WAMBO COAL PTY LIMITED

SOUTH BATES UNDERGROUND MINE

EXTRACTION PLAN
LONGWALLS 11 TO 16

APPENDIX C
BIODIVERSITY MANAGEMENT PLAN

Peabody ENERGY

WAMBO COAL
BIODIVERSITY MANAGEMENT PLAN

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Document Control

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1	22 June 2005	Final Draft	Resource Strategies	JT/TS	
2	August 2005	Final	Resource Strategies	TS	
3	Oct 2008	Revision	WCPL	SB	
4	Jan 2010	Revision	WCPL	SB	
5	Sept 2011	Revision	WCPL	LC	
6	March 2012	Revision	WCPL	LC/TF	
7	March 2013	Revision	WCPL	TF	
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9	June 2016	Major revision. Renamed Biodiversity Management Plan. Format updated to be consistent with new MP format. Incorporates Conservation Agreement and Offset Strategy commitments	Palaris/ WCPL	SP	
10	August 2016	Clarification of Macroinvertebrate monitoring	WCPL	HE	
11	Sept 2016	Amendments to address OEH comments on Rev 9	Palaris/ WCPL	SP	
12	October 2016	Amendments to include SBU Longwalls 11 - 16	WCPL	HE	

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1.0 Introduction

1.1 Background

The Wambo Coal Mine (the Mine) is situated approximately 15 kilometres west of Singleton, near the village of Warkworth, New South Wales (**Figure 1**). Wambo is owned and operated by Wambo Coal Pty Limited (WCPL), a subsidiary of Peabody Energy Australia Pty Limited.

A range of open cut and underground mine operations have been conducted at WCPL since mining operations commenced in 1969. Mining under the current Development Consent (DA305-7-2003) commenced in 2004 and permits both open cut, underground operations and associated activities to be conducted.

The approved run-of-mine (ROM) coal production rate is 14.7 million tonnes per annum and all product coal is transported from WCPL by rail. A summary of the approved Wambo Coal Mine is provided in **Table 1**.

WCPL prepared a Flora and Fauna Management Plan (FFMP) in accordance with Schedule 4 Condition 44 of DA305-7-2003 and Annexure 1 Paragraph 2 of EPBC 2003/1138. The Plan was approved by DPE and the Commonwealth Department of the Environment in 2005. A number of revisions have been made to the FFMP following modifications to WCPL's approvals.

This Biodiversity Management Plan (BMP) replaces WCPL's previous FFMP (Revision 8) and incorporates the Biodiversity Offset Management Strategy, required under Schedule 4 Condition 40 of DA305-7-2003. It also addresses the requirements within the draft Conservation Agreements prepared under Schedule 4 Condition 41(a) of DA305-7-2003, and the requirements of the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* approval (EPBC 2003/1138).

This BMP also addresses the requirements for a Biodiversity Management Plan under Schedule 4 Condition 22C of DA 305-7-2003 in support of the Extraction Plan for South Bates Underground Mine Longwalls 11 to 16.

Table 1: Summary of the Approved Wambo Coal Mine

Component	Approved Wambo Coal Mine[1]
Life of Mine	21 years (from the date of the commencement of Development Consent [DA305-7-2003]). 1st March 2025
Open Cut Mining	Open cut mining at a rate of up to 8 Mtpa of ROM coal from the Whybrow, Redbank Creek, Wambo and Whynot Seams
	An estimated total open cut ROM coal reserve of 98 Mt
	Open cut mining operations under current approved MOP
Underground Mining	Underground mining of up to 7.5 Mtpa of ROM coal from the Whybrow, Wambo, Arrowfield and Bowfield Seams. Underground ROM coal reserves are estimated at 114.9 Mt
Subsidence commitments and management.	The subsidence performance measures listed in Conditions 22 and 22A of the Development Consent (DA305-7-2003)
ROM Coal Production Rate	Up to 14.7 Mtpa of ROM coal
Total ROM Coal Mined	212.9 Mt
Waste Rock Management	Waste rock deposited in open cut voids and in waste rock emplacements adjacent open cut operations
Total Waste Rock	640 million bank cubic metres (Mbcm)
Coal Washing	Coal handling and preparation plant (CHPP) capable of processing approximately 1,800 tonnes per hour (tph)
Product Coal	Production of up to 11.3 Mtpa of thermal coal predominantly for export
CHPP Reject Management	Coarse rejects and tailings would be incorporated, encapsulated and/or capped within open cut voids in accordance with existing Wambo management practices
Total CHPP Rejects	Approximately 29.3 Mt of coarse rejects and approximately 19.4 Mt of tailings
Water Supply	Make-up water demand to be met from runoff recovered from tailings storage areas, operational areas, dewatering, licensed extraction from Wollombi Brook and Hunter River
Mining Tenements	Coal Lease (CL) 365, CL374, CL397, Consolidated Coal Lease (CCL) 743, Mining Lease (ML) 1402, ML1572, ML1594, Authorisation (A) 444, Exploration Licence (EL) 7211
Conservation Agreements (CAs)	Two CAs have been drafted in consultation with the NSW Office of Environment and Heritage (OEH), one for the Remnant Woodland Enhancement Areas (RWEAs) A, B, C, D & D Extension and one for the RWEA Wambo Coal Terminal
Biodiversity Conservation	Mine approval under Federal EPBC Act received on 23/11/2004. EPBC approval number 2003/1138

Note: [1] Development Consent DA305-7-2003 (as modified November 2015)

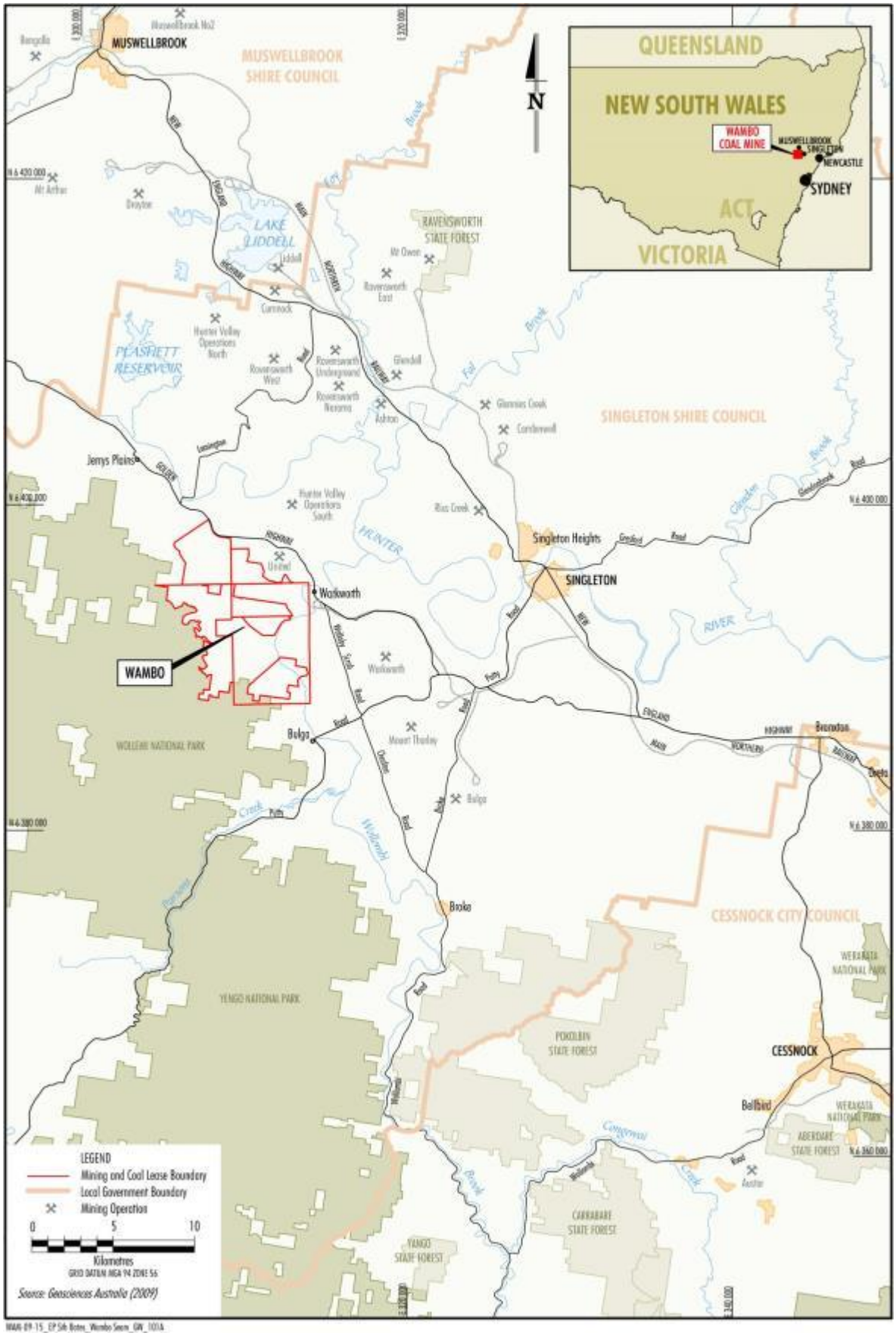

Figure 1: Wambo Coal Regional Location

1.2 Purpose

The purpose of this BMP is to describe the management strategies, procedures, controls and monitoring programs required to manage flora and fauna at the Mine, including within the Remnant Woodland Enhancement Areas (RWEAs) and Open Cut Revegetation Areas.

This BMP has been developed to:

- Identify lands to be managed in accordance with this BMP;
- Provide a framework for the management of biodiversity in the RWEAs and Open Cut Revegetation Areas;
- Provide a clear, concise set of management actions and a schedule for the coordinated and effective delivery of biodiversity enhancement;
- Define realistic Completion Criteria for RWEAs and Open Cut Revegetation Areas that can be quantitatively evaluated through a seasonally based monitoring program;
- Define a seasonally based monitoring program suitable for determining management success (or otherwise);
- Provide suitable contingency measures and associated trigger action response plans (TARP) that adequately address any deviation from the Completion Criteria; and
- Define the responsibilities for implementing, reviewing and reporting on the BMP.

1.3 Scope

This BMP applies to all activities undertaken within WCPL's mining authorisations and approved mining areas (**Figure 2**) that may impact on biodiversity as well as biodiversity in WCPL's RWEAs and Open Cut Revegetation Areas (**Figure 8, Section 4.1**).

This BMP has been prepared to address the requirements detailed in WCPL's statutory approvals and Conservation Agreements (CAs) for biodiversity management and provides management actions for those areas identified in **Figure 8** (**Section 4.1**).

1.4 Relationship to WCPL's Other Environmental Management Plans

This BMP forms part of WCPL's Environmental Management System (EMS). Other environmental management plans relevant to biodiversity management at the Mine site include:

- Bushfire Management Plan;
- Water Management Plan; and
- Mining Operations Plan (MOP).

A detailed Bushfire Management Plan has been developed in consultation with the NSW Rural Fire Service (RFS) to specifically address bushfire management issues across WCPL landholdings, including the identification of assets, assessment of fire risk and identification of management strategies to reduce the risk of fire to people and property. This BMP includes specific information on bushfire management within the RWEAs, as detailed within WCPL's CAs.

Aquatic ecosystem monitoring and associated triggers are included in the various components of WCPL's Water Management Plan, to satisfy the relevant conditions of

DA305-7-2003. Details of the aquatic ecosystem monitoring program are also included in this BMP, to satisfy the requirements of Schedule 4, Condition 48 of DA305-7-2003.

Detailed information on rehabilitation management and completion criteria is contained in the WCPL Mining Operations Plan (MOP). The MOP has been prepared to provide an efficient approach to the management of WCPL's mining operation whilst maintaining compliance with its regulatory approvals. The MOP also addresses WCPL's rehabilitation requirements, as identified by Schedule 4, Condition 94 of DA305-7-2003. WCPL's Open Cut Woodland Revegetation Areas are one of the management domains described in this BMP, and as such, details relating to baseline data, completion criteria, monitoring and management activities are also included in this BMP. These details are consistent with those contained within the MOP and are updated following any updates to the MOP.

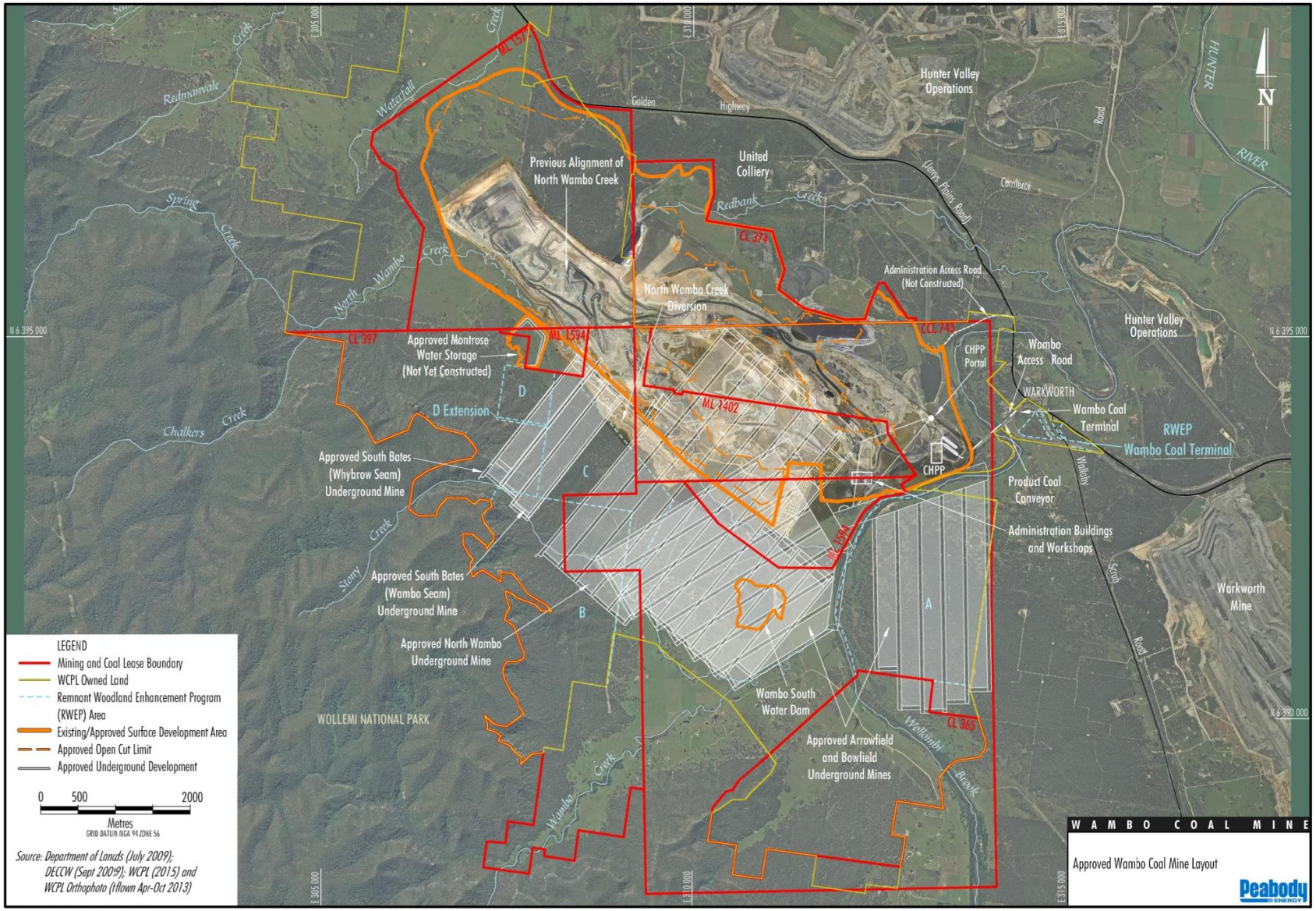

Figure 2: Approved Wambo Coal Mine Layout

2.0 Statutory Requirements

This BMP has been prepared to fulfil the requirements of WCPL's statutory approvals (**Appendix A**) where they relate to the management of flora and fauna.

Legislation and guidelines considered during the preparation of this BMP includes:

- Environmental Planning and Assessment Act 1979*;*
- Environment Protection and Biodiversity Conservation Act 1999;
- Mining Act 1992;
- Native Vegetation Act 2003;
- National Parks and Wildlife Act 1974;
- Threatened Species Conservation Act 1995;
- Fisheries Management Act 1994;
- Rural Fires Act 1997;
- Pesticides Act 1999
- Rural Lands Protection Act 1998;
- Rural Fire Service Bush Fire Environmental Assessment Code for New South Wales, (RFS, February 2006); and
- Hunter Valley Coal Mines - Best Practice Guidelines for Biodiversity Offset Management Plans (NSW Department of Environment and Planning (DPE), January 2014).

2.1 Stakeholder Consultation

WCPL have undertaken consultation with NSW government agencies on the FFMP as part of the Extraction Plan (EP) application process for:

- North Wambo Underground (NWU) Longwalls (LWs) 7-8 (DPE, OEH, Division of Resources and Energy (DRE) and Department of Primary Industries (DPI) - Fisheries);
- NWU LWs 7-10 (DPE and OEH);
- NWU LWs 8-10A (DPE and OEH); and
- South Bates Underground (SBU) LWs 11-13 (DPE).

Consultation has also been undertaken with the OEH relating to the implementation of the CAs. A final draft has been received from the OEH as of the 20 April 2016.

WCPL also consulted with the WCPL Community Consultative Committee (CCC) and a number of members of the local community as part of this EP consultation process. Any comments that were received during this consultation process were addressed by WCPL during the EP application process.

WCPL provided a copy of the BMP (Rev 10) to OEH and the Commonwealth Department of Environment and Energy (DoEE) in July 2016 for comment. Comments were received from OEH on 16 August 2016 and DoEE on <ENTER DATE>. These comments have been addressed in this version of the BMP.

Correspondence in relation to the BMP is attached as **Appendix B**.

3.0 Existing Environment

3.1 Landforms and Landuse

Landforms of the Upper Hunter region are characterised by gently sloping flood plains associated with the Hunter River and the undulating foothills, ridges and escarpments of the Mount Royal Range and Great Dividing Range. Local elevations range from approximately 60 metres (m) Australian Height Datum (AHD) at Wollombi Brook to approximately 650 m AHD at Mount Wambo within the Wollemi National Park to the south west.

Within WCPL mining tenements elevations range from 60 m to 200 m AHD, while narrow ridges to the south-east of Waterfall Creek and along the lower slopes of the Wollemi National Park landforms rise to above 200 m AHD.

Land use in the vicinity of the Mine is characterised by a combination of coal mining operations, agricultural land uses, areas of remnant vegetation and rural residential development at Warkworth. WCPL controlled lands that are not subject to WCPL's operations are utilised for the agistment of stock (primarily cattle).

3.2 Climate

A meteorological station that continuously records wind speed and direction, temperature, relative humidity, net solar radiation, rainfall and evaporation has operated at the Mine since March 1998. Long-term meteorological data recorded from the Jerrys Plains weather station is available from WCPL's database. The data indicates that regional temperatures are warmest from November through March and coolest from May through September. Average daily maximum temperatures peak in January at 31.7°C, while average daily minimum temperatures are lowest in July at 3.8°C.

The data also indicates that the regional rainfall is generally lowest from May through to September and highest December through March. The annual total rainfall is 645 mm for Jerrys Plains. The average annual evaporation recorded at Scone is 1,592 mm, with monthly evaporation highest in December (220 mm) and January (217 mm) and lowest in June (48 mm) and July (59 mm).

Wind roses for the WCPL meteorological station indicate that relatively strong winds from the west north-west are dominant during winter and spring, while winds for the south-east are more common during summer and autumn. Moderate south-easterly winds are common during the evening and night-time throughout spring, summer and autumn.

3.3 Geology

The Mine is situated within the Hunter Coalfield subdivision of the Sydney Basin, which forms the southern part of the Sydney-Gunnedah-Bowen Basin. The coal bearing rocks of the Sydney Basin are Permian in age (i.e. approximately 225 to 270 million years old) and are typically associated with low-lying gentle topography. The overlying rocks of Triassic age (i.e. approximately 180 to 225 million years old) cover large parts of the Sydney Basin and tend to form prominent escarpments where they outcrop.

3.4 Hydrology

The Mine is located within the catchment of the Hunter River, which drains some 22,000 km of central-eastern NSW to the Pacific Ocean at Newcastle. At a local level, the Mine is situated adjacent to Wollombi Brook, south-west of its confluence with the Hunter River.

Wollombi Brook drains an area of approximately 1,950 km^2 and joins the Hunter River some 5 km north-east of the Mine.

North Wambo Creek drains the mid and eastern sections of the North Wambo Underground Mine development area and flows south-east into Wollombi Brook, approximately 600 m south of the Mine. North Wambo Creek has been highly disturbed by historic and present grazing activities.

Stony Creek drains from Mount Wambo in a north-east direction and meanders across the western boundary of coal lease (CL) 397 near the south-western boundary of the North Wambo Underground Mine and passes in a south-easterly direction through the existing underground development area of WCPL to join Wambo Creek. Earthworks have been conducted to re-contour the stream channel and banks to remediate subsidence effects from previous underground mining operations at the Mine.

3.5 Soils and Rural Land Use Capability

A soils, rural land capability and agricultural suitability assessment was conducted for the Project EIS and utilised information from previous soil surveys, the Department of Land and Water Conservation (DLWC) and NSW Agriculture mapping, aerial photography and field surveys.

Major soil types identified include alluvial soils along major drainage lines, siliceous sands to the east of Wollombi Brook, yellow podzolics and yellow solodic intergrades adjacent to the alluvials on lower slopes and undulating plains, soloths on moderately elevated slopes and lithosols along the eastern boundary of the Wollemi National Park.

A rural land capability assessment was conducted in accordance with the standard NSW eight class system (Cunningham et al., undated) which assesses biophysical soil properties and categorises land according to limitations such as erosion hazard, climate and slope. Seven of the eight classes were identified in the vicinity of the mine.

An agricultural suitability assessment was conducted in accordance with the five class system (Riddler, 1996), which classifies land according to its potential agricultural productivity. Based on the NSW Agriculture (2002) Agricultural Land Classification for the portion of the Singleton Local; Government Area (LGA) between Bulga and Jerrys Plains, Class 2, 3, 4 and 5 agricultural lands were identified within WCPL mining tenements.

The Soil Landscapes of the Singleton 1:250,000 Sheet (Kovac and Lawrie, 1991) identifies eight soil landscapes within the mine area e.g. Bulga, Benjang, Lees Pinch, Branxton, Jerrys Plains, Wollombi, Hunter and Warkworth. The landform characteristics, lithology, typical soils and limitations of these landscapes are summarised in **Table 2**.

Table 2: Soil Landscapes of the Mine Area

Landscape	Landform	Lithology	Dominant Soils	Limitations
Bulga	Smooth slopes forming undulating rises. Local relief is 20-40 m. Elevations range from 80-160 m. Slopes up to 10 %.	Narrabeen Group and Singleton Coal Measures.	Yellow soloths, Yellow solodic.	Minor to moderate sheet erosion. Low fertility. Moderate – high erosion hazard. High soil salinity. Moderate – high structural degradation hazard.
Benjang	Rolling hills, with large open valleys and some sandstone cliffs. Local relief is 80-120 m. Elevations 240-440 m. Slopes 10-25 %.	Singleton Coal Measures.	Yellow solodic, Red solodic.	Minor to severe sheet erosion on cleared hillslopes. Low fertility. High soil salinity. High to very high erosion hazard. High structural degradation hazard.
Lees Pinch	Rolling hills to steep mountains. Elevations range from 180-800 m. Slopes to 90 %.	Narrabeen Group.	Siliceous sands.	Minor to moderate sheet and rill erosion where disturbed. High structural degradation hazard. Low fertility.
Branxton	Undulating rises to low hills and creek flats. Local relief is 10-40 m. Elevations range from 50-80 m. Slopes range from 3-5 %.	Branxton Formation and Singleton Coal Measures.	Yellow podzolic, Yellow soloths, Red podzolic, Alluvials.	High soil salinity. Tunnel and gully erosion risk. Low fertility. High structural degradation hazard.
Hunter	Level plains and river terraces. Local relief is less than 10 m. Slopes range from 0-3 %.	Quaternary Alluvium.	Alluvials, Yellow solodic, Brown soils.	Minor stream bank erosion occurs with minor sheet and gully erosion on terraces. Moderate-high erosion hazard. High structural degradation hazard.
Jerrys Plains	Undulating low hills. Relief to 60 m. Elevation 80-180 m. Slopes range from 2-10 %.	Jerrys Plains subgroup of the Whittingham Coal Measures.	Yellow soloths and solodic soils.	Poorly to imperfectly drained. Low fertility. High soil salinity. Up to very high erosion hazard.
Wollombi	Valley Flats. Relief to 20 m. Elevation 60-140 m. Slopes < 3 %.	Narrabeen Group and Quaternary alluvium.	Alluvial soils and Earthy sands.	Potential for salting hazard. Low fertility. Flood hazard. Erosion hazard.
Warkworth	Linear sand dunes 1-3 m high on old river terraces. Generally aligned north-west to south-west.	Tertiary gravel and sandstone and Quaternary alluvium.	Siliceous sands.	Moderate flood hazard. Low fertility. Moderate erosion hazard. High structural degradation hazard.

Source: Kovac and Lawrie (1991)

3.6 Floristic and Fauna Habitat

3.6.1 Flora

Flora surveys of the Mine site and RWEAs were undertaken in 2003 by Mount King Ecological Surveys and Greg Richards and Associates as part of the 2003 EIS. Follow up surveys were completed as part of the South Wambo Underground and South Bates Underground in 2015 and 2016 by Flora Search. The findings of these surveys have been compiled in **Table 3** and shown in **Figure 3** below.

Due to a consistent naming convention not being applied across surveys, **Table 4** has been included to reconcile the different naming conventions employed.

Table 3: Flora Species Surveyed

Plant Community Type (OEH 2015a)	Common Name	Conservation Status[1]		Threatened Species
		TSC Act	EPBC Act	
PCT 1692: Bull Oak grassy woodland of the central Hunter Valley	Bull Oak Grassy Woodland	-	-	-
-	Derived Grassland	-	-	*Acacia pendula* population in the Hunter Catchment Endangered Population
PCT 42: River Red Gum / River Oak riparian woodland wetland in the Hunter Valley	Forest Red Gum Floodplain Forest & River Oak Riparian Woodland	E	-	*Eucalyptus camaldulensis* population in the Hunter catchment Endangered Population
PCT 1655: Grey Box – Slaty Box shrub-grass woodland on sandstone slopes of the upper Hunter and Sydney Basin	Grey Box - Slaty Box Woodland	V	-	*Cymbidium canaliculatum* population in the Hunter Catchment Endangered Population
PCT 922: Melaleuca decora low forest of the central Hunter Valley, Sydney Basin Bioregion	Melaleuca decora Low Forest	-	-	-
PCT 1603: Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter	Narrow-leaved Ironbark - Grey Box Woodland	E	-	*Cymbidium canaliculatum* population in the Hunter Catchment Endangered Population *Acacia pendula* population in the Hunter Catchment Endangered Population
PCT 485: River Oak riparian grassy tall woodland of the western Hunter Valley	River Oak Riparian Woodland	Partial	-	-

Plant Community Type (OEH 2015a)	Common Name	Conservation Status[1]		Threatened Species
		TSC Act	EPBC Act	
PCT 1653: Rough-barked Apple - Narrow-leaved Ironbark - Blakely's Red Gum - Bull Oak - Coast Banksia woodland on sands of the Warkworth area	Rough-barked Apple - Coast Banksia Woodland (Warkworth Sands Woodland)	E	CE	-
PCT 1584: White Mahogany - Spotted Gum - Grey Myrtle semi-mesic shrubby open forest of the central and lower Hunter Valley	Sandstone Riparian Scrub	-	-	-
PCT 1604: Narrow-leaved Ironbark - Grey Box - Spotted Gum shrub - grass woodland of the central and lower Hunter	Spotted Gum - Narrow-leaved Ironbark - Grey Box Woodland	E	-	-
PCT 116: Weeping Myall – Coobah – Scrub Wilga shrubland of the Hunter Valley	Weeping Myall Woodland	E	CE	-
PCT 1748: Grey Box grassy open forest of the central and lower Hunter Valley[2]	Hunter Lowlands Red Gum Forest[4]	-	-	*Eucalyptus glaucina* potentially (no actual record).
PCT 1598: Forest Red Gum grassy open forest on floodplains of the lower Hunter.	Forest Red Gum Floodplain Forest[4]	E	-	*Eucalyptus glaucina* potentially (no actual record).
PCT 1629: Narrow-leaved Stringybark – Grey Gum shrubby open forest on sandstone ranges of the Sydney Basin[3]	Stringybark – Grey Gum sandstone range forest[4]	-	-	*Grevillea parviflora* subsp. *parviflora*

1) Threatened species status listed under the TSC Act and EPBC Act (Current at July 2015). V = Vulnerable; E = Endangered; CE = Critically Endangered.
2) This community occurs sparingly in some broad flat gullies and on drainage lines in the south.
3) Restricted to small areas on the crests of sandstone escarpments adjacent to Wollemi NP.
4) Not shown on **Figure 3** as populations are very small and outside any future impact zone.

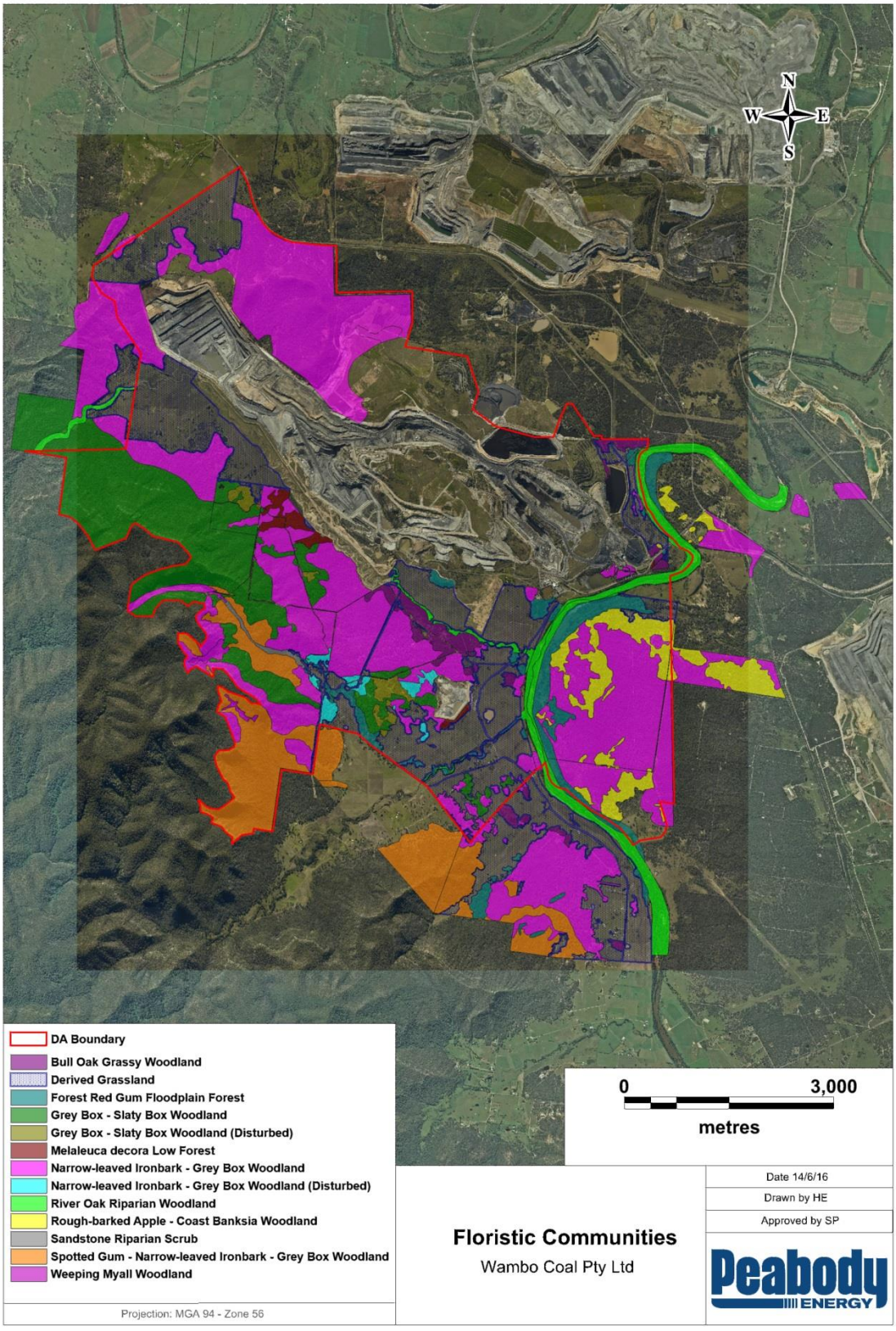

Figure 3: Floristic Communities

Table 4: RWEA Flora Species Survey Identification Reconciliation

Orchid Research 2003	Flora Search 2016 (From Table 14 below)	CA Community Identification	Corresponding PCT
Slaty Gum/Narrow-leaf Ironbark/Bulloak/ Paperbark Forest	Grey Box - Slaty Box Woodland	Narrabeen Footslopes Slaty Box Woodland, Biometric Vegetation Type HU618	PCT 1655: Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley
Narrow-leaf Ironbark/ Grey Box/Bulloak/ Honeymyrtle Forest & Grey Gum/Narrow-leaf/ Ironbark/Bulloak/ Honeymyrtle Forest	Narrow-leaved Ironbark - Grey Box Woodland	Central Hunter Box – Ironbark Woodland, Biometric Vegetation Type HU551	PCT 1603: Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter
Narrow-leaf Ironbark/ Grey Box/Bulloak/ Honeymyrtle Forest & Grey Gum/Narrow-leaf/ Ironbark/Bulloak/ Honeymyrtle Forest	Narrow-leaved Ironbark - Grey Box Woodland	Central Hunter Box – Ironbark Woodland, Biometric Vegetation Type HU551	PCT 1603: Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter regeneration
Narrow-leaf Ironbark / Grey Box / Bulloak / Honeymyrtle Forest	Melaleuca decora Low Forest	Central Hunter Paperbark Soak Woodland (HU564)	PCT 922: Melaleuca decora low forest of the central Hunter Valley, Sydney Basin Bioregion
Not Mapped	Bull Oak Grassy Woodland	Not Mapped	PCT 1692: Bull Oak grassy woodland of the central Hunter Valley
Spotted Gum / Narrow-leaf Ironbark / Bulloak / Paperbark Forest	Spotted Gum - Narrow-leaved Ironbark - Grey Box Woodland	Southern Hunter Escarpment Spotted Gum Woodland	PCT 1604: Narrow-leaved Ironbark - Grey Box - Spotted Gum shrub – grass woodland of the central and lower Hunter
River Red Gum Woodland & Yellow Box / Blakely's Red Gum / Rough-barked Apple Forest & River Oak / Rough-barked Apple Forest	Forest Red Gum Floodplain Forest & River Oak Riparian Woodland	Hunter Floodplain Red Gum Woodland Complex, Biometric Vegetation Type HU599 & Hunter Valley River Oak Forest	PCT 42: River Red Gum / River Oak riparian woodland wetland in the Hunter Valley
River Oak / Rough-barked Apple Forest	River Oak Riparian Woodland	Hunter Valley River Oak Forest	PCT 485: River Oak riparian grassy tall woodland of the western Hunter Valley
Coast Banksia / Rough-barked Apple / Blakely's Red Gum Forest	Warkworth Sands Woodland	Warkworth Sands Woodland	PCT 1653: Rough-barked Apple - Narrow-leaved Ironbark - Blakely's Red Gum - Bull Oak - Coast Banksia woodland on sands of the Warkworth area
White Mahogany/Rough-barked Apple Forest	Sandstone riparian scrub	Wollombi Alluvial Red Gum – Apple Forest	PCT 1584: White Mahogany - Spotted Gum - Grey Myrtle semi-mesic shrubby open forest of the central and lower Hunter Valley
Secondary Native Grassland	Secondary Native Grassland	NA	NA

3.6.2 Fauna

Avifauna, mammals, reptiles and amphibians were surveyed at the Mine in 2003 (Mount King Ecological Surveys, 2003; Greg Richards and Associates, 2003), 2009 (RPS Harper Somers O'Sullivan [RPS HSO], 2009), 2010 (Biosphere Environmental Consultants, 2012), 2011 (Niche Environment and Heritage, 2012), 2014 (Niche Environment and Heritage, 2014) and 2015 (Eco Logical Australia, 2015).

Threatened and migratory fauna species known to or considered to have the potential to occur in the vicinity of the mine have been summarised in **Table 5**.

Table 5: Threatened Fauna Species with Potential to Occur in the Vicinity of the Mine

Scientific Name	Common Name	Conservation Status[1]	
		TSC Act	EPBC Act
Amphibians			
Litoria aurea	Green and Golden Bell Frog	E	V
Litoria booroolongensis	Booroolong Frog	E	E
Birds			
Leipoa ocellata	Malleefowl	E	V
Botaurus poiciloptilus	Australasian Bittern	E	E
Ardea ibis	Cattle Egret	-	M
Ardea modesta	Eastern Great Egret	-	M
Pandion cristatus	Eastern Osprey	V	M
Lophoictinia isura	Square-tailed Kite	V	-
Circus assimilis	Spotted Harrier	V	-
Erythrotriorchis radiatus	Red Goshawk	CE	V
Hieraaetus morphnoides	Little Eagle	V	-
Rostratula australis	Australian Painted Snipe	E	E
Gallinago hardwickii	Latham's Snipe	-	M
Calyptorhynchus lathami	Glossy Black-cockatoo	V	-
Callocephalon fimbriatum	Gang-gang Cockatoo	V	-
Glossopsitta pusilla	Little Lorikeet	V	-
Neophema pulchella	Turquoise Parrot	V	-
Lathamus discolor	Swift Parrot	E	E
Tyto tenebricosa	Sooty Owl	V	-
Tyto novaehollandiae	Masked Owl	V	-
Ninox strenua	Powerful Owl	V	-
Hirundapus caudacutus	White-throated Needletail	-	M
Apus pacificus	Fork-tailed Swift	-	M
Merops ornatus	Rainbow Bee-eater	-	M
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V	-
Chthonicola saggitatus	Speckled Warbler	V	-
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V	-
Anthochaera phrygia	Regent Honeyeater	CE	CE
Grantiella picta	Painted Honeyeater	V	V
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	V	-

Scientific Name	Common Name	Conservation Status[1]	
		TSC Act	EPBC Act
Petroica phoenicea	Flame Robin	V	-
Petroica boodang	Scarlet Robin	V	-
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V	-
Daphoenositta chrysoptera	Varied Sittella	V	-
Pachycephala olivacea	Olive Whistler	V	-
Rhipidura rufifrons	Rufous Fantail	-	M
Monarcha melanopsis	Black-faced Monarch	-	M
Myiagra cyanoleuca	Satin Flycatcher	-	M
Stagonopleura guttata	Diamond Firetail	V	-
Mammals			
Dasyurus maculatus maculatus	Spotted-tailed Quoll (SE mainland population)	V	E
Phascolarctos cinereus	Koala	V	V
Phascogale tapoatafa	Brush-tailed Phascogale	V	-
Petaurus norfolcensis	Squirrel Glider	V	-
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 Long-eared Bat (south-eastern form)	V	V
Chalinolobus dwyeri	Large-eared Pied Bat	V	V
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-
Myotis macropus	Southern Myotis	V	-
Scoteanax rueppelli	Greater Broad-nosed Bat	V	-
Vespadelus troughtoni	Eastern Cave Bat	V	-
Pseudomys novaehollandiae	New Holland Mouse	-	V

1) Threatened species status listed under the TSC Act and EPBC Act (Current at July 2015). V = Vulnerable; E = Endangered; CE = Critically Endangered.

