Macquariedale Road, Appin

Biodiversity Certification Assessment Report & Biocertification Strategy

FINAL REPORT – POST EXHIBITION

Prepared for
Wollondilly Shire Council
21 January 2019

DOCUMENT TRACKING

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Abbreviations

Abbreviation	Description
ARA	Adjacent Remnant Area
APZ	Asset Protection Zone
BAM	Biodiversity Assessment Method (*BC Act*)
BC Act	*Biodiversity Conservation Act* 2016
BCAA	Biodiversity Certification Assessment Area
BCAM	Biodiversity Certification Assessment Methodology (TSC Act)
BCAR	Biodiversity Certification Assessment Report (TSC Act)
BCS	Biodiversity Certification Strategy (TSC Act)
BVT	Biometric Vegetation Type
CEEC	Critically Endangered Ecological Community
CPW	Cumberland Plain Woodland, a critically endangered ecological community
DECCW	NSW Department of Environment, Climate Change and Water (now OEH)
DNG	Derived Native Grassland
DoP	NSW Department of Planning
DP&I	NSW Department of Planning and Infrastructure (formerly DoP)
DPE	NSW Department of Planning and Environment (formerly DoP)
DoTEE	Commonwealth Department of the Environment and Energy)
EEC	Endangered Ecological Community
ELA	Eco Logical Australia Pty Ltd
EPBC Act	*Commonwealth Environment Protection and Biodiversity Conservation Act 1999*
IoM	Improve or Maintain
LGA	Local Government Area
MNES	Matters of National Environmental Significance (EPBC Act)
NPW Act	*National Parks and Wildlife Act 1974*
NPWS	NSW National Parks and Wildlife Service (now part of OEH)
OEH	NSW Office of Environment and Heritage (formerly DECCW, DECC, DEC)
SSTF	Shale Sandstone Transition Forest, a critically endangered ecological community
TBSA	Threatened Biodiversity Survey and Assessment guidelines
TSC Act	*NSW Threatened Species Conservation Act 1995*
TSPD	Threatened Species Profile Database

WSC	Wollondilly Shire Council

Definitions

The following table provides definitions for the terminology used in biocertification assessments. Where these terms have been used in the report they have been included in 'quotation marks'.

DEFINITION	DESCRIPTION
Area of High Biodiversity Conservation Value	As described under Section 2.3 of the BCAM. Areas include critically endangered and endangered ecological communities (CEEC and EEC) not in low condition, threatened species that cannot withstand further loss, areas of vegetation that have regional or state conservation significance, and state and regional biodiversity corridors. Also termed Red Flag Areas.
Biodiversity Certification Assessment Area	As described in the BCAM, it includes land where certification is proposed to be conferred and any surrounding or adjacent land. Surrounding and adjacent land may be proposed for biodiversity conservation, or neither certification or development (Retained Land).
BioMetric Vegetation Type	A plant community classification system used in BioMetric Tools, including the BioBanking Tool, Biodiversity Certification Tool and Property Vegetation Planning Tool
Conservation Area	Land within the Biodiversity Certification Assessment Area that is proposed for conservation measures.
Conservation Measures	The range of measures identified in Section 126L of the TSC Act
Development Area	Land within the Biodiversity Certification area that is proposed for development
Ecosystems Credit	As described under the BCAM, the class of credit for biodiversity certification that are generated for conservation measures or required for the land proposed for certification. Ecosystem credits are also generated for some threatened species that are assumed to be present based on the location of the site and the vegetation types present.
Low BioMetric Condition	As described in Section 2.3 of the BCAM. To meet the 'low condition' threshold a number of criteria described in the method must be met, including <50% of the lower benchmark value of over storey percent cover for the relevant vegetation type or native vegetation with a site value score of less than 34 (Site value score is described in Section 3.6.2 of the BCAM)
Managed and Funded Conservation Measure	As described under Section 8.1.1 of the BCAM. Examples include entering into a Biodiversity Banking Agreement with respect to the land under Part 7A of the TSC Act and the reservation of land under the NPW Act.
Managed Conservation Measure	As described under Section 8.1.2 of the BCAM. Examples include entering into a conservation agreement under Division 12, Part 4 of the NPW Act and entering into a planning agreement under the EP&A Act that makes provision for development contributions to be used for or applied towards the conservation or enhancement of the natural environment.
Moderate-Good BioMetric Condition	As described in Section 2.3 of the BCAM. Any vegetation that is not in 'low condition' is in 'moderate to good' condition

DEFINITION	DESCRIPTION
Planning Instrument Conservation Measure	As described under 8.1.3 of the BCAM. Application of this measure requires a number of conditions to be met that are described under the relevant Section of the method.
Red Flags	As described in Section 2.3 of the BCAM. See 'Areas of High Biodiversity Conservation Value above.
Retained Land	Land within the Biodiversity Certification Assessment Area that is not land proposed for biodiversity certification or subject to proposed conservation measures.
Species credit	As described in the BCAM, the class of credits for biodiversity certification that are generated for a conservation measure or are required for the land proposed for certification

Executive Summary

Eco Logical Australia Pty Ltd (ELA) has been engaged by Walker Corporation Pty Ltd to undertake a Biodiversity Certification Assessment of a planning proposal at Macquariedale Road, Appin and prepare a Biocertification Strategy seeking 'biocertification' of land proposed for residential development and associated infrastructure from the Minister for the Environment.

The assessment was placed on public exhibition between 15 November 2017 and 28 February 2018 in accordance with Clause 126N of the now repealed *Threatened Species Conservation Act* 1995 with 37 submissions being received. This assessment report has been updated in response to these submissions and proposed amendments to the planning proposal. In summary, these changes are the removal of the proposed SP2 zone providing for a possible future Appin Rd By-Pass corridor, a **reduction** in developable area of 4.67 ha (23.24 ha down to 18.57 ha), and a resulting **increase** in proposed conservation lands of 6.04 ha (now 40.35 ha up from 34.31 ha), and further clarification regarding the status of Koala and Koala habitat in the study area.

The revised Biodiversity Certification Assessment Area now encompasses a total area of 58.92 ha and includes 50.33 ha of native vegetation communities comprising two vegetation types (Cumberland Plain Woodland (CPW) and Shale Sandstone Transition Forest (SSTF), both of which are listed as critically endangered ecological communities on the NSW *Threatened Species Conservation Act* 1995 and Commonwealth *Environment Protection and Biodiversity Conservation* Act 1999. The remaining 8.59 ha is cleared land previously used for rural activities, a dam and 4WD track.

Whilst a number of threatened fauna species have been recorded in the study area, only two species recorded on site, the endangered Cumberland Plain Land Snail, and vulnerable Koala, require specific assessment under the Biocertification Methodology. The Koala has been recorded on-site and assumed to use suitable habitat across the entire study area. The land snail has been determined to be present in a smaller proportion of the site comprising the higher condition CPW and a transition zone into the SSTF.

The application now proposes to develop 18.57 ha of the assessment area, which includes 10.63 ha of the two EECs, 9.36 ha of which is in moderate to good biometric condition and thus constitute a red flag or 'Areas of High Biodiversity Conservation Value'. Impacts to these areas requires a 'variation' from the Minister for the Environment. The remaining areas to be developed are either in low condition (and are not red flags) or are cleared of native vegetation. A request for a red flag variation is included in the application.

The Biodiversity Certification Assessment has found that 275 ecosystem credits are required for impacts to two vegetation types (193 for SSTF and 82 for CPW). In addition, 258 species credits are required for Koala and 122 for Cumberland Land Snail.

The application proposes to permanently protect and manage for conservation 40.35 ha of land as an on-site Biobank site (now a Biodiversity Stewardship Agreement site under the new Biodiversity Conservation Act). The proposed BioBank site comprises 39.70 ha of Shale Sandstone Transition Forest (generating 415 ecosystem credits), 39.7 ha of Koala habitat (generating 238 species credits) and 20.4 ha of Cumberland Plain Land Snail habitat generating 122 species credits, i.e. the proposed on-site conservation measure meets all of the SSTF and Cumberland Land Snail offset requirements (providing 222 surplus SSTF credits) and over 90% of the Koala habitat requirements (20 credit deficit).

If an improve or maintain outcome is to be achieved, the 82 deficit Cumberland Plain Woodland and 20 Koala credits must be generated by an 'off-site' conservation measure.

In addition to the 'on-site' conservation measure, it is proposed that either at least 20 ha of a separate parcel of land at Elladale Road, that is also owned by Walker Corporation, will be established as a second BioBank site to generate the 82 Cumberland Plain Woodland credits required and the remaining 20 Koala credits, or alternatively, the deficit biodiversity credits will be purchased from local biobank sites or the Biodiversity Conservation Trust. These two sites will be subject to a separate assessment, audit and registration of two Biodiversity Stewardship Agreements (formerly Biobank Agreements) in accordance with Part 5 of the *Biodiversity Conservation Act* 2016. Biodiversity Stewardship Agreements are recognised as a 100% 'conservation measure' under s.126L(i) of the TSC Act and will provide in perpetuity conservation protection and management on the land title.

Subject to the Minister's approval of the red flag variation request and registration of the two proposed Biobank sites, the proposal meets and 'improve or maintain' outcome and is eligible for biodiversity certification. If the Minister confers biocertification on the requested land, Wollondilly Council as the consent authority for future development applications, is no longer required to assess impacts to biodiversity values as these have already been addressed by the Minister and conservation areas will be required to be managed in perpetuity for conservation.

1 Preamble

1.1 Project background

Wollondilly Shire Council has been in consultation with the Office of Environment and Heritage (OEH) and Department of Planning and Environment (DPE) since 2008 regarding a proposal to rezone land fronting Macquariedale and Appin Roads in Appin consistent with Wollondilly Council's Growth Management Strategy. Following this consultation and addressing the various biodiversity issues raised by the OEH, it became apparent that the proposal could qualify for Biodiversity Certification under the then Part 7AA of the *Threatened Species Conservation Act* 1995 (TSC Act) and thus streamline subsequent biodiversity assessment at the development application stage. An application for Biodiversity Certification must follow the Biodiversity Certification Assessment Methodology (BCAM) (DECCW 2011) and meet the requirements of Section 126K of the TSC Act, i.e. be accompanied by a Biodiversity Certification Strategy.

In August 2017, the TSC Act was repealed and replaced with the *Biodiversity Conservation Act* 2016. At the same time, a Savings and Transition order was gazetted that allowed the application to continue to be assessed under the 2011 BCAM and TSC Act until August 2019 on the basis that the application was 'significantly advanced'.

The BCAM was developed by the NSW Office of Environment and Heritage (OEH) and was gazetted by the NSW government in February 2011. The methodology may be applied to land for which 'biodiversity certification' (hereafter biocertification) is sought, and conferred by the Minister for the Environment if the conservation measures proposed in the biocertification application result in an overall 'improvement or maintenance' in biodiversity values. This is referred to under the methodology as satisfying the 'improve or maintain test' (IoM test).

Only a 'Planning Authority' as defined by section 126G of the *Threatened Species Conservation Act* 1995 (TSC Act) may apply to the Minister for biocertification.

The methodology provides an equitable, transparent and scientifically robust framework with which to address the often competing demands of urban development and biodiversity conservation. If the Minister for the Environment is satisfied that an IoM outcome has been achieved, he/she may confer biodiversity certification (hereafter, biocertification) on 'land'. If the Minister confers biocertification on land, a consent/approval authority does not have to take biodiversity issues into consideration when assessing development applications, i.e., for the purpose of s.5A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act), the development or activity is not subject to an Assessment of Significance for threatened species, populations or ecological communities. Similarly, biodiversity components of Part 3 of the EP&A Act (i.e. State Environmental Planning Policies such as SEPP 44 Koala Habitat Protection) do not apply. This does not mean that Koala's are not assessed as part of the process, they are specifically addressed as 'species' credits as part of the BCAM. A management plan that accompanies the offset area will provide for management of Koala habitat and threats to Koala, and a Construction Environmental Management Plan will include specific references to addressing and mitigating indirect impacts to Koala's resulting from the development (e.g. vehicles, dogs, Koala friendly landscape plantings in open space areas etc), i.e. whilst a SEPP44 Koala Management Plan is not required, there will still be a management plan for Koala.

Eco Logical Australia Pty Ltd (ELA) has been engaged by Walker Corporation to apply the BCAM to assess a proposed residential rezoning at Macquariedale Road Appin. This has been done by assessing

the 'loss' of biodiversity values associated with vegetation clearance on the impacted land and the biodiversity 'gains' that will be achieved as a result of 'conservation measures' on land adjacent to the proposed rezoning site at Macquariedale Road and on land located approximately 1 km to the west at Elladale. The net result has then been considered in the context of the 'improve or maintain' test defined under the BCAM.

This Biocertification Strategy and the associated credit calculations have been undertaken by an accredited assessor (Jennie Powell, Accreditation Number 0092) and supported by other ELA staff (Vivian Hamilton and Robert Humphries) and field ecologists Michael Sheather-Reid, Lyndsay Holmes and Corey Mead of Travers Ecology and Bushfire who undertook the ecological investigations associated with the rezoning application. Brief cvs for the project team members are provided in **Appendix A**.

Version 1.9 of the Biocertification credit calculator was initially used to calculate the biodiversity credits for this assessment and resulted in the public exhibition of the application between 15 November 2017 and 28 February 2018.

Following the public exhibition, consideration of the submissions received and the resulting proposed amendments to the application, this assessment has been revised in response to the submissions received following the public exhibition using version 1.09_HN556_201216 of the tool that has corrected problems with the assessment of BVT HN556 (SSTF) together with amendments to the benchmarks for the number of hollow bearing trees and length of fallen logs for CPW and SSTF being 1 and 50 respectively for both vegetation communities. It is noted that the SSTF is now classified as a Grassy Woodland Vegetation Formation rather than a Dry Sclerophyll Forest Formation.

1.2 Description of project timelines, management and governance

The application for biocertification is being undertaken in parallel with an application to rezone the subject land under Wollondilly Local Environment Plan (LEP) LEP 2011 (WSC 2017).

The rezoning application was originally submitted in 2007 but was placed on hold in 2008 whilst Council prepared its Growth Management Strategy. The Growth Management Strategy, including south Appin, was adopted in 2011 and the preliminary planning proposal exhibited in 2011. The Department of Planning and Environment (DPE) issued the Gateway Determination in October 2011 and exhibition under section 57 of the Environmental Planning & Assessment Act 1979 was completed in August 2014. The planning proposal attracted a number of objections and was amended and required be re-exhibited together with this Biocertification Strategy.

In late 2015 Council resolved that Walker should withdraw their planning proposal in light of the Greater Macarthur Land Release Investigation. In early 2016 Walker responded with reasons why the planning proposal should not be withdrawn and at a further Council meeting in April 2016 Council resolved to support the submission of the revised planning proposal back to the Department of Planning and Environment for a revised gateway determination. The rezoning and accompanying Biocertification Strategy and Voluntary Planning Agreement were re-exhibited in January and February 2018. Following exhibition, further changes were made to address concerns raised by Roads and Maritime Services and Council. The outcome proposed is a greater area of land provided as E2 Environmental Conservation.

Subject to endorsement by government the planning proposal is expected to be gazetted by mid-2019 and preliminary subdivision plans submitted thereafter. Subject to all approvals being in place, construction is proposed to commence in early 2020 with works completed in 2021. Full details of the original planning proposal exhibited in August 2014 and the amended planning proposal exhibited in

January and February 2018 can be found in Wollondilly Shire Council (2014) and Wollondilly Shire Council (2017) which are included at **Appendix B**.

1.3 Community Consultation and Stakeholder Engagement

As indicated in **Section 1.2,** the planning proposal to rezone land at Macquariedale Road has undergone extensive community and stakeholder consultation, including with the DPE and OEH, since 2007 (refer to **Appendix B**). Further, consistent with section 126N of the TSC Act, the proposal to seek biocertification of land at Macquariedale Road was placed on public exhibition between 15 November 2017 and 28 February 2018. A total of 37 submissions were received.

A response to submissions report will be prepared outlining the issues raised and how these have been responded to and included as **Appendix C** to this report in accordance with the direction issued by WSC. In summary, these changes are the removal of the proposed SP2 zone providing for a possible future Appin Rd By-Pass corridor, a reduction in developable area of 4.67 ha (23.24 ha down to 18.57 ha), reducing red flag impacts, and a resulting increase in proposed conservation lands of 6.04 ha (now 40.35 ha up from 34.31 ha), and further clarification regarding the status of Koala and Koala habitat in the study area.

This assessment report and credit calculations have been updated in light of these submissions.

Further, as there are Matters of National Environmental Significance (MNES)(listed communities and species on the schedules of the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) that will be impacted in the study area (CPW, SSTF and Koala), the proposal will also be referred to the Commonwealth Department of the Environment and Energy (DoTEE).

