



# **BIODIVERSITY CERTIFICATION ASSESSMENT REPORT**

**Brimbin**

**September 2014**

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## ABBREVIATIONS

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BCAM (or ‘the Methodology’) - Biodiversity Certification Assessment Methodology

BCCC (or ‘the Calculator’) - Biodiversity Certification Credit Calculator

BVT - Biometric Vegetation Type (revised and re-aligned to PCTs in the Calculator within the Hunter CMA, see ‘PCT’ below)

DoE - Commonwealth Department of Environment (formerly Department of Sustainability, Environment, Water, Population, and Communities - SEWPaC)

EP&A Act - NSW *Environmental Planning and Assessment Act 1979*

EPBC Act - Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

GTCC (or the Council) - Greater Taree City Council

OEH - NSW Office of Environment and Heritage

PCT - Plant Community Type (formerly BVT)

TEC - Threatened Ecological Community (as listed on the TSC and/or EPBC Acts)

TSC Act - NSW *Threatened Species Conservation Act 1995*

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## EXECUTIVE SUMMARY

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Niche Environment and Heritage Pty Ltd (Niche) was commissioned by Roche Group Pty Ltd (Roche Group) to conduct a Biodiversity Certification Assessment as the approval mechanism for future development on the Brimbin site under direction from Greater Taree City Council (GTCC).

Advice from the NSW Office of Environment and Heritage (OEH) is that a Biodiversity Certification assessment entails a two stage reporting process:

1. The *Biodiversity Certification Assessment Report*; and
2. The *Biodiversity Certification Strategy*.

This report constitutes the *Biodiversity Certification Assessment Report* (the Assessment Report) and contains a description of the proposal, the survey methodology and results, and provides the Ecosystem and Species Credit calculations. This Assessment Report describes the way in which the prescribed conservation measures for the development meet an 'improve or maintain' outcome for biodiversity values. The *Biodiversity Certification Strategy* (the Strategy) provides a full description and justification of these measures and also any red flag variations that may be requested of the Director General.

### Field Survey

Niche conducted field surveys of the Brimbin site over five discrete survey periods in June 2010, July 2010, August 2010, October 2011, September 2013 and September 2014. Surveys of the site by other consultants have been conducted in February 2004 and December 2009. Collectively, these surveys included vegetation mapping and validation, bushland condition and resilience assessment, threatened flora random meanders, threatened plant population estimates (*Eucalyptus seeana*), Biobanking plots and a variety of threatened fauna surveys. The surveys undertaken for the assessment were consistent with the requirements of the *Biodiversity Certification Assessment Methodology* (the BCAM).

### Key ecological features of the Assessment Area

The Assessment Area (the Certification Area, the Conservation Area and retained areas collectively) contain three Threatened Ecological Communities (TECs) as listed on the NSW *Threatened Species Conservation Act 1995* (TSC Act) and include Swamp Sclerophyll Forest, Swamp Oak Floodplain Forest and Subtropical Coastal Floodplain Forest. Of these TECs, 7.4 hectares is within the Certification Area, while 367.8 hectares is in the Conservation Area.

### Threatened Flora

One endangered population as listed on the TSC Act, *Eucalyptus seeana* (Narrow-leaved Red Gum) in the Greater Taree LGA, is located both within the Assessment Area.

A single individual of the threatened plant, *Corybas dowlingii* (Red Helmet-orchid), which is listed as endangered on the TSC Act, was detected in the proposed Conservation Area only.

Nine individuals of the threatened plant, *Eucalyptus glaucina* (Slaty Red Gum), which is listed as vulnerable on the TSC Act and the Commonwealth *Environment Protection and*

*Biodiversity Conservation Act 1999* (EPBC Act), were detected in the Conservation Area and retained lands.

### **Threatened Fauna**

Twenty threatened fauna species were recorded within the Assessment Area, including; Glossy Black-cockatoo, Varied Sittella, Little Lorikeet, Scarlet Robin, Square-tailed Kite, Powerful Owl, Masked Owl, Black-necked Stork, Comb-crested Jacana, Koala, Squirrel Glider, Brush-tailed Phascogale, Grey-headed Flying-fox, Little Bentwing-bat, Eastern Bentwing-bat, Yellow-bellied Sheath-tailed Bat, East-coast Freetail Bat, Eastern False Pipistrelle, Greater Broad-nosed Bat and Large-footed Myotis.

A further nine migratory species listed on the EPBC Act have been recorded from the Assessment Area, including; Australian Wood Duck, Pacific Black Duck, Black-shouldered Kite, Whistling Kite, Wedge-tailed Eagle, Nankeen Kestrel, White-throated Needle-tail, Cattle Egret and Great Egret.

### **Wildlife Corridors and Key Habitat**

The Lower Manning Valley regional wildlife corridor runs through the southern part of the site and connects extensive areas of vegetation east and west of the Assessment Area. This will largely be protected in the Conservation Area.

The Lower Manning Valley sub-regional wildlife corridor connects vegetation in the south of the Assessment Area to vegetation outside of the Assessment Area and over the Dawson River to the west.

### **Credit Calculations**

Ecosystem and species credit calculations using the Biodiversity Certification Credit Calculator have shown that, subject to approval of red flag variations for three EECs (Swamp Sclerophyll Forest, Subtropical Coastal Floodplain Forest and Swamp Oak Floodplain Forest) and approval of a more appropriate local data (MALD) assessment for the *Eucalyptus seeana* Endangered Population (Appendix F), retirement of ecosystem and species credits will achieve an improved outcome from the conferral of Biodiversity Certification on the Brimbin Draft Structure Plan.

The assessment resulted in an overall surplus of 4,619 Ecosystem Credits. Consistent with the BCAM rules for offsetting, a deficit of 904 Ecosystem Credits for HU763 Tallowwood - Spotted Gum - Grey Gum grassy tall open forest has, for the purposes of this assessment, been retired against the 975 ecosystem credit surplus for HU511 Blackbutt - Tallowwood dry grassy open forest, as both of these PCTs occur in the same Keith Vegetation Class. Thus the credit requirement for HU763 is reduced to 0 and therefore impacts to this PCT are considered to be offset.

Subject to approval of the MALD Assessment in Appendix F, impacts to the *Eucalyptus seeana* Endangered Population can be more than adequately offset through the retirement of species credits (a surplus of 34,777 species credits is present within the Conservation Area). Neither *Corybas dowlingii* nor *Eucalyptus glaucina* are impacted by the proposed development and therefore no offsetting of these species is required.

Brush-tailed Phascogale and Koala are not predicted in Ecosystem Credits on the site and therefore retirement of Species Credits is required for each of these species. Although the Black-necked Stork and Comb-crested Jacana were both previously recorded within the Assessment Area, habitat for these species only occurred within retained lands and therefore further consideration of these species was not required (i.e., habitat for these two species will not be impacted within the Certification Area).

### **Red flags**

Three red flag issues fall within the Certification Area:

1. Swamp Sclerophyll Forest TEC;
2. Subtropical Coastal Floodplain Forest TEC; and
3. Swamp Oak Floodplain Forest TEC;

Red flag variations will be provided in the Strategy report.

## 1 INTRODUCTION

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### 1.1 Project background

Niche Environment and Heritage Pty Ltd (Niche) was commissioned by Roche Group Pty Ltd (Roche Group) to survey their lands at Brimbin in order to gain an understanding of the ecological value of the area, guide future land use of the site and assist with the determination of the site's suitability as compensatory habitat for on-site and off-site developments. The *Biodiversity Certification Assessment Methodology* or BCAM (DECCW 2011), has been utilised in this assessment for the purposes of providing the justification for conferring Biodiversity Certification on one particular development as proposed by Roche Group, Brimbin. The Brimbin site is located approximately eight kilometres north of Taree in the lower Manning River catchment (Figure 1).

#### 1.1.1 Purpose of this report

The purpose of the Assessment Report is to accompany the Strategy which must ultimately be collated and submitted by Greater Taree City Council (GTCC). The Assessment Report describes the procedures and assumptions used to calculate the offset requirement (in terms of biodiversity credits). It also explains how the assessment provides an 'improve or maintain' outcome for biodiversity values. The Strategy outlines how, when and by whom the conservation measures will be provided. Both the Assessment Report and the Strategy must be submitted to the Minister for the Environment for consideration and certification of the development proposal.

#### 1.1.2 Objectives of this assessment

The specific objectives of Biodiversity Certification Assessment include the following:

- Undertake a review of relevant literature, a review of relevant databases and discussion with relevant experts;
- Undertake targeted surveys for threatened plant and animal species and their habitat in the Assessment Area;
- Accurately map the vegetation types occurring within the Assessment Area and align these types to previous classifications used, and the 'best fit' Plant Community Types (PCTs) used in the Biodiversity Certification Credit Calculator (the Calculator);
- Provide a description of the ecological values of the Assessment Area, including threatened biodiversity and red flags; and
- Assess the ecological value in terms of Ecosystem and Species Credit Status using the Calculator.

### 1.2 Brimbin Biodiversity Certification Assessment Area

Throughout the report there is reference to the Certification Area which is illustrated in Figure 2. The report outlines the various land uses for the proposed development, including

conservation. In this report it is assumed that the entirety of the Certification Area will be developed, although some areas may remain undeveloped once the proposal is finalised. Some additional, though negligible, impacts will be associated with future roads and associated infrastructure. Areas set aside for conservation within the Assessment Area are divided into the following categories:

1. Conservation E1 (and replanting);
2. Conservation E2 (and replanting);
3. Vegetation 10 metre buffer;
4. Retained Area (*Eucalyptus seeana*);
5. Retained Area (EEC);
6. Retained Area (riparian linkage); and
7. Retained Area (steep land).

Although the Vegetation 10 metre buffer and Retained lands (E. Seeana, EEC, riparian linkage and vegetation on steep land) would not be developed, they do not currently form part of the offset package and have therefore been considered as 'retained lands' and are not assessable. The Conservation E2 (replanting) area also includes the Vegetation 10 metre buffer on the northern boundary of the Conservation E1 lands in the west of the site, and do form part of the offset package. Approximately 182.5 hectares of the Conservation lands (E1 National Park and Nature Reserves) have already been set aside as an offset for previous developments and do not form part of the Conservation Area for the certification of the Brimbin development. This 182.5 hectare portion of the conservation lands is mapped in Figure 2 and has been excluded from the Conservation Area in this assessment.

As required by the BCAM, the land uses have been classed into the Certification Area (lands on which Certification will be conferred), Conservation Area (land utilised to offset the development) and Retained Lands (non-assessable at this stage). Figure 2 maps these three components within the Assessment Area. The Certified Area of 1,666.2 hectares includes 1,406.6 hectares of cleared land, 0.6 hectares of exotic vegetation for which little or no ecological value exists and an area of 259 hectares of native vegetation that attracts a credit requirement. The Conservation Area will provide protection for 953.2 hectares of mature and early regeneration native vegetation, of which 367.8 hectares is TEC. An additional 45.2 hectares will be strategically replanted in order to provide linkages and supplementary refuges for wildlife.

## 2 METHODS

### 2.1 Offsetting methodology

The current assessment utilises the *Biodiversity Certification Assessment Methodology* (the BCAM), after advice from GTCC and OEH. During the field survey of June, July and August 2010, a total of 65 Biobanking Plots (50 x 20 metres) were conducted. A further 12 plots were conducted in September 2014 in the northwest portion of the Certification Area, subsequently determining this area to be in BCAM Low condition, as defined in the BCAM (refer to Section 3.1). The required data for the parameters in ‘Appendix 2 - Field methodology for measuring condition attributes in Site Value’ of DECCW (2009) were collected within each plot. This more than meets the requirements of the BCAM.

Indicative plots, under certain assumptions, have been utilised in the Calculator for vegetation zones that were not sampled. For instance, all replanting areas are in exotic paddocks and therefore have been assumed to have no native over-storey or mid-storey cover, a low native groundcover, a moderate exotic plant cover, no logs and no trees with hollows.

### 2.2 Literature and database review

#### 2.2.1 Previous surveys

A number of previous surveys have been undertaken within the site and its environs for flora and fauna, including:

- Connell Wagner (February 2004), *LES Baseline Environmental Assessment*;
- Connell Wagner (September 2004), *LES Stage 2 Impact Assessment Report*;
- Andrews Neil (October 2006), *Biometric and Analysis of Environmental Trade-Offs*;
- Andrews Neil (2008), *Brimbin Biometric and Constraints Analysis*;
- Whelans Insites (December 2009), *Preliminary Ecological Constraints Report for Specific Areas*; and
- Niche (2011), *Brimbin Flora and Fauna Assessment*.

The field survey effort and results of these assessments and reports have been summarised in Table 1.

**Table 1. Summary of previous surveys**

Report	Survey methods	Results
<b>Connell Wagner (February 2004)</b> <i>LES Baseline Environmental Assessment</i>	<ul style="list-style-type: none"> <li>• Review of existing information and databases;</li> <li>• Field survey 17 Nov – 5 Dec 2003;</li> <li>• Targeted threatened plant random meanders;</li> <li>• Plot-based floristic surveys;</li> <li>• Diurnal bird and animal searches;</li> </ul>	<ul style="list-style-type: none"> <li>• Five vegetation communities identified, none nominated as TECs;</li> <li>• Presence of <i>Eucalyptus seeana</i> (narrow-leaved red gum) Endangered Population;</li> <li>• Threatened animals recorded included; Square-tailed Kite, Glossy</li> </ul>

Report	Survey methods	Results
	<ul style="list-style-type: none"> <li>Nocturnal surveys (spotlighting, call playback);</li> <li>Owl broadcast survey;</li> <li>Ultrasonic bat detection;</li> <li>Elliot trapping; and,</li> <li>Hair tubes.</li> </ul>	Black-cockatoo, Brush-tailed Phascogale, Squirrel Glider, Koala, Grey-headed Flying Fox, Little Bent-wing Bat, Large Bent-wing Bat and Yellow-bellied Sheath-tailed Bat.
<b>Connell Wagner (September 2004)</b> <i>LES Stage 2 Impact Assessment Report</i>	No additional survey work conducted. Assessment of likely impact on natural environment	<ul style="list-style-type: none"> <li>Proposal was likely to have a significant impact on the natural environment and therefore mitigation, offsetting and compensatory habitat measures recommended for the unavoidable residual impact.</li> </ul>
<b>Andrews Neil (October 2006)</b> <i>Biometric and Analysis of Environmental Trade-Offs</i>	<ul style="list-style-type: none"> <li>Desktop investigations related to previous works and mapping; and,</li> <li>Use of the PVP Developer to calculate 'Improve or Maintain' offsetting requirement of the proposed development (altered since 2006).</li> </ul>	<ul style="list-style-type: none"> <li>The system of improve or maintain offsets as proposed in 2006 were sufficient subject to an overall management strategy incorporating the offsets proposed (rejected by Greater Taree City Council).</li> </ul>
<b>Andrews Neil (2008)</b> <i>Biometric and Constraints Analysis</i>	<ul style="list-style-type: none"> <li>Largely desktop analysis with some vegetation validation.</li> </ul>	<ul style="list-style-type: none"> <li>Identified the presence of Subtropical Coastal Floodplain Forest and the <i>Eucalyptus seeana</i> Endangered Population within the study area</li> </ul>
<b>Whelans Insites (December 2009)</b> <i>Preliminary Ecological Constraints Report for Specific Areas</i>	<ul style="list-style-type: none"> <li>Preliminary Site Inspection with OEH;</li> <li>Ecological Survey, 2-6 November 2009;</li> <li>3 nocturnal surveys including Elliot trapping, harp trapping, Anabat and remote camera;</li> <li>Habitat searches and diurnal bird surveys;</li> <li>Threatened plant random meander surveys;</li> <li>20 x 20 m floristic plots using Braun-Blanquet cover-abundance;</li> <li>Updated flora species list; and,</li> <li>Vegetation mapping validation</li> </ul>	<ul style="list-style-type: none"> <li>Seven vegetation communities identified including the TECs Subtropical Coastal Floodplain Forest and Swamp Sclerophyll Forest;</li> <li>Presence of <i>Eucalyptus seeana</i> (narrow-leaved red gum) Endangered Population.</li> <li>Threatened animals recorded included; Little Lorikeet, Koala (scat), East-coast Freetail Bat, Eastern False Pipistrelle, Large-footed Myotis, Greater Broad-nosed Bat, Little Bentwing Bat, Eastern Bentwing Bat.</li> </ul>

### 2.2.2 Other data sources

Biodiversity datasets and associated literature for the region were reviewed including:

- Existing vegetation mapping, as well as other available GIS data;
- Atlas of NSW Wildlife (OEH);
- EPBC Act Protected Matters Search Tool (DoE);
- Threatened Species Profiles Database (OEH);
- Biometric Vegetation Types Database (OEH, May 2012 updated version);
- Biometric Vegetation Types Benchmarks Database; and
- Correspondence from Mr John Seidel, OEH BioBanking Team, regarding updated Hunter CMA Plant Community Types (PCTs) and their relationship to revised Biometric Vegetation Types (BVTs).

## 2.3 Field survey

### 2.3.1 Vegetation Mapping - Ecosystem Credits

Base vegetation maps utilising information from previous studies and reports and aerial photography were utilised in the field for classifying the vegetation communities on the site.

Vegetation had been at least partially mapped for previous assessments of the Assessment Area and at a coarser resolution by GTCC. A comparison of the Niche (2010) mapping with these mapping products is provided in Appendix C.

For this assessment, which utilises the BCAM, conversion of the previously utilised revised Biometric Vegetation Types (BVTs) to the new Plant Community Types (PCTs) for the Hunter CMA was required. This was done under advisement from Mr John Seidel of the OEH BioBanking Team. The alignment of Niche mapping with PCTs and the actual PCTs, TECs, red flag vegetation greater than 70 per cent cleared and vegetation formations and classes (Keith 2004) is provided in Appendix A.

#### Vegetation zone mapping

The BCAM requires the mapping of vegetation zones within the Assessment Area and defines a vegetation zone as a relatively homogenous area that is of the same vegetation type and broad condition state. Condition was determined to be in three different categories throughout the site:

- Intact or relatively mature forest and woodland where the original structure and composition exists;
- Early regeneration and woodland where one or more layers of the vegetation have been modified or lost but the zone retains good capacity for regeneration (i.e., resilience); and
- Future replanting zones that are currently cleared land.

A description of each of the vegetation zones within the Assessment Area is provided in Section 3.3.

#### Vegetation Plots

As required by the BCAM, 50 x 20 metre BioBanking plots were conducted at select locations within each PCT to collect the required ten site attributes for Ecosystem Credit calculations. This fieldwork was conducted over three separate survey periods in June, July and August 2010. An additional survey was conducted in September 2014 in the northern portion of the Certification Area. Plots were randomly selected in the field with the use of field maps but were maintained, where possible at 200 metres apart.

An array of equidistant survey locations was defined using GIS and a rapid assessment of structure, with the composition of the vegetation being assessed at as many of these locations as possible. Full floristic plots, Braun-Blanquet cover-abundance scores and dissimilarity analyses were viewed as unnecessary for the purposes of this assessment.

Flora survey effort is shown in Figure 3.



### 2.3.2 Threatened flora surveys - Species Credits

#### Threatened flora random meanders

Random meander surveys were carried out to locate and record threatened plant species. Where threatened plant species were detected, population estimates were made using a suitably robust and scientific method.

Random meander surveys were conducted in November and December 2003, November 2009 and June, July and August 2010, either by Niche or other parties.

Additional threatened flora random meanders were carried out in late September 2013 for *Diuris flavescens* which was identified in the Biodiversity Certification Calculator as a species requiring survey and, as the species is relatively cryptic for much of the year, for which the appropriate season had not been previously sampled. Areas proposed for Certification were sampled as a priority and according to the OEH threatened species survey guidelines (DEC 2004). The random meander is represented in Figure 4. No specimens of *D. flavescens* were detected within the area proposed for Certification and, therefore, the species is not required to be offset.

#### *Eucalyptus seeana* population estimates

A population estimate was made for *Eucalyptus seeana* using the following methodology.

*E. seeana* density was mapped as points in the northwest and southwest corners of the Brimbin site (Figure 6). Points were attributed with stems/hectare counts (zero for sites without *E. seeana*). Eighty-seven locations were sampled over an area of approximately 250 hectares.

Stem densities were then averaged for the coincident vegetation types, and these averages were then assigned to all equivalent vegetation types. In doing so, densities were separately calculated for where vegetation was in Low condition, versus Moderate/Good condition (BCAM).

### 2.3.3 Threatened fauna surveys - Species Credits

Fauna surveys were conducted from 21 June to 1 July 2010 by two zoologists, Rhidian Harrington and Matt Swan. Surveys were conducted across all habitat types within the study area. All survey locations and data were recorded with the use of a Trimble Nomad GPS (accuracy 2-5 metres).

Survey methodology is described below and survey effort is summarised in Table 2. Survey locations are displayed in Figure 4.

**Table 2. Fauna survey techniques and survey effort**

Survey Technique	Number of Sites	Survey Effort per Site	Survey Dates	Total Survey Effort
Diurnal Birds	24	20 minute 2 hectare census	22/06/10 – 1/07/10	8.3 Person Hours
Call Playback - Owls	4	5 minute playback and listening for each species	24/06/10 – 1/07/10	11.2 Person Hours
Call Playback - Mammals	3	5 minute playback and listening for each species	27/06/10 – 30/06/10	3 Person Hours
Terrestrial Camera Traps	9 (11 separate camera traps)	1 or 2 cameras per site	22/06/10 – 1/07/10	96 Trap Nights
Arboreal Elliot Trapping	5	8 Elliot A and 7 Elliot B Traps at each site	21/06/10 – 1/07/10	630 Trap Nights
Hair Tubes (Ground)	7	7 50 mm and 7 110x70 mm hair tubes	21/06/10 – 1/07/10	798 Trap Nights
Hair Tube Arboreal	1	7 50 mm and 7 110x70 mm hair tubes	23/06/10 – 30/06/10	98 Trap nights
Harp Trapping	3 (2 harp traps)	1 harp trap	23/06/10 – 1/07/10	15 Trap Nights
Anabat Detection	7 (2 Anabat units)	1, 2 or 3 nights per site	22/06/10 – 30/06/10	15 Recording Nights
Spotlight Search	11 Separate sites	At least 0.5 hours of spotlighting	23/06/10 – 1/07/10	11 Person Hours

### Elliot Traps - Arboreal

Type A and B arboreal Elliot trapping was undertaken at five sites for either eight or ten consecutive nights. Eight type A and seven type B traps were set up at each of the five trapping sites. Pairs of traps were spaced at 20 m intervals along a transect to make seven separate trapping stations at each site, with the last station having three traps (two Elliot A, one Elliott B). Traps were placed on platforms and mounted on trees approximately 2.0-2.5 metres off the ground. Traps were baited with a mixture of peanut butter, rolled oats, honey and truffle oil. The base of the trees was sprayed with a mixture of honey and water.

Traps were checked each morning and any captured animals were identified and released at the site of capture.

### Hair Tubes - Ground

Two sizes of hair tubes (50 mm and 110 x 70 mm) were placed at each of the five trapping sites and at two additional sites. At the trapping sites seven pairs of the hair tubes were placed at the trapping stations close the arboreal Elliott traps. At the two additional hair tube sites, the hair tubes were placed at 20 metre intervals. Of the additional hair tube sites, Hair Tube Site 1 had eight pairs of hair tubes and Hair tube Site 2 had seven pairs. Hair tubes were in place for either seven, eight or ten nights.

The hair tubes were baited with either dog food, chicken wings or a mixture of peanut butter, rolled oats, honey and truffle oil. Double-sided tape was only adhered to the upper and lateral inner surface of the tubes so as to limit the incidence of ‘by catch’. Hair samples were sent to Barbara Triggs of “Dead Finish” for analysis.

### **Hair Tubes - Arboreal**

At Hair Tube Site 2 seven pairs of hair tubes were placed in trees using water resistant electrical tape. Arboreal hair tubes were placed in pairs alongside ground hair tubes. The hair tubes were baited with a mixture of peanut butter, rolled oats, honey and truffle oil. Hair samples were sent to Barbara Triggs of “Dead Finish” for analysis.

### **Camera Traps**

‘Reconyx’ motion sensing camera traps were placed at ground level. Two camera traps were placed at four of the five trapping sites. One camera was placed at a hair tube sites, and another camera trap was placed at the remaining trapping site. On the 28<sup>th</sup> of June, six camera traps were moved from the trapping sites and placed in three separate transects consisting of two camera traps for the remaining three nights.

The cameras were set to take three pictures upon sensing motion and placed in front of baited hair tubes. The ground in front of the camera traps was sprayed with a mixture of truffle oil and water. Upon recovery, the pictures were individually analysed and animals were identified to the lowest possible taxonomic level.

### **Nocturnal Call Playback - Owls**

Four call playback sites were established at strategic positions in the landscape so calls would broadcast down in to valleys and achieve maximum coverage.

After an initial listening period of five minutes, calls of the Barking Owl, Grass Owl, Masked Owl, Sooty Owl and Powerful Owl were broadcast through a 10 watt megaphone for five minutes followed by a five minute listening period and a two minute period of spotlighting. Calls of the Grass Owl were only broadcast at two of the sites which were deemed to be in the vicinity of potential habitat.

No call playback was performed on the 21<sup>st</sup>, 22<sup>nd</sup> or 23<sup>rd</sup> of June 2010 due to rainfall impeding the ability to broadcast.

### **Nocturnal Call Playback - Mammals**

Calls of the Squirrel Glider and Koala were broadcast at three of the owl call playback sites. The calls were broadcast on the 28<sup>th</sup>, 29<sup>th</sup> and 30<sup>th</sup> of June 2010. Calls were broadcast for five minutes followed by a five minute listening period.

### **Diurnal Bird Surveys**

Birds were surveyed at stationary points by one zoologist for at least twenty minutes. Birds were identified with the use of 10 X 42 binoculars or from their calls. Surveys were conducted as close as possible to dawn or dusk when bird activity is greatest.