3.6.3 Pest Fauna Species

Eleven introduced species were recorded by the 2003 EIS surveys, consisting of:

- House Sparrow (Passer domesticus)
- Common Starling (Sturnus vulgaris)
- Common Mynah (Sturnus tristis)
- House Mouse (Mus musculus)
- Black Rat (Rattus rattus)
- Cat (Felis catus)
- Dog (Canis familiaris)
- Red Fox (Vulpes vulpes)

- Brown Hare (Lepus capensis)
- European Rabbit (Oryctolagus cuniculus)
- Cattle (Bos taurus).

3.6.4 Aquatic Ecosystems

Aquatic macroinvertebrate, fish and water quality sampling was conducted for the Wambo Development Project EIS. The sampling sites displayed considerable variation in terms of stream structure (e.g. pool/run sequence or isolated pools), stream flow and the condition of the riparian zone. The sampling found North Wambo Creek to represent minimal fish habitat with two native and one introduced fish species recorded from North Wambo Creek during the sampling (Resource Strategies, 2003).

Currently Stoney, Wambo, Waterfall, Wollombi Creeks and the North Wambo Creek Diversion are monitored as part of the annual monitoring program.

3.6.5 Landscape Function Analysis

Landscape Function Analysis (LFA) is a monitoring procedure developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) (Tongway and Hingley, 2004). It provides a rapid, reliable and easily applied method for assessing and monitoring landscape restoration or rehabilitation. It uses simple indicators that assess how well a landscape works as a system. Completion criteria has been developed for LFA assessment purposes (**Section 5.3**). Details of the monitoring methodology for LFA are provided in **Section 7.1.1.** The LFA monitoring program is described in **Section 7.2** and shown on **Figure 11.**

Landscape Function Analysis (LFA) monitoring plots were established at the Mine in 2006, in areas of woodland and pasture rehabilitation. Monitoring plots were also established in riparian rehabilitation areas along the North Wambo Creek in 2008. Additional plots were added in 2015 in the North Wambo Creek Diversion and Wambo Creek.

Established plots were monitored on an annual basis using the method for Landscape Organisation Index and Soil Surface Assessment (SSA) (refer **Section 7.1.1** for details). Baseline LFA monitoring data for the period 2006 – 2015 is included in **Appendix C**. Averages for the monitored LFA monitoring program for selected plots are summarised in **Tables 6-9** and shown graphically in **Figures 4-7.** These averages are compared to the LFA completion criteria (**Section 5.3**) to compare rehabilitation and regeneration areas with reference sites throughout the course of the monitoring program (**Section 7.2**).

Table 6: Baseline LFA Results - Landscape Organisation Index

Vegetation Community	Year									
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Woodland Rehabilitation										
Average	**0.24**	**0.17**	**0.14**	**0.57**	**0.33**	**0.80**	**0.91**	**0.93**	**0.75**	**0.77**
Pasture Rehabilitation										
Average	**0.54**	**0.58**	**0.76**	**0.85**	**0.94**	**0.97**	**1.00**	**0.79**	**0.98**	**0.84**
North Wambo Creek Diversion										
Average	**-**	**-**	**0.22**	**0.90**	**0.86**	**0.96**	**0.89**	**0.96**	**0.73**	**0.56**
Wambo Creek*										
Average	-	-	-	-	-	-	-	-	-	**0.67**

* New riparian rehabilitation monitoring site added in 2015

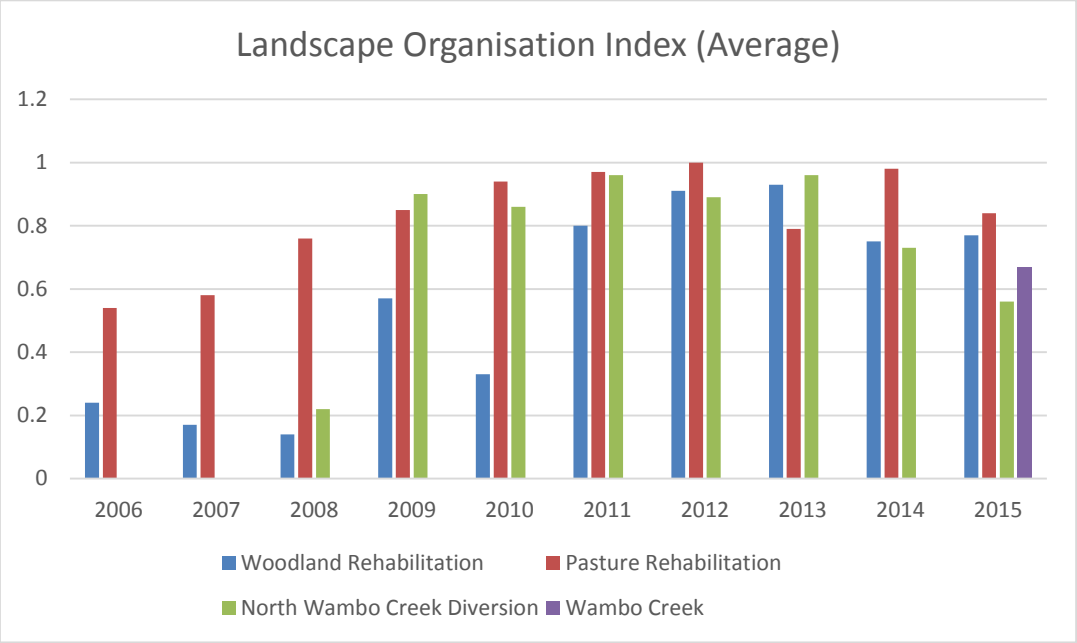

Figure 4: Landscape Organisation Index (Average) 2006-2015

The Landscape Organisation Index (LOI) value for woodland rehabilitation is considerably lower in the first three years of monitoring, being 0.24, 0.17 and 0.14 respectively. The Pasture Rehabilitation values for the first two years are approximately half that of subsequent years, being 0.54 and 0.58. Data was not collected in the first two years for the North Wambo Creek Diversion, however the 2008 data is significantly lower than that of subsequent years, being 0.22. Data for Wambo Creek was only collected in 2015 so no analysis on this can be drawn. For woodland, pasture and the North Wambo Creek Diversion, the trend has been a steady improvement in LOI followed by a plateau and then fluctuating values around the plateau.

As LOI refers to the percentage of transect covered by patches and the rehabilitation understory is considerably sparse with a covering of leaf litter, this may reflect the development of a leaf litter layer. However this should be incrementally increasing (unless leaf drop suddenly increased). A number of factors may be at play in the variation in data, including the use of multiple data collectors over time or climatic factors such as drought periods or large rainfall events.

Table 7: Baseline LFA Results – Stability Index

Vegetation Community	Year									
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Woodland Rehabilitation										
Average	**39.95**	**45.65**	**57.98**	**55.80**	**53.40**	**57.70**	**61.83**	**67.53**	**72.33**	**56.58**
Pasture Rehabilitation										
Average	**57.18**	**62.63**	**58.50**	**66.53**	**65.67**	**66.34**	**63.52**	**69.03**	**63.34**	**60.03**
North Wambo Creek Diversion										
Average	**-**	**-**	**54**	**69.25**	**60.25**	**63.725**	**54.15**	**60.125**	**55.625**	**53.26**
Wambo Creek*										
Average	-	-	-	-	-	-	-	-	-	**52.3**

* New riparian rehabilitation monitoring site added in 2015

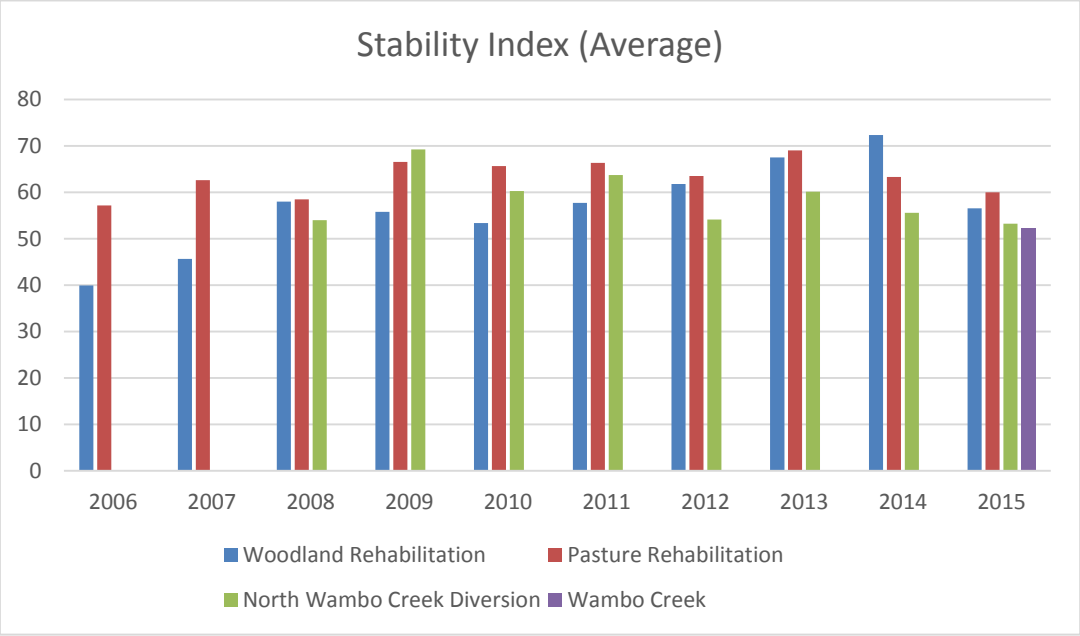

Figure 5: Stability Index (Average) 2006-2015

Overall there is not a huge amount of variation in the data collected over the ten year period. The Woodland Rehabilitation site was initially low, at 39.95 and 45.65, however the average over the following eight year period is 60.39. It is difficult to ascertain why there is this variation and as discussed previously could be attributed to a number of factors such as multiple data collectors over time or climatic factors such as drought periods or large rainfall events.

Table 8: Baseline LFA Results - Infiltration

Vegetation Community	Year									
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Woodland Rehabilitation										
Average	23.73	22.88	29.78	31.26	34.53	33.88	29.08	37.40	47.00	40.43
Pasture Rehabilitation										
Average	33.83	32.87	32.53	30.89	31.72	36.63	32.92	35.96	36.49	38.64
North Wambo Creek Diversion										
Average	-	-	30.00	38.25	29.50	33.53	25.30	27.43	27.85	28.76
Wambo Creek*										
Average	-	-	-	-	-	-	-	-	-	45.0

* New riparian rehabilitation monitoring site added in 2015

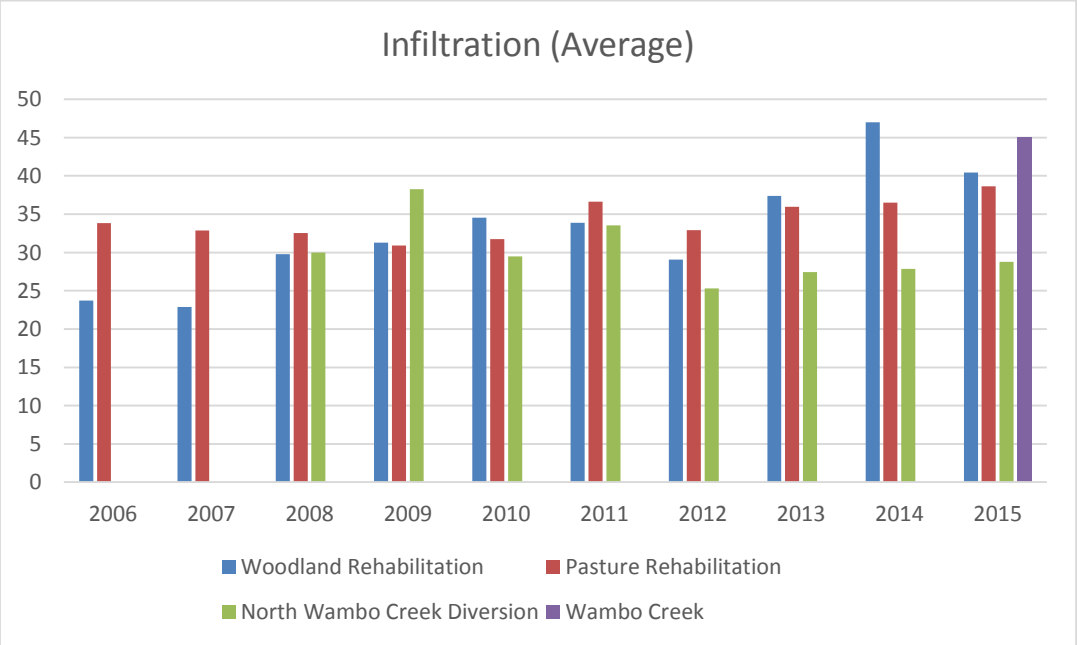

Figure 6: Infiltration (Average) 2006-2015

Pasture Rehabilitation sites are quite stable in terms of infiltration capacity and there has been little variation over time. This may be attributed to the high cover of pasture species that allows infiltration to occur consistently over this ten year period. There is variability in the infiltration capacity of the woodland sites, with the first two years sitting at 23.73 and 22.88, however this has increased over the following six years with a peak in 2014 of 47.00 and a decrease the following year to 40.43. The North Wambo Creek Diversion site has remained relatively consistent with a peak in 2009 of 38.25 and a decrease in 2012 to 25.30. Infiltration rates are likely to be affected by factors such as percentage of groundcover i.e. leaf litter, groundcover growth. No clear patterns can be drawn from the results and it is likely that variation in data, including the use of multiple data collectors over time or climatic factors such as drought periods or large rainfall events may be attributed to the variation in results.

Table 9: Baseline LFA Results –Nutrient Index

Vegetation Community	Year									
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Woodland Rehabilitation										
Average	**13.70**	**17.33**	**23.00**	**25.33**	**29.05**	**31.88**	**28.48**	**32.10**	**39.95**	**33.95**
Pasture Rehabilitation										
Average	**24.55**	**30.45**	**26.40**	**28.70**	**30.57**	**36.59**	**33.62**	**31.76**	**31.49**	**31.86**
North Wambo Creek Diversion										
Average	-	-	**11.5**	**27.8**	**20**	**25.18**	**19.68**	**18.3**	**17.1**	**19.34**
Wambo Creek*										
Average	-	-	-	-	-	-	-	-	-	**29.6**

* New riparian rehabilitation monitoring site added in 2015

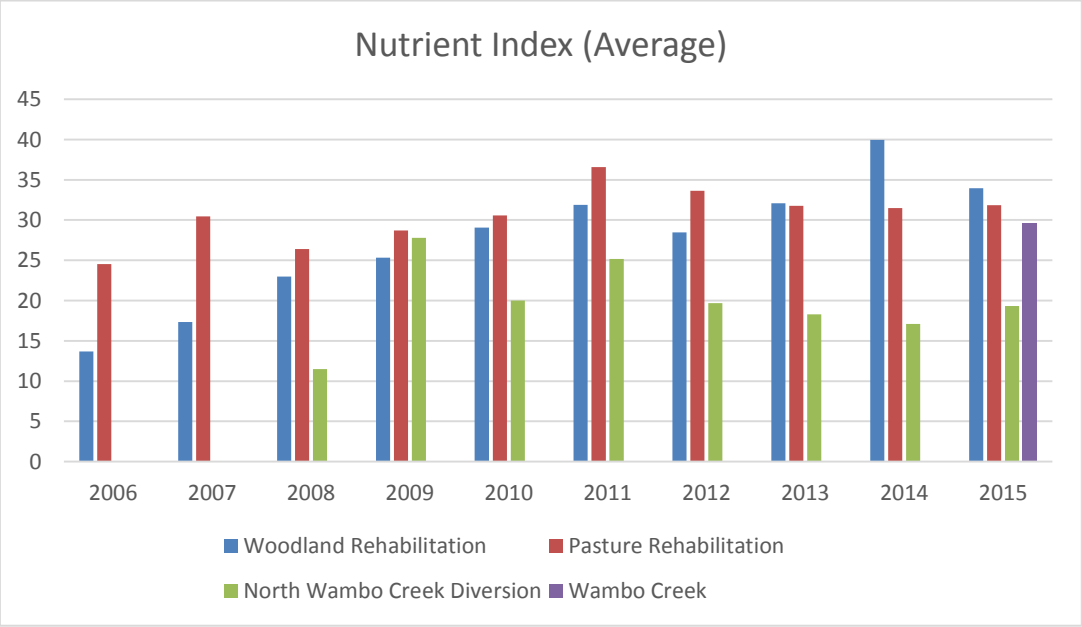

Figure 7: Nutrient Index (Average) 2006-2015

The nutrient index at Woodland Rehabilitation sites has seen consistently increasing results since 2006 with one slight decrease in 2012 and a peak in 2014. Overall the nutrient index of the woodland sites is improving and may be attributed to the development of a more complex natural system i.e. increased ground layer, leaf litter etc. The Pasture Rehabilitation sites have varying results with slight decreases and peaks occurring throughout the ten year period. Generally these are not large variations with the lowest score being 24.55 and the highest score 36.59 and an average of 30.59. There is large variability in the results for the North Wambo Creek Diversion sites with the lowest score being 11.5 and the highest score being 27.8 in the following year. Overall there is a trend of improvement in nutrient index, particularly with woodland and pasture rehabilitation sites, while the North Wambo Creek experienced an initial peak in improvement followed by a smaller reduction then has plateaued and remained fairly constant.

As discussed previously it is likely that variation in data, including the use of multiple data collectors over time or climatic factors such as drought periods or large rainfall events may be attributed to the variation in results.

3.6.6 BioMetric Vegetation Monitoring

BioMetric is a terrestrial biodiversity Native Vegetation Assessment Tool that assesses losses of biodiversity from proposed clearing and calculates gains in biodiversity from proposed offsets (OEH, 2016). The BioMetric method (Gibbons et al 2009) is proposed as the model for determining meaningful, quantitative, biodiversity focused Completion Criteria (**Section 5.1**). BioMetric, a NSW Government endorsed biodiversity assessment method (developed for the NSW BioBanking Assessment Methodology), provides a useful decision making framework founded on a standardised repeatable measurement method readily applicable to a monitoring program. BioMetric is a quantitative method developed to comparatively assess the condition of vegetation and habitat values of native vegetation against pre-defined benchmarks (i.e. pre European settlement). Further detail on the methodology is included in **Section 7.1.2.**

Baseline biometric monitoring was undertaken in the RWEAs in October 2015, in accordance with the methods described in **Sections 5.1** and **7.1.2.** A total of 9.4mm of rain was recorded during the two week monitoring period (16-19th and 19-29th October) and the average temperature was 29-30°C. Data was collected from 34 locations previously surveyed by Niche (2014a) and RPS (2010). Baseline biometric monitoring data for this monitoring event is included in **Appendix C,** with average values for each Plant Community Type included in **Table 10.**

During November 2015, floristic data was collected from an additional four sites in woodland rehabilitation areas to measure biometric attributes in addition to Landscape Function Analysis (**Section 3.6.5**). Baseline biometric monitoring data for this monitoring event is included in **Appendix C,** with average values included in **Table 11.**

Table 10: Baseline Floristic Results for RWEAs

Vegetation Community	NPS[1]	NOS (%)[2]	NMS (%)[3]	NGCG[4]	NGCS[5]	NGCO[6]	EPC[7]	OR8	HBT[9]	FL[10]
PCT 42: River Red Gum / River Oak riparian woodland wetland in the Hunter Valley										
Average Values	**14.3**	**15.3**	**14.5**	**28.9**	**1.1**	**6.9**	**38.3**	**1**	**0**	**14.9**
PCT 1658: Rough barked Apple–Narrow leaved Ironbark-Blakely's Red Gum-Bull Oak–Coast Banksia woodland on sands of the Warkworth area										
Average Values	**27**	**11.8**	**10.8**	**19.5**	**3.5**	**31**	**10.4**	**1**	**1**	**13.9**
PCT 1603: Narrow leaved Ironbark – Bull Oak - Grey Box shrub- grass open forest of the central and lower Hunter										
Average Values	**29**	**13.8**	**9.2**	**26**	**7.4**	**4**	**0.2**	**1**	**0.7**	**26.35**
PCT1604: Narrow leaved Ironbark – Grey Box - Spotted Gum shrub - grass of the central and lower Hunter										
Average Values	**35**	**22.5**	**7.2**	**34**	**8**	**5.3**	**0**	**1**	**0**	**35.3**
PCT1176: Slaty Box – Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion										
Average Values	**31**	**12.1**	**11.6**	**23.5**	**3**	**6**	**0**	**1**	**0**	**26**
PCT 1584: White Mahogany – Spotted Gum - Grey Myrtle semi-mesic shrubby open forest of the central and lower Hunter Valley										
Average Values	**50**	**10.5**	**19**	**70**	**16**	**8**	**0**	**1**	**0**	**25**
PCT 1603: Narrow-leaved Ironbark – Bull Oak - Grey Box shrub -grass open forest of the central and lower Hunter *										
Average Values	**39**	**5.5**	**25.7**	**40.7**	**6.7**	**12.6**	**4**	**1**	**0**	**12.6**

Notes:
1. Native Plant Species Richness (NPS)
2. Native Overstorey Cover (NOS)
3. Native Midstorey Cover (NMS)
4. Native Ground Cover – grasses (NGCG)
5. Native Ground Cover – shrubs (NGCS)
6. Native Ground Cover – other (NGCO)
7. Exotic plant cover (EPC)
8. Proportion of native overstorey species regenerating (OR)
9. Hollow bearing trees
10. Fallen Log

*. Likely a derived community, resulting from the removal of overstorey species in Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest and a dense regeneration of the shrub layer.

Table 11: Baseline Floristic Results for Woodland Rehabilitation Areas

	NPS[1]	NOS (%)[2]	NMS (%)[3]	NGCG	NGCS	NGCO	EPC[4]	OR	HBT	FL
Average Values	**7**	**20.25**	**7.13**	**4**	**0**	**1.5**	**5.5**	**0**	**0**	**6.38**[5]

Notes:
1. Native to NSW
2. Including E.cladocalyx
3. Including A.saligna
4. Exotic to Australia
5. Logs recorded in one site only

3.6.7 Photo Point Monitoring in RWEAs

A number of photo monitoring points were established in the RWEAs in October 2014 in accordance with the requirements of the Conservation Agreements and as part of WCPL's Biodiversity Monitoring Program (**Section 7.0**). Maps showing the Photo Monitoring Point locations are included in **Appendix D** Baseline photos of these monitoring points are included in **Appendix E**, along with notes describing the monitoring sites and dominant species present at each site. A description of baseline conditions at each of the sites is provided in **Table 12** below.

Table 12: Description of Baseline Conditions at Photo Monitoring Points in RWEAs

RWEA	Photo Point	Baseline Condition
A	A1	Vegetation is predominately River Red Gum Woodland on fertile sandy alluvial soils. The site is dominated by native tree and shrub species. However, the understorey has a high cover of introduced herbaceous species and accordingly is in 'low' condition. It is noted that native parrots nest at this site.
	A2	Vegetation has been identified as Coast Banksia / Rough-barked Apple / Blakely's Red Gum Forest (Warkworth Sands Woodland EEC). The understorey is dense, with groundcover consisting predominately of Bracken Fern (*Pteridium esculentum*), typical of Warkworth Sands EEC, reaching a height of 1 m. The overstorey is dominated by Rough-barked Apple (*Angophora floribunda*) and Coast Banksia (*Banksia integrifolia*). Trees at this site are on average 6 m or higher in height. Flora species are mostly native, however, some exotic species (including Prickly Pear [*Opuntia species*], Flatweed [*Senecio madagascariensis*], and Greater Beggars Ticks [*Bidens subalternans*]), have been recorded.
	A3	Vegetation is River Oak / Rough-barked Apple Forest on fertile sandy alluvial soils. Groundcover at this site consists mostly of Casuarina foliage, with some large woody debris. Trees at this site are on average 20 m or higher in height. Five exotic flora species have been noted at this site, with the most abundant exotic species being Wandering Jew (*Tradescantia flumensis*) and Panic Veldtgrass (*Ehrharta erecta*).
	A4	Vegetation is predominately Narrow-leaf Ironbark / Grey Box / Bulloak / Honeymyrtle Forest. The groundcover consists mostly of leaf litter, small woody debris and large woody debris (fallen trees). The site is prone to waterlogging and is therefore subject to dieback as a result of extended wetness. However, a number of young Bulloak (*Allocasuarina luehmannii*) trees and a naturally sparse cover of foliage have been observed at this site, indicating healthy regeneration from historical disturbance. Trees at this site are on average 6 m or higher in height. Limited exotic flora species have been recorded at this site.
B	B1	Vegetation is White Mahogany / Rough-barked Apple Forest, with shrubs reaching 2 m in height. Ground cover consists of short grasses and sparse tussock grasses. This site consists almost entirely of native flora species and very limited exotic flora has been identified at this site.
	B2	Vegetation is Spotted Gum / Narrow-leaf Ironbark / Bulloak / Paperbark Forest. Groundcover consists mostly of leaf litter and woody debris. Active regeneration of eucalypts is present, and most trees at the site are 6 m or higher in height. Very limited exotic flora species has been recorded at this site.
C	C1	Vegetation is Narrow-leaf Ironbark / Grey Box / Bulloak / Honeymyrtle Forest. Groundcover consists mostly of leaf litter and woody debris, with a very sparce cover of long grasses and small shrubs. Trees at this site are on average 6 m or higher in height. Very limited exotic flora species has been recorded at this site.
	C2	Vegetation is Narrow-leaf Ironbark / Grey Box / Bulloak / Honeymyrtle Forest. Groundcover consists mostly of leaf litter and woody debris, with a very sparce cover of long grasses and small shrubs. Trees at this site are on average 6 m or higher in height. Tree hollows are present at this site, and evidence of fire has been recorded. Very limited exotic flora species

RWEA	Photo Point	Baseline Condition
		has been recorded at this site.
D	D1	Vegetation is Slaty Gum / Narrow-leaf Ironbark / Bulloak / Paperbark Forest. There is this groundcover consisting of leaf litter, woody debris, rocks and live vegetation (small trees and shrubs). Very limited exotic flora has been recorded at this site.
Coal Terminal	CT1	Vegetation is a combination of Narrow-leaf Ironbark / Grey Box / Bulloak / Honeymyrtle Forest. This site has very little native or introduced ground cover owing to the dense Bulloak regeneration which suppresses ground cover development. , with an understorey of tussock grasses. Trees at this site are on average 6 m or higher, however many young pine trees (1 – 2 m tall) have been recorded. Vegetation is predominately native flora, however, Creeping Prickly Pear (*Opuntia humifusa*) and Fireweed (*Senecio madagascariensis*) have been recorded.
	CT2	The vegetation is Ironbark eucalypt dominated woodlands/forest, with a clear understorey. This site is transitional between Ironbark / Bulloak Forest and Warkworth Sands Woodland. It has shallow Aeolian sand deposited over Permian sediments. It is considered to be semi-cleared, and an old track runs through the site. A number of exotic flora species have been recorded at this site, namely including Creeping Pear (*Opuntia humifusa*), Blue Heliotrope (*Heliotropium amplexicaule*), Red Natal Grass (*Melinis repens*), Fireweed (*Senecio madagascariensis*) and Galenia (*Galenia pubescens*). Feral animals appear to be present at this site, as evidence of digging and scats, likely to be European Wild Rabbit (*Oryctolagus cuniculus*), has been recorded

4.0 Biodiversity Management Domains

4.1 Overview

The term 'Management Domain' has been used to identify a management area for the purpose of management action implementation and monitoring. A description of each Management Domain is provided below.

The Management Domains described in this BMP are:

1. RWEA - A, B, C, D and D Extension and RWEA Wambo Coal Terminal (RWEAs are also the designated Biodiversity Offset areas);
2. Open Cut Woodland Revegetation Areas (land disturbed by mining);
3. North Wambo Creek Diversion Area (NWCD); and
4. Buffer/Grazing Areas.

Table 13 provides the land area of the management domains and **Figure 8** illustrates the domain boundaries. Non-shaded areas in **Figure 8** are assumed to be mining related and not under a management regime. Revegetation Areas and Buffer/Grazing Areas are subject to continual change and will be managed in accordance with this BMP.

Table 13: Biodiversity Management Domain Areas

Management Domain[1]	Area (ha)
RWEA A	424
RWEA B	454
RWEA C	211
RWEA D & D Extension	46 + 2
RWEA Wambo Coal Terminal	15.52
Open Cut Woodland Revegetation Areas[2]	1570
North Wambo Creek Diversion Area (Stage 2 & 3)	23
Buffer/Grazing Areas[3]	1983

1. Should the Secretary determine that an additional offset is required under Condition 22, WCPL will be required to provide this offset in addition to the specified offsets (RWEAs) in **Table 13**. The size of any additional offset required shall be determined in consultation with the NSW Office of Environment and Heritage (OEH) and to the satisfaction of the Secretary.
2. This area is based on the establishment of 50% woodland within the mixed woodland/pasture areas shown in the EIS, and with the agreement of the Secretary, may vary depending on the shape of the final landform and the approved mine closure plan.
3. Includes all areas of WCPL managed land not contained within other Management Domains as of June 2016 i.e. Peabody pastoral land holdings.

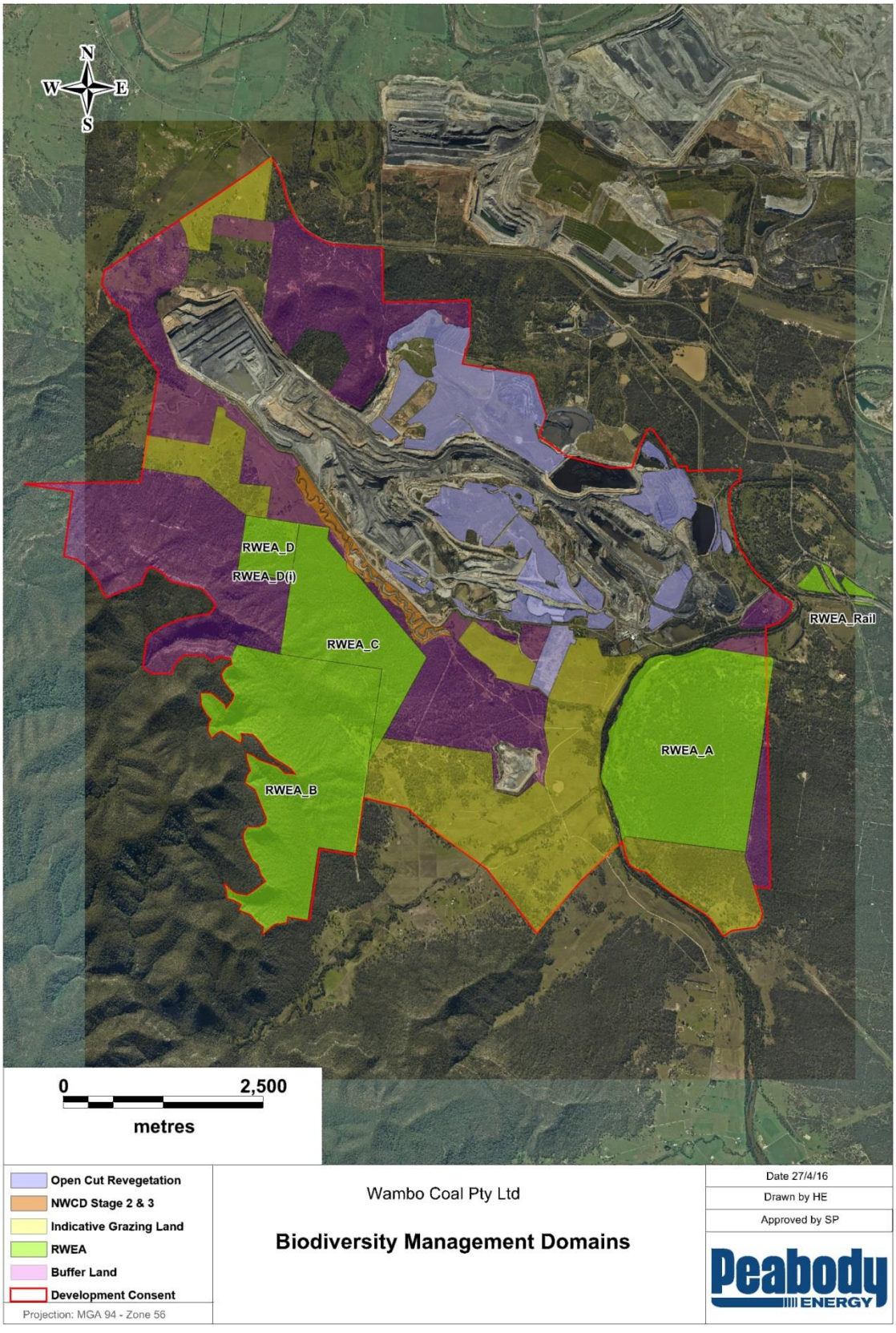

Figure 8: Biodiversity Management Domains

4.2 Management Domains

4.2.1 Remnant Woodland Enhancement Areas

The RWEAs (A, B, C, D & D Extension and Wambo Coal Terminal) have been established on areas of WCPL-owned land containing 1153 ha of remnant vegetation, as shown on **Figure 8.** The RWEAs are currently the subject of draft CAs, in accordance Condition 41 of DA 305-7-2003, with the NSW Minster responsible for administering the *National Parks and Wildlife Act 1974.* Once finalised, the CAs will provide for the enhancement and conservation of existing remnant vegetation. Ongoing management and monitoring of the RWEAs is required to be undertaken in accordance with this BMP.

The objective of the RWEA program is to assist in the conservation of regional biodiversity, whilst enhancing the habitat available to flora and fauna. In accordance with EPBC approval 2003/1138, the RWEA program will provide a strategy that gives protection in perpetuity for RWEA A and long-term protection of RWEAs B, C and D & D extension. The five RWEAs are shown on **Figure 8.** The RWEA enhancement strategies are detailed in **Section 6.1.**

A Biodiversity Offset Strategy has been developed and incorporated into Schedule 4 Condition 40 of DA 305-7-2003. The Strategy incorporates the RWEAs and Open Cut Revegetation Areas. Ongoing management and monitoring of these areas is required to be undertaken in accordance with this BMP.

Surveys of the ecological communities which comprise the RWEAs A – D were undertaken during 2015 by Flora Search as part of the South Wambo Underground Mine Modification EIS (FloraSearch, 2016). The identified communities are summarised in **Table 14** and shown on **Figure 9**.

4.2.1.1 Conservation Values of RWEAs A-D

The following conservation values apply to RWEAs A-D:

- MU7 - Narrabeen Footslopes Slaty Box Woodland, Biometric Vegetation Type HU618. Also recognised as Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion (listed as Vulnerable under the TSC Act and Critically Endangered under the EPBC Act);
- MU10 - Central Hunter Box – Ironbark Woodland, Biometric Vegetation Type HU551. Also recognised as Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions (listed as Endangered under the TSC Act and Critically Endangered under the EPBC Act);
- MU12 - Southern Hunter Escarpment Spotted Gum Woodland;
- MU13 - Hunter Floodplain Red Gum Woodland Complex, Biometric Vegetation Type HU599 95% cleared within the Hunter-Central Rivers CMA. Also recognised as Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions (listed as Endangered under the TSC Act);
- MU14 - Warkworth Sands Woodland (Warkworth Sands Woodland in the Sydney Basin Bioregion listed as an EEC under Schedule 1 of the TSC Act EEC and Critically Endangered under the EPBC Act);
- MU17 - Central Hunter Paperbark Soak Woodland (HU564 Biometric Vegetation Type - 80% cleared within the Hunter-Central Rivers CMA);

- MU22 - Wollombi Alluvial Red Gum – Apple Forest;
- MU30 - Hunter Valley River Oak Forest;
- 8 - Native Olive-Scrub Wilga Woodland; and
- G - Secondary Native Grassland.

The Conservation Area contains habitat suitable for fauna species listed as Endangered (seven species), Vulnerable (37 species) and Critically Endangered (two species), respectively under the TSC Act plus 10 species listed only under the EPBC Act (refer **Table 5**).

The Conservation Area contains extensive registered Aboriginal sites, including open artefact sites, grinding grooves, isolated finds and potential archaeological digs.

The Conservation Area is adjacent to remnant bushland areas (i.e. Wollemi National Park). Wollemi National Park is part of the Greater Blue Mountains World Heritage Area, which covers approximately 1 million ha and supports an exceptional number of threatened flora and fauna species.

4.2.1.2 Conservation Values of RWEA Coal Terminal

The following conservation values apply to the RWEA Coal Terminal:

- The RWEA Coal Terminal contains:
  - MU10 - Central Hunter Box – Ironbark Woodland (Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions listed as an EEC under Schedule 1 of the TSC Act) and Critically Endangered under the EPBC Act) (also HU551 Biometric Vegetation Type);
  - MU14 – Warkworth Sands Woodland (Warkworth Sands Woodland in the Sydney Basin Bioregion listed as an EEC under Schedule 1 of the TSC Act, also listed by the Commonwealth as CEEC; and
  - G - Secondary Native Grassland.
- The RWEA Coal Terminal contains habitat suitable for fauna species listed as Endangered (seven species), Vulnerable (37 species) and Critically Endangered (two species), respectively under Schedules 1, 1A and 2 of the TSC Act plus 10 species listed only under the EPBC Act (refer to **Table 5**).
- The RWEA Coal Terminal contains registered Aboriginal sites, (open artefact sites 37-6-1131 and 37-6-0594).
- The RWEA Coal Terminal is adjacent to remnant bushland areas (i.e. Wollemi National Park). Wollemi National Park is part of the Greater Blue Mountains World Heritage Area, which covers approximately 1 million ha and supports an exceptional number of threatened flora and fauna species.