1.4 Strategic Context

The strategic context of the biocertification application is outlined in Wollondilly Shire Council (2014) The planning proposal provides a detailed account of the site in a local and regional context, the need for the planning proposal and its relationship to the Wollondilly LEP 2011 and Growth Management Strategy, the current and proposed zoning of the land, relevant planning instruments that apply to the land, environmental, social and economic impact of the planning proposal, community consultation, and State and Commonwealth Interest (**Appendix B**).

1.5 Biodiversity certification assessment area and proposal

The Biodiversity Certification Assessment Area (BCAA) encompasses a total area of 58.92 ha located close to the township of Appin within the Wollondilly Local Government Area in south-western Sydney (**Figure 1**). The site is located immediately west of the existing township of Appin and accessed off Macquariedale Road. The site includes land proposed for rezoning, land subject to conservation measures. A second BioBank site is proposed off-site at Elladale Road as an alternative offset source (approximately 1.45 km further west of the Macquariedale Road site).

The BCAA includes 50.33 ha of native vegetation; the remaining area comprises a dam, 4wd tracks and exotic pasture species which fits the definition of ‘cleared land’ as defined by the BCAM (DECW 2011) i.e. areas where there is no canopy or shrub layer and the ground cover is greater than 50% exotic cover.

The regional location of the BCAA is shown in **Figure 1** and details of the lots that make up the biocertification land uses in the BCAA are presented in **Table 1** and shown in **Figure 2**.

The proposal is to rezone the land proposed for biodiversity certification from RU2 Rural Landscape, to R2 Low Density Residential under the Wollondilly Local Environmental Plan (2011). The land proposed for conservation is currently zoned RU2 Rural Landscape under the Wollondilly Local Environmental Plan (2011) and will be rezoned E2 Environment Conservation (Figure 3**)**. This land will be subject to a BioBank Agreement under Part 7A of the TSC Act (now a Biodiversity Stewardship Agreement under Part 5 of the BC Act 2016) as described in **Section 5** of this report – Biodiversity Certification Strategy. A BioBank Agreement is a 'Permanently Managed and Funded Conservation Measure' as outlined in s126L(i) of the TSC Act and section 8.1.1 of the BCAM.

Table 1: Proposed biocertification land uses and in the BCAA

	Land Proposed for Conservation Measures	Land Proposed for Biodiversity Certification	Total
Area of Vegetation	39.70	10.63	50.33
Cleared Land	0.65	7.94	8.59
Total Area	40.35	18.57	58.92

Vegetation within the BCAA includes open pasture (cleared land) and two vegetation communities, both of which are listed as critically endangered ecological communities under the NSW TSC Act and the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (**Table 2**). Small areas of the BCAA consist of derived native grassland where the native over-storey trees and most shrubs have been cleared. Some of these derived native grasslands of a certain patch size and native species richness and density conform to the two threatened ecological communities listed under the TSC and EPBC Acts.

Table 2: Vegetation communities and conservation status in the BCAA

Vegetation	Area (Ha)	TSC Act	EPBC Act
Cumberland Plain Woodland	4.01	CEEC	CEEC
Shale Sandstone/Transition Forest	46.32	CEEC	CEEC
Cleared	8.59	NA	NA
Total	58.92		

CEEC: Critically Endangered Ecological Community

1.5.1 Conditions of biocertification

Under the BCAM, the impact of development and conservation measures on biodiversity values is quantified using 'biodiversity credits' which are defined by each of the vegetation types (ecosystem credits) and threatened species present (species credits). In this regard, the methodology determines the number of credits that are required to offset the adverse impacts of development on biodiversity values, and, the number of credits that can be generated by undertaking recognised conservation measures as outlined in s126L of the TSC Act that will improve biodiversity values within the BCAA. Where the number of credits that are created is equal to, or exceeds the number required, the 'improve or maintain' test described under the methodology is considered to be satisfied, provided 'red flags' have been avoided, or a red flag variation has been approved by the Director General of OEH.

Red flags are areas of high biodiversity conservation value, and include vegetation types that are >70% cleared, CEECs and EECs listed under the TSC Act and/or EPBC Act, certain threatened species and areas that are recognised as biodiversity corridors of state or regional significance. This assessment report includes a red flag variation request (**Section 3**) in response to the proposed rezoning impacts on areas of Cumberland Plain Woodland and Shale Sandstone Transition Forest within the BCAA.

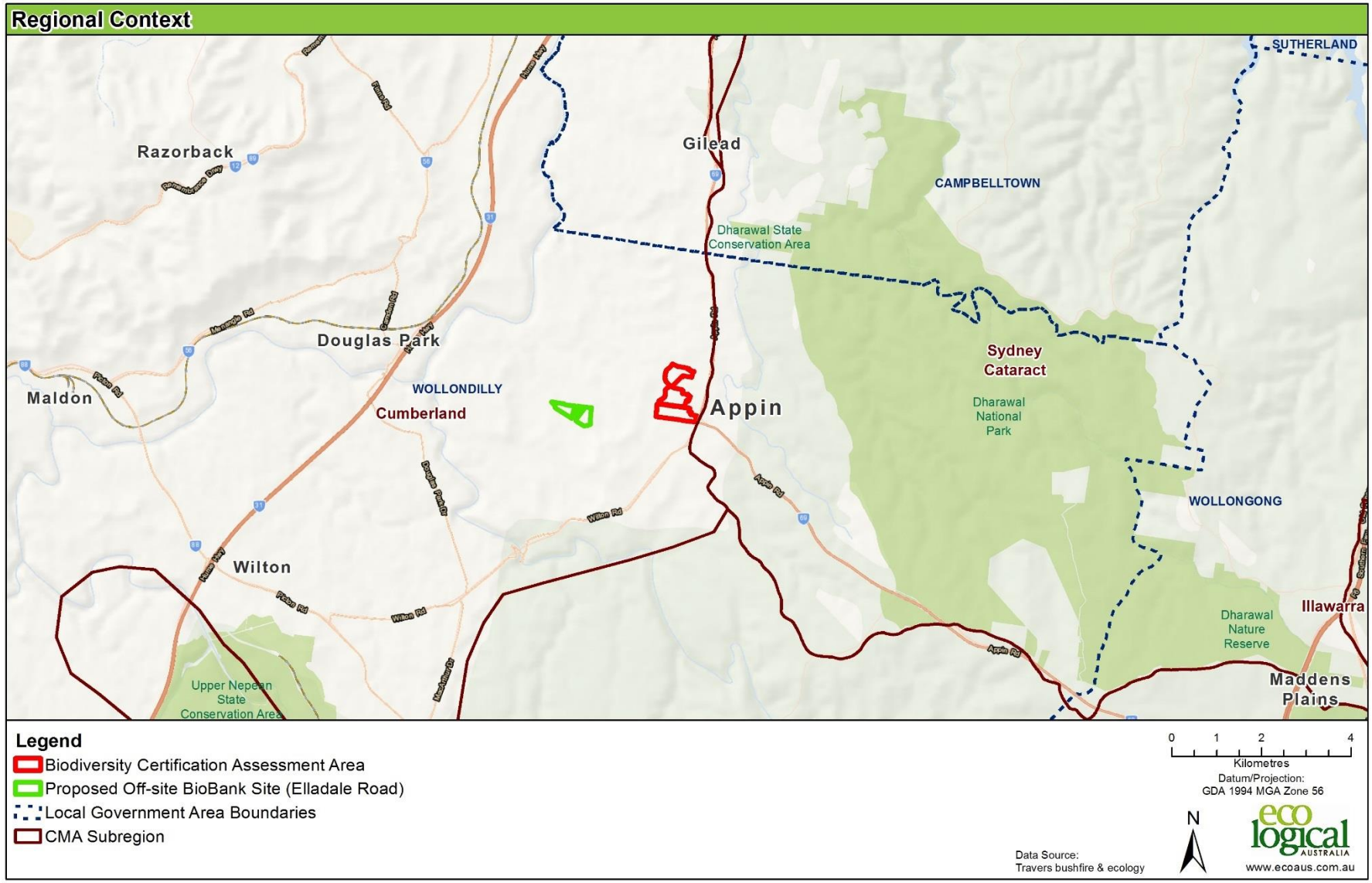

Figure 1: Appin Biocertification Assessment Area locality map

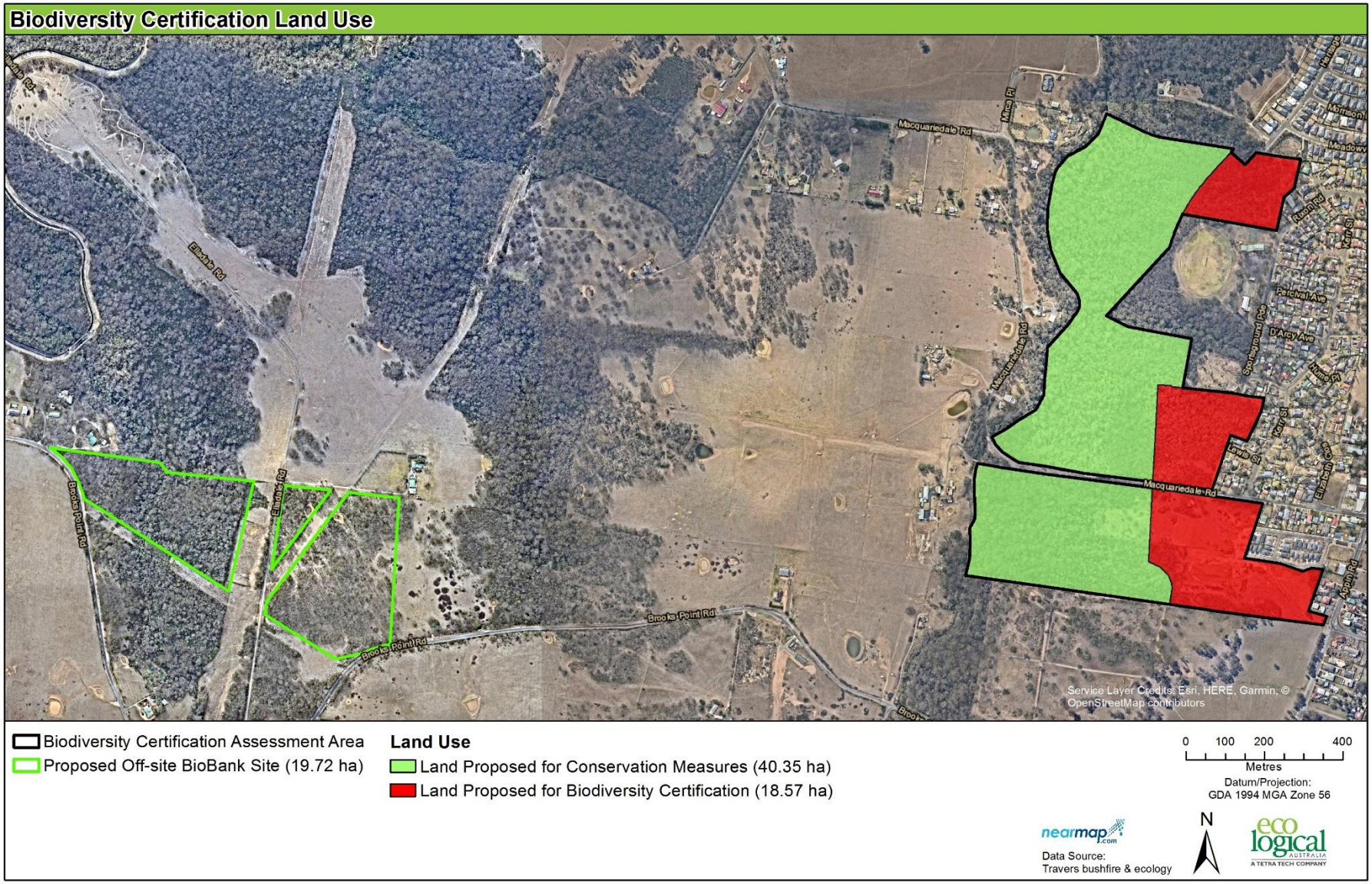

Figure 2: Biodiversity Certification land use

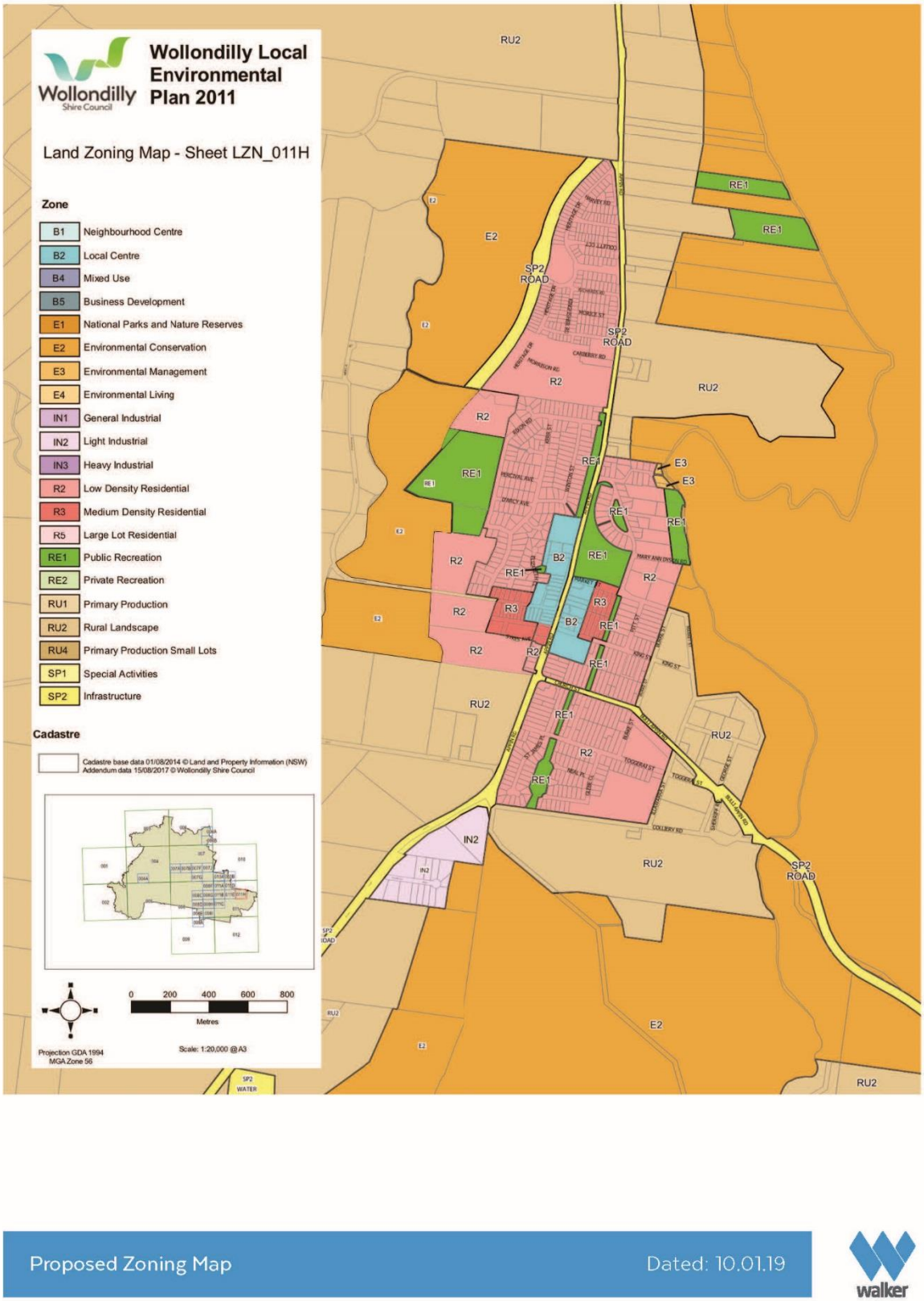

Figure 3: Proposed rezoning of BCAA

2 Biodiversity Values Assessment Report - methodology and results

An application for biodiversity certification must include an assessment of the biodiversity values of the BCAA undertaken in accordance with the BCAM. The results of the assessment of ecological values are to be included in a report titled '**Biodiversity Assessment Report**. This section addresses this requirement.

2.1 Literature review and data research

This Biodiversity Certification Assessment Report uses the information presented in the ecological assessment reports prepared by Travers bushfire & ecology (April 2014a and 2014b) for the proposed residential rezoning at Macquariedale Road and assessment of conservation values at the proposed off-site BioBank site at Elladale Road. The report titled "*Ecological Assessment – proposed residential rezoning at Macquariedale Road April 2014*" is included at **Appendix D**. This report summarises the information and results of the Travers bushfire & ecology report (April 2014a) in regards to the land where biocertification is sought. **Appendix** D should be referred to for further detail.