Twenty-four separate bird surveys were undertaken across the study area for a total survey effort of 8.3 person hours. Two dawn water bird surveys were conducted in the large dam in the paddock to the north of the site. Incidental observations of birds were recorded throughout the course of other surveys.

### **Harp Trapping**

Harp traps targeting microchiropteran bats were deployed at three sites within the study area. Traps were set up in potential flyways and checked the following morning.

### **Anabat Detection**

Two ultrasonic recording devices (Anabats) were deployed at seven separate sites across the study area. The devices were left in place for a minimum of two nights and recorded from dusk until dawn.

### **Spotlighting**

Spotlighting took place either on foot or from a slow moving vehicle using one or two handheld 50-watt spotlights. The speed of survey was approximately one kilometre per hour on foot or five kilometres per hour in the vehicle.

Spotlighting and active listening for frogs was conducted in the sedgeland complex, however detectability was limited due to the time of year surveys were undertaken (winter).

### **Stag Watching**

Stag watches involved observing hollows for fauna occupancy. Stag watches were conducted from 30 minutes before dusk to 30 minutes after dusk on two trees within the study area on the 29<sup>th</sup> of June. A total survey effort of 2 person hours was conducted.

### **Habitat Assessment**

Habitat assessments were carried out at various locations throughout the course of surveys of the study area and involved an assessment of the type and condition of fauna habitat as well as potential for threatened species to occur. The habitat assessment was guided by plant community structure and the occurrence of important features such as tree hollows, canopy feeding resources, leaf litter, fallen timber, water bodies and specific feeding resources such as koala feed trees.

## **2.4 Determination of threatened species requiring survey - Species Credits**

Upon a review of the available threatened species data from previous and current surveys, the seasons that surveys have been carried out and the answers given to the Geographic Habitat questions in the BioBanking Calculator, the Calculator determined that further survey is required for two threatened species; Eastern Pygmy-possum (an arboreal mammal) and *Diuris flavescens* (Pale Yellow Doubletail, a terrestrial orchid). In the case of Eastern Pygmy-possum, the nomination of this species as requiring additional survey effort is entirely a result of no single month of the year being identified in the Calculator as appropriate for survey for the species. Clearly this is an error in the Calculator. Previous and current survey effort described in Section 3 is deemed adequate for the species.

As described in Section 2.3.2, additional threatened flora random meanders were carried out in late September 2013 targeting *Diuris flavescens*. No specimens of *D. flavescens* were

detected within the Certification Area and, therefore, the species is not required to be offset.

## 2.5 Limitations of this assessment

Some species are cryptic, and are only likely to occur or be detected seasonally, or use the site periodically. For example, some frogs and bats are more difficult to detect in the winter months.

Inclement weather was experienced for the first three days of the survey period in July 2011, which affected some surveys such as call playback. This also limited vehicular travel within the study area and accessing some sections of the site. For example, more time was needed in the field for vegetation mapping and validation as large parts of the study area had to be accessed on foot. Furthermore, a lack of vehicle access to more remote areas made the checking of traps difficult and time-costly. Remote techniques (camera traps and hair tubes) were utilised in these sections so that they did not need to be revisited on a daily basis.

Despite these limitations, it is considered that the survey effort and data now at hand, through either the Niche surveys or previous surveys, is sufficient to support robust conclusions in relation to the biodiversity of the site.

Vegetation communities have been aligned to a best-fit PCT. The alignments have been discussed with OEH.

## 3 RESULTS

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### 3.1 Stratification of BCAM vegetation condition

#### 3.1.1 BCAM Definition of 'Low condition' vegetation

As defined in the BCAM, vegetation in low condition means:

- a) *woody native vegetation with native over-storey percent foliage cover less than 50 % of the lower value of the over-storey percent foliage cover benchmark for that vegetation type, and where either;*
- *less than 50% of ground cover vegetation is indigenous species, or*
  - *greater than 90% of ground cover vegetation is cleared*

OR

- b) *native grassland, wetland or herbfield where either;*
- *less than 50 % of ground cover vegetation is indigenous species, or*
  - *more than 90 % of ground cover vegetation is cleared*

OR

- c) *native vegetation with a site value score of 34 or lower.*

*If native vegetation is not in low condition, it is in moderate to good condition.*

#### 3.1.2 Plot data and site scores

Upon additional BioBanking plot survey conducted in September 2014, BCAM Low condition was assigned to the entirety of the vegetation in the northern portion of the Certified Area previously mapped as 'regrowth' and is represented as 'Certified BCAM Low condition' in Figure 2. Three vegetation types as mapped by Niche are affected:

- Spotted Gum Ironbark Forest (SI) which aligns to the PCT HU763 Tallowwood - Spotted Gum - Grey Gum grassy tall open forest;
- Narrow-leaved Red Gum Ironbark Woodland (RGIB) which aligns to the PCT HU703 Narrow-leaved Red Gum woodlands; and
- Red Gum Grey Ironbark Paperbark Forest (RGIB Mel) which also aligns to HU703.

The site attribute data was collated from 12 plots conducted (thus meeting the minimum number of plots required for vegetation in Moderate - Good condition). Plot locations were selected randomly on-site using marked up A3 field maps and spaced at least 200 metres apart.

Most, if not all, of the plots are well outside of benchmark for the relevant PCTs, particularly in relation to Native Plant Species Richness, Native Overstorey Cover, Native Midstorey Cover, Native Ground Cover Shrubs, Exotic Plant Cover, Length of Fallen Logs and Trees with Hollows (seven of the ten attributes). Occasionally the attributes for Native Ground Cover ('grasses' and 'other') are also outside of benchmark.

Native Plant Species Richness (NPS) is generally very low compared to the benchmark and exotic plant cover (EPC) is for the most part very high. This is mostly due to the severe infestation of perennial exotic grasses in this area, primarily *Andropogon virginicus* (whiskey grass) and clearly demonstrates the severely degraded composition of this part of the site and its lack of regenerative potential. No trees with hollows (NTH) were detected, clearly indicating a lack of mature trees and, together with the lack of fallen timber or logs (FL), shows that the area has been subject to quite vigorous land management practices such as clearing, stick-raking, possible tilling, grazing, pasture improvement and burning-off. This is also borne out by the analysis of historical imagery provided in Section 3.1.3. In summary, the area mapped as ‘Certified BCAM Low condition’ in Figure 2 not only meets the definition of Low condition, it is clearly highly modified and degraded and has limited value for biodiversity (other than as a nursery for an artificially high number immature *Eucalyptus seeana*).

Table 3 through to 5 below clearly demonstrate that these vegetation zones are in Low condition as defined in the BCAM. The main implication of this vegetation being in Low condition is that 10.8 hectares of Subtropical Coastal Floodplain Forest can be excluded from consideration as a red flag as per the definition of red flags in the BCAM (i.e., only EECs that are in ‘Moderate to Good’ condition). This reclassification as Low condition vegetation is also likely to mean a substantial reduction in credits required.

**Table 3. Comparison of Spotted Gum – Ironbark Forest (SI) to benchmark values for HU763**

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL
D	13	0	0	10	2	16	80	0	1	0
E	20	0	1.5	20	0	32	58	0	1	0
F	23	0	0	28	0	18	52	0	1	0
K	26	0	14.5	28	0	14	44	0	1	0
L	20	0	0	12	2	16	68	0	1	0
Benchmarks from BCAM Calculator (HU763)	>= 51	22-45	5-40	5-25	10-20	5-20	> 5	>= 1	1	>= 20
Benchmark for ‘Low condition’		< 11		< 50 %						
Average score from plots		0		$(28+52+46+42+30)/5 = 39.6$						
Meets ‘Low condition’		Yes		Yes						
Site score	The site value score for this vegetation zone was 27 and is therefore in Low condition									

**Table 4. Comparison of Narrow-leaved Red Gum Ironbark Woodland (RGIB) to benchmark values for HU703**

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL
A	24	0	1	6	0	14	62	0	1	0
B	27	4	4.5	20	0	10	66	0	1	0
C	23	0	7.5	20	6	32	74	0	1	0

H	12	0	0	16	0	28	46	0	1	0
Benchmarks from BCAM Calculator	>= 41	15-40	5-20	30-50	5-10	20-40	> 5	>= 1	1	>= 5
Benchmark for 'Low condition'		< 7.5		< 50 %						
Average score from plots		1		$(20+30+58+14)/4 = 30.5$						
Meets 'Low condition'		Yes		Yes						
Site score	The site value score for this vegetation zone was 33 and is therefore in Low condition									

**Table 5. Comparison of Red Gum Grey Ironbark Paperbark Forest (RGIB Mel) to benchmark values for HU703**

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL
G	13	0	0	14	4	20	70	0	1	0
I	21	0	8.5	20	8	8	40	0	1	0
J	13	0	6.5	12	28	14	66	0	1	0
Benchmarks from BCAM Calculator	>= 41	15-40	5-20	30-50	5-10	20-40	> 5	>= 1	1	>= 5
Benchmark for 'Low condition'		< 7.5		< 50 %						
Average score from plots		0		$(38+36+54)/3 = 42.7$						
Meets 'Low condition'		Yes		Yes						
Site score	The site value score for this vegetation zone was 31 and is therefore in Low condition									

### 3.1.3 Air photo Interpretation of BCAM 'Low condition' area

This section adds a further justification to the classification of the area mapped as 'Certified (BCAM Low condition) in Figure 2.

A series of aerial photographs are available to underpin the assessment of the 'Low condition' area, as shown in Appendices G (i) and G (ii). Non-rectified imagery from 1969, 1979, 1989, 1991 and 1997 were obtained through LPI and OEH and locally geo-referenced to the low condition area. These images have not been orthorectified, so terrain and camera distortions are still present. However, the rectification is sufficient to establish multi-temporal visual comparison of the imagery and associated vegetation change. These changes are itemised below:

- ❑ 1969: Although the image is of poor resolution, the canopy pattern is indicative of a mature forest, with no evidence of recent clearing;
- ❑ 1979: This image indicates that a major disturbance event occurred between 1969 and 1979. A number of features suggest the area has been cleared by timber harvesting activities. These include a cleared central access zone with irregular margins, narrower cleared zones running off the central zone at c. 90 degrees, and a canopy texture indicative of understorey or young regenerating trees only (i.e., although the image is of higher resolution compared to 1969, the mature canopy pattern is not evident);
- ❑ 1989: By this time, the 'Low condition' area is essentially free of trees, with an image tone and texture consistent with an open, grassy landscape. The slightly



darker tone of the area, compared to adjacent open paddocks to the east and south, is indicative of either harvesting trash, or very low density, and low elevation, regeneration. Adjacent, more heavily vegetated areas show a disturbance pattern consistent with selective logging;

- ❑ 1991: There is very little significant difference between 1989 and 1991 imagery in terms of vegetation cover or growth-disturbance status. However, the higher resolution and colour imagery allows a more definitive separation between highly-disturbed, selectively logged areas, and the cleared areas, where there is only minor evidence of regeneration;
- ❑ 1997: The most conspicuous feature of this image is that of recent fire, affecting the entire 'Low condition' area, as well as adjacent areas to the east and south. The burn was moderately hot, evidenced by the (just discernible) crown scorching on the scattered, late-regeneration trees. Any understorey regeneration appears to have been destroyed, as opposed to what might be expected in a 'cool' burn, where only the grassy understorey is consumed; and
- ❑ 2010: By this time, scattered trees have reached mid-regeneration status, and adjacent selectively-logged areas display canopy closure. The 'Low condition' area is best described as secondary grassy open woodland, as opposed to the closed canopy forest, or open forest with shrubby understorey, typical of the regional surrounds.

In summary, the aerial photographic interpretation of the 'Low condition' area indicated that it has a timber harvesting and burn history from post 1969 to 1997, resulting in conversion of a tall open forest (or, potentially, a closed canopy forest) into an open grassy woodland.

### **3.2 Vegetation zones**

After stratification into BCAM condition (Moderate - Good or Low) and then qualitative ancillary code assignments, 38 Vegetation Zones were defined for the Assessment Area of which 24 are present in the Certified Area (Table 6) and 25 are present in the E1 and E2 Conservation Areas (Table 7). In the case of the Certification Area, ancillary code stratification was on the basis of whether mature forest or early regeneration was affected and whether the impacts were direct or indirect. For the Conservation Area, ancillary code stratification was on the basis of whether the area to be conserved was in E1 or E2 lands, mature forest or early regeneration and replanting. Such a detailed and complex stratification was necessary to accurately assess the credit requirement and credits generated by the proposed conservation measures.

Substantial areas of cleared land exist within the Certification Area (1,407.2 hectares, including 0.6 hectares of exotic vegetation) and a smaller amount in the Conservation Area (20.8 hectares). These cleared areas are not assessable and cannot therefore form vegetation zones as per the BCAM, but are separate to cleared areas within the Conservation Area that will be replanted, which do form part of the assessment.

Vegetation mapping for the study area is presented in Figure 7, with the Plant Community Types (PCTs) mapped in Figure 10.

**Table 6. Vegetation zones within the Certified Area**

Vegetation zone details	Niche vegetation type	EEC	Area of veg zone certified (ha)	Red Flag
HU511_Moderate/Good_BT	Blackbutt Tallowood Tall Open Forest	Not an EEC	1.6	No
HU511_Moderate/Good_BT indirect	Blackbutt Tallowood Tall Open Forest (indirectly impacted)	Not an EEC	0.6	No
HU511_Moderate/Good_BT Regen	Blackbutt Tallowood Tall Open Forest (early regeneration)	Not an EEC	4.8	No
HU591_Moderate/Good_DP	Derived Swamp Paperbark Thicket	Swamp Sclerophyll Forest	0.8	Yes
HU703_Low_RGIB	Narrow-leaved Red Gum Ironbark Woodland (low condition)	Not an EEC	42.2	No
HU703_Low_RGIB Indirect	Narrow-leaved Red Gum Ironbark Woodland (low condition, indirectly impacted)	Not an EEC	0.8	No
HU703_Low_RGIB Mel	Red Gum Grey Ironbark Paperbark Forest (low condition)	Subtropical Coastal Floodplain Forest	9.5	No (BCAM low condition)
HU703_Low_RGIB Mel Indirect	Red Gum Grey Ironbark Paperbark Forest (low condition, indirectly impacted)	Subtropical Coastal Floodplain Forest	1.3	No (BCAM low condition)
HU703_Moderate/Good_RGIB	Narrow-leaved Red Gum Ironbark Woodland	Not an EEC	32.1	No
HU703_Moderate/Good_RGIB indirect	Narrow-leaved Red Gum Ironbark Woodland (indirectly impacted)	Not an EEC	4.5	No
HU703_Moderate/Good_RGIB Mel	Red Gum Grey Ironbark Paperbark Forest	Subtropical Coastal Floodplain Forest	3.1	Yes
HU703_Moderate/Good_RGIB Mel Indirect	Red Gum Grey Ironbark Paperbark Forest (Indirectly impacted)	Subtropical Coastal Floodplain Forest	0.2	Yes
HU703_Moderate/Good_RGIB Regen	Narrow-leaved Red Gum Ironbark Woodland (early regeneration)	Not an EEC	2.5	No
HU762_Moderate/Good_TG	Grey Gum Stringybark Tallowood Tall Open Forest	Not an EEC	4.7	No
HU762_Moderate/Good_TG indirect	Grey Gum Stringybark Tallowood Tall Open Forest (Indirectly impacted)	Not an EEC	0.5	No
HU762_Moderate/Good_TG Regen	Grey Gum Stringybark Tallowood Tall Open Forest (early regeneration)	Not an EEC	1.2	No
HU763_Low_SI	Spotted Gum Ironbark Forest	Not an EEC	98.2	No
HU763_Low_SI Indirect	Spotted Gum Ironbark Forest (low condition)	Not an EEC	1.2	No
HU763_Moderate/Good_SI	Spotted Gum Ironbark Forest	Not an EEC	39.4	No
HU763_Moderate/Good_SI indirect	Spotted Gum Ironbark Forest (Indirectly impacted)	Not an EEC	1.3	No
HU763_Moderate/Good_SI Regen	Spotted Gum Ironbark Forest (early regeneration)	Not an EEC	5.2	No
HU943_Moderate/Good_SO	Swamp Oak Forest	Swamp Oak Floodplain Forest	1.6	Yes
HU943_Moderate/Good_SO indirect	Swamp Oak Forest (Indirectly impacted)	Swamp Oak Floodplain Forest	0.3	Yes
HU943_Moderate/Good_SO Regen	Swamp Oak Forest (early regeneration)	Swamp Oak Floodplain Forest	1.4	Yes
Total			259	

### 3.2.1 Conservation Areas

Twenty-five Vegetation Zones are present within the Conservation Areas (Table 7).

**Table 7. Vegetation zones within the Conservation Areas (E1 and E2)**

Vegetation zone details	Niche vegetation type	EEC	Area of veg zone offset (ha)
HU511_Moderate/Good_BT	Blackbutt Tallowwood Tall Open Forest	Not an EEC	115.7
HU511_Moderate/Good_BT Regen	Blackbutt Tallowwood Tall Open Forest (early regeneration)	Not an EEC	0.9
HU591_Moderate/Good_DP	Derived Swamp Paperbark Thicket	Swamp Sclerophyll Forest	2.2
HU591_Moderate/Good_PT	Swamp Paperbark Thicket	Swamp Sclerophyll Forest	3.6
HU703_Moderate/Good_RGAng E2	Red Gum Angophora Mahogany Woodland (E2 conservation)	Subtropical Coastal Floodplain Forest	22.9
HU703_Moderate/Good_RGIB	Narrow-leaved Red Gum Ironbark Woodland	Not an EEC	76.4
HU703_Moderate/Good_RGIB E2	Narrow-leaved Red Gum Ironbark Woodland (E2 conservation)	Not an EEC	13
HU703_Moderate/Good_RGIB E2 Regen	Narrow-leaved Red Gum Ironbark Woodland (E2 early regeneration)	Not an EEC	4.4
HU703_Moderate/Good_RGIB E2 Replanting	Narrow-leaved Red Gum Ironbark Woodland (E2 replanting)	Not an EEC	12.7
HU703_Moderate/Good_RGIB Mel	Red Gum Grey Ironbark Paperbark Forest	Subtropical Coastal Floodplain Forest	197.9
HU703_Moderate/Good_RGIB Mel E2	Red Gum Grey Ironbark Paperbark Forest (E2 conservation)	Subtropical Coastal Floodplain Forest	9.6
HU703_Moderate/Good_RGIB Regen	Narrow-leaved Red Gum Ironbark Woodland (early regeneration)	Not an EEC	2
HU762_Moderate/Good_TG	Grey Gum Stringybark Tallowwood Tall Open Forest	Not an EEC	141.5
HU762_Moderate/Good_TG Regen	Grey Gum Stringybark Tallowwood Tall Open Forest (early regeneration)	Not an EEC	22.7
HU762_Moderate/Good_TG Replanting	Grey Gum Stringybark Tallowwood Tall Open Forest (replanting)	Not an EEC	15.1
HU763_Moderate/Good_SI	Spotted Gum Ironbark Forest	Not an EEC	187.7
HU763_Moderate/Good_SI E2	Spotted Gum Ironbark Forest (E2 conservation)	Not an EEC	1
HU763_Moderate/Good_SI Regen	Spotted Gum Ironbark Forest (early regeneration)	Not an EEC	11.2
HU763_Moderate/Good_SI Replanting	Spotted Gum Ironbark Forest (replanting)	Not an EEC	9.6
HU783_Moderate/Good_FG E2	Flooded Gum Brush Box Tall Forest (E2 conservation)	Not an EEC	7
HU932_Moderate/Good_SM	Swamp Mahogany Forest	Swamp Sclerophyll Forest	66.9
HU934_Moderate/Good_FR Regen	Forest Redgum Forest (early regeneration)	Not an EEC but highly cleared PCT	1.9
HU934_Moderate/Good_FR Replanting	Forest Redgum Forest (replanting)	Not an EEC but highly cleared PCT	7.8
HU943_Moderate/Good_SO	Swamp Oak Forest	Swamp Oak Floodplain Forest	64.7
<b>Total</b>			<b>998.4</b>

### 3.2.2 Threatened Ecological Communities

Six vegetation zones equate to three distinct Threatened Ecological Communities (TECs); Subtropical Coastal Floodplain Forest, Swamp Sclerophyll Forest and Swamp Oak Floodplain Forest. These TECs are listed in Table 8 and mapped in Figure 8. No more than 7.4 hectares of TEC that are not in Low condition will be impacted within the Certification Area, while 367.8 hectares of TEC falls within the Conservation Area.

A total of 597.6 hectares of TEC exists within the retained lands of which 102.5 hectares of Herbfield constitutes a fourth TEC within the study area, namely Freshwater Wetlands on Coastal Floodplain.

**Table 8. TECs within the study area**

Niche Vegetation Type	TEC	Retained Land	Certification Area	Red flag vegetation	Total Conservation (E1 and E2)
Herbfield	Freshwater Wetland	102.5	0	0	0
Red Gum Grey Ironbark Paperbark Forest	Subtropical Coastal Floodplain Forest	39.4	14.1	3.3 (10.8 ha in BCAM Low condition)	230.4
Derived Swamp Paperbark Thicket					
Swamp Paperbark Thicket	Swamp Sclerophyll Forest	432.1	0.8	0.8	72.7
Swamp Mahogany Forest					
Swamp Mahogany (early regeneration)					
Swamp Oak Forest	Swamp Oak Floodplain Forest	23.6	3.3	3.3	64.7
Swamp Oak Forest (early regeneration)					
<b>Total</b>		<b>597.6</b>	<b>18.0</b>	<b>7.4</b>	<b>367.8</b>

### 3.3 Vegetation Community Descriptions

#### Blackbutt - Tallowood Tall Open Forest (BT)

123.6 hectares of Blackbutt - Tallowood Tall Open Forest and associated early regeneration is located in the Assessment Area of which 7.0 hectares falls within the Certification Area. In general this unit was considered to have good resilience throughout the Assessment Area.

The unit is dominated by an open canopy of *Eucalyptus pilularis* (blackbutt) and *Eucalyptus microcorys* (tallowood) with less common occurrences of *Eucalyptus eugenioides* (thin-leaved stringybark) and *Eucalyptus siderophloia* (grey ironbark). The mid-storey is a sparse

combination of medium-sized trees such as *Callistemon salignus*, *Alphitonia excelsa*, *Melaleuca styphelioides* and *Glochidion ferdinandi*. The shrub layer is more-or-less absent except for the occasional *Breynia oblongifolia* and sub-shrubs such as *Hibbertia aspera*. The ground-cover is dominated by grasses such as *Imperata cylindrica*, *Poa labillardieri*, *Echinopogon* spp. and *Entolasia* spp., while the herbs *Pteridium esculentum*, *Lomandra longifolia*, *Dichondra repens*, *Pseuderanthemum variabile* and *Pratia purpurascens* are also common.

For the purposes of this report, this vegetation type has been aligned to the PCT, HU511 Blackbutt - Tallowwood dry grassy open forest of the southern North Coast, and is not considered to constitute any component of a TEC.

#### **Forest Redgum Forest (early regeneration) (FR Regen)**

1.9 hectares of Forest Red Gum early regeneration is located within the Assessment Area, none of which falls within the Certification Area. This unit displayed poor resilience, although it would regenerate with moderate management input and removal of grazing pressure.

The unit is dominated by *E. tereticornis* with a largely absent mid-storey and shrub layer. The ground cover was dominated by grasses and herbs such as *Carex appressa*, *Echinopogon* spp., *Entolasia* spp., *Oplismenus imbecillus* and *Dichondra repens*.

For the purposes of this report, this vegetation type has been aligned to the PCT, HU934 Cabbage Gum - Forest Red Gum - Flax-leaved Paperbark Floodplain Forest. The type does not equate to any TEC but is a highly cleared vegetation type in the PCTs database.

#### **Flooded Gum Brush Box Tall Forest (FG)**

7.0 hectares of Flooded Gum Brush Box Tall Forest is located within the Assessment Area, all of which falls within the E2 Conservation Area. This unit displayed good resilience and was largely intact remnant vegetation.

The unit is dominated by a tall (+30 metre) open canopy of *Eucalyptus grandis* (flooded gum) and *E. microcorys* (tallowwood) with *Lophostemon confertus* (brush box) and *Syncarpia glomulifera* (turpentine) forming a dense, tall mid-storey. A shrub and small tree layer was dominated by *Acmena smithii*, *Neolitsea dealbata* and *Cryptocarya microneura*. Common ground covers included *Oplismenus imbecillus*, *Dichondra repens* and *Gymnostachys anceps*.

For the purposes of this report, this vegetation type has been aligned to the PCT, HU783 Flooded Gum - Brush Box - Tallowwood mesic tall open forest, and is not considered to constitute any component of a TEC.

#### **Grey Gum Stringybark Tallowwood Tall Open Forest (TG)**

170.6 hectares of Grey Gum Stringybark Tallowwood Tall Open Forest and associated early regeneration is located within the Assessment Area, of which 6.4 hectares falls within the Certification Area. In general, this unit displayed good resilience and would regenerate to a remnant state with a reduction in grazing pressure and fire frequency.

The unit is dominated by an open canopy of *Eucalyptus microcorys* (tallowwood) and *Eucalyptus propinqua* (small-fruited grey gum) with less common occurrences of *Eucalyptus eugenioides* (thin-leaved stringybark) and *Eucalyptus siderophloia* (grey ironbark). The mid-storey is sparse and typically features *Allocasuarina littoralis*. The shrub layer is more-or-less absent except for the occasional *Leucopogon juniperinus* and the ground cover is dominated by grasses and herbs such as *Echinopogon* spp., *Entolasia* spp., *Oplismenus imbecillus* and *Dichondra repens*.

For the purposes of this report, this vegetation type has been aligned to the PCT, HU762 Tallowwood - Small-fruited Grey Gum - Kangaroo Grass grassy tall open forest, and is not considered to constitute any component of a TEC.

