Willeroi Offset Area

Independent Review

Prepared for
Whitehaven Coal Mining Pty Ltd

8 November 2013

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Abbreviations

Abbreviation	Description
DBH	Diameter at Breast Height
DNG	Derived Native Grassland
DSEWPaC	Commonwealth Department of Sustainability, Environment, Water, Population and Communities
EEC	Endangered Ecological Community
ELA	Eco Logical Australia Pty Ltd
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
WBYBBRG EEC	White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland EEC listed under the EPBC Act
WHC	Whitehaven Coal Mining Pty Ltd
WOA	Willeroi Offset Area

Executive summary

Under sections 130(1) and 133 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), Whitehaven Coal Mining Pty Ltd (WHC) have been given approval for the expansion of the Tarrawonga Coal Mine (Tarrawonga Mine). WHC propose to establish an offset area on the 'Willeroi' property, located to the north-east of the Tarrawonga Coal Mine. Eco Logical Australia (ELA) was engaged by WHC to conduct an independent review of the Willeroi Offset Area (WOA), consistent with condition 2, 6, 7 and 9 of the EPBC Approval 2011/5923.

The EPBC Approval requires the review of the following within the proposed offset area:

- The quantity and condition class of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community
- The quantity and quality of habitat for the regent honey eater, swift parrot and greater long-eared bat.

Background data and information pertinent to the Tarrawonga Coal Project and proposed WOA was reviewed. The quantity and condition class of the critically endangered ecological community, White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland, was assessed in regards to that proposed to be removed for the Tarrawonga Coal Project and the area proposed as offsets at WOA, including ensuring that the offset area meets the definition of the ecological community described in the EPBC Act listing advice. In addition the quantity and quality of habitat for *Anthochaera phrygia* (Regent Honeyeater), *Lathamus discolour* (Swift Parrot) and *Nyctophilus timoriensis* (Greater Long-eared Bat) in the WOA was assessed in comparison to that proposed to be removed.

Based on rapid assessments, biometric assessments and review of data from previous reports, the condition and extent of the White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland EEC on the WOA was found to be of an overall equivalent or better quality to that which proposed to be removed at Tarrawonga Mine and exceeds the areas specified in condition 6 of the approval (**Table 1**). In relation to condition 9a of the approval, the White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland on WOA meets the definition of the EEC. However, the WOA is made up of 16% woodland condition class, whereas impacts to White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland at the Tarrawonga Mine site is made up of 42% woodland, albeit the impact area of this condition class (5.4 ha) is substantially smaller in comparison to the WOA (37.35 ha). While the greater proportion of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland on the WOA is Derived Native Grassland, the WOA provides a large area of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland with high resilience that can be regenerated to provide a substantial net gain in the extent of woodland over time. This is consistent with Section 7.1 of the EPBC Act offset Policy (DSEWPaC 2012) which states that '*where a proposed offset site has a lower habitat quality than that of the impact site, the offset must be managed and resourced over a defined period of time so that the habitat quality is improved to meet the quality of habitat originally impacted'*. Condition 12 of EPBC Act approval 2011/5923 requires the preparation of a management plan that will address the management of these Derived Native Grassland areas so that its quality is improved. Furthermore, the remaining area of WOA provides important ecological attributes and is situated in a landscape that could provide substantial conservation gains, as much of the intact and regenerating vegetation communities provides habitat for numerous state and federal listed threatened species and the WOA is situated adjacent to Mount Kaputar National Park in an area identified by the

NSW Office of Environment and Heritage as a regional biodiversity link. These factors make the WOA a strategically significant offset site.

Detailed surveys investigating the presence or absence of the target fauna species, or the availability of sufficient breeding, nesting or denning resources were not undertaken. Rather, assumptions have been made, with the area of habitat based on the area of vegetation communities containing known browse resources for the target fauna species. In terms of breeding, nesting and denning resources, the Regent Honeyeater and Swift Parrot are not likely to use the site for these purposes, as their breeding sites are well known and do not occur in the region. Assumptions were made on the availability of denning resources for the Greater Long-eared (i.e. hollow bearing trees), based on the condition and age of forests observed during the field visit and the vegetation condition types mapped for the Tarrawonga site and WOA.

Given the species preference towards vegetation with an intact canopy (DSEWPaC 2013), intact woodland/forest and regenerating vegetation communities were assumed to offer potential forage habitat for the Greater Long-eared Bat; however, the condition of habitat for the species does vary, with intact and mature woodland likely to offer the full range of habitat requirements (i.e. foraging and denning), and the remaining vegetation conditions (i.e. regeneration) only likely to offer foraging habitat for this species. The table below summarises how the project area and the WOA measures up against the EPBC Act approval conditions.

Table 1: Summary of the area and condition calculations for the EEC's and threatened species investigated

Species or EEC	Condition	Tarrawonga Impact Area (ha)	Willeroi Offset Area (ha)	Required Offset Area (ha) (Condition 6, EPBC Approval)	EPBC Approval Condition
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Woodland	5.40 (42%)	37.35 (16%)	232 ha	Condition 6d is met Condition 9a: While the proposed impact area at Tarrawonga Mine has a greater proportion of WBYBGW in woodland condition (42%) compared to the WOA (16%), the woodland offset ratio is 7:1 (37.35 ha to 5.4 ha). The area of DNG at the WOA will be regenerated to provide a substantial net gain in the extent of WBYBBRGGW woodland over time.
	White Cypress Pine Regeneration	3.19 (25%)	-		
	DNG	4.35 (34%)	200.92 (84%)		
Regent Honeyeater habitat	Foraging	57.00	1,053.29	1055 ha	Condition 2a is met The forage habitat area in WOA falls short of Condition 6a by 1.71 ha; this is due to differences in rounding GIS determined areas from the original vegetation mapping (Flora Search 2011) and ELA (2013) in the independent review report. It should be considered that Condition 6a is met. Condition 9b is met
Swift Parrot habitat	Foraging	45.53	890.33	397	Condition 2b is met Condition 6b is met Condition 9b is met
Greater Long-Eared Bat habitat	Breeding and foraging	253.71	626.11	1355	Condition 2c is met The forage habitat area in WOA falls short of Condition 6c by 1.17 ha; this is due to differences in rounding GIS determined areas from the original vegetation mapping (Flora Search 2011) and ELA (2013) in the independent review report. It should be considered that Condition 6a is met. Condition 9b is met
	Foraging	327.14	1,353.83		

1 Introduction

Under sections 130(1) and 133 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), Whitehaven Coal Mining Pty Ltd (WHC) have been given approval for the expansion of the Tarrawonga Coal Mine. WHC propose to establish an offset area on the 'Willeroi' property. Eco Logical Australia (ELA) was engaged by WHC to conduct an independent review of the Willeroi Offset Area (WOA), consistent with condition 2, 6, 7 and 9 of the EPBC Approval 2011/5923. Once the Department of Sustainability, Environment, Water, Populations and Communities (DSEWPaC) have endorsed the WOA as being adequate to meet the offset requirements of the project, WHC will then progress with meeting the other conditions of the Approval, including registering a legally binding covenant over the offset areas (Condition 10) and preparing an Offset Management Plan (Condition 12).

The WOA is located approximately 40 kilometres north-east of the town of Boggabri, NSW and approximately 25 kilometres north-east from Whitehaven's Tarrawonga Coal Mine (**Figure 1.1**). The WOA is bounded on the western side by Mount Kaputar National Park and the steep wooded terrain of the central range of hills to the east. Historic land uses appear to have been dominated by grazing with some small areas of cropping. The parts of the property with low topographic relief have been largely cleared of native trees and shrubs and are dominated by native grassland. Remnant trees and shrubs are largely confined to riparian areas.

1.1 Report objective

The objective of this independent review is to meet condition 7 of the EPBC Approval 2011/5923 and verify that the WOA meets conditions 2, 6 and 9 of the EPBC Approval 2011/5923. The conditions require the offset area to be of an overall equivalent or better quality than the areas being cleared within Tarrawonga Mine:

- For White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community, offset areas must meet the definition of the ecological community described in the listing advice, and must be of an overall equivalent or better condition class than the areas being cleared, based on the proportion of each condition class represented and other relevant ecological attributes
- For the threatened species, *Anthochaera phrygia* (Regent Honeyeater), *Lathamus discolour* (Swift Parrot) and *Nyctophilus timoriensis* (Greater Long-eared Bat), the quality of the habitat for the species, taking account of its ecological requirements, must be equivalent to or better than the areas being cleared.