The documents specifically relating to the BCAA reviewed by Travers bushfire & ecology (section 2.1 p4 April 2014) were:

- A previous flora study of the Macquariedale Road site undertaken by Clements and Associates in 2007
- A fauna survey on land to the north east of the site by Ambrose Ecological in 2011
- Office of Environment and Heritage (OEH) correspondence and determinations under the Department of Planning and Infrastructure 'gateway' plan making process

Relevant legislation and standard technical resources such as the *Threatened Biodiversity Survey and Assessment Guidelines for Development and Activitie*s (2004 working draft) and the *Cumberland Plain Recovery Plan* (2010) underpinned the survey methodology and provided background information for the ecological assessment.

In addition to the database searches of the *Atlas of NSW Wildlife* and *EPBC Protected Matters Search Tool* undertaken by Travers bushfire & ecology (section 2.1 p4 April 2013), ELA used the biocertification credit calculator v 1.9_HN556_201216 to determine ecosystem and species credit threatened species filtered into the BCAA and validated these against the threatened species profile ecological data from the *BioNet Atlas of NSW Wildlife*.

2.2 Field assessment

Travers bushfire & ecology initially carried out six days of flora survey and five days of fauna survey within the BCAA during November 2012 followed by one additional day of flora survey and four days of targeted survey for *Meridolum connivens* (Cumberland Plain Land Snail) and threatened bird species in February 2013. The field survey effort and methodology is detailed in the ecological assessment report (Travers bushfire & ecology *2014a)* (see section 2 *Survey Methodology*, Appendix 1 *Fauna Survey Methodologies*, Appendix 2 *Threatened and Migratory Species Habitat Assessment*, and Appendix 3 *Threatened Birds Expert Advice*).

Subsequent vegetation survey, mapping and biometric plots of the proposed 'off-site' Elladale offset site and additional targeted survey for Cumberland Plain Land Snail on all lands subject to conservation measures was undertaken in 2014 (Travers Bushfire and Ecology 2014b) to confirm that the proposed on-site and off-site conservation measures were able to generate the required number and types of credits to meet any deficit of credits generated within the BCAA. A copy of this report is provided as **Appendix E**.

In addition to the studies undertaken by Travers (2014a and 2018), Colman (2016) and OEH have undertaken additional Koala habitat assessment and survey and have compiled a data base of all Koala records in the locality that have been used in this assessment.

2.3 BioMetric vegetation type, condition and threatened status

Travers bushfire & ecology (April 2014a) recorded a total of 208 plant species and identified nine separate vegetation communities within the BCAA including an aquatic herbfield in one small dam. A photograph and description of the structure, dominant plant species and condition of each vegetation community is provided on p19 section 3.1.2 under *Chapter 3 Survey Results* of the Travers bushfire & ecology (April 2014) in **Appendix C**.

Using the data collected from 39 BioMetric quadrats, a comparative analysis with BioMetic vegetation types was undertaken and a vegetation condition category was determined in accordance with the BCAM definition of 'low' or 'moderate to good'. A second quadrat analysis using the number of positive diagnostic plant species was undertaken to validate whether vegetation was more closely aligned to Cumberland Plain Woodland or Shale Sandstone Transition Forest in accordance with Tozer (2003) and NPWS (2002).

The results of the quadrat analysis identified two BioMetric vegetation types (BVTs) in the BCAA: both are threatened ecological communities listed under the TSC and EPBC Acts (**Table 3**)

Table 3: BioMetric vegetation types in the BCAA and relationship to threatened ecological communities

BioMetric Vegetation Code and Type	Vegetation Class and Formation	TSC Act	EPBC Act
HN528 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin	Coastal Valley Grassy Woodland	Cumberland Plain Woodland in the Sydney Basin Bioregion	Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest
HN556 Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin	Coastal Valley Grassy Woodland	Shale/Sandstone Transition Forest	Shale/Sandstone Transition Forest

Vegetation in the BCAA was mapped into five 'vegetation zones' based on vegetation type and vegetation condition ('low' or 'moderate to good') which were further stratified using ancillary codes as per the BCAM (DECCW 2011) (**Table 4**). An ancillary code is an optional field which splits zones further to reflect a more homogenous condition state. The ancillary code was used in the BCAA to identify zones that comprise of derived native grassland (DNG), regrowth, the presence of canopy and understorey, or the

presence of canopy only. The vegetation zones and location of the BioMetric plots are shown in **Figure 4**.

Table 4: Vegetation zones in the BCAA

Veg Zone ID	BioMetric Vegetation Type	Condition[1]	Ancillary Condition Code
1	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin (HN528)	M/G	Canopy and Understorey
2	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin (HN528)	Low	Canopy Only
3	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin (HN528)	Low	Regrowth
4	Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin (HN556)	M/G	Canopy and Understorey
5	Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin (HN556)	Low	DNG

[1] Condition as defined by the BCAM

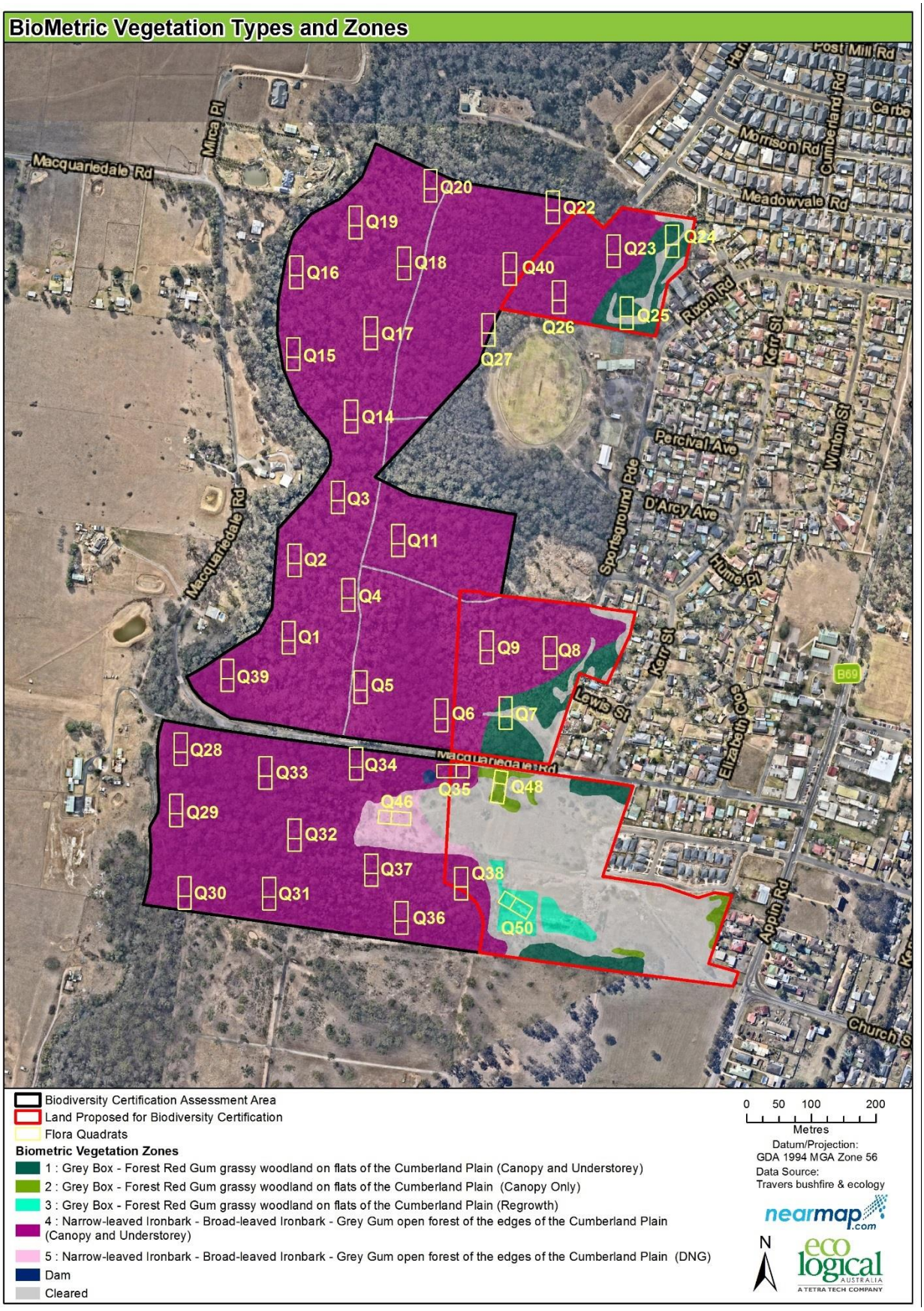

Figure 4: BioMetric vegetation types, zones and location of biometric plots within the BCAA

2.4 Determination of species credit species requiring survey

'Species credits' are the class of biodiversity credit created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. All threatened flora and approximately half of all threatened fauna species are species credits. Furthermore, some species credit species are also 'red flag species' which the BCAM defines as "*a species that cannot withstand further loss in the CMA because it is extremely rare/critically endangered, restricted or it's ecology is poorly known*".

The BCAM requires targeted survey for threatened flora and fauna considered to be 'species credit' species, on the land that will be impacted by development. Where a survey or expert report confirms that a species credit species is present or likely to use potential habitat on land proposed for biodiversity certification then a survey must also be undertaken or expert report prepared for that species on land to be used as an offset confirming its presence or likely presence. The biocertification credit calculator will use the survey results to calculate the number of credits required to offset the loss of the threatened species on land to be certified and the number of credits generated on land subject to conservation measures to determine whether the 'improve or maintain' test is satisfied provided a Red Flag species is not impacted.

Species that require species credits for the land proposed for biodiversity certification or are being used to generate species credits for a proposed conservation measure are identified and assessed in accordance with seven steps outlined in Section 4.3 of the BCAM. The results of the candidate species identification and assessment process are presented in **Appendix F.**

2.4.1 Step 1. – identify candidate species for initial assessment

A list of candidate species were filtered into the BCAA using the biocertification credit calculator version 1.9_HN556_201216 and validated against the threatened species profile ecological data from the BioNet Atlas of NSW Wildlife. This list is presented in **Appendix E**.

2.4.2 Step 2. – review list to include additional species

The list of candidate species was reviewed to include additional species for assessment. This was undertaken using the results of the Travers bushfire & ecological (April 2014a) database search in their Ecological Assessment report (see Tables A.2.1, A.2.2 and A.2.3 of **Appendix D**) which included:

- A search of the Atlas of NSW Wildlife database (OEH 2012) undertaken to identify records of threatened flora and fauna species located within 10km radius of the site updated in 2014 by ELA
- A search of the EPBC Act protected matters search tool website to generate a report to assist to determine whether matters of national environmental significance (MNES) were located within 10km radius of the site

There were no additional species considered 'likely' to have habitat in the BCAA by Travers bushfire & ecology (April 2014a) and the ELA undated database search that were not already on the list generated at Step 1.

2.4.3 Step 3. – identify candidate species for further assessment

The list of candidate species was then reviewed to identify only those species that require further assessment in the BCAA. The species were removed and a justification supporting the removal of these species from the candidate list is provided in **Appendix F**.

2.4.4 Step 4. – identify potential habitat for species requiring further assessment and step 5 determine whether species is present

The flora and fauna survey methodology and techniques used is described in Section 2 of *Travers bushfire & ecological* (April 2014a, 2018) – see **Appendix D.** The results of the targeted survey are presented in **Appendix D.** Only two candidate species, Koala (*Phascolarctos cinereus*) and Cumberland Plain Land Snail (*Meridolum corneovirens*) were recorded within the land proposed for biocertification within the BCAA (**Figures 5** and **6**).

Whilst not recorded during the assessment on site by Travers (2014a), Koala has been included as a candidate species based on records over the past 20 years within the locality, observations near to the BCAA by local residents and the presence of primary and secondary food tree species (Forest Red Gum, Grey Box and Grey Gum) as defined by the Koala Recovery Plan (DECC 2008b)(Travers 2018, Colman 2016 and OEH (Figure 6).

It is noted that whilst Rosenberg's Goanna is considered a 'potential' species in the land to be certified, it was not recorded in the study area despite targeted survey as outlined in Tables 2.3 and 2.4 of *Travers bushfire & ecological* (April 2014a) – see **Appendix D** and thus have not been included as species credits in this assessment.

Similarly, the Fishing Bat, *Myotis macropus* whilst considered a 'potential' species in the land to be certified, only requires credits when its breeding habitat, hollow bearing trees within riparian buffer areas, are being impacted. There are no riparian buffers containing hollow bearing trees that will be impacted by the proposal .– see **Figure 8** and thus have not been included as species credits in this assessment.

2.4.5 Step 6 – identify the threatened species that trigger a red flag

There were no species confirmed as likely to have habitat on-site that triggered a red flag.

2.4.6 Step 7 finalise the boundary of species polygons and area of impact

A total of 59 Cumberland Plain Land Snail shells (15 living and 44 dead specimens) were found within land proposed for certification and land subject to conservation measures in the BCAA. No living snail shells were recorded within the Cumberland Plain Woodland vegetation community. Most of the shells 54 (91%) were recorded with the Shale Sandstone Transition Forest vegetation (Travers bushfire & ecology 2014a).

Because a targeted survey confirmed the presence of Cumberland Plain Land Snail habitat within the impact area of the BCAA, a targeted survey of the lands subject to conservation measures was undertaken. The survey found 36 snail shells within these areas (Travers Bushfire & ecology 2014b).

The Cumberland Plain Land Snail habitat was mapped as three species polygons across the BCAA and is presented in **Figure 5.** A total of 29.58 ha of habitat for the Cumberland Plain Land Snail has been mapped in the BCAA (9.18 ha on land proposed for Biocertification, 20.40 ha on land subject to conservation measures).

Whilst no Koala's were recorded on site during the initial assessment period (November 2012 to November 2014 (Travers bushfire and ecology 2014a), a review of all known Koala records from the locality of the Biocertification Assessment Area (Travers 2018, NSW Wildlife Atlas and Professor Rob Close, University of Western Sydney, Wollondilly Shire Baseline Koala survey (Colman 2016), the presence of primary and secondary food tree species (Forest Red Gum, Grey Box and Grey Gum) as listed in the NSW Koala Recovery Plan (DECC 2008b), and observations of Koalas by long term local residents in the vicinity of the proposed development and conservation areas indicate that the area is

likely to be used by Koala. A total of 49.50 ha of suitable Koala habitat has been mapped in the BCAA (9.80 ha will be impacted and 39.70 ha is proposed as a conservation measure)(**Figure 6**).