Table 14: Flora Communities within RWEAs A - D

Offset Area	Community	EEC name	Threatened[1]
RWEA A	River Oak Riparian Woodland	N/A	No
	Forest Red Gum Floodplain Forest	Hunter Floodplain Red Gum Woodland	Yes
	Narrow-leaved Ironbark - Grey Box Woodland	Central Hunter Grey Box—Ironbark Woodland (part of Commonwealth listed Central Hunter Valley Eucalypt Forest and Woodland CEEC)	Yes
	Rough-barked Apple - Coast Banksia Woodland	Warkworth Sands Woodland (listed by Commonwealth as a Critically Endangered Ecological Community (CEEC))	Yes
	Derived Grassland	N/A	No
RWEA B	Forest Red Gum Floodplain Forest	Hunter Lowland Redgum Forest	Yes
	Rusty Fig - Native Quince - Native Olive Dry Rainforest	N/A	No
	Spotted Gum - Narrow-leaved Ironbark - Grey Box Woodland	Central Hunter Ironbark—Spotted Gum—Grey Box Forest (part of Commonwealth listed Central Hunter Valley Eucalypt Forest and Woodland CEEC)	Yes
	Narrow-leaved Ironbark - Grey Box Woodland	Central Hunter Grey Box—Ironbark Woodland (part of Commonwealth listed Central Hunter Valley Eucalypt Forest and Woodland CEEC)	Yes
	Narrow-leaved Ironbark - Grey Box Woodland (Disturbed)	Central Hunter Grey Box—Ironbark Woodland (part of Commonwealth listed Central Hunter Valley Eucalypt Forest and Woodland CEEC)	Yes
	Sandstone riparian scrub	N/A	No
	Grey Box - Slaty Box Woodland	Hunter Valley Footslopes Slaty Gum Woodland (part of Commonwealth listed Central Hunter Valley Eucalypt Forest and Woodland CEEC)	Yes
	Derived Grassland	N/A	No
RWEA C	Forest Red Gum Floodplain Forest	Hunter Lowland Redgum Forest	Yes
	Narrow-leaved Ironbark - Grey Box Woodland	Central Hunter Grey Box—Ironbark Woodland (part of Commonwealth listed Central Hunter Valley Eucalypt Forest and Woodland CEEC)	Yes
	Bull Oak Grassy Woodland	N/A	No
	Melaleuca decora Low Forest	N/A	No
	Grey Box - Slaty Box Woodland	Hunter Valley Footslopes Slaty Gum (part of Commonwealth listed Central Hunter Valley Eucalypt Forest and Woodland CEEC)	Yes
	Grey Box - Slaty Box Woodland (Disturbed)	Hunter Valley Footslopes Slaty Gum (part of Commonwealth listed Central Hunter Valley Eucalypt Forest and Woodland CEEC)	Yes
	Derived Grassland	N/A	No
RWEA D	Narrow-leaved Ironbark - Grey Box Woodland	Central Hunter Grey Box—Ironbark Woodland (part of Commonwealth listed Central Hunter Valley Eucalypt Forest and Woodland CEEC)	Yes
	Grey Box - Slaty Box Woodland	Hunter Valley Footslopes Slaty Gum (part of Commonwealth listed Central Hunter Valley Eucalypt Forest and Woodland CEEC)	Yes
	Grey Box - Slaty Box Woodland (Disturbed)	Hunter Valley Footslopes Slaty Gum (part of Commonwealth listed Central Hunter Valley Eucalypt Forest and Woodland CEEC)	Yes
	Derived Grassland	N/A	No
RWEA Rail	Narrow-leaved Ironbark - Grey Box Woodland	Central Hunter Grey Box—Ironbark Woodland (part of Commonwealth Central Hunter Valley Eucalypt Forest and Woodland CEEC)	Yes
	Rough-barked Apple - Coast Banksia Woodland	Warkworth Sands Woodland(listed by Commonwealth as a Critically Endangered Ecological Community (CEEC))	Yes
	Secondary Native Grassland	N/A	No

Note
1. Listed as a Threatened Ecological Community or Critically Endangered Ecological Community under the NSW Threatened Species Conservation Act 1995 or the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999

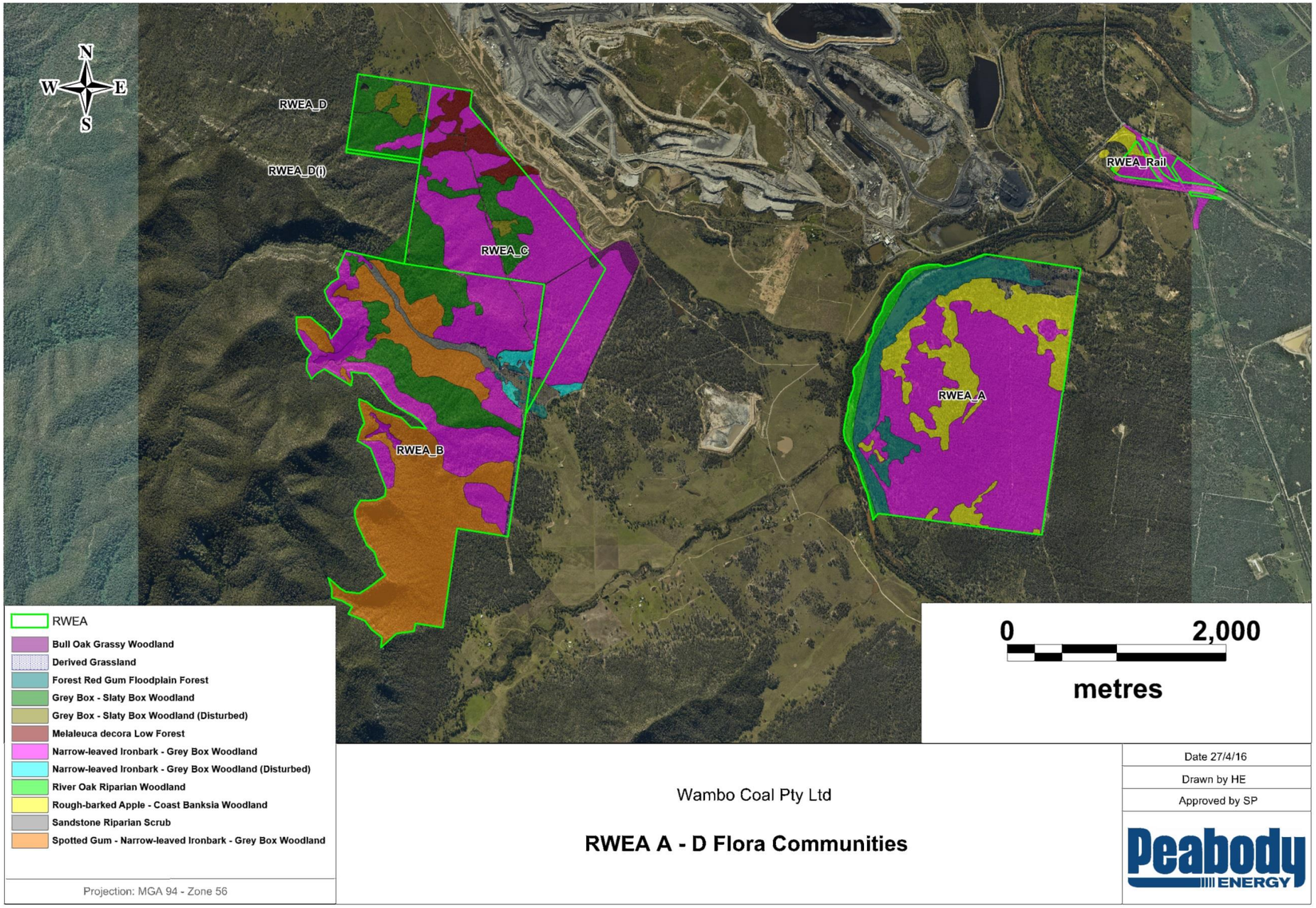

Figure 9: Flora Communities within the RWEAs

4.2.2 Open Cut Woodland Revegetation Areas

The approved disturbance area for the Mine includes active and future mining areas and infrastructure areas. Rehabilitation and revegetation of areas disturbed by mining and infrastructure are undertaken progressively in accordance with the approved Mining Operations Plan (MOP). The revegetation program for Project rehabilitation areas provides for a combination of woodland and pasture outcomes. Further detail on the establishment of suitable PCTs within woodland rehabilitation areas is provided in **Sections 5.1** and **6.1.2**.

As of the 31 December 2015 approximately 453.49ha of completed landforms have been rehabilitated (137.13 ha for grazing and 316.36ha for Woodland corridor).

4.2.3 North Wambo Creek Diversion Area

The ephemeral North Wambo Creek has been diverted around the active Bates South Open Cut Pit. The North Wambo Creek Diversion (NWCD) is located adjacent to the finishing (i.e. north-eastern) ends of the proposed underground longwall panels SBU LWs 14-16 and is partially located above panels SBU LWs 11-13.

The NWCD has been constructed within the natural surface soils, with the heights of the banks typically ranging between 3 to 5 metres.

4.2.4 Buffer/Grazing Areas

Peabody pastoral land holdings are subject to individual farm management agreements and action plans, as well as this BMP. Refer to **Section 6.3** for general land management strategies applicable to buffer/grazing areas.

5.0 Completion Criteria

WCPL has developed measurable, quantitative Completion Criteria that will support the agreed final land use for the Mine. Completion Criteria have been developed to ensure that progress can be quantitatively assessed and that progress towards overall mine closure objectives is occurring. A monitoring program (**Section 7.0**) will be implemented to monitor the Mine's progress against the developed Completion Criteria.

WCPL's Completion Criteria and monitoring program has been developed based on the Biometric (Gibbons et al 2009) and LFA methodologies for assessing ecosystem function and landform establishment success respectively (**Section 7.1**).

5.1 Biometric Assessment

A green, yellow, orange and red colour system has been developed to rank each measured attribute according to the performance and management actions required. This colour ranking system is shown in **Table 15.** The number of hollow-bearing trees and length of fallen logs have been presented as a measure of fauna habitat attributes. However no performance criteria has been set for these attributes in remnant vegetation, as in some cases it may take many years (50+) for a suitable density of hollows and logs to form naturally.

Table 15: Colour Ranking System for Floristic Attributes and Performance Targets

Site Attribute	Red (needs greater improvement)	Orange (in need of improvement)	Yellow (Not meeting target but values still acceptable)	Green (Excellent – within target range)
Native Plant Species Richness (NPS)	0-10%	>10-<50% of target range	50-<100% of target range	≥ target range
Native Overstorey Cover (NOS)	0-10% or >200% of target range	>10-<50% or >150-200% of target range	50-<100% or >100-150% of target range	Within target range
Native Midstorey Cover (NMS)	0-10% or >200% of target range	>10-<50% or >150-200% of target range	50-<100% or >100-150% of target range	Within target range
Native Ground Cover – grasses (NGCG)	0-10% or >200% of target range	>10-<50% or >150-200% of target range	50-<100% or >100-150% of target range	Within target range
Native Ground Cover – shrubs (NGCS)	0-10% or >200% of target range	>10-<50% or >150-200% of target range	50-<100% or >100-150% of target range	Within target range
Native Ground Cover – other (NGCO)	0-10% or >200% of target range	>10-<50% or >150-200% of target range	50-<100% or >100-150% of target range	Within target range
Proportion of native overstorey species regenerating (OR) in vegetation zone	0	0-0.5	0.5-1	1
Exotic plant cover (EPC)	>66%	33-66%	5-33%	0-5%

Completion criteria for seven Plant Community Types (PCT) present within the RWEAs has been developed considering both the baseline data collected during the 2014/2015 monitoring program (refer **Appendix C**) and OEH benchmark values for each PCT (**Section 3.6.6**). This criterion is included within **Table 16**, along with the average value calculated from the site value scores for each monitoring plot within the PCT (**Table 10**)**.**

Community condition benchmarks (developed by OEH for each PCT) have been modified to provide realistic, ambitious but achievable performance criteria for each plant community. Monitoring results can then be compared to these performance criteria to determine if management actions are likely to be required.

The following PCTs are considered most appropriate for the establishment of woodland vegetation within rehabilitation areas at the Mine, given the post mining landscape and surrounding vegetation:

- PCT 1603: Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter;
- PCT 1604: Narrow-leaved Ironbark - Grey Box - Spotted Gum shrub - grass woodland of the central and lower Hunter; and
- PCT 1176: Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion.

Based on the above, completion criteria have been developed for older woodland rehabilitation areas with a canopy of Sugar Gum and rehabilitated areas of Narrow-leaved Ironbark – Bull Oak - Grey Box open forest (**Error! Reference source not found.**).

As existing woodland rehabilitation areas have been designed and implemented applying old techniques that do not reflect the current best practice of utilising species of local provenance, performance criteria for these older rehabilitation areas has been developed by modifying condition benchmarks for Grey-Box-Slaty Box shrub-grass woodland on sandstone slopes of the upper Hunter and Sydney Basin, which is expected to have a similar vegetation structure, albeit different species composition, to the mature rehabilitated woodland community.

Table 16: Floristic Performance Criteria for Plant Community Types in RWEAs

Plant Community Type (PCT)		NPS	NOS (%)	NMS (%)	NGCG	NGCS	NGCO	EPC	OR	HBT	FL
PCT 42: River Red Gum / River Oak riparian woodland wetland in the Hunter Valley	Average Value	14.3	15.3	14.5	28.9	1.1	6.9	38.3	1	0	14.9
	Benchmark Value	38	10-50	10-50	20-60	1-5	10-30	<5	1	0.1	10
	Completion Criteria	**>20**	**10-50**	**10-50**	**20-60**	**1-5**	**5-30**	**<10**	**1**	**-**	**-**
PCT 1658: Rough barked Apple–Narrow leaved Ironbark-Blakely's Red Gum-Bull Oak–Coast Banksia woodland on sands of the Warkworth area	Average Value	27	11.8	10.8	19.5	3.5	31	10.4	1	1	13.9
	Benchmark Value	26	13-40	10-50	4-15	5-30	5-25	0	1	0.8	20
	Completion Criteria	**>20**	**10-40**	**10-50**	**4-20**	**5-30**	**5-35**	**<10**	**1**	**-**	**-**
PCT 1603: Narrow leaved Ironbark – Bull Oak - Grey Box shrub- grass open forest of the central and lower Hunter	Average Value	29	13.8	9.2	26	7.4	4	0.2	1	0.7	26.35
	Benchmark Value	41	15-40	5-10	30-50	5-10	20-40	<5	1	3	5
	Completion Criteria	**>25**	**10-40**	**5-10**	**15-50**	**5-10**	**5-40**	**<5**	**1**	**-**	**-**
PCT1604: Narrow leaved Ironbark – Grey Box - Spotted Gum shrub - grass of the central and lower Hunter	Average Value	35	22.5	7.2	34	8	5.3	0	1	0	35.3
	Benchmark Value	41	15-40	5-20	30-50	5-10	20-40	<5	1	3	5
	Completion Criteria	**>35**	**15-40**	**5-20**	**30-50**	**5-15**	**5-40**	**<5**	**1**	**-**	**-**
PCT1176: Slaty Box – Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	Average Value	31	12.1	11.6	23.5	3	6	0	1	0	26
	Benchmark Value	21	19-42	6-24	5-20	0-25	2-10	<5	1	1	30
	Completion Criteria	**21**	**15-40**	**5-30**	**5-30**	**0-25**	**2-10**	**<5**	**1**	**-**	**-**
PCT 1584: White Mahogany – Spotted Gum - Grey Myrtle semi-mesic shrubby open forest of the central and lower Hunter Valley	Average Value	50	10.5	19	70	16	8	0	1	0	25
	Benchmark Value	51	22-45	5-40	5-25	10-20	5-20	<5	1	1	20

Plant Community Type (PCT)		NPS	NOS (%)	NMS (%)	NGCG	NGCS	NGCO	EPC	OR	HBT	FL
	Completion Criteria	**>45**	**15-45**	**5-40**	**5-40**	**10-20**	**5-20**	**0**	**1**	**-**	**-**
PCT 1603: Narrowleaved Ironbark – Bull Oak - Grey Box shrub -grass open forest of the central and lower Hunter *	Average Value	39	5.5	25.7	40.7	6.7	12.6	4	1	0	12.6
	Benchmark Value	41	15-40	5-10	30-50	5-10	20-40	<5	1	3	5
	Completion Criteria	**>30**	**5-40**	**5-40**	**30-50**	**5-10**	**10-40**	**<5**	**1**	**-**	**-**

* *Bench mark values for PCT 1603: Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter, however this vegetation may be derived from more than one community or from a transition zone between plant communities*

Table 17: Performance Targets for Older Woodland Areas and Rehabilitation Sites

	NPS	NOS (%)	NMS (%)	NGCG	NGCS	NGCO	EPC	OR	FL
Older Woodland Rehabilitation on areas with a canopy of Sugar Gum	>15	15-40	5-40	5-15	5-10	5-15	<20	1	5
Rehabilitated areas of Narrow-leaved Ironbark – Bull Oak - Grey Box open forest	>20	10-40	5-10	15-50	5-10	5-40	<20	1	-

5.2 CA Requirements

Whilst specific criteria have not been established for the RWEAs in the CAs, Annexure C of the CAs (Item 1) requires that WCPL "aim" for an exotic plant cover within the Conservation Areas that does not exceed the percentages described in **Table 18** below.

Table 18: Conservation Agreement Aims

RWEA	Aim	Timing
Coal Terminal	Exotic plant cover within the Conservation Area must not be permitted to exceed : - 5% of the foliage cover at monitoring site CT1*; and - 15% of the foliage cover at monitoring site CT2*.	In Year 1 and at the end of Year 5
RWEAs A, B, C and D	Exotic plant cover within the Conservation Area must not be permitted to exceed : - 70% of the foliage cover at monitoring site A1 within Area A; - 20% of the foliage cover at monitoring site A2 within Area A; - 30% of the foliage cover at monitoring site A3 within Area A; - 10% of the foliage cover at monitoring site A4 within Area A; - 5% of the foliage cover at monitoring site B1 within Area B; - 5% of the foliage cover at monitoring site B2 within Area B; - 5% of the foliage cover at monitoring site C1 within Area C; and - 5% of the foliage cover at monitoring site D1 within Area D,	In Year 1
	Exotic plant cover within the Conservation Area must not be permitted to exceed : - 60% of the foliage cover at monitoring site A1 within Area A; - 15% of the foliage cover at monitoring site A2 within Area A; - 20% of the foliage cover at monitoring site A3 within Area A; - 5% of the foliage cover at monitoring site A4 within Area A; - 5% of the foliage cover at monitoring site B1 within Area B; - 5% of the foliage cover at monitoring site B2 within Area B; - 5% of the foliage cover at monitoring site C1 within Area C; and - 5% of the foliage cover at monitoring site D1 within Area D,	Years 2-5

* Monitoring locations are shown on **Figure 10**.

Actions to address the Conservation Area aims in **Table 18** are included in the Three Year Management Strategy (**Appendix F**).

5.3 Landscape Function Analysis

A colour system was devised to highlight the performance of each LFA site (**Table 19**). This was applied to the average score from all the LFA sites within each rehabilitation area.

Table 19: Colour system devised to highlight the performance of each LFA site

Green	Yellow	Orange	Red
Area is generally meeting or exceeding target values and values do not show trend of decline over time – where monitoring sites are meeting targets and values are relatively consistent, reduce monitoring to infrequent LFA when changes in landscape or management practices occur i.e. fire or grazing)	Area generally falls below target values but within 75% of targets or appears to be on a trajectory of improvement without the need for management intervention – further monitoring required	Area generally falls between 75% and 50% of target values or shows little sign of improvement over several monitoring events – further monitoring and possibly management actions required	Area falls below 50% of target and is unlikely to improve without management actions or shows trend of decline which is unlikely to improve without management actions

Target scores were developed to provide quantitative measures that can be used to compare rehabilitation areas with reference sites throughout the course of the monitoring program (**Section 7.0**). These scores were developed using the baseline data (**Section 3.6.5**) and data from nearby sites within relatively undisturbed riparian habitat. Target scores are provided in **Table 20**, along with the average scores from the 2015 baseline monitoring program (showing the current condition).

Table 20: LFA Target Scores

Site Type		LOI	SI	INFI	NI
Woodland Rehabilitation	Average Score	0.77	56.58	40.43	33.95
	Target Score	**>0.87**	**>59**	**>43**	**>36**
Pasture Rehabilitation	Average Score	0.84	60.03	38.64	31.86
	Target Score	**>0.93**	**>61**	**>29**	**>25**
North Wambo Creek Diversion	Average Score	0.56	53.26	28.76	19.34
	Target Score	**>0.84**	**>62**	**>41**	**>37**
Wambo Creek	Average Score	0.67	52.3	45.0	29.6
	Target Score	**>0.84**	**>62**	**>41**	**>37**

The ongoing use of LFA will be result-based, with achievement of a self-sustaining stable landform no longer requiring further monitoring. Incremental improvement toward target scores is anticipated in each successive monitoring season. Failure to progress towards completion criteria for three consecutive years will trigger further investigation (**Section 8.0**).

5.4 Subsidence Impact Performance Measures and Indicators

Biodiversity performance measures and indicators have been developed to assess the impact of subsidence relating to longwall mining upon ecological communities located within the RWEAs. These performance measures and indicators are detailed in relevant longwall extraction plans and are outlined in **Table 21.**

WCPL will report on progress against these performance indicators in the Annual Review (**Section 11.2**). In the event that a complaint is received relating to biodiversity, it will be handled in accordance with the complaints management protocol (**Section 10.0**). Contingency plans for unpredicted biodiversity impacts are discussed in **Section 8.0**.

Table 21: Subsidence Impact Performance Measures and Indicators

Biodiversity	Performance Indicator	Relevant Management and Contingency Measures
Wollemi National Park Negligible subsidence impacts. Negligible environmental consequences.	The performance indicators will be considered to have been exceeded if conventional vertical subsidence exceeds 20 millimetres (mm) or the limit of survey accuracy (whichever is greater) at the base of the Wollemi National Park escarpment. The performance indicators will be considered to have been exceeded if visual inspections identify cliff or rock face instability at the Wollemi National Park escarpment.	Consider whether the performance measure has been exceeded. If the performance measure has been exceeded, implement a Contingency Plan, which may include: ○ Implementation of erosion and sediment control measures and stabilisation techniques. ○ Scaling/dislodgement/removal of remaining loose rock. ○ Measures to improve the aesthetic values if cliff instability occurs (e.g. planting of endemic native vegetation at the base of the escarpment). ○ Additional monitoring (e.g. increase in monitoring frequency). ○ Consideration of changes to longwall extraction geometry in consultation with relevant regulatory authorities. ○ Offset in accordance with Condition 22, Schedule 4 of the Development Consent (DA 305-7-2003).
Other threatened species, populations or communities Minor cracking and ponding of the land surface or other impact. Negligible environmental consequences.	The performance indicator will be considered to have been exceeded if annual monitoring at flora monitoring sites V6-B1c and V11-B1 or bird monitoring sites above Longwalls 11 to 16 indicate a statistically significant downward trend or change between monitoring periods not observed at analogue/reference sites.	Consider whether the performance measure has been exceeded. If the performance measure has been exceeded, implement a Contingency Plan, which may include: ○ Filling of minor cracks with appropriate material (e.g. soil or mulch) to avoid the creation of drainage channels. ○ Re-grading of isolated depressions or highpoints and revegetation. ○ Re-grading of slopes to minimise the potential for erosion. ○ Remediation of creek beds to minimise bank and headwater erosion. ○ Revegetation with monitoring in accordance with the MOP. ○ Additional monitoring (e.g. increase in monitoring frequency). ○ Offset in accordance with Condition 22, Schedule 4 of the Development Consent (DA 305-7-2003).

Biodiversity	Performance Indicator	Relevant Management and Contingency Measures
Warkworth Sands Woodland Community Minor cracking and ponding of the land surface or other impact. Negligible environmental consequences.	The Warkworth Sands Woodland Community is absent from the South Bates Underground Mine area. On this basis, monitoring of environmental consequences against performance indicators and measures relating to the Warkworth Sands Woodland Community are not considered necessary for the South Bates Underground Mine. Monitoring relevant to the Warkworth Sands Woodland Community will be addressed in future revisions of the BMP prior to any extraction under the Warkworth Sands Woodland Community.	
White Box, Yellow Box, Blakely's Red Gum Woodland/Grassy White Box Woodland Community Minor cracking and ponding of the land surface or other impact. Negligible environmental consequences.	The White Box, Yellow Box, Blakely's Red Gum Woodland/Grassy White Box Woodland Community is absent from the South Bates Underground Mine area. On this basis, monitoring of environmental consequences against performance indicators and measures relating to the White Box, Yellow Box, Blakely's Red Gum Woodland/Grassy White Box Woodland Community are not considered necessary for the South Bates Underground Mine. Monitoring relevant to the White Box, Yellow Box, Blakely's Red Gum Woodland/Grassy White Box Woodland Community will be addressed in future revisions of the BMP prior to any extraction under the White Box, Yellow Box, Blakely's Red Gum Woodland/Grassy White Box Woodland Community.	

6.0 Biodiversity Management Measures and Strategies

6.1 Management Measures for Management Domains

6.1.1 Remnant Woodland Enhancement Area A – D and Rail Loop Strategies

The RWEA strategies include the conservation and enhancement of areas of remnant woodland adjacent to Wollemi National Park and Warkworth Sands. Conservation and enhancement of these areas will strengthen the linkages to be developed between Wollemi National Park, existing remnant woodland and woodland rehabilitation areas.

Activities that are not permitted to occur within the RWEAs are detailed in **Section 6.1.1.2**. Specific management measures to be implemented in the RWEAs over the next three years are detailed in the Three Year Management Schedule (**Section 6.4** and **Appendix F**.

6.1.1.1 Conservation Agreements

Condition 41, Schedule 4 of DA305-7-2003 requires WCPL to enter into CAs for the RWEAs pursuant to section 69B of the *National Parks and Wildlife Act 1974*. WCPL has drafted two CAs, in consultation with OEH, covering all offset areas listed in Table 16 (Condition 40, Schedule 4) of DA305-7-2003. These areas are listed in **Table 13** and shown on **Figure 8.**

Once finalised, the CAs will be registered pursuant to section 69F of the *National Parks and Wildlife Act 1974*. Where OEH has advised in writing that it is of the view that any such offset area or part of such an area should not be subject to a CA for a period of time, then WCPL shall by the same date cause to be registered against the land title(s) of the area/s a public positive covenant and/or restriction on the use of the land, in favour of the Secretary, requiring WCPL to implement and observe all obligations under the conditions of DA305-7-2003 in relation to the management of these areas. The CA or the public positive covenant and/or restriction on the use of land, as the case may be, shall remain in force in perpetuity in relation to the area.

Conditions of the CAs relevant to this BMP are included in **Appendix A.** The outcomes of the CAs will be reported in the Annual Review (**Section 11.2**).

6.1.1.2 Non Permitted Activities

The following activities are not permitted within the RWEAs unless provided for under the CA or with prior written consent of the Chief Executive (OEH):

- The sowing or planting of trees, grasses or other plants;
- The introduction of any non-indigenous plants or non-indigenous fauna;
- The entry of domestic animals including pets (except for the Owner's domestic pets, and only if kept under control/on a leash) and domestic livestock;
- The use or application of fertilizers or pesticides;
- The use of trail bikes, four wheel drive vehicles or any other vehicle off any formed road (except for management purposes, research, firefighting and/or any emergency requirements);
- Any works, especially any revegetation work, or any development which has the potential to adversely impact on any of the Conservation Values;
- The removal of any biological or inorganic component of the RWEAs;
- Any works which will adversely affect the natural flows of water;

- Grazing of domestic livestock;
- Any act or omission that may harm any native fauna, native plants, their habitats, cultural heritage or geo-heritage in the RWEAs or the Conservation Values;
- The construction of any new road, access track, trail, building or internal fencing; and
- Subdivide the RWEAs.

6.1.1.3 Permitted Activities

WCPL will not undertake any mining operations (except approved underground mining operations) or other activities within RWEAs, other than:

- Activities approved in this BMP;
- Environmental management, environmental monitoring or other monitoring required by DA305-7-2003 or under an approved management plan or monitoring program; and
- Rehabilitation activities under an approved Extraction Plan (see **Section 6.1.4**).

6.1.1.3.1 Control of Pests and Non-Indigenous Fauna

WCPL have implemented a pest control program in the RWEAs and adjacent grazing land to control the occurrence of pests. Depending upon annual requirements the pest control program may consist of the following:

- Monitoring:
  - observations and/or hearing calls
  - the use of standard remote infra-red camera traps
  - the use of non-poisoned “bait stations”
  - scat counts
  - other quantitative techniques which can be designed in discussion with OEH or Local Land Services (LLS)
- Controls:
  - shooting
  - trapping
  - use of poisonous baits consistent with advice from OEH and LLS.

All control methods must be identified as ‘humane’ as defined in the NSW Codes of Practice and Standard Operating Procedures for Humane Pest Vertebrate Control (Control Capture and Destruction of Feral Animals in Australia) as developed by the NSW Department of Primary Industries.

Additionally WCPL will participate in community pest animal control programs, and encourage neighbours to implement pest animal control programs.

6.1.1.3.2 Fencing, Tracks and Trails

Uncontrolled stock access to woodland vegetation can limit the regeneration of plants and reduce middle and understorey vegetation. The perimeters of the RWEAs are fenced to exclude livestock which will allow the natural regeneration of native flora species. WCPL will:

- Maintain all existing fences within the RWEAs;
- Maintain existing access tracks in the RWEAs to a maximum width of 2m;
- Maintain existing access trails in the RWEAs to a maximum width of 4m with 1m either side permissible for clearing; and
- Construction of any new internal fence, access track or trail only with prior written approval from OEH or DP&E (excluding cases of emergency, e.g. bushfire risk/control).

6.1.1.3.3 Bushfire Management

A detailed Bushfire Management Plan has been developed in consultation with the NSW Rural Fire Service (RFS) to specifically address bushfire management issues across WCPL landholdings, including the identification of assets, assessment of fire risk and identification of management strategies to reduce the risk of fire to people and property.

A bushfire risk analyses has been undertaken for the RWEAs. Suitable fire access tracks are maintained within/around the RWEAs. The standard protocols outlined in the Bushfire Management Plan will be followed in the event of a bushfire, including contacting the NSW RFS regarding all fires at the Mine.

Fire management activities that are permitted in the RWEAs include:

- Using fire hazard reduction burns and controlled burning which take into account the recommended fire intervals given in the Bush Fire Environmental Assessment Code for New South Wales (Rural Fire Service February 2006) and the guidelines contained in the Threatened Species Hazard Reduction Lists for the Bush Fire Environmental Assessment Code or equivalent replacements.

  Current recommendations are:

  - In the Warkworth Sands Woodland in the Sydney Basin Bioregion EEC, no fire more than once every 10 years and no slashing, trittering or tree removal relating to mechanical forms of hazard reduction.
  - In general, at least 50% of the EEC/CEEC within each LGA must exist in a state that has been burnt less frequently than the minimum fire interval.
  - Both live and dead trees with hollows should be protected from burning to preserve nesting habitat for hollow dwelling animals.
- Lighting a fire, or causing a fire to be lit on the RWEA if it complies with the NSW *Rural Fires Act 1997*, and:
  - The lighting of the fire is for the purposes of controlled burning and is carried out in accordance with any fire guidelines for controlled burning as provided for in Annexure C to the CA; or
  - The lighting of the fire is a necessary component of bush fire hazard reduction work carried out in accordance with a notice served on the Owner under the NSW *Rural Fires Act 1997* or other applicable legislation; or
  - Life or property is in immediate threat by bush fire and the lighting of the fire is reasonably necessary to protect life or property; or
  - The fire is a camp fire, subject to the compliance with the NSW *Rural Fires Act 1997*, or

- The Chief-Executive (OEH) gives prior written consent to the lighting of the fire.

WCPL will also implement one hazard reduction burn during low risk fire season in consultation with NSW Rural Fire Services. This burn must take into account the recommended fire intervals given in the *Bush Fire Environmental Assessment Code for New South Wales* (Rural Fire Service February 2006) and the guidelines contained in the *Threatened Species Hazard Reduction Lists for the Bush Fire Environmental Assessment Code* or equivalent replacements.

In the case of bushfire emergency and under the direction of the NSW RFS, emergency isolated clearing of vegetation may be required and undertaken within RWEAs.

6.1.1.3.4 Use of Timber

WCPL may harvest fallen non-hollow wood in amounts necessary for heating WCPL's dwellings on the Land and camp fires on the Conservation Area and for fencing the Conservation Area.

6.1.1.3.5 Threatened Species

WCPL is permitted to:

- Implement any measures included in recovery plans for any threatened species, population or ecological communities which are or may be found in the RWEAs; and
- Implement other specific management advice from OEH for any threatened species, populations or ecological communities which are or may be found in the RWEAs.

In addition to the above WCPL must follow current best practice advice regarding the management of threatened species when carrying out any activities within the Conservation area as advised. This advice may be provided by OEH, LLS or subsequent NSW authority.

6.1.1.3.6 Restoration of Indigenous Vegetation

WCPL may restore native vegetation in the RWEAs using a preferred method of encouraging and retaining natural regeneration. Preferred methods include:

- Bush regeneration
- brush mulching; and/or
- direct seeding.

WCPL will undertake all revegetation using indigenous plants to maintain the vegetation structure in keeping with the identified vegetation community, using species produced from material sourced locally and without fertilisers, where the ability to regenerate naturally within a reasonable time frame has been lost, or to prevent soil erosion.

6.1.1.3.7 Seed Collection

Collection of seed is permitted within the RWEAs provided it is for non-commercial use in accordance with the Guidelines and Codes of Practice as given in the Florabank guidelines (http://www.florabank.org.au), and the following limitations and permissions:

- Collect seed in the RWEAs only if seed of the particular species and genotype is not available elsewhere, or if the seed collected is intended for seedlings that will be planted within the RWEAs or adjacent to the RWEAs;
- Seeds may be collected from within endangered ecological communities;

- Seeds may not be collected from species individually listed in Schedules 1, 1A or 2 to the TSC Act without prior written approval from the Chief-Executive (OEH), or under a licence granted under section 132C of the NPW Act or section 91 of the TSC Act;
- Seeds may be collected from any protected species listed in Schedule 13 to the NPW Act; and
- Seeds may be collected from any other native species.

6.1.1.3.8 Approved Surface Disturbance

WCPL may undertake surface disturbance associated with underground mining within RWEA A – D only (up to 11 ha) including but not limited to surface gas drainage, exploration, dewatering boreholes and associated access tracks approved under the EP&A Act to be undertaken in areas to be determined in consultation with OEH and the Secretary of the Department of Planning and Environment, consistent with the requirements of this BMP.

If required WCPL will review and revise the BMP to include the following:

- Strategies to avoid clearing of Warkworth Sands Endangered Ecological Community and minimise the extent of clearing in other ecological communities for gas drainage infrastructure in the RWEAs; and/or
- Strategies for the minimisation of impacts of exploration activity in the RWEAs.

6.1.1.3.9 Thinning of Indigenous Vegetation

Thinning of regenerating indigenous species is permitted (with prior written approval from the Chief-Executive (OEH)), if the species is altering the structure of the vegetation in the RWEA and/or reducing the Conservation Values.

6.1.1.3.10 Cultural Heritage

Recording and management of any newly identified Aboriginal Objects within the RWEAs will be undertaken in consultation with OEH (and the Aboriginal community where applicable).

6.1.1.3.11 Visitation and Research

Visitation, research and community use is permitted in the RWEAs provided it does not adversely impact on the Conservation Values. Research projects will be discussed with OEH before being carried out.

6.1.1.3.12 Development

Carrying out any development as described in the Conservation Agreement and maintaining development (including existing fire trails, access trails and infrastructure), with the following conditions:

- Clear a corridor not greater than 3 metres wide during construction or for maintenance for the installation of fences or other agreed rural structures;
- Construct and maintain fences to ensure they are stock proof;
- Move fallen timber and any other obstructions to maintain access;
- Undertake underground mining beneath the RWEA within CL 743 and ML 1594;
- Where clearing is necessary, undertake all works in a manner that minimises disturbance to soil and hydrological characteristics; and
- Remove old fences and close unwanted tracks within the RWEAs and facilitate restoration of native vegetation by allowing natural regeneration.

6.1.2 Open Cut Woodland Rehabilitation Areas

As per the approved Mining Operations Plan, WCPL will rehabilitate identified open cut mining areas in compliance with the Mixed Pasture/Woodland (Domain D) and Woodland Corridor (Domain E) rehabilitation objectives. These rehabilitation objectives are consistent with the establishment of appropriate PCTs across rehabilitation areas, given the post mining landscape and surrounding vegetation. PCTs considered most appropriate for the establishment of woodland vegetation within rehabilitation areas at the Mine are:

- PCT 1603: Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter;
- PCT 1604: Narrow-leaved Ironbark - Grey Box - Spotted Gum shrub - grass woodland of the central and lower Hunter; and
- PCT 1176: Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion.

Management measures that will be implemented within these Domains to improve biodiversity values are discussed below.

6.1.2.1 Woodland Corridor Revegetation

Rehabilitation initiatives will aim to increase the continuity of vegetation in the region through the establishment of woodland corridors. Accordingly, the rehabilitation program has been designed to establish linkages between the rehabilitation areas, existing remnant vegetation and Wollemi National Park.

Revegetation of woodland areas includes the use of endemic plant species which are characteristic of the vegetation communities to be disturbed within the open cut operations area. Where possible, seed collection and propagation activities will contribute to revegetation associated with the rehabilitation of WCPL disturbance areas.

Provisional revegetation species lists are presented in **Appendix G**. **Table 22** below provides an indication of the flora species (from **Appendix G**) that are present within each of the three PCTs mentioned above.

Table 22: Flora Species (from Appendix G) that are present in PCTs

PCT	Flora Species Present
1603: Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter	• *Eucalyptus crebra* • *Eucalyptus moluccana* • *Allocasuarina luehmannii* • *Cymbopogon refractus* • *Lomandra multiflora* Note: *Aristida ramosa* found in PCT, species list contains *Aristida vagans* which is considered equivalent.
1604: Narrow-leaved Ironbark - Grey Box - Spotted Gum shrub - grass woodland of the central and lower Hunter	• *Eucalyptus crebra* • *Eucalyptus moluccana* • *Corymbia maculata* • *Cymbopogon refractus* • *Lomandra multiflora*

PCT	Flora Species Present
	• *Austrodanthonia* sp. Note: *Aristida ramosa* found in PCT, species list contains *Aristida vagans* which is considered equivalent.
1176: Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	• *Eucalyptus dawsonii* • *Eucalyptus punctata* • *Eucalyptus moluccana* • *Eucalyptus crebra* • *Eucalyptus fibrosa* • *Brachychiton populneus* • *Allocasuarina luehmannii* • *Cymbopogon refractus* • *Lomandra multiflora* Note: *Aristida ramosa* found in PCT, species list contains *Aristida vagans* which is considered equivalent. A number of Acacia species present in this PCT include *Acacia doratoxylon, A. linearifolia* and *A. salicina. A. Filicifolia, A. implexa, A. decora* and *A. decurrens* are present within the species list and whilst not specifically within the PCT flora list, they are known to occur in the Hunter region.

6.1.2.2 Grazing and Stock Management

Domestic stock may be introduced to rehabilitation area dependent on future monitoring results showing achievement of relevant completion criteria. In this instance ongoing monitoring and management will occur to ensure sustainable grazing practices are implemented.

6.1.2.3 Habitat Augmentation

Habitat augmentation involves the establishment of habitat structures within Management Domains. This includes the relocation of surplus trees and rock removed from the Mine footprint for relocation as habitat structures within the Management Domains.

Procedures and recording requirements will be developed for the re-establishment of logs and rock within Management Domains.

6.1.2.4 Assisted Natural Regeneration

Natural regeneration is reliant upon seedlings germinating from seed naturally distributed from existing remnant vegetation. This approach will be utilised in areas where there is a viable seed bank of native species is present within the topsoil of cleared areas.

6.1.2.5 Direct Seeding

Direct seeding will be utilised on freshly shaped or existing rehabilitation areas that are not believed to have an adequate natural seed bank within disturbed topsoil to meet LFA completion criteria.

Application of seed by hand or machinery will follow preparation of the surface which may consist of scarification and ameliorates to allow successful establishment of applied seed.

6.1.2.6 Tubestock Planting

Tubestock planting will be utilised where it is considered natural regeneration of native species is unlikely to occur in a timely manner. This will be determined on a case by case basis. Species composition and rates for tubestock planting will be reflective of the adjacent

and pre-clearing vegetation community type with seedlings propagated from local provenance seed stock where possible.

6.1.3 North Wambo Creek Diversion Area

The North Wambo Creek Diversion (NWCD) was constructed in accordance with the approved North Wambo Creek Diversion Plan (WCPL, 2013). Ongoing management of the NWCD will be consistent with the Domain 7 management actions and objectives as outlined in the MOP.

The North Wambo Creek Diversion Plan also includes detailed management measures for the NWCD. Monitoring of riparian vegetation and creek bed stability along the NWCD is detailed in **Section 7.2.3.**

6.1.4 Buffer/Grazing Areas

Aside from ongoing weed and pest management and maintenance of fencing, no active management is proposed in buffer/grazing areas.

6.2 Subsidence Management

FloraSearch (2015a) recorded one endangered ecological community (EEC) listed under the NSW Threatened Species Conservation Act, 1995 in the South Bates Underground Mine area, namely the Central Hunter Grey Box – Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions EEC.

The impacts of subsidence monitoring within the RWEAs and along the Wollemi National Park Cliff line will be undertaken as part of the annual fauna and flora monitoring program as detailed in **Section 7.0**. Identified impacts will be assessed as detailed in **Section 5.4.** Measures to manage identified impacts may consist of:

- Threatened Species or Communities
    - Filling of minor cracks with appropriate material (e.g. soil or mulch) to avoid the creation of drainage channels.
    - Re-grading of isolated depressions or highpoints and revegetation.
    - Re-grading of slopes to minimise the potential for erosion.
    - Remediation of creek beds to minimise bank and headwater erosion.
    - Revegetation with monitoring in accordance with Section 4.1 of the FFMP.
    - Additional monitoring (e.g. increase in monitoring frequency).
    - Offset in accordance with Condition 22, Schedule 4 of the Development Consent (DA 305-7-2003)
- Wollemi National Park
    - Implementation of erosion and sediment control measures and stabilisation techniques.
    - Scaling/dislodgement/removal of remaining loose rock.
    - Measures to improve the aesthetic values if cliff instability occurs (e.g. planting of endemic native vegetation at the base of the escarpment).
    - Additional monitoring (e.g. increase in monitoring frequency).
    - Consideration of changes to longwall extraction geometry in consultation with relevant regulatory authorities.

- Offset in accordance with Condition 22, Schedule 4 of the Development Consent (DA 305-7-2003).

6.3 General Land Management Strategies

WCPL will implement a range of management actions throughout the various Management Domains. WCPL has identified those actions as being required and likely to be effective using risk management principals and with consideration to the practicality of implementing such actions.

6.3.1 Fencing, Gates and Signage

Boundary fence integrity will be inspected quarterly and maintained during all management periods to exclude livestock and unauthorised human access from applicable areas.

New fencing erected within or on the boundary (including repairs to existing fence lines where required) of the RWEAs will use post and two or three strand non-barbed (plain) wire only. If required boundary fences to these areas may use a top barbed wire (or electric fencing) to protect the fence from neighbouring grazing cattle.

In order to reduce the risk of injury to native fauna, existing fencing within the boundaries of the Domains will be removed in areas where it is providing no benefit to revegetation outcomes.

6.3.2 Seed Collection and Propagation

WCPL has implemented a native seed collection and propagation program, to ensure that the genetic integrity, structure and composition of local vegetation types are maintained.

The collection of locally sourced native seed will be carried out annually by a licensed provider with the Florabank guidelines (Florabank 1999 and 2000) used to guide the seed collection process.

The seed collection program will take into account seasonality of seed availability and the specific target seed lists required to establish the various vegetation classes onsite.

6.3.2.1 Progressive Rehabilitation

Rehabilitation of the mine waste rock emplacements and other areas of disturbance will be conducted progressively over the life of the mine and will be scheduled to minimise the disturbed area at any point in time.

Revegetation of open cut mining disturbed areas will be undertaken in accordance with the approved WCPL MOP (2015-2020).

6.3.2.2 Weed Management

WCPL's weed management program will involve six monthly inspections of the RWEAs and Revegetation Areas. In addition to this, an annual routine weed management program will be implemented whereby herbaceous weed species are treated to prevent further spread. Treatment of all weeds will be undertaken by suitably qualified and experienced personnel.

6.3.2.3 Vertebrate Pest Management

A variety of vertebrate pest species have been identified within WCPLs RWEA and rehabilitation areas. These have primarily consisted of feral pigs, rabbits, foxes and dogs.

The WCPL operated pest control program, as detailed in **Section 6.1.1.3.1** is complemented by a year round WCPL agister-managed pest control program. The agister-managed

program primarily targets feral pigs on grazing and buffer lands surrounding WCPLs open cut mine site.

The agister-managed program utilises WCPL-owned night vision cameras to monitor the movement of pet species. Humane trapping and shooting practices are employed to capture and euthanize targeted feral species.

6.3.3 Waste Management

Routine inspections of the RWEAs and Revegetation Areas will include monitoring of potential waste management issues, including illegal dumping of waste, and removal of waste if/when required. All waste removed from these areas will be managed in accordance with WCPL's Waste Management Plan.

6.3.4 Erosion, Sedimentation and Soil Management

Routine inspections of the RWEAs and Revegetation Areas will include monitoring of potential erosion, sedimentation and soil management issues. All erosion and sediment control works will be carried out in accordance with WCPL's Erosion and Sediment Control Plan.

6.4 Three Year Management Schedule

WCPL have developed a detailed three year management schedule which aligns to the requirements of WCPL's Conservation Agreements for the RWEAs. The three year management schedule includes management strategies for weed and pest control, fire hazard reduction burns, vehicle access, fencing and annual reporting on the monitoring program. This schedule is included in **Appendix F.**

6.5 Management Protocols

6.5.1 Surface Disturbance Permit

WCPL has implemented a Surface Disturbance Permit (SDP) procedure and checklist. The SDP is implemented and approved by WCPL's Environmental Department prior to any land disturbance activities on undisturbed or rehabilitated land taking place. The SDP applies to WCPL owned land, mining leases and privately owned land where an agreement with the landowner is in place

The SDP aims to identify and manage any environmental restraints such as cultural heritage sites, flora and fauna communities, surface drainage, threatened species and permitting required prior to disturbance. Example of management measures are:

- Erosion and sediment controls
- Cultural heritage salvage
- Disturbance delineation
- Timing of activities

The SDP has been attached as **Appendix H.**

6.5.2 Vegetation Clearance Protocol

A Vegetation Clearance Protocol (VCP) has been developed to minimise impacts on both non-threatened and threatened flora and fauna (as listed under the TSC Act or the EPBC Act). The VCP is applicable across all WCPL managed land. The key components of the VCP are:

- Pre-clearance surveys
- Fauna management strategies
- Seed Collection
- Vegetation Clearance
- Salvage and re-use of materials

Procedures in relation to the salvage of Aboriginal sites prior to vegetation clearance are detailed in the Wambo Development Project – Aboriginal Heritage Research Design and Study Plan (incorporating Salvage Programme) (Navin Officer Heritage Consultants, 2005).

An updated VCP, which meets the requirements of DA305-7-2003 and DA177-8-2004, is included as **Appendix J.**

6.5.3 Threatened Species Management Protocol

A Threatened Species Management Protocol (TSMP) has been developed to facilitate implementation of threatened species management strategies to minimise the potential impacts on threatened flora and fauna species. The key components of the TSMP are:

- Site observations/surveys
- Threatened species management strategies
- RWEAs restrictions
- Threat abatement
- Capture and release
- Relocation
- Provision of habitat resources

An updated TSMP, which meets the requirements of DA305-7-2003 and DA177-8-2004, is included as **Appendix K.**

6.6 Inspections

Quarterly inspections of Domains will be undertaken by an Environmental Representative in accordance with the 3 Year Management Schedule (**Appendix F**). These inspections will identify potential fencing, access track, weed and pest management and maintenance requirements. Records of inspections will be maintained by the Environmental Representative and actions will be assigned to relevant personnel as required.

Monthly inspections will be undertaken for Rehabilitation Areas in accordance with the MOP.

7.0 Biodiversity Monitoring Program

7.1 Monitoring Methodologies

7.1.1 Landscape Function Analysis

The LFA component of the WCPL monitoring program focuses on monitoring and providing quantitative assessment of the success of newly rehabilitated landscape establishment. Two separate assessments consisting of a varieties of measured site attributes make contribute to LFA as provided in Tongway and Hindley (2004), these are:

- Landscape Organisation Index (LOI)
- Soil Surface Assessment

Landscape Organisation Index is the initial LFA data acquisition step and collects information at the hill slope scale .It relates to the proportion of the transect occupied by patches of landscape elements that are relatively permanent and provide stable, resource accumulating structures, such as grassy tussocks and other ground cover, leaf litter and logs. LOI can vary from 0.0 (a totally bare site) to 1.0 (a site totally covered by vegetation).

Soil Surface Assessment results provide an index on stability, infiltration and nutrient cycling for all patch and inter-patch types for the whole of landscape (transect). The combined score from each patch type provides a stability, infiltration and nutrient cycling index.

Eleven Soil Surface Condition Indicators (SSCIs) (**Table 23**), each focusing on specific biological and/or physical processes, are used to develop three LFA indices: Stability Index (SI), Soil Infiltration (INFI) and Nutrient Cycling (NI).

Table 23: Soil Surface Condition Indicators

SSCI	Description	Relevant LFA Index		
		SI	INFI	NI
Soil Cover	Percentage cover of perennial vegetation to a height of 0.5 m. plus rocks > 2 cm and woody material > 1 cm in diameter or other long-lived, immoveable objects.	X		
Perennial Vegetation Cover	Percentage perennial vegetation cover.		X	X
Litter Cover	Percentage cover of annual grasses and ephemeral herbage (both standing and detached) as well as detached leaves, stems, twigs, fruit, dung, etc.	X	X	X
Cryptogam Cover	Percentage cover of algae, fungi, lichens, mosses, liverworts and fruiting bodies of mycorrhizas.	X		X
Crust Brokenness	Categorises soil crusts from 0-4 where 0 refers to 'no crust present' and 4 refers to an 'intact and smooth' soil crust.	X		
Erosion Type and Severity	Categorises the aerial extent and severity of various erosion types from 'Insignificant' to 'Severe'.	X		
Deposited Materials	Categorises the extent and depth of deposited alluvial material.			
Surface Roughness	Categorises the depth of surface depressions from 'smooth' to 'deep depressions'.	X	X	X
Surface Resistance to Disturbance	Categorises the soils capacity to resist disturbance based on the soils 'hardness' or 'brittleness'.	X	X	
Slake Test	Categorises the soils stability when exposed to water.		X	
Soil Texture	Categorises the soils water infiltration capacity from 'very slow' to 'high'.		X	

7.1.2 Biometric Vegetation Assessment

The BioMetric method (Gibbons et al 2009) is proposed as the model for determining meaningful, quantitative, biodiversity focused Completion Criteria. BioMetric, a NSW Government endorsed biodiversity assessment method (developed for the NSW BioBanking Assessment Methodology), provides a useful decision making framework founded on a standardised repeatable measurement method readily applicable to a monitoring program.

Management measures can be performance tested through the BioMetric process, thereby providing an appropriate evidence-based mechanism for optimising future management decisions. Evidence-based adjustments made to a predefined management regime are central to maximising the likelihood of a successful outcome.

BioMetric is a quantitative method developed to comparatively assess the condition of vegetation and habitat values of native vegetation against pre-defined benchmarks (i.e. pre European settlement). Vegetation and habitat condition is quantitatively evaluated by ten readily measurable 'site attributes' considered to reflect the relative health or level of disturbance of a specific vegetation class. These site attributes when measured against relative performance criteria provide meaningful ecological information used to inform management decisions. Site attributes measured in a BioMetric assessment are listed in **Table 24.**

Table 24: Biometric Site Attributes and Measurement Parameters

Site Attribute	Measurement parameter
Native Plant Species Richness (NPS)	Number of native plant Species within 400 m^2 plot (count)
Native Over-storey Cover (NOS)	Projected foliage cover above 10 m height along a 50 m transect (%) – measured every 5 m
Native Mid-storey Cover (NMS)	Projected foliage cover between 1 and 10 m height along a 50 m transect (%) – measured every 5 m
Native Ground Cover (grasses) (NGCG)	Cover below 1 m along a 50 m transect (%) – measured every metre
Native Ground Cover (shrubs) (NGCS)	Cover below 1 m along a 50 m transect (%) – measured every metre
Native Ground Cover (other) (NGCO)	Cover below 1 m along a 50 m transect (%) – measured every metre
Exotic Plant Cover (EPC)	Cover along a 50 m transect (%) – measured every metre
Over-storey Regeneration (OR) within vegetation zone	Overstorey canopy species <5 cm diameter at breast height (DBH) within a 1,000 m^2 plot (score 0 to 1)
Number Of Trees With Hollows (HBT)	Number of trees containing hollows within a 1,000 m^2 plot (count)
Total Length of Fallen Logs (FL)	Log length touching ground >10 cm diameter and >0.5 m in length within a 1,000 m^2 plot (metres)

7.2 Monitoring Program

A summary of WCPL's Biodiversity Monitoring Program is provided in **Table 25**. Monitoring locations are shown on **Figures 10-14.** Details on the monitoring program requirements and timing are provided in the following sections.

Table 25: Biodiversity Monitoring Program

Monitoring Type	Area	Site	Monitoring Frequency and Timing	Details
Biometric	RWEA A	V1-B1, V1-B2, V1-B3, V2-B1, V2-B2, V3-B1, V5-B1, V5-B2, V5-B3, V6-B1, V6-B2, V6-B3	Annually (Spring)	A number of permanent flora survey quadrats have been established in RWEAs to obtain quantitative data on plant species diversity and abundance. Quadrat data will be collected at each of the floristic quadrat monitoring sites. Note: Biometric monitoring in the Woodland Rehabilitation Areas will be undertaken at the same time as the LFA monitoring in the Woodland Rehabilitation Areas
	RWEA B	V9-B1, V9-B2, V10-B1, V13-B1, V14-B1, V14-B2		
	RWEA C	V6-A1c, V6-B1c, V6-B2c, V11-B1, V11-B2		
	RWEA D	V10-A1, V10-B3		
	Rail Loop	V5-B4, V6-B4		
	Reference Sites	V1-A1, V1-A2, V2-A1, V6-A3, V9-A1, V10-A2, V14-A1		
	Woodland Rehabilitation	3R, 4R, 6R & 8R		
LFA	Woodland Rehabilitation	3R, 4R, 6R & 8R	Annually (Autumn or Spring)	LFA consists of a number of permanent transects being established in areas of revegetation, along with corresponding transects in adjacent undisturbed areas to provide reference/ analogue sites. LFA transects are monitored annually either in autumn or spring following the commencement of revegetation
	Pasture Rehabilitation	1R, 2R, 5R, 7R, 9R, 10R, 16R, 33R & 34R		
	NWCD	17R, 19R, 21R, 23R, 25R, 26R, 27R & 28R		
	Wambo Creek	14R		
Birds	RWEA A	BP1, BP2, BP3, BP4, BP5, BP6, BP17, BP18	Annually (Spring) Alternate Years (Winter)	Avifauna surveys are undertaken in spring each year, using sites established for the terrestrial fauna surveys. Additional avifauna surveys are undertaken in winter (alternate years) to target the Swift Parrot (*Lathamus discolor*) and the Regent Honeyeater (*Xanthomyza phrygia*).
	RWEA B	BP7, BP8, BP9, BP10, BP11, BP12		
	RWEA C	BP13, BP14, BP16, BP19, BP20, BP21, BP22		
	RWEA D	BP25, BP26		
	Rail Loop	BP23, BP24		
	Reference Sites	BP15		
	Woodland Rehabilitation	-		
Riparian Vegetation	North Wambo Creek (Diversion)	8A, 9A, 10A, 11A, 12A, 13A, 14A, 15A	Annually	Rapid Appraisal of Riparian Condition (RARC) index is made up of five sub-indices, each with a number of indicators: • Habitat continuity and extent • Vegetation cover and structure
	South Wambo	1B, 2B, 3B, 4B, 5B		

Monitoring Type	Area	Site	Monitoring Frequency and Timing	Details
	Creek			• Dominance of natives *versus* exotics • Standing dead trees, hollows, fallen logs and leaf litter • Indicative features Visual assessment of the impact of erosion and subsidence will also be included as part of an ongoing photographic record.
	Stoney Creek	1C, 2C, 3C, 4C, 5C		
Freshwater Macroinvertebrate Monitoring	North Wambo Creek	1D, 2D, 3D, 12D	Every 5 years (2016, 2021, 2026 etc.)	Including assessment of SIGNAL A values. Water quality data to (EC, pH and temperature) to be sourced from scheduled surface water monitoring.
	South Wambo	4D, 5D, 13D		
	Waterfall Creek	6D		
	Wollombi Brook	7D, 8D, 9D, 10D, 11D,		
Photo Point	RWEA A	A1 (SE bearing)	Annually	A photo is required to be taken at a number of photo monitoring points within the RWEAs every year. Photos must be taken from the exact location and bearing to allow subsequent comparison and assessment.
		A2 (SSE bearing)		
		A3 (NE bearing)		
		A4 (NW bearing)		
	RWEA B	B1 (SW bearing)		
		B2 (W bearing)		
	RWEA C	C1 (NE bearing)		
		C2 (E bearing)		
	RWEA D	D1 (SW bearing)		
	Coal Terminal/Rail Loop	CT1 (NE bearing)		
		CT2 (W bearing)		
Creek Bed and Bank Stability	North Wambo Creek, South Wambo Creek and Stoney Creek	Various Cross Sections	Annually	Bed and bank stability monitoring is undertaken by surveying consultants who undertake replicate surveys of the three creeks to measure areas of significant erosion and identify changes related to creek bed condition and water flow.
Walk Through Assessment/ Specific	All RWEAs	NA	Annually	A walk through assessment will be undertaken during the monitoring event to record opportunistic sightings within the RWEAs including:

Monitoring Type	Area	Site	Monitoring Frequency and Timing	Details
Enhancement Initiatives				• Fire events or management; • Weeds (including compiling a list of exotic species and recording new weed infestations including location and extent); • Pest animals (species and location must be recorded, including evidence of pest animals such as burrows, scats or disturbance); • Visitor impact and vehicle access (including evidence of any recent usage, and the presence of any new access tracks); • Rubbish dumping; • Natural regeneration of previously disturbed areas; and • Sightings of threatened species.
Visual Monitoring	All Rehabilitation Areas	NA	Annually	Visual monitoring of revegetation will be undertaken to ensure vegetation is establishing and to determine the need for any maintenance and/or contingency measures (such as the requirement for supplementary plantings, erosion control and weed and animal pest control). Visual assessments allow for the rapid application of remedial actions where necessary.
Subsidence Inspection	Areas overlying existing underground workings or proposed underground mining areas	Those areas identified as being affected by subsidence	Annually	Areas overlying existing underground workings or proposed underground mining areas are subject to annual subsidence monitoring inspections. These inspections: • Identify any isolated surface disturbances; • Assess the level of disturbance to native vegetation and the condition of the vegetation (e.g. health and vigour of species and communities); and • Assess any changes in drainage lines or watercourses (that may be attributable to subsidence).

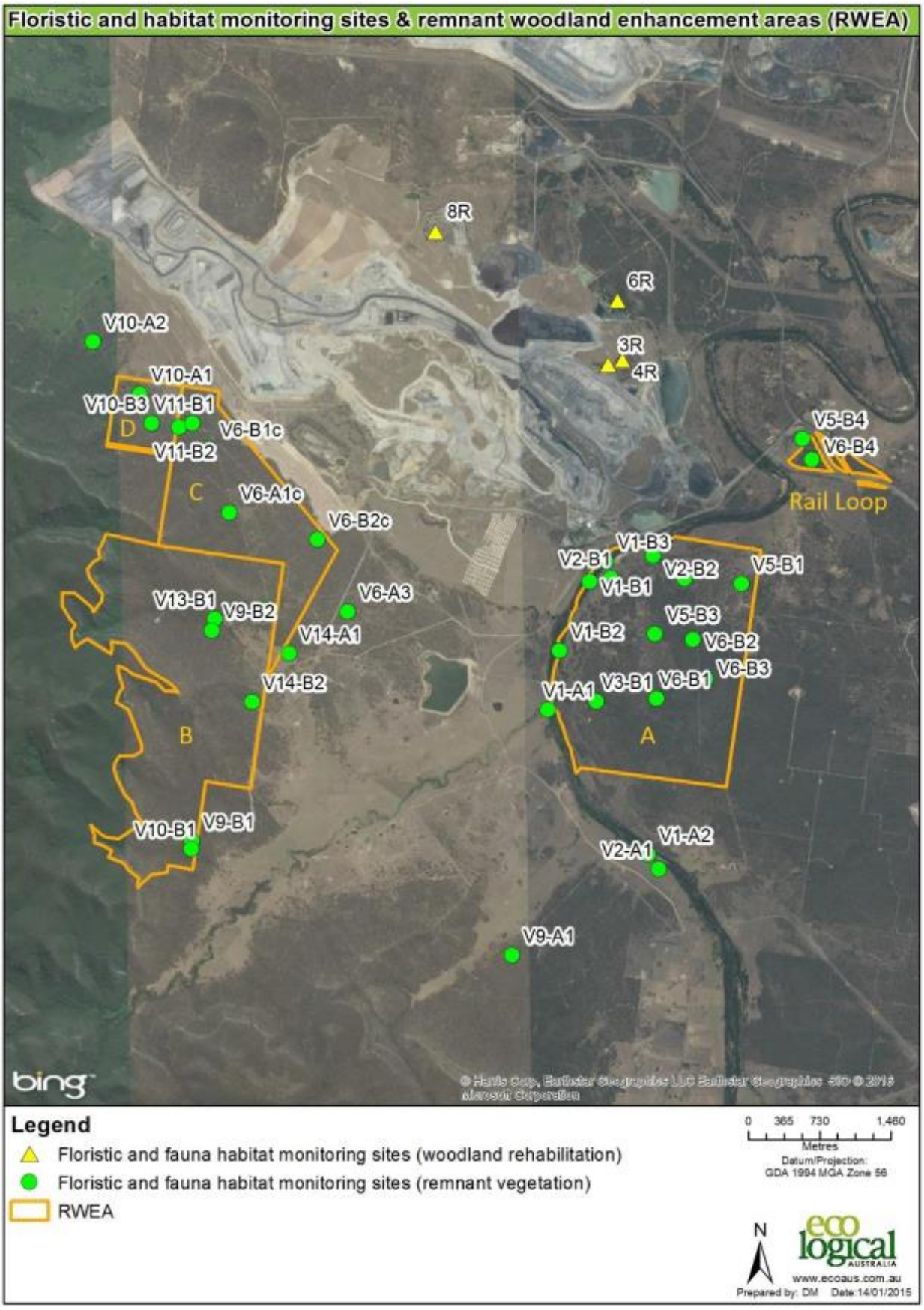

Figure 10: Floristic and Habitat Monitoring Sites

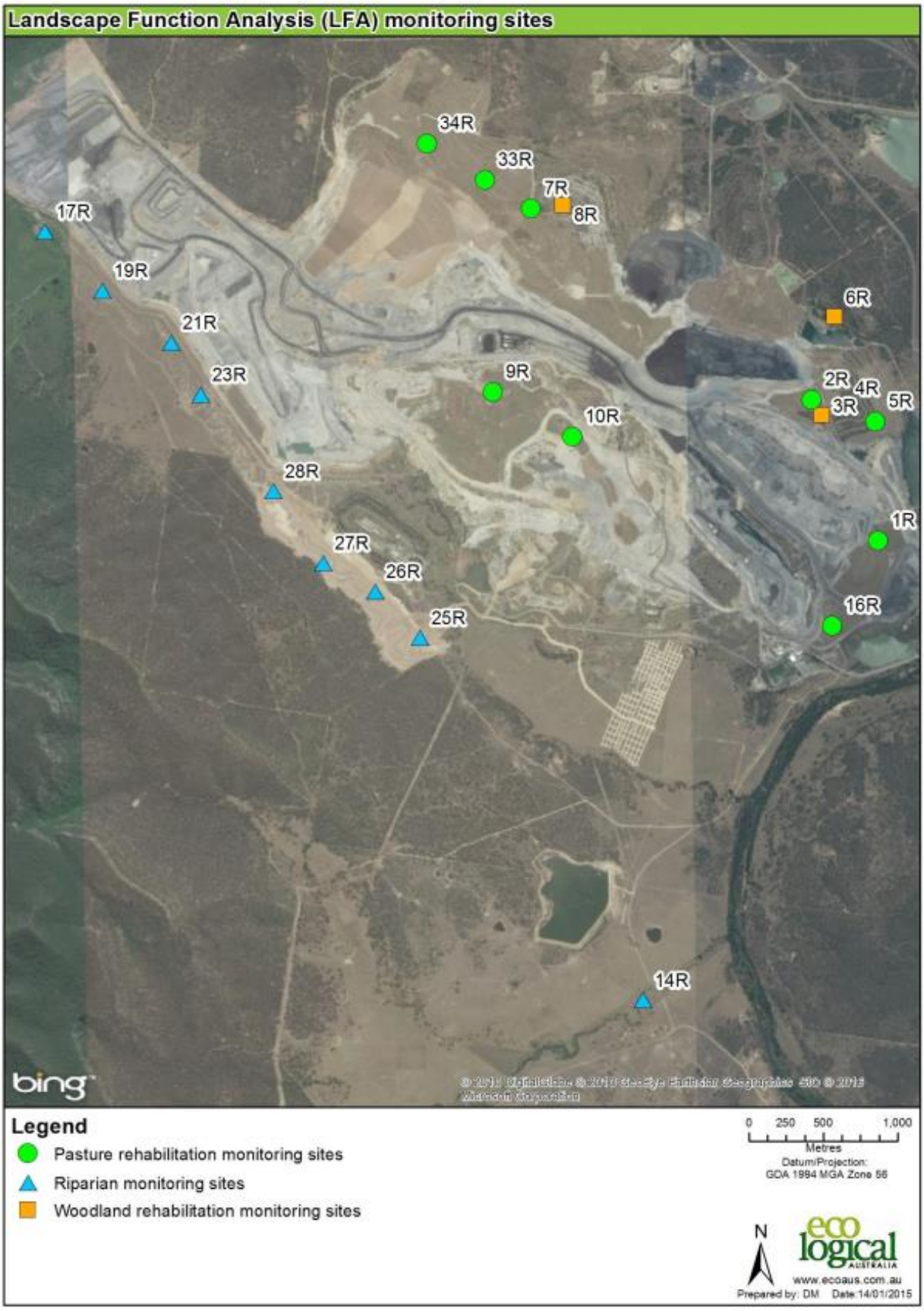

Figure 11: LFA Monitoring Locations

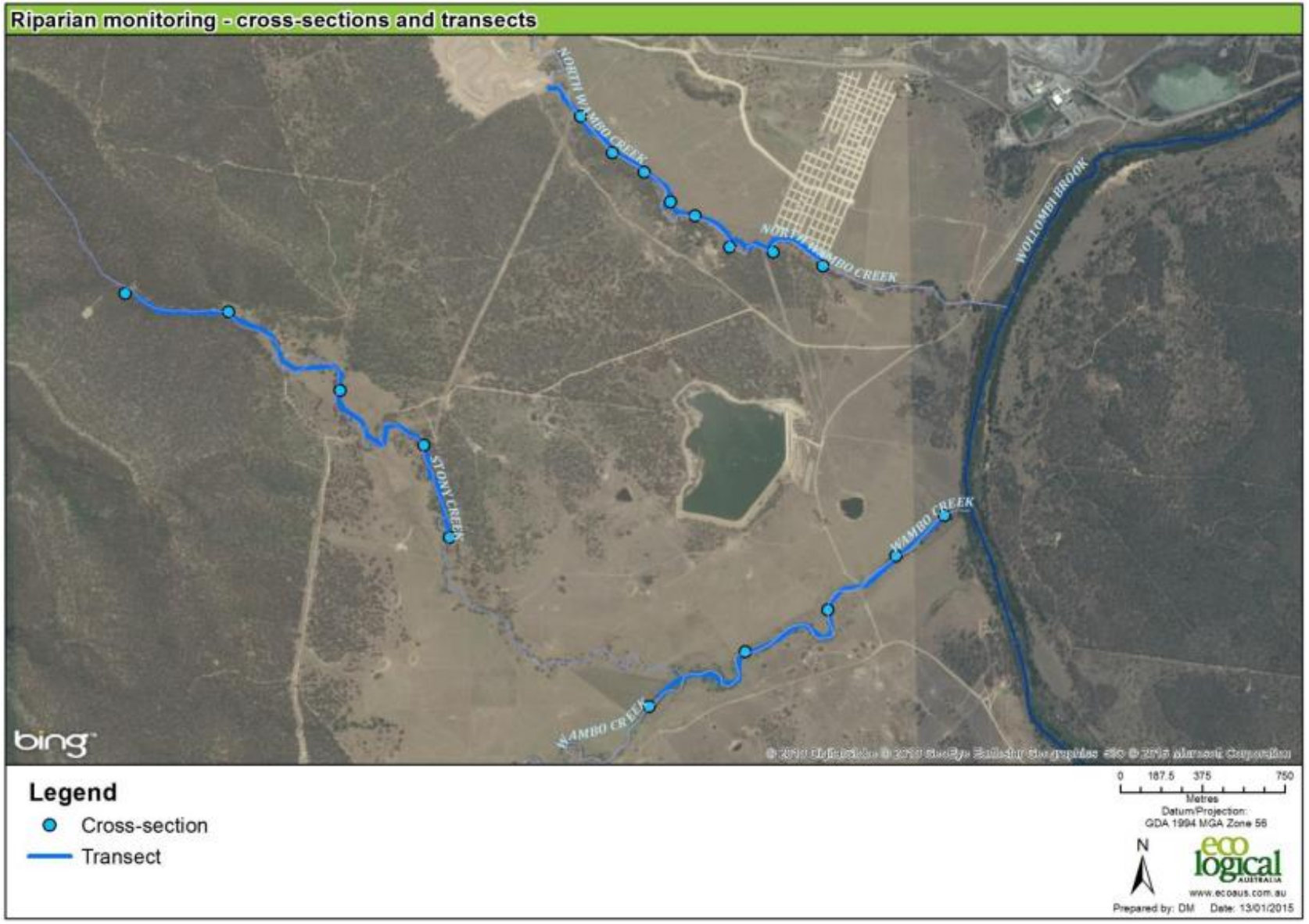

Figure 12: Location of Riparian Monitoring Cross-Sections and Transects

Figure 13: Bird Monitoirng Locations

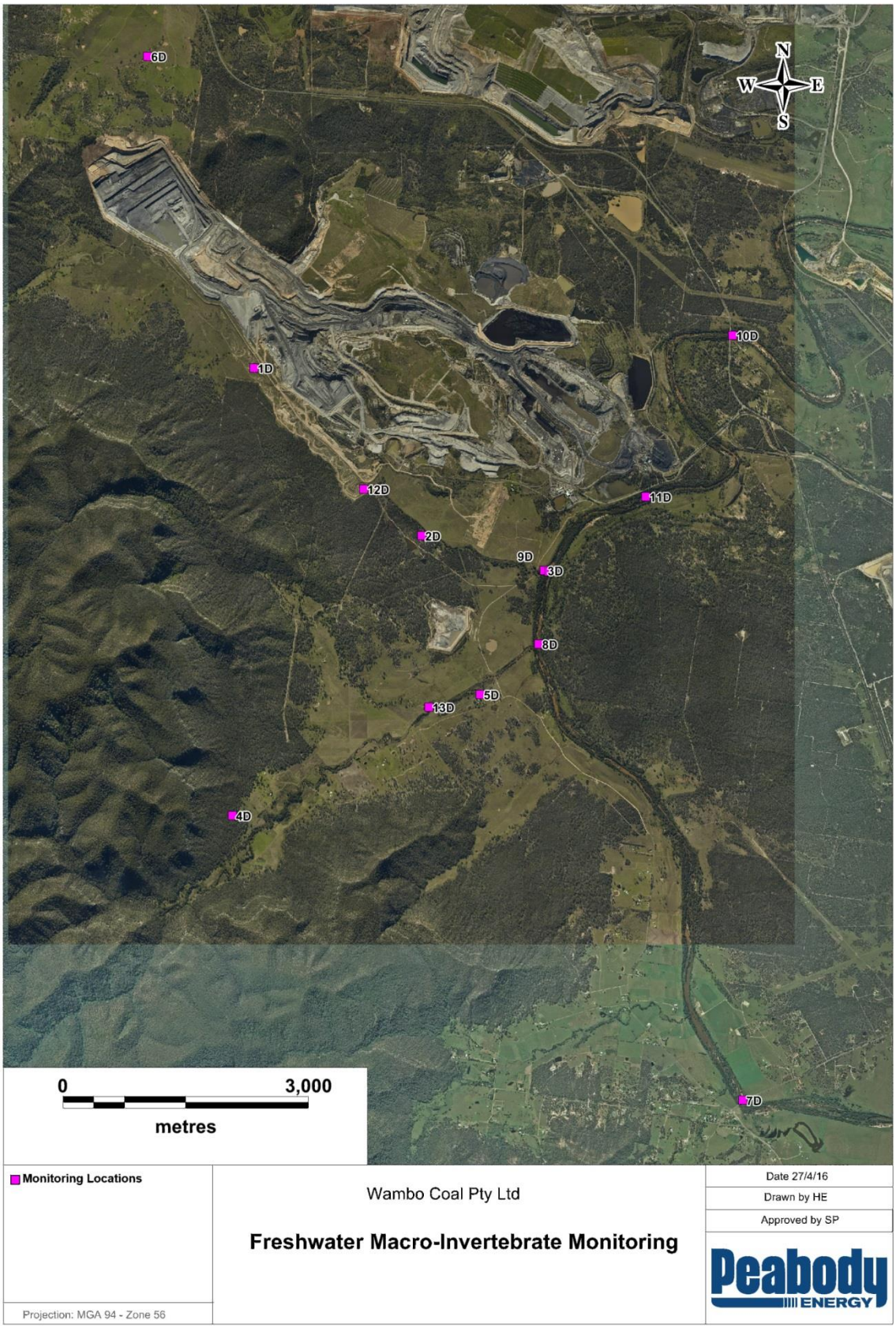

Figure 14: Freshwater Macroinvertebrate Monitoring

7.2.1 RWEAs

Monitoring of biodiversity in the RWEAs will be undertaken in accordance with the requirements of the CAs and DA305-7-2003 (Schedule 4, Condition 48(b)). These requirements are summarised in **Table 26** and further detail provided in the following sections.

Table 26: RWEA Monitoring Program Requirements

Instrument	Monitoring Component	Monitoring Description	BMP Section
CAs	Photo	A photo is required to be taken at a number of photo monitoring points within the RWEAs. Photos must be taken from the exact location and bearing to allow subsequent comparison and assessment.	7.2.1.1
CAs	Walk Through Assessment	A walk through assessment must be undertaken to record opportunistic sightings within the RWEAs e.g. for weed and pest management etc	7.2.1.2
CAs	Quadrat (Biometric)	Quadrat data must be collected at floristic quadrat monitoring sites within the RWEAs. Results must be compared to baseline and benchmark quadrat data.	7.2.1.3
DA305-7-2003	Flora	A number of permanent flora survey quadrats (of varying sizes to survey tree, shrubs and ground cover) should be established in woodland enhancement areas to obtain quantitative data on plant species diversity and abundance.	7.2.1.3
DA305-7-2003	Habitat Complexity	Habitat complexity should be monitored using a number of permanent transects established within woodland enhancement areas. Habitat complexity parameters such as canopy cover, shrub cover, ground vegetation cover, the amount of litter, fallen logs and rocks should be surveyed.	7.2.1.3
DA305-7-2003	Specific Enhancement Initiatives	Monitoring of specific enhancement initiatives (e.g. the provision of nesting/ roosting boxes, weed control or feral animal control).	7.2.1.4
DA305-7-2003	Terrestrial Fauna	Terrestrial fauna surveys should be conducted to monitor the usage of enhancement areas by vertebrate fauna. Monitoring may include fauna species diversity and abundance or, alternatively, the use of indicator species to measure the effectiveness of enhancement measures.	7.2.1.5
DA305-7-2003	Aquatic Fauna	Freshwater macro-invertebrate monitoring, including an assessment of SIGNAL A values and water quality (e.g. temperature, pH, and salinity).	7.2.1.5

In compliance with the CAs a qualified ecologist will be engaged to undertake the monitoring in the RWEAs each year. A monitoring report on the RWEAs will be produced by WCPL's ecologist each year and submitted to the Chief-Executive (OEH) within 14 days of it being received by WCPL (**Section 11.3**).

7.2.1.1 Photo Monitoring

Photo monitoring points have been established in each of the RWEAs (**Table 27** and **Appendix D**)**.** A photo will be taken at each photo point (exact location and bearing) annually during each monitoring event, to allow subsequent comparison and assessment. Baseline photographs are provided in **Appendix E.**

Table 27: CA Monitoring Photo Point Locations (Oct 2014)

RWEA	Photo Point	Easting	Northing	Bearing	Vegetation Community Represented
Wambo Coal Terminal	CT1	314587	6393774	NE	Narrow-leaf Ironbark / Grey Box / Bulloak / Honeymyrtle Forest
	CT2	314556	6393925	W	Ironbark eucalypt dominated woodlands/forest
RWEA A	A1	312525	6392578	SE	River Red Gum Woodland
	A2	313850	6392523	SSE	Coast Banksia / Rough-barked Apple / Blakely's Red Gum Forest (Warkworth Sands Woodland EEC)
	A3	312012	6391818	NE	River Oak / Rough-barked Apple Forest
	A4	313004	6391327	NW	Narrow-leaf Ironbark / Grey Box / Bulloak / Honeymyrtle Forest
RWEA B	B1	308525	6392151	SW	White Mahogany / Rough-barked Apple Forest
	B2	308274	6389887	W	Spotted Gum / Narrow-leaf Ironbark / Bulloak / Paperbark Forest
RWEA C	C1	308272	6394148	NE	Narrow-leaf Ironbark / Grey Box / Bulloak / Honeymyrtle Forest
	C2	308254	6394144	E	Narrow-leaf Ironbark / Grey Box / Bulloak / Honeymyrtle Forest
RWEA D	D1	307836	6394168	SW	Slaty Gum / Narrow-leaf Ironbark / Bulloak / Paperbark Forest

7.2.1.2 Walk Through Assessment

A walk through assessment will be undertaken during the monitoring event to record opportunistic sightings within the RWEAs including:

- Fire events or management;
- Weeds (including compiling a list of exotic species and recording new weed infestations including location and extent);
- Pest animals (species and location must be recorded, including evidence of pest animals such as burrows, scats or disturbance);
- Visitor impact and vehicle access (including evidence of any recent usage, and the presence of any new access tracks);
- Rubbish dumping;
- Natural regeneration of previously disturbed areas; and
- Sightings of threatened species.

7.2.1.3 Quadrat Monitoring (Biometric)

A number of permanent flora survey quadrats have been established in RWEAs and rehabilitation areas to obtain quantitative data on plant species diversity and abundance (**Figure 10**). Quadrat data will be collected at each of the floristic quadrat monitoring sites, listed in **Table 25.** Results will be compared to baseline and benchmark quadrat data (**Table 10** and **Table 11**).

Monitoring locations have been selected based on their representativeness as either reference or treatment sites i.e. those selected from the various management domains across the Mine.

The Monitoring Data Sheet in **Appendix I** will be used to record the Biometric Monitoring Data.

7.2.1.4 Specific Enhancement Initiatives

The RWEA enhancement strategies (**Section 6.1**) are monitored for their effectiveness. These enhancement strategies include fencing, weed and pest control, and where necessary the provision of nesting/roosting boxes. This monitoring will be undertaken as part of the walk through assessment (**Section 7.2.1.2**).

7.2.1.5 Terrestrial Fauna

The monitoring of indicator species will be used to qualitatively validate BioMetric and LFA monitoring results (i.e. self-sustaining stable landforms and vegetation structure have been successfully recreated or reintroduced and are being inhabited or frequented by local fauna).

Avifauna (as an indicator species) will be monitored to assess the effectiveness of management measures in maintaining species richness and increase the relative abundance of woodland birds within Management Domains (except grazing). Systematic surveys at a selection of representative sites already established for Biometric monitoring will be utilised (**Table 25**).

Survey sites have been established in each major habitat type present within each RWEA (**Figure 13**). These habitats include:

- Creek line and riparian habitats;
- Woodland/open forest on steep hills; and
- Woodland, including scattered trees, on undulating and level land.

Corresponding survey sites have also been established in areas of equivalent habitat type adjacent to the Management Domains to provide reference sites. Reference sites provide comparative data so that the long-term progress of the Management Domains can be determined.

Fauna species diversity and abundance will be monitored annually in spring. Additional avifauna monitoring undertaken in winter during alternate years (starting 2016) will target the Swift Parrot (*Lathamus discolor*) and the Regent Honeyeater (*Xanthomyza phrygia*). The actual total period over which monitoring will occur will be dependent on the ultimate mine life.

Survey techniques are described in **Table 28**.

Table 28: Overview of Fauna and Aquatic Survey Methods

Survey Technique	Description
Bird Surveys	Diurnal bird censuses will be undertaken within each survey site on two separate days. The census will survey avifauna species diversity, relative abundance and behaviour (e.g. breeding/nesting activities).
Opportunistic observations	Opportunistic observations for vertebrate fauna, particularly threatened species, will be noted during the survey.
Aquatic Fauna	A visual assessment of aquatic habitat is conducted using the AUSRIVAS (Australian River Assessment System) proforma. Water quality is measured and macroinvertebrate sampling is conducted using AUSRIVAS protocol

7.2.2 Monitoring of Revegetation of Disturbance Areas

WCPL will revegetate areas of the Mine to woodland, pasture and/or riparian vegetation, as described in the WCPL MOP (2015-2020). A number of techniques, such as visual monitoring, LFA and Biometric monitoring will be utilised to monitor the progress of the revegetation of disturbance areas.

7.2.2.1 Visual Monitoring

Visual monitoring of revegetation will be undertaken to ensure vegetation is establishing and to determine the need for any maintenance and/or contingency measures (such as the requirement for supplementary plantings, erosion control and weed and animal pest control). Visual assessments allow for the rapid application of remedial actions where necessary.

7.2.2.2 Landscape Function Analysis (LFA) and Biometric Monitoring

LFA and Biometric Monitoring will be adopted as the primary monitoring methodologies to assess revegetated landscape stability and progress towards quantitative completion criteria targets.

Monitoring will be undertaken annually as per the locations detailed in **Table 25** and **Figure 11,** and consistent with the methodology outlined in **Section 7.1**.

Areas that have progressed beyond the landform establishment phase will transition to Biometric monitoring as described in **Section 6.1.3.**

7.2.3 Aquatic Monitoring

Localised bed and bank instability is a natural phenomenon in alluvial creeks, which contributes to the dynamic geomorphology of fluvial systems. Creek beds are also susceptible to subsidence induced erosion, due to the variable depth of subsidence associated with underground longwall mining.

The Baseline Riparian Vegetation and Bed Bank Stability Monitoring Program commenced in October 2006 to monitor for potential subsidence impacts. The program aims to distinguish natural erosion from mine subsidence associated instability, through pre-mining and post-mining survey of North Wambo Creek, NWCD, South Wambo Creek and Stoney Creeks.

Freshwater macro-invertebrate monitoring including an assessment of SIGNAL A values and water quality (temperature, pH and salinity) is also undertaken to determine the effectiveness of rehabilitation efforts and enhancement initiatives.

Two types of monitoring are undertaken as part of the program:

- Freshwater Macro-Invertebrate Monitoring including SIGNAL A assessment;

- Bed and Bank Stability Monitoring; and
- Riparian Vegetation Monitoring.

7.2.3.1 Bed and Bank Stability Monitoring

Bed and bank stability monitoring is undertaken by surveying consultants who undertake replicate surveys of the three creeks to measure areas of significant erosion and identify changes related to creek bed condition and water flow. A written assessment is completed, detailing any areas of significant erosion, bare soil and subsidence along each creek line.

7.2.3.2 Riparian Vegetation Monitoring

Two types of transect are assessed for sections of the three creeks, consisting of:

- Cross sectional – A marked single line transect across the width of the stream from bank to bank, also referred to as 'transects'; and
- Longitudinal – An unmarked transect along the length of the creek between two transects, also referred to as 'sections'.

Transect and section locations are established along those sections of the three creeks situated above underground workings, plus at least one site beyond each end of the underground workings.

The effects of subsidence and erosion on riparian vegetation are monitored by repetitive sampling of established permanent transects by assessing:

- The current erosion status of transects and sections;
- Photographing each transect site & any areas of significant erosion or subsidence impacts; and
- Quantifying vegetative structure and species composition for each transect.

Assessment of riparian vegetation characteristics is also undertaken using a standardised RARC methodology as developed by Jensen et.al (2005). The methodology is made up of five sub-indices, each with a number of indicators:

- Habitat continuity and extent
- Vegetation cover and structure
- Dominance of natives versus exotics
- Standing dead trees, hollows, fallen logs and leaf litter
- Indicative features

Visual assessment of the impact of erosion and subsidence will also be included as part of an ongoing photographic record.

The location of riparian monitoring cross-sections and transects is shown on **Figure 12.** The location and number of transects is subject to annual review.

7.2.3.3 Riparian Vegetation Monitoring

Freshwater macro-invertebrate monitoring is undertaken at identified monitoring locations targeting critical creek lines.

Assessment of SIGNAL A values are completed at these sites to assist in determining the anthropogenic impacts of mine site activities and the success of enhancement and rehabilitation efforts.

7.2.4 Subsidence Impacts

Areas overlying existing underground workings or proposed underground mining areas are subject to annual subsidence monitoring inspections. These inspections:

- Identify any isolated surface disturbances;
- Assess the level of disturbance to native vegetation and the condition of the vegetation (e.g. health and vigour of species and communities); and
- Assess any changes in drainage lines or watercourses (that may be attributable to subsidence).

Details regarding the remediation of subsidence impacts are provided in the relevant Extraction Plans.

7.3 Data Management and Review

Monitoring results will be collated after each monitoring round and compared against the Completion Criteria and Performance Targets in **Section 5.0**. If monitoring results show that targets are not being met, the TARPs in **Section 8.0** will be implemented.

All monitoring results are filed by the Manager Environment and Community (ECM) and/or Environmental Representative within the document control system and maintained at the Mine for at least four years after the monitoring or event to which they relate took place, as required by law. All records are kept in a legible form, or in a form that can readily be reduced to a legible form.

Monitoring results for the annual biodiversity monitoring program are included in WCPL's Annual Review reports, which are publically available on WCPL's website (refer **Sections 11.2** and **11.6**). Where relevant, statistical analysis (including any underlying assumptions) will also be included in the Annual Review reports.

8.0 Contingency Plans and Incident Response

8.1 Adaptive Management

WCPL will assess and manage project-related risks to ensure that there are no exceedances of the criteria and/or performance measures in **Section 5.0.** Any exceedance of these criteria and/or performance measures constitutes a breach of the conditions of DA305-7-2003 and may be subject to penalty or offence provisions under the EP&A Act or EP&A Regulation.

Where any exceedance of these criteria and/or performance measures has occurred, WCPL will, at the earliest opportunity:

- Take all reasonable and feasible steps to ensure that the exceedance ceases and does not recur;
- Consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action; and
- Implement remediation measures as directed by the Secretary, to the satisfaction of the Secretary.

WCPL will notify the Chief-Executive (OEH) in writing as soon as possible after becoming aware of the deterioration of any of the Conservation Values, or of any threat to the Conservation Values.

8.2 Trigger Action Response Plans

WCPL has developed TARPs for both Biometric and LFA sites

TARPs are provided in **Table 29** (Biometric), **Table 31** (LFA) and **Table 32** (Subsidence). Additional TARPs are included in the MOP for rehabilitated areas. Potential biometric TARP management measures are provided in **Table 30.**

Table 29: Native Vegetation and Habitat Complexity (BioMetric) TARP

TARP	
Trigger	• Score obtained during annual monitoring round has stagnated or is retreating from completion target range for three consecutive years.
Action	• Notify the WCPL ECM. • Check and validate the data to ensure correct/accurate. • Review site attribute scores to determine which attributes are contributing to the lower than expected score • Review management actions undertaken during previous 12 months to determine if actions have contributed to the lower than expected score • Review previous monitoring scores and climatic conditions to establish whether external factors could be contributing to the lower than expected score
Response	Site Attribute Classification - Green (within target range): • Maintain monitoring for three years and seek DRE sign off if no significant decline observed (exclude reference sites). Site Attribute Classification - Yellow (not meeting target but still acceptable): • Review monitoring data against seasonal variations and existing management actions • Increase/adopt management effort to address identified lagging site attribute scores. • Maintain monitoring until all site attributes classifications are Green (within target ranges).

TARP	
	Site Attribute Classification – Orange (in need of improvement): • Review monitoring data against seasonal variations and existing management actions • Increase/adopt management effort to address identified lagging site attribute score. • Refer to LFA results to determine if there are other causal factors. • Maintain monitoring until all site attributes classifications are Yellow (not meeting targets but still acceptable). Site Attribute Classification – Red (needs greater improvement): • Review monitoring data against seasonal variations and existing management actions. • Increase/adopt management effort to address identified lagging site attribute score. • Treat surface as if rehabilitation is establishing. Use management actions to improve condition. • Refer to LFA results to determine if there are other causal factors • Maintain monitoring until all site attributes classifications are Orange (in need of improvement). Site value score declines from expected performance target range to a preceding range: • Analyse data for potential reasons for decline. • Develop remedial actions to address declining biodiversity values. • Review LFA monitoring to examine for potential casual factors OR start LFA monitoring if landform instability is detected.
Plan	• Review and revise the Management Schedule, targeting the specific site attribute/s contributing to the lower score. • Report monitoring results and management actions in the Annual Review.

Table 30: Potential BioMetric TARP Management Measures

Site Attribute	Red (needs greater improvement)	Orange (in need of improvement)	Yellow (Not meeting target but values still acceptable)	Green (Excellent – within target range)
Native Plant Species Richness (NPS) Native Overstorey Cover (NOS) Native Midstorey Cover (NMS) Native Ground Cover – grasses (NGCG) Native Ground Cover – shrubs (NGCS) Native Ground Cover – other (NGCO) Proportion of native overstorey species regenerating (OR)	Review LFA monitoring data Review of climactic trends to determine potential influence Sample and analysis of soil characteristics Application of soil ameliorates Targeted planting/seeding Establishment of watering regime or infrastructure	Review of climactic trends to determine potential influence Sample and analysis of soil characteristics Application of soil ameliorates Targeted planting/seeding Establishment of watering regime or infrastructure	Review of climactic trends to determine potential influence Establishment of watering regime or infrastructure Ongoing monitoring	Ongoing monitoring Seek DRE sign off
Exotic plant cover (EPC)	Weed control management measures Planting of select species to prevent recolonisation of removed weeds	Weed control management measures Planting of select species to prevent recolonisation of removed weeds	Weed control management measures Ongoing monitoring	Continue monitoring until DRE sign off

Table 31: Landscape Stability (LFA) TARP

TARP	
Trigger	• <5% annual improvement or significant decline in LFA Score (from previous monitoring round)
Action	• Notify the WCPL ECM. • Check and validate the data to ensure correct/accurate. • Review individual SSCI and LFA Index results to determine which SSCI or index result is contributing to the lower than expected score • Review management actions undertaken during previous 12 months (applicable to relevant Management Period) to determine if actions have contributed to the lower than expected score • Review previous monitoring scores and climatic conditions to establish whether external factors could be contributing to the lower than expected score
Response	• Develop remedial actions to address stagnant or declining landscape stability, if stagnant or declining score not caused by external factors. • Maintain monitoring of affected site until first LFA score ≥50 (i.e. stable landform) and • Review monitoring program and consider expanding to include additional treatment and reference sites.
Plan	• Review and revise the Management Schedule, targeting the specific SSCI and LFA indices contributing to the lower score. • Report monitoring results and management actions in the Annual Review.

Table 32: Subsidence TARP

TARP	
Trigger	• Biodiversity performance measure in Section 5.4 has been exceeded, or is likely to be exceeded.

Action	• Notify WCPL ECM and GM.
	• Notify DP&E, DRE and OEH (National Parks and Wildlife).
	• Conduct an investigation to identify/evaluate contributing factors, including:
	  ○ Re-survey of relevant subsidence monitoring lines.
	  ○ Analysis of measured versus predicted subsidence parameters.
	  ○ Ecological and/or geotechnical review of the observed consequences.

Response	• Develop an appropriate course of action in consultation with relevant agencies, including:
	  ○ Proposed contingency measures (see Sections 5.4 and 6.2).
	  ○ Program to review the effectiveness of the contingency measures.
	  ○ Consideration of adaptive management (see Section 8.1).
	• DP&E to approve the course of action.
	• Implement the approved course of action to the satisfaction of the DP&E.

Plan	• Review of this BMP and the performance indicators to adequately manage future potential impacts within the limits of the Development Consent. • Review of the subsidence monitoring program and update of the program where appropriate. • Report monitoring results and management actions in the Annual Review.

8.3 Management of Incidents and Non-compliances

Environmental incidents are managed and reported in accordance with the requirements detailed in **Section 11.7.**

If a non-compliance of any approval condition is identified, WCPL will investigate the non-compliance and implement corrective actions as required. Reporting of non-compliances will be undertaken in accordance with WCPL's statutory requirements.

A review of the effectiveness of the corrective or preventative action will be undertaken within one month of the occurrence of the incident and the relevant procedures will be updated as required.

9.0 Training and Awareness

Training forms an integral part of environmental management at WCPL. All personnel and contractors at the Mine undergo General Induction Training before being allowed to commence work at the Mine. This includes specific training in flora and fauna risks, the location of Domains, Vegetation Clearance Protocols (including Surface Disturbance Permits), cultural heritage and rehabilitation. Competency assessments are completed as part of this training.

Employees and permanent full-time contractors also undergo specific training undertaken as tool-box talks. This type of training is provided on an as-needed basis, for example, when introducing a new procedure such as the Surface Disturbance Permit process, or following identification of a new environmental risk, relevant changes in legislation or a change in operations. The Environmental Representative in consultation with the Environment and Community Manager (ECM) undertakes the identification of environmental training needs of personnel and the delivery method, including source material as appropriate.

10.0 Community Complaint Response

All biodiversity related community complaints received by WCPL will be recorded within the Community Complaints Register. The E&C Manager will investigate the complaint, which will include, where possible, contacting the complainant within 24 hours to discuss the complaint. A review of the effectiveness of the corrective or preventative actions will be conducted within a month of the complaint and the relevant work procedures updated if required.

Preliminary investigations will commence as soon as practicable upon receipt of a complaint to establish if WCPL is responsible. All efforts will be made to determine the likely causes contributing to the complainants concerns.

WCPL will attempt to address the complainants concerns such that a mutually acceptable outcome is achieved. However, if required, the Independent Dispute Resolution Process in DA305-7-2003 would be referred to.

WCPL will retain a copy of the Community Complaints Register for at least four years. The ECM will ensure the latest Community Complaints Register is posted on the WCPL website.

11.0 Review and Reporting

11.1 Review

The performance of the biodiversity monitoring program (**Section 7.0**) will be reviewed annually by the E&C Manager. A complete review of the BMP will occur:

- Every two years;
- When there are changes to consent or licence conditions relating to biodiversity;
- Prior to new underground mining areas being developed;
- Following significant biodiversity related incidents at WCPL;
- Following continual exceedance of completion criteria;
- Following an independent environmental audit which requires BMP review; or
- If there is a relevant change in technology, practice or legislation.

The revised BMP will be re-submitted to the Secretary of DPE for approval as required by Condition 44, Schedule 4 of DA305-7-2003. A copy will also be submitted to the Federal Minister for Environment for approval, in accordance with Condition 5 of EPBC approval 2003/1138.

If the Federal Minister for Environment believes that it is necessary or desirable for the better protection of the listed threatened and migratory species to do so, the Minster may request that WCPL make specified revisions to the BMP approved and submit the revised plan for the Minister's approval.

The RWEA Monitoring Program (**Section 7.0**) may be reviewed 5 years after the date of the CAs. If the parties determine to vary the Monitoring Program, the parties may vary the CA under section 69D of the NPW Act to give effect to any agreed variation to the Monitoring Program.

11.2 Annual Review

Prior to the end of March each year, WCPL will review the environmental performance of the Mine and submit an Annual Review report to the DPE. This report will:

- Describe the development (including any rehabilitation) that was carried out in the past year, and the development that is proposed to be carried out over the next year;
- Include a comprehensive review of the monitoring results (including any statistical analysis and associated underlying assumptions) and complaints records of the Project over the past year, which includes a comparison of these results against the:
    - Relevant statutory requirements, limits or performance measures/criteria
    - Monitoring results of previous years; and
    - Relevant predictions in the EA;
- Identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;
- Identify any trends in the monitoring data over the life of the Project;
- Identify any discrepancies between the predicted and actual impacts of the Project, and analyse the potential cause of any significant discrepancies; and

- Describe what measures will be implemented over the next year to improve the environmental performance of the Project.

A copy of the Annual Review will be forwarded to other relevant government agencies, including OEH.

11.3 Conservation Area Monitoring Report

After each Monitoring Event, WCPL's Ecologist will produce a monitoring report on the Conservation Area by 1 March of each year.

The Monitoring Report must include:

- A description of all completed management actions undertaken in the previous 12 month period;
- Copies of all receipts from third party contractors engaged by WCPL to undertake management actions listed in **Appendix F**;
- Completed monitoring data sheets (including photographs) using the template provided in **Appendix I;**
- A discussion of the changes recorded at monitoring points and quadrats;
- A discussion of the condition of conservation values (as described in **Sections 4.2.1.1** and **4.2.1.2**);
- A discussion of effectiveness of any management actions implemented; and
- Recommendations and proposed management actions to be performed in following year.

The Monitoring Report will be submitted to the Chief-Executive (OEH) within 14 days of it being received by WCPL.

11.4 Independent Audit of the Biodiversity Offset Strategy

Every 5 years, unless the Secretary of DPE directs otherwise, WCPL will commission an Independent Audit of the biodiversity offset strategy. This audit will:

- Be conducted by a suitably qualified, experienced, and independent person whose appointment has been endorsed by the Secretary of DPE;
- Assess the performance of the offset strategy and compliance with the conditions of approval (EPBC 2003/1138);
- Review the adequacy of this BMP; and, if necessary,
- Recommend actions or measures to improve the performance of the offset strategy, and the adequacy of this BMP.

The last independent audit of the biodiversity offset strategy was undertaken by Umwelt in February 2015. Relevant recommendations from this audit have been considered in the development of this BMP.

11.5 Independent Environmental Audit

Every 3 years, unless the Secretary of DPE directs otherwise, WCPL will commission an Independent Environmental Audit of the Mine. This audit will:

- Be conducted by a suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Secretary of DPE;

- Include consultation with the relevant agencies;
- Assess the environmental performance of the development and assess whether it is complying with the requirements in the development approvals and any relevant EPL or Mining Lease (including any assessment, plan or program required under these consents/approvals);
- Review the adequacy of strategies, plans or programs required under the abovementioned consents/approvals; and
- Recommend appropriate measures or actions to improve the environmental performance of the development, and/or any assessment, plan or program required under the abovementioned consents.

The last independent environmental audit of the Mine was undertaken by Hansen Bailey in November 2014. Relevant recommendations from this audit have been considered in the development of this BMP.

11.6 Website Updates

A comprehensive summary of the biodiversity monitoring results will be made publicly available at WCPL's website:

http://www.peabodyenergy.com/content/404/australia-mining/new-south-wales/wambo-mine)

Information on the website will be updated regularly as required by DA305-7-2003.

WCPL will also ensure that any information relevant to biodiversity monitoring is uploaded to the website (and kept up to date). This includes:

- Current statutory approvals;
- Approved strategies, plans or programs required under the DA305-7-2003;
- A community complaints register;
- Minutes of Community Consultative Committee (CCC) meetings;
- Annual Reviews;
- A copy of any Independent Audits and WCPL's response to any recommendations in any audit; and
- Any other matter required by the Secretary.

11.7 Reportable Environmental Incidents

All reportable incidents will be reported via the EPA's Environmental Line on **131 555** by the E&C Manager in accordance with WCPL's Pollution Incident Response Management Plan (PIRMP).

In accordance with the PIRMP, WCPL must notify all relevant authorities of incidents causing or threatening material harm to the environment immediately after the person becomes aware of the incident in accordance with the requirements of *Part 5.7* of the *POEO Act.*

For all other incidents that do not cause threatening material harm to the environment associated with the Project, WCPL will notify the Secretary and any other relevant agencies as soon as practicable after WCPL becomes aware of the incident.

Within 7 days of the date of the incident, WCPL will provide the Secretary and any relevant agencies with a detailed report on the incident to include:

- The cause, time and duration of the event;
- Where possible the type, volume and concentration of every pollutant discharged as a result of the event;
- The name, address and business hours telephone number of employees or agents of the licensee who witnessed the event;
- The name, address and business hours telephone number of every other person (of whom the licensee is aware) who witnessed the event, unless the licensee has been unable to obtain that information after making reasonable effort;
- Action taken by the licensee in relation to the event, including any follow-up contact with any complainants;
- Implement remediation measures as directed by the Secretary, to the satisfaction of the Secretary;
- Details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an event; and
- Any other relevant matters.

12.0 Responsibilities

Table 33 below summarises responsibilities documented in the BMP. Responsibilities may be delegated as required.

Table 33: Biodiversity Management Plan Responsibilities

No	Task	Responsibility	Timing
1	Ensure biodiversity monitoring is undertaken in accordance with **Section 7.0**	Environmental Advisor	As required (refer **Section 7.0**)
2	Assess monitoring data against relevant completion criteria and interim performance indicators listed in **Section 5.0**	Environmental Advisor	Annually
3	Review BMP in accordance with **Section 11.0**.	Environmental Advisor	Annually
4	Notify government departments if an incident occurs in accordance with **Section 11.7**	E&C Manager	As required
5	Submit updated BMP to DPE and Department of the Environment and Energy.	E&C Manager	As required
6	Biodiversity related complaints to be responded to in accordance with **Section 10.0**	E&C Manager	As required
7	Annual Review to include biodiversity monitoring results, complaints, mitigation measures undertaken and a review of the monitoring undertaken	E&C Manager	Annually
8	Regulator review to be undertaken of the BMP	E&C Manager	As required
9	Prepare investigation reports and implementation of corrective actions in accordance with **Section 11.7**	E&C Manager	As required
10	Liaise with government authorities to establish conservation agreements/bonds for RWEAs	E&C Manager	By Dec 2016
11	Ensure Three Year Management Strategy is implemented	E&C Manager	As required (refer **Appendix F**).

13.0 References

- Development Consent (DA305-7-2003)
- Development Consent (DA177-8-2004)
- Draft Conservation Agreements for Remnant Woodland Enhancement Areas (RWEAs) A, B, C, D & D Extension and RWEA Wambo Coal Terminal. 20 April 2016
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- Navin Officer Heritage Consultants (2005) Wambo Development Project – Aboriginal Heritage Research Design and Study Plan (incorporating Salvage Programme). Attachment 3 of Wambo Coal Pty Limited, Navin Officer Heritage Consultants (2005) Application for Permit under Section 87 and Consent under Section 90 of the National Parks and Wildlife Act, 1974 in relation to the Wambo Development Project.
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- Riddler, A.M.H. (1996) Agricultural Suitability Maps – Uses and Limitations. Agfact AC.9. 3rd Edn. NSW Agriculture, NSW.
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- Wambo Environment Protection Licence (529)
- WCPL Mining Operations Plan (2015-2020).
- Eco Logical Australia (2015) South Bates (Wambo Seam) Underground Mine Modification Fauna Assessment. Report prepared for Wambo Coal Pty Limited.
- FloraSearch (2015) South Bates (Wambo Seam) Underground Mine Modification Environmental Assessment – Flora Assessment. Report prepared for Wambo Coal Pty Limited.
- Mine Subsidence Engineering Consultants (2016) South Bates Underground Mine Subsidence Assessment – Subsidence Predictions and Impact Assessments for the Natural and Built Features in Support of the Extraction Plan for WYLW11 to WYLW13 in the Whybrow Seam and WMLW14 to WMLW16 in the Wambo Seam. Report prepared for Wambo Coal Pty Limited.
- Orchid Research (2003) Wambo Development Project Flora Assessment.
- Wambo Coal Pty Limited (2003) Wambo Development Project Environmental Impact Statement.
- Wambo Coal Pty Limited (2015) South Bates (Wambo Seam) Underground Mine Modification Environmental Assessment.

APPENDIX A
BIODIVERSITY MANAGEMENT PLAN STATUTORY REQUIREMENTS

<table>
<tr><th>Approval</th><th>Condition</th><th>Requirement</th><th>Section</th></tr>
<tr><td>DA305-7-2003</td><td>Schedule 4
Condition 22</td><td>
SUBSIDENCE - Subsidence Management Plan
Performance Measures – Natural and Heritage Features, etc
The Applicant shall ensure that the development does not cause any exceedances of the performance measures in Table 14A, to the satisfaction of the Secretary.

Table 14A: Subsidence Impact Performance Measures
<table>
<tr><td>Biodiversity</td><td></td></tr>
<tr><td>Wollombi National Park</td><td>Negligible subsidence impacts.
Negligible environmental consequences.</td></tr>
<tr><td>Warkworth Sands Woodland Community</td><td>Minor cracking and ponding of the land surface or other impact. Negligible environmental consequences</td></tr>
<tr><td>White Box, Yellow Box, Blakely’s Red Gum, Woodland/ Grassy White Box Woodland Community</td><td>Minor cracking and ponding of the land surface or other impact.
Negligible environmental consequences</td></tr>
<tr><td>Other threatened species, populations or communities</td><td>Minor cracking and ponding of the land surface or other impact.
Negligible environmental consequences</td></tr>
<tr><td colspan="2">Notes:
1) The Applicant will be required to define more detailed performance indicators for each of these performance measures in the various management plans that are required under this consent (see condition 22C below).
2) The requirements of this condition only apply to the impacts and consequences of mining operations undertaken following the date of approval of modification 9.

If the Applicant exceeds the performance measures in Table 14A and the Secretary determines that:
(a) it is not reasonable or feasible to remediate the impact or environmental consequences; or
(b) remediation measures implemented by the Applicant have failed to satisfactorily remediate the impact or environmental consequence, then the Applicant shall provide a suitable offset to compensate for the impact or environmental consequence, to the satisfaction of the Secretary.

Note: An offset required under this condition must be proportionate with the significance of the impact or environmental consequence.</td></tr>
</table>
</td><td>5.4</td></tr>
</table>

<table>
<tr><th>Approval</th><th>Condition</th><th>Requirement</th><th>Section</th></tr>
<tr><td>DA305-7-2003</td><td>Schedule 4 Condition 22C(h)</td><td>The Applicant shall prepare and implement an Extraction Plan for the second workings within each seam to be mined to the satisfaction of the Secretary. Each Extraction Plan must:
…
(h) include a:
…
- Biodiversity Management Plan, which has been prepared in consultation with OEH, which provides for the management of the potential impacts and/or environmental consequences of the proposed second workings on flora and fauna;
…
Notes:
1. An SMP approved by DRE prior to 30 July 2011 is taken to satisfy the requirements of this condition for the workings covered by this plan.
2. Management plans prepared under condition 22C(h) should address all potential impacts of proposed underground coal extraction on the relevant features. Other similar management plans required under this consent (eg under conditions 30 - 35 and 44 - 48) are not required to duplicate these plans or to otherwise address the impacts associated with underground coal extraction.</td><td>Refer to specific Extraction Plans</td></tr>
<tr><td>DA305-7-2003</td><td>Schedule 4 Condition 22D</td><td>The Applicant shall ensure that the management plans required under condition 22C(h) above include:
(a) an assessment of the potential environmental consequences of the Extraction Plan, incorporating any relevant information that has been obtained since this consent;
(b) a detailed description of the measures that would be implemented to remediate predicted impacts; and
(c) a contingency plan that expressly provides for adaptive management.</td><td>6.2, 8.2, Appendix L</td></tr>
<tr><td>DA305-7-2003</td><td>Schedule 4 Condition 40</td><td>Flora and Fauna – Offset Strategy
Within the limits of current technology and best practice flora and fauna management, the Applicant shall implement the biodiversity offset strategy summarised in Table 16 (including any subsequent revisions approved in writing by the Secretary), to the satisfaction of the Secretary.

Table 16: Broad Targets for Offset Strategy
<table>
<tr><th>Area</th><th>Size</th></tr>
<tr><td>Remnant Woodland Enhancement Area A</td><td>424ha</td></tr>
<tr><td>Remnant Woodland Enhancement Area B</td><td>454ha</td></tr>
<tr><td>Remnant Woodland Enhancement Area C</td><td>211ha</td></tr>
<tr><td>Open Cut Woodland Revegetation</td><td>1,570ha</td></tr>
<tr><td>Remnant Woodland Enhancement Area D</td><td>46ha</td></tr>
<tr><td>Remnant Woodland Enhancement Area D</td><td>2ha</td></tr>
</table></td><td>4.1 and 6.1</td></tr>
</table>

<table>
<tr><th>Approval</th><th>Condition</th><th>Requirement</th><th>Section</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>Extension</td><td></td></tr>
<tr><td>Remnant Woodland Enhancement Area for the Wambo Coal Terminal</td><td>As shown in Appendix 4</td></tr>
<tr><td>Other Areas</td><td>As identified under Condition 47(b) and/or as required under Condition 22</td></tr>
<tr><td colspan="2">Notes:
(a) The areas specified in table 16 are shown in Appendix 4.
(b) The area of Open Cut Woodland Revegetation in Table 16 is based on the establishment of 50% woodland within the mixed woodland/pasture areas shown in the EIS, and with the agreement of the Secretary, may vary depending on the shape of the final landform and the approved mine closure plan.
(c) Should the Secretary determine that an additional offset is required under Condition 22, the Applicant will be required to provide this offset in addition to the specified offsets in Table 16. The size of any additional offset required shall be determined in consultation with OEH and to the satisfaction of the Secretary.</td></tr>
</table>
</td><td></td></tr>
<tr><td>DA305-7-2003</td><td>Schedule 4
Condition 41</td><td>Conservation Agreement
By the end of June 2015, unless otherwise agreed by the Secretary, the Applicant shall:
(a) enter into a conservation agreement/s pursuant to section 69B of the National Parks and Wildlife Act 1974 covering all offset areas listed in Table 16 (see condition 40) and which records the Applicant's obligations under the conditions of this consent in relation to the management of these areas, and register the agreement/s pursuant to section 69F of the National Parks and Wildlife Act 1974; or
(b) where OEH has advised in writing that it is of the view that any such offset area or part of such an area should not be subject to a conservation agreement for a period of time, then the Applicant shall by the same date cause to be registered against the land title(s) of the area/s a public positive covenant and/or restriction on the use of the land, in favour of the Secretary, requiring the Applicant to implement and observe all obligations under the conditions of this consent in relation to the management of these areas.
The conservation agreement or the public positive covenant and/or restriction on the use of land, as the case may be, shall remain in force in perpetuity in relation to the area.
Note: Should the Secretary determine that the specified conservation mechanism is no longer appropriate, the Secretary may approve an alternative conservation mechanism to satisfy this condition, in consultation with OEH.</td><td>6.1.1.1</td></tr>
<tr><td>DA305-7-2003</td><td>Schedule 4
Condition 41a</td><td>Offset Conservation
The Applicant shall not undertake any mining operations (except approved underground mining operations) or other activities within the offset areas listed in Table 16, other than:
(a) activities under an approved Biodiversity Management Plan, Flora & Fauna Management Plan or Heritage Management Plan;
(b) environmental management, environmental monitoring or other monitoring required under this consent or under an approved management plan or monitoring program; and
(c) rehabilitation activities under an approved Extraction Plan.</td><td>6.1.1.2 and 6.1.1.3</td></tr>
</table>

Approval	Condition	Requirement	Section
DA305-7-2003	Schedule 4 Condition 43	**Strategic Study Contribution (when established).** If, during the development, the Department commissions a strategic study into the regional vegetation corridor stretching from the Wollemi National park to the Barrington Tops National Park, then the Applicant shall contribute a reasonable amount, up to $20,000, towards the completion of this study.	NA to this Plan
DA305-7-2003	Schedule 4 Condition 44	**Flora & Fauna Management Plan** Before carrying out any development, the Applicant shall prepare a Flora and Fauna Management Plan for the development, in consultation with the Hunter Coalfield Flora and Fauna Advisory Committee (when established), and to the satisfaction of the Secretary. This plan must include: (a) a Vegetation Clearance Protocol; (b) a Threatened Species Management Protocol; (c) a Remnant Woodland Enhancement Program; (d) a Flora and Fauna Monitoring Program; (e) strategies to manage any subsidence impacts in the Remnant Woodland Enhancement Areas; and (f) strategies to avoid clearing of Warkworth Sands Endangered Ecological Community and minimise the extent of clearing in other ecological communities for gas drainage infrastructure in the Remnant Woodland Enhancement Areas, to the satisfaction of the Secretary. (g) strategies for the minimisation of impacts of exploration activity in the Remnant Woodland Enhancement Areas; and (h) a description of who would be responsible for monitoring, reviewing, and implementing the plan. By the end of March 2013, the applicant shall revise the Flora and Fauna Management Plan for the development to the satisfaction of the Secretary.	This plan 6.5.2 6.5.3 6.1.1 7.0 6.2 6.1.1.3.8 6.1.1.3.8 12.0
DA305-7-2003	Schedule 4 Condition 45	The Vegetation Clearance Protocol shall include: (a) the delineation of areas of remnant vegetation to be cleared; (b) progressive clearing; (c) pre-clearance surveys; (d) identification of fauna management strategies; (e) collection of seed from the local area; (f) salvage and reuse of material from the site; and (g) control of weeds during clearing activities	6.5.2 and Appendix J
DA305-7-2003	Schedule 4 Condition 46	The key components of the Threatened Species Management Protocol shall include: (a) observations/surveys for threatened species (facilitated by the vegetation clearance surveys and Flora and Fauna Monitoring Program); (b) consultation with regulatory authorities; and (c) threatened species management strategies and reporting.	6.5.3 and Appendix K
DA305-7-2003	Schedule 4 Condition 47	The Remnant Woodland Enhancement Program shall include: (a) a habitat assessment of all areas listed in Table 16, to obtain additional information on existing habitat resources and characteristics of each area; (b) investigation of other areas to be included in the Program, including the Acacia anuera Community (Community 15) and the Southern Area; (c) appropriate enhancement strategies to be implemented based on the habitat assessment including:	6.1.1

<table>
<tr><th>Approval</th><th>Condition</th><th>Requirement</th><th>Section</th></tr>
<tr><td></td><td></td><td>· the fencing of remnants to exclude livestock;
· control measures to minimise the occurrence of weeds;
· control measures to minimise the occurrence of feral pests;
· limiting vehicular traffic;
· selective planting of native vegetation; and the provision of roosting/nesting resources for fauna.</td><td></td></tr>
<tr><td>DA305-7-2003</td><td>Schedule 4
Condition 48</td><td>The Flora and Fauna Monitoring Program shall include:
(a) a program to monitor revegetation of disturbance areas including:
· visual monitoring to determine the need for maintenance and/or contingency measures; and
· monitoring of the quality of rehabilitation using Ecosystem Function Analysis (or a similar systems based approach) through the assessment of landscape function, vegetation dynamics and habitat complexity; and
(b) a program to monitor the effectiveness of offset strategy in accordance with the description in Table 17.

Table 17: Flora & Fauna Monitoring Program
<table>
<tr><th>Monitoring Component</th><th>Monitoring Description</th></tr>
<tr><td>Flora</td><td>A number of permanent flora survey quadrats (of varying sizes to survey tree, shrubs and ground cover) should be established in woodland enhancement areas to obtain quantitative data on plant species diversity and abundance.</td></tr>
<tr><td>Habitat Complexity</td><td>Habitat complexity should be monitored using a number of permanent transects established within woodland enhancement areas. Habitat complexity parameters such as canopy cover, shrub cover, ground vegetation cover, the amount of litter, fallen logs and rocks should be surveyed.</td></tr>
<tr><td>Terrestrial Fauna</td><td>Terrestrial fauna surveys should be conducted to monitor the usage of enhancement areas by vertebrate fauna. Monitoring may include fauna species diversity and abundance or, alternatively, the use of indicator species to measure the effectiveness of enhancement measures.</td></tr>
<tr><td>Aquatic Fauna</td><td>Freshwater macro-invertebrate monitoring, including an assessment of SIGNAL A values and water quality (e.g. temperature, pH, and salinity).</td></tr>
<tr><td>Specific Enhancement Initiatives</td><td>Monitoring of specific enhancement initiatives (e.g. the provision of nesting/ roosting boxes, weed control or feral animal control).</td></tr>
</table></td><td>7.0</td></tr>
<tr><td>DA305-7-2003</td><td>Schedule 4
Condition 49</td><td>Annual Review
The Applicant shall:
(a) review the performance of the Flora and Fauna Management Plan annually, in consultation with the Hunter Coalfield Flora & Fauna Advisory Committee (when established); and</td><td>11.2</td></tr>
</table>

Approval	Condition	Requirement	Section
		(b) revise the document as necessary to take into account any recommendations from the annual review.	
DA305-7-2003	Schedule 4 Condition 50	**Independent Audit** Within 5 years of the date of this consent, and every 5 years thereafter, unless the Secretary directs otherwise, the Applicant shall commission, and pay the full cost of, an Independent Audit of the offset strategy. This audit must: (a) be conducted by a suitably qualified, experienced, and independent person whose appointment has been endorsed by the Secretary; (b) assess the performance of the offset strategy; (c) review the adequacy of the Flora & Fauna Management Plan; and, if necessary, (d) recommend actions or measures to improve the performance of the offset strategy, and the adequacy of the Flora & Fauna Management Plan.	11.4
DA305-7-2003	Schedule 6 Condition 3	**Adaptive Management** The Applicant must assess and manage project-related risks to ensure that there are no exceedances of the criteria and/or performance measures in schedule 4. Any exceedance of these criteria and/or performance measures constitutes a breach of this consent and may be subject to penalty or offence provisions under the EP&A Act or EP&A Regulation. Where any exceedance of these criteria and/or performance measures has occurred, the Applicant must, at the earliest opportunity: (a) take all reasonable and feasible steps to ensure that the exceedance ceases and does not recur; (b) consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action; and (c) implement remediation measures as directed by the Secretary, to the satisfaction of the Secretary.	8.1
DA305-7-2003	Schedule 6 Condition 4	**Management Plan Requirements** The Applicant shall ensure that the management plans required under this consent are prepared in accordance with any relevant guidelines, and include: (a) detailed baseline data; (b) a description of: · the relevant statutory requirements (including any relevant consent, licence or lease conditions); · any relevant limits or performance measures/criteria; · the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures; (c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria; (d) a program to monitor and report on the: · impacts and environmental performance of the Wambo Mining Complex; · effectiveness of any management measures (see c above); (e) a contingency plan to manage any unpredicted impacts and their consequences; (f) a program to investigate and implement ways to improve the environmental performance of the Wambo Mining Complex over time; (g) a protocol for managing and reporting any: · incidents;	3.0 2.0 and this Appendix 5.0 5.0 6.0 7.0 and 11.2 8.0 11.2, 11.4 and 11.5

Approval	Condition	Requirement	Section
		· complaints; · non-compliances with statutory requirements; and · exceedances of the impact assessment criteria and/or performance criteria; and (h) a protocol for periodic review of the plan.	11.7 10.0 8.3 8.3 11.1
DA305-7-2003	Schedule 6 Condition 5	**Annual Review** By the end of March each year, the Applicant shall submit an annual review of the environmental performance of the development to the satisfaction of the Secretary. This review must: (a) describe the development (including any rehabilitation) that was carried out in the previous calendar year, and the development that is proposed to be carried out over the current calendar year; (b) include a comprehensive review of the monitoring results and complaints records of the development over the previous calendar year, which includes a comparison of these results against: · the relevant statutory requirements, limits or performance measures/criteria; · the monitoring results of previous years; and · the relevant predictions in the EIS; (c) identify any non-compliance over the previous calendar year, and describe what actions were (or are being) taken to ensure compliance; (d) identify any trends in the monitoring data over the life of the development; (e) identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and (f) describe what measures will be implemented over the current calendar year to improve the environmental performance of the development.	11.2
DA305-7-2003	Schedule 6 Condition 6	**Revision of Strategies, Plans and Programs** Within 3 months of: (a) the submission of an annual review under Condition 5 above; (b) the submission of an audit report under Condition 7 below; (c) the submission of an incident report under Condition 10 below; or (d) any modification to the conditions of this consent, (unless the conditions require otherwise), the Applicant shall review, and if necessary revise, the strategies, plans, and programs required under this consent to the satisfaction of the Secretary. Note: This is to ensure the strategies, plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the development.	11.1
DA305-7-2003	Schedule 6 Condition 7	**Independent Environmental Audit** Every 3 years, unless the Secretary directs otherwise, the Applicant shall commission and pay the full cost of an Independent Environmental Audit of the development. This audit must: (a) be conducted by a suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Secretary; (b) include consultation with the relevant agencies; (c) assess the environmental performance of the development and assess whether it is complying with the requirements in this consent and any relevant EPL or Mining Lease (including any assessment, plan or program required under these consents/approvals);	11.5

Approval	Condition	Requirement	Section
		(d) review the adequacy of strategies, plans or programs required under the abovementioned consents/approvals; and (e) recommend appropriate measures or actions to improve the environmental performance of the development, and/or any assessment, plan or program required under the abovementioned consents. Note: This audit team must be led by a suitably qualified auditor and include experts in any field specified by the Secretary. Within 6 weeks of the completion of this audit, or as otherwise agreed by the Secretary, the Applicant shall submit a copy of the audit report to the Secretary, together with its response to any recommendations contained in the audit report.	
DA305-7-2003	Schedule 6 Condition 10	**Incident Reporting** The Applicant shall notify at the earliest opportunity, the Secretary and any other relevant agencies of any incident that has caused, or threatens to cause, material harm to the environment. For any other incident associated with the project, the Applicant shall notify the Secretary and any other relevant agencies as soon as practicable after the Applicant becomes aware of the incident. Within 7 days of the date of the incident, the Applicant shall provide the Secretary and any relevant agencies with a detailed report on the incident, and such further reports as may be requested.	11.7
DA305-7-2003	Schedule 6 Condition 11	**Regular Reporting** The Applicant shall provide regular reporting on the environmental performance of the development on its website, in accordance with the reporting arrangements in any plans or programs approved under the conditions of this consent.	11.6
DA305-7-2003	Schedule 6 Condition 12	**Access to Information** From the end of June 2011, the Applicant shall: (a) make copies of the following publicly available on its website: · the documents referred to in Condition 2 of Schedule 3; · all current statutory consents for the development; · all approved strategies, plans and programs required under the conditions of this consent; · a comprehensive summary of the monitoring results of the development, reported in accordance with the specifications in any conditions of this consent, or any approved plans and programs; · a complaints register, updated on a monthly basis; · minutes of CCC meetings; · the annual reviews of the development; · any independent environmental audit of the development, and the Applicant's response to the recommendations in any audit; · any other matter required by the Secretary; and (b) keep this information up-to-date, to the satisfaction of the Secretary.	11.6
DA177-8-2004	Schedule 4 Condition 31	**FLORA & FAUNA** The Applicant shall take all practicable measures to minimise vegetation clearing during the development.	6.5.2
DA177-8-2004	Schedule 4 Condition 32	Before carrying out the development, the Applicant shall prepare, and then subsequently implement, a Flora and Fauna Management Plan for the development to the satisfaction of the Director-General. This plan must include: (a) a Vegetation Clearance Protocol; and (b) Revegetation and Landscaping Plan for the area marked on the map in Appendix 3.	This BMP 6.5.2 and Appendix J N/A – refer

Approval	Condition	Requirement	Section
			C34 below
DA177-8-2004	Schedule 4 Condition 33	The Vegetation Clearance Protocol shall include: (a) the delineation of areas of remnant vegetation to be cleared; (b) progressive clearing; (c) the identification of fauna management strategies; (e) the collection of seed from the local areas; (f) the salvage and reuse of material from the site; and (g) the control of weeds during clearing activities.	6.5.2 and Appendix J
DA177-8-2004	Schedule 4 Condition 34	The Revegetation and Landscaping Plan shall: (a) describe the measures that would be implemented to revegetate the area marked on the map in Appendix 3, including: · measures to control the occurrence of weeds; · measures to minimise the occurrence of feral pests; · selective planting of native vegetation; · the provision of roosting/nesting resources for fauna; and · describe the measures that would be implemented to: · landscape the new Walllaby Scrub Road/Golden Highway intersection; and · maintain this landscaping during the life of the development; (b) include a program to monitor the effectiveness of the plan during the development.	N/A - revegetation and landscaping complete and well established. Maintenance undertaken as required.
DA177-8-2004	Schedule 6 Condition 4	**Annual reporting** Within 1 year of the date of this consent, and annually thereafter, the Applicant shall submit an Annual Review on the development to the Director-General and relevant agencies. This report must: (a) identify the standards and performance measures that apply to the development; (b) include a summary of the complaints received during the last year, and compare this to the complaints received in previous years; (c) include a summary of the monitoring results on the development during the last year; (d) include an accurate record of the amount of product coal transported on the development over the last year on a weekly basis; (e) include an analysis of these monitoring results against the relevant: · impact assessment criteria; · monitoring results from previous years; and · predictions in the SEE; (f) identify any trends in the monitoring over the life of the development; (g) identify any non-compliance during the last year; and, if necessary, (h) describe what actions were, or are being taken, to ensure compliance.	11.2
DA177-8-2004	Schedule 6 Condition 5	**Incident Reporting** The Applicant shall notify the Director-General and any other relevant agencies of any incident that has caused, or has the potential to cause, significant risk of material harm to the environment, at the earliest opportunity. For any other incident associated with the development, the Applicant shall notify the Director-General and any other relevant agencies as soon as practicable after the Applicant becomes aware of the incident. Within 7 days of the date of the incident, the Applicant shall provide the Director-General and any relevant agencies with a detailed report on the incident, and such further reports as may be requested.	11.7
DA177-8-2004	Schedule 6 Condition 6	**Regular Reporting** The Applicant shall provide regular reporting on the environmental performance of the development on its website, in accordance with	11.6

Approval	Condition	Requirement	Section
		the reporting arrangements in any condition of this consent.	
DA177-8-2004	Schedule 6 Condition 7	**Independent Environmental Audit** The Applicant shall ensure that the development is included in the Independent Environmental Audit of the Wambo Mining Complex.	11.5
DA177-8-2004	Schedule 6 Condition 8	**Access to Information** From 31 May 2012, the Applicant shall: (a) make copies of the following publicly available on its website: · the SEE, SEE (Mod 1) and EA (Mod 2); · all current statutory approvals for the development; · approved strategies, plans and programs required under the conditions of this consent; · a comprehensive summary of the monitoring results of the development, which have been reported in accordance with the various plans and programs approved under the conditions of this consent; · a complaints register, which is to be updated on a monthly basis; · the annual reviews (over the last 5 years); · any independent environmental audit, and the Applicant's response to the recommendations in any audit; · any other matter required by the Director-General; and (b) keep this information up to date, to the satisfaction of the Director-General.	11.6
EPBC 2003/1138	Condition 1	The person taking the action must not clear any vegetation in the area designated as Remnant Woodland Enhancement Area A without the prior written agreement of the Minister.	6.1.1.3
EPBC 2003/1138	Condition 2	Prior to the commencement of the mine expansion, the person taking the action must submit for the Minister's approval a plan for managing the impacts of the mine expansion on listed threatened and migratory species. The plan must include measures to: (a) define and implement an offsets strategy that provides: - protection in perpetuity for Remnant Woodland Enhancement Area A; and - long-term protection of Remnant Woodland Enhancement Areas B and C; (b) define and implement a Remnant Woodland Enhancement Program that includes the fencing of remnants to exclude livestock, weed and feral animal management, restrictions on site access, and bushfire management (c) define and implement a Vegetation Clearance Protocol that includes the delineation of areas of remnant vegetation to be cleared, progressive clearing and the salvage and reuse of materials (d) define and implement a Threatened Species Management Protocol that includes surveys for threatened species, the implementation of threatened species management strategies, and the development and implementation of a Flora and Fauna Monitoring Program (e) define and implement a Project Area Rehabilitation Programme that includes progressive rehabilitation, erosion and sediment control, revegetation, and maintenance and monitoring (f) a process to review and report annually on this plan and the offsets strategy (g) outline a process for stakeholder consultation The mine expansion must not commence until the plan has been approved. The approved plan must be implemented.	This BMP 6.1.1 6.1.1 6.1.1 6.5.2 6.5.3 Refer to WCPL MOP 11.2 2.1
EPBC 2003/1138	Condition 3	Within three months of the date of this approval, the person taking the action must submit for the Minister's approval a plan for managing the impacts of the rail spur on listed threatened and migratory species. The plan must include measures for:	This BMP

Approval	Condition	Requirement	Section
		(a) the permanent protection and ongoing management of woodland areas in the vicinity of the rail spur; (b) defining and implementing a Vegetation Clearance Protocol; (c) a revegetation and landscaping plan that includes the fencing of woodland remnants to exclude livestock, weed and feral animal management, restrictions on site access, and bushfire management; and (d) a process to review and report annually on this plan Construction of the rail spur must not commence until the plan has been approved. The approved plan must be implemented.	6.1.1 6.5.2 6.1.1 and Appendix F 11.2
EPBC 2003/1138	Condition 4	Within five years of the commencement of this action, and every subsequent five years,, the person taking the action must ensure that an independent audit of compliance with the conditions of approval is conducted and a report submitted to the Minister. The independent auditor must be approved by the Minister prior to the commencement of the audit. Audit criteria must be agreed to by the Minister and the audit report must address the criteria to the satisfaction of the Minister.	11.4
EPBC 2003/1138	Condition 5	If the person taking the action wishes to carry out any activity otherwise than in accordance with the plans referred to in paragraphs 2 and 3, the person taking the action may submit for the Minister's approval a revised version of any such plan. If the Minister approves such a revised plan, that plan must be implemented in place of the plan originally approved.	11.1
EPBC 2003/1138	Condition 6	If the Minister believes that it is necessary or desirable for the better protection of the listed threatened and migratory species to do so, the Minster may request that the person taking the action make specified revisions to the plans approved pursuant to paragraphs 2 and 3 and submit the revised plan for the Minister's approval. The person taking the action must comply with any such request. The revised approved plan must be implemented	11.1
CAs – Wambo Coal Terminal RWEP and RWEAs	Condition 5	**Use of the Conservation Area** The Owner must not undertake, consent to or permit the following activities on or in the Conservation Area, unless provided for under the Conservation Agreement or with prior written consent of the Chief-Executive: (a) the sowing or planting of trees, grasses or other plants; (b) the introduction of any non-indigenous plants or non-indigenous fauna; (c) the entry of domestic animals including pets (except for the Owner's domestic pets, and only if kept under control/on a leash) and domestic livestock; (d) the use or application of fertilizers or pesticides; (e) the use of trail bikes, four wheel drive vehicles or any other vehicle off any formed road (except for management purposes, research, firefighting and/or any emergency requirements); (f) any works, especially any revegetation work, or any development which has the potential to adversely impact on any of the Conservation Values; (g) the removal of any biological or inorganic component of the Conservation Area; (h) any works which will adversely affect the natural flows of water; (i) grazing of domestic livestock; (j) any act or omission that may harm any native fauna, native plants, their habitats, cultural heritage or geo-heritage in the Conservation Area or the Conservation Values; (k) the construction of any new road, access track, trail, building or internal fencing; and (l) subdivide the Conservation Area.	6.1.1.2
CAs – Wambo Coal Terminal RWEP and RWEAs	Condition 6	**Management of the Conservation Area** 1. The Owner must undertake the management activities listed in Item 1 of Annexure C to the Conservation Agreement on or in the Conservation Area, at the times specified in Item 1 of Annexure C to the Conservation Agreement, for a minimum period of 10 years from the Commencement date.	Appendix F

Approval	Condition	Requirement	Section
		2. The Owner must undertake the management activities listed in Item 2 of Annexure C to the Conservation Agreement on or in the Conservation Area, from Year 11 for the duration of the Conservation Agreement. 3. The Owner may undertake the management activities listed in Item 3 of Annexure C to the Conservation Agreement on or in the Conservation Area, if carried out in the manner prescribed in Item 3 of Annexure C to the Conservation Agreement. 4. The Owner must notify the Chief-Executive in writing as soon as possible after becoming aware of the deterioration of any of the Conservation Values, or of any threat to the Conservation Values.	Noted – not included in this version of the BMP (will be included in future versions) 6.1.1.3 8.1
CAs – Wambo Coal Terminal RWEP and RWEAs	Condition 7	**Monitoring** 1. The Owner must engage a suitably qualified ecologist to undertake the monitoring program as set out in Annexure D to the Conservation Area (Monitoring Program). 2. The Monitoring Program must be undertaken, beginning in 2016, for a minimum period of 10 years. 3. The Monitoring Program may be reviewed and updated throughout the duration of the Conservation Agreement with prior written approval from OEH.	7.2 7.2 11.1
CAs – Wambo Coal Terminal RWEP and RWEAs	Condition 8	**Reporting Obligations** Following completion of the Monitoring Program the Owner should from time to time (i.e. as part of the Annual Environmental Management Report/Annual Review), complete a monitoring report, including photo-point photos, noting changes occurring in the Conservation Area. This will form the basis for decisions about ongoing management actions for the Conservation Area. A copy of all monitoring reports should be forwarded to OEH.	11.2 and 11.3
CAs – Wambo Coal Terminal RWEP and RWEAs	Condition 13	**Non-compliance** In the event that the Owner fails to comply with the Conservation Agreement, including, without limitation, damaging or causing damage to the Conservation Area, OEH may issue a written notice to the Owner requiring the Owner to remedy the non-compliance or damage within a specified time period. This clause does not affect any rights of the parties under section 69G of the NPW Act.	Noted
CA – Wambo Coal Terminal RWEP	Annexure B	**Conservation Values** The Owner and the Minister recognise that the Conservation Area contains the following conservation values: The Conservation Area contains: • MU10 Central Hunter Box – Ironbark Woodland (Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions listed as an Endangered Ecological Community under Schedule 1 of the TSC Act and Critically Endangered under the EPBC Act) (also HU551 Biometric Vegetation Type); • MU14 – Warkworth Sands Woodland (Warkworth Sands Woodland in the Sydney Basin Bioregion listed as an Endangered Ecological Community under Schedule 1 of the TSC Act EEC); and • G - Secondary Native Grassland.	4.2.1.2

Approval	Condition	Requirement	Section
		The Conservation Area contains habitat suitable for fauna species listed as Endangered (seven species), Vulnerable (37 species) and Critically Endangered (two species), respectively under Schedules 1, 1A and 2 of the TSC Act plus 10 species listed only under the EPBC Act (refer to table 1 Annexure B). The Conservation Area contains registered Aboriginal sites (open artefact sites 37-6-1131 and 37-6-0594). The Conservation Area is adjacent to remnant bushland areas (i.e. Wollemi National Park [Figure 1]). Wollemi National Park is part of the Greater Blue Mountains World Heritage Area, which covers approximately 1 million ha and supports an exceptional number of threatened flora and fauna species.	
CA – RWEAs	Annexure B	**Conservation Values** The following conservation values apply to RWEAs A-D: • MU7 - Narrabeen Footslopes Slaty Box Woodland, Biometric Vegetation Type HU618. Also recognised as Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion (listed as Vulnerable under the TSC Act and Critically Endangered under the EPBC Act); • MU10 - Central Hunter Box – Ironbark Woodland, Biometric Vegetation Type HU551. Also recognised as Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions (listed as Endangered under the TSC Act and Critically Endangered under the EPBC Act); • MU12 - Southern Hunter Escarpment Spotted Gum Woodland; • MU13 - Hunter Floodplain Red Gum Woodland Complex, Biometric Vegetation Type HU599 95% cleared within the Hunter-Central Rivers CMA. Also recognised as Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions (listed as Endangered under the TSC Act); • MU14 - Warkworth Sands Woodland (Warkworth Sands Woodland in the Sydney Basin Bioregion listed as an Endangered Ecological Community under Schedule 1 of the TSC Act EEC); • MU17 - Central Hunter Paperbark Soak Woodland (HU564 Biometric Vegetation Type - 80% cleared within the Hunter-Central Rivers CMA); • MU22 - Wollombi Alluvial Red Gum – Apple Forest; • MU30 - Hunter Valley River Oak Forest; • 8 - Native Olive-Scrub Wilga Woodland; and • G - Secondary Native Grassland. The Conservation Area contains habitat suitable for fauna species listed as Endangered (seven species), Vulnerable (37 species) and Critically Endangered (two species), respectively under the TSC Act plus 10 species listed only under the EPBC Act (refer **Table 4**).	4.2.1.1

Approval	Condition	Requirement	Section
		The Conservation Area contains extensive registered Aboriginal sites, including open artefact sites, grinding grooves, isolated finds and potential archaeological digs. The Conservation Area is adjacent to remnant bushland areas (i.e. Wollemi National Park). Wollemi National Park is part of the Greater Blue Mountains World Heritage Area, which covers approximately 1 million ha and supports an exceptional number of threatened flora and fauna species.	
CAs – Wambo Coal Terminal RWEP and RWEAs	Annexure C	**Item 1: Management actions for a minimum period of 10 years** Refer to Annexure C, Item 1 of the Conservation Agreements.	Appendix F
CAs – Wambo Coal Terminal RWEP and RWEAs	Annexure C	**Item 2: Management actions for the Conservation Agreements from Year 11 onwards** Refer to Annexure C, Item 2 of the Conservation Agreements.	Noted – not included in this version of the BMP (will be included in future versions)
CAs – Wambo Coal Terminal RWEP and RWEAs	Annexure C	**Item 3: Permitted Activities** Control of pest animals and non-indigenous fauna (in addition to pest animal control management actions in Items 1 and 2 of Annexure C to the Conservation Agreement) a) Participate in community pest animal control programs, and encourage neighbours to implement pest animal control programs. Contact your local National Parks and Wildlife Service Area office to find out where community control programs are occurring.	6.1.1.3.1
CAs – Wambo Coal Terminal RWEP and RWEAs	Annexure C	**Fencing, tracks and trails** b) Maintaining all existing fences within the Conservation Area. c) Maintaining existing access tracks in the Conservation Area to a maximum width of 2m. d) Maintaining existing access trails in the Conservation Area to a maximum width of 4m with 1m either side permissible for clearing. e) Construction of any new internal fence, access track or trail only with prior written approval from OEH or DPE (excluding cases of emergency, e.g. bushfire risk/control).	6.1.1.3.2
CAs – Wambo Coal Terminal RWEP and RWEAs	Annexure C	**Fire management** (in addition to fire management actions in Item 1 of Annexure C to the Conservation Agreement) f) Using fire hazard reduction burns and controlled burning which take into account the recommended fire intervals given in the Bush Fire Environmental Assessment Code for New South Wales (Rural Fire Service February 2006) and the guidelines contained in the Threatened Species Hazard Reduction Lists for the Bush Fire Environmental Assessment Code or equivalent replacements. Current recommendations are: • in the Warkworth Sands Woodland in the Sydney Basin Bioregion EEC, no fire more than once every 10 years and no slashing, trittering or tree removal relating to mechanical forms of hazard reduction. • in general, at least 50% of the EEC/CEEC within each LGA must exist in a state that has been burnt less frequently than the minimum fire interval. • both live and dead trees with hollows should be protected from burning to preserve nesting habitat for hollow dwelling animals.	6.1.1.3.3

Approval	Condition	Requirement	Section
		g) lighting a fire, or causing a fire to be lit on the Conservation Area if it complies with the Rural Fires Act 1997 (NSW), and: • the lighting of the fire is for the purposes of controlled burning and is carried out in accordance with any fire guidelines for controlled burning as provided for in Annexure C to the Conservation Agreement; or • the lighting of the fire is a necessary component of bush fire hazard reduction work carried out in accordance with a notice served on the Owner under the Rural Fires Act 1997 (NSW) or other applicable legislation; or • life or property is in immediate threat by bush fire and the lighting of the fire is reasonably necessary to protect life or property; or • the fire is a camp fire, subject to the compliance with the Rural Fires Act 1997 (NSW), or • the Chief-Executive gives prior written consent to the lighting of the fire.	
CAs – Wambo Coal Terminal RWEP and RWEAs	Annexure C	**Use of timber** h) Harvesting of fallen non-hollow wood in amounts necessary for heating the Owner's dwelling on the Land and camp fires on the Conservation Area and for fencing the Conservation Area.	6.1.1.3.4
CAs – Wambo Coal Terminal RWEP and RWEAs	Annexure C	**Threatened species** (in addition to management actions in Item 2 of Annexure C to the Conservation Agreement) i) Implementing any measures included in recovery plans for any threatened species, population or ecological communities which are or may be found in the Conservation Area. j) Implementing other specific management advice from OEH for any threatened species, populations or ecological communities which are or may be found in the Conservation Area.	6.1.1.3.5
CAs – Wambo Coal Terminal RWEP and RWEAs	Annexure C	**Restoration of indigenous vegetation** k) Restoration of native vegetation on the Conservation Area using a preferred method of encouraging and retaining natural regeneration. Preferred methods include: i) bush regeneration ii) brush mulching; and/or iii) direct seeding. l) Revegetation to establish indigenous plants to maintain the vegetation structure in keeping with the identified vegetation community, using species produced from material sourced locally and without fertilisers, where the ability to regenerate naturally within a reasonable time frame has been lost, or to prevent soil erosion.	6.1.1.3.6
CAs – Wambo Coal Terminal RWEP and RWEAs	Annexure C	**Seed collection** m) Collection of seed on the Conservation Area for non-commercial use in accordance with Guidelines and Codes of Practice as given in the Florabank guidelines (http://www.florabank.org.au), and the following limitations and permissions: i) Collect seed in the Conservation Area only if seed of the particular species and genotype is not available elsewhere, or if the seed collected is intended for seedlings that will be planted within the Conservation Area or adjacent to the Conservation Area. ii) Seeds may be collected from within endangered ecological communities. iii) Seeds may not be collected from species individually listed in Schedules 1, 1A or 2 to the TSC Act without prior written approval from the Chief-Executive, or under a licence granted under section 132C of the NPW Act or section 91 of the TSC Act. iv) Seeds may be collected from any protected species listed in Schedule 13 to the NPW Act. v) Seeds may be collected from any other native species.	6.1.1.3.7
CAs – Wambo Coal Terminal RWEP and RWEAs	Annexure C	**Cultural heritage** o) Recording and management of any newly identified Aboriginal Objects, in consultation with OEH (and the Aboriginal community where applicable).	6.1.1.3.10

Approval	Condition	Requirement	Section
CAs – Wambo Coal Terminal RWEP and RWEAs	Annexure C	**Visitation and research** p) Visitation, research and community use at a level that does not adversely impact on the Conservation Values or the amenity of the Owner. Research projects must be discussed with OEH before being carried out.	6.1.1.3.11
CAs – Wambo Coal Terminal RWEP and RWEAs	Annexure C	**Development** q) Carrying out any development as described in the Conservation Agreement and maintaining development (including existing fire trails, access trails and infrastructure), with the following conditions: i) clear a corridor not greater than 3 metres wide during construction or for maintenance for the installation of fences or other agreed rural structures; ii) construct and maintain fences to ensure they are stockproof; iii) move fallen timber and any other obstructions to maintain access; iv) where clearing is necessary, undertake all works in a manner that minimises disturbance to soil and hydrological characteristics; and v) remove old fences and close unwanted tracks within the Conservation Area and facilitate restoration of native vegetation by allowing natural regeneration.	6.1.1.3.12
CAs – Wambo Coal Terminal RWEP and RWEAs	Annexure D	**Monitoring Program** (a) The Owner must instruct a suitably qualified ecologist (Ecologist) to undertake a monitoring event in each year, beginning in 2015 (Monitoring Event).	7.2
CAs – Wambo Coal Terminal RWEP and RWEAs	Annexure D	(b) Each Monitoring Event must include: i) photo monitoring - a photo is required to be taken at each of the two monitoring photo points. Photos must be taken from the exact location and bearing to allow subsequent comparison and assessment. Photo point locations are provided in Table 1 of Annexure D to the Conservation Agreement (below). Baseline photographs are provided in Annexure A to the Conservation Agreement; ii) quadrant monitoring – quadrant data must be collected at each of the two floristic quadrat monitoring sites. Quadrant locations and baseline quadrat scores in October 2015 are shown in tables 1 and 2 of Annexure D. Results must be compared to baseline and benchmark quadrat. iii) a walk through assessment to record opportunistic sightings within the Conservation Area including: i. fire events or management ii. weeds (including compiling a list of exotic species and recording new weed infestations including location and extent) iii. pest animals (species and location must be recorded, including evidence of pest animals such as burrows, scats or disturbance) iv. visitor impact and vehicle access (including evidence of any recent usage, and the presence of any new access tracks) v. rubbish dumping vi. natural regeneration of previously disturbed areas; and vii. sightings of threatened species.	7.2
CAs – Wambo Coal Terminal RWEP and RWEAs	Annexure D	(c) After each Monitoring Event, the Ecologist must produce a monitoring report on the Conservation Area of each year, beginning in [2016] (Monitoring Report). The Monitoring Report must include: 1. a description of all completed management actions undertaken in the previous 12 month period; 2. copies of all receipts from third party contractors engaged by the Owner to undertake management actions listed in items 1 and 2 of Annexure C to the Conservation Agreement; 3. completed monitoring data sheets (including photographs) using the template provided in Table 4 of Annexure D to the Conservation	11.3

Approval	Condition	Requirement	Section
		Agreement; 4. a discussion of the changes recorded at monitoring points and quadrats; 5. a discussion of the condition of Conservation Values; 6. a discussion of effectiveness of any management actions implemented; and 7. recommendations and proposed management actions to be performed in following year. The Monitoring Report must be submitted to OEH within 14 days of it being received by the Owner.	

APPENDIX B CORRESPONDENCE WITH REGULATORY AUTHORITIES

NSW GOVERNMENT | Office of Environment & Heritage

DOC16/386436-1
DA 305-7-2003

Mr Steven Peart
Manager: Environment & Community
Wambo Coal Pty Limited
speart@peabodyenergy.com

Dear Mr Peart

RE: REVIEW OF WAMBO COAL PTY LIMITED 2016 BIODIVERSITY MANAGEMENT PLAN

I refer to your letter dated 22 July 2016 requesting review and comment on the Biodiversity Management Plan (BMP) for the Wambo Mine. The Office of Environment and Heritage (OEH) understands that this BMP has been prepared to comply with Schedule 4 Conditions 44 to 48 of the Wambo Coal Pty Limited Development Consent (DA 305-7-2003) that was reissued by Department of Planning and Environment in October 2014 (MOD 15).

The Office of Environment and Heritage (OEH) encourages the development of such plans to ensure that proponents have determined how they will meet their statutory obligations and designated environmental objectives. However, OEH does not approve or endorse these documents as our role is to set environmental objectives for environmental/conservation management, not to be directly involved in the development of strategies to achieve those objectives. In this instance, OEH provides some advice in relation to proposed outcomes of the Biodiversity Management Plan and also recommends that some details are updated. These comments are provided in **Attachment 1**.

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

Yours sincerely

16 AUG 2016

STEVE LEWER
A/Senior Team Leader Planning, Hunter Central Coast Region
Regional Operations

Enclosure: Attachment 1

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ATTACHMENT 1: OEH REVIEW OF WAMBO COAL PTY LIMITED's 2016 BIODIVERSITY MANAGEMENT PLAN

The Office of Environment and Heritage (OEH) has reviewed the 2016 'Biodiversity Management Plan' (BMP) for the Wambo mine site. OEH understands that this document replaces the 'Flora and Fauna Management Plan' that was originally required under Schedule 4 Consent Conditions 44 to 50 inclusive. Comments on the BMP are provided below:

BIODIVERSITY MANAGEMENT PLAN 2016

Section 1.2 and 1.3 Purpose and Scope

The Wambo BMP is one of several management plans that pertain to biodiversity on the Wambo Mine Site (e.g. Bushfire Management Plan, Wambo Mine Operation Plan and Rehabilitation Management Plan, WCPL's Water Management Plan). It is not clear how the BMP fits with those plans and whether there are any gaps or conflicts.

Section 3.6 Flora and Fauna Habitat

The colour ramp used in Figure 3 'Floristic Communities' (and Figure 5) included some very similar colours, e.g. shades of pink and purple for 'Bulloak Grassy Woodland', 'River Oak Riparian Woodland' and 'Spotted Gum – Narrow-leaved Ironbark - Grey Box Woodland' that are weakly discernible in the legend, but when placed in a different context on the map there is ambiguity in differentiating these vegetation communities. OEH recommends that the colour ramp of the vegetation maps in the BMP are changed, perhaps to include some non-solid polygon fill, such as stripes of differing spacing and orientation, or perhaps stippling, or both in order to make it easier for any reader of the report to be able to understand which vegetation community has been mapped where.

Section 3.6.5 Landscape Function Analysis

Why was Landscape Function Analysis (LFA) chosen? A sentence or two to state the objective of this approach would be useful (and cross-references to Sections 5.3 and 7.1.1). Also, a cross-reference in this section to Figure 7 (the map showing the location of LFA plots) would help in this section. There appears to be no discussion on the LFA results presented in Tables 6, 7 and 8 – what do the numbers mean? It is clear that they change in time and space, but what does that mean? The citation of 'Tongway and Hingley (2004)' in this section would also help link this text to the key reference for this approach which is given in the References section on page 75.

Section 3.6.1 Threatened Flora and Endangered Plant Populations

The BMP is missing a section on threatened flora species (including Endangered Populations) on the Wambo Mine Site. OEH recommends that this is added to the final document, for several species have been recorded in the Remnant Woodland Enhancement Areas (RWEAs), such as Tiger Orchid (*Cymbidium canaliculatum*), River Red Gum (*Eucalyptus camaldulensis* endangered population), Slaty Gum (*Eucalyptus glaucina*) and Small-flower Grevillea (*Grevillea parviflora* subsp. *parviflora*), all of which will require consideration in how those areas are managed, and thus how harm to those species or populations can be avoided. OEH therefore recommends that such a section is added to the BMP.

Section 3.6.6 Biometric Vegetation Monitoring

The section on Biometric Vegetation Monitoring is too brief to glean the value of the work done to date. For starters, a sentence or two in the introductory paragraph on why Biometric Vegetation Monitoring was chosen, along with a citation to background papers on this methodology would help set the scene for the reader on what is being measured and why it is being measured (this could include copy and pasting some text from Section 7.1.2 which does not appear to be cross-referenced with Section 3.6.6). Additionally the following information would help put the results presented in Tables 10 and 11 in context:

a. A table showing how many vegetation quadrats were established in each Plant Community Types (PCT) would help demonstrate sampling density and provide context to the range of values obtained for each site variable;
b. The inclusion of the benchmark values (and what is the intended PCT or suite of PCTs planned for the post-mine rehabilitation?) would also help show how the sampled vegetation compares with what are considered to be site variables of vegetation in 'good to moderate' condition;

c. Presenting the lowest and highest values measured in the quadrats, rather than presented in Tables 10 and 11 would help paint a clearer picture of what may be going on on-site which are not at all clear from the provision of averages alone;
d. Details of when were the quadrats were undertaken and under what conditions would also be helpful? Seasonal and soil moisture factors play a large role in the growth rate, amount of biomass and therefore cover of groundcover plants, and ability to identify plants on site (e.g. tussock grasses) during plant survey, and all of these influence several of the site variable scores measured by using Biometric; and
e. Provision of copies of the raw completed field sheets would present the clearest picture of what is occurring on site, including which species (rather than just tallies) have been recorded to paint a picture of the species that are doing well, and those that are not persisting and require more specialised management to assist their re-establishment. The raw field sheets could be provided as an appendix.

Section 3.6.7 Photo Point Monitoring in RWEAs
The information presented here (and in appendix E) is good and would be improved if the 'notes' part of the description given for each photo also identified the main species in the photo (or the Section 3.6.7 included a cross-reference to where that information may be available).

Section 4.2 Biodiversity Management Domains
Schedule 4, Condition 41 requires that the RWEAs will be secured by Conservation Agreements (CAs) under Section 69B of the *National Parks and Wildlife Act 1974*. No distinction is made in the consent for the duration of the CAs for those areas. OEH understands that the two draft Conservation Agreements for the Wambo biodiversity offset lands are nearing completion. Each of these Conservation Agreements will have their own management plans which will be placed on title of the lots covered. Therefore, it is important that the management actions in the BMP (particularly those outlined in Section 6) are consistent with the management plans for the Conservation Agreements as these will be part of the agreement listed on title in perpetuity.

Section 4.2.2 Open Cut Woodland Revegetation Areas
The BMP is not explicit in PCTs that are intended to be recreated on the post-mine landscape on the Wambo Mine Site. OEH notes that "Provision Species Lists for Woodland Corridors" (in Appendix G) comprise species that locally dominant components of woodland vegetation in the central Hunter Valley and include species that very rarely occur together, such as White Box (*Eucalyptus albens*) and Slaty Box (*E. dawsonii*). In addition, if 'Narrow-leaved Ironbark – Bull Oak - Grey Box open forest' (in Table 17) is the only or primary native vegetation intended to be recreated (Sugar Gum (*E. cladocalyx*) is not native to New South Wales) this seems at odds with the species lists in Appendix G. Therefore it would be helpful to know what PCTs are intended to be recreated on the post-mine landscape, and where they are planned to occur.

Section 5.1 Biometric Assessment
It is unclear in the BMP where the classification of site value scores and condition states (Table 15) and the completion criteria targets (Table 17) come from or on what they are based. Also, as described in response to Section 3.6.6 (above), local factors such as when surveys were undertaken (season) and local soil moisture conditions (drought verses wet period) can play a large role in the results of some site attribute scores, particularly in relation to the groundcover.

Section 7.0 Biodiversity Monitoring Program
OEH notes that the monitoring frequency and timing for birds in Table 24 is currently "Annually (Spring)" with additional surveys to target Swift Parrots and Regent Honeyeaters in "Alternate Years (Winter)". In relation to regent honeyeaters, the dramatic decline in numbers of this species across Australia means that detecting individuals these days is more about undertaking targeted searches rather than surveys in order to try and detect them. As such it is recommended that in addition to the annual spring and alternate year winter surveys it would be beneficial to include a commitment to "targeted searches for the species during any times of local influxes to the Hunter Valley and/or during the flowering of key eucalypt species in the region such as Spotted Gums (*Corymbia maculata*)". The Australian Government also has survey guidelines for threatened birds which may be helpful. These can be

downloaded at www.environment.gov.au/resource/survey-guidelines-australias-threatened-birds-guidelines-detecting-birds-listed-threatened

Section 7.3 Data Management Review

In relation to the review of monitoring data OEH recommends that this includes appropriate statistical analysis as this will help identify trends before they necessarily become obvious on the ground, and can allow for early implementation of adaptive management. For example, the Analysis of Similarity ('ANOSIM') has often been used to assess changes in plant species composition in space and time (e.g. Brown, 2006; Wevill and Florentine, 2014; and Wilkins *et al.*, 2003). OEH recommends consideration of this type of analysis in the monitoring project; if appropriate in relation to the type of data gathered, the questions being asked and underlying assumptions. Further, OEH recommends that the results of any such monitoring, analysis and underlying assumptions are made publically available to allow more efficient sharing of lessons learnt that may be applied to other projects.

It is not clear why monitoring results are intended to be kept for only 4 years. OEH instead recommends that they are retained on site, or provided in full on its website in line with consent conditions 11 and 12 in Schedule 6 of the consent. The planned discarding of monitoring results seems at odds with the intent of monitoring to track progress towards planned objectives, and also in being able to apply adaptive management to ensure that lessons are not needed to be relearnt, and thus potentially reducing the resources needed to achieve specific outcomes (as is the objective of Section 8.0 of the BMP).

Section 11.2 & 11.3 Annual Review and Conservation Area Monitoring Report

OEH supports the provision of monitoring data in the Annual Review report and the Conservation Area Monitoring Report. OEH recommends that the raw monitoring data, any statistical analysis and the assumptions behind them are included in these reports and are also available on the company's webpage where they are publically accessible.

Appendix G Species List for Rehabilitation

OEH notes that the Provisional Species Lists for Pasture" for the grassland areas (page 119) includes Kikuyu (*Pennisetum clandestinum*). OEH recommends against the inclusion of this species where they are likely to invade adjacent woodland restoration areas. The addition of some small native Nitrogen fixers like *Glycine*, *Desmodium*, *Chorizema* spp., etc. could be useful. In relation to native pastures, some native daisies (Asteraceae) like *Vittadinia* spp. are readily available too and would make the grasslands more diverse. Mr Bill Baxter from Rio Tinto may be able to provide some additional advice here based on his experience with grassland rehabilitation.

Definitions

Throughout the document there are examples where ambiguous descriptors are used. It would be beneficial if these were reworded to become prescriptive and measureable to improve future outcomes and accountability of the BMP. For example, Section 6.1.2 (page 43) states "Management measures that *may be implemented* within these Domains to *improve biodiversity values* are discussed below" and Section 6.1.2.6 states "Tubestock planting will be utilised *where it is considered* natural regeneration of native species is unlikely to occur *in a timely manner*". The BMP could be strengthened if statements such as these throughout the document were written in a more prescriptive manner to make it easier for these commitments to be assessed and accountable as the BMP is implemented.

Conclusions

The draft BMP provides some useful guidance to the management and monitoring of the Remnant Woodland Enhancement Areas and areas of post-mined landscape rehabilitation, however the rational for some techniques are not clear (particularly in the introductory sections of the document), and others could be enhanced for greater return on efforts. The current structure makes it difficult to see the big picture of the use of some techniques, e.g. Landscape Function Analysis, which could be better helped by more cross-referencing to link related section of the report together.

References:

Brown K. (2006) Control of Bulbil Watsonia, *Watsonia meriana* var. *meriana* invading a Banksia Woodland: effectiveness of 2,2-DPA and its impacts on native flora. *Ecological Management & Restoration* **7**, 69–71.

Wevill, T. and Florentine, S.K. (2014) An assessment of riparian restoration outcomes in two rural catchments in south-western Victoria: Focusing on tree and shrub species richness, structure and recruitment characteristics. *Ecological Management & Restoration* **15**(2): 133-139

Wilkins, S., Keith, D.A. and Adams, P. (2003) Measuring success: Evaluating the restoration of a Grassy Eucalypt Woodland on the Cumberland Plain, Sydney, Australia. *Restoration Ecology* **11**(4): 498-503

APPENDIX C
BASELINE DATA

Baseline LFA Results - Landscape Organisation Index

LFA Monitoring Plot	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Woodland Rehabilitation										
3R	0.04	0.03	0.07	0.45	0.36	1	1	1	1	0.72
4R	0.08	0.22	0.26	0.52	0.56	0.68	0.73	0.81	0.59	0.82
6R	0.77	0.37	0.17	0.84	0.17	1	0.89	0.91	0.86	0.90
8R	0.05	0.05	0.04	0.45	0.23	0.51	1	1	0.56	0.65
Average	**0.24**	**0.17**	**0.14**	**0.57**	**0.33**	**0.80**	**0.91**	**0.93**	**0.75**	**0.77**
Pasture Rehabilitation										
1R	0.69	0.74	0.94	0.9	0.9	1	1	0.86	1	0.83
2R	0.57	0.45	0.89	0.89	1	1	1	0.86	0.94	0.68
5R	0.29	0.52	0.68	0.72	0.94	1	1	0.7	0.91	0.70
7R				0.94	1	1	1	0.85	0.99	0.97
9R				0.56	0.83	0.72	1	0.55	1	0.68
10R	0.6	0.62	0.85	0.91	0.89	1	1	0.67		0.89
16R	0.69	0.74	0.94	0.9	0.9	1	1	0.86	1	0.96
33R					1	1	1	0.77	0.98	0.98
34R					0.9	1	1	0.94	1	0.84
Average	**0.54**	**0.58**	**0.76**	**0.85**	**0.94**	**0.97**	**1.00**	**0.79**	**0.98**	**0.84**
North Wambo Creek Diversion										
17R	-	-	-	1	1	1	0.86	0.92	0.97	0.93
19R	-	-	0.25	1	1	1	1	1	0.69	0.71
21R	-	-	0.18	1	0.81	1	0.86	1.07	0.54	0.66
23R	-	-		0.6	0.63	0.85	0.84	0.84	0.7	0.41
25R*	-	-	-	-	-	-	-	-	-	0.45
26R*	-	-	-	-	-	-	-	-	-	0.55
27R*	-	-	-	-	-	-	-	-	-	0.35
28R*	-	-	-	-	-	-	-	-	-	0.43
Average			**0.22**	**0.90**	**0.86**	**0.96**	**0.89**	**0.96**	**0.73**	**0.56**
Wambo Creek										
14R*	-	-	-	-	-	-	-	-	-	0.67

* New riparian rehabilitation monitoring site added in 2015

Baseline LFA Results – Stability Index

LFA Monitoring Plot	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Woodland Rehabilitation										
3R	40.4	41.9	61.5	53.7	52.91	48	64.2	73.6	100.4	54.80
4R	48.8	50.3	61.5	52.5	52.39	54.2	66.2	70	61.5	60.50
6R	24.7	47.2	59.3	58.3	57.39	72.2	55.4	67.7	67.6	55.30
8R	45.9	43.2	49.6	58.7	50.91	56.4	61.5	58.8	59.8	55.7
Average	**39.95**	**45.65**	**57.98**	**55.80**	**53.40**	**57.70**	**61.83**	**67.53**	**72.33**	**56.58**
Pasture Rehabilitation										
1R	52.7	65	66.1	65.68	66.44	65.6	53.9	70.3	71.7	58.1
2R	58	69.7	62.8	70.05	66.1	65.5	51.9	64.8	62.4	55.2
5R	57.3	57.4	52.6	64.84	61.95	62	66.4	59.1	61	57.40
7R				65.94	67.78	69.4	70	67.4	70.1	58.00
9R				50.2	57.91	55.8	50.9	65.4	61.3	59.80
10R	60.7	58.4	67	70.52	70.65	73.3	63.7	79.7		67.10
16R			44	78.47	67.22	72.2	71.1	78.6	68.9	61.80
33R					68.89	65	70.6	67.1	68.8	63.30
34R					64.13	68.3	73.2	68.9	42.5	59.60
Average	**57.18**	**62.63**	**58.50**	**66.53**	**65.67**	**66.34**	**63.52**	**69.03**	**63.34**	**60.03**
North Wambo Creek Diversion										
17R	-	-	-	79	70	71.3	56.1	74.5	64	60.1
19R	-	-	53	71	61	65.6	57	54.3	55.1	53.8
21R	-	-	56	75	62	65.4	58.6	65.8	53.4	56.5
23R	-	-	53	52	48	52.6	44.9	45.9	50	51.4
25R*	-	-	-	-	-	-	-	-	-	52.1
26R*	-	-	-	-	-	-	-	-	-	54.2
27R*	-	-	-	-	-	-	-	-	-	52.1
28R*	-	-	-	-	-	-	-	-	-	45.9
Average	**-**	**-**	**54**	**69.25**	**60.25**	**63.725**	**54.15**	**60.125**	**55.625**	**53.26**
Wambo Creek										
14R*	-	-	-	-	-	-	-	-	-	52.3

* New riparian rehabilitation monitoring site added in 2015

Baseline LFA Results - Infiltration

LFA Monitoring Plot	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Woodland Rehabilitation										
3R	25.8	20.7	29.4	28.23	24.74	28.2	28.5	26.6	63.3	37.6
4R	30.4	23.9	29.8	25.85	30.32	35.5	35.1	43.2	38.5	42.5
6R	16.3	30.9	31.7	43.38	56.66	44.5	27.3	46.2	49.3	48.3
8R	22.4	16	28.2	27.58	26.4	27.3	25.4	33.6	36.9	33.3
Average	**23.73**	**22.88**	**29.78**	**31.26**	**34.53**	**33.88**	**29.08**	**37.40**	**47.00**	**40.43**
Pasture Rehabilitation										
1R	29.7	34.8	36.5	36.74	34.22	39.8	37.1	40.4	39.7	39.2
2R	35	32.2	38.5	34.96	34.96	35.6	25.8	32.4	36	32.6
5R	36.8	31.6	25.8	30.04	31.93	33.6	30.6	27.9	29.3	34.10
7R	-	-	-	31.32	33.65	44.2	41.3	34.7	38.4	39.90
9R	-	-	-	22.16	24.69	23.7	20.7	29.9	30.1	33.00
10R	-	-	-	22.16	24.69	23.7	20.7	44.5		42.90
16R	-	-	29.3	38.86	30.77	44.5	38.6	38.7	41.7	45.90
33R	-	-	-	-	35.05	44.1	40.8	33.4	37.4	46.30
34R	-	-	-	-	35.52	40.5	40.7	41.7	39.3	33.90
Average	**33.83**	**32.87**	**32.53**	**30.89**	**31.72**	**36.63**	**32.92**	**35.96**	**36.49**	**38.64**
North Wambo Creek Diversion										
17R	-	-	-	37	36	41.2	27.7	38.4	38.4	37.6
19R	-	-	27	42	33	30.7	25.1	19.6	23.1	27.7
21R	-	-	33	47	23	33.2	30	28.4	24.2	33.70
23R	-	-	30	27	26	29	18.4	23.3	25.7	30.1
25R*	-	-	-	-	-	-	-	-	-	23.9
26R*	-	-	-	-	-	-	-	-	-	28.1
27R*	-	-	-	-	-	-	-	-	-	22.9
28R*	-	-	-	-	-	-	-	-	-	26.1
Average			**30.00**	**38.25**	**29.50**	**33.53**	**25.30**	**27.43**	**27.85**	**28.76**
Wambo Creek										
14R*	-	-	-	-	-	-	-	-	-	45.0

* New riparian rehabilitation monitoring site added in 2015

Baseline LFA Results –Nutrient Index

LFA Monitoring Plot	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Woodland Rehabilitation										
3R	12	15.2	24.4	20.66	22.51	25.7	25.8	20.1	55.5	29.2
4R	15.6	15.9	24.9	20.65	23.12	34.1	34.5	41.2	30.7	39.6
6R	12.1	24.9	27.6	37.76	47.28	42.7	26.6	40.5	44.3	37.8
8R	15.1	13.3	15.1	22.23	23.27	25	27	26.6	29.3	29.2
Average	**13.70**	**17.33**	**23.00**	**25.33**	**29.05**	**31.88**	**28.48**	**32.10**	**39.95**	**33.95**
Pasture Rehabilitation										
1R	20.1	33.6	33.7	31.65	29.26	36.7	36.2	32.1	36.4	30
2R	24.6	28.8	27.2	30.1	34.35	38.5	21.7	28.2	30.2	22.4
5R	26.5	31.3	20.5	26.72	27.77	34.5	31	22.9	20.5	23.60
7R	-	-	-	28.97	32.98	39.7	43.2	31.2	37.4	34.80
9R	-	-	-	15.71	21.52	20.1	15.9	26	25	26.00
10R	27	28.1	36.4	27.33	37.21	41.4	30	43.5		37.80
16R	-	-	14.2	40.43	25.35	42.7	39.5	35.1	36.4	39.60
33R	-	-	-	-	32.51	39.5	41.5	29.4	34.5	42.20
34R	-	-	-	-	34.14	36.2	43.6	37.4		30.30
Average	**24.55**	**30.45**	**26.40**	**28.70**	**30.57**	**36.59**	**33.62**	**31.76**	**31.49**	**31.86**
North Wambo Creek Diversion										
17R	-	-	-	39	30	40.1	28.2	34.6	30.2	28.3
19R	-	-	15	38	30	30.8	25.1	15.2	18.4	20
21R	-	-	17	44	21	30.5	29.7	26.1	19.5	24.60
23R	-	-	14	18	19	24.5	15.4	15.6	17.4	17.2
25R*	-	-	-	-	-	-	-	-	-	16.2
26R*	-	-	-	-	-	-	-	-	-	18.5
27R*	-	-	-	-	-	-	-	-	-	13.9
28R*	-	-	-	-	-	-	-	-	-	16
Average			**11.5**	**27.8**	**20**	**25.18**	**19.68**	**18.3**	**17.1**	**19.34**
Wambo Creek										
14R*	-	-	-	-	-	-	-	-	-	29.6

* New riparian rehabilitation monitoring site added in 2015

Baseline Floristic Results for RWEAs

Vegetation Community	RWEA	Plot Name	NPS	NOS (%)	NMS (%)	NGCG	NGCS	NGCO	EPC	OR	HBT	FL
PCT 42: River Red Gum / River Oak riparian woodland wetland in the Hunter Valley												
River Oak/Rough Barked Apple Forest	-	V1-A1	5	35	0	6	0	0	8		0	23
	-	V1-A2	13	8.5	34	70	2	4	50		0	49
	A	V1-B1	14	15.5	15.5	12	0	10	50		0	0
	A	V1-B2	17	14.5	12.5	46	2	2	52.5		0	2.5
	A	V1-B3	10	0.5	34	14	2	0	24		0	12
River Red Gum Woodland	-	V2-A1	18	8.5	0	18	2	4	54	1	0	7
	A	V2-B1	15	27	19	14	0	2	52		0	6
	A	V2-B2	18	14.5	15.5	64	2	2	54		0	0
Yellow Box / Blakely's Red Gum / Rough barked Apple Forest	A	V3-B1	19	14	0	16	0	38	0		0	35
Average Values			**14.3**	**15.3**	**14.5**	**28.9**	**1.1**	**6.9**	**38.3**	**1**	**0**	**14.9**
PCT 1658: Rough barked Apple–Narrow leaved Ironbark-Blakely's Red Gum-Bull Oak–Coast Banksia woodland on sands of the Warkworth area												
Coast Banksia/ Rough barked	A	V5-B1	23	11.5	10.5	28	2	18	9.5	1	0	4
	A	V5-B2	28	15.0	5.5	24	4	60	0		1	4.5

Vegetation Community	RWEA	Plot Name	NPS	NOS (%)	NMS (%)	NGCG	NGCS	NGCO	EPC	OR	HBT	FL
Apple /Blakely's RedGum Forest	A	V5-B3	31	3.5	17.5	10	4	32	0		2	34
	Rail Loop	V5-B4	25	17	10	16	4	14	32		1	13
Average Values			**27**	**11.8**	**10.8**	**19.5**	**3.5**	**31**	**10.4**	**1**	**1**	**13.9**
PCT 1603: Narrow leaved Ironbark – Bull Oak - Grey Box shrub- grass open forest of the central and lower Hunter												
Narrow-leaf Ironbark / Grey Box / Bulloak / Honeymyrtle Forest	C	V6-A1c	36	12.5	9	50	4	6	0	1	2	44
	-	V6-A3	26	16	13	30	0	4	0		0	10
	A	V6-B1	29	13.5	7	8	2	4	0		3	42
	C	V6-B1c	35	11	13	26	12	2	0		0	13
	A	V6-B2	27	13.5	12.5	12	12	2	0		0	60
	C	V6-B2c	28	7	4	38	4	0	0		0	28
	A	V6-B3	31	9.5	9	4	4	2	2		1	35
	Rail Loop	V6-B4	12	16	0	12	2	0	0		0	4
Grey Gum / Narrow-leaf / Ironbark / Bulloak / Honeymyrtle Forest	C	V11-B1	26	16	10.5	24	30	2	0		0	21
	C	V11-B2	41	22.5	14	56	4	18	0		1	6.5
Average Values			**29**	**13.8**	**9.2**	**26**	**7.4**	**4**	**0.2**	**1**	**0.7**	**26.35**

Vegetation Community	RWEA	Plot Name	NPS	NOS (%)	NMS (%)	NGCG	NGCS	NGCO	EPC	OR	HBT	FL
PCT1604: Narrow leaved Ironbark – Grey Box - Spotted Gum shrub - grass of the central and lower Hunter												
Spotted Gum / Narrow-leaf Ironbark/ Bulloak /Paperbark Forest	-	V9-A1	27	29	6	26	2	8	0	1	0	21
	B	V9-B1	42	23	8	24	16	8	0		0	45
	B	V9-B2	37	15.5	7.5	52	6	0	0		0	40
Average Values			**35**	**22.5**	**7.2**	**34**	**8**	**5.3**	**0**	**1**	**0**	**35.3**
PCT1176: Slaty Box – Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion												
Slaty Gum / Narrow-leaf Ironbark / Bulloak / Paperbark Forest	D	V10-A1	27	12	13.5	6	0	0	0	1	0	17
	-	V10-A2	29	9.5	10.5	30	4	6	0		0	9
	B	V10-B1	36	14.5	12	22	6	12	0		0	38
	D	V10-B3	33	12.5	10.5	36	2	6	0		0	40
Average Values			**31**	**12.1**	**11.6**	**23.5**	**3**	**6**	**0**	**1**	**0**	**26**
PCT 1584: White Mahogany – Spotted Gum - Grey Myrtle semi-mesic shrubby open forest of the central and lower Hunter Valley												
White Mahogany / Rough-barked Apple Forest	B	V13-B1	**50**	**10.5**	**19**	**70**	**16**	**8**	**0**	**1**	**0**	**25**
PCT 1603: Narrow leaved Ironbark – Bull Oak - Grey Box shrub -grass open forest of the central and lower Hunter *												

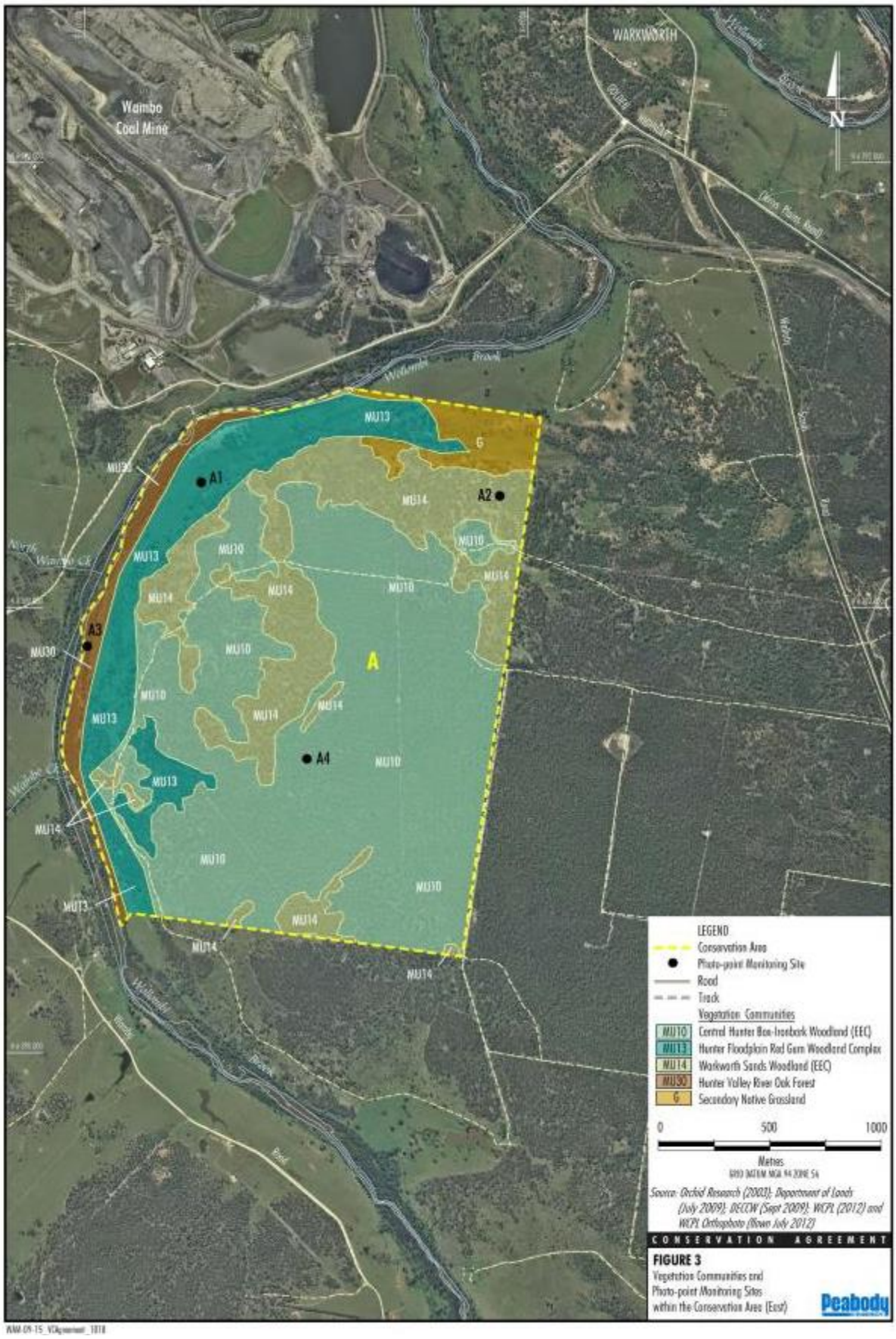
Vegetation Community	RWEA	Plot Name	NPS	NOS (%)	NMS (%)	NGCG	NGCS	NGCO	EPC	OR	HBT	FL
Brush Wilga/Native Olive Shrubland	-	V14-A1	41	1	50	24	0	8	10	1	0	7
	B	V14-B1	30	6.5	10.1	46	4	8	0		0	25
	B	V14-B2	47	9	17	52	16	22	2		0	6
Average Values			**39**	**5.5**	**25.7**	**40.7**	**6.7**	**12.6**	**4**	**1**	**0**	**12.6**

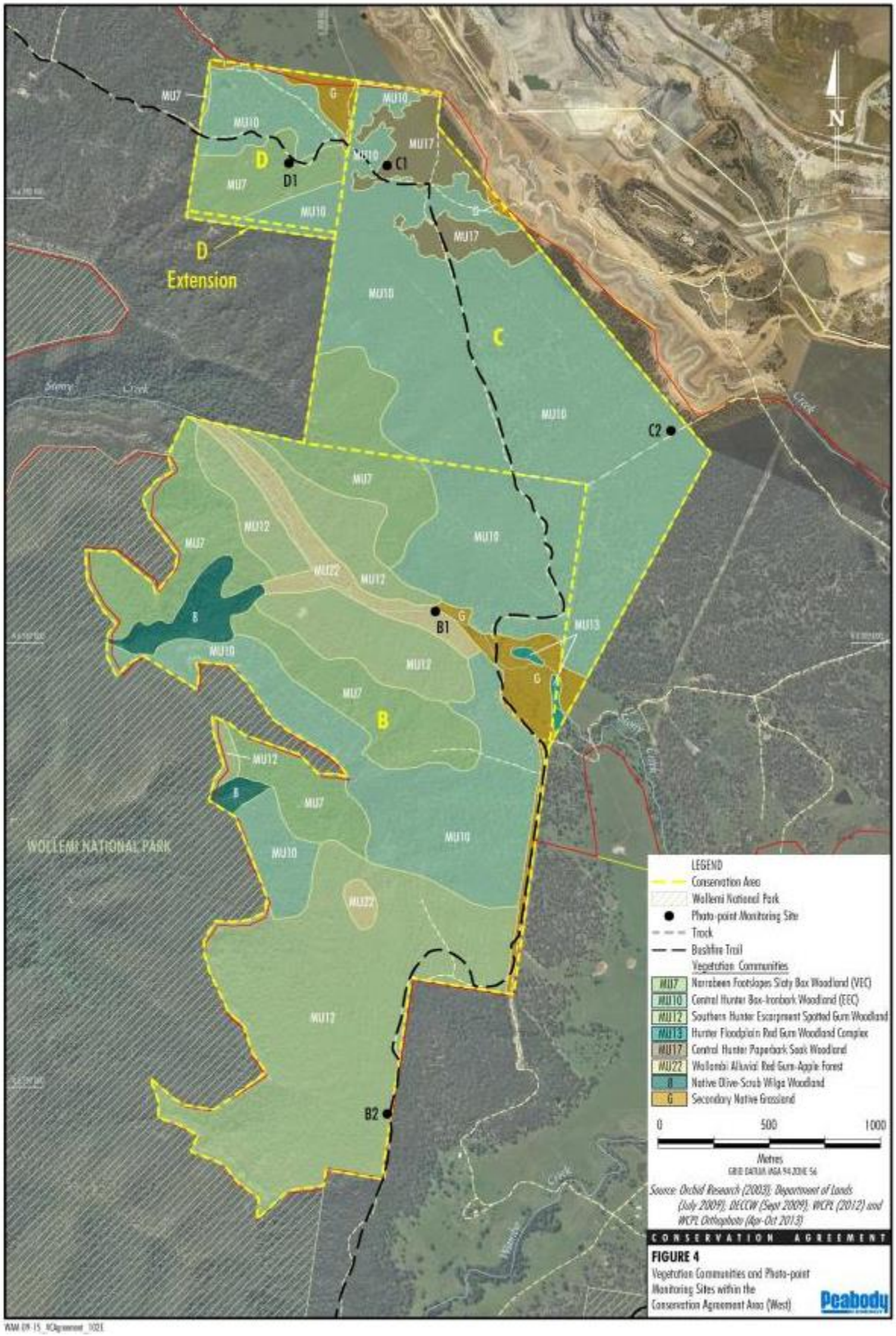
Baseline Floristic Results for Woodland Rehabilitation Areas

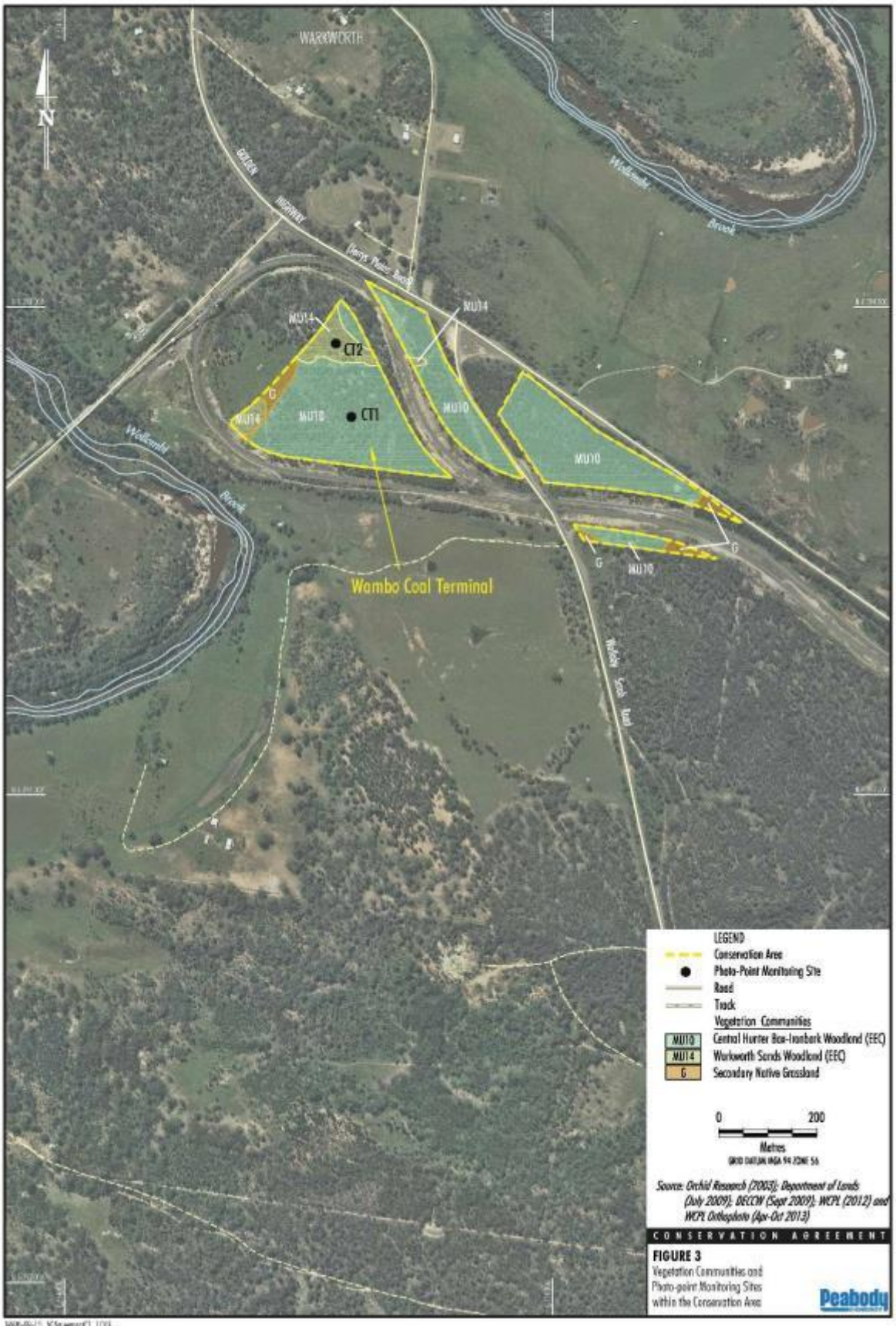
Plot Name	NPS[1]	NOS (%)[2]	NMS (%)[3]	NGCG	NGCS	NGCO	EPC[4]	OR	HBT	FL
3R	3	24.5	2	0	0	4	0	Planted	0	0
4R	4	4	14	0	0	0	0		0	0
6R	16	37.5	6.5	12	0	0	18		0	25.5
8R	5	18	6	4	0	2	4		0	0
Average Values	**7**	**20.25**	**7.13**	**4**	**0**	**1.5**	**5.5**	**0**	**0**	**6.38[5]**

1. Native to NSW
2. Including *E.cladocalyx*
3. Including *A.saligna*
4. Exotic to Australia
5. Logs recorded in one site only

APPENDIX D
PHOTO POINT MONITORING SITES WITHIN THE RWEAS (OCT 2014)


WARKWORTH
Wambo Coal Mine
N
A1
A2
A3
A4
A
G
MU10
MU13
MU14
MU30
LEGEND
Conservation Area
Photo-point Monitoring Site
Road
Track
Vegetation Communities
MU10 Central Hunter Box-Ironbark Woodland (EEC)
MU13 Hunter Floodplain Red Gum Woodland Complex
MU14 Warkworth Sands Woodland (EEC)
MU30 Hunter Valley River Oak Forest
G Secondary Native Grassland
0
500
1000
Metres
Source: Orchid Research (2003); Department of Lands (July 2009); DECCW (Sept 2009); WCPL (2012) and WCPL Orthophoto (flown July 2012)
CONSERVATION AGREEMENT
FIGURE 3
Vegetation Communities and Photo-point Monitoring Sites within the Conservation Area (East)
Peabody


N
D
Extension
C
B
MU7
MU10
MU12
MU17
MU22
MU13
B
G
C1
C2
D1
B1
B2
WOLLEMI NATIONAL PARK
LEGEND
Conservation Area
Wollemi National Park
Photo-point Monitoring Site
Track
Bushfire Trail
Vegetation Communities
MU7 Narrabeen Footslopes Sooty Box Woodland (VEC)
MU10 Central Hunter Box-Ironbark Woodland (EEC)
MU12 Southern Hunter Escarpment Spotted Gum Woodland
MU13 Hunter Floodplain Red Gum Woodland Complex
MU17 Central Hunter Paperbark Swamp Woodland
MU22 Wollombi Alluvial Red Gum-Apple Forest
B Native Olive-Scrub Wilga Woodland
G Secondary Native Grassland
0
500
1000
Metres
GRID DATUM: MGA 94 ZONE 56
Source: Orchid Research (2003); Department of Lands (July 2009); DECCW (Sept 2009); WCPL (2012) and WCPL Orthophoto (Apr-Oct 2013)
CONSERVATION AGREEMENT
FIGURE 4
Vegetation Communities and Photo-point Monitoring Sites within the Conservation Agreement Area (West)
Peabody


WARKWORTH
N
Wollombi Brook
MU14
CT2
CT1
MU10
G
Wambo Coal Terminal
LEGEND
Conservation Area
Photo-Point Monitoring Site
Road
Track
Vegetation Communities
MU10 Central Hunter Box-Ironbark Woodland (EEC)
MU14 Warkworth Sands Woodland (EEC)
G Secondary Native Grassland
0
200
Metres
Source: Orchid Research (2003); Department of Lands (July 2009); DECCW (Sept 2009); WCPL (2012) and WCPL Orthophoto (Apr-Oct 2013)
CONSERVATION AGREEMENT
FIGURE 3
Vegetation Communities and Photo-point Monitoring Sites within the Conservation Area
Peabody

APPENDIX E
PHOTO MONITORING POINT BASELINE PHOTOS (OCT 2014)

Site A1

Location

Easting	Northing
312525	6392578

MGA 94 Zone 56

Date and Time:
15/10/13 – 1.15 pm.

Weather Conditions:
Fine and warm, approximately 25°C.

Direction of Photo:
SE.

Notes:
Dominant canopy species include *Acacia sp.* and groundcover includes native and exotic herbaceous and grass species.

Site A2

Location

Easting	Northing
313850	6392523

MGA 94 Zone 56

Date and Time:
15/10/13 – 1.00 pm.

Weather Conditions:
Fine and warm, approximately 25°C.

Direction of Photo:
SSE.

Notes:
Prickly Pear present. Dominant canopy species include Rough-barked Apple (*Angophora floribunda*) and Coast Banksia (*Banksia integrifolia*). Bracken Fern (*Pteridium esculentum*) is the dominant groundcover.

Site A3	
Location	
Easting	**Northing**
312012	6391818

MGA 94 Zone 56

Date and Time:
15/10/13 – 1.22 pm.

Weather Conditions:
Fine and warm, approximately 25°C.

Direction of Photo:
NE.

Notes:
Unidentified soft weed present. The dominant canopy species is River Oak (*Casuarina cunninghamiana*) and dominant groundcover is Panic Veldtgrass (*Ehrharta erecta*).

Site A4	
Location	
Easting	**Northing**
313004	6391327

MGA 94 Zone 56

Date and Time:
15/10/13 – 1.40 pm.

Weather Conditions:
Fine and warm, approximately 25°C.

Direction of Photo:
NW.

Notes:
Dominant canopy species include juvenile Narrow-leaf Ironbark (*Eucalyptus crebra*) and juvenile Grey Box (*E. moluccana*).

Site B1	
Location	
Easting	**Northing**
308525	6392151

MGA 94 Zone 56

Date and Time:

15/10/13 – 11.00 am.

Weather Conditions:

Fine and warm, approximately 25°C.

Direction of Photo:

SW.

Notes:

Some erosion along stream bank. Dominant vegetation comprises juvenile Rough-barked Apple (*Angophora floribunda*) and groundcovers include *Lomandra sp*. and native grasses.

Site B2	
Location	
Easting	**Northing**
308274	6389887

MGA 94 Zone 56

Date and Time:

15/10/13 – 10.45 am.

Weather Conditions:

Fine and warm, approximately 25°C.

Direction of Photo:

W.

Notes:

The dominant canopy species is Spotted gum (*Corymbia maculata*).

Site C1	
Location	
Easting	**Northing**
308272	6394148.7

MGA 94 Zone 56

Date and Time:
15/10/13 – 11.45 am.

Weather Conditions:
Fine and warm, approximately 25°C.

Direction of Photo:
NE.

Notes:
A little water erosion present. Prickly Pear present. Dominant canopy species include juvenile Narrow-leaf Ironbark (*E. crebra*) and juvenile Grey Box (*E. moluccana*).

Site C2	
Location	
Easting	**Northing**
308254	6394144

MGA 94 Zone 56

Date and Time:
15/10/13 – 12.07 pm

Weather Conditions:
Fine and warm, approximately 25°C.

Direction of Photo:
E.

Notes:
Some erosion present. Deep hole (approx. 1 m deep and 20 cm diameter) noted. Fire evidence on logs. Dominant canopy species include juvenile Narrow-leaf Ironbark (*E. crebra*)

Site D1	
Location	
Easting	**Northing**
307836	6394168

MGA 94 Zone 56

Date and Time:
15/10/13 – 11.30 am.

Weather Conditions:
Fine and warm, approximately 25°C.

Direction of Photo:
SW.

Notes:
Erosion around walking track. Dominant canopy species include Narrow-leaf Ironbark (*E. crebra*) and Bulloak (*Allocasuarina luehmannii*).

Site CT1	
Location	
Easting	**Northing**
314587.5	6393774.6

MGA 94 Zone 56

Date and Time:
16/10/13 – 9.15 am.

Weather Conditions:
Fine and warm, approximately 25°C.

Direction of Photo:
NE towards the picket.

Notes:
Prickly Pear noted. The dominant canopy species is Bulloak (*A. luehmannii*).

Site CT2	
Location	
Easting	**Northing**
314556	6393925

MGA 94 Zone 56

Date and Time:

29/08/14 – 1.30 pm.

Weather Conditions:

Mild, sunny with overcast periods, approximately 16^{o}C.

Direction of Photo:

W.

Notes:

Evidence of pests (most likely rabbits). Creeping Pear and Galenia noted. Narrow-leaf Ironbark (*E. crebra*) comprise the dominant canopy.

APPENDIX F
THREE YEAR MANAGEMENT STRATEGY (2016-2018)

<table>
<tr><th>Management Strategy</th><th>Aim</th><th>Year 1 (2016)</th><th>Year 2 (2017)</th><th>Year 3 (2018)</th></tr>
<tr><td rowspan="2">Weed Control</td><td rowspan="2">Exotic plant cover within the Conservation Area must not be permitted to exceed:<table><tr><th>Monitoring Site/s</th><th colspan="2">Foliage Cover (%)</th></tr><tr><th></th><th>Year 1</th><th>Year 2-3</th></tr><tr><td>A1</td><td>70</td><td>60</td></tr><tr><td>A2</td><td>20</td><td>15</td></tr><tr><td>A3</td><td>30</td><td>20</td></tr><tr><td>CT2</td><td>15</td><td>15</td></tr><tr><td>A4</td><td>10</td><td>5</td></tr><tr><td>B1, B2, C1, D1, CT1</td><td>5</td><td>5</td></tr></table></td><td>Primary weed control, consisting of bush regeneration by qualified bush regeneration contractor, applying a range of techniques including:
Removal of weeds ensuring that all plant parts which can reproduce are removed and that soils do not become prone to erosion.
Use of carefully selected herbicide according to label directions and/or current off label permit, ensuring minimal off target damage.
Use of appropriate control measures as recommended in the Department of Primary Industries Noxious and Environmental Weed Control Handbook 5th Edition 2011 or equivalent replacements for control of weeds, ensuring minimal off target damage.
Use of forestry mulching or slashing machinery only with prior written permission from OEH.
Ensure control programs are commenced when timing and extent of weed removal will minimise adverse effects on wildlife (weeds may provide protection or habitat for native fauna). Dense thickets of lantana should be removed in gradually mosaic patterns to minimise disturbance to the habitat of native animals.
Contact OEH if any uncertainty exists regarding weed control methods.
Other weed control methods may be undertaken with prior written permission of OEH.</td><td>Follow up weed control, consisting of bush regeneration by qualified bush regeneration contractor, applying a range of techniques as described for Year 1.

Targets for exotic weed cover will be reviewed annually with the aim of them being reduced, based on the performance of weed management documented within the annual report for the monitoring program.</td><td>As per Year 2.</td></tr>
<tr><td colspan="3">Management Effort Required:

RWEAs A-D: between approximately 300 and 500 hours up to a maximum of $30,000/year (depending on contract rate and chemical requirement).

RWEA Coal terminal: between approximately 100 and 167 hours up to a maximum of $10,000/year (depending on contract rate and chemical requirement).</td></tr>
<tr><td>Pest Control</td><td>Liaise with LLS and OEH annually and participate in coordinated pest animal control activities as required.</td><td>Pest animal control activities to be determined based on density and species of pest animals. Methods for monitoring pest animal activity may include:</td><td>As per Year 1</td><td>As per Year 1</td></tr>
</table>

Management Strategy	Aim	Year 1 (2016)	Year 2 (2017)	Year 3 (2018)
		• observations and/or hearing calls, • the use of standard remote infra-red camera traps, • the use of non-poisoned "bait stations", • scat counts, and • other quantitative techniques which can be designed in discussion with OEH or Local Land Services (LLS). Methods for pest animal control can include; shooting, trapping and use of poisonous baits consistent with advice from OEH and LLS. Use control methods identified as 'humane' as defined in the *NSW Codes of Practice and Standard Operating Procedures for Humane Pest Vertebrate Control (Control Capture and Destruction of Feral Animals in Australia)* as developed by the NSW Department of Primary Industries.		
Fire hazard reduction burn[1]	Operate with NSW Rural Fire Service or fire management contractor to implement hazard reduction burn. Liaise with RFS and NPWS regarding appropriate timing.	Implement 1 hazard reduction burn during low risk fire season. Must take into account the recommended fire intervals given in the *Bush Fire Environmental Assessment Code for New South Wales* (Rural Fire Service February 2006) and the guidelines contained in the *Threatened Species Hazard Reduction Lists for the Bush Fire Environmental Assessment Code* or equivalent replacements.		
Vehicle Access to RWEAs	Maintain vehicle access to RWEAs for visitor management, fire management, weed and fencing management.	Repair existing tracks/trails and fire breaks.	Maintain existing tracks/trails and fire breaks as required.	Maintain existing tracks/trails and fire breaks as required.
Fencing	Erect/repair and maintain stock proof fencing on boundaries of RWEAs.	RWEAs A-D: Erect 2450 metres stock proof fence on boundary of RWEAs and repair 2.1 km of existing fence on other boundaries of the RWEAs as required. RWEA Coal terminal: Erect 340 metres stock proof fence on boundary of RWEA and repair 3.82 km of existing fence on other boundaries of the RWEA as required. The fencing must have plain wire on the top and bottom strands to minimise harm to fauna.	Maintain fences as required.	Maintain fences as required.
Annual Reports for Monitoring Program	Annual reports to be prepared in accordance with requirements detailed in **Section 11.3.**	Prepare and submit Annual Report for Monitoring Program.	Prepare and submit Annual Report for Monitoring Program.	Prepare and submit Annual Report for Monitoring Program.

1. WCPL's Conservation Agreements require a fire hazard reduction burn to occur within the RWEAs between Year 1-10. It is assumed that one fire hazard reduction burn will take place across the RWEAs during the 3 year management strategy period, however the timing of these burns will be determined in consultation with RFS and NPWS. The cost of the burn has been included in the total cost of this 3 year strategy.

APPENDIX G
SPECIES LISTS FOR REHABILITATION (FROM WCPL MOP, 2015-2020)

Provisional Species Lists for Woodland Corridors	
Scientific Name	**Common Name**
Trees*	
Allocasuarina luehmanii	Bulloak
Allocasuarina verticillata	Drooping Sheoak
Angophora floribunda^	Rough-barked Apple
Brachychiton populneum	Kurrajong
Casuarina glauca	Swamp Oak
Corymbia maculata	Spotted Gum
Eualyptus albens	White Box
Eualyptus crebra	Narrow-leaved Ironbark
Eucalyptus dawsonii	Slaty Gum
Eucalyptus fibrosa	Red Ironbark
Eucalyptus moluccana	Grey Box
Eucalyptus punctata	Grey Gum
Eucalyptus teretitornis^	Forest Red Gum
Melaleuca decora	A Honeymyrtle
Notelaea microcarpa	Native Olive
Geijera salicifolia	Brush Wilga
Shrubs*	
Acacia filicifolia^	Fern-leaf Wattle
Acacia implexa^	Hickory Wattle
Acacia amblygona	Fan Wattle
Acacia falcate	Sickle Wattle
Acacia decora	Western Silver Wattle
Acacia decurrens	Green Wattle
Acacia parvifolia^	-
Grevillea montana	A Grevillea
Hibbertia linearis	-
Cassinia quinquefaria	A Cough Bush
Grasses and Herbs*	
Dianella revoluta	Blue Flax Lily
Lomandra multiflora	Many-flowered Matrush
Chloris venticosa	Tall Windmill Grass
Laxmannia gracilis	Wire Lily
Gahnia aspera	Rough Saw-sedge
Aristida vagans	Threeawn Speargrass
Austrodanthonia sp.	A Wallaby Grass
Austrostipa scabra ssp. *falcata*	Speargrass
Cymbopogon refractus	Barbwire Grass

Note: ^ Species identified for the Montrose Tree Screening project. * *Sowing rates for tree and shrub species, pasture species will be in consultation with WCPL rehabilitation specialist.*

Provisional Species Lists for Pasture		
Scientific Name	**Common Name**	
Native Species List*		
Austrodanthonia sp.	Bunderra Wallaby Grass	
Austrodanthonia caespitosa	Ringed Wallaby Grass	
Austrodanthonia richardsonii cv. Hume	Hume Wallaby Grass	
Austrodanthonia richardsonii cv. Taranna	Taranna Wallaby Grass	
Austrodanthonia setacea	Smallflower Wallaby Grass	
Austrostipa aristiglumis or *Austrostipa bigeniculata*	Plains Grass	
Austrostipa scabra	Speargrass	
Austrostipa verticillata	Slender Bamboo Grass	
Dichelachne micrantha	Shorthair Plumegrass	
Elymus scaber	Common Wheatgrass	
Lachnagrostis filiformis	Blown Grass	
Aristida ramosa	Wiregrass	
Bothriochloa macra/decipiens	Redgrass/Pitted Bluegrass	
Chloris truncata	Windmill Grass	
Chloris ventricosa	Tall Windmill Grass	
Cymbopogon refractus	Barbed Wire Grass	
Dichanthium sericeum	Queensland Bluegrass	
Digitaria brownii	Cotton Panic Grass	
Digitaria divaricatissima	Umbrella Grass	
Eriochloa pseudoacrotricha	Early Spring Grass	
Panicum decompositum	Native Millet	
Panicum effusum	Hairy Panic	
Cover Crop and Pasture Species List		
	Rate (kg/ha) Autumn Sowing	Rate (kg/ha) Spring Sowing
Couch (Hulled/Unhulled)	6 - 10	10
Wimmera Rye Grass	8	
Green Panic		10
Perennial Rye Grass	6	
Sub Clover	5	5
Seaton Park Clover	3	
Sephi Medic	5	
Japanese Millet		10 -15
Kikuyu	15	
Phalaris	3	3
Lucerne	6	6
Oats	10 - 15	

Notes:. *Shaded Cells: A light cover crop at 2-5kg/ha for assisting initial soil stabilisation when direct seeding with woodland corridor species.* *****Sowing rates for native pasture species will be subject to availability and in consultation with WCPL rehabilitation specialist.

APPENDIX H
WCPL SURFACE DISTURBANCE PERMIT

WA-SAH-PER-305.23 SURFACE DISTURBANCE PERMIT

The Surface Disturbance Permit is to be used when assessing and approving mine related activities requiring ground disturbance within exploration and mining leases

SDP Number:	

Activity:					
Responsible Person:			**Statutory Area Manager:**		
Project Start:			**Project Finish:**		
Disturbance Area (ha):		**Easting:**		**Northing:**	

ALL PERMITS REQUIRE A FIGURE SHOWING RELEVANT: ABORIGINAL ARCHAEOLOGY, THREATENED ECOLOGICAL COMMUNITIES, MONITORING LOCATIONS, DEVELOPMENT CONSENT, MOP, MINING/EXPLORATION LEASE, LAND OWNERSHIP AND EPL BOUNDARIES

Approvals and Constraints	**Y**	**N**	**N/A**	**Boundaries and Conditions**	**Y**	**N**	**N/A**
Regulatory approvals/notifications required?	☐	☐	☐	Is the proposed activity ***inconsistent*** with any of the following boundaries or conditions:			
Landholder notification/access agreement required?	☐	☐	☐	Wambo's land ownership	☐	☐	☐
Flora/fauna or archaeological constraints?	☐	☐	☐	AHIP	☐	☐	☐
Erosion and Sediment Control Implementation Plan (ESCIP) required?	☐	☐	☐	EPL 529	☐	☐	☐
Will any infrastructure be impacted? (e.g. access tracks, pipelines, monitoring)	☐	☐	☐	MOP	☐	☐	☐
Dust, noise, or lighting impacts?	☐	☐	☐	Mining and Exploration Leases	☐	☐	☐
Does the SDP boundary require fencing?	☐	☐	☐	Development Consents	☐	☐	☐
Topsoil resource identification and an appropriate stockpile location required?	☐	☐	☐	Environmental Management Plans	☐	☐	☐
Activity within 40m of a riparian zone?	☐	☐	☐	Relevant regulation and planning policies	☐	☐	☐

IF YES WAS ANSWERED TO ANY OF THE ABOVE; FURTHER APPROVALS, CONTROLS OR DUE DILIGENCE ASSESSMENTS MAY BE REQUIRED. ATTACH COPIES OF ALL ADDITIONAL WORKS

Comments and Conditions

SDP Approval			
Role	**Name**	**Signature**	**Date**
Responsible Person			
Environment and Community Manager			

PRIOR TO SDP COMPLETION SIGN OFF THE DISTURBANCE AREA IS TO BE REHABILITATED WITH TOPSOIL REPLACED AND SEEDED. ALL UNECESSARY INFRASTRUCTURE, EQUIPMENT AND MATERIALS ARE TO BE REMOVED WITH THE SITE LEFT IN A CLEAN AND TIDY MANNER.

SDP Completion Sign Off			
Role	**Name**	**Signature**	**Date**
Responsible Person			
Environment and Community Manager			

APPENDIX I
BIOMETRIC MONITORING DATA SHEET

Monitoring Data Sheet			
Monitoring Point Number		**Date**	
Vegetation Community			
1. Site Photo(s)Taken			
2. Floristic BioMetric attributes			
Native cover			
Overstorey:			
Midstorey:			
Groundcover(grass):			
Groundcover (shrub):			
Groundcover (other):			
Native species richness:			
Proportion of canopy species regenerating			
Exotic cover			
3. Opportunistic observations	**GPS coordinates**	**Photo number**	**Observations**
Natural regeneration of disturbed areas			
Threatened species sightings			
Fire event/fuel			
Weeds			
Pest animals			
Visitor impact/vehicles			
Rubbish dumping			

APPENDIX J
VEGETATION CLEARANCE PROTOCOL

WAMBO COAL
VEGETATION CLEARANCE PROTCOL

Document No. WA-ENV-PRO-506.1
July 2016

Document Control

Document No.	WA-ENV-PRO-506.
Title	Vegetation Clearance Protocol
General Description	Vegetation Clearance Protocol at WCPL
Document Owner	Environment & Community Manager

Revisions

Rev No	Date	Description	By	Checked	Signature
1	June 2016	Original as part of Biodiversity Management Plan	Harry Egan	Steve Peart	

1.0 Purpose

The purpose of this Vegetation Clearance Protocol (VCP) is to outline the approved procedure for the disturbance and removal of vegetation on Wambo Coal Pty Ltd (WCPL) owned land.

Implementation of this protocol will minimise impacts on both non-threatened and threatened flora and fauna as listed under the Threatened Species Conservation Act 1995 (TSC Act) or the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

2.0 Scope

This VCP relates to all clearing activities undertaken at WCPL. The VCP forms part of WCPL's Biodiversity Management Plan and has been developed in accordance with DA 305-7-2003.

3.0 Procedure

The VCP consists of the following steps:

- Delineation of Disturbance Area
- Pre-Clearance Surveys
- Clearing Process and Fauna Management Strategies
- Habitat Feature Salvage
- Weed Control

3.1 Delineation of Disturbance Area

The proposed disturbance area will be identified by the project manager in consultation with the Environmental Department as part of the Surface Disturbance Permit process. The extent of disturbance will be selected to minimise or prevent impact to adjacent flora and archaeological sites.

The extent of disturbance will be demarcated by GPS and made visible using temporary fencing, marking tape or GPS guided dozer dependant on the particular project.

3.2 Pre Clearance Surveys

Pre-clearance surveys undertaken by the Environmental Advisor or ecological consultant involve the inspection of flora communities located within proposed disturbance areas. The survey aims to identify habitat features and threatened or endangered fauna and flora as listed under the TSC or EPBC Acts.

Habitat features generally consist of hollow bearing trees or other features (fallen logs and rock features) which may provide habitat to birds, mammals and reptiles.

In the event that any threatened flora or fauna species are observed during the habitat assessment the *WA-ENV-PRO-506.2 Threatened Species Management Protocol* is initiated.

3.3 Clearing Process and Fauna Management Strategies

A two stage vegetation clearing process has been adopted at WCPL to mitigate harm to fauna. The steps have been developed to mitigate harm to fauna occupying habitat features and consist of the following steps:

- Potential habitat features are identified during a pre clearance survey and are marked with either an 'H' or marking tape in consultation with the project manager and operator;
- Surrounding trees are felled and the habitat tree is disturbed (nudged) with equipment to encourage relocation;
- The habitat tree is left for 24 hours overnight to promote self-relocation of fauna and then soft felled the following day; and
- The habitat tree is either mulched or stored for use on rehabilitation sites.

The location of habitat features and above procedure is to be communicated to operators by the project manager prior to the commencement of clearing activities.

Long term fauna management strategies such as the placement of nesting or roosting boxes will be implemented as detailed in the Biodiversity Management Plan.

3.4 Habitat Feature Salvage

Habitat features from disturbed areas such as rocks or hollow bearing trees and logs may be stored in designated areas for relocation onto rehabilitation areas where possible. These features will provide habitat for ground dwelling native fauna.

4.0 Seed Collection

Seed collection will be on-going over the life of the mine the timing of which will be determined by WCPL's Environmental Department.

Seed collection will be sourced from onsite ecological communities identified across WCPL mine and Remnant Woodland Enhancement Areas. Where seed is required and not available from onsite sources in adequate volumes supplies may be supplemented from external providers.

5.0 Progressive Clearing

Land disturbance and rehabilitation will occur progressively as detailed in the 2003 EIS and the WCPL Open Cut Mining Operations Plan. The amount of disturbed land at any one time will primarily be associated with the advancing open pit and active mine waste rock emplacement areas.

6.0 Control of Weeds

Surveys of weed coverage within rehabilitation and Remnant Woodland Enhancement Areas are undertaken as part of the annual Biodiversity Monitoring Program.

Where weed coverage exceeds the approved completion criteria management measures will be implemented to reduce infestation levels. The type and timing of the adopted control measures will be appropriate for the weed species identified.

7.0 Responsibilities

Responsibilities under the Vegetation Clearance Protocol are details below in **Table 1**.

Table 1: Vegetation Clearance Protocol Responsibilities

No	Task	Responsibility
1	Delineation of Disturbance Area	Project Manager
2	Pre Clearance Survey	Environmental Advisor
3	Seed Collection	Environmental Advisor
4	Clearing Process	Environmental Advisor and Project Manager
5	Habitat Feature Salvage	Environmental Advisor and Project Manager

APPENDIX K
THREATENED SPECIES MANAGEMENT PROTOCOL

WAMBO COAL
THREATENED SPECIES MANAGEMENT PROTCOL

Document No. WA-ENV-PRO-506.2
July 2016

Document Control

Document No.	WA-ENV-PRO-506.2
Title	Threatened Species Management Protocol
General Description	Threatened Species Management at WCPL
Document Owner	Environment & Community Manager

Revisions

Rev No	Date	Description	By	Checked	Signature
1	July 2016	Original as part of Biodiversity Management Plan	Harry Egan	Steve Peart	

1.0 Purpose

The purpose of this Threatened Species Management Protocol (TSMP) is to outline the approved procedure for the management of threatened or endangered fauna and flora species within Wambo Coal Pty Ltd (WCPL) owned land.

Implementation of this protocol will minimise impacts on both non-threatened and threatened flora and fauna as listed under the Threatened Species Conservation Act 1995 (TSC Act) or the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

2.0 Scope

This TSMP is triggered by the discovery of threatened or endangered flora and fauna as part of pre-clearance inspection completed as part of the WCPL *WA-ENV-PRO-506.1 Vegetation Clearance Protocol* (VCP). The TSMP dictates the required management measures to be undertaken for the management of threatened or endangered communities. The TSMP forms part of WCPL's Biodiversity Management Plan and has been developed in accordance with DA 305-7-2003.

3.0 Procedure

The TSMP consists of the following steps:

- Observation/Surveys for Threatened Species
- Threatened species management strategies
    - Avoiding Remnant Woodland Enhancement Areas
    - Threat Abatement
    - Capture and Release
- Consultation and Reporting

3.1 Observation/Surveys for Threatened Species

Pre-clearance surveys of proposed disturbance areas will be undertaken as part of the VCP by a suitably qualified ecologist or the WCPL Environmental Advisor. Surveys of rehabilitation and offset areas are also undertaken annually as part of the WCPL annual rehabilitation monitoring program.

3.2 Threatened Species Management Strategies

Management strategies to mitigate or prevent impacts to identified threatened species will be determined on a case by case basis. Some examples of possible management strategies are provided below.

3.2.1 Avoiding Remnant Woodland Enhancement Areas

As per Schedule 4, Condition 41A of DA 305-7-2003, WCPL shall not undertake any activities within the RWEA other than the following:

- Approved underground mining operations
- Activities under an approved Biodiversity Management Plan, Flora & Fauna Management Plan or Heritage Management Plan

- Environmental management, environmental monitoring or other monitoring required under this consent or under an approved management plan or monitoring program
- Rehabilitation activities under an approved Extraction Plan

Prior to any disturbance within the RWEA WCPL will seek approval from:

- The Federal Minster of the Department of the Environment for any proposed disturbance activities in RWEA A
- The Director General for Department of Planning and Environment for any proposed disturbance activities in all RWEA Areas
- Ensure that proposed activities are conducted in accordance with conditions 40,41 and 41A of DA 305-7-2003

3.2.2 Threat Abatement

Threat abatement is the implementation of management strategies at the site to alleviate threatening processes. Actions may include:

- Activity modification to reduce or prevent impacts
- Scheduling of vegetation clearance activities
- Relocation of identified species

Strategies will be dependent on the degree of flexibility provided by mine planning and practicality of available options.

3.2.3 Capture and Release

Capture and relocation of identified threatened fauna will be attempted where conditions allow utilising accepted trapping techniques. Captured fauna will be released into suitable habitat as identified by a qualified ecologist. All capture and relocation activities will be undertaken by a suitably qualified and licensed ecologist.

3.3 Consultation and Reporting

The activities conducted as a result of the TSMP will be undertaken under the guidance of the supervising ecologist in consultation with WCPL Environment and Community Manager (E&C Manager) or delegate. The results of actions undertaken as part of the TSMP will be reported in the Annual Review.

Regulatory authorities will be consulted with as required in compliance with the Biodiversity Management Plan and DA 305-7-2003.

4.0 Responsibilities

Responsibilities under the TSMP are detailed below in **Table 1**.

Table 1: TSMP Responsibilities

No	Task	Responsibility
1	Vegetation Clearance Protocol	Environmental Advisor
2	Threatened Species Management Strategies	Environmental Advisor and Environmental and Community Manager
3	Consultation and Reporting	Environmental Advisor and Environmental and Community Manager

APPENDIX L
ASSESSMENT OF POTENTIAL ENVIRONMENTAL CONSEQUENCE FOR SOUTH BATES UNDERGROUND MINE

Assessment of Potential Environmental Consequences for South Bates Underground Mine

In accordance with Schedule 4 Condition 22D of DA 305-7-2003, this appendix presents an assessment of the potential environmental consequences of the Extraction Plan, incorporating any relevant information that has been obtained since this consent.

1.1 Flora

FloraSearch (2015) recorded two threatened ecological communities listed under the TSC Act above South Bates Underground Mine, namely the Central Hunter Grey Box – Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions EEC and the Hunter Valley Footslopes Slaty Box Woodland in the Sydney Basin Bioregion Vulnerable Ecological Community (Hunter Valley Footslopes Slaty Gum Woodland VEC)[1].

In the South Bates Underground Mine, the Central Hunter Grey Box – Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions EEC is equivalent to Central Hunter Valley Eucalypt Forest and Woodland CEEC (listed under the EPBC Act)[2] and is collectively referred to as the Central Hunter Grey Box – Ironbark Woodland EEC/CEEC.

In regard to potential environmental consequences on flora, FloraSearch (2015) stated:

> *It is noted that the majority of land within the Study area is currently approved for subsidence impacts associated with mining of Longwalls 11 to 13 in the Whybrow Seam.*
>
> *Mine subsidence effects on the surface associated with the Modification, are expected to vary slightly according to the depth of cover above the coal seam and surface features such as steep narrow ridge lines. Surface cracking of soils may potentially occur over most of the lower flat areas within the Modification, however would likely be less prevalent as depth of cover increases towards the southern escarpment. Surface cracking can be expected to occur across the crest of the narrow ridge line on the north side of Stony Creek.*
>
> *...*
>
> *The Subsidence Assessment prepared for the Modification concluded that there is only minor potential for increased ponding as a result of the Modification and that it would be restricted to the constructed North Wambo Creek diversion (MSEC 2015).*

FloraSearch (2015) concluded it is unlikely that vegetation above South Bates Underground Mine would be adversely affected by soil cracking or surface ponding due to mine subsidence, although some minor effects to riparian vegetation may occur along Stony Creek.

As a result of further mine planning and gas monitoring results, the commencing ends of Longwalls 12, 13 and 14 have been shortened and no longer directly undermine Stony Creek. Therefore, Mine Subsidence Engineering Consultants (MSEC) (2016) predicts it is

[1] Under section 5D of the EP&A Act, reference to *threatened species, populations and ecological communities* does not include a reference to any VEC. Therefore the Hunter Valley Footslopes Slaty Gum Woodland VEC is not discussed further in this BMP.

[2] The Wambo Development Project is undertaken in accordance with Approval Decision (EPBC 2003/1138) granted on 23 November 2004 under the EPBC Act. The Central Hunter Valley Eucalypt Forest and Woodland was listed as critically endangered under the EPBC Act on 7 May 2015. This listing does not apply to the approved Wambo Development Project pursuant to section 158A of the EPBC Act.

unlikely that there would be any adverse changes to the levels of ponding along Stony Creek.

Further, MSEC (2016) predict the subsidence parameters for Longwalls 11 to 16 will be the same as the maxima previously provided in the *South Bates (Wambo Seam) Underground Mine Modification Environmental Assessment* (WCPL, 2015). As such, environmental consequences on flora are expected to be generally consistent with those presented in the South Bates (Wambo Seam) Underground Mine Modification Environmental Assessment (WCPL, 2015).

1.1.1 Warkworth Sands Woodland Endangered Ecological Community

The Development Consent (DA 305-7-2003) includes performance measures specific to the Warkworth Sands Woodland EEC.

Mapping of the Warkworth Sands Woodland EEC by Orchid Research (2003) indicates that the community has a patchy, yet extensive distribution on lands to the east of Wollombi Brook around Warkworth and between Wollombi Brook and Wallaby Scrub Road. The closest occurrence of the Warkworth Sands Woodland EEC is more than 4 km east of the South Bates Underground Mine.

MSEC (2016) predicts that far-field horizontal movements resulting from the extraction of Longwalls 11 to 16 are not expected to be associated with any significant strains.

Given the absence of the Warkworth Sands Woodland EEC from the South Bates Underground Mine area, the Warkworth Sands Woodland EEC is not expected to experience impacts resulting from the extraction of Longwalls 11 to 16.

1.1.2 White Box, Yellow Box, Blakely's Red Gum Woodland/Grassy White Box Woodland Endangered Ecological Community/Critically Endangered Ecological Community

The Development Consent (DA 305-7-2003) includes performance measures specific to the White Box, Yellow Box, Blakely's Red Gum Woodland/Grassy White Box Woodland EEC/CEEC.

Mapping of the White Box, Yellow Box, Blakely's Red Gum Woodland/Grassy White Box Woodland EEC/CEEC by Orchid Research (2003) indicates that the community is represented by scattered occurrences of Yellow Box (Eucalyptus melliodora) in small isolated groups and individuals along both sides of Wollombi Brook, and near the North Wambo Creek Diversion.

Revised vegetation mapping by FloraSearch (2015) shows there is no White Box, Yellow Box, Blakely's Red Gum Woodland/Grassy White Box Woodland EEC/CEEC within the South Bates Underground Mine area.

MSEC (2016) predicts that far-field horizontal movements resulting from the extraction of Longwalls 11 to 16 are not expected to be associated with any significant strains.

Given the absence of the White Box, Yellow Box, Blakely's Red Gum Woodland/Grassy White Box Woodland EEC/CEEC from the South Bates Underground Mine area, the White Box, Yellow Box, Blakely's Red Gum Woodland/Grassy White Box Woodland EEC/CEEC is not expected to experience impacts resulting from the extraction of Longwalls 11 to 16.

1.1.3 Other Threatened Ecological Communities

The Central Hunter Grey Box – Ironbark Woodland EEC/CEEC has been recorded in the vicinity of the Longwalls 11 to 16 Application Area by FloraSearch (2015).

The *South Bates (Wambo Seam) Underground Mine Modification Environmental Assessment – Flora Assessment* (FloraSearch, 2015) provided updated vegetation community mapping and additional flora survey data for the South Bates Underground Mine area.

FloraSearch (2015) concluded Longwalls 11 to 16 are unlikely to significantly impact on the Central Hunter Grey Box – Ironbark Woodland EEC/CEEC.

Monitoring of environmental consequences against performance indicators and measures relating to the Central Hunter Grey Box – Ironbark Woodland EEC/CEEC within the Longwalls 11 to 16 Application Area is discussed in Section 5.4 of the BMP.

1.1.4 Threatened Populations

No flora populations listed in the schedules of the TSC Act or EPBC Act have been found in targeted searches or other sampling conducted over the South Bates Underground Mine area (FloraSearch, 2015).

Although not recorded in targeted surveys, FloraSearch (2015) considers that two endangered populations, *Acacia pendula population in the Hunter Catchment* and *Cymbidium canaliculatum population in the Hunter Catchment*, may have the potential to occur in small numbers within the Longwalls 11 to 16 Application Area.

FloraSearch (2015) concluded Longwalls 11 to 16 are unlikely to significantly impact on the *Acacia pendula population in the Hunter Catchment* or the *Cymbidium canaliculatum population in the Hunter Catchment*, if they were to occur above the South Bates Underground Mine area.

Any disturbance in the South Bates Underground Mine area (e.g. for remediation) will be conducted in accordance with the VCP and TSMP, which includes procedures in the event that threatened flora populations are identified.

1.1.5 Threatened Flora Species

No flora species listed in the schedules of the EPBC Act or the TSC Act have been found in targeted searches or other sampling conducted over the South Bates Underground Mine area (FloraSearch, 2015).

FloraSearch (2015) considers that two species would, if present, have any potential to be adversely affected by Longwalls 11 to 16:

- Illawarra Greenhood (*Pterostylis gibbosa*); and
- White-flowered Wax Plant (*Cynanchum elegans*).

FloraSearch (2015) concluded Longwalls 11 to 16 are unlikely to significantly impact on threatened flora species if they were to occur above the South Bates Underground Mine area.

Any disturbance in the South Bates Underground Mine area (e.g. for remediation) will be conducted in accordance with the VCP and TSMP, which includes procedures in the event that threatened flora species are identified.

1.2 Fauna

FloraSearch (2015) concluded it is unlikely that vegetation above the South Bates Underground Mine area would be adversely affected by soil cracking or surface ponding due to mine subsidence.

Given there is unlikely to be any significant adverse effect on flora and subsidence impacts on fauna are expected to be generally consistent with those presented in the *Wambo Development Project Environmental Impact Statement* (Wambo Development Project EIS) and *South Bates (Wambo Seam) Underground Mine Modification Environmental Assessment* (WCPL, 2015), it is expected that environmental consequences on fauna would be generally consistent with those presented in the Wambo Development Project EIS and *South Bates (Wambo Seam) Underground Mine Modification Environmental Assessment* (WCPL, 2015).

1.3 Aquatic Ecosystems

Stony Creek is the only named natural drainage line in the South Bates Underground Mine area. At the time of sampling, the entire length of Stony Creek was dry and no macroinvertebrate, fish or water quality samples were collected from Stony Creek.

The *South Bates (Wambo Seam) Underground Mine Modification Fauna Assessment* (Eco Logical, 2015) notes that any potential impacts on Stony Creek are unlikely to be significant.

As a result of further mine planning and gas monitoring results, the commencing ends of Longwalls 12, 13 and 14 have been shortened and no longer directly undermine Stony Creek. Therefore, the maximum predicted subsidence parameters and the potential for environmental consequences for Stony Creek have reduced (MSEC, 2016).

Given the restricted aquatic habitat present in Stony Creek and the reduction in predicted subsidence effects, it is expected that environmental consequences on aquatic ecosystems would be generally consistent with or less than those presented in the *South Bates (Wambo Seam) Underground Mine Modification Environmental Assessment* (WCPL, 2015).

1.4 Wollemi National Park

The visual landscape in the vicinity of the Wambo Coal Mine is dominated by the Wollemi National Park escarpment and the forested landforms that rise behind the escarpment. The escarpment rises above 600 metres (m) Australian Height Datum (AHD) and peaks at Mount Wambo (approximately 650 m AHD). Cliffs associated with the Wollemi National Park escarpment are shown in **Figure 1**.

Other cliffs in the vicinity of South Bates Underground Mine are addressed in the Land Management Plan for Longwalls 11 to 16.

The Development Consent (DA 305-7-2003) includes performance measures specific to the Wollemi National Park.

In regard to potential environmental consequences on the Wollemi National Park escarpment, Section 4.2 of the Wambo Development Project EIS stated:

> *The Wollemi National Park escarpment would not be subsided by the extraction of Project longwall panels (Appendix O).*

MSEC (2016) predicts the following for Longwalls 11 to 16:

> *The predicted vertical subsidence for the Cliffs Associated with the Wollemi Escarpment are all less than 20 mm. These cliffs are not predicted to experience any significant conventional tilts, curvatures or strains, even if the predicted vertical subsidence were exceeded by a factor of 2 times.*
>
> *...*
>
> *WYLW11 commenced in February 2016 and was completed in July 2016. This longwall is located at a minimum distance of 580 m from the Cliffs Associated with the Wollemi Escarpment. There have been no reported impacts on these cliffs as a result of mining WYLW11.*
>
> *...*
>
> *…it is not expected that there would be any adverse impacts on the Cliffs Associated with the Wollemi Escarpment resulting from the extraction of WYLW12, WYLW13 and WMLW14 to WMLW16.*

Given the sensitivity of the escarpment and associated cliffs, performance indicators and a monitoring program have been developed for the Wollemi National Park escarpment as summarised in Section 5.4 of the BMP.

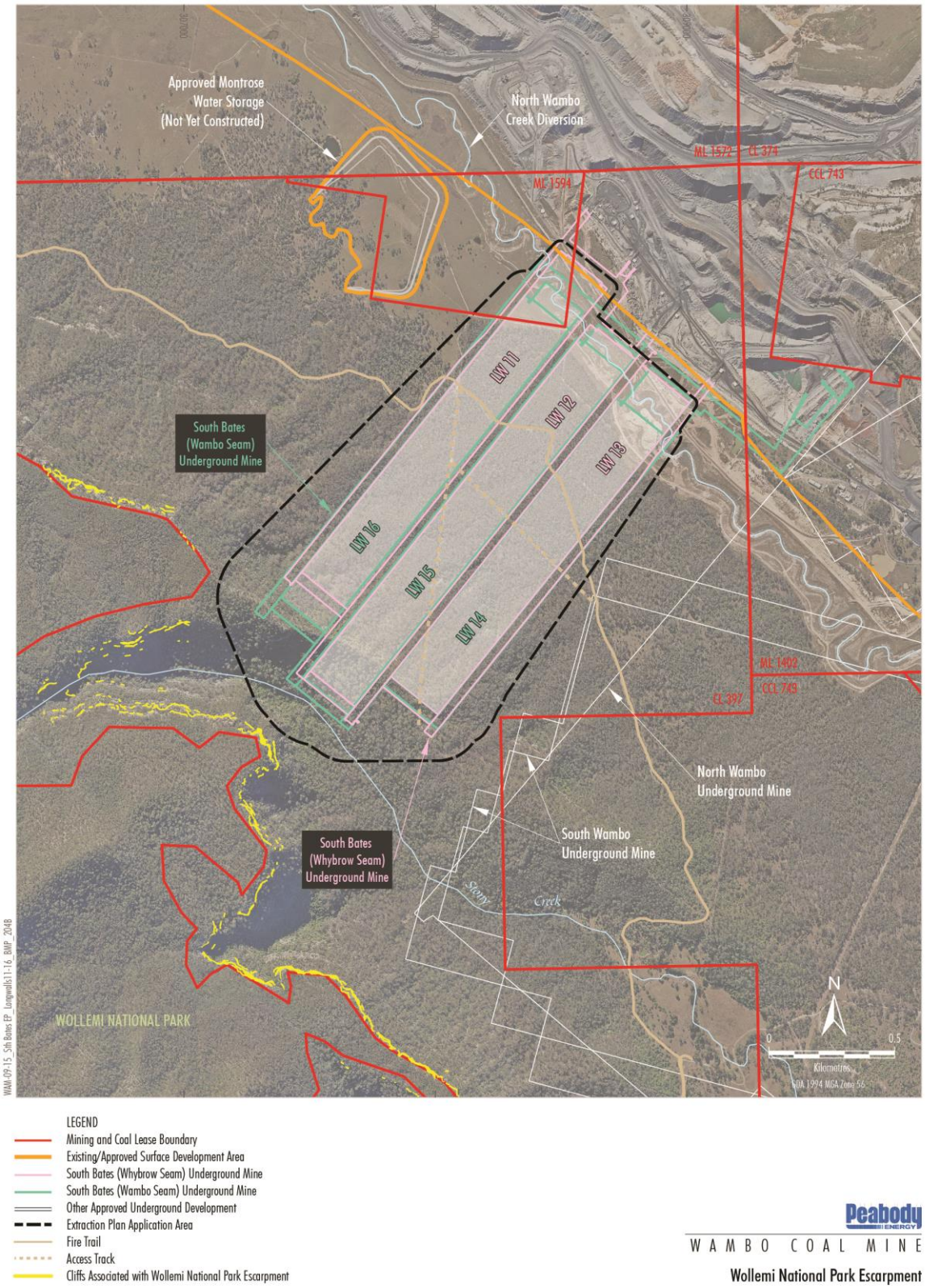


Figure 1: Wollemi National Park Escarpment