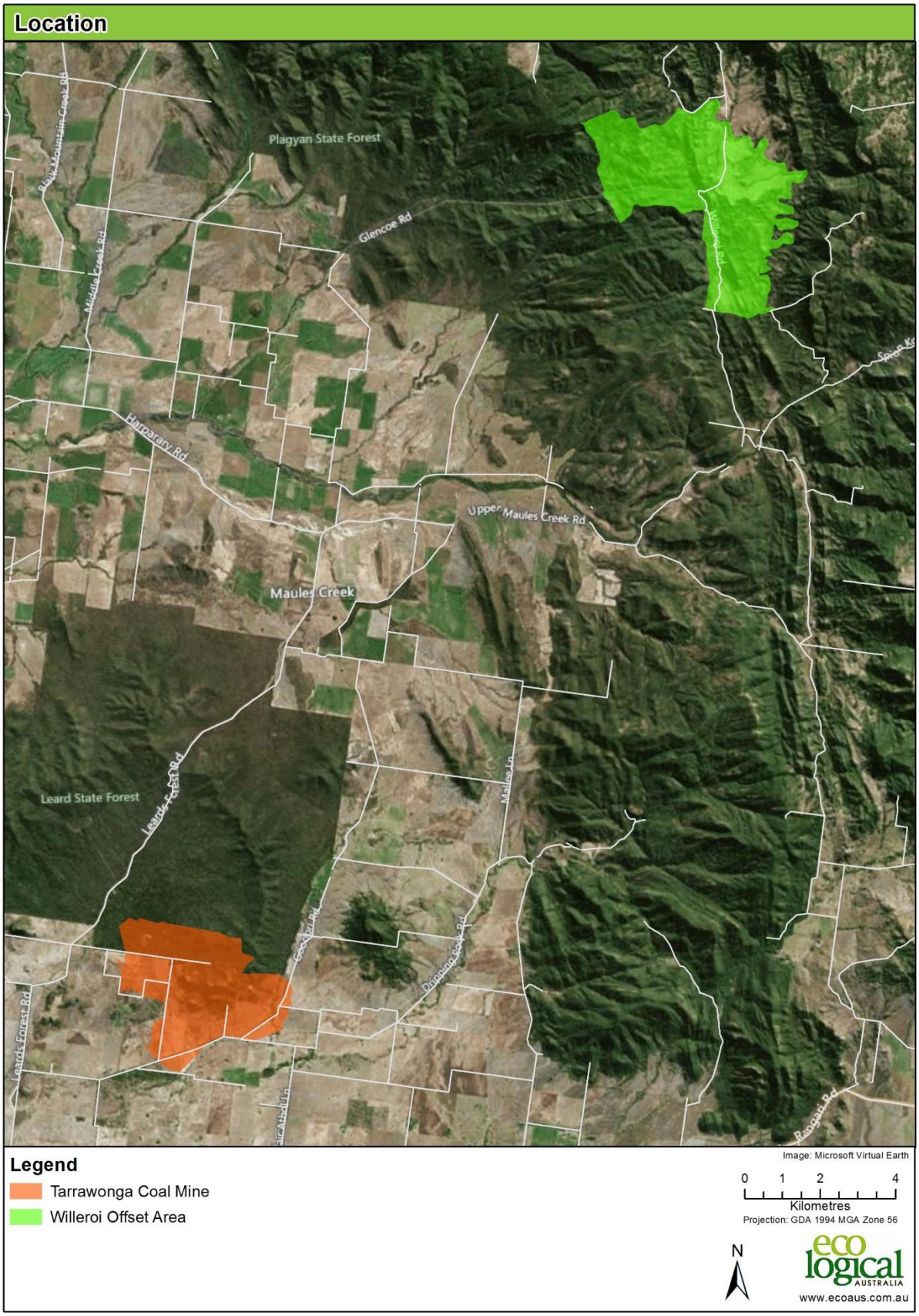

Figure 1.1: Location of the Tarrawonga Mine and WOA

2 Methods

2.1 Information review

A review of data relevant to the WOA was undertaken. The documents reviewed were:

- Tarrawonga Coal Project Environmental Assessment Report (Resource Strategies 2011)
- DSEWPAC EPBC Approval 2011/5923 (DSEWPAC 2013a)
- Vegetation of the Willeroi Offset Area (Flora Search 2011b)
- Tarrawonga Coal Project Flora Assessment (Flora Search 2011a)
- Tarrawonga Coal Project Fauna Assessment (Resource Strategies and Cenwest Environmental Services 2011)
- Willeroi Fauna Survey Report (Cenwest Environmental Services 2011).

Information reviewed in these documents focused on the ecological survey data collected on the Tarrawonga and WOA sites, including floristic and biometric plot data, which has been used to inform this independent review against the approval conditions in **Section 4**.

2.2 Site investigation

Site investigations were undertaken on 4 and 5 September 2013 by two ELA ecologists.

2.2.1 Tarrawonga Mine

Two ecologists spent three hours at the Tarrawonga Mine investigating the condition of the White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland (DNG) community to gain an appreciation of the condition of the area to be impacted.

Three rapid vegetation assessments were completed to verify vegetation mapping and condition, noting canopy, midstorey cover, and native understory foliage cover and dominant species. A random meander through the White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland impact footprint was also conducted (**Figure 2.1** and **Table 2.1).**

2.2.2 Willeroi Offset Area

Two ecologists examined the condition of the White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and DNG community within the WOA via quadrats and a traverse of the property. Four 20 x 50 m flora/biometric quadrats (two in woodland areas and two in DNG) and a traverse of the WOA were used to examine native and exotic vegetation cover and abundance within the FloraSearch (2011b) White Box-White Cypress Pine grassy woodland in their intact and DNG forms. Note that vegetation mapping as per FloraSearch (2011b) has been converted to Biometric vegetation types for consistency with mapping applied at the Tarrawonga Mine (**Figure 2.2** and **Table 2.2**).

Some minor inaccuracies were observed on the ground regarding vegetation community boundaries. Plots were located in representative examples of the target vegetation community and condition type (**Figure 2.2** and **Table 2.2**). Additional plots were taken in the White-Box – White Cypress Pine shrubby woodland but not used in the analysis. Although plots were not completed within the Yellow-box – Rough-barked Apple Grassy Woodland, which also makes up part of the White Box – Yellow Box – Blakely's Red Gum Grassy Woodland EEC within the WOA, this community was validated through random meander surveys.

At each quadrat, all flora species were identified within the nested 20 x 20 m quadrat, with the number of native species tallied. Overstorey and midstorey cover was estimated at 10 m intervals along a 50 m

linear transect then divided by 10 to give a percentage foliage cover. The number of hits of either shrubs, grasses, other native vegetation and exotic vegetation from each meter along a 50 m transect was recorded and then doubled to get a percentage cover. The number of hollow bearing trees and total length of logs within the 20 x 50 m quadrat was also tallied. The proportion of overstorey species observed regenerating was also recorded. Data collected from each quadrat can be found in **Appendix A**.

In addition, during traverses within the WOA observations were made on the condition and age of the vegetation communities as they related to quality of potential habitat for Regent Honeyeater, Swift Parrot and Greater Long-eared Bat. Although it was not possible to traverse the whole of the WOA, tools such as binoculars were used to broadly verify vegetation communities and condition.

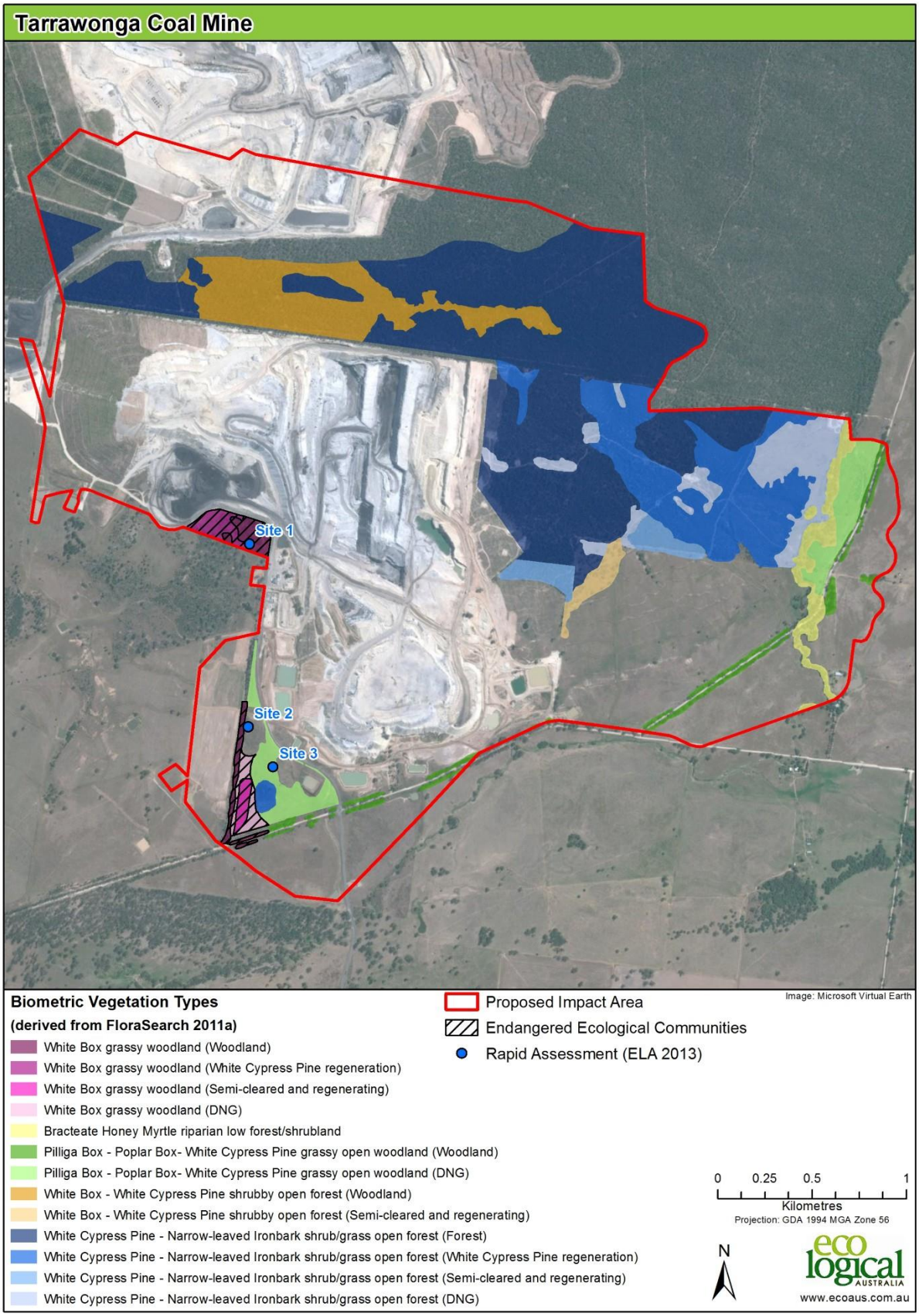

Figure 2.1: Location of rapid assessments and random meander traverses at the Tarrawonga Mine

Table 2.1: Area of vegetation communities and condition types within the Tarrawonga Mine

Biometric Vegetation Type	Condition	EEC	Area (ha)
White Cypress Pine - Narrow-leaved Ironbark shrub/grass open forest of the western Nandewar Bioregion	Forest	-	186.30
White Cypress Pine - Narrow-leaved Ironbark shrub/grass open forest of the western Nandewar Bioregion	White Cypress Pine regeneration	-	54.89
White Cypress Pine - Narrow-leaved Ironbark shrub/grass open forest of the western Nandewar Bioregion	Semi cleared and regenerating	-	9.11
White Cypress Pine - Narrow-leaved Ironbark shrub/grass open forest of the western Nandewar Bioregion	DNG	-	24.90
White Box - White Cypress Pine shrubby open forest of the Nandewar and Brigalow Belt South Bioregions	Woodland	-	40.13
White Box - White Cypress Pine shrubby open forest of the Nandewar and Brigalow Belt South Bioregions	Semi cleared and regenerating	-	4.66
White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions	Woodland	WBYBBLRGW EEC	5.40
White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions	White Cypress Pine regeneration	WBYBBLRGW EEC	3.19
White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions	Semi cleared and regenerating	WBYBBLRGW EEC	1.59
White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions	DNG	WBYBBLRGW EEC	2.76
Pilliga Box - Poplar Box- White Cypress Pine grassy open woodland on alluvial loams mainly of the temperate (hot summer) climate zone	Woodland	-	10.41
Pilliga Box - Poplar Box- White Cypress Pine grassy open woodland on alluvial loams mainly of the temperate (hot summer) climate zone	DNG	-	19.79
Bracteate Honey Myrtle riparian low forest/shrubland of rich soil depressions in the Brigalow Belt South Bioregion	Forest	-	11.47
Cleared	Cleared	-	5.73
Total			**380.32**

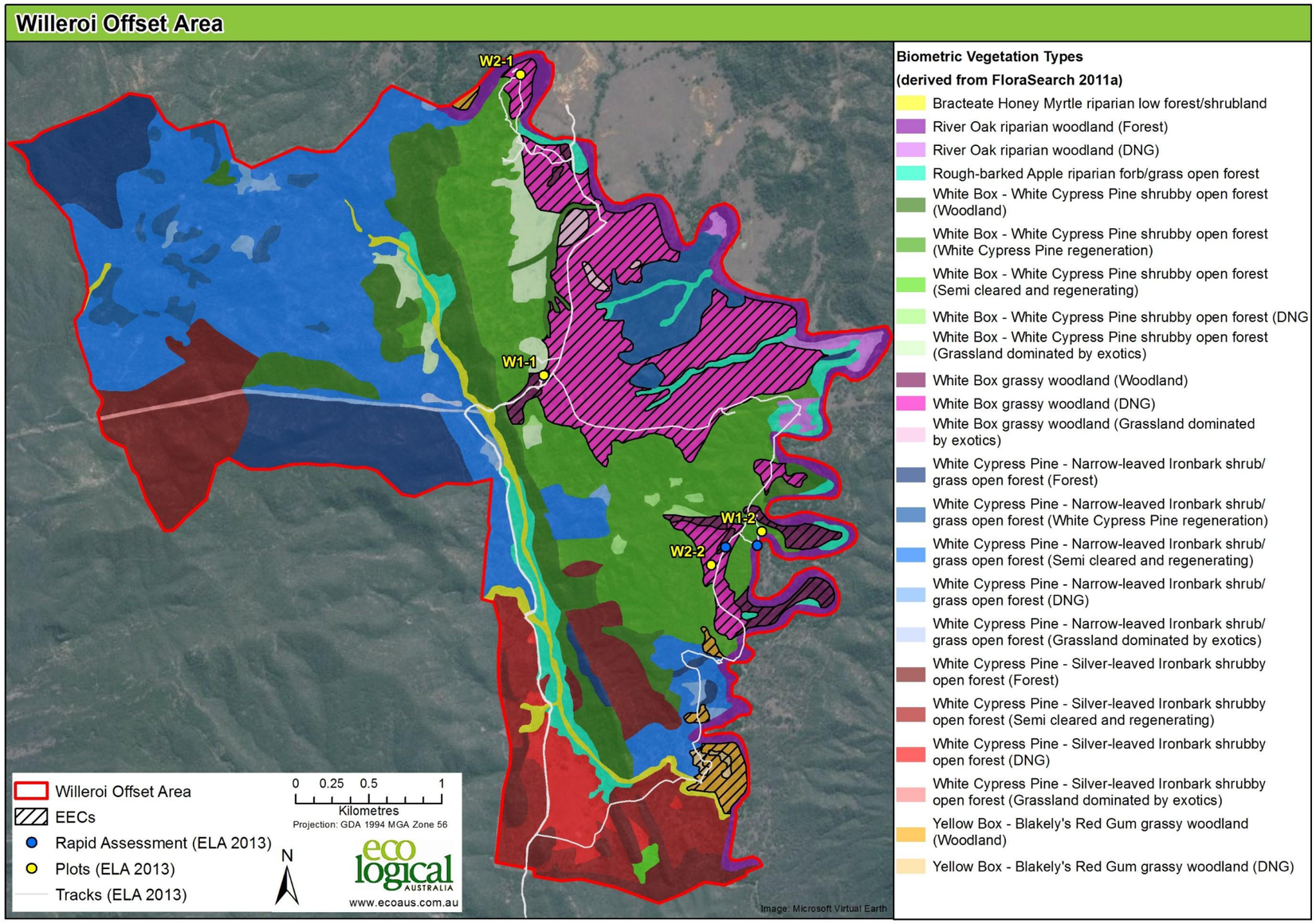

Figure 2.2: Location of plots and random meander traverses on Willeroi Offset area.

Note: vegetation mapping is as per FloraSearch (2011b), but has been converted to Biometric vegetation types for consistency with Tarrawonga Mine

Table 2.2: Area of vegetation communities and condition types within the Willeroi Offset Area

FloraSearch Vegetation Type	Biometric Vegetation Type	Condition	EEC	Area (ha)
Bracteate Honeymyrtle Low Riparian Forest	Bracteate Honey Myrtle riparian low forest/shrubland of rich soil depressions in the Brigalow Belt	Forest	-	27.23
Narrow-leaved Ironbark - White Box - White Cypress Pine Shrubby Open Forest	White Cypress Pine - Narrow-leaved Ironbark shrub/grass open forest of the western Nandewar Bioregion	Forest	-	127.82
Narrow-leaved Ironbark - White Box - White Cypress Pine Shrubby Open Forest	White Cypress Pine - Narrow-leaved Ironbark shrub/grass open forest of the western Nandewar Bioregion	DNG	-	14.53
Narrow-leaved Ironbark - White Box - White Cypress Pine Shrubby Open Forest	White Cypress Pine - Narrow-leaved Ironbark shrub/grass open forest of the western Nandewar Bioregion	Exotic grassland	-	2.44
Narrow-leaved Ironbark - White Box - White Cypress Pine Shrubby Open Forest	White Cypress Pine - Narrow-leaved Ironbark shrub/grass open forest of the western Nandewar Bioregion	Semi cleared	-	357.28
Narrow-leaved Ironbark - White Box - White Cypress Pine Shrubby Open Forest	White Cypress Pine - Narrow-leaved Ironbark shrub/grass open forest of the western Nandewar Bioregion	WCP Regen	-	67.43
River Oak - River Red Gum Riparian Forest	River Oak riparian woodland of the Brigalow Belt South and Nandewar Bioregions (Benson 84)	Forest	-	76.96
River Oak - River Red Gum Riparian Forest	River Oak riparian woodland of the Brigalow Belt South and Nandewar Bioregions (Benson 84)	DNG	-	11.50
Rough-barked Apple Riparian Forb/Grass Open Forest	Rough-barked Apple riparian forb/grass open forest of the Nandewar Bioregion	Forest	-	58.76
Silver-leaved Ironbark - Narrow-leaved Ironbark - White Box Shrubby Open Forest	White Cypress Pine - White Box - Silver-leaved Ironbark shrubby open forest of the Nandewar Bioregion	Forest	-	157.14
Silver-leaved Ironbark - Narrow-leaved Ironbark - White Box Shrubby Open Forest	White Cypress Pine - White Box - Silver-leaved Ironbark shrubby open forest of the Nandewar Bioregion	DNG	-	33.58
Silver-leaved Ironbark - Narrow-leaved Ironbark - White Box Shrubby Open Forest	White Cypress Pine - White Box - Silver-leaved Ironbark shrubby open forest of the Nandewar Bioregion	Exotic grassland	-	3.01
Silver-leaved Ironbark - Narrow-leaved Ironbark - White Box Shrubby Open Forest	White Cypress Pine - White Box - Silver-leaved Ironbark shrubby open forest of the Nandewar Bioregion	Semi cleared	-	67.39
White Box - White Cypress Pine Grassy Woodland	White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions	Woodland	WBYBBLRGW EEC	22.89
White Box - White Cypress Pine Grassy Woodland	White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions	DNG	WBYBBLRGW EEC	192.80

FloraSearch Vegetation Type	Biometric Vegetation Type	Condition	EEC	Area (ha)
White Box - White Cypress Pine Grassy Woodland	White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions	Exotic grassland	WBYBBLRGW EEC	5.73
White Box - White Cypress Pine Shrubby Woodland	White Box White Cypress Pine shrubby open forest of the Nandewar and Brigalow Belt south bioregions	Woodland	-	140.84
White Box - White Cypress Pine Shrubby Woodland	White Box White Cypress Pine shrubby open forest of the Nandewar and Brigalow Belt south bioregions	DNG	-	4.66
White Box - White Cypress Pine Shrubby Woodland	White Box White Cypress Pine shrubby open forest of the Nandewar and Brigalow Belt south bioregions	Exotic grassland	-	33.07
White Box - White Cypress Pine Shrubby Woodland	White Box White Cypress Pine shrubby open forest of the Nandewar and Brigalow Belt south bioregions	Semi cleared	-	2.50
White Box - White Cypress Pine Shrubby Woodland	White Box White Cypress Pine shrubby open forest of the Nandewar and Brigalow Belt south bioregions	WCP Regen	-	233.11
Yellow Box - Rough-barked Apple Grassy Woodland	Yellow Box - Blakely's Red Gum grassy woodland of the Nandewar Bioregion	DNG	WBYBBLRGW EEC	2.40
Yellow Box - Rough-barked Apple Grassy Woodland	Yellow Box - Blakely's Red Gum grassy woodland of the Nandewar Bioregion	Woodland	WBYBBLRGW EEC	14.45
Total				**1657.54**

3 Results

3.1 Information review

Florasearch (2011a) identified and mapped within the disturbance area at the Tarrawonga Mine 13 ha of White Box-White Cypress Pine grassy woodland, listed under the EPBC Act as White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and DNG Critically Endangered Ecological Community (EEC). Plot data collected within these areas of EEC were used to inform the vegetation condition analysis between the Tarrawonga mine site and the WOA.

Two Biometric vegetation communities on WOA are considered to belong to the White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered Ecological Community (EEC) requiring offset *(*FloraSearch 2011b). These two communities are White Box Grassy Woodland of the Nandewar and Brigalow Belt South Bioregions and Yellow Box – Blakely's Red Gum grassy woodland of the Nandewar Bioregion (**Figure 2.2** and **Table 2.2**).

3.2 Site investigation

3.2.1 Tarrawonga Mine

Rapid Assessment Site 1

The northern woodland area adjacent to the current Northern Emplacement (Site 1, **Figure 2.1**) was found to be in good condition and met the EPBC Act listing requirements for White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically EEC (**Plate 3.1**).

This area was observed to contain a canopy dominated by *Eucalyptus albens* (White Box), both mature and regenerating, a midstorey containing scattered *Callitris glaucophylla* and *Acacia* spp. and a diverse understory dominated by native grasses and herbs including at least one 'important' species from the species list for White box - yellow box- Blakely's red gum grassy woodlands (DEH 2006).

Plate 3.1: Rapid Assessment Site 1, Tarrawonga Mine

Rapid Assessment Site 2

Rapid Assessment Site 2 was adjacent to a narrow strip of White Box Grassy Woodland and an area of cleared vegetation, as mapped by FloraSearch (2011a) (**Figure 2.1**).

This site contains a narrow row of mature *Eucalyptus albens* alongside an existing road surrounded by regenerating C. *glaucophylla* and *E. albens* and patches of derived native grassland (DNG) (**Plate 3.2**). Site two contained an estimated native ground cover of 75% dominated by the grasses, *Aristida* and *Austrostipa* spp.

Plate 3.2: Rapid Assessment Site 2, Tarrawonga Mine

Rapid Assessment Site 3

Rapid Assessment Site 3 has been previously mapped as Pilliga Box – Poplar Box – White Cypress Pine grassy open woodland DNG by FloraSearch (2011a). This was observed to be in poor condition with a low floristic diversity and high weed abundance (**Plate 3.3**). An estimated exotic ground cover of 45% and a native ground cover of 55% were recorded.

Plate 3.3: Rapid assessment Site 3, Tarrawonga Mine

3.2.2 Willeroi Offset Area

Overall the White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically EEC examined on the WOA was in good condition and dominated by native vegetation. Some weed issues were identified; however, these have been previously discussed within FloraSearch (2011b). The White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically EEC that was examined met the EPBC Act listing requirements for White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically EEC.

The following provides the results of the flora plots completed within WOA.

White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions - Flora plots 1-1 and 1-2

This vegetation type was observed to be in good condition with remnant canopy trees, including mature hollow bearing trees, and high diversity of native understory species (**Plate 3.4** and **Plate 3.5**). Dominant species reflected those in the listing criteria for this EEC; the understory was dominated by native species, the patch size exceeded 0.1 ha, on average 21 native non-grass understory species and 5.5 important species were recorded within the 20 m x 20 m plots (with additional species likely across the vegetation condition class). Thus this community is considered to meet the EPBC Act listing requirements for White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland EEC.

Plate 3.4: Flora plot 1-1, WOA

Plate 3.5: Flora plot 1-2, WOA

White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions Derived Native Grassland - Flora quadrat 2-1 and 2-2

This vegetation community and condition type was dominated by native grasses with isolated mature *E. albens* (**Plate 3.6** and **Plate 3.7**). Grazing has clearly been the primary land use and has influenced floristic composition and condition within this vegetation type and condition class (**Plate 3.6**).

Despite the absence of an intact canopy, the understory was dominated by natives, patch size exceeded 0.1 ha, on average 12.5 native non-grass understory species and two important species were recorded from plots (20 m x 20 m) within this vegetation community and condition class (with additional species likely across the vegetation condition class). Therefore, this derived native grassland meets the EPBC listing requirements for White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered Ecological Community (EEC). While not all of the 192.8 ha of mapped DNG was traversed, that mapped by FloraSearch (2011b) as DNG appeared to be in uniform condition. FloraSearch (2011b) also mapped an area of DNG 'exotic grassland' that, although having introduced stone fruit and appearing to have been more heavily grazed/trodden, still contains reasonable resilience and a presence of native species.

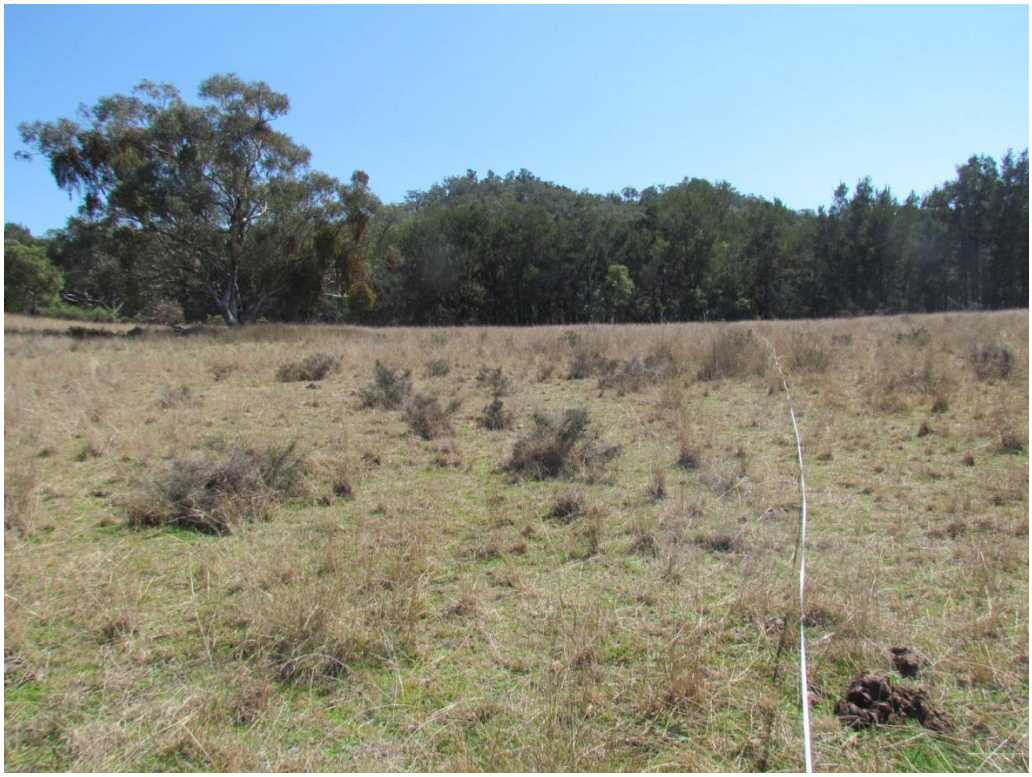

Plate 3.6: Flora plot 2-1, WOA

Plate 3.7: Flora plot 2-2, WOA

4 Analysis against approval conditions

The purpose of this review was to address the EPBC Act conditions of approval, where by an independent review is required to verify that the offset areas provided within the WOA are of an overall equivalent or better quality than the areas being cleared within Tarrawonga Coal Mine.

4.1.1 Analysis of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland

Quantity of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland

Approval conditions limit the clearing of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically EEC to 13 ha and require an associated offset area of at least 232 ha.

Table 4.1 provides the calculations developed from the vegetation mapping shape files for the Tarrawonga Mine and WOA using ArcGIS (v10). This demonstrates that the WOA meets the EPBC Act approval condition for the quantity of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically EEC, whereby the amount of EEC at the WOA (238 ha) was slightly greater than 232 ha, not including an area of DNG containing numerous exotics.

In relation to condition 9a, the WOA is made up of 16% woodland condition class, providing an area of woodland of 37.35 ha. The proposed impact area to the EEC at the Tarrawonga Mine site is 42% woodland (5.4 ha). The clearing to offset ratio for the woodland condition class is 6.92:1 (37.35 ha protected at WOA to 5.40 ha impacted).

While the greater proportion of EEC on WOA is grassland, the WOA provides a large area of high resilience White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and DNG with that can be regenerated to provide a substantial net gain in the total area of woodland on WOA over time. This is consistent with Section 7.1 of the EPBC Act offset Policy (DSEWPaC 2012) which states that '*where a proposed offset site has a lower habitat quality than that of the impact site, the offset must be managed and resourced over a defined period of time so that the habitat quality is improved to meet the quality of habitat originally impacted'*.

Condition 12 of EPBC Act approval 2011/5923 requires the preparation of a management plan that will address the management of these Derived Native Grassland areas so that its quality is improved by regeneration activities over time.

Table 4.1: Quantity and condition classes of Box-Gum EEC in both the disturbance and offset area

Community	EEC	Condition	Habitat quantity	
			Disturbance area (Tarrawonga Mine) (ha)	Offset area (WOA) (ha)
White Box – White Cypress Pine Grassy Woodland	White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Woodland	5.40 (42%)	22.89 (10%)
		White Cypress Pine regeneration	3.19 (24%)	-
		Semi cleared and regenerating	1.59 (12%)	-
		DNG	2.76 (21%)	192.8 (81%)
		DNG with exotics	-	5.73 (2%)
Yellow Box – Rough-barked Apple Grassy Woodland	White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Woodland	-	14.45 (6%)
		DNG	-	2.4 (1%)
Total			12.94	238.27

Condition of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland

Both the woodland and DNG areas at Tarrawonga and the WOA were in largely equivalent condition, with woodland areas being in good condition and DNG areas as moderate-to-good. To quantify condition, variants from plot data collected from within woodland and DNG at Tarrawonga Mine (FloraSearch 2011a) and the WOA (this assessment) were used to develop averages for five attributes (canopy cover, shrub cover, native ground cover, number of non-grass ground cover species and important species) pertaining to condition. **Figure 4.1** and **Figure 4.2** present these data for woodland and DNG condition respectively. While the performance of the condition attributes fluctuate between the Tarrawonga and WOA sites, all attributes fall within standard error and are considered to be of generally equal condition.

Note that the data presented are mean values with error bars representing the standard error. Data shown for Tarrawonga Mine is sourced from FloraSearch (2011a). Only one flora quadrat in White Box - Yellow Box - Blakely's Red Gum Derived Native Grassland was completed at Tarrawonga Mine.

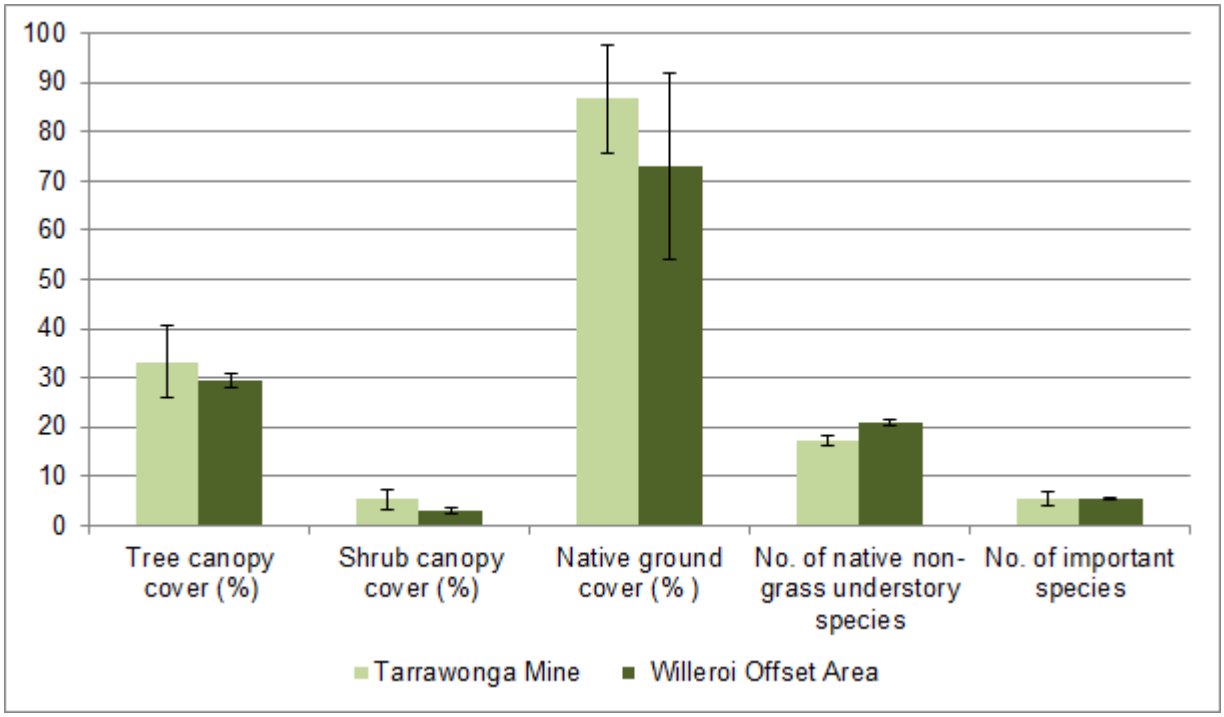

Figure 4.1: Comparison between White Box - Yellow Box - Blakely's Red Gum Grassy Woodlands at Tarrawonga Mine and WOA

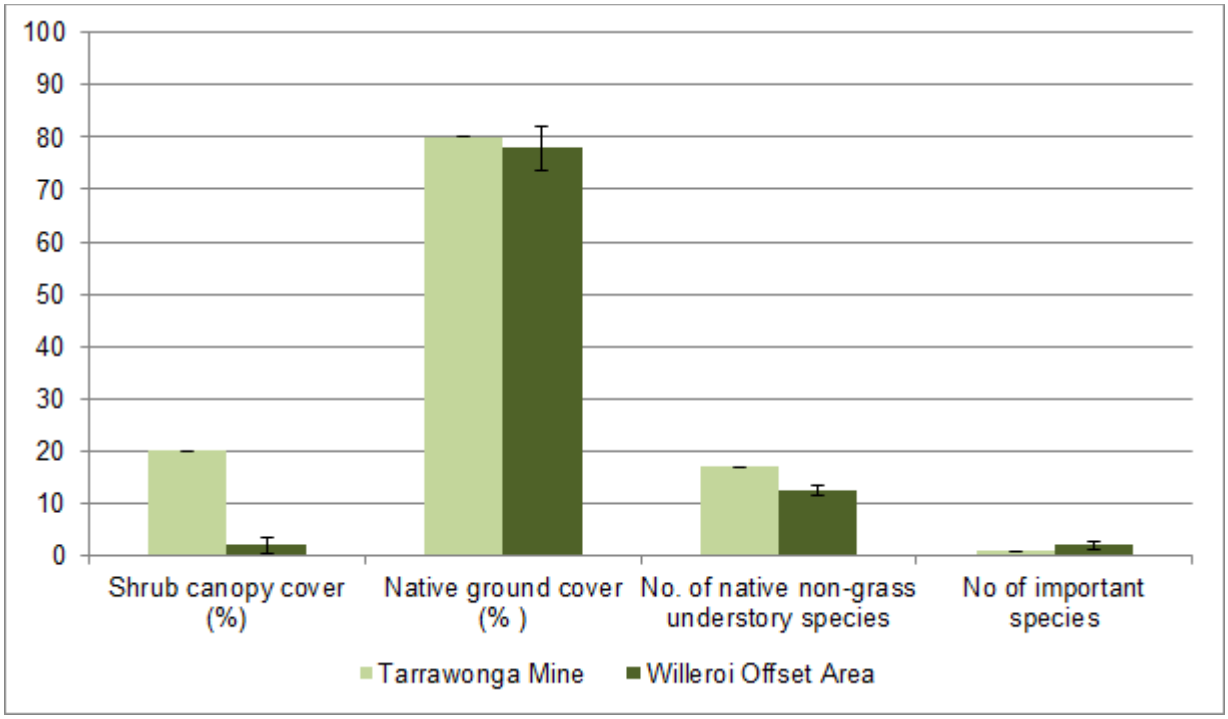

Figure 4.2: Comparison between White Box - Yellow Box - Blakely's Red Gum Derived Native Grassland at Tarrawonga Mine and WOA

4.1.2 Analysis of Regent Honeyeater, Swift Parrot and Greater Long-eared Bat

Quantity and quality of habitat for Regent Honeyeater, Swift Parrot and Greater Long-eared Bat

Detailed surveys investigating the presence or absence of the target fauna species, or the availability/abundance of sufficient breeding, nesting or denning resources was outside of the scope of this investigation. As such, some assumptions have been made, with the quantity of habitat based on the area of vegetation communities containing known browse resources for the target fauna species. Habitat quality is difficult to evaluate, particularly in the absence of data on target surveys for the species and breeding/nesting/denning resources. Habitat quality has therefore been inferred from vegetation condition classes (i.e. intact woodland was assumed to contain key resources, such as hollows, based on its mature age) and validation of habitat and forest age from the field investigation. Habitat quality was represented in two classes, foraging habitat and breeding habitat/nesting/denning habitat and calculations were developed for the areas of these habitat quality classes (**Table 4.2**).

In terms of the approach to classifying the habitat condition classes, the following provides a justification for the assigning of vegetation communities and classes for each of the target species.

Swift Parrot

The Swift Parrot breeds in Tasmania from September to March and migrates to the mainland during autumn and winter where they forage primarily on flowering eucalypts but also consume psyllids, lerps and seeds. Winter flowering eucalypts such as White Box form an important part of Swift Parrot habitat in NSW (Birdlife Australia, 2013). Therefore, breeding habitat for the species does not occur within the region and only foraging habitat in the form of communities containing White Box and other winter flowering species have been used in the forage habitat calculations.

Regent Honeyeater

Regent Honeyeaters predominately occur in box ironbark open-forest and woodland areas inland of the Great Dividing Range. Eucalypts such as the Mugga Ironbark, White Box and Yellow Box, and Blakeley's Red Gum provide critical foraging resources. In NSW, Regent Honeyeaters also regularly take nectar from Needle-leaf Mistletoe (*Amyema cambagei*) growing on River She-oak (Menkhorst et. al 1999). Breeding habitat is not known to occur in the region for this species and, therefore, only foraging habitat in the form of communities containing White Box and other winter flowering species and riparian communities containing River Oak have been used in the forage habitat calculations.

Greater Long-eared Bat

The Greater Long-eared Bat is distributed throughout inland NSW within the Murray Darling Basin. Its distribution is scattered in this region and it is rarely recorded. The Greater Long-eared Bat occurs in a range of inland woodland vegetation types, including box, ironbark and cypress pine woodlands where it forages on insects and roosts during the day in tree hollows, crevices and under loose bark (DSEWPaC 2013) The species seems to have a preference for vegetation within a distinct canopy and dense cluttered shrub layer (DSEWPaC 2013c).

Assumptions were made on the availability of denning resources for the Greater Long-eared Bat (i.e. hollow bearing trees), based on the condition and age of forests observed during the field visit and the vegetation condition types mapped for the Tarrawonga and WOA. Given the species preference towards vegetation with an intact canopy (DSEWPaC 2013c), intact woodland/forest and regenerating vegetation communities were assumed to offer potential forage habitat for the Greater Long-eared Bat; however, the condition of habitat for the species does vary, with intact and mature woodland likely to

offer the full range of habitat requirements (i.e. foraging and denning), and the remaining vegetation conditions (i.e. regeneration) only likely to offer foraging habitat for this species.

Table 4.2: Quantity and quality of habitat for Regent Honeyeater, Swift Parrot and Greater Long-eared Bat

Tarrawonga Mine (impact area) (ha) FloraSearch 2011a)				Willeroi Offset Area (ha) (FloraSearch 2011b)				EPBC Approval - area and condition criteria
Regent Honeyeater								
Biometric Vegetation Type	**Condition**	**Habitat quality/ class**	**Area (ha)**	**Biometric Vegetation Type**	**Condition**	**Habitat quality/ class**	**Area (ha)**	
White Box - White Cypress Pine shrubby open forest of the Nandewar and Brigalow Belt South Bioregions	Woodland	Foraging	40.13	Bracteate Honey Myrtle riparian low forest/shrubland of rich soil depressions in the Brigalow Belt	Forest	Foraging	27.23	**Condition 2a** - met Based on mapping undertaken during this assessment, the forage habitat area in WOA falls short of Condition 6a by 1.71 ha; this is due to the rounding of habitat areas during the initial assessment /approvals stage. It should be considered that **Condition 6a** is met. **Condition 9b** – met
White Box - White Cypress Pine shrubby open forest of the Nandewar and Brigalow Belt South Bioregions	Semi cleared and regenerating	Foraging	4.66	White Cypress Pine - Narrow-leaved Ironbark shrub/grass open forest of the western Nandewar Bioregion	Forest	Foraging	127.82	
White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions	Woodland	Foraging	5.40	White Cypress Pine - Narrow-leaved Ironbark shrub/grass open forest of the western Nandewar Bioregion	Semi cleared	Foraging	357.28	
White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions	Semi cleared and regenerating	Foraging	1.59	River Oak riparian woodland of the Brigalow Belt South and Nandewar Bioregions (Benson 84)	Forest	Foraging	76.96	
Bracteate Honey Myrtle riparian low forest/shrubland of rich soil depressions in the Brigalow Belt South Bioregion	Forest	Foraging	11.47	Rough-barked Apple riparian forb/grass open forest of the Nandewar Bioregion	Forest	Foraging	58.76	
Total			**63.24**	White Cypress Pine - White Box - Silver-leaved Ironbark shrubby open forest of the Nandewar Bioregion	Forest	Foraging	157.14	
				White Cypress Pine - White Box - Silver-leaved Ironbark shrubby open forest of the Nandewar Bioregion	Semi cleared	Foraging	67.39	
				White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions	Woodland	Foraging	22.89	
				White Box White Cypress Pine shrubby open forest of the Nandewar and Brigalow Belt south bioregions	Woodland	Foraging	140.84	

<table>
<tr><th colspan="4">Tarrawonga Mine (impact area) (ha)
FloraSearch 2011a)</th><th colspan="4">Willeroi Offset Area (ha) (FloraSearch 2011b)</th><th>EPBC Approval - area and condition criteria</th></tr>
<tr><td colspan="4"></td><td>White Box White Cypress Pine shrubby open forest of the Nandewar and Brigalow Belt south bioregions</td><td>Semi cleared</td><td>Foraging</td><td>2.50</td><td rowspan="4"></td></tr>
<tr><td colspan="4"></td><td>Yellow Box - Blakely's Red Gum grassy woodland of the Nandewar Bioregion</td><td>Woodland</td><td>Foraging</td><td>14.45</td></tr>
<tr><td colspan="4"></td><td colspan="2">Total</td><td>1053.29</td></tr>
<tr><td colspan="9">Swift Parrot</td></tr>
<tr><td>Biometric Vegetation Type</td><td>Condition</td><td>Habitat quality/ class</td><td>Area (ha)</td><td>Biometric Vegetation Type</td><td>Condition</td><td>Habitat quality/ class</td><td>Area (ha)</td><td rowspan="10">Condition 2b - met
Condition 6b - met
Condition 9b - met</td></tr>
<tr><td>White Box - White Cypress Pine shrubby open forest of the Nandewar and Brigalow Belt South Bioregions</td><td>Woodland</td><td>Foraging</td><td>40.13</td><td>White Cypress Pine - Narrow-leaved Ironbark shrub/grass open forest of the western Nandewar Bioregion</td><td>Forest</td><td>Foraging</td><td>127.82</td></tr>
<tr><td>White Box - White Cypress Pine shrubby open forest of the Nandewar and Brigalow Belt South Bioregions</td><td>Semi cleared and regenerating</td><td>Foraging</td><td>4.66</td><td>White Cypress Pine - Narrow-leaved Ironbark shrub/grass open forest of the western Nandewar Bioregion</td><td>Semi cleared</td><td>Foraging</td><td>357.28</td></tr>
<tr><td>White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions</td><td>Woodland</td><td>Foraging</td><td>5.40</td><td>White Cypress Pine - White Box - Silver-leaved Ironbark shrubby open forest of the Nandewar Bioregion</td><td>Forest</td><td>Foraging</td><td>157.14</td></tr>
<tr><td>White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions</td><td>Semi cleared and regenerating</td><td>Foraging</td><td>1.59</td><td>White Cypress Pine - White Box - Silver-leaved Ironbark shrubby open forest of the Nandewar Bioregion</td><td>Semi cleared</td><td>Foraging</td><td>67.39</td></tr>
<tr><td colspan="2">Total</td><td></td><td>51.78</td><td>White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions</td><td>Woodland</td><td>Foraging</td><td>22.89</td></tr>
<tr><td colspan="4"></td><td>White Box White Cypress Pine shrubby open forest of the Nandewar and Brigalow Belt south bioregions</td><td>Woodland</td><td>Foraging</td><td>140.84</td></tr>
</table>

<table>
<tr><th colspan="4">Tarrawonga Mine (impact area) (ha)
FloraSearch 2011a)</th><th colspan="4">Willeroi Offset Area (ha) (FloraSearch 2011b)</th><th>EPBC Approval - area and condition criteria</th></tr>
<tr><td colspan="4"></td><td>White Box White Cypress Pine shrubby open forest of the Nandewar and Brigalow Belt south bioregions</td><td>Semi cleared</td><td>Foraging</td><td>2.50</td><td></td></tr>
<tr><td colspan="4"></td><td>Yellow Box - Blakely's Red Gum grassy woodland of the Nandewar Bioregion</td><td>Woodland</td><td>Foraging</td><td>14.45</td><td></td></tr>
<tr><td colspan="4"></td><td colspan="2">Total</td><td>890.33</td><td></td></tr>
<tr><td colspan="9">Greater Long-eared Bat</td></tr>
<tr><td>Biometric Vegetation Type</td><td>Condition</td><td>Habitat quality/ class</td><td>Area (ha)</td><td>Biometric Vegetation Type</td><td>Condition</td><td>Habitat quality /class</td><td>Area (ha)</td><td rowspan="10">Condition 2c - met
Based on mapping undertaken during this assessment, the forage habitat area in WOA falls short of Condition 6a by 1.17 ha; this is due to the rounding of habitat areas during the initial assessment /approvals stage. It should be considered that Condition 6a is met.
Condition 9b - met</td></tr>
<tr><td>White Cypress Pine - Narrow-leaved Ironbark shrub/grass open forest of the western Nandewar Bioregion</td><td>Forest</td><td>Breeding and foraging</td><td>186.30</td><td>Bracteate Honey Myrtle riparian low forest/shrubland of rich soil depressions in the Brigalow Belt</td><td>Forest</td><td>Breeding and foraging</td><td>27.23</td></tr>
<tr><td>White Cypress Pine - Narrow-leaved Ironbark shrub/grass open forest of the western Nandewar Bioregion</td><td>White Cypress Pine regeneration</td><td>Foraging</td><td>54.89</td><td>White Cypress Pine - Narrow-leaved Ironbark shrub/grass open forest of the western Nandewar Bioregion</td><td>Forest</td><td>Breeding and foraging</td><td>127.82</td></tr>
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<tr><td>White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions</td><td>Woodland</td><td>Breeding and foraging</td><td>5.40</td><td>White Cypress Pine - Narrow-leaved Ironbark shrub/grass open forest of the western Nandewar Bioregion</td><td>WCP Regen</td><td>Foraging</td><td>67.43</td></tr>
<tr><td>White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions</td><td>White Cypress Pine regeneration</td><td>Foraging</td><td>3.19</td><td>River Oak riparian woodland of the Brigalow Belt South and Nandewar Bioregions (Benson 84)</td><td>Forest</td><td>Breeding and foraging</td><td>76.96</td></tr>
<tr><td></td><td></td><td></td><td></td><td>Rough-barked Apple riparian forb/grass open forest of the Nandewar Bioregion</td><td>Forest</td><td>Breeding and foraging</td><td>58.76</td></tr>
<tr><td></td><td></td><td></td><td></td><td>White Cypress Pine - White Box - Silver-leaved Ironbark shrubby open</td><td>Forest</td><td>Breeding and</td><td>157.14</td></tr>
</table>

Tarrawonga Mine (impact area) (ha) FloraSearch 2011a)				Willeroi Offset Area (ha) (FloraSearch 2011b)				EPBC Approval - area and condition criteria
Pilliga Box - Poplar Box- White Cypress Pine grassy open woodland on alluvial loams mainly of the temperate (hot summer) climate zone	Woodland	Breeding and foraging	10.41	forest of the Nandewar Bioregion		foraging		
Bracteate Honey Myrtle riparian low forest/shrubland of rich soil depressions in the Brigalow Belt South Bioregion	Forest	Breeding and foraging	11.47	White Cypress Pine - White Box - Silver-leaved Ironbark shrubby open forest of the Nandewar Bioregion	Semi cleared	Foraging	67.39	
Total			**311.79**	White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions	Woodland	Breeding and foraging	22.89	
				White Box White Cypress Pine shrubby open forest of the Nandewar and Brigalow Belt south bioregions	Woodland	Breeding and foraging	140.84	
				White Box White Cypress Pine shrubby open forest of the Nandewar and Brigalow Belt south bioregions	Semi cleared	Foraging	2.50	
				White Box White Cypress Pine shrubby open forest of the Nandewar and Brigalow Belt south bioregions	WCP Regen	Foraging	233.11	
				Yellow Box - Blakely's Red Gum grassy woodland of the Nandewar Bioregion	Woodland	Breeding and foraging	14.45	
				Total			**1353.83**	

5 Conclusion

The objectives of this review were to verify that the environmental offset provided within the WOA are of an overall equivalent or better quality than the areas being cleared within Tarrawonga Coal Mine site and to investigate:

- The quantity and condition class of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland community (including ensuring that the offset area meets the definition of the ecological community described)
- The quantity and quality of habitat for *Anthochaera phrygia* (Regent Honeyeater), *Lathamus discolour* (Swift Parrot) and *Nyctophilus corbeni* (Greater Long-eared Bat).

The quantity and condition class of the critically endangered ecologically community; White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland, was assessed in regards to that proposed to be removed from the Tarrawonga Mine (including ensuring that the offset area meets the definition of the ecological community described). In addition the quantity and quality of habitat for *Anthochaera phrygia* (Regent Honeyeater), *Lathamus discolour* (Swift Parrot) and *Nyctophilus timoriensis* (Greater Long-eared Bat) was assessed in comparison to that proposed to be removed.

Based on rapid assessments, biometric assessments and review of data from previous reports, the condition and extent of the White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland EEC on the WOA was found to be of an overall equivalent or better quality to that which is proposed to be removed at Tarrawonga Mine. The offset area proposed exceeds the area specified in condition 6 of the approval (**Table 5.1**).

In relation to condition 9a of the approval, the White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland on WOA meets the definition of the EEC. While the WOA provides a smaller proportion of woodland habitat condition class than the Tarrawonga impact area (16% woodland at WOA compared to 42% at Tarrawonga Mine), the clearing to offset ratio for the woodland condition is 5.40 ha to 37.35 ha. Furthermore, the area of DNG at WOA provides a substantial area of EEC of high resilience that can be regenerated to provide a substantial net gain in the area of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland over time. This is consistent with Section 7.1 of the EPBC Act offset Policy (DSEWPaC 2012) which states that '*where a proposed offset site has a lower habitat quality than that of the impact site, the offset must be managed and resourced over a defined period of time so that the habitat quality is improved to meet the quality of habitat originally impacted*'. Condition 12 of EPBC Act Approval 2011/5923 requires the preparation of a management plan that will address the management of these Derived Native Grassland areas so that its quality is improved. Furthermore, the remaining area of WOA provides important ecological attributes and is situated in a landscape that could provide substantial conservation gains, as much of the intact and regenerating vegetation communities provides habitat for numerous state and federal listed threatened species and the WOA is situated adjacent to Mount Kaputar National Park, an area identified by OEH as a regional biodiversity link. These factors make the WOA a strategically significant offset site.

In terms of the quantity of habitat for the target threatened species, the extent of habitat provided within the WOA exceeded that which is proposed to be removed at the Tarrawonga mine, though the amount of habitat required for the Regent Honeyeater and Greater Long-eared Bat, under condition 6a and 6c,

fell short by very small amounts (**Table 5.1**) and it due entirely to differences in rounding GIS determined areas from the original vegetation mapping (Flora Search 2011).

In terms of habitat quality, detailed surveys investigating the presence or absence of the target fauna species, or the availability of sufficient breeding, nesting or denning resources were not undertaken. Rather, assumptions have been made, with the area of habitat based on the area of vegetation communities containing known browse resources for the target fauna species. In terms of breeding, nesting and denning resources, the Regent Honeyeater and Swift Parrot are not likely to use the site for these purposes, as their breeding sites are well known and do not occur in the region. Assumptions were made on the availability of denning resources for the Greater Long-eared (i.e. hollow bearing trees), based on the condition and age of forests observed during the field visit and the vegetation condition types mapped for the Tarrawonga site and WOA.

Given the species preference towards vegetation with an intact canopy (DSEWPaC 2013c), intact woodland/forest and regenerating vegetation communities were assumed to offer potential forage habitat for the Greater Long-eared Bat; however, the condition of habitat for the species does vary, with intact and mature woodland likely to offer the full range of habitat requirements (i.e. foraging and denning), and the remaining vegetation conditions (i.e. regeneration) only likely to offer foraging habitat for this species.

Table 5.1 summarises how the project area and the WOA measures up against the EPBC Act approval conditions.

Table 5.1: Summary of the area and condition calculations for the EEC's and threatened species investigated.

