INDEPENDENT PEER REVIEW OF OFFSETS FOR THE MAULES CREEK MINE PROJECT - EPBC 2010/5566

VERIFICATION REPORT FOR ADDITIONAL OFFSETS

Prepared for
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by

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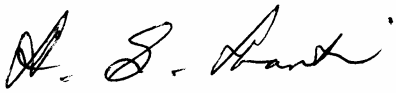
Signed:	
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Cover photos: Top centre – White Box Grassy Woodland in the Leard State Forest

Bottom left – Derived Native Grasslands in the Oakleigh/Onavale Properties

Bottom right – White Box Grassy Woodland in the Eastern Offset Properties

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Executive Summary

BACKGROUND AND PURPOSE

This Verification Report presents the results of the independent review process to verify the quantity and condition class of *White Box–Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* Critically Endangered Ecological Community (CEEC) and the quantity and quality of habitat for the Regent Honeyeater, Swift Parrot and South-eastern Long-eared Bat within all proposed additional offset areas, as well as those properties within the Eastern Offsets not previously accessed, as requested by Whitehaven. Offsets are required to compensate for impacts on the CEEC and threatened species habitat from the development of the Maules Creek Coal Project near Boggabri, NSW. The Project will require staged clearing of 1,665.85 ha of forest/woodland vegetation and habitats and 512.59 ha of Derived Native Grassland and other grasslands. The required clearing area encompasses 544 ha of CEEC, comprising 458 ha of Box-Gum Woodland and 87 ha of Derived Native Grassland.

The additional offsets were required to provide sufficient quantity and quality of the CEEC and threatened fauna habitats for Whitehaven to comply with Condition 10 of the Approval Conditions for the Maules Creek Project:

> ***'The person taking the action must verify through independent review the quantity*** *and* ***condition class*** *of White Box – Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community and the quantity and quality of habitat for the regent honeyeater, swift parrot and greater long-eared bat within all proposed* ***offset areas*** *including those proposed in the* ***Environmental Assessment****, as defined in Attachment C of these conditions, and any additional offsets as required at condition 9….'*

The results from the combined desktop assessments, field inspections, surveys and data analysis for the Greenloaning December 2013 report lead to the conclusion that the proposed offset package complied with Condition 10, providing that the additional offset properties of Roseglass, Oakleigh/Onavale and Bimbooria were included as offsets. This conclusion also relied on the mapping and assessments of both CEEC and threatened fauna habitats as provided in the consultant reports on the additional offset properties. The conclusion took into account the necessity for assessing compliance with Conditions 9 and 12:

> *'9. The person taking the action must register a legally binding conservation covenant over* ***offset areas*** *of no less than:*
>
> *.a. 9,334 ha of an equivalent or better quality of habitat for the regent honeyeater, swift parrot and greater-long-eared bat; and*

b. 5,532 ha of an equivalent or better quality of the White Box-Yellow Box-Blakely's Red Gum Woodland and Derived Grassland ecological Community.'

12. The offsets areas must be of an overall equivalent or better quality than the areas being cleared. This means:

a. 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, 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 the other relevant ecological attributes;*

b. for the threatened species, 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.'

The inclusion of the additional offsets to provide sufficient offset area and quality was in compliance with Condition 11:

11. If the ***independent review*** *finds that the* ***offset areas*** *do not meet the conditions of 9, 12a and 12b, then additional areas must be included in the offset areas until all relevant criteria are met.*

It was subsequently recommended in the December 2013 Independent Peer Review (Greenloaning December 2013 report) that verification of the additional offset community boundaries and habitats be undertaken, taking into account the verification processes employed for the purposes of the 2013 peer review. In response to this recommendation, Whitehaven requested that Greenloaning conduct field assessments of the additional offsets. Additionally, Whitehaven requested that the review process include six properties (henceforth referred to as the six original offset properties) which Greenloaning had been unable to access prior to the submission of the Greenloaning December 2013 report, owing to either time constraints or issues with property access. During the latter stages of the 2014 verification process, it was determined that an additional offset area would be required to comply with the Approval Conditions. The Wongala property, adjoining the Wirradale property and the Northern Offsets that form part of the original offset package, was subsequently added to the additional offsets to be assessed.

The offsets that are the subject of this Verification Report thus comprise:

Additional Offsets:

a) Oakleigh/Onavale;

b) Bimbooria;

c) Roseglass; and

d) Wongala.

Original Eastern/Western Offset Properties

a) Blue Range;

b) Cattle Plain;

c) Olivedeen;

d) Teston North; and

e) Tralee.

Shared Offset

The purpose of this report is to verify the attributes identified within the above offsets (henceforth referred to collectively as the subject offsets). As for the 2013 Independent Peer Review, the assessment process is designed to examine the extent to which these attributes may, or may not, conform to the offset requirements as stipulated in Conditions 9, 10 and 12 for the Project Approval and provide verification, if appropriate, that the amended offset package is in compliance overall with the Approval Conditions.

As stated in the December 2013 report, the peer review and associated assessments have not been prepared within a framework of either support for, or opposition to the Maules Creek project, or the concept of offsets per se. The two key tasks of the review focus on the requirements of the Approval Conditions: firstly to verify the areas of CEEC and threatened species habitat to be provided, as presented in **Appendix G** of the Greenloaning December 2013 report, and secondly to provide advice to Whitehaven regarding matters in which the offsets may not be compliant such that further additional offsets may be provided, as per Condition 11.

Offsets

The offsets that are the subject of this peer review are intended to compensate for the residual biodiversity impacts from the Project. The five original offset properties that are encompassed within the Eastern Offset, are either adjacent to Leard State Forest and/or Leard State Conservation Area, or are in immediate proximity and are within the same land system as the Project Site. The property referred to as the 'Shared Offset' and included in the original offset package for the Maules Creek Project, is under shared ownership with Boggabri Coal. As for the Eastern Offsets, the Shared Offset property occurs within some proximity to the Project site, but is not immediately adjacent, being located approximately six km to the south-west of the main area of the Project Site. The rail corridor for the Project runs through the centre of the Shared Offset property, dividing the two main vegetation units. The majority of this site is on more rugged topography similar to the south-western sectors of the Project Site and the Leard State Conservation Area.

The combined offset properties of Oakleigh and Onavale are also located within the same land system as the Project Site and Eastern Offsets and are adjacent to Leard State Forest

on the north-eastern extremity of the forest. The Bimbooria Offset adjoins the Roseglass Offset to the north-east of Roseglass and these additional offsets are located immediately to the west of Vickery State Forest, approximately 15 km to the south-east of Leard State Forest. The Wongala Offset adjoins the south-eastern sector of the Northern Offsets and is located approximately 15 km to the north/northeast of Leard State Forest and 12 km from the Eastern Offsets. The combined offsets support an array of forest/woodland vegetation, grasslands and agricultural land. All offset properties have been utilised over a period of many decades for agricultural-based activities, primarily sheep and cattle grazing, cropping and timber harvesting.

Preliminary assessments of the various properties comprising the subject offsets were conducted by three different consultancies. The relevant reports and/or maps provided by these consultancies indicated varying amounts of forest /woodland habitats occurring on the offsets, some of which represent the *Box-Gum Woodland and Derived Grasslands* and/or potential foraging habitat for one or more of the subject threatened fauna species.

Review Methodology

As for the 2013 Independent Peer Review, the focus of the required verification process for the subject offsets was very specific as determined by the Approval Conditions. The range of procedures employed during the review process reflects this focus. The methods utilised encompassed desktop reviews of existing data on the Project Site and the offset properties, site inspections and surveys, reviews of relevant key definitions and criteria for the *Box-Gum Woodland* CEEC and threatened fauna species requirements, GIS mapping, data collation and analysis and preliminary and final assessments of results. The procedures generally replicated those developed for the 2013 review process, but owing to the lack of a statutory deadline for the 2014 review, there was opportunity for more time to be spent on the review process, particularly if any potential issues with mapped CEEC units were identified. Consequently the subject offsets, particularly the additional offsets of Oakleigh/Onavale, Bimbooria and Roseglass, were subject to a more detailed on-ground assessment process than the offsets previously assessed in 2013.

The review procedures encompassed a strong focus on reviewing the key definitions for the *Box-Gum Woodland and Derived Grasslands* CEEC and determining the appropriate field data collection procedures for both the CEEC review and evaluation of fauna species habitats. Additionally, it was a requirement of the review process to consider the quantity and quality of the subject threatened fauna species habitat in accordance with the definitions and guidance provided in section 2C of the document 'How to use the Offsets Assessment Guide.'

The main limitation to the field assessment process in 2013 was associated with the seasonal conditions, with the timing of the review period coinciding with a prolonged period of drought in both the Project Site and the offset properties. These conditions continued throughout the 2014 review period, the exception being for the Wongala Offset, which is located within a higher rainfall area than the other subject offsets. The area had also received good rainfall in late 2013 and early 2014. The drought conditions were

similar however for both the Project Site and other offset properties and some allowance for the seasonally poor conditions was therefore incorporated into the assessment process.

Key Peer Review Outcomes

Box-Gum Woodland and Derived Grasslands

Plot data was somewhat limited for the subject offsets as most areas had been subject to either desktop assessments as part of the Ecological Impact Assessment process, or preliminary on-ground assessments. The exception to this was for the Roseglass Offset, which had been subject to more detailed data collection procedures in 2011 by Niche Environment and Heritage. Desktop comparisons of available plot data with both mapped vegetation community units and conformance to the CEEC criteria (where applicable) found the majority of plot data to correspond with the mapped units, but some amendments to the offset map units, and thus to the offset areas, were required. This entailed some additions to the area of CEEC and some losses.

Based on the assessments conducted for the 2013 Independent Peer Review, there was a shortfall of approximately 58 ha of CEEC in the areas provided by the combined Eastern, Western, Northern and the Shared Offset. This shortfall however, seemed to be more than compensated for by an additional 729 ha of Box-Gum Woodland and Derived Grassland provided by the combined Additional Offsets. The ground-truthing of the subject offsets secured by Whitehaven and subsequent assessments of these offsets indicated that the majority of areas inspected conformed to the definition of the CEEC, with some sectors of non-conformance. The CEEC was mostly represented by White Box communities in all offsets in the vicinity of the Project Site and to the east, as well as in the southern portion of the Wongala Offset. In the northern sector of the Wongala Offset, the CEEC was represented by Yellow Box-Blakely's Red Gum communities.

The on-ground assessments and associated data analysis also indicated that some areas did not conform to the CEEC definition and more mapping revisions were required. Such revisions were minor for the majority of the subject offsets but were more substantial for the Bimbooria and Roseglass properties. Non-conforming areas were excluded from the CEEC areas, with the total area of the community recalculated accordingly for the offset properties. With the subsequent securing of the Wongala Offset by Whitehaven, the total area of the CEEC to be provided as offsets for the Project is therefore 5,660 ha, comprising 1,862 ha of low to moderate condition CEEC (Derived Native Grassland) and 3,798 ha of good condition CEEC (Box-Gum Woodland).

Threatened Fauna

Swift Parrot

Surveys conducted by Cumberland Ecology for the EIA yielded no records of the Swift Parrot from either the Project site or from any offset areas and surveys conducted on the Roseglass property by Niche Environment and Heritage also yielded no records. The

Project Site however, was recognised during the EIA process as providing potential stepping stone habitat for the species between larger expanses of vegetation to the west and north. Potential foraging habitat identified for the Swift Parrot within the Project Site encompassed all forest and woodland types occurring within the general box–ironbark habitat.

The majority of woodland/forest habitat occurring on the subject offset properties was considered to represent suitable foraging habitat for the Swift Parrot equivalent to, or better quality than, the habitats represented within the Project Site. Although some sectors of the offset properties potentially support fewer large mature trees/ha than the Project Site, mature trees are well represented in many of the offset habitats. Forage tree species are also very well represented within all offset areas. Any potential lower habitat value arising from a lower density representation of large mature trees on some properties is considered to be counterbalanced by the following factors provided by the combined offset properties:

- More extensive representation of drainage line habitat, including sheltered watercourses encompassed by the favoured box–ironbark habitat;
- Extensive occurrence of Yellow Box on the Wongala offset, including sectors supporting numerous medium to large mature trees and providing substantial alternative good quality forage habitat; and
- Direct habitat linkages of the Wongala Offset, in combination with the Northern Offset, with Mount Kaputar National Park to the west, where the species has been recorded previously.

Additional large areas of open woodland, small habitat patches and vegetated drainage lines within the offset properties also represent low to moderate condition habitat for the species equivalent or better in habitat value than the low to moderate condition habitat occurring within the Project site.

The total offset habitat comprises 7,379 ha of good condition habitat, the majority of which provides suitable foraging and/or roosting habitat for the Swift Parrot and 5,539 ha of low to moderate condition habitat, representing varying levels of habitat value to this species. The low to moderate condition habitat incorporates woodland/ forest areas with lower quality understorey or ground cover development and small vegetation patches that also would provide some potential foraging habitat for the Swift Parrot, equivalent to the lower quality habitat of the project site.

The potential for habitat value to be affected adversely in the long term by dense cypress pine regeneration applies to the Project Site and offset properties alike.

Regent Honeyeater

The EIA surveys yielded no records of the Regent Honeyeater from either the Project Site or the offset areas and no other surveys recently conducted in the area, encompassing the subject offsets, have detected the species. There is one record however, a few kilometres

to the south of the Roseglass offset and all of the lower offset properties are within the historical range of the species. Additionally, the Wongala Offset, in conjunction with the Northern Offsets, is within the vicinity of one of the four key known breeding areas for the species – the Barraba–Bundarra area. Potential foraging habitat was identified for the Regent Honeyeater within the Project Site and encompassed all forest and woodland types within the general box–ironbark habitat.

The majority of woodland/forest habitat occurring on the offset properties is considered to represent suitable foraging habitat for the Regent Honeyeater of equivalent quality to the habitats represented within the Project Site. Although some sectors of the offset properties potentially support fewer large mature trees/ha than the Project Site, mature trees are well represented in most sectors. Other key habitat features provided by the subject offsets include:

- Extensive representation of drainage lines, including sheltered drainage lines encompassed by the favoured box–ironbark habitat;
- Sectors of drainage lines in the Eastern Offsets supporting River Red Gum, a known major source of the favoured food resource of lerps for the Regent Honeyeater;
- The occurrence of both Blakely's Red Gum and Rough-barked Apple, known resources for lerps for Regent Honeyeater;
- Direct connections with larger vegetation remnants and the Bimbooria and Roseglass Offsets, although as for Leard State Forest and the Project Site, these areas are fragmented at a regional level; and
- Direct connections between the Wongala Offset and the large tracts of habitat associated with Mount Kaputar National Park, as well as habitat in the Northern Offsets to the east.

The total offset habitat comprises 7,379 ha of good condition habitat, the majority of which provides suitable foraging and/or roosting habitat for the Regent Honeyeater and 5,539 ha of low to moderate condition habitat, representing varying levels of habitat value to this species. The low to moderate condition habitat incorporates woodland/ forest areas with lower quality understorey or ground cover development and small vegetation patches that also provide some potential foraging habitat for the Regent Honeyeater, equivalent to the lower quality habitat of the Project Site.

South-eastern Long-eared Bat

Records of the South-eastern Long-eared Bat were detected from within Leard State Forest during the EIA surveys and the removal of 1665 ha of woodland/forest habitat for the Project was recognised as likely to have a significant impact on the local occurrence of the species. Other records for the species closest to either the Project Site or offsets are from the Mount Kaputar National Park, in habitat immediately adjacent to the southern sector

of the Wongala Offset, and from the Leard State Conservation Area, adjoining parts of the Eastern Offsets.

Large portions of the woodland/forest habitat occurring on the offset properties represent suitable foraging habitat for the South-eastern Long-eared Bat and are of equivalent or better quality overall than the habitats represented within the Project Site. This assessment takes into account all habitat features assessed. Although some of the offset properties may support a lower density of old-growth trees in many sectors and a corresponding lower average hollow density than the Project Site, mature trees are well represented in most offset woodland/forest habitats, and many provide roosting potential for the species. In addition, the larger offset properties of Bimbooria, Roseglass and Wongala have yielded high values generally for the key habitat attributes for the subject microbat that are comparable to or higher than the same values for the Project Site. In this context, it is important to note that the Project Site also includes some semi-cleared/cleared grazing lands to the west.

Habitat features representing favourable habitat for the South-eastern Long-eared Bat and well represented within the offset properties include:

- Good representation of suitable roosting sites for the species in the form of tree hollows of varying sizes, dense foliage along some gully lines or in habitat supporting vine thicket, loose bark or fissures, particularly on large/old growth ironbarks and cypress pines or on dead specimens gradually shedding bark;
- The occurrence of large habitat patches (Shared Offset, Roseglass, Bimbooria and Wongala);
- Connectivity with very large areas of high quality known habitat (Bimbooria/Roseglass with Boonalla Conservation Area; Wongala with Mount Kaputar National Park);
- Prevalence of dense/complex shrubby habitat (Shared Offset, Bimbooria, Roseglass and Wongala);
- Presence of high quality roosting site habitat (Cattle Plains, Shared Offset, Bimbooria, Roseglass and Wongala); and
- Occurrence of high quality drainage line habitat (Cattle Plains, Shared Offset, Roseglass and Wongala).

Conclusions

The results from the combined desktop assessments, field inspections, surveys and data analysis has led to the conclusion that the proposed offset package complies with Conditions 9, 10 and 12, providing that the additional offset properties of Oakleigh/Onavale, Roseglass, Bimbooria and Wongala are included as offsets. Reviews of the quantity and condition class of the *White Box–Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* CEEC determined that most areas of offset

vegetation conformed to the CEEC definition but some further mapping amendments and associated adjustments to the offset calculations were required. With the inclusion of all additional offsets in the offset package, providing a further 831 ha of CEEC, the requirement for the Maules Creek offsets to provide a total of 5,532 ha of the CEEC is fulfilled. The total area of CEEC provided is 5,660, comprising 1,862 ha of low to moderate condition CEEC (Derived Native Grassland) and 3,798 ha of good condition CEEC (Box-Gum Woodland).

As for the CEEC assessments, the desktop assessments confirmed the vegetation community mapping, relevant to habitat for the Regent Honeyeater, Swift Parrot and South-eastern Long-eared Bat, to be reasonably accurate, albeit with some minor adjustments to habitat areas required. In conjunction with the habitat provided by the inclusion of the additional offsets, the total quantity of offset habitat provided is 12,918 ha, complying with the 9,334 ha specified in the Approval Conditions. This total comprises 7,379 ha of good condition habitat suitable for the subject threatened fauna species combined and 5,539ha of low to moderate condition habitat, representing varying levels of habitat value to these species. The low to moderate condition habitat incorporates woodland/ forest areas with lower quality understorey or ground cover development, small vegetation patches and other vegetation types that would provide some potential as foraging habitat for one or more of the Swift Parrot, Regent Honeyeater and/or South-eastern Long-eared Bat, equivalent to the lower quality habitat of the Project Site.

The overall conclusion therefore is that the review process, incorporating adjustments to map units and area calculations as was determined to be appropriate, has verified that the offsets comply overall with the requirement for equivalent or better quality CEEC and threatened fauna habitat as required under the Approval Conditions.

Recommendations

For the purposes of development and ongoing management of the offset properties, it is recommended that the final vegetation and habitat mapping for these properties encompass the amendments undertaken as part of the 2013 and 2014 review process. It would be appropriate that updated management plans for the CEEC and threatened fauna species habitats also take account of this mapping. It is also recommended that a range of integrated weed and feral pest management measures be incorporated into the proposed management strategies for the offset properties to enhance offset biodiversity outcomes.

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Chapter

1

Introduction

1.1 BACKGROUND

Greenloaning Biostudies (Greenloaning) was commissioned by Whitehaven Coal Limited (Whitehaven) in June 2013 to undertake an independent review of the condition and quantity of proposed biodiversity offsets for the Maules Creek Mine Project (the Project) near Boggabri, NSW. The review was required as part of the Commonwealth Conditions of Consent for the Project (Department of Sustainability, Environment, Water, Population and Communities, [DSEWPAC] 2013) under s 130(1) and 133 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act). Condition 10 states that:

> *'The person taking the action must verify through **independent review** the quantity and **condition class** of White Box – Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community and the quantity and quality of habitat for the regent honeyeater, swift parrot and greater long-eared bat within all proposed **offset areas** including those proposed in the Environmental Assessment, as defined in Attachment C of these conditions, and any additional offsets as required at condition 9….'*

Condition 10 also requires that the offsets must meet the requirements prescribed in Conditions 9, 12a and 12b of the Approval. Condition 9 dictates the total amount of Critically Endangered Ecological Community (CEEC) and habitats that must be provided, either separately or combined if appropriate, viz:

> *'a. 9,334 ha of an equivalent or better quality of habitat for the regent honeyeater, swift parrot and greater-long-eared bat; and*
>
> *b. 5,532 ha of an equivalent or better quality of the White Box-Yellow Box-Blakely's Red Gum Woodland and Derived Grassland ecological Community.'*

Condition 12 prescribes the necessity for the offset areas to be of equivalent or better quality overall than the areas to be cleared, meaning that:

a. *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, 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 the other relevant ecological attributes;*

b. *for the threatened species, 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.'*

A total area of 2,177.44 of vegetation is to be cleared, comprising:

- 1,164.85 ha of native forest and woodland;
- 86.48 ha of Derived Native Grassland; and
- 426.11 ha of exotic grassland.

The total area of CEEC to be cleared within the total clearing is 544.47 ha, comprising:

- 457.99 ha of Box Gum Woodland; and
- 86.48 ha of Derived Native Grassland.

The required Independent Peer Review was subsequently carried out by Greenloaning during the latter half of 2013 and the Independent Peer Review Report (Greenloaning Biostudies, 2013) was submitted to the Department of Environment (DoE) on the 27th December 2013, in compliance with the Condition 10 requirement that :

*…Details of all independently verified **offset areas** must be submitted to the **Minister** for approval by 30 December 2013…*

Under Condition 11, if the review found that the (then) current offset areas did not meet fully the requirements of Conditions 9, 10 and 12, additional offset areas were to be provided to the extent necessary to ensure compliance. In November 2013, Greenloaning advised Whitehaven that, at that stage of the review process, the package of proposed offset areas contained a lesser quantity of offset areas than required under Condition 9.

This shortfall arose from a combination of two key factors. Firstly, mapping refinements were required in some areas where the vegetation community or condition did not conform to the definition of the *White Box – Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community* (Box-Gum Woodland CEEC), as required under Condition 12a.

Secondly, there were some areas of habitat that were considered to be of lower quality than required under Condition 12b, generally as a result of degradation from overuse by domestic stock and/or feral pest animals. These areas were either excluded from the offset habitat area total or included in the lower condition class.

On the basis of these assessments and identification of a shortfall in the total offset areas, Greenloaning recommended that additional offsets would be required in order to comply with the Approval Conditions. In response to this recommendation, Whitehaven proposed three additional properties for inclusion within the offsets package:

e) Oakleigh/Onavale

f) Roseglass; and

g) Bimbooria.

Owing to a range of factors however, that either delayed, hindered or extended Greenloaning's fieldwork schedule, the capacity for assessing the extent and condition of the CEEC and threatened fauna habitats within the additional offset properties, whilst meeting the statutory deadline of the 30th December, was limited to desktop assessments. These assessments were applied to the three additional properties.

This desktop assessment process also was applied to five of the original properties included in the Eastern/Western Offset component of the Maules Creek offset package that were unable to be accessed prior to the December 2013 deadline, owing to either time constraints or issues with property access. These properties are clearly shown as not accessed on **Figure C.1** of the Independent Peer Review Report and comprise:

f) Blue Range;

g) Cattle Plain;

h) Olivedeen;

i) Teston North; and

j) Tralee.

The Shared Offset property also was not accessed prior to the December 2013 deadline, owing to the same constraints as outlined above.

It was recommended, however at **Section 7.2.1** of the December 2013 report that field assessments of the additional offsets be undertaken, following the same verification processes employed for the 2013 peer review field assessments. In response to this recommendation, Whitehaven requested that Greenloaning conduct field assessments, not only of the additional offsets, but also of the six original offset properties not subject to field inspections/surveys.

1.2 PURPOSE OF REPORT AND APPROACH TO THE REVIEW PROCESS

The purpose of this report is to verify the attributes identified within the additional offset properties and the six original offset properties not subject to field inspections/surveys (henceforth referred to collectively as the Subject Offset Properties) (refer to **Figure 1.1**). As for the 2013 Independent Peer Review, the assessment process is designed to examine the extent to which these attributes may, or may not, conform to the offset requirements as stipulated in Conditions 9, 10 and 12 for the Project Approval and provide verification, if appropriate, that the amended offset package is in compliance overall with the Approval Conditions.

As stated in the December 2013 report, the peer review and associated assessments have not been prepared within a framework of either support for, or opposition to the Maules Creek project, nor is the purpose of the review to examine the benefits or otherwise, as may be perceived by the various stakeholders, of the concept of offsets per se. The two

key tasks of the review focus on the requirements of the Approval Conditions: firstly to review the level of compliance of the proposed offsets as presented in Attachment A of the conditions; and secondly, to provide advice to Whitehaven regarding matters in which the offsets may not be compliant such that additional offsets may be provided, as per Condition 11.

The review process takes into account the most recent ecological studies and assessments undertaken for the Maules Creek Project that are relevant to the offsets package. A summary of the key aspects of the Project and offset provisions are presented in **Section 1.3** of the December 2013 report**.** Key attributes of the Maules Creek Project Site and offsets to be provided, including the additional offsets, are outlined in **Section 1.4** of the December 2013 report**.** Details of the properties that are now the subject of this Verification Report are provided in **Section 1.3** of this report. Details on a fourth additional offset, Wongala, added to the offset package on the basis of field assessments of the other subject offsets, are also provided in **Section 1.3**.

Details on the procedures employed for the additional verification review process and the understanding of the relevant definitions is provided in Chapter 2 of this document.

1.3 KEY ATTRIBUTES OF ORIGINAL OFFSET PROPERTIES NOT PREVIOUSLY ACCESSED AND ADDITIONAL OFFSETS

1.3.1 Eastern/Western Offsets

Five of the Subject Offset Properties form part of the Eastern/Western Offsets and occur within the same landscape as the Project Site, as well as adjoining, in part, the Project Site/Leard State Forest (refer to **Figure 1.1**). The Eastern/Western Offsets are primarily located on relatively moderate terrain, albeit with occasional rocky outcrops, such as on the Cattle Plains property. The topographical features of the properties are most similar to the north-eastern and north-western sectors of the Project Site. The vegetation studies and associated mapping undertaken for the Eastern/Western Offsets (Cumberland Ecology 2011, 2013a) indicate that the main communities identified in this area comprise:

Communities Determined by EIA as Conforming to CEEC Criteria

- *White Box-White Cypress Pine Grassy Woodland;* and
- *White Box-Blakely's Red Gum-Melaleuca Riparian Forest*.

Other Communities

- *Pilliga Box-Poplar Box-Narrow-leaved Ironbark-White Cypress Pine Grassy Open Woodland;*
- *Dwyer's Red Gum-Ironbark Woodland;*

- *Silver-leaved Ironbark Heathy Woodland;* and
- *Melaleuca Riparian Forest.*

The Eastern/Western Offsets also encompass large areas of cultivated lands. A full list of the communities identified for the Eastern/Western Offset properties and the area of each community as mapped by Cumberland Ecology, is provided in **Appendix A**. The extent and distribution of these communities, as mapped for the EIA, is shown in **Appendix B**, **Figure B1**.

A number of the communities occurring within the Eastern/Western Offsets have been identified as potential habitat for the Swift Parrot and Regent Honeyeater, whilst the *White Box - Narrow-leaved Ironbark - White Cypress Pine Grassy Open Forests* and the *Dwyer's Red Gum - Ironbark Woodland* have been identified as potential habitat for the South-eastern Long-eared Bat.

1.3.2 The Shared Offset

One property included in the offsets package for the Maules Creek Project is under shared ownership with Boggabri Coal and is referred to as the 'Shared Offset.' As for the Eastern/Western Offsets, the Shared Offset property occurs within some proximity to the Project Site. Unlike the Eastern/Western Offsets, however, it is not immediately adjacent, being located approximately six km to the south-west of the main area of the Project Site (refer to **Figure 1.1**). The rail corridor for the Project runs through the centre of the Shared Offset property, dividing the two main vegetation units.

The Shared Offset is located on primarily relatively rugged terrain, at elevations of approximately 250m to 400m. The vegetation studies and associated mapping undertaken in this area (Parsons Brinckerhoff Australia Pty Ltd, 2010) indicate that the main communities identified in this area comprise:

Communities Determined as Conforming to CEEC Criteria

- *White Box - White Cypress Pine Grassy Woodland (poor condition).*

Other Communities

- *White Box - Narrow-leaved Ironbark - White Cypress Pine Shrubby Open Forest;*
- *Dwyer's Red Gum – Woodland;* and
- *Silver-leaved Ironbark Heathy Woodland.*

Small patches of White Cypress Pine regrowth also occur.

The extent of the communities listed above, as mapped for the EIA, is shown in **Figure B.2, Appendix B**.

A number of the communities occurring within the Shared Offset have been identified as potential habitat for the Swift Parrot and Regent Honeyeater, whilst the *White Box - Narrow-leaved Ironbark - White Cypress Pine Grassy Open Forests* and the *Dwyer's Red Gum - Ironbark Woodland* have been identified as potential habitat for the South-eastern Long-eared Bat (Parsons Brinckerhoff, 2010).

1.3.3 Additional Offsets

Since the commencement of the peer review process, four additional properties have been added to the offset package. These properties comprise:

1. Oakleigh/Onavale;
2. Bimbooria;
3. Roseglass; and
4. Wongala.

A brief overview of the attributes of these properties is provided below.

i. Oakleigh/Onavale

These combined offset properties are located immediately adjacent to Leard State Forest on the north-eastern extremity of the forest (refer to **Figure 1.1**). The offsets have been subject to recent broad reconnaissance surveys by Cumberland Ecology and the property descriptions have been drawn from the report on the survey results (Cumberland Ecology, 2013b). The property has been cleared extensively for agricultural purposes but retains some vegetation patches, primarily comprising:

Communities Determined as Conforming to CEEC Criteria

- *White Box-Narrow-leaved Ironbark-White Cypress Pine Grassy Woodland.*

Small patches of other communities not conforming to the CEEC also occur. The distribution of all communities on the site as determined by the recent surveys is shown in **Appendix B**, **Figure B.4**. The Oakleigh/Onavale Offset is located on relatively flat terrain with moderately fertile soils. The location of the offset, in immediate proximity to Leard State Forest, has been described as providing long term biodiversity benefits, with potential to link Leard State Forest, Boggabri and the Nandewar Ranges. However, the potential for the occurrence of threatened species was considered to be limited by the current fragmentation of habitats (Cumberland Ecology, 2013b).

ii. Bimbooria

The Bimbooria Offset is located immediately to the north-east of, and adjoining the Roseglass Offset (refer to **Figure 1.1**). This offset also has been subject to recent broad

reconnaissance surveys by Cumberland Ecology and the property descriptions have been drawn from the report on the survey results (Cumberland Ecology, 2013c). The property has been partially cleared for agricultural purposes but also retains a large vegetation remnant, comprising the following communities:

Communities Determined as Conforming to CEEC Criteria

- *White Box-Narrow-leaved Ironbark-White Cypress Pine Grassy Woodland;*
- *White Box - White Cypress Pine Grassy Woodland;*
- *Red Gum/Ironbark Forests;* and
- *Derived Nativ*e *Grasslands (Box-Gum Woodland*).

Other Communities

- *White Box - Narrow-leaved Ironbark - White Cypress Pine Shrubby Open Forest;*
- *White Cypress Pine Shrubby Open Forest;*
- *Dwyer's Red Gum - Ironbark Woodland;*
- *Silver-leaved Ironbark Heathy Woodland;* and
- *Derived Native Grasslands.*

The distribution of all communities on the site, as determined by the recent surveys, is shown in **Appendix B**, **Figure B.5.** It is noted that the mapping vegetation and habitats was regarded as 'broadly indicative and … likely to change with more detailed study' (Cumberland Ecology 2013c). The Bimbooria Offset is located on relatively rugged terrain along a central ridgeline, partially encompassed by more gentle terrain with moderately fertile soils. The more fertile areas have tended to be utilised for agricultural purposes. The vegetated remnant of the offset links to Boonalla Aboriginal Area to the south and also adjoins another approved offsets to the south-west. The habitats occurring on the property were identified as are likely to provide high quality habitat for fauna, including actual habitat for the Greater Long-eared Bat and potential habitat for the Regent Honeyeater and Swift Parrot (Cumberland Ecology 2013c).

iii. Roseglass

The Roseglass property is located immediately to the east of Vickery State Forest, approximately 15 km to the south-east of Leard State Forest (refer to **Figure 1.1**). A report on the Roseglass property was prepared by Niche Environment and Heritage (2012) as part of the Vickery Coal Project. The report encompassed preliminary vegetation mapping, flora plot surveys threatened fauna habitat assessments and target threatened species surveys for both flora and fauna. The level of survey effort appears to be similar to that undertaken by Cumberland Ecology for the Northern Offsets that were subject to the

2013 Independent Peer Review process. A total of 11 main vegetation types were identified on the property, subdivided into 20 condition states. Key vegetation communities, including those most represented on the property comprised:

Communities Determined as Conforming to CEEC Criteria

- *White Box- Grassy Woodland – semi-cleared;*
- *White Box-Wilga-Quinine – semi-cleared;* and
- *White Box-Wilga-Quinine Derived Native Pasture.*

Other Communities

- *Narrow-leaved Ironbark-White Cypress Pine Shrubby Open Forest;*
- *Narrow-leaved Ironbark-White Cypress Pine Shrubby/Grassy Open Forest – semi-cleared*
- *Narrow-leaved Ironbark-White Cypress Pine Shrubby/Grassy Open Forest – Derived Native Pasture*
- *White Box-White Cypress Pine Shrubby Derived Shrubland;*
- *Bracteate Honey-myrtle Riparian Forest – semi-cleared;*
- *Semi-evergreen Vine Thicket;*
- *Belah-Wilga-Rosewood Exotic Pasture;*
- *Metasediment Rock Outcrop Shrubland;*
- *Narrow-leaved Ironbark-Tumbledown Gum - cleared;* and
- *White Box--Tumbledown Gum on Creek Lines.*

Small patches of other communities also were identified, including small areas of derived pasture (grasslands). The extent of the communities listed above, as mapped for the EIA, is shown in **Appendix B**, **Figure B.3**. The site habitats were recognised in terms of representing potential habitat for both the Regent honeyeater and the South-eastern Long–eared Bat.

iv. Wongala

The Wongala Offset is located immediately to the west of, and adjoining the Wirradale property of the Northern Offset (refer to **Figure 1.1**). This offset has been subject to a broad reconnaissance survey by Cumberland Ecology and the preparation of a preliminary indicative vegetation map (Cumberland Ecology 2013d). The property has been partially cleared for agricultural purposes but also retains substantial patches of

remnant woodland and a large vegetation remnant in the more rugged sectors to the east, south and west. Broad vegetation communities mapped comprise:

Communities Determined as Conforming to CEEC Criteria

- *Box-Gum Woodland*

Other Communities

- *Shrubby Pine/Ironbark/White Box Forest; and*
- *Ribbon Gum.*

The distribution of all communities on the site, as determined by the recent surveys, is shown in **Appendix B**, **Figure B.6**. The central section of the Wongala Offset is located on moderate terrain with more rugged terrain surrounding the central ridgeline on three sides. The more fertile areas have been utilised for agricultural purposes. The western sectors adjoin the Mount Kaputar National Park, as shown on **Figure 1.1**.

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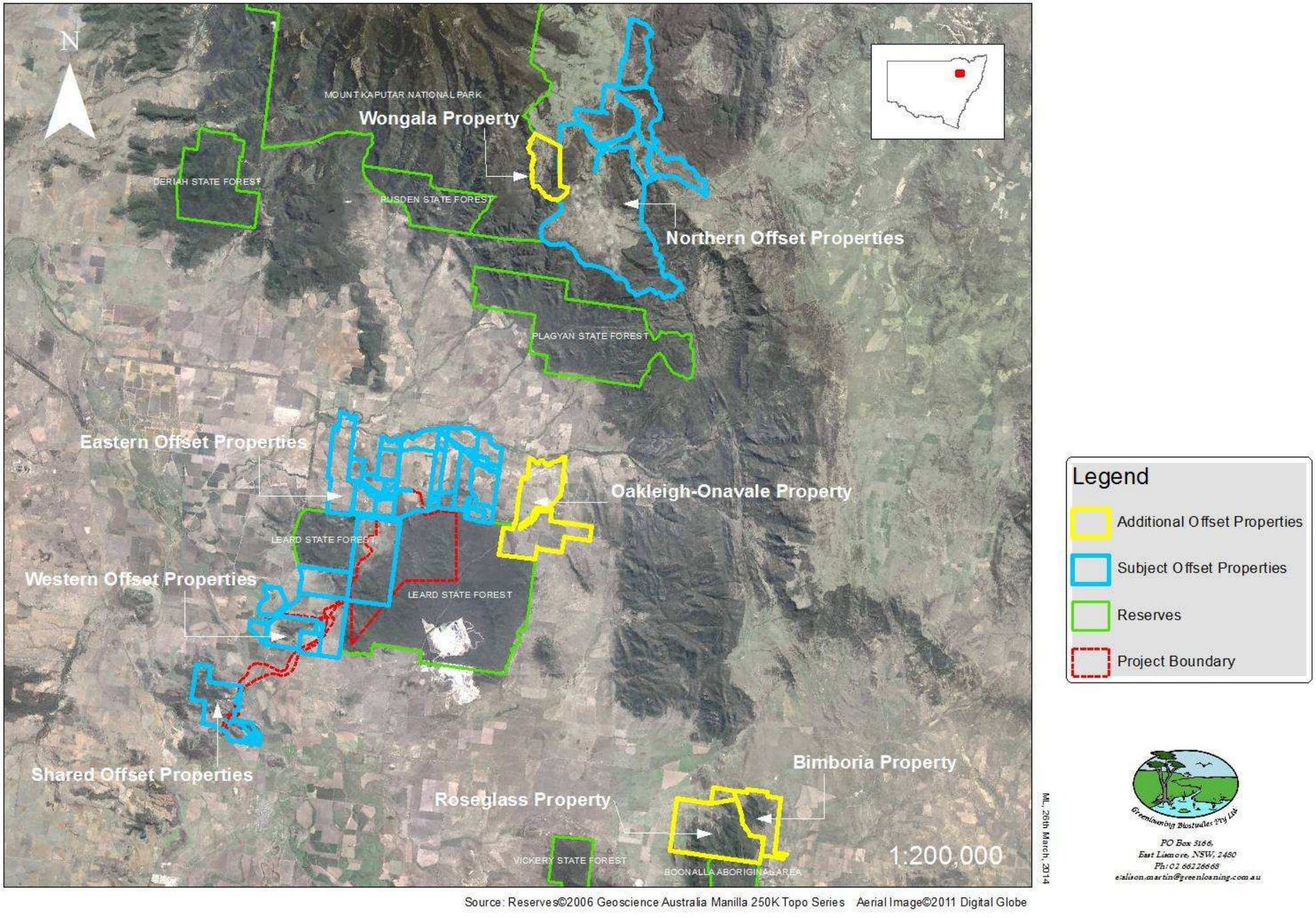

Figure 1.1 LOCATIONS OF PROJECT SITE, ALL OFFSET PROPERTIES AND RESERVES WITHIN PROXIMITY TO THE PROJECT AREA

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Chapter

2

Methodology

2.1 BACKGROUND TO REVIEW PROCEDURES

As indicated in Chapter 1 of the December 2013 report, and reaffirmed in this Verification Report, the focus of the required review is very specific and the range of procedures employed during the review process reflects this focus. The same methods as utilised for the 2013 surveys and assessments were employed for the subsequent surveys and assessments of the subject offset properties and encompassed the following primary procedures:

- Preliminary desktop reviews of available information and sourcing of additional information;
- Initial site inspections;
- Follow-up reviews of relevant documentation on the subject properties;
- Field data collection and assessments;
- GIS Mapping;
- Data Collation and Analysis;
- Preliminary and final assessments of results;
- Review of results and recalculations of areas; and
- Provision of advice to Whitehaven and preparation of final draft report.

A key difference between the 2013 and 2014 surveys and assessments was, in the absence of a statutory deadline, the potential in 2014 for additional site surveys and assessments as was considered appropriate, based on the results of the initial surveys. This factor facilitated a more detailed assessment process for the six original offset properties and the additional offsets than was possible for the December 2013 report. During the course of the field investigations for the Wongala property, the opportunity was also taken to carry out some additional field observations on the Northern Offset properties, although the time for such procedures was very limited. The main area reviewed was the south-western sector of the Wongala property, as access to the south-eastern sector of the Wongala Offset was via the Wirradale property of the Northern Offset. Much of this sector on Wirradale had not been able to be accessed for the purposes of the December 2013 report.

For the Additional Offset Properties and Subject Property review, the following is an approximation on hours spent by Greenloaning personnel and sub-contractors on field and office based procedures:

- More than 260 hours of fieldwork between four Greenloaning personnel (other than Alison Martin, Director, Greenloaning);
- More than 280 hours of fieldwork personally undertaken by Alison Martin and encompassing personal supervision of all other fieldwork;
- A total of approximately 30 days in the field, with Alison Martin and 1 to 2 field assistants/ecologists working average 10 hour days;
- Approximately 380 hours of office work by Greenloaning personnel and GIS sub-consultants on mapping and report preparation; and
- Approximately 200 hours of office work by Alison Martin on mapping and report preparation.

Further details on the procedures employed for both the December 2013 report and this report are provided in the following sections under the relevant headings.

2.2 PRELIMINARY DESKTOP REVIEW AND INITIAL SITE INSPECTIONS

A preliminary review of available information on the original offset areas, assessment processes and relevant mapping was undertaken as part of the 2013 review process to gain an understanding of the extent and key characteristics of the proposed offsets. This process was incorporated into the preliminary reviews for the six original offset properties and the additional offsets, with the desktop assessments focusing on available vegetation mapping and plot data, aerial photographs of the relevant properties and any reports on the offset areas and CEEC condition. Vegetation maps, with survey plot locations where available, are provided in **Appendix** B. Following the initial desktop assessment process, a reconnaissance survey was undertaken to gain an overview of the characteristics of each site and relevant access details. Areas proposed for mining or associated disturbances also were re-inspected briefly in January 2014 and some additional data collected on the Project Site to enable more up-to date comparisons with the offset vegetation and habitat condition. This was considered particularly relevant in view of the severe and prolonged drought conditions prevailing during most of the 2013 and 2014 review period. Survey point locations are shown on the maps provided in **Appendix C** and photographs of the Project Site habitats, illustrating the extent of moisture stress on plant communities during the survey period, are provided in **Appendix D**.

The offset areas were subsequently surveyed to review the specific attributes of each area, some of the identified key vegetation boundaries and general condition of habitats, and to gain some site and access familiarity. In the case of the Eastern Offset properties known as Blue Range and Cattle Plains, only one site inspection/survey was undertaken as the

offset vegetation/habitat on each of these properties was small in extent and also readily accessible.

2.3 FOLLOW-UP REVIEWS

Following the initial site inspections, as well as throughout the review period, data collected was assessed and available reports on the offset properties reviewed. Sources of information for the follow-up review process included:

- Ecological Assessment (Cumberland Ecology, 2011);
- Biodiversity Offset Strategy for the Shared Offset (Parsons Brinkerhoff 2010);
- Preliminary reports and vegetation mapping on the Oakleigh/Onavale and Bimbooria properties (Cumberland Ecology, 2013b and 2013c);
- Preliminary vegetation mapping of the Wongala property (Cumberland Ecology 2013d)
- Flora and Fauna Assessment Report on the Roseglass Offset Property (Niche Environment and Heritage, 2012);
- Biodiversity Management Plan (Revision Date 18 June 2013) (Cumberland Ecology, 2013a);
- Draft Recovery Plan for the Regent Honeyeater (Ingwersen et al., 2013);
- Vegetation plot data for the Project Site and offset properties from which plot data was collected;
- Mapped locations of vegetation plots (refer to **Figures C.1 – C.6 Appendix C)**;and plot coordinates;
- Topographical maps (1:25000) of the offset areas; and
- Regional Vegetation and Soil Mapping (OEH, 2012).

Additional documents subject to additional reviews for the purposes of this Verification Report included available recovery plans for the CEEC and the Swift Parrot, Listing/Conservation Advice documents for the CEEC, the EPBC Policy Statement for assessing the Box-Gum Woodland and Derived Grasslands and threatened fauna species and species/community profiles and/or fact sheets. Other reference material referred to during the course of the studies is listed under 'References and Bibliography'. This material included, inter alia, various reports and appendices providing specialists' advice and comments as prepared by, or on behalf of, the Northern Inland Council for the Environment (NICE). Matters contained within these documents and relating to the Maules Creek offsets will be discussed under the individual assessments for the subject

CEEC and threatened species (refer to **Chapters 3-6**) as may be relevant. Reference was also made to the Report on the Botany, Wildlife and Ecology of the Leard State Forest (James B Croft and Associates, 1979), compiled in the late 1970s by the author of this Verification Report, particularly in relation to the historical context of the Project Site.