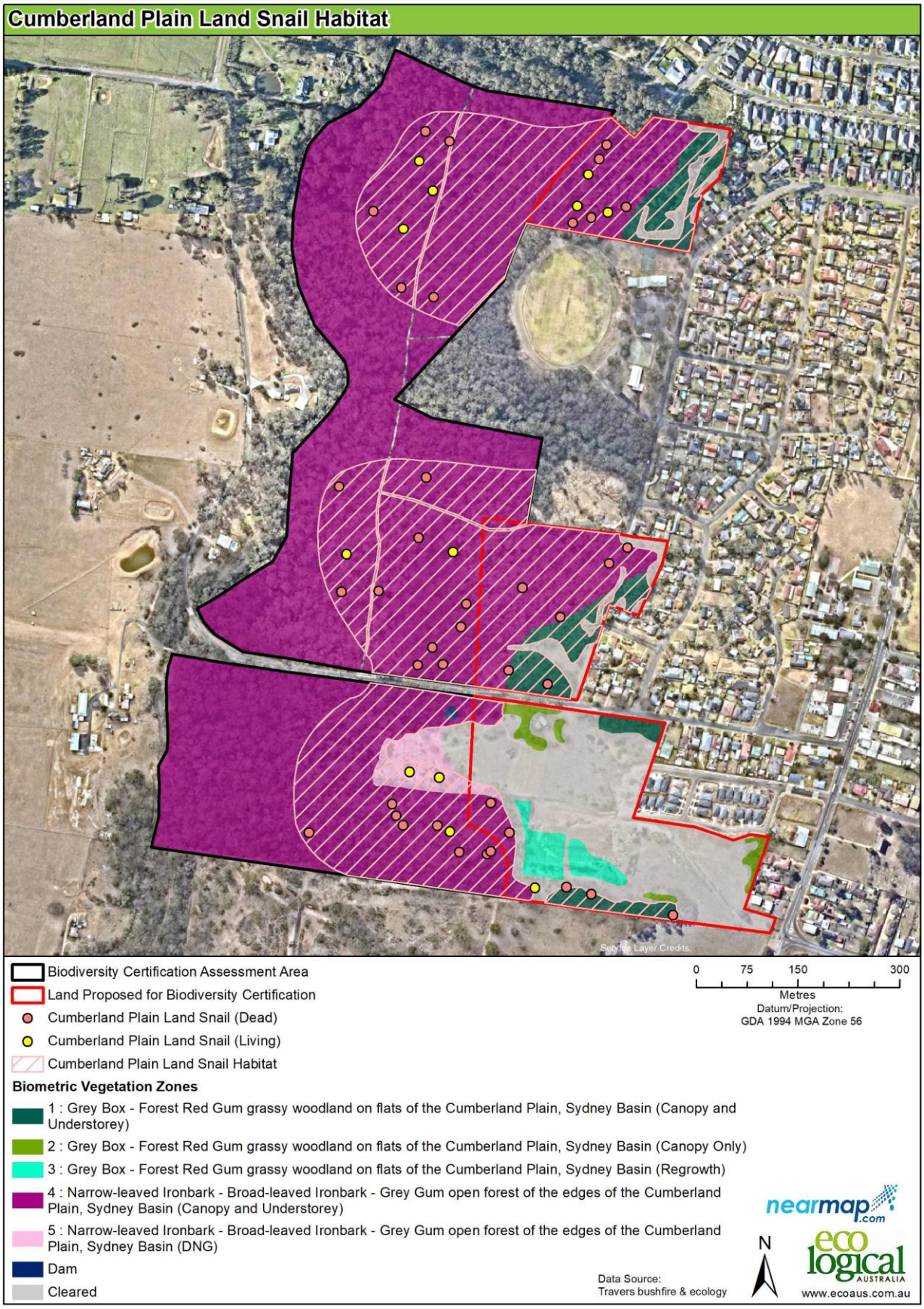

Figure 5: Habitat map for Cumberland Plain Land Snail

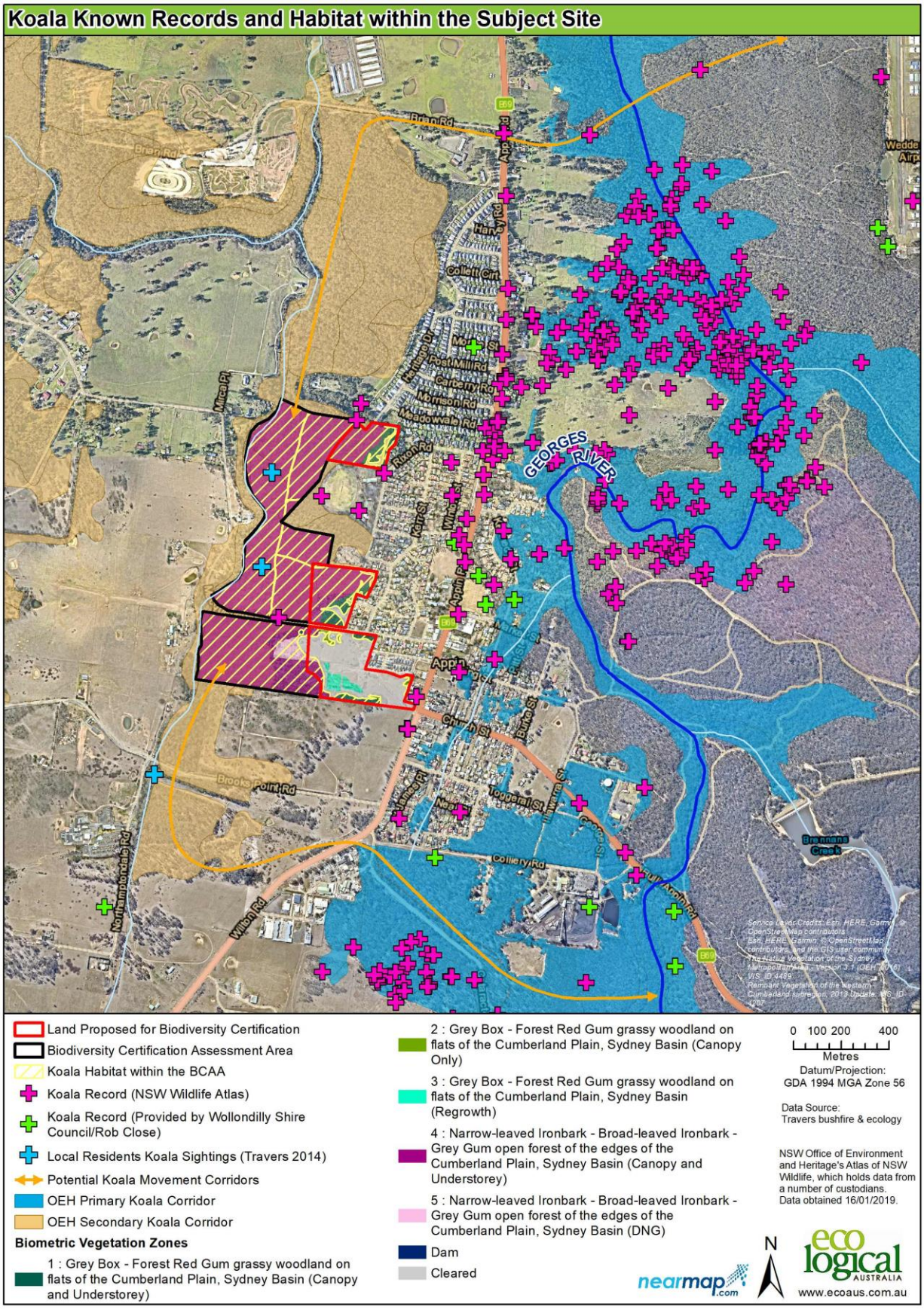

Figure 6: Koala records and potential Koala habitat map

3 More Appropriate Local Data used in the Biocertification Assessment

The BCAM outlines the methods by which general biodiversity values are assessed and measured in the BCAA to determine whether the conferral of biodiversity certification on land, as demonstrated in the application for biodiversity certification, improves or maintains biodiversity values (DECCW 2011a). These methods, along with the methods by which measurements of threatened species, assessments of indirect impacts on biodiversity values, and calculations of ecosystem and species credits are made, were followed in the Biocertification Assessment (**Section 4**).

According to the methodology, Biometric Vegetation Types (BVTs) are used as surrogates for assessing general biodiversity levels. Information on each BVT, including a description, the vegetation class and formation to which it belongs, and percent cleared value, are contained within the Vegetation Types Database held by the OEH. A range of quantitative measures that represent the benchmark conditions for vegetation types are contained within the Vegetation Benchmark Database, also held by the OEH. The Vegetation Benchmark Database is organised by CMA, and as such, information for the same BVTs that may occur across different CMAs are repeated across CMAs, although the range of measures representing benchmark conditions can differ between CMAs to reflect variations in BVTs across their range.

Generally, default data contained in the Vegetation Benchmark Database are used when undertaking an assessment of, and measuring, general biodiversity values. However, the BCAM specifies that the Director General may certify that '*more appropriate local data'* (MALD) can be used instead of the data in this database, '*where local data more accurately reflects local environmental conditions'* (section 3.4 of the BCAM). Benchmark data that more accurately reflect the local environmental conditions for a BVT may be collected from local reference sites, or obtained from relevant published sources. Data other than benchmark data may also be obtained from relevant published sources. The Director General must provide justifications for certifying the use of local data. The certified local data can then be used in applying the methodology.

ELA considered that some of the 'default' benchmark values for '*Grey-Box – Forest Red Gum grassy woodlands on flats of the Southern Cumberland Plain, Sydney Basin Bioregion'* and '*Narrow-leaved Ironbark – Broad-leaved Ironbark – Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion'*, as contained in the Vegetation Benchmark Database, were not accurate reflections of the benchmark condition of these BVTs. This is because the database contained low or benchmark values that were not consistent with the vegetation types i.e. zero values for hollow-bearing trees and length of fallen logs, which would be expected to have some hollows and logs when in benchmark condition.

ELA has previously consulted with the OEH on this matter with regard to 'HN528 *Grey-Box – Forest Red Gum grassy woodlands on flats of the Southern Cumberland Plain, Sydney Basin Bioregion'*. An outcome of a previous discussion between ELA and Tim Hagar of the OEH was that 'local' benchmark data for the number of trees with hollows and for the length of fallen logs could be added for this BVT, with one and 50 m added for the number of trees with hollows and the length of fallen logs, respectively. This was to be consistent with other woodland/open forest vegetation types on the Cumberland Plain, and is consistent with the assessment undertaken for El Cabello, Emerald Hills and Mt Gilead biocertification assessments and numerous Biobank site assessments undertaken on the Cumberland Plain.

ELA also consulted with the OEH on this matter with regard to 'HN556 *Narrow-leaved Ironbark – Broad-leaved Ironbark – Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion'* (email correspondence with Tim Hager and John Seidel on 20 April 2015). The OEH advised that 'local' benchmark data for the number of trees with hollows and for the length of fallen logs could be added for this BVT, with one and 30 m added for the number of trees with hollows and the length of fallen logs, respectively. However, more recently, the Vegetation Information System (VIS) has been updated and these benchmarks have now been amended to one and 50 m for the number of trees with hollows and the length of fallen logs, respectively. It is also noted that the VIS now classifies SSTF as a Grassy Woodland Vegetation Formation rather than a Dry Sclerophyll Forest Formation.

As this is an error in the Biobanking Tool datasets, it is not considered that a formal application for the use of local benchmark data is required to be submitted to the OEH for approval. Accordingly, the local (or amended) benchmark values for the number of trees with hollows and the length of fallen logs in the two BVTs were used in this Biocertification Assessment (**Section 4**).

4 Biocertification Assessment Results

This section details the results of the biodiversity certification assessment conducted to the requirements of the BCAM. The information below is technical in nature, and relies on a broad understanding of the BCAM to understand the methods applied. Readers should make themselves familiar with the BCAM before reviewing this section of the document.

4.1 Biodiversity certification assessment area

The Biodiversity Certification Assessment Area (BCAA) is comprised of:

- Land proposed for biodiversity certification (development) – 'requires' biodiversity credits
- Land proposed for conservation – 'generates' biodiversity credits
- Lands where the current land use will be retained (retained lands) – neither requires nor generates biodiversity credits – there is no retained land in this assessment

The footprint proposed for biodiversity certification (development) is 18.57 ha (10.63 ha of which comprises native vegetation as defined by the BCAM) (**Table 5** and **Figure 2**). The land proposed for conservation totals 40.35 ha of which 39.70 ha has been mapped as native vegetation (the remaining 0.65 ha is a dam and 4WD tracks).

Table 5: Land use breakdown

Development Footprint	Area (ha)	% of Area	Area of Native Vegetation	% of Native Vegetation
Land Proposed for Biodiversity Certification (Development)	18.57	31.52	10.63	21.12
Land Proposed for Conservation Measures	40.35	68.48	39.7	78.88
Total	58.92	100	50.33	100

As defined in the BCAM, different levels of conservation security and ongoing management result in the generation of a different number of credits. The credit entitlement for conservation areas are broken into three broad categories, being:

- Areas that are managed and funded in perpetuity (i.e. BioBank sites or national parks) – 100% credit entitlement
- Areas that are managed in perpetuity (e.g. NPW Act Conservation Agreements etc.) – 90% credit entitlement
- Areas that are secured through planning instrument (i.e. environmental zoning) – 25% credit entitlement

4.2 Vegetation mapping and zones

Two vegetation types were identified in the BCAA (**Table 6**). In total, 50.33 ha of native vegetation were mapped, with the dominant vegetation type being 'HN556 *Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin'* (46.32 ha). The site also supports 4.01 ha of 'HN528 *Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin*' and 8.59 ha of 'cleared' land, which in the context of the BCAM includes exotic vegetation.

Table 6: Area of vegetation within the BCAA

BioMetric Vegetation Type	Area (Ha)
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin	4.01
Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin	46.32
Cleared	8.59
Total	58.92

The two vegetation types were separated into five vegetation zones for this assessment (**Table 7** and **Figure 4**). Two zones were mapped in 'moderate to good' condition and three vegetation zones were mapped in 'low condition'. The following ancillary codes were used to further stratify the vegetation zones:

- Canopy and Understorey
- Canopy only
- DNG
- Regrowth

Table 7: Area of vegetation zones assessed within the BCAA

Veg Zone ID	BioMetric Vegetation Type	Condition[1]	Ancillary Condition Code	Area (ha)		
				Land Proposed for Conservation	Land Proposed for Biodiversity Certification	Total
1	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin (HN528)	M/G	Canopy and Understorey	0	2.81	**2.81**
2	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin (HN528)	Low	Canopy Only	0	0.44	**0.44**
3	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin (HN528)	Low	Regrowth	0	0.76	**0.76**
4	Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin (HN556)	M/G	Canopy and Understorey	38.77	6.55	**45.32**
5	Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin (HN556)	Low	DNG	0.93	0.07	**1.00**
Total				**39.70**	**10.63**	**50.33**

[1] Condition as defined by the BCAM

4.3 Transect/Plot data and site value scores

Appendix 3 of the BCAM defines the minimum number of transects/plots required per vegetation zone area (DECCW 2011). Data from a total of thirty nine (39) BioMetric vegetation transects/plots was collected across the BCAA, with a transect/plot requirement of seven transects/plots calculated from the combined area of conservation, development and retained lands (**Table 8** and **Figure 4**). The collected transect/plot data is provided in **Appendix G**.

The field survey targeted locations that were considered likely to be representative of the mapped vegetation communities in their various condition states.

Table 8: Vegetation zones and transect/plot data

Veg Zone ID	BioMetric Vegetation Type	Ancillary Code	Area to be Assessed (ha)	Transects/ Plots Required	Transects/ Plots Collected & used in Assessment
1	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin (HN528)	Canopy and Understorey	2.81	1	3
2	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin (HN528)	Canopy Only	0.44	1	1
3	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin (HN528)	Regrowth	0.76	1	1
4	Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin (HN556)	Canopy and Understorey	45.32	3	33
5	Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin (HN556)	DNG	1	1	1
Total			**50.33**	**7**	**39**

Current site value and future site value scores were calculated for each vegetation zone using the transect/plot data collected. The BCAM credit calculator was used to produce the current and future site value scores for both development and conservation areas (**Table 9**).

Table 9: Site value scores allocated to each vegetation zone

Veg Zone ID	BioMetric Vegetation Type	Ancillary Code	Current Site Value Score	Future Site Value Score (Development)	Future Site Value Score (Conservation)
1	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin (HN528)	Canopy and Understorey	44.1	0	68
2	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin (HN528)	Canopy Only	21.88	0	33
3	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin (HN528)	Regrowth	30.73	0	46
4	Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin (HN556)	Canopy and Understorey	60.07	0	81
5	Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin (HN556)	DNG	11.46	0	26

4.4 Landscape Score

The credit calculator calculated a landscape value score of **16** for the land to be certified and a score of **15.2** for the land subject to conservation measures. The landscape value is calculated from the sum of the scores obtained from the following three attributes:

- percent native vegetation cover in the landscape
- connectivity value
- adjacent remnant area determined according to the Mitchell landscape in which most of the land proposed for biocertification occurs.

Scores for the each landscape attribute for land to be certified and land subject to conservation measures are provided in **Table 10** and **Table 11**. An explanation on how the score was determined for each attribute is provided in the sub sections below.

4.4.1 Percent Native Vegetation Cover Score

The percent native vegetation cover calculation was completed within a single 1,000 ha circle (**Figure 5**). The area of vegetation cover was digitised from an aerial photograph at a scale of approximately 1:10,000. The results of the assessment are contained in **Table 10**.

All low condition derived native grasslands (site value < 34) (1.00 ha) were excluded from this assessment because it was considered that the condition of this vegetation was significantly below the benchmark cover of the original vegetation type.

A pre-certification score of **15** was determined with 442.76 ha (442.76/1000 = 44.28%) native vegetation mapped within the 41-50% native vegetation cover class. Vegetation clearance required for residential development would result in 434.33 ha of vegetation cover (43.43%) remaining in the assessment circle. The post certification score is also **15** because vegetation cover falls within the same 10% increment (41-50%).

Table 10: Native vegetation cover in assessment circle

Circle	Before Certification			After Certification		
	Area of Vegetation Within Assessment Circle (Ha)	Native Vegetation Cover Class (%)	Score	Area of Vegetation Within Assessment Circle (Ha)	Native Vegetation Cover Class (%)	Score
1 (1,000ha)	442.76 (44.28%)	41-50%	15	434.33 (43.43%)	41-50%	15

The land subject to conservation measures (post-biodiversity certification) is 40.35 ha, of which 39.70 ha is currently vegetated land. Therefore (using Table 3 of the BCAM) a gain of **2.2** is recorded for the per cent native vegetation score after conferral of biodiversity certification.

4.4.2 Connectivity Value

The current connectivity value of the site was assessed according to Section 3.7.2 of the BCAM and provided in **Table 11.** There are three components of connectivity; these are areas approved as a 'state' or 'regional' biodiversity links by the Director General, the hierarchy and riparian zone width of water courses in accordance with Appendix 1 of the BCAM and an assessment of vegetation connectivity. At a meeting with OEH on 13 May 2014, OEH officers confirmed that there were currently no state or regional biodiversity links relevant to the BCAA.

'Minor creeks' and 'minor watercourses' defined as a 'local biodiversity link' and patches of vegetation that conform to the criteria of a local biodiversity link (moderate to good condition, has a patch size >1 ha which is separated by <30 m) occur on land to be developed and land subject to conservation measures (Figure 8). According to Table 4 of the BCAM the score for a local biodiversity link is 6.