#### **Spotted Gum - Grey Ironbark Open Forest (SI)**

345.2 hectares of Spotted Gum - Grey Ironbark Open Forest and associated early regeneration is located within the Assessment Area, of which 145.3 hectares falls within the Certification Area (99.4 hectares in BCAM Low condition). In general this unit displayed good resilience (other than the Low condition area) and would regenerate to a remnant state with a reduction in grazing pressure and fire frequency. A discussion on the assessment of Low condition for this and other vegetation units is provided in Section 3.1.

The unit is dominated by an open canopy of *Corymbia maculata* (spotted gum) and *Eucalyptus siderophloia* (grey ironbark) with less common occurrences of *Eucalyptus microcorys* (tallowwood). The mid-storey is sparse and typically features *Allocasuarina littoralis*, *Acacia maidenii* and immature eucalypts. The shrub layer is largely non-existent and the ground-cover is dominated by grasses and herbs such as *Echinopogon* spp., *Entolasia* spp., *Microlaena stipoides*, *Eragrostis brownii*, *Schoenus paludosus* and *Lomandra multiflora*.

For the purposes of this report, this vegetation type has been aligned to the PCT, HU763 Tallowwood - Spotted Gum - Grey Gum tall open forest, and is not considered to constitute any component of a TEC.

*Eucalyptus seeana* (Narrow-leaved Red Gum) is common in this vegetation type (though not dominant) and therefore this type is considered known habitat for the *Eucalyptus seeana* Endangered Population.

Sporadic occurrences of the threatened *Eucalyptus glaucina* (Slaty Red Gum) were also found in this vegetation type.

#### **Narrow-leaved Red Gum - Grey Ironbark - Paperbark Forest (RGIB Mel)**

221.6 hectares of Narrow-leaved Red Gum - Grey Ironbark - Paperbark Forest and associated early regeneration is located within the Assessment Area, of which 10.8 hectares, entirely of Low condition vegetation, falls within the Certification Area. Other than the vegetation in Low condition, this unit generally displayed good resilience and would regenerate to a remnant state with a reduction in grazing pressure. A discussion on the assessment of Low condition for this and other vegetation units is provided in Section 3.1.

The unit is primarily dominated by *Eucalyptus seeana* (narrow-leaved red gum) and *E. siderophloia* (grey ironbark), but included a mixed eucalypt canopy of *E. tereticornis*, *E. amplifolia*, *E. resinifera* and *E. propinqua*. The mid-storey is a dense layer of trees with dominant species including *Melaleuca nodosa*, *Callistemon salignus*, *Melaleuca styphelioides*, *Casuarina glauca* and *Melaleuca linariifolia*, typically featuring *Allocasuarina littoralis*. The shrub layer is largely absent except for occasional *Leucopogon juniperinus* and juvenile over-storey species. The ground cover is dominated by grasses and herbs such as *Echinopogon* spp., *Entolasia* spp., *Oplismenus imbecillus* and *Dichondra repens*.

For the purposes of this report, this vegetation type has been aligned to the PCT, HU703 Narrow-leaved Red Gum woodlands of the lowlands of the North Coast. This was the best fit PCT when compared to other PCTs in the OEH Vegetation Types Database. This vegetation type directly aligns to the Subtropical Coastal Floodplain Forest TEC due to the predominance of *Melaleuca* spp. in the mid-storey and its predominant position in the landscape being flow channels and floodplain areas.

*Eucalyptus seeana* (narrow-leaved red gum) is a dominant in this vegetation type and therefore this type is considered known habitat for the *Eucalyptus seeana* Endangered Population.

#### **Narrow-leaved Red Gum Grey Ironbark Woodland (RGIB)**

177.9 hectares of Narrow-leaved Red Gum Grey Ironbark Woodland is located within the Assessment Area, of which 82.1 hectares falls within the Certification Area (43 hectares in Low condition). Other than the vegetation in Low condition, this unit generally displayed good resilience and would regenerate to a remnant state with a reduction in grazing pressure. A discussion on the assessment of Low condition for this and other vegetation units is provided in Section 3.1.

The unit is primarily dominated by *Eucalyptus seeana* (narrow-leaved red gum) and *E. siderophloia* (grey ironbark), associated with *E. propinqua*. The mid-storey is a sparse layer of trees including *Melaleuca nodosa* and *Allocasuarina littoralis*. The shrub layer is largely absent except for occasional *Leucopogon juniperinus* and juvenile over-storey species. The ground cover is dominated by grasses and herbs such as *Echinopogon* spp., *Entolasia* spp., *Oplismenus imbecillus* and *Dichondra repens*.

This unit differs from Narrow-leaved Red Gum - Grey Ironbark - Paperbark Forest and Red Gum Angophora Mahogany Woodland in that it is located in drier substrates away from flow channels and floodplains and lacks the dense mid-storey of these other similar types. On this basis, it is not considered to constitute a part of the Subtropical Coastal Floodplain Forest TEC. This vegetation type is, however, considered a part of the PCT, HU703 Narrow-leaved Red Gum woodlands of the lowlands of the North Coast.

*Eucalyptus seeana* (narrow-leaved red gum) is a dominant in this vegetation type and therefore this type is considered known habitat for the *Eucalyptus seeana* Endangered Population.

### **Red Gum Angophora Mahogany Woodland (RG Ang)**

22.8 hectares of Narrow-leaved Red Gum Angophora Mahogany Woodland is located within the Assessment Area, all of which falls within the E2 Conservation Area.

The unit is primarily dominated by *Eucalyptus seeana* (narrow-leaved red gum), *Angophora subvelutina* (broad-leaved apple) and *Eucalyptus carnea* (broad-leaved mahogany). The mid-storey is an open layer of trees with dominant species including *Melaleuca nodosa*, *Callistemon salignus*, *Melaleuca styphelioides*, *Casuarina glauca* and *Melaleuca linariifolia*. Common ground covers included *Echinopogon* spp., *Microlaena stipoides*, *Imperata cylindrica* and *Entolasia* spp.

For the purposes of this report, this vegetation type has been aligned to the PCT, HU703 Narrow-leaved Red Gum woodlands of the lowlands of the North Coast. This was the best fit PCT when compared to other PCTs in the OEH Vegetation Types Database. This vegetation type directly aligns to the Subtropical Coastal Floodplain Forest TEC due to the predominance of *Melaleuca* spp. in the mid-storey and its predominant position in the landscape being flow channels and floodplain areas.

*Eucalyptus seeana* (narrow-leaved red gum) is a dominant in this vegetation type and therefore this type is considered known habitat for the *Eucalyptus seeana* Endangered Population.

### **Swamp Oak Forest (SO)**

68 hectares of Swamp Oak Forest and associated early regeneration is located within the Assessment Area, of which 3.3 hectares falls within the Certification Area. The condition of this unit varies from intact mature forest to early regeneration with moderate levels of weed infestation. Overall the type exhibits a high level of resilience.

The unit is dominated by a moderately dense canopy of *Casuarina glauca* (swamp oak) with scattered *Melaleuca* spp. Eucalypts are largely absent from this unit except the occasional *Eucalyptus amplifolia* (cabbage gum), *E. resinifera* (red mahogany) and *E. propinqua* (small-fruited grey gum). A mid-storey and shrub layer is largely absent except for immature *C. glauca* and patches of *Parsonsia straminea*. The ground cover is dominated by a mix of moisture loving grasses and herbs such as *Oplismenus* spp., *Carex appressa*, *Dichondra repens*, *Gahnia clarkei* and *Christella dentata*.

This vegetation type has been aligned to the PCT, HU943 Swamp Oak swamp forest. The type is also aligned with the Swamp Oak Floodplain Forest TEC.

### **Swamp Paperbark Thicket and derived type (PT and DP)**

Swamp Paperbark Thicket was largely a derived community resulting from intensive ploughing of the lowland areas (non-assessable retained lands) in the eastern portion of the Draft Structure Plan. A total of 6.6 hectares of this community is found within the Assessment Area, of which 0.8 hectares of the derived type only (DP), falls within the Certification Area. No intact thicket occurs in the Certification Area, however 3.6 hectares of intact thicket (PT) and 2.2 hectares of the derived type (DP) occurs in the Conservation Area.



This is a simplified vegetation type comprised of a dominant shrub-layer of *Melaleuca ericifolia* (swamp paperbark) at varying stages of maturity, depending on when it had last been ploughed. This shrub layer typically had a projective foliage cover of more than 80 per cent and was up to 2.5 metres high at its tallest. Small patches of this community appeared to resemble a remnant form but there is no obvious justification for this. The type is species poor, typically recording less than ten native species per plot. This is likely due to the dominance of *M. ericifolia*. Immature individuals of *Eucalyptus robusta* and *Casuarina glauca* inhabit this type as sporadic occurrences, suggesting that it was once a swamp forest type with *M. ericifolia* dominant in patches in the mid-storey. At the time of the field survey, this type was inundated to an average of 100 millimetres.

As this type is a derived vegetation unit, it was difficult to align it to a Hunter Central Rivers PCT, however the unit was most likely derived from HU591 Paperbark Swamp Forest of the coastal lowlands of the North Coast and Sydney Basin. Despite the poor structural and floristic integrity of the unit, it is considered a modified form of the Swamp Sclerophyll Forest TEC.

### Swamp Mahogany Forest

66.9 hectares of Swamp Mahogany Forest falls entirely within the Conservation Area and none occurs in the Certification Area. This unit is largely in good condition within the Assessment Area, having been spared from over-clearing; however it suffers from heavy grazing pressure in places.

The over-storey is primarily dominated by *Eucalyptus robusta* (swamp mahogany), with *E. tereticornis* (forest red gum) and *E. resinifera* (red mahogany) occurring less frequently. The mid-storey is dominated by a dense layer of medium-sized trees with dominant species including *Melaleuca nodosa*, *Callistemon salignus*, *Melaleuca styphelioides*, *Casuarina glauca* and *Melaleuca linariifolia*. The shrub layer is largely absent except for sporadic occurrences of *Breynia oblongifolia*, *Glochidion ferdinandi* and immature over-storey and mid-storey species. The ground cover is dense and generally dominated by *Gahnia clarkei*, *Blechnum indicum* and *Dichondra repens*.

This vegetation type has been aligned to the PCT, HU932 Swamp Mahogany - Flax-leaved Paperbark swamp forest, and forms part of the Swamp Sclerophyll Forest TEC present on the site.

### Replanting

45.2 hectares of cleared land will be strategically revegetated with local provenance tube stock. This will include the planting of *Eucalyptus seeana*. Planting within each vegetation type will be conducted at a stems per hectare density as detailed in Table 9. Revegetation will be composed of a variety of vegetation types typical of the adjacent native vegetation. The split of relevant vegetation types is provided in Table 7.

### Herbfield

102.5 hectares of Herbfield is located within the eastern part of the Assessment Area and is entirely within an area of non-assessable retained lands. This unit is substantially modified with a moderate cover of weeds, low species richness and low resilience.

Structurally the unit has a high cover of native grasses and herbs no more than 0.2 metres high due to a high level of grazing. Due to the heavy grazing pressure plant identification was difficult, however the unit is dominated by the native grass *Hemarthria uncinata*, with *Chorizandra cymbaria*, *Baumea teretifolia* and *Juncus usitatus* also common. Common weed species included *Paspalum dilatatum* and *Cyperus congestus*. Along with Derived Swamp Paperbark Thicket, this unit is seen as having been heavily impacted by the combination of the alteration of natural flow regimes, heavy ploughing and grazing pressure.

This vegetation type was aligned to the PCT, HU532 Coastal floodplain sedgelands, rushlands and forblands of the North Coast, and is also aligned with the Freshwater Wetland on Coastal Floodplain TEC.

### **Cleared and exotic**

1,427.4 hectares of cleared land exists throughout the Assessment Area, of which 1,406.6 hectares is within the Certification Area. The remaining area of cleared land exists within retained lands. A small area of exotic weed cover has been mapped, 0.6 hectares.

The cleared land is a mixture of native and exotic pastures and herbfields with some regenerating patches of eucalypts. Isolated areas might hold moderate resilience but, on the whole, these areas have been degraded through first clearing, then tilling, pasture improvement and grazing, and therefore hold little or no ecological value.

## **3.4 Flora**

171 plant species were recorded during the field survey, of which 16 were exotic (nine per cent) and 155 were native species (91 per cent). A full list of the flora recorded on-site is provided in Appendix C.

### **3.4.1 Threatened Flora**

Threatened flora (and fauna) recorded during the field surveys are represented in Figure 4. Fauna survey effort

Figure 5 and the distribution of the *Eucalyptus seeana* population is shown in Figure 6.

#### ***Eucalyptus glaucina* (Slaty Red Gum)**

Seven individuals of *Eucalyptus glaucina* (Slaty Red Gum) occurred in the Conservation Area on drier soils along ridge tops, while an additional two specimens were located in retained lands (Riparian). These specimens were confirmed by the presence of buds.

#### ***Corybas dowlingii* (Red Helmet-orchid)**

*Corybas dowlingii* (Red Helmet-orchid), which is listed as endangered on the TSC Act was recorded within the proposed Conservation Land in the east of the Assessment Area. Previously this species had not been recorded further north than Bulahdelah, approximately 75 kilometres to the south. This is considered a significant record and raises the conservation significance of the Assessment Area. The specimen was confirmed by the National Herbarium of NSW.

#### ***Eucalyptus seeana* (Narrow-leaved Red Gum)**

Previous recordings (Whelans Insites 2009) of *Eucalyptus seeana*, which is listed on the TSC Act as an Endangered Population within the Greater Taree LGA, were confirmed in the Assessment Area by Niche. The species is considered common to dominant in the western portion of the Assessment Area.

Due to the extent and density of the species within the Assessment Area, it was considered necessary to provide a rigorous estimate of the population. This estimate was carried out using the BCAM described in Section 2.3.2.

The population estimates (number of stems) for the Conservation Area and for the Certification Area is provided in Appendix F. *E. seeana* was known to be present in seven of the vegetation types as mapped by Niche (2011).

Table 9 summarises this data for the Biodiversity Certification Assessment Area and provides a population estimate based on these density counts. The population estimate found that 3,215 individuals fall within the Certification Area while 16,160 individuals will be reserved in the E1 and E2 Conservation Areas (including replanting). A further 2,015 individuals are estimated to occur within the retained lands, whilst a further 3,791 individuals are estimated to occur in the West Wallsend Offset and 195 individuals within the Vegetated 10 metre buffer. However, the individuals outside the E1 and E2 Conservation Areas have not been included in the BCAM credit calculations and thus the relative impacts are less than that stated by the credit calculations.

Table 10 shows the number of *E. seeana* replanted within each conservation zone.

Tree health, DBH, presence/absence of tree hollows were not recorded as these attributes were not regarded as necessary for the stem density analysis. However, based on observations during the field assessment, the Conservation Lands generally contain larger and healthier individuals of *E. seeana*, being located in undisturbed forest and in optimal habitat adjacent to the Dawson River, when compared to the Certified lands. The same statement can be made regarding *E. seeana* within the Retained lands, although to a lesser degree.

**Table 9. Summary of *E. seeana* population estimate**

Vegetation Zone	<i>E. seeana</i> (stems/ha)	Certified Area habitat (ha)	Certified Area stems	Certified Low condition habitat (ha)	Certified Low condition stems	Conservation E1 habitat (ha)	Conservation E1 stems	Conservation E2 habitat (ha)	Conservation E2 stems	Retained Area habitat (ha)	Retained Area stems	Separate Development Offset habitat (ha)	Separate Development Offset stems	Grand Total habitat (ha)	Grand Total stems
Blackbutt Tallowwood Tall Open Forest-Mod/good	22.1	7.06	156	-	-	116.0	2563	-	-	0.5	11.0	-	-	123.6	2730
Grey Gum Stringybark Tallowwood Tall Open Forest-Mod/good	14.9	6.45	95	-	-	164.1	2445	-	-	20.6	306.0	20.7	309	211.9	3155
Narrow-leaved Red Gum Ironbark Woodland-Mod/good	28.4	39.4	995	-	-	78.4	2176	13.2	374	26.5	610.0	8.8	250	166.3	4405
Narrow-leaved Red Gum Ironbark Woodland-Low	2.4	-	-	42.7	103	-	-	-	-	-	-	-	-	42.7	351
Red Gum Angophora Mahogany Woodland-Mod/good	51.5	-	-	-	-	-	-	22.2	1,144	6.6	338.0	34.2	1765	62.9	3247

Vegetation Zone	<i>E. seeana</i> (stems/ha)	Certified Area habitat (ha)	Certified Area stems	Certified Low condition habitat (ha)	Certified Low condition stems	Conservation E1 habitat (ha)	Conservation E1 stems	Conservation E2 habitat (ha)	Conservation E2 stems	Retained Area habitat (ha)	Retained Area stems	Separate Development Offset habitat (ha)	Separate Development Offset stems	Grand Total habitat (ha)	Grand Total stems
Red Gum Grey Ironbark Paperbark Forest- Mod/good	17.2	4.59	79	-	-	197.9	3404	5.9	102	33.3	573.0	-	-	245.4	4221
Red Gum Grey Ironbark Paperbark Forest-Low	17.2			9.5	164	-	-	-	-	-	-	-	-	9.5	164
Spotted Gum Ironbark Forest- Mod/good	14.3	47	648	-	-	198.9	2863	1.0	15	13.2	177.0	99.8	1467	360.0	5170
Spotted Gum Ironbark Forest-Low	9.3	-	-	98.2	975	-	-	-	-	-	-	-	-	98.2	975
Grand Total	177.3	105	1,973	150	1,242	755	13,451	42	1,635	100.6	2,015	164	3,791	1,371.16	25,535

NB. Total areas will not correspond to those in other tables as only vegetation types that contain *E. seeana* have been included.

Table 10. *E. seeana* replanting numbers (stem rates as per Table 9)

Replanting strategy and veg type	Conservation E1 habitat (ha)	Conservation E1 stems	Conservation E2 habitat (ha)	Conservation E2 stems	Grand Total habitat (ha)	Grand Total stems
Supplementary planting (RGIB)	-	-	4.4	125	4.4	125
Restoration replanting (FR)	7.8	222	-	-	7.8	222
Restoration replanting (RGIB)	-	-	12.7	360	12.7	360
Restoration replanting (SI)	9.6	141	-	-	9.6	141
Restoration replanting (TG)	15.1	226	-	-	15.1	226
<b>Grand Total</b>	<b>32.5</b>	<b>589</b>	<b>17.1</b>	<b>485</b>	<b>49.6</b>	<b>1,074</b>

### 3.4.2 Weeds

Remnant and early regeneration areas within the Assessment Area were considered to be in a good resilient condition.

Areas that were not in good condition included:

- Derived Swamp Paperbark Thicket;
- Herbfield;
- Paddocks;
- Tracks; and
- Areas adjacent to canal works.

The common weed species within the Assessment Area were largely associated with these disturbances and included; *Andropogon virginicus*, *Axonopus ficifolius*, *Chenopodium album*, *Cinnamomum camphora*, *Cirsium vulgare*, *Conyza* sp., *Cyperus congestus*, *Hypochaeris radicata*, *Lantana camara*, *Paspalum dilatatum*, *Plantago lanceolata*, *Rubus ulmifolius*, *Senecio madagascariensis*, *Setaria parviflora*, *Solanum mauritianum* and *Verbena bonariensis*. Two of these species, *Lantana camara* (lantana) and *Rubus ulmifolius* (blackberry) are listed as noxious weeds within the Greater Taree Local Government Area.

## 3.5 Fauna

### 3.5.1 Trapping Results

#### Arboreal Elliot Trapping

The trapping effort resulted in 50 captures across the five sites which is equivalent to 8 per cent trapping success. Animals were trapped at all of the trapping sites (Figure 4).

Three ground dwelling mammal species, Brown Antechinus (*Antechinus stuartii*) Bush Rat (*Rattus fuscipes*) and Black Rat (*Rattus rattus*) were trapped during the surveys. Three

arboreal mammal species were trapped, Common Brushtail Possum (*Trichosurus vulpecula*), Brush-tailed Phascogale (*Phascogale tapoatafa*) and Sugar Glider (*Petaurus breviceps*).

### Camera Traps

The vast majority of pictures taken with the camera traps were of cattle, however, overall there were many photos of small mammals. Animals were identified to species level, although for a number of photos this could not be achieved. For example, many of the pictures of rats and antechinus are assumed to be of Bush Rats (*Rattus fuscipes*) and Brown Antechinus (*Antechinus stuartii*) as these were the most common species observed through trapping, however, without having these animals in hand it is not possible to identify them definitively.

Bandicoots were observed at two of the camera trap sites, one in riparian forest and the other in Spotted Gum Grey Ironbark Open Forest. The Bandicoot recorded in the riparian forest is believed to be a Long-nosed Bandicoot (*Perameles nasuta*) as it clearly has large ears and a long snout. The other Bandicoot was much smaller and is believed to be a juvenile. It was not possible to determine the species of this individual. It is possible that it is a Northern Brown Bandicoot (*Isodon macrourus*). The presence of medium sized ground dwelling mammals such as these is indicative of habitat complexity and confirms observations that the site is in moderate to good condition.

Positive identifications from the camera traps included Red-necked Wallaby (*Macropus rufogriseus*), Common Brushtail Possum (*Trichosurus vulpecula*), Common Ringtail Possum (*Pseudocheirus peregrinus*), Long-nosed Bandicoot, Domestic Cow and Red Fox (*Vulpes vulpes*).

### Hair Tubes

Hair was recovered at all of the sites at which hair tubes were installed. Three mammal species were recorded with definite certainty; the introduced House Mouse (*Mus musculus*), Feral Cat (*Felis catus*) and Brushtail Possum (*Trichosurus sp*). It is not possible to distinguish between the hairs of Common Brushtail Possum (*Trichosurus vulpecula*) and Mountain Brushtail Possum (*Trichosurus caninus*), however, it is considered likely that the hairs were from the Common Brushtail Possum given the number of observations of this species within the Assessment Area. Species recorded with probable certainty included Feathertail Glider (*Acrobates pygmaeus*) and Swamp Rat (*Rattus lutreolus*).

### 3.5.2 Species Recorded

A total of 107 animal species were recorded during the field surveys, including 84 native birds, 13 native mammals, six introduced mammals and four frog species.

Eleven species listed on either the TSC or EPBC Acts were recorded from within the study area during the current surveys (see Figure 9):

- Varied Sittella (Vulnerable TSC Act);
- Little Lorikeet (Vulnerable TSC Act);
- Scarlet Robin (Vulnerable TSC Act);
- Masked Owl (Vulnerable TSC Act);
- Black-necked Stork (Endangered TSC Act);

- Comb-crested Jacana (Vulnerable TSC Act);
- Brush-tailed Phascogale (Vulnerable TSC Act);
- Koala (Vulnerable TSC Act);
- Grey-headed Flying-fox (Vulnerable TSC and EPBC Acts);
- Cattle Egret (Migratory EPBC Act); and,
- Great Egret (Migratory EPBC Act).

The following species listed on the TSC and/or EPBC Acts have been previously recorded from the study area:

- Glossy Black-cockatoo (Vulnerable TSC Act);
- Square-tailed Kite *Lophoictinia isura* (Vulnerable TSC Act);
- Powerful Owl (Vulnerable TSC Act);
- Squirrel Glider (Vulnerable TSC Act);
- Little Bentwing-bat *Miniopterus australis* (Vulnerable TSC Act);
- Eastern Bentwing-bat *Miniopterus schreibersii oceanensis* (Vulnerable TSC Act);
- Yellow-bellied Sheath-tailed Bat *Saccolaimus flaviventris* (Vulnerable TSC Act);
- East-coast Freetail Bat *Mormopterus norfolkensis* (possible) (Vulnerable TSC Act);
- Eastern False Pipistrelle *Falsistrellus tasmaniensis* (possible) (Vulnerable TSC Act);
- Greater Broad-nosed Bat *Scoteanax rueppellii* (possible) (Vulnerable TSC Act);
- Large-footed Myotis *Myotis macropus* (possible) (Vulnerable TSC Act);
- Australian Wood Duck (Migratory EPBC Act);
- Pacific Black Duck (Migratory EPBC Act);
- Black-shouldered Kite (Migratory EPBC Act);
- Whistling Kite (Migratory EPBC Act);
- Wedge-tailed Eagle (Migratory EPBC Act);
- Nankeen Kestrel (Migratory EPBC Act); and,
- White-throated Needle-tail (Migratory EPBC Act).

In total, 20 threatened species (TSC and/or EPBC Act) and nine migratory species (EPBC Act) have been recorded from the study area. Of the threatened species, four were microchiropteran bat species that were recorded with only “possible” certainty.

### 3.5.3 Habitat Descriptions

#### Open Forest

Tree hollows of various sizes are present within this forest type providing refuge for a wide variety of vertebrates. There are some large trees with hollows (>200 mm) suitable for large forest owls. Eucalypts within the forest canopy provide direct (foliage, nectar) and indirect (invertebrates) foraging for a range of vertebrate species, particularly birds and arboreal mammals.

Although the ground layer has been disturbed by the impacts of grazing in many areas, leaf litter, fallen logs and debris are scattered throughout the open forest of the study area at varying densities. These important microhabitats provide refuge and foraging for a range of small mammals, birds, reptiles and amphibians. In isolated areas such as Trap Site 1 there is a heavy coverage of lantana in the mid storey and ground cover.



*Angophora subvelutina* (broad-leaved apple), *Eucalyptus amplifolia* (cabbage gum), *E. grandis* (flooded gum), *E. microcorys* (Tallowwood), *E. propinqua* (small-fruited grey gum), *E. robusta* (swamp mahogany), *E. seeana* (narrow-leaved red gum), *Eucalyptus tereticornis* (forest red gum) and *Lophostemon confertus* (brush box) are present at varying densities within the open forest of the study area. All of these species are listed as either primary or secondary Koala feed tree species for the north coast bioregion in the Koala Recovery Plan (DECC 2008).