The desktop assessment process also incorporated a review of both Cumberland and Niche plot data and verification of whether recorded attributes conformed to the definitions and criteria described in the following section. This process involved summarising all vegetation plot data for the Project Site and offset areas and each plot summary checked against both the key CEEC attributes (refer to **Section 2.3.1**) and the location of the plot in relation to the vegetation community mapping prepared for the Project (refer to **Appendix B)**. This process was only relevant for those offset areas that had been subject to specific, more detailed surveys and from which plot data had been collected.

As the underlying basis for the CEEC assessment process is the Listing Advice for the community, and the definitions and criteria contained therein, the manner in which the Listing Advice definitions were interpreted and followed for the purposes of the review process have been explained in some detail in **Section 2.3.1** of the Greenloaning December 2013 report. The same interpretations and procedures as applied to the 2013 review process were followed for the 2014 assessments. Some key aspects of the approach to determining the conformity of vegetation communities to the CEEC are outlined below.

2.3.1 Key Definitions and Criteria

i. Box-Gum Woodland and Derived Grasslands

a. Key Characteristics and Habitat Requirements

The key characteristics of the Box-Gum Woodland and Derived Grasslands, as listed and defined under the EPBC Act comprise:

- The dominance, **or** prior dominance of White Box (*Eucalyptus albens*), Yellow Box *(E. melliodora*) **or** Blakely's Red Gum (*E. blakelyi*);
- The presence of a species-rich understorey of native tussock grasses and herbs; and
- Scattered shrubs, as opposed to a dense, continuous shrub cover (Threatened Species Scientific Committee, 2006).

By definition, a 'patch' of the CEEC is considered to be 'a continuous area containing the ecological community' and excludes other woodland vegetation of a different type. A patch must also comprise at least five trees, with individual trees separated by no greater distance than 75 m, or be an area dominated by a predominantly native understory, with the patch taken to be whichever of these two scenarios represents the larger area.

Further, a patch must have a predominantly native understorey.

For the purposes of this review, it is important to note that the **prior dominance** of any one of the above tree species characteristic of the CEEC could be indicative of the occurrence of the Box–Gum Woodland. Further background on this aspect of vegetation communities on the various offset properties was sought from long term landholders where possible during the course of the review process. The listing advice also states the potential for a number of other tree species to be associated, or occasionally co-dominant with the three Box -Gum Woodland species, such species, including, inter alia, Apple Box (*E. bridgesiana*), Red Stringybark (*E. macrorhyncha*), White Cypress Pine *(Callitris glaucophylla*) and Kurrajong (*Brachychiton populneus).*

Given that it was determined that both the White Box Grassy Woodland and the Yellow Box-Red Gum Grassy Woodland were 'sufficiently similar and intermixed to merit listing as a single entity,' it suggests that: 1) the CEEC is likely to exhibit an intermixing of the dominant species; and 2) the two woodland types are considered to be interchangeable as part of the CEEC. The Listing Advice also indicates that the occurrence of the subject CEEC can be from altitudes of 170-1299 metres, within areas experiencing 400-1200 mm per annum and on moderate to high fertility soils.

Taking the above factors into account, it is apparent that there is allowance for a wide variation in distribution and habitat features for the CEEC. Within the defined parameters, any occurrence of the three diagnostic species as a dominant or co-dominant, in combination with a native grassy understorey and sparse or patchy shrub cover, thus was considered representative of the Box-Gum Woodland CEEC. In addition, where one of these species was clearly a dominant species within an area, the absence of this species from small patches of vegetation within the larger extent of vegetation was therefore not necessarily taken as a reason for excluding such small patches. In this respect, before an area mapped as CEEC was excised from this map unit, a number of other factors also were taken into account, as explained further in **Section 2.2.2**ii**.**

b. Structural Features

Further to the above characteristics, the overall structure is defined as woodland by the naming of the community. The Listing Advice also states that tree-cover is generally discontinuous, with widely-spaced trees of medium height in which the canopies are clearly separated (Threatened Species Scientific Committee, 2006). The use of the term 'generally' however, suggests some allowance for variation, as could be expected with any community and some communities listed as representatives of the CEEC within the Listing Advice are listed as forest communities.[1] Additional variation in structure is provided, both in the Listing Advice and in the Policy Statement for the community (Department of the Environment and Heritage [DEH] 2006), whereby the community conforms to the CEEC definition if there is 'natural regeneration of the overstorey

[1] Refer to **Table 2** in the Commonwealth Listing Advice

eucalypts.'[2] On this basis, a reasonably flexible approach has been taken in assessing the occurrence of the CEEC according to overall structure. This approach also was adopted on the basis of observations and data collected from the Project Site, whereby a range of structural variations in canopy cover, from open woodland, woodland and open forest, was evident. It is also noted that the Policy Statement defines a mature tree as having a circumference of at least 125 cm at 130 cm above the ground. This has been taken to equate to approximately 40cm dbh,[3] a tree's diameter being more readily estimated in the field during rapid assessment procedures.

ii. Understorey Features

A critical component of the CEEC definition is the composition of the understorey, both in relation to shrub cover and the ground cover stratum. Key aspects to consider with regard to shrub cover comprise:

- The overall percentage cover of shrubs within a patch of CEEC, with patches supporting over 30 per cent shrubcover deemed not to conform to the community definition;
- The extent of shrub cover can be patchy within a remnant and the remnant still conform to the CEEC definition (Threatened Species Scientific Committee, 2006); and
- A patch is defined as a continuous area supporting the CEEC and excludes areas dominated by other species (DEH, 2006).

There are also a number of factors to consider with regard to the ground cover species: Firstly, there needs to be a dominance of native tussock grasses, although the extent of cover can be expected to vary with season, as discussed later in this Chapter (see **Section 2.7**). Secondly, there is a requirement for at least 50 per cent of the ground cover to comprise native perennial species and thirdly, at least 12 species of native non-grassy understorey species need to be present to provide sufficiently high diversity to conform to the CEEC. Additionally, at least one of the herb species present should comprise an 'important species' as listed for the CEEC.

All of these factors therefore needed to form an integral part of both the desktop and field assessment processes, as described in **Section 2.4**.

[2] This item forms part of the flowchart to assist landowners in determining the occurrence of the CEEC on their property.

[3] Diameter at breast height.

iii. Criteria for Threatened Fauna Species

The criteria for assessing the extent and condition of habitat had a number of similarities for all three subject species, but also some dissimilarity. The feature with greatest commonality for all three species was considered to be the presence of mature tree species (Saunders and Tzaros, 2011; Ingwersen et al., 2013; Schulz and Lumsden, 2010). These would have the potential to provide adequate nectar resources for the Swift Parrot and Regent Honeyeater and potential roost sites and sources of insect resources for the South-eastern Long-eared Bat. Drainage lines also seem to be favoured by all three species. Other features considered for each species included:

- Swift Parrot
  - Occurrence of favoured box-ironbark and grassy woodlands, including White Box woodlands, as foraging resources;
  - Large and small forest remnants.
- Regent Honeyeater – occurrence of box-ironbark communities, with favoured tree species such as the Mugga Ironbark trees (*E. sideroxylon)* and Yellow Box, White Box, Blakely's Red Gum and Broad-leaved Ironbark (*E. fibrosa)* as a foraging resource; and
- South-eastern Long-eared Bat
  - Presence of shrubby habitat apparently favoured as foraging habitat;
  - Presence of tree hollows, exfoliating bark or dense foliage to provided diurnal shelter sites; and
  - Larger tree hollows for maternity sites.

2.4 FIELD ASSESSMENTS

To comply with Condition 10, taking into account all of the factors discussed in **Section 2.3.1,** the field data collection process entailed the following key procedures:

- Strategic checking of a proportion of vegetation plots or the general vicinity of plots sampled by Cumberland Ecology or Niche Environment and Heritage to obtain independent data on the vegetation community characteristics to confirm that such areas conform to the CEEC definitions;
- Similar data collection procedures to be undertaken at a small number of other 20m x 50m plots at randomly or strategically selected locations within areas currently mapped as the CEEC;

- Checking of mapped vegetation boundaries and identifying any adjustment in mapping of the CEEC (either expansion or contraction of areas) that may be appropriate;
- Use of a rapid assessment procedure to check on the condition class of the CEEC;
- Use of rapid assessment pro forma to assess habitat characteristics and quality for the three subject threatened species (Swift Parrot, Regent Honeyeater and Long-eared Bat);
- Use of handheld GPS units, aerial photographs and 1: 25000 topographical maps to locate and mark plot or survey point locations; and
- Photographing of plot and rapid assessment point locations.

Details of the field assessment with regard to properties surveyed and the dates and survey procedures utilised are outlined in **Table 2.1**. Summaries of plot data collected are provided in **Appendix E**.

Table 2.1 DETAILS OF 2014 GREENLOANING VEGETATION SURVEYS

Property	Date	Waypoints	Procedures
Roseglass	17.1.14	440-471	Rapid Assessment, Habitat Assessment, Site photographed, Vehicle/walking survey, Point descriptions
	11.2.14 - 14.2.14	555-639	Rapid Assessment, Habitat Assessment, Site photographed, Vehicle/walking survey, Point descriptions
	23.1.14	481-500, 501-510	Rapid Assessment, Habitat Assessment, Site photographed, Vehicle survey/walking, Point descriptions
	20.2.14 - 23.2.14	640-695	Rapid Assessment, Site photographed, Vehicle/Walking survey, Point descriptions
	3.3.14 - 5.3.14	715-751	Rapid Assessment, Habitat Assessment, Site photographed, Vehicle survey/walking, Point descriptions
Oakleigh Onavale	15.1.14	405-418, 550-554	Rapid Assessment, Habitat Assessment, Site photographed, Vehicle/walking survey, Point descriptions
	10.2.14	"Etrex" 8-13	Rapid Assessment, Habitat Assessment, Site photographed, Vehicle/walking survey, Point descriptions
	11.2.14	550-554	Vehicle/walking survey, Point descriptions
Bimbooria	17.1.14 - 18.1.14	472-480	Rapid Assessment, Habitat Assessment, Site photographed, Vehicle/walking survey, Point descriptions
	23.1.14 - 24.1.14	501-505, 523-536	Rapid Assessment, Habitat Assessment, Site photographed, Vehicle/walking

Table 2.1 DETAILS OF 2014 GREENLOANING VEGETATION SURVEYS

Property	Date	Waypoints	Procedures
			survey, Point descriptions
	23.2.14 - 24.2.14	701-714	Rapid Assessment, Habitat Assessment, Vehicle/walking survey, Point descriptions
	5.3.14 - 7.3.14	752-809	Rapid Assessment, Habitat Assessment, Site photographed, Vehicle/walking survey, Point descriptions
Wongala	14.3.14 - 18.3.14	810-811, 815-840, 843-884	Rapid Assessment, Habitat Assessment, Site photographed, Vehicle/walking survey, Point descriptions, Tree count/transect
	18.3.14	896-906	Rapid Assessment, Habitat Assessment, Vehicle/walking survey, Point descriptions, Tree vegetation plot
Wirradale	14.3.14 - 16.3.14	813,833, 841-842	Vehicle/walking survey, Point descriptions
	18.3.14	885-890, 895, 907-910	Tree vegetation plot, Vehicle/walking survey, Point descriptions
Mt Lindsey	14.3.14 - 16.1.14	812, 832	Vehicle/walking survey, Point descriptions
	18.3.14	891-894	Vehicle/walking survey, Point descriptions, Very Rapid Assessment
Shared Offset	16.1.14	419-430, 434-438	Rapid Assessment, Habitat Assessment, Site photographed, Vehicle/walking survey, Point descriptions
Olivedeen	14.1.14	403-404	Vehicle survey, Point descriptions

Table 2.1 DETAILS OF 2014 GREENLOANING VEGETATION SURVEYS

Property	Date	Waypoints	Procedures
Tralee	14.1.14	399, 541-549	Site Photographed, Rapid Assessment, Point descriptions, Habitat Assessment, Vehicle/walking survey
Teston North	14.1.14	395-398, 400-402	Site Photographed, Rapid Assessment, Point descriptions, Habitat Assessment, Vehicle/walking survey
	11.2.14	537-540	Vehicle survey, Point descriptions
Blue Range	16.1.14	431-433	Site Photographed, Rapid Assessment, Point descriptions
Cattle Plain	24.1.14	518-522	Point descriptions, Habitat Assessment, Vehicle/walking survey, Site Photographed
Leard State Forest	24.1.14	511-515	Rapid Assessment, Habitat Assessment, Vehicle/walking survey, Point descriptions
Teston North Project Area	24.1.14	516-517	Rapid Assessment, Vehicle survey, Point descriptions

2.4.1 *Plot Data Collection*

Data collected from a small number of 20m x 50m plots initially comprised:

- Tree species present and percentage canopy cover at 5 m intervals along a line transect through the centre of the plot;
- Mid–story species present and percentage cover at 5 m intervals along the same line transect;
- Ground cover species and percentage cover at 1 m intervals along the same line transect;
- Number of hollow–bearing trees;
- Number and length of hollow-bearing logs;
- Number of native species occurring within the 20 x 20 m plot, nested within the 20 x 50 m plot;
- Proportion of canopy species that were regenerating; and
- GPS coordinates of the plot location.

2.4.2 *Rapid Assessments*

i. Vegetation Assessments

Given that a key objectives of all field surveys was to inspect and assess as many field locations as possible, rapid assessment procedures for both the CEEC and fauna habitats were employed. Vegetation data collected generally was limited to a compilation of the dominant species in all strata, confirmation that at least 12 native non-grassy ground cover species were present and estimates of percentage cover for all strata. In some locations, cover estimates were more structured and were obtained from 50 m line transects, following the same process for this attribute as for the 20 m x 50 m plots. Tree counts per species were also taken at some plot locations or along transects, with counts categorised into the following age groups:

- Saplings (<5cm diameter);
- Young mature;
- Mature;
- Large mature; and
- Old growth.

As there is no clear definition within the Listing Advice of how large a shrub patch may be, but rather the size of the remnant vegetation patch is to be taken into account, some flexibility in the approach to determining the extent of shrub cover was adopted. Large areas that supported an obviously dense shrub layer, viz: shrubs obscured the visibility of adjoining habitat and/or the ground stratum, and/or obstructed easy walking passage through to adjoining habitat; were classified as shrubby as a matter of course. If, however, such areas of moderately dense to dense shrub cover appeared to be localised, further ground investigations were undertaken to confirm that the shrubs were not part of a large continuous area of shrubby habitat. Such investigations were typically undertaken on foot but if the area in question was adjacent to a vehicle track, some inspections, if considered appropriate, were undertaken from a vehicle.

If these further investigations indicated that the shrub layer was in fact continuous, the area was discounted as conforming to the CEEC. If such shrub patches however, were confirmed as limited in extent, e.g. comprising scattered patches of approximately 5-10m radius within a much larger extent of non-shrubby habitat, the area was not considered to represent shrubby habitat. Similarly, where larger areas of CEEC were present that encompassed much smaller patches of shrubby habitat, the overall remnant was considered to represent the CEEC. On the other hand, where stands of Box-Gum Woodland supporting a dense shrub layer were adjacent to shrubby habitat, these stands were not considered to represent the CEEC but to form part of a larger shrubby remnant.

ii. Vegetation Mapping Procedures

The original vegetation mapping for the offset property was used as a basis for assessing the degree of conformity of the mapped vegetation boundaries to the field situation, bearing in mind that the majority of the original mapping by the various consultants had been of a preliminary nature. For reference, field maps included the original vegetation mapped, printed Google Earth aerial photographic images, printed GIS vegetation layers superimposed over the Google Earth images and 1; 25000 topographical maps. Checking of mapped boundaries was a continuous process during all field surveys, with the additional plot and survey point data collected representing supporting information, rather than being the primary source for mapping of boundaries. Thus during any walking or vehicle traverses of the offset properties, any changes in vegetation type, boundaries of the CEEC etc. that were observed were marked as accurately as possible on the available maps and aerial photographs and GPS locations recorded. These GPS locations were subsequently entered into GIS layers and the mapped locations then used to check and refine as appropriate any mapping boundaries and/or defined map units.

iii. Fauna Habitat Assessment

Rapid fauna habitat assessments were also conducted using two different assessment pro forma. The first involved collection of data on ten attributes comprising:

1. Size of the habitat area/connectivity (context in the landscape);

2. Degree of disturbance (past and current);
3. Maturity of regeneration;
4. Structural complexity;
5. Occurrence of alternative forage/ roosting habitats adjoining sample area;
6. Number of forage habitat species present;
7. Extent of occurrence of old growth trees;
8. Extent of occurrence of hollow–bearing-trees;
9. Extent of occurrence of hollow-bearing logs and ground debris; and
10. Special habitat attributes such as presence of drainage lines/watercourses, extent of shrubby habitat or potential roosting habitat.

Each attribute was scored from 1 to 6, the scores summed and then averaged to provide a basis for comparison. It should be noted that one of the above attributes (attribute five) was inadvertently omitted from the Greenloaning December 2013 report, but all data summaries provided in this report did encompass consideration of this attribute.

The second pro forma more specifically targeted the South-eastern Long–Eared Bat, with the data collected on attributes as follows:

1. Size of habitat/connectivity;
2. Extent of occurrence of old growth trees;
3. Number of hollows readily observed;
4. Extent of presence of loose or shedding bark/dense foliage; and
5. Extent of shrub cover.

As for the first pro forma, each attribute was scored from 1 to 6. This data was used as supporting data for the main fauna habitat assessment data collection process them of assessing values of habitat for the subject threatened microbat species.

It is important to note that the data summary values obtained from the rapid assessment process and in the Greenloaning December 2013 report, are derived from a rapid assessment process from a variable sized dataset which is designed to provide a basis for comparative assessments between habitat areas. The scores obtained are intended to be indicative of both average values and the level of variation in specific habitat attributes, such as the density of old growth trees, hollow-bearing trees and other key features. The overall average habitat value score provides an indicative comparison between one area of habitat and another, taking into account a range of habitat features that are likely to be important to one or more of the subject threatened species, but not necessarily all three

species. Thus the overall assessment of habitat quality discussed in **Sections 4.4, 5.4** and **6.4** of this report, takes into account the overall average habitat value and the values for individual attributes relevant to each subject threatened species.

Rapid checks of ground cover species diversity and visual checking of vegetation mapping boundaries and key structural features subsequently were undertaken within the Eastern/Western Offsets and the Oakleigh/Onavale, Bimbooria and Roseglass Offsets over 2.5 days in early January 2014. Subsequent more detailed field surveys, utilising eared seekers out and in the previous sections, were undertaken throughout January, February and March 2014 as documented in **Table 2.1.**

2.5 DATA COLLATION AND ANALYSIS

Data from the field reconnaissance and subsequent surveys was collated and analysed following each field session, locations mapped and the results assessed and compared against the offset data and mapping. All data was digitally compiled into excel spreadsheets, sorted and summarised according to the key attributes for each verification process. The subsequent desktop assessments following each survey encompassed a review of offset proposal areas, the extent and range of the CEEC representations and target threatened species habitat in each area and the condition classes/habitat quality as assessed. The review process also included consideration of the corresponding assessments for the areas to be impacted by mining and background documents on the subject CEEC and threatened fauna species. Vegetation mapping was reviewed as described in **Section 2.2.2**.

2.6 GIS MAPPING

Vegetation community GIS datasets prepared by Cumberland Ecology for the Eastern/Western Offsets and for the Onavale/Oakleigh, Bimbooria and Wongala properties, and by Niche for the Roseglass Offset property were analysed for any overlap errors that could account for vegetation area discrepancies. Vegetation communities were dissolved using community name (data set a), thereby removing any potential self-overlap. All vegetation communities were also dissolved into one shape (data set b) to determine total vegetation communities mapped, again to remove any overlap. There was no significant discrepancy between the two data sets in terms of area and no significant 'double counting' of vegetation therefore had occurred.

The dissolved vegetation communities were then intersected with the property boundaries to generate areas of each community by property for the offset areas. Areas were provided in an excel pivot table for reporting.

2.7 CEEC AND VEGETATION COMMUNITY MAPPING

Using the printed GIS vegetation layers superimposed over the Google Earth images as a basis, refinements to vegetation boundaries or community classifications were marked up and individual GIS calculations may for each individual refinement. This process was also continuous throughout the review period, such that for the larger offset areas, particularly the Bimbooria and Roseglass properties, a series of refinements were made as more locations on each property were accessed. This process was especially complex for the Roseglass offset as discussed further in **Section 3.3.6.** All variations in calculations for each mapping refinement within each GIS vegetation polygon were entered into a composite spreadsheet linked to the overall offset area calculation spreadsheet. Thus calculations for the total area of both CEEC and fauna habitats were continually updated as additional field data was collected and compiled.

The overall mapping and area calculation has thus been relatively complex and for the proposes of this report, as well as for the Greenloaning December 2013 report, the focus has been on providing updated and ultimately final estimates for the areas of CEEC and threatened fauna habitat to be provided by each offset property. General areas of offset vegetation where the need for mapping refinement was identified and for which areas have been cultivated, are thus indicated on **Figures F.1-F.6,** following the same procedure as adopted for the Greenloaning December 2013 report. Final GIS vegetation layers for all offsets, encompassing all mapping amendments as identified for the purposes of the 2013 and 2014 review process, are currently being compiled and will be subject to a rigorous cross checking process prior to the provision of the final vegetation community maps to Whitehaven.

2.8 DATA REVIEWS AND OFFSET RECALCULATIONS

Reviews of the fully collated data were undertaken and various checks of the data entries made to verify the validity of each dataset. Summary tables of the data were then compiled. Where any variations in offset areas were considered to be required, area calculations were carried out by a GIS specialist. Positive or negative revisions to offset areas were then entered into an Excel spreadsheet to facilitate final calculations and assessments.

The final assessment of the condition class of the CEEC offset areas relied upon the various field assessment procedures, further reference to the relevant definitions in the Listing/Conservation Advice and consideration of ecological benchmark values for the communities (OEH, 2014). Final assessments for the quality of the threatened fauna species' habitat relied on the fauna habitat assessments, further informed by the microbat habitat assessment process. Detailed consideration was also given to the definitions and guidance provided in section 2C of the support document for the *EPBC Act Environmental Offset Policy* (Department of Sustainability, Environment, Water, Populations and Communities [DSEWPaC], 2012). Key aspects of this consideration included the landscape context of the Project Site and the offset habitats and the extent of representation of key habitat attributes for the subject threatened species.

2.9 LIMITATIONS TO THE REVIEW PROCESS

The main limitation to the field assessment process was derived from the adverse seasonal conditions. The timing of the review period coincided with a prolonged period of drought in both the Project Site and all offset areas, although the Wongala Offset, in conjunction with the Northern Offset area, received good rainfall in late 2013 and again in early 2014. The assessment of the Wongala property was therefore greatly facilitated by the much better condition of vegetation in general, in comparison with the severely drought-affected vegetation inspected elsewhere. The prevailing drought conditions also meant that more time had to be spent at each location to record the species present as those that were still evident were often very difficult to recognise from their dried remnants. The situation was similar however for both the Project Site and the offset properties, although the seasonal conditions continued to deteriorate over the survey period. Thus areas surveyed within the Bimbooria and Roseglass properties during February and March 2014 could be expected to have been in worse condition than the areas in the Eastern/Western Offsets and the Project Site expected or surveyed in January 2014. Some allowance for the seasonally poor conditions has therefore been incorporated into the assessment process by focussing on the full range of community attributes and minimising the reliance on individual plant species' identification, unless specific identification was essential. Additionally, in relation to the assessments of conformity to the CEEC, where data collection processes indicated slightly lower ground cover species complements than desirable, where possible data collected previously for that location was also taken into account.

Some additional limitations were associated with the restricted access to the more rugged areas of the Roseglass and Bimbooria properties. The lack of vehicle tracks to many locations, in combination with heatwave conditions, thus prolonged the time required to access some areas.

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Chapter

3

Results - Box Gum Woodland

3.1 RESULTS FROM DESKTOP ASSESSMENTS

3.1.1 Verification of Offset Plot Data and Mapped Vegetation Units

The availability of plot data, for the purpose of desktop comparison with mapped vegetation units, and particularly areas mapped as CEEC, was far more limited for the majority of the Subject Offset Properties than for the previously assessed Eastern/Western and Northern Offsets. A small number of plots were available for data comparison for the Blue Range, Tralee and Teston North properties in the Eastern Offsets and the Shared Offset. No plot data was available for the Cattle Plain or Olivedeen properties in the Eastern/Western Offsets and for the Additional Offsets of Oakleigh/Onavale, Bimbooria and Wongala. It is understood that the lack of data for the Eastern/Western Offset properties is attributable to a lack of available access to these properties at the time of the data collection process for development of the Maules Creek offset package. Desktop assessments, broad scale vegetation mapping, limited ground-truthing and limited quantitative site surveys were undertaken on the Shared Offset (Parsons Brinckerhoff, 2010).

The lack of plot data for the majority of the Additional Offsets is attributable to the preliminary nature of the assessments (Cumberland Ecology, 2013b, 2013c) undertaken on these properties and short timeframe of the reconnaissance surveys (D. Martin, Whitehaven Coal, pers. comm. (6 January 2014). Substantial plot sampling and rapid assessments were undertaken by Niche Environment and Heritage (Niche) for the Roseglass Offset, suggesting a more detailed level of survey undertaken on this property.

Desktop comparisons of the available plot data with both mapped vegetation community units (refer to **Appendix B)** and to the CEEC criteria (where applicable) found the majority of plot data to correspond with the mapped units, but there were also some discrepancies. A number of plots were found to exhibit minor discrepancies with the map units, with some of these being close to mapped community boundaries where some overlap of species could be expected. Four plots within the Roseglass Offset for instance, indicated records of White Box within the mapped areas of *Narrow-leaved Ironbark Shrubby Open Forest* community, but this is a reflection of the limitations of broadly adopted community names, White Box being listed as an associated species within the *Narrow-leaved Ironbark Shrubby Woodland* biometric vegetation type for the Namoi Catchment Management Area (OEH, 2014a), with which the mapped community conforms. It is noted that White Box is listed as a dominant species in the community for the Roseglass Site (Niche Environment and Heritage, 2012).

The available Eastern/Western Offset plot data for areas mapped as good condition CEEC generally conformed to the criteria for diagnostic species' dominance or co-dominance and presence of at least 12 non-grassy native ground cover species, of which at least one represented an important species. One plot (Q25) however, within the mapped *White Box Blakely's Red Gum– Melaleuca Riparian Forest,* had no record of White Box, although Yellow Box was present. The community therefore conformed to the CEEC, but not to the mapped community classification. Data from one other plot (Q26), located within an area mapped as *White Box–White Cypress Pine Grassy Woodland* also was not consistent with representing this map unit, with Dwyer's Red Gum recorded as the dominant species within the plot. No areas of Derived Native Grassland (Box-Gum Woodland) were mapped as occurring within the Eastern/Western Offsets and there were no plots shown as located within areas mapped as low diversity Derived Native Grassland. One plot (Q1) (**Figure B.1** in **Appendix B**) was located within an area mapped as cultivated land on the Blue Range property and the data was consistent with this category, with exotic weed species well represented (Cumberland Ecology, 2011).

By far the highest number of vegetation plots sampled was within the Roseglass Offset, understood to be surveyed by Dr John Hunter[4], subcontracted as lead botanist for the Roseglass surveys by Niche Environment and Heritage. Data was collected from a total of 82 plots, with additional data collected from Rapid Data Points (RDP) (number not specified). There was a reasonable spread of vegetation plots across the site, although there were also some noticeable gaps in coverage in some sectors, particularly in the more rugged sectors. It is understood that there were some access and weather constraints that affected some survey procedures in these areas but the combination of detailed plot sampling, RDP and random meanders was considered by Niche to have provided adequate coverage of the site for the purposes of the study (Niche Environment and Heritage, 2012).

A comparison of the plot data for the Roseglass Offset with the map units indicated good conformance in some areas but also identified a number of discrepancies, particularly in relation to the mapped areas of CEEC. Further examination of the map units provided on **Figure 3** of the Niche report (shown as **Figure B.5** in **Appendix B**), in conjunction with examination of aerial photographs, suggested that there had been an error in the GIS mapping process. Thus the two layers representing Map Unit 18b - *White Box – Wilga – Quinine Semi-cleared* and Map Unit 18c - *White Box – Wilga – Quinine Derived Native Pasture* appeared to have been reversed, such that the mapped grassland areas were located in areas supporting variable but visible tree cover, whilst the mapped 'semi-cleared' areas occurred on the outer edges of the 'Grassland' areas and supported only isolated trees.

Subsequent discussions with the Niche project manager for the Roseglass Offset studies confirmed that there did appear to be an error of this type. This assessment by Greenloaning was further supported by confirmation of the description of Map Unit 3b - *White Box Grassy Woodland – Semi-cleared* as supporting a moderate tree cover in the far south-eastern sector of the Roseglass property. In addition, **Figure 6** in the Niche report

[4] Director of Hewlett Hunter Pty Ltd

clearly shows the outer fringes of the area mapped as CEEC as woodland habitat, rather than the grassland habitat evident from examination of the aerial photograph. The plot data also suggests the same error, with no plot shown as located within the *White Box – Wilga – Quinine Semi-cleared* community supporting any White Box trees, and in most instances there are also no records of any other large tree species within the plot.

Some further discrepancies were identified in relation to a few plots within areas mapped as CEEC. Two key examples of this relate to the Niche flora survey plots 29 and 54. Plot 29 for instance, was recorded as supporting only eight non-grassy native herbs and small shrubs and no species listed as 'important' under the Listing Advice for the CEEC. Similarly, plot 54 was recorded as supporting only nine non-grassy native herbs/small shrubs, although two of these species were listed as 'important.' Plot 22 was also within an area mapped as the CEEC, but plot data indicates the presence of only Narrow-leaved Ironbark in the tree stratum and a native ground cover species of 8. In general, the desktop assessments for the Roseglass Offset suggested the need for a thorough level of field review of the CEEC mapping.

A review of the survey methodology indicated that the field surveys for the Roseglass Offset to determine community floristics, relevant to examining the conformity of vegetation to the CEEC, appear to have been undertaken at appropriate times for seasonal conditions. In fact, it is understood from discussions with the Niche project manager for the Roseglass surveys that the surveys were conducted during very favourable seasonal conditions, as opposed to the drought conditions prevailing at the time of the surveys undertaken for the purposes of this review. It therefore was assumed, for the purposes of this Verification Report that the data collected in 2011 could be assumed to be more representative of ground cover species occurrence than was observed by Greenloaning during the severe drought conditions in 2014.

It was also established, as part of the 2013 review process, that surveys and inspections of the Eastern/Western Offset properties by Cumberland Ecology were undertaken during very favourable seasonal conditions, as were early reconnaissance surveys of the Oakleigh/Onavale Offset. Subsequent reconnaissance surveys by Cumberland Ecology however, of the Oakleigh/Onavale, Bimbooria and Wongala Offset properties, were undertaken during severe drought conditions, although at the time of surveys on Wongala in late December 2013, some plant growth is likely to have been facilitated by a substantial rainfall event a month earlier.[5]

[5] Greenloaning personnel were present in the field during the heavy rainfall event in late November 2013.

3.2 GENERAL FIELD OBSERVATIONS

3.2.1 *Vegetation Condition and Regeneration*

This section provides an outline of the vegetation condition and level of regeneration at each offset property. This needs to be considered in the context of the review requirements, i.e. to compare the condition of the Box-Gum Woodland on the offset properties with the Box-Gum Woodland to be impacted on the Project Site. It therefore should be noted that the review requirements **do not** require comparisons to determine if the offsets provide **'like-for-like'** Box-Gum Woodland Thus, all communities conforming to the EPBC Listing Advice definition for the CEEC were not also expected to represent the same type of representation of the broader Box-Gum Woodland community as occurs within the area of impact, although those mapped occurrences of the CEEC occurring within the same land system as the Project Site, the expected more to approach 'like-for-like' communities. The discussion on the condition of the Box-Gum Woodland occurring on the offset properties thus focuses on the condition of the range of representations of the CEEC in terms of the conformity to the Listing Advice definition and key benchmark attributes.

i. Project Site

Two brief inspections of Leard State Forest on the 8th and 24th of January 2014, indicated that the overall condition of the understorey, in terms of plant vigour, was very poor, having deteriorated further since the 2013 inspections and data collection procedures conducted by Greenloaning. This deterioration in condition was attributable to the prevailing severe drought conditions (refer to photographs in **Appendix D**). Other observations described in the Greenloaning December 2013 report remain valid. Key points relevant to the assessment process for the subject offsets include:

- Plots selected within the Project Site in Leard State Forest as part of the 2013 review process, were selected subjectively during the initial stage of the review process on the basis of the occurrence of better representations of the CEEC, although grass cover in these plots was observed to be relatively sparse;

- A proportion of the CEEC mapped as occurring within the Project Site occurs in more hilly terrain, whilst other sectors are associated with more gentle topography and/or drainage lines;

- There appears to have been extensive understorey regeneration throughout much of the Leard State Forest since the 1970s, including within the Project Site, such that the general appearance of the forest and woodland communities is less open than previously observed by the author of this Verification Report;

- The overall structure of Leard State Forest communities is variable and this was historically the case in the 1970s;

- Past land practices conducted in the forest are likely to have had a major contributing factor to the existing floristics and community structure. Examples of the current characteristics of some of the communities and variations in vegetation structure and attributes are illustrated in the photographs provided in **Appendix D** to this report;

- In some sectors, regeneration comprised primarily juvenile Cypress Pine, suggesting a low fire frequency. It is likely that reduced fire frequency would encourage an increase in understorey growth over time. The observation of increased understorey density does not apply however, to the steeper rocky knolls which have historically often supported dense shrub thickets as observed by the author (James B Croft and Associates, 1979); and

- Some sectors of the Project Site, particularly in the far South Western sector and in the central Western sector of Leard state forest, appeared to represent shrubby habitat although at least part of these areas had been mapped previously as CEEC.

ii. Eastern/Western Offsets

The subject Eastern/Western Offset properties support predominantly low diversity Derived Grasslands and exotic pastures/cultivated land. There are however, some areas of remnant or regenerating woodland vegetation, including some *White Box-Wilga Grassy Woodland,* and patches of *White Box-White Cypress Pine Grassy Woodland,* but the vegetation overall tends to be fragmented. Ground cover in the Eastern/Western Offsets, as for Leard State Forest and the Project Site in general, was exhibiting the effects of the prevailing drought conditions and vegetation condition overall was variable. In the areas determined to conform to the CEEC, which tended to be associated with better quality soils and/or drainage lines of the properties, condition class was rated as moderate to good, albeit with poor vigour at the time of the inspections owing to the drought conditions and concurrent heatwave temperatures.

Dense regeneration of Cypress Pine was evident in some sectors, again suggesting low frequency fire regimes. In particular, the Cattle Plains property was subject to a severe fire within the main vegetated area in the 1960s that destroyed much of the existing woodland (Pers. Comm. Property Owner February 2014). Fire frequency since that time however, appears to have been minimal and Cypress Pine regeneration predominates in one of the areas that previously supported woodland. The majority of the vegetated areas however, comprised White Box dominated woodland, interspersed with some areas supporting ironbarks as dominant or sub-dominant.

iii. Shared Offset

The Shared Offset was observed to support primarily shrubby woodland and forest communities with the small areas of grassland appearing highly degraded. Only small areas of CEEC were observed to occur, with these areas restricted mainly to drainage

lines. As with other properties, vegetation vigour within the Shared Offset was observed to be very poor, particularly with regard to the ground cover and lower strata.

iv. Oakleigh /Onavale

The Oakleigh/Onavale offset is located immediately adjacent to the north-eastern sector of Leard State Forest and is similar in landform and vegetation to both this sector of the forest and the Eastern Offsets. The majority of grassland areas on the offset are either of low diversity or have been cultivated, but some grassland in close proximity to patches of woodland appeared to be in better condition. Although the general vigour of both grassland and woodland communities was very poor owing to the prevailing drought conditions and the time of inspection coinciding with very high temperatures, the general condition of the woodland communities appear to be moderate to good.

v. Bimbooria

As for the Oakleigh/Onavale Offset, the majority of grassland areas on the Bimbooria property appeared to be of low diversity or to have been cultivated, although a few locations were observed to be in better condition. These areas had been mapped however as CEEC. Although the general vigour of both grassland and woodland communities was very poor owing to the prevailing drought conditions and the time of inspection coincided with extreme high temperatures, the general condition of the woodland communities appeared to be moderate to good, with low incidence of weed species other than scattered Prickly Pear and Tiger Pear. These weed species are common to all areas, including the Project Site. The dense regeneration of Cypress Pine however, was observed in a number of areas and appears to have increased in recent years. Feral goats were observed to be present.

vi. Roseglass

The Roseglass Offset was observed to be in similar condition to the Bimbooria property, although grassland areas appeared to be of very low diversity or to have been cultivated in a number of areas, as evidenced by the prevalence of thistles. Woodland/forested areas however, were generally in moderate to good condition, with low incidence of weed incidence other than scattered Prickly Pear and Tiger Pear, this assessment to be viewed in the context of the prevailing drought conditions throughout the period of observations and assessments. The extent of grass cover within the Box-Gum Woodland was variable, but this was also considered to be attributable to the effects from the severe drought conditions. Feral goats also were observed to be present.

vii. Wongala

The Wongala Offset was observed to be in relatively good condition, with the Box–Gum Woodland, represented by both Yellow Box-dominated and White Box–dominated communities, well distributed throughout the central portions of the site. Vigour of both

the Derived native Grassland and Box–Gum Woodland was observed to have been enhanced by substantial rainfall events in late 2013 and also early 2014, as reported by the landholder. Incidence of weeds appeared to be localised and disturbance to some grassland patches by feral pigs was also observed.

3.2.2 General Observations on Offset Mapping Accuracy

i. Eastern/Western Offsets

Mapping of the CEEC on the Eastern/Western Offsets appeared to be relatively accurate in areas that had been accessed during the course of the development of the Maules Creek offset package, although some minor mapping refinements were considered warranted on most properties. The Cattle Plains property was observed to differ from the area mapped, in the extent of CEEC, the difference resulting from the extent of Cypress Pine regeneration and the density of shrubby understory. It is noted that this area was not able to be accessed during the offset development stage of the Maules Creek Project.

ii. Shared Offset

Community mapping of the Shared Offset appeared to be relatively accurate, the majority of the site supporting shrubby habitat and therefore not mapped as CEEC. It was observed that some of the relatively small area mapped as CEEC appeared highly degraded and some mapping refinement was required.

iii. Oakleigh/Onavale

Mapping of the extent of CEEC on the Oakleigh/Onavale offset property appeared to be relatively accurate, facilitated by the comparatively open nature and moderate terrain of the site and relatively easy access to the patches of vegetation present. Some small areas, appearing to be dominated more by Narrow-leaved Ironbark than by White Box, were identified as potentially warranting minor mapping refinements.

iv. Bimbooria

The mapping of the CEEC occurring within the Bimbooria property appeared to be relatively accurate as broad scale mapping, but a number of areas were identified as warranting some amendments to define additional areas of Cypress Pine regeneration, rather than the Box-Gum Woodland. Areas of the CEEC mapped as occurring in the central sectors of the property supporting rugged topography were also identified as likely to require some boundary adjustments, with the potential for some areas to be redefined as shrubby habitat.

v. Roseglass

Given the identified issues with the GIS mapping layers for the Roseglass Offset, initial observations were focused on confirming the relative locations of areas of the Box–Gum Woodland and Derived Native Pasture. Initial observations also suggested there were likely to be some mapping refinements required, including inclusion of some additional areas of Box–Gum Woodland visible from access tracks and exclusion of some areas appearing not to support any representations of the diagnostic species for the Box-Gum Woodland. Observations of a number of the grassland areas also indicated that some refinement to mapping of these areas as the CEEC was required based on the prevalence of thistles throughout substantial patches of grassland and the observed low condition of such areas.

vi. Wongala

Community mapping of the Wongala property appeared to be relatively accurate, likely to have been facilitated by the comparatively open nature and moderate terrain of the central ridge line and clear visibility to adjoining areas from a number of locations. Some more open areas were identified as potentially warranting mapping refinements to define areas of Derived Native Grassland rather than the Box-Gum Woodland.

3.3 RESULTS OF REVIEW PLOT SURVEYS AND RAPID ASSESSMENTS

3.3.1 Project Site

As stated in the Greenloaning December 2013 report, locations previously mapped as CEEC from which plot data and some rapid assessment data was collected within the Project Site for the purposes of the 2013 review, and which remain relevant for the purposes of this Verification Report, conformed to the definition of the CEEC, if allowance is made for the low level of grass cover and herbs in some areas that were subject to plot sampling (refer to photographs in **Appendix D** and data summaries provided in **Appendix E**), with grass cover in these plots ranging from 14-68 per cent (native ground cover benchmark value for the *White Box Grassy Woodland* is 50%). As Leard State Forest vegetation also was suffering adverse effects from the prevailing drought conditions, it seemed reasonable to assume that ground cover would normally be more extensive under less severe seasonal conditions.

The extent of shrub cover was low in the areas sampled, although there was also substantial variation noted in adjacent areas in some sectors, such as at Plot 157. In this location, the plot data indicated only a two per cent shrub cover, whereas the understorey adjacent to the plot had a higher density with patches of over 30 per cent cover observed.

A small number of rapid assessments undertaken in January 2014 confirmed that the level of representation of native herbs and small shrubs in the understory strata was relatively

low. This was attributed to the prevailing and widespread drought conditions affecting all vegetation within both the Project Site and all offset areas.

3.3.2 Eastern/Western Offsets

A number of rapid assessments within the Eastern/Western Offset properties confirmed the occurrence of the CEEC on all properties except the Olivedeen property, on which no CEEC had been mapped as part of the offset package. Some minor refinements to the CEEC mapping boundaries were found to be required on the Teston North and Tralee properties. More substantial revisions were required in respect of the CEEC mapping boundaries for the Cattle Plains property, which had been accessed as part of the EIA surveys. The extent of amendments required is indicated in **Table 3.1**.

Table 3.1 COMPARISON OF ORIGINAL QUANTITIY OF TOTAL CEEC FOR THE SUBJECT EASTERN/WESTERN OFFSETS CALCULATED BY CUMBERLAND ECOLOGY AND TOTAL CEEC CALCULATED AFTER MAPPING AMENDMENTS CONDUCTED BY GREENLOANING

Quantity of Box Gum Woodland mapped by Cumberland		Quantity of Box-Gum Woodland found to be present by Greenloaning	Quantity of Derived Native Grassland Woodland mapped by Cumberland	Quantity of Derived Native Grassland found to be present by Greenloaning
Blue Range	21.70	21.70	0.00	0.00
Cattle Plain	36.00	8.00	0.00	6.40
Olivedeen	0.00	0.00	0.00	0.00
Teston (Nth)	57.80	55.92	0.00	0.84
Tralee	13.95	17.20	0.00	13.95
Total	**129.45**	**102.82**	**0.00**	**21.19**

The locations where amendments to the mapping of the CEEC were warranted are indicated in **Figure F.1, Appendix F.** More comprehensive details on the extent of amendments required are provided in **Table G.1**, **Appendix G**.

3.3.3 Shared Offset

The rapid assessments conducted on the Shared Offset indicated that the areas marked as CEEC for the most part did not conform to the definition of the community. Other areas supporting White Box however, primarily along drainage lines, were found to conform to the CEEC definition, although as for other areas, the overall vigour of the vegetation was poor as a result of the prevailing drought conditions. In effect, although the need for

refinements to the CEEC mapping was identified, the total extent of CEEC remained virtually unchanged, as shown in **Table 3.2** below.

Table 3.2 COMPARISON OF ORIGINAL QUANTITIY OF TOTAL CEEC FOR THE SHARED OFFSET MAPPED BY PARSONS BRINCKERHOFF AND TOTAL CEEC CALCULATED AFTER MAPPING AMENDMENTS CONDUCTED BY GREENLOANING

Quantity of Box Gum Woodland mapped by Parsons Brinckerhoff	Quantity of Box-Gum Woodland found to be present by Greenloaning	Quantity of Derived Native Grassland Woodland mapped by Parsons Brinckerhoff	Quantity of Derived Native Grassland found to be present by Greenloaning
5.6	5.6	0	0

The locations where amendments to the mapping of the CEEC were warranted are indicated in **Figure F.2, Appendix F.** More comprehensive details on the extent of amendments required are provided in **Table G.1**, **Appendix G**.

3.3.4 Oakleigh/Onavale

A number of rapid assessments conducted within areas mapped as CEEC occurring on the Oakleigh/Onavale Offset identified some areas where minor refinements to the CEEC mapping boundaries were required, as indicated in **Table 3.3** below

Table 3.3 COMPARISON OF ORIGINAL QUANTITIY OF TOTAL CEEC FOR THE OAKLEIGH/ONAVALE OFFSETS CALCULATED BY CUMBERLAND ECOLOGY AND TOTAL CEEC CALCULATED AFTER MAPPING AMENDMENTS CONDUCTED BY GREENLOANING

Quantity of Box Gum Woodland mapped by Cumberland	Quantity of Box-Gum Woodland found to be present by Greenloaning	Quantity of Derived Native Grassland Woodland mapped by Cumberland	Quantity of Derived Native Grassland found to be present by Greenloaning
111.00	92.54	49.00	54.37

The locations where amendments to the mapping of the CEEC were warranted are indicated in **Figure F.3, Appendix F.** More comprehensive details on the extent of amendments required are provided in **Table G.1**, **Appendix G**.