As a local biodiversity link is located on land proposed for biodiversity certification and will be impacted it was allocated a score of 0 after development. A local biodiversity link is also present on land subject to conservation measures and will be protected after certification accordingly it was allocated a connectivity score of 6.

Table 11: Connectivity scores allocated for the assessment

Connectivity Score	Pre-certification	Post-certification
Land to be certified	6	0
Land subject to conservation measures	0	6

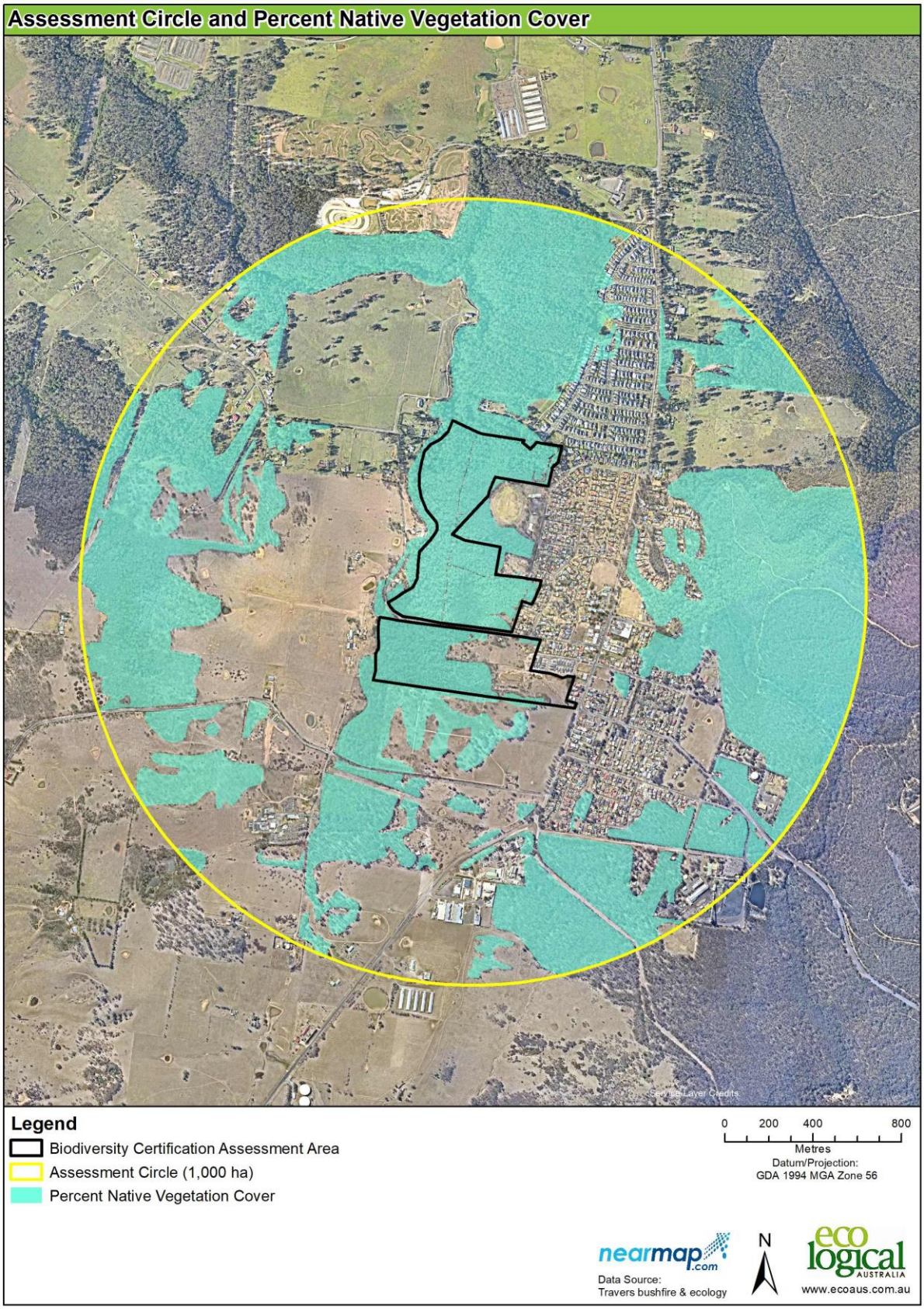

Figure 7: Assessment circle

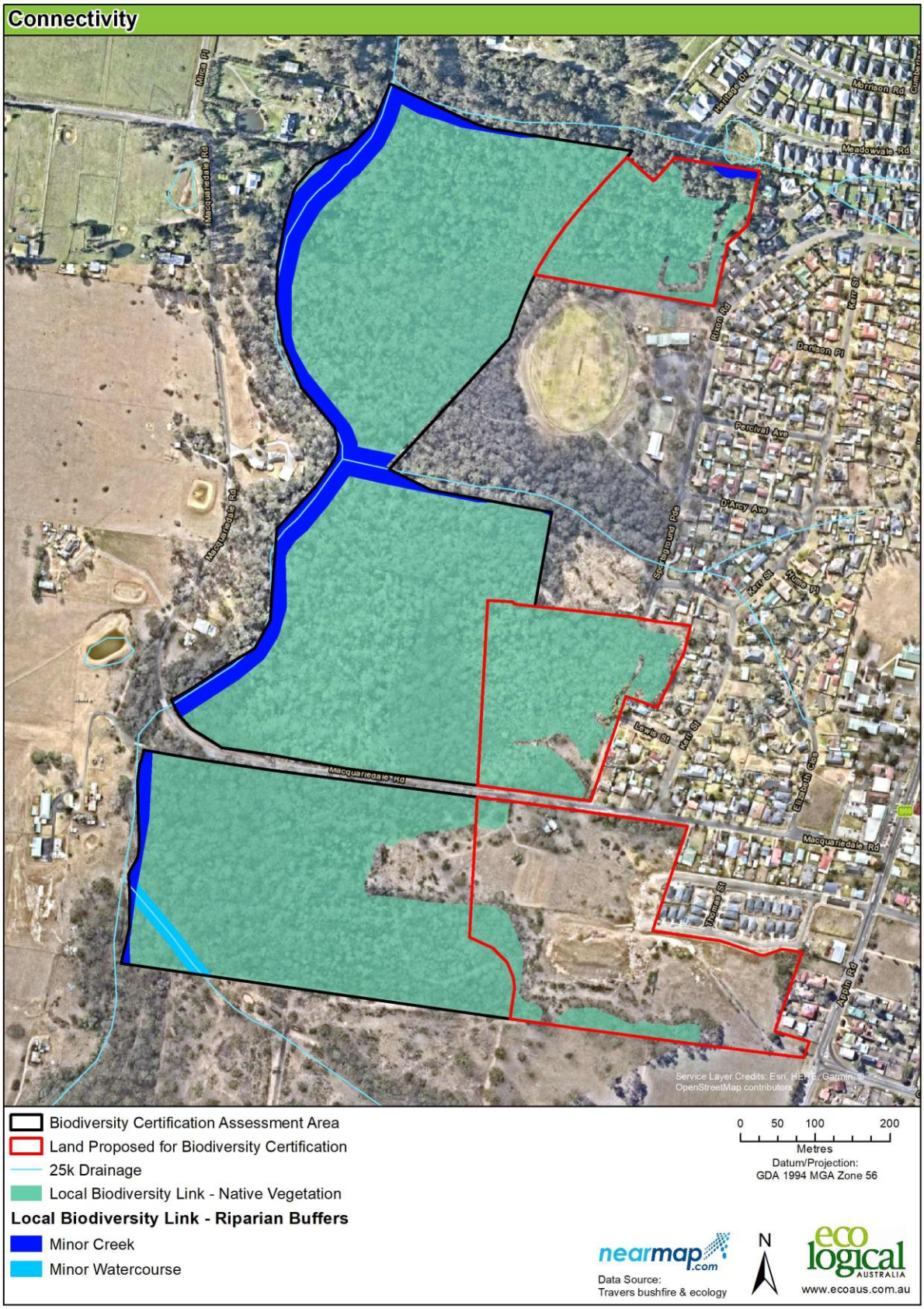

Figure 8: Connectivity

4.4.3 Adjacent Remnant Area

The BCAA predominantly occurs on the Picton – Razorback Hills Mitchell Landscape which is 61% cleared. The vegetation on-site is well connected and as such has an adjacent remnant area (ARA) of >100 ha which receives the maximum score of **10** for Mitchell Landscapes within the 30-70% cleared range.

The land subject to conservation measures also occurs within the same Picton – Razorback Hills Mitchell Landscape with the same ARA of >100 ha. Therefore the score allocated for the conservation lands is also **10**.

4.5 Red Flags

The two vegetation types within the BCAA have been identified as being Critically Endangered Ecological communities (CEEC) and both are also classified as over-cleared vegetation types (>70% of original extent in the CMA cleared) (**Table 12**). These vegetation types are therefore 'red-flagged' when in moderate to good condition under the BCAM. The area of red flagged vegetation is shown in **Table 12** and **Figure 9.** Red flag areas should be avoided and can only be impacted in accordance with certain rules outlined in Section 2.4 of the BCAM.

On completion of the required BioMetric plots and calculation of site value scores, three zones, '*Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain*, Sydney Basin (Canopy Only and Regrowth)' and '*Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain*, Sydney Basin (DNG)' were identified as being in 'low' condition because the site value score for these vegetation zones was less than 34/100. Accordingly, these vegetation zones are not red flagged.

A total of 48.13 ha of red flagged vegetation is present within the BCAA of which 9.36 ha or 19.45% would be impacted by the proposed residential rezoning. A red flag variation request prepared in accordance with the criteria set out in Section 2.4 of the BCAM is provided in **Section 5** of this report. It is noted that a red flag variation request must be assessed and approved by OEH before biodiversity certification can be conferred.

Table 12: Impacts to red flagged vegetation

BioMetric Vegetation Type	EEC/CEEC Name	Cleared within CMA	Area within BCAA (ha)	Area Impacted (ha)	Proportion Impacted (%)
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin	Cumberland Plain Woodland CEEC	95%	2.81	2.81	100%
Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin	Shale/Sandstone Transition Forest EEC	80%	45.32	6.55	14.45%
Total			48.13	9.36	

4.6 Indirect Impacts

The BCAM requires that any application for formal biodiversity certification must demonstrate how the "*proposed ownership, management, zoning and development controls of the land proposed for biodiversity certification is intended to mitigate any indirect impacts on biodiversity values*" (DECCW 2011).

The development area includes all urban development areas and associated roads, stormwater management structures, infrastructure and features such as Asset Protection Zones (APZs) and other impacts within the land identified for development or proposed to be certified. Accordingly all impacts, direct and indirect, have been considered to be completely contained within the area proposed for biocertification. Whilst some of these development components (e.g. APZs), do not result in 100% loss of biodiversity values, in accordance with the BCAM, they have been counted as 100% loss. Further, the storm water detention basins will be re-vegetated with landscape plantings consistent with the relevant surrounding CPW or SSTF vegetation types providing a buffer between the development and proposed conservation areas, further reducing potential indirect impacts.

4.7 Buffers on Red flag areas

In accordance with Section 6 of the BCAM, where a proposed conservation measure is used to protect land that is a red flag area, the area of the proposed conservation measure must include a buffer to mitigate any negative indirect impacts from development following the conferral of biocertification. The buffer area may be secured via a conservation measure and used to offset the impacts of biodiversity certification, or it may be a retained area in the biocertification assessment area (and not generate any credits) (see Section 6 of the BCAM).

In consultation with OEH on other similar projects, it was determined that an appropriate buffer for red flag vegetation in proposed conservation areas adjacent to impact sites would be 30 m and this could be partly comprised by any perimeter roads separating development from the proposed conservation area and should be classified as a 'retained area' within the BCAA.

A shown in the amended Masterplan for the certified land (**Figure 14**), the development area is surrounded by perimeter roads and detention basins (that will be landscaped) and provide a 25-50 metre buffer to the conservation area comprising a 15m road corridor and10- 40m APZ. Further, this area has been counted as 'impacted' and does not generate credits as an offset area

The roads surrounding this conservation buffer area will be fully curbed and guttered with piped stormwater management that will not flow into the conservation area of buffer area.

4.8 Ecosystem Credit Calculations

4.8.1 Ecosystem Credits

Ecosystem credits have been calculated for the impact caused by the proposed development and improvement to biodiversity values resulting from the management of conservation lands. In total, **275** ecosystem credits are required for the proposed residential rezoning (**Table 13**).

As described earlier, different levels of protection and management for conservation lands results in the generation of a different number of credits as outlined below:

- Areas that are managed and funded in perpetuity (i.e. BioBank sites or national parks) – 100% credit entitlement – generating 415 credits
- Areas that are managed in perpetuity (e.g. NPW Act Conservation Agreements etc) – 90% credit entitlement - generating 373 credits

- Areas that are secured through planning instrument (i.e. environmental zoning) – 25% credit entitlement - generating 104 credits

It is noted that a surplus of 222 HN556 SSTF ecosystem credits are generated (193 required, 415 generated) and a deficit of 82 HN528 CPW credits (82 required, zero (0) generated).

Section 8.5 of the BCAM states that planning authorities should in the first instance attempt to generate all required credits from conservation measures 'within' the BCAA. Section 10.2.1 of the BCAM provides a number of variation rules that permit the use of credits generated from vegetation types in the same vegetation formation to meet an IoM outcome. It is noted that both CPW and SSTF are classified as Coastal Valley Grassy Woodlands and in accordance with the BCAM, the surplus credits for SSTF could be used to meet the deficit for CPW, still leaving a 140 credit surplus of SSTF credits.

It is proposed that the land subject to conservation measures within the BCAA will be secured by entering into a BioBanking Agreement under Part 7A of the TSC Act as described in **Section 5** of this report – Biodiversity Certification Strategy. The Biocertification credit calculator tool has calculated that this measure will generate 415 SSTF ecosystem credits, 122 Cumberland Land Snail species credits and 238 Koala species credits (Table 13).

4.9 Threatened Species Assessment

4.9.1 Species credits

Species credit requirements have been calculated for the Cumberland Plain Land Snail (*Meridolum corneovirens*) which has been surveyed for, identified on-site and likely habitat mapped as species polygons and Koala. Other threatened fauna and flora species were not detected and have not been calculated for species credit requirements.

In summary, for the Cumberland Land Snail, a total of 122 species credits are required for the land proposed to be certified (**Table 14)**. The offset areas generate 122,110 or 31 credits using the 100%, 90% or 25% conservation measures respectively. As a 100% conservation measure is proposed on-site, this equates to all land snail offsets being met on-site.

For Koala, a total of 258 species credits are required for the land proposed to be certified (Error! Reference s ource not found.). The offset areas could generate 238, 214 or 60 credits using the 100%, 90% or 25% conservation measures respectively. As a 100% conservation measure is proposed on-site, this equates to a deficit of 20 credits.

Table 13: Final ecosystem credit results

BioMetric Vegetation Type	Condition	Ancillary Zone	Credits Required	Credits Generated (100%)	Credits Generated (90%)	Credits Generated (25%)	Credit Status (100%)	Credit Status (90%)	Credit Status (25%)
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin	M/G	Canopy and Understorey	63	0	0	0	-82	-82	-82
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin	Low	Canopy Only	6	0	0	0			
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin	M/G	Regrowth	13	0	0	0			
Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin	M/G	Canopy and Understorey	192	408	367	102	222	180	89
Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin	Low	DNG	1	7	6	2			
Total			275	415	373	104	140	98	7

Table 14: Final species credit results

Common Name	Area (ha) Impacted	Credits Required	Area (ha) in Offset Area	Credits Generated (100%)	Credits Generated (90%)	Credits Generated (25%)	Credit Status (100%)	Credit Status (90%)	Credit Status (25%)
Cumberland Plain Land Snail	9.18	122	20.40	122	110	31	0	-12	-91
Koala	9.80	258	39.70	238	214	60	-20	-44	-198

5 Red Flag Variation Request

5.1 Impact on Red Flagged Areas

The BCAM requires each of the criteria set out in section 2.4 of the methodology to be addressed in order for the Director-General to be satisfied that impacts to red flag areas are able to be offset.

Section 3 of this report has identified an impact on red flagged areas as defined by BCAM. This section addresses this requirement.

A red flag is triggered under the BCAM when there is an impact on any of the following:

- a vegetation type >70% cleared in the CMA for which it is mapped (not in 'low condition')
- a critically endangered (CEEC) or endangered ecological community (EEC) listed under the TSC Act or EPBC Act (not in 'low condition')
- a threatened species that cannot withstand further loss
- an area of land with regional or state conservation significance

The Biocertification Operational Manual states that each red flag area within the proposed biodiversity certification area should be numbered and listed in a table and shown on a map. Each red flag area impacted will require a separate red flag variation request unless the responses are the same for each entity, i.e. vegetation type is the same, patches are of similar condition, patches have the same connectivity etc.