Bird diversity within the large tracts of open forest is good. Invasive native species such as the Noisy Miner (*Manorina melanocephala*) were observed only on the edges of the larger patches and did not appear to be overabundant or occur away from forest edges. Species most commonly recorded within this habitat type included: Yellow-faced Honeyeater (*Lichenostomus chrysops*), Eastern Yellow Robin (*Eopsaltria australis*), Brown Thornbill (*Acanthiza pusilla*), Grey Fantail (*Rhipidura albiscapa*), Golden Whistler (*Pachycephala pectoralis*) and Laughing Kookaburra (*Dacelo novaeguineae*). Threatened bird species recorded in this habitat type included: Varied Sittella (*Daphoenositta chrysoptera*), Little Lorikeet (*Glossopsitta pusilla*) and Masked Owl (*Tyto novaehollandiae*).

#### Swamp Sclerophyll Forest

This forest type had relatively fewer large hollow bearing trees than the open forest types, although some *Eucalyptus robusta* had small hollows. The ground layer vegetation has been affected by grazing, although *Gahnia* appeared unaffected, thus the ground cover remains relatively dense providing refuge for a range of vertebrates such as small mammals, birds and reptiles. Important microhabitats such as leaf litter, fallen logs and debris are common throughout this habitat type.

Canopy trees such as *Casuarina* spp., *Melaleuca* spp. and *Eucalyptus* spp. provide direct (foliage, nectar) and indirect (invertebrates) foraging for a range of vertebrate species, particularly birds, bats and arboreal mammals. Numerous Grey-headed Flying-foxes were observed utilising this habitat type. No evidence of a Flying-fox colony was observed throughout the study area. It is likely that individuals are exploiting the abundance of foraging resources (nectar) and travelling from a nearby colony external to the study area.

Bird diversity within this forest type is good, species most commonly recorded in this habitat type included: White-browed Scrubwren (*Sericornis frontalis*), Yellow-faced Honeyeater, Lewin's Honeyeater (*Meliphaga lewinii*), Yellow Thornbill (*Acanthiza nana*), Eastern Yellow Robin, Noisy Friarbird (*Philemon corniculatus*) Grey Fantail and Brown Thornbill.

#### Derived Swamp Paperbark Thicket

This derived *Melaleuca ericifolia* (swamp paperbark) thicket covers a large portion of the study area. It is very dense and structurally homogenous. Native bird species recorded utilising this habitat type included edge specialists such as Superb Fairy Wrens (*Malurus cyaneus*), Grey Fantails and Australian Magpies (*Cracticus tibicen*).

Small linear stands of *Casuarina glauca* are scattered throughout the thicket landscape providing some refuge, for native bird species. Species observed utilising these small patches included Mistletoebird (*Dicaeum hirundinaceum*), Golden Whistler and Yellow-

facéd Honeyeater. The threatened Scarlet Robin (*Petroica boodang*) was recorded from this habitat type.

There are a number of man-made drainage channels bordering areas of this vegetation type. These provide some limited habitat for common native amphibians and indirect foraging (invertebrates) for bird species.

### **Sedgeland**

This habitat type consists of a wet seepage area with native sedges and exotic pasture grasses. There are pools of stagnant water up to 10-15 cm deep. This area is heavily affected by grazing, although it does provide habitat for native amphibians such as the Common Eastern Froglet (*Crinia signifera*), exotic mammals such as house mice (*Mus musculus*) and birds that specialise in open or edge environments such as raptors and butcherbirds.

### **Wetland**

Two large dams are present within the study area providing foraging and refuge for a number of species of water birds. Species recorded using these dams included: Black Swan (*Cygnus atratus*), Great Egret (*Ardea Alba*), Grey Teal (*Anas gracilis*), Pacific Black Duck (*Anas superciliosa*), and two species listed as threatened under the NSW TSC Act, the Black-necked Stork (*Ephippiorhynchus australis*) and Comb-crested Jacana (*Irediparra gallinacea*).

## **3.5.4 Threatened Fauna**

The relatively high diversity of animal species within the study area is considered to be a reflection of the quality and heterogeneity of habitat available. There are habitat opportunities for a range of fauna within the study area. Measures to improve the vegetation condition such as removal of grazing would be beneficial to a range of local threatened and non-threatened animal species.

A total of 57 species listed on either the TSC or EPBC Acts as threatened or migratory species or their habitat have been previously recorded from within 10 km of the study area. This section of the report discusses the local occurrence of these species and the likelihood of occurrence within the study area of species not recorded during the current study.

### **Bats - Grey-headed Flying Fox, Eastern Bentwing Bat, Little Bentwing Bat, Eastern Freetail Bat, Large-eared Pied Bat Greater Broad-nosed Bat, Golden-tipped Bat**

Numerous individual Grey-headed Flying-foxes were recorded from within the study area. No evidence of a Flying-fox colony was observed within the study area. It is likely that individuals are exploiting the abundance of foraging resources on site from a colony located outside the study area.

Only one individual microchiropteran bat was captured during the surveys. The lack of captures is likely to be related to time of year and conditions during the surveys. It is considered highly likely that microchiropteran bat diversity is high in the study area, given the habitat heterogeneity, potential roosting structures (tree hollows) and invertebrate diversity.

The Eastern Bentwing Bat, Large-eared Pied Bat and Little Bentwing Bat are obligate cave dwelling species (Churchill 2008) and if present, would only utilise the site for foraging.

The Eastern Freetail Bat and Greater Broad-nosed Bat were not recorded within the study area, although they are considered likely to occur and could potentially utilise hollows within the study area for roosting.

The Golden-tipped Bat has not been recorded from the study area. This species has a highly specialised diet and roosting requirements, requiring Yellow-throated Scrubwren or Brown Gerygone nests for roosting (Churchill 2008). This species most often roosts in wet forest or rainforest gullies, although it has also been recorded from casuarina dominated riparian forests and coastal melaleuca forest (Churchill 2008). The Swamp Sclerophyll forest types within the study area could provide potential habitat for this species.

#### **Arboreal Mammals - Brush-tailed Phascogale, Squirrel Glider, Koala, Yellow-bellied Glider**

One individual Brush-tailed Phascogale was trapped during the surveys in open forest.

No Squirrel Gliders were recorded from within the study area. The closely related sugar glider was recorded calling during a spotlighting survey, and the species was trapped within open forest at Trap Site 3. Squirrel Gliders are much less vocal than Sugar Gliders and are rarely detected by call. Two Individual gliders were observed whilst spotlighting and a glider responded to a Squirrel Glider call during call-playback surveys, but it is not possible to definitively distinguish the two species without having them in hand. Given that Squirrel Gliders have been previously recorded in close proximity to the study area (Whelans Insites 2009), it is considered likely that they also occur within the study area.

No Individual Koalas were recorded from within the study area during the surveys, although evidence of their presence (scats) was observed and previous surveys have detected their presence on site (Whelans Insites 2009). This species has been recorded many times in habitat to the west and southwest of the study area. It is likely that individuals from the local population utilise the study area at least on a transient basis. *State Environmental Planning Policy No. 44 - Koala Habitat Protection* (SEPP 44) is addressed below.

The Yellow-bellied Glider is not considered likely to occur within the study area. This species prefers tall wet sclerophyll forest on high nutrient soils.

#### **Terrestrial Mammals - Spotted-tailed Quoll, Long-nosed Potoroo, Brush-tailed Rock Wallaby, Parma Wallaby**

The Spotted-tailed Quoll was not recorded from within the study area, but has been recorded within the locality. The habitat within the study area is considered suitable for this species.

The Long-nosed Potoroo, Parma Wallaby and Brush-tailed Rock Wallaby are not considered likely to occur within the study area.

**Woodland Birds - Powerful Owl, Grass Owl, Masked Owl, Sooty Owl, Barking Owl, Bush Stone-curlew, Varied Sittella, Little Lorikeet, Square-tailed Kite, Scarlet Robin, Spotted Harrier, Little Eagle, Hooded Robin, Glossy Black Cockatoo, Black-chinned Honeyeater, Painted Honeyeater, Regent Honeyeater, Swift Parrot**

The Little Lorikeet was recorded from within the study area and is known to be highly nomadic (NSW Scientific Committee 2009a). It is not known how the individuals are using the site (i.e., roosting, foraging). There are numerous suitable tree hollows which this species could utilise for nesting, and abundant forage.

The Varied Sittella was recorded from two locations within the study area (Figure 9). This species is sedentary in nature (NSW Scientific Committee 2010e) and is likely to be relatively common within the study area.

The Scarlet Robin was recorded in the derived swamp paperbark thicket within the study area. It is unknown if this species breeds within the study area.

Although not detected, the Hooded Robin is considered likely to occur within the study area at least on a transient basis.

The Masked Owl was recorded in open forest from three separate parts of the study area. Given that this species has average territory size of 500 - 1000 hectares (Kavanagh and Murray 1996) it is considered likely that the study area comprises only one pair's territory. These individuals were not recorded within or adjacent to the Certification Area.

The Grass Owl is not considered likely to occur within the study area given the lack of preferred habitat (long grass) as a result of grazing impacts. The removal of grazing from the study area would improve habitat availability for the Grass Owl.

The Powerful Owl has been previously recorded in the western section of the study area. The Sooty Owl and Barking Owl could potentially occur within the study area as suitable habitat exists.

Foraging habitat for the Little Eagle, Spotted Harrier and Square-tailed Kite is considered to be present within the study area, and these species are considered likely to occur, although they were not detected.

The Glossy Black-cockatoo is considered likely to occur within the study area as there was abundant suitable foraging habitat in the form of Allocasuarina and many suitable tree hollows for breeding.

The Regent Honeyeater, Painted Honeyeater and Swift Parrot are highly nomadic species and could potentially utilise foraging resources within the study area on a seasonal basis.

**Migratory Birds - Great Egret, Cattle Egret, White-bellied Sea-eagle, Satin Flycatcher, Black-faced Monarch, Rufous Fantail, Rainbow Bee-eater, Spectacled Monarch, Fork-tailed Swift, Latham's Snipe, Australian Painted Snipe**

Both the Cattle Egret and Great Egret were recorded from the study area, and are likely to be relatively common in suitable habitat such as dams, seepage and wet paddocks in and around the study area. The remaining migratory species are considered to potentially occur within the study area at least on a transient basis.

#### **Wetland Birds - Comb Crested Jacana, Black-necked Stork, Magpie Goose**

Both the Comb-crested Jacana and the Black-necked Stork were recorded from a dam/wetland within the study area. It is unknown if either species breeds within the study area. The Magpie Goose may utilise wetland habitats within the study area on a transient basis.

Habitat for the Comb-crested Jacana and the Black-necked Stork is restricted to the two large dams within the study area and the open areas subject to periodic inundation (cleared riparian areas, and Herbfield and Derived Swamp Paperbark Thicket). All these areas fall with Retained lands within the study area.

#### **Amphibians - Wallum Froglet, Green-thighed Frog, Giant Barred Frog, Stuttering Frog, Green and Golden Bell Frog**

No threatened frog species were recorded from within the study area.

The Wallum Froglet occurs in coastal acid paperback swamps (DEC 2005). The study area is considered to contain marginal potential habitat in sections of swamp sclerophyll forest.

Habitat for the Green-thighed Frog includes ephemeral streams within open forest. The habitat within the study area is not considered likely to sustain a population of this species given the lack of preferred habitat.

It is considered unlikely that the Giant Barred Frog or the Stuttering Frog would occur within the study area given the lack of preferred breeding habitat in the form of permanent streams.

The Green and Golden Bell Frog is considered unlikely to occur within the study area as existing local populations are predominantly coastal.

#### **Reptiles - Stephen's Banded Snake**

Stephen's Banded Snake was not recorded from within the study area, although this species is highly cryptic and difficult to detect. Spotlighting is the only survey that was undertaken for this species. The open forest habitat within the study area is considered to be suitable for this species.

### **3.5.5 SEPP 44**

State Environmental Planning Policy No. 44 - Koala Habitat Protection aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koalas to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline:

- a) By requiring the preparation of plans of management before development consent can be granted in relation to areas of core Koala habitat; and
- b) By encouraging the identification of areas of core Koala habitat; and
- c) By encouraging the inclusion of areas of core Koala habitat in environment protection zones.

A number of criteria in the SEPP are to be considered during an assessment of potential Koala habitat. These criteria are set out and assessed below.

**1. Does the policy apply? Does the subject land occur in a Local Government Area (LGA) identified in Schedule 1?**

The subject site occurs in the Greater Taree LGA, which is listed under Schedule 1 of the SEPP.

**2. Is the landholding to which the DA applies greater than 1 hectare in area?**

Yes.

**3. Is the land potential Koala habitat? Does the site contain areas of native vegetation where the trees of types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component?**

The subject site contains forest red gum *Eucalyptus tereticornis*, grey gum *Eucalyptus punctata* and swamp mahogany *Eucalyptus robusta* which are listed as Koala feed tree species on Schedule 2 of the SEPP. Within the subject site each of these species are dominant in their relevant vegetation types and would represent at least 15% or more of the total number of trees in the upper or lower strata.

**4. Is the land core Koala habitat?**

Under the SEPP *core Koala habitat* means an area of land with a resident population of Koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population.

Whilst it is clear that the Greater Taree LGA supports a healthy and viable population of Koala, three recent fauna surveys only detected one individual of the species within the subject site, and this record did not represent a juvenile or breeding female. This individual was recorded within a small patch of Grey Gum Stringybark Tallowood Tall Open Forest within a large isolated patch of vegetation in the centre of the western part of the property (see Figure 9). Numerous Koalas have been recorded within the Conservation Area and immediately adjacent to the study area (current study and Whelans Insites 2009). Therefore, despite the dominance of Koala feed tree species within the study area, it is considered unlikely that the Certified Area represents core Koala habitat as defined in SEPP 44.

**Conclusion**

Although the Certification Area is unlikely to contain core habitat for Koalas, as defined by SEPP 44, the adjacent Conservation Area does. Therefore, a plan of management for this species should be prepared.

**3.5.6 Corridor Values**

The Assessment Area contains a regional and sub-regional corridor as mapped by OEH. Regional corridors are primary landscape corridors which provide potential residential and dispersal habitat for many species (Scotts 2003). Preserving these corridors is important for regional conservation planning and helping to reverse historical species declines. Almost all of the regional corridor that occurs within the Brimbin property will be protected within the Conservation Area, which adds significance to the importance of the offset package.

The Lower Manning Valley regional wildlife corridor runs through the southern part of the site and connects extensive areas of vegetation east and west of the Assessment Area. There is a gap in this corridor at Lansdowne Road in the southern-central part of the property which would limit the value of the corridor for some native species such as small and medium ground-dwelling mammals. However, this gap would be replanted as part of the offset package, significantly improving the east-west connectivity within the locality. The broader corridor is considered to be highly valuable for biodiversity within the region given the links between important habitats and the suite of rare or threatened species that are known to occur, and this will be improved further by the replanting.

The Lower Manning Valley sub-regional wildlife corridor connects vegetation in the south of the Assessment Area to vegetation outside of the Assessment Area and over the Dawson River to west.

All riparian areas within the Draft Structure Plan are only local biodiversity links, as defined in the second to last point above, and have been buffered by 50 metres to form potential additions to the Conservation Area that are currently being excluded from this assessment as retained lands.

## 4 RED FLAGS

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Under Biodiversity Certification, red flags are areas that cannot simply be offset by the retirement of biodiversity credits in order to achieve an Improve or Maintain outcome for biodiversity. Red flags include:

- Highly cleared vegetation types (70 per cent or greater);
- Endangered or critically endangered ecological communities as listed on the TSC or EPBC Acts, and are not in Low condition as defined in the BCAM;
- Threatened species (TSC Act only) that are classed as not being able to withstand further loss in the CMA;
- Land that is mapped or defined as a state or regional biodiversity link in accordance with section 3.7.2 of the BCAM ;
- A riparian buffer 40 metres either side of a major river on the coast and tablelands or 100 m either side of a major river on the western slopes and plains;
- A riparian buffer 30 metres either side of a minor river or major creek on the coast and tablelands or 60 metres either side of a minor river or major creek on the western slopes and plains;
- A riparian buffer 20 metres either side of a minor creek on the coast and tablelands or 40 m either side of a minor creek on the western slopes and plains; and
- Areas listed as a SEPP 14 wetland.

All riparian areas within the Assessment Area have been buffered by at least the riparian buffer distance noted above for Red Flags (i.e. no riparian buffer red flags are impacted) or, if they are vegetated beyond this buffer distance, the width of the adjacent vegetation. These riparian areas form additional conservation zones that are currently being withheld from the assessment as retained lands. No SEPP 14 land is present in the study area and none of the vegetation types within the Certified Area are highly cleared vegetation types as defined in the Biometric Vegetation Types database.

Further, the red flag for the *Eucalyptus seeana* Endangered Population has not been triggered due to the more appropriate local data (MALD) assessment in Appendix F of this Assessment Report. A MALD assessment is part of the BCAM that allows you to remove the red flag status of a species or community based on local data. By demonstrating that a species can “withstand temporary loss” its red flag status can be removed. For *E. seeana* there were previously only 50 known records from the LGA (the Endangered Population), but following the ecology surveys for the Brimbin project it is now known that there are more than 25,000 within the Brimbin property alone and, therefore, an even greater number in the LGA as a whole. Based on this “local data” the MALD assessment concludes that the *E. seeana* Endangered Population is capable of withstanding a temporary loss and will be suitably offset through the retirement of species credits.

Habitat for both Koala and Brush-tailed Phascogale will be impacted by the development, however a red flag is not triggered for either of these species.

Therefore, the following three EECs constitute the red flag issues that fall within the Certification Area:

1. The Swamp Sclerophyll Forest EEC (0.8 hectares);



2. The Subtropical Coastal Floodplain Forest EEC (3.3 hectares); and
3. The Swamp Oak Floodplain Forest EEC (3.3 hectares).

A further 10.8 hectares of Subtropical Coastal Floodplain Forest exists within the Certification Area as BCAM ‘Low’ condition and therefore doesn’t meet the definition of a red flag.

Table 11 outlines the process that must be followed in order to demonstrate that the development of the site achieves an ‘improve or maintain’ outcome for biodiversity values (the ‘improve or maintain test’) in relation to its potential impact on red flags.

In order to answer yes to Criteria 1b), and therefore achieve an ‘improve or maintain’ outcome, the criteria for a red flag variation must be addressed. These criteria are provided in Section 2.4 of the BCAM and are fully addressed in Section 3.3 of the Biodiversity Certification Strategy.

**Table 11. Improve or maintain test using the BCAM**

Improve or maintain criteria (must answer YES to all three criteria)	YES	NO	Comment
1a) The development does not impact on the red flag, <b>or</b>			
1b) The Director General has made a determination that the development does not impact on the red flag as per Section 2.4 of the BCAM	Possible		1a) is not satisfied and, therefore, to address 1b) justification must be presented to OEH using the criteria in Section 2.4 of the BCAM that the development will not impact on red flags
2. The direct impacts on the red flag are offset in accordance with the rules of Section 10 of the BCAM	Possible		Credit calculations described in detail in Section 5 of this Assessment Report and summarised in Section 4 of the Strategy).
3. The indirect impacts on the red flag are appropriately minimised in accordance with Section 6 of the BCAM	Possible		Indirect impacts have been minimised and residual incorporated into credit calculations. Section 3.7 of the Strategy addresses indirect impacts.

## 5 BIODIVERSITY CERTIFICATION CREDIT CALCULATIONS

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### 5.1 Landscape value assessment

The screen-shot on the page 45 shows the landscape value scores from the Calculator given the values used for native vegetation cover, connectivity and the Adjacent Remnant Area. The landscape score calculations were conducted within a single 8,000 hectare circle for both the whole of the Assessment Area (Figure 9) and whilst the Certification Area does not impact on any biodiversity links, the Conservation Area will preserve a regional biodiversity link along the Dawson River in the western part of the site.

Native vegetation cover will be reduced by 259 hectares. Within a 8,000 hectare circle this represents only 3.2 per cent of the cover which falls within the 41-50 percentile both before and after certification (Greater Hunter vegetation mapping used to estimate cover percentile). The native vegetation of the Assessment Area is well-connected to more than 501 hectares of moderate-good condition vegetation and this is the same in both the Certification Area (i.e., the land to be certified) and the Conservation Area (i.e., the land to be offset), of which a total of 998.4 hectares will be conserved.

The result of the landscape assessment was a value of 10 for the Certification Area and 18.75 for the Conservation Area.

### 5.2 Vegetation Zone Assessment

The vegetation zones as listed in Table 6 and 7 were the inputs at the second stage of the Calculator. For this, the vegetation formation and class were required to be known and this is why Appendix A has been included.

One of the complications of moving from the previously utilised *BioBanking Assessment Methodology* (BBAM) to the BCAM has been the alignment of revised Biometric Vegetation Types (BVTs) with the new Plant Community Types (PCTs) as used in the BCAM.

An alignment of the parent vegetation types as mapped by Niche with PCTs, EECs and red flag vegetation greater than 70 per cent cleared and vegetation formations and classes (Keith 2004) is provided in Appendix A. The alignment between the vegetation types mapped by Niche and those of previous studies at Brimbin are presented in Appendix B.

#### 5.2.1 Management scores for indirect impact zones

Management scores for indirect impact vegetation zones were manipulated to reflect that edge effects were likely to be the only unmitigated indirect impact and yet even these would subject to a management regime. Accordingly partial loss was assumed for three of the site attributes; Native Ground Cover Grasses, Native Ground Cover Other and Exotic Plant Cover. No loss of management score was assumed for the other seven attributes which are considered likely to be wholly unaffected in the indirect impact zone (e.g., mature native tree will be retained and therefore no loss was assumed for Native Overstorey Cover).

### 5.2.2 Management scores for replanting zones

Management scores for replanting vegetation zones were manipulated to reflect that, through management of these areas, full gain in biodiversity value would be achieved over time in relation to all attributes other than the Number of Trees with Hollows, for which it is unlikely that improvement would occur in the immediate future (though, in reality may occur in perpetuity). For example, management scores were optimised for Native Overstorey Cover and the reason given, 'Improvement through replanting' and for Exotic Plant Cover, 'Improvement through weed management'.

### 5.2.3 Management scores for direct impact zones

The default decrease in site score was accepted for all other impacted vegetation zones (i.e., direct impacts associated with removal of biodiversity habitat).

### 5.2.4 Impacts subject to credit requirement

Impacts are categorised as direct or indirect as described in DECC (2007), which states:

*“Direct impacts are those that directly affect the habitat and individuals. They include, but are not limited to, death through predation, trampling, poisoning of the animal/plant itself and the removal of suitable habitat. When applying each factor, consideration must be given to all of the likely direct impacts of the proposed activity or development.”*

*Indirect impacts occur when project-related activities affect species, populations or ecological communities in a manner other than direct loss. Indirect impacts can include loss of individuals through starvation, exposure, predation by domestic and/or feral animals, loss of breeding opportunities, loss of shade/shelter, deleterious hydrological changes, increased soil salinity, erosion, inhibition of nitrogen fixation, weed invasion, fertiliser drift, or increased human activity within or directly adjacent to sensitive habitat areas. As with direct impacts, consideration must be given, when applying each factor, to all of the likely indirect impacts of the proposed activity or development.”*

The direct impacts of the proposal can be classified as four key and unavoidable impacts on threatened biodiversity and its habitat:

1. The removal of native vegetation (direct impact).
2. The removal of part of the *Eucalyptus seeana* Endangered Population (direct impact).
3. The removal of habitat for Koala (direct impact).
4. The removal of habitat for Brush-tailed Phascogale (direct impact).

These four impacts cannot be avoided or mitigated against and therefore must be offset.

Indirect impacts likely to occur as a result of the Brimbin development include edge effects, deleterious hydrological changes, sedimentation and erosion, weed invasion and increased human activity within or directly adjacent to sensitive habitat areas. Other than

edge effects, each of these indirect impacts would be fully mitigated through the implementation of on-site management actions.

Furthermore indirect impacts will be absorbed through the following:

- The riparian buffers in retained lands;
- Lands to be added to the conservation area between the boundary roads and the offset lands once the former is defined by future engineering and structure plans;
- Replanting of the conservation area in selected locations; and
- Local street scape planting and retaining of native vegetation in the certified area where possible.

### **Edge effects**

Edge effects are an indirect impact and relate to how ecological interactions are altered along the edge between two adjacent and competing land uses, in this case the zone between the proposed Certified Area, the E1 and E2 Conservation Areas and also the retained areas that will act as informal conservation areas. Such edge effects invariably result in an altered microclimate (light, heat and moisture) which can lead to a reduction in the resilience of native bushland, potential for weed invasion, potential for increased grazing of stock and altered predator-prey relationships. In respect to the mitigation of potential edge effects on site, stock will be removed, the conservation area fenced and public access will be minimised through the construction of a perimeter road in addition to a 10 metre buffer around the all areas of retained vegetation and the Conservation E1 and E2 Areas. Therefore, including private lot set backs the buffer would be effectively 20 to 25 metres. It is envisaged that this would contribute substantially to the management of uncontrolled human, pet and vehicle access into the adjacent Conservation Area and provide immunity from the consequences of edge effects.

Given the substantial buffer area, of which 10 metres will be fully revegetated along the boundary of the western E1 Conservation Area, and the mitigation measures listed above, it is anticipated that the only un-mitigated edge effect will be a minor level of weed invasion as a result of the altered microclimate and rubbish dumping by residents. Predator-prey relationships are unlikely to be exacerbated any more than currently exist on the site and it is anticipated that weed invasion would be limited to a few minor annual herbaceous weeds with, at worst the potential for some invasion of perennial exotic grasses within two or three metres of the disturbance edge. Current weed invasion within remnant vegetation within the Assessment Area generally doesn't extend more than 10 metres from an edge. Therefore, a 10 metre buffer was selected to absorb the impacts from herbaceous weed invasion and rubbish dumping. This 10 metre buffer for edge effects is considered more than adequate given mitigation, through an on-site weed management program, will prioritise weed invasion along the development edge and the exclusion zone created by the fencing of the Conservation Area would likely incorporate the buffer (i.e., in reality form a component of the Conservation Area).



# Landscape Value Assessment

Done

Assessment Circle Number / Name

CMA Subregion

calculate landscape value score

BrimbinCircle

% Native Vegetation Cover in 1000ha Circle:

**Before certification**  
41-50%

**After certification**  
41-50%

Size of assessment circle (certified areas) (ha circle)

8000

**Area of land as an offset in the assessment area (ha)**

998.4

Size of assessment circle (offset area) (ha circle)

8000

**Connectivity Value**

**The land proposed to be certified impacts on a**  
Nil

**The land proposed for an offset in the assessment area includes a**  
Regional biodiversity link

**Adjacent Remnant Area (hectares)**

**The land proposed to be certified**  
501 (ha)

**The land proposed as an offset**  
501 (ha)

**Landscape value score**

**Certification area**  
10

**Offset area**  
18.75

**Status:**

Completed

Add Assessment Circle

Delete this Assessment Circle

### 5.3 Threatened Species Assessment

An assessment was completed for species requiring survey under the BCAM. Appendix E is a list of the threatened fauna predicted to occur in the PCTs at the site. These species are offset by the Ecosystem Credits generated within the Conservation Area.

Threatened species requiring survey as determined by the Calculator are discussed in Section 2.4.

Threatened species recorded within the Assessment Area that also generate Species Credits include the following:

- Brush-tailed Phascogale and Koala - 82.5 hectares of habitat in the Certification Area and 904.3 hectares of habitat in the Conservation Area;
- *Corybas dowlingii* (Red Helmet-orchid) - a single record in the Conservation Area;
- *Eucalyptus glaucina* (Slaty Red Gum) - seven records from the Conservation Area, as well as two records from the retained lands (riparian); and
- *Eucalyptus seeana* (Narrow-leaved Red Gum) - an estimated 3,215 individuals in the Certification Area and 16,160 individuals will be reserved in the E1 and E2 Conservation Areas (including replanting). A further 2,015 individuals are estimated to occur within the retained lands, 3,791 individuals are estimated to occur within the West Wallsend Offset and 195 individuals within the Vegetation 10 metre buffer.

Although the Black-necked Stork and Comb-crested Jacana were recorded from the study area, their habitat only occurs within the retained lands so species credits are not considered further for these two species.

The information as presented above is used in the third stage of the Calculator to determine the Species Credits required and those generated. Areas of habitat were determined by an examination of the appropriate vegetation types within the Assessment Area, including low-lying cleared areas for Black-necked Stork and Comb-crested Jacana.

The area of habitat within the Certification Area and Conservation Area for each of the two threatened fauna species was calculated as per Table 12 (Koala and Brush-tailed Phascogale). More habitat exists for each of these species within the non-assessable retained lands.

**Table 12. Area of assessable habitat for Koala and Brush-tailed Phascogale (arboreal mammals)**

Niche Veg Code	Niche Veg Type	Certification Area (ha)	Conservation Area (ha)
BT	Blackbutt Tallowood Tall Open Forest	1.6	115.7
FG	Flooded Gum Brush Box Tall Forest	0	7.0
TG	Grey Gum Stringybark Tallowood Tall Open Forest	4.7	141.5
RGIB	Narrow-leaved Red Gum Ironbark Woodland	32.1	89.4
RG Ang	Red Gum Angophora Mahogany Woodland	0	22.9
RGIB Mel	Red Gum Grey Ironbark Paperbark Forest	3.1	207.5
SI	Spotted Gum Ironbark Forest	39.4	188.7

SM	Swamp Mahogany Forest	0	66.9
SO	Swamp Oak Forest	1.6	64.7
<b>Total</b>		<b>82.50</b>	<b>904.30</b>

## 5.4 Assessment Summary

The following section summarises the credits required from the Certification Area and the credits generated from the Conservation Area. Table 13, 14 and 15 should be referred to in relation to this section.

### 5.4.1 Ecosystem credits

Table 13 is a summary of the credit status from PCT through to Keith Class level. A deficit in credits exists for a single PCT, HU763 Tallowwood - Spotted Gum - Grey Gum grassy tall open forest (a deficit of 904 ecosystem credits). Impacts to all other eight PCTs can be fully offset on a like-for-like basis. The proposal has an overall surplus of 4,619 Ecosystem Credits.

#### Application of offset variation rules to Ecosystem Credits

##### *Step 1. IBRA bioregion*

The entirety of the Assessment Area and the conservation measures proposed are in the same IBRA bioregion (NSW North Coast).

##### *Step 2. Ecosystem Credit status at vegetation class level*

Under the offsetting rules of the BCAM, the shortage of 904 Ecosystem Credits for HU763, can be offset by the surpluses for either HU511 Blackbutt - Tallowwood dry grassy open forest (975 credits available) or HU762 Tallowwood - Small-fruited Grey Gum - Kangaroo Grass grassy tall open forest (1,645 credits available), as both of these PCTs occur in the same Keith Vegetation Class as HU763; Northern Hinterland Wet Sclerophyll Forests. Referring to Table 13, for the purposes of this assessment, retirement of the 904 ecosystem credit deficit for HU763 has occurred against the 975 ecosystem credit surplus for HU511, thereby reducing the credit surplus for HU511 to 71 credits. Thus the credit requirement for HU763 is reduced to 0 and therefore impacts to this PCT are considered to be offset.

##### *Step 3. Ecosystem Credit status at vegetation formation level*

Impacts to vegetation types within the Certified Area have been fully offset at PCT and Keith Class level and therefore offsetting at Keith Formation level is not required.

##### *Minor variation to offsetting rules*

Impacts to vegetation types within the Certified Area have been fully offset at PCT and Keith Class level and therefore a minor variation to the offsetting rules is not required.

**Table 13. Ecosystem Credit status**

Code	PCT name abbreviated	Class	Formation	Certified Area (ha)	Credits required	E2 Offset Area (ha)	E2 Credits (25%)	E1 Offset Area (ha)	E1 Credits (100%)	PCT Credit Status (Total)	Credit Status after class level retirement
HU934	Cabbage Gum - Forest Red Gum - Flax-leaved Paperbark Floodplain Forest	Coastal Floodplain Wetlands	Forested Wetlands	0	0	0	0	9.7	87	87	87
HU943	Swamp Oak swamp forest	Coastal Swamp Forests	Forested Wetlands	3.3	95	0	0	64.7	734	639	639
HU591	Paperbark swamp forest	Coastal Swamp Forests	Forested Wetlands	0.8	11	0	0	5.8	57	46	46
HU932	Swamp Mahogany - Flax-leaved Paperbark swamp forest	Coastal Swamp Forests	Forested Wetlands	0	0	0	0	66.9	802	802	802
HU703	Narrow-leaved Red Gum woodlands	Coastal Valley Grassy Woodlands	Grassy Woodlands	96.0	2,083	62.6	132	276.3	3,260	1,309	1,309
HU783	Flooded Gum - Brush Box - Tallowwood mesic tall open forest	North Coast Wet Sclerophyll Forests	Wet Sclerophyll Forests	0	0	7.0	20	0	0	20	20
HU511	Blackbutt - Tallowwood dry grassy open forest	Northern Hinterland Wet Sclerophyll Forests	Wet Sclerophyll Forests	7.0	140	0	0	116.6	1,115	975	71
HU762	Tallowwood - Small-fruited Grey Gum - Kangaroo Grass grassy tall open forest	Northern Hinterland Wet Sclerophyll Forests	Wet Sclerophyll Forests	6.4	181	0	0	179.3	1,826	1,645	1,645
HU763	Tallowwood - Spotted Gum - Grey Gum grassy tall open forest	Northern Hinterland Wet Sclerophyll Forests	Wet Sclerophyll Forests	145.5	3,135	1.0	3	208.5	2,228	-904	0
<b>Totals</b>				<b>259</b>	<b>5,645</b>	<b>70.6</b>	<b>155</b>	<b>927.8</b>	<b>10,109</b>	<b>4,619</b>	<b>4,619</b>

*(Shading used to indicate Keith Class alignment)*



## 5.4.2 Species credits

The following species credits are required for the development:

1. *Eucalyptus seeana* (45,929 credits);
2. Koala (2,171 credits); and
3. Brush-tailed Phascogale (1,650 credits).

The Strategy demonstrates that the Conservation Areas can more than adequately offset each of these three species (80,706 credits created for *Eucalyptus seeana* and 5,426 credits created for both Koala and Brush-tailed Phascogale).

Table 14 shows that, subject to approval of the MALD assessment (Appendix F), *Eucalyptus seeana* can be more than adequately offset through the retirement of species credits purely within the proposed E1 Conservation Area. Niche have calculated that a further 3,180 species credits can be created for *Eucalyptus seeana* through the conservation of an additional 2,120 individuals within the proposed E2 Conservation Area, including replanting (25 per cent of full credit generation), and a further 3,534 credits generated for planting of 584 *E. seeana* in E1 Conservation areas. Therefore, the full suite of conservation measures in both E1 and E2 areas will generate 87,420 *Eucalyptus seeana* species credits.

Neither *Corybas dowlingii* nor *Eucalyptus glaucina* are impacted by the proposed development and therefore no offsetting of these species is required.

**Table 14. Species Credit status (balance) - threatened flora**

Species	Listing status (NSW)	No on land to be certified	Number of credits required for certification	Red flagged	No on land under offset (E1 only)	Number of credits created for offset	Status of Species Credits (Flora)
<i>Eucalyptus glaucina</i> Slaty Red Gum	V	0	0	No	7	42	42
<i>Eucalyptus seeana</i> Narrow-leaved Red Gum	EP (Taree LGA)	3,215	45,929	No	13,451 *	80,706	34,777
<i>Corybas dowlingii</i> Red Helmet Orchid	E	0	0	No	1	6	6

\* Stems conserved in E1 remnant areas only. Additional 3,534 credits generated for planting of 584 *E. seeana* in E1 areas (refer to Table 10) and a further 3,180 credits can be generated through the conservation and replanting of 2,120 individuals in E2 areas.

Two threatened fauna recorded within the Assessment Area are not predicted in ecosystem credits on the site and therefore retirement of species credits is required for each of these species. These species are the Brush-tailed Phascogale and Koala. The assessable area of habitat is used to calculate the species credits required and created for threatened fauna.

As is evident from Table 15, an excess of species credits is generated for both the Brush-tailed Phascogale and Koala.

**Table 15. Species Credit status (balance) - threatened fauna**

Species	Listing status (NSW)	Certified area of habitat (ha)	Number of credits required for certification	Red flagged	Conservation area of habitat (ha)	Number of credits created for offset	Status of Species Credits (Fauna)
<i>Phascogale tapoatafa</i> Brush-tailed Phascogale	V	82.5	1,650	No	904.3	5,426	3,776
<i>Phascolarctos cinereus</i> Koala	V	82.5	2,171	No	904.3	5,426	3,275

## 6 CONCLUSION

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This report has described the natural environment of the Assessment Area and how the developments within it will achieve an ‘improve or maintain’ outcome for biodiversity outcomes as required by the BCAM (DECCW 2011).

Ecosystem and species credit calculations using the Biodiversity Certification Credit Calculator have shown that, subject to approval of red flag variations for three EECs (Swamp Sclerophyll Forest, Subtropical Coastal Floodplain Forest and Swamp Oak Floodplain Forest) and approval of the MALD Assessment for the *Eucalyptus seeana* Endangered Population (Appendix F), retirement of ecosystem and species credits will achieve an improved outcome from the conferral of Biodiversity Certification on the Brimbin Draft Structure Plan.

A *Biodiversity Certification Strategy* has been prepared to describe the conservation measures proposed and also provide a justification in relation to impacts on red flags through an address of the red flag criteria.

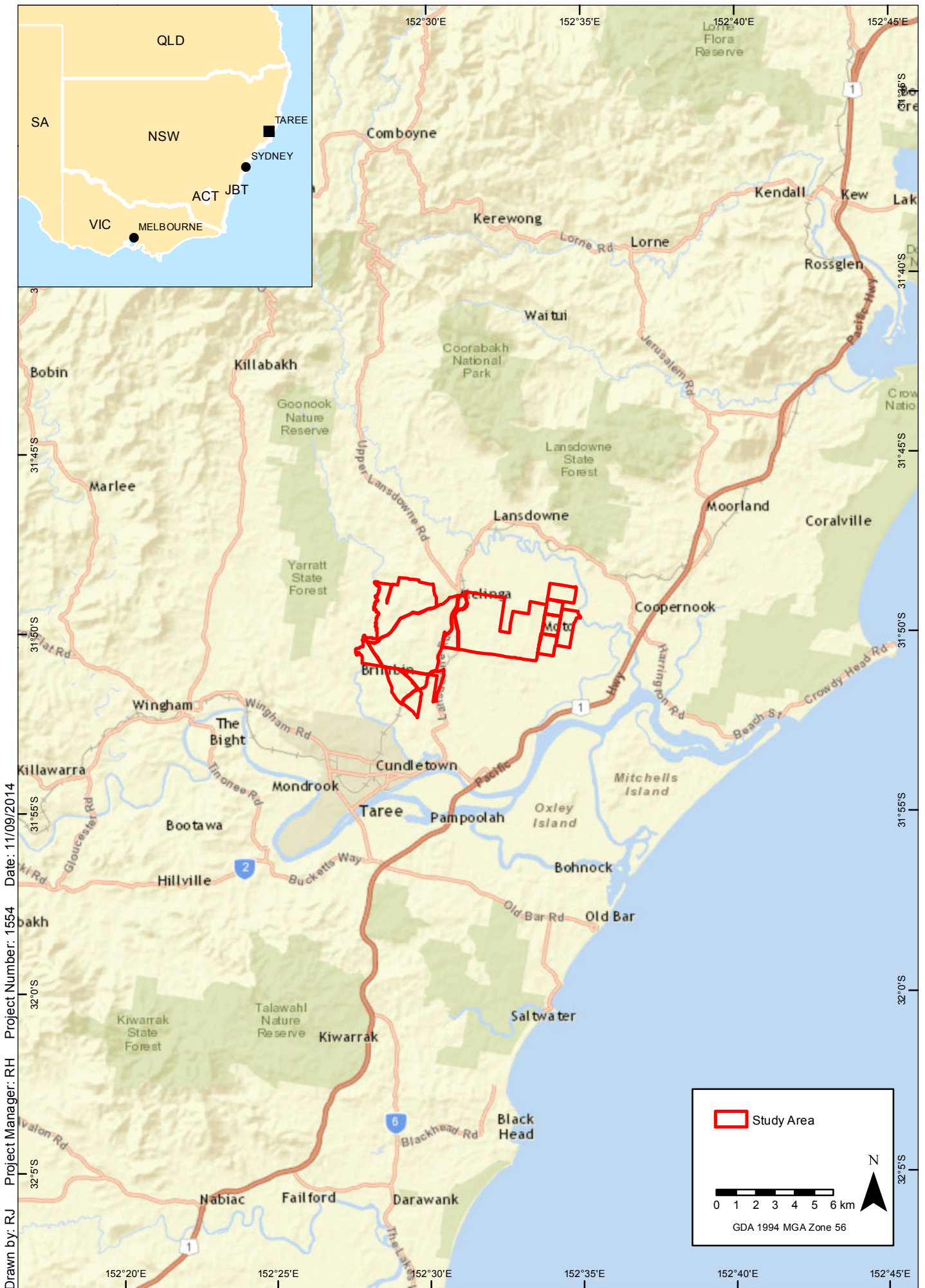
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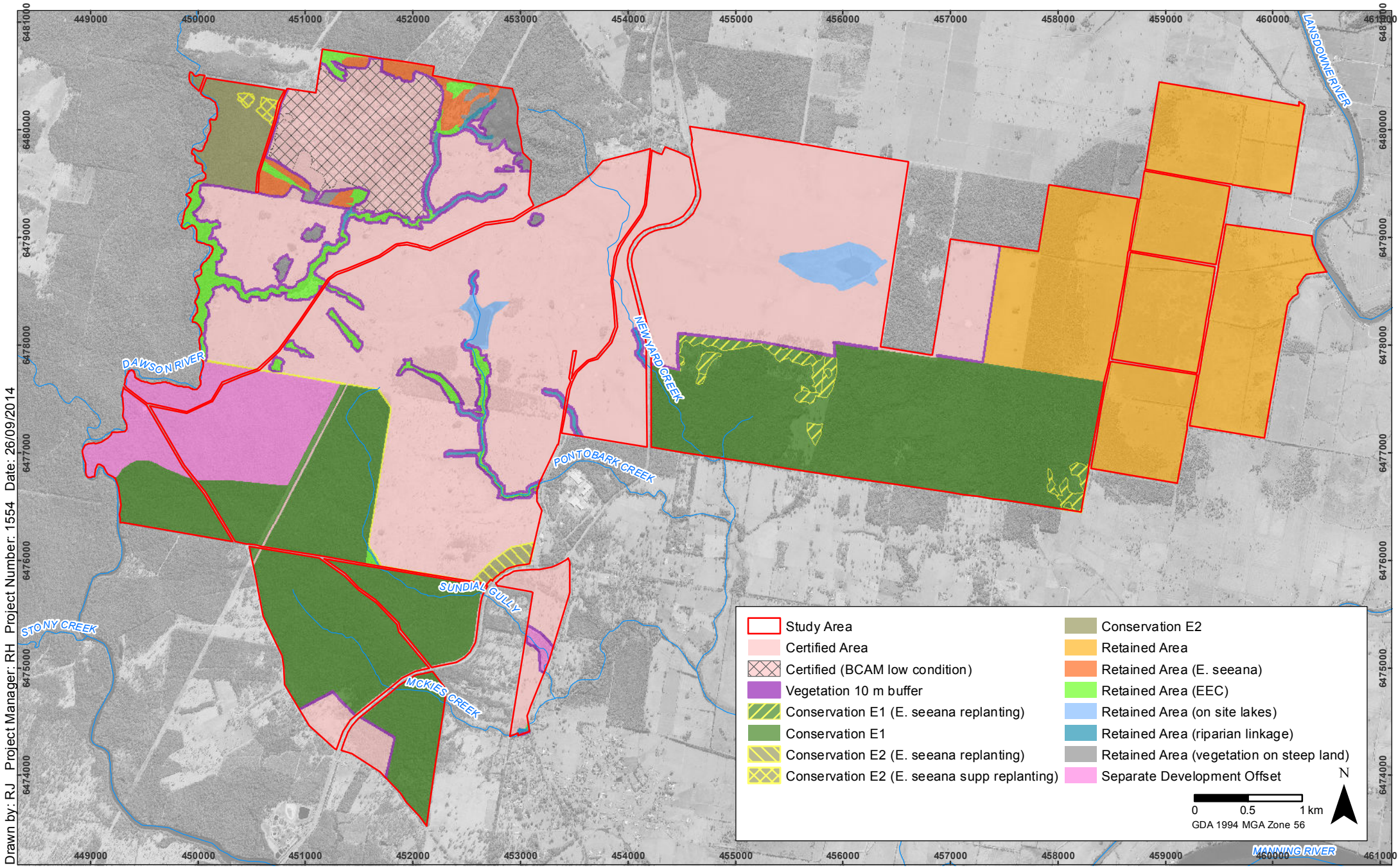
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# FIGURES



Location of the Biodiversity Certification Assessment Area  
Brimbin Biocertification Assessment

FIGURE 1



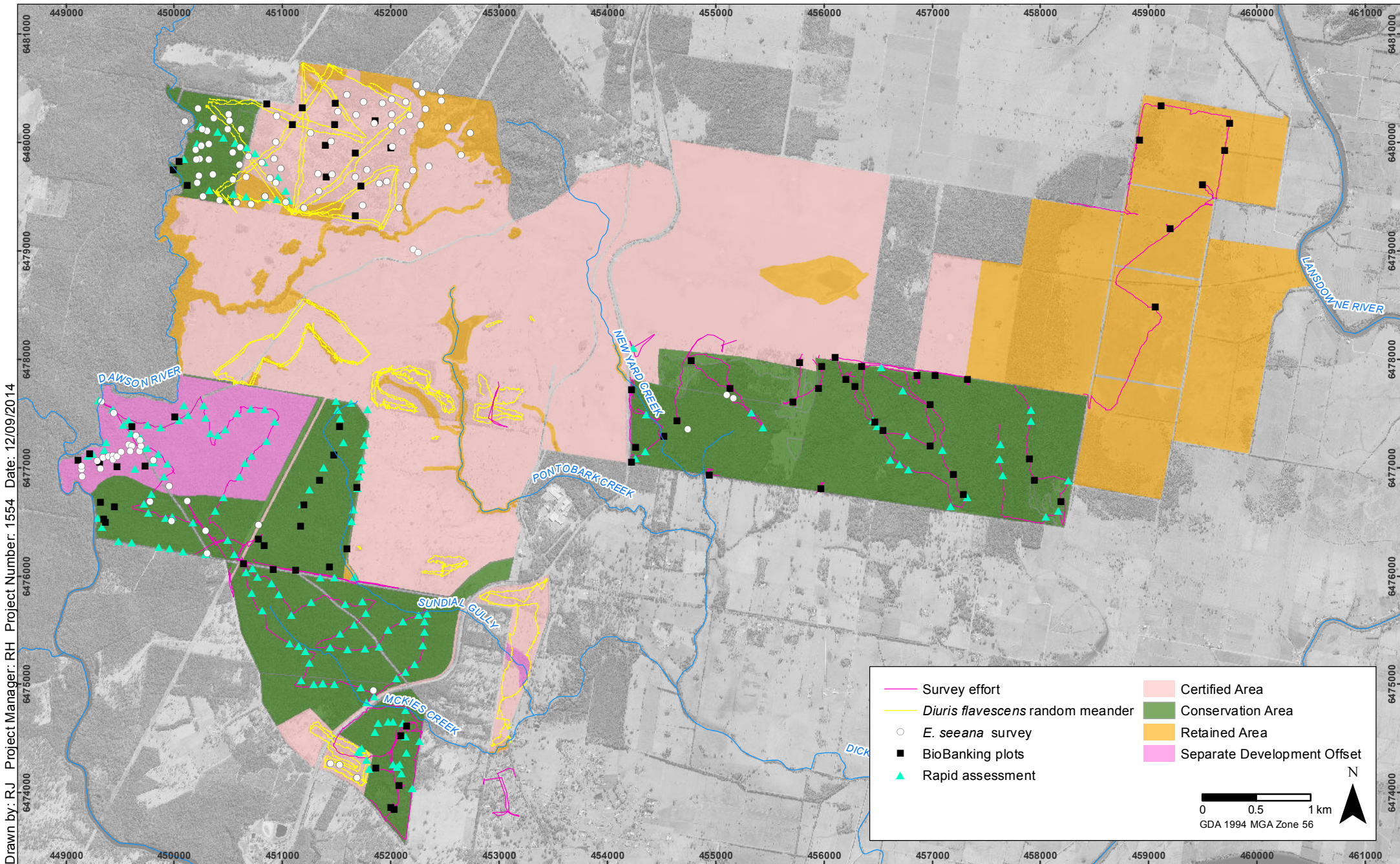
Drawn by: R.J. Project Manager: RH. Project Number: 1554. Date: 26/09/2014