3.3.5 Bimbooria

A number of locations mapped on a preliminary basis as CEEC by Cumberland Ecology and from which plot data and some rapid assessment data was collected for the purposes

of this review, conformed to the definition of the CEEC. In some instances, the same allowance was made for the low level of grass cover and herbs in some areas subject to plot sampling as was made for the Project Site (refer to photographs in **Appendix D** and data summaries provided in **Appendix E**) (native ground cover benchmark value for the *White Box Grassy Woodland* is 50%). This allowance takes into account the effect on plant growth from the prevailing severe drought conditions for the duration of assessments on the Bimbooria property. As for Leard State Forest, it was deemed reasonable to assume that ground cover would normally be more extensive under less severe seasonal conditions.

Not all areas mapped as CEEC conformed to the definition of the Box-Gum Woodland, the extent of shrub cover in the north-western sector of the vegetation for instance being too high and rendering this sector as shrubby woodland/forest. Some sectors also supported patches of dense cypress pine regeneration, and where such patches are of sufficient size and have not been included in the preliminary mapping of cypress pine Shrubland, mapping revisions are required. It should be noted that dense areas of Cypress Pine regeneration have been consistently excised from inclusion in the areas of CEEC, although technically, where such areas also support White Box in the immediate vicinity, these areas also represent part of the original community. The past land practices thus have substantially affected the present community structure and could be expected that the areas currently dominated by regenerating cypress pine, would be restored to the original White Box-Cypress Pine Grassy Woodland, or even a White Box dominated grassy woodland.

One area in the far north of the Bimbooria property and mapped as *White Box-Cypress Pine Grassy Woodland* also was found not to represent the CEEC but was in fact *Silver-leaved Ironbark Open Forest/Woodland.* In other areas however, field surveys and assessments, involving walking transects and numerous rapid assessments and point descriptions, identified that the CEEC extended further than originally mapped, or adjustments to the alignment of the mapped communities were more appropriate. Various refinements and amendments to the mapped CEEC boundaries were therefore warranted, as indicated in **Table 3.4** below.

Table 3.4 COMPARISON OF ORIGINAL QUANTITIY OF TOTAL CEEC FOR THE BIMBOORIA OFFSETS CALCULATED BY CUMBERLAND ECOLOGY AND TOTAL CEEC CALCULATED AFTER MAPPING AMENDMENTS CONDUCTED BY GREENLOANING

Quantity of Box Gum Woodland mapped by Cumberland	Quantity of Box-Gum Woodland found to be present by Greenloaning	Quantity of Derived Native Grassland Woodland mapped by Cumberland	Quantity of Derived Native Grassland found to be present by Greenloaning
169.00	150.23	40.00	29.48

The locations where amendments to the mapping of the CEEC were warranted are indicated in **Figure F.4, Appendix F.** More comprehensive details on the extent of amendments required are provided in **Table G.1**, **Appendix G**.

3.3.6 Roseglass

Some locations mapped as CEEC by Niche were confirmed to represent the Box-Gum Woodland, particularly within the 'semi-cleared' areas, once such areas were re-categorised from the Derived Native Grassland mapping unit, noting that the eastern edge of the Roseglass property, areas mapped as CEEC 'semi-cleared' it in fact conform to this classification. As for the Project Site, Bimbooria and other offset properties, allowance was made for the low level of grass cover and herbs in some areas subject to plot sampling to account for the effect on plant growth from the severe drought conditions prevailing for the duration of assessments on the Roseglass property. It is understood that in contrast, ground cover was lush during the period of the Niche surveys (Pers. Comm. Roseglass Project Manager February 2014). In order to take account of the differing seasonal conditions as much as possible, where Greenloaning plot data indicated nonconformity to an area mapped as CEEC, reference was also made to the original plot data collected by the Niche at that location or nearby.

In some instances, the plot data provided by Niche also did not support the conformity of all areas, in particular grassland, to the definition of the CEEC. In this respect, substantial revisions to the CEEC mapping were therefore warranted, as indicated in **Table 3.6** below. These revisions also substantially altered the proportions of good condition CEEC and low to moderate condition CEEC to be provided by the Roseglass Offset, as indicated in **Table 3.5** below. The identified amendments and associated recalculations of areas of the CEEC to be provided, lead to the recommendation by Greenloaning that an offset property additional to the seventeen assessed for the December 2013 Greenloaning Report be identified by Whitehaven.

Table 3.5 COMPARISON OF ORIGINAL QUANTITIY OF TOTAL CEEC FOR THE ROSEGLASS OFFSET CALCULATED BY NICHE ENVIRONMENT AND HERTIAGE AND TOTAL CALCULATED AFTER MAPPING AMENDMENTS CONDUCTED BY GREENLOANING

Quantity of Box Gum Woodland mapped by Niche Environment and Heritage	Quantity of Box-Gum Woodland found to be present by Greenloaning	Quantity of Derived Native Grassland Woodland mapped by Niche Environment and Heritage	Quantity of Derived Native Grassland found to be present by Greenloaning
262.00	136.02	97.00	85.84

Some positive amendments also were made to the Roseglass CEEC mapping on the basis on the basis of observations during that the Greenloaning field surveys. Initially, two areas visible from vehicle tracks and observed to support White Box Woodland with

mature trees were subject to further investigation via walking transects as part of the review process. These areas were expected to comprise a narrow fringe of White Box but were found to be more extensive and to conform to the CEEC definition, excluding areas of dense Cypress Pine regeneration, rocky outcrops and larger patches of shrubby habitat. Further investigations identified some additional areas of the Box-Gum Woodland extending up onto some of the high ridgelines on the site (refer to photographs in **Appendix D**), one area of which had been partially mapped in the original Niche/Hunter mapping (shown as the innermost section of *White Box-Wilga-Quinine Derived Native Grassland* on the far central western side of **Figure B.5** in **Appendix B**). These locations of the CEEC on the higher areas of the Roseglass Offset are similar in topographical features to the central locations of the CEEC on the adjacent Bimbooria Offset.

In general, a range of refinements to the mapped CEEC boundaries for the Roseglass Offset were required. The locations where amendments to the mapping of the CEEC were warranted are indicated in **Figure F.5, Appendix F.** More comprehensive details on the extent of amendments required are provided in **Table G.1**, **Appendix G**.

3.3.7 Wongala

Locations mapped on a preliminary basis as CEEC by Cumberland Ecology, and from which plot data and some rapid assessment data was collected for the purposes of this review, conformed to the definition of the CEEC. Owing to the breaking of drought conditions in the locality of the Wongala Offset property, a greater extent of ground cover growth and flowering material was evident than was observed on all other offset properties during the review process (refer to photographs in **Appendix D** and data summaries provided in **Appendix E).** The majority of areas mapped as CEEC conformed to the definition of the Box-Gum Woodland, with woodland structure well represented, but some of the more open areas supporting only scattered trees conformed more to Derived Native Pasture. Both Yellow Box and White Box were dominant over most of the central ridgeline area, the former in the northern, higher section of the site and the latter in the lower sectors.

An additional area of *White Box Grassy Woodland* was identified on the far eastern side of the Wongala property during the assessment surveys, with plot data confirming that this woodland and the adjoining grassland, both conform to the CEEC definition (refer to photographs in **Appendix D** and data summaries provided in **Appendix E).** This area adjoins more extensive areas of the same community along the western boundary and through the south-western sector of the Wirradale property that forms part of the Northern Offsets. The extent of the amendments to the CEEC required overall is indicated in **Table 3.6** below.

Table 3.6 COMPARISON OF ORIGINAL QUANTITIY OF TOTAL CEEC FOR THE WONGALA OFFSET CALCULATED BY CUMBERLAND ECOLOGY AND TOTAL CALCULATED AFTER MAPPING AMENDMENTS CONDUCTED BY GREENLOANING

Quantity of Box Gum Woodland mapped by Cumberland	Quantity of Box-Gum Woodland found to be present by Greenloaning	Quantity of Derived Native Grassland Woodland mapped by Cumberland	Quantity of Derived Native Grassland found to be present by Greenloaning
274.00	219.18	00.00	63.74

Overall, only relatively minor refinements to the mapped CEEC boundaries for the Wongala property are required. The locations where amendments to the mapping of the CEEC are required are indicated in **Figure F.6, Appendix F.** More comprehensive details on the extent of amendments required are provided in **Table G.1**, **Appendix G**.

3.4 BRIEF RESPONSE TO RECENT REPORTS INFERRING THAT THE NORTHERN OFFSETS CONTAIN VERY LITTLE CEEC

Greenloaning has reviewed a report by Dr John Hunter titled "Preliminary Overview of Independent Assessments of Wirradale & Mt Lindesay Offset Mapping" of February 2014 (referred to in this report as the Hunter Report). This report was based on a preliminary field survey by Dr Hunter, and on the work of two colleagues, Wendy Hawes and Phillip Spark, undertaken in 2013. A key conclusion of the report was that Cumberland Ecology's preliminary mapping of CEEC within the Northern Offsets was "vastly overstated".

Greenloaning made three observations regarding the Hunter Report in a letter of 13 March 2014 to Whitehaven, which Greenloaning understands has been sent to the Department of the Environment. It is appropriate that those comments are reproduced here, as they relate specifically to the Greenloaning December 2013 report assessments and conclusions.

Observation 1: The Hunter Report Study Area was Limited in Extent

The Hunter Report's conclusions are based on data collected within a selected study area on the Northern Offsets. The study area is identified in **Figure 1**, on page 4 of the Hunter Report. Based on a preliminary extrapolation exercise drawn from the location of the survey locations provided on **Figure 2** on page 8 of the Hunter report, one can conclude the Hunter report covered less than 10% of the vegetation present on the Northern Offsets.

Observation 2: The Hunter Report made conclusions about the offsets package as a whole based on an extrapolation from the limited survey area

Page 6 of the Hunter report presents the conclusion that, if its findings were replicated across the whole of the offsets package, "only approximately 200 ha of CEEC maybe [sic] present within the offset properties". To extrapolate from such limited data to draw

conclusions about the entirety of the offsets package seems to Greenloaning to be methodologically inappropriate. The following is also noted:

k) A number of the areas subject to surveys/inspections by Dr Hunter or by other ecologists on whose data Dr Hunter has relied, have been subject to mapping refinement and revision of community names by Greenloaning as part of the December Independent Peer Review Report, but also support areas of CEEC;

l) Greenloaning has made significant refinements to Cumberland Ecology's mapping of the more complex central section of the Northern Offsets, but much more limited revisions to Cumberland Ecology's mapping of the southern section; and

m) The summed cover and sum of rank values of Yellow Box (*Eucalyptus melliodora)* provided in **Appendix D** of the Hunter Report indicate that this species was the third most common eucalypt/tree recorded within the defined study area of the Hunter Report. This species is one of the three species required to be dominant **or co-dominant** as a prerequisite for occurrence of the CEEC.

Observation 3: The Hunter Report is only a preliminary study

Pages 3, 6 and 7 of the Hunter Report, acknowledge, very properly in my view, that it is based only on a preliminary field assessment that ought to be followed by a more comprehensive survey. This qualification, however, has not been reflected in recent media reports that I have heard or read and I consider this to be regrettable. It is my opinion that the December Greenloaning report, and this Verification report, is based upon comprehensive studies of the type called for by Dr Hunter.

In addition, since the release of the Hunter report and during the course of the field investigations for the Wongala Offset, I was able to reconfirm the occurrence of extensive areas of *White Box Grassy Woodland* in the south-western sector of the Wirradale property, as illustrated by photographs provided in **Appendix D**. The suggestion that *White Box Grassy Woodland* is very limited in occurrence within the Northern Offsets is erroneous.

I would also make the following observations regarding future offset developments, given the current issues surrounding the development of the Maules Creek offsets, and offsets in general. It would be beneficial to all stakeholders, including development proponents, State and Commonwealth government authorities, ecological consultants and community representatives, as may be appropriate to an individual project, to identify, within the bounds of practicalities, the level of accuracy of offset vegetation mapping and habitat assessments to be required. This process should be undertaken prior to the commencement of offset surveys that may be relied upon at a later date by any of the stakeholders or other interested parties. In conjunction with this process, or even more particularly if such a process is not followed, it would be useful if consultancies engaged to undertake survey work for offset development could provide clear assessments of the level of accuracy of any mapping outcomes and associated assessments. It is suggested that adopting these measures would facilitate achieving one of the key aims of the *EPBC Act 1999 Environmental Offsets Policy* to provide more certainty regarding the offset

development process[6] and provide a clearer framework regarding the expectations for the offset assessment process.

3.5 OFFSET OUTCOMES FOR BOX-GUM WOODLAND AND DERIVED GRASSLANDS

The final outcomes for the offset areas for this Verification Report are presented in **Appendix G, Table G.1**. The outcomes from the previous assessments, conducted for the 2013 Independent Peer Review, were that the total area of Box-Gum Woodland and Derived Grassland to be provided by the combined Eastern, Western, Northern and Shared Offset, left shortfall of approximately 558 ha below the required amount of 5,532 ha. The combined Additional Offsets however, provided an additional 729 ha of. CEEC, which more than compensated for the identified shortfall. As indicated in **Section 3.3**, further assessments of the offsets secured by Whitehaven have indicated the need for more mapping revisions, with some losses and some gains of CEEC, and an additional offset, Wongala, has consequently been secured. With the inclusion of Wongala with the offset package, the total area of the CEEC to be provided as offsets for the Project is therefore 5,660 ha, comprising 1,862 ha of low to moderate condition CEEC (Derived Native Grassland) and 3,798 ha of good condition CEEC (Box-Gum Woodland).

This represents an additional 128 ha of CEEC above the 5,532 ha required to be provided under Condition 9b of the Project's EPBC Approval and thus allows for a buffer of over 100 ha for any areas that may require further mapping refinements. This total also takes into account some additional mapping refinements within previously assessed offsets, particularly the Northern Offsets, based on recent field observations and additional desktop assessments. As such, Greenloaning concludes that Whitehaven has met the obligations under the Approval Conditions. Further, Greenloaning is satisfied that the condition class of the CEEC in the offset properties is equivalent or better, than that of the CEEC in the Project Site (see **Chapter 7** for more detail in respect of these conclusions).

[6] Refer to Aim 2 of the EPBC Act 1999 Environmental Offsets Policy

Chapter

4

Results - Threatened Fauna - Swift Parrot (*Lathamus discolor*)

4.1 RESULTS FROM DESKTOP ASSESSMENTS

Species Requirements and General Habitat Records in Locality

The initial desktop assessments conducted for the 2013 Independent Peer Review process confirmed that the removal of 1665 ha of forest/woodland habitat from the Project Site was identified in the EIA as including potential foraging habitat for the Swift Parrot. Although this migratory species was not recorded from the Project Site, nor from offset areas, the Namoi and Border Rivers–Gwydir CMAs support known winter foraging habitat for the Swift Parrot (Saunders et al, 2010) and the Project Site was recognised during the EIA process as providing potential stepping stone habitat for the species (Cumberland Ecology, 2011). All of the subject offsets also fall within this foraging habitat area. The most recent checks of the Atlas of NSW for the purposes of this review indicate the closest records for the species are to the west of Gunnedah, approximately 40 km to the south of the Project Site, Eastern/Western Offsets and Oakleigh/Onavale and approximately 25 km southwest of Roseglass and Bimbooria. The closest records to the Northern Offsets are approximately 35 km to the east (OEH, 2014b). However, according to National Park records, the Swift Parrot has also been detected within the Mount Kaputar National Park (Department of Environment and Conservation [DEC], 2006), which adjoins the Wongala Offsets in the south and western sectors of the property.

As noted in **Section 4.1** of the Greenloaning December 2013 report, the potential foraging habitat identified for the Swift Parrot within the Project Site encompassed all forest and woodland types occurring within the general box–ironbark habitat. This encompassed both known forage tree species (White Box and Yellow Box) and species generally occurring within the general box-ironbark habitat type (Narrow-leaved Ironbark [*Eucalyptus crebra*], Blue-leaved Ironbark [*E. nubila*] and Dwyer's Red Gum [*E. dwyeri*]). Thus, when assessing suitable habitat for the Swift Parrot within the offset properties, it was considered to be consistent to consider all patches of forest/woodland habitat within the general box-ironbark habitat type occurring on the offset properties as potential foraging habitat, including patches supporting tree species that are not specifically known to be forage species. This consideration thus also has been applied in the assessment process for this Verification Report.

Other key points identified as relevant to the assessment process and also therefore applicable to this report include:

- The occurrence of the Swift Parrot may not necessarily be associated primarily with the level of flowering within the favoured box–ironbark habitat. Other

factors, such as flowering of wattle species and the occurrence of other aggressive nectivorous species, have been found to be highly influential on the spatial distribution of the Swift Parrot (MacNally and Horrocks, 2000);

- The use of specific foraging habitat may be highly variable over time;
- Both small and large patches of habitat are utilised (MacNally and Horrocks 2000);
- Site fidelity, although not necessarily important in some areas, is considered important overall for the long term survival of the species (Saunders and Tzaros, 2011); and
- Key threats to the species are the loss, fragmentation and disturbance of foraging habitat. Other threats include grazing, increased fire frequency and climate change (Saunders and Tzaros, 2011).

As for the 2013 review process, the following key attributes were identified for the habitat assessment process:

- Favoured winter foraging habitat of box-ironbark woodlands, including Mugga Ironbark (*Eucalyptus sideroxylon*) and White Box Woodland (for the western slopes of NSW);
- Drainage lines;
- Medium to large forage trees (small and very large trees tend to be excluded from foraging activities) (Kennedy and Tzaros, 2005, Department of Environment, 2013); and
- Small and large habitat patches.

4.1.1 Eastern/Western Offsets

A desktop assessment of the potential for Swift Parrot habitat on the Eastern/Western Offsets indicated that most of the properties had some potential habitat for the species in the form of box-ironbark woodland, and in a number of cases, also encompassing drainage line habitat (refer to **Figure B.1** in **Appendix B**). Most habitat areas were somewhat fragmented but the proximity of the Leard Conservation Area and the known use of small habitat patches by the Swift Parrot lead to the assessment that the offsets provided potential foraging habitat and/or 'stepping stone' habitat for the species.

4.1.2 Shared Offset

The Shared Offset was assessed as potentially supporting a variety of box-ironbark habitats, based on the habitat mapping of the area, with both box and ironbark forage species well represented (Parsons Brinckerhoff, 2010) (refer to **Figure B.2** in **Appendix B**). Examination of aerial photographs of the Shared Offset and locality indicated that the site was well vegetated (as illustrated by photographs provided in **Appendix D**), with some

vegetated linkages to the west and would be likely to represent potential foraging habitat for the species. Based on the assessments conducted by Parsons Brinckerhoff, the most common vegetation community occurring on the Shared Offset property is *White Box–Narrow–laved Ironbark–White Cypress Pine Shrubby Open Forest*, which could be expected to provide suitable foraging habitat for the subject species. The *Silver–leaved Ironbark Heathy Woodland* and *White Box-White Cypress Pine Grassy Woodland* (low condition) would also represent potential foraging habitat for the Swift Parrot. The species was not recorded during diurnal bird surveys but the site was assessed as supporting 'potential habitat for this species in the form of suitable winter foraging resources (*E.albens*)' (Parsons Brinckerhoff 2010).

4.1.3 Oakleigh/Onavale

The potential forage habitat for the Swift Parrot occurring on the Oakleigh/Onavale Offset appeared to be similar to the habitat in the Eastern/Western Offsets, but with the southern sectors having stronger and direct links to the north-western sector of Leard State Forest. The travelling stock reserve running through the central section of the offset also provides habitat linkages. The main vegetation type identified on the site as part of the offset surveys is the *White Box-Narrow-leaved Ironbark – White Cypress Pine Grassy Woodland* (Cumberland Ecology, 2013a), which represents favoured forage habitat for the Swift Parrot (refer to **Figure B.3** in **Appendix B**).

4.1.4 Bimbooria

Vegetation mapping of the Bimbooria property (Cumberland Ecology, 2013c) indicated the representation of substantial areas of potential forage habitat for the Swift Parrot (refer to **Figure B.4** in **Appendix B**). The offset is also linked directly with much larger areas of potential habitat to the west (Roseglass Offset), and to the southwest, via Roseglass (Boonalla Aboriginal Area). The habitats were assessed as providing suitable habitat for the Swift Parrot (Cumberland Ecology, 2013c). It is noted that a record of the Swift Parrot is located within approximately 25 km from the Bimbooria property, to the south-west.

4.1.5 Roseglass

Large expanses of box-ironbark woodland/forest habitat have been mapped as occurring on the Roseglass Offset, with forage trees recorded including White Box and Narrow-leaved Ironbark. The Swift Parrot was assessed as having a low potential for occurrence as part of the offset assessment by Niche (Niche Environment and Heritage, 2012). It is noted that the majority of vegetated habitats was assessed as being in moderate to good condition in the Niche report. The full extent and types of vegetation communities and habitats represented are shown on **Figure B5** in **Appendix B**. As is evident from examination of this figure, the predominant vegetation community occurring on the property is *Narrow-leaved Ironbark-White Cypress Pine Shrubby Open Forest*, with patches of other communities supporting White Box. As the *Narrow-leaved Ironbark-White Cypress Pine Shrubby Open Forest* has been considered as potential foraging habitat for the Swift

Parrot within the Project Site, it is consistent to consider the same habitat type as representing potential foraging habitat within the Roseglass property.

4.1.6 Wongala

The Wongala Offset was mapped as supporting large expanses of both open box-gum woodland and Shrubby Pine/Ironbark/White Box Forest (Cumberland Ecology 2013d) (refer to **Figure B6** in **Appendix B**). On the basis of the preliminary mapping and review of aerial photographs, the property was assessed as likely to provide suitable foraging habitat for the Swift Parrot. The recorded occurrence of the species within the adjacent Mount Kaputar National Park (DEC, 2006), in conjunction with the observation of favoured foraging habitat for the species, supports this assessment.

4.2 GENERAL ON-SITE HABITAT OBSERVATIONS

4.2.1 Eastern Offsets/Western

Inspections and surveys of the Eastern Offsets/Western confirmed the occurrence of potential suitable foraging and/or movement habitat on all properties, albeit to varying extents. Given the proximity of Leard State Forest, it is not surprising that the habitats, in terms of the foraging requirements of the Swift Parrot, exhibited some similarities to the Project Site habitats. Specific suitable habitat attributes observed comprised:

Mature White Box trees;

Mature ironbark trees;

Medium to large trees represented to varying degrees;

Some areas of the above tree groups on moderately fertile soils, such as on the Teston North, Tralee, Blue Range and Olivedeen properties;

Well vegetated drainage lines (Cattle Plains, Blue Range, Olivedeen); and

Some connectivity of suitable habitat with large areas of habitat, in particular associated with the southern sector of the Teston North property that adjoins the vegetation of the Leard Conservation Area.

As for the 2013 surveys and assessments, the extent of occurrence of potentially limiting factors to Swift Parrot usage, such as high concentrations of the Fuscous Honeyeater, or other aggressive nectivorous bird species, was not included specifically in the review study methodology. No such concentrations however, were observed during any of the field assessments, although the seasonal conditions also were not conducive to extensive flowering of forage tree species.

4.2.2 Oakleigh/Onavale

The Oakleigh/Onavale property was found to be similar in habitat types to both the Eastern/Western Offsets and parts of the Project Site. Similar features as observed on the Eastern/Western Offsets were apparent, with the two main vegetation patches supporting primarily White Box-dominated woodland, with patches of ironbarks. The initial assessments suggested good foraging potential for the Swift Parrot and habitat connectivity was considered likely to be facilitated by both the direct connection with Leard State Forest in the south and the travelling stock reserve linking the northeast with the south-west.

4.2.3 Bimbooria

Initial field inspections of the Bimbooria property on the 7th of January 2014, confirmed the occurrence of both box-ironbark woodland/forest and large expanses of potential foraging habitat in general. Large mature and old growth White Box trees were observed to be well represented, although dense Cypress Pine regeneration over the past few decades (landholder, pers. comm. March 2014) appeared to be limiting the potential for eucalypt regeneration in some sectors. Other relevant habitat attributes observed included:

Large mature White Box and/or ironbark trees along drainage lines in the eastern and southern sectors of the property; and

Good connectivity with large expanses of vegetation to the west and south-west.

4.2.4 Roseglass

The Roseglass Offset was observed to support large expanses of forest and woodland, with ironbark-cypress being visually dominant over the extensive higher ground and rugged terrain. Both young mature and large mature specimens of White Box were observed, the former more evident in the western sectors of the site as fringing vegetation. The latter occurred either as isolated paddock trees or in more secluded stands within the larger body of forest/woodland. Key habitat attributes relevant to the Swift Parrot habitat potential of the offset included:

Large mature White Box and/or ironbark trees along some drainage lines, both within predominantly cleared paddocks and the inner gullies of the more rugged areas of the site; and

Excellent connectivity with large expanses of vegetation to the east and south.

4.2.5 Wongala

The initial field inspections of the Wongala property, conducted on the 14th January 2014, confirmed the occurrence of extensive areas of box-gum woodland in the centre of the

offset, bounded to the east, west and south by shrubby forest on the steeper terrain. Woodland patches generally comprised young mature to mature, with old growth specimens of both White Box and Yellow Box apparent. Small patches of dense cypress pine were also observed on the far eastern boundary of the property, with other occurrence of cypress pine tending to be scattered. Other relevant habitat attributes observed included:

Large mature/old growth White Box and/or eucalypts/other tree species along drainage lines in the far north-eastern, central and central-eastern sectors of the property;

Excellent connectivity with large expanse of vegetation to the west, southwest, south and southeast (Mount Kaputar National Park); and

Good connectivity with White Box woodland habitat to the east (Wirradale property – Northern Offsets).

4.3 FIELD ASSESSMENTS OF HABITAT FEATURES

4.3.1 Re-appraisal of Project Site Habitats

Plot data, rapid assessments and point descriptions conducted within the Project Site, initially for the purposes of the 2013 peer review and subsequently as further background for this Verification Report, supports the supposition that suitable foraging habitat for the Swift Parrot is represented in the form of box-ironbark woodland/open forest. The extent of mature and large mature trees was observed to be variable but overall, mature trees in particular were well represented. The variation in maturity of regeneration of tree species is illustrated by comparison of individual scores for this attribute, which ranged from consistent scores of 5 in one sector (a score of 6 representing a climax community) to average scores of 3.5 in ridgeline areas with more pronounced young ironbark/cypress pine regeneration. Overall habitat scores for the Project Site areas sampled ranged from 2.1 to 3.8, with an average score of 3.2 in better quality habitat and an average of 2.8 in lower quality habitat. Factors such as the level of past and current disturbances and variation in the occurrence of old growth trees and hollow bearing trees limited the total habitat value score. A summary of the fauna habitat assessment data is provided in **Table E.2, Appendix E.**

Of relevance is that a number of plots or point description locations were observed in 2013 to be adjacent to drainage lines, with small drainage lines and intermittent watercourses well represented within the Project Site. Such areas would represent potential favoured foraging habitat for the Swift Parrot. Random checks of ironbark species detected three ironbark species occurring within the Project Site, viz: Narrow-leaved Ironbark (*E. crebra*), Silver-leaved Ironbark (*E. melanophloia*) and Blue-leaved Ironbark (*E. nubila*), corresponding with the species identified for the EIA.

4.3.2 Eastern/Western Offsets

Plot data for the Eastern/Western Offsets also confirmed the occurrence of the vegetation communities mapped for the EIA, primarily representing box–ironbark woodland/open forest and thus suitable foraging habitat for the Swift Parrot. Plots in the Eastern/Western offsets rated an average score of 3.3 for maturity of regeneration, which was reasonably comparable with the 2014 average score of 3.5 for Leard State Forest. These comparisons should also be viewed in the context of only limited data being obtained for each offset site. Overall habitat value scores for the Eastern/Western Offset areas sampled ranged from 2.2 to 2.6, with an overall average of 2.47 and these scores were also reasonably comparable with the Project Site overall habitat values (2014 values) of 2.86. The level of past and current disturbances, particularly in relation to associated fragmentation of habitat, was a substantial factor in limiting the total habitat value score. A summary of the fauna habitat assessment data for the Eastern/Western Offsets is provided in **Table E.1, Appendix E.**

As for the Project Site, a few sectors of the subject Eastern/Western Offsets supported areas of dense cypress pine regeneration, particularly on the Cattle Plains property, which could be expected to reduce the value of potential habitat for the Swift Parrot in the long-term. Drainage lines however, were well developed in parts of the Eastern/Western Offsets, particularly on the northern edge of Cattle Plains along Maules Creek. Plot data and point descriptions from this location indicated good quality riparian habitat, with a variety of large to old growth tree species present. Rating scores of 6, and 3 were recorded for old growth trees and forage habitat respectively and an overall habitat value of 2.9 was recorded for this sample site.

Suitable foraging habitat within the Eastern/Western Offsets is typically represented as either small fragmented patches or small patches adjoining, and connected with, large vegetation remnants. Both of these types of habitat units conform to the requirements of the Swift Parrot as described by McNally and Horrocks (2000). Scattered trees also are utilised as a foraging resource (Saunders and Heinsohn, 2008), and scattered White Box trees are present in a number of sectors of the Easter/Western offsets with in areas mapped as Derived Native Grassland (Box-Gum Woodland).

4.3.3 Shared Offset

Plot data for the Shared Offset yielded averages of 3.8 for maturity of regeneration and 2.8 for overall habitat value. These values are highly comparable with the scores for the same attributes for Leard State Forest 2014 plot data. Although the extent of White Box woodland on the site was limited, there were substantial areas of shrubby White Box and/or Ironbark habitat representing good quality foraging habitat for the Swift Parrot. A summary of the fauna habitat assessment data for the Shared Offset is provided in **Table E.1**, **Appendix E.**

4.3.4 Oakleigh and Onavale

As the habitats on the Oakleigh/Onavale Offset were similar in many respects to the Eastern/Western Offset habitats and parts of the Project Site, similar habitat rating scores could be expected. The average score for both maturity of regeneration and overall habitat value scores were lower however (2.3 and 2.2 respectively), attributable to the younger status of regenerating vegetation and the fragmented nature of some habitat patches. On the whole however, trees were typically mature and large mature and/or old growth trees were present to varying degrees (refer to Photographs in **Appendix D**). A summary of the fauna habitat assessment data for the Oakleigh/Onavale Offsets is provided in **Table E.1, Appendix E**.

4.3.5 Bimbooria

Habitat values for the Bimbooria Offset were comparable with the values for Leard State Forest with the average score for maturity of regeneration being 3.1. The scores for this attribute varied however, ranging from 2.5 to 3.5. The overall habitat value for the offset habitats was 3, which was slightly higher than the 2014 overall habitat value for Leard State Forest. The higher values for Bimbooria can be attributed in part to the representation of large mature and old growth trees along a number of drainage lines. A summary of the fauna habitat assessment data for the Bimbooria Offset is provided in **Table E.1**, **Appendix E**.

4.3.6 Roseglass

Habitat values for the Roseglass Offset were also variable, with the average score for maturity of regeneration being 3.76 but ranging from 3 to 5. The extent of both eucalypt and cypress pine regeneration substantially affected this score. The overall habitat value for the offset habitats was 3.20, which as for the Bimbooria Offset, was higher than the 2014 overall habitat value of 2.86 for Leard State Forest, as well as being comparable with the 2013 overall habitat value. The higher values for Roseglass can be attributed in part to the representation of large mature and old growth trees in numerous sectors of the property, particularly within sheltered gullies and the more remote slopes and ridges. A summary of the fauna habitat assessment data for the Roseglass Offset is provided in **Table E.1**, **Appendix E**.

4.3.7 Wongala

Plot data for the Wongala Offset yielded averages of 4.1 for maturity of regeneration and 3.24 for overall habitat value. These values reflect the overall good condition of the Wongala habitats, the maturity of much of the vegetation and the substantial extent of well developed habitat representing good quality foraging habitat for the Swift Parrot. A summary of the fauna habitat assessment data for the Wongala Offset is provided in **Table E.1**, **Appendix E**.

4.4 HABITAT QUALITY

As outlined in **Section 2.5.2** of the Greenloaning December 2013 Report, it was considered appropriate to derive an overall evaluation of habitat condition by consideration of both general observations of vegetation and habitat condition in the field, and consideration of the fauna habitat assessment data collected from various locations within the Project Site and the offset properties. The assessment of the condition of vegetation at individual sites is provided in the summary tables in **Appendix E.** As discussed in **Section 4.3.1** to **Section 4.3.3**, the overall average habitat scores for the Project Site, Eastern/Western Offsets and Oakleigh/Onavale are reasonably comparable, whilst the overall average habitat value score for the other Additional Offsets is slightly higher.

As discussed in **Section 4.5** and in the December 2013 report, vegetation overall at all sites, including the Project Site, was exhibiting signs of severe moisture stress during the entire review period and the general vigour of plants consequently was very poor. Similarly, there was little evidence of significant flowering or fruiting of forage trees on most offset properties, although rain in the Northern Offset area, adjoining the Wongala property had potentially encouraged flowering of some eucalypt species over the summer period (prior to the review survey period for the Wongala Offset). White Box fruit were relatively common on the Wongala property and Yellow Box had been observed to flower the previous spring. Another factor likely to have contributed to the better condition of the ground stratum in the Wongala property is lower grazing pressures, with stock having been removed from the offset area during the drought (Property owner, pers. comm. 14th March 2014).

Negative impacts on habitat condition from exotic species were evident in all areas, with substantial localised damage to the ground stratum evident from feral pigs. Groups of feral pigs were observed within the Wongala Offset, as well as previously within the Project Site and the Northern Offsets. Feral goats were more prevalent on the Bimbooria and Roseglass Offsets. Incidence of exotic weeds was generally low in the offset areas, except in sectors subject to cultivation or poor condition derived grasslands.

The overall condition of the habitats providing suitable foraging habitat for the Swift Parrot was rated as moderate to good with some exceptions where the combination of land practices and/or feral pest activity had adversely and substantially affected the understory strata. These areas also tended to be on more rugged terrain, rocky slopes and poorer soils and were observed primarily on the Cattle Plains, Roseglass and Bimbooria properties. Such impacts have been substantially exacerbated by the prevailing drought conditions and associated heavy grazing pressures on limited available forage by both domestic stock and feral herbivores. As a precautionary measure, some adjustments to the condition ratings for affected areas have been incorporated into the overall assessment process and offset area calculations.

4.5 OUTCOMES FOR SWIFT PARROT HABITAT

The majority of woodland/forest habitat occurring on the subject offset properties was considered to represent suitable foraging habitat for the Swift Parrot equivalent to, or better quality than, the habitats represented within the Project Site. Although some sectors of the offset properties potentially support fewer large mature trees/ha than the Project Site, mature trees are well represented in many of the offset habitats. Any potential lower habitat value arising from a lower density representation of large mature trees is considered to be counterbalanced by the following factors provided by the combined offset properties:

More extensive representation of drainage line habitat, including sheltered watercourses encompassed by the favoured box–ironbark habitat;

More extensive occurrence of Yellow Box, including sectors supporting large mature trees; and

Direct habitat linkages on the Wongala Offset, in combination with the Northern Offset, with an area of known records of the species to the west in Mount Kaputar National Park.

Additional large areas of open woodland, small habitat patches and vegetated drainage lines within the offset properties also represent low to moderate condition habitat for the species equivalent or better in habitat value than the low to moderate condition habitat occurring within the Project Site.

The potential for habitat value to be affected adversely in the long term by dense cypress pine regeneration applies to the Project Site and offset properties alike.

Areas of offset habitat estimated as providing foraging habitat for the Swift Parrot and other threatened species and equivalent in quality to the Project Site habitats are provided in **Appendix E, Table E.1**. The total area of the threatened fauna species habitat to be provided as offsets for the Project, encompassing large areas of suitable, high quality foraging habitat for the Swift Parrot, is approximately 12,918 ha, comprising 5,539 ha of low to moderate condition habitat and 7,379 ha of good condition habitat.

This represents 3.584 ha of threatened species habitat additional to the 9,334 ha required to be provided under Condition 9a of the Project's EPBC Approval and thus allows for a substantial buffer for any areas not subject to specific inspections and assessments that may be of variable quality. This total also takes into account some additional mapping refinements within previously assessed offsets, particularly the Northern Offsets, based on recent field observations and additional desktop assessments. As such, Greenloaning concludes that Whitehaven has met the obligations under the Approval Conditions. Further, Greenloaning is satisfied that the condition class of Swift Parrot habitat within the offset properties is equivalent or better, than that of the potential habitat for the species represented within the Project Site (see **Chapter 7** for more detail in respect of these conclusions)

Chapter

5

Results for Threatened Species - Regent Honeyeater (*Anthochaera phrygia*)

5.1 RESULTS FROM DESKTOP ASSESSMENTS

As identified in the Greenloaning December 2013 report, the EIA surveys yielded no records of the Regent Honeyeater from either the Project Site or the offset properties. No other surveys recently conducted in the area and encompassing the Shared Offset and the Roseglass, Bimbooria and Oakdale additional offset properties, have detected the species (Parsons Brinckerhoff, 2010, Niche Environment and Heritage, 2012 and Cumberland Ecology, 2013a). The Project Site, Eastern/Western Offsets, Shared Offset, Bimbooria and Roseglass Offsets however, are within the historical range of the species, whilst the Wongala Offset is within the vicinity of one of the four key known breeding areas for the species – the Barraba–Bundarra area (Ingwerson et al., 2013).

Key habitat requirements of the Regent Honeyeater, summarised from the information provided in the Greenloaning December 2013 report, include:

- Box-ironbark communities, particularly wetter, more fertile sites such as creek flats and lower slopes;
- Habitat supporting a combination of key forage species and drainage (Ingwerson et al 2013);
- Flowering of favoured forage species:
    - Mugga Ironbark;
    - White Box;
    - Yellow Box; and
    - Box Mistletoe (*Amyema miquelii*).
- Eucalypt and other tree species that provide a suitable substrate for lerps (an important factor in determining the seasonal distribution of Regent Honeyeaters (Menkhorst et al., 1999). (A key species providing suitable lerps substrate that occurs within the Wongala Offset, as well as the Northern Offset properties of Mt Lindesay and Wirradale is Blakely's Red Gum. Rough-barked Apple and River

Red Gum are also known substrate species for lerps and both species occur to some extent on offset properties).

The most recent checks of the Atlas of NSW for the purposes of this Verification Report indicate records for the species closest to either the Project Site or offsets are from approximately 10 km to the south/southwest of the Roseglass and Bimbooria Offsets. There are also records from the Horton Falls National Park area, approximately 10km east of the Wongala Offset (OEH, 2014b). There is also a record of the Regent Honeyeater within the Mount Kaputar National Park in the far north-western sector (Department of Conservation [DEC] 2006; OEH, 2014b), approximately 15 km to the northwest of the Wongala Offset. Most records of the species in the Barraba area are from further to the east, but as identified in the 2013 peer review process, recent records in general have been very scarce (local residents pers. com. 4 September, 9 December 2013).

There are no current records known from the vicinity of the Project Site (OEH, 2014b) but removal of 1665 ha of forest/woodland habitat from the Project Site was identified in the EIA as including potential foraging habitat for the Regent Honeyeater. It was suggested that the Project Site would provide potential stepping stone habitat for the species, representing a substantial habitat area between the larger expanse of habitat of the Pilliga to the west and the Nandewar Ranges to the north (Cumberland Ecology 2011).

5.1.1 Eastern/Western Offsets

The Eastern/Western Offsets were identified in the BMP for the Maules Creek Project as supporting suitable foraging habitat for the Regent Honeyeater (Cumberland Ecology 2013a). Primary habitats occurring on the Eastern/Western Offset properties were identified as box-ironbark woodlands representing the favoured feeding/foraging habitat for the species. Examination of the mapping conducted for the Eastern/Western Offsets also suggested that there are stretches of vegetated riparian habitat likely to provide suitable foraging habitat.

5.1.2 Shared Offset

The Shared Offset also was identified in the BMP for the Maules Creek Project as supporting suitable foraging habitat for the species (Cumberland Ecology 2013a). The assessments of the Shared Offset conducted by Parsons Brinckerhoff (2010) indicated that the areas of *White Box–Narrow–leaved Ironbark–White Cypress Pine Shrubby Open Forest*, *Silver–leaved Ironbark Heathy Woodland* and *White Box-White Cypress Pine Grassy Woodland* (low condition) would represent potential foraging habitat for the Regent Honeyeater and the species was considered likely to occur in the area, considering the suitability of the habitat and the proximity to Biunbarra/Barraba.

5.1.3 Oakleigh/Onavale

The preliminary assessments of the Oakleigh/Onavale, Bimbooria and Wongala Offsets identified potential foraging habitat for the Regent Honeyeater on all properties in the

form of box-ironbark or box- gum communities (Cumberland Ecology 2013b, 2013c, 2013d). The south-eastern sector of the Oakdale property adjoins Leard State Forest on the north-eastern corner of the forest as shown in **Figure 1.1**. The reconnaissance surveys found the property to support patches of woodland and derived grasslands with the main patch of woodland comprising *White Box Grassy Woodland* (Cumberland Ecology, 2013b). The southern edge of this woodland also adjoins Leard State Forest, as indicated in **Figure B.6,** indicating the reasonable connectivity with the larger vegetation remnant.

5.1.4 Bimbooria

The Bimbooria property was reported as supporting large areas of box-gum woodland habitat, as shown on **Figure B.4**, in **Appendix B,** with the reconnaissance surveys identifying the habitats as comprising a mixture of *Box-Gum Grassy Woodland, Narrow-leaved Ironbark Woodland, Silver-leaved Ironbark Woodland* and *Cypress Pine Woodland*, as well as areas of *Derived Native Grassland* (Cumberland Ecology, 2013a). A watercourse running through the property from the north-west to the south-east was also mapped as supporting fringing vegetation of *Box-Gum Grassy Woodland* habitat, extending out along associated gullies, as shown on **Figure B.4** in **Appendix B**. Examination of the Bimbooria property on Google Earth (2013) shows the central portion of the site to be well vegetated, with the watercourse vegetation and more open vegetation on the less rugged topography in the north-east readily distinguishable.

5.1.5 Roseglass

The Roseglass Offset adjoins the Bimbooria Offset to the west and is within the same land system and could be expected to provide similar habitat for the Regent honeyeater as Bimbooria. Potential habitat for the species on the Roseglass Offset was identified generally on **Figure 13** of the Niche report and the potential for the occurrence of the species on the offset property was rated as moderate, based on previous records in the locality (Niche Environment and Heritage 2012). As is evident from examination of **Figure B.5** in **Appendix B**, the predominant vegetation community occurring on the property is *Narrow-leaved Ironbark-White Cypress Pine Shrubby Open Forest*, with patches of other communities supporting White Box. These communities have been considered as potential foraging habitat for the Regent Honeyeater within the Project Site and it is consistent therefore to consider the same habitat type as representing potential foraging habitat within the Roseglass property.

Viewing of this offset on Google Earth (2014) shows the property generally to be well vegetated and quite rugged, with numerous gullies and drainage lines aligned south-east to north-west. These gullies are shown on **Figure B.5** as supporting *White Box-Tumbledown Red Gum* along creek lines and represent habitat supporting both a favoured forage tree species (White Box) and favoured drainage line habitat.

5.1.6 Wongala

The Wongala Offset is situated within a different land system and adjoins the previously reviewed Northern Offsets. The broad reconnaissance surveys on this property found box woodlands to be widespread, with both open and shrubby habitat represented, as shown on **Figure B.6** of **Appendix B**. Viewing of this offset on Google Earth (2014) shows the property generally to be well vegetated and quite rugged to the east, west and south, with numerous gullies and drainage lines running through the more rugged areas. Suitable habitat for the Regent Honeyeater thus appears to be well represented.

Of specific relevance to both the 2013 and current review process, both the EIA and the BMP consider potential foraging habitat identified for the Regent Honeyeater within the Project Site to encompass all forest and woodland types within the general box–ironbark habitat. This broad habitat categorisation encompassed both known forage tree species (White Box and Yellow Box) and species generally occurring within the general box-ironbark habitat type (Narrow-leaved Ironbark [*Eucalyptus crebra*], Blue-leaved Ironbark [*E. nubila*], Silver-leaved ironbark [*E. melanophloia]* and Dwyer's Red Gum [*E. dwyeri*]). Thus, when assessing suitable habitat for the Regent Honeyeater within the subject offset properties, the approach of considering all patches of forest/woodland habitat occurring within the general box-ironbark habitat category as potential foraging habitat, including patches supporting tree species that are not specifically known forage species was continued for the purposes of this Verification Report.

Following the procedures utilised for the 2013 review process, the following key attributes were assessed for the purposes of this report:

- Presence of box-ironbark woodlands;
- Representation and nature of drainage lines;
- Occurrence of larger trees; and
- Occurrence of more fertile soils.

Mapping undertaken for the EIA indicated the representation of potentially suitable foraging habitat for the Regent Honeyeater within the Project Site, Eastern/Western Offsets and Shared Offset and subsequent mapping of the Additional Offset areas has also indicated the presence of suitable foraging habitat for the species on all properties, albeit to varying extents. This habitat included White Box, Yellow Box, Blakely's Red Gum and ironbark woodland/open forest. As noted for the Swift Parrot, drainage lines were represented to some extent within the Project Site and Western Offsets, and to a greater extent in the Eastern Offset areas. All of the additional offset areas have also been shown as supporting drainage line habitat as indicated in **Figures B3-B6** in **Appendix B**.

The few potential minor inconsistencies between the EIA mapped units and EIA plot data, as discussed in **Section 3.1** of this peer review report**,** do not affect the potential habitat suitability of the Project Site for the Regent Honeyeater.

5.2 GENERAL ON-SITE HABITAT OBSERVATIONS

5.2.1 Project Site

Observations conducted on the Project Site as part of the review process, confirmed the assessments provided in the EIA that suitable potential foraging habitat for the Regent Honeyeater was present. This was represented primarily by numerous mature White Box trees and some Yellow Box and Blakely's Red Gum, with a proportion of these trees occurring on relatively fertile soil. Other areas of forage species however, occurred on less fertile soil in the more rugged sectors of the Project Site. As observed for the Swift parrot, Leard State Forest and the Project Site also supported large areas of ironbarks and cypress pine, with a lower level of occurrences of box species or Blakely's Red Gum.

The dense regeneration of cypress pine, noted by the author in the Greenloaning December 2013 Report as seeming more prevalent than during the early studies in Leard State Forest in the 1970s (James B Croft and Associates 1979) was assessed as being likely to detract from the habitat value of the Project Site for the Regent Honeyeater over time. This assessment remains valid for the purposes of this Verification Report.

5.2.2 Eastern/Western Offsets

Similar habitat as occurs in Leard State Forest, in terms of the requirements of the Regent Honeyeater, was observed in the Eastern/Western Offsets, with specific suitable habitat attributes observed comprising:

- Mature White Box and Yellow Box trees;
- Mature ironbark trees;
- Medium to large trees in both groups;
- Some areas of the above tree groups on moderately fertile soils, such as on Tralee, Blue Range and Teston North properties; and
- Large mature trees along drainage lines (Cattle Plains, Blue Range, Teston North and Olivedeen).

5.2.3 Shared Offset

In relation to Regent Honeyeater habitat, the Shared Offset property was observed to support forms of the box–ironbark woodland representing the favoured foraging habitat of the Regent Honeyeater (refer to **Figure B.2**). A number of well vegetated drainage lines, featuring large mature and/or old growth trees, were also apparent, some of which were on the low-lying perimeter areas of the site on more fertile soils. The location of these soils however, had encouraged the past clearing and more extensive use of the low-lying areas, with associated habitat degradation.

5.2.4 Oakleigh/Onavale

All woodland and open woodland patches viewed on the property were considered to represent potential habitat for the Regent Honeyeater, particularly when viewed in the context of the broader landscape, the proximity of Leard State Forest and the well vegetated travelling stock route running through the central section of the offset. The headwaters of Oakey Creek also run through the property and the vegetated portions of these drainage lines also represent potential foraging habitat for the Regent Honeyeater.

5.2.5 Bimbooria

Initial inspections of the Bimbooria Offset confirmed the occurrence of large expanses of box-ironbark habitat, as well as other key features such as vegetated drainage lines and large mature trees. The common occurrence of one of the favoured tree species, White Box, was also apparent over much of the offset property. As identified in the Greenloaning December 2013 report, although areas mapped as *Cypress Pine Woodland* do not typically represent favoured foraging habitat for the Regent Honeyeater, following the same procedure as adopted for the assessment of potential habitat for the Project Site, this habitat is appropriate to be encompassed in the overall category of potential Regent Honeyeater foraging habitat. This is particularly so given that the areas of *Cypress Pine Woodland* mapped are primarily surrounded by White Box or ironbark-dominated habitat.

5.2.6 Roseglass

The predominant vegetation community occurring on the Roseglass property was confirmed to be *Narrow-leaved Ironbark-White Cypress Pine Shrubby Open Forest* during initial site inspections of the property, although much of this habitat was observed to be grassy rather than shrubby. Patches of other communities supporting White Box were also observed. These communities have been considered as potential foraging habitat for the Regent Honeyeater within the Project Site and it is consistent therefore to consider the same habitat type as representing potential foraging habitat within the Roseglass property.

5.2.7 Wongala

The initial field inspections of the Wongala property confirmed the occurrence of extensive areas of box-dominated woodland in the centre of the offset, bounded to the east, west and south by shrubby forest on the more steep terrain. Relevant habitat attributes that were readily observed included observed included:

- Large mature/old growth White Box and/or Yellow Box trees;
- Large mature specimens of other species, such as Ribbon Gum, Apple Box and stringybarks along drainage lines in the far north eastern and central sectors of the property;

- Excellent connectivity with large expanse of vegetation to the west, southwest, south and southeast (Mount Kaputar National Park); and
- Good connectivity with White Box woodland habitat to the east (Wirradale property – Northern Offsets).

5.3 FIELD ASSESSMENTS OF HABITAT FEATURES

5.3.1 Re-appraisal of Project Site Habitats

As outlined in **Section 5.3.1** of the Greenloaning December 2013 report, plot data, rapid assessments and point descriptions conducted for the purposes of the Independent Peer Review, supported the observation that the Project Site provided suitable foraging habitat for the Regent Honeyeater in the form of box-ironbark woodland/open forest. Additional rapid assessments, conducted for the purposes of this Verification Report, provided further confirmation of the occurrence of the key forage species favoured by the Regent Honeyeater. The data from both plots and rapid assessments, as well as point descriptions, also indicated good representation of large mature trees, although the incidence of large mature or old growth trees throughout the project site varied considerably (refer to plot data summaries in **Table E.2** in **Appendix E**).

If the review plot data from 2013 and 2014 for the Project Site is combined (16 data collection points), with the datasets representing both higher fertility lowland habitat and lower fertility hilly habitat, the overall average habitat value for the Project Site is 2.97 (refer to procedures outlined in **Section 2.4.2(ii).** This value takes into account a range of habitat features relevant to the Regent Honeyeater, including the number of favoured forage tree species present, presence of drainage lines, representation of old growth trees and degree of connectivity of the site with other large are vegetation remnants at a local and/or regional level. The variation in habitat values between different data collection points (representing different habitat types or quality) is indicated by comparing the 2013 average overall habitat value score of 3.2, with the 2014 average of 2.86. A summary of the fauna habitat assessment data for the Project Site is provided in **Table E.4, Appendix E**.

5.3.2 Eastern/Western Offsets

As indicated in the previous chapters, plot data for the Eastern/Western Offsets confirmed the occurrence of the vegetation communities mapped for the EIA, primarily representing box–ironbark woodland/open forest and thus suggesting potential suitable foraging habitat for the Regent Honeyeater. The average overall habitat values for the subject Eastern/Western Offsets, drawn from seven data collection points, is 2.47, which is a little lower than for the Project Site, primarily owing to a lower level of connectivity for the Eastern/Western Offset habitat patches and lower levels of ground debris. The latter attribute however, is of less relevance to the Regent Honeyeater.

Well vegetated drainage lines were recorded within the Eastern/Western Offsets. In particular, plot data and point descriptions on Maules Creek, on the Cattle Plains property, indicated good quality riparian habitat. A summary of the fauna habitat assessment data for the Eastern/Western Offsets is provided in **Table E.1, Appendix E**.

5.3.3 Shared Offset

The overall average habitat value for the Shared Offset, drawn from 8 data collection points, is 2.8, which is slightly lower than the combined overall habitat value of 2.97 for the project site and highly comparable with the average overall habitat value of 2.8 from the 2014 field assessments. Comparison of habitat scores for key attributes relevant to the Regent Honeyeater also indicated that the Shared Offset habitats are comparable with the Project Site habitats. A summary of the fauna habitat assessment data for the Shared Offset is provided in **Table E.4, Appendix E**.

5.3.4 Oakleigh/Onavale

As the habitats on the Oakleigh/Onavale Offset were similar in many respects to the Eastern/Western Offset habitats and parts of the Project Site, similar habitat rating scores could be expected. The average score for both maturity of regeneration and overall habitat value scores were lower however (2.3 and 2.2 respectively), attributable in part to the younger status of regenerating vegetation in some sectors and to the fragmented nature of much of the habitat. Ground debris values were also lower on the Oakleigh/Onavale Offset, reflecting similarities to the Eastern/Western Offset habitats. As referred to earlier however, this attribute is not particularly relevant to the habitat requirements for the Regent Honeyeater. A summary of the fauna habitat assessment data for the Oakleigh/Onavale Offset is provided in **Table E.5, Appendix E**.

5.3.5 Bimbooria

As noted in **Section 4.3.5** of this report, habitat values for the Bimbooria Offset were comparable with the values for Leard State Forest with the average score for maturity of regeneration being 3.1. The scores for this attribute varied however, ranging from 2.5 to 3.5, with the extent of both eucalypt and cypress pine regeneration substantially affecting this score. The overall habitat value for the Bimbooria Offset habitats was 3, which was slightly higher than the 2014 average overall habitat value for Leard State Forest and comparable with the combined 2013/2014 average overall habitat value for the Project Site. A summary of the fauna habitat assessment data for the Bimbooria Offset is provided in **Table E.5**, **Appendix E**.

5.3.6 Roseglass

As for all offsets, as well as the Project Site, habitat values for the Roseglass Offset were variable, with the average overall habitat value for the offset habitats being 3.20. This is higher than the average 2014 overall habitat value of 2.86 for the Project Site, as well as

being higher than the combined 2013/2014 average overall habitat value, and the same as the 2013 overall habitat value for the Project Site of 3.2. The higher values for Roseglass can be attributed in part to the representation of large mature and old growth trees in numerous sectors of the property, particularly within sheltered gullies and the more remote slopes and ridges. A summary of the fauna habitat assessment data for the Roseglass Offset is provided in **Table E.5**, **Appendix E**.

5.3.7 Wongala

Both White Box and Yellow Box are commonly represented on the Wongala Offset, as evident from examination of the survey data provided in **Table E.5**, **Appendix E** and as illustrated by photographs provided in **Appendix D**. These species represent favoured forage trees for the Regent Honeyeater. As indicated in **Section 4.3.3**, habitat assessment plot data yielded an average maturity of regeneration score of 4.1, indicating the occurrence of relatively mature vegetation within the areas sampled. Large mature and old growth specimens were recorded in a number of locations on the offset property, both within the open woodland habitat and the less accessible sectors of the offset properties. The average overall habitat value score the Wongala Offset is 3.24, which is slightly higher than obtained for the Roseglass Offset and comparable with the values obtained the Project Site. Dense cypress pine regeneration, as was noted for the Project Site and some of the subject offsets, was only recorded as a feature in habitat assessments in the far south-east of the Wongala property. As indicated earlier in this report, continuation of cypress pine regeneration could be expected to reduce the value of habitat for the Regent Honeyeater in the long term.

Further discussion on habitat quality is provided in **Section 5.4**.

5.4 HABITAT QUALITY

As outlined in **Section 2.5.2** and **Section 4.4**, overall evaluation of habitat condition has been drawn from consideration of both general observations of vegetation and habitat condition in the field, and consideration of the fauna habitat assessment data collected from various locations within the Project Site and the offset properties. The assessment of the condition of habitat at individual sites is provided in the summary tables in **Appendix E.** As the Swift Parrot and Regent Honeyeater have somewhat similar habitat requirements, the assessments of habitat quality for the Swift Parrot, as provided in **Section 4.4** of this Verification Report, also apply to the habitat quality for the Regent Honeyeater. Some key points relating to the habitat quality for the Regent Honeyeater provided by the subject offsets are summarised below.

Vegetation overall at all sites, including the Project Site, was exhibiting signs of severe moisture stress during the review period and the general vigour of plants was very poor. The vegetation vigour in turn affects habitat quality for the Regent Honeyeater and there was a noticeable lack of evidence of significant flowering or fruiting of forage trees on most sites for the duration of both the 2013 and 2014 assessment period. The exception to

this was on the Wongala Offset, and the associated Northern Offset properties of Mt Lindesay and Wirradale. Yellow Box was observed to be flowering and fruiting on the latter two properties during 2013 and fruiting material from this species and from White Box was not uncommon on the Wongala property in March 2014. It could be expected that the higher rainfall per annum of the Wongala Offset and locality would provide more reliable seasonal conditions favouring the Regent Honeyeater during generally widespread drought conditions, as was experienced in 2013.

Negative impacts on habitat condition from exotic species have been discussed in **Section 4.4**. Primary potential impacts on Regent Honeyeater habitat quality arising from exotic species impacts, identified both within the Project Site and offset properties, would be most likely to be associated with inhibition of natural regeneration processes of forage species through either ground disturbance or browsing activities of herbivores.

The overall condition of the habitats providing suitable foraging habitat for the Regent Honeyeater was rated as moderate to good with some exceptions where the combination of land practices had adversely and substantially affected the understory strata. Some adjustments to the condition ratings for these properties have thus been incorporated into the assessment process and offset area calculations.

5.5 OUTCOMES FOR REGENT HONEYEATER HABITAT

The majority of woodland/forest habitat occurring on the offset properties is considered to represent suitable foraging habitat for the Regent Honeyeater of equivalent quality to the habitats represented within the Project Site. Although some sectors of the offset properties potentially support fewer large mature trees/ha than the Project Site, mature trees are well represented in most sectors. The offsets also provide more extensive representation of drainage lines, including sheltered watercourses encompassed by the favoured box–ironbark habitat. The Bimbooria and Roseglass Offsets provide direct connections with larger vegetation remnants, although as for Leard State Forest and the Project Site, these areas are fragmented at a regional level. The Wongala Offset however, also provides the advantage of direct connections with large tracts of habitat associated with Mount Kaputar National Park, as well as connecting directly with the Northern Offsets to the east. As stated previously, the potential for habitat value to be affected adversely in the long term by dense cypress pine regeneration applies to the Project Site and offset properties alike.

Areas of offset habitat estimated as providing foraging habitat for the Regent Honeyeater and the other subject threatened fauna species, with the habitat equivalent in quality to the Project Site habitats are provided in **Appendix G, Table G.1.** The total area of threatened fauna species habitat to be provided as offsets for the Project, encompassing large areas of suitable, high quality foraging habitat for the Regent Honeyeater, is approximately 12,918 ha, comprising 5,539 ha of low to moderate condition habitat and 7,379 ha of good condition habitat.

This represents 3,584 ha of threatened species habitat additional to the 9,334 ha required to be provided as offsets for the Maules Creek project under Condition 9a of the Project's EPBC Approval. This total habitat offset thus allows for a substantial buffer for any areas not subject to specific inspections and assessments that may be of variable quality. This total also takes into account some additional mapping refinements within previously assessed offsets, particularly the Northern Offsets, based on recent field observations and additional desktop assessments. As such, Greenloaning concludes that Whitehaven has met the obligations under the Approval Conditions. Further, Greenloaning is satisfied that the condition class of Regent Honeyeater habitat within the offset properties is equivalent or better, than that of the potential habitat for the species represented within the Project Site (see **Chapter 7** for more detail in respect of these conclusions).

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Chapter

6

Results for Threatened Species - South-eastern Long-eared Bat (*Nyctophilus corbeni*)

6.1 RESULTS FROM DESKTOP ASSESSMENTS

As referred to in Chapter 1 of this report, the threatened microbat species referred to in Conditions 9 and 10 of the Project Approval and in the EIA and BMP for the Project as the Greater Long-eared Bat, has been reclassified as the South-eastern Long-eared Bat (*Nyctophilus corbeni).* The updated taxonomic classification is adopted for this report.

Records of the South-eastern Long-eared Bat were detected during surveys for the Maules Creek Project from three widely separated locations within Leard State Forest, as shown on **Figure 3.3** of the EIA. The species was originally recorded (under the former taxonomic classification of *N. timoriensis*) within Leard State Forest in the 1970s by the author of this review and Fred van Gessel during the early ecological studies in the Forest (James B. Croft and Associates, 1979). It is also known from the nearby Leard State Conservation Area (DECC, 2006). The most recent checks of the Atlas of NSW (OEH, 2014b) for the purpose of this review indicate the records for the species closest to the Project Site and most of the offsets (excluding the records within Leard State Forest) are from the Leard State Conservation Area. The Atlas also shows records however, within Mount Kaputar National Park, in habitat immediately adjacent to the southern extremity of the Wongala Offset. Other records in the locality of the Wongala Offset are from the Horton Falls National Park area, approximately 10km east of the Northern Offsets, and from the far north-western sector of the Mount Kaputar National Park, approximately 15 km to the west of the offsets (OEH, 2014b). The South-eastern Long-eared Bat therefore is known from the immediate locality of the Eastern Offsets, Oakleigh/Onavale and Wongala.

It is of relevance to note that the Horton Falls area is located at elevations of approximately 700m to 960m (Google Earth, 2014) whilst the lower portions of Mount Kaputar National Park, in the vicinity of the South-eastern Long-eared Bat records, range from approximately 380m to 600m. Other records north of Tamworth are from an elevation of 809m (Google Earth, 2014; OEH, 2014b). For comparison, the locations within Leard State Forest at which the species was captured ranged from approximately 330m to 600m. The general area of records further to the north, in the vicinity of Warialda, is at elevations ranging from approximately 350m to 500m, whilst the general location of records south of Inverell is at elevations of approximately 750m to 900m (Google Earth, 2014). The Wongala Offset, for comparison is at elevations ranging from approximately 700m in the far southern sector to 930m in the far north-west (Google Earth, 2014).

Specific surveys for bats were not undertaken on the majority of offset properties, with most offsets being subject only to preliminary investigations. Limited target microbat surveys on/in the immediate vicinity of the Shared Offset, utilising harp nets, did not yield any records of the South-eastern Long-eared Bat but suitable foraging, roosting and breeding habitat was identified for the general area (Parsons Brinckerhoff, 2010). The more detailed fauna surveys undertaken for the Roseglass Offset also incorporated some bat surveys, but these did not incorporate harp net trapping as a survey method, which would be required to target the South-eastern Long-eared Bat. It was assessed in the Niche report that the species had a low to moderate likelihood of occurrence on the offset property.

The removal of 1,665 ha of woodland/forest habitat for the Project was recognised during the EIA process as likely to have a significant impact on the local occurrence of the South-eastern Long-eared Bat (Cumberland Ecology, 2011). As for the Swift Parrot and the Regent Honeyeater, it is noted that the 1,665 ha considered as potential habitat for the microbat species encompassed all forest and woodland communities within the Project Site, and thus was not restricted to a specific habitat type or habitat structure.

The ecology of the South-eastern Long-eared Bat is little known and only limited studies have been conducted on foraging behaviour. On the basis of what information is available, key habitat/behavioural attributes identified in the 2013 Independent Peer Review process and relevant to the assessment process for this Verification Report, include:

- Potential solitary roosting behaviour;
- Frequent roost changes;
- May move large distances between roosts (Lumsden et al., 2008);
- Variable roosting habitat, such as dead spouts on Mallee eucalypts, under bark or fissures of Buloke (*Allocasuarina leuhmannii*) or Belah (*Casuarina cristata*) or dense foliage (Dominelli, 2000);
- Strong association with box-ironbark-cypress pine communities (OEH, 2014b);
- Changes from forest/woodland habitats to grasslands/shrublands in the north-west and to more moist forest types in coastal areas are possible limits to distribution; and
- Dense understory and a distinct canopy (Turnbill and Ellis, 2005).

This information was used to determine appropriate attributes for assessments conducted for the 2013 Independent Peer Review and these were also applied to the 2014 offset assessments. A summary of the field attributes considered is provided below:

- Occurrence of box-ironbark woodlands;
- Presence of tree hollows (of varying sizes);

- Presence and density of shrub layer;
- Presence of a distinct canopy layer;
- Occurrence and extent of exfoliating/decorticating bark, fissures; and
- Size of vegetation patches/connectivity.

The general findings of desktop assessments for the offset properties have been outlined for the Swift Parrot and Regent Honeyeater and do not warrant complete replication, particularly when the broad habitat of box woodland is common to all three species as favoured habitat and the box-ironbark habitat is common to both the Regent Honeyeater and the South-eastern Long-eared Bat. In general, suitable habitat for the subject microbat appears to occur on all offset properties, although to varying extents.

6.2 GENERAL ON-SITE HABITAT OBSERVATIONS

6.2.1 Eastern/Western Offsets

The Eastern/Western Offsets were observed to support the favoured box-ironbark habitat to varying degrees, but most areas lacked substantial shrub development, an exception being the Cattle Plains property. Some well-developed vegetation along creeklines was also observed, and would be likely to provide good potential roosting habitat. It should be noted however, that connectivity with large vegetation patches may limit potential usage, except in the case of the southern portion of the Teston North property, which is connected to the Leard State Conservation Area.

6.2.2 Shared Offset

The Shared Offset appeared to provide the majority of key habitat features likely to be required by the South-eastern Long-eared Bat, with substantial areas of box-ironbark shrubby woodland, well vegetated gullies with large trees and old growth trees with hollows visible in a number of areas. The offset property also represents a relatively large vegetation patch (356 ha) and is connected to an additional vegetated area to the west, which forms part of another offset property. The total area of the vegetation patch however, is substantially smaller than Leard State Forest. As for Leard State Forest and the Project Site, the Shared Offset is somewhat fragmented in a regional context, as is evident from examination of **Figure 1.1.**

6.2.3 Oakleigh/ Onavale

As for the Eastern/Western Offsets, the Oakleigh/Onavale Offset was observed to support patches of the favoured box-ironbark habitat, but with most areas lacking a shrubby understory. The southern portion of habitat of the property is directly connected

with Leard State Forest and is thus part of a large vegetation patch but the other main large patch of box-ironbark habitat in the north is more isolated. There is however, a minor connection between this woodland patch and the travelling stock reserve running through the centre of the offset.

6.2.4 Bimbooria

Observations of the Bimbooria habitats confirmed that the offset supports large areas of the favoured box-ironbark habitat, with the Bimbooria property also representing a large habitat patch (approximately 383 ha). This habitat is directly connected to the larger expanses of habitat on the Roseglass property and thence to the Boonalla Aboriginal Area to the south. Other key habitat features observed on the Bimbooria Offset included large mature and old growth trees with hollows, large mature and old growth ironbarks with bark fissures and decorticating bark, large mature trees and well developed canopies along drainage lines, substantial patches of shrubby understory and rocky outcrops with some shrubs presenting alternative roosting opportunities.

6.2.5 Roseglass

The Roseglass Offset was also confirmed to support large areas of the favoured box-ironbark habitat and to form part of an extensive habitat patch (approximately 1,300 ha) directly connected both to the Bimbooria Offset to the east and the larger expanses of habitat forming the Boonalla Aboriginal Area to the south. Other key habitat features observed on the Roseglass Offset were similar in nature to those observed on the Bimbooria Offset and included a substantial range of structural features and large expanses of potential suitable roosting and foraging habitat for the South-eastern Long-eared Bat.

6.2.6 Wongala

The Wongala Offset was confirmed to support large areas of both open and shrubby box habitat, with extensive areas of the shrubby habitat occurring in the more rugged areas and deep gullies surrounding the more open habitat on three sides. The property so forms part of an extensive tract of native vegetation, comprising for the most part the Mount Kaputar National Park. The Wongala Offset appeared to provide all of the key habitat features considered to be required by the subject microbat.

6.3 FIELD ASSESSMENTS OF HABITAT FEATURES

6.3.1 Re-appraisal of Project Site Habitats

On the basis of the plot data, rapid assessments and point descriptions conducted within the Project Site for the purposes of the 2013 Independent Peer Review, the following features and values of the Project Site were identified:

- Variable representation of hollows and other shelter habitat features such as loose/shedding bark and shrubby understorey;
- Good representation of mature trees overall; and
- Variable representation of old growth trees (as would be expected within a state forest subject to logging activities).

Taking into account additional assessments from data collected in 2014 for the purposes of this Verification Report, rating scores for the occurrence of old growth trees ranged from 0 to 5. This level of variation was consistent for both 2013 and 2014 data. The average score overall from the combined 2013/2014 data set (16 samples) for old growth trees within the Project Site is 3.1. The representation of hollow-bearing trees was similarly variable, with scores ranging from 0 in the western sector of the Project Site to 6 in one location within Leard State Forest (waypoint 110, **Figure C.1**, **Appendix C**). The 2013/2014 combined average score for hollow-bearing trees for the Project Site is 2.6, providing an overall rating of low-moderate value.[7] The overall average habitat value for the Project Site (2013/2014 combined), which additionally takes into account other habitat features and factors such as connectivity, is 2.97, which equates to moderate-good value.

A summary of all plot data for the Project Site is provided in **Table E.4, Appendix E**.

6.3.2 Easter/Western Offsets

As indicated in the previous chapters, plot data for the Eastern/Western Offsets confirmed the occurrence of the vegetation communities mapped for the EIA, primarily representing box–ironbark woodland/open forest and thus suggesting potential suitable habitat for the South-eastern Long-eared Bat. The majority of plot data for the subject Eastern/Western Offsets, typically representing samples of box-ironbark woodland habitats, yielded variable rating scores for the specific habitat features, with both higher and lower ratings than recorded for the Project Site. With regard to old growth and hollow-bearing trees for instance, the average values for the Eastern/Western Offsets are highly variable, with some areas, such as on the creekline on Cattle Plain, scoring very highly (3.2 overall). The average score (from a smaller dataset than for the Project Site) for

[7] Note that a similar value was incorrectly referred to at page 6.7 of the Greenloaning December 2013 report as a 'moderate low value', rather than a 'low-moderate value.'

old growth trees within the Eastern/Western Offsets was 3.14, which is similar to the score for the same attribute for the Project Site. Individual scores however, ranged from 2 to 5 and a larger sample size could be expected to lower the average value to some degree.

This result needs to be viewed in the context that the overall average habitat value for the Eastern/Western Offsets of 2.47 is considerably lower than the overall value for the Project Site owing to other factors such as connectivity, ground debris and extent of shrub layer. A summary of all plot data for the Eastern/Western Offsets is provided in **Table E.4 Appendix E**.

6.3.3 Shared Offset

Plot data for the Shared Offset confirmed a range of box-ironbark woodland habitats to be present, with variable rating scores for specific habitat features. Whilst the overall habitat value of 2.82 is lower than the overall habitat value for the Project Site, as for the Eastern/Western Offsets, some values for specific attributes are higher or comparable with the ratings recorded for the Project Site. The overall values for old growth and hollow-bearing trees for instance (2.5) are comparable with the combined Project Site values, whilst the average structural diversity value of 4 for the Shared Offset is higher than the average value for this attribute for the Project Site (3.36).

A summary of all plot data for the Shared Offset is provided in **Table E.4 Appendix E**.

6.3.4 Oakleigh/Onavale

As could be expected, given the similarity of habitats on the Eastern Offsets and the Oakleigh/Onavale property, plot data for the two offset areas exhibited a number of similarities. However, the values overall tended to be slightly lower for the Oakleigh/Onavale Offset. The rating scores for attributes of specific relevance to the South-eastern Long-eared Bat are generally only low to moderate and the overall habitat value of 2.2 is lower than the overall habitat value for both the Project Site and the Eastern/Western Offsets. These results reflect an apparent lower incidence of old growth trees and tree hollows, general paucity of shrubby habitat and the fragmented nature of some habitat patches.

A summary of all plot data for the Oakleigh/Onavale is provided in **Table E.5 Appendix E**.

6.3.5 Bimbooria

The Bimbooria Offset plot data yielded an overall average habitat value of 3, which is a higher value than for the Eastern/Western and Shared Offset, and slightly higher than for the Project Site. Of particular relevance to the habitat value for the South-eastern Long-eared Bat, relatively high values were obtained for the attributes of connectivity (3.8), old growth trees (4.5), structural diversity (3.1), ground debris (4.7) and tree hollow

representation (3.4). All of these values are either comparable with, or higher than the values for the same attributes obtained for Leard State Forest.

A summary of all plot data for the Bimbooria Offset is provided in **Table E.5, Appendix E**.

6.3.6 Roseglass

The Roseglass Offset yielded somewhat similar results to both the Bimbooria and Project Site, with an overall average habitat value rating of 3.2, which is comparable with the combined Project Site score of 2.97. The comparative ratings for attributes of particular relevance to the habitat value for the South-eastern Long-eared Bat comprise: connectivity (3.6), old growth trees (3.5), structural diversity (3.4), ground debris (4.5) and tree hollow representation (3.4). All of these values are either comparable with, or higher than the values for the same attributes obtained for the Project Site.

A summary of all plot data for the Roseglass Offset is provided in **Table E.5, Appendix E**.

6.3.7 Wongala

Plot data for the Wongala offset, yielded a slightly higher overall habitat value of 3.24 then was obtained for the Roseglass Offset. Although there was a high consistency in values obtained for a number of attributes, there was also substantial variation in others, such as tree hollow representation (0-4) and ground debris (2-6). The comparative ratings for attributes of particular relevance to the habitat value for the South-eastern Long-eared Bat comprise: connectivity (4.9), old growth trees (3.7), structural diversity (3.7), ground debris (4.2) and tree hollow representation (2.3). All of these values except for the tree hollow representation being slightly lower are comparable with, or higher than the values for the same attributes obtained for the Project Site. The lower value for this attribute on the Wongala Offset can be attributed to the relatively low number of sample points conducted within the more diverse shrubby habitat within the rugged terrain of the property and the location of at least 30 per cent of the data collection points sampling areas supporting species that do not readily develop hollows (stringybarks and Apple Box).[8]

A summary of all plot data for the Wongala Offset is provided in **Table E.5, Appendix E**.

6.4 HABITAT QUALITY

As outlined in **Section 2.5.2, Section 4.4** and **Section 5.4**, overall evaluation of habitat condition has been drawn from consideration of both general observations of vegetation and habitat condition in the field, and consideration of the fauna habitat assessment data

[8] The lower sampling rate in general for the Wongala Offset was owing to time constraints for completion of the assessment.

collected from various locations within the Project Site and the offset properties. The assessment data also has been reviewed in terms of the overall values and in particular, the values for specific attributes of most relevance to the subject South-eastern Long-eared Bat. The assessment of the condition of habitat at individual sites is provided in the summary tables in **Appendix E.** Some key points relating to the habitat quality for the South-eastern Long-eared Bat provided by the subject offsets are summarised below.

As referred to previously in **Sections 3.4**, **4.4** and **5.5**, vegetation and habitats at all sites, including the Project Site, was exhibiting signs of severe moisture stress during both the 2013 and 2014 review periods and the general vigour of plants was very poor. The severe conditions however, had been alleviated to some extent for the Wongala Offset, which had experienced substantial rainfall events in late 2013 and early 2014. It could be expected that the higher rainfall per annum of the Wongala Offset and locality would provide more reliable seasonal conditions for both plant growth and insect populations, in turn favouring the subject microbat, known to occur in the adjoining Mount Kaputar National Park, during times of drought.

Negative impacts on habitat condition from exotic species have been discussed in **Section 4.4**. Primary potential impacts on habitat quality for the South-eastern Long-eared Bat arising from exotic species impacts, identified both within the Project Site and the offset properties, would be most likely to be associated with inhibition of natural regeneration processes, associated long term changes in vegetation structure and composition and potential flow on effects to the insect food resources for the subject species. Long term ground disturbance from feral pigs or browsing activities from feral herbivores contribute to the effects.

The overall condition of the habitats providing suitable foraging and/or roosting habitat for the South-eastern Long-eared Bat was rated as moderate to good with some exceptions where the combination of land practices had adversely and substantially affected the understory strata. Dense cypress pine regeneration, as was noted for some sectors of the Project Site, was only recorded as a feature in habitat assessments for small portions of the Eastern/Western Offsets, larger sectors of Bimbooria and a small sector of the far south-east of the Wongala property, but raises management issues for these areas and cypress pine occurrences within the offset properties in general. Some adjustments to the condition ratings for the offsets have been made in the final offset calculations provided in **Appendix G**.

6.5 OUTCOMES FOR SOUTH-EASTERN LONG-EARED BAT

Large portions of the woodland/forest habitat occurring on the offset properties represent suitable foraging habitat for the South-eastern Long-eared Bat and are of equivalent or better quality overall than the habitats represented within the Project Site. This assessment takes into account all habitat features assessed. Although some of the offset properties may support a lower density in old-growth trees in many sectors and a corresponding lower average hollow density than the Project Site, mature trees are well represented in most offset woodland/forest habitats, and many of these trees support

suitable roosting sites for the species in the form of loose bark or fissures. In addition, the larger offset properties of Bimbooria, Roseglass and Wongala have yielded high values generally for the key habitat attributes for the subject microbat that are comparable or higher than the same values for the Project Site. In this context, it is important to note that the Project Site is not confined to Leard State Forest, but also encompasses semi-cleared and cleared land to the west. Thus the plot data for the Project Site includes data from these grazing lands to the west.

Habitat features representing favourable habitat for the South-eastern Long-eared Bat and well represented within the offset properties include:

- The occurrence of large habitat patches (Shared Offset, Roseglass, Bimbooria and Wongala);
- Connectivity with very large areas of high quality known habitat (Bimbooria/Roseglass with Boonalla Aboriginal Area; Wongala with Mount Kaputar National Park);
- Prevalence of dense/complex shrubby habitat (Shared Offset, Bimbooria, Roseglass and Wongala);
- Presence of high quality roosting site habitat (Cattle Plains, Shared Offset, Bimbooria, Roseglass and Wongala; and
- Occurrence of high quality drainage line habitat (Cattle Plains, Shared Offset, Roseglass and Wongala).

The assessed potential for habitat value to be affected adversely in the long term by dense Cypress Pine regeneration, and/or exotic pests applies to the Project Site and offset properties alike.

Areas of offset habitat estimated as providing suitable foraging and/or roosting/breeding habitat for the South-eastern Long-eared Bat and the other subject threatened fauna species, with the habitat equivalent in quality to the Project Site habitats, are provided in **Appendix G, Table G.1**. The total area of the threatened fauna species habitat to be provided as offsets for the Project, encompassing large areas of suitable, high quality habitat for the South-eastern Long-eared Bat, is approximately 12,918 ha, comprising 5,539 ha of low to moderate condition habitat and 7,379 ha of good condition habitat.

This represents 3.584.ha of threatened species habitat additional to the 9,334 ha required to be provided under Condition 9a of the Project's EPBC Approval and thus allows for a substantial buffer for any areas not subject to specific inspections and assessments that may be of variable quality. As such, Greenloaning concludes that Whitehaven has met the obligations under the Approval Conditions. Further, Greenloaning is satisfied that the condition class of South-eastern Long-eared Bat habitat within the offset properties is equivalent or better, than that of the potential habitat for the species represented within the Project Site (see **Chapter 7** for more detail in respect of these conclusions).

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Chapter

7

Conclusions and Recommendations

7.1 CONCLUSIONS

This Verification Report presents the results of the independent review process, as requested by Whitehaven, to verify the quantity and condition class of *White Box–Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* Critically Endangered Ecological Community (CEEC) and the quantity and quality of habitat for the Regent Honeyeater, Swift Parrot and South-eastern Long-eared Bat within all proposed additional offset areas, as well as those properties within the Eastern/Western Offsets and the Shared Offset that were not previously accessed. The additional offsets of Oakleigh/Onavale, Bimbooria and Roseglass were identified in the December 2013 Independent Peer Review Report as being required to enable Whitehaven to comply with Condition 10 of the Project Approval for the Maules Creek Project.

The application of the same assessment procedures as used for the 2013 review process identified the potential for a minor shortfall in the quantity and quality of CEEC provided by the offsets assessed in the 2013 review process. As a result of this potential shortfall, Greenloaning recommended to Whitehaven that it add an additional offset property. An additional offset, Wongala, subsequently was included in the assessment process.

Six Eastern/Western Offset properties, the Shared Offset, and the additional offset properties (Oakleigh/Onavale, Bimbooria, Roseglass and Wongala) were subject to further desktop assessments and field assessments for the purpose of this Verification Report. On the basis of these assessments, suitable representations of the Box-Gum Woodland CEEC and box-gum and box-ironbark woodland habitat, favoured by the subject threatened fauna species, have been verified to occur on these additional properties.

More specific conclusions relevant to the Box-Gum Woodland CEEC and threatened fauna species habitat are provided below.

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

The desktop assessments conducted to verify the conformity of original plot data (where available) with the vegetation communities as originally mapped by the various consultancies, found a reasonable level of conformity between the map units and plot data attributes for the Eastern/Western Offset properties of Teston North, Tralee and Blue Range, with only minor discrepancies. The Cattle Plains property required more substantial mapping refinement but no plots had been sampled on this property

previously. There was conformity with a majority of the Roseglass plots with communities mapped but some discrepancies were identified and further substantial discrepancies were found with the placement of GIS mapping layers.

Taking into account the broad definition of the CEEC, the majority of areas mapped as CEEC conformed to the community definition as provided in the Listing/Conservation Advice for the *White Box–Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland*. There were however, some sectors of map units, with associated area calculations relied upon for the December 2013 report that did not conform to the CEEC community definition. The total areas of CEEC in these sectors required some adjustments. Relatively minor boundary or community classification amendments were required for the Eastern/Western Offsets, Shared Offset and Wongala Offset. More substantial amendments were required for the Bimbooria Offset in the form of some realignment of CEEC boundaries and the exclusion of some areas as CEEC.

Further substantial amendments were required for the Roseglass Offset. Mapping discrepancies exacerbated by the incorrect interchange of GIS CEEC map units, which in turn lead to a reduction in extent of the CEEC. Additional areas, that either did not conform in condition or represented non-CEEC communities, were also excised from the CEEC area calculations for Roseglass. Final adjustments were subsequently made to the offset calculations of the total quantity and condition of the CEEC to be provided, taking into full account all the required map revisions. With the addition of the Roseglass, Oakleigh/Onavale, Bimbooria and Wongala properties, that provide 831 ha of CEEC in addition to the 4,829 ha provided by the Eastern/Western, Northern and Shared Offset, the requirement for the Maules Creek offsets to provide a total of 5532 ha of *White Box–Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* is fulfilled. The total area of CEEC to be provided overall as offsets for the Project is therefore 5,660 ha, comprising 1,862 ha of low to moderate condition CEEC (Derived Native Grassland) and 3,798 ha of good condition CEEC (Box-Gum Woodland). This represents an additional 128.ha of CEEC above the 5,532 ha required to be provided under Condition 9b of the Project's EPBC Approval.

In relation to the requirement for the offset CEEC to be of equivalent or better quality than the CEEC to be impacted by the Project, the review found most areas of CEEC woodland/forest inspected or surveyed were in moderate to good condition. Communities generally were comparable with the Project Site CEEC in benchmark ratings for community attributes, based on a combination of plot data, rapid assessments and point observations. This conclusion also takes into account the following salient considerations:

- Areas categorised as CEEC and assessed as part of the Verification Report as of lower condition, have either been excised from the offset CEEC calculations, or have been included in the Derived Native Grassland category;

- The conformity of a community to the CEEC definitions has been assessed on the basis of the broad community definitions under the Listing Advice for White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland,

as required under Approval Condition 10. The consideration of 'like-for-like' in terms of floristics therefore was not required as part of the review process;

- Substantial variation in values was apparent in some attributes of the CEEC, both within offset properties and the Project Site;
- Allowance was made in the assessment of CEEC quality for the effects of prolonged drought conditions on vegetation vigour. In this respect, the Wongala Offset was in better condition than either the Project Site or other offset area owing to the better rainfall in the northern area of the Wongala property;
- A proportion of the area of CEEC to be impacted is Derived Native Grassland; and
- The total of 5,560 ha of CEEC to be provided allows for over a 100 ha buffer above the 5,532 ha requirement and also encompasses some further refinement to the previously assessed offset areas where either desktop assessments or field observations suggested such amendments were appropriate.

The overall conclusion is that the offsets comply with the requirement for equivalent or better quality CEEC in relation to the Project Site CEEC.

7.1.2 Threatened Fauna Species

The desktop assessments confirmed the vegetation community mapping, relevant to habitat for the Regent Honeyeater, Swift Parrot and South-eastern Long-eared Bat, to be reasonably accurate. Some adjustments to habitat areas were made as was identified to be appropriate and corresponding adjustments made to the calculations for total habitat area to be provided. The final outcome, taking all offset areas including the additional offsets into account, is a total quantity of offset habitat to be provided of 12,918 ha. This exceeds the 9,334 ha specified in condition 9a of the Project Approval by 3,584 ha, of which a substantial proportion represents good condition habitat for one or more of the subject threatened species.

In relation to the requirement for the offset habitats to be of equivalent or better quality than the habitats to be impacted by the Project, the final assessment has taken into account the following factors:

- The principles applied to the definition of potential habitat for the subject species within the Project Site for the EIA and BMP, which considered all woodland/forest vegetation to be cleared as potential foraging habitat;
- The occurrence of habitat of variable quality within the Project Site, including Derived Native Grassland and other grassland habitats;
- The definitions and guidance provided in the document 'How to Use the Offsets Assessment Guide';

- The combined habitat requirements for each of the subject species;
- The consideration that areas of habitat that may not be suitable for one of the subject threatened species may still have the potential to provide suitable habitat for one or both of the other subject species; and
- The expectation that most habitats would be in better condition under more favourable seasonal conditions.

The review found most areas of forest/woodland habitat inspected or surveyed within the offsets to be in moderate to good condition, taking into account the adverse seasonal conditions. Most areas were comparable with the Project Site habitats in key attributes relevant to the threatened species and overall habitat ratings based on the results of the review field surveys and assessments. Some habitat attributes, particularly old growth trees and hollows were not recorded consistently across all offsets but the larger offsets supported good representation of this attribute. It is noted that this attribute is not essential to all three subject species. Other key habitat features favoured by the Swift Parrot, Regent Honeyeater and/or South-eastern Long-eased Bat, including large and small habitat patches, favoured forage tree species, drainage lines with large mature trees, shrubby understory and decorticating/exfoliating bark and fissures, are well provided for by the offsets. As for the CEEC, allowance was made in the assessment of habitat quality for the effects of prolonged drought conditions on vegetation vigour.

The total offset habitat comprises 5,539 ha of low to moderate condition habitat and 7,379 ha of good condition habitat suitable for the subject threatened fauna species combined, representing varying levels of habitat value to these species. The total habitat offset to be provided however, encompasses large areas of high quality potential habitat for each of the subject threatened species. The low to moderate condition habitat incorporates woodland/ forest areas with lower quality understorey or ground cover development, small vegetation patches and other vegetation types that would provide some potential as foraging habitat for one or more of the Swift Parrot, Regent Honeyeater and/or South-eastern Long-eared Bat, equivalent to the lower quality habitat of the Project Site.

The conclusion therefore is that the offsets comply overall with the requirement for equivalent or better quality habitats for the three subject threatened fauna species in relation to the Project Site habitats.

7.2 RECOMMENDATIONS

For the purposes of development and ongoing management of the offset properties, it is recommended that the final vegetation mapping for these properties encompass the amendments undertaken as part of the 2013 and 2014 review process and management plans for the CEEC and threatened fauna species habitats also take account of this mapping. It is also recommended, that proposed weed and feral pest management strategies for the offset properties, outlined in the Biodiversity Management Plan for the

Maules Creek Project, incorporate the following measures to enhance offset biodiversity outcomes:

- Integration of weed and pest management procedures with adjoining landowners, particularly in relation to land under state government authority control, including Leard State Conservation Area, Leard State Forest, the travelling stock route intersecting the Oakleigh/Onavale Offset, Boonalla Aboriginal Area and Mount Kaputar National Park;

- Development of integrated weed management procedures, targeting the Tiger Pear, on all lower altitude offset properties;

- Prioritisation of feral goat control on the Bimbooria and Roseglass properties; and

- Prioritisation of feral pig control on all offset properties.

Additionally, although the naturally occurring cypress pine species are not technically exotic weed species, the adverse impact on the Box-Gum woodland communities from dense cypress pine regeneration can be severe. An integrated approach to management of cypress pine on all offsets therefore is recommended.

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Appendix A

Vegetation Community & Fauna Habitat Table from EIA & BMP

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Table A.1 Vegetation Areas within the Eastern, Western, Northern and Shared Offset Properties (Source Cumberland Ecology, Biodiversity Management Plan, 2013)

Vegetation Communities	Eastern Properties						Northern Properties		Shared Property	Western Properties					SubTotal (ha)
	Blue Range	Cattle Plain	Teston North	Tralee	Wallandilly	Warriahdool	Mt Lindesay	Wirradale	Shared Offset	Kelso	Louenville	Olivedeen	Teston South	Velyama	
Cliff and scree Thickets (Rainforest Species)											0.53				0.53
Manna Gum - Yellow Box - Blakely's Red Gum open forest							139.68	245.85							385.53
Melaleuca riparian forest	9.04	2.68	6.18	14.63	66.55	35.16		4.61							138.85
Narrow-leaved Ironbark - Brown Bloodwood - White Cypress Pine shrubby open forest													0.00		0.00
Narrow-leaved Ironbark - White Cypress Pine shrubby open forest								853.61		270.42	33.70		416.12	79.36	1653.21
River Red Gum riparian woodlands and forests										11.89		8.30			20.19
Stringybark - Blakely's Red Gum grassy open forest							770.30								770.30
Stringybark - Blakely's Red Gum shrubby open forest							84.94								84.94
White Box - Blakely's Red Gum - Melaleuca riparian forest	19.74		10.23	4.49					11.09				4.82		50.37
White Box - Narrow-leaved Ironbark - White Cypress Pine grassy open forest			0.05	0.01	53.29	58.32				16.49	151.10		185.79	23.23	488.28
White Box - Narrow-leaved Ironbark - White Cypress Pine shrubby open forest						0.75			369.43		0.28		34.93	4.13	409.52
Belah woodland													4.21	6.94	11.15
Dwyer's Red Gum - Ironbark woodland			2.84	8.62							3.09		211.64		226.19
Dwyer's Red Gum woodland									176.73				3.59		180.32
Pilliga Box - Poplar Box - White Cypress Pine grassy open woodland				1.75	161.61	16.05				44.01		4.95		6.50	234.87
Regrowth - White Cypress Pine									10.70						10.70
Rough-barked Apple - Blakely's Red Gum riparian grassy woodland							25.34	223.22							248.56

Vegetation Communities	Eastern Properties						Northern Properties		Shared Property	Western Properties					SubTotal (ha)
	Blue Range	Cattle Plain	Teston North	Tralee	Wallandilly	Warriahdool	Mt Lindesay	Wirradale	Shared Offset	Kelso	Louenville	Olivedeen	Teston South	Velyama	
Silver-leaved Ironbark heathy woodland						42.47			69.42						111.89
Weeping Myall grassy open woodland														0.15	0.15
White Box - stringybark grassy woodland							553.72	881.39							1435.11
White Box - Stringybark shrubby woodland							139.21	192.30							331.51
White Box - White Cypress Pine grassy woodland	2.26	35.98	48.74	16.96	99.27	91.14		226.75							521.10
White Box - White Cypress Pine grassy woodland (low condition)									72.56						72.56
White Box - Wilga - Belah woodland													85.75	18.26	104.01
Yellow Box - Blakely's Red Gum grassy woodland					0.02										0.02
Total Forest and Woodland	31.04	38.66	68.04	46.46	380.74	243.89	1713.19	2627.73	709.93	342.81	188.70	13.25	946.85	138.57	7489.86
Tea-tree shrubland in drainage lines								69.61							69.61
Total shrubland	0.00	0.00	0.00	0.00	0.00	0.00	0.00	69.61	0.00	0.00	0.00	0.00	0.00	0.00	69.61
Derived Native Grassland (Box Gum Woodland)							577.56	1406.40					105.90	71.62	2161.48
Derived Native Grassland (Non-threatened)								74.09						94.10	168.19
Total Derived Native Grassland	0.00	0.00	0.00	0.00	0.00	0.00	577.56	1480.49	0.00	0.00	0.00	0.00	105.90	165.72	2329.67
Derived Native Grassland (Low Diversity - Box Gum Woodland)		103.09	51.69	69.48	0.43	74.87		87.94	2.44	22.12			101.41	126.13	639.60
Improved Pastures							131.98						37.14	62.61	231.73
Low Diversity Native/Exotic Grassland and Cultivation	692.05	139.19	170.77	224.18	1471.60	687.11				134.31	270.19	177.90	81.22	426.16	4474.68
Total Other Grassland	692.05	242.28	222.46	293.66	1472.03	761.98	131.98	87.94	2.44	156.43	270.19	177.90	219.77	614.90	5346.01
Total Vegetation in each Property (ha)	**723.09**	**280.94**	**290.50**	**340.12**	**1852.77**	**1005.87**	**2422.73**	**4265.77**	**712.37**	**499.24**	**458.89**	**191.15**	**1272.52**	**919.19**	**15235.15**
Total Box Gum Woodland (remnant vegetation and derived native	**22.00**	**35.98**	**59.02**	**21.46**	**152.58**	**149.46**	**2066.60**	**2983.61**	**11.09**	**16.49**	**151.10**	**0.00**	**382.26**	**113.11**	**6164.76**

Vegetation Communities	Eastern Properties						Northern Properties		Shared Property	Western Properties					SubTotal (ha)
	Blue Range	Cattle Plain	Teston North	Tralee	Wallandilly	Warriahdool	Mt Lindesay	Wirradale	Shared Offset	Kelso	Louenville	Olivedeen	Teston South	Velyama	
grassland) (ha)															
Total Vegetation to be protected in Conservation Management Zones (ha)	127.42	154.27	204.53	103.17	822.53	202.52	2277.55	3536.06	356.18	499.24	303.62	45.08	302.76	398.77	9333.70
Total Box Gum Woodland (remnant vegetation and derived native grassland) in Conservation Management Zones (ha)	21.65	35.95	57.84	17.19	98.29	64.46	2035.89	2335.79	5.54	16.49	151.04	0.00	82.04	109.40	5031.57
% Total Vegetation to be conserved from each property	17.62	54.91	70.41	30.33	44.39	20.13	94.01	82.89	50.00	100.00	66.16	23.58	23.79	43.38	61.26
% Total Box Gum Woodland (remnant vegetation and derived native grassland) to be conserved from each property (ha)	98.41	99.92	98.00	80.10	64.42	43.13	98.51	78.29	49.95	100.00	99.96	N/A	21.46	96.72	81.62

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Table A.2 **Area Condition of Habitat for Threatened Species to be Conserved in the Eastern, Western, Northern and Shared Offset Properties (Source: Cumberland Ecology Biodiversity Management Plan, 2013)**

OFFSETS	[a] HABITAT for Wide-foraging Bird Species (White-throated Needletail, Fork-tailed Swift, Square-tailed Kite, Spotted Harrier, Little Eagle)		[b] HABITAT for Forest and Woodland Species*		[c] Potential HABITAT for Koala		[d] Potential HABITAT for *Pultenaea setulosa*		[e] Potential HABITAT for *Pomaderris queenslandica*	
Property (describe each discrete property separately)	**Good condition vegetation (ha)**	**Low or moderate condition vegetation to be re-vegetated (ha)**	**Good condition vegetation (ha)**	**Low or moderate condition vegetation to be re-vegetated (ha)**	**Good condition vegetation (ha)**	**Low or moderate condition vegetation to be re- vegetated (ha)**	**Good condition vegetation (ha)**	**Low or moderate condition vegetation to be re-vegetated (ha)**	**Good condition vegetation (ha)**	**Low or moderate condition vegetation to be re-vegetated (ha)**
Blue Range	30.69	96.7	0	127.4	0	30.7	0	0	0	28.4
Cattle Plain	38.6	115.6	36.0	118.3	36.0	2.7	0	0	0.0	2.7
Teston (nth)	66.1	138.4	0.1	204.5	0.1	63.3	0.1	2.8	0.0	15.7
Tralee	35	68.1	0.0	103.2	0	26.5	0	8.6	0	9.5
Wallandilly	266.7	555.8	122.8	699.7	122.8	143.9	10.5	0	0.0	56.2
Warriahdool	89.7	112.9	64.5	138.1	64.5	25.2	0	0	0.0	25.2
Mt Lindesay	2260.4	17.5	1456.7	821.2	686.4	1.9	0	0	0.0	226.1
Wirradale	3495.9	40.1	1942.2	1593.7	1088.9	432.9	853.4	0	853.4	420.1
Shared	355.0	1.3	124.1	232.1	0	41.8	35.8	183.6	35.8	189.2

Kelso	342.8	156.4	342.8	156.4	72.4	0	286.9	0	282.3	0.0
Louenville	188.6	115.0	188.6	115.0	151.0	0	188.1	0	34.5	0.0
Olivedeen	13.2	31.8	13.2	31.8	13.2	0	0	0	8.3	0.0
Teston (sth)	246.6	56.2	175.1	127.6	10.6	52.9	175.1	0	83.1	0.0
Velyama	116.9	281.9	83.0	315.8	25.2	16.1	79.5	0	57.8	0.0
TOTAL	**7546.3**	**1787.7**	**4549.1**	**4784.8**	**2271.1**	**837.9**	**1629.4**	**195.1**	**1355.1**	**973.1**

Table A.3 COMPARATIVE SUMMARY TABLE OF CLEARING AND REVISED OFFSET AREAS (INCLUDING ADDITIONAL OFFSETS) – FROM DECEMBER 2013 INDEPENDENT PEER REVIEW REPORT

OFFSETS	Box Gum Woodland and Derived Grasslands provided (ha) (derived from BMP - Table 4.29 and Corresponding with Management Zone Totals in Attachment A - Approval Conditions)			Variations for Box Gum Woodland and Derived Grasslands provided (ha)							HABITAT for EPBC Matters of National Environmental Significance (Regent Honeyeater, Swift Parrot and South-eastern Long-eared Bat [Greater Long-eared Bat]) (derived from BMP - Table 4.29 and Corresponding with Management Zone Totals in Attachment A - Approval Conditions)			Variations for HABITAT for EPBC Matters of National Environmental Significance (Regent Honeyeater, Swift Parrot and South-eastern Long-eared Bat					
Property	Derived Grassland	Box-Gum Woodland	**Total area of offsets (ha) (Combined)**	Positive Variation (Derived Grass-land)	Positive Variation (Box-Gum Wood-land)	Negative Variation (Derived Grass-land)	Negative Variation (Box-Gum Wood-land)	**Adjusted Total Derived Grass-land**	**Adjusted Total Box-Gum Wood-land**	**Adjusted Total Area of Offsets**	Good condition vegetation (ha)	Low or moderate condition vegetation to be re-vegetated (ha)	**Total Habitat Offset Area**	Positive Variation - Good condition vegetation (ha)	Positive Variation - Low or moderate condition vegetation (ha)	Negative Variation - Good condition vegetation (ha)	Negative Variation - Low or moderate condition vegetation (ha)	**Adjusted Total - Good condition vegetation (ha)**	**Adjusted Total - Low or moderate condition vegetation (ha)**	**Adjusted Total Habitat Offset Area Estimate (if required)**
Northern Offsets																				
Mt Lindesay	577.3	1458.6	**2035.9**	7.34	21.5		275.23	584.64	1204.87	1789.51	1456.7	821.2	2277.9	230.9		50.3	218.3	1637.3	602.9	**2240.2**
Wirradale	818.7	1517.1	**2335.8**		20.89	3.37	113.2	815.33	1424.79	2240.12	1942.2	1593.7	3535.9	458.4	44			2400.6	1637.7	**4038.3**
Western Offsets								0	0	0										
Kelso	0	16.5	**16.5**					0	16.5	16.5	342.8	156.4	499.2		40.2	40.2		302.6	196.6	**499.2**
Louenville	0	151	**151**					0	151	151	188.6	115	303.6					188.6	115	**303.6**
Olivedeen	0	0	**0**					0	0	0	13.2	31.8	45					13.2	31.8	**45**
Teston (sth)	18.6	63.4	**82**		14			18.6	77.4	96	175.1	127.6	302.7					175.1	127.6	**302.7**
Velyama	71.6	37.8	**109.4**		36		36	71.6	37.8	109.4	83	315.8	398.8		20	**20**		63	335.8	**398.8**
Eastern Offsets																				
Blue Range	0	21.7	**21.7**					0	21.7	21.7	0	127.4	**127.4**					0	127.4	**127.4**
Cattle Plain	0	36	**36**					0	36	36	36	118.3	**154.3**					36	118.3	**154.3**
Teston (nth)	0	57.8	**57.8**					0	57.8	57.8	0.1	204.5	**204.6**					0.1	204.5	**204.6**
Tralee	0	17.2	**17.2**					0	17.2	17.2	0	103.2	103.2					0	103.2	**103.2**

OFFSETS	Box Gum Woodland and Derived Grasslands provided (ha) (derived from BMP - Table 4.29 and Corresponding with Management Zone Totals in Attachment A - Approval Conditions)			Variations for Box Gum Woodland and Derived Grasslands provided (ha)							HABITAT for EPBC Matters of National Environmental Significance (Regent Honeyeater, Swift Parrot and South-eastern Long-eared Bat [Greater Long-eared Bat]) (derived from BMP - Table 4.29 and Corresponding with Management Zone Totals in Attachment A - Approval Conditions)			Variations for HABITAT for EPBC Matters of National Environmental Significance (Regent Honeyeater, Swift Parrot and South-eastern Long-eared Bat						
Property	Derived Grassland	Box-Gum Woodland	**Total area of offsets (ha) (Combined)**	Positive Variation (Derived Grass-land)	Positive Variation (Box-Gum Wood-land)	Negative Variation (Derived Grass-land)	Negative Variation (Box-Gum Wood-land)	**Adjusted Total Derived Grass-land**	**Adjusted Total Box-Gum Wood-land**	**Adjusted Total Area of Offsets**	Good condition vegetation (ha)	Low or moderate condition vegetation to be re-vegetated (ha)	**Total Habitat Offset Area**	Positive Variation - Good condition vegetation (ha)	Positive Variation - Low or moderate condition vegetation (ha)	Negative Variation - Good condition vegetation (ha)	Negative Variation - Low or moderate condition vegetation (ha)	**Adjusted Total - Good condition vegetation (ha)**	**Adjusted Total - Low or moderate condition vegetation (ha)**	**Adjusted Total Habitat Offset Area Estimate (if required)**
Wallan-dilly	0	98.3	**98.3**	198.06	107		34.75	198.06	170.55	368.61	122.8	699.7	822.5	106.2		106.2		122.8	699.7	**822.5**
Warriah-dool	0	64.5	**64.5**					0	64.5	64.5	64.5	138.1	202.6		30	**30**		34.5	168.1	**202.6**
Shared Property																				
	0	5.6	5.6						5.6	5.6	**124.1**	**232.1**	**356.2**							356.2
SUB-TOTAL	**1486.2**	**3545.5**	**5031.7**	**205.4**	**199.39**	**3.37**	**459.18**	**1688.23**	**3285.71**	**4973.94**	**4549.1**	**4784.8**	**9333.9**	**795.5**	**134.2**	**246.7**	**218.3**	**4973.8**	**4468.6**	**9798.6**
Additional Properties																				
Roseglass	97	262	**359**					97	262	**359**	864.5	425.5	**1290**							1290
Oakleigh/ Onavale	49	111	**160**					49	111	**160**	134	129	**263**							263
Bimbooria	40	169	**209**					40	169	**210**	383	300	**683**							683
SUB-TOTAL	186	542	728	0	0			186	542	729	1381.5	854.5	2236							2236
TOTAL	1672.2	4087.5	5759.7	205.4	199.39	3.37	459.18	1874.33	3827.71	5702.94	5930.6	5639.3	11569.9	795.5	134.2	246.7	218.3	4973.8	4468.6	12034.6

Appendix B

Vegetation Community Maps of Additional Offset Areas

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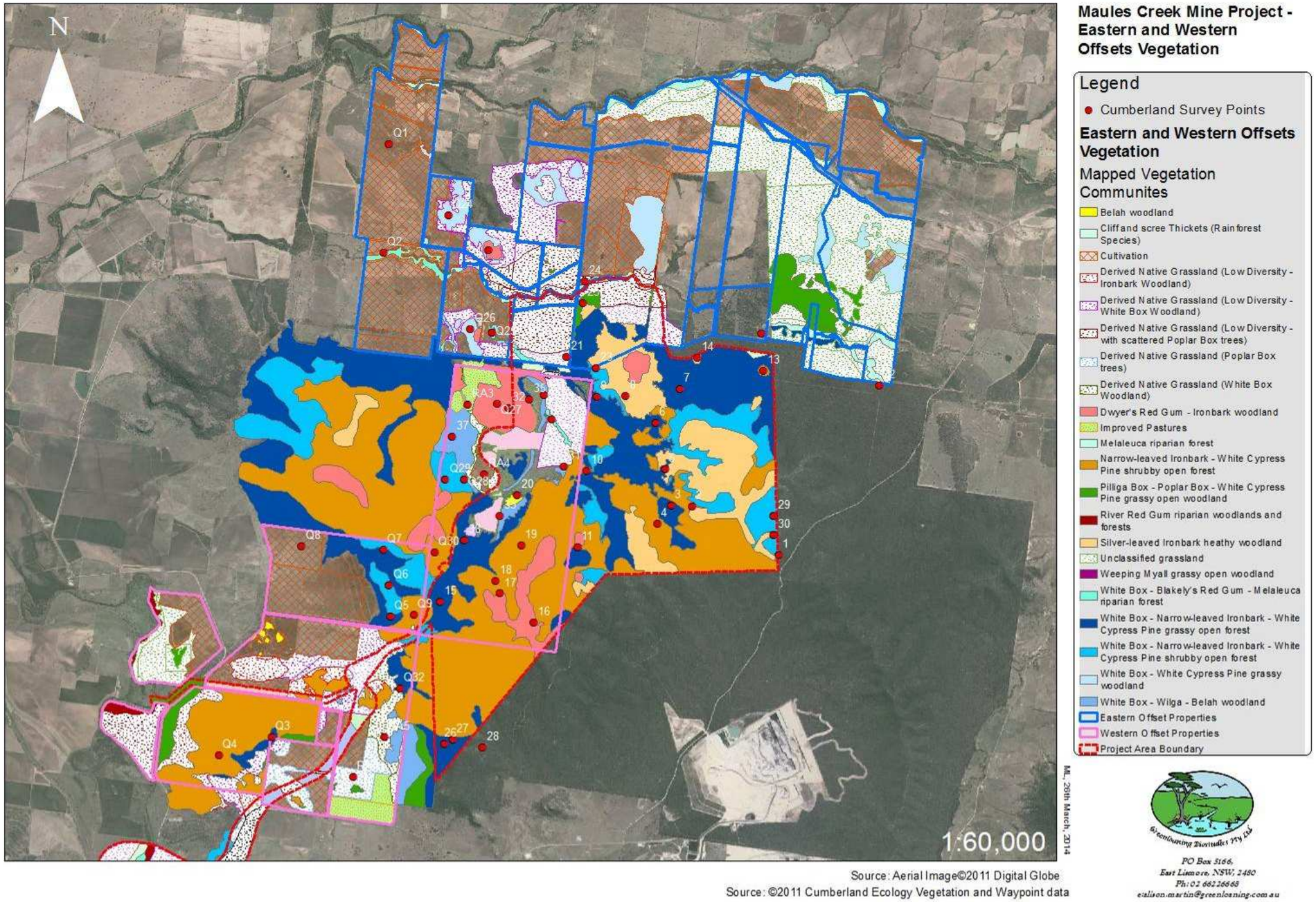

Maules Creek Mine Project - Eastern and Western Offsets Vegetation

Legend

- Cumberland Survey Points

Eastern and Western Offsets Vegetation

Mapped Vegetation Communites

- Belah woodland
- Cliff and scree Thickets (Rainforest Species)
- Cultivation
- Derived Native Grassland (Low Diversity - Ironbark Woodland)
- Derived Native Grassland (Low Diversity - White Box Woodland)
- Derived Native Grassland (Low Diversity - with scattered Poplar Box trees)
- Derived Native Grassland (Poplar Box trees)
- Derived Native Grassland (White Box Woodland)
- Dwyer's Red Gum - Ironbark woodland
- Improved Pastures
- Melaleuca riparian forest
- Narrow-leaved Ironbark - White Cypress Pine shrubby open forest
- Pilliga Box - Poplar Box - White Cypress Pine grassy open woodland
- River Red Gum riparian woodlands and forests
- Silver-leaved Ironbark heathy woodland
- Unclassified grassland
- Weeping Myall grassy open woodland
- White Box - Blakely's Red Gum - Melaleuca riparian forest
- White Box - Narrow-leaved Ironbark - White Cypress Pine grassy open forest
- White Box - Narrow-leaved Ironbark - White Cypress Pine shrubby open forest
- White Box - White Cypress Pine grassy woodland
- White Box - Wilga - Belah woodland
- Eastern Offset Properties
- Western Offset Properties
- Project Area Boundary

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FIGURE B.1 VEGETATION COMMUNITIES IN THE EASTERN AND WESTERN OFFSET AREAS AND CUMBERLAND SURVEY LOCATIONS

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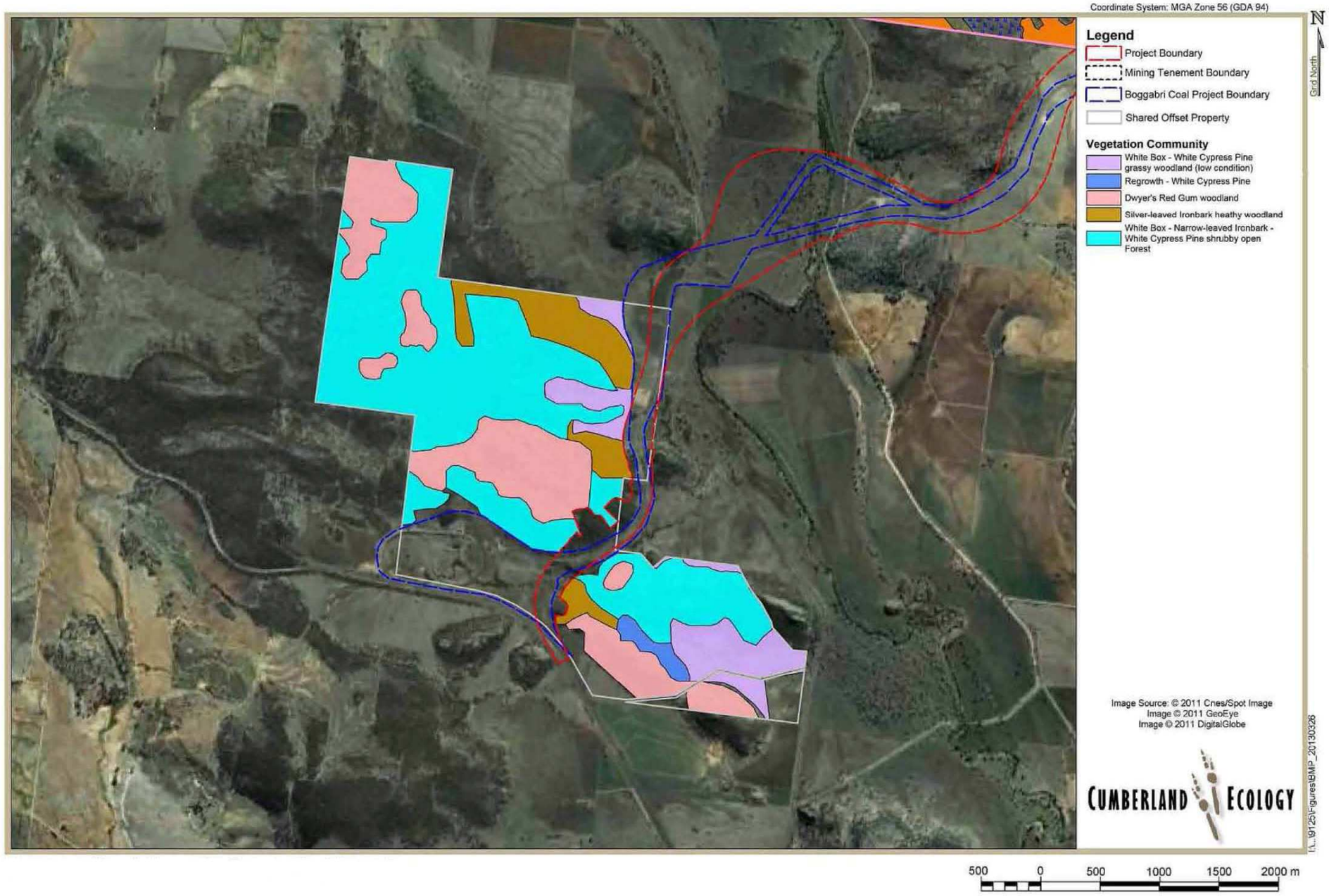

Figure B.2 VEGETATION COMMUNITIES IN THE SHARED OFFSET (SOURCE: CUMBERLAND ECOLOGY, BMP, 2013)

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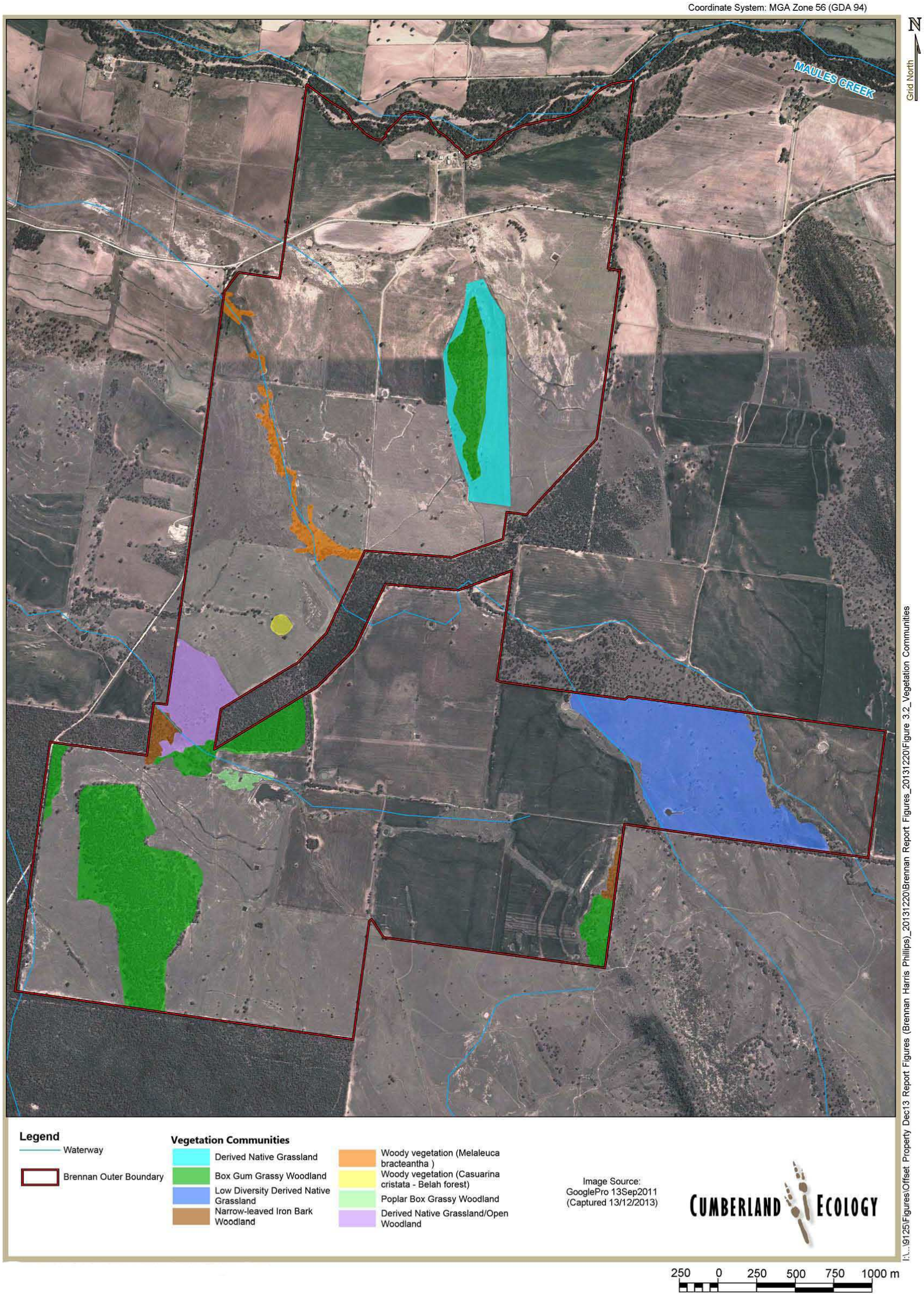

Figure B.3 VEGETATION COMMUNITIES OF OAKLEIGH AND ONAVALE PROPERTIES

(SOURCE: MAULES CREEK COAL PROJECT: ANALYSIS OF OFFSET POTENTIAL OF THE OAKLEIGH AND ONAVALE PROPERTY, CUMBERLAND ECOLOGY, 2013)

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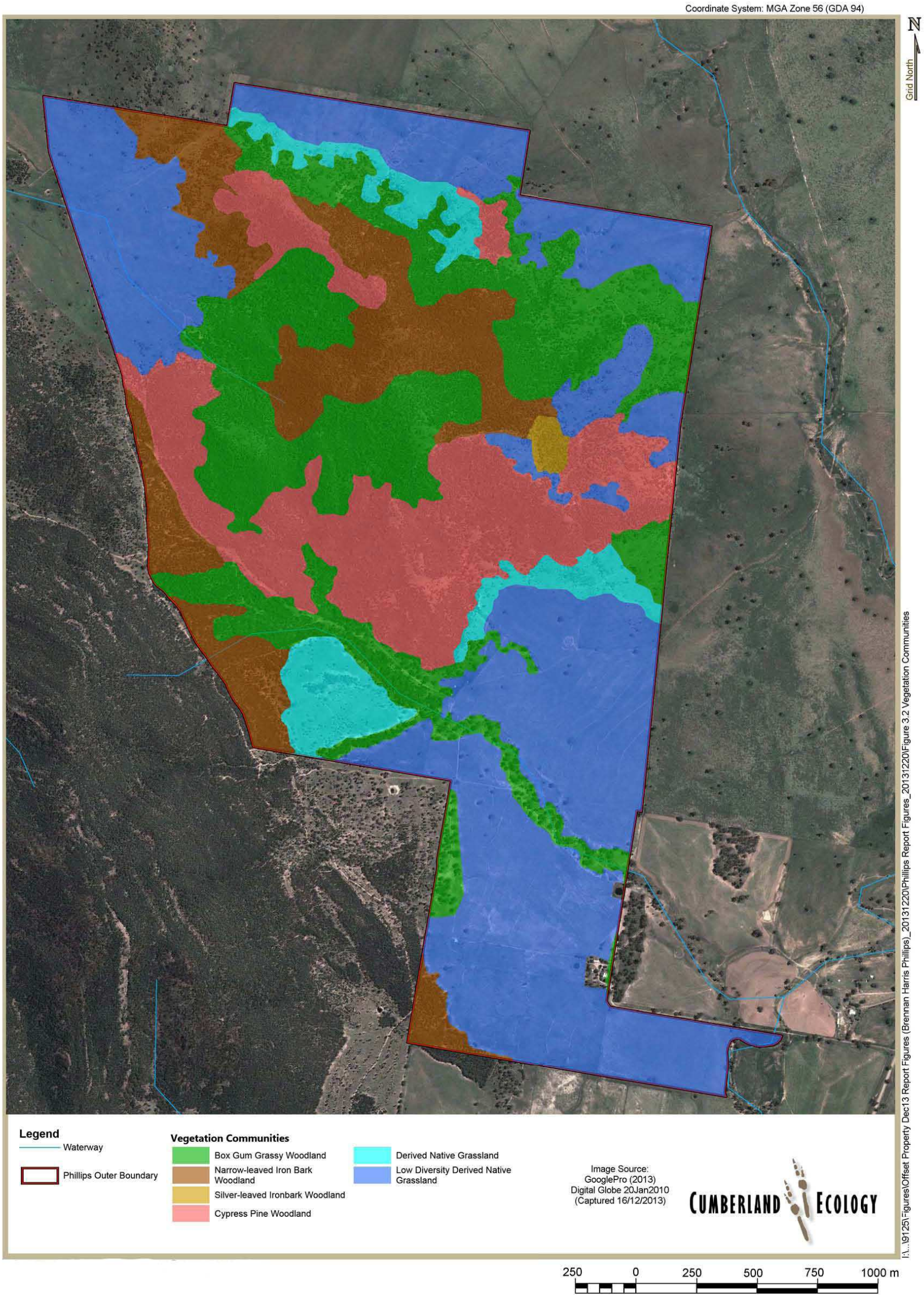

Figure B.4 VEGETATION COMMUNITIES OF BIMBOORIA PROPERTY

(SOURCE: MAULES CREEK COAL PROJECT: ANALYSIS OF OFFSET POTENTIAL OF THE BIMBOORIA PROPERTY, CUMBERLAND ECOLOGY 2013)

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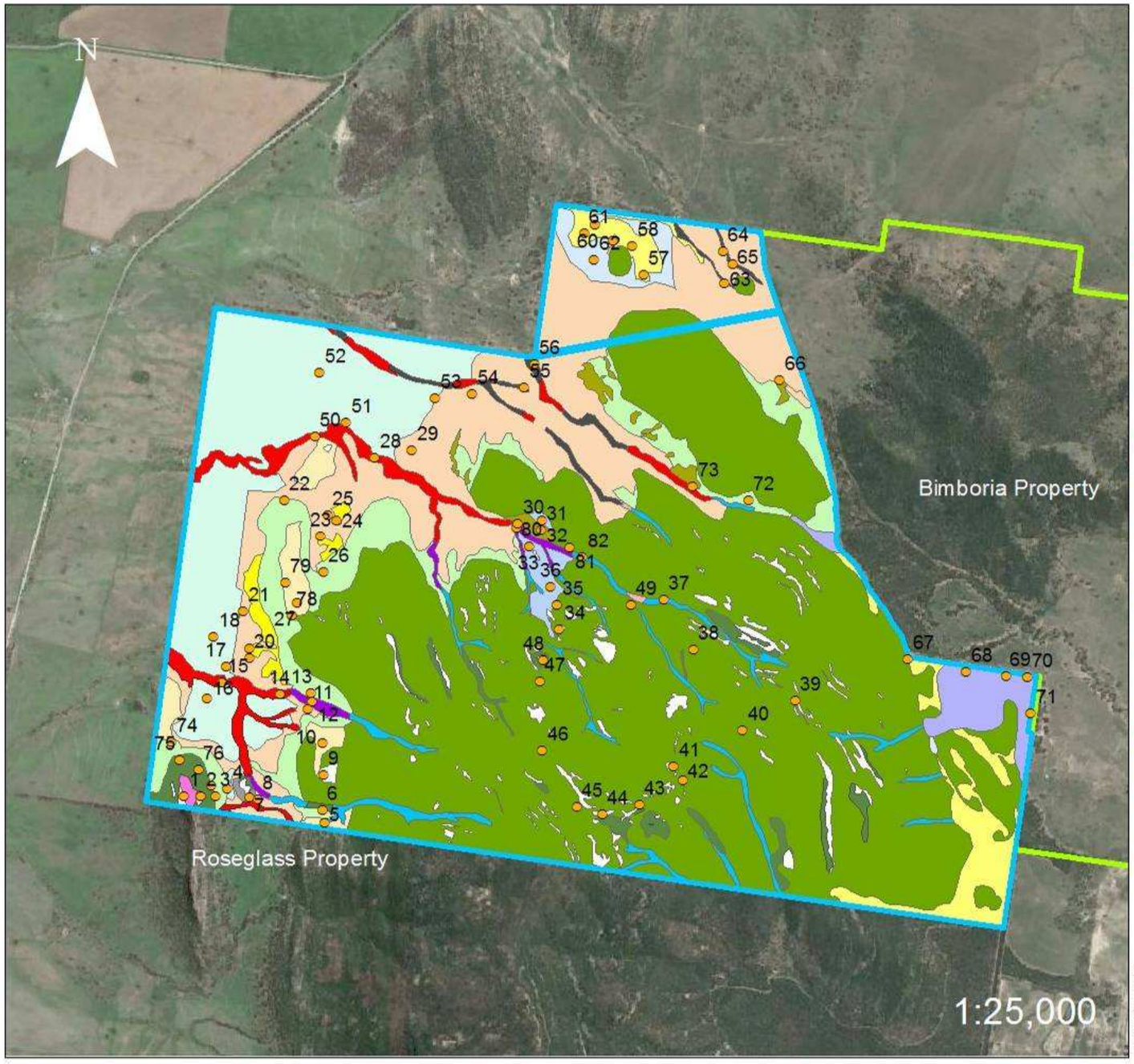

Maules Creek Mine Project - Roseglass Offset Property Vegetation as mapped by Niche

Legend

Flora Survey

Roseglass Property Boundary

- Roseglass Property Boundary
- Bimboria Property Boundary

Roseglass Property Vegetation

Mapped Vegetation Communities

- Belah - Wilga - Rosewood_Derived Budda
- Belah - Wilga - Rosewood_Exotic Pasture
- Bracteate Honeymyrtle low riparian forest_Derived Native Pasture
- Bracteate Honeymyrtle low riparian forest_Semicleared regenerating
- Metasediment rock outcrop shrubland
- Motherumbah - Narrow-leaved Ironbark forest
- Motherumbah - Narrow-leaved Ironbark_Semi-Cleared
- Narrow-leaved Ironbark - Tumbedown Gum
- Narrow-leaved Ironbark - Tumbedown Gum_Cleared
- Narrow-leaved Ironbark - White Cypress Pine Shrubby open forest
- Narrow-leaved Ironbark - White Cypress_Derived Native Pasture
- Narrow-leaved Ironbark - White Cypress_Semi-cleared
- Semi-evergreen vine thicket
- White Box - Tumbledown Gum Creek Lines_Derived Native Pasture
- White Box - Tumbledown Gum on creek lines
- White Box - Tumbledown Gum_Semi-cleared
- White Box - White Cypress Pine_Derived Shrubland
- White Box - Wilga - Quinnine_Derived Native Pasture
- White Box - Wilga - Quinnine_Semi-Cleared
- White Box grassy woodland_Semi-cleared

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Figure B.5 VEGETATION COMMUNITIES OF ROSEGLASS PROPERTY AND NICHE FLORA SURVEY POINTS

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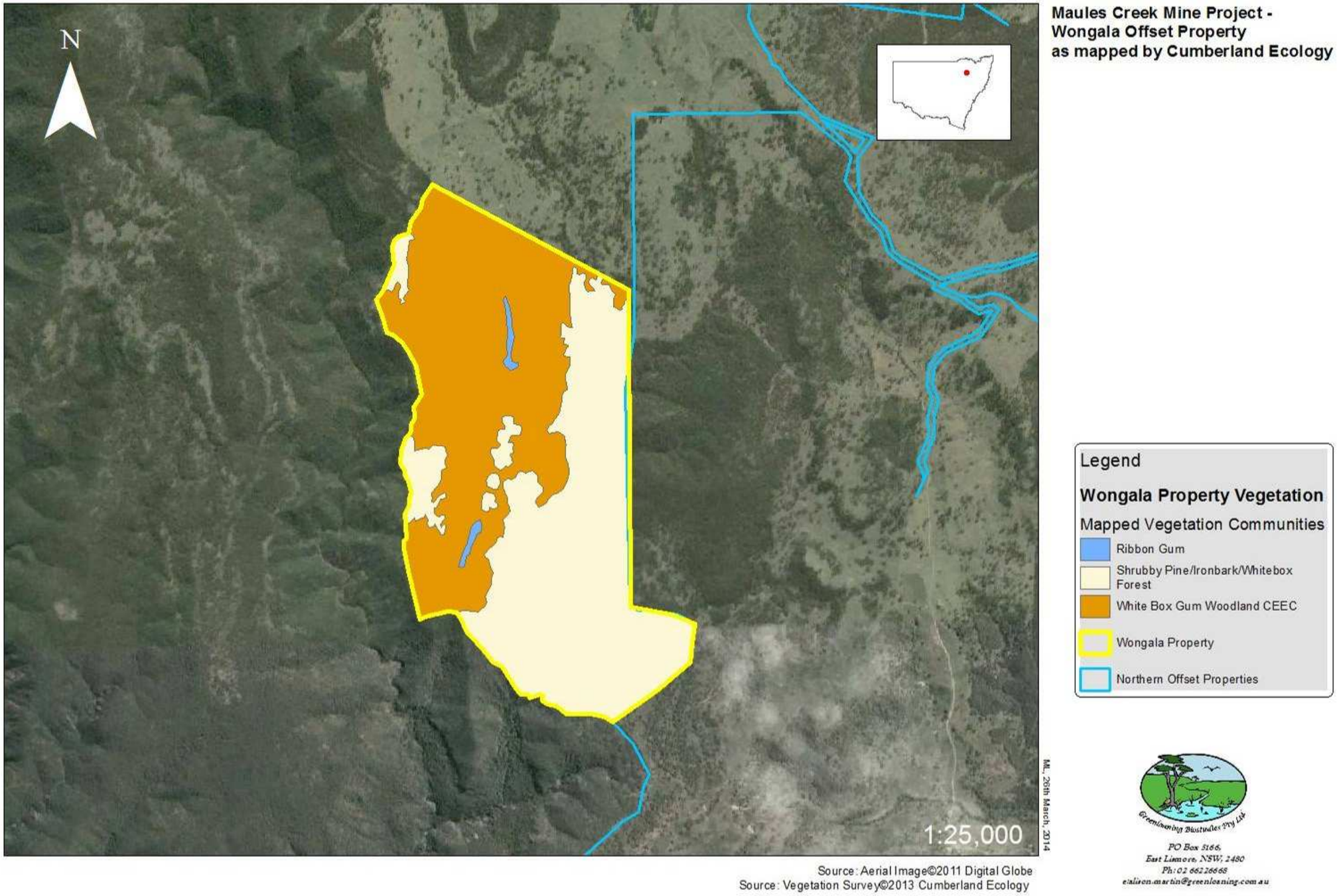

Figure B.6 VEGETATION COMMUNITIES OF WONGALA PROPERTY

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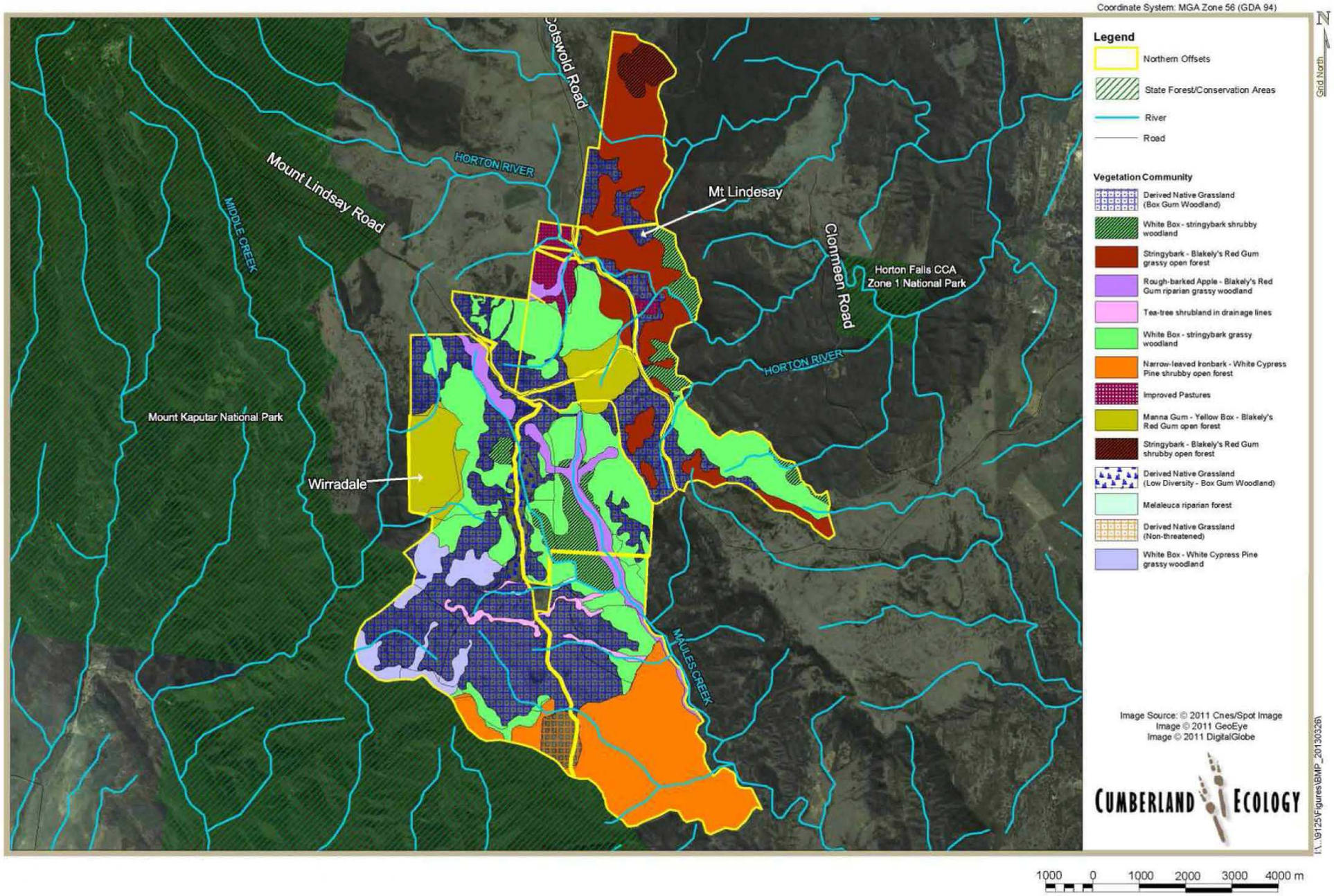

Figure B.7 VEGETATION COMMUNITIES IN THE NORTHERN OFFSET AREAS (SOURCE: CUMBERLAND ECOLOGY, BMP, 2013)