Two vegetation types recorded on-site ('*Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin*', and, '*Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin*') meet the definition of critically endangered ecological communities listed on the schedules of the TSC Act and will be impacted by the proposed development. Two out of the five vegetation zones (zones 1, and 4) are in moderate-good biometric condition, with each of these vegetation zones being impacted. In total 9.36 ha of Red Flag Vegetation will be impacted by the proposed development (**Table 15**).

Table 15: Impacted red flag vegetation

BioMetric Vegetation Type	EEC/CEEC Name	% Cleared in CMA (DECC 2008)	Area of vegetation type in BCAA (ha)	Area of red flag vegetation Impacted (ha)
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin	Cumberland Plain Woodland CEEC	95%	4.01	2.81
Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin	Shale/Sandstone Transition Forest EEC	80%	46.32	6.55
Total	N/A	N/A	50.33	9.36

The distribution and patch size of red flag vegetation on land proposed for biodiversity certification is presented in **Table 16** and shown in **Figure 9** and **Figure 10** and discussed for each of the red flag variation criteria in section 2.4 of the BCAM.

Table 16: Red flag vegetation on land proposed for biodiversity certification

Red Flag Patch	Biometric Vegetation Type	Condition	Ancillary	Area (ha)
1	Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin	M/G	Canopy and Understorey	2.45
2	Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin	M/G	Canopy and Understorey	0.07
3	Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin	M/G	Canopy and Understorey	3.36
4	Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin	M/G	Canopy and Understorey	0.15
5	Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin	M/G	Canopy and Understorey	0.52
	Sub-total			**6.55**
6	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin	M/G	Canopy and Understorey	1.00
7	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin	M/G	Canopy and Understorey	0.20
8	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin	M/G	Canopy and Understorey	0.44
9	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin	M/G	Canopy and Understorey	0.50
10	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin	M/G	Canopy and Understorey	0.23
11	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin	M/G	Canopy and Understorey	0.44
	Sub-total			**2.81**
Grand Total				**9.36**

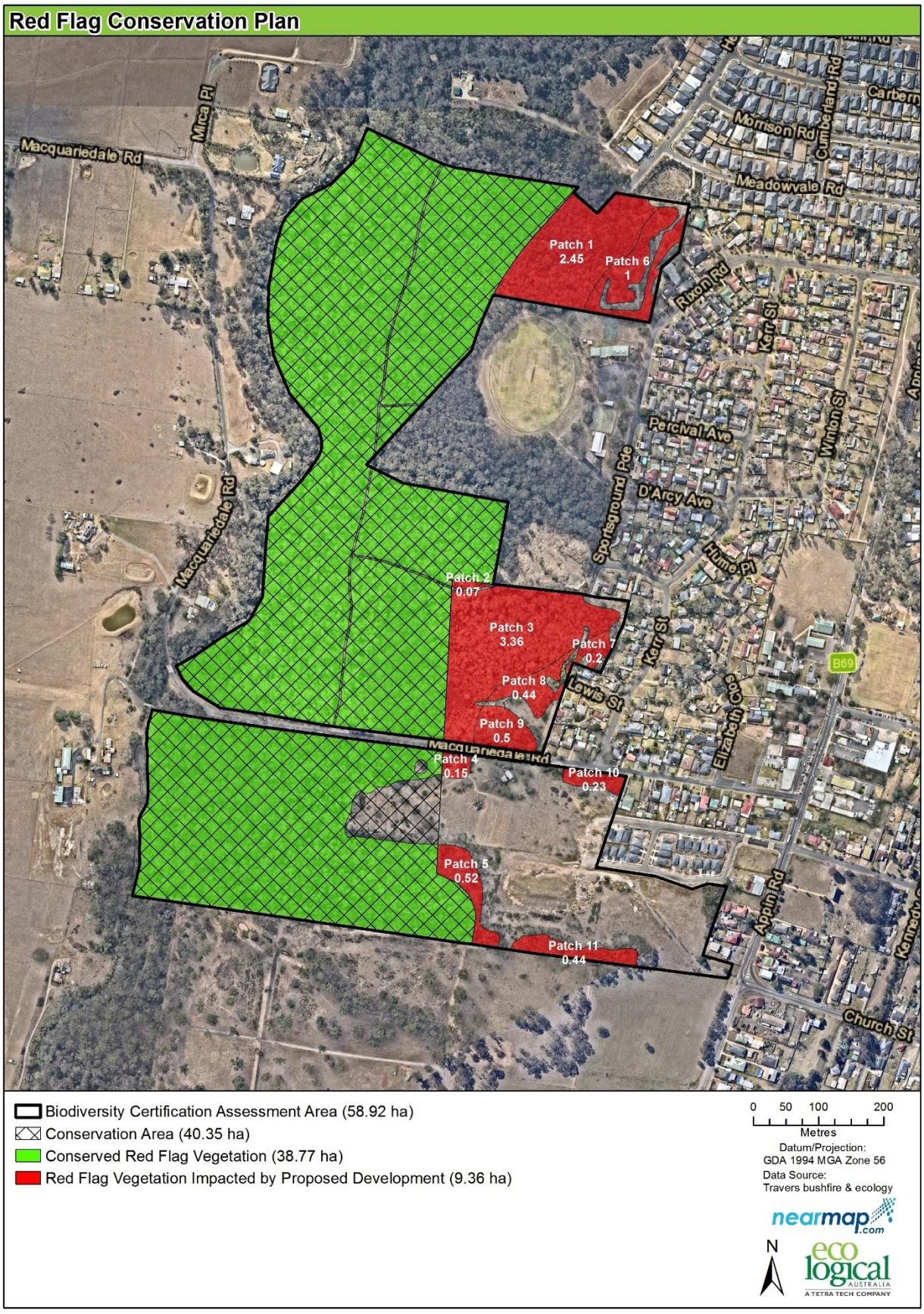

Figure 9: Impacted red flag vegetation

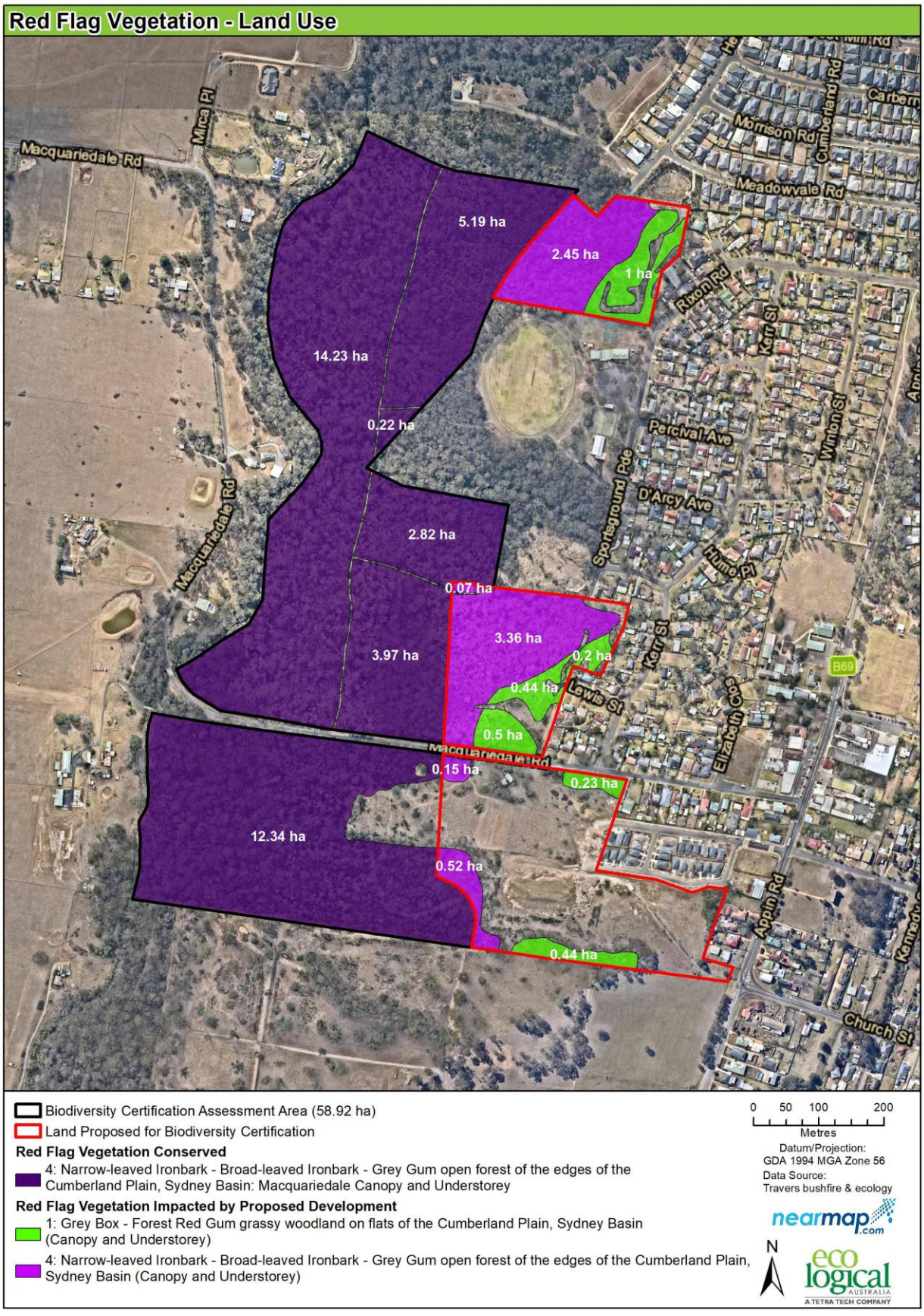

Figure 10: Red flag vegetation zones, patch size and BCAA land use

5.2 Red Flag Variation Criteria

The presence of Red Flags within the proposed development area means that Biocertification of the land cannot be conferred unless a red flag variation is granted by the Director General (or equivalent) of OEH. An application for a red flag variation must satisfactorily address the criteria in Section 2.4 of the BCAM (DECCW 2011) for a proposal to be regarded as improving or maintaining biodiversity values.

The following criteria must be addressed for a vegetation type which is greater than 70% cleared or is a critically endangered or endangered ecological community

1. Feasibility of options to avoid impacts on red flag area(s) where biodiversity certification is conferred (Section 2.4.1 of the BCAM)

2. Viability must be low or not viable (Section 2.4.2.1 of the BCAM)

3. Contribution to regional biodiversity values must be low (Section 2.4.2.2 of the BCAM)

The remaining red flag variation criteria (2.4.3 – species that cannot withstand further loss and 2.4.4 – impacts to areas with regional or state biodiversity conservation significance) do not need to be addressed as there are no red flag species or areas of state or regional conservation significance to be impacted in the BCAA.

This report provides the information required for OEH to assess a red flag variation for the impacted areas of the endangered Shale Sandstone Transition Forest community and the critically endangered Cumberland Plain Woodland community in the BCAA. Both vegetation communities will be considered at the same time when addressing each criterion because the related information and mapping is broadly the same for each red flag.

5.2.1 Avoiding and Minimising Impacts on Red Flags (Criteria 2.4.1)

The Director General must be satisfied that the feasibility of options to avoid impacts on red flag areas has been considered in the application for biodiversity certification. An application for biodiversity certification can address this requirement by demonstrating that:

a) all reasonable measures have been taken to avoid adverse impacts on the red flag areas and to reduce impacts of development on vegetation remaining within the biodiversity certification area

In addressing the criteria for a), the application for biodiversity certification may include information that demonstrates:

- *how the subdivision design, (including the configuration of lots, minimum lot sizes and/or options for lot averaging and lot clustering) have been used to avoid and minimise impacts on red flag areas*
- *how the spatial distribution, configuration, size of patches and connectedness of the red flag areas proposed for conservation measures within the biodiversity certification assessment area have minimised the overall impacts of conferring biodiversity certification on the red flag areas.*

b) appropriate conservation management arrangements cannot be established over the red flag area given its current ownership, status under a regional plan and zoning and the likely costs of future management.

a) All reasonable measures to avoid adverse impacts

Wollondilly Shire Council has been liaising with the OEH since November 2008 regarding an amendment to the Wollondilly Local Environment Plan 2011 to rezone land fronting Macquariedale Road. The main issues discussed during these consultations has been the need to reduce impacts to priority conservation lands on the Cumberland Plain as identified in the Cumberland Plain Recovery Plan (DECCW 2011) and in particular to the Shale Sandstone Transition Forest EEC.. The amended proposal is consistent with this advice. The current proposal and previous amendments since 2008 have significantly reduced the proposed residential zone area to reduce the impact on the red flag vegetation and other associated habitat. The residential zone area has also been placed in a logical location that strategically extends the developed area of the Appin township and protects a core area of connected vegetation to the west.

b) Appropriate conservation management arrangements cannot be established over the red flag area given its current ownership, status under a regional plan and zoning and the likely costs of future management.

Under the Wollondilly LEP 2011 the majority of the site is currently zoned RU2 Rural Landscape with a small area of land zoned R3 Medium Density Residential. The objectives of the RU2 zone are focussed on facilitating agricultural land uses with some consideration given to maintaining the rural landscape character. The objectives of the R3 zone are to address the housing needs of the community within a medium density residential environment. In this context, the opportunity for red flagged vegetation to be appropriately conserved, particularly in light of continued grazing pressure under the current RU2 zoning on the southern section of the site and ongoing edge effects from adjacent residential development is highly unlikely.

5.2.2 Viability (Criteria 2.4.2.1)

The BCAM states that:

> *The application for biodiversity certification must demonstrate to the satisfaction of the Director General that the viability of biodiversity values in the red flag area is low or not viable.*
>
> *For the purpose of the methodology, viability is defined as the ability of biodiversity values at a site to persist for many generations or long time periods. The ecological viability of a site and its biodiversity values depend on its:*
>
> - *condition*
> - *the area of the patch of native vegetation and its isolation*
> - *current or proposed tenure and zoning under any relevant planning instrument*
> - *current and proposed surrounding land use*
> - *whether mechanisms and funds are available to manage low viability sites such that their viability is improved over time*
>
> *In making an assessment that the viability of biodiversity values in the red flag area is low or not viable, the Director General must be satisfied that <u>one</u> of the following factors applies:*
>
> *a) The current or future uses of land surrounding the red flag area where biodiversity certification is to be conferred reduce its viability or make it unviable. Relatively small areas of native vegetation surrounded or largely surrounded by intense land uses, such as urban development, can be unviable or have low viability because of disturbances from urbanisation, including edge effects; or*

b) The size and connectedness of the vegetation in the red flag area where biodiversity certification is to be conferred to other native vegetation is insufficient to maintain its viability. Relatively small areas of isolated native vegetation can be unviable or have low viability; or

c) The condition of native vegetation in the red flag area where biodiversity certification is to be conferred is substantially degraded, resulting in loss of or reduced viability. Native vegetation in degraded condition can be unviable or have low viability. 'Degraded condition' means substantially outside benchmark for many of the vegetation condition variables as listed in Table 1 of the methodology (s.3.6.2), without the vegetation meeting the definition of low condition set out in section 2.3. Vegetation that is substantially outside benchmark due to a recent disturbance such as a fire, flood or prolonged drought is not considered degraded for the purposes of the methodology; or

d) The area of a vegetation type in a red flag area on land where biodiversity certification is conferred is minor relative to the area containing that vegetation type on land subject to proposed conservation measures.

Reference is made to **Figure 10** and **Table 16** when addressing the viability of the red flag vegetation in the BCAA. In summary, the combined red flag area of 9.36 ha is part of a larger fragmented remnant of bushland of over 50 ha in various condition states intersected by roads and existing rural development. The six patches of Cumberland Plain Woodland comprising the red flag variation request total 2.81 ha and the five patches of Shale Sandstone Transition Forest total 6.55 ha.

a) Current or Future Land Use surrounding the red flag area

The existing land uses surrounding the red flag areas include a sports field, open pasture, Macquariedale Road and existing residential development as shown on **Figure 10** . These existing land uses are likely to result in on-going long term impacts on the eastern and southern edges of the six impacted patches of Cumberland Plain Woodland and five patches of impacted Shale Sandstone Transition Forest. These impacts, termed "edge effects", describe the various consequences on vegetation and wildlife which occur as a result of vegetation sharing a border with a developed area. The type of edge effects likely to impact the vegetation patches at this location include nutrient enrichment, weed invasion, access from pest animals such as cats, dogs and foxes, illegal dumping and unauthorised clearing. Although the vegetation in the larger patches may have a good level of plant species diversity and be in relatively good condition, because this land is not currently protected in some form of reserve and does not require active conservation management, and are currently not being actively managed or will not be managed in the future will result in a long-term decline in biodiversity values.

b) Size and connectedness

Whilst the size of each 'patch' of red flagged vegetation ranges from 0.2 ha to 1.00 ha for the Cumberland Plain Woodland and 0.07 ha to 3.36 ha for the Shale Sandstone Transition Forest, when considered as a whole, the combined CPW and SSTF red flag patches are 3.45 ha to the north of the oval (Patches 1 & 6), 4.57 ha south of the oval and north of Macquariedale Road (Patches 2, 3, 7, 8 & 9) and 0.9 ha south of Macquariedale Road (Patches4, 5, 10 & 11 respectively). These patches are all relatively small and in the context of existing urban development to the east and north, cleared rural land to the south, have limited connectivity.

c) Vegetation substantially outside of benchmark condition

Generally the condition of vegetation within entire BCAA site is biometric 'good'. Weeds are limited to the periphery of vegetation patches, in particular, around the sporting oval and north along the back edge of

the existing housing, along the edge of Macquariedale Road, within the cleared paddocks and a small amount within Ousedale Creek (Travers bushfire & ecology 2014a).

d) Relative area of red flag vegetation impacted is minor compared to land subject to conservation measures

The area of each red flag vegetation type on land where biodiversity certification is being sought is not minor relative to the area containing the same vegetation type on land subject to conservation measures.

100% of the red flagged Cumberland Plain Woodland within the BCAA is proposed to be impacted and 14.45% of the Shale Sandstone Transition Forest (**Table 17**), although the area of red flag Shale Sandstone Transition Forest subject to conservation measures (38.77 ha) is approximately 6 times the area being impacted (6.55 ha impacted).

Table 17: Red flag vegetation type on development and conservation land

BioMetric Vegetation Type	EEC/CEEC Name	Cleared within CMA (DECC 2008)	Red Flag Area within BCAA (ha)	Red Flag Area Impacted (ha)	Proportion Impacted (%)	Area Conserved (ha)	Proportion Conserved (%)
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin	Cumberland Plain Woodland CEEC	95%	2.81	2.81	100%	0	0%
Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin	Shale/Sandstone Transition Forest EEC	80%	45.32	6.55	14.45%	38.77	85.55%

All patches of red flag vegetation within the BCAA to be conserved will be subject to in perpetuity conservation management as outlined in **Section 5** of this report.

In conclusion, it is considered that factors a) and b) apply.

5.2.3 Contribution to Regional Biodiversity Values (Criteria 2.4.2.2)

The BCAM states that:

> *The application for biodiversity certification must demonstrate to the satisfaction of the Director General that the red flag area on land proposed for biodiversity certification makes a low contribution to regional biodiversity values.*

In making an assessment that the contribution of the red flag area to regional biodiversity values is low, the Director General must consider the following factors for each vegetation type or critically endangered or endangered ecological community regarded as a red flag area:

a) relative abundance: that the vegetation type or critically endangered or endangered ecological community comprising the red flag area is relatively abundant in the region; and

b) percent remaining is high: that the percent remaining of the vegetation type or critically endangered or endangered ecological community comprising the red flag area is relatively high in the region; and

c) percent native vegetation (by area) remaining is high: that the percent remaining of all native vegetation cover in the region is relatively high.

'Region' for the purposes of section 2.4.2.2 means the CMA subregion in which the red flag area is located and any adjoining CMA subregions.

The contribution to regional biodiversity values was assessed for both red flagged vegetation communities on-site, using regional datasets where available. Under the BCAM the 'region' is defined as both the CMA subregion where the red flag area is located (in this case the Cumberland Hawkesbury/Nepean subregion) and adjoining CMA subregions; the Cumberland (Sydney Metro), Burragorang, Pittwater, Sydney Cataract (Hawkesbury/Nepean), Sydney Cataract (Sydney Metro), Wollemi and Yengo CMA subregions shown in **Figure 11**. In some cases consistent data is not available across this entire region. Where alternate regions have been used they have been identified in this assessment.

The use of regional vegetation datasets in this assessment, while the best data currently available, does have limitations. The data in some cases is several years old and therefore the extant mapping may require revision.

In addition, most regional vegetation mapping products only map patches greater than a minimum size (for example 0.5 ha) and generally only map vegetation in reasonably good condition. It is highly likely that smaller patches of the red flag vegetation type exists in the relevant regions, however have not been included in this assessment as the patches are too small to map, or the condition is disturbed and therefore has not been mapped. This includes areas of Derived Native Grassland, which may be considered 'moderate-good' vegetation under the BCAM, but have not been mapped due to the canopy and midstorey vegetation having been removed.

The contribution to regional biodiversity values included an assessment of the relative abundance of the red flagged vegetation type, the percent remaining of the vegetation type, percent native vegetation remaining in the region and vegetation condition across the region. The results are provided below.

a) Relative Abundance

The first measure for the contribution to regional biodiversity values criteria is a measure of relative abundance of the red flagged vegetation types in the 'region'.

Analysis was conducted into the relative abundance of the red flagged vegetation types across the entire 'region'. The associated data layers that were assessed include:

- Sub CMA Cumberland & Yengo (Hawkesbury Nepean) (NPWS 2002 – Cumberland Plain western Sydney vegetation mapping)
- Sub CMA Cumberland (Sydney Metro) (NPWS 2002 - Cumberland Plain western Sydney vegetation mapping)
- Sub CMA Burragorang & Wollemi (Hawkesbury-Nepean) (NPWS 2003a – Native Vegetation of the Warragamba Special Area and BMCC 2002 - Blue Mountains LGA)

- Sub CMA Sydney Cataract (Hawkesbury-Nepean and Sydney Metro) (NPWS 2003b – Native Vegetation of the Woronora, O'Hares and Metropolitan Catchments)

ELA are confident that the data used captures the majority of the BioMetric vegetation types '*Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain'*, and *'Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain'* as the extent of these vegetation types are restricted to the 'region" as defined by the BCAM and is largely incorporated into the mapping used.

The results of the analysis for each vegetation type can be seen in **Table 18** and the distribution of the vegetation types is displayed in **Figure 12**. The area of each red flag vegetation type and its condition as defined by NPWS (2002) (where known) is shown separately. It is noted that whilst Tozer (2003) found that the '*current extent of woody native vegetation was best represented by polygons of condition classes A and B'* that there are significant areas mapped as "Tx" that meet the biometric definition of "moderate to good" condition as defined by the BBAM and BCAM (DECC 2008, DECCW 2011) and are assessed as red flag vegetation. Accordingly when addressing this criteria, i.e. the abundance of the red flagged vegetation type in the region, the extent of these vegetation types in the Tx condition category has been shown.

The results for the '*Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin*' are summarised below:

- 17,211 ha (of which 6,568 ha is in condition class A, B or C) is recorded within the Cumberland (Hawkesbury- Nepean and Sydney Metro) sub CMAs, in which the majority of the BCAA is located. The clearing of 2.81 hectares of red flagged CPW represents 0.02% of the total extent of the vegetation type in the Cumberland (Hawkesbury Nepean and Sydney Metro) sub CMAs and 0.04% in condition class A, B or C
- In the region (17,839 ha), 2.81 ha to be impacted by this proposal represents 0.02% of the extant 'Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin' or 0.04% of the extent of condition class A, B or C in the region (6,711 ha)

The results for the '*Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin*' are summarised below:

- 11,556 ha (of which 5,886 ha is in condition class A, B or C) is recorded within the Cumberland (Hawkesbury Nepean) sub CMA, in which the majority of the BCAA is located. The clearing of 6.55 hectares of red flagged SSTF represents 0.06% of the total extent of the vegetation type in the Cumberland (Hawkesbury Nepean) sub CMA and 0.11% in condition A, B or C.
- In the region (21,790 ha), 6.55 ha to be impacted by this proposal represents 0.03% of the extant 'Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin or 0.07% of the extent of condition class A, B or C in the region (9,949 ha)

The above information indicates that the impact to the red flagged vegetation types from the rezoning proposal is 'relatively minor' when compared to the amount mapped in the analysed regions.

Table 18: Relative abundance of red flag vegetation types in surrounding regions

Biometric Vegetation Type	Area Impacted (ha)	Vegetation Condition#	Area in Sub CMA (ha)								Total Area in Sub CMAs (ha)
			Cumberland (HN)	Cumberland (SM)	Burragorang	Pittwater	Sydney Cataract (HN)	Sydney Cataract (SM)	Wollemi	Yengo	
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin	2.81	ABC	5,707	861	0.29	0	0	4		173	6,711.29
		Cmi & Tx's	8,643	2,000	95	0	0	57	22	277	11,127.71
Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin	6.55	ABC	5,886	593	977	14	49	485	119	1,826	9,949
		Cmi & Tx's	5,420	711	1,113	7	54	466	176	1,436	9,383
		Unknown	249	0	874	0	1,106	0	208	0	2,437

Vegetation condition follows NPWS (2002) with A, B, C being patches >0.5 ha in area and canopy cover projection density (CCPD) > 10%. Cmi, Tx's being patches > 0.5 ha and CCPD < 10%.

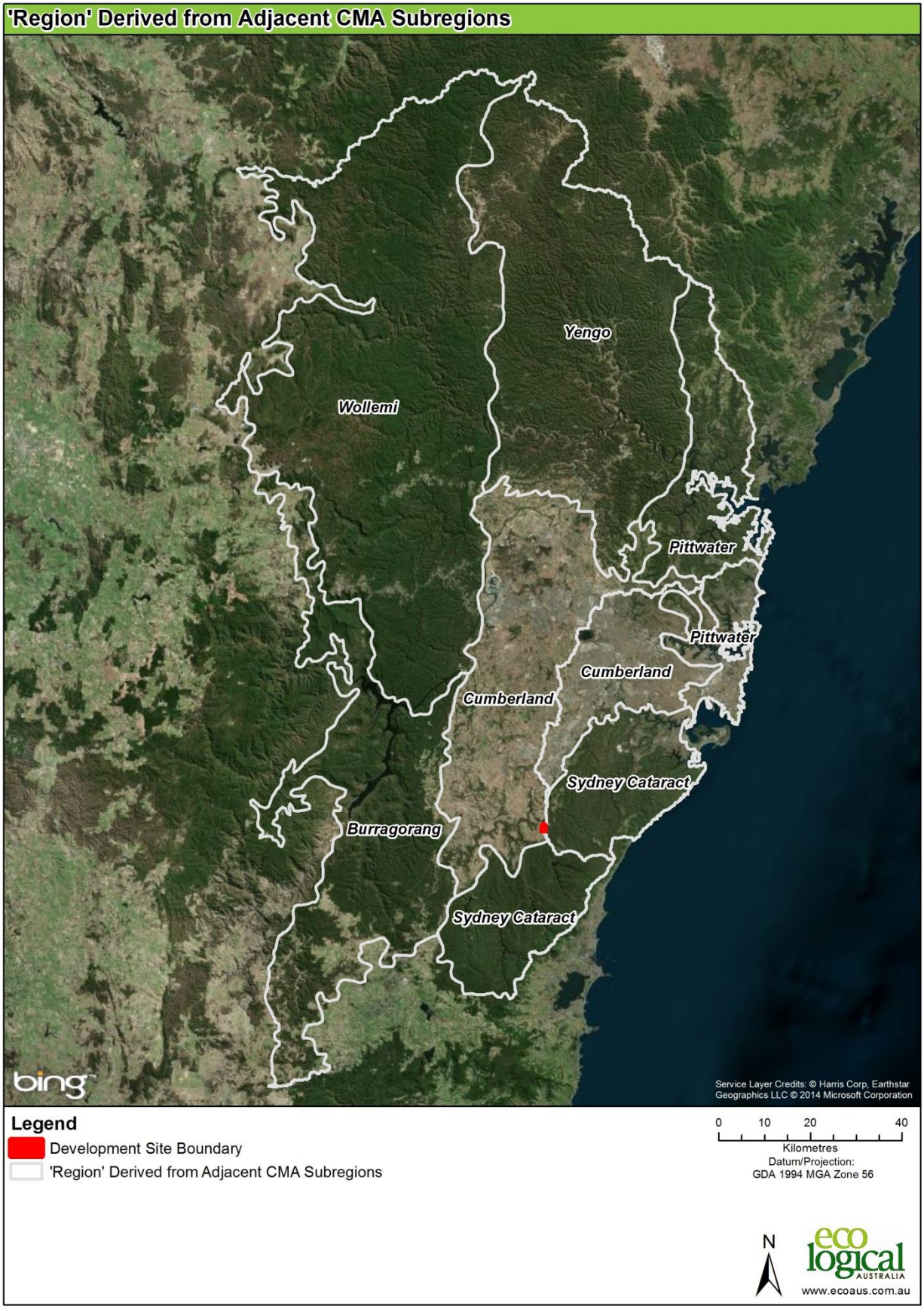

Figure 11: 'Region' derived from adjacent CMA subregions

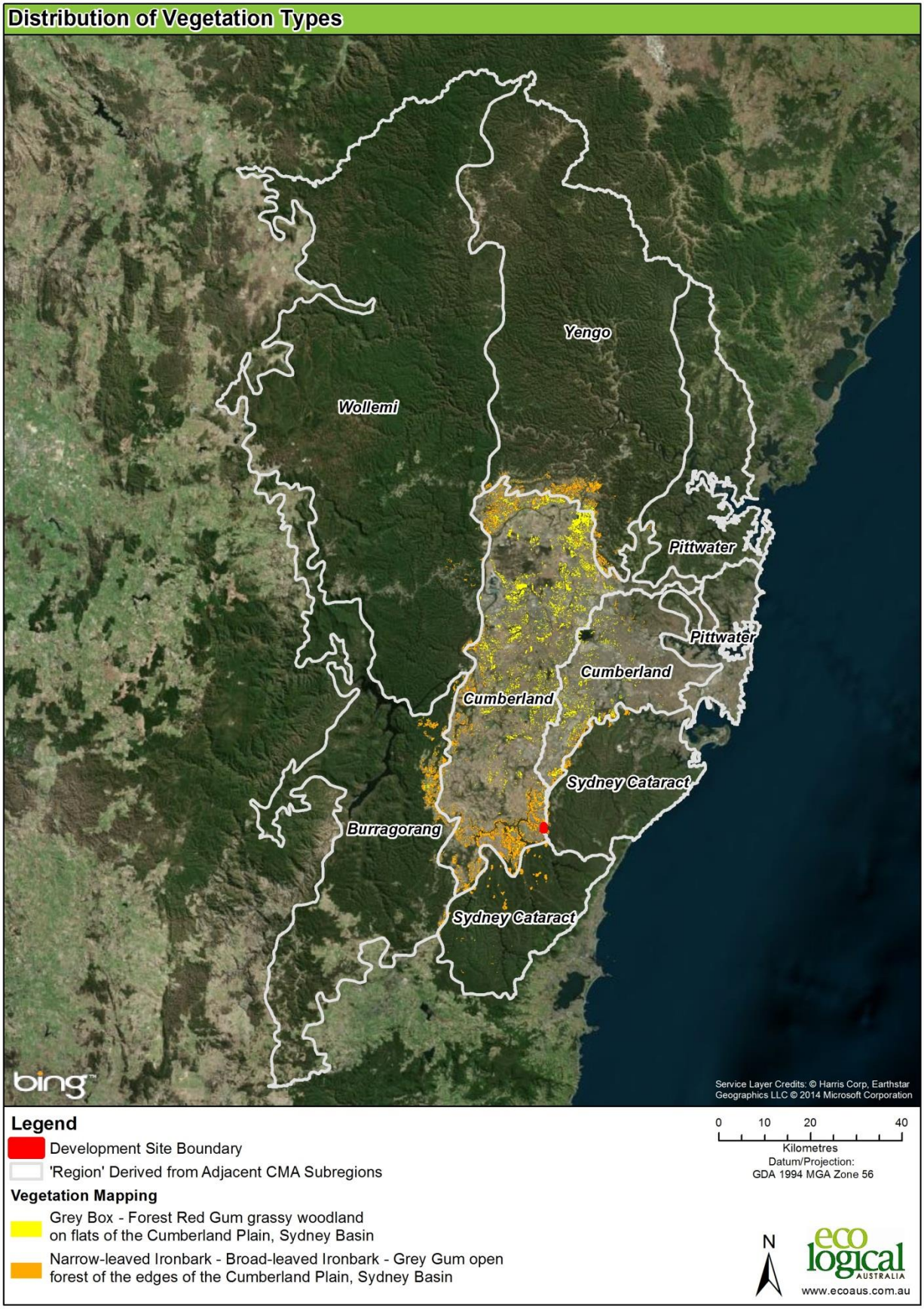

Figure 12: Regional distribution of Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin and Narrow-leaved Ironbark – Broad-leaved Ironbark – Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin

b) Percent Remaining is high

Two data sources were utilised to determine the percent remaining of each vegetation type, again at various scales due to the lack of consistent data across the 'region'. The data sources used include:

- OEH BBAM & BCAM Vegetation Types Database (DECCW 2008)
- National Parks and Wildlife Services Cumberland Plain western Sydney vegetation mapping (NPWS 2002)

The OEH Vegetation Types database contains a percent cleared figure for the red flagged vegetation type by CMA. For the other two data sources (where analysis was required) the pre-1750 data for each vegetation type was compared to the extent remaining to determine the percent remaining for each of the red flagged vegetation types.

The results of the analysis are shown in **Table 19**. The OEH vegetation types database records '*Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin*' as being 95% cleared within the Hawkesbury Nepean CMA, therefore leaving 5% of the vegetation type remaining. Using the vegetation types in NPWS (2002) and for the Cumberland CMA sub-region, 7.7% of the '*Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin*' with canopy cover >10%, remains (i.e., condition A, B, C), though with the inclusion of all remaining vegetation (i.e. including condition Tx), a significant proportion of which meets the biometric condition 'moderate-good' definition and thus would be red flagged, 20.5% remains. Further, the mapping by NPWS (2002) does not included derived native grasslands in these per cent remaining figures, which also meets the biometric condition 'moderate-good' definition and again would be red flagged, and has been recorded in the BCAA in moderate to good condition.

The OEH vegetation types database records '*Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain*, Sydney Basin' as being 80% cleared within the Hawkesbury Nepean CMA, therefore leaving 20% of the vegetation type remaining. Using the vegetation types in NPWS (2002) and for the Cumberland CMA sub-region, 22.6% of the '*Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain*, Sydney Basin' with canopy cover >10%, remains (i.e., condition A, B, C), though with the inclusion of all remaining vegetation (i.e. including condition Tx), 44% remains. As for *Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin*', a proportion of the Tx category meets the biometric condition 'moderate-good' definition and thus would be red flagged

Table 19: Percent remaining of each vegetation type

Biometric Vegetation Type	Red Flag Area Impacted (ha)	% Remaining in HN CMA (DECC 2008)	% ABC condition remaining in the Cumberland Plain (NPWS 2002)	% ABC & Tx condition remaining in the Cumberland Plain (NPWS 2002)
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin	2.81	5%	7.7%	20.5%
Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin	6.55	20%	22.6%	44.0%

c) Percent Native Vegetation (by area) is high

The area of native vegetation was calculated for the region, being the Cumberland (Hawkesbury/Nepean (HN)), Cumberland (Sydney Metro (SM)), Wollemi, Burragorang, Sydney Cataract (HN), Sydney Cataract (SM), Pittwater and Yengo CMA subregions is shown in **Table 20** and **Figure 13**. The OEH state-wide vegetation extent layer was used for the assessment (Keith and Simpson, 2006) and was intersected with the six CMA subregions to determine the proportion of each region with native vegetation cover.

Table 20: Native vegetation cover of CMA subregions

Native Vegetation Cover	Burragorang (ha)	Cumberland (ha)	Pittwater (ha)	Sydney Cataract (ha)	Wollemi (ha)	Yengo (ha)	Total (ha)
Cleared	41,567 (18%)	231,218 (84%)	44,079 (35%)	17,095 (12%)	21,260 (4%)	29,613 (9%)	384,831 (24%)
Vegetated	192,769 (82%)	44,200 (16%)	80,915 (65%)	131,254 (88%)	485,884 (96%)	293,273 (91%)	1,228,296 (76%)
Total	*234,335 (100%)*	*275,418 (100%)*	*124,994 (100%)*	*148,349 (100%)*	*507,144 (100%)*	*322,886 (100%)*	*1,613,127 (100%)*

In total, 76% (1,228,296 hectares) of the assessment region contains native vegetation cover. The proportion of vegetation cover for five of the CMA subregions is high, with Burragorang containing 82% vegetation cover, Pittwater 65%, Sydney Cataract 88%, Wollemi 96% and Yengo 91%. The other CMA subregion, Cumberland has been heavily cleared through agriculture and development, and contains only 16% native vegetation cover. As stated earlier, the vegetation type impacted is predominantly located on the Cumberland Plain, and therefore very little of the vegetation type is likely to extend into the surrounding five CMA subregions. This assessment demonstrates that the majority of the CMA subregions assessed are relatively well vegetated, however when considering the two Cumberland CMA subregions, which are between 7-17% vegetated, native vegetation cover is low.

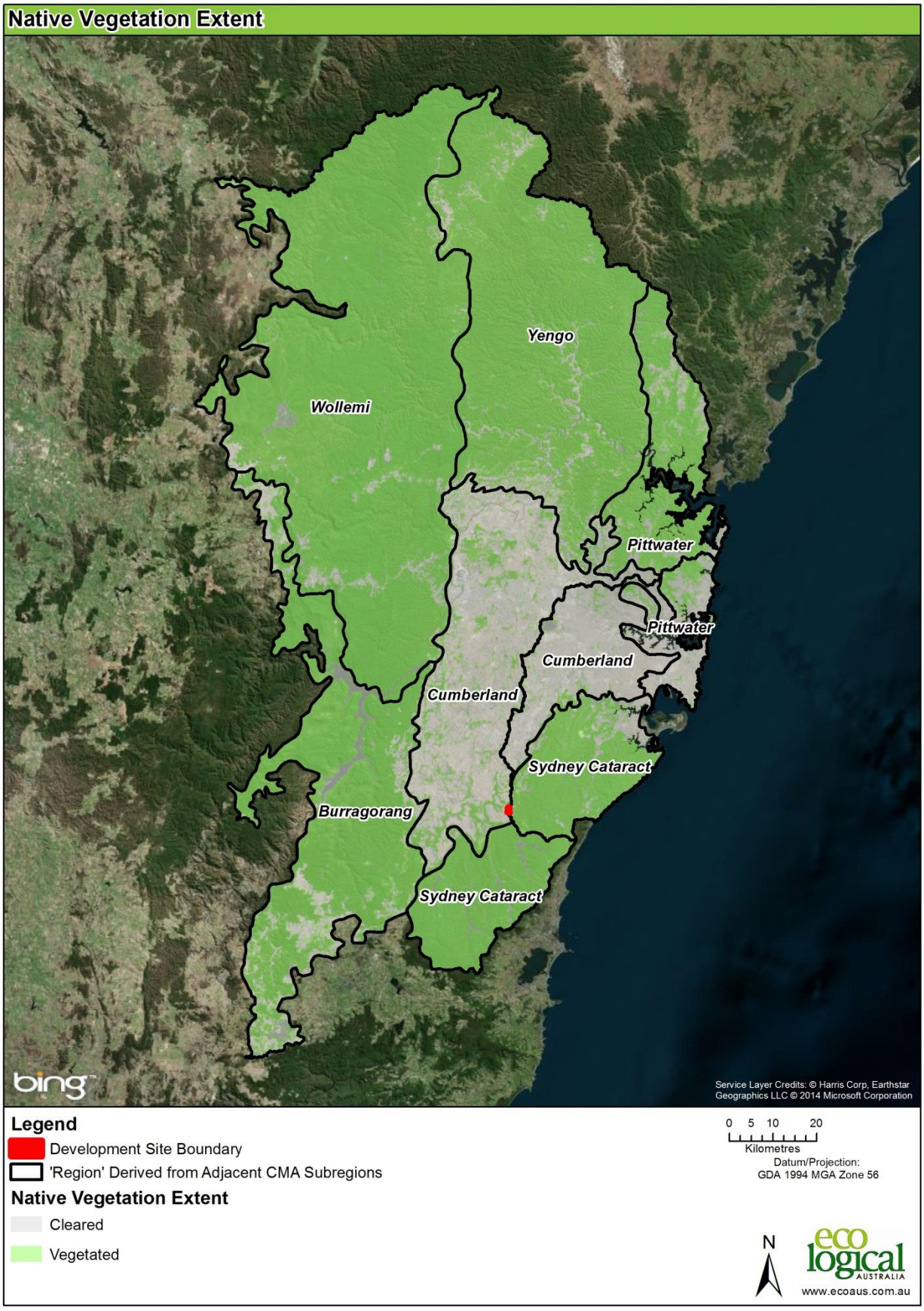

Figure 13: Native vegetation extent

6 Biocertification Strategy

Section 126K of the TSC Act states that biocertification may only be conferred on land by the Minister if the applicant has a biocertification strategy.

Section 126K (2) sates that a biocertification strategy is a policy or strategy for the implementation of conservation measures to ensure that the overall effect of biodiversity certification is to improve or maintain biodiversity values. The Biocertification strategy is to be used as the basis for the assessment of the application for biodiversity certification.

A biodiversity strategy is to include the following:

(a) the land proposed for biodiversity certification
(b) the land proposed for biodiversity conservation
(c) the proposed conservation measures
(d) any person or body proposed as a party to the biodiversity certification

This section addresses these requirements.

6.1 Land proposed for biodiversity certification

The land proposed for biodiversity certification is shown in **Figure 2** in **Section 1** of this report.

6.2 Land proposed for biodiversity conservation

The land proposed for biodiversity conservation is shown in **Figure 2** and **Section 1** of this report.

6.3 Proposed conservation measures

6.3.1 On-site conservation measures

It is proposed that the land subject to conservation measures (40.35 ha) within the BCAA will be secured by entering into a BioBanking Agreement under Part 7A of the TSC Act (now Biodiversity Stewardship Site Agreement under Part 5 of the *Biodiversity Conservation Act* 2016) and will be managed in accordance with a Biodiversity Stewardship Site Agreement and fully funded Management Plan. A Biodiversity Stewardship Site Agreement is a 'Permanently Managed and Funded' or 100% Conservation Measure as outlined in s126L(i) of the TSC Act and section 8.1.1 of the BCAM and will generate 100% of the calculated credits as shown in **Table 21**.

As a result of the modifications to the development footprint following the public exhibition, the land subject to this conservation measure has increased by 6.04 ha and will now generate **415** HN556 ecosystem credits instead of 350, which is significantly more than the 193 credits required for impacts to HN556 ('*Narrow-leaved Ironbark – Broad-leaved Ironbark – Grey Gum open forest on the edges of the Cumberland Plain'*). However, as stated in Section 4 of this assessment, Section 8.5 of the BCAM states that planning authorities should in the first instance attempt to generate all required credits from conservation measures 'within' the BCAA. Section 10.2.1 of the BCAM provides a number of variation rules that permit the use of credits generated from vegetation types in the same vegetation formation that can be used to meet an IoM outcome. It is noted that both CPW and SSTF are classified as Coastal Valley Grassy Woodlands Formation and in accordance with the BCAM, the surplus credits for SSTF could be used to meet the deficit for CPW as determined by the BCAM credit calculator tool.

In accordance with section 7.1 of the BCAM, the now 'surplus' 140 HN556 credits must be retired as a condition of certification, unless the proposed on-site offset measure becomes an off-site offset measure. This will be discussed with OEH as part of the final application for certification.

If the proposal is amended to commit to an off-site conservation measure, only the 193 HN556 credits and 82 HN528 would be required to be 'retired' resulting in a surplus of 140 HN556 credits. The entire 40.35 ha conservation area will still be registered as a Biodiversity Stewardship Site and zoned E2 providing in perpetuity conservation protection and fully funded, active conservation management.

The land proposed for on-site conservation measures does not generate any credits for HN528 ('*Grey Box – Forest Red Gum grassy woodland on flats of the Cumberland Plain'*). If the 82ecosystem credits for HN528 cannot be offset by the surplus HN556 credits, these will need to be generated by a second, off-site Biodiversity Stewardship Site, purchased from an existing/registered Biobank or Biodiversity Stewardship Site or from the Biodiversity Conservation Trust (see below in Section 6.3.2).

The proposed on-site conservation measure will generate 238 Koala and 122 Cumberland Land Snail species credits. **Table 22** shows that there will be a deficit of **20** Koala credits. As for the CPW credits, these will need to be purchased from an existing/registered Biobank or Biodiversity Stewardship Site or from the Biodiversity Conservation Trust (see below in Section 6.3.2)

i.e. the proposed on-site conservation measure meets all of the SSTF and Cumberland Land Snail offset requirements (providing 222 surplus SSTF credits) and over 90% of the Koala habitat requirements (20 credit deficit). If some of the surplus SSTF credits are used to meet the 82 credit deficit for CPW, there would be 140 remaining SSTF credits.

The BioBank Agreement will be registered on title and will be enforceable against the owner of the land (i.e. Walker Corporation) or any future land owner.

The BioBank site will be subject to the terms of the Biobank Agreement which includes annual conservation management in perpetuity, submission of an annual report to OEH regarding these management obligations and audit by OEH.

This management plan for the BioBank site will be implemented annually by the owner of the Biobank site (or suitable qualified and experienced contractors engaged by the owner of the Biobank site) in perpetuity and reviewed every 5 years in accordance with the terms of the BioBank Agreement. Initially this will be Walker Corporation Pty Ltd or if Walker Corporation sells the land the new owner.

An annual report will be prepared for the Minister by the Biobank site owner outlining the actions that have been undertaken in the previous 12 months, the response of the conservation area to the conservation management and any required modification of the management actions for the following 12 months.

The application for registration of the BioBank Agreement will be submitted to OEH within 6 months of biodiversity certification being conferred and prior to any clearing. This will provide in perpetuity protection on title.

6.3.2 Off-site conservation measures

If the surplus 222 SSTF credits cannot be used to meet the 82 credit requirement for CPW, Walker Corporation will either register a second BioBank site (Biodiversity Stewardship site) of at least 20 hectares on land owned by Walker Corp at Elladale Road, 1.45 km west of Maquariedale Road (**Figure 1**) or purchase the required credits from existing registered Biobank sites in the Wollondilly LGA (there

are several registered sites that can provide these credits) or purchase the credits from the Biodiversity Conservation Trust.

Travers Bushfire and Ecology (2014b) have already mapped the vegetation at this site, confirming the presence of HN528 ('*Grey Box – Forest Red Gum grassy woodland on flats of the Cumberland Plain')* and HN556 ('*Narrow-leaved Ironbark – Broad-leaved Ironbark – Grey Gum open forest on the edges of the Cumberland Plain')* sufficient to generate the required **82** credit deficit for this vegetation type and confirmed the presence of Koala and Koala habitat (primary and secondary browse species). Further, OEH and Colman 2016) have recorded Koala on these lands and have identified this land as a secondary Koala corridor as for the study area.

The BioBank Agreement will be registered on title and will be enforceable against the owner of the land (i.e. Walker Corporation) or any future land owner.

The BioBank site will be subject to the terms of the Biobank Agreement which includes annual conservation management in perpetuity, submission of an annual report to OEH regarding these management obligations and audit by OEH.

This management plan for the BioBank site will be implemented annually by the owner of the Biobank site (or suitable qualified and experienced contractors engaged by the owner of the Biobank site) in perpetuity and reviewed every 5 years in accordance with the terms of the BioBank Agreement. Initially this will be Walker Corporation Pty Ltd or if Walker Corporation sells the land the new owner.

An annual report will be prepared for the Minister by the Biobank site owner outlining the actions that have been undertaken in the previous 12 months, the response of the conservation area to the conservation management and any required modification of the management actions for the following 12 months.

The application for registration of the off-site BioBank Agreement will be submitted to OEH within 12 months of biodiversity certification being conferred and prior to any clearing. This will provide in perpetuity protection on title.

Table 21: Summary of ecosystem credit surplus/deficit

BioMetric Vegetation Type	Condition	Ancillary Zone	Credits Required	Credits Generated (100% Measure)	Credit Status (100% Measure)
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin	M/G	Canopy and Understorey	63	0	-82
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin	Low	Canopy Only	6	0	
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin	Low	Regrowth	13	0	
Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin	M/G	Canopy and Understorey	192	408	222
Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin	Low	DNG	1	7	
Total			275	415	140

Table 22: Summary of species credit surplus/deficit

Common Name	Credits Required	Credits Generated (100% Measure)	Credit Status (100% Measure)
Cumberland Plain Land Snail	122	122	0
Koala	258	238	-20

6.3.3 Existing management obligations

The entire on-site Biobank site is currently zoned RU2 Rural landscape under Wollondilly LEP 2011. There are no covenants or conservation funding arrangements for the property or any existing requirements to actively manage the site for biodiversity conservation. The entire Biobank site is to be managed for ecosystem and species credits.

Similarly, the entire off-site Biobank site (Elladale Road) is also zoned RU2 Rural Landscape, has no covenants or existing requirements to actively manage the site for biodiversity conservation. The entire Biobank site will be managed for ecosystem and species credits.

6.3.4 Timing of credit retirement

It is proposed to “retire” biodiversity credits in accordance with the staged development of the certified land as outlined in **Table 23** and shown in **Figure 13**. The proportion and types of credits to be retired is

based on the area of vegetation to be cleared in each Area/Stage of development. A likely time frame is provided however this will be subject to the demand for housing lots and may occur sooner or later. No clearing of mapped vegetation will occur in each stage until Walker Corp has provided proof of the retirement of the required quantum of credits. This proof will be in the form of a 'certificate' of credit retirement issued by OEH. Development in areas with no mapped native vegetation may occur prior to the purchase and retirement of credits.

6.4 Any person or body proposed as a party to the biodiversity certification

Walker Corporation will be solely responsible for the preparation and submission of the application for registration of any BioBank Agreements by an accredited assessor. The subsequent implementation, monitoring, