur in the Survey Areas, due to known records from immediate area.
Vespadelus troughtoni	Eastern Cave Bat	V	-	Dry open forest and woodland, near cliffs or rocky overhangs (OEH, 2015b).	Yes. Recorded in the Survey Areas by previous surveys (Lesryk, 2013) and in the surrounds (Biodiversity Monitoring Services, 2013). One record in the greater surrounds by database records (OEH, 2015a).	Known from the Survey Areas, located during previous surveys.
Pseudomys novaehollandiae	New Holland Mouse	-	V	Open heathland, open woodland with a heathland understorey and vegetated sand dunes (DotE, 2015c).	No. This species has not been recorded within the Survey Areas or immediate surrounds. This species is predicted to occur in the EPBC Act Protected Matters search only (DotE, 2015b).The closest known record is 50 km east of ML 1573 on the eastern side of Goulburn River National Park.	Unlikely to occur in the Survey Areas due to a lack of records within the Survey Areas or immediate surrounds

[1] Threatened fauna species status under the TSC Act and/or EPBC Act (current at November 2015).
V = Vulnerable; E = Endangered; CE = Critically Endangered.

4 RESULTS

4.1 Fauna Located

A total of 108 bird, 19 native and eight introduced mammal, 12 reptile and four amphibian species were located during the surveys. These are listed, together with their status in NSW and Federally, in Attachments B and C. The survey results from OB12 and OB13 are reported separately in Attachment C as these sites were established adjacent to the existing mine site within an Enhancement and Conservation Area and in Munghorn Gap Nature Reserve.

Table 6 provides information about the biodiversity values for each fauna group. Because of the influence from Evenness on the Diversity Index, a second set of indices have been calculated by removing any species having large population numbers. A single species with large population numbers can skew the value of a fauna group's Simpson Index of Diversity (such as the Eastern Grey Kangaroo (*Macropus giganteus*) and Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) [Table 6]). Once removed, a better picture of biodiversity values for the remainder of the population can be obtained.

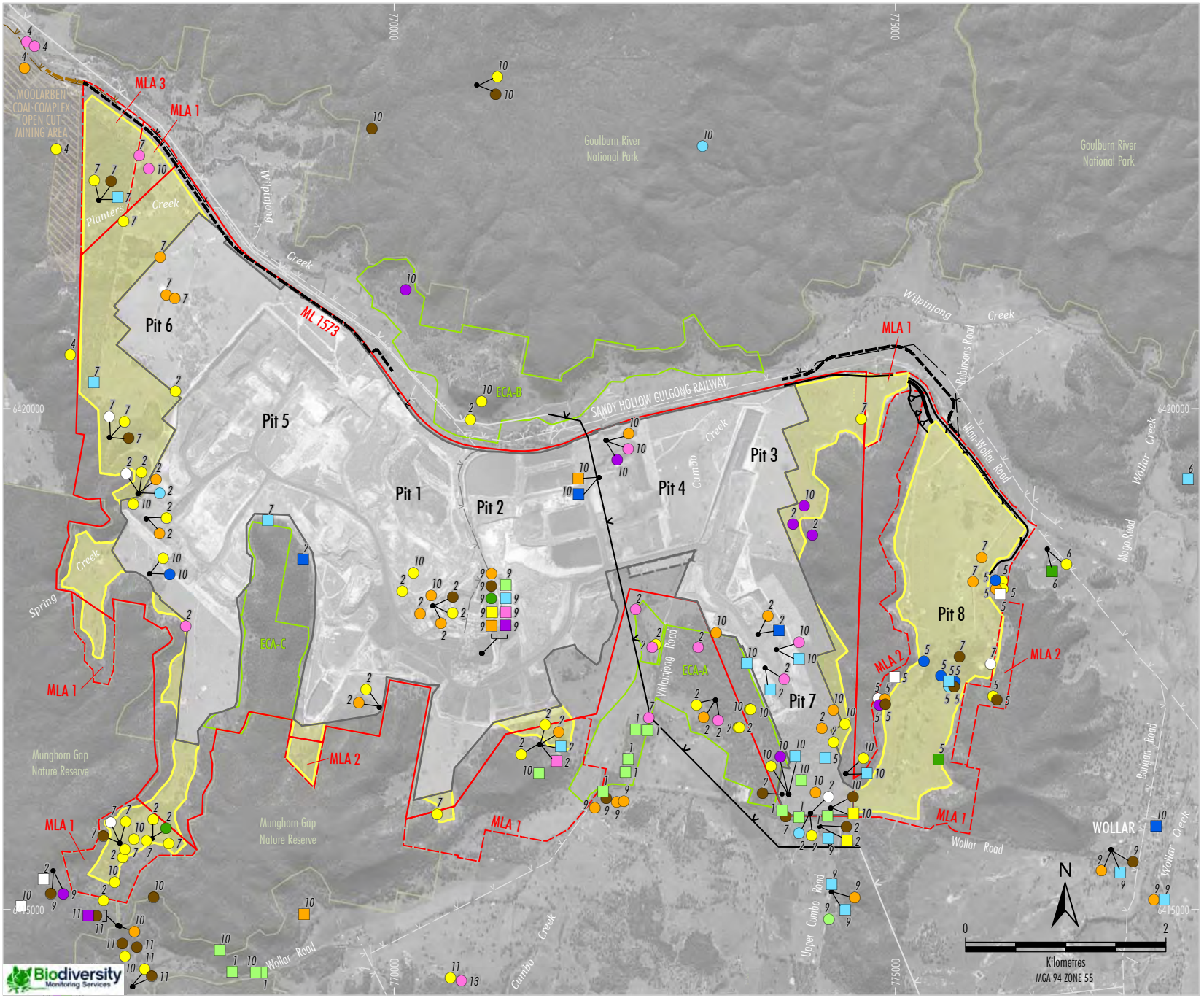
Table 6: Biodiversity Indices for Fauna Groups in the Survey Areas

Fauna Group	Evenness	Simpson's Index of Diversity (1/D)	Number Recorded	Species Richness
Birds	0.790	0.959	4938	108
Native Mammals (non-bats)	0.348	0.352	1291	11
Native Mammals (less Eastern Grey Kangaroo)	0.734	0.781	259	10
Bats	0.402	0.399	190	8
Bats (less Eastern Bentwing-bat)	0.657	0.655	45	7
Reptiles	0.694	0.760	88	12
Amphibians	0.749	0.605	20	4

4.2 Threatened Fauna Species

4.2.1 Number of Threatened Species at Wilpinjong

A number of threatened fauna species have been located in the vicinity of the Wilpinjong Coal Mine either during surveys (MKES, 2005; Biodiversity Monitoring Surveys, 2013 and Lesryk, 2013) or database searches (Section 3.1). The distribution of these records is shown on **Figures 4a** (Birds) **and 4b** (Mammals and Amphibians).



LEGEND

- Mining Lease Boundary
- Mining Lease Application Boundary
- Approved/Existing Open Cut and Contained Infrastructure Area
- Relocated Block Bank and Cumbo Creek Disturbance Area
- Proposed Open Cut Extension Area
- Proposed Public Road Realignment
- Proposed Pit 3/8 Haul Road
- Proposed Service Road
- Proposed Local ETL Realignment/Relocation
- Proposed Relocated TransGrid 330 kV ETL
- Existing Local ETL
- Existing TransGrid 330 kV ETL
- Enhancement and Conservation Area

Threatened Birds

- Black-chinned Honeyeater (eastern subspecies)
- Brown Treecreeper (eastern subspecies)
- Diamond Firetail
- Flame Robin
- Gang-gang Cockatoo
- Glossy Black-Cockatoo
- Grey-crowned Babbler (eastern subspecies)
- Hooded Robin (south-eastern form)
- Little Eagle
- Little Lorikeet
- Masked Owl
- Painted Honeyeater
- Powerful Owl
- Regent Honeyeater
- Scarlet Robin
- Speckled Warbler
- Square-tailed Kite
- Turquoise Parrot
- Varied Sittella

Reference:

1 *DECC (2005)*
2 *Mount King Ecological Surveys (2005)*
4 *EcoVision (2006)*
5 *Lesryk Environmental Consultants (2013)*
6 *Biodiversity Monitoring Services (2013)*
7 *Biodiversity Monitoring Services (2015a)*
9 *Birdlife (2014)*
10 *OEH (2015)*
11 *Biodiversity Monitoring Services (2015b)*

Note: There are no references 3 or 8 on this figure.

Source: WCPL (2015); Orthophoto: WCPL (Jun 2015, Jun 2014)

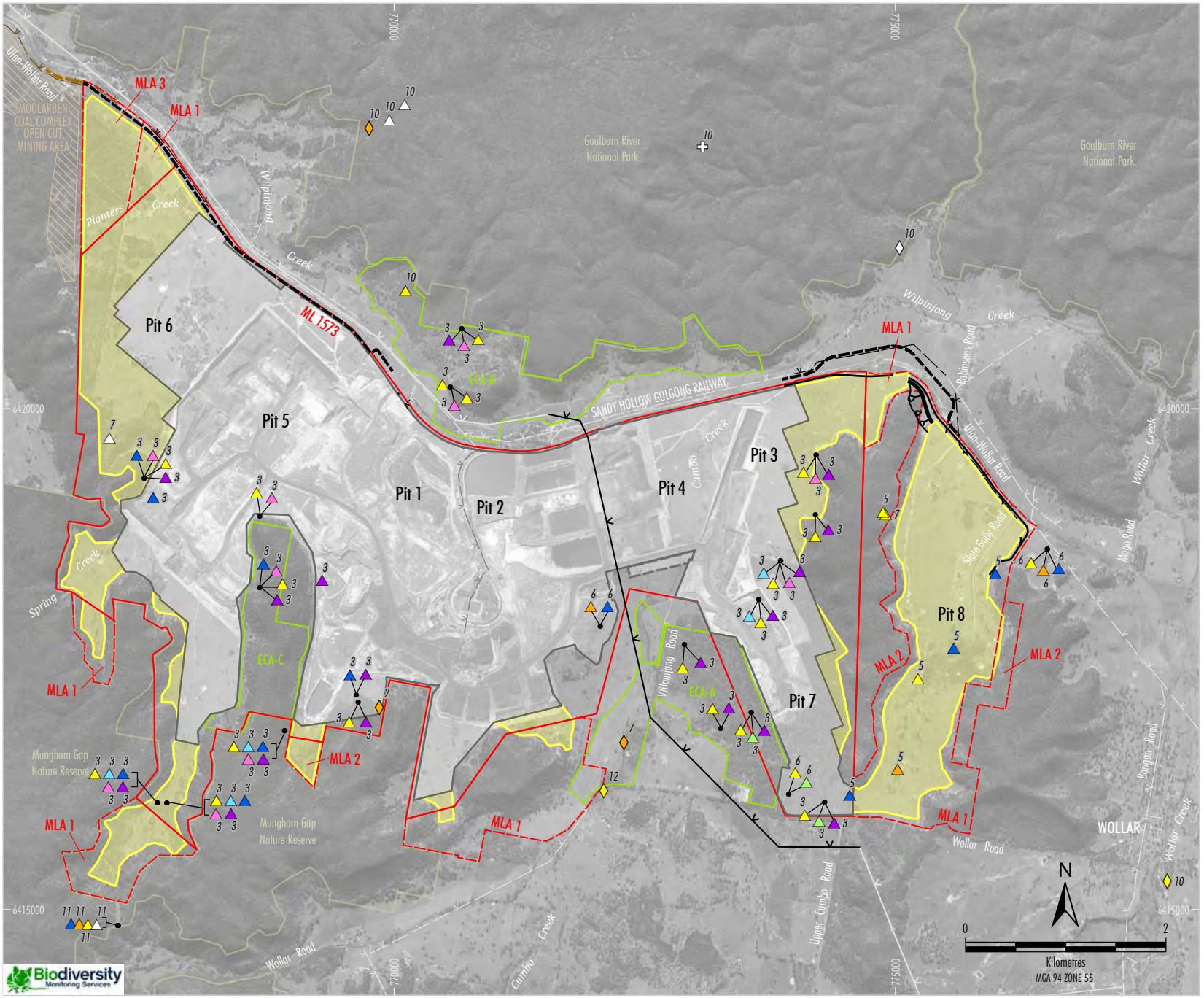
Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Threatened Birds

Figure 4a

WIL-12-12_WEP_EIS_Fauna_205E



LEGEND

- Mining Lease Boundary
- Mining Lease Application Boundary
- Approved/Existing Open Cut and Contained Infrastructure Area
- Relocated Block Bank and Cumbo Creek Disturbance Area
- Proposed Open Cut Extension Area
- Proposed Public Road Realignment
- Proposed Pit 3/8 Haul Road
- Proposed Service Road
- Proposed Local ETL Realignment/Relocation
- Proposed Relocated TransGrid 330 kV ETL
- Existing Local ETL
- Existing TransGrid 330 kV ETL
- Enhancement and Conservation Area

Threatened Species

- Brush-tailed Rock-wallaby
- Koala
- Squirrel Glider
- Corben's Long-eared Bat
- Eastern Bentwing-bat
- Eastern Cave Bat
- Eastern False Pipistrelle
- Eastern Freetail-bat
- Large-eared Pied Bat
- Little Bentwing-bat
- Yellow-bellied Sheathtail-bat
- Giant Barred Frog

Reference:

2 Mount King Ecological Surveys (2005)
3 Greg Richards and Associates Pty Ltd (2005)
5 Lesryk Environmental Consultants (2013)
6 Biodiversity Monitoring Services (2013)
7 Biodiversity Monitoring Services (2015a)
10 OEH (2015)
11 Biodiversity Monitoring Services (2015b)

Note: There are no references 1, 4, 8 or 9 on this figure.

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (Jun 2015; Jun 2014)

Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Threatened Mammals and Amphibians

Figure 4b

Biodiversity Monitoring Services

WIL-12-12_WEP_EIS_Fauna_207F

Threatened species located during the present survey of the Survey Areas are shown in Table 7, together with information about how and where they were located. **Figures 4a and 4b** show the surveyed locations of these threatened species. Because of the identification of a potential roosting site for the Eastern Bentwing-bat, this species is described in detail in Section 4.2.2.

The range of threatened species located during the Project surveys is similar to that found during previous surveys at the Wilpinjong Coal Mine. Most species located are those associated with woodland habitat and existence of stands of this habitat in the Survey Areas results in a variety of threatened woodland bird species. Two threatened species of bat were located, the Eastern Bentwing-bat and the Corben's/South-Eastern Long-eared Bat (*Nyctophilus corbeni*). The Corben's/South-Eastern Long-eared Bat is also listed as Vulnerable under the Federal EPBC Act.

Table 7: Threatened Species Located Within Survey Areas

Date	Easting	Northing	Species	Conservation Status[1]		No	Method	Survey Site
				TSC Act	EPBC Act			
20/02/2014	775949	6417454	Black-chinned Honeyeater	V	-	2	Sight	Opportunistic
22/02/2014	767261	6415664	Black-chinned Honeyeater	V	-	1	Heard	D4
26/02/2014	767159	6419715	Black-chinned Honeyeater	V	-	1	Heard	D3
22/02/2014	767313	6415599	Brown Treecreeper	V	-	3	Heard	Opportunistic
22/02/2014	767159	6419715	Brown Treecreeper	V	-	1	Heard	D3
23/02/2014	767159	6419715	Brown Treecreeper	V	-	1	Heard	D3
23/02/2014	767261	6415664	Brown Treecreeper	V	-	2	Heard	D4
23/02/2014	767529	6415687	Brown Treecreeper	V	-	1	Heard	Opportunistic
24/02/2014	767159	6419715	Brown Treecreeper	V	-	1	Heard	D3
24/02/2014	767261	6415664	Brown Treecreeper	V	-	2	Sight	D4
24/02/2014	774660	6419893	Brown Treecreeper	V	-	1	Heard	OB2
25/02/2014	767052	6422077	Brown Treecreeper	V	-	1	Heard	D2
25/02/2014	767261	6415664	Brown Treecreeper	V	-	3	Sight	D4
25/02/2014	767298	6421872	Brown Treecreeper	V	-	1	Sight	Opportunistic
25/02/2014	767750	6415661	Brown Treecreeper	V	-	1	Heard	Opportunistic
26/02/2014	767159	6419715	Brown Treecreeper	V	-	1	Heard	D3
26/02/2014	770426	6415954	Brown Treecreeper	V	-	1	Heard	OB7
18/02/2014	767724	6421135	Diamond Firetail	V	-	9	Sight	Opportunistic
20/02/2014	775862	6418513	Diamond Firetail	V	-	7	Sight	Opportunistic

Table 7: Threatened Species Located Within Survey Areas (Continued)

Date	Easting	Northing	Species	Conservation Status[1]		No	Method	Survey Site
				TSC Act	EPBC Act			
21/02/2014	775777	6418269	Diamond Firetail	V	-	6	Sight	Opportunistic
23/02/2014	767811	6421100	Diamond Firetail	V	-	9	Sight	Opportunistic
25/02/2014	767665	6421509	Diamond Firetail	V	-	10	Sight	Opportunistic
27/02/2014	774904	6418946	Eastern Bentwing-bat	V	-	145	Harp Trap	historical mine adit
18/02/2014	764950	6424200	Glossy Black-Cockatoo	V	-	7	Sight	Opportunistic
20/02/2014	767456	6422519	Hooded Robin	V	-	2	Sight	Opportunistic
21/02/2014	772541	6416912	Hooded Robin	V	-	1	Sight	OB Ob11
20/02/2014	775640	6417519	Little Lorikeet	V	-	2	Heard	D1
21/02/2014	773905	6415922	Little Lorikeet	V	-	2	Sight	OB Ob8
22/02/2014	767052	6422077	Little Lorikeet	V	-	1	Heard	D2
22/02/2014	767159	6419715	Little Lorikeet	V	-	1	Sight	D3
22/02/2014	767261	6415664	Little Lorikeet	V	-	2	Heard	D4
23/02/2014	767261	6415664	Little Lorikeet	V	-	2	Heard	D4
24/02/2014	767261	6415664	Little Lorikeet	V	-	2	Sight	D4
25/02/2014	767261	6415664	Little Lorikeet	V	-	2	Sight	D4
26/02/2014	767261	6415664	Little Lorikeet	V	-	6	Sight	D4
23/02/2014	767159	6419715	Corben's/South-Eastern Long-eared Bat	V	V	1	Harp Trap	D3
19/02/2014	767052	6422077	Speckled Warbler	V	-	2	Sight	D2
20/02/2014	767052	6422077	Speckled Warbler	V	-	1	Sight	D2
25/02/2014	767052	6422077	Speckled Warbler	V	-	1	Sight	D2
25/02/2014	767003	6420252	Speckled Warbler	V	-	2	Sight	Opportunistic
26/02/2014	768740	6418878	Speckled Warbler	V	-	1	Sight	OB12
25/02/2014	772292	6416668	Squirrel Glider	V	-	1	Sight	Opportunistic

[1] Threatened fauna species status under the TSC Act and/or EPBC Act (current at November 2015).
V = Vulnerable

4.2.2 Eastern Bentwing-bat

Surveys undertaken within Slate Gully in 2013 by Lesryk (2013) resulted in harp trapping of bats emerging from an adit associated with the Historical Shale Oil Mine Complex in Slate Gully (**Figure 3**). The emerging bats were identified as the Eastern Bentwing-bat, listed as threatened in NSW. A further survey of this site was undertaken during the present survey with a harp trap set up at the entrance of the historical mine adit on 27 February 2014.

During this survey, a total of 145 individual Eastern Bentwing-bats were recorded emerging from the adit in the early evening. Many of these were only counted as they emerged but 70 bats were captured and examined over four occasions. The results of the examination are given in Table 8.

Table 8: Results from Harp Trap Survey at the Historical Mine Adit

Species	Number	Method of Record	Site	Comments
Eastern Bentwing-bat	30	Examined	Adit	Male bats
Eastern Bentwing-bat	75	Sight	Adit	Bats flying past harp trap in 15 mins
Eastern Bentwing-bat	3	Examined	Adit	Two adults, one sub-adult male
Eastern Bentwing-bat	18	Examined	Adit	Adult females (post lactational or very late lactation)
Eastern Bentwing-bat	19	Examined	Adit	Sub-adult females (juveniles from maternity roost)

Based on the results of the surveys (i.e. the number of bats using the adit), the historical mine adit is potentially used as a maternity roost for Eastern Bentwing-bats.

5 CONCLUSION

A total of 108 bird, 19 native and eight introduced mammal, 12 reptile and four amphibian species were located during the surveys. A total of 10 threatened species listed under the NSW *Threatened Species Conservation Act, 1995* were located within the Survey Areas. These were:

- Black-chinned Honeyeater (eastern subspecies) (*Melithreptus gularis gularis*);
- Brown Treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*)
- Diamond Firetail (*Stagonopleura guttata*);
- Glossy Black-cockatoo (*Calyptorhynchus lathami*);
- Hooded Robin (south-eastern form) (*Melanodryas cucullata cucullata*);
- Little Lorikeet (*Glossopsitta pusilla*);
- Speckled Warbler (*Chthonicola sagittata*);
- Squirrel Glider (*Petaurus norfolcensis*);
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*); and
- Corben's/South-eastern Long-eared Bat (*Nyctophilus corbeni*).

The Corben's/South-eastern Long-eared Bat is also listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999*.

All threatened fauna species were recorded within woodland habitats, with exception of the Eastern Bentwing-bat. An adit associated with the Historical Shale Oil Mine Complex in Slate Gully (historical mine adit) was investigated and found to contain numbers of Eastern Bentwing-bats. Some of the bats emerging from the adit were lactating or young, indicating that the adit is a potential maternity roost site.

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ATTACHMENT A

THREATENED FAUNA DATABASE RECORDS

Table A1: Threatened Fauna Species Database Records

Scientific Name	Common Name	Conservation Status[1]		Previous Records				Database Records				
		TSC Act	EPBC Act	MKES (2005)[2]	Greg Richards and Associates (2005)[3]	Lesryk (2013)[4]	BMS (2013)[5]	Australian Museum (2014)[6]	BirdLife Australia (2014)[7]	DotE (2015)[8]	OEH (2015)[9]	ALA (2015)[10]
Fish												
Maccullochella peelii	Murray Cod	-	V	-	-	-	-	-	-	•	-	-
Amphibians												
Mixophyes iteratus	Giant Barred Frog	E	E	-	-	-	-	-	-	-	•	-
Litoria booroolongensis	Booroolong Frog	E	E	-	-	-	-	-	-	•	-	-
Reptiles												
Aprasia parapulchella	Pink-tailed Worm-lizard	V	V	-	-	-	-	-	-	•	•	-
Hoplocephalus bungaroides	Broad-headed Snake	E	V	-	-	-	-	-	-	•	-	-
Birds												
Leipoa ocellata	Malleefowl	E	V	-	-	-	-	-	-	•	•	-
Botaurus poiciloptilus	Australasian Bittern	E	E	-	-	-	-	-	-	•	-	-
Lophoictinia isura	Square-tailed Kite	V	-	•	-	-	-	-	•	-	•	▪
Hieraaetus morphnoides	Little Eagle	V	-	•	-	•	•	-	•	-	•	▪
Rostratula australis	Australian Painted Snipe	E	E & M	-	-	-	-	-	-	•	-	-
Calyptorhynchus lathami	Glossy Black-cockatoo	V	E	•	-	•	-	-	•	-	•	▪
Callocephalon fimbriatum	Gang-gang Cockatoo	V	-	•	-	-	-	-	•	-	•	▪
Glossopsitta pusilla	Little Lorikeet	V	-	•	-	•	-	•	•	-	•	▪
Neophema pulchella	Turquoise Parrot	V	-	•	-	-	-	-	•	-	•	▪
Lathamus discolor	Swift Parrot	E	E	-	-	-	-	-	•	•	•	-
Polytelis swainsonii	Superb Parrot	V	V	-	-	-	-	-	-	•	-	-

Table A1: Threatened Fauna Species Database Records (Continued)

Scientific Name	Common Name	Conservation Status[1]		Previous Records				Database Records				
		TSC Act	EPBC Act	MKES (2005)[2]	Greg Richards and Associates (2005)[3]	Lesryk (2013)[4]	BMS (2013)[5]	Australian Museum (2014)[6]	BirdLife Australia (2014)[7]	DotE (2015)[8]	OEH (2015)[9]	ALA (2015)[10]
Birds (Continued)												
Ninox connivens	Barking Owl	V	-	-	-	-	-	-	•	-	•	-
Tyto novaehollandiae	Masked Owl	V	V	•	-	•	-	-	-	-	•	•
Ninox strenua	Powerful Owl	V	-	-	-	-	-	-	•	-	•	
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)*	V	-	•	-	•	•	-	-	-	•	•
Chthonicola sagittata	Speckled Warbler	V	-	•	-	•	•	•	•	-	•	•
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V	-	•	-	•	-	-	-	-	•	•
Anthochaera phrygia	Regent Honeyeater+	CE	CE	-	-	-	-	-	•	•	•	•
Grantiella picta	Painted Honeyeater	V	V	•	-	-	-	-	•	-	•	•
Certhionyx variegatus	Pied Honeyeater	V	-	-	-	-	-	-	-	-	•	•
Epthianura albifrons	White-fronted Chat	V	-	-	-	-	-	-	•	-	•	•
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	V	-	•	-	-	-	-	-	-	•	•
Petroica rodinogaster	Pink Robin	V	-	-	-	-	-	-	-	-	•	•
Petroica boodang	Scarlet Robin	V	-	-	-	•	-	-	•	-	•	•
Petroica phoenicea	Flame Robin	V	-	-	-	-	-	-	•	-	-	•
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V	-	-	-	•	•	-	-	-	•	•
Daphoenositta chrysoptera	Varied Sittella	V	-	-	-	-	•	•	•	-	•	•

Table A1: Threatened Fauna Species Database Records (Continued)

Scientific Name	Common Name	Conservation Status[1]		Previous Records				Database Records				
		TSC Act	EPBC Act	MKES (2005)[2]	Greg Richards and Associates (2005)[3]	Lesryk (2013)[4]	BMS (2013)[5]	Australian Museum (2014)[6]	BirdLife Australia (2014)[7]	DotE (2015)[8]	OEH (2015)[9]	ALA (2015)[10]
Birds (Continued)												
Stagonopleura guttata	Diamond Firetail	V	-	•	-	•	•	-	•	-	•	•
Ardea modesta	Eastern Great Egret	-	M	-	-	-	-	-	•	•	-	•
Circus assimilis	Spotted Harrier	V	-	-	-	-	-	-	•	-	•	-
Falco hypoleucos	Grey Falcon	E	-	-	-	-	-	-	•	-	-	-
Falco subniger	Black Falcon	V	-	-	-	-	-	-	•	-	•	•
Hirundapus caudacutus	White-throated Needletail	-	M	-	-	-	-	-	•	•	•	•
Gallinago hardwickii	Latham's Snipe	-	M	-	-	-	-	-	•	•	-	-
Merops ornatus	Rainbow Bee-eater	-	M	-	-	•	-	-	•	•	•	•
Myiagra cyanoleuca	Satin Flycatcher	-	M	-	-	-	-	-	•	•	-	•
Rhipidura rufifrons	Rufous Fantail	-	M	-	-	-	-	-	•	•	-	•
Apus pacificus	Fork-tailed Swift	-	M	-	-	-	-	-	-	•	•	•
Haliaeetus leucogaster	White-bellied Sea-Eagle	-	M	-	-	-	-	-	-	•	-	-
Ardea ibis	Cattle Egret	-	M	-	-	-	-	-	-	•	-	-
Actitis hypoleucos	Common Sandpiper	-	M	-	-	-	-	-	-	-	•	-
Hydroprogne caspia	Caspian Tern	-	M	-	-	-	-	-	-	-	•	-
Mammals												
Dasyurus maculatus	Spotted-tailed Quoll	V	E	-	-	-	-	-	-	•	•	-
Phascolarctos cinereus	Koala	V	V	-	-	-	-	-	-	•	•	•
Petaurus norfolcensis	Squirrel Glider	V	-	•	-	-	-	-	-	-	•	•

Table A1: Threatened Fauna Species Database Records (Continued)

Scientific Name	Common Name	Conservation Status[1]		Previous Records				Database Records				
		TSC Act	EPBC Act	MKES (2005)[2]	Greg Richards and Associates (2005)[3]	Lesryk (2013)[4]	BMS (2013)[5]	Australian Museum (2014)[6]	BirdLife Australia (2014)[7]	DotE (2015)[8]	OEH (2015)[9]	ALA (2015)[10]
Mammals (Continued)												
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V	-	-	-	-	-	-	•	•	•
Pteropus poliocephalus	Grey-headed Flying Fox	V	V	-	-	-	-	-	-	•	-	-
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-	-	•	-	-	-	-	-	-	-
Mormopterus norfolkensis	Eastern Freetail-bat	V	-	-	•	-	-	-	-	-	-	•
Miniopterus australis	Little Bentwing-bat	V	-	-	•	-	-	-	-	-	-	-
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	-	-	•	•	•	-	-	-	•	•
Nyctophilus corbeni	Corben's/South-eastern Long-eared Bat	V	V	-	-	-	-	-	-	•	•	•
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	-	•	•	•	-	-	•	•	•
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	-	•	-	•	-	-	-	•	•
Vespadelus troughtoni	Eastern Cave Bat	V	-	-	-	•	•	-	-	-	•	-
Pseudomys novaehollandiae	New Holland Mouse	-	V	-	-	-	-	-	-	•	-	-

Note: V (Vulnerable), E (Endangered), CE (Critically Endangered), M (Migratory Species) (current at November 2015)

1 Threatened fauna species status under the NSW *Threatened Species Conservation Act, 1995* and Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (current at May 2014).

2 Mount King Ecological Surveys (2005) *Wilpinjong Coal Project Terrestrial Fauna Assessment.* Appendix HB of Wilpinjong Coal Pty Limited (2005) *Wilpinjong Coal Project Environmental Impact Statement.*

3 Greg Richards and Associates Pty Ltd (2005) *Wilpinjong Coal Project Bat Fauna Assessment.* Appendix HC of Wilpinjong Coal Pty Limited (2005) *Wilpinjong Coal Project Environmental Impact Statement.*

4 Lesryk Environmental Consultants (2013) *Biodiversity Audit – Slate Gully, Ulan NSW.*

5 Biodiversity Monitoring Services (2013) *Wilpinjong Coal Mine Modification – Terrestrial Fauna Assessment.*

6 Australian Museum (2014) *Database records for the following area: -32.21, 149.71; -32.20, 150.03; -32.47, 150.04; -32.48, 149.72.* Data received: 2 May 2014.

7 BirdLife Australia (2014) *Database records for the following area: -32.21, 149.71; -32.20, 150.03; -32.47, 150.04; -32.48, 149.72.* Data received: 15 April 2014.

[8] Department of the Environment (2015) *Protected Matters Search for the following area: -32.21, 149.71; -32.20, 150.03; -32.47, 150.04; -32.48, 149.72.* Data received: July 2015.

[9] Office of Environment and Heritage (2015) *Bionet Database records for the following area: -32.21, 149.71; -32.20, 150.03; -32.47, 150.04; -32.48, 149.72.* Data received: May 2015.

[10] Atlas of Living Australia (2015) *Database records from area of 10km surrounding Wilpinjong locality*

* Recorded by Ecovision Consulting (2006) *Ecological Impact Assessment Stage 2 of the Moolarben Coal Project, Ulan, New South Wales.* Prepared for Moolarben Coal Mines Pty Limited.

+ Reported by the Department of Environment and Climate Change (2005) in Mount King Ecological Surveys (2005).