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Appendix C

Greenloaning Survey Point Locations

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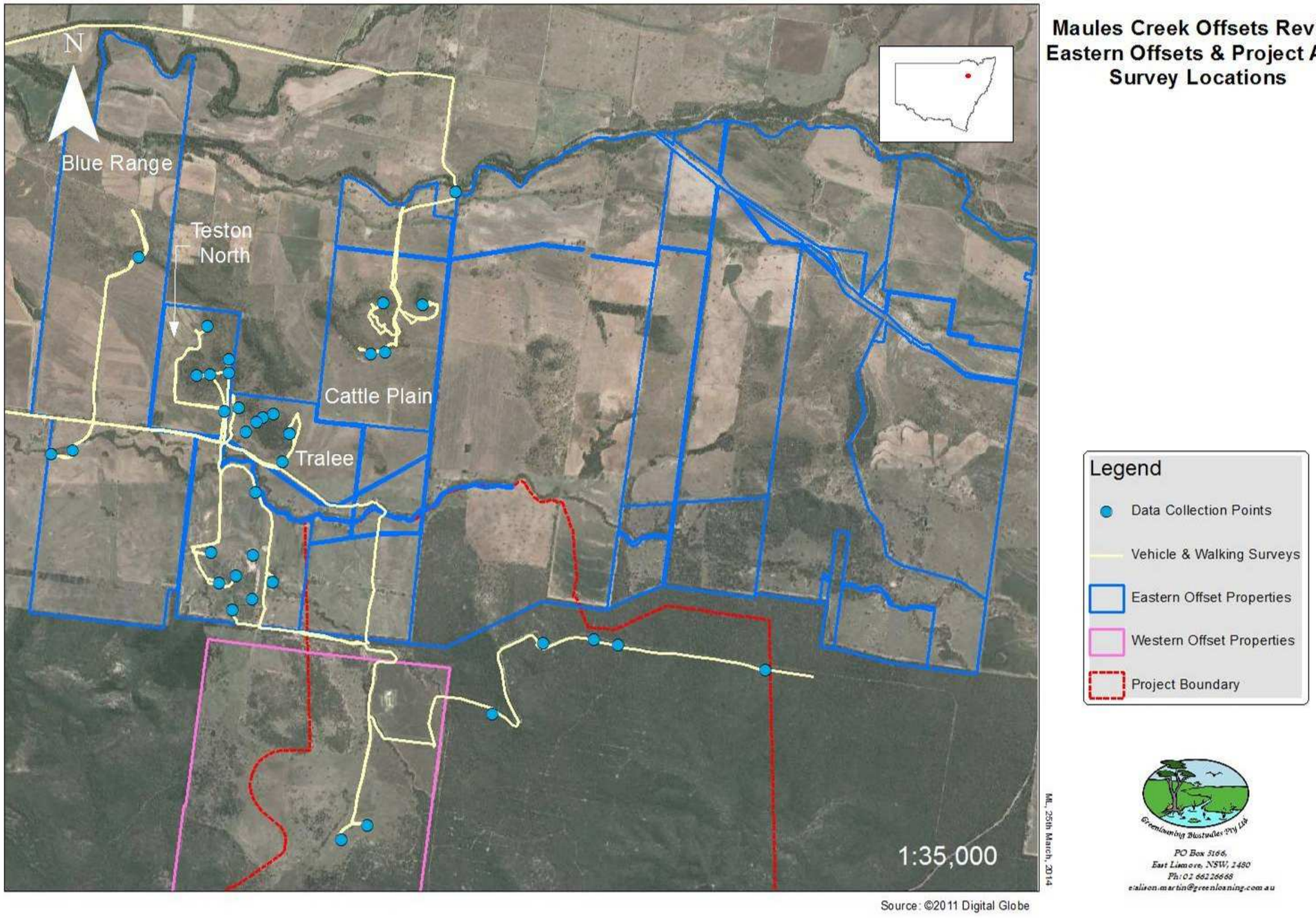

Figure C.1 GREENLOANING SURVEY LOCATIONS WITHIN THE PROJECT AREA AND EASTERN OFFSET PROPERTIES BLUE RANGE, TESTON NORTH, TRALEE, AND CATTLE PLAIN DURING THE 2014 SURVEYS

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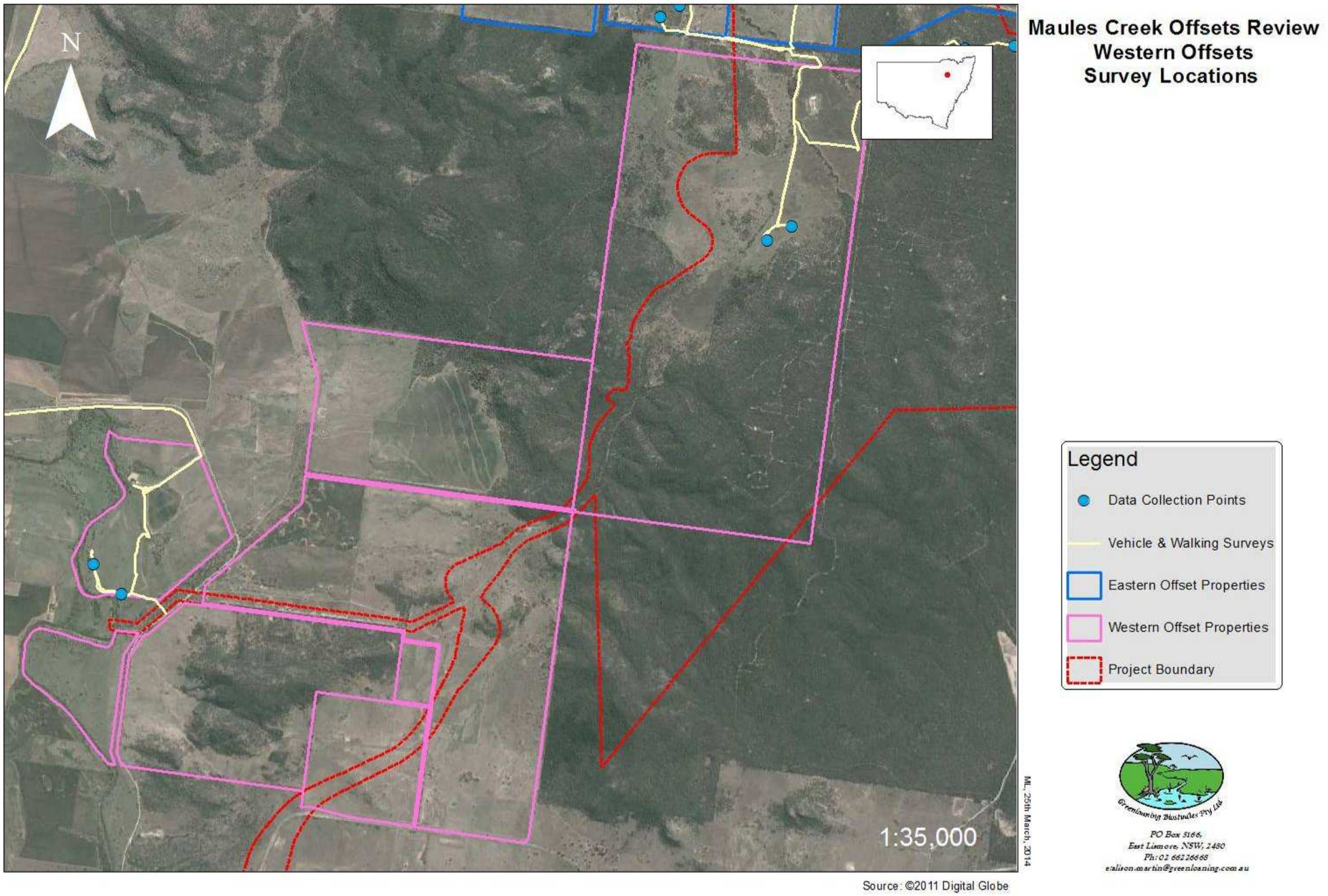

Figure C.2 GREENLOANING SURVEY LOCATIONS WITHIN THE OLIVEDEEN WESTERN OFFSET PROPERTY AND PROJECT SITE DURING 2014 SURVEYS

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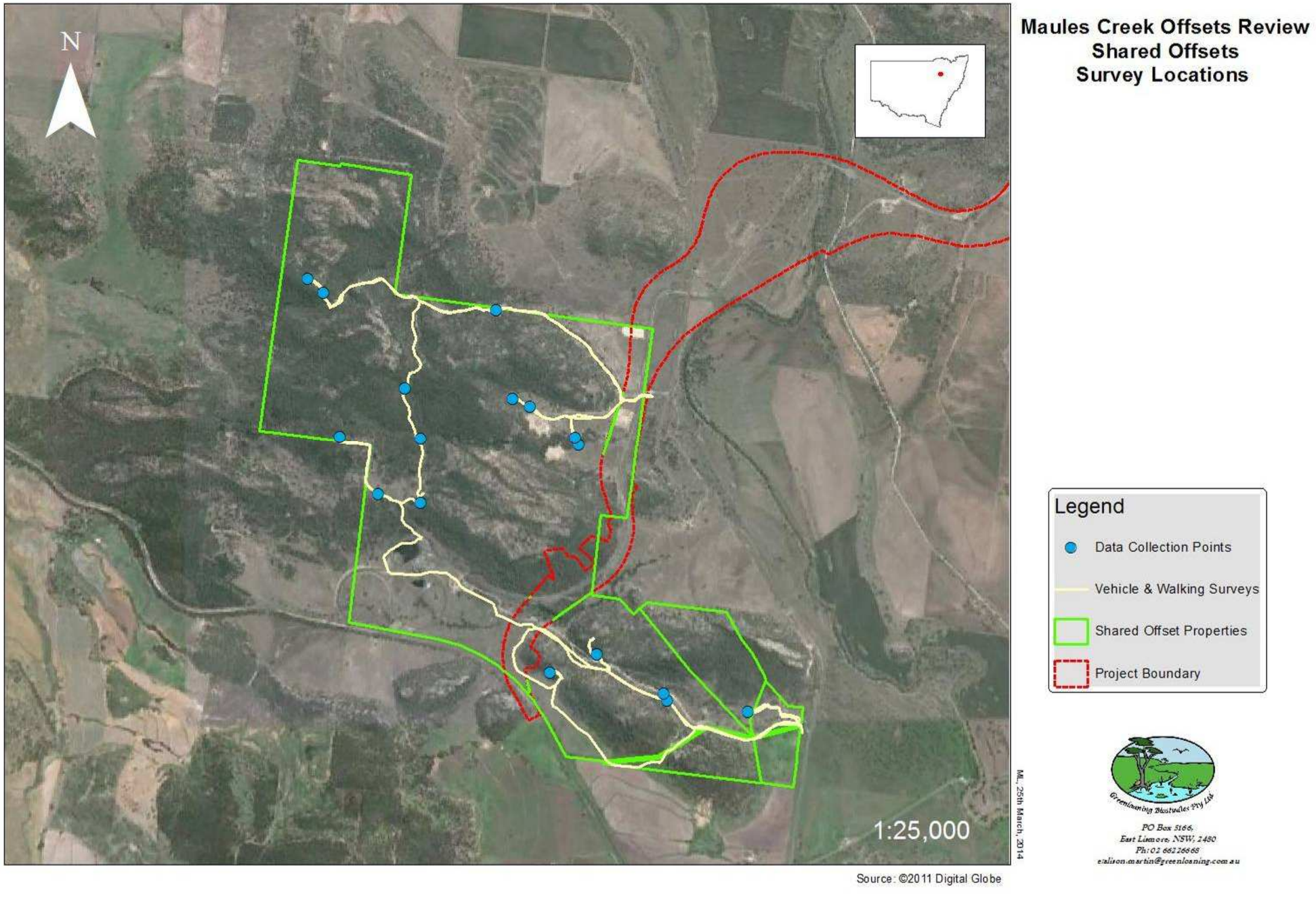

Figure C.3 GREENLOANING SURVEY LOCATIONS WITHIN THE SHARED OFFSET DURING THE 2014 SURVEYS

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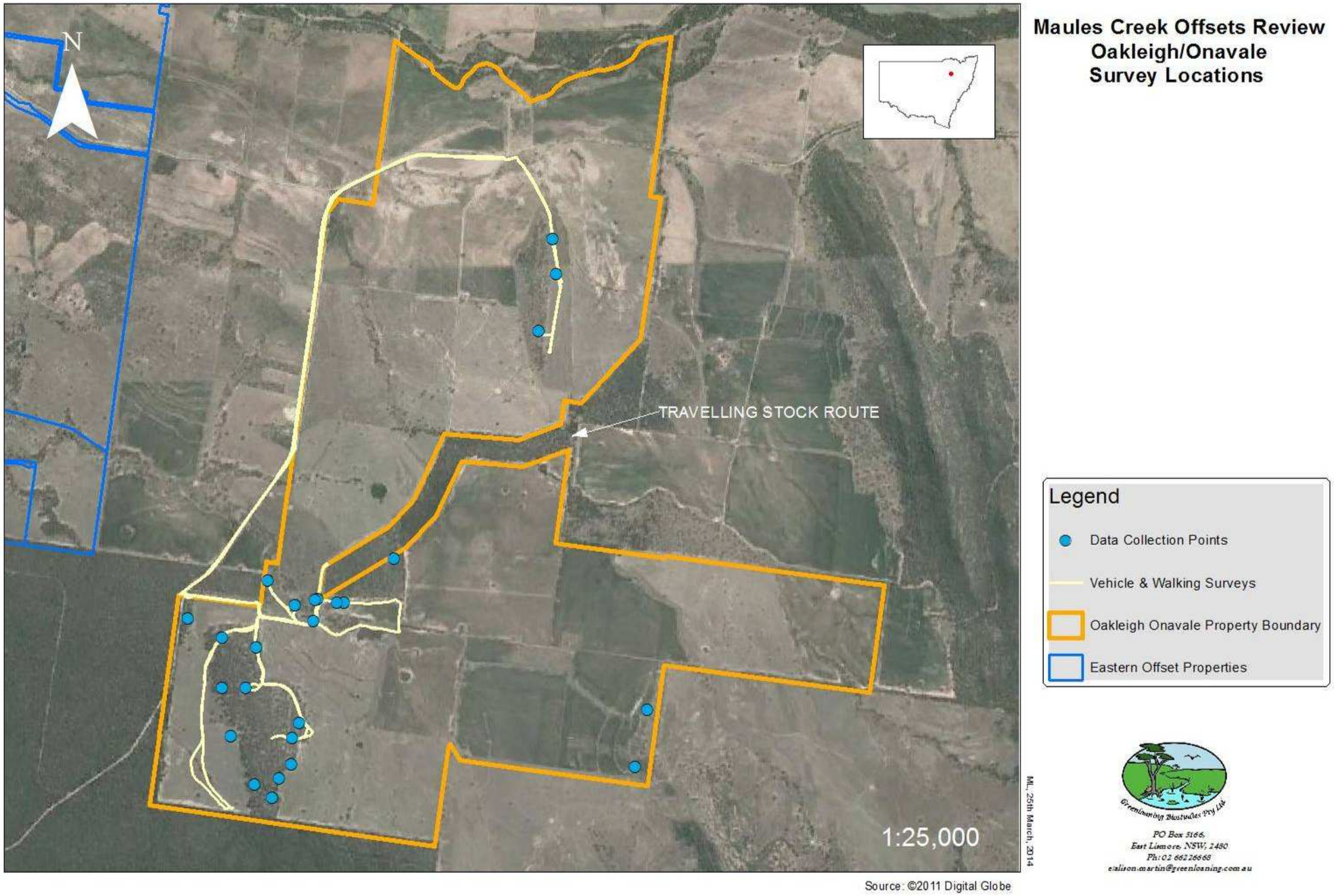

Figure C.4 GREENLOANING SURVEY LOCATIONS WITHIN OAKLEIGH ONAVALE OFFSET PROPERTY DURING THE 2014 SURVEYS

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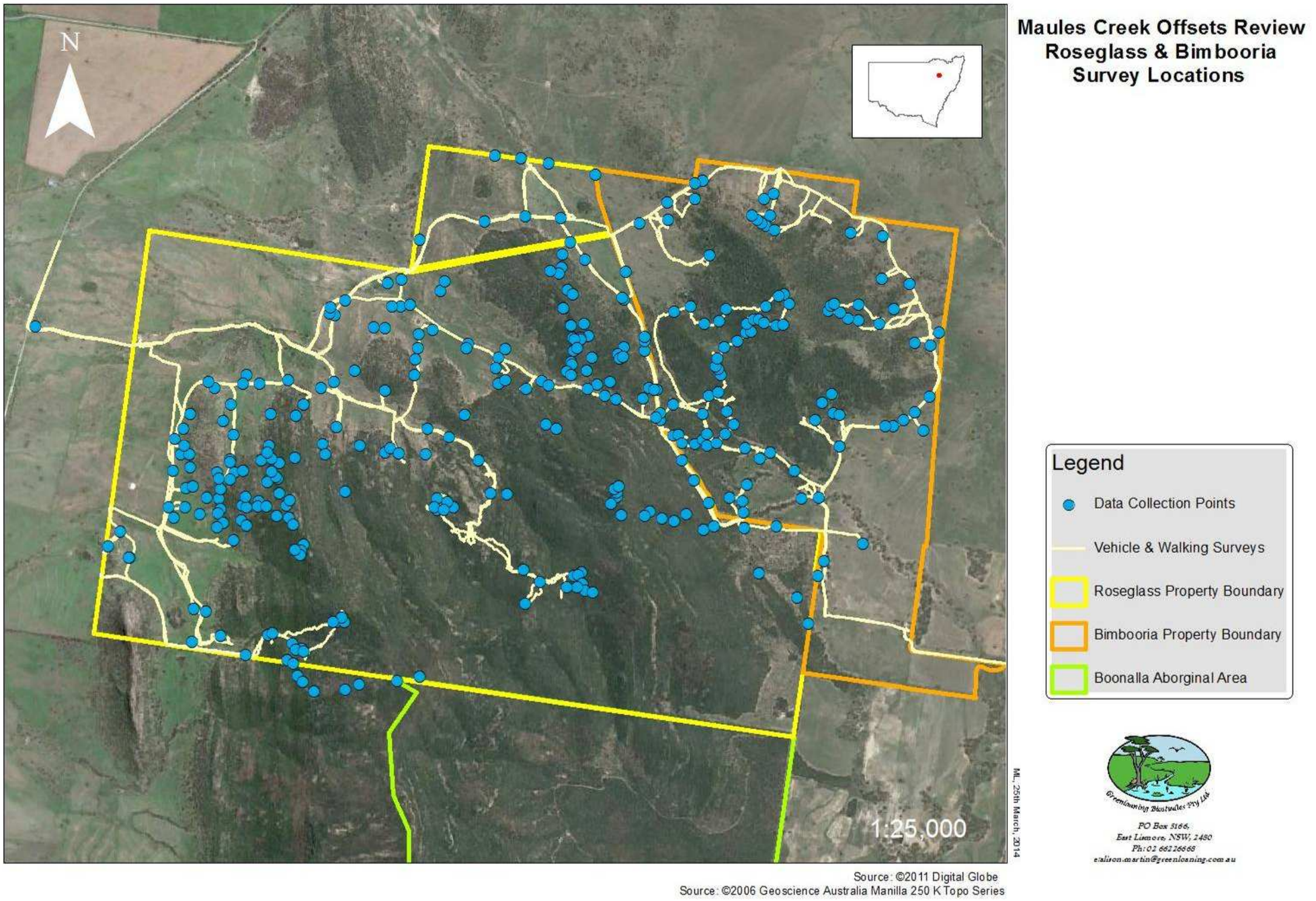

Figure C.5 GREENLOANING SURVEY LOCATIONS WITHIN ROSEGLASS AND BIMBOORIA OFFSET PROPERTIES DURING THE 2014 SURVEYS

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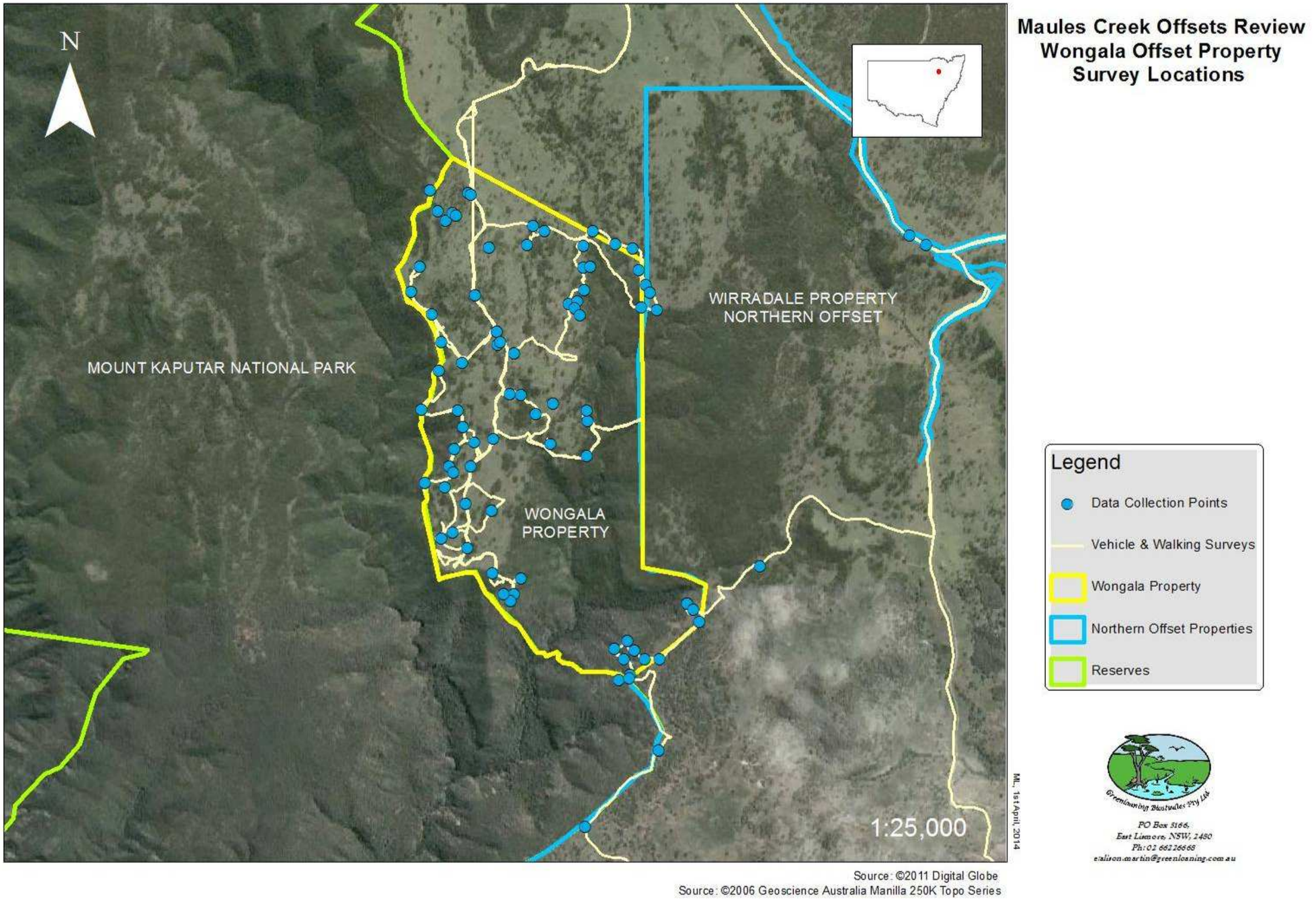

Figure C.6 GREENLOANING SURVEY LOCATIONS WITHIN WONGALA OFFSET PROPERTY DURING THE 2014 SURVEYS

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Appendix D

Photographs

Photograph D.1 **Mixed age stand of White Box – Cypress Pine Forest / Woodland during drought conditions, Leard State Forest.**

Photograph D.2 **Young Silver-leaved Ironbark Forest / Woodland, Leard State Forest.**

Photograph D.3 **Young White Box – Cypress Pine Woodland with low level ground cover, Project Site.**

Photograph D.4 **Low condition Derived Native Grassland, Western Project Site.**

Photograph D.5 **White Box – Ironbark Grassy Woodland, Teston North.**

Photograph D.6 **Shrubby habitat and low condition Derived Native Grasslands in foreground, Cattle Plains.**

Photograph D.7 Habitat and rugged topography of the Shared Offset.

Photograph D.8 Good quality habitat with tree hollows, Shared Offset.

Photograph D.9 White Box Grassy Woodland with old growth, Oakleigh/Onavale.

Photograph D.10 White Box – Ironbark Grassy Woodland, Oakleigh/Onavale.

Photograph D.11 **Derived Native Grassland with White Box Grassy Woodland on low ridge, Oakleigh/Onavale.**

Photograph D.12 **Poorer quality White Box – Cypress Pine with shrubby patches, Bimbooria.**

Photograph D.13 **White Box – Ironbark Grassy Woodland, Bimbooria.**

Photograph D.14 **White Box extending down gully with Ironbark on edges, Bimbooria.**

Photograph D.15 **Shrubby habitat likely to favour the Long-eared Bat *(Nyctophilus corbeni)*, Bimbooria.**

Photograph D.16 **White Box Grassy Woodland extends up ridgelines, Roseglass.**

Photograph D.17 **White Box – Cypress Grassy Woodlands extending along ridge top, Roseglass.**

Photograph D.18 **Feral goats on Roseglass Southern boundary.**

Photograph D.19 **Good quality shrubby habitat showing rocky outcrops on Roseglass.**

Photograph D.20 **Marginal condition Derived Native Grasslands, CEEC, Roseglass.**

Photograph D.21 **Derived Native Grassland mapped as CEEC but low condition, Roseglass.**

Photograph D.22 **Grassy Woodland showing mature White Box surrounded by White Box regeneration, Wongala.**

Photograph D.23 **White Box – Cypress Pine Grassy Woodland mixed age stand with old growth, Wongala.**

Photograph D.24 **White Box Grassy Woodland with old growth, Wongala.**

Photograph D.25 Yellow Box Grassy Woodland CEEC, Wongala.

Appendix E

Summary Table of Field Data Attributes and Community/Habitat Condition

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Table E.1 SUMMARY OF POINT DESCRIPTION DATA

Site code	Waypoint	Elevation	Dominant/Co-dominant species	Condition	Conforms to box-gum woodland	Comments
CP - Cattle Plain	519	325	Wilga	Poor	No	Occasional White box.
CP - Cattle Plain	520	326	Wilga	Moderate	No	Northern track boundary; predominantly Wilga to West and similar to East with cypress occasional
Olivedeen	404	235	River Red Gum - Angophora - Poplar box	Poor - Moderate	No	Lagoon fringed by River Red Gum.
EOTN - Teston North	402	304	Ironbark - Cypress - White box	Moderate	Yes	Near Cumberland's Q24. Grassy - Patchy.
EOTN – Teston North	537	287	White box - Ironbark	Moderate	Yes	White box extends from 50m North, Mixed with Ironbark.
EOTN - Teston North	538	285	Ironbark	Moderate	No	South east corner of mapped Ironbark.
EOTN - Teston North	539	279	Ironbark - Cypress	Moderate	No	
EOTN - Teston North	540	271	Bimble box - Melaleuca riparian	Moderate	No	
EOTN - Teston North	547	314	Ironbark - Cypress	Moderate	No	Top of rocky ridge extends to East and West.
EOTN - Teston North	548	300	White box	Moderate	Yes	White Box visible to West and shrubby White box - Cypress to East.
EOTN - Teston North	549	291	White box	Moderate	Yes	Number of large mature trees. Ironbark to West.
Tralee	541	271	Dwyer's Red gum	Moderate	No	Regenerating patch.
Tralee	542	283	White box - Ironbark - Cypress	Moderate	Yes	Small White box clump.
Tralee	543, 544	303	White box	Moderate	Yes	Fringe of White box.
Tralee	545	293	White box	Moderate	Yes	Eastern boundary White box.

Site code	Waypoint	Elevation	Dominant/Co-dominant species	Condition	Conforms to box-gum woodland	Comments
Tralee	546	271	White box - Cypress	Moderate	Yes	Edge of open woodland.
Shared Offset						
SO	424	289	White box - Cypress	Moderate	Yes	Boundary grassland and shrubby White box- Cypress.
SO	428	279	Cypress	Poor	No	Dense Cypress regeneration.
SO	434	310	White box - Cypress	Poor	No	Edge of shrubby woodland. Open areas previously cultivated.
SO	436	281	Cypress	Poor	No	Near start more open grassy habitat fringed by Cypress and Hop bush re-growth.
Blue Range	431	302	Wilga	Moderate	No	Occasional Dwyer's Red Gum. Scattered Ironbark.
Blue Range	433	264	White box	Moderate	Yes	Creek line with White box.
Additional Offsets						
AOO	408	342	White box - Ironbark	Good	Yes	White box dominant patch to the South west. Grassy.
AOO	409	331	Poplar box	Moderate	No	Poplar Box Grassy Woodland.
AOO	411	342	White box	Good	Yes	Grassy open woodland.
AOO- Onavale	414	361	White box -Ironbark	Good	Yes	Halfway upslope. Appears initially to be dominant Ironbark however White box increasing upslope.
AOO	415	347	Ironbark - Cypress.	Moderate	No	Fence line along ridge.
AOO	417	336	White box	Good	Yes	Where White box starts.
AOOn	8	407	White box	Moderate - Good	Yes	Grassy woodland.
AOOn	9		White box	Moderate - Good	Yes	Northern boundary of White box, NL Ironbark to the North.
AOOn	10	353	Cypress	Poor	No	Occasional Ironbark with White box to the East.
AOOn	11	336	White box	Moderate	Yes	Western boundary. Mixed with Ironbark - Cypress.

Site code	Waypoint	Elevation	Dominant/Co-dominant species	Condition	Conforms to box-gum woodland	Comments
AOOn	12	336	White box - Red Gum.	Poor	No	Highly degraded. Clump of trees with grassland and larger clump to West.
AOOn	13	336	White box - NL Ironbark	Moderate	Yes	Possible northern limit with NL Ironbark to North.
AOOn	550	354	White box - Ironbark	Good	Yes	White box East and West. Ironbark to east and south.
AOOn	551	342	Ironbark	Moderate	No	In gully.
AOOn	552	353	White box	Moderate	Yes	White box in immediate gully area and upslope 100m and West. Ironbark to south.
AOOn	553	360	White box - NL Ironbark	Moderate	Yes	Extending up and down slope.
AOOn	554	357	Ironbark - White box.	Moderate	Yes	Ironbark more prominent down slope.
Roseglass						
RO	440	427	NL Ironbark - *E. E.dealbata*	Moderate	No	Ridge top, semi-cleared.
RO	443	380	White box	Moderate - Good	Yes	Grassland, regenerating white box. Ironbark start 100m to East.
RO	444	346		Poor	No	Derived native grassland
RO	445	354	Budda	Poor	No	Low diversity. Budda patch.
RO	447	344	Ironbark - Cypress.	Moderate	No	Grassy Forest/Woodland.
RO	448	359	Ironbark - *E.dealbata*	Poor	No	Couple of White box. Scattered shrub patches down slope with Wilga, Budda, and Quinine bark.
RO	449	358	Ironbark - *E.dealbata*	Moderate	No	To South, North fairly open.
RO	451	386	White box	Moderate- Good	Yes	In gully.
RO	452	406	White box	Moderate	Yes	In gully. Point becomes shrubbier.
RO	453	432	Ironbark - *E.dealbata*	Moderate	No	Top of ridge.
RO	456	382			No	Grassland. West is gully of *E.dealbata, A.decora,* Supple jack.
RO	457	398	*A.cheelii* - Ironbark	Good	No	Regeneration tall, shrubland/open shrubland. *E.dealbata* along creek.

Site code	Waypoint	Elevation	Dominant/Co-dominant species	Condition	Conforms to box-gum woodland	Comments
RO	466	429	White box - Ironbark - Cypress	Moderate	No	Mainly Ironbark - Cypress.
RO	467	437	White box	Moderate - Good	Yes	Grassy woodland extends around 100m upslope where Ironbark become dominant.
RO	468	454	NL Ironbark -Cypress	Good	No	Occasional old growth, young mature to mature trees. Fairly open with rocky outcrops.
RO	470	428	Ironbark - Cypress + White box.	Moderate - Good	Yes	Grassy with shrubby patches, cypress regeneration. White box increases to the East.
RO	484	333			No	Grassland only small trees.
RO	487	396	White box	Good	Yes	Starting point along creek line.
RO	488	339		Poor	No	Scattered White box upslope on edge of vegetation to East.
RO	493	411	Ironbark	Moderate	No	Shrubby habitat.
RO	494	411	Ironbark - Cypress	Moderate	No	Open grassy forest to South east and Shrubby patches particularly to the West.
RO	495	400	Occasional Ironbark	Poor	No	Grassland. No white box visible.
RO	498	339	White box	Poor	No	Grassland. Beginning of White box.
RO	499	419	Ironbark	Moderate	No	Grassland. Scattered Ironbark with old growth, + Cypress to South and North.
RO	500	453	*E.dealbata*	Moderate	No	Back into *E.dealbata*.
RO&BO	501	465	White box	Moderate	Yes	Either side of boundary.
RO	502	465	White box	Moderate	Yes	Boundary- less shrubby White box coming in to head of gully. Grassy.
RO	503	465	White box	Moderate	Yes	Semi-cleared.
RO	504	472	White box	Moderate - Good	Yes	Semi-cleared grassy + Cypress.
RO	505		E.dealbata	Moderate - Good	No	Loss White box
RO	506	429		Poor	No	Corner of cultivated paddock.

Site code	Waypoint	Elevation	Dominant/Co-dominant species	Condition	Conforms to box-gum woodland	Comments
RO	507	416	White box	Moderate	Yes	Grassy woodland/open forest 150m upslope fringe of forest area with scattered or patches of shrubs.
RO	508	412	White box	Poor - Moderate	On edge	Box Gum Derived grassland. White box. Heavily grazed. 8 to 10 native species.
RO	509	405	White box	Moderate - Good	Yes	Western boundary.
RO	510	392	White box	Moderate	Yes	Grassland. Eastern Boundary of white box. 9 native species.
RO	ROF1		Grassland	Poor	No	Highly degraded and heavily grazed.
RO	555	359	White box	Moderate	Yes	Small White box patch. Mainly *E.dealbata* to North east and Ironbark to South east.
RO	556	349	Ironbark - *E.dealbata* - Wilga	Moderate	No	White box, one 70m away.
RO	557	361	Ironbark - *E.dealbata*	Moderate	No	
RO	558	362	Ironbark - *E.dealbata*	Moderate	No	
RO	559	367	Quinine bark - Budda	Moderate	No	Ironbark – *E.dealbata* upslope.
RO	560	348	White box	Moderate	Yes	Very occasional White box on fringe area mapped as derived grassland.
RO	ROF3	425	Ironbark - *E.dealbata*	Moderate	No	Rocky steep slope.
RO	561	422	White box	Moderate - Good	Yes	Extending upslope in shallow gully. *E.dealbata* down slope.
RO	562	463	Red ash - Cypress-*E.dealbata*	Moderate	No	White box directly up from rocky shelter and 20m back.
RO	563	471	White box	Good	Yes	Going upslope and along ridge top. Poa grass and herbs present.
RO	564	491	Ironbark - *E.dealbata*	Good	No	End of White box.
RO	565	468	Ironbark - White box.	Good	Yes (South)	Ironbark - North, White box- South
RO	566	415	Ironbark - *E.dealbata*	Moderate	No	First ridge.

Site code	Waypoint	Elevation	Dominant/Co-dominant species	Condition	Conforms to box-gum woodland	Comments
RO	567	418	White box	Moderate		Shrubby.
RO	568	396	White box	Moderate	Yes	White box in gully and upslope before becoming shrubby.
RO	ROF4	389	Ironbark - *E.dealbata* - Cypress	Moderate	No	Spot check.
RO	ROF8	403	Ironbark - Cypress	Moderate	No	Spot check.
RO	570	395	White box	Moderate	Yes	Stops before gully and Ironbark - *E.dealbata* present.
RO	ROF5	380		Poor	No	In yards highly degraded.
RO	ROF10	377		Poor	No	Highly degraded grasslands, heavily grazed.
RO	ROF12	393	NL Ironbark	Poor - Moderate	No	Derived grassland.
RO	ROF11	399	Ironbark - *E.dealbata* - Cypress	Poor - Moderate	No	Woodland/ shrubland
RO	576	418		Poor - Moderate	No	Grassland surrounded by Ironbark - Cypress, +/- *E.dealbata*.
RO	577	433	Ironbark - Cypress	Moderate	No	Variable grassy and shrubby patches.
RO	ROF20	416	Ironbark - Cypress	Poor - Moderate	No	Shrubby. Grassland below very poor. One White box to North east.
RO	ROF19		Ironbark	Poor - Moderate	No	Grassland, Ironbark regeneration with one juvenile White box.
RO	577A	429	Ironbark - Cypress	Moderate	No	Shrubby and rocky. Top of ridge.
RO	578	383	White box	Moderate	Yes	In scattered clumps. Western extent.
RO	579	433	Cypress - Ironbark	Moderate	No	White box to North.
RO	580	473	White box - Ironbark	Moderate	Yes	Boundary between White box Ironbark.
RO	582	523	White box - Ironbark	Moderate	Yes	Boundary between White box Ironbark.
RO	583	406	White box	Moderate	Yes	Scattered near track, semi-cleared on fringe of the main vegetation body.
RO	ROF2		*E.dealbata*	Moderate	No	Grassy.

Site code	Waypoint	Elevation	Dominant/Co-dominant species	Condition	Conforms to box-gum woodland	Comments
RO	585	515	Cypress - Ironbark - *E.dealbata*	Moderate - Good	No	Top of first ridge. White box just over edge 50m to the South.
RO	586	533	White box	Good	Yes	Grassy woodland.
RO	587	538	White box	Moderate - Good	Yes	Grassy woodland. White box boundary.
RO	589	531	White box	Good	Yes	Grassy woodland. On upper edge with *E.dealbata* on top.
RO	590	533	White box	Good	Yes	Southern edge grassy White box.
RO	591	527	White box	Moderate	Yes	Scattered grass and shrubs. Down slope Ironbark and shrubby.
RO	592	502	White box - Ironbark	Moderate	Yes	Boundary. Grassy woodland.
RO	ROF7		Ironbark - Cypress	Moderate	No	
RO	593	408	White box - Ironbark	Good	Yes	Boundary. Grassy woodland.
RO	594	475	Ironbark - Cypress	Moderate	No	Cypress regenerating.
RO	595	478	Ironbark - Cypress	Moderate	No	Grassy with scattered shrubby clumps.
RO	596	481	White box	Moderate - Good	Yes	White box beginning.
RO	597	499	White box	Moderate	No	Shrubby habitat. In gully, extends upslope.
RO	598	538	White box	Moderate	Yes	Upper limit of White box, Cypress. Grassy with rocks and scattered shrubs.
RO	599	559	White box - Cypress	Moderate	Yes	Scattered shrubs, still grassy further along gully. Shrubbier upslope.
RO	600	635	White box	Good	Yes	Top of ridge.
RO	601	664	White box - Ironbark - Cypress	Moderate	No	Shrubby.
RO	602	657	Ironbark - Cypress	Moderate	No	Grassy.
RO	603	654	White box - Ironbark	Good	Yes	Grassy woodland extending along ridge to North.
RO	605	648	Ironbark - Cypress	Moderate	No	Shrubby.

Site code	Waypoint	Elevation	Dominant/Co-dominant species	Condition	Conforms to box-gum woodland	Comments
RO	606		Ironbark - Cypress	Moderate	No	*E.dealbata* +/-. In gully.
RO	607	386		Moderate	Yes	Semi cleared - Wilga - Cypress. 14 species of native groundcover found. Disturbed area.
RO	608	406	White Box	Good	Yes	Grassy. Shrub clumps in gully.
RO	609	439	White box - Cypress	Good	Yes	Grassy.
RO	610	510	Cypress - Wilga	Moderate	No	Grassy and rocky. Ridge top. +/- Ironbark.
RO	611	535	White box - Ironbark	Moderate	Yes to North + West	Boundary. Ironbark on rocky knoll. White box -cypress down spur to North.
RO	612	529	*E.dealbata*	Moderate	No	Shrubby and rock face on ridge top.
RO	613	513	White box	Moderate	Yes	Shrubby patches. Cypress - Ironbark - Wilga present.
RO	614	483	White box - Cypress	Good	Yes	Grassy. Gully to East is limit.
RO	615	477	White box - Cypress	Moderate	No	Shrubby patch.
RO	616	457	Cypress	Moderate	No	Shrubby patch. End of White box.
RO	617	432	Ironbark - Cypress	Moderate	No	
RO	618	419	White box - Ironbark - Cypress	Good	Yes	White box in side gully - Grassy.
RO	619	390	Ironbark - Cypress	Moderate	No	
RO	620	382	*E.dealbata* - Ironbark	Moderate	No	Regenerating. Derived Grassland.
RO	621	386		Poor	No	Derived grassland highly degraded.
RO	622	377		Poor	No	Derived grassland highly degraded.
RO	623	387		Poor	No	Derived grassland highly degraded.
RO	624	388	White box	Moderate	Yes	Derived grassland. 11 native species found.
RO	ROF16		White box	Good	Yes	Derived grassland.
RO	ROF15		Ironbark	Moderate	No	Derived grassland.
RO	625	447	Ironbark - Cypress	Moderate	No	Patch. Looks to be white box upslope.
RO	626	469	White box - Ironbark - Cypress	Good	Yes	White box - Cypress boundary. Grassy woodland/Open forest. White box in a band.
RO	627	473	White box	Good	Yes	Edge of band.

Site code	Waypoint	Elevation	Dominant/Co-dominant species	Condition	Conforms to box-gum woodland	Comments
RO	628	488	White box - Cypress	Moderate	No	Shrubby band.
RO	629	485	White box - Cypress	Moderate	Yes	Grassy scattered shrubs. End shrubby band.
RO	632	546	Cypress - *E.dealbata*	Moderate	No	Shrubby. End of rocky knoll/ridge.
RO	633	542	White box - *E.dealbata*	Moderate	Yes -edge	Boundary on main ridgeline. Beginning White box - *E.dealbata*.
RO	635	542	White box	Good	Yes	Eastern extent along main ridgeline.
RO	636	536	White box	Good	Yes	Western extent of white box on spur.
RO	637	531	White box - Cypress	Good	Yes	Grassy. Edge of spur.
RO	638	518	White box - Cypress	Moderate	Yes to South	South White box extends up and down shallow gully and to north above dense Cypress patch.
RO	639	427	White box	Moderate	Yes	Northern end of fringe.
RO	ROF26			Poor	No	Cultivated paddock.
RO	ROF24	445	White box - Wilga	Moderate	Yes -edge	Derived Grassland. Rapid assessment found 10 native species of ground cover.
RO	640	351	*E.dealbata*	Moderate	No	Similar vegetation on ridge to North east. +/- Ironbark+ Wilga.
RO	641	368	*E.dealbata*	Moderate	No	+/- Ironbark+ Wilga.
RO	642	421	*E.dealbata* - Ironbark - Cypress	Moderate	No	Grassy woodland.
RO	643	478	*E.dealbata* - Ironbark - Cypress	Moderate	No	On rocky ridge.
RO	644	445	Ironbark - Cypress	Moderate	No	Grassy/shrubby.
RO	645	411	Ironbark - Cypress	Moderate	No	Grassy woodland, cypress regeneration. Shrubby patches, + olive and Wilga.
RO	646	390	Ironbark - Cypress	Moderate	No	Grassy woodland.
RO	647	380	Ironbark - Cypress	Moderate	No	Semi-cleared grassy woodland.

Site code	Waypoint	Elevation	Dominant/Co-dominant species	Condition	Conforms to box-gum woodland	Comments
RO	648	415	White box - Cypress	Moderate	Yes	Lower boundary of White box, Cypress - occ. Ironbark upslope. Ironbark- Cypress grassy downslope. Some shrubby patches.
RO	649	408	White box	Moderate - Good	Yes	White box extending up gully.
RO	650	407	Ironbark - Cypress	Moderate	No	Ridge.
RO	651	408	Ironbark - Cypress	Moderate	No	Extending South east around ridge. White box extending from 50m down slope to S.
RO	652	446	Ironbark - Cypress	Moderate	No	
RO	654	515	White box - Cypress	Good	Yes	Grassy woodland.
RO	655	530	White box	Moderate	No	Rocky intrusion into White box. White box extends to the South and South East. Some shrubby patches. Area too small.
RO	656	566	White box	Moderate	Yes	Shrubs increase slightly upslope leading to shrubby woodland.
RO	657	586	White box	Good	Yes	Patch of grassy woodland with White box - Cypress.
RO	658	624	*E.dealbata* - Ironbark	Moderate	No	Rocky patch.
RO	660	730	Ironbark	Moderate	No	Grassy/shrubby.
RO	661	811	White box - Ironbark	Moderate	No	Top of ridge small patches grassy and some Ironbark shrubby patches. Area too small.
RO	662	801	White box	Moderate	No	Previously burnt. Grassy patches. Area too small.
RO	665	673	White box	Good	Yes	Grassy woodland. Extending upslope.
RO	666	521	White box	Good	Yes	Grassy woodland. Extending down slope.
RO	667	424	*E.dealbata* - Ironbark	Moderate	No	Extends around western slope to the North.
RO	668	430	White box	Good	Yes	Previously mapped.
RO	670	438	*E.dealbata* - Ironbark	Moderate	No	In creek bed with Ironbark - Cypress either side.
RO	671	450	White box - Cypress	Good	Yes	Grassy woodland extending up gully.
RO	672	466	White box	Good	Yes	White box extends upslope to West and North.
RO	673	521	White box	Moderate -	Yes	Extends onto ridge top with cypress.

Site code	Waypoint	Elevation	Dominant/Co-dominant species	Condition	Conforms to box-gum woodland	Comments
				Good		
RO	674	532	White box	Moderate - Good	Yes	Extends down slope with occasional *E.dealbata* and Ironbark.
RO	675	526	White box	Moderate - Good	Yes	Continues down slope to East and South. Rocky knoll.
RO	676	489	White box	Good	Yes	Extends down slope to East.
RO	677	476	White box - Cypress	Moderate - Good	Yes	Patch.
RO	678	461	White box	Moderate - Good	Yes	Western extent.
RO	679	449	White box	Moderate - Good	Yes	Southern extent.
RO	680	481	White box	Good	Yes	Small patch in gully. Mapped.
RO	681	451	White box	Moderate	Yes	Upper level White box fringe extends well to the East.
RO	682	439	White box	Moderate	Yes	Eastern extent of fringe.
RO	683	446	White box	Moderate	Yes	Edge of semi-cleared. White box extending 50m up gully and upslope.
RO	684	528	White box	Moderate	Yes	To edge of rocky knoll and immediately down slope.
RO	685	545	Ironbark - Cypress - White box	Moderate	Yes to SW	Ridge top. White box on South West side for at least 150m (grassy) with patches cypress.
RO	686	545	White box	Moderate - Good	Yes	South East extent of ridge top.
RO	687	534	White box	Moderate - Good	Yes	South East extent of North East slope.
RO	688	364		Poor	No	Degraded grassland.
RO	689	360		Poor	No	Degraded grassland.
RO	690	369		Poor	No	Poor native species groundcover.
RO	691	370		Poor	No	Poor native species groundcover.
RO	692	381		Poor	No	Poor native species groundcover.
RO	693	386	White box	Moderate	Yes	Native grassland. White box continues upslope.
RO	696	428	White box	Moderate	Yes	Going up gully at least halfway upslope.
RO	697	457	Ironbark - Cypress	Moderate	No	Woodland/open forest with some shrubby patches, fairly rocky and dry.

Site code	Waypoint	Elevation	Dominant/Co-dominant species	Condition	Conforms to box-gum woodland	Comments
RO	698	411	White box	Good	Yes	Extending through gully.
RO	699	400	White box	Good	Yes	Extends from boundary fence, back up gully to N of track.
RO	700	399	White box	Moderate	Yes	Southern edge semi-cleared White box.
RO	715	431	White box - Cypress	Moderate - Good	Yes	Western down slope extent.
RO	716	442	White box	Moderate	Yes	White box fringe ends. Shrubby further upslope and in gully.
RO	717	487	White box - Cypress	Moderate - Good	Yes	Grassy woodland.
RO	718	507	White box	Good	Yes	Grassy limit beyond more shrubs.
RO	719	518	White box	Good	Yes	White box boundary.
RO	720	648	White box - Cypress	Good	Yes	Southern extent grassy woodland extends upslope to North.
RO	721	672	White box	Moderate - Good	No	Eastern extent. Patch less than 1 ha.
RO	722	675	White box	Moderate	No	Shrubby.
RO	723	645	White box	Moderate	Yes	Grassy. Rocky and shrubby patches down slope.
RO	725	447	*E.dealbata* - Cypress	Moderate	No	Extends down and up rocky ridge.
RO	726	619	Cypress - Ironbark	Moderate	No	Scattered shrubs, rocky and grassy.
RO	727	626	Cypress - Ironbark	Moderate	No	Rocky and grassy with scattered to moderate shrubs.
RO	728	676	White box	Moderate	No	Shrubby. Only small patch grassy.
RO	729	618	White box	Good	Yes	Edge of grassy White box extends down slope to East and across to North.
RO	730	626	White box	Good	Yes	Extent grassy White box going upslope.
RO	733	587	White box	Moderate	Yes	Lower edge.
RO	734	594	White box	Moderate	Yes	Upper most Eastern point of White box.
RO	735	587	White box - Ironbark - Cypress	Moderate	Yes	Patchy shrubs. Grassy extending down slope to East.
RO	736	586	White box	Moderate	Yes	Grassy open patch.
RO	737	444	White box - Ironbark - Cypress	Moderate - Good	Yes	Grassy forest.
RO	738	449	Cypress - Ironbark	Moderate	No	Grassy woodland.

Site code	Waypoint	Elevation	Dominant/Co-dominant species	Condition	Conforms to box-gum woodland	Comments
RO	739	452	White box - Ironbark - Cypress	Moderate - Good	No	Area too small. Upper edge of White Box – Ironbark – Cypress upslope to North.
RO	740	469	White box - Ironbark - Cypress	Moderate - Good	Yes	Upper limit of grassy White box. North East edge.
RO	741	487	White box	Good	Yes	Grassy woodland. Upper limit North West edge.
RO	742	467	White box - Ironbark - Cypress	Good	Yes	Grassy woodland. 11 native species count. On edge.
RO	743	370	White box	Moderate	Yes	Native grassland. 11 native species count. On edge.
RO	744	360	White box - Ironbark	Poor	No	Grazed. Grassland. 9 native species count.
RO	745	376	White box	Poor	No	Grazed. Grassland. 9 native species count.
RO	746	402	White box	Poor	No	Grassland.
RO	747	514	Cypress - Ironbark		No	Small ridge.
Bimbooria						
BO	473	405	White box	Moderate	Yes	Cypress regeneration with large mature White box scattered throughout.
BO	475	414	White box	Moderate	Yes	NL Ironbark + *E.dealbata* coming from West. Still Cypress regeneration. On edge.
BO	476	430	White box	Moderate	Yes	On either side of track. Manly Ironbark on track area.
BO	477	437	Ironbark - Cypress	Moderate	No	Occasional White box.
BO	478	449	White box - Cypress	Moderate	Yes	*E.dealbata* and Ironbark +/-
BO	480	393	Ironbark	Moderate	No	Occasional White box towards end of vegetation patch.
BO	502	465	White box - Cypress	Moderate	Yes	Open grassy.
BO	503	465	White box - Cypress - Ironbark	Moderate	Yes	Grassy.
BO	504	472	Ironbark - *E.dealbata* - Cypress	Moderate	No	
BO	505	462	Dense Cypress	Poor	No	
BO	523	437	*E.dealbata* + Cypress	Moderate	No	Grassy woodland.
BO	526	453	SL Ironbark	Moderate	No	Southern- second finger to south of SL-Ironbark.

Site code	Waypoint	Elevation	Dominant/Co-dominant species	Condition	Conforms to box-gum woodland	Comments
BO	527	447		Moderate	No	Derived grassland. Very rapid assessment 12 native species.
BO	529	414	Cypress	Poor	No	Patch
BO	530	437	Cypress - White box	Moderate - Good	Yes	Patch Cypress in front of occasional White box. Grassy White box behind up slope.
BO	531	413	Cypress	Poor	No	Dense Cypress.
BO	532	449	SL Ironbark- West. White box- North.	Moderate - Good	North- Yes	Grassy woodlands.
BO	533	411	Whitewood	Moderate	No	Patch crossing track.
BO	534	409	Cypress	Poor - Moderate	No	Gully. Occasional White box scattered upslope over last 20m. Still dense fingers Cypress.
BO	535	406	Cypress - White box	Good	Yes	Grassy woodland/open forest. Dense Cypress to north.
BO	536	401	Cypress	Poor	No	Knoll to south appears to be dense Cypress clump.
BO	702	432	White box	Moderate - Good	Yes	Northern upper limit. Before dense Cypress to the North.
BO	703	429	White box	Moderate - Good	Yes	Western extent.
BOF9	BOF9	433	Cypress	Poor	No	Dense regeneration.
BO	706	419	White box	Moderate - Good	Yes	Grassy interspersed with Cypress regeneration.
BO	707	408	White box	Moderate	Yes/No	Box-gum grassy woodland. Species 9-10. Upper half conforms.
BO	BOF15		Cypress	Moderate	No	Woodland occasional White box.
BO	BOF16			Poor	No	Heavily grazed grassland.
BO	BOF14	452	SL Ironbark - Cypress	Moderate	No	Extends further upslope to West and South West.
BO	708	463	White box - Cypress	Moderate	Yes	Down and upslope to East and West. Rocky and grassy with scattered shrubs.
BO	709	497	White box - Cypress	Moderate	No	Scattered shrubs, patches of cypress regeneration. Rocky slope with grassy patches.
BO	710	541	White box - Cypress	Moderate	No	Shrubby, rocky patch.
BO	711	585	White box	Moderate -Good	Yes	Rocky at point, grassy in all other directions.

Site code	Waypoint	Elevation	Dominant/Co-dominant species	Condition	Conforms to box-gum woodland	Comments
BO	712	590	Cypress	Poor	No	Dense Cypress patch. Grassy White box upslope.
BO	713	575	White box	Good	Yes	Extends across contour. + Cypress.
BO	714	489	White box - Cypress	Good	Yes	Grassy woodland. Extends all directions.
BO	748	462	White box - Cypress	Moderate -Good	Yes	Boundary with Ironbark - Cypress. White box extends down gully to South East.
BO	749	442	White box	Moderate	Yes	In gully.
BO	751	441	White box - Ironbark	Moderate	Yes	Follows gully around. Very mixed dominant two tree species.
BO	752	436	Ironbark	Moderate	No	Dominant along gully for around 100m.
BO	753	433	White box - Ironbark - Cypress	Moderate -Good	Yes	Extends mainly southern side of gully crossing again in 100m. Outer edge, mixed dominant species.
BO	754	426	White box - Ironbark - Cypress	Moderate -Good	Yes	South East boundary of patch.
BO	755	420	White box	Moderate -Good	Yes	Extending down and along gully.
BO	756	432	White box	Moderate	Yes	Extending across open area. Dense Cypress either side.
BO	757	433	Cypress	Poor	No	Regeneration. Scattered White box - Ironbark.
BO	758	438	Cypress	Poor	No	Regeneration. Scattered White box - Ironbark - E.dealbata.
BO	BOF3		Cypress	Poor - Moderate	No	Occasional mature White box.
BO	759	451	White box - Cypress	Moderate	Yes	Less dense cypress. Mature old growth trees. White box extending up slope.
BO	760	454	White box	Moderate -Good	Yes	Down gully and close to boundary fence. + Ironbark - Cypress.
BO	761	403	Cypress	Poor	No	Cypress shrubland.
BO	763	393	White box - Cypress	Moderate	Yes	Grassland. 11 herbs and shrubs.
BO	764	418	Cypress	Poor	No	Cypress shrubland.
BO	766	415	White box	Moderate	No	Grassland. 10 herbs and shrubs.
BO	768	442	Cypress	Poor	No	Edge fringing band.
BO	769	464		Good	Yes	Grassland 14 herbs and shrubs.
BO	770	484	Cypress	Moderate	No	Cypress up rocky spur. E.dealbata in gully. White box - Cypress to East.

Site code	Waypoint	Elevation	Dominant/Co-dominant species	Condition	Conforms to box-gum woodland	Comments
BO	771	489	White box - Cypress	Moderate	No	Rocky spur with Cypress regeneration. White box upslope and White box - Cypress down slope.
BO	772	483	White box - Cypress	Moderate	No	Downslope to North and West. Upslope grassy areas. At point rocky slope with scattered cypress.
BO	773	485	White box	Moderate	Yes	White box down gully. Ironbark band South.
BO	774	439	Cypress	Poor	No	Dense Cypress shrubland.
BO	775	440	Cypress	Moderate	No	Scattered White box.
BO	776	443	White box - E.dealbata - Cypress	Moderate	No	Patches dense Cypress.
BO	777	415	White box	Poor	No	Low diversity grassland. Scattered White box, 6 herbs and shrubs counted. Heavily grazed.
BO	778	420	White box	Poor	No	Low diversity grassland. 8 native species count.
BO	779	472	Cypress	Poor	No	+ *E.dealbata*.
BO	780	466	White box - Cypress - Ironbark.	Moderate -Good	Yes	White box extending up gully.
BO	783	411	White box	Good	Yes	Patch grassy woodland.
BO	784	428	White box	Moderate -Good	Yes	Edge of vegetation White box goes in 50m + Cypress.
BO	785	445	Cypress	Poor	No	Dense Cypress regrowth. Occasional mature White box.
BO	786	487	White box	Moderate	Yes	Small White box patch surrounded by dense Cypress. On edge.
BO	787	504	White box	Moderate -Good	Yes	More concentrated White box patch.
BO	789	533	White box - *E.dealbata*	Moderate -Good	Yes	White box almost to top of ridge and other side. *E.dealbata* on top of ridge.
BO	790	537	White box - *E.dealbata*	Good	Yes	White box also extending part way down gully.
BO	791	543	Cypress	Moderate	Yes	Scattered White box +/- *E.dealbata* - Grassy.
BO	792	579	White box	Good	Yes	To South, East and West. White box immediately below knoll. Grassy. Cypress - White box upslope, grassy.
BO	793	588	White box - Cypress	Good	Yes	Grassy Woodland. White box extending down slope.
BO	794	591	White box	Moderate -Good	Yes	Cypress and occasional shrub clumps present.

Site code	Waypoint	Elevation	Dominant/Co-dominant species	Condition	Conforms to box-gum woodland	Comments
BO	795	606	White box - Cypress	Moderate -Good	Yes	Grassy woodland. Top of ridge.
BO	796	611	White box	Good	Yes	Grassy woodland on ridge. Assessment found 14 herbs/shrubs and 1 important species.
BO	797	624	White box	Good	Yes	Patch grassy White box.
BO	798	651	White box - *E.dealbata*	Good	Yes	Intermingled.
BO	799	653	White box - *E.dealbata*	Moderate	Yes	Grassy woodland. Top of ridge with small rocky part with *E.dealbata*.
BO	800	673	White box	Moderate	No	White box to South and South East. Rocky mountain top.
BO	801	648	White box - *E.dealbata*	Moderate	Yes	Grassy and rocky patches on knolls.
BO	802	641	Cypress	Poor - Moderate	No	More dense Cypress with occasional White box
BO	803	607	White box	Moderate	No	Patch White box shrubby and rocky.
BO	804	511	White box	Good	Yes	Grassy + Cypress - *E.dealbata*. White box appears on contour and slightly up slope.
BO	805	486	White box	Good	Yes	Extending upslope and down gully, continues to W. Grassy.
BO	806	473	White box - Cypress	Good	Yes	Grassy extends down gully to the gully junction.
BO	807	445	White box	Moderate-Good	Yes	Extends down gully. Scattered grassy patches at bottom of gullies. Assessment 13 herbs and shrubs, 1 important species. Dense Cypress adjacent/nearby.
BO	808	439	Cypress	Poor	No	Dense regeneration to South West, South and East.
BO	809	396	White box - Ironbark - Cypress	Poor	No	Vegetation finger in high use area. Very degraded. Old growth trees.
Wongala, Wirradale, Mt Lindsey (Northern offsets)						
NOWong	810	921	Yellow box	Good	Yes	Grassy Woodland.
NOWong	815	908		Moderate	Yes	Open area western boundary. Adjoining; scattered clumps of Yellow box - Apple box and Orange Gum.
NOWong	816	919		Moderate	No	Head of gully and start of shrubby patches. Red Gum dominant in adjoining vegetation.
NOWong	818	931	Yellow box	Good	Yes	Transect. Also six Blakely's red gum.
NOWong	819	931	Yellow box	Good	Yes	Transect. Also four Blakely's red gum.

Site code	Waypoint	Elevation	Dominant/Co-dominant species	Condition	Conforms to box-gum woodland	Comments
NOWong	822	931	Yellow box	Good	Yes	Large patch Yellow box woodland.
NOWong	823	938	Yellow box - Blakely's Red Gum	Good	Yes	Woodland.
NOWong	824	916	Yellow box - Red Gum	Moderate	Yes	Trees in clumps.
NOWong	826	910	White box	Good	Yes	Start White box. Adjoining to North Blakelyi - Yellow box woodland.
NOWong	827	894	White box	Good	Yes	Woodland extending down gully to the East. On slope to North West of gully. To North mixed clump of Yellow box - Apple box and scattered White box.
NOWong	828	900	Stringybark - Apple box		No	Patchy shrubs.
NOWong	829	899	White box	Moderate		Patches White box with open grassy area.
NOWong	830	888	White box	Good	Yes	70m South dense clump White box linking to South East with contour. East to South East continues down the gully some shrubby patches.
NOWong	831	873	White box - Yellow box	Good	Yes	Patch. Old, mature and young mature trees.
NOWong	835 836	917	Yellow box	Good	Yes	Transects. + Red Gum and occasional Apple box.
NOWong	837	888	Manna gum - Melaleuca	Moderate	No	To south along creek.
NOWong	838	898	Apple box	Moderate	No	Woodland extends South into gully.
NOWong	839	908	Apple box - Yellow box	Moderate	Yes	Boundary between species dominating. Scattered shrubs.
NOWong	840	905	Red Gum	Moderate	No	Cluster Red Gum. Apple box and Stringybark adjacent.
NOWong	845	906	Yellow box - Red Gum	Moderate - Good	Yes	Extending up slope to the W. Shrubby to South through gully.
NOWong	846	904	Yellow box	Moderate - Good	Yes	Western edge of Yellow box woodland extends East to gully. + Stringybark - Apple box.
NOWong	847	883	Yellow box	Moderate - Good	Yes	Eastern edge.+ Stringybark - Apple box.
NOWong	848	881	Apple box	Moderate	No	To North, South and East. Stringybark also present.
NOWong	849	885		Good	Yes	Grassland.
NOWong	850	878	Blakely's Red Gum	Moderate - Good	Yes	Woodland.

Site code	Waypoint	Elevation	Dominant/Co-dominant species	Condition	Conforms to box-gum woodland	Comments
NOWong	851	885		Moderate - Good	Yes	Grassland assessment 15herbs, 1 shrub and 1 important species.
NOWong	852	885	Apple box	Moderate	No	Edge of shrubby habitat.
NOWong	853	920	Yellow box - Red Gum	Moderate	Yes	Grassland with trees clumps. Assessment 13 herbs + 1 shrub.
NOWong	854	884		Moderate	Yes	Small area poor condition. Grassland. Part thistle ground cover with native species still present.
NOWong	855	858	White box - Red gum.	Good	Yes	Grassland with scattered trees. Southern edge.
NOWong	856	834	White box	Good	Yes	Eastern edge grassy woodland patch.
NOWong	857	841	White box	Good	Yes	Grassy Southern edge.
NOWong	858	843	White box	Good	Yes	Grassy Western edge.
NOWong	859	838	White box	Good	Yes	Grassy woodland some cypress. Surrounded by shrubby woodland.
NOWong	860	860	White box	Moderate	No	Small patch shrubland surrounded by grassland.
NOWong	861	868	White box	Moderate	No	Shrubby patch.
NOWong	862	886	White box	Moderate - Good	Yes	Woodland with scattered shrubs.
NOWong	863	854	Red Gum	Moderate	No	Shrubby. Extending to western property boundary.
NOWong	864	887	Yellow box - Apple box	Moderate	No	Shrubby woodland extending to western border with scattered Cypress.
NOWong	865	885	White box	Moderate	No	North East edge shrubland extends W to border.
NOWong	866	901	Yellow box	Good	Yes	Southern edge of patch. Patchy Shrub/grassland to South.
NOWong	867	884	Apple box	Moderate	No	Northern edge, patchy.
NOWong	868	856	White box	Moderate	Yes	Clump of White Box including old growth.
NOWong	869	868	Cypress	Poor	No	Patch within shrubby area.
NOWong	870	868		Moderate	No	Small grassland. East White box grassland and West and North East White box shrubland.
NOWong	871	865	White box	Moderate - Good	Yes	Grassy White Box clump to North and to South West across shallow gully. Grassland.
NOWong	872	871	White box	Good	Yes	On track extends 40m West. Beyond is shrubland.

Site code	Waypoint	Elevation	Dominant/Co-dominant species	Condition	Conforms to box-gum woodland	Comments
NOWong	873	866	White box	Moderate	No	Shrubby. Extends West to border. Small grassland to South.
NOWong	874	864		Moderate - Good	Yes	Grassland assessment 13 herbs, 1 important species. Edge of Derived native grassland/woodland.
NOWong	875	853	Red Gum	Moderate	No	Shrubby.
NOWong	876	872	White box	Moderate	No	Scattered Stringybark, patchy grassland/shrub. Patch Cypress to North East.
NOWong	877	883	White box	Moderate	No	Eastern edge shrubby travelling along track.
NOWong	878	849	White box	Good	Yes	Patch grassy woodland.
NOWong	879	884	White box	Moderate	No	Shrubby along gully. Small patch Red Gum to East.
NOWong	881	824	White box - Stringybark	Moderate	No	Shrubby.
NOWong	882	819	Yellow box	Good	Yes	Grassy woodland scattered Stringybark. Southern edge.
NOWong	883	823	Yellow box	Good	Yes	Northern edge.
NOWong	896	852	White box	Good	Yes	Grassy woodland. Mainly mature and young mature trees. 50x20 tree count plot.
NOWong	897	845	White box	Good	Yes	Grassland. 14+ herbs and 1 important species. Occasional White box and extensive rejuvenation of White box. Woodland to west continuing to valley.
NOWong	898	848	White box	Moderate - Good	Yes	Another small group on Wongala eastern border. White box open forest continues further east.
NOWong	900	839	Blakely's red gum	Good	Yes	Grassy woodland.
NOWong	901	832	Cypress	Poor	No	Small patch. With grassy White box extending south.
NOWong	902	826	White box	Moderate	No	Shrubby.
NOWong	903		Red Gum - White box - Cypress	Moderate	Yes	Percentage cover transect. 61% grass, 25% shrub, herbs 22.5%. On the edge of shrubby.
NOWong	904	835	White box - Cypress	Moderate	Yes	Grassy woodland extends up gully.
NOWong	905	841	White box - Cypress	Moderate	No	Shrubby and grassy patches.
NOWong	906	839	White box - Red Gum - Cypress	Moderate - Good	Yes	Eastern edge of patch of grassy woodland.
Mt Lindesay	812	922	Orange Gum - Blakely's Red Gum	Moderate	Potential	Mapped CEEC potential Orange Gum as one of the dominant. Limited specimen material.

Site code	Waypoint	Elevation	Dominant/Co-dominant species	Condition	Conforms to box-gum woodland	Comments
Mt Lindesay	832	951	Blakely's Red Gum - Apple box - Orange gum	Moderate	Yes	Woodland.
Mt Lindesay	891	1053	Stringybark	Moderate	No	Upper edge of patch on steep E slope. Grassland to North.
Mt Lindesay	892	1012	Stringybark	Moderate	No	North West edge of second patch on steep slope.
Mt Lindesay	893	1038	Yellow box	Moderate - Good	Yes	Yellow box, occasional Red Gums occurring down slope of Stringybark's. Grassland.
Mt Lindesay	894	956	White box	Moderate - Good	Yes	Patch scattered White box woodland/ derived grassland. Rapid assessment 13 herbs 1 important species. Extending upslope 100m as well as N and S.
Wirradale NO	841	914	Stringybark	Good	No	Patch along boundary. Grassland to East and South East.
Wirradale NO	842	914	Yellow box	Moderate - Good	Yes	Small clump within grassland.
Wirradale NO	843	912	Yellow box	Moderate	Yes	End of grassland and start woodland, some shrubby areas.
Wirradale NO	885	1060	Yellow box - Stringybark - Apple box	Good	Yes	Just inside Wirradale eastern boundary. Adjoining Yellow Box dominant.
Wirradale NO	886	1053	Apple box - Stringybark	Moderate	No	Along Wirradale boundary Yellow box decreasing.
Wirradale NO	887	1065	Yellow box	Good	Yes	Along Wirradale boundary, woodland with scattered Apple box - Stringybark.
Wirradale NO	888	1067	Yellow box	Good	Yes	Tree count in 50 x 20 plot.
Wirradale NO	889	1071	Yellow box - Apple box	Good	Yes	Patches of Yellow box and Apple box.
Wirradale NO	890	1064	Yellow box	Good	Yes	Scattered Apple box and Stringybark.
Wirradale NO	895	870	Yellow box	Moderate - Good	Yes	Patches of grassy Yellow box.
Wirradale NO	899	840	White box	Moderate - Good	Yes	White box to the south, south east and south west. Red Gum to the west.
Wirradale NO	907	841	White box	Good	Yes	Western edge grassy woodland.

Site code	Waypoint	Elevation	Dominant/Co-dominant species	Condition	Conforms to box-gum woodland	Comments
Wirradale NO	908	841	White box	Moderate- Good	Yes	Grassy woodland/ derived native grassland. Some shrubby patches.
Wirradale NO	909	837	White box	Moderate- Good	Yes	Derived native grassland.
Wirradale NO	910	856	Yellow box	Moderate	Yes	Open grassland occasional Yellow box.

Table E.2 SUMMARY OF VEGETATION PLOT DATA IN THE PROJECT AREA AND EASTERN AND SHARED OFFSET PROPERTIES

Site code	Waypoint	Elevation	Dominant/Co-dominant species	Non-grassy native ground cover	Number of important species found	Condition	Conforms to box-gum woodland	Comments
Leard State Forest								
LSFJ1	511	334	Ironbark - Cypress	9	2	Moderate	No	Dry, lots of leaf litter with variable grass cover. Scattered shrubs.
LSFJ3	513	316	White box	12	3	Moderate	Yes	Grassy woodland.
LSFJ5	515	331	White box	16	3	Moderate	Yes	Lots of leaf litter, variable grass cover. Open forest.
Project Area Teston								
PATJ1	516	323	Wilga	11	1	Moderate	Potential	Derived Grassland.
PATJ2	517	323		10	2	Moderate	Potential	Derived Grassland.
Eastern Offsets Teston North								
EOTN1	395	283	Cypress - Ironbark	13	2	Moderate	No	Rocky and grassy. Cypress regeneration. Derived grassland.
EOTN2	396	296	White box - NL Ironbark - Cypress	13	3	Moderate - Good	Yes	Woodland. Rocky, grassy and very dry.
EOTN3	397	282	Melaleuca - Blakely's - Yellow box	13	1	Moderate - Good	Yes	Trees occurring in clumps. Grassy.
EOTN4	398	311	Blakely's - NL Ironbark - Cypress	14	1	Moderate	No	Rocky slope, variable grass cover with small clumps of trees. Very dry.
EOTN5	400	301	White box - Cypress - Wilga	14	2	Moderate	Yes	Gentle slope with scattered trees and small rocky clumps. Dry and previously grazed.
EOTN6	402	295	Cypress- Ironbark - White box.	13	1	Poor-Moderate	Yes	Grassy (patchy), variable ground cover. Large clump of Cypress nearby.

Site code	Waypoint	Elevation	Dominant/Co-dominant species	Non-grassy native ground cover	Number of important species found	Condition	Conforms to box-gum woodland	Comments
Eastern Offsets Tralee and Blue Range								
EOTr	399	293	White box - Cypress	12	1	Moderate	Yes	Grassy slope with scattered trees. Very dry with rocky patches and previous grazing.
EOBR1	432	263	White box - Cypress- Blakely's	12	1	Poor - Moderate	Yes	Heavily disturbed by cattle, very dry.
Shared Offset								
SO5	425	281	White box - Cypress - Wilga	7	1	Poor	No	Grassland with occasional trees. Heavily disturbed.
SO6	426	261	Angophora- White box - Yellow box	12	3	Moderate	Yes	Woodland. Quite grassy and open in parts.
SO9	437	287	White box - Cypress	10	2	Poor	No	Highly disturbed. Very dry and very patchy ground cover.
SO10	438	262		6	1	Poor	No	Grassland- low diversity. Occasional White box, Wilga + Cypress. Very dry and disturbed.
SO 420	420		White box - Cypress	11	1	Moderate	No	Rocky and grassy steep slope of gully. Grassy Woodland. Only small area.

Table E.3 SUMMARY OF VEGETATION PLOT DATA IN THE ADDITIONAL OFFSET PROPERTIES

Site code	Waypoint	Elevation	Dominant/Co-dominant species	Non-grassy native ground cover	Number of important species	Condition	Conforms to box-gum woodland	Comments
Oakleigh/Onavale								
AOO1	405	362	White box - Ironbark	12	1	Moderate	Yes	Grassy open woodland. Slightly rocky, grass cover variable.
AOO2	406	353	White box - Ironbark	12	2	Moderate	Yes	Grassy slope on edge of clearing. Small area with Ironbark more dominant then returns to White Box.
AOO3	407	353	Ironbark	13	1	Moderate	No	Very occasional white box. Slope with rocky patches however most quite well covered by grass.
AOO4	410	359	White box	14	1	Good	Yes	Rocky on ridge top, grassy down slope and continues further along top.
AOO5	413	331	White box - Red Gum	4	0	Poor	No	Box Gum woodland/grassland. Highly disturbed scattered trees
AOO	8	407	White box	14	2	Good	Yes	Grass cover variable, dry conditions.
AOO7	418	343		13	1	Good	Yes	Grassland conforms to high diversity.
Roseglass								
RO1	439	373	White box - Wilga - Cypress	14	3	Moderate	Yes	Grassy, highly disturbed.
RO2	441	377	NL-Ironbark - Cypress - Wilga	15	1	Moderate	No	Open Woodland/DSF. Semi-cleared. Rocky slope with patchy grass cover. Shrubby toward gully.
RO3	442	368	Wilga	9	1	Poor	No	Grassland. Very dry and disturbed by goats.
RO4	446	368	Cypress - *E.dealbata*	17	2	Good	No	Moderate rocky slope, good grass cover. Open woodland.
RO5	450	372	Wilga - Budda	8	1	Poor	No	Scattered Budda. Very dry.

Site code	Waypoint	Elevation	Dominant/Co-dominant species	Non-grassy native ground cover	Number of important species	Condition	Conforms to box-gum woodland	Comments
RO7	455	368	Scattered White box.	14	3	Moderate	Yes	Grassland. Budda- South, White box - North-East.
RO11	461	365	Wilga	7	1	Poor	No	Grassland. Very dry, heavily disturbed by grazing.
RO12	462	359	Wilga	7	0	Poor	No	Grassland very dry and disturbed.
RO13	463	368		6	0	Poor	No	Grassland very dry and disturbed.
RO14	464	380		9	0	Poor	No	Heavily grazed grassland.
RO15	465	407	White box - Cypress - NL Ironbark - *E.dealbata*	12	3	Moderate	Yes	Heavily disturbed in localised patches. Rocky slope with clump of trees and moderate to good White box upslope along ridge top.
RO16	471	406	White box- Cypress - Ironbark.	14	2	Good	Yes	Open woodland.
RO17	482	348		5	0	Poor	No	Derived grassland, grazed and very dry condition.
RO19	484	333	Ironbark - Wilga	7	0	Poor	No	Derived grassland, grazed and very dry condition.
RO20	489	362	Ironbark - Cypress	8	1	Poor-moderate	No	Derived Grassland. Rocky and grazed.
RO24	496	386	Ironbark - Wilga scattered.	10	1	Poor	No	Derived Grassland. Grazed.
RO25	497	378		7	1	Poor	No	Derived Grassland. Grazed. Grass cover variable.
RO 571	571	357		9	0		Yes	Grassland. Locations very close to conforming to CEEC, considering poor seasonal conditions.
RO 581	581	501	White box - Cypress	12	1	Moderate	Yes	Localised rocky patches with patchy shrubs very dry seasonal conditions.
RO 588	588	536	White box	14	1	Moderate	Yes	Dry conditions and variable grass cover.

Site code	Waypoint	Elevation	Dominant/Co-dominant species	Non-grassy native ground cover	Number of important species	Condition	Conforms to box-gum woodland	Comments
RO 600	600	635	White box	12	1	Good	Yes	Ridge top.
RO 653	653	384	White box	13	1	Moderate	Yes	White box above gully. Ironbark - Cypress upslope with scattered white box.
RO 669	669	356	White box - Ironbark	14	1	Moderate	Yes	Grassland with occasional White box.
RO 695	695	398		13	2	Moderate	No	Grassland. Area is too small to conform.
RO 724	724	369	Occasional White box	11	1	Low - Moderate	Yes	White box regeneration. Grassland. On edge of conforming area.
RO 731	731	615	White box	9	0	Moderate	No	Grassy woodland with scattered shrubs. Shrub cover 18%. Edge of better quality habitat.
RO 732	732	601	White box	14	1	Good	Yes	Scattered shrubs
RO 740	740	461	White box - Ironbark	11		Moderate	No	Patchy variable grass cover. Better quality Grassy Woodland downslope.
Bimbooria								
BO1	472	395	White box-Ironbark.	12	2	Moderate	Yes	Mature trees + Cypress regeneration. Heavily used by cattle. Beside creek line.
BO2	474	409	White box - Cypress	14	2	Moderate	Yes	Cypress regeneration present.
BO3	479	410	White box	13	1	Moderate	Yes	Patches of low condition and some thistles. Grassland. Parts conform to CEEC.
BOJ1	524	473	White box - Cypress	13	2	Good	Yes	Grassy woodland.
BO 701	701	416	White box - Cypress	12	4	Good	Yes	
BO 704	704	392	White box - Ironbark	13	1	Good	Yes	

Site code	Waypoint	Elevation	Dominant/Co-dominant species	Non-grassy native ground cover	Number of important species	Condition	Conforms to box-gum woodland	Comments
BO 705	705	381	White box - Ironbark	16	2	Good	Yes	
BO 750	750	444	White box - Cypress	13	1	Good	Yes	Grassy woodland.
BO 762	762	404	White box	15	1	Good	Yes	Native Grassland.
BO 765	765	430	White box	8	0	Poor	No	Native Grassland. Heavily grazed, potential as White box DNG.
BO 767	767	441	White box	15	1	Good	Yes	Native Grassland.
BO 781	781	424	White box - Ironbark	12	1	Moderate	Yes	Native Grassland. Found White box seedling.
BO 782	782	429	White box - Ironbark	13	1	Moderate	Yes	Native Grassland.
BO 788	788	514	White box	15	2	Moderate-Good	Yes	Grassy woodland.
Wongala								
NOWong	817	942	Yellow Box - Blakely's Red Gum	16	4	Good	Yes	
NOWong	823	938	Yellow Box - Blakely's Red Gum	16	1	Good	Yes	Mixture of Yellow Box - Red Gum.
NOWong	834	911	Yellow Box - Blakely's Red Gum	15		Good	Yes	Very rapid assessment.
NOWong	854	884	White box	13	2	Poor	No/Yes	Derived Grassland with White box 50m from plot. Very disturbed ground cover thistles common. Very localized patches – Yes for surroundings.
NOWong	880	860	White box	17	3	Good	Yes	White box dominant grassy woodland.
NOWong	884	916	Yellow box	14	2	Good	Yes	Grassland adjacent to Yellow box woodland.

Site code	Waypoint	Elevation	Dominant/Co-dominant species	Non-grassy native ground cover	Number of important species	Condition	Conforms to box-gum woodland	Comments
NOWong	896	852	White box	15	2	Good	Yes	Cypress. Grassy woodland.

Table E.4 SUMMARY OF FAUNA HABITAT VALUES IN THE EASTERN AND SHARED OFFSET PROPERTIES AND PROJECT AREA

LEGEND	
Dis	Level of disturbance
OG	Representation of old growth trees
Mr	Maturity of regeneration
SD	Structural diversity
Alt	Alternative habitat availability
FH	Forage species presence
GD	Extent of ground debris
TH	Representation of hollow-bearing trees
SF	Occurrence of special habitat features

LEGEND (Abbreviations)	
WB	White box
YB	Yellow Box
RG	Red Gum
DwRG	Dwyer's Red Gum
BRG	Blakely's Red Gum
Cyp	Cypress pine
IB	Ironbark
Wdld	Woodland
OF	Open Forest

SCORE (VAULES)	
1	Very Low
2	Low
3	Moderate
4	Moderately High
5	High
6	Very High

Site	WP	Aspect	Habitat Type	Connectivity	Dis	OG	Mr	SD	Alt	FH	GD	TH	SF	Total	Avg	Comments
Eastern Offsets - Teston North																
EOTN2	396	SW	WB- NLIB- Cyp Wdld.	3	3	2	3.5	3	1	2	4	3	1	**25.5**	**2.6**	Decorticating bark.
EOTN3	397	E	BRG - YB - Melaleuca riparian Wdld	2	3	2	3	3	1	2	4	0	2	**22**	**2.2**	Gully -drainage line. Exfoliating Bark.
EOTN4	398	E	BRG- NLIB- Cyp Wdld.	3	3	3	3	3	2	2	5	2	1	**27**	**2.7**	Bark
EOTN5	400	SW	WB - Cyp. + Wilga.	2	3	3	3.5	3	1	1	3	2	1	**22.5**	**2.3**	Exfoliating Bark
EOTN6	402	N	NLIB- WB- Cyp.	2	3	5	3	3	1	2	4	2	1	**26**	**2.6**	Bark
Eastern Offsets - Tralee																
EOTr	399	W	WB - Cyp. Woodland/open forest.	2	3	4	4	3	2	1	3	4	0	**26**	**2.6**	
Eastern Offsets – Blue Range																
EOBR1	432	E	WB - BRG - Mel. Rip. Wdld/OF.	2	3	3	3	3	1	2	2	3	2	**24**	**2.4**	4 tree hollows. Creek line. Dense foliage.
Summary- Totals				**16**	**21**	**22**	**23**	**21**	**9**	**12**	**25**	**16**	**8**	**173**	**17.3**	
Summary -Average				**2.29**	**3.00**	**3.14**	**3.29**	**3.00**	**1.29**	**1.71**	**3.57**	**2.29**	**1.14**		**2.47**	
Eastern Offsets – Cattle Plain																
CP2	521	NE	WB - BRG -Cyp. Shrubby Wdld.	2	3	3	4	4	2	1	2	3	2.5	**26.5**	**2.7**	Shrubby; Rocky shelter; Some Bark.
CP3	522	NW	RRG - YB - PB - BRG Rip. Forest/Wdld.	2	3	6	3.5	3	1	2	5	5	1	**31.5**	**3.2**	Creek line (Maules Creek).
Summary- totals				**4**	**6**	**9**	**7.5**	**7**	**3**	**3**	**7**	**8**	**3.5**	**58**	**5.8**	
Summary -Average				**2**	**3**	**4.50**	**3.75**	**3.5**	**1.5**	**1.5**	**3.5**	**4**	**1.75**		**2.9**	
Project Area – Leard State Forest																

Site	WP	Aspect	Habitat Type	Connectivity	Dis	OG	Mr	SD	Alt	FH	GD	TH	SF	Total	Avg	Comments
LSF	384	NE	NLIB/Cyp DSF (regen)	4	2	0	4	3	1	1	4	0	2	**21**	**2.1**	Very dry.
LSF	285	E	WB Grassy Wdld.	4	4	4	4	3	2	1	4	3	1	**30**	**3.0**	Very dry.
LSF	386	E	SLIB - Cyp.	4	4	1	3	3	2	1	3	1	2	**24**	**2.4**	
LSF	387	E	NLIB - SLIB - Cyp	4	3	2	3.5	4	2	1	3	0	2	**24.5**	**2.5**	Shrubby; Food trees; Bark.
LSF	388	N	NLIB - Cyp	4	2	0	3	4	1	1	3	0	3	**21**	**2.1**	Shrubby, food trees. Bark.
LSF	389	SE	NLIB - Cyp	4	2	3	3.5	3	1	1	5	1	3	**26.5**	**2.7**	
LSFJ1	511	N	NLIB - Cyp + WB OF/Wdld.	4	3	5	3.5	3	1	2	6	4	2	**33.5**	**3.4**	Partially shrubby; Decorticating bark.
LSFJ2	512	W	SLIB - Cyp Wdld	4	3	5	3.5	3	2	1	5	5	2	**33.5**	**3.4**	Partially shrubby; Decorticating bark.
LSFJ3	513	E	WB - Cyp +- NLIB	4	3	6	3.5	3	2	2	6	6	2	**37.5**	**3.8**	Partially shrubby; Decorticating bark.
LSFJ4	514	NE	NLIB - SLIB - Cyp DSF/Wdld	4	3	3	3.5	4	2	2	4	1	2	**28.5**	**2.9**	Shrubby; Bark.
LSFJ5	515	NW	WB (+Wilga) Grassy wdld.	4	3	5	3.5	4	1	1	6	6	1	**34.5**	**3.5**	Shrubby; Bark.
Summary- Totals				**44**	**32**	**34**	**38.5**	**37**	**17**	**14**	**49**	**27**	**22**	**314.5**	**31.45**	
Summary -Average				**4**	**2.91**	**3.09**	**3.50**	**3.36**	**1.55**	**1.27**	**4.45**	**2.45**	**2.0**		**2.86**	
Shared Offsets																
SO1	419	SW	WB- IB - Cyp. Shrubby Wdld.	3	3	1	3.5	4	2	2	5	3	2	**28.5**	**2.9**	Adj. to boundary and open area to S. Mod. Dense shrubby habitat to EW and N.
SO2	421	W	DwRG + Cyp. Shrubby Wdld.	3	3	1	3.5	4	2	0	5	2	2	**25.5**	**2.6**	
SO3	422	E	WB - Cyp +- RG dwyeri/blakelyi Shrubby Wdld.	3	3	2	4.5	4	2	2	4	2	4	**30.5**	**3.1**	Shrubby, Bark. Goats present, gully and rocky
SO4	423	SE	WB - Cyp +- DwRG	3	3.5	3	3	4	2	1	3.5	3	3	**29**	**2.9**	Shrubby, Gully, Rocky.

Site	WP	Aspect	Habitat Type	Connectivity	Dis	OG	Mr	SD	Alt	FH	GD	TH	SF	Total	Avg	Comments
SO6	426	NE	WB - Angophora - YB	2	2	3	4.5	4	2	2	3	2	2	**26.5**	**2.7**	Gully. Shrubs in patches.
SO7	429	NW	DRG - Cyp.	3	2	2	3.5	4	2	0	6	3	2	**27.5**	**2.8**	Shrubs, Bark.
SO8	430	E	WB - Cyp. - DRG	3	3	5	4.5	4	2	1	5	5	2	**34.5**	**3.5**	Shrubby, Gully.
SO9	435	S	DRG - WB + Cyp.	3	3	3	3.5	4	2	1	3	0	1	**23.5**	**2.4**	Shrubby.
Summary- Totals				**23**	**22.5**	**20**	**30.5**	**32**	**16**	**9**	**34.5**	**20**	**18**	**225.5**	**22.55**	
Summary -Average				**2.9**	**2.8**	**2.5**	**3.8**	**4.0**	**2.0**	**1.1**	**4.3**	**2.5**	**2.3**		**2.82**	

Table E.5 SUMMARY OF FAUNA HABITAT VALUES IN THE ADDITIONAL OFFSET PROPERTIES

Site	WP	Aspect	Habitat Type	Connectivity	Dis	OG	Mr	SD	Alt	FH	GD	TH	SF	Total	Average	Comments (special features)
Oakleigh/Onavale																
AOO1 Onavale	405	SW	WB - IB grassy open Wdld. Mod. Slope	3	3	0	3	2.5	2	2	2.5	1	0	**19**	**1.9**	Grassy variable 10 - 60%
AOO2 Onavale	406	SW	Gentle slope. Grassy IB - WB Wdld.	3	3	2	2	2	2	2	2.5	2	1	**21.5**	**2.2**	Grassy >50%, variable. Some clearing and grazing disturbance.
AOO3 Onavale	407		IB - +/- WB	3	3	0	2	2.5	2	1	3	0	0	**16.5**	**1.7**	Grassy IB woodland.
AOO5 Onavale	412		WB - IB - RG	2	4	3	1	3	3	2	2.5	5	3	**28.5**	**2.9**	Very open and grassy. Dry creek bed & nearby dam. Onavale
AOO6 Onavale	413		WB - RG, +/- Bimble box. Grassy Wdld, patchy.	2	4	2	2	2	3	1	3	2	1	**22**	**2.2**	Onavale. RG, small patch woodland surrounded by derived grassland with adj IB woodland.
AOO4 Oakleigh	410		WB grassy Wdld.	3	2	1	3	2	1	1	2	1.5	2	**18.5**	**1.9**	Rocky outcrop. Oakleigh
AOO Oakleigh	8	NW	WB - grassy wdld on low ridge, +/-NLIB	2	3	4	3	3	1	2	4	2	2	**26**	**2.6**	Some shrubby patches nearby.
Summary- Totals				**18**	**22**	**12**	**16**	**17**	**14**	**11**	**20**	**14**	**9**	**152**	**15.2**	
Summary- Average				**2.57**	**3.14**	**1.71**	**2.29**	**2.43**	**2.00**	**1.57**	**2.79**	**1.93**	**1.29**		**2.17**	
Bimbooria																
BO1	472	SE	WB - NLIB - Cyp. O Wdld.	3	2	6	3	3	2	2	4	5	2	**32**	**3.2**	Gully, Bark.
BO2	473	E	WB - Cyp. Grassy Wdld	4	2	5	3	3	1	1	5	2	2	**28**	**2.8**	Gully, Cypress Pine shrubby cover.
BOJ1	524	W	WB - Cyp. Grassy Wdld	4	3	3	3.5	3	2	1	6	3	1	**29.5**	**3.0**	7 hollows. Dense shrubby pine patches.

Site	WP	Aspect	Habitat Type	Connectivity	Dis	OG	Mr	SD	Alt	FH	GD	TH	SF	Total	Average	Comments (special features)
BOJ2	528	E	WB- Cyp - Grassy/shrubby Wdld/OF. Rocky slope.	4	3	5	3.5	3	2	1	5	4	2	**32.5**	**3.3**	Gully, Shrubby patches. Grassy upslope to North & South.
BO 701	701			4	3	5	3	3	2	1	6	4	1	**32**	**3.2**	
BO 786	786	E	Small patch of WB on rocky knoll. Dense Cypress regeneration surrounding.	4	3	3	3	3	1	1	3	2	2	**25**	**2.5**	Dense cover, Rocky shelter.
BO 792	792	S	WB - *E.dealbata* + Cyp up steep slope rocky and grassy.	4	3	5	3	3	2	1	3	3	2	**29**	**2.9**	Dense cover, Rocky shelter.
BO 795	795	NW	WB +/- *E.dealbata* - Cyp grassy wdld.	4	3	5	3.5	4	2	1	6	6	2	**36.5**	**3.7**	Shrubby patches, Rocky shelter.
BO 804	804	W	Edge of WB grassy to S/Dense shrubby Cyp to N/NE.	4	3	4	3	3	2	1	5	3	2	**30**	**3.0**	Shrubby patches, Rocky shelter.
BO 809	809	N	Finger of remnant veg. along side tributary.	3	2	4	2.5	3	3	2	4	2	1	**26.5**	**2.7**	Gully.
Summary- Totals				**38**	**27**	**45**	**31**	**31**	**19**	**12**	**47**	**34**	**17**	**301**	**30.1**	
Summary -Average				**3.8**	**2.70**	**4.5**	**3.1**	**3.10**	**1.9**	**1.2**	**4.70**	**3.40**	**1.7**		**3.01**	
Roseglass																

Site	WP	Aspect	Habitat Type	Connectivity	Dis	OG	Mr	SD	Alt	FH	GD	TH	SF	Total	Average	Comments (special features)
RO2	441	W	Semi-cleared NLIB - Cyp-Wilga Wdld	3	3	0	3	3	3	1	3	0	2	**21**	**2.1**	Dense shrubby clumps. Rocky.
RO6	436	N	O Wdld - Vine thicket sp. + *E.dealbata* - NLIB.	4	3	3	3.5	3	2	1	4	0	2	**25.5**	**2.6**	Dense foliage, Caves.
RO8	458	NE	NLIB Wdld/OF + Cyp. *E.dealbata in gully.*	3	3	1	3	3	2	1	5	4	2	**27**	**2.7**	Gully, Bark.
RO9	459	NE	NLIB - Cyp + /- *E.dealbata.*OF	4	3	1	3.5	4	2	1	6	4	3	**31.5**	**3.2**	Gully, Bark, Shrubby.
RO10	460	S	NLIB - Cyp Wdld/OF- patches of shrubby habitat.	4	4	4	3.5	3	1	1	4	6	3	**35.5**	**3.6**	Gully, Bark, Shrubby.
RO15	465	NW	WB- NLIB- Cyp W/OF	3	3	6	4.5	4	2	2	4	6	3	**37.5**	**3.8**	Shrubby patches. Bark. Rocky crevices.
RO16	467	SW	WB Grassy Wdld. Good condition.	4	3	6	3.5	2	2	2	4	3	2	**31.5**	**3.2**	Adjacent gully, Bark, 4 large IB adjacent.
RO18	483	N	NLIB + Cyp + Wilga OW	2	2	5	3	3	2	1	4	3	3	**28**	**2.8**	Bark, Shrubby clumps, Rocky shelter.
RO21	490	NW	NLIB - Cyp - *E.dealbata.*	3	3	4	3.5	3	1	1	4	3	3	**29.5**	**3.0**	Box thorn sprayed. Shrubby clumps, Rocky shelter, Bark.
RO22	491	NE	NLIB - Cyp. Open/shrubby Wdld/OF	4	3	3	3.5	3	1	1	6	3	3	**30.5**	**3.1**	Bark, Shrubby clumps, Rocky shelter.
RO23	492	E	NLIB - Cyp. Shrubby Wdld/OF	4	3	2	3.5	2	2	1	6	3	3.5	**30**	**3.0**	Shrubby (more). Bark.
ROF6	ROF6	N	NLIB - Cyp. DSF/Wdld.	3	3	5	3	4	1	1	5	0	3	**29**	**2.9**	Rocky, shrubs, loose bark.
RO 569	569	E	WB - Cyp. Grassy Wdld/OF	3	3	3	4	4	2	2	4	3	4	**32**	**3.2**	Rocky, shrubs, loose bark, gully.

Site	WP	Aspect	Habitat Type	Connectivity	Dis	OG	Mr	SD	Alt	FH	GD	TH	SF	Total	Average	Comments (special features)
RO	574	NW	NLIB - Cyp. +/- *E.dealbata*. Shrubby woodland/ OF	3	3	3	4	4	2	1	5	3	3	**31**	**3.1**	Shrubby, bark and rocky shelter.
RO	ROF9	W	NLIB - Cyp. +/- E.dealbata. Shrubby wdld	4	4	3	4	4	2	1	4	4	4	**34**	**3.4**	Gully, shrubby, loose bark and rocky shelter.
RO	575	N	Shrubby wdld	4	4	4	4	4	1	1	4	4	4	**34**	**3.4**	Gully, shrubby, bark and rocky shelter.
RO	579	NW	IB - Cyp. Young forest.	3	3	1	3.5	3	2	2	5	3	2	**27.5**	**2.8**	Fairly bare down slope, grassy with shrubs upslope. Shrubs upslope, bark
RO 581	581	NE	WB - Cyp. Wdld -scattered shrubs.	4	4	6	4.5	4	2	2	5	5	4	**40.5**	**4.1**	Gully, shrub clumps, rocky shelter, bark.
RO 588	588	SW	WB - Cyp. Grassy wdld (IB+ *E.dealbata* upslope).	4	4	5	4.5	4	3	2	4	5	2	**37.5**	**3.8**	Rocky shelter, shrub clumps.
RO 600	600	SW	Edge of WB - Cyp. Grassy wdld.	4	4	4	5	3	3	2	6	5	3	**39**	**3.9**	Rocky, shrub clumps, bark (IB nearby).
RO 618	618	W	WB - Cyp grassy wdld fringe by IB - Cyp.	4	4	4	3.5	4	2	2	5	3	4	**35.5**	**3.6**	Gully, Bark, shrub clumps, rocky shelter.
RO 630	630		WB - Cyp. Grassy Wdld	4	4	4.5	4.5	3	2	2	2.5	4	2	**32.5**	**3.3**	Ridge top. Rocky knolls, shrub clumps.
RO 732	732	SE	WB - IB - Cyp grassy/shrubby wdld/OF. Habitat variable.	4	4	4	4	4	2	2	5	5	3	**37**	**3.7**	Rocky shelter, Shrubby patches, Bark exfoliating.
Summary- Totals				**82**	**77**	**81.5**	**86.5**	**77**	**48**	**33**	**104.5**	**79**	**67.5**	**737**	**73.7**	
Summary -Average				**3.57**	**3.35**	**3.54**	**3.76**	**3.35**	**2.09**	**1.43**	**4.54**	**3.43**	**2.93**		**3.20**	

Site	WP	Aspect	Habitat Type	Connectivity	Dis	OG	Mr	SD	Alt	FH	GD	TH	SF	Total	Average	Comments (special features)
Wongala																
NOWong	844	S	StB - Apple box on mod.- steep slope with mod.- dense shrubs.	3	4	3	4.5	4	3	1	2	0	3	**27.5**	**2.75**	Shrubby, Bark, adjacent to gully. Yellow Box adjacent.
NOWong	847	E	YB grassy wdld to Manna gum + StB +/-Apple box shrubby forest.	4	4	4	3.5	4	2	2	5	3	3	**34.5**	**3.45**	Some large mature/OG YB. Occasional Angophora.
NOWong	856	E	WB- Cyp-Grassy/shrubby wdld	5	4	4	4	4	3	1	6	3	2	**36**	**3.6**	Shrubby, gully.
NOWong	859	E	WB- Cyp-Grassy/shrubby wdld	5	4	4	4	4	3	1	5	1	2	**33**	**3.3**	Shrubby, gully.
NOWong	868	S	Patch of WB wdld	3	3	4	4	3	3	2	3	3	1	**29**	**2.9**	Gully/ drainage area.
NOWong	875	SE	WB - RG shrubby wdld/forest	6	4	3	4	4	3	2	3	1	1	**31**	**3.1**	Shrubby.
NOWong	880	SE	WB Grassy Wdld.	5	3	2	4	4	2	1	5	2	2	**30**	**3**	Exfoliating bark; adj. shrubby habitat.
NOWong	881	E	WB - StB shrubby OF.	6	4	4	5	4	3	2	5	4	1	**38**	**3.8**	Shrubby. Occasional Angophora.
NOWong	896	W	WB grassy wdld adjacent to deep gully.	6	3	5	4	2	3	1	4	4	1	**33**	**3.3**	Adj. deep gully.
Summary- Totals				**43**	**33**	**33**	**37**	**33**	**25**	**13**	**38**	**21**	**16**	**292**	**25.9**	
Summary -Average				**4.78**	**3.67**	**3.67**	**4.11**	**3.67**	**2.78**	**1.44**	**4.22**	**2.33**	**1.78**		**3.24**	

Table E.6 FAUNA HABITAT ASSESSMENT COMPILATION OF THE 2013 AND 2014 SURVEYS WITHIN THE PROJECT SITE

Site	WP	Aspect	Habitat Type	Connectivity	Dis	OG	Mr	SD	Alt	FH	GD	TH	SF	Total	Average	Comments
Leard State Forest / Project Site																
LSF	384	NE	NLIB/Cyp DSF (regen)	4	2	0	4	3	1	1	4	0	2	**21**	**2.1**	Very dry.
LSF	285	E	WB Grassy Wdld.	4	4	4	4	3	2	1	4	3	1	**30**	**3**	Very dry.
LSF	386	E	SLIB - Cyp.	4	4	1	3	3	2	1	3	1	2	**24**	**2.4**	
LSF	387	E	NLIB - SLIB - Cyp	4	3	2	3.5	4	2	1	3	0	2	**24.5**	**2.45**	Shrubby; Food trees; Bark.
LSF	388	N	NLIB - Cyp	4	2	0	3	4	1	1	3	0	3	**21**	**2.1**	Shrubby, food trees. Bark.
LSF	389	SE	NLIB - Cyp	4	2	3	3.5	3	1	1	5	1	3	**26.5**	**2.65**	
LSFJ1	511	N	NLIB - Cyp + WB OF/Wdld.	4	3	5	3.5	3	1	2	6	4	2	**33.5**	**3.35**	Partially shrubby; Decorticating bark.
LSFJ2	512	W	SLIB - Cyp Wdld	4	3	5	3.5	3	2	1	5	5	2	**33.5**	**3.35**	Partially shrubby; Decorticating bark.
LSFJ3	513	E	WB - Cyp +- NLIB	4	3	6	3.5	3	2	2	6	6	2	**37.5**	**3.75**	Partially shrubby; Decorticating bark.
LSFJ4	514	NE	NLIB - SLIB - Cyp DSF/Wdld	4	3	3	3.5	4	2	2	4	1	2	**28.5**	**2.85**	Shrubby; Bark.
LSFJ5	515	NW	WB (+Wilga) Grassy wdld.	4	3	5	3.5	4	1	1	6	6	1	**34.5**	**3.45**	Shrubby; Bark.
LSF1	91	W	SLIB – Cyp.	4	2	3	5	3	2	1	6	1	4	**31**	**3.1**	Location N.W Rd/ South Lawlers Rd Junction

Site	WP	Aspect	Habitat Type	Connectivity	Dis	OG	Mr	SD	Alt	FH	GD	TH	SF	Total	Average	Comments
LSF1	109		WB grassy wdld.	4	2	4	5	3	2	2	6	5	3	**36**	**3.6**	Lots of leaf litter. Gully. Mod-dense grass cover.
LSF	110			4	2	5	5	3	2	2	6	6	3	**38**	**3.8**	More grass
LSFPL2	113			4	2	4	5	3	2	2	6	2	2	**32**	**3.2**	More dense grass cover.
WOT3 (project site)	255	N	White Box, cypress open Grassy Wdld.	3	2	0	4	3	2	2	4	0	3	**23**	**2.3**	Grassy near gully, scattered shrub patches
Total				**63**	**42**	**50**	**62.5**	**52**	**27**	**23**	**77**	**41**	**37**	**474.5**	**47.45**	
Average				**3.94**	**2.63**	**3.13**	**3.91**	**3.25**	**1.69**	**1.44**	**4.81**	**2.56**	**2.31**	**29.66**	**2.97**	

Appendix F

Key Areas for Mapping Amendments for Subject Offsets

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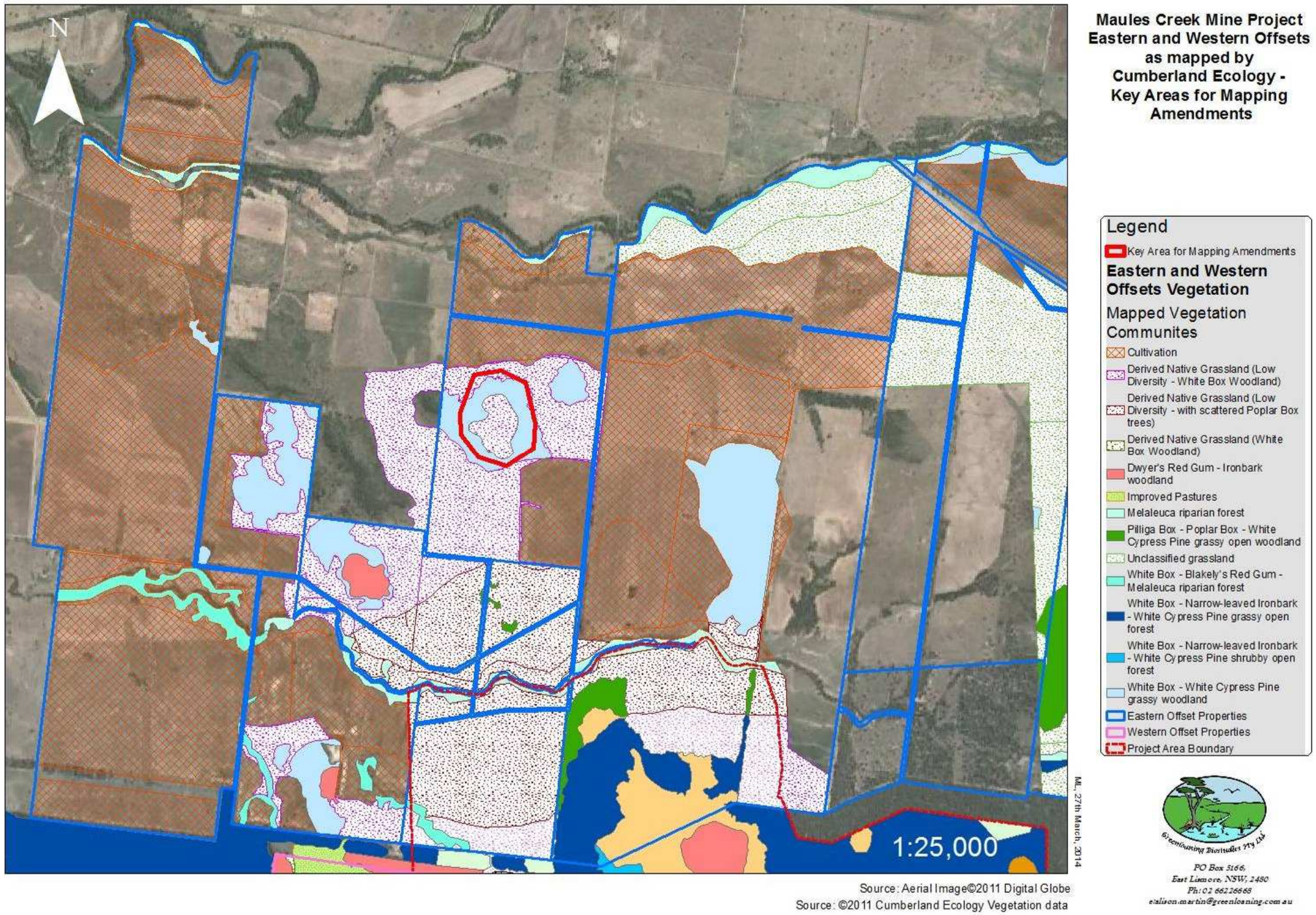

Figure F.1 KEY AREAS FOR VEGETATION MAPPING AMENDMENTS IN EASTERN OFFSETS

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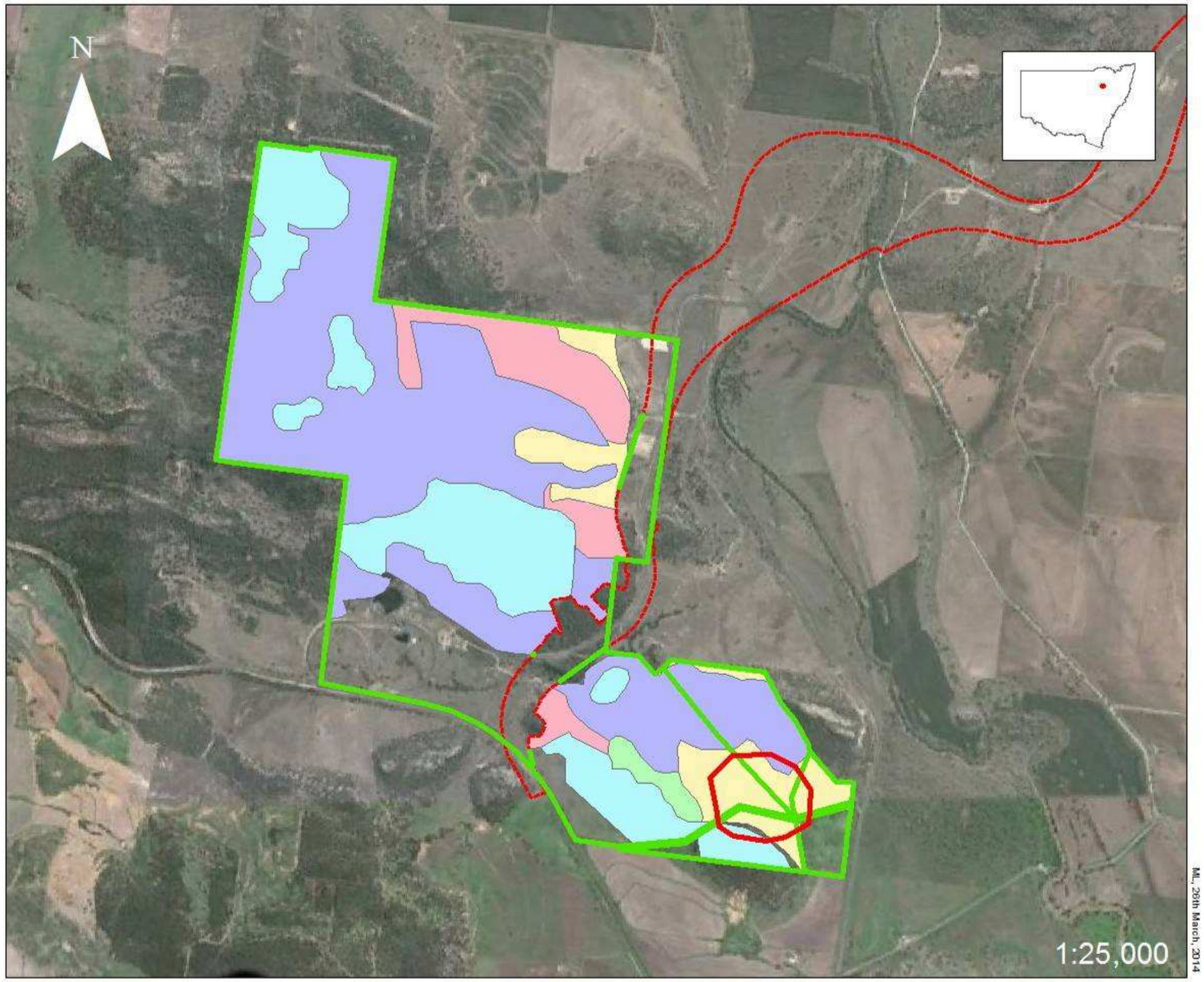

Maules Creek Mine Project
Shared Offsets
as mapped by Parsons Brinckerhoff Aust Pty Ltd
for Boggabri Coal Project -
Key Mapping Amendments

Legend

- Key Areas for Mapping Amendments

Shared Offset Area Vegetation

Mapped Vegetation Communites

- Dwyer's Red Gum woodland
- Regrowth - White Cypress Pine
- Silver-leaved Ironbark heathy woodland
- White Box - Narrow-leaved Ironbark - White Cypress Pine shrubby open Forest
- White Box - White Cypress Pine grassy woodland (low condition)
- Shared Offset Properties
- Project Boundary

Greenleaning Biostudies Pty Ltd
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East Lismore, NSW, 2480
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Figure F.2 KEY AMENDMENTS FOR VEGETATION MAPPING AMENDMENTS WITHIN THE SHARED OFFSET

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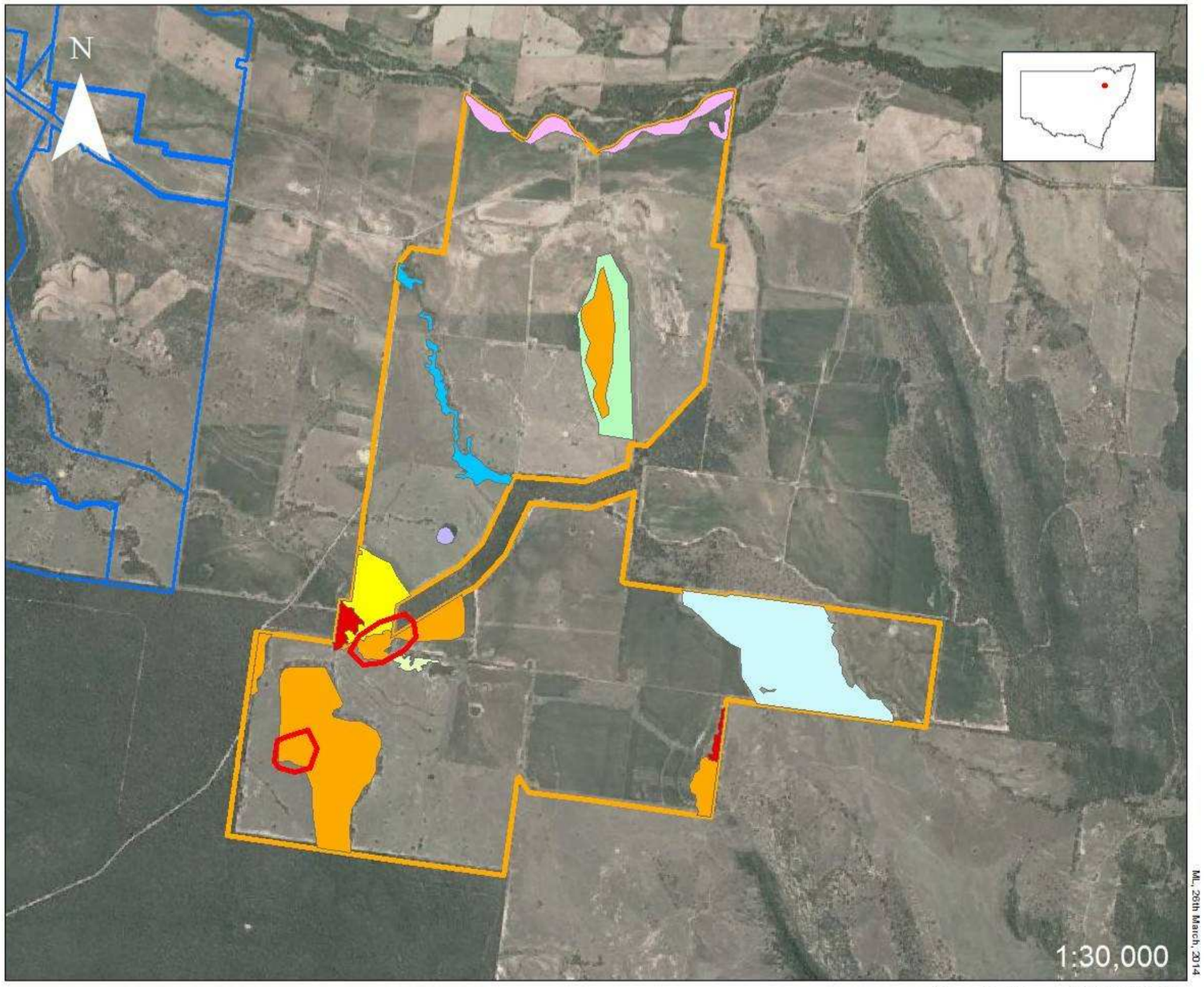

Maules Creek Mine Project
Oakleigh-Onavale Offset Property
as mapped by Cumberland Ecology
Key Mapping Amendments

Legend

Key Areas for Mapping Amendments

Oakleigh Onavale Property Vegetation

Mapped Vegetation Communities

- Belah Woodland
- Derived Native Grassland
- Derived Native Grassland/Open Woodland
- Low Diversity Native Grassland
- Melaleuca bracteata Riparian Forest
- Pilliga Box - Poplar Box - White Cypress Pine Grassy Woodland
- River Red Gum Forest
- Silver-leaved Ironbark Heathy Woodland
- White Box - Narrow-leaved Ironbark White Cypress Open Forest
- Oakleigh Onavale Property Boundary
- Eastern Offset Properties

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Figure F.3 KEY AREAS FOR VEGETATION MAPPING AMENDMENTS WITHIN THE OAKLEIGH ONAVALE OFFSET PROPERTY

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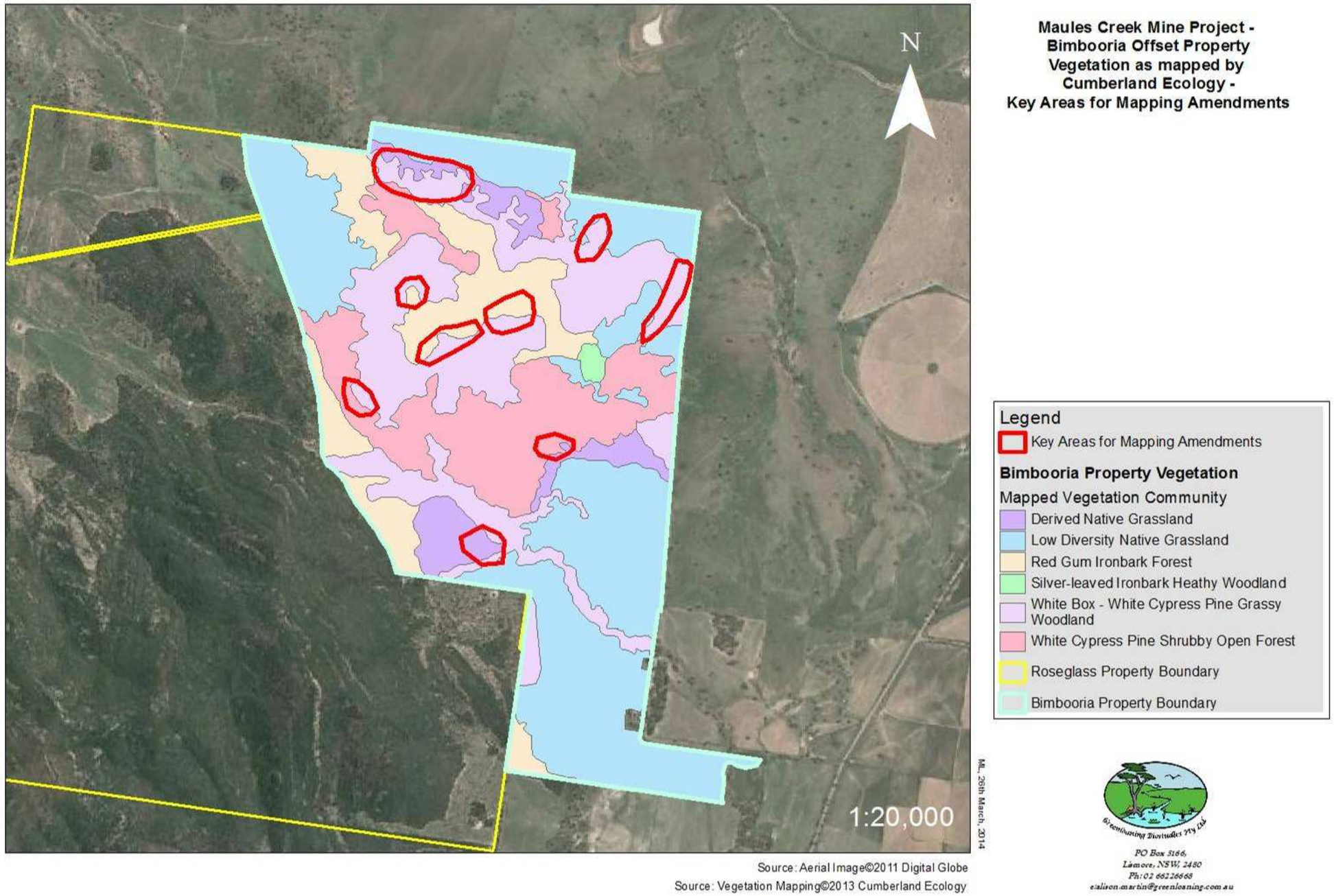

Figure F.4 KEY AREAS FOR VEGETATION MAPPING AMENDMENTS WITHIN THE BIMBOORIA OFFSET PROPERTY

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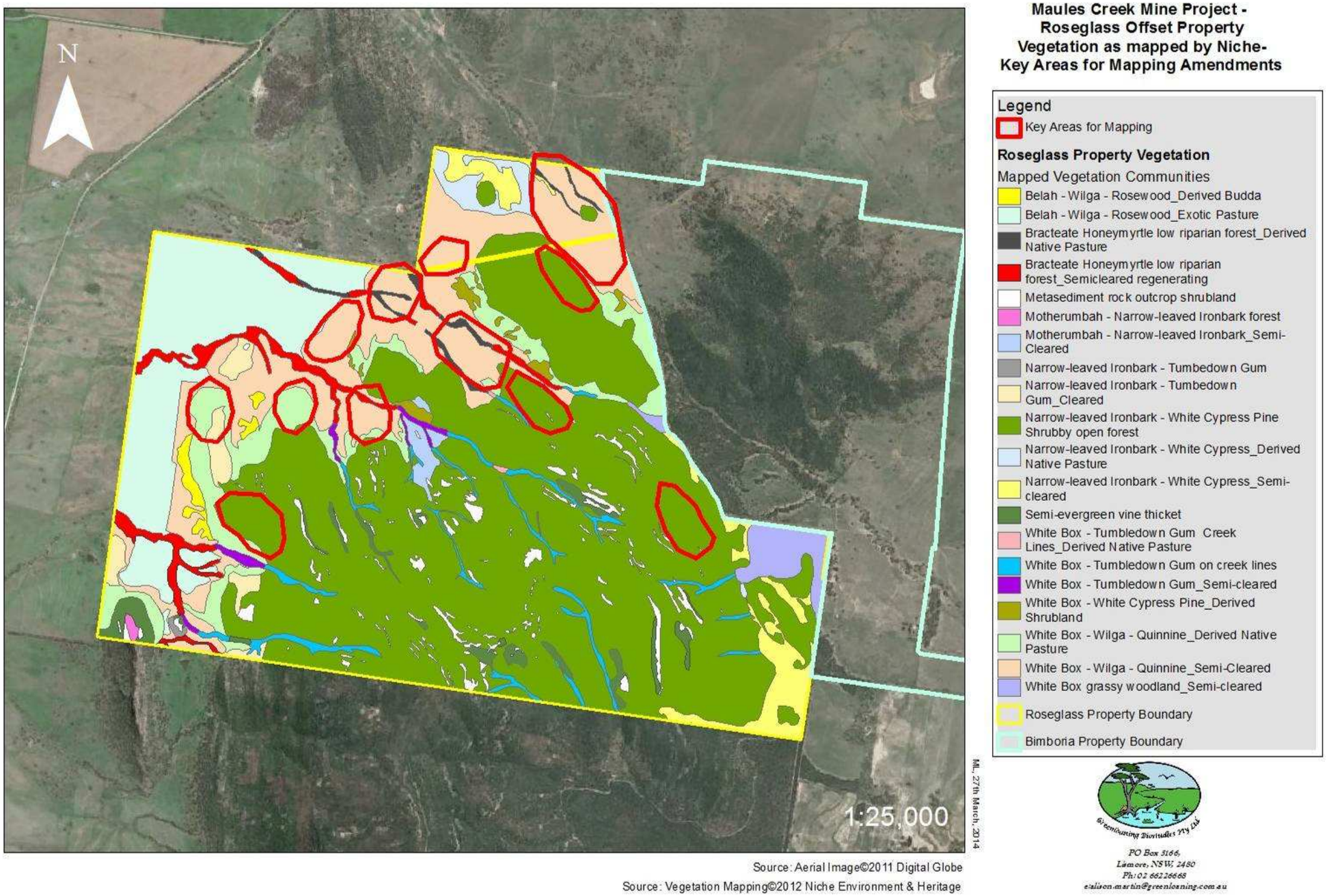

Figure F.5 KEY AREAS FOR MAPPING AMENDMENTS WITHIN THE ROSEGLASS OFFSET PROPERTY

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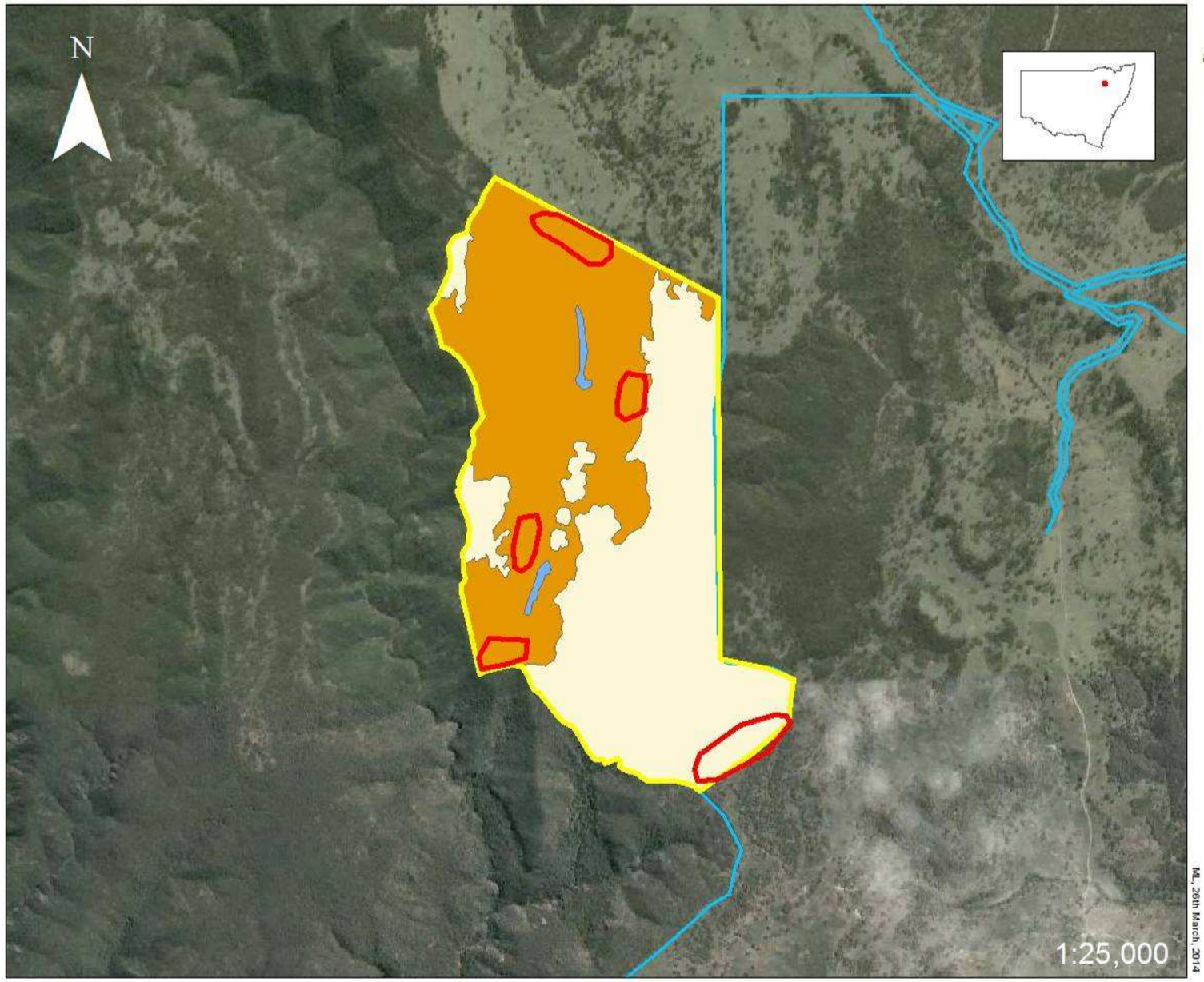

**Maules Creek Mine Project -
Wongala Offset Property
as mapped by Cumberland Ecology -
Key Areas of Mapping Amendments**

Legend

Key Areas of Mapping Amendments

Wongala Property Vegetation

Mapped Vegetation Communities

- Ribbon Gum
- Shrubby Pine/Ironbark/Whitebox Forest
- White Box Gum Woodland CEEC
- Wongala Property
- Northern Offset Properties

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Figure F.6 KEY AREAS FOR MAPPING AMENDMENTS WITHIN THE WONGALA OFFSET PROPERTY

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Appendix G

Comparative Summary Table of Clearing and Revised Offset Areas (Including Additional Offsets)

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Table G.1 COMPARITIVE SUMMARY TABLE OF ORIGINAL OFFSET ESTIMATES AND FINAL OFFSET OUTCOMES WITH ADDITIONAL OFFSETS INCLUDED

OFFSETS	ORIGINAL ESTIMATES for Box Gum Woodland and Derived Grasslands provided (ha)*			VARIATIONS for Box Gum Woodland and Derived Grasslands provided (ha) (Derived from Greenloaning Assessments)				ADJUSTED TOTAL (Derived from Greenloaning Assessments)			ORIGINAL ESTIMATES FOR THREATENED SPECIES HABITAT PROVIDED (ha)**			Variations for HABITAT for EPBC Matters of National Environmental Significance (Regent Honeyeater, Swift Parrot and South-eastern Long-eared Bat (Derived from Greenloaning Assessments)				ADJUSTED TOTALS (Derived from Greenloaning Assessments)		
Property	Derived Grassland	Box-Gum Woodland	**Total area of offsets (ha) (Combined)**	Positive Variation (Derived Grassland)	Positive Variation (Box-Gum Woodland)	Negative Variation (Derived Grassland)	Negative Variation (Box-Gum Woodland)	**Adjusted Total Derived Grassland**	**Adjusted Total Box-Gum Woodland**	**Adjusted Total Area of Offsets**	Good condition vegetation (ha)	Low or moderate condition vegetation to be re-vegetated (ha)	**Total Habitat Offset Area**	Positive Variation - Good condition vegetation (ha)	Positive Variation - Low or moderate condition vegetation (ha)	Negative Variation - Good condition vegetation (ha)	Negative Variation - Low or moderate condition vegetation (ha)	**Adjusted Total - Good condition vegetation (ha)**	**Adjusted Total - Low or moderate condition vegetation (ha)**	**Adjusted Total Habitat Offset Area Estimate (if required)**
Northern Offsets (A)																				
Mt Lindesay	577.30	1458.60	2035.90	7.34	21.50	16.02	361.83	568.62	1118.27	1686.89	1456.70	821.20	2277.90	230.90		50.30	218.30	1637.30	602.90	2240.20
Wirradale	818.70	1517.10	2335.80		107.99	90.47	130.70	728.23	1494.39	2222.62	1942.20	1593.70	3535.90	545.50	44.00	0.00	87.10	2487.70	1550.60	4038.30
Western Offsets (A)																				
Kelso	0.00	16.50	16.50					0.00	16.50	16.50	342.80	156.40	499.20		40.20	40.20		302.60	196.60	499.20
Louenville	0.00	151.00	151.00					0.00	151.00	151.00	188.60	115.00	303.60					188.60	115.00	303.60
Olivedeen	0.00	0.00	0.00					0.00	0.00	0.00	13.20	31.80	45.00					13.20	31.80	45.00
Teston (sth)	18.60	63.40	82.00		14.60			18.60	78.00	96.60	175.10	127.60	302.70					175.10	127.60	302.70
Velyama	71.60	37.80	109.40	36.00			36.00	107.60	1.80	109.40	83.00	315.80	398.80		20.00	20.00		63.00	335.80	398.80
Eastern Offsets (A)																				
Blue Range	0.00	21.70	21.70					0.00	21.70	21.70	0.00	127.40	127.40					0.00	127.40	127.40
Cattle Plain	0.00	36.00	36.00	6.40			28.00	6.40	8.00	14.40	36.00	118.30	154.30			10.00		26.00	118.30	144.30
Teston (nth)	0.00	57.80	57.80	0.84	0.00	0.00	1.88	0.84	55.92	56.76	0.10	204.50	204.60					0.10	204.50	204.60
Tralee	0.00	17.20	17.20	0.00	0.43	0.00	3.68	0.00	13.95	13.95	0.00	103.20	103.20					0.00	103.20	103.20
Wallandilly	0.00	98.30	98.30	198.06	107.00		34.75	198.06	170.55	368.61	122.80	699.70	822.50			10.00		112.80	699.70	812.50
Warriahdool	0.00	64.50	64.50					0.00	64.50	64.50	64.50	138.10	202.60		30.00	30.00		34.50	168.10	202.60
Shared Offset (B)																				
	0.00	5.60	5.60					0.00	5.60	5.60	124.10	232.10	356.20					124.10	232.10	356.20
SUBTOTAL	**1486.20**	**3545.50**	**5031.70**	**248.64**	**251.52**	**106.49**	**596.85**	**1628.35**	**3200.18**	**4828.53**	**4549.10**	**4784.80**	**9333.90**	**776.40**	**134.20**	**160.50**	**305.40**	**5165.00**	**4613.60**	**9778.60**
Additional Properties																				
Oakleigh/ Onavale (C)	49.00	111.00	160.00	5.37	0.87	0.00	19.33	54.37	92.54	146.91	134.00	129.00	263.00	0.00	0.00	0.00	0.00	134.00	129.00	263.00
Bimbooria (D)	40.00	169.00	209.00	4.34	30.02	14.85	48.80	29.48	150.23	179.71	383.00	300.00	683.00	0.00	11.21	11.21	0.00	371.79	311.21	683.00
Wongala (E)	0.00	274.00	274.00	63.74	15.39	0.00	70.21	63.74	219.18	282.92	569.00	0.00	569.00	0.00	21.25	21.25	0.00	547.75	21.25	569.00
Roseglass (F)	97.00	262.00	359.00	83.49	110.44	94.65	236.42	85.84	136.02	221.86	1299.00	325.00	1624.00	97.00	236.00	236.00	97.00	1160.00	464.00	1624.00
SUBTOTAL	186.00	816.00	**1002.00**	156.93	**156.72**	**109.50**	**374.76**	**233.44**	**597.96**	**831.40**	**2385.00**	**754.00**	**3139.00**	**97.00**	**268.46**	**268.46**	**97.00**	**2213.54**	**925.46**	**3139.00**
TOTAL	**1672.20**	**4361.50**	**6033.70**	**405.57**	**408.24**	**215.99**	**971.60**	**1861.79**	**3798.14**	**5659.93**	**6934.10**	**5538.80**	**12472.90**	**873.40**	**402.66**	**428.96**	**402.40**	**7378.54**	**5539.06**	**12917.60**
										Areas Required under Approval Conditions	**5532.00**								Areas Required under Approval Conditions		**9334.00**
										Additional Area Provided Exceeding Required Amount	**127.93**								Additional Area Provided Exceeding Required Amount		**3583.60**

*Box Gum Woodland and Derived Grasslands provided (ha) and ** Habitat for EPBC Matters of National Environmental Significance (Regent Honeyeater, Swift Parrot and South-eastern Long-eared Bat [Greater Long-eared Bat]) derived from:

(A): BMP (Revision Date 18 June 2013) Cumberland Ecology 2013 - Table 4.29 and Corresponding with Management Zone Totals in Attachment A - Approval Conditions);

(B): Continuation of the Boggabri Coal Mine, Biodiversity Impact Assessment, Appendix J, Parsons Brinckerhoff, 2010;

(C): Maules Creek Coal Project: Analysis of Offset Potential of the Oakleigh and Onavale Property, Cumberland Ecology, 2013;

(D): Maules Creek Coal Project: Analysis of Offset Potential of the Bimbooria Property, Cumberland Ecology, 2013;

(E): Maules Creek Coal Project: Analysis of Offset Potential of the Harris Property, Cumberland Ecology, 2013;

(F): Roseglass Offset Area Flora and Fauna Assessment - Table 2 and Table 5, Niche Environment and Heritage 2012.