Species or EEC	Condition	Impact Area Tarrawonga (ha)	Willeroi Offset Area (ha)	EPBC Condition of Approval
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Woodland	5.40 (42%)	37.35 (16%)	Condition 6d is met Condition 9a: While the proposed impact area at Tarrawonga Mine has a greater proportion of WBYBGW in woodland condition (42%) compared to the WOA (16%), the woodland offset ratio is 7:1 (37.35 ha to 5.4 ha). The area of DNG at the WOA will be regenerated to provide a substantial net gain in the extent of WBYBBRGGW woodland over time.
	White Cypress Pine Regeneration	3.19 (25%)	-	
	DNG	4.35 (34%)	200.92 (84%)	
Regent Honeyeater	Foraging	57.00	1,053.29	Condition 2a is met The forage habitat area in WOA falls short of Condition 6a by 1.71 ha; this is due to differences in rounding GIS determined areas from the original vegetation mapping (Flora Search 2011) and ELA (2013) in the independent review report. It should be considered that **Condition 6a** is met. Condition 9b is met
Swift Parrot	Foraging	45.53	890.33	Condition 2b is met Condition 6b is met Condition 9b is met
Greater Long-eared Bat	Breeding and foraging	253.71	626.11	Condition 2c is met The forage habitat area in WOA falls short of Condition 6a by 1.17 ha this is due to differences in rounding GIS determined areas from the original vegetation mapping (Flora Search 2011) and ELA (2013) in the independent review report. It should be considered that **Condition 6a** is met. Condition 9b is met
	Foraging	327.14	1,353.83	

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Appendix A: Flora quadrat data - Willeroi Offset Area

Table A.1: Flora quadrat data - WOA

Plot Name	Native Plant Species	Native overstorey cover %	Native midstorey cover %	Native groundcover (Grasses) %	Native groundcover (Shrubs) %	Native groundcover (Other) %	Exotic plant cover %	Number of trees with hollows	Proportion of overstory regenerating	Length of fallen logs (over 15 cm diameter)	Number of native non-grass understory species	Number of 'important' species
W1-1	39	31.5	0.5	38	2	6	0	4	1	37.5	20	5
W1-2	38	27.5	4	70	4	26	0	9	1	73.5	22	6
W2-1	19	0	0	74	0	10	16	0	0	0	14	1
W2-2	22	0	0	58	4	10	28	0	0	0	11	3

Table A.2: Flora quadrat locations - WOA

Plot Name	Community Type	Easting	Northing
W1-1	Woodland	242730	6628749
W1-2	Woodland	244225	6627681
W2-1	DNG	242572	6630804
W2-2	DNG	243878	6627452

Table A.3: Quadrat floristic data - WOA

Family	Genus	Species	Common Name	Willeroi 1-1	Willeroi 1-2	Willeroi 2-1	Willeroi 2-2
Adiantaceae	*Cheilanthes*	*sieberi*					1
Apiaceae	*Hydrocotyle*	*laxiflora*	Stinking Pennywort	2		3	
Asteraceae	*Bidens*	*pilosa**	Cobbler's Pegs		1		2
Asteraceae	*Brachyscome*	*spp.*				2	
Asteraceae	*Calotis*	*cuneata*	Mountain Burr-Daisy		1		2
Asteraceae	*Cassinia*	*arcuata*	Sifton Bush		1		
Asteraceae	*Cassinia*	*quinquefaria*			1		
Asteraceae	*Chrysocephalum*	*apiculatum*	Common Everlasting, Yellow Buttons	1	2		2
Asteraceae	*Cymbonotus*	*lawsonianus*	Bear's Ear	1			2
Asteraceae	*Hypochaeris*	*radicata**	Catsear		1	2	3
Asteraceae	*Olearia*	*spp.*			4		
Asteraceae	*Onopordum*	*acanthium**	Scotch Thistle			1	1
Asteraceae	*Senecio*	*spp.*			1		
Asteraceae	*Silybum*	*marianum**	Variegated Thistle				1
Asteraceae	*Solenogyne*	*spp.*			1	2	
Asteraceae	*Vittadinia*	*muelleri*	Fuzzweed	1			3
Bignoniaceae	*Pandorea*	*pandorana*	Wonga Wonga Vine	1			
Cactaceae	*Opuntia*	*spp.**		1			1
Campanulaceae	*Wahlenbergia*	*communis*	Tufted Bluebell	2	1		
Caryophyllaceae	*Paronychia*	*brasiliana**	Chilean Whitlow Wort			1	

Family	Genus	Species	Common Name	Willeroi 1-1	Willeroi 1-2	Willeroi 2-1	Willeroi 2-2
Chenopodiaceae	*Einadia*	*nutans*	Climbing Saltbush	1	1		
Chenopodiaceae	*Maireana*	*spp.*		1	1	4	1
Clusiaceae	*Hypericum*	*gramineum*	Small St John's Wort		1		
Convolvulaceae	*Dichondra*	*repens*	Kidney Weed			3	
Convolvulaceae	*Dichondra*	*species A*		2	3		3
Cupressaceae	*Callitris*	*glaucophylla*	White Cypress Pine	5	4		1
Cyperaceae	*Carex*	*appressa*	Tall Sedge				1
Dilleniaceae	*Hibbertia*	*spp.*			1		
Fabaceae (Faboideae)	*Desmodium*	*brachypodum*	Large Tick-trefoil		3		
Fabaceae (Faboideae)	*Glycine*	*clandestina*		2	1		1
Fabaceae (Faboideae)	*Medicago*	*spp.**				3	
Fabaceae (Faboideae)	*Swainsona*	*galegifolia*	Smooth Darling Pea	3	2		
Fabaceae (Faboideae)	*Trifolium*	*repens*	White Clover			2	
Fabaceae (Mimosoideae)	*Acacia*	*decora*	Western Golden Wattle	1	1		
Fabaceae (Mimosoideae)	*Acacia*	*spp.*		1			
Gentianaceae	*Centaurium*	*spp.**				3	
Geraniaceae	*Geranium*	*solanderi*	Native Geranium	1	3	2	2
Goodeniaceae	*Goodenia*	*spp.*		1			
Haloragaceae	*Gonocarpus*	*spp.*			1		
Iridaceae	*Gladiolus*	*spp.**				2	
Juncaceae	*Juncus*	*spp.*				2	

Family	Genus	Species	Common Name	Willeroi 1-1	Willeroi 1-2	Willeroi 2-1	Willeroi 2-2
Lomandraceae	*Lomandra*	*filiformis*			2		
Lomandraceae	*Lomandra*	*multiflora*	Many-flowered Mat-rush		1		
Malvaceae	*Sida*	*corrugata*		2		2	
Malvaceae	*Sida*	*spp.*		1			
Myrtaceae	*Eucalyptus*	*albens*	White Box	5	4		
Oleaceae	*Notelaea*	*microcarpa*	Native Olive	2	2		
Oxalidaceae	*Oxalis*	*perennans*		1	1	3	
Plantaginaceae	*Plantago*	*lanceolata**	Lamb's Tongues*				2
Plantaginaceae	*Plantago*	*spp.*		1	2	2	
Poaceae	*Aristida*	*ramosa*	Purple Wiregrass	2	3	3	5
Poaceae	*Aristida*	*vagans*	Threeawn Speargrass	2	2		
Poaceae	*Chloris*	*ventricosa*	Tall Chloris	2		1	
Poaceae	*Cymbopogon*	*refractus*	Barbed Wire Grass	1	4		3
Poaceae	*Danthonia*	*spp.*	Wallaby Grass	1			2
Poaceae	*Dichelachne*	*spp.*			1		
Poaceae	*Echinopogon*	*caespitosus*	Bushy Hedgehog-grass			1	
Poaceae	*Eragrostis*	*leptocarpa*	Drooping Lovegrass	1	2		
Poaceae	*Eragrostis*	*spp.*				1	
Poaceae	*Microlaena*	*stipoides*		1	1	1	
Poaceae	*Panicum*	*effusum*	Poison or Hairy Panic				1
Poaceae	*Sporobolus*	*creber*	Slender Rat's Tail Grass			2	2

Family	Genus	Species	Common Name	Willeroi 1-1	Willeroi 1-2	Willeroi 2-1	Willeroi 2-2
Poaceae	*Stipa*	*scabra*		2	2		
Poaceae	*Stipa*	*verticillata*		1	1	2	2
Poaceae	*Themeda*	*australis*	Kangaroo Grass	1			
Poaceae			Unidentified native grass				1
Polygonaceae	*Rumex*	*brownii*	Swamp Dock			1	
Primulaceae	*Anagallis*	*arvensis**	Scarlet/Blue Pimpernel		1	2	1
Rosaceae	*Acaena*	*spp.*		1			1
Rosaceae	*Rosa*	*rubiginosa**	Sweet Briar	1		1	
Rubiaceae	*Galium*	*propinquum*	Maori Bedstraw		1		
Rubiaceae	*Galium*	*spp.*		1			
Sapindaceae	*Dodonaea*	*viscosa*		1	1		
Scrophulariaceae	*Veronica*	*plebeia*	Trailing Speedwell		1		2
Stackhousiaceae	*Stackhousia*	*spp.*		1			
Sterculiaceae	*Brachychiton*	*populneus*	Kurrajong	1			
Thymelaeaceae	*Pimelea*	*neo-anglica*	Poison Pimelea	2	2		2
Verbenaceae	*Verbena*	*bonariensis*	Purpletop				1
Verbenaceae	*Verbena*	*spp.**				1	2
			Unidentified exotic herb*			1	
			Unidentified native shrub				1

Note: Shaded indicates an important species.

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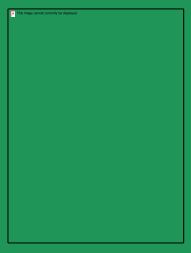

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