ATTACHMENT B

FAUNA SPECIES RECORDED WITHIN THE PROJECT SURVEY AREAS

Scientific Name	Common Name	Status[1]	
		NSW	EPBC
A. REPTILES			
Cheluidae			
Chelodina longicollis	Eastern Snake-necked Turtle	P	
Agamidae			
Amphibolurus nobbi	Nobbi	P	
Pogona barbata	Eastern Bearded Dragon	P	
Gekkonidae			
Underwoodisaurus milii	Thick-tailed Gecko	P	
Varanidae			
Varanus gouldii	Gould's Goanna	P	
Varanus varius	Lace Monitor	P	
Scincidae			
Anomalopus leuckartii	Two-claw Worm-skink	P	
Carlia tetradactyla	Southern Rainbow Skink	P	
Ctenotus robustus	Robust Ctenotus	P	
Lampropholis delicata	Dark-flecked Garden Sunskink	P	
Lampropholis guichenoti	Garden Skink	P	
Morethia boulengeri	South-eastern Morethia Skink	P	
B. AMPHIBIANS			
Hylidae			
Litoria latopalmata	Broad-palmed Frog	P	
Myobatrachidae			
Limnodynastes dumerilii	Eastern Banjo Frog	P	
Limnodynastes tasmaniensis	Spotted Marsh Frog	P	
Neobatrachus sudelli	Common Spadefoot Toad	P	
C. MAMMALS			
Tachyglossidae			
Tachyglossus aculeatus	Short-beaked Echidna	P	
Dasyuridae			
Antechinus flavipes	Yellow-footed Antechinus	P	
Petauridae			
Petaurus breviceps	Sugar Glider	P	
Petaurus norfolcensis	Squirrel Glider	V	
Phalangeridae			
Trichosurus vulpecula	Common Brushtail Possum	P	
Pseudocheiridae			
Pseudocheirus peregrinus	Common Ringtail Possum	P	
Vombatidae			
Vombatus ursinus	Bare-nosed Wombat	P	
Macropodidae			
Macropus giganteus	Eastern Grey Kangaroo	P	
Macropus robustus	Common Wallaroo	P	
Macropus rufogriseus	Red-necked Wallaby	P	
Wallabia bicolor	Swamp Wallaby	P	
Vespertilionidae			
Chalinolobus gouldii	Gould's Wattled Bat	P	
Chalinolobus morio	Chocolate Wattled Bat	P	
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	
Nyctophilus geoffroyi	Lesser Long-eared Bat	P	
Nyctophilus gouldi	Gould's Long-eared Bat	P	
Nyctophilus corbeni	Corben's/South-eastern Long-eared Bat	V	V
Tadarida australis	White-striped Mastiff Bat	P	
Vespadelus vulturnus	Little Forest Bat	P	

Scientific Name	Common Name	Status[1]	
		NSW	EPBC
Canidae			
Vulpes vulpes	Red Fox	U	
Artiodactyla			
Ovis aries	Sheep	U	
Bovidae			
Bos taurus	European cattle	U	
Capra hircus	Goat	U	
Suidae			
Sus scrofa	Feral Pig	U	
Leporidae			
Lepus capensis	Brown Hare	U	
Oryctolagus cuniculus	Rabbit	U	
Cervidae			
Dama dama	Fallow Deer	U	
D. BIRDS			
Dromaiidae			
Dromaius novaehollandiae	Emu	P	
Anatidae			
Anas gracilis	Grey Teal	P	
Anas superciliosa	Pacific Black Duck	P	
Chenonetta jubata	Australian Wood Duck	P	
Podicipedidae			
Tachybaptus novaehollandiae	Australasian Grebe	P	
Phalacrocoracidae			
Phalacrocorax carbo	Great Cormorant	P	
Ardeidae			
Egretta novaehollandiae	White-faced Heron	P	
Egretta pacifica	White-necked Heron	P	
Threskiornithidae			
Threskiornis spinicollis	Straw-necked Ibis	P	
Accipitridae			
Aquila audax	Wedge-tailed Eagle	P	
Elanus axillaris	Black-shouldered Kite	P	
Haliastur sphenurus	Whistling Kite	P	
Falconidae			
Falco berigora	Brown Falcon	P	
Falco cenchroides	Nankeen Kestrel	P	
Falco peregrinus	Peregrine Falcon	P	
Charadriidae			
Elseyornis melanops	Black-fronted Dotterel	P	
Vanellus miles	Masked Lapwing	P	
Columbidae			
Geopelia placida	Peaceful Dove	P	
Ocyphaps lophotes	Crested Pigeon	P	
Phaps chalcoptera	Common Bronzewing	P	
Cacatuidae			
Cacatua galerita	Sulphur-crested Cockatoo	P	
Calyptorhynchus funereus	Yellow-tailed Black-Cockatoo	P	
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	
Eolophus roseicapillus	Galah	P	
Psittacidae			
Alisterus scapularis	Australian King-Parrot	P	
Glossopsitta concinna	Musk Lorikeet	P	

Scientific Name	Common Name	Status[1]	
		NSW	EPBC
Glossopsitta pusilla	Little Lorikeet	V	
Platycercus adscitus eximius	Eastern Rosella	P	
Platycercus elegans	Crimson Rosella	P	
Psephotus haematonotus	Red-rumped Parrot	P	
Aprosmictus erythropterus	Red-winged Parrot	P	
Cuculidae			
Chalcites basalis	Horsfield's Bronze-Cuckoo	P	
Strigidae			
Ninox novaeseelandiae	Southern Boobook	P	
Podargidae			
Podargus strigoides	Tawny Frogmouth	P	
Caprimulgidae			
Eurostopodus mystacalis	White-throated Nightjar	P	
Halcyonidae			
Dacelo novaeguineae	Laughing Kookaburra	P	
Todiramphus sanctus	Sacred Kingfisher	P	
Meropidae			
Merops ornatus	Rainbow Bee-eater	P	M
Coraciidae			
Eurystomus orientalis	Dollarbird	P	
Menuridae			
Menura novaehollandiae	Superb Lyrebird	P	
Climacteridae			
Climacteris picumnus	Brown Treecreeper (eastern sub-species)	V	
Cormobates leucophaeus	White-throated Treecreeper	P	
Maluridae			
Malurus cyaneus	Superb Fairy-wren	P	
Malurus lamberti	Variegated Fairy-wren	P	
Pardalotidae			
Pardalotus punctatus	Spotted Pardalote	P	
Pardalotus striatus	Striated Pardalote	P	
Acanthizidae			
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	P	
Acanthiza lineata	Striated Thornbill	P	
Acanthiza nana	Yellow Thornbill	P	
Acanthiza pusilla	Brown Thornbill	P	
Acanthiza reguloides	Buff-rumped Thornbill	P	
Aphelocephala leucopsis	Southern Whiteface	P	
Gerygone olivacea	White-throated Gerygone	P	
Origma solitaria	Rockwarbler	P	
Pyrrholaemus sagittatus	Speckled Warbler	V	
Sericornis frontalis	White-browed Scrubwren	P	
Smicrornis brevirostris	Weebill	P	
Meliphagidae			
Acanthagenys rufogularis	Spiny-cheeked Honeyeater	P	
Acanthorhynchus tenuirostris	Eastern Spinebill	P	
Anthochaera carunculata	Red Wattlebird	P	
Entomyzon cyanotis	Blue-faced Honeyeater	P	
Lichenostomus chrysops	Yellow-faced Honeyeater	P	
Lichenostomus leucotis	White-eared Honeyeater	P	
Lichenostomus melanops	Yellow-tufted Honeyeater	P	
Lichenostomus penicillatus	White-plumed Honeyeater	P	
Manorina melanocephala	Noisy Miner	P	

Scientific Name	Common Name	Status[1]	
		NSW	EPBC
Manorina melanophrys	Bell Miner	P	
Melithreptus brevirostris	Brown-headed Honeyeater	P	
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subsp.)	V	
Melithreptus lunatus	White-naped Honeyeater	P	
Myzomela sanguinolenta	Scarlet Honeyeater	P	
Philemon corniculatus	Noisy Friarbird	P	
Plectorhyncha lanceolata	Striped Honeyeater	P	
Petroicidae			
Eopsaltria australis	Eastern Yellow Robin	P	
Melanodryas cucullata	Hooded Robin (south-eastern form)	V	
Microeca fascinans	Jacky Winter	P	
Petroica goodenovii	Red-capped Robin	P	
Pomatostomidae			
Pomatostomus superciliosus	White-browed Babbler	P	
Pachycephalidae			
Colluricincla harmonica	Grey Shrike-thrush	P	
Falcunculus frontatus	Eastern Shrike-tit	P	
Pachycephala pectoralis	Golden Whistler	P	
Pachycephala rufiventris	Rufous Whistler	P	
Dicruridae			
Grallina cyanoleuca	Magpie-lark	P	
Myiagra inquieta	Restless Flycatcher	P	
Myiagra rubecula	Leaden Flycatcher	P	
Rhipidura albiscapa	Grey Fantail	P	
Rhipidura leucophrys	Willie Wagtail	P	
Artamidae			
Artamus cyanopterus	Dusky Woodswallow	P	
Cracticus nigrogularis	Pied Butcherbird	P	
Cracticus torquatus	Grey Butcherbird	P	
Gymnorhina tibicen	Australian Magpie	P	
Strepera graculina	Pied Currawong	P	
Campephagidae			
Coracina novaehollandiae	Black-faced Cuckoo-shrike	P	
Oriolidae			
Oriolus sagittatus	Olive-backed Oriole	P	
Corvidae			
Corvus coronoides	Australian Raven	P	
Corcoracidae			
Corcorax melanorhamphos	White-winged Chough	P	
Ptilonorhynchidae			
Ptilonorhynchus violaceus	Satin Bowerbird	P	
Sturnidae			
Sturnus vulgaris	Common Starling	U	
Hirundinae			
Hirundo neoxena	Welcome Swallow	P	
Petrochelidon ariel	Fairy Martin	P	
Petrochelidon nigricans	Tree Martin	P	
Zosteropidae			
Zosterops lateralis	Silvereye	P	
Sylviidae			
Cisticola exilis	Golden-headed Cisticola	P	
Dicaeidae			
Dicaeum hirundinaceum	Mistletoebird	P	

Scientific Name	Common Name	Status[1]	
		NSW	EPBC
Motacillidae			
Anthus australis	Australasian Pipit	P	
Estrilidae			
Neochmia temporalis	Red-browed Finch	P	
Stagonopleura guttata	Diamond Firetail	V	
Taeniopygia bichenovii	Double-barred Finch	P	

[1] Threatened fauna species status under the NSW *Threatened Species Conservation Act, 1995* and Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (current at May 2014). Threatened Species highlighted in green.

Code: NSW Status P – Protected, V – Vulnerable, U – Introduced
EPBC Status M – Migratory, V - Vulnerable

ATTACHMENT C

RESULTS FROM OBSERVATIONAL SURVEYS AT OB12 AND OB13

Scientific Name	Common Name	Status	OB12	OB13
A. BIRDS				
Accipitridae				
Aquila audax	Wedge-tailed Eagle	P	X	
Falconidae				
Falco cenchroides	Nankeen Kestrel	P	X	X
Cacatuidae				
Cacatua galerita	Sulphur-crested Cockatoo	P	X	
Eolophus roseicapillus	Galah	P	X	X
Psittacidae				
Glossopsitta concinna	Musk Lorikeet	P	X	X
Platycercus adscitus eximius	Eastern Rosella	P		X
Halcyonidae				
Dacelo novaeguineae	Laughing Kookaburra	P	X	X
Climacteridae				
Cormobates leucophaeus	White-throated Treecreeper	P	X	
Maluridae				
Malurus cyaneus	Superb Fairy-wren	P	X	X
Pardalotidae				
Pardalotus punctatus	Spotted Pardalote	P	X	X
Pardalotus striatus	Striated Pardalote	P	X	X
Acanthizidae				
Acanthiza nana	Yellow Thornbill	P	X	
Acanthiza pusilla	Brown Thornbill	P	X	X
Pyrrholaemus sagittatus	Speckled Warbler	V	X	
Meliphagidae				
Lichenostomus leucotis	White-eared Honeyeater	P	X	
Lichenostomus melanops	Yellow-tufted Honeyeater	P	X	
Lichenostomus penicillatus	White-plumed Honeyeater	P	X	
Manorina melanocephala	Noisy Miner	P	X	X
Melithreptus brevirostris	Brown-headed Honeyeater	P	X	
Myzomela sanguinolenta	Scarlet Honeyeater	P	X	
Philemon corniculatus	Noisy Friarbird	P	X	
Petroicidae				
Eopsaltria australis	Eastern Yellow Robin	P	X	
Pachycephalidae				
Colluricincla harmonica	Grey Shrike-thrush	P	X	
Pachycephala rufiventris	Rufous Whistler	P	X	
Dicruridae				
Grallina cyanoleuca	Magpie-lark	P		X
Rhipidura leucophrys	Willie Wagtail	P		X
Artamidae				
Cracticus nigrogularis	Pied Butcherbird	P	X	X
Gymnorhina tibicen	Australian Magpie	P	X	X
Strepera graculina	Pied Currawong	P	X	X
Corvidae				
Corvus coronoides	Australian Raven	P	X	

Scientific Name	Common Name	Status	OB12	OB13
Hirundinae				
Petrochelidon ariel	Fairy Martin	P	X	X
Dicaeidae				
Dicaeum hirundinaceum	Mistletoebird	P	X	
Estrilidae				
Taeniopygia bichenovii	Double-barred Finch	P	X	
B. MAMMALS				
Pseudocheiridae				
Pseudocheirus peregrinus	Common Ringtail Possum	P	X	
Vombatidae				
Vombatus ursinus	Bare-nosed Wombat	P	X	X
Macropodidae				
Macropus giganteus	Eastern Grey Kangaroo	P	X	X
Macropus robustus	Common Wallaroo	P	X	X
Macropus rufogriseus	Red-necked Wallaby	P	X	X
Leporidae				
Oryctolagus cuniculus	Rabbit	U	X	X
C. REPTILES				
Scincidae				
Morethia boulengeri	South-eastern Morethia Skink	P	X	X

Note: NSW Status P – Protected, V – Vulnerable, U – Introduced.
X - Recorded.

ATTACHMENT E
BIODIVERSITY CREDIT REPORT (DEVELOPMENT SITE)

Biodiversity credit report

This report identifies the number and type of biodiversity credits required for a major project.

Date of report: 4/11/2015 Time: 4:33:33PM Calculator version: v4.0

Major Project details

Proposal ID:	0011/2015/1804MP
Proposal name:	Wilpinjong Coal Extension Project
Proposal address:	Ulan-Wollar Road Wollar NSW
Proponent name:	Wilpinjong Coal
Proponent address:	Ulan-Wollar Road Wollar NSW
Proponent phone:	
Assessor name:	Colin Driscoll
Assessor address:	PO Box 1047 Toronto NSW 2783
Assessor phone:	02 4959 8016
Assessor accreditation:	0011

Summary of ecosystem credits required

Plant Community type	Area (ha)	Credits created
Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	4.00	170.00
Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	6.00	253.50
Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion	1.50	36.00
Grey Box grassy open forest of the Central and Lower Hunter Valley	3.00	74.00
Narrow-leaved Ironbark - Black Cypress Pine shrub - grass woodland upper Hunter and northern Wollemi	20.50	706.00
Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	42.50	2,216.00
Red Ironbark - Grey Gum - Black Pine heathy woodland on sandstone ranges of the Sydney Basin	39.50	2,129.00
Rough-barked Apple grassy tall woodlands of the Brigalow Belt South	126.00	5,155.00
Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	9.50	511.00
White Box - Black Cypress Pine shrubby woodland of the Western Slopes	98.00	3,947.00
Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion	3.50	116.43
Total	354.00	15,314

Credit profiles

1. Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion, (HU547)

Number of ecosystem credits created	36
IBRA sub-region	Kerrabee - Hunter/Central Rivers

Offset options - Plant Community types	Offset options - IBRA sub-regions
Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion, (HU547)	Kerrabee - Hunter/Central Rivers and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

2. Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion, (HU732)

Number of ecosystem credits created	116
IBRA sub-region	Kerrabee - Hunter/Central Rivers

Offset options - Plant Community types	Offset options - IBRA sub-regions
Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion, (HU732) Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion, (HU547) Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley, (HU690) Yellow Box grassy woodland on basalt soils of the upper Hunter, (HU909)	Kerrabee - Hunter/Central Rivers and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

3. Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter, (HU910)

Number of ecosystem credits created	170
IBRA sub-region	Kerrabee - Hunter/Central Rivers

Offset options - Plant Community types	Offset options - IBRA sub-regions
Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter, (HU910) Weeping Myall - Coobah - Scrub Wilga shrubland of the Hunter Valley, (HU652) White Box x Grey Box - red gum - Rough-barked Apple grassy woodland on rich soils on hills in the upper Hunter Valley, (HU730) Grey Gum - Forest Red Gum - Yellow Box grassy tall open forest on mid-slopes of the Hunter Valley - North Coast escarpment, (HU691) Narrow-leaved Ironbark +/- Grey Box grassy woodland of the upper Hunter Valley, mainly Sydney Basin Bioregion, (HU701) Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter, (HU817) Narrow-leaved Ironbark - Grey Box - Spotted Gum shrub - grass woodland of the central and lower Hunter, (HU818) Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter, (HU905) Bull Oak grassy woodland of the central Hunter Valley, (HU906)	Kerrabee - Hunter/Central Rivers and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

4. Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion, (HU681)

Number of ecosystem credits created	254
IBRA sub-region	Kerrabee - Hunter/Central Rivers

Offset options - Plant Community types	Offset options - IBRA sub-regions
Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion, (HU681) Ribbon Gum - Rough-barked Apple - Yellow Box grassy woodland of the New England Tableland Bioregion and NSW North Coast Bioregion, (HU709)	Kerrabee - Hunter/Central Rivers and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

5. Rough-barked Apple grassy tall woodlands of the Brigalow Belt South, (HU981)

Number of ecosystem credits created	5,155
IBRA sub-region	Kerrabee - Hunter/Central Rivers

Offset options - Plant Community types	Offset options - IBRA sub-regions
Rough-barked Apple grassy tall woodlands of the Brigalow Belt South, (HU981) Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion, (HU547) Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion, (HU714) Apple Box - Rough-barked Apple terrace flats woodland of the southern Brigalow Belt South Bioregion, (HU675) Derived Kurrajong grassy open woodland / isolated trees in the Brigalow Belt South Bioregion and Nandewar Bioregion, (HU683) Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion, (HU732) Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley, (HU690) White Box - White Cypress Pine - Native Olive woodland of upper Hunter and northern Wollemi, (HU823) White Box - Grass Tree - Spinifex woodland of the Upper Hunter, (HU901) Yellow Box - Rough-barked Apple grassy woodland of the upper Hunter and Liverpool Plains, (HU907) Yellow Box grassy woodland on basalt soils of the upper Hunter, (HU909)	Kerrabee - Hunter/Central Rivers and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

6. Narrow-leaved Ironbark - Black Cypress Pine shrub - grass woodland upper Hunter and northern Wollemi, (HU825)

Number of ecosystem credits created	706
IBRA sub-region	Kerrabee - Hunter/Central Rivers

Offset options - Plant Community types	Offset options - IBRA sub-regions
Narrow-leaved Ironbark - Black Cypress Pine shrub - grass woodland upper Hunter and northern Wollemi, (HU825) White Box - Silvertop Stringybark +/- White Cypress Pine grass shrub open forest of the southern Nandewar Bioregion and New England Tableland Bioregion, (HU729) Forest Ribbon Gum sedge - grass woodland of western Barrington Tops, (HU774) White Box - Sticky Daisy Bush - Bead Bush shrubby woodland with semi - evergreen vine thicket elements of the Central Hunter Valley, (HU800) White Box - Blackthorn shrubby woodland on sandstone ranges of the Sydney Basin, (HU801) Narrow-leaved Ironbark - Native Olive shrubby open forest of the central and upper Hunter, (HU819) Blakely's Red Gum - Narrow-leaved Ironbark - Rough-barked Apple shrubby woodland of the upper Hunter, (HU821) Narrow-leaved Ironbark - Grey Gum - Native Olive woodland of Central Hunter, (HU826) White Box - Red Box shrubby woodland on sandstone ranges of the Sydney Basin, (HU827)	Kerrabee - Hunter/Central Rivers and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

7. Grey Box grassy open forest of the Central and Lower Hunter Valley, (HU962)

Number of ecosystem credits created	74
IBRA sub-region	Kerrabee - Hunter/Central Rivers

Offset options - Plant Community types	Offset options - IBRA sub-regions
Grey Box grassy open forest of the Central and Lower Hunter Valley, (HU962) Melaleuca decora low forest of the central Hunter Valley, Sydney Basin Bioregion, (HU564) Slaty Red Gum grassy woodland on hinterland foothills of the southern North Coast, (HU619) Grey Ironbark - Broad-leaved Mahogany - Forest Red Gum shrubby open forest on Coastal Lowlands of the Central Coast, (HU802) Spotted Gum - Broad-leaved Mahogany - Grey Gum grass - shrub open forest on Coastal Lowlands of the Central Coast, (HU803) Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest, (HU804) Grey Gum - Rough-barked Apple shrubby open forest of the lower Hunter, (HU805) Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter, (HU806) Red Ironbark - Spotted Gum - Prickly-leaved Paperbark shrubby open forest of the Lower Hunter, (HU807) Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter, (HU814) Spotted Gum - Narrow-leaved Ironbark-Red Ironbark shrub - grass open forest of the central and lower Hunter, (HU815) Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the central and lower Hunter, (HU816) Grey Box - Grey Gum - Rough-barked Apple - Blakely's Red Gum grassy open forest of the central Hunter, (HU822) Smooth-barked Apple - Broad-leaved Mahogany - Red Bloodwood heathy low open forest on hills at Nelson Bay, (HU840)	Kerrabee - Hunter/Central Rivers and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

8. Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion, (HU618)

Number of ecosystem credits created	511
IBRA sub-region	Kerrabee - Hunter/Central Rivers

Offset options - Plant Community types	Offset options - IBRA sub-regions
Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion, (HU618) Dapper Mugga Ironbark - Western Grey Box - Blakely's Red Gum - Black Cypress Pine grass shrub hill woodland (southern Brigalow Belt South Bioregion), (HU698) Red Ironbark - Black Cypress Pine - stringybark +/- Narrow-leaved Wattle shrubby open forest on sandstone in the Gulgong - Mendooran region, southern Brigalow Belt South Bioregion, (HU707) Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bio, (HU702) Narrow-leaved Ironbark - box - Mock Olive shrubby open forest mainly on basalt slopes over sandstone in the upper Hunter Valley, Brigalow Belt South Bioregion and Sydney Basin Bioregion, (HU700) White Box - Black Cypress Pine shrubby woodland of the Western Slopes, (HU824) Narrow-leaved Ironbark - Grey Gum shrubby open forest on sandstone ranges of the upper Hunter Valley, (HU868) Grey Box - Slaty Box shrub - grass woodland on sandstone slopes of the upper Hunter and Sydney Basin, (HU869) Narrow-leaved Ironbark - Black Pine - Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin, (HU875) Narrow-leaved Stringybark - Ironbark heathy open forest on sandstone ranges of the upper Hunter, (HU882) Broom Bush - Allocasuarina gymnanthera heathy woodland on sandstone outcrops of the Sydney Basin, (HU923)	Kerrabee - Hunter/Central Rivers and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

9. White Box - Black Cypress Pine shrubby woodland of the Western Slopes, (HU824)

Number of ecosystem credits created	3,947
IBRA sub-region	Kerrabee - Hunter/Central Rivers

Offset options - Plant Community types	Offset options - IBRA sub-regions
White Box - Black Cypress Pine shrubby woodland of the Western Slopes, (HU824) Narrow-leaved Stringybark - Ironbark heathy open forest on sandstone ranges of the upper Hunter, (HU882) Broom Bush - Allocasuarina gymnanthera heathy woodland on sandstone outcrops of the Sydney Basin, (HU923)	Kerrabee - Hunter/Central Rivers and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

10. Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin, (HU843)

Number of ecosystem credits created	2,216
IBRA sub-region	Kerrabee - Hunter/Central Rivers

Offset options - Plant Community types	Offset options - IBRA sub-regions

Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin, (HU843) Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion, (HU618) Dapper Mugga Ironbark - Western Grey Box - Blakely's Red Gum - Black Cypress Pine grass shrub hill woodland (southern Brigalow Belt South Bioregion), (HU698) Blue-leaved Ironbark - Black Cypress Pine shrubby sandstone open forest in the southern Brigalow Belt South Bioregion (including Goonoo), (HU682) Narrow-leaved Wattle low open forest / very tall shrubland on ridges in northern NSW South Western Slopes Bioregion and southern Brigalow Belt South Bioregion, (HU704) Red Ironbark - Black Cypress Pine - stringybark +/- Narrow-leaved Wattle shrubby open forest on sandstone in the Gulgong - Mendooran region, southern Brigalow Belt South Bioregion, (HU707) Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bio, (HU702) Black Cypress Pine - ironbark +/- Narrow-leaved Wattle low open forest mainly on Narrabeen Sandstone in the Upper Hunter region of the Sydney Basin Bioregion, (HU678) Mugga Ironbark - Black Cypress Pine shrub/grass open forest of the upper Hunter Valley, mainly Sydney Basin Bioregion, (HU697) Narrow-leaved Ironbark - box - Mock Olive shrubby open forest mainly on basalt slopes over sandstone in the upper Hunter Valley, Brigalow Belt South Bioregion and Sydney Basin Bioregion, (HU700) White Box - Black Cypress Pine shrubby woodland of the Western Slopes, (HU824) Narrow-leaved Ironbark - Grey Gum shrubby open forest on sandstone ranges of the upper Hunter Valley, (HU868) Grey Box - Slaty Box shrub - grass woodland on sandstone slopes of the upper Hunter and Sydney Basin, (HU869) Narrow-leaved Ironbark - Black Pine - Narrow-leaved Wattle shrub - grass open forest on sandstone slopes of the upper Hunter and Sydney Basin, (HU870) Bulga Wattle low closed forest on sandstone slopes of the central Hunter, (HU871) Narrow-leaved Ironbark heathy woodland on sandstone ranges of the Sydney Basin and Brigalow Belt South, (HU874) Narrow-leaved Ironbark - Black Pine - Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin, (HU875) Tumbledown Red Gum - Spinifex grass heathy low open woodland on sandstone slopes of the Sydney Basin, (HU877) Narrow-leaved Stringybark - Ironbark heathy open forest on sandstone ranges of the upper Hunter, (HU882) Red Ironbark - Grey Gum - Narrow-leaved Stringybark - Brown Bloodwood shrubby open forest on sandstone ranges of the Sydney Basin, (HU883)	Kerrabee - Hunter/Central Rivers and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

Brown Bloodwood - Dwyer's Red Gum - Red Ironbark heathy woodland on sandstone ranges of the Sydney Basin, (HU885) Red Ironbark - Grey Gum - Black Pine heathy woodland on sandstone ranges of the Sydney Basin, (HU886) Red Ironbark - Brown Bloodwood - Black Pine heathy open forest on sandstone ranges of the Sydney Basin, (HU888) Grey Gum - Scribbly Gum - Black Pine heathy open forest on sandstone ranges of the Sydney Basin, (HU890) Caley's Ironbark - Red Ironbark - Currawang shrubby woodland on sandstone ranges of the Sydney Basin, (HU891) Brown Bloodwood - Currawang - Caley's Ironbark shrubby woodland on sandstone ranges of the Sydney Basin, (HU892) Dywer's Red Gum - Fringe Myrtle heathy open woodland on sandstone plateau of the upper Hunter and Sydney Basin, (HU893) Dywer's Red Gum - Micromyrtus sessilis heathy open woodland on sandstone plateau of the upper Hunter and Sydney Basin, (HU894) Broom Bush - Allocasuarina gymnanthera heathy woodland on sandstone outcrops of the Sydney Basin, (HU923) Tantoon - Lepyrodia leptocaulis shrubland on sandstone drainage lines of the Sydney Basin, (HU925) Narrow-leaved Ironbark - Red Stringybark - Black Pine woodlands on sandstone substrates of the Brigalow Belt South, (HU984)	

11. Red Ironbark - Grey Gum - Black Pine heathy woodland on sandstone ranges of the Sydney Basin, (HU886)

Number of ecosystem credits created	2,129
IBRA sub-region	Kerrabee - Hunter/Central Rivers

Offset options - Plant Community types	Offset options - IBRA sub-regions

Red Ironbark - Grey Gum - Black Pine heathy woodland on sandstone ranges of the Sydney Basin, (HU886)

Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion, (HU618)

Dapper Mugga Ironbark - Western Grey Box - Blakely's Red Gum - Black Cypress Pine grass shrub hill woodland (southern Brigalow Belt South Bioregion), (HU698)

Blue-leaved Ironbark - Black Cypress Pine shrubby sandstone open forest in the southern Brigalow Belt South Bioregion (including Goonoo), (HU682)

Red Ironbark - Black Cypress Pine - stringybark +/- Narrow-leaved Wattle shrubby open forest on sandstone in the Gulgong - Mendooran region, southern Brigalow Belt South Bioregion, (HU707)

Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bio, (HU702)

Black Cypress Pine - ironbark +/- Narrow-leaved Wattle low open forest mainly on Narrabeen Sandstone in the Upper Hunter region of the Sydney Basin Bioregion, (HU678)

Mugga Ironbark - Black Cypress Pine shrub/grass open forest of the upper Hunter Valley, mainly Sydney Basin Bioregion, (HU697)

Narrow-leaved Ironbark - box - Mock Olive shrubby open forest mainly on basalt slopes over sandstone in the upper Hunter Valley, Brigalow Belt South Bioregion and Sydney Basin Bioregion, (HU700)

White Box - Black Cypress Pine shrubby woodland of the Western Slopes, (HU824)

Narrow-leaved Ironbark - Grey Gum shrubby open forest on sandstone ranges of the upper Hunter Valley, (HU868)

Grey Box - Slaty Box shrub - grass woodland on sandstone slopes of the upper Hunter and Sydney Basin, (HU869)

Narrow-leaved Ironbark - Black Pine - Narrow-leaved Wattle shrub - grass open forest on sandstone slopes of the upper Hunter and Sydney Basin, (HU870)

Narrow-leaved Ironbark heathy woodland on sandstone ranges of the Sydney Basin and Brigalow Belt South, (HU874)

Narrow-leaved Ironbark - Black Pine - Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin, (HU875)

Tumbledown Red Gum - Spinifex grass heathy low open woodland on sandstone slopes of the Sydney Basin, (HU877)

Narrow-leaved Stringybark - Ironbark heathy open forest on sandstone ranges of the upper Hunter, (HU882)

Red Ironbark - Grey Gum - Narrow-leaved Stringybark - Brown Bloodwood shrubby open forest on sandstone ranges of the Sydney Basin, (HU883)

Red Ironbark - Brown Bloodwood - Black Pine heathy open forest on sandstone ranges of the Sydney Basin, (HU888)

Grey Gum - Scribbly Gum - Black Pine heathy open forest on sandstone ranges of the Sydney Basin, (HU890)

Kerrabee - Hunter/Central Rivers

and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

Dywer's Red Gum - Micromyrtus sessilis heathy open woodland on sandstone plateau of the upper Hunter and Sydney Basin, (HU894) Broom Bush - Allocasuarina gymnanthera heathy woodland on sandstone outcrops of the Sydney Basin, (HU923) Narrow-leaved Ironbark - Red Stringybark - Black Pine woodlands on sandstone substrates of the Brigalow Belt South, (HU984)	

Summary of species credits required

Common name	Scientific name	Extent of impact Ha or individuals	Number of species credits created
Koala	Phascolarctos cinereus	165.00	4,290
Ozothamnus tesselatus	Ozothamnus tesselatus	589.00	23,560
Regent Honeyeater	Anthochaera phrygia	273.00	21,021

ATTACHMENT F
BIODIVERSITY CREDIT REPORTS (OFFSET AREAS)

BioBanking credit report

This report identifies the number and type of credits required at a BIOBANK SITE

Date of report: 18/11/2015 Time: 7:08:24PM Calculator version: v4.0

Biobank details

Proposal ID: 0011/2015/2227B

Proposal name: WCEP Offset 1

Proposal address: NSW

Proponent name: Wilpinjong Coal

Proponent address:

Proponent phone:

Assessor name: Colin Driscoll

Assessor address: PO Box 1047 Toronto NSW 2783

Assessor phone: 02 4959 8016

Assessor accreditation: 0011

Additional information required for approval:

- ☐ Use of local benchmark
- ☐ Expert report...
- ☐ Request for additional gain in site value

Ecosystem credits summary

Plant Community type	Area (ha)	Credits created
Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	60.00	508.00
Grey Gum - Scribbly Gum - Black Pine heathy open forest on sandstone ranges of the Sydney Basin	7.50	76.00
Mugga Ironbark - Black Cypress Pine shrub/grass open forest of the upper Hunter Valley, mainly Sydney Basin Bioregion	1.50	19.00
Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	49.00	527.00
Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	2.50	33.00
White Box - Blackthorn shrubby woodland on sandstone ranges of the Sydney Basin	78.50	803.00
Total	199.00	1,966

Credit profiles

1. Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter, (HU910)

Number of ecosystem credits created	508
IBRA sub-region	Kerrabee - Hunter/Central Rivers

2. White Box - Blackthorn shrubby woodland on sandstone ranges of the Sydney Basin, (HU801)

Number of ecosystem credits created	803
IBRA sub-region	Kerrabee - Hunter/Central Rivers

3. Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion, (HU618)

Number of ecosystem credits created	33
IBRA sub-region	Kerrabee - Hunter/Central Rivers

4. Mugga Ironbark - Black Cypress Pine shrub/grass open forest of the upper Hunter Valley, mainly Sydney Basin Bioregion, (HU697)

Number of ecosystem credits created	19
IBRA sub-region	Kerrabee - Hunter/Central Rivers

5. Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin, (HU843)

Number of ecosystem credits created	527
IBRA sub-region	Kerrabee - Hunter/Central Rivers

6. Grey Gum - Scribbly Gum - Black Pine heathy open forest on sandstone ranges of the Sydney Basin, (HU890)

Number of ecosystem credits created	76
IBRA sub-region	Kerrabee - Hunter/Central Rivers

Species credits summary

Common name	Scientific name	Extent of impact Ha or individuals	Number of species credits created
Koala	Phascolarctos cinereus	162.50	1,154
Regent Honeyeater	Anthochaera phrygia	164.00	1,164

Additional management actions

Additional management actions are required for:

Vegetation type or threatened species	Management action details
Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	Exclude commercial apiaries
Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	Exclude miscellaneous feral species
Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	Feral and/or over-abundant native herbivore control
Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	Fox control
Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	Slashing
Grey Gum - Scribbly Gum - Black Pine heathy open forest on sandstone ranges of the Sydney Basin	Exclude commercial apiaries
Grey Gum - Scribbly Gum - Black Pine heathy open forest on sandstone ranges of the Sydney Basin	Exclude miscellaneous feral species
Grey Gum - Scribbly Gum - Black Pine heathy open forest on sandstone ranges of the Sydney Basin	Feral and/or over-abundant native herbivore control
Grey Gum - Scribbly Gum - Black Pine heathy open forest on sandstone ranges of the Sydney Basin	Fox control
Grey Gum - Scribbly Gum - Black Pine heathy open forest on sandstone ranges of the Sydney Basin	Slashing
Koala	Exclude miscellaneous feral species
Koala	Slashing
Mugga Ironbark - Black Cypress Pine shrub/grass open forest of the upper Hunter Valley, mainly Sydney Basin Bioregion	Exclude commercial apiaries
Mugga Ironbark - Black Cypress Pine shrub/grass open forest of the upper Hunter Valley, mainly Sydney Basin Bioregion	Exclude miscellaneous feral species
Mugga Ironbark - Black Cypress Pine shrub/grass open forest of the upper Hunter Valley, mainly Sydney Basin Bioregion	Feral and/or over-abundant native herbivore control
Mugga Ironbark - Black Cypress Pine shrub/grass open forest of the upper Hunter Valley, mainly Sydney Basin Bioregion	Fox control

Mugga Ironbark - Black Cypress Pine shrub/grass open forest of the upper Hunter Valley, mainly Sydney Basin Bioregion	Slashing
Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	Exclude commercial apiaries
Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	Exclude miscellaneous feral species
Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	Feral and/or over-abundant native herbivore control
Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	Fox control
Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	Slashing
Regent Honeyeater	Exclude miscellaneous feral species
Regent Honeyeater	Feral and/or over-abundant native herbivore control
Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	Exclude commercial apiaries
Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	Exclude miscellaneous feral species
Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	Feral and/or over-abundant native herbivore control
Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	Fox control
Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	Slashing
White Box - Blackthorn shrubby woodland on sandstone ranges of the Sydney Basin	Exclude commercial apiaries
White Box - Blackthorn shrubby woodland on sandstone ranges of the Sydney Basin	Exclude miscellaneous feral species
White Box - Blackthorn shrubby woodland on sandstone ranges of the Sydney Basin	Feral and/or over-abundant native herbivore control
White Box - Blackthorn shrubby woodland on sandstone ranges of the Sydney Basin	Fox control
White Box - Blackthorn shrubby woodland on sandstone ranges of the Sydney Basin	Slashing

BioBanking credit report

This report identifies the number and type of credits required at a BIOBANK SITE

Date of report: 15/10/2015 Time: 7:39:42AM Calculator version: v4.0

Biobank details

Proposal ID: 0011/2015/2249B

Proposal name: WCEP Offset 2

Proposal address:

Proponent name: Wilpinjong Coal

Proponent address:

Proponent phone:

Assessor name: Colin Driscoll

Assessor address: PO Box 1047 Toronto NSW 2783

Assessor phone: 02 4959 8016

Assessor accreditation: 0011

Additional information required for approval:

- ☐ Use of local benchmark
- ☐ Expert report...
- ☐ Request for additional gain in site value

Ecosystem credits summary

Plant Community type	Area (ha)	Credits created
Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	127.50	1,360.00
Caley's Ironbark - Red Ironbark - Currawang shrubby woodland on sandstone ranges of the Sydney Basin	66.50	622.00
Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	5.50	57.00
Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	14.50	132.00
White Box - Blackthorn shrubby woodland on sandstone ranges of the Sydney Basin	173.50	1,914.00
Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion	29.00	319.00
Total	416.50	4,404

Credit profiles

1. Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion, (HU732)

Number of ecosystem credits created	319
IBRA sub-region	Kerrabee - Hunter/Central Rivers

2. Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter, (HU910)

Number of ecosystem credits created	1,360
IBRA sub-region	Kerrabee - Hunter/Central Rivers

3. White Box - Blackthorn shrubby woodland on sandstone ranges of the Sydney Basin, (HU801)

Number of ecosystem credits created	1,914
IBRA sub-region	Kerrabee - Hunter/Central Rivers

4. Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion, (HU618)

Number of ecosystem credits created	132
IBRA sub-region	Kerrabee - Hunter/Central Rivers

5. Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin, (HU843)

Number of ecosystem credits created	57
IBRA sub-region	Kerrabee - Hunter/Central Rivers

6. Caley's Ironbark - Red Ironbark - Currawang shrubby woodland on sandstone ranges of the Sydney Basin, (HU891)

Number of ecosystem credits created	622
IBRA sub-region	Kerrabee - Hunter/Central Rivers

Species credits summary

Common name	Scientific name	Extent of impact Ha or individuals	Number of species credits created
Koala	Phascolarctos cinereus	198.00	1,406
Regent Honeyeater	Anthochaera phrygia	198.00	1,406

Additional management actions

Additional management actions are required for:

Vegetation type or threatened species	Management action details
Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	Exclude commercial apiaries
Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	Exclude miscellaneous feral species
Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	Feral and/or over-abundant native herbivore control
Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	Fox control
Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	Slashing
Caley's Ironbark - Red Ironbark - Currawang shrubby woodland on sandstone ranges of the Sydney Basin	Exclude commercial apiaries
Caley's Ironbark - Red Ironbark - Currawang shrubby woodland on sandstone ranges of the Sydney Basin	Exclude miscellaneous feral species
Caley's Ironbark - Red Ironbark - Currawang shrubby woodland on sandstone ranges of the Sydney Basin	Feral and/or over-abundant native herbivore control
Caley's Ironbark - Red Ironbark - Currawang shrubby woodland on sandstone ranges of the Sydney Basin	Fox control
Caley's Ironbark - Red Ironbark - Currawang shrubby woodland on sandstone ranges of the Sydney Basin	Slashing
Koala	Exclude miscellaneous feral species
Koala	Slashing
Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	Exclude commercial apiaries
Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	Exclude miscellaneous feral species
Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	Feral and/or over-abundant native herbivore control
Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	Fox control
Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	Slashing

Regent Honeyeater	Exclude miscellaneous feral species
Regent Honeyeater	Feral and/or over-abundant native herbivore control
Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	Exclude commercial apiaries
Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	Exclude miscellaneous feral species
Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	Feral and/or over-abundant native herbivore control
Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	Fox control
Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	Slashing
White Box - Blackthorn shrubby woodland on sandstone ranges of the Sydney Basin	Exclude commercial apiaries
White Box - Blackthorn shrubby woodland on sandstone ranges of the Sydney Basin	Exclude miscellaneous feral species
White Box - Blackthorn shrubby woodland on sandstone ranges of the Sydney Basin	Feral and/or over-abundant native herbivore control
White Box - Blackthorn shrubby woodland on sandstone ranges of the Sydney Basin	Fox control
White Box - Blackthorn shrubby woodland on sandstone ranges of the Sydney Basin	Slashing
Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion	Exclude commercial apiaries
Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion	Exclude miscellaneous feral species
Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion	Feral and/or over-abundant native herbivore control
Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion	Fox control
Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion	Slashing

BioBanking credit report

This report identifies the number and type of credits required at a BIOBANK SITE

Date of report: 15/10/2015 Time: 7:41:44AM Calculator version: v4.0

Biobank details

Proposal ID: 0011/2015/2259B

Proposal name: WCEP Offset 3

Proposal address:

Proponent name: Wilpinjong Coal

Proponent address:

Proponent phone:

Assessor name: Colin Driscoll

Assessor address: PO Box 1047 Toronto NSW 2783

Assessor phone: 02 4959 8016

Assessor accreditation: 0011

Additional information required for approval:

- ☐ Use of local benchmark
- ☐ Expert report...
- ☐ Request for additional gain in site value

Ecosystem credits summary

Plant Community type	Area (ha)	Credits created
Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	5.00	68.00
Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	7.00	95.00
Grey Gum - Grey Myrtle - Narrow-leaved Stringybark - Rusty Fig open forest on ranges of the Upper Hunter	3.50	55.00
Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	27.50	437.00
Red Ironbark - Brown Bloodwood - Black Pine heathy open forest on sandstone ranges of the Sydney Basin	49.50	750.00
Rough-barked Apple grassy tall woodlands of the Brigalow Belt South	13.00	176.00
Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	18.00	261.00
Tumbledown Red Gum - Spinifex grass heathy low open woodland on sandstone slopes of the Sydney Basin	1.00	15.00
Total	124.50	1,857

Credit profiles

1. Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley, (HU690)

Number of ecosystem credits created	95
IBRA sub-region	Kerrabee - Hunter/Central Rivers

2. Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion, (HU681)

Number of ecosystem credits created	68
IBRA sub-region	Kerrabee - Hunter/Central Rivers

3. Rough-barked Apple grassy tall woodlands of the Brigalow Belt South, (HU981)

Number of ecosystem credits created	176
IBRA sub-region	Kerrabee - Hunter/Central Rivers

4. Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion, (HU618)

Number of ecosystem credits created	261
IBRA sub-region	Kerrabee - Hunter/Central Rivers

5. Grey Gum - Grey Myrtle - Narrow-leaved Stringybark - Rusty Fig open forest on ranges of the Upper Hunter, (HU828)

Number of ecosystem credits created	55
IBRA sub-region	Kerrabee - Hunter/Central Rivers

6. Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin, (HU843)

Number of ecosystem credits created	437
IBRA sub-region	Kerrabee - Hunter/Central Rivers

7. Tumbledown Red Gum - Spinifex grass heathy low open woodland on sandstone slopes of the Sydney Basin, (HU877)

Number of ecosystem credits created	15
IBRA sub-region	Kerrabee - Hunter/Central Rivers

8. Red Ironbark - Brown Bloodwood - Black Pine heathy open forest on sandstone ranges of the Sydney Basin, (HU888)

Number of ecosystem credits created	750
IBRA sub-region	Kerrabee - Hunter/Central Rivers

Species credits summary

Common name	Scientific name	Extent of impact Ha or individuals	Number of species credits created
Koala	Phascolarctos cinereus	57.50	408
Regent Honeyeater	Anthochaera phrygia	57.50	408

Additional management actions

Additional management actions are required for:

Vegetation type or threatened species	Management action details
Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	Exclude commercial apiaries
Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	Exclude miscellaneous feral species
Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	Feral and/or over-abundant native herbivore control
Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	Fox control
Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	Slashing
Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Exclude commercial apiaries
Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Exclude miscellaneous feral species
Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Feral and/or over-abundant native herbivore control
Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Fox control
Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Slashing
Grey Gum - Grey Myrtle - Narrow-leaved Stringybark - Rusty Fig open forest on ranges of the Upper Hunter	Exclude commercial apiaries
Grey Gum - Grey Myrtle - Narrow-leaved Stringybark - Rusty Fig open forest on ranges of the Upper Hunter	Exclude miscellaneous feral species
Grey Gum - Grey Myrtle - Narrow-leaved Stringybark - Rusty Fig open forest on ranges of the Upper Hunter	Feral and/or over-abundant native herbivore control
Grey Gum - Grey Myrtle - Narrow-leaved Stringybark - Rusty Fig open forest on ranges of the Upper Hunter	Fox control
Koala	Exclude miscellaneous feral species
Koala	Slashing
Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	Exclude commercial apiaries

Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	Exclude miscellaneous feral species
Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	Feral and/or over-abundant native herbivore control
Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	Fox control
Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	Slashing
Red Ironbark - Brown Bloodwood - Black Pine heathy open forest on sandstone ranges of the Sydney Basin	Exclude commercial apiaries
Red Ironbark - Brown Bloodwood - Black Pine heathy open forest on sandstone ranges of the Sydney Basin	Exclude miscellaneous feral species
Red Ironbark - Brown Bloodwood - Black Pine heathy open forest on sandstone ranges of the Sydney Basin	Feral and/or over-abundant native herbivore control
Red Ironbark - Brown Bloodwood - Black Pine heathy open forest on sandstone ranges of the Sydney Basin	Fox control
Red Ironbark - Brown Bloodwood - Black Pine heathy open forest on sandstone ranges of the Sydney Basin	Slashing
Regent Honeyeater	Exclude miscellaneous feral species
Regent Honeyeater	Feral and/or over-abundant native herbivore control
Rough-barked Apple grassy tall woodlands of the Brigalow Belt South	Exclude commercial apiaries
Rough-barked Apple grassy tall woodlands of the Brigalow Belt South	Exclude miscellaneous feral species
Rough-barked Apple grassy tall woodlands of the Brigalow Belt South	Feral and/or over-abundant native herbivore control
Rough-barked Apple grassy tall woodlands of the Brigalow Belt South	Fox control
Rough-barked Apple grassy tall woodlands of the Brigalow Belt South	Slashing
Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	Exclude commercial apiaries
Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	Exclude miscellaneous feral species
Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	Feral and/or over-abundant native herbivore control
Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	Fox control
Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	Slashing
Tumbledown Red Gum - Spinifex grass heathy low open woodland on sandstone slopes of the Sydney Basin	Exclude miscellaneous feral species
Tumbledown Red Gum - Spinifex grass heathy low open woodland on sandstone slopes of the Sydney Basin	Feral and/or over-abundant native herbivore control
Tumbledown Red Gum - Spinifex grass heathy low open woodland on sandstone slopes of the Sydney Basin	Fox control

BioBanking credit report

This report identifies the number and type of credits required at a BIOBANK SITE

Date of report: 15/10/2015 Time: 7:43:35AM Calculator version: v4.0

Biobank details

Proposal ID: 0011/2015/2262B

Proposal name: WCEP Offset 4

Proposal address:

Proponent name: Wilpinjong Coal

Proponent address:

Proponent phone:

Assessor name: Colin Driscoll

Assessor address: PO Box 1047 Toronto NSW 2783

Assessor phone: 02 4959 8016

Assessor accreditation: 0011

Additional information required for approval:

- ☐ Use of local benchmark
- ☐ Expert report...
- ☐ Request for additional gain in site value

Ecosystem credits summary

Plant Community type	Area (ha)	Credits created
Grey Box grassy open forest of the Central and Lower Hunter Valley	1.50	12.00
Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	6.50	47.00
Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	3.50	33.00
Red Ironbark - Brown Bloodwood - Black Pine heathy open forest on sandstone ranges of the Sydney Basin	26.50	284.00
Total	38.00	376

Credit profiles

1. Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley, (HU690)

Number of ecosystem credits created	47
IBRA sub-region	Kerrabee - Hunter/Central Rivers

2. Grey Box grassy open forest of the Central and Lower Hunter Valley, (HU962)

Number of ecosystem credits created	12
IBRA sub-region	Kerrabee - Hunter/Central Rivers

3. Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin, (HU843)

Number of ecosystem credits created	33
IBRA sub-region	Kerrabee - Hunter/Central Rivers

4. Red Ironbark - Brown Bloodwood - Black Pine heathy open forest on sandstone ranges of the Sydney Basin, (HU888)

Number of ecosystem credits created	284
IBRA sub-region	Kerrabee - Hunter/Central Rivers

Species credits summary

Common name	Scientific name	Extent of impact Ha or individuals	Number of species credits created
Koala	Phascolarctos cinereus	11.50	82
Regent Honeyeater	Anthochaera phrygia	11.50	82

Additional management actions

Additional management actions are required for:

Vegetation type or threatened species	Management action details
Grey Box grassy open forest of the Central and Lower Hunter Valley	Exclude commercial apiaries
Grey Box grassy open forest of the Central and Lower Hunter Valley	Exclude miscellaneous feral species
Grey Box grassy open forest of the Central and Lower Hunter Valley	Feral and/or over-abundant native herbivore control
Grey Box grassy open forest of the Central and Lower Hunter Valley	Fox control
Grey Box grassy open forest of the Central and Lower Hunter Valley	Slashing
Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Exclude commercial apiaries
Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Exclude miscellaneous feral species
Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Feral and/or over-abundant native herbivore control
Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Fox control
Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Slashing
Koala	Exclude miscellaneous feral species
Koala	Slashing
Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	Exclude commercial apiaries
Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	Exclude miscellaneous feral species
Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	Feral and/or over-abundant native herbivore control
Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	Fox control
Narrow-leaved Stringybark - Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin	Slashing

Red Ironbark - Brown Bloodwood - Black Pine heathy open forest on sandstone ranges of the Sydney Basin	Exclude commercial apiaries
Red Ironbark - Brown Bloodwood - Black Pine heathy open forest on sandstone ranges of the Sydney Basin	Exclude miscellaneous feral species
Red Ironbark - Brown Bloodwood - Black Pine heathy open forest on sandstone ranges of the Sydney Basin	Feral and/or over-abundant native herbivore control
Red Ironbark - Brown Bloodwood - Black Pine heathy open forest on sandstone ranges of the Sydney Basin	Fox control
Red Ironbark - Brown Bloodwood - Black Pine heathy open forest on sandstone ranges of the Sydney Basin	Slashing
Regent Honeyeater	Exclude miscellaneous feral species
Regent Honeyeater	Feral and/or over-abundant native herbivore control

BioBanking credit report

This report identifies the number and type of credits required at a BIOBANK SITE

Date of report: 15/10/2015 Time: 7:45:23AM Calculator version: v4.0

Biobank details

Proposal ID: 0011/2015/2264B

Proposal name: WCEP Offset 5

Proposal address:

Proponent name: Wilpinjong Coal

Proponent address:

Proponent phone:

Assessor name: Colin Driscoll

Assessor address: PO Box 1047 Toronto NSW 2783

Assessor phone: 02 4959 8016

Assessor accreditation: 0011

Additional information required for approval:

- ☐ Use of local benchmark
- ☐ Expert report...
- ☐ Request for additional gain in site value

Ecosystem credits summary

Plant Community type	Area (ha)	Credits created
Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	27.50	280.00
Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	171.00	1,806.00
White Box - Blackthorn shrubby woodland on sandstone ranges of the Sydney Basin	19.50	204.00
Total	218.00	2,290

Credit profiles

1. Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter, (HU910)

Number of ecosystem credits created	280
IBRA sub-region	Kerrabee - Hunter/Central Rivers

2. White Box - Blackthorn shrubby woodland on sandstone ranges of the Sydney Basin, (HU801)

Number of ecosystem credits created	204
IBRA sub-region	Kerrabee - Hunter/Central Rivers

3. Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion, (HU618)

Number of ecosystem credits created	1,806
IBRA sub-region	Kerrabee - Hunter/Central Rivers

Species credits summary

Common name	Scientific name	Extent of impact Ha or individuals	Number of species credits created
Ozothamnus tesselatus	Ozothamnus tesselatus	6,458.00	45,852
Scant Pomaderris	Pomaderris queenslandica	50.00	355
Tylophora linearis	Tylophora linearis	2.00	14
Koala	Phascolarctos cinereus	218.00	1,548
Regent Honeyeater	Anthochaera phrygia	190.50	1,353

Additional management actions

Additional management actions are required for:

Vegetation type or threatened species	Management action details
Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	Exclude commercial apiaries
Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	Exclude miscellaneous feral species
Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	Feral and/or over-abundant native herbivore control
Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	Fox control
Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	Slashing
Koala	Exclude miscellaneous feral species
Koala	Slashing
Ozothamnus tesselatus	Feral and/or over-abundant native herbivore control
Regent Honeyeater	Exclude miscellaneous feral species
Regent Honeyeater	Feral and/or over-abundant native herbivore control
Scant Pomaderris	Feral and/or over-abundant native herbivore control
Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	Exclude commercial apiaries
Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	Exclude miscellaneous feral species
Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	Feral and/or over-abundant native herbivore control
Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	Fox control
Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	Slashing

White Box - Blackthorn shrubby woodland on sandstone ranges of the Sydney Basin	Exclude commercial apiaries
White Box - Blackthorn shrubby woodland on sandstone ranges of the Sydney Basin	Exclude miscellaneous feral species
White Box - Blackthorn shrubby woodland on sandstone ranges of the Sydney Basin	Feral and/or over-abundant native herbivore control
White Box - Blackthorn shrubby woodland on sandstone ranges of the Sydney Basin	Fox control
White Box - Blackthorn shrubby woodland on sandstone ranges of the Sydney Basin	Slashing

ATTACHMENT G
WILPINJONG EXTENSION PROJECT TERRESTRIAL FLORA BASELINE REPORT (POTENTIAL OFFSET AREAS)

WILPINJONG EXTENSION PROJECT

BASELINE FLORA REPORT (POTENTIAL OFFSET AREAS)

October 2015

PREPARED BY
HUNTER ECO

ID: 00705689

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EXECUTIVE SUMMARY

The Wilpinjong Extension Project (the Project) is located approximately 40 kilometres north-east of Mudgee, New South Wales (NSW). The Project is a proposed extension of open cut operations at the existing Wilpinjong Coal Mine.

This report provides information about the flora values across five potential biodiversity offset areas for the Project.

Field surveys were conducted over 20 days through March, July, August and September 2015 with data collected from 680 ground truth Rapid Data Points and 114 floristic plots and transects.

Twenty vegetation communities were mapped for the study within the Offset Areas. Of these, four are considered to meet the definition of threatened ecological communities. In total, two threatened ecological communities were recorded for the study, namely:

- *White Box Yellow Box Blakely's Red Gum Woodland* Endangered Ecological Community/Critically Endangered Ecological Community; and
- *Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion* Vulnerable Ecological Community.

A total of 144 flora species were recorded within the Offset Areas during surveys (including 13 introduced species). Three of the recorded flora species are listed as threatened under the NSW *Threatened Species Conservation Act, 1995* (TSC Act) and/or Commonwealth *Environmental Protection and Biodiversity Conservation Act, 1999* (EPBC Act), namely:

- Scant Pomaderris (*Pomaderris queenslandica*) (listed as Vulnerable under the TSC Act);
- *Ozothamnus tesselatus* (listed as Vulnerable under both the TSC Act and EPBC Act); and
- *Tylophora linearis* (listed as Vulnerable under both the TSC Act and EPBC Act).

All three threatened flora species were recorded only in Offset Area 5.

One endangered population listed under the TSC Act was recorded in the Offset Areas (within Offset Areas 1 and 5), namely:

- *Cymbidium canaliculatum R. Br. in the Hunter Catchment*.

1.0 INTRODUCTION

The Wilpinjong Extension Project (the Project) is located approximately 40 kilometres (km) north-east of Mudgee, New South Wales (NSW) (Figure 1). The Project is a proposed extension of open cut operations at the existing Wilpinjong Coal Mine (Figure 2).

The primary objective of this report is to provide the results of surveys across five potential biodiversity offset areas for the Project (Figure 2). Although the emphasis is on those species listed as threatened under the NSW *Threatened Species Conservation Act*, *1995* (TSC Act) and Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act), populations of all terrestrial flora relevant to the Project are documented.

Five parcels of land all owned by Peabody Australia have been selected as part of the land-based offset strategy for the Project. The Offset Areas are located in the Hunter Central Rivers CMA, Sydney Basin Interim Biogeographic Regionalisation for Australia (IBRA) Bioregion, Kerrabee IBRA Sub-Region, and Central Western Slopes botanical division.

Figure 2 shows the location of the five Offset Areas in context with the Project. Offset Area 1 is surrounded by the Munghorn Gap Nature Reserve and the western boundaries of Offset Area 2 adjoin the Munghorn Gap Nature Reserve. Offset Areas 3, 4 and 5 are surrounded by the Goulburn River National Park.

LEGEND

- Mining Lease Boundary
- Exploration Licence Boundary
- Authorisation Boundary
- Biodiversity Assessment Report
- Development Site Footprint
- Local Government Boundary
- NSW State Forest
- National Park, Nature Reserve or State Conservation Area
- Mining Operation

Source: NSW Land & Property Information (2015);
NSW Dept of Industry (2015; Geoscience Australia (2011)

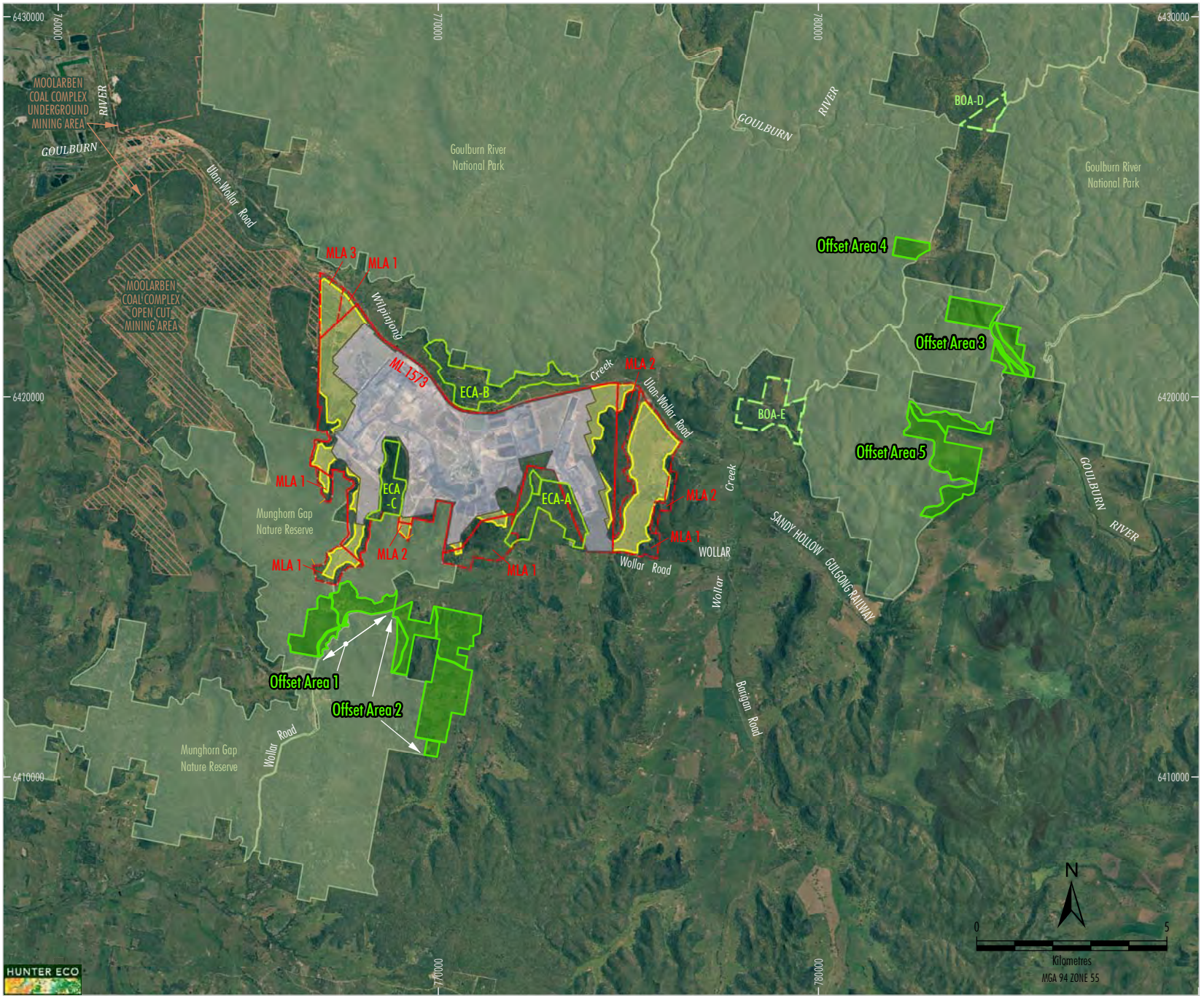
Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Regional Location

Figure 1

WIL-12-12_WEP_EIS_Flora Offset_201A



LEGEND

- Mining Lease Boundary
- Mining Lease Application Boundary
- Approved/Existing Open Cut and Contained Infrastructure Area
- Proposed Open Cut Extension Area
- Enhancement and Conservation Area
- Existing Biodiversity Offset Area
- Offset Area
- National Park/Nature Reserve

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (Jun 2015, 2011)

Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Locations of the Offset Areas

Figure 2

WIL-12-12_WEP_EIS_Flora Offset_202B

2.0 PHYSIOGRAPHY

Figure 3 shows the landscape location of Offset Areas 1 and 2 and Figure 4 shows the landscape location of Offset Areas 3, 4 and 5.

Overall the geology of the areas in which the Offset Areas are located covers the Quaternary, Permian and Triassic eras which are associated with alluvium, more elevated flats and rises and upper slopes and ridgetops respectively. Offset Areas 1 and 2 are mostly Permian with Triassic at the southern elevated end of Offset Area 1 and a small amount of Quaternary on the centre eastern edge of Offset Area 2. Offset Area 3 has Quaternary along the alluvial edges of the Goulburn River, Permian on the higher flats and lower slopes, and Triassic on the upper slopes and ridgetops. The eastern half of Offset Area 4 is Permian and the western half Triassic. Offset Area 5 is almost entirely Permian with a narrow strip of Triassic along the northern boundary and a small amount of Quaternary in the centre eastern edge.

Offset Areas 1 and 2 contain Australian Soil Classification types Kurosols, Natric on the lower flats and Rudosols and Tenosols on the adjoining sideslopes. Offset Areas 3 and 4 contain Sodosols on the valley floor, Rudosols and Tenosols on the adjoining sideslopes and ridges with small areas of Ferrosols. Offset Area 5 is almost entirely Rudosols and Tenosols with a small area of Ferrosols in the east.

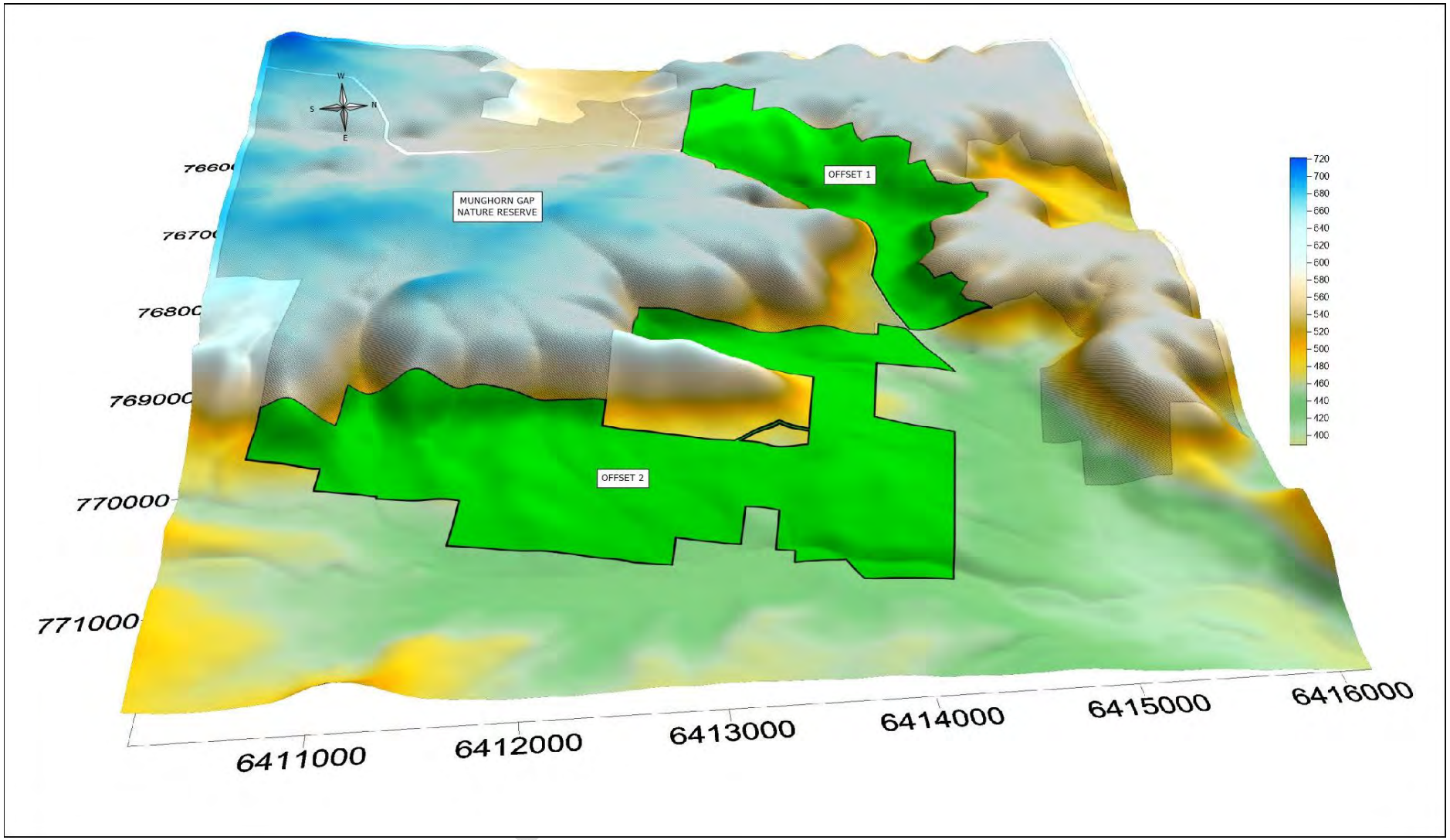


Figure 3: Location of Offset Areas 1 and 2 in the Landscape

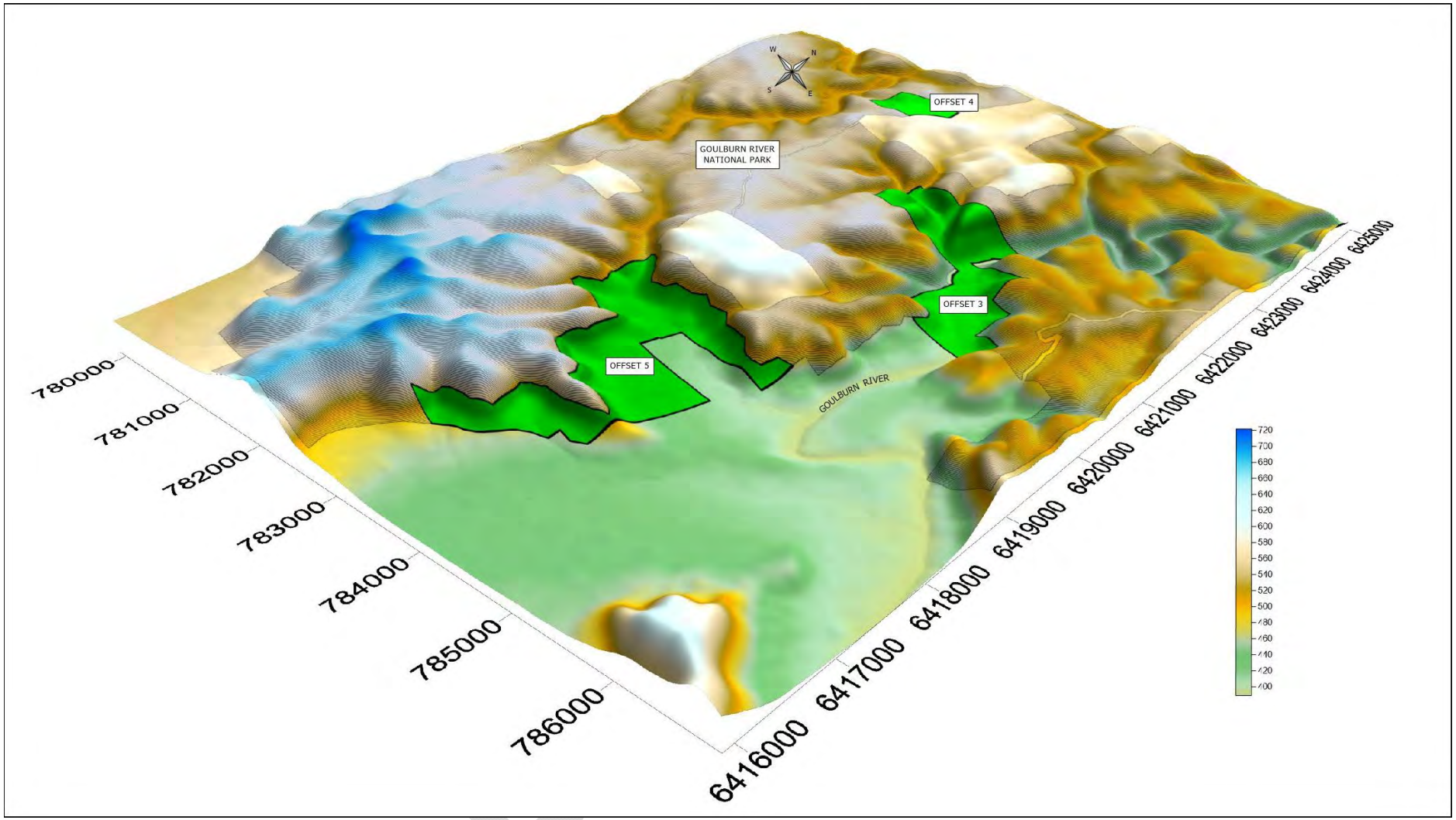


Figure 4: Location of Offset Areas 3, 4 and 5 in the Landscape

3.0 METHODS

The primary aim of this investigation was to assess the capacity of the Offsets to provide credits that could in full or in part, offset the credits generated by the Project, and provide offset for Commonwealth protected matters. To that end, vegetation communities were classified and mapped and the size and extent of the threatened flora species *Ozothamnus tesselatus* previously recorded on Offset Area 5 (Driscoll and Bell 2014 unpublished) was determined. During this field work any other threatened flora and fauna species encountered were recorded opportunistically.

Flora surveys were undertaken in consideration of the following guidelines:

- *BioBanking Assessment Methodology and Credit Calculator Operational Manual* (Department of Environment, Climate Change and Water, 2009);
- *Draft NSW Biodiversity Offsets Policy for Major Projects* (and underlying *Framework for Biodiversity Assessment*) (Office of Environment and Heritage [OEH] 2014a, 2014b);
- *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities - Working Draft* (Department of Environment and Conservation, 2004); and
- *Threatened species survey and assessment guidelines* (OEH, 2015).

3.1 Vegetation Community Mapping and Classification

Several processes are involved in preparing ground-truthed vegetation community classification and mapping and these were used for this study:

- Collection of field data at numerous points on the dominant species present in the canopy, shrub and ground structural layers. These records are referred to as Rapid Data Points (RDP) and provide an understanding of floristic variation across the survey area.
- RDP are initially coded according to an assumed community type and that data extrapolated across the survey area to create a draft vegetation community map. Aerial Photo Interpretation is used to assist with determining likely community boundaries where changes in vegetation patterns are visible.
- Detailed data are then collected from standard 0.04 hectares (ha) (generally 20 metres [m] x 20 m) plots. The presence and projected foliage cover of all vascular species in each plot were recorded using a modified Braun-Blanquet cover abundance scale: 1 = <1%, 2 = 1–5%, 3 = 5–25%, 4 = 25–50%, 5 = 50–75% and 6 = 75–100%. The overall Study area is stratified according to the variation recorded in the RDP data and floristic plots are randomly placed in these stratified units. The number of plots in each unit is determined in accordance with the requirements of the NSW Framework for Biodiversity Assessment (OEH, 2014b).

- Similarity analysis (hierarchical agglomerative clustering and non-metric multi-dimensional scaling) is then used to place the floristic plots into groups having similar floristic content. Final community classification follows from the similarity analysis.

These procedures for ground-truthed vegetation mapping were first published by S. Bell and C. Driscoll in (Department of Environment and Climate Change, 2008) and further elaborated in Bell (2013).

Using the results of similarity analyses, vegetation communities were first classified at the local level of the immediate region from which the sample data were drawn. Using the floristic composition of these communities, they would then be matched to the NSW vegetation classification hierarchy as follows:

1. local classification by Hunter Eco;
2. NSW BioMetric Vegetation Types (BVTs);
3. NSW Plant Community Types (PCTs);
4. NSW Vegetation Classes (Keith, 2004); and
5. NSW Vegetation Formations (Keith, 2004).

3.2 Biometric Data

In addition to collecting floristic cover abundance data, biometric data were collected at each plot location; Biometric data provides input into the NSW BioBanking credit calculator. Collecting biometric data includes an extension to the 20 m x 20 m floristic plot to form a 20 m x 50 m plot. Data collected are:

• Total number of native plant species	20 m x 20 m plot
• Native overstorey cover %	50 m transect
• Native mid-storey cover %	50 m transect
• Native ground cover grasses %	50 m transect
• Native ground cover shrubs %	50 m transect
• Native ground cover other %	50 m transect
• Exotic plant cover %	50 m transect
• Number of trees with hollows	20 m x 50 m plot
• Overstorey regeneration %	entire stratified unit
• Length of fallen logs	20 m x 50 m plot

3.3 *Ozothamnus tesselatus* Population Density Estimate on Offset Area 5

All *Ozothamnus tesselatus* plants were counted across 60% of the population distribution with plants being flagged so as to avoid double counting. Population density as plants per hectare was determined and a total estimated population size was arrived at by extrapolating this density over the entire distribution area.

3.4 Summary of Survey Effort

Table 1 provides a summary of the field survey effort.

Table 1 Summary of Field Survey Effort

Task	Effort
OFFSET 1	
Field survey dates	3 March 2015; 4 March 2015; 16 September 2015; 17 September 2015.
RDP	201
Floristic plots and transects	23
OFFSET 2	
Field survey dates	4 March 2015; 5 March 2015; 6 March 2015; 16 July 2015; 17 July 2015; 18 July 2015; 18 September 2015.
RDP	329
Floristic plots and transects	43
OFFSET 3	
Field survey dates	10 August 2015; 11 August 2015; 12 August 2015; 13 August 2015.
RDP	65
Floristic plots and transects	25
OFFSET 4	
Field survey dates	14 July 2015; 15 July 2015.
RDP	37
Floristic plots and transects	10
OFFSET 5	
Field survey dates	15 September 2015; 16 September 2015.
Ozothamnus tesselatus population estimate Offset 5	14 September 2015.
RDP	48
Floristic plots and transects	13

4.0 RESULTS

4.1 Vegetation Communities

Twenty vegetation communities were mapped for the study within the Offset Areas, including four derived native grassland types (Table 2; Figures 5 and 6).

Table 2 Vegetation Communities Mapped for the Study

Local Community	PCT	BVT	PCT Name	TEC
Dry Sclerophyll Forests (Shrub/Grass Formation)				
Western Grey Box Woodland	1748	HU962	Grey Box grassy open forest of the Central and Lower Hunter Valley	None
White Box Shrubby Woodland	1587	HU801	White Box - Blackthorn shrubby woodland on sandstone ranges of the Sydney Basin	None
White Box Shrubby Woodland DNG	1587	HU801	White Box - Blackthorn shrubby woodland on sandstone ranges of the Sydney Basin	None
Dry Sclerophyll Forests (Shrubby)				
Caley's Ironbark Woodland	1677	HU891	Caley's Ironbark - Red Ironbark - Currawang shrubby woodland on sandstone ranges of the Sydney Basin	None
Caley's Ironbark Woodland DNG	1677	HU891	Caley's Ironbark - Red Ironbark - Currawang shrubby woodland on sandstone ranges of the Sydney Basin	None
Grey Gum - Blue-leaved Stringybark Forest	1629	HU843	Narrow-leaved Stringybark - Grey Gum open forest on sandstone ranges of the Sydney Basin	None
Grey Gum - Narrow-leaved Stringybark Forest	1629	HU843	Narrow-leaved Stringybark - Grey Gum open forest on sandstone ranges of the Sydney Basin	None
Grey Myrtle Dry Rainforest	1614	HU828	Grey Gum - Grey Myrtle - Narrow-leaved Stringybark - Rusty Fig open forest on ranges of the Upper Hunter	None
Mugga Ironbark Forest	482	HU697	Mugga Ironbark - Black Cypress Pine shrub/grass open forest of the upper Hunter Valley, mainly Sydney Basin Bioregion	None
Red Ironbark - Brown Bloodwood Forest	1674	HU888	Red Ironbark - Brown Bloodwood - Black Pine heathy open forest on sandstone ranges of the Sydney Basin	None
Scribbly Gum Forest	1676	HU890	Grey Gum - Scribbly Gum - Black Pine heathy open forest on sandstone ranges of the Sydney Basin	None
Slaty Box Forest	1176	HU618	Slaty Box - Grey Gum shrubby woodland on the footslopes of the upper Hunter Valley, Sydney Basin Bioregion	TSC Act, V: Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion
Spinifex Woodland	1663	HU877	Tumbledown Red Gum - Spinifex grass heathy low open woodland on sandstone slopes of the Sydney Basin	None

Local Community	PCT	BVT	PCT Name	TEC
Grassy Woodlands				
Blakely's Red Gum - Rough-barked Apple Woodland	1696	HU910	Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	None
Blakely's Red Gum - Rough-barked Apple Woodland DNG	1696	HU910	Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	None
Blakely's Red Gum Woodland	1696	HU910	Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	None
Rough-barked Apple Forest	1696	HU981	Rough-barked Apple grassy tall woodlands of the Brigalow Belt South	None
White Box Grassy Woodland	483	HU690	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	TSC Act, E: White Box Yellow Box Blakely's Red Gum Woodland (Equivalent) ; EPBC Act, CE: White Box Yellow Box Blakely's Red Gum Woodland (Equivalent)
Yellow Box Woodland	1924	HU732	Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion	TSC Act, E: White Box Yellow Box Blakely's Red Gum Woodland (Equivalent) ; EPBC Act, CE: White Box Yellow Box Blakely's Red Gum Woodland (Equivalent)
Yellow Box Woodland DNG	1924	HU732	Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion	TSC Act, E: White Box Yellow Box Blakely's Red Gum Woodland (Equivalent) ; EPBC Act, CE: White Box Yellow Box Blakely's Red Gum Woodland (Equivalent)

Appendix 1 provides details of the vegetation communities mapped within each of the five Offset Areas. Vegetation community descriptions are provided in Appendix 2.

4.2 Threatened Species, Populations and Ecological Communities

Two threatened ecological communities were recorded, these being (Figures 7 and 8):

- *White Box Yellow Box Blakely's Red Gum Woodland* (listed as an Endangered Ecological Community [EEC] under the TSC Act)*/White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland* (listed as a Critically Endangered Ecological Community [CEEC] under the EPBC Act); and
- *Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion* (listed as a Vulnerable Ecological Community [VEC] under the TSC Act).

A total of 144 flora species were recorded within the Offset Areas during surveys (including 13 introduced species). A floristic list provided in Appendix 3 lists the families and species recorded in the floristic plots for each Offset Area; a comprehensive list involving additional meanders was not prepared.

LEGEND

- Mining Lease Application Boundary
- Offset Area
- Nature Reserve

VEGETATION COMMUNITIES

Grassy Woodlands - Western Slopes Grassy Woodlands

- 5a Yellow Box Woodland (HU732)
- 5b Yellow Box Woodland Derived Native Grassland (HU732)

Grassy Woodlands - Coastal Valley Grassy Woodlands

- 14a Blakely's Red Gum - Rough-barked Apple Woodland (HU910)
- 14b Blakely's Red Gum - Rough-barked Apple Woodland Derived Native Grassland (HU910)

Dry Sclerophyll Forests (Shrubby sub-formation) - Western Slopes Dry Sclerophyll Forests

- 7 Grey Gum - Narrow-leaved Stringybark Forest (HU843)
- 9 Slaty Box Forest (HU618)
- 16 Grey Gum - Blue-leaved Stringybark Forest (HU843)
- 17a Caley's Ironbark Woodland (HU891)
- 17b Caley's Ironbark Woodland Derived Native Grassland (HU891)
- 18 Mugga Ironbark Forest (HU697)
- 20 Scribbly Gum Forest (HU890)

Dry Sclerophyll Forests (Shrub/grass sub-formation) - North-west Slopes Dry Sclerophyll Woodlands

- 22a White Box Shrubby Woodland (HU801)
- 22b White Box Shrubby Woodland Derived Native Grassland (HU801)

Cleared Land

- Pasture Improved Grassland/Stubble Field
- Existing Infrastructure
- Dam/Typha

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (June 2014)

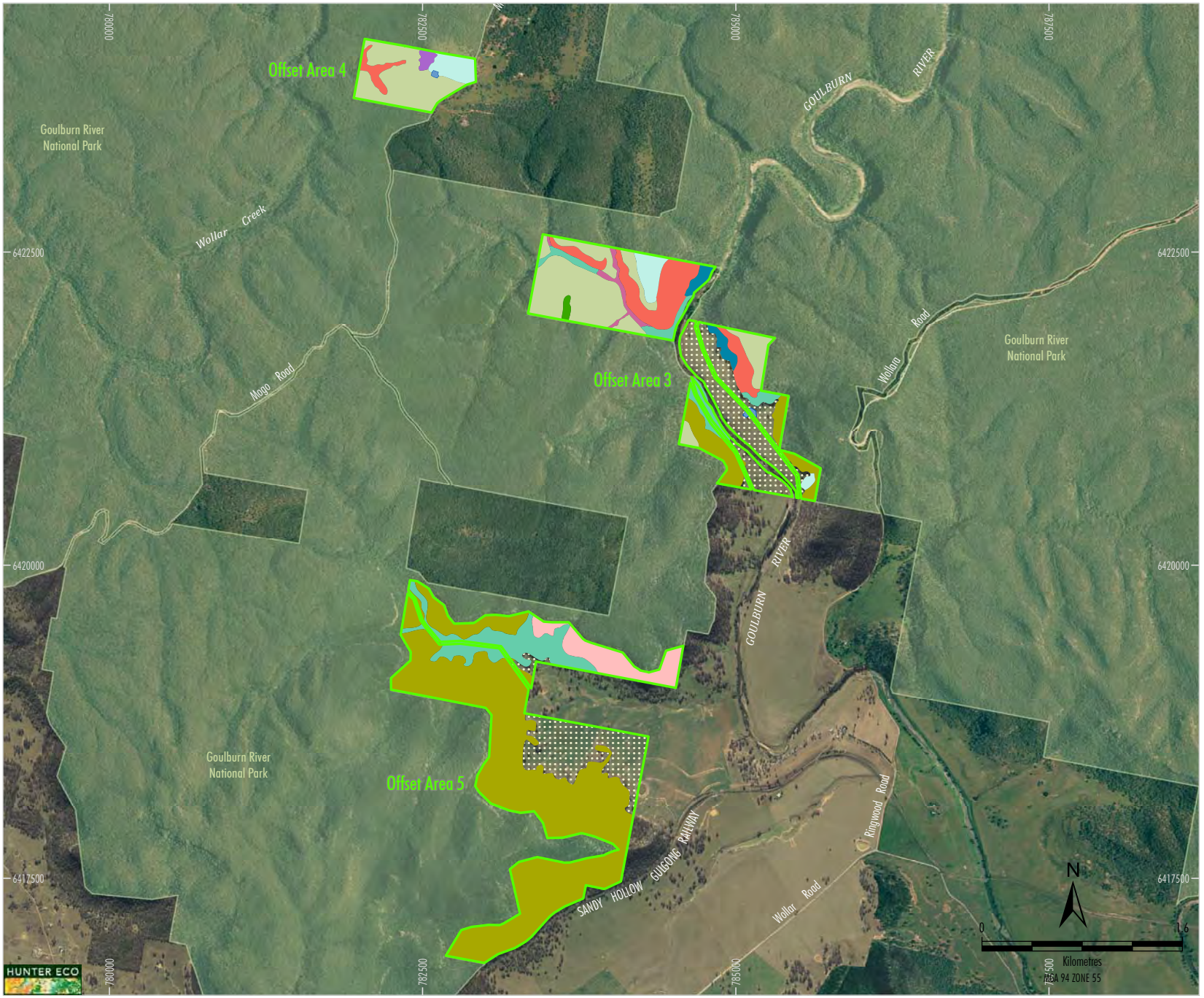
Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Offset Areas 1 and 2 - Vegetation Communities

Figure 5

WIL-12-12_WEP_EIS_Flora Offset_203A



LEGEND

- Offset Area
- National Park

VEGETATION COMMUNITIES

Grassy Woodlands - Western Slopes Grassy Woodlands

- 13 White Box Grassy Woodland (HU690)

Grassy Woodlands - Coastal Valley Grassy Woodlands

- 6 Blakely's Red Gum Woodland (HU910)
- 15 Rough-barked Apple Forest (HU910)

Dry Sclerophyll Forests (Shrubby sub-formation) - Western Slopes Dry Sclerophyll Forests

- 9 Slaty Box Forest (HU618)
- 16 Grey Gum - Blue-leaved Stringybark Forest (HU843)
- 19 Red Ironbark - Brown Bloodwood Forest (HU888)
- 21 Spinifex Woodland (HU877)

Dry Sclerophyll Forests (Shrub/grass sub-formation) - North-west Slopes Dry Sclerophyll Woodlands

- 22a White Box Shrubby Woodland (HU801)

Dry Sclerophyll Forests (Shrubby sub-formation) – Sydney Hinterland Dry Sclerophyll Forests

- 23 Grey Myrtle Dry Rainforest (HU828)

Dry Sclerophyll Forests (Shrub/grass sub-formation) – Hunter Macleay Dry Sclerophyll Forests

- 24 Western Grey Box Woodland (HU962)

Cleared Land

- Pasture Improved Grassland/Stubble Field
- Dam/Typha

Source: WCPL (2015); Orthophoto: WCPL (June 2014)

Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Offset Areas 3, 4 and 5 - Vegetation Communities

Figure 6

WIL-12-12_WEP_EIS_Flora Offset_204A

Three threatened flora species were recorded during the study, all within Offset Area 5 (Table 3; Figure 8):

Table 3 Threatened Flora Species Recorded within the Offset Areas

Scientific Name	Common Name	Listing		Occurrence within Offset Area 5
		TSC Act	EPBC Act	
Pomaderris queenslandica	Scant Pomaderris	E	-	50 individuals.
Ozothamnus tesselatus	-	V	V	6,458 individuals.
Tylophora linearis	-	V	E	2 individuals.

One endangered population listed under the TSC Act was recorded in Offset Areas 1 and 5, namely (Figures 7 and 8):

- *Cymbidium canaliculatum R. Br. in the Hunter Catchment*.

The following sections provide summary descriptions of each Offset Area.

4.3 Offset Area 1

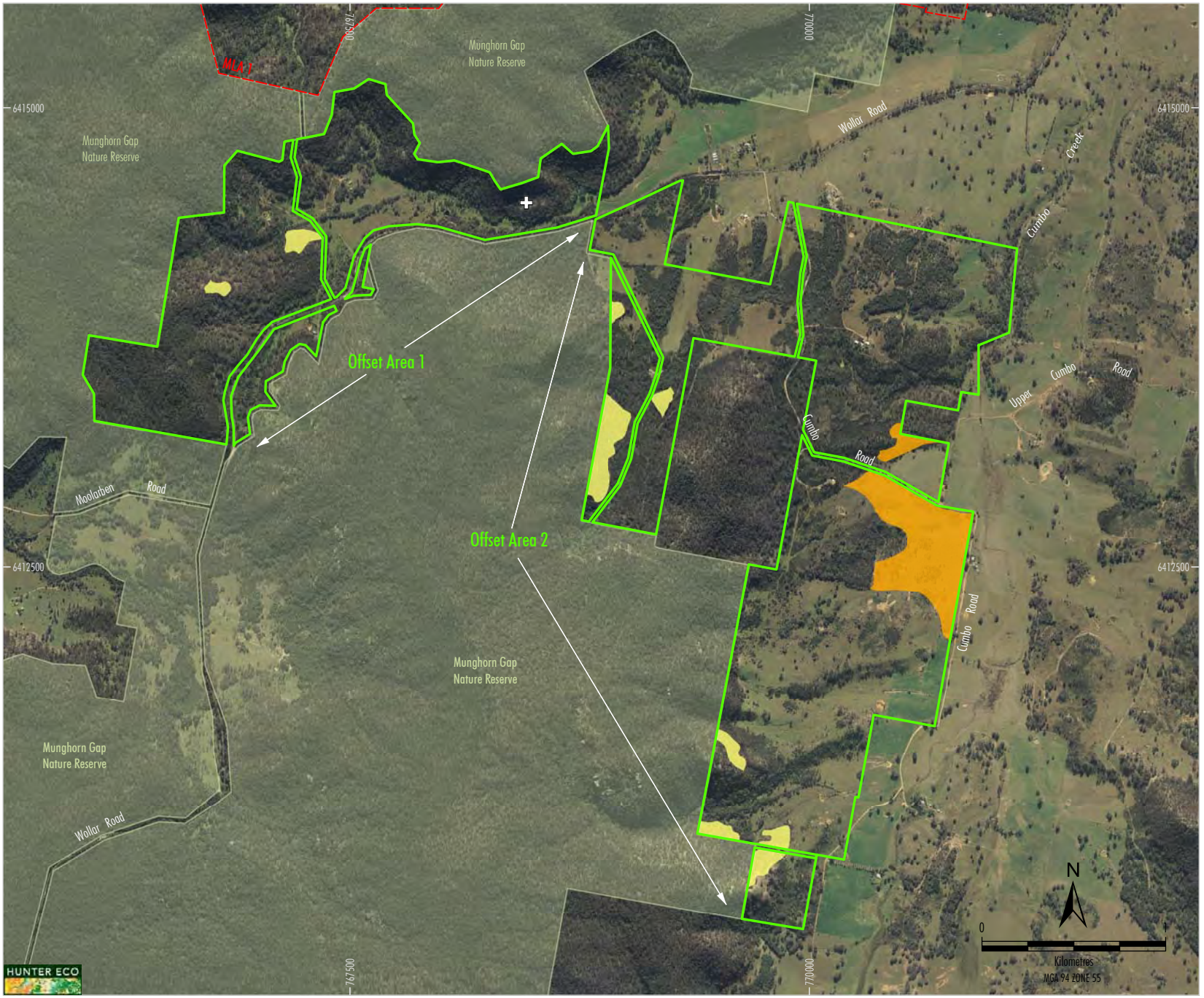
Offset Area 1 is located immediately south of the Project in a narrow valley surrounded on three sides by Munghorn Gap Nature Reserve, with a total area of 201 ha. Approximately 86% is vegetated with evidence of past timber harvesting and clearing. The valley floor has been mostly cleared with remnants indicating the vegetation would have been dominated by Rough-barked Apple (*Angophora floribunda*) and Blakely's Red Gum (*Eucalyptus blakelyi*). This habitat remains on the lower slopes, merging into shrubby White Box (*Eucalyptus albens*) on the mid-slopes and Grey Gum (*E. punctata*) - Narrow-leaved Stringybark (*Eucalyptus sparsifolia*) on the upper slopes. At the southern end there is a wide colluvial basin with Rough-barked Apple and Blakely's Red Gum and adjoining Scribbly Gum (*Eucalyptus rossii*). There are also small patches of Slaty Box (*Eucalyptus dawsonii*) and Mugga Ironbark (*Eucalyptus sideroxylon*).

There are three unoccupied residences with associated sheds and access tracks.

This Offset Area contains one threatened ecological community, namely *Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion* VEC.

One endangered population listed under the TSC Act was recorded in Offset Area 1, namely:

- *Cymbidium canaliculatum R. Br. in the Hunter Catchment*.



LEGEND

- Mining Lease Application Boundary
- Offset Area
- Nature Reserve

Threatened Ecological Communities

- Box-Gum Woodland Endangered Ecological Community/ Critically Endangered Ecological Community
- Slaty Gum Woodland Vulnerable Ecological Community

Threatened Populations

- *Cymbidium canaliculatum R. Br in the Hunter Catchment*

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (2011)

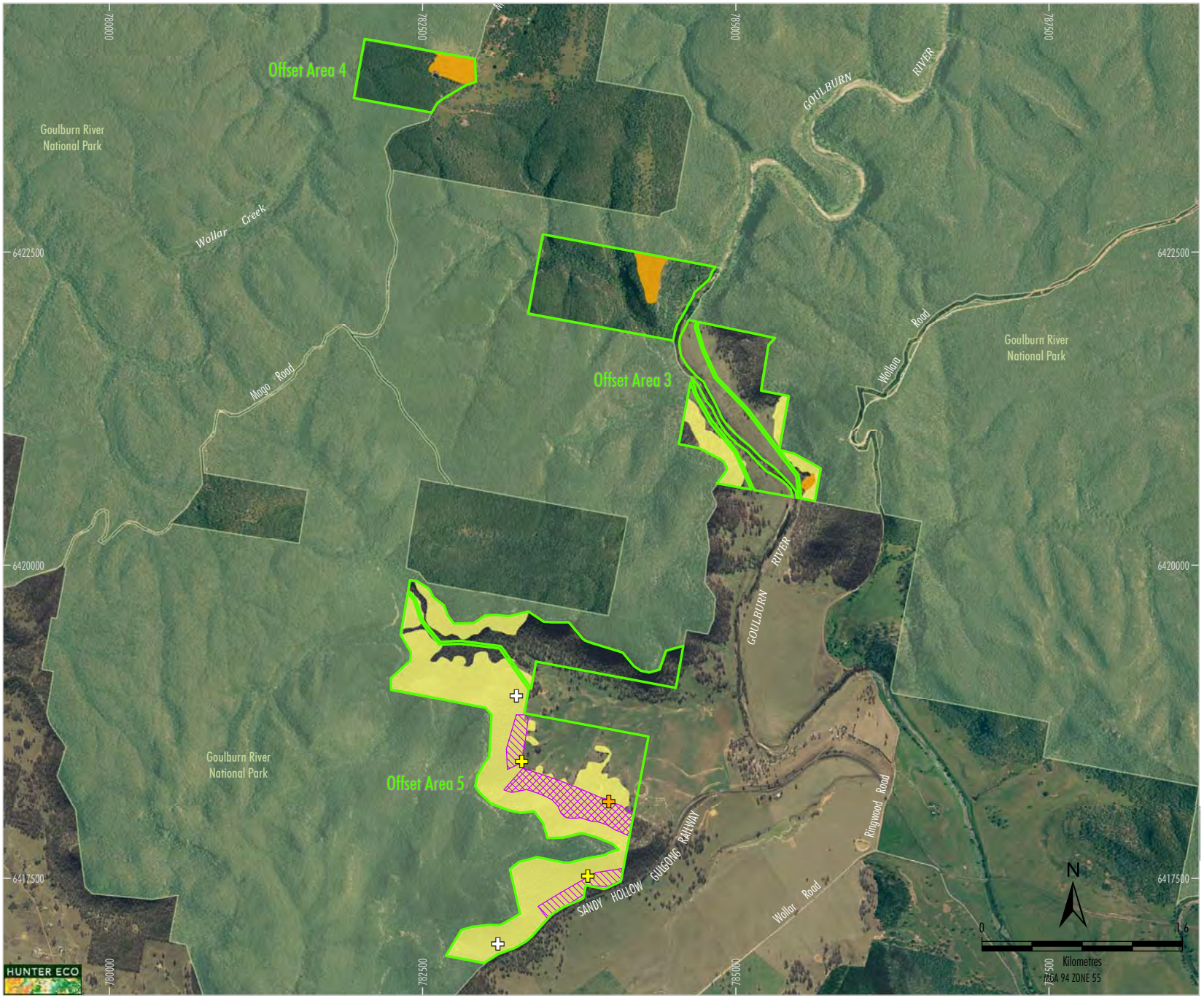
Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Offset Areas 1 and 2 - Threatened Populations and Ecological Communities

Figure 7

WIL-12-12_WEP_EIS_Flora Offset_205A



LEGEND

- Offset Area
- National Park

Threatened Ecological Communities

- Box-Gum Woodland
- Endangered Ecological Community/ Critically Endangered Ecological Community
- Slaty Gum Woodland
- Vulnerable Ecological Community

Threatened Species

- *Ozothamus tesselatus* (Sporadic Occurence)
- *Ozothamus tesselatus* (Dense Occurence)
- *Pomaderris queenslandica*
- *Tylophora linearis*

Threatened Populations

- *Cymbidium canaliculatum R. Br in the Hunter Catchment*

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (2011)

Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Offset Areas 3, 4 and 5 - Threatened Species, Populations and Ecological Communities

Figure 8

WIL-12-12_WEP_EIS_Flora Offset_206A

4.4 Offset Area 2

The western boundary adjoins Munghorn Gap Nature Reserve with 55% of the area vegetated, a large amount being advanced regeneration from prior clearing. The total area of the offset is 441 ha. Caley's Ironbark (*Eucalyptus caleyi*) mixed with Red Stringybark (*Eucalyptus macrorhyncha*) occurs in the north eastern section where abundant Black Cypress Pine (*Callitris endlicheri*) indicates previous clearing. A long alluvial valley to the west is dominated by Rough-barked Apple and Blakely's Red Gum that continues up the lower slopes, merging into shrubby White Box on the mid-slopes and Grey Gum/Stringybark on the upper slopes. The central eastern part contains a small amount of Yellow Box (*Eucalyptus melliodora*) woodland with a larger area of Yellow Box woodland derived native grassland. Elsewhere on the side slopes are patches of Slaty Box merging into Grey Gum/Stringybark on the upper slopes.

There is one unoccupied dwelling and associated sheds as well as three dams. There are several natural springs

This Offset Area contains two threatened ecological communities namely:

- *White Box Yellow Box Blakely's Red Gum Woodland* EEC/*White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland* CEEC; and
- *Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion* VEC.

4.5 Offset Area 3

Offset Area 3 is a mix of high ridges, steep sandstone escarpments with numerous caves and shelters, and incised gorges, with a total area of 164 ha.

The Offset Area is surrounded on three sides by Goulburn River National Park, is split by just over 2 km of the Goulburn River itself, and is 75% vegetated (most of which is largely undisturbed). There is an area of old growth dry rainforest dominated by Grey Myrtle (*Backhousia myrtifolia*) in the deep central sheltered gorge. The ridge tops and upper side slopes contain predominantly Red Ironbark (*Eucalyptus fibrosa*)/Brown Bloodwood (*Corymbia trachyphloia*) with Grey Gum/Stringybark in the more sheltered upper slopes. There is a small area (1 ha) of Tumbledown Red Gum (*Eucalyptus dealbata*)/Spinifex woodland in the south eastern portion.

A wide alluvial flat on the eastern side of the Goulburn River has been fully cleared and pasture improved and is dominated by exotic species. A northern ridge has remnant White Box grassy woodland on Basalt with evidence of past clearing resulting in a dominant shrub layer of Blackthorn (*Bursaria spinosa*) and Sticky Wallaby Bush (*Beyeria viscosa*) which has flourished due to lack of fire.

Offset Area 3 in particular has over 2 km of sandstone escarpment with numerous caves. There are also a small number of caves in Offset Area 4. Otherwise the habitat in the Offset Areas consists of woodland and forest with varying degrees of past disturbance, all with a high fuel load and large amounts of fallen timber as a consequence of lack of fire.

This Offset Area contains two threatened ecological communities namely:

- *White Box Yellow Box Blakely's Red Gum Woodland* EEC/*White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland* CEEC; and
- *Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion* VEC.

4.6 Offset Area 4

Offset Area 4 is surrounded on three sides by Goulburn River National Park, with a total area of 39 ha. Just over 7 ha has been partially cleared but still retains characteristics of White Box grassy woodland. The land is generally flat with a central incised gully system extending to the west dominated by Grey Gum/Stringybark. The flat areas are dominated by Red Ironbark/Brown Bloodwood with a small area (1.5 ha) of Western Grey Box (*Eucalyptus microparpa*).

There are low sandstone escarpments along this system. There are two unoccupied dwellings and associated sheds.

This Offset Area contains one threatened ecological community, namely *White Box Yellow Box Blakely's Red Gum Woodland* EEC/*White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland* CEEC.

4.7 Offset Area 5

Offset Area 5 is surrounded on three sides by Goulburn River National Park, with a total area of 255 ha and over 80% vegetated (with evidence of some prior clearing and timber harvesting). The Offset area consists of colluvial lower slopes surrounding an alluvial cultivated valley floor. The dominant community is Slaty Box forest with White Box mixed to varying degrees. White Box shrubby woodland is present on the northern slopes and a central alluvial valley contains Rough-barked Apple and Blakely's Red Gum.

This Offset Area contains one threatened ecological community, namely *Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion* VEC.

Three threatened flora species were recorded within Offset Area 5, namely:

- Scant Pomaderris (*Pomaderris queenslandica*) (listed as Vulnerable under the TSC Act);
- *Ozothamnus tesselatus* (listed as Vulnerable under both the TSC Act and EPBC Act); and
- *Tylophora linearis* (listed as Vulnerable under both the TSC Act and EPBC Act).

One endangered population listed under the TSC Act was recorded in Offset Area 5, namely:

- *Cymbidium canaliculatum R. Br. in the Hunter Catchment*.

5.0 CONCLUSION

Twenty vegetation communities were mapped for the study within the Offset Areas. Of these, four are considered to meet the definition of threatened ecological communities. In total, two threatened ecological communities were recorded for the study, namely:

- *White Box Yellow Box Blakely's Red Gum Woodland* EEC/CEEC; and
- *Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion* VEC.

A total of 144 flora species were recorded within the Offset Areas during surveys (including 13 introduced species). Three of the recorded flora species are listed as threatened under the TSC Act and/or EPBC Act, namely:

- Scant Pomaderris (*Pomaderris queenslandica*) (listed as Endangered under the TSC Act);
- *Ozothamnus tesselatus* (listed as Vulnerable under both the TSC Act and EPBC Act); and
- *Tylophora linearis* (listed as Vulnerable under the TSC Act and Endangered under the EPBC Act).

All three threatened flora species were recorded only in Offset Area 5.

One endangered population listed under the TSC Act was recorded in the Offset Areas (within Offset Areas 1 and 5), namely:

- *Cymbidium canaliculatum R. Br. in the Hunter Catchment*.

6.0 REFERENCES

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APPENDIX 1 Vegetation Communities Mapped for each Offset Area

Local Community	Area (ha)	PCT	BVT	PCT Name	Class	TEC
OFFSET AREA 1						
Dry sclerophyll forests (Shrub/grass formation)						
White Box Shrubby Woodland	78.5	1587	HU801	White Box - Blackthorn shrubby woodland on sandstone ranges of the Sydney Basin	North-west Slopes Dry Sclerophyll Woodlands	None
Dry sclerophyll forests (Shrubby)						
Grey Gum - Narrow-leaved Stringybark Forest	49	1629	HU843	Narrow-leaved Stringybark - Grey Gum open forest on sandstone ranges of the Sydney Basin	Western Slopes Dry Sclerophyll Forests	None
Mugga Ironbark Forest	1.5	482	HU697	Mugga Ironbark - Black Cypress Pine shrub/grass open forest of the upper Hunter Valley, mainly Sydney Basin Bioregion	Western Slopes Dry Sclerophyll Forests	None
Scribbly Gum Forest	7.5	1676	HU890	Grey Gum - Scribbly Gum - Black Pine heathy open forest on sandstone ranges of the Sydney Basin	Western Slopes Dry Sclerophyll Forests	None
Slaty Box Forest	2.5	1176	HU618	Slaty Box - Grey Gum shrubby woodland on the footslopes of the upper Hunter Valley, Sydney Basin Bioregion	Western Slopes Dry Sclerophyll Forest	TSC Act, V: Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion
Grassy Woodlands						
Blakely's Red Gum - Rough-barked Apple Woodland	32.5	1696	HU910	Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	Coastal Valley Grassy Woodlands	None
Blakely's Red Gum - Rough-barked Apple Woodland DNG	27.5	1696	HU910	Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	Coastal Valley Grassy Woodlands	None
OFFSET AREA 2						
Dry sclerophyll forests (Shrub/grass formation)						
White Box Shrubby Woodland	60	1587	HU801	White Box - Blackthorn shrubby woodland on sandstone ranges of the Sydney Basin	North-west Slopes Dry Sclerophyll Woodlands	None
White Box Shrubby Woodland DNG	113.5	1587	HU801	White Box - Blackthorn shrubby woodland on sandstone ranges of the Sydney Basin	North-west Slopes Dry Sclerophyll Woodlands	None

Local Community	Area (ha)	PCT	BVT	PCT Name	Class	TEC
Dry Sclerophyll Forests (Shrubby)						
Caley's Ironbark Woodland	40.5	1677	HU891	Caley's Ironbark - Red Ironbark - Currawang shrubby woodland on sandstone ranges of the Sydney Basin	Western Slopes Dry Sclerophyll Forest	None
Caley's Ironbark Woodland DNG	26	1677	HU891	Caley's Ironbark - Red Ironbark - Currawang shrubby woodland on sandstone ranges of the Sydney Basin	Western Slopes Dry Sclerophyll Forest	None
Grey Gum - Blue-leaved Stringybark Forest	5.5	1629	HU843	Narrow-leaved Stringybark - Grey Gum open forest on sandstone ranges of the Sydney Basin	Western Slopes Dry Sclerophyll Forests	None
Slaty Box Forest	14.5	1176	HU618	Slaty Box - Grey Gum shrubby woodland on the footslopes of the upper Hunter Valley, Sydney Basin Bioregion	Western Slopes Dry Sclerophyll Forest	TSC Act, V: Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion
Grassy Woodlands						
Blakely's Red Gum - Rough-barked Apple Woodland	115	1696	HU910	Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	Coastal Valley Grassy Woodlands	None
Blakely's Red Gum - Rough-barked Apple Woodland DNG	12.5	1696	HU910	Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter	Coastal Valley Grassy Woodlands	None
Yellow Box Woodland	3	1924	HU732	Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion	Western Slopes Grassy Woodlands	TSC Act, E: White Box Yellow Box Blakely's Red Gum Woodland (Equivalent) ; EPBC Act, CE: White Box Yellow Box Blakely's Red Gum Woodland (Equivalent)
Yellow Box Woodland DNG	26	1924	HU732	Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion	Western Slopes Grassy Woodlands	TSC Act, E: White Box Yellow Box Blakely's Red Gum Woodland (Equivalent) ; EPBC Act, CE: White Box Yellow Box Blakely's Red Gum Woodland (Equivalent)
OFFSET AREA 3						
Dry Sclerophyll Forests (Shrubby)						
Grey Myrtle Dry Rainforest	3.5	1614	HU828	Grey Gum - Grey Myrtle - Narrow-leaved Stringybark - Rusty Fig open forest on ranges of the Upper Hunter	Sydney Hinterland Dry Sclerophyll Forests	None

Local Community	Area (ha)	PCT	BVT	PCT Name	Class	TEC
Grey Gum - Blue-leaved Stringybark Forest	27.5	1629	HU843	Narrow-leaved Stringybark - Grey Gum open forest on sandstone ranges of the Sydney Basin	Western Slopes Dry Sclerophyll Forests	None
Red Ironbark - Brown Bloodwood Forest	49.5	1674	HU888	Red Ironbark - Brown Bloodwood - Black Pine heathy open forest on sandstone ranges of the Sydney Basin	Western Slopes Dry Sclerophyll Forests	None
Slaty Box Forest	18.0	1176	HU618	Slaty Box - Grey Gum shrubby woodland on the footslopes of the upper Hunter Valley, Sydney Basin Bioregion	Western Slopes Dry Sclerophyll Forest	TSC Act, V: Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion
Spinifex Woodland	1.0	1663	HU877	Tumbledown Red Gum - Spinifex grass heathy low open woodland on sandstone slopes of the Sydney Basin	Western Slopes Dry Sclerophyll Forests	None
Grassy Woodlands						
Blakely's Red Gum Woodland	5.0	510	HU681	Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	New England Grassy Woodlands	TSC Act, E: White Box Yellow Box Blakely's Red Gum Woodland (Equivalent) ; EPBC Act, CE: White Box Yellow Box Blakely's Red Gum Woodland (Equivalent)
Rough-barked Apple Forest	13.0	1696	HU981	Rough-barked Apple grassy tall woodlands of the Brigalow Belt South	Western Slopes Grassy Woodlands	None
White Box Grassy Woodland	7.0	483	HU690	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Western Slopes Grassy Woodlands	TSC Act, E: White Box Yellow Box Blakely's Red Gum Woodland (Equivalent) ; EPBC Act, CE: White Box Yellow Box Blakely's Red Gum Woodland (Equivalent)
OFFSET AREA 4						
Dry sclerophyll forests (Shrub/grass formation)						
Western Grey Box Woodland	1.5	1748	HU962	Grey Box grassy open forest of the Central and Lower Hunter Valley	Hunter-Macleay Dry Sclerophyll Forests	None
Dry sclerophyll forests (Shrubby)						
Grey Gum - Blue-leaved Stringybark Forest	3.5	1629	HU843	Narrow-leaved Stringybark - Grey Gum open forest on sandstone ranges of the Sydney Basin	Western Slopes Dry Sclerophyll Forests	None

Local Community	Area (ha)	PCT	BVT	PCT Name	Class	TEC
Red Ironbark - Brown Bloodwood Forest	26.5	1674	HU888	Red Ironbark - Brown Bloodwood - Black Pine heathy open forest on sandstone ranges of the Sydney Basin	Western Slopes Dry Sclerophyll Forests	None
Grassy Woodlands						
White Box Grassy Woodland	6.5	483	HU690	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Western Slopes Grassy Woodlands	TSC Act, E: White Box Yellow Box Blakely's Red Gum Woodland (Equivalent) ; EPBC Act, CE: White Box Yellow Box Blakely's Red Gum Woodland (Equivalent)
OFFSET AREA 5						
Dry sclerophyll forests (Shrub/grass formation)						
White Box Shrubby Woodland	19.5	1587	HU801	White Box - Blackthorn shrubby woodland on sandstone ranges of the Sydney Basin	Western Slopes Dry Sclerophyll Forests	None
Dry Sclerophyll Forests (Shrubby)						
Slaty Box Forest	171	1176	HU618	Slaty Box - Grey Gum shrubby woodland on the footslopes of the upper Hunter Valley, Sydney Basin Bioregion	Western Slopes Dry Sclerophyll Forest	TSC Act, V: Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion
Grassy Woodlands						
Rough-barked Apple Forest	27.5	1767	HU910	Rough-barked Apple grassy tall woodlands of the Brigalow Belt South	Western Slopes Grassy Woodlands	None

APPENDIX 2 Vegetation Community Descriptions

Blakely's Red Gum - Rough-barked Apple Woodland

Located on Offset Areas 1 and 2 generally in valleys and on lower slopes.

Canopy: *Eucalyptus blakelyi* and *Angophora floribunda*.

Shrubs: *Cassinia arcuata, Bursaria spinosa* subsp*. spinosa, Acacia ixiophylla* and *Melicytus dentatus*.

Grasses*:* *Microlaena stipoides* var. *stipoides, Aristida ramosa, Digitaria diffusa, Aristida vagans*, *Eragrostis leptostachya* and *Austrostipa scabra* subsp. *falcata*.

Herbs: *Hydrocotyle laxiflora, Dichondra repens, Geranium solanderi* var. *solanderi, Calotis cuneifolia, Cynoglossum australe* and *Lagenophora stipitata*.

Graminoids and Sedges: None.

Vines and twiners: *Clematis glycinoides var. glycinoides, Desmodium gunni,* and *Desmodium varians.*

Weeds: *Cirsium vulgare, Plantago lanceolata*, and *Paronychia brasiliana*.

Blakely's Red Gum - Rough-barked Apple Woodland DNG

Located on Offset Areas 1 and 2 generally in valleys and on lower slopes.

Canopy: None.

Shrubs: None.

Grasses: *Sporobolus creber, Bothriochloa decipiens* var. *decipiens, Microlaena stipoides* var. *stipoides, Aristida ramosa* and *Aristida vagans.*

Herbs: None.

Graminoids and Sedges: *Carex inversa.*

Weeds: *Hypochaeris radicata, Trifolium repens, Plantago lanceolata, Verbena bonariensis, Cerastium glomeratum, Anagallis arvensis, Hypericum perforatum, Lamium amplexicaule, Cirsium vulgare, Trifolium campestre, Conyza bonariensis* and *Echium plantagineum.*

Blakely's Red Gum Woodland

Located on Offset Area 3 on alluvium.

Canopy: *Eucalyptus blakelyi*.

Shrubs: *Acacia implexa*.

Grasses: *Microlaena stipoides* var. *stipoides* and *Austrostipa verticillata*.

Herbs: *Cotula australis, Dichondra repens, Einadia hastata, Geranium solanderi* var. *solanderi, Vittadinia sulcata,* and *Calotis lappulacea.*

Graminoids and Sedges: None.

Weeds: *Stellaria media, Echium plantagineum, Paronychia brasiliana, Hypochaeris radicata.*

Caley's Ironbark Woodland

Located on Offset Area 2 on low ridges and upper sideslopes.

Canopy: *Eucalyptus caleyi, Eucalyptus macrorhyncha, Eucalyptus macrorhyncha* x *cannonii* and *Callitris endlicheri*.

Shrubs: *Cassinia arcuata, Cassinia quinquefaria, Acacia implexa* and *Acacia ixiophylla*.

Grasses: *Microlaena stipoides* var. *stipoides, Aristida vagans, Austrostipa densiflora, Austrostipa scabra* subsp. *falcata, Eragrostis leptostachya, Rytidosperma racemosa* var. *racemosa* and *Digitaria diffusa*.

Herbs: *Goodenia hederacea* subsp. *hederacea, Calotis cuneifolia, Einadia hastata, Dichondra repens, Lagenophora stipitata, Hibbertia obtusifolia* and *Calotis lappulacea.*

Graminoids and Sedges: *Cyperus gracilis.*

Ferns: *Cheilanthes sieberi* subsp. *sieberi.*

Weeds: *Opuntia stricta* var. *stricta*.

Caley's Ironbark Woodland DNG

Located on Offset Area 2 across low valley floors.

Canopy: None.

Shrubs: *Cassinia arcuata.*

Grasses: *Aristida vagans, Aristida ramosa, Sporobolus creber, Austrostipa scabra* subsp. *falcata, Bothriochloa decipiens* var. *decipiens* and *Digitaria diffusa.*

Herbs: *Calotis cuneifolia, Microtis unifolia* and *Crassula sieberiana.*

Graminoids and Sedges: *Carex inversa.*

Weeds: *Hypochaeris radicata, Anagallis arvensis, Briza minor, Cerastium glomeratum, Hypericum perforatum, Paspalum dilatatum* and *Sonchus asper* subsp. *glaucescens.*

Grey Gum - Blue-leaved Stringybark Forest

Located on Offset Areas 2, 3, and 4 on upper sideslopes and ridgetops.

Canopy: *Eucalyptus punctata, Eucalyptus agglomerata, Angophora floribunda* and *Eucalyptus dawsonii.*

Shrubs: *Bursaria spinosa* subsp. *spinosa, Persoonia linearis, Acacia linearifolia, Cassinia quinquefaria, Podolobium ilicifolium, Zieria cytisoides, Acacia implexa, Macrozamia reducta, Pultenaea flexilis* and *Hakea dactyloides.*

Grasses: *Microlaena stipoides* var. *stipoides, Entolasia stricta* and *Poa affinis*.

Herbs: *Pomax umbellata, Solanum campanulatum, Solanum prinophyllum, Galium propinquum, Gonocarpus elatus, Opercularia hispida* and *Einadia hastata.*

Graminoids and Sedges: *Lomandra confertifolia* subsp. *rubiginosa, Lepidosperma laterale* and *Lomandra longifolia.*

Ferns: *Cheilanthes sieberi* subsp. *sieberi*.

Vines and twiners: *Clematis glycinoides* var. *glycinoides* and *Glycine clandestina*.

Weeds: None.

Grey Gum - Narrow-leaved Stringybark Forest

Located on Offset Area 1 on upper sideslopes and ridgetops.

Canopy: *Eucalyptus punctata* and *Eucalyptus sparsifolia*.

Shrubs: *Acacia linearifolia, Persoonia linearis, Leucopogon muticus* and *Podolobium ilicifolium.*

Grasses: *Microlaena stipoides* var. *stipoides.*

Herbs: *Phyllanthus hirtellus, Poranthera corymbosa* and *Wahlenbergia communis*.

Graminoids and Sedges: *Lomandra confertifolia* subsp. *rubiginosa, Lomandra filiformis* subsp. *coriacea* and *Lomandra multiflora* subsp*. multiflora.*

Ferns: None.

Vines and twiners: None.

Weeds: None.

Grey Myrtle Dry Rainforest

Located on Offset Area 3 in a deeply incised gorge system.

Canopy: *Backhousia myrtifolia, Stenocarpus salignus* and *Angophora floribunda.*

Shrubs: *Trema tomentosa* var. *aspera.*

Grasses: *Oplismenus imbecillis* and *Microlaena stipoides* var. *stipoides.*

Herbs: *Galium propinquum, Stellaria flaccida, Solanum prinophyllum, Sigesbeckia orientalis* subsp. *orientalis* and *Dichondra repens.*

Graminoids and Sedges: None.

Ferns: *Pellaea falcata, Asplenium flabellifolium, Pyrrosia rupestris* and *Cyathea cooperi.*

Vines and twiners: *Clematis glycinoides* var. *glycinoides* and *Morinda jasminoides*.

Weeds: None.

Mugga Ironbark Forest

Located on Offset Area 1 on a low ridgetop with evidence of having previously been cleared.

Canopy: *Callitris endlicheri, Eucalyptus sideroxylon* and *Brachychiton populneus* subsp. *populneus.*

Shrubs: *Acacia linearifolia, Astroloma humifusum, Cassinia quinquefaria* and *Acacia ixiophylla.*

Grasses: *Austrostipa scabra* subsp. *falcata, Digitaria diffusa, Digitaria ramularis, Aristida ramosa, Aristida vagans, Rytidosperma tenuior* and *Microlaena stipoides* var. *stipoides.*

Herbs: *Calotis cuneifolia, Solanum cinereum, Veronica plebeia, Wahlenbergia gracilis* and *Goodenia hederacea* subsp. *hederacea.*

Graminoids and Sedges: *Gahnia aspera.*

Ferns: *Cheilanthes sieberi* subsp*. sieberi.*

Vines and twiners: None.

Weeds: None.

Red Ironbark - Brown Bloodwood Forest

Located on Offset Areas 3 and 4 on ridgetops and upper sideslopes.

Canopy: *Eucalyptus fibrosa* and *Corymbia trachyphloia* subsp. *amphistomatica.*

Shrubs: *Leucopogon muticus, Acrotriche rigida, Dodonaea viscosa* subsp. *cuneata, Allocasuarina gymnanthera, Persoonia linearis, Phebalium squamulosum* subsp. *gracile, Acacia doratoxylon, Cassinia quinquefaria, Cassinia decipiens, Correa reflexa* var. *reflex* and *Macrozamia reducta.*

Grasses: *Digitaria ramularis, Microlaena stipoides* var. *stipoides* and *Cleistochloa rigida.*

Herbs: *Pomax umbellata, Phyllanthus hirtellus, Acianthus collinus, Pterostylis concinna* and *Hibbertia circumdans.*

Graminoids and Sedges: *Lomandra glauca* and *Lomandra confertifolia* subsp. *rubiginosa.*

Ferns: *Cheilanthes sieberi* subsp. *sieberi.*

Vines and twiners: None.

Weeds: None.

Rough-barked Apple Forest

Located on Offset Area 3 on alluvium.

Canopy: *Angophora floribunda.*

Shrubs: *Acacia implexa, Melicytus dentatus* and *Bursaria spinosa* subsp. *spinosa.*

Grasses: *Microlaena stipoides* var. *stipoides* and *Austrostipa verticillata.*

Herbs: *Dichondra repens, Geranium solanderi var. solanderi, Hydrocotyle laxiflora, Rumex brownii, Sigesbeckia orientalis subsp. orientalis, Einadia hastata, Cynoglossum australe, Daucus glochidiatus, Galium propinquum, Oxalis perennans, Cotula australis, Urtica incisa, Pterostylis curta, Solanum brownii, Hybanthus monopetalus, Hypericum gramineum, Plantago debilis, Ajuga australis* and *Lagenophora stipitata.*

Graminoids and Sedges: *Lomandra longifolia.*

Ferns: *Cheilanthes sieberi* subsp. *sieberi.*

Vines and twiners: *Clematis glycinoides* var. *glycinoides*.

Weeds: *Anagallis arvensis, Stellaria media, Trifolium* spp., *Hypochaeris radicata* and *Sonchus oleraceus.*

Scribbly Gum Forest

Located on Offset Area 1 in a colluvial basin.

Canopy: *Eucalyptus rossii* and *Eucalyptus punctata.*

Shrubs: *Persoonia linearis, Macrozamia reducta, Acacia linearifolia, Cassinia quinquefaria, Leucopogon muticus* and *Podolobium ilicifolium.*

Grasses: *Microlaena stipoides var. stipoides* and *Joycea pallida.*

Herbs: *Phyllanthus hirtellus, Hibbertia obtusifolia, Calotis cuneifolia* and *Poranthera microphylla.*

Graminoids and Sedges: *Lomandra confertifolia* subsp. *rubiginosa* and *Lomandra multiflora* subsp. *multiflora.*

Ferns: None.

Vines and twiners: None.

Weeds: None.

Slaty Box Forest

Located on Offset Areas 1, 2, 3 and 5 generally on upper sideslopes and end of some ridges.

Canopy: *Eucalyptus dawsonii, Eucalyptus albens* and *Callitris endlicheri.*

Shrubs: *Cassinia quinquefaria, Dodonaea viscosa* subsp. *cuneata, Acacia ixiophylla, Acrotriche rigida* and *Cassinia decipiens.*

Grasses: *Microlaena stipoides* var. *stipoides, Austrostipa scabra* subsp. *falcata, Aristida ramosa, Aristida vagans* and *Digitaria ramularis.*

Herbs: *Dichondra repens, Calotis lappulacea, Maireana enchylaenoides, Einadia hastata, Goodenia hederacea subsp. hederacea, Plantago debilis, Wahlenbergia communis, Sida corrugata, Dichondra sp. A, Calotis cuneifolia* and *Templetonia stenophylla.*

Graminoids and Sedges: *Lomandra multiflora* subsp. *multiflora* and *Lomandra filiformis* subsp. *coriacea.*

Ferns: *Cheilanthes sieberi* subsp. *sieberi.*

Vines and twiners: *Clematis glycinoides* var. *glycinoides.*

Weeds: *Opuntia stricta var. stricta* and *Anagallis arvensis.*

Spinifex Woodland

Located on Offset Area 3 on a low shelf and side slope.

Canopy: *Eucalyptus albens* and *Eucalyptus dealbata.*

Shrubs: *Dodonaea viscosa* subsp. *cuneata, Indigofera adesmiifolia, Cassinia quinquefaria, Acacia doratoxylon* and *Bursaria longisepala.*

Grasses: *Triodia scariosa* subsp. *scariosa, Dichelachne micrantha* and *Panicum effusum.*

Herbs: *Ajuga australis, Asperula conferta, Calotis lappulacea, Dichondra repens, Hybanthus monopetalus, Opercularia hispida, Solanum brownii, Brunoniella australis* and *Dianella revoluta* var. *revoluta.*

Graminoids and Sedges: None.

Ferns: *Cheilanthes distans* and *Cheilanthes sieberi* subsp. *sieberi.*

Vines and twiners: None.

Weeds: None.

Western Grey Box Woodland

Located on Offset Area 4 on level ground.

Canopy: *Eucalyptus microcarpa.*

Shrubs: *Astroloma humifusum, Daviesia genistifolia, Dodonaea triquetra, Acacia gladiiformis, Myoporum montanum* and *Dodonaea viscosa* subsp. *cuneata.*

Grasses: *Panicum effusum, Aristida vagans, Austrodanthonia* spp., *Austrostipa scabra* subsp. *falcata, Digitaria diffusa, Sporobolus creber, Aristida ramosa* and *Microlaena stipoides* var. *stipoides.*

Herbs: *Einadia hastata, Einadia nutans* subsp. *nutans, Goodenia hederacea* subsp. *hederacea, Goodenia pinnatifida, Hypericum gramineum, Oxalis perennans, Solanum cinereum, Veronica plebeia, Vittadinia sulcata, Asperula conferta, Cymbonotus lawsonianus, Daucus glochidiatus, Dichondra repens, Lagenophora stipitata, Plantago debilis, Stackhousia muricata* and *Wahlenbergia communis.*

Graminoids and Sedges: *Lomandra multiflora* subsp. *multiflora, Cyperus gracilis* and *Lomandra confertifolia* subsp. *pallida.*

Ferns: *Cheilanthes distans* and *Cheilanthes sieberi subsp. sieberi.*

Vines and twiners: *Desmodium varians* and *Glycine tabacina*.

Weeds: *Opuntia stricta* var. *stricta.*

White Box Grassy Woodland

Located on basalt ridge tops in Offset Areas 3 and 4 with evidence of past clearing.

Canopy: *Eucalyptus albens*.

Shrubs: *Cassinia arcuata, Cassinia quinquefaria, Dodonaea viscosa* subsp. *cuneata* and *Myoporum montanum*.

Grasses: *Aristida ramosa, Austrostipa scabra* subsp. *falcata* and *Microlaena stipoides*.

Herbs: *Dichondra repens, Dichondra sp. A, Cymbonotus lawsonianus, Plantago debilis, Pimelea curviflora* var. *sericea, Wahlenbergia communis*.

Graminoids and Sedges: None.

Vines and twiners: None

Weeds: *Opuntia stricta* var. *stricta*, and *Anagallis arvensis*.

White Box Shrubby Woodland

Located on sheltered sideslopes in Offset Areas 1, 2 and 5.

Canopy: *Eucalyptus albens* and *Brachychiton populneus* subsp. *populneus.*

Shrubs: *Bursaria spinosa* subsp. *spinosa, Cassinia quinquefaria, Acacia implexa, Melicytus dentatus* and *Indigofera adesmiifolia.*

Grasses: *Microlaena stipoides* var. *stipoides, Aristida ramosa, Aristida vagans* and *Rytidosperma racemosum* var. *racemosum.*

Herbs: *Dichondra repens, Hydrocotyle laxiflora, Galium propinquum, Plantago debilis, Lagenophora stipitata, Oxalis perennans, Geranium solanderi* var. *solanderi, Daucus glochidiatus, Goodenia ovata, Cymbonotus lawsonianus, Ranunculus sessiliflorus* var. *sessiliflorus, Cynoglossum australe, Hypericum gramineum, Einadia hastata, Veronica plebeia, Hibbertia pilifera, Arthropodium* sp. B and *Dichondra* sp. A.

Graminoids and Sedges: *Lomandra confertifolia* subsp. *pallida.*

Ferns: *Cheilanthes sieberi* subsp. *sieberi.*

Vines and twiners: *Clematis glycinoides* var. *glycinoides* and *Glycine clandestina.*

Weeds: *Stellaria media, Anagallis arvensis, Sonchus oleraceus* and *Cirsium vulgare.*

White Box Shrubby Woodland DNG

Located on Offset Area 2 on lower slopes and flats.

Canopy: *Eucalyptus albens.*

Shrubs: *Cassinia arcuata.*

Grasses: *Aristida ramosa, Microlaena stipoides* var. *stipoides, Aristida vagans, Bothriochloa decipiens* var. *decipiens, Austrostipa scabra* subsp. *falcata, Sporobolus creber, Eragrostis leptostachya, Chloris ventricosa, Themeda australis* and *Digitaria diffusa.*

Herbs: *Cymbonotus lawsonianus, Dichondra repens, Oxalis perennans, Hydrocotyle laxiflora* and *Geranium solanderi* var. *solanderi.*

Graminoids and Sedges: *Carex inversa* and *Lomandra confertifolia* subsp. *pallida.*

Ferns: *Cheilanthes sieberi subsp. sieberi.*

Vines and twiners: None.

Weeds: *Carthamus lanatus, Anagallis arvensis, Hypericum perforatum* and *Conyza bonariensis.*

Yellow Box Woodland

Located on Offset Area 2 on lower slopes and flats.

Canopy: *Eucalyptus melliodora.*

Shrubs: *Bursaria spinosa* subsp*. spinosa* and *Cassinia arcuata.*

Grasses: *Aristida ramosa, Microlaena stipoides* var. *stipoides* and *Themeda australis.*

Herbs: *Dichondra repens, Hydrocotyle laxiflora, Asperula conferta, Galium propinquum, Geranium solanderi* var. *solanderi, Lagenophora stipitata* and *Cymbonotus lawsonianus.*

Graminoids and Sedges: *Lomandra confertifolia* subsp. *pallida.*

Ferns: *Cheilanthes sieberi* subsp*. sieberi.*

Vines and twiners: None.

Weeds: *Cirsium vulgare.*

Yellow Box Woodland DNG

Located on Offset Area 2 on lower slopes and flats.

Canopy: *Eucalyptus melliodora.*

Shrubs: *Cassinia arcuata.*

Grasses: *Aristida ramosa, Aristida vagans, Eragrostis leptostachya, Sporobolus creber* and *Themeda australis.*

Herbs: *Asperula conferta, Cymbonotus lawsonianus, Daucus glochidiatus, Oxalis perennans, Pterostylis bicolor* and *Geranium solanderi* var. *solanderi.*

Graminoids and Sedges: Carex inversa.

Ferns: *Cheilanthes sieberi* subsp. *sieberi.*

Vines and twiners: None.

Weeds: *Carthamus lanatus, Plantago lanceolata, Briza minor, Cirsium vulgare, Romulea rosea* var. *australis* and *Hypochaeris radicata.*

APPENDIX 3 Floristic List for all Offset Areas

Family and Scientific Name	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5
Acanthaceae					
Brunoniella australis			✓		
Adiantaceae					
Cheilanthes distans			✓		
Cheilanthes sieberi subsp. sieberi	✓	✓	✓	✓	✓
Pellaea falcata			✓		
Aizoaceae					
Tetragonia tetragonioides			✓		
Anthericaceae					
Thysanotus patersonii		✓		✓	✓
Apiaceae					
Daucus glochidiatus		✓	✓	✓	✓
Hydrocotyle laxiflora	✓	✓			✓
Apocynaceae					
Tylophora linearis					✓
Asteraceae					
**Bidens pilosa*			✓		
**Carthamus lanatus*		✓			
**Cirsium vulgare*	✓	✓			
**Sonchus oleraceus*			✓		✓
Calotis cuneifolia	✓	✓			
Calotis lappulacea	✓	✓	✓		✓
Cassinia arcuata		✓		✓	
Cassinia decipiens			✓		
Cassinia quinquefaria	✓	✓	✓	✓	✓
Cotula australis			✓		
Cymbonotus lawsonianus		✓	✓	✓	
**Hypochaeris radicata*	✓	✓			✓
Lagenophora stipitata	✓	✓	✓	✓	
Ozothamnus tesselatus					✓
Sigesbeckia australiensis			✓		✓
Sigesbeckia orientalis subsp. orientalis			✓		
Vittadinia sulcata			✓		
Boraginaceae					
**Echium plantagineum*			✓		
Cynoglossum australe	✓				✓
Cactaceae					
**Opuntia stricta var. stricta*	✓		✓	✓	✓
Campanulaceae					
Wahlenbergia communis		✓	✓	✓	
Caryophyllaceae					
Stellaria flaccida	✓		✓		✓
**Stellaria media*			✓		

Family and Scientific Name	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5
Casuarinaceae					
Allocasuarina gymnanthera				✓	
Chenopodiaceae					
Einadia hastata	✓	✓	✓		✓
Maireana enchylaenoides					✓
Chloanthaceae					
Spartothamnella juncea			✓		
Clusiaceae					
**Hypericum perforatum*	✓	✓			
Hypericum gramineum					✓
Convolvulaceae					
Dichondra repens	✓	✓	✓	✓	✓
Dichondra sp. A		✓	✓	✓	
Cupressaceae					
Callitris endlicheri		✓			✓
Cyperaceae					
Carex inversa	✓	✓			
Gahnia aspera	✓	✓	✓	✓	✓
Dilleniaceae					
Hibbertia obtusifolia	✓				
Ericaceae (Styphelioideae)					
Acrotriche rigida			✓	✓	✓
Astroloma humifusum	✓				
Leucopogon muticus	✓		✓	✓	
Euphorbiaceae					
Phyllanthus hirtellus	✓		✓		
Poranthera corymbosa	✓				
Fabaceae (Faboideae)					
Desmodium varians		✓			
Glycine clandestina	✓	✓			
Glycine tabacina	✓	✓			✓
Hardenbergia violacea	✓				
Indigofera adesmiifolia			✓		✓
Medicago sp.			✓		
Podolobium ilicifolium	✓				
Swainsona galegifolia		✓			
Fabaceae (Mimosoideae)					
Acacia crassa subsp. crassa			✓		
Acacia doratoxylon			✓		
Acacia implexa	✓	✓	✓	✓	✓
Acacia ixiophylla		✓			✓
Acacia linearifolia	✓		✓		

Family and Scientific Name	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5
Geraniaceae					
Geranium solanderi var. solanderi	✓	✓	✓		✓
Goodeniaceae					
Goodenia hederacea subsp. hederacea		✓			✓
Goodenia ovata					✓
Goodenia pinnatifida				✓	
Haloragaceae					
Gonocarpus elatus			✓		
Lamiaceae					
Ajuga australis			✓		
Lamium amplexicaule			✓		
Mentha satureioides					✓
Lomandraceae					
Lomandra confertifolia subsp. pallida	✓	✓			
Lomandra confertifolia subsp. rubiginosa	✓		✓	✓	
Lomandra filiformis subsp. coriacea	✓			✓	
Lomandra glauca			✓	✓	
Lomandra multiflora subsp. multiflora	✓	✓	✓	✓	✓
Loranthaceae					
Amyema miquelii	✓				✓
Malvaceae					
Hibiscus sturtii var. sturtii					✓
Myoporaceae					
Myoporum montanum				✓	
Myrsinaceae					
**Anagallis arvensis*	✓	✓	✓	✓	✓
Myrtaceae					
Angophora floribunda	✓	✓	✓		✓
Backhousia myrtifolia			✓		
Corymbia trachyphloia subsp. amphistomatica			✓	✓	
Eucalyptus agglomerata			✓		
Eucalyptus albens	✓	✓	✓	✓	✓
Eucalyptus blakelyi		✓	✓		
Eucalyptus crebra				✓	
Eucalyptus dawsonii			✓		✓
Eucalyptus fibrosa			✓	✓	
Eucalyptus punctata	✓		✓	✓	
Eucalyptus rossii	✓				
Eucalyptus sparsifolia	✓				
Oleaceae					
Notelaea microcarpa var. microcarpa			✓		
Orchidaceae					
Acianthus collinus				✓	

Family and Scientific Name	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5
Cymbidium canaliculatum	✓				✓
Pterostylis concinna				✓	
Oxalidaceae					
Oxalis perennans	✓	✓	✓	✓	✓
Pittosporaceae					
Bursaria spinosa subsp. spinosa	✓	✓	✓	✓	✓
Plantaginaceae					
**Plantago lanceolata*	✓				
Plantago debilis		✓	✓	✓	✓
Poaceae					
**Briza minor*		✓			
Aristida ramose	✓	✓	✓	✓	V
Aristida vagans	✓	✓		✓	
Austrostipa scabra subsp. falcata		✓	✓	✓	✓
Austrostipa verticillata			✓		
Bothriochloa decipiens var. decipiens	✓	✓			
Dichelachne micrantha		✓		✓	
Digitaria brownie	✓				
Digitaria diffusa	✓	✓			
Digitaria ramularis			✓	✓	
Eragrostis leptostachya		✓			
Microlaena stipoides var. stipoides	✓	✓	✓	✓	✓
Oplismenus imbecillis			✓		
Poa affinis			✓		
Rytidosperma racemosum var. racemosum	✓	✓			
Sporobolus creber	✓	✓			
Themeda australis		✓			
Polygonaceae					
Rumex brownie	✓		✓		✓
Proteaceae					
Hakea dactyloides				✓	
Persoonia linearis	✓		✓	✓	
Stenocarpus salignus			✓		
Ranunculaceae					
Clematis glycinoides var. glycinoides	✓	✓	✓		✓
Ranunculus sessiliflorus var. sessiliflorus	✓				✓
Rhamnaceae					
Pomaderris queenslandica					✓
Rosaceae					
Acaena echinata					✓
Rubiaceae					
Asperula conferta			✓	✓	
Galium propinquum	✓	✓	✓		✓

Family and Scientific Name	Offset Area 1	Offset Area 2	Offset Area 3	Offset Area 4	Offset Area 5
Pomax umbellate			✓	✓	
Rutaceae					
Correa reflexa var. reflexa			✓	✓	
Phebalium squamulosum subsp. gracile			✓		
Sapindaceae					
Dodonaea triangularis				✓	
Dodonaea viscosa subsp. cuneata			✓	✓	✓
Scrophulariaceae					
Veronica plebeian	✓			✓	
Solanaceae					
Solanum brownie			✓		✓
Solanum campanulatum			✓		
Solanum cinereum	✓		✓		
Solanum prinophyllum			✓	✓	
Sterculiaceae					
Brachychiton populneus subsp. populneus	✓				
Thymelaeaceae					
Pimelea curviflora var. sericea				✓	
Ulmaceae					
Trema tomentosa var. aspera			✓		
Urticaceae					
Urtica incise			✓		
Verbenaceae					
**Verbena bonariensis*	✓				
Violaceae					
Hybanthus monopetalus			✓		✓
Melicytus dentatus		✓			✓
Zamiaceae					
Macrozamia reducta	✓			✓	
Total Species	**61**	**52**	**81**	**49**	**52**

*indicates weed species

ATTACHMENT H
WILPINJONG EXTENSION PROJECT TERRESTRIAL FAUNA BASELINE REPORT (POTENTIAL OFFSET AREAS)

WILPINJONG EXTENSION PROJECT

TERRESTRIAL FAUNA BASELINE REPORT (POTENTIAL OFFSET AREAS)

A report by Biodiversity Monitoring Services, November 2015

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EXECUTIVE SUMMARY

The Wilpinjong Extension Project (the Project) is a proposed extension of open cut operations at the Wilpinjong Coal Mine, located approximately 40 kilometres north-east of Mudgee, New South Wales (NSW).

This report provides information about fauna and habitat use within five potential biodiversity offset areas for the Project, with a particular emphasis on the terrestrial vertebrate fauna located during fauna surveys.

The surveys were undertaken over 10 days during April and May 2015 (autumn) and over six days in September 2015 (spring). A total of 24 survey sites were established within the five Survey Areas. Survey techniques included call broadcasting, spotlighting, harp traps, Anabat recording, bird surveys and herpetological searches.

A total of 108 native bird (plus one introduced), 26 native mammal (plus nine introduced), 10 reptile and two amphibian species were located within the Survey Areas. A total of 15 threatened species listed under the NSW *Threatened Species Conservation Act, 1995* were located within the Survey Areas, namely, the:

- Brown Treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*);
- Diamond Firetail (*Stagonopleura guttata*);
- Little Lorikeet (*Glossopsitta pusilla*);
- Black-chinned Honeyeater (eastern subspecies) (*Melithreptus gularis gularis)*;
- Speckled Warbler (*Chthonicola sagittata*);
- Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*);
- Varied Sittella (*Daphoenositta chrysoptera*);
- Sooty Owl (*Tyto tenebricosa*);
- Powerful Owl (*Ninox strenua)*;
- Squirrel Glider (*Petaurus norfolcensis*);
- Koala (*Phascolarctos cinereus*);
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*);
- Large-eared Pied Bat (*Chalinolobus dwyeri*);
- Corben's/South-eastern Long-eared Bat (*Nyctophilus corbeni*); and
- Eastern Cave Bat (*Vespadelus troughtoni*).

The Koala, Corben's/South-eastern Long-eared Bat and Large-eared Pied Bat are also listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999*. In addition to the above, there are a number of threatened species records in the vicinity of the Survey Areas from various databases and previous studies (e.g. the Regent Honeyeater [*Anthochaera phrygia*]).

1 INTRODUCTION

The Wilpinjong Extension Project (the Project) is located approximately 40 kilometres (km) north-east of Mudgee, New South Wales (NSW) (**Figure 1**). The Project is a proposed extension of open cut operations at the existing Wilpinjong Coal Mine (**Figure 2**).

The primary objective of this report is to provide the results of surveys across five potential biodiversity offset areas for the Project (**Figure 2**). Although the emphasis is on those species listed as threatened under the NSW *Threatened Species Conservation Act, 1995* (TSC Act) and Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act), populations of all terrestrial vertebrates relevant to the Project are documented and biodiversity values for each fauna group and Survey Area are evaluated.

The potential biodiversity offset areas are located in the western extent of the Hunter Local Land Services area and the north-western extent of the Sydney Basin Interim Biogeographic Regionalisation for Australia (IBRA) Bioregion, Kerrabee IBRA Sub-region (Thackway and Cresswell, 1995; Commonwealth Department of the Environment [DotE], 2015).

Two of the potential biodiversity offset areas boarder Munghorn Gap Nature Reserve (potential biodiversity offset areas 1 and 2) and the other three border Goulburn River National Park (potential biodiversity offset areas 3, 4 and 5) (**Figure 2**).

Due to the low annual rainfall, dry sclerophyll eucalypt forest is the dominant vegetation form in the potential biodiversity offset areas. Much of the cleared grazing lands are generally referred to as derived native grasslands.

Source: NSW Land & Property Information (2015); NSW Dept of Industry (2015; Geoscience Australia (2011)

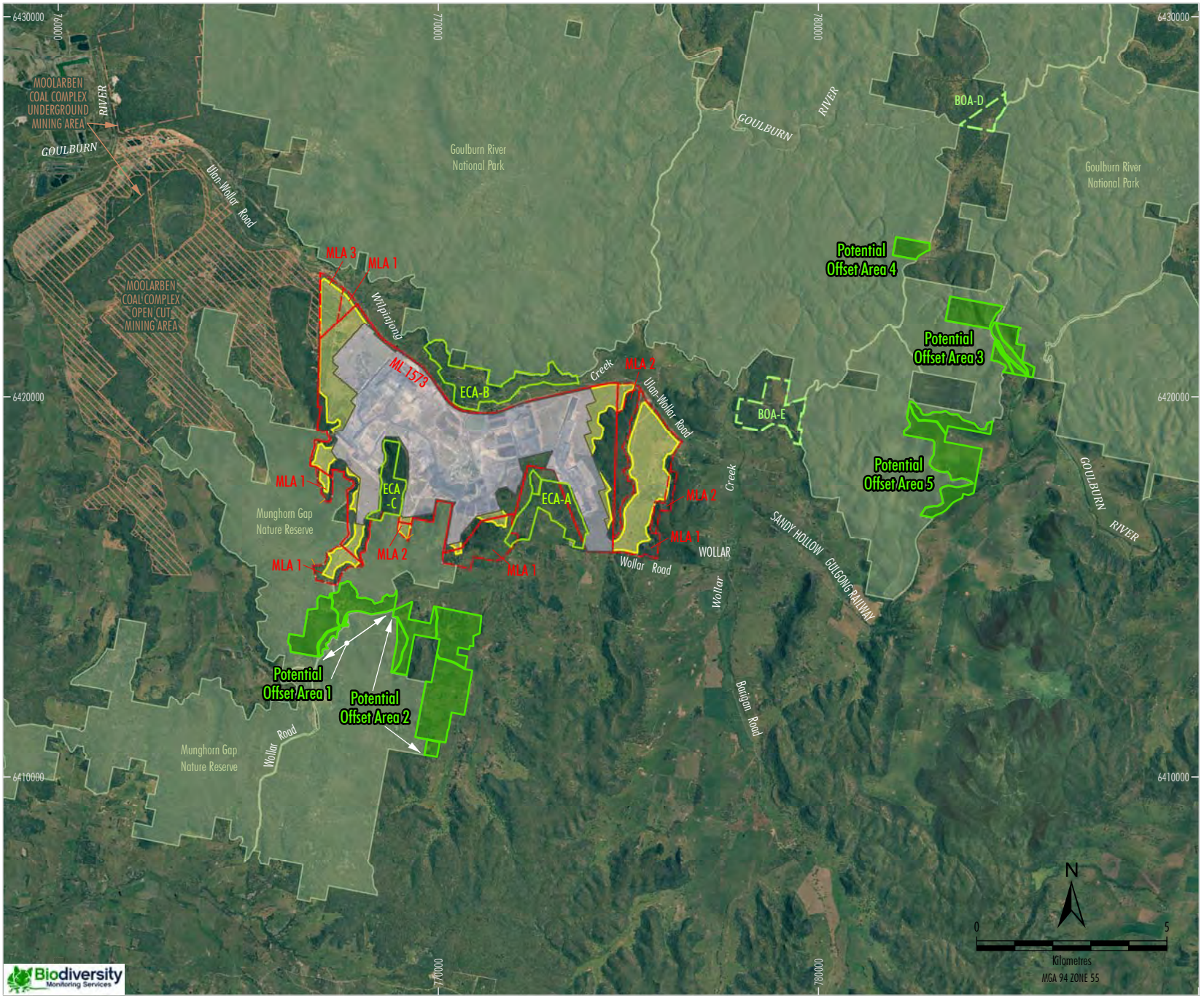
WIL-12-12_WEP_EIS_Fauna Offset_203A

Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Regional Location

Figure 1



LEGEND

- Mining Lease Boundary
- Mining Lease Application Boundary
- Approved/Existing Open Cut and Contained Infrastructure Area
- Proposed Open Cut Extension Area
- Enhancement and Conservation Area
- Existing Biodiversity Offset Area
- Potential Offset Area
- National Park/Nature Reserve

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (Jun 2015, 2011)

Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Locations of the Potential Offset Areas

Figure 2

WIL-12-12_WEP_EIS_Fauna Offset_205A

2 METHODOLOGY

2.1 Approach

Surveys were undertaken over 10 days during April and May 2015 and over six days in September 2015 (spring). The surveys were designed to target threatened fauna species listed under the TSC Act and EPBC Act with potential to occur in the vicinity of the Project (**Table 1**).

Table 1: Threatened Species Targeted During the Survey

Species	Conservation Status[1]	
	TSC Act	EPBC Act
Birds		
Square-tailed Kite (*Lophoictinia isura*)	V	-
Little Eagle (*Hieraaetus morphnoides*)	V	-
Glossy Black-Cockatoo (*Calyptorhynchus lathami*)	V	-
Gang-gang Cockatoo (*Callocephalon fimbriatum*)	V	-
Little Lorikeet (*Glossopsitta pusilla*)	V	-
Swift Parrot (*Lathamus discolour*)	V	V
Turquoise Parrot (*Neophema pulchella*)	V	-
Masked Owl (*Tyto novaehollandiae*)	V	-
Powerful Owl (*Ninox strenua*)	V	-
Brown Treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*)	V	-
Speckled Warbler (*Chthonicola sagittata*)	V	-
Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*)	V	-
Varied Sittella (*Daphoenositta chrysoptera*)	V	-
Diamond Firetail (*Stagonopleura guttata*)	V	-
Black-chinned Honeyeater (eastern subspecies) (*Melithreptus gularis gularis*)	V	-
Regent Honeyeater (*Anthochaera phrygia*)	CE	CE
Painted Honeyeater (*Grantiella picta*)	V	V
Hooded Robin (south-eastern form) (*Melanodryas cucullata cucullata*)	V	-
Scarlet Robin (*Petroica boodang*)	V	-
Flame Robin (*Petroica phoenicea*)	V	-
Mammals		
Koala (*Phascolarctos cinereus*)	V	V
Brush-tailed Rock-wallaby (*Petrogale penicillata*)	E	V
Squirrel Glider (*Petaurus norfolcensis*)	V	-
Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*)	V	-
Eastern Freetail-bat (*Mormopterus norfolkensis*)	V	-
Corben's Long-eared Bat (*Nyctophilus corbeni*)	V	V
Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)	V	-
Little Bentwing-bat (*Miniopterus australis)*	V	-
Eastern Bentwing-bat (*Miniopterus schreibersii oceansis*)	V	-
Large-eared Pied Bat (*Chalinolobus dwyeri*)	V	V
Eastern Cave Bat (*Vesoadelus troughtoni*)	V	-

[1] As listed under the TSC Act and EPBC Act (at November 2015).

The five potential offset areas were treated as five separate Survey Areas (**Figures 3a and 3b**). The activities undertaken during the survey period (on each date) are listed in **Table 2**.

Table 2: Activities Undertaken During the Survey

Date	Survey Area	Activity
15.04.15	2	• General observation. • Spotlighting. • Call detection and playback.
16.04.15	1	• General observation.
18.04.15	3 and 4	• Site inspection. • General observation.
12.05.15	2	• Harp trap. • Bat call detection. • General observation. • Targeted searches.
13.05.15	2	• Harp trap. • Bat call detection. • General observation. • Spotlighting. • Call detection and playback. • Targeted searches. • Cave inspection.
14.05.15	1	• Harp trap. • Bat call detection. • General observation. • Targeted searches. • Cave inspection. • Spotlighting.
15.05.15	1	• Harp trap. • Bat call detection. • General observation. • Targeted searches. • Broad-headed Snake search.
16.05.15	3	• Harp trap. • Bat call detection. • General observation. • Targeted searches. • Call detection and playback. • Spotlighting. • Cave inspection.
17.05.15	3 and 4	• Harp trap. • Bat call detection. • General observation. • Targeted searches. • Call detection and playback. • Spotlighting. • Cave inspection.
18.05.15	4	• Harp trap. • Bat call detection. • General observation.
20.09.15	5	• General observation
21.09.15	5	• Harp trap. • Bat call detection. • Habitat. • General observation.

Table 2: Activities Undertaken During the Survey (Continued)

Date	Survey Area	Activity
22.09.15	5	• Harp trap. • Bat call detection, • Habitat. • General observation.
23.09.15	5	• Harp trap. • Bat call detection. • Habitat. • General observation.
24.09.15	3	• Harp trap. • Bat call detection. • Habitat. • General observation.
25.09.15	3 & 5	• General observation.

2.2 Survey Areas

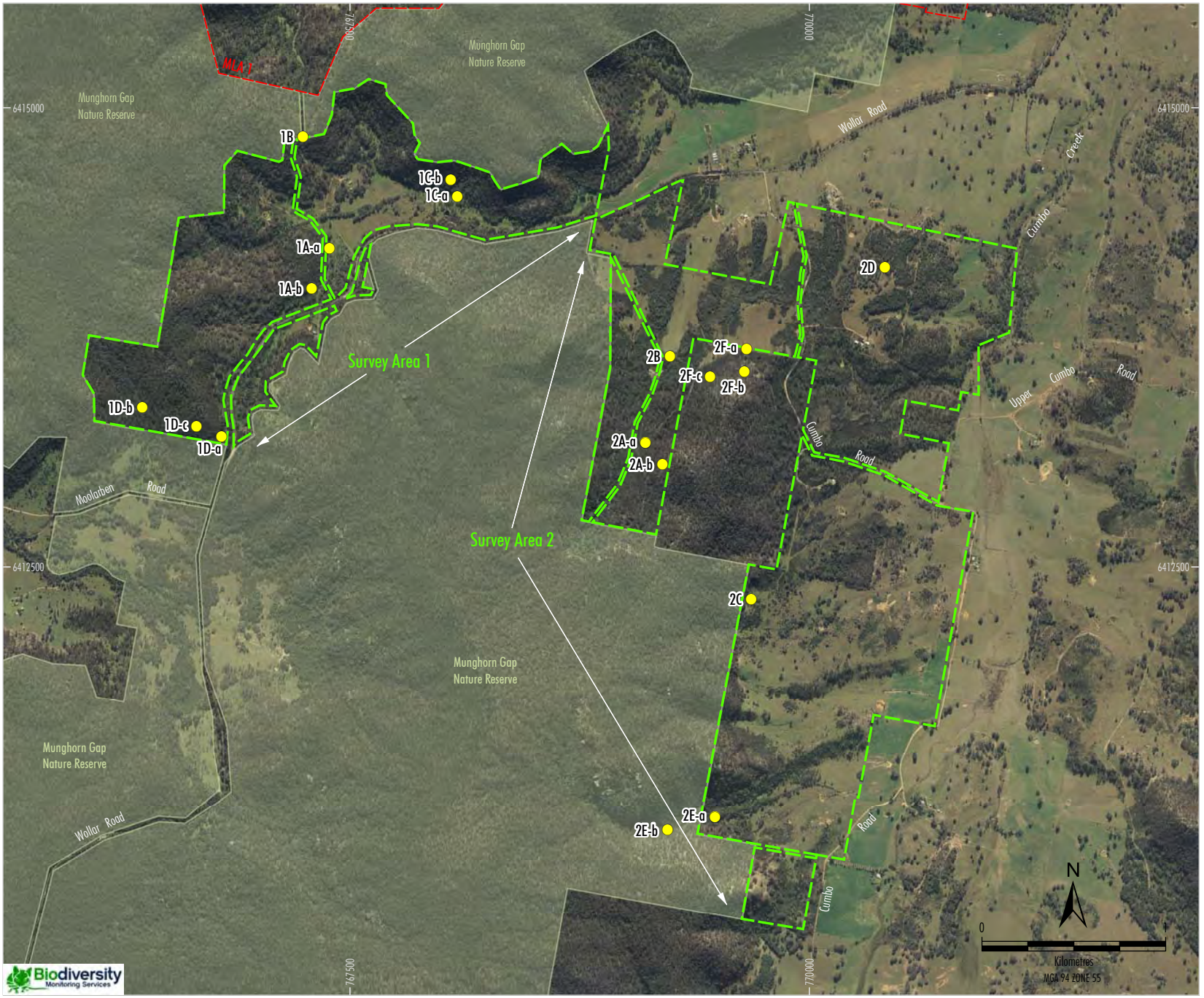
The five Survey Areas are within the Kerrabee IBRA Sub-region of the Hunter/Central Rivers Catchment Management Area. Survey Areas 1 and 2 are located south of the existing Wilpinjong Coal Mine, with access from Wollar and Cumbo Roads, and are bounded by Munghorn Gap Nature Reserve (**Figure 3a**). Survey Areas 3, 4 and 5 (**Figure 3b**) are to the north of the Village of Wollar, with access from Ringwood and Mogo Roads, and bounded by Goulburn River National Park.

2.2.1 Survey Area 1

Survey Area 1 (**Figure 3a**) adjoins Munghorn Gap Nature Reserve and includes a partly wooded hill that is well covered. The remainder of the area consists of cleared land used for grazing. There are two dwellings in the area, and Wollar Road passes along the eastern edge. The natural habitat within Survey Area 1 is in good condition and directly links with Munghorn Gap Nature Reserve. Survey Area 1 covers an area of approximately 205 hectares (ha).

2.2.2 Survey Area 2

Survey Area 2 is also on the edge of Munghorn Gap Nature Reserve (**Figure 3a**). Approximately half of the area is cleared for housing and grazing. Survey Area 2 contains a gully in which White Box (*Eucalyptus albens*) was recorded, and steep hills with cliff-lines and caves. Cumbo Road passes through and along the edge of the area. Survey Area 2 covers an area of approximately 525 ha.



LEGEND

- Mining Lease Application Boundary
- Survey Area
- Nature Reserve
- Fauna Survey Site

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (Jun 2014)

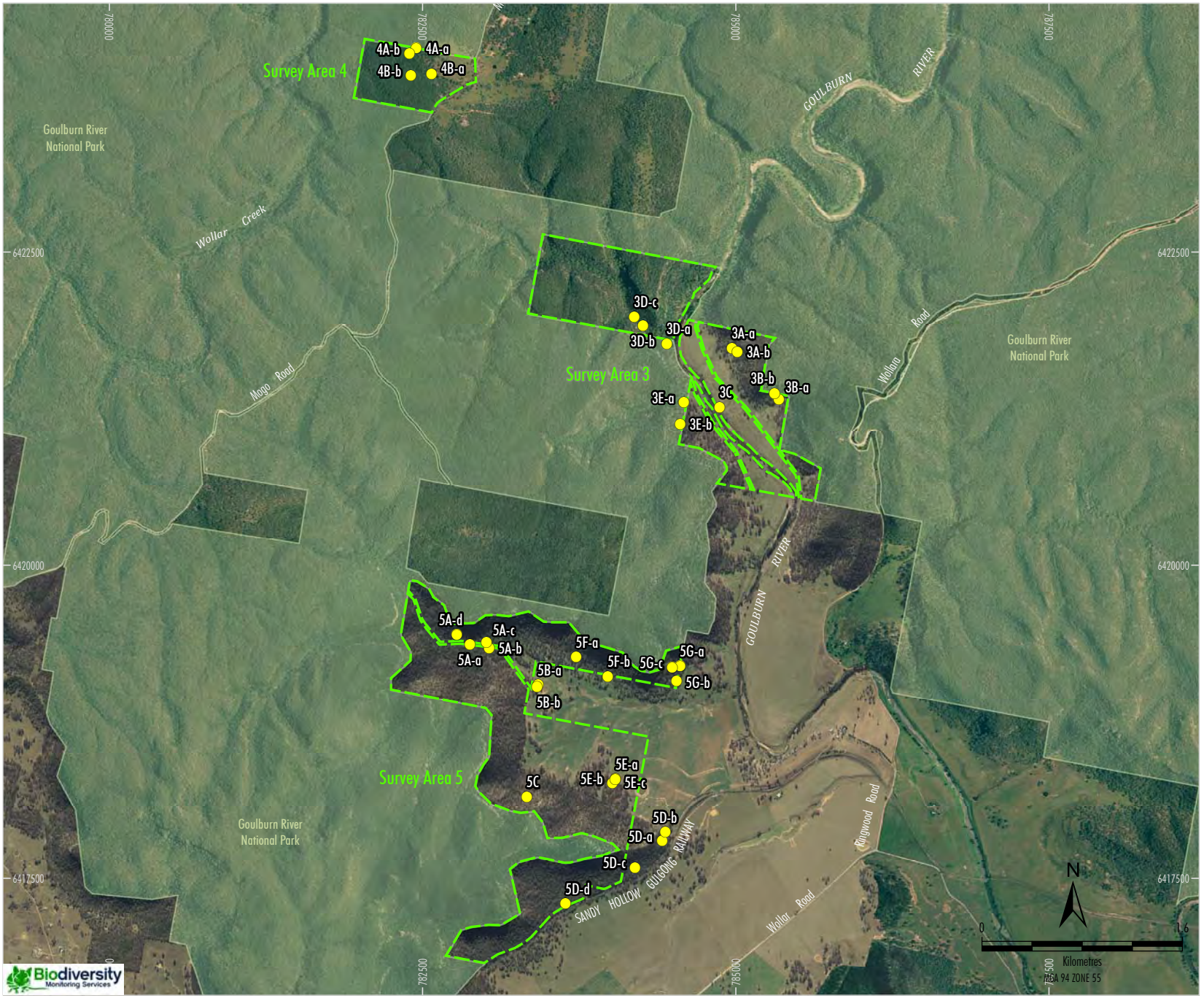
Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Fauna Survey Sites - Survey Areas 1 and 2

Figure 3a

WIL-12-12_WEP_EIS_Fauna Offset_202A



LEGEND

- Survey Area
- National Park
- Fauna Survey Site

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (2011)

Biodiversity Monitoring Services

Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Fauna Survey Sites -
Survey Areas 3, 4 and 5

Figure 3b

WIL-12-12_WEP_EIS_Fauna Offset_206A

2.2.3 Survey Area 3

Survey Area 3 (**Figure 3b**) is surrounded by Goulburn River National Park and contains a series of cliff-lines with caves and overhangs along its eastern edge and in the northern section. Goulburn River passes through this area. Although partly cleared and still used for grazing, the natural habitats are in good condition. Survey Area 3 covers an area of approximately 175 ha.

2.2.4 Survey Area 4

Survey Area 4 (**Figure 3b**) is also surrounded by Goulburn River National Park. The area contains a number of dwellings in the eastern quarter. The remainder of the area is covered by woodland and contains a gully with steep sides. This Survey Area is the smallest of the Survey Areas and covers an area of approximately 35 ha.

2.2.5 Survey Area 5

Survey Area 5 (**Figure 3b**) is located south of Offset Area 3 and is part of Wollara Downs property. This area is partly cleared and used for cropping and cattle, covering an area of approximately 260 ha. There are steep-sided hills in the northern, southern and western parts of the area. The clifflines associated with these hills are outside the boundaries of the offset area but there are still areas containing overhangs and outcrops.

2.3 Techniques

Survey effort was stratified across the five Survey Areas (**Figures 3a and 3b**). The Survey Areas cover a large area (approximately 1,160 ha), and the five individual Survey Areas are widely separated. Consequently, direct survey techniques were predominately used during the surveys (i.e. visual surveys, call recognition, harp trapping) with indirect survey techniques used where possible (i.e. Anabat recording and scratch, track and scat recognition).

A summary of the survey techniques utilised during the surveys to target specific fauna groups is provided in **Table 3**. The survey techniques are consistent with the:

- *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities Working Draft* (Department of Environment and Conservation [DEC], 2004),

- *Survey Guidelines for Australia's threatened bats: Guidelines for detecting bats listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999* (SEWPaC, 2010a); and
- *Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999* (Department of Sustainability, Environment, Water, Population and Communities [SEWPaC], 2010b).

Table 3: Survey Techniques Targeting Each Fauna Group During Surveys

Fauna Group	Survey Techniques
Reptiles	• Herpetological searches.
Arboreal Mammals	• Call detection and playback. • Spotlighting. • Opportunistic observations (including searches for scratches and scats associated with Koalas).
Bats	• Harp traps. • Bat call detection.
Birds	• Point counts. • Targeted searches. • Call detection and playback. • Opportunistic observations.
Amphibians	• Spotlighting. • Herpetological searches.

Spotlighting

Spotlighting from a moving vehicle was undertaken along tracks within the Survey Areas. Spotlighting was conducted at all sites.

Bird Surveys

In addition to the results obtained from general observations and spotlighting, listening and observing periods were undertaken at all sites. A 30 minute search was used where the observer walked around each site, as well as observing and listening for calls from a single point (point surveys). Where possible, up to four periods of observation were undertaken (two in the morning and two in the late afternoon) at each site. Bird calls were recognised using the Morcombe Birds of Australia app and bird calls were broadcast using the same app.

The timing of the surveys (April/May and September 2015) coincided with the flowering of several species of eucalypts, particularly White Box. These trees were targeted due to their potential to provide habitat for winter migratory birds such as the Regent Honeyeater (*Anthochaera phrygia*) and Swift Parrot (*Lathamus discolor*). Effort was focused on detecting the Regent Honeyeater and Swift Parrot within suitable flowering eucalypt communities.

Call Detection and Playback for Marsupials and Nocturnal Birds

Calls of several species of arboreal marsupials and nocturnal birds were broadcast during the night. Calls were broadcast through a megaphone for approximately five minutes, with a 10 minute listening time.

Calls from the Koala (*Phascolarctos cinereus*), Squirrel Glider (*Petaurus norfolcensis*), Yellow-bellied Glider (*Petaurus australis*), Bush Stone-curlew (*Burhinus grallarius*), Powerful Owl (*Ninox strenua*), Masked Owl (*Tyto novaehollandiae*) and Barking Owl (*Ninox connivens*), were broadcast.

Herpetological Searches

Systematic searches for reptiles and amphibians were undertaken within each habitat type at each survey site. Litter was raked and rocks and logs turned over. One hundred logs and/or rocks were turned over in sites 1A, 2D, 2E and 2F (**Figure 3a**). No herpetological searches were undertaken at Survey Areas 3, 4 and 5, in preference of other survey techniques. Loose bark was prised from the trunks of dead trees. Each search took approximately 30 minutes and was repeated at each site.

Searches for amphibians took place at night using spotlights (particularly after the one day of rain) and recognition of characteristic calls. Spotlighting searches were also undertaken for reptiles, particularly in areas of rock.

Bat Call Detection

An Anabat II Bat Detector with a Compact Flash Storage ZCAIM was placed at Sites 1A, 1D, 2A, 2B, 2C, 3A, 3C, 3D, 4A, 4B, 5A, 5B, 5D, 5E and 5G for one night and at site 1B for two nights (**Figures 3a and 3b**), recording all bat calls. Bat calls were analysed by Andrew Lothian (Biodiversity Monitoring Services) and by Glenn Hoye (Fly By Night Bat Surveys Pty Ltd).

Harp Traps

Harp traps usually consist of a 1.8 metre square frame made of aluminium mounted on adjustable legs. Monofilament fishing line is strung vertically in the frame in two banks, with the lines 2.5 centimetres (cm) apart and the banks separated by 10 cm.

Below the bottom of the frame is a canvas catch bag lined with plastic. Traps are usually placed in vegetation corridors, over water tanks, and at cave or mine entrances. Bats fly into the fishing lines and slide down into the catch bag from which they cannot escape. Harp traps were placed within sites 1A, 1D, 3B, 3E, 4B, 5A, 5B, 5D, 5E and 5G for one night and at site 2A for two nights (**Figures 3a and 3b**).

Several caves were visually inspected within sites 1c, 2E, 2F, 3A, 3D, 5A, 5B, 5D, 5F and 5G.

Opportunistic Observations and Scat Analysis

Any sightings of fauna were recorded whilst moving throughout the Survey Areas (Visual Encounter/Direct Observation) and located using a Global Positioning System. Any scats and owl casts were collected and identified, and their contents analysed. Burrows and nests observed were noted and identified, where possible.

2.4 Survey Effort

The survey timing and activities undertaken at each site during the survey period is provided in **Table 2**. **Table 4** provides a breakdown of the survey effort at each survey site. At least two days were spent in each Survey Area surveying for fauna. As much of each area was traversed on foot as possible with an emphasis on woodland and cliff-line habitats.

Table 4: Survey Effort at Each Survey Site

Site	Harp Trap	Rock/Log Turning	Cave Inspection
1A (a, b)	1 night	100 rocks	-
1B	-	-	-
1C (a, b)	-	-	1 day
1D (a, b, c)	1 night	-	-
2A (a, b)	2 nights	-	-
2B	-	-	-
2C	-	-	-
2D	-	100 rocks	-
2E (a, b)	-	100 rocks	1 day
2F (a, b, c)	-	100 rocks	1 day
3A (a, b)	-	-	1 day
3B (a, b)	1 night	-	-
3C	-	-	-
3D (a, b, c)	-	1 night	1 day
4A (a, b)	-	-	-
4B (a, b)	1 night	-	-
5A (a, b, c, d)	1 night	1 night	1 day
5B (a, b)	1 night	1 night	1 day
5C	-	-	-
5D	1 night	1 night	1 day
5E (a, b, c)	1 night	1 night	-
5F (a, b)	-	-	1 day
5G (a, b, c)	1 night	1 night	1 day

3 RESULTS

3.1 Fauna Located

A total of 108 native bird (plus one introduced), 26 native mammals (plus nine introduced), 10 reptile and two amphibian species were located within the Survey Areas. **Appendix A** lists the species located in each Survey Area. There was sufficient data obtained for birds and native mammals to calculate biodiversity indices for each Survey Area and the results are given in **Table 5**.

Table 5: Biodiversity Indices for Fauna Groups in the Survey Areas

Offset Area	Evenness	Simpsons Index of Diversity	Number	Species Richness
Area 1 Birds	0.876	0.958	351	51
Area 1 Mammals	0.608	0.57	34	7
Area 2 Birds	0.825	0.95	983	68
Area 2 Mammals	0.637	0.669	87	10
Area 3 Birds	0.83	0.925	253	34
Area 3 Mammals	0.454	0.487	88	8
Area 4 Birds	0.865	0.941	158	36
Area 4 Mammals	0.774	0.5	4	2
Area 5 Birds	0.848	0.959	635	80
Area 5 Mammals	0.388	0.337	106	7
Overall Birds	0.821	0.965	3256	111
Overall Mammals	0.443	0.483	410	12
Overall Mammals Less Kangaroos	0.715	0.766	121	11

There is some variation in the bird species richness between the five Survey Areas, as shown in **Figure 4**, and this is possibly due to variation in the area sizes and extent and variety of habitats.

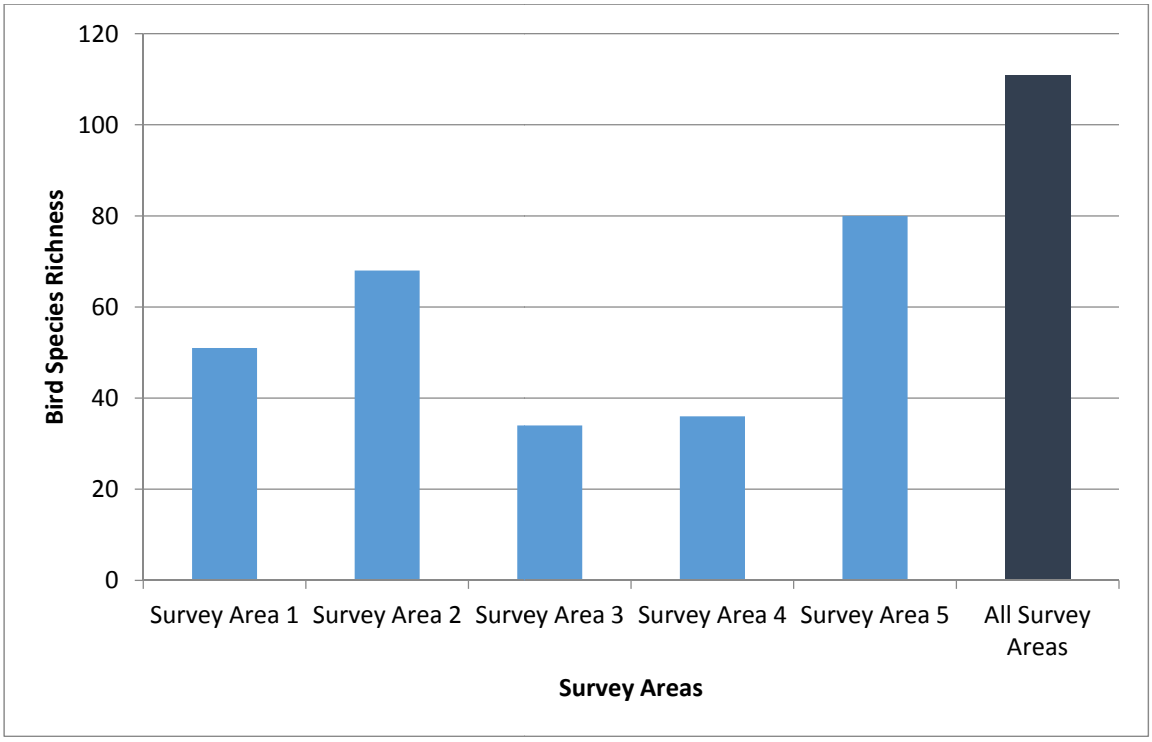


Figure 4: Bird Species Richness in Survey Areas

3.2 Threatened Species

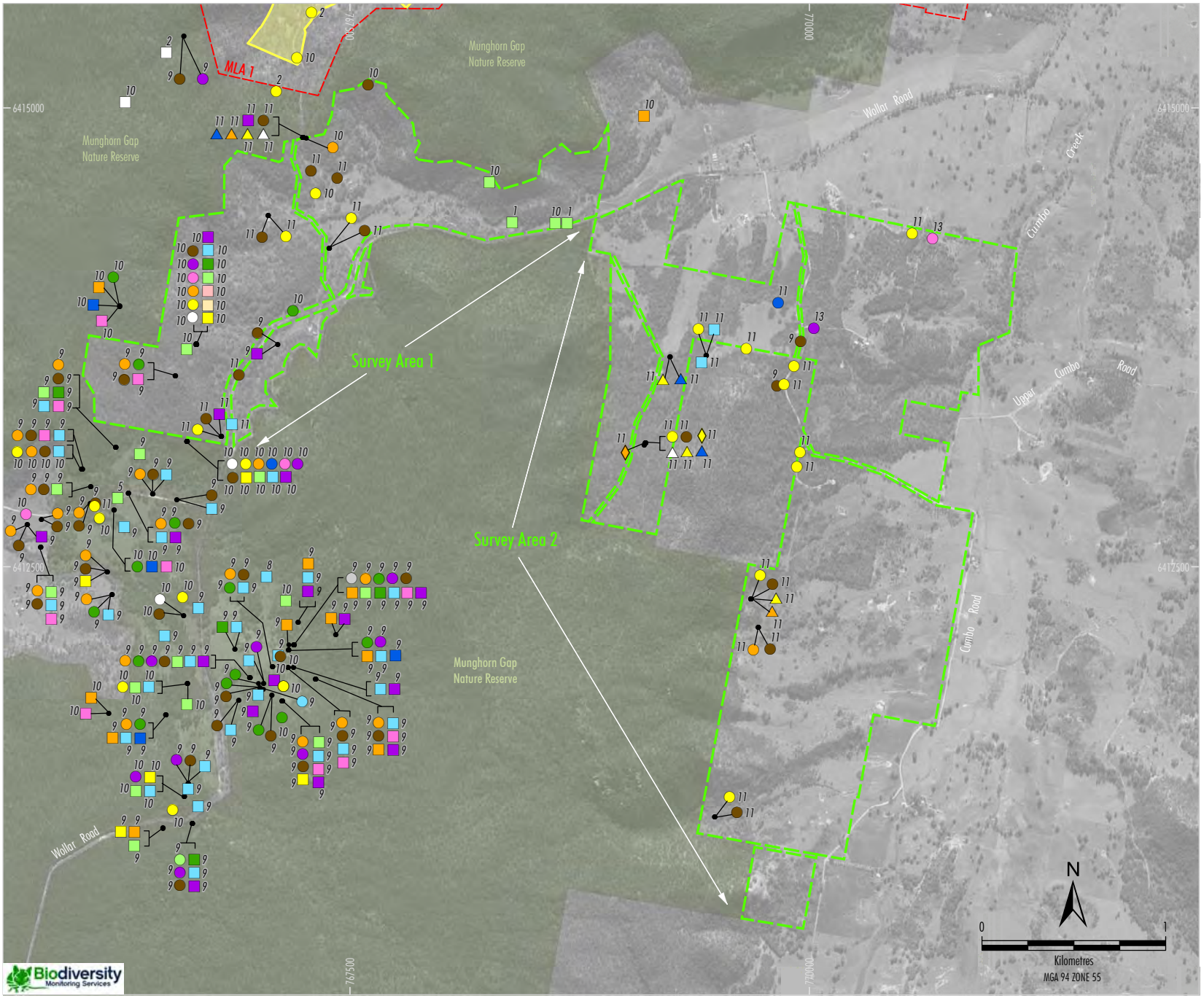
Fifteen threatened species listed under the TSC Act (three of which are listed under the EPBC Act) were located within the Survey Areas (**Figures 5a and 5b**). **Table 6** provides locational information for each record. Each species is described below:

- **Little Lorikeet (*Glossopsitta pusilla*)**

  The Little Lorikeet (*Glossopsitta pusilla*) was found within Survey Areas 1, 2, 4 and 5 (**Figures 5a and 5b**). At the time of the surveys several tree species were in flower and attracted numbers of this species, particularly to flowering White Box (*Eucalyptus albens*). This species was recorded a total of 35 times (at 14 locations [**Figures 5a and 5b**]) during the surveys.

- **Brown Treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*)**

  The Brown Treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*) was recorded in Survey Areas 1, 2, 3 and 5, with 21 birds recorded at 17 locations (**Figures 5a and 5b**). This species is classed as 'woodland-dependent' and was found in the many patches of woodland habitat in the areas.



LEGEND

- Mining Lease Application Boundary
- Proposed Open Cut Extension Area
- Survey Area
- Nature Reserve

Threatened Birds

- Black Falcon
- Black-chinned Honeyeater (eastern subspecies)
- Brown Treecreeper (eastern subspecies)
- Diamond Firetail
- Flame Robin
- Gang-gang Cockatoo
- Glossy Black-Cockatoo
- Grey-crowned Babbler (eastern subspecies)
- Hooded Robin (south-eastern form)
- Little Eagle
- Little Lorikeet
- Masked Owl
- Painted Honeyeater
- Pied Honeyeater
- Pink Robin
- Powerful Owl
- Regent Honeyeater
- Scarlet Robin
- Speckled Warbler
- Square-tailed Kite
- Turquoise Parrot
- Varied Sittella

Threatened Mammals

- Koala
- Squirrel Glider
- Corben's Long-eared Bat
- Eastern Bentwing-bat
- Eastern Cave Bat
- Large-eared Pied Bat

Reference:
1 DECC (2005)
2 Mount King Ecological Surveys (2005)
5 Lesryk Environmental Consultants (2013)
8 Australian Museum (2013)
9 Birdlife (2014)
10 OEH (2015)
11 Biodiversity Monitoring Services (2015)

Note: There are no references 3, 4, 6 or 7 on this figure.

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (Jun 2014)

Peabody ENERGY

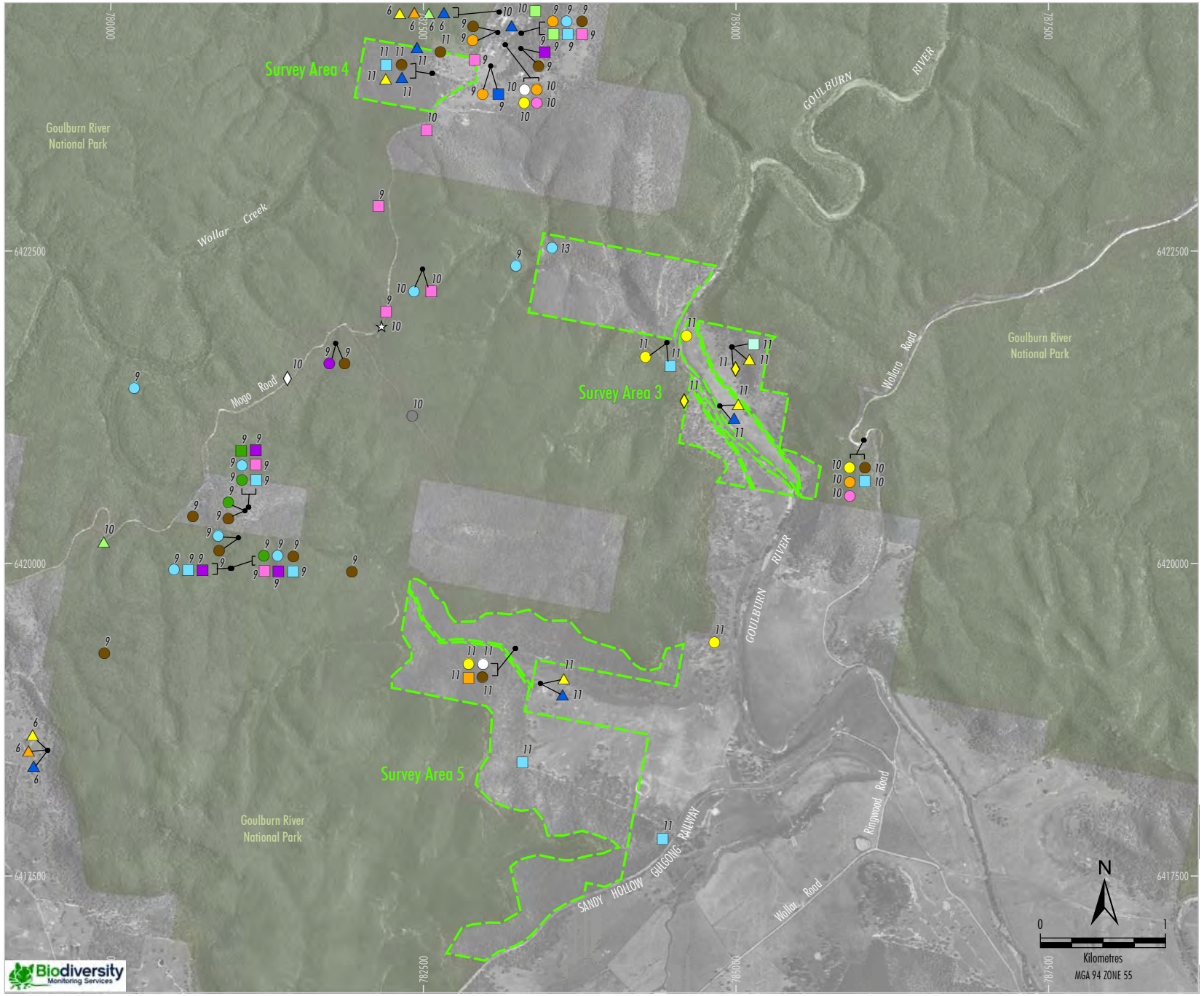
WILPINJONG EXTENSION PROJECT

Threatened Fauna - Survey Areas 1 and 2

Figure 5a

Biodiversity Monitoring Services

WIL-12-12_WEP_EIS_Fauna Offset_201A



LEGEND

- Survey Area
- National Park

Threatened Birds

- Black-chinned Honeyeater (eastern subspecies)
- Brown Treecreeper (eastern subspecies)
- Diamond Firetail
- Gang-gang Cockatoo
- Glossy Black-Cockatoo
- Hooded Robin (south-eastern form)
- Little Eagle
- Little Lorikeet
- Malleefowl
- Powerful Owl
- Regent Honeyeater
- Scarlet Robin
- Sooty Owl
- Speckled Warbler
- Square-tailed Kite
- Turquoise Parrot
- Varied Sittella

Threatened Mammals

- Brush-tailed Rock-wallaby
- Koala
- Eastern Bentwing-bat
- Eastern Cave Bat
- Eastern False Pipistrelle
- Large-eared Pied Bat

Threatened Reptile

- Pink-tailed Legless Lizard

Reference:
6 Biodiversity Monitoring Services (2013)
9 Birdlife (2014)
10 OEH (2015)
11 Biodiversity Monitoring Services (2015)
13 Incidental Sighting (Colin Driscoll) (2015)

Note: There are no references 1 - 5, 7, 8 or 12 on this figure.

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (2011)

Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Threatened Fauna - Survey Areas 3, 4 and 5

Figure 5b

WIL-12-12_WEP_EIS_Fauna Offset_207A

Table 6: Threatened Species Located Within Survey Areas

Date	Easting	Northing	Common Name	No.	Method	Habitat	Site
22/09/2015	218415	6419368	Black-chinned Honeyeater	4	Sight	Woodland	5A
21/09/2015	220001	6419503	Brown Treecreeper	1	Heard	Woodland	*
23/09/2015	219489	6421877	Brown Treecreeper	1	Heard	Woodland	3D
21/09/2015	218415	6419368	Brown Treecreeper	1	Sight	Woodland	5A
16/05/2015	219641	6421941	Brown Treecreeper	1	Heard	Woodland	*
12/05/2015	766110	6412830	Brown Treecreeper	1	Heard	Woodland	*
15/05/2015	766800	6413210	Brown Treecreeper	1	Heard	Woodland	1D
13/05/2015	767056	6414416	Brown Treecreeper	1	Heard	Woodland	*
15/05/2015	767388	6414234	Brown Treecreeper	1	Heard	Woodland	1A
13/05/2015	769109	6413176	Brown Treecreeper	2	Heard	Woodland	2A
13/05/2015	769440	6413652	Brown Treecreeper	1	Sight	Grassland	*
13/05/2015	769486	6411139	Brown Treecreeper	1	Heard	Woodland	2E
14/05/2015	769658	6413688	Brown Treecreeper	1	Heard	Woodland	2F
13/05/2015	769684	6412326	Brown Treecreeper	2	Heard	Woodland	2C
14/05/2015	769684	6412326	Brown Treecreeper	1	Heard	Woodland	2C
12/05/2015	769863	6413492	Brown Treecreeper	1	Heard	Woodland	*
14/05/2015	769917	6413594	Brown Treecreeper	1	Heard	Woodland	*
12/05/2015	769932	6413045	Brown Treecreeper	1	Heard	Woodland	*
14/05/2015	769950	6413124	Brown Treecreeper	1	Heard	Woodland	*
13/05/2015	770560	6414315	Brown Treecreeper	1	Heard	Woodland	*
12/05/2015	769109	6413176	Corben's Long-eared Bat	na	Call Detection	Woodland	2A
14/05/2015	767244	6414841	Corben's Long-eared Bat	na	Call Detection	Woodland	1B
12/05/2015	769724	6412172	Diamond Firetail	2	Sight	Shrubland	*
12/05/2015	769109	6413176	Eastern Bentwing-bat	na	Call Detection	Woodland	2A
12/05/2015	769242	6413646	Eastern Bentwing-bat	na	Call Detection	Woodland	2B
13/05/2015	769684	6412326	Eastern Bentwing-bat	na	Call Detection	Woodland	2C
14/05/2015	767244	6414841	Eastern Bentwing-bat	na	Call Detection	Woodland	1B
15/05/2015	767244	6414841	Eastern Bentwing-bat	na	Call Detection	Woodland	1B
16/05/2015	220010	6421873	Eastern Bentwing-bat	na	Call Detection	Woodland	3A
16/05/2015	219939	6421396	Eastern Bentwing-bat	na	Call Detection	Woodland	3C
17/05/2015	217494	6423924	Eastern Bentwing-bat	na	Call Detection	Woodland	4B
22/09/2015	218631	6419099	Eastern Bentwing-bat	na	Call Detection	Woodland	5B
13/05/2015	769684	6412326	Eastern Cave Bat	na	Call Detection	Woodland	2C
14/05/2015	767244	6414841	Eastern Cave Bat	na	Call Detection	Woodland	1B
15/04/2015	769829	6413938	Grey-crowned Babbler	3	Sight	Grassland	*
23/09/2015	219652	6421420	Koala	1	Scratchings	Woodland	3E
17/05/2015	220010	6421873	Koala	1	Scat	Woodland	3A
14/05/2015	769109	6413176	Koala	1	Scratchings	Woodland	2A
22/09/2015	218631	6419099	Large-eared Pied Bat	1	Bat Harp	Grassland	5B
12/05/2015	769109	6413176	Large-eared Pied Bat	na	Call Detection	Woodland	2A
12/05/2015	769242	6413646	Large-eared Pied Bat	na	Call Detection	Woodland	2B
14/05/2105	767244	6414841	Large-eared Pied Bat	na	Call Detection	Woodland	1B
15/05/2015	767244	6414841	Large-eared Pied Bat	na	Call Detection	Woodland	1B
17/05/2015	219939	6421396	Large-eared Pied Bat	na	Call Detection	Woodland	3C
17/05/2015	782450	6424128	Large-eared Pied Bat	na	Call Detection	Woodland	4A
17/05/2015	217494	6423924	Large-eared Pied Bat	na	Call Detection	Woodland	4B
21/09/2015	218415	6419368	Little Lorikeet	4	Sight	Woodland	5A
22/09/2015	218415	6419368	Little Lorikeet	2	Sight	Woodland	5A
17/05/2015	217494	6423924	Little Lorikeet	2	Sight	Woodland	4B
17/05/2015	217549	6424097	Little Lorikeet	1	Heard	Grassland	*
16/05/2015	766800	6413210	Little Lorikeet	2	Heard	Woodland	1D
15/05/2015	766895	6413544	Little Lorikeet	1	Heard	Woodland	*

Table 6: Threatened Species Located Within Survey Areas (Continued)

Date	Easting	Northing	Common Name	No.	Method	Habitat	Site
13/05/2015	767056	6414416	Little Lorikeet	2	Sight	Woodland	*
16/05/2015	767244	6414841	Little Lorikeet	1	Heard	Woodland	1B
16/05/2015	767287	6414658	Little Lorikeet	1	Heard	Woodland	*
15/05/2015	767388	6414234	Little Lorikeet	2	Heard	Woodland	1A
13/05/2015	767430	6414617	Little Lorikeet	1	Heard	Woodland	*
13/05/2015	769109	6413176	Little Lorikeet	1	Heard	Woodland	2A
13/05/2015	769486	6411139	Little Lorikeet	4	Sight	Woodland	2E
13/05/2015	769684	6412326	Little Lorikeet	1	Heard	Woodland	2C
14/05/2015	769684	6412326	Little Lorikeet	4	Sight	Woodland	2C
12/05/2015	769724	6412172	Little Lorikeet	6	Sight	Woodland	*
23/09/2015	218415	6419365	Powerful Owl	1	Spotlight	Woodland	5A
17/05/2015	220010	6421873	Sooty Owl	1	Nest	Woodland	3A
22/09/2015	219676	6417913	Speckled Warbler	2	Sight	Woodland	5D
23/09/2015	219489	6421877	Speckled Warbler	2	Sight	Woodland	3D
24/09/2015	219489	6421877	Speckled Warbler	1	Sight	Woodland	3D
22/09/2015	218521	6418460	Speckled Warbler	1	Sight	Woodland	5C
18/05/2015	217494	6423924	Speckled Warbler	1	Sight	Woodland	4B
13/05/2015	766858	6413277	Speckled Warbler	1	Sight	Woodland	*
14/05/2015	769414	6413614	Speckled Warbler	1	Sight	Grassland	*
13/05/2015	769440	6413652	Speckled Warbler	2	Sight	Grassland	*
15/04/2015	769102	6413163	Squirrel Glider	1	Call	Woodland	2A
16/05/2015	767244	6414841	Varied Sittella	2	Sight	Woodland	1B
15/05/2015	766800	6413210	Varied Sittella	4	Sight	Woodland	1D

na - Not applicable as numbers not accurately recorded with call detection recordings.
* - Observational.

- **Speckled Warbler (*Chthonicola sagittata*)**

  Also woodland-dependent, the Speckled Warbler (*Chthonicola sagittata*) was recorded from patches of woodland in Survey Areas 4 and 5 as well as just outside Survey Areas 1, 2 and 3 (**Figures 5a and 5b**). This species was documented a total of nine times during the surveys at seven locations (**Figures 5a and 5b**).

- **Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*)**

  There was a single sighting of three Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*) individuals in an ecotone between grassland and shrubland in Survey Area 2 (**Figure 5a**).

- **Black-chinned Honeyeater (eastern subspecies) (*Melithreptus gularis gularis*)**

  There was a single sighting of four Black-chinned Honeyeater (eastern subspecies) (*Melithreptus gularis gularis*) individuals within Offset Area 5 (**Figure 5b**).

- **Varied Sittella (*Daphoenositta chrysoptera*)**

  There were two sightings of small groups of Varied Sittellas (*Daphoenositta chrysoptera*) in Survey Area 1 (**Figure 5a**). Both sightings were within woodland habitat.

- **Diamond Firetail (*Stagonopleura guttata*)**

  There was a single sighting of two Diamond Firetail (*Stagonopleura guttata*) individuals in an area of grassland in Survey Area 2 (**Figure 5a**).

- **Sooty Owl (*Tyto tenebricosa*)**

  A Sooty Owl (*Tyto tenebricosa*) individual was located in a roost within an overhang in a cliff-line in Survey Area 3 (**Figure 5b**). A deep deposit of small bones (from Dasyurid species) was found beneath the roost.

- **Powerful Owl (*Ninox strenua*)**

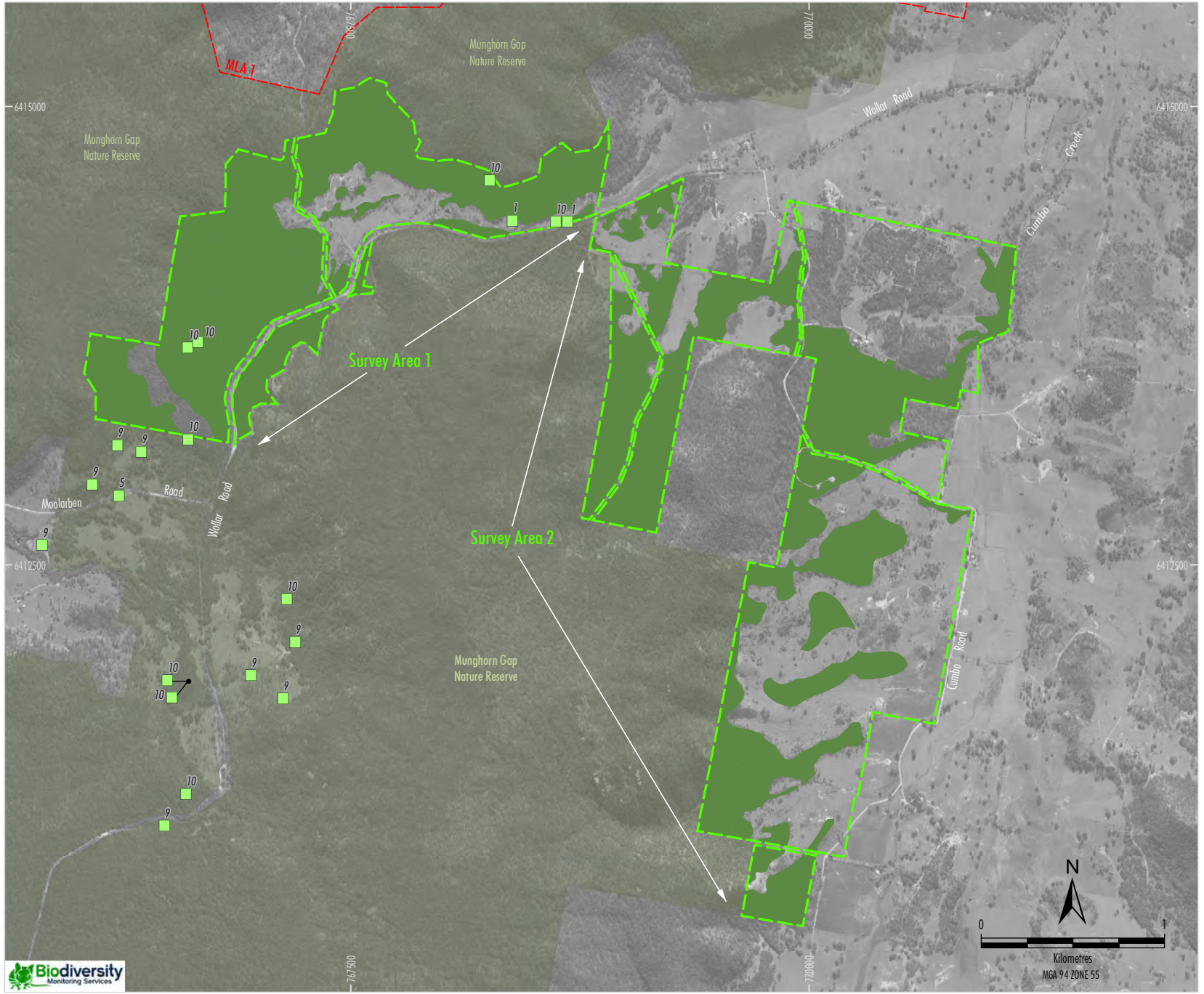
  There was a single sighting of the Powerful Owl (*Ninox strenua*) in Offset Area 5 (**Figure 5b**).

- **Regent Honeyeater (*Anthochaera phrygia*)**

  The Regent Honeyeater (*Anthochaera phrygia*) has been previously recorded in Survey Area 1 (DECC, 2005 in Mount King Ecological Surveys, 2005; Office of Environment and Heritage [OEH], 2015) (**Figure 5a**). Although conditions were ideal for the presence of the Regent Honeyeater, with preferred feed tree species in flower (e.g. White Box [*Eucalyptus albens*]), this species was not located during the surveys.

  The Regent Honeyeater was not recorded in Survey Areas 2 to 5 (despite the targeted survey), however habitat for the species is abundant within these areas (**Figures 6a and 6b**). Dr Martin Denny (Biodiversity Monitoring Services) is of the opinion that the majority of the woodland/forest habitat in the offset areas provides habitat for the Regent Honeyeater and that the species is likely to be present in the Survey Areas 1 to 5 based on:

  - his extensive experience with fauna surveys in the locality;
  - first-hand survey of the offset areas; and
  - consideration of the flora survey information by Dr Colin Driscoll (Hunter Eco, 2015).



LEGEND

- Mining Lease Application Boundary
- Survey Area
- Nature Reserve

Regent Honeyeater

- Recorded Location
- Potential Habitat

Reference:
1 DECC (2005)
5 Lesryk Environmental Consultants (2013)
9 Birdlife (2014)
10 OEH (2015)

Note: There are no references 2 - 4, 6 - 8 on this figure.

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (Jun 2014)

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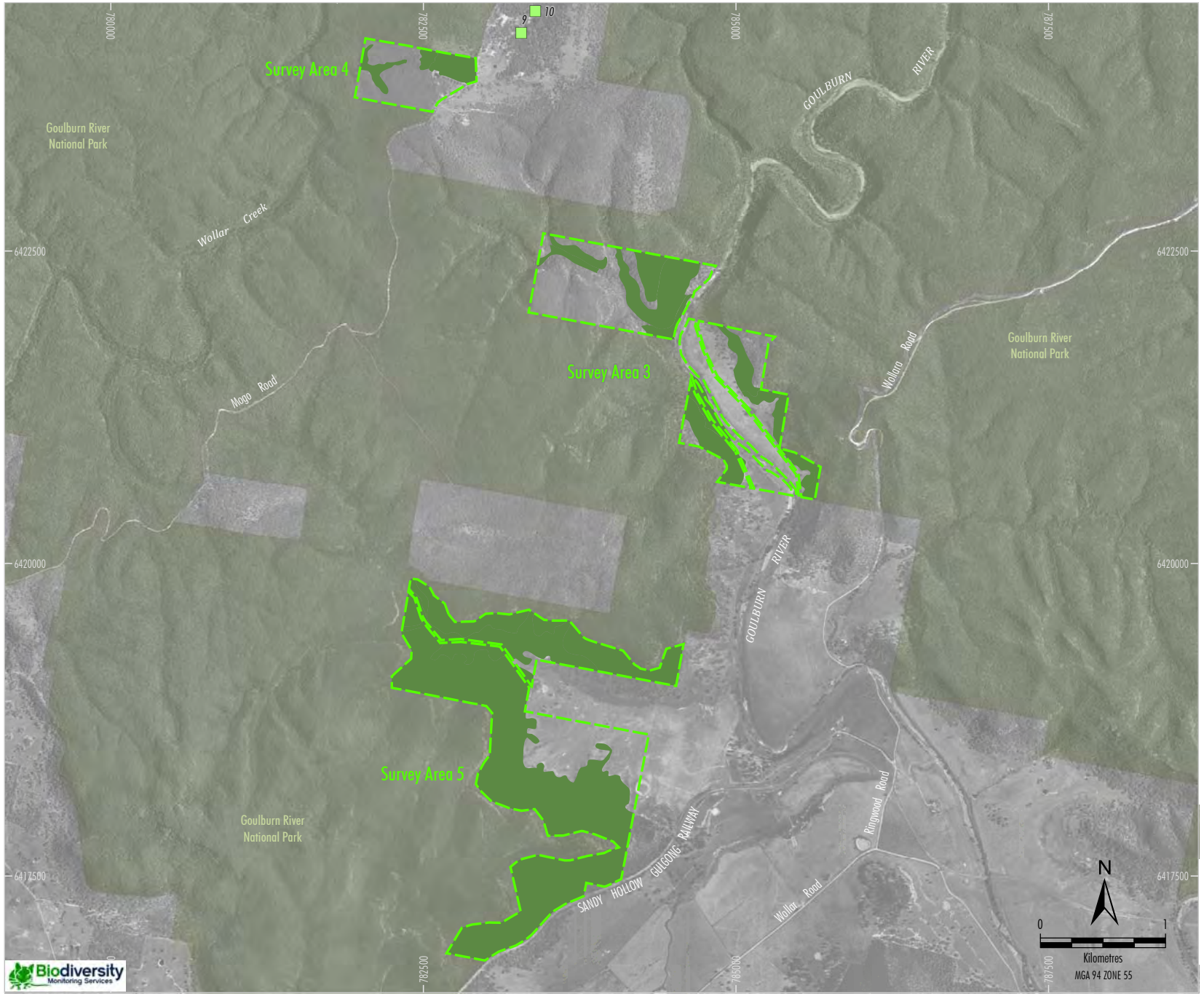
WILPINJONG EXTENSION PROJECT

Survey Areas 1 and 2 - Regent Honeyeater Habitat

Figure 6a



LEGEND

- Survey Area
- National Park

Regent Honeyeater

- Recorded Location
- Potential Habitat

Reference: *9 Birdlife (2014)*
10 OEH (2015)

Note: There are no references 1 - 8 on this figure.

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (2011)

Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Survey Areas 3, 4 and 5 - Regent Honeyeater Habitat

Figure 6b

WIL-12-12_WEP_EIS_Fauna Offset_211A

Figures 6a and 6b show the extent of habitat for the Regent Honeyeater based on the following vegetation types mapped by Dr Colin Driscoll (Hunter Eco, 2015):

- HU981 Rough-barked Apple Forest;
- HU962 Western Grey Box Woodland;
- HU910 Blakely's Red Gum - Rough-barked Apple Woodland/Blakely's Red Gum Woodland/Rough-barked Apple Forest;
- HU843 Grey Gum/Narrow-leaved Stringybark Forest;
- HU801 White Box Shrubby Woodland;
- HU732 Yellow Box Woodland;
- HU730 White Box Grassy Woodland;
- HU697 Mugga Ironbark;
- HU690 White Box Grassy Woodland; and
- HU618 Slaty Box Forest.

- **Swift Parrot**

  Although conditions were ideal for the presence of the Swift Parrot, with preferred feed tree species in flower (e.g. White Box [*Eucalyptus albens*]), this species was not located during the surveys. There are no records of the Swift Parrot within the vicinity of the Survey Areas.

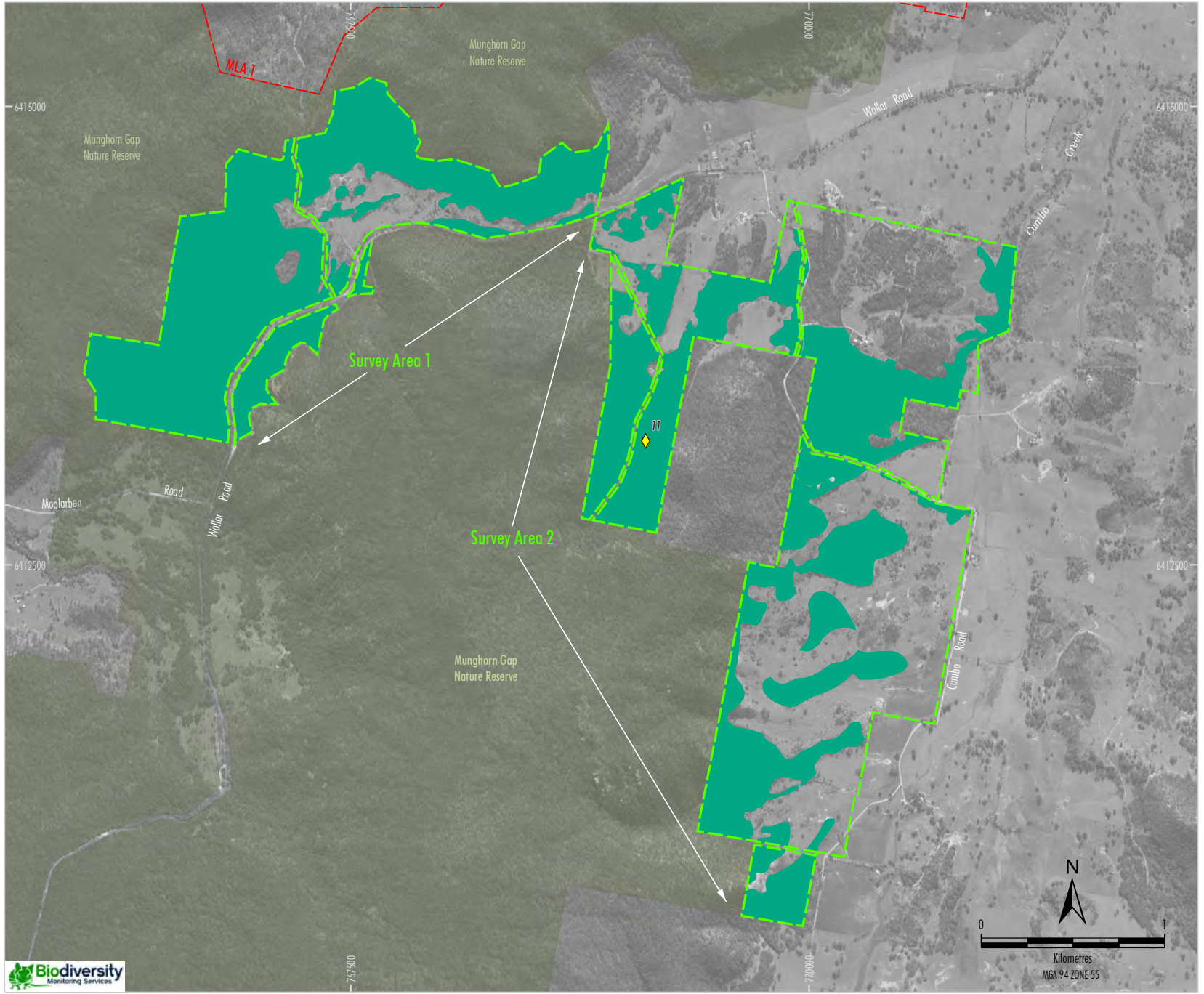
- **Squirrel Glider (*Petaurus norfolcensis*)**

  A Squirrel Glider (*Petaurus norfolcensis*) was heard calling during spotlighting at Survey Area 2, in woodland associated with an ephemeral creekline (**Figure 5a**).

- **Koala (*Phascolarctos cinereus*)**

  There was evidence of the Koala (*Phascolarctos cinereus*) within Survey Areas 2 and 3 (**Figures 5a and 5b**). Characteristic scratched trees were found in Survey Areas 2 and 3, and a scat was found in Survey Area 3 (**Figure 5a and 5b**). The Koala was not recorded in Survey Areas 1, 4 or 5 (despite the targeted survey), however habitat for the species is abundant within these areas (**Figures 7a and 7b**). Dr Martin Denny (Biodiversity Monitoring Services) is of the opinion that large areas of the woodland/forest habitat in the offset areas provides habitat for the Koala and that the species is likely to be present in the Survey Areas 1, 4 and 5 based on:

  - his extensive experience with fauna surveys in the locality;
  - first-hand survey of the offset areas; and
  - consideration of the flora survey information by Dr Colin Driscoll (Hunter Eco, 2015).



LEGEND

- Mining Lease Application Boundary
- Survey Area
- Nature Reserve

Koala

- Recorded Location
- Potential Habitat

Reference: *11 Biodiversity Monitoring Services (2015b)*

Note: There are no references 1 - 10 on this figure.

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (Jun 2014)

Peabody ENERGY

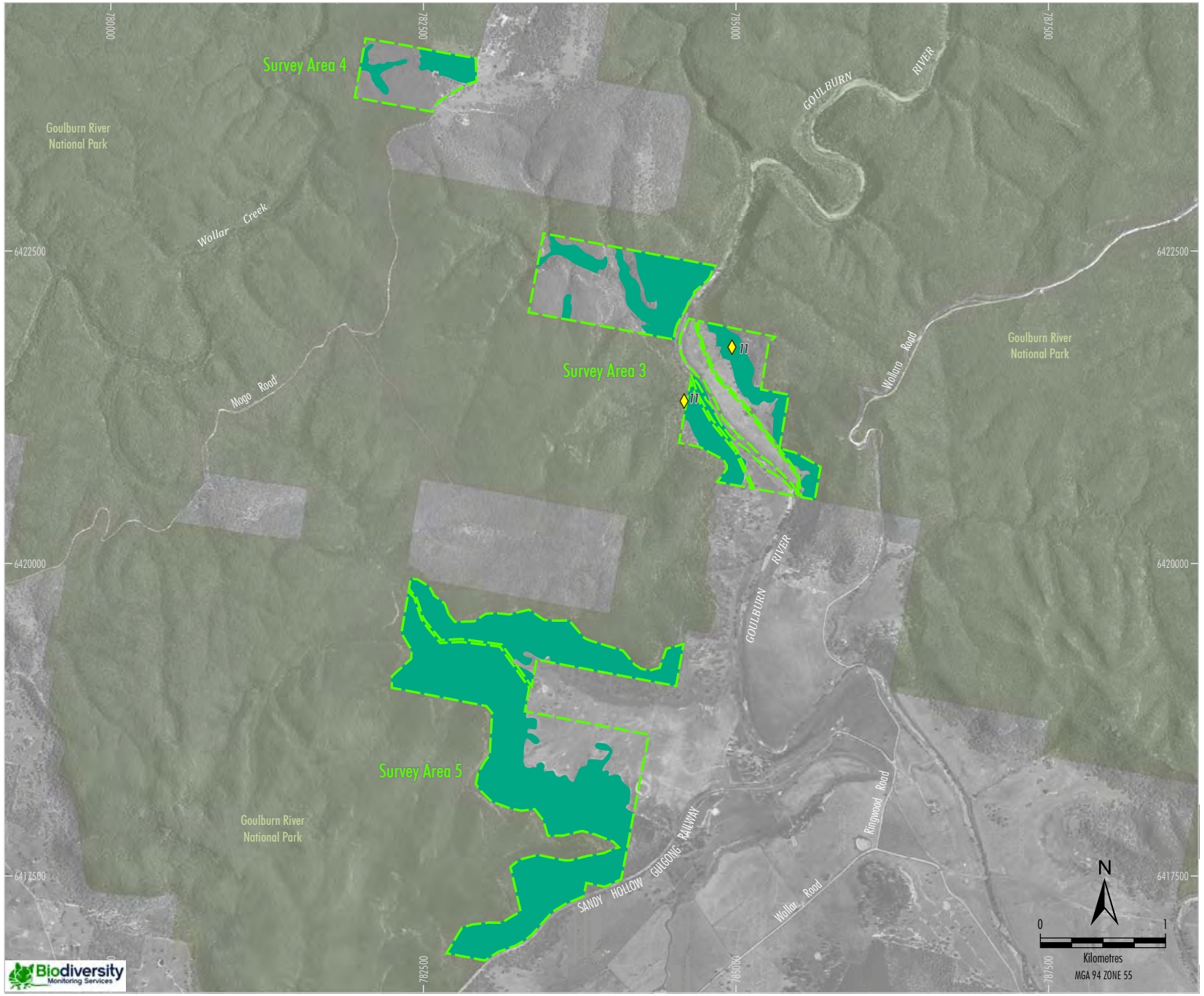
WILPINJONG EXTENSION PROJECT

Survey Areas 1 and 2 - Koala Habitat

Figure 7a

Biodiversity Monitoring Services

WIL-12-12_WEP_EIS_Fauna Offset_208B



LEGEND
Survey Area
National Park
Koala
Recorded Location
Koala Habitat

Reference: *11 Biodiversity Monitoring Services (2015)*

Note: There are no references 1 - 10 on this figure.

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (2011)

Peabody ENERGY

WILPINJONG EXTENSION PROJECT

Survey Areas 3, 4 and 5 - Koala Habitat

Figure 7b

WIL-12-12_WEP_EIS_Fauna Offset_209A

Figures 7a and 7b show the extent of habitat for the Koala based on the following vegetation types mapped by Dr Colin Driscoll (Hunter Eco, 2015):

- HU618 Slaty Box Forest;
- HU681 Blakely's Red Gum Woodland;
- HU690 White Box Grassy Woodland;
- HU732 Yellow Box Woodland;
- HU801 White Box Shrubby Woodland;
- HU843 Grey Gum - Narrow-leaved Stringybark Forest/Grey Gum/ Blue-leaved Stringybark Forest;
- HU877 Spinifex Woodland;
- HU890 Scribbly Gum Forest;
- HU910 Blakely's Red Gum - Rough-barked Apple Woodland;
- HU962 Western Grey Box Woodland; and
- HU981 Rough-barked Apple Forest

- **Large-eared Pied Bat (*Chalinolobus dwyeri*)**

  Calls of the Large-eared Pied Bat (*Chalinolobus dwyeri*) were recorded in Survey Areas 1 to 4 where it is likely to roost in caves and crevices in cliffs (Plate 1), foraging in dry open forest and woodland close to these features (**Figures 5a and 5b**). An individual was also captured in a harp trap just outside of Survey Area 5 (**Figure 5b**). The calls were likely evidence of the species foraging.

- **Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*)**

  The Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) is a relatively common bat which was recorded from Survey Areas 1 to 4, and just outside of Survey Area 5 (**Figures 5a and 5b**). This species roosts in caves and old mine adits and forages over open ground and woodland. The calls were likely evidence of the species foraging.

Plate 1 An Example of Caves within the Survey Areas

- **Corben's Long-eared Bat (*Nyctophilus corbeni*)**

  The Corben's Long-eared Bat (*Nyctophilus corbeni*) was recorded in Survey Areas 1 and 2 and is associated with woodland habitat where it roosts in tree hollows, crevices, and under loose bark (**Figure 5a**). The calls were likely evidence of the species foraging.

- **Eastern Cave Bat (*Vespadelus troughtoni*)**

  The Eastern Cave Bat (*Vespadelus troughtoni*) is a cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs. This species was recorded from Survey Areas 1 and 2 (**Figure 5a**). The calls were likely evidence of the species foraging.

- **Other Threatened Fauna Species**
  Figures 5a and 5b show threatened fauna species records from databases (OEH, 2015; Birdlife Australia, 2014; Australian Museum, 2013), survey reports (Mount King Ecological Surveys, 2005; Biodiversity Monitoring Services, 2013; Lesryk Environmental Consultants, 2013) and other sources (DECC, 2005 in Mount King Ecological Surveys, 2005).

Three additional threatened species have been recorded in the immediate surrounds of the Survey Areas during previous field surveys, namely the Glossy Black-Cockatoo (*Calyptorhynchus lathami*) (C. Driscoll, pers. comm.) Masked Owl (*Tyto novaehollandiae*) (Mount King Ecological Surveys, 2005) and Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) (Biodiversity Monitoring Services, 2013).

In addition to the species recorded during field surveys, the following species are mapped within the Survey Areas and surrounds in the OEH (2015) and/or Birdlife Australia (2014) databases:

- Pink-tailed Legless Lizard (*Aprasia parapulchella*).
- Black Falcon (*Falco subniger*).
- Flame Robin (*Petroica phoenicea*).
- Gang-gang Cockatoo (*Callocephalon fimbriatum*).
- Hooded Robin (south-eastern form) (*Melanodryas cucullata cucullata*).
- Little Eagle (*Hieraaetus morphnoides*).
- Malleefowl (*Leipoa ocellata*).
- Painted Honeyeater (*Grantiella picta*).
- Pied Honeyeater (*Certhionyx variegatus*).
- Scarlet Robin (*Petroica boodang*).
- Pink Robin (*Petroica rodinogaster*)
- Square-tailed Kite (*Lophoictinia isura*).
- Turquoise Parrot (*Neophema pulchella*).
- Brush-tailed Rock-wallaby (*Petrogale penicillata*).

There is also a record of the New Holland Mouse (*Mus musculus*) from Lees Pinch Lookout, approximately 2 km east of Survey Area 3 (Denny, 1981). The area where the New Holland Mouse was located at Lees Pinch is steep rocky cliffs.

4 CONCLUSION

A total of 108 native bird (plus one introduced), 26 native mammals (plus nine introduced), 10 reptile and two amphibian species were located within the Survey Areas during the current surveys. A total of 15 threatened species listed under the TSC Act were located within the Survey Areas during the current survey, namely, the:

- Brown Treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*);
- Diamond Firetail (*Stagonopleura guttata*);
- Little Lorikeet (*Glossopsitta pusilla*);
- Speckled Warbler (*Chthonicola sagittata*);
- Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*);
- Black-chinned Honeyeater (eastern subspecies) (*Melithreptus gularis gularis*);
- Varied Sittella (*Daphoenositta chrysoptera*);
- Powerful Owl (*Ninox strenua*);
- Sooty Owl (*Tyto tenebricosa*);
- Squirrel Glider (*Petaurus norfolcensis*);
- Koala (*Phascolarctos cinereus*);
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*);
- Large-eared Pied Bat (*Chalinolobus dwyeri*);
- Corben's/South-eastern Long-eared Bat (*Nyctophilus corbeni*); and
- Eastern Cave Bat (*Vespadelus troughtoni*).

The Koala, Corben's/South-eastern Long-eared Bat and Large-eared Pied Bat are also listed under the EPBC Act. In addition to the above, there are a number of threatened species records within the Survey Areas and surrounds from various databases and previous studies (e.g. the Regent Honeyeater [*Anthochaera phrygia*]).

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APPENDIX A

FAUNA SPECIES LIST

Table A-1: Fauna Species Located in Survey Areas

Scientific Name	Common Name	Conservation Status[1]		Survey Area 1	Survey Area 2	Survey Area 3	Survey Area 4	Survey Area 5
		TSC Act	EPBC Act					
Birds								
Dromaiidae								
Dromaius novaehollandiae	Emu	P	-	Located close to Survey Areas				
Anatidae								
Anas gracilis	Grey Teal	P	-	X	X	-	-	X
Anas superciliosa	Pacific Black Duck	P	-	-	-	X	-	-
Aythya australis	Hardhead	P	-	-	-	-	-	X
Chenonetta jubata	Australian Wood Duck	P	-	-	X	-	-	X
Podicipedidae								
Tachybaptus novaehollandiae	Australasian Grebe	P	-	X	X	-	-	X
Phalacrocoracidae								
Phalacrocorax melanoleucos	Little Pied Cormorant	P	-	-	-	X	-	
Phalacrocorax sulcirostris	Little Black Cormorant	P	-	-	-	-	-	X
Ardeidae								
Egretta novaehollandiae	White-faced Heron	P	-	-	-	X	-	-
Accipitridae								
Accipiter cirrocephalus	Collared Sparrowhawk	P	-	-	X	-	-	-
Aquila audax	Wedge-tailed Eagle	P	-	-	X	X	X	X
Haliaeetus leucogaster	White-bellied Sea-eagle	P	-	-	-	-	-	X
Elanus axillaris	Black-shouldered Kite	P	-	Located close to Survey Areas				
Haliastur sphenurus	Whistling Kite	P	-	Located close to Survey Areas				
Falconidae								
Falco berigora	Brown Falcon	P	-	Located close to Survey Areas				
Falco cenchroides	Nankeen Kestrel	P	-	-	X	-	-	-
Falco peregrinus	Peregrine Falcon	P	-	-	-	-	-	X
Rallidae								
Gallinula tenebrosa	Dusky Moorhen	P	-	-	-	X	-	-
Charadriidae								
Vanellus miles	Masked Lapwing	P	-	-	X	-	-	X

Table A-1: Fauna Species Located in Survey Areas (Continued)

Scientific Name	Common Name	Conservation Status[1]		Survey Area 1	Survey Area 2	Survey Area 3	Survey Area 4	Survey Area 5
		TSC Act	EPBC Act					
Birds (Continued)								
Elseyornis melanops	Black-fronted Dotterel	P	-	-	-	-	-	X
Columbidae								
Geopelia placida	Peaceful Dove	P	-	-	X	X	-	X
Geopelia humeralis	Bar-shouldered Dove	P	-	-	-	-	-	X
Ocyphaps lophotes	Crested Pigeon	P	-	-	-	X	-	X
Phaps chalcoptera	Common Bronzewing	P	-	X	X	-	-	X
Leucosarcia melanoleuca	Wonga Pigeon	P	-	-	-	-	-	X
Cacatuidae								
Cacatua galerita	Sulphur-crested Cockatoo	P	-	X	X	X	X	X
Eolophus roseicapillus	Galah	P	-	X	X	X	-	X
Psittacidae								
Alisterus scapularis	Australian King-Parrot	P	-	X	X	X	-	X
Glossopsitta concinna	Musk Lorikeet	P	-	-	X	-	-	-
Glossopsitta pusilla	Little Lorikeet	V	-	X	X	-	X	X
Platycercus adscitus eximius	Eastern Rosella	P	-	X	X	X	X	X
Platycercus elegans	Crimson Rosella	P	-	X	X	-	X	X
Psephotus haematonotus	Red-rumped Parrot	P	-	-	X	-	-	X
Cuculidae								
Cuculus pallidus	Pallid Cuckoo	P	-	-	X	-	-	X
Cacomantis flabelliformis	Fan-tailed Cuckoo	P	-	-	-	-	-	X
Chalcites basalis	Horsfield's Bronze-Cuckoo	P	-	-	-	-	-	X
Tytonidae								
Tyto tenebricosa	Sooty Owl	V	-	-	-	X	-	-
Strigidae								
Ninox strenua	Powerful Owl	V	-	-	-	-	-	X
Halcyonidae								
Dacelo novaeguineae	Laughing Kookaburra	P	-	X	X	X	X	X
Alcedo azurea	Azure Kingfisher	P	-	-	-	X	-	

Table A-1: Fauna Species Located in Survey Areas (Continued)

Scientific Name	Common Name	Conservation Status[1]		Survey Area 1	Survey Area 2	Survey Area 3	Survey Area 4	Survey Area 5
		TSC Act	EPBC Act					
Birds (Continued)								
Menuridae								
Menura novaehollandiae	Superb Lyrebird	P	-	X	X	X	X	X
Climacteridae								
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V	-	X	X	X	-	X
Cormobates leucophaeus	White-throated Treecreeper	P	-	X	X	X	X	X
Maluridae								
Malurus cyaneus	Superb Fairy-wren	P	-	X	X	X	X	X
Malurus lamberti	Variegated Fairy-wren	P	-	-	-	-	X	X
Pardalotidae								
Pardalotus punctatus	Spotted Pardalote	P	-	X	X	X	-	X
Pardalotus striatus	Striated Pardalote	P	-	X	X	-	-	X
Acanthizidae								
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	P	-	-	X	-	X	-
Acanthiza lineata	Striated Thornbill	P	-	X	X	-	X	-
Acanthiza nana	Yellow Thornbill	P	-	X	X	-	-	-
Acanthiza pusilla	Brown Thornbill	P	-	X	X	-	X	X
Acanthiza reguloides	Buff-rumped Thornbill	P	-	X	X	-	-	X
Origma solitaria	Rockwarbler	P	-	-	X	X	-	-
Chthonicola sagittata	Speckled Warbler	V	-	-	-	-	X	X
Sericornis frontalis	White-browed Scrubwren	P	-	-	X	-	-	X
Gerygone olivacea	White-throated Gerygone	P	-	-	-	-	-	X
Smicrornis brevirostris	Weebill	P	-	X	X	-	X	-
Meliphagidae								
Acanthagenys rufogularis	Spiny-cheeked Honeyeater	P	-	-	X	-	-	-
Acanthorhynchus tenuirostris	Eastern Spinebill	P	-	-	X	X	X	X
Anthochaera carunculata	Red Wattlebird	P	-	X	X	-	X	X
Lichenostomus chrysops	Yellow-faced Honeyeater	P	-	X	X	X	X	X

Table A-1: Fauna Species Located in Survey Areas (Continued)

Scientific Name	Common Name	Conservation Status[1]		Survey Area 1	Survey Area 2	Survey Area 3	Survey Area 4	Survey Area 5
		TSC Act	EPBC Act					
Birds (Continued)								
Lichenostomus leucotis	White-eared Honeyeater	P	-	X	X	X	X	X
Lichenostomus melanops	Yellow-tufted Honeyeater	P	-	X	X	-	X	X
Lichenostomus penicillatus	White-plumed Honeyeater	P	-	X	X	-	X	X
Manorina melanocephala	Noisy Miner	P	-	X	X	X	X	X
Manorina melanophrys	Bell Miner	P	-	X	-	-	-	-
Melithreptus brevirostris	Brown-headed Honeyeater	P	-	X	X	-	X	X
Melithreptus lunatus	White-naped Honeyeater	P	-	X	X	-	X	-
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V	-	-	-	-	-	X
Philemon corniculatus	Noisy Friarbird	P	-	X	X	-	X	X
Myzomela sanguinolenta	Scarlet Honeyeater	P	-	-	-	-	-	X
Phylidonyris novaehollandiae	New Holland Honeyeater	P	-	-	X	-	-	-
Plectorhyncha lanceolata	Striped Honeyeater	P	-	-	X	-	X	X
Petroicidae								
Eopsaltria australis	Eastern Yellow Robin	P	-	X	X	-	-	X
Microeca fascinans	Jacky Winter	P	-	X	X	-	X	X
Petroica rosea	Rose Robin	P	-	X	-	-	-	-
Pomatostomidae								
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V	-	-	X	-	-	-
Pomatostomus superciliosus	White-browed Babbler	P	-	-	-	-	-	X
Eupetidae								
Cinclosoma punctatum	Spotted Quail-thrush	P	-	-	-	-	X	-
Psophodes olivaceus	Eastern Whipbird	P	-	X	-	-	-	X
Estrildidae								
Neochmia temporalis	Red-browed Finch	P	-	X	X	-	-	X
Stagonopleura guttata	Diamond Firetail	V	-	-	X	-	-	-
Taeniopygia bichenovii	Double-barred Finch	P	-	X	X	-	-	X

Table A-1: Fauna Species Located in Survey Areas (Continued)

Scientific Name	Common Name	Conservation Status[1]		Survey Area 1	Survey Area 2	Survey Area 3	Survey Area 4	Survey Area 5
		TSC Act	EPBC Act					
Birds (Continued)								
Neosittidae								
Daphoenositta chrysoptera	Varied Sittella	V	-	X	-	-	-	-
Pachycephalidae								
Colluricincla harmonica	Grey Shrike-thrush	P	-	X	X	-	-	X
Pachycephala rufiventris	Rufous Whistler	P	-	-	X	X	X	X
Pachycephala pectoralis	Golden Whistler	P	-	-	-	-	-	X
Dicruridae								
Grallina cyanoleuca	Magpie-lark	P	-	-	-	X	-	X
Myiagra inquieta	Restless Flycatcher	P	-	-	-	-	-	X
Rhipidura albiscapa	Grey Fantail	P	-	X	-	-	-	X
Rhipidura leucophrys	Willie Wagtail	P	-	X	X	X	-	X
Artamidae								
Cracticus nigrogularis	Pied Butcherbird	P	-	X	X	-	-	X
Cracticus torquatus	Grey Butcherbird	P	-	X	X	X	-	X
Gymnorhina tibicen	Australian Magpie	P	-	X	X	X	X	X
Strepera graculina	Pied Currawong	P	-	X	X	X	X	X
Campephagidae								
Coracina novaehollandiae	Black-faced Cuckoo-shrike	P	-	X	X	-	-	-
Coracina papuensis	White-bellied Cuckoo-shrike	P	-	-	-	-	-	X
Lalage tricolor	White-winged Triller	P	-	-	-	-	-	X
Zosteropidae								
Zosterops lateralis	Silvereye	P	-	X	-	X	X	X
Dicaeidae								
Dicaeum hirundinaceum	Mistletoebird	P	-	-	X	-	X	X
Corvidae								
Corvus coronoides	Australian Raven	P	-	X	X	X	X	X
Oriolidae								
Oriolus sagittatus	Olive-backed Oriole	P	-	-	-	-	-	X

Table A-1: Fauna Species Located in Survey Areas (Continued)

Scientific Name	Common Name	Conservation Status[1]		Survey Area 1	Survey Area 2	Survey Area 3	Survey Area 4	Survey Area 5
		TSC Act	EPBC Act					
Birds (Continued)								
Sylviidae								
Acrocephalus australis	Australian Reed-Warbler	P	-	-	-	-	-	X
Motacillidae								
Anthus australis	Australasian Pipit	P	-	-	-	-	-	X
Corcoracidae								
Corcorax melanorhamphos	White-winged Chough	P	-	X	-	X	X	X
Sturnidae								
Sturnus vulgaris	Common Starling	-	-	-	X	-	-	X
Hirundinae								
Hirundo neoxena	Welcome Swallow	P	-	X	X	X	-	X
Petrochelidon ariel	Fairy Martin	P	-	-	X	-	-	X
Petrochelidon nigricans	Tree Martin	P	-	-	X	-	-	-
Mammals								
Tachyglossidae								
Tachyglossus aculeatus	Short-beaked Echidna	P	-	X	X	-	-	-
Dasyuridae								
Antechinus flavipes	Yellow-footed Antechinus	P	-	X	X	X	-	-
Petauridae								
Petaurus norfolcensis	Squirrel Glider	V	-	-	X	-	-	-
Phalangeridae								
Trichosurus vulpecula	Common Brushtail Possum	P	-	-	X	X	-	-
Pseudocheiridae								
Pseudocheirus peregrinus	Common Ringtail Possum	P	-	-	X	X	-	-
Phascolarctidae								
Phascolarctos cinereus	Koala	V	V	-	X	X	-	-
Vombatidae								
Vombatus ursinus	Bare-nosed Wombat	P	-	X	X	X	-	X

Table A-1: Fauna Species Located in Survey Areas (Continued)

Scientific Name	Common Name	Conservation Status[1]		Survey Area 1	Survey Area 2	Survey Area 3	Survey Area 4	Survey Area 5
		TSC Act	EPBC Act					
Mammals (Continued)								
Macropodidae								
Macropus giganteus	Eastern Grey Kangaroo	P	-	X	X	X	X	X
Macropus robustus	Common Wallaroo	P	-	X	X	X	-	-
Macropus rufogriseus	Red-necked Wallaby	P	-	X	X	-	X	X
Wallabia bicolor	Swamp Wallaby	P	-	X	X	-	-	-
Muridae								
Mus musculus	House Mouse	U	-	-	-	-	X	-
Rattus fuscipes	Southern Bush Rat	P	-	-	-	X	-	-
Rhinolophidae								
Rhinolophus megaphyllus	Eastern Horseshoe-bat	P	-	X	X	X	-	-
Molossidae								
Mormopterus sp 2	undescribed mastiff-bat	P	-	X	X	X	X	
Mormopterus sp 4	undescribed mastiff-bat	P	-	X	X	X	X	
Vespertilionidae								
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	X	X	X	X	-
Chalinolobus gouldii	Gould's Wattled Bat	P	-	X	X	X	X	-
Chalinolobus morio	Chocolate Wattled Bat	P	-	X	X	X	X	-
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	-	X	X	X	X	-
Nyctophilus geoffroyi	Lesser Long-eared Bat	P	-	X	X	-	-	X
Nyctophilus gouldi	Gould's Long-eared Bat	P	-	X	X	-	-	-
Nyctophilus corbeni	Corben's Long-eared Bat	V	V	X	X	-	-	-
Scotorepens balstoni	Inland Broad-nosed Bat	P	-	X	-	-	-	-
Scotorepens orion	Eastern Broad-nosed Bat	P	-	X	X	X	X	-
Tadarida australis	White-striped Mastiff Bat	P	-	X	X	X	X	-
Vespadelus troughtoni	Eastern Cave Bat	V	-	X	X	-	-	-
Vespadelus vulturnus	Little Forest Bat	P	-	X	X	X	X	X

Table A-1: Fauna Species Located in Survey Areas (Continued)

Scientific Name	Common Name	Conservation Status[1]		Survey Area 1	Survey Area 2	Survey Area 3	Survey Area 4	Survey Area 5
		TSC Act	EPBC Act					
Mammals (Continued)								
Canidae								
Canis familiaris	Dog	-	-	-	X	-	-	-
Vulpes vulpes	Red Fox	-	-	X	X	X	-	X
Felidae								
Felis catus	Cat	U	-	-	-	-	-	X
Bovidae								
Bos Taurus	European cattle	-	-	-	X	X	-	X
Suidae								
Sus scrofa	Feral Pig	-	-	X	X	-	-	X
Leporidae								
Lepus capensis	Brown Hare	-	-	-	X	-	-	-
Oryctolagus cuniculus	Rabbit	-	-	X	X	X	-	X
Artiodactyla								
Ovis aries	Sheep	-	-	X	-	-	-	-
Reptiles								
Cheluidae								
Chelodina longicollis	Eastern Snake-necked Turtle	P	-	-	X	-	-	X
Agamidae								
Pogona barbata	Eastern Bearded Dragon	P	-					X
Gekkonidae								
Diplodactylus vittatus	Eastern Stone Gecko	P	-	Slate Gully				
Oedura lesueurii	Lesueur's Velvet Gecko	P	-	X	-	-	-	-
Phyllurus platurus	Broad-tailed Gecko	P	-	X	-	-	-	-
Underwoodisaurus milii	Thick-tailed Gecko	P	-	X	-	-	X	-
Scincidae								
Carlia foliorum	Litter Skink	P	-	X	-	X	-	-
Ctenotus taeniolatus	Copper-tailed Ctenotus	P	-	-	-	-	X	-
Morethia boulengeri	South-eastern Morethia Skink	P	-	Slate Gully				

Table A-1: Fauna Species Located in Survey Areas (Continued)

Scientific Name	Common Name	Conservation Status[1]		Survey Area 1	Survey Area 2	Survey Area 3	Survey Area 4	Survey Area 5
		TSC Act	EPBC Act					
Reptiles								
Boidae								
Morelia spilota	Diamond Python	P	-	-	-	X	-	-
Amphibians								
Myobatrachidae								
Limnodynastes peronii	Striped Marsh Frog	P	-	All areas in farm dams				
Crinea signifera	Common Eastern Froglet	P	-	All areas in farm dams				

[1] Threatened fauna species status under the TSC Act and/or EPBC Act (current at November 2015).
V = Vulnerable; P = Protected; U = Introduced.

ATTACHMENT I
COMPARISON OF VEGETATION COMMUNTIES – BAR FOOTPRINT AND OFFSET AREAS

Table I1
Vegetation Communities- Clearance and Offset Areas

BVT	Project Area	Offset Areas 1 to 5
Grassy Woodlands – New England Grassy Woodlands		
HU681	6 ha of [1]Blakely's Red Gum Woodland (grassy)	5 ha of Blakely's Red Gum Woodland (grassy)
Grassy Woodlands - Western Slopes Grassy Woodlands		
HU547	1.5 ha of Fuzzy Box Woodland	-
HU981	126 ha, comprising: • 51.5 ha of Rough-barked Apple - Black Cypress Pine Woodland • 7.5 ha of Rough-barked Apple - Black Cypress Pine Woodland – regeneration • 58 ha of Rough-barked Apple Woodland – alluvial • 9 ha of Rough-barked Apple Woodland - alluvial – regeneration	13 ha of Rough-barked Apple Forest
HU732	3.5 ha of [1]Yellow Box Woodland (grassy)	29 ha, comprising: • 3 ha of Yellow Box Woodland • 26 ha of Yellow Box Woodland Derived Native Grassland
HU690	-	13.5 ha of White Box Grassy Woodland
Grassy Woodlands - Coastal Valley Grassy Woodlands		
HU910	4 ha of Blakely's Red Gum Woodland (shrubby)	215 ha, comprising: • 175 ha of Blakely's Red Gum - Rough-barked Apple Woodland • 40 ha of Blakely's Red Gum - Rough-barked Apple Woodland Derived Native Grassland
Dry Sclerophyll Forests (Shrubby sub-formation) - Western Slopes Dry Sclerophyll Forests		
HU843	42.5 ha of Grey Gum - Narrow-leaved Stringybark Forest	85.5 ha, comprising: • 36.5 ha of Grey Gum - Blue-leaved Stringybark Forest • 49 ha of Grey Gum - Narrow-leaved Stringybark Forest
HU886	39.5 ha, comprising: • 33.5 ha of Red Ironbark Forest • 6 ha of Red Ironbark Forest – regeneration	-
HU618	9.5 ha of Slaty Box Forest	206 ha of Slaty Box Forest

Table I1 (Continued)
Vegetation Communities- Clearance and Offset Areas

BVT	Project Area	Offset Areas 1 to 5
HU824	98 ha, comprising: • 95 ha of White Box Woodland (shrubby) • 3 ha of White Box Woodland (shrubby) – regeneration	-
HU891	-	66.5 ha, comprising: • 40.5 ha of Caley's Ironbark Woodland • 26 ha of Caley's Ironbark Woodland Derived Native Grassland
HU697	-	1.5 ha of Mugga Ironbark Forest
HU888	-	76 ha Red Ironbark - Brown Bloodwood Forest
HU890	-	7.5 ha of Scribbly Gum Forest
HU877	-	1 ha of Spinifex Woodland
Dry Sclerophyll Forests (Shrub/grass sub-formation) - North-west Slopes Dry Sclerophyll Woodlands		
HU825	20.5 ha of Narrow-leaved Ironbark Forest	-
HU801	-	271.5 ha of White Box Shrubby Woodland
Dry Sclerophyll Forests (Shrubby sub-formation) – Sydney Hinterland Dry Sclerophyll Forests		
HU828	-	3.5 ha of Grey Myrtle Dry Rainforest
Dry Sclerophyll Forests (Shrub/grass sub-formation) – Hunter Macleay Dry Sclerophyll Forests		
HU962	3 ha of Western Grey Box Woodland	1.5 ha of Western Grey Box Woodland
Total	**354 ha**	**996 ha**

[1] Box-Gum Woodland EEC/CEEC