Biodiversity Certification Assessment Area  
Brimbin Biocertification Assessment

**FIGURE 2**

Imagery: (c) OEH 2010 - 2013

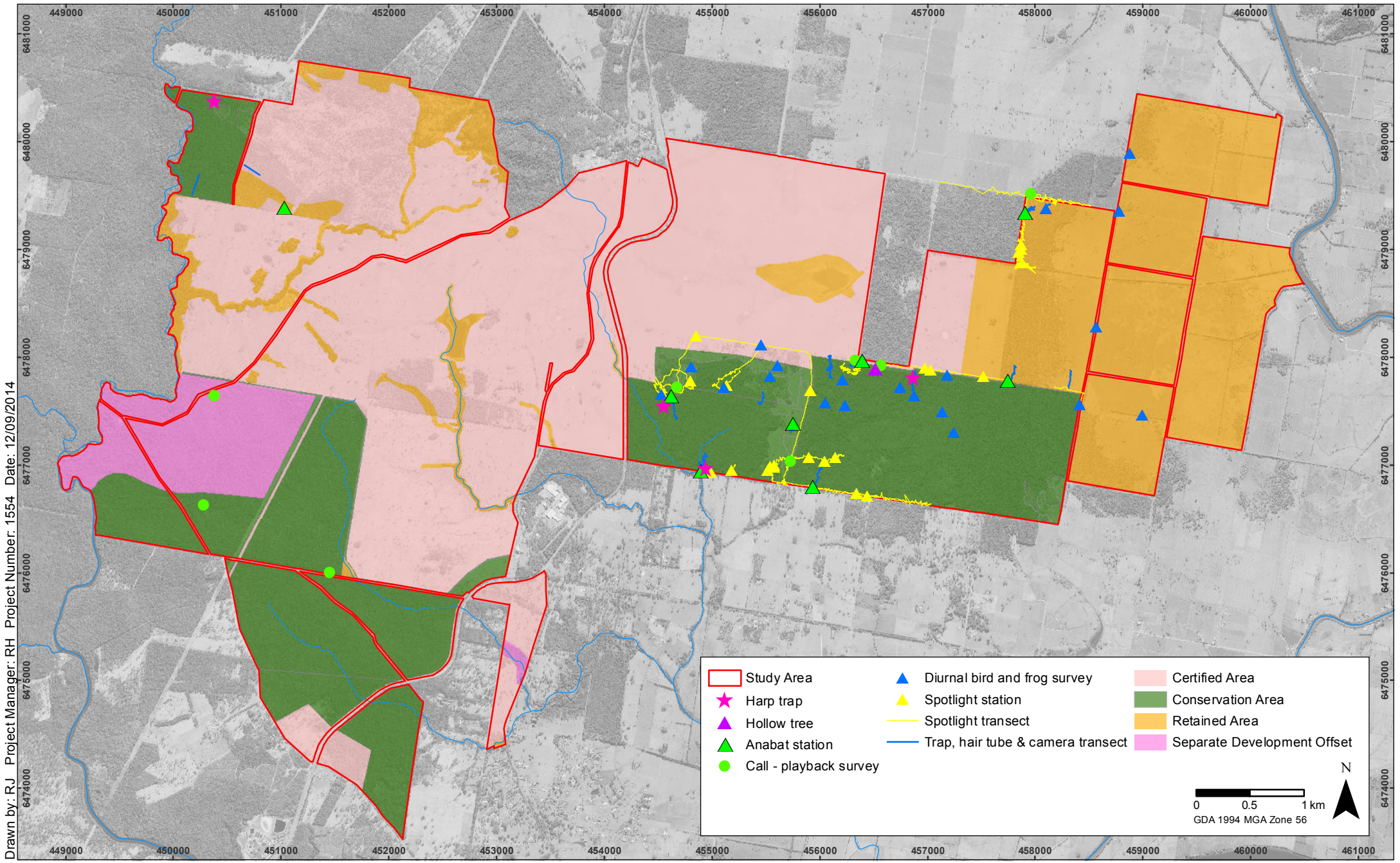




Flora survey effort  
Brimbin Biocertification Assessment

**FIGURE 3**

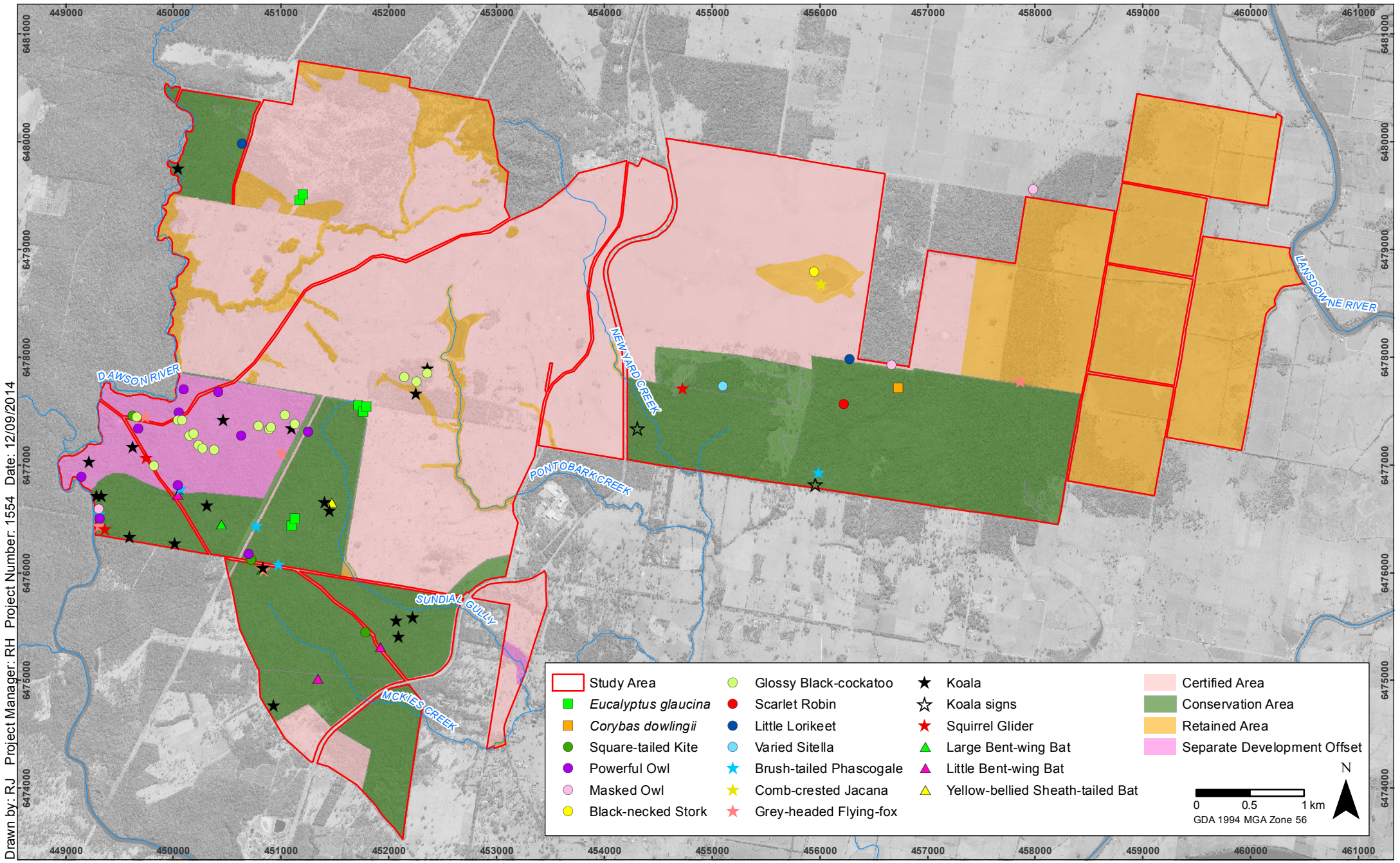
Imagery: (c) OEH 2010 - 2013



Fauna survey effort  
Brimbin Biocertification Assessment

**FIGURE 4**

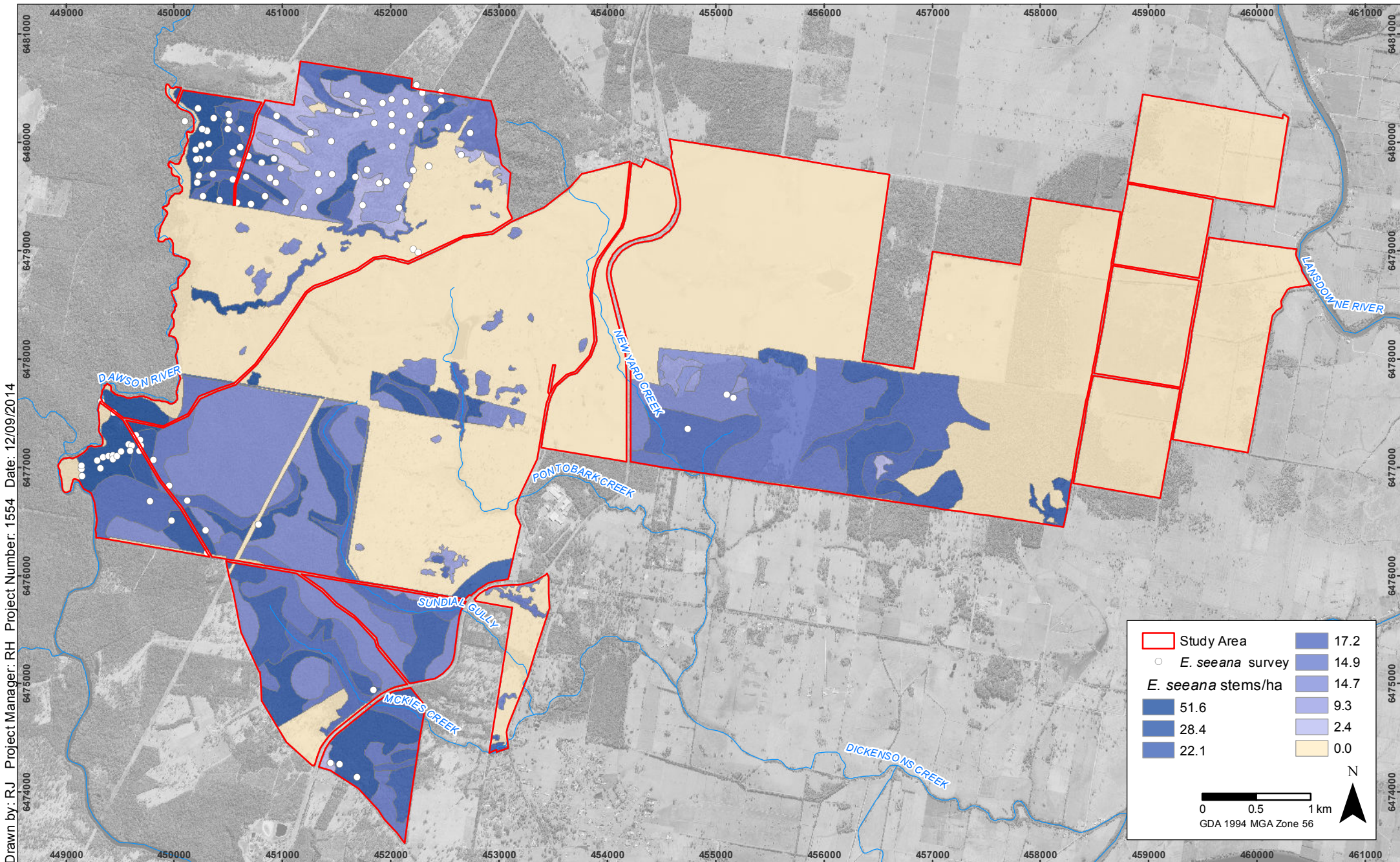
Imagery: (c) OEH 2010 - 2013



Threatened flora and fauna located during survey  
Brimbin Biocertification Assessment

**FIGURE 5**

Imagery: (c) OEH 2010 - 2013

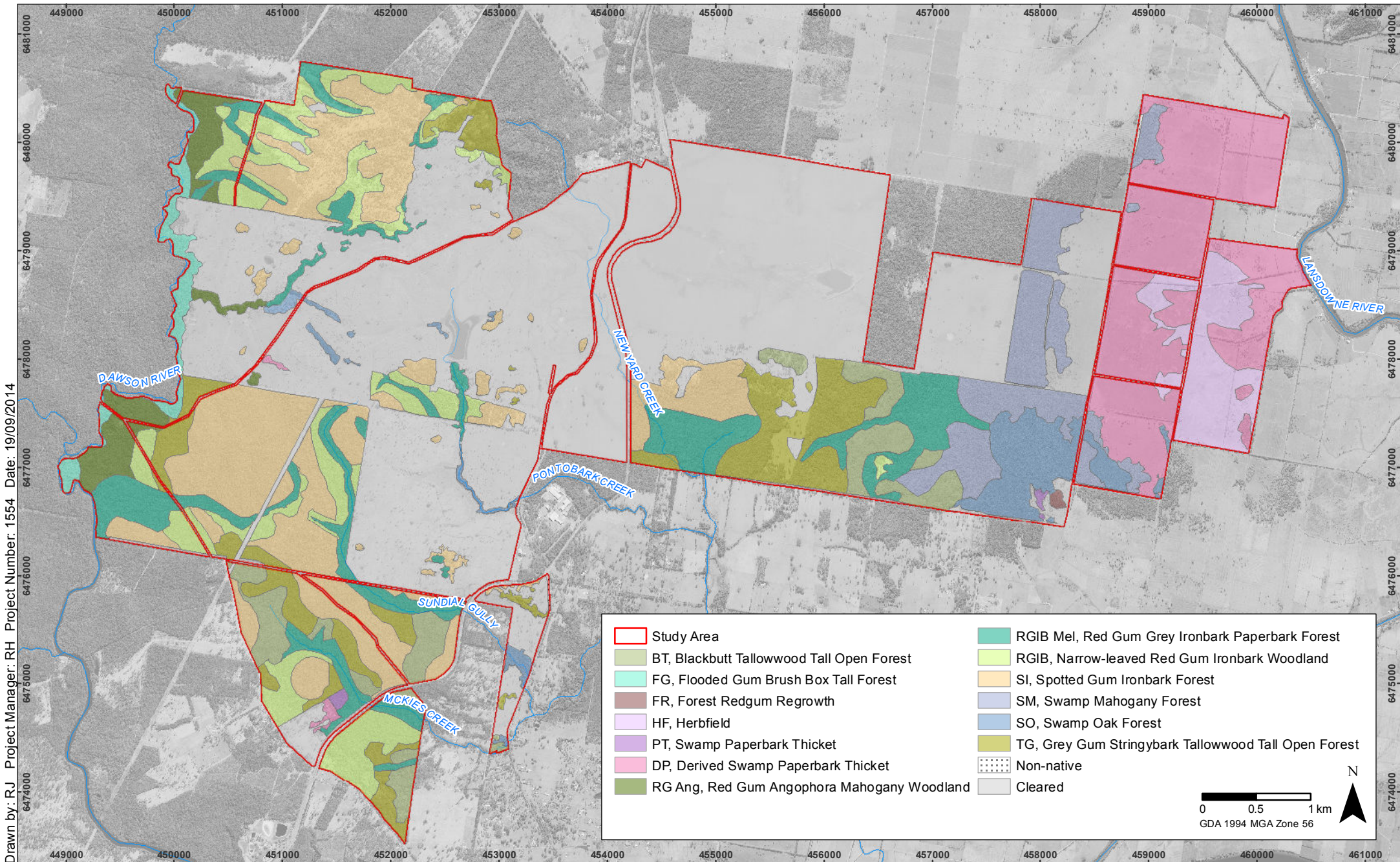


*Eucalyptus seeana* calculated stem density  
Brimbin Biocertification Assessment

**FIGURE 6**

Imagery: (c) OEH 2010 - 2013

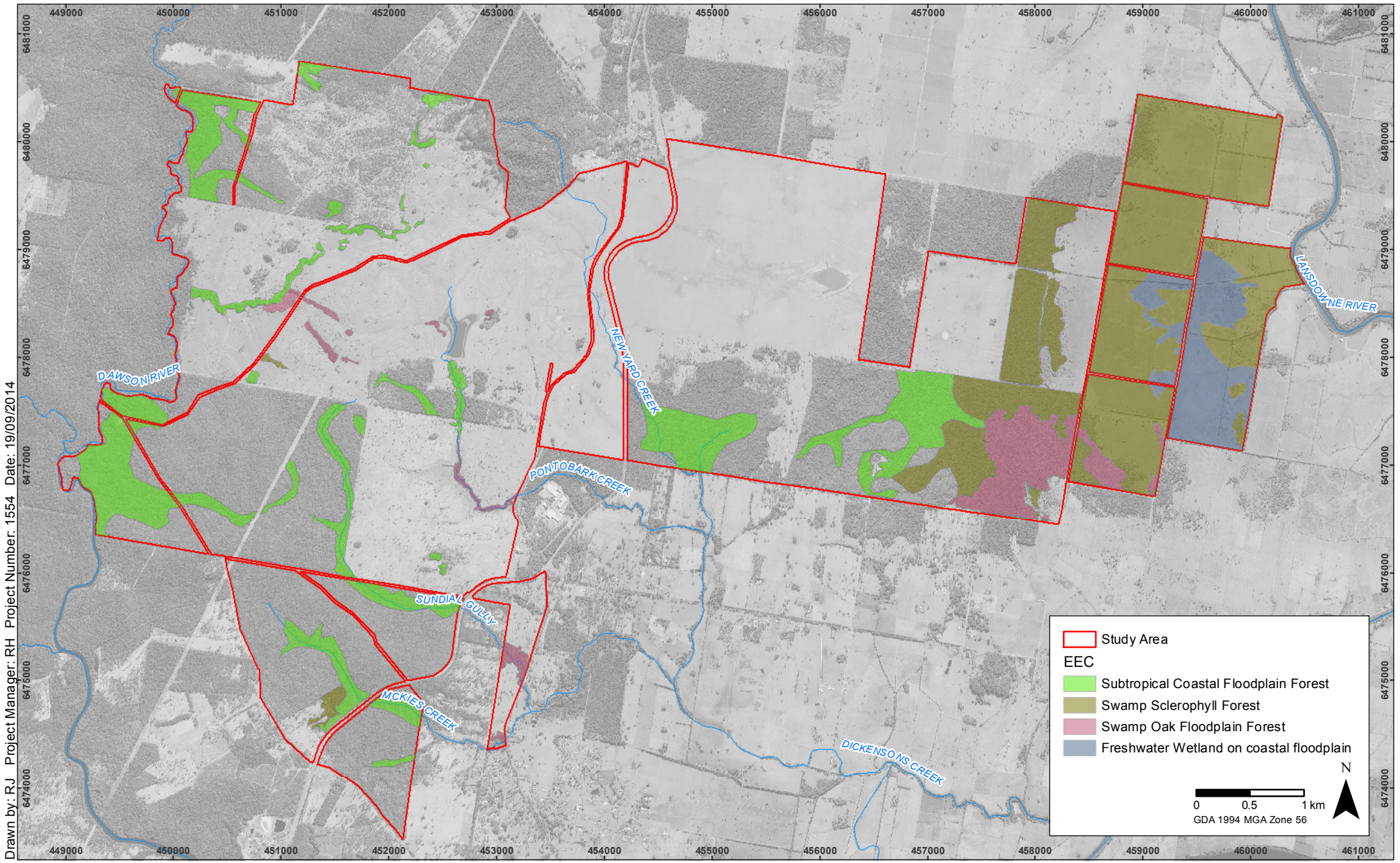
Drawn by: R.J. Project Manager: RH. Project Number: 1554. Date: 12/09/2014



Vegetation mapping (Niche 2011)  
Brimbin Biocertification Assessment

**FIGURE 7**

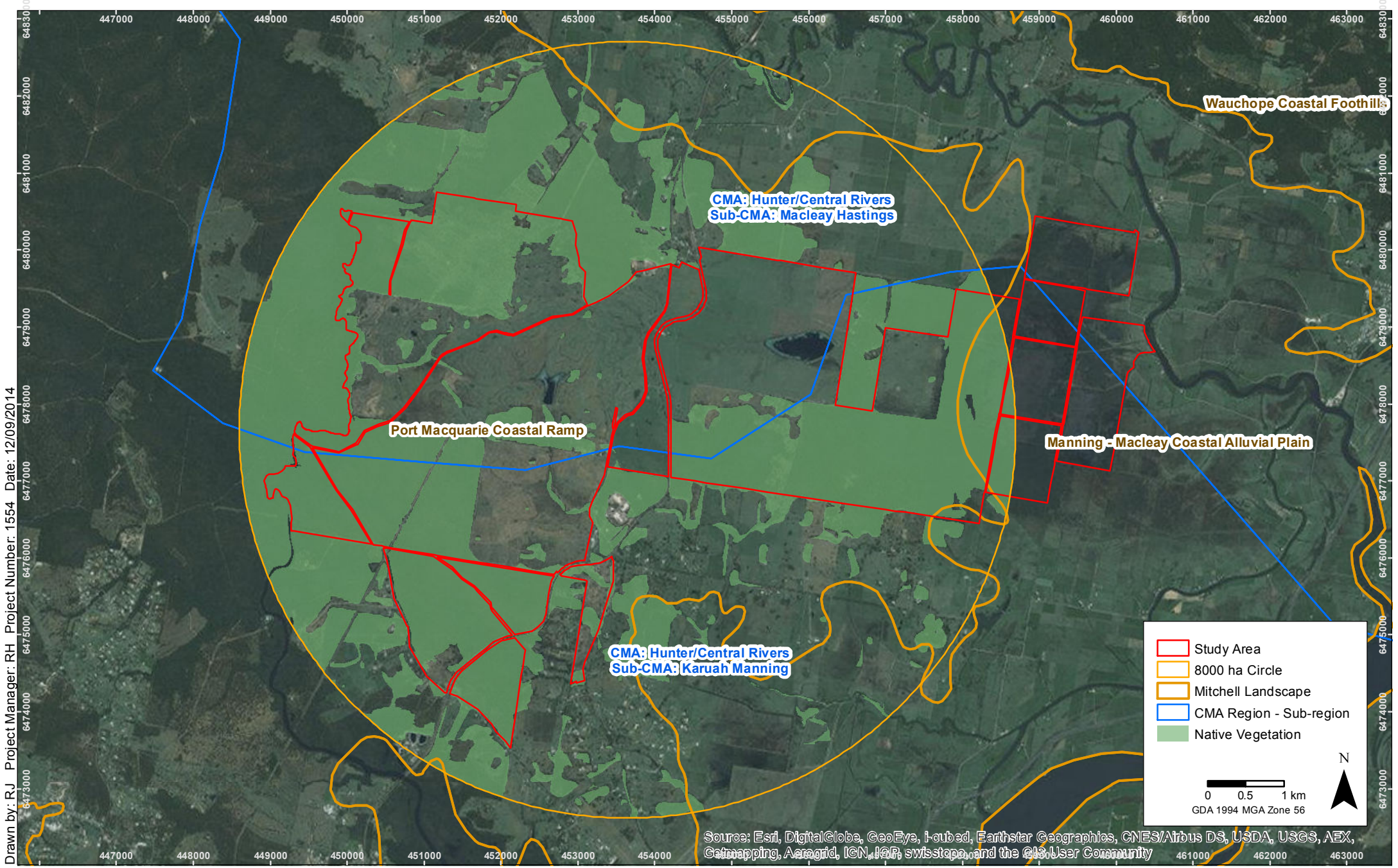
Imagery: (c) OEH 2010 - 2013



Endangered Ecological Communities  
Brimbin Biocertification Assessment

**FIGURE 8**

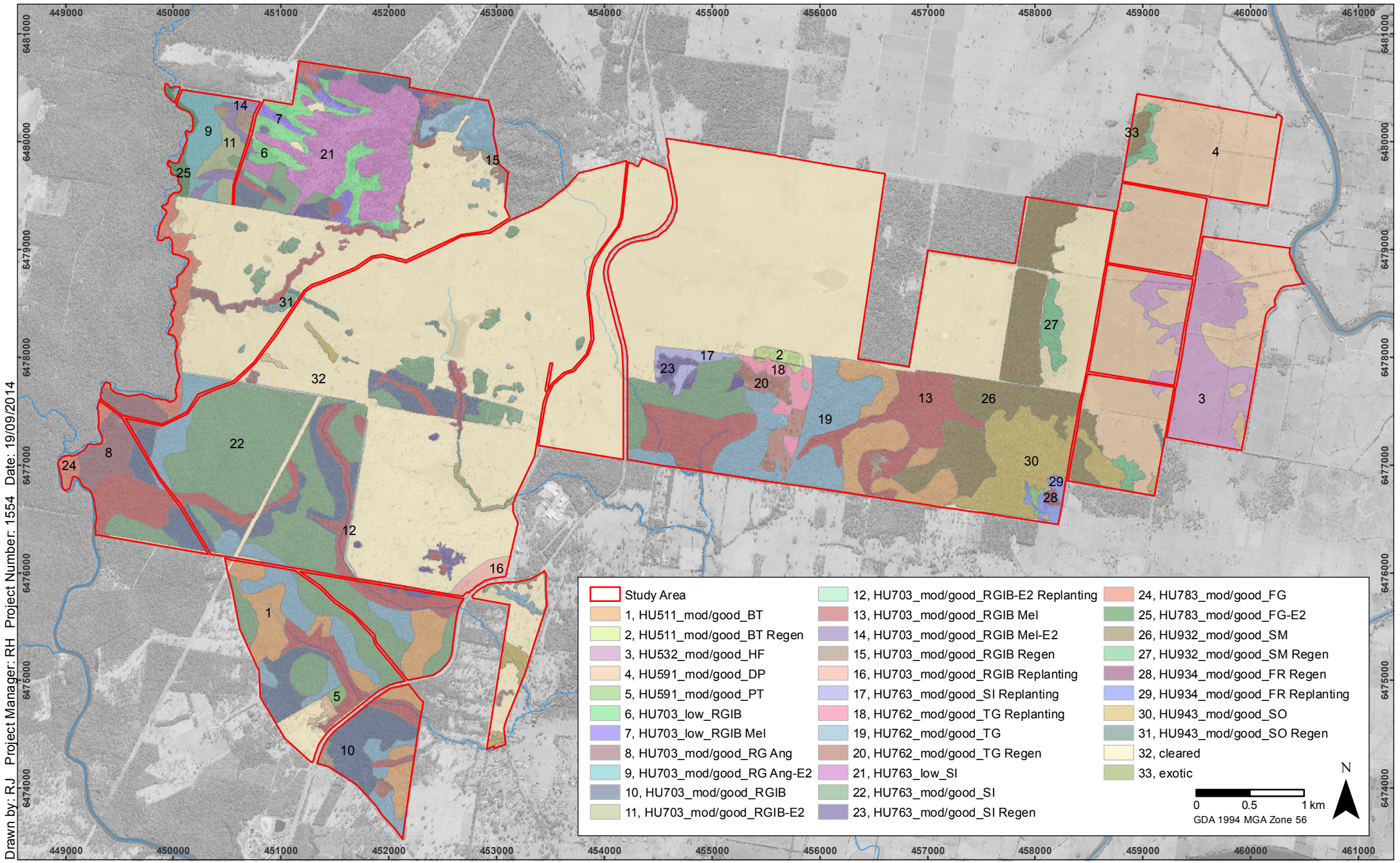
Imagery: (c) OEH 2010 - 2013



Landscape and connectivity assessment  
Brimbin Biocertification Assessment

**FIGURE 9**

Imagery: (c) OEH 2010 - 2013



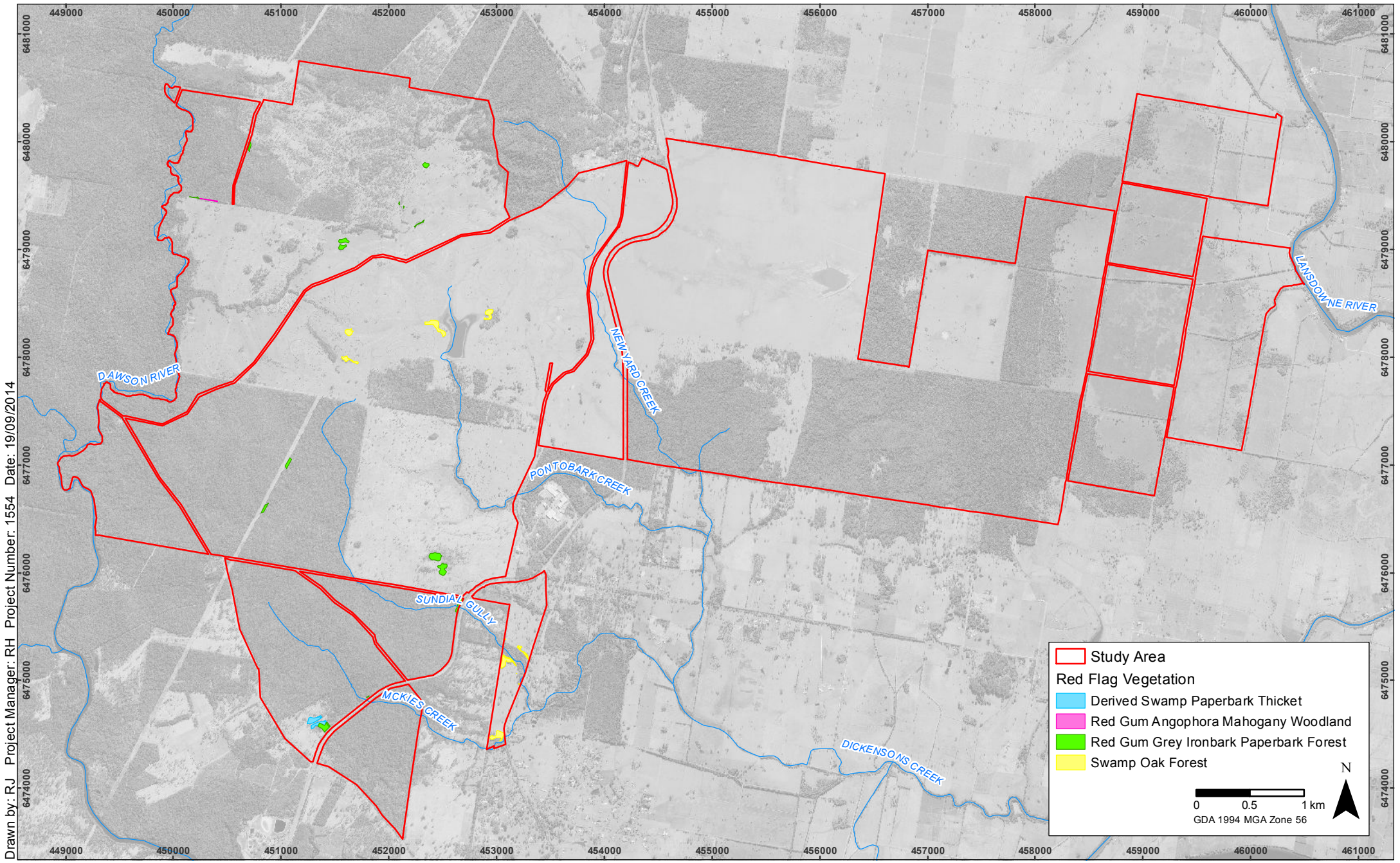
Vegetation zones  
Brimbin Biocertification Assessment

**FIGURE 10**

Imagery: (c) OEH 2010 - 2013

Note: Five vegetation zones within the indirect impact area are too fine a scale to map. They occur within a ten metre buffer around the Conservation Area



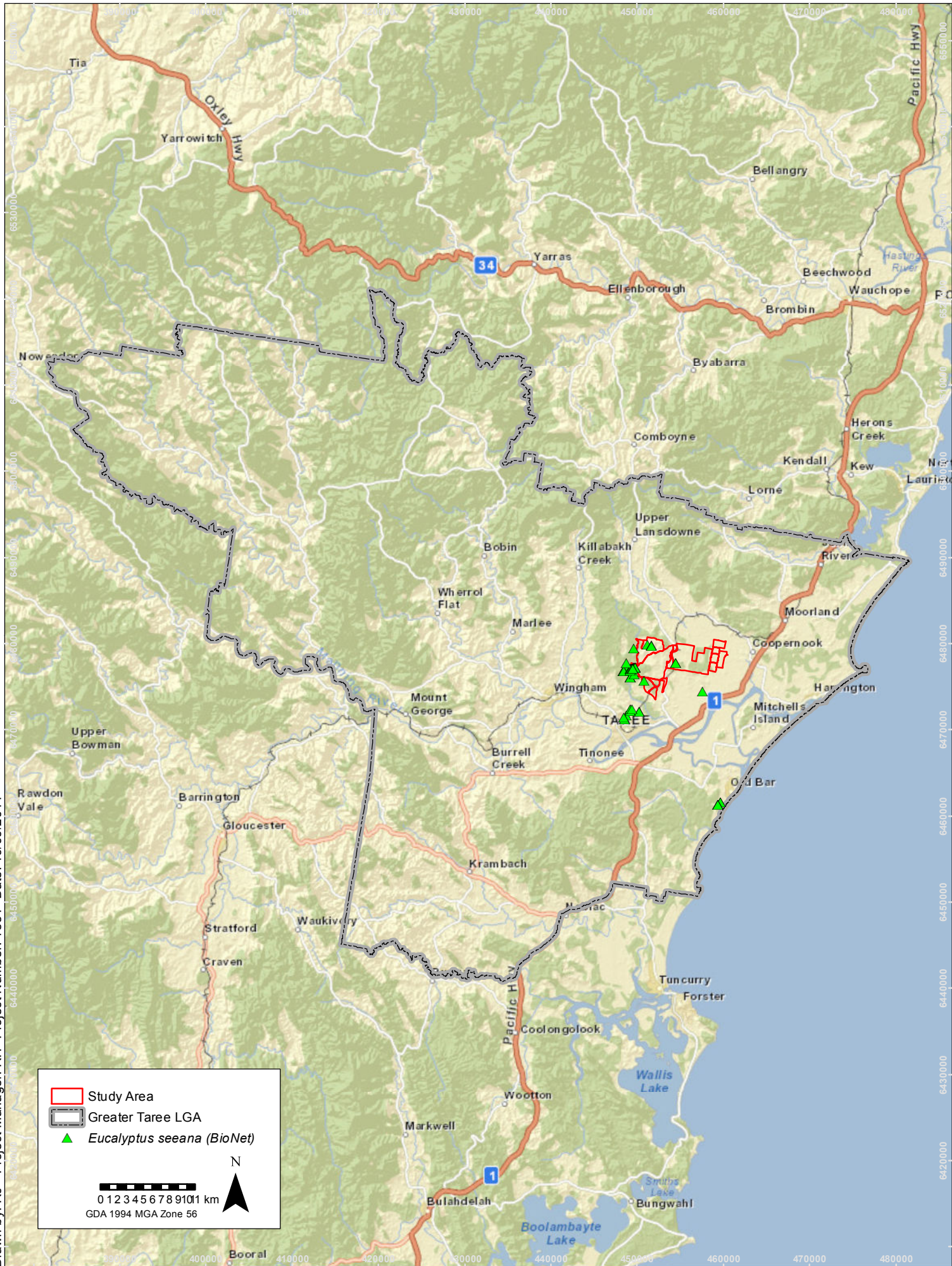


Red Flag vegetation that requires a variation  
Brimbin Biocertification Assessment

**FIGURE 11**

Imagery: (c) OEH 2010 - 2013

Drawn by: RJ Project Manager: RH Project Number: 1554 Date: 19/09/2014



*Eucalyptus seeana* Endangered Population within Greater Taree LGA

Brimbin Biocertification Assessment

# APPENDICES

## Appendix A: Alignment of parent Niche Vegetation Types to PCTs, EECs, Class and Formation (sorted by Formation and Class)

Vegetation Code	Niche Vegetation Type	EEC	PCT Code	PCT Name (abbreviated)	Keith Formation	Keith Class
FR	Forest Redgum (early regeneration)	Not an EEC (but highly cleared vegetation type, 90 %)	HU934	Cabbage Gum - Forest Red Gum - Flax-leaved Paperbark Floodplain Forest	Forested Wetlands	Coastal Floodplain Wetlands
HF	Herbfield	Freshwater Wetland	HU532	Coastal floodplain sedgelands, rushlands, and forblands	Forested Wetlands	Coastal Floodplain Wetlands
DP	Derived Swamp Paperbark Thicket	Swamp Sclerophyll Forest	HU591	Paperbark swamp forest	Forested Wetlands	Coastal Swamp Forests
PT	Swamp Paperbark Thicket	Swamp Sclerophyll Forest	HU591	Paperbark swamp forest	Forested Wetlands	Coastal Swamp Forests
SM	Swamp Mahogany Forest	Swamp Sclerophyll Forest	HU932	Swamp Mahogany - Flax-leaved Paperbark swamp forest	Forested Wetlands	Coastal Swamp Forests
SO	Swamp Oak Forest	Swamp Oak Forest	HU943	Swamp Oak swamp forest	Forested Wetlands	Coastal Swamp Forests
RG Ang	Red Gum Angophora Mahogany Woodland	Subtropical Coastal Floodplain Forest	HU703	Narrow-leaved Red Gum woodlands	GW	Coastal Valley Grassy Woodlands
RGIB	Narrow-leaved Red Gum Ironbark Woodland	Not an EEC	HU703	Narrow-leaved Red Gum woodlands	GW	Coastal Valley Grassy Woodlands
RGIB Mel	Red Gum Grey Ironbark Paperbark Forest	Subtropical Coastal Floodplain Forest	HU703	Narrow-leaved Red Gum woodlands	GW	Coastal Valley Grassy Woodlands
FG	Flooded Gum Brush Box Tall Forest	Not an EEC	HU783	Flooded Gum - Brush Box - Tallowwood mesic tall open forest	Wet Sclerophyll Forests (shrubby sub-formation)	North Coast Wet Sclerophyll Forests
BT	Blackbutt Tallowwood Tall Open Forest	Not an EEC	HU511	Blackbutt - Tallowwood dry grassy open forest	Wet Sclerophyll Forests (grassy sub-formation)	Northern Hinterland Wet Sclerophyll Forests
SI	Spotted Gum Ironbark Forest	Not an EEC	HU763	Tallowwood - Spotted Gum - Grey Gum grassy tall open forest	Wet Sclerophyll Forests (grassy sub-formation)	Northern Hinterland Wet Sclerophyll Forests
TG	Grey Gum Stringybark Tallowwood Tall Open Forest	Not an EEC	HU762	Tallowwood - Small-fruited Grey Gum - Kangaroo Grass grassy tall open forest	Wet Sclerophyll Forests (grassy sub-formation)	Northern Hinterland Wet Sclerophyll Forests

## Appendix B: Niche vegetation types compared to previous on-site vegetation mapping

Niche Vegetation Type (2011)	Whelans Insites (2009)	Connell Wagner (2004)	Greater Taree City Council Types	Forest Ecosystems (NPWS 1999)
Blackbutt Tallowwood Tall Open Forest	-	Dry Grassy Blackbutt Tallowwood Complex	4	FE 34
Small-fruited Grey Gum Stringybark Tallowwood Tall Open Forest	Grey Gum Tallowwood Forest	Grey Gum Complex	3b, 3c	FE 36
Flooded Gum Brush Box Tall Forest	Flooded Gum Turpentine Forest	Flooded Gum Complex	1a	FE 154
Spotted Gum Ironbark Forest	Spotted Gum Ironbark Forest	Spotted Gum Complex	4b	-
Grey Box Red Gum Grey Ironbark Woodland	-	Grey Box, Red Gum, Grey Ironbark Complex	3h	FE 54
Forest Red Gum Open Woodland	-	-	Loosely 6	FE 36
Narrow-leaved Red Gum Ironbark Woodland	Grey Gum Ironbark Forest	Part of Grey Gum Complex	Loosely 6	-
Narrow-leaved Red Gum Angophora Mahogany Woodland	Grey Gum Ironbark Forest	Redgum – Apple Complex	Loosely 3b	-
Narrow-leaved Red Gum Grey Ironbark Paperbark Forest	Grey Gum Ironbark Forest	-	Loosely 3b	-
Herbfield	-	-	-	FE 141
Swamp Paperbark Thicket and Derived type	-	-	15	FE 112
Swamp Mahogany Forest	-	Swamp Mahogany Complex	14a	FE 142
Swamp Oak Forest	-	Swamp Oak Complex	7	FE 143

## Appendix C: Flora Recorded During the Field Survey

<i>Acacia blakei</i> ssp. <i>diphylla</i>	<i>Dianella revoluta</i>	<i>Lagenophora gracilis</i>
<i>Acacia floribunda</i>	<i>Dichondra repens</i>	<i>Lagenophora stipitata</i>
<i>Acacia maidenii</i>	<i>Digitaria parviflora</i>	<i>Lantana camara</i> *
<i>Acacia myrtifolia</i>	<i>Echinopogon caespitosus</i>	<i>Leptospermum polygalifolium</i>
<i>Acacia ulicifolia</i>	<i>Entolasia marginata</i>	<i>Leucopogon juniperinus</i>
<i>Acianthus fornicatus</i>	<i>Entolasia stricta</i>	<i>Lomandra filiformis</i> spp. <i>filiformis</i>
<i>Acmena smithii</i>	<i>Eragrostis benthamii</i>	<i>Lomandra longifolia</i>
<i>Acronychia oblongifolia</i>	<i>Eragrostis brownii</i>	<i>Lomandra multiflora</i> ssp. <i>multiflora</i>
<i>Allocasuarina littoralis</i>	<i>Eucalyptus amplifolia</i>	<i>Lophostemon confertus</i>
<i>Alphitonia excelsa</i>	<i>Eucalyptus carnea</i>	<i>Marsdenia suaveolens</i>
<i>Andropogon virginicus</i> *	<i>Eucalyptus eugenioides</i>	<i>Melaleuca ericifolia</i>
<i>Angophora subvelutina</i>	<i>Eucalyptus glaucina</i>	<i>Melaleuca linariifolia</i>
<i>Aristida vagans</i>	<i>Eucalyptus globoidea</i>	<i>Melaleuca nodosa</i>
<i>Axonopus fissifolius</i> *	<i>Eucalyptus grandis</i>	<i>Melaleuca quinquenervia</i>
<i>Banksia spinulosa</i> var. <i>collina</i>	<i>Eucalyptus microcorys</i>	<i>Melaleuca sieberi</i>
<i>Baumea articulata</i>	<i>Eucalyptus pilularis</i>	<i>Melaleuca styphelioides</i>
<i>Billardiera scandens</i>	<i>Eucalyptus propinqua</i>	<i>Microlaena stipoides</i>
<i>Blechnum indicum</i>	<i>Eucalyptus resinifera</i>	<i>Mitrasacme</i> sp.
<i>Breynia oblongifolia</i>	<i>Eucalyptus robusta</i>	<i>Morinda jasminoides</i>
<i>Brunoniella australis</i>	<i>Eucalyptus seeana</i>	<i>Myrsine howittiana</i>
<i>Caesia parviflora</i>	<i>Eucalyptus siderophloia</i>	<i>Myrsine variabilis</i>
<i>Caladenia catenata</i>	<i>Eucalyptus tereticornis</i>	<i>Neolitsea dealbata</i>
<i>Callistemon citrinus</i>	<i>Euchiton sphaericus</i>	<i>Notelaea longifolia</i>
<i>Callistemon salignus</i>	<i>Eustrephus latifolius</i>	<i>Notothixos incanus</i>
<i>Calochlaena dubia</i>	<i>Exocarpus cupressiformis</i>	<i>Opercularia</i> sp.
<i>Carex appressa</i>	<i>Fimbristylis dichotoma</i>	<i>Oplismenus aemulus</i>
<i>Cassine australis</i>	<i>Gahnia clarkei</i>	<i>Oplismenus imbecillus</i>
<i>Casuarina glauca</i>	<i>Gahnia sieberiana</i>	<i>Oxalis exilis</i>
<i>Centella asiatica</i>	<i>Galium</i> sp.	<i>Oxalis perennans</i>
<i>Cheilanthes sieberi</i>	<i>Geitonoplesium cymosum</i>	<i>Ozothamnus diosmifolius</i>
<i>Chenopodium album</i> *	<i>Glochidion ferdinandi</i> var. <i>ferdinandi</i>	<i>Pandorea pandorana</i>
<i>Chorizandra cymbaria</i>	<i>Glochidion ferdinandi</i> var. <i>pubens</i>	<i>Panicum simile</i>
<i>Christella dentata</i>	<i>Glycine clandestina</i>	<i>Parsonsia straminea</i>
<i>Cinnamomum camphora</i> *	<i>Glycine microphylla</i>	<i>Paspalidium distans</i>
<i>Cirsium vulgare</i> *	<i>Glycine tabacina</i>	<i>Paspalum dilatatum</i> *
<i>Convolvulus erubescens</i>	<i>Gonocarpus teucroides</i>	<i>Persicaria</i> sp.
<i>Conyza</i> sp.*	<i>Goodenia</i> sp.	<i>Persoonia linearis</i>
<i>Corybas dowlingii</i>	<i>Gymnostachys anceps</i>	<i>Philydrum lanuginosum</i>
<i>Corymbia intermedia</i>	<i>Hemarthria uncinata</i>	<i>Pimelea linifolia</i>
<i>Corymbia maculata</i>	<i>Hibbertia aspera</i>	<i>Pittosporum revolutum</i>
<i>Cryptocarya microneura</i>	<i>Hibbertia riparia</i>	<i>Pittosporum undulatum</i>
<i>Cryptostylis</i> sp.	<i>Hibbertia scandens</i>	<i>Plantago lanceolata</i> *
<i>Cymbopogon refractus</i>	<i>Hybanthus monopetalus</i>	<i>Platycerium bifurcatum</i>
<i>Cynodon dactylon</i>	<i>Hydrocotyle peduncularis</i>	<i>Plectorrhiza tridentata</i>
<i>Cyperus congestus</i> *	<i>Hypericum gramineum</i>	<i>Poa labillardierei</i> var. <i>labillardierei</i>
<i>Cyperus</i> sp.	<i>Hypochaeris radicata</i> *	<i>Podolobium scandens</i>
<i>Daviesia genistifolia</i>	<i>Hypolepis muelleri</i>	<i>Pomaderris</i> sp.
<i>Daviesia ulicifolia</i>	<i>Imperata cylindrica</i>	<i>Pratia purpurascens</i>
<i>Desmodium gunnii</i>	<i>Jacksonia scoparia</i>	<i>Pseuderanthemum variabile</i>
<i>Desmodium rhytidophyllum</i>	<i>Juncus usitatus</i>	<i>Pteridium esculentum</i>
<i>Dianella caerulea</i> var. <i>producta</i>		<i>Pterostylis</i> sp.

*Pultenaea rosmarinifolia*  
*Ranunculus inundatus*  
*Rubus moluccanus*  
*Rubus ulmifolius\**  
*Sannantha similis*  
*Schoenus paludosus*  
*Senecio madagascariensis\**  
*Setaria parviflora\**  
*Smilax glyciophylla*  
*Solanum mauritianum\**  
*Stephania japonica*  
*Syncarpia glomulifera*  
*Tricoryne elatior*  
*Verbena bonariensis\**  
*Vernonia cinerea*  
*Veronica calycina*  
*Viola betonicifolia*  
*Viola hederacea*



## Appendix D: Fauna Recorded During the Field Survey

Common Name	Scientific Name	Observation Type
<b>Mammals - Native</b>		
Brown Antechinus	<i>Antechinus stuartii</i>	T
Bush Rat	<i>Rattus fuscipes</i>	T
Swamp Rat*	<i>Rattus lutreolus</i>	I
Brush-tailed Phascogale	<i>Phascogale tapoatafa</i>	T
Eastern Grey Kangaroo	<i>Macropus giganteus</i>	O
Red-necked Wallaby	<i>Macropus rufogriseus</i>	O
Feathertail Glider*	<i>Acrobates pygmaeus</i>	I
Sugar Glider	<i>Petaurus breviceps</i>	IHT
Long-nosed Bandicoot	<i>Perameles nasuta</i>	C
Brushtail Possum	<i>Trichosurus vulpecula</i>	IOT
Ringtail Possum	<i>Pseudocheirus peregrinus</i>	C
Little Forest Bat	<i>Vespadelus vulturnus</i>	T
Grey-headed Flying Fox	<i>Pteropus poliocephalus</i>	OH
<b>Mammals - Introduced</b>		
Hare	<i>Lepus europaeus</i>	O
Rabbit	<i>Oryctolagus cuniculus</i>	O
Black Rat	<i>Rattus rattus</i>	T
House Mouse	<i>Mus musculus</i>	IO
Red Fox	<i>Vulpes vulpes</i>	O
Feral Cat	<i>Felis catus</i>	I
<b>Frogs</b>		
Common Eastern Froglet	<i>Crinia signifera</i>	H
Striped Marsh Frog	<i>Limnodynastes peronii</i>	H
Wallum Rocket Frog	<i>Litoria freycineti</i>	O
Verreaux's Tree Frog	<i>Litoria verreauxii</i>	H
<b>Birds</b>		
Australasian Grebe	<i>Tachybaptus novaehollandiae</i>	O
Australasian Shoveler	<i>Anas rhynchos</i>	O
Australian Hobby	<i>Falco longipennis</i>	O
Australian Magpie	<i>Cracticus tibicen</i>	OH
Australian Owllet Nightjar	<i>Aegotheles cristatus</i>	H
Australian Raven	<i>Corvus coronoides</i>	H
Australian Wood Duck	<i>Chenonetta jubata</i>	O

Common Name	Scientific Name	Observation Type
Barn Owl	<i>Tyto javanica</i>	OH
Black Duck	<i>Anas superciliosa</i>	O
Black Swan	<i>Cygnus atratus</i>	O
Black-faced Cuckoo Shrike	<i>Coracina novaehollandiae</i>	OH
Black-necked Stork	<i>Ephippiorhynchus australis</i>	O
Black-shouldered Kite	<i>Elanus axillaris</i>	O
Brown Falcon	<i>Falco berigora</i>	O
Brown Gerygone	<i>Gerygone mouki</i>	H
Brown Thornbill	<i>Acanthiza pusilla</i>	H
Buff-rumped Thornbill	<i>Acanthiza reguloides</i>	O
Cattle Egret	<i>Ardea ibis</i>	O
Comb-crested Jacana	<i>Irediparra gallinacea</i>	O
Eastern Rosella	<i>Platycercus eximius</i>	OH
Eastern Spinebill	<i>Acanthorhynchus superciliosus</i>	OH
Eastern Whipbird	<i>Psophodes olivaceus</i>	H
Eastern Yellow Robin	<i>Eopsaltria australis</i>	O
Fan-tailed Cuckoo	<i>Cacomantis flabelliformis</i>	H
Galah	<i>Eolophus roseicapillus</i>	OH
Golden Whistler	<i>Pachycephala pectoralis</i>	OH
Golden-headed Cisticola	<i>Cisticola exilis</i>	O
Great Egret	<i>Ardea alba</i>	O
Grey Butcherbird	<i>Cracticus torquatus</i>	H
Grey Fantail	<i>Rhipidura albiscapa</i>	OH
Grey Goshawk	<i>Accipiter novaehollandiae</i>	O
Grey Shrike Thrush	<i>Colluricincla harmonica</i>	OH
Grey Teal	<i>Anas Gracilis</i>	O
Laughing Kookaburra	<i>Dacelo novaeguineae</i>	H
Lewin's Honeyeater	<i>Meliphaga lewinii</i>	H
Little Black Cormorant	<i>Phalacrocorax sulcirostris</i>	O
Little Lorikeet	<i>Glossopsitta pusilla</i>	OH
Little Wattlebird	<i>Anthochaera chrysoptera</i>	H
Magpie Lark	<i>Grallina cyanoleuca</i>	OH
Masked Lapwing	<i>Vanellus miles</i>	OH
Masked Owl	<i>Tyto novaehollandiae</i>	H
Mistletoebird	<i>Dicaeum hirundinaceum</i>	H
Musk Lorikeet	<i>Glossopsitta concinna</i>	OH
Nankeen Kestrel	<i>Falco cenchroides</i>	O

Common Name	Scientific Name	Observation Type
New Holland Honeyeater	<i>Phylidonyris novaehollandiae</i>	OH
Noisy Friarbird	<i>Philemon corniculatus</i>	H
Noisy Miner	<i>Manorina melanocephala</i>	OH
Peregrine falcon	<i>Falco peregrinus</i>	O
Pheasant Coucal	<i>Centropus phasianinus</i>	O
Pied Butcherbird	<i>Cracticus nigrogularis</i>	OH
Pied Cormorant	<i>Phalacrocorax varius</i>	O
Purple Swamphen	<i>Porphyrio porphyrio</i>	O
Rainbow Lorikeet	<i>Trichoglossus haematodus</i>	OH
Red Wattlebird	<i>Anthochaera carunculata</i>	OH
Red-browed Finch	<i>Neochmia temporalis</i>	OH
Richards Pipit	<i>Anthus novaeseelandiae</i>	O
Rose Robin	<i>Petroica rosea</i>	H
Royal Spoonbill	<i>Platalea regia</i>	O
Rufous Whistler	<i>Pachycephala rufiventris</i>	OH
Scarlet Robin	<i>Petroica boodang</i>	O
Silvereye	<i>Zosterops lateralis</i>	H
Southern Boobook Owl	<i>Ninox novaeseelandiae</i>	H
Spangled Drongo	<i>Dicrurus bracteatus</i>	O
Spotted Pardalote	<i>Pardalotus punctatus</i>	H
Straw-necked Ibis	<i>Threskiornis spinicollis</i>	O
Striated Pardalote	<i>Pardalotus striatus</i>	H
Striated Thornbill	<i>Acanthiza lineata</i>	OH
Superb Fairy Wren	<i>Malurus cyaneus</i>	H
Superb Lyrebird	<i>Menura novaehollandiae</i>	OH
Tawny Frogmouth	<i>Podargus strigoides</i>	O
Torresian crow	<i>Corvus orru</i>	H
Varied Sittella	<i>Daphoenositta chrysoptera</i>	OH
Weebill	<i>Smicromis brevirostris</i>	H
Welcome Swallow	<i>Hirundo neoxena</i>	O
White-browed Scrubwren	<i>Sericornis frontalis</i>	H
White-cheeked Honeyeater	<i>Phylidonyris nigra</i>	OH
White-faced Heron	<i>Egretta novaehollandiae</i>	O
White-throated Treecreeper	<i>Cormobates leucophaeus</i>	OH
White-winged Chough	<i>Corcorax melanorhamphos</i>	O
Willie wagtail	<i>Rhipidura leucophrys</i>	O
Wonga Pigeon	<i>Leucosarcia melanoleuca</i>	OH

Common Name	Scientific Name	Observation Type
Yellow Thornbill	<i>Acanthiza nana</i>	O
Yellow-billed Spoonbill	<i>Platalea flavipes</i>	O
Yellow-faced Honeyeater	<i>Lichenostomus chrysops</i>	OH
Yellow-tailed Black Cockatoo	<i>Calyptorhynchus funereus</i>	H

Key: O = Observed, H = Heard, T = Trapped, C = Camera Trap I = Indirect Evidence such as scats, hair or feeding signs. \* indicates probable identification through hair analysis.

## Appendix E: Threatened fauna predicted

Common Name	Scientific Name	Tg value
Barking Owl	<i>Ninox connivens</i>	0.33
Barred Cuckoo-shrike	<i>Coracina lineata</i>	0.68
Bush Stone-curlew	<i>Burhinus grallarius</i>	0.38
Common Blossom-bat	<i>Syconycteris australis</i>	0.83
Eastern Bentwing-bat	<i>Miniopterus schreibersii oceanensis</i>	0.75
Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>	0.45
Eastern Freetail-bat	<i>Mormopterus norfolkensis</i>	0.45
Flame Robin	<i>Petroica phoenicea</i>	0.75
Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>	0.55
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>	0.45
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	0.93
Hooded Robin (south-eastern form)	<i>Melanodryas cucullata cucullata</i>	0.6
Little Bentwing-bat	<i>Miniopterus australis</i>	0.75
Little Eagle	<i>Hieraaetus morphnoides</i>	0.73
Little Lorikeet	<i>Glossopsitta pusilla</i>	0.58
Long-nosed Potoroo	<i>Potorous tridactylus</i>	0.75
Masked Owl	<i>Tyto novaehollandiae</i>	0.33
Powerful Owl	<i>Ninox strenua</i>	0.33
Red-legged Pademelon	<i>Thylogale stigmatica</i>	0.38
Scarlet Robin	<i>Petroica boodang</i>	0.75
Southern Myotis	<i>Myotis macropus</i>	0.45
Speckled Warbler	<i>Chthonicola sagittata</i>	0.38
Spotted Harrier	<i>Circus assimilis</i>	0.73
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	0.38
Square-tailed Kite	<i>Lophoictinia isura</i>	0.73
Squirrel Glider	<i>Petaurus norfolcensis</i>	0.45
Superb Fruit-Dove	<i>Ptilinopus superbus</i>	0.75
Swift Parrot	<i>Lathamus discolor</i>	0.75
Varied Sittella	<i>Daphoenositta chrysoptera</i>	0.75
Wompoo Fruit-Dove	<i>Ptilinopus magnificus</i>	0.75
Yellow-bellied Glider	<i>Petaurus australis</i>	0.43
Yellow-bellied Sheath-tail-bat	<i>Saccolaimus flaviventris</i>	0.45

## Appendix F: Assessment of Certified Local Data under the BCAM in relation to the *Eucalyptus seeana* Endangered Population (MALD Assessment)

### Background

Under section 3.4 of the BCAM the use of certified local data is permissible under the following conditions:

*The Director General may certify that more appropriate local data can be used instead of the data in the Vegetation Types Database, Vegetation Benchmarks Database and the Threatened Species Profile Database. Local data may be used if the Director- General is of the opinion that the data more accurately reflects local environmental conditions. In certifying the use of local data, the Director General must provide reasons for this opinion.*

*Benchmark data that more accurately reflect the local environmental conditions for a vegetation type may be collected from local reference sites, or obtained from relevant published sources using the procedures set out in Appendix 2 [of the BCAM].*

*The certified local data can then be used in applying the methodology in accordance with any procedures outlined in the Biodiversity Certification Operational Manual.*

This assessment requests the use of certified local data for the *Eucalyptus seeana* Endangered Population in the application of the BCAM for the proposed certification of the Brimbin Draft Structure Plan. The use of certified, local data for the Endangered Population has been considered as it:

- More accurately reflects local environmental conditions; and
- Is more appropriate to the assessment of the proposed biodiversity certification of the Brimbin Draft Structure Plan, which is considered to provide a suitable outcome in relation to the conservation of the species in perpetuity.

The information in this report is not yet certified local data and will from here on be referred to as more appropriate local data (MALD) and this assessment, in general terms, as the MALD assessment.

### Aim of the MALD assessment

The MALD assessment aims to replace the data available in the Threatened Species Profile Database (TSPD) for the following field:

- “Ability to withstand loss?” - change the data for the *Eucalyptus seeana* Endangered Population within the TSPD from “No” to “Yes” (able to sustain a temporary reduction in numbers).

### Reasons for the assessment of More Appropriate Local Data

The reasons for the application for the use of local data are provided below. The information demonstrates that the *Eucalyptus seeana* Endangered Population is able to withstand a temporary reduction in numbers from the proposed biodiversity certification of the Brimbin Draft Structure Plan based on:

1. The relatively small number of individuals impacted by the proposed biodiversity certification compared to the number of individuals within the Taree LGA;
2. The conservation of a relatively high number of the local population within the Assessment Area, adjacent conservation reserves and offsets, compared to the number impacted by the proposed certification;
3. The degraded nature of a substantial portion of the habitat to be impacted within the Certified Area. It will be demonstrated that this portion is regrowth since the late 80s and has been subject to heavy grazing, stick-raking and additional land clearance activities (such as burning);
4. The majority of old growth trees with hollows are conserved within the Conservations Areas;
5. The immaturity of many of the individuals which leads to an over-abundance in previously disturbed habitats; and
6. The Credit Calculations have demonstrated that the proposed conservation measures more than adequately provides offset the impacts to the species.

Provided below is an outline of the species ecology, conservation status, its abundance within the Taree LGA. A description of the impact on the species and the offsets required are provided.

#### **Assessment of More Appropriate Local Data - *Eucalyptus seeana* Endangered Population**

##### *Description and conservation status*

The population of *Eucalyptus seeana* (narrow-leaved red gum) in the Greater Taree LGA is listed as an endangered population on Part 2 of Schedule 1 of the TSC Act (NSW Scientific Committee 2002). Neither the species nor the population are listed on the EPBC Act.

The Flora of NSW v.2 (Harden 2002) classifies the species as a red gum (Section *Exsertaria*) and describes it as a tree to 40 metres high with smooth white or grey bark that sheds in plates or flakes. The species has a wide distribution from Taree to Caloundra and the population in the Greater Taree LGA is disjunct and at or near the southern limit of the range of the species (NSW Scientific Committee 2002).

Within the Assessment Area, the species was clearly recognisable from other species in the red gum group, including the common *Eucalyptus tereticornis* (forest red gum), by its distinctively smaller and narrower leaves and bark type (Author pers. comm.). Compared to other red gums in the Assessment Area, the species had a distinctively sparse and open crown due to the smaller foliage. The species was observed in large numbers, both as mature remnant trees and immature regrowth and in general, was in greater densities within lower parts of the landscape associated with periodic inundation (e.g. flow channels and floodplains). This latter association is consistent with the description for the species in the OEH on-line profile (OEH Threatened Species Profiles, accessed September 2014).

##### *Distribution and extent*

*Eucalyptus seeana* is distributed from the Taree LGA north through Port Macquarie to South-west Rocks, where there is then a gap in the distribution until Woolli, north of Coffs Harbour. It is then common from Woolli to the NSW border and to Caloundra in the southern

Sunshine Coast of Queensland. No extensive count information exists for the species as a whole, though it is considered common where it occurs north of Taree LGA.

Within the Greater Taree LGA, the Atlas of NSW Wildlife lists 50 records for the species for which there are no reliable count data or population estimates. It is clear though, from the distribution of the species within the LGA, that the Brimbin locality is a hotspot for the Endangered Population. In this sense, the population estimates provided for *Eucalyptus seeana* in the Assessment Report are ahead of current published information on the species within the Greater Taree LGA and significant in terms of quantifying the extent and size of the population. Niche has estimated that 25,535 individuals exist within the local population, not including unknown numbers from locations other than the Brimbin Assessment Area within the LGA. Of these, 21,744 exist within the Assessment Area (i.e., the Certified Area, E1 and E2 Conservation Areas, retained lands and the Vegetation 10 metre buffer). The difference between the local population and that of the Assessment Area is 3,791 individuals and represents the portion of the population that occurs in the West Wallsend separate development offset area. For the purposes of this assessment, given that there is no reliable count information specified in either the Atlas of NSW Wildlife records or in the Final Determination (NSW Scientific Committee 2002), the size of the entire population within the Taree LGA is taken as 25,535 individuals. This estimate is based on the best available local data from rigorous field assessment, however is clearly an underestimate given the much broader extent of habitat within the entire LGA, other than in the Assessment Area.

#### *Avoid and mitigate*

The Draft Structure Plan has been subject to numerous revisions that have been based on avoiding impacts to the *Eucalyptus seeana* Endangered Population. The impacts to the population has been minimised through these revisions.

Details regarding the Weed Management Plan and Master Plan are provided in the Biodiversity Certification Strategy. Both will be implemented to minimise the overall impacts of conferring Biodiversity Certification at Brimbin.

#### *Impacts on the Eucalyptus seeana Endangered Population*

The area of *Eucalyptus seeana* habitat that will be removed in the Certified Area is 105 hectares, while 842.2 hectares will be conserved (including 45.2 hectares of replanting) in perpetuity as a result of the proposal (Section 3.4.1). This equates to the estimated formal conservation of 13,451 existing individuals in E1 lands and 1,635 in E2 lands, for the loss of 3,215 individuals in the Certified Area. A further 1,074 individuals will be planted in E1 and E2 revegetation zones (i.e., formally conserved), 2,015 individuals are estimated to occur within retained lands, 3,791 individuals are estimated to occur within the West Wallsend Offset and 195 individuals are estimated to occur within the buffer that has been allowed for indirect impacts but will be retained in this zone. On this basis, the number of individuals that will come under formal conservation in the E1 and E2 Conservation Areas for this Biodiversity Assessment only (16,160 plants including replanting) represents 63.3 per cent of the local population. The number of plants that are, or will be, conserved in retained lands, the West Wallsend offset and the vegetated buffer (6,001 individuals) represents a further 23.5 per cent of the local population.



The loss of 3,215 individuals represents 12.6 per cent of the local population and 15 per cent of the individuals within the Assessment Area. Of these, at least 1,242 occur as regrowth as recent as the late 80s, in land that has been assessed as being in BCAM ‘Low condition’ (refer to Section 3.2 of this Assessment Report). This area is mapped in Figure 2 and has been substantially altered in the past with the regrowth occurring almost in its entirety since 1989 (Section 3.1.3). As a result, the *Eucalyptus seeana* trees are mostly mid-storey regrowth to a maximum height of between 10 and 15 metres. Given the land use history in this area, it is considered that these trees are at artificially high densities in hillside and ridge-top habitats. Furthermore, if land use was to continue in its current form, numbers would be likely to decline and ecosystem resilience lost due to grazing pressure, clearing, burning off and pasture improvement. On this basis, it is likely that they are unsustainable at these densities and would naturally senesce as they age and because the habitat is considered to be less than ideal for the species.

Restoration and on-going management of vegetation which contain *Eucalyptus seeana* in the BCAM Low condition areas (1,242 immature individuals) would be prohibitively expensive due to the high inputs required to restore such non-resilient habitat. The potential gain to *Eucalyptus seeana* would be negligible given that the population is unlikely to be sustained at current densities in these areas.

If the estimated 1,242 individuals in the BCAM Low condition area are removed from consideration, then the remaining 1,973 individuals within the Certified Area represents 7.7 per cent of the local population, which is considered “minor”.

Whilst it is acknowledged that the actual percentage change is not quantifiable, it is considered that the percentage impact on the total population of the species is likely to be much lower than 7.7 per cent as:

1. Many more plants are known to exist in adjacent private and public lands (Author pers. obs.);
2. Many local occurrences, other than in the Assessment Area, would be protected in local conservation reserves (e.g., Brimbin Nature Reserve);
3. The species is considered common elsewhere in its broader distribution;
4. This assessment has assumed full loss for *Eucalyptus seeana* plants within the Certified Area. In all likelihood, the loss is likely to be substantially less than this as, where possible, individuals of *Eucalyptus seeana* within the certified area will be retained for street trees, open space and landscaping (e.g., parklands, golf courses); and
5. The proponent has agreed that *Eucalyptus seeana* will be utilised in all landscape planting to occur within the Certified Area.

#### *Offsetting of the Eucalyptus seeana Endangered Population*

The species credit requirement for *Eucalyptus seeana* is 45,929 credits for the loss of 3,215 individuals within the Certified Area (refer to Section 5.4.3). As a minimum for the conservation measures proposed (i.e., conservation and replanting), the E1 Conservation Area alone generates 80,706 species credits. Therefore, on the basis of creating the E1 Conservation Area as an offset, a credit surplus of 34,777 species credits exists for *Eucalyptus seeana* and therefore, subject to approval of this MALD Assessment, the

proposed conservation measures exceed the improve or maintain outcome requirement for the species.

An additional 3,534 species credits will be created in the E1 Conservation Area from replanting of 589 individuals and 3,180 species credits will be created for the E2 Conservation Area (which includes 1,635 existing individuals and 485 planted). This would bring the total number of species credits generated for *Eucalyptus seeana* to 87,420 and a surplus of 41,491 species credits. The table below provides a complete breakdown of the individuals conserved and the credits generated for the conservation measures proposed.

Conservation Measure	Credits per Individual	Remnant stems conserved	Remnant stems credits	Planted stems	Planted stems credits	Total <i>E. seeana</i> species credits
E1	6	13,451	80,706	589	3,534	84,240
E2	1.5*	1,635	2,452	485	668	3,180
Total		15,086	83,158	1,074	4,202	87,420

\* 25 % credit generation for E2 lands

The E1 Conservation Area will be secured and managed as a transfer to National Parks Estate and thereby attracts 100 per cent credit value for the conservation measures proposed. The E2 Conservation Areas will be secured through conversion to an E2 Planning Instrument and therefore the conservation measures in this area attracts 25 per cent of the full credit amount, as is required in the BCAM. Although the retained lands do not provide a formal addition to the species credits generated for *Eucalyptus seeana*, they will provide protection for an additional 2,015 individuals.

### Conclusion

Previous knowledge of the extent of the *Eucalyptus seeana* Endangered Population and its protection in conservation reserves was limited. The size of the population to be protected, secured and managed within the Conservation Area in perpetuity, as a result of conferring Biodiversity Certification for the Brimbin Draft Structure Plan, is considered to be a significant contribution to threatened biodiversity values. The securing of the proposed Conservation Area will lead to the sustainable protection of a significant Endangered Population in perpetuity.

This assessment provides a justification for the use of more appropriate local data for the assessment of impacts on the *Eucalyptus seeana* Endangered Population associated with the proposed Biodiversity Certification of the Brimbin Draft Structure Plan. It is the opinion of the assessor that this data more accurately reflects the local environmental conditions within the study area, and this information should replace the data available in the Threatened Species Profile Database (TSPD) for the following field:

- “Ability to withstand loss?” - change the data for the *Eucalyptus seeana* Endangered Population within the TSPD from “No” to “Yes” (able to sustain a temporary reduction in numbers).

**Appendix G (i): Image interpretation 1969 - 1991, Certified Area with modified vegetation**

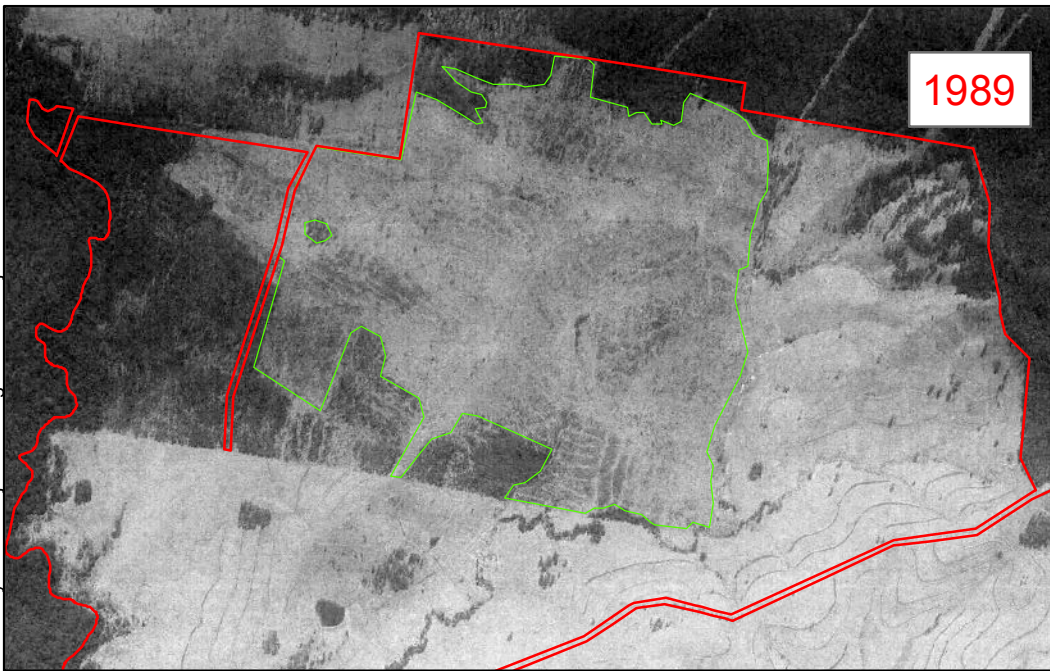
Drawn by: RJ Project Manager: RH Project Number: 1554 Date: 19/09/2014



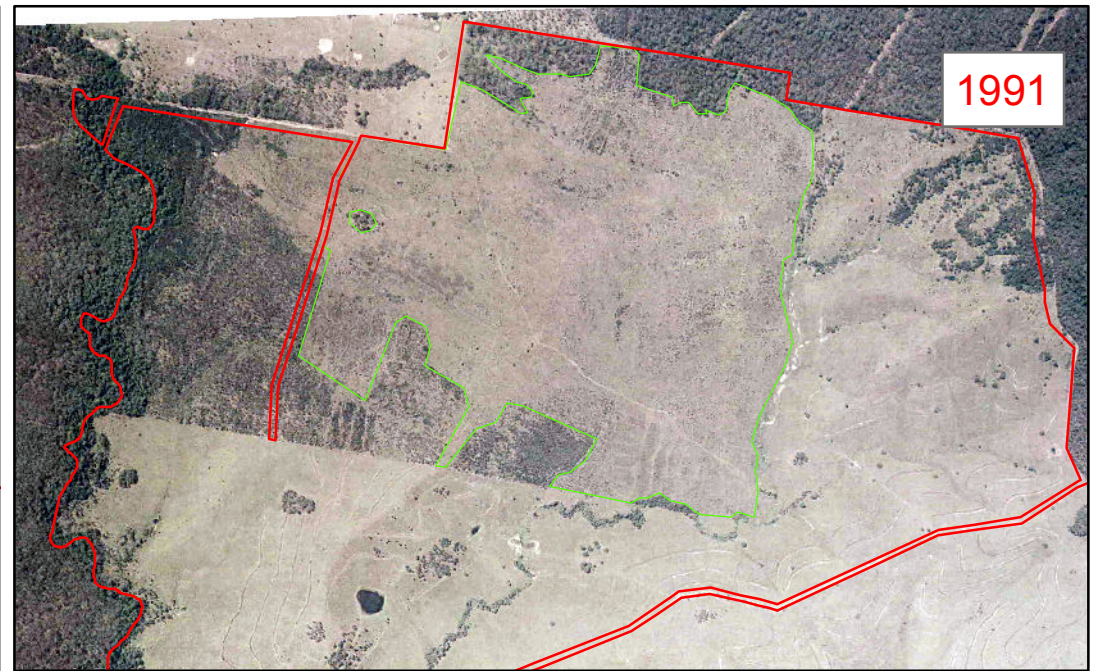
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1979



1989



1991

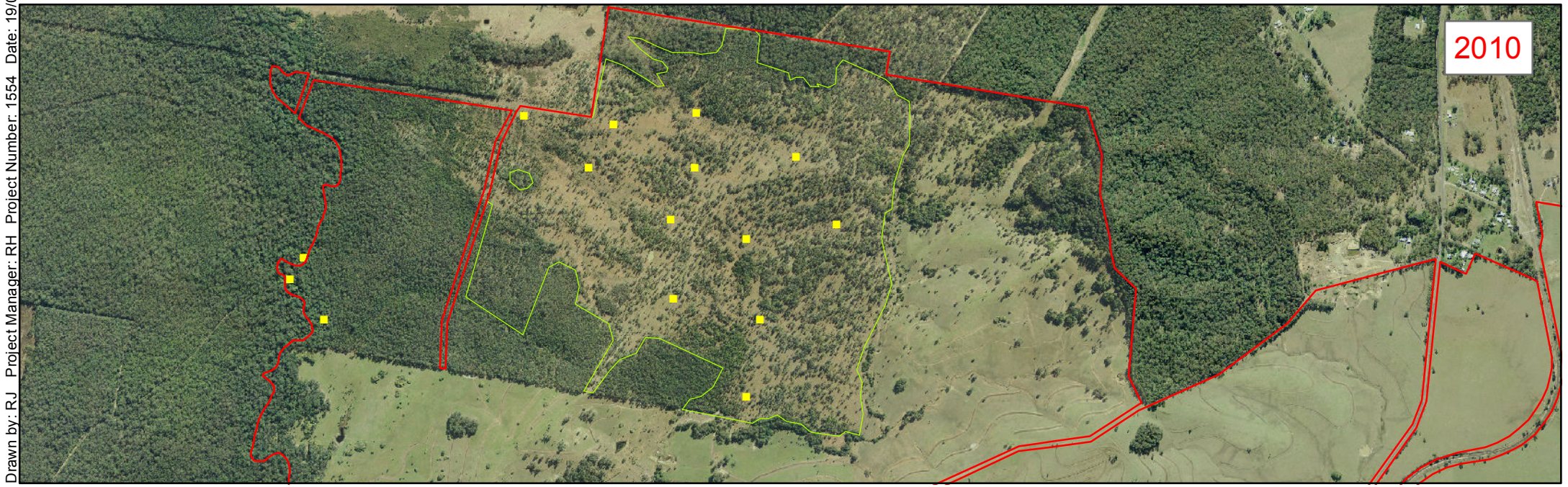
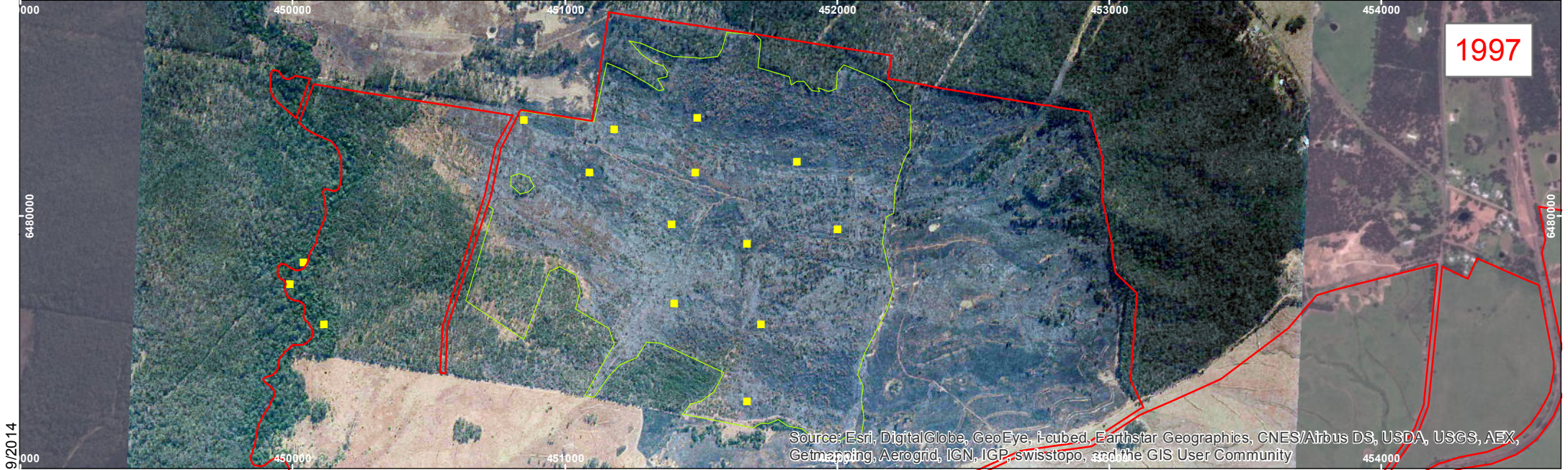


Image interpretation 1969 - 1991: Certified Area with modified vegetation

Brimbin Biocertification Assessment

**Appendix G - i**

**Appendix G (ii): Image interpretation 1997 - 2010, Certified Area with modified vegetation**



Drawn by: R.J. Project Manager: RH. Project Number: 1554. Date: 19/09/2014

- Study Area
- 'Low condition' zone
- BioBanking plots

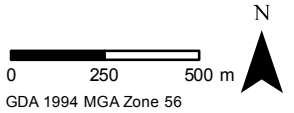


Image interpretation 1997 - 2010: Certified Area with modified vegetation  
Brimbin Biocertification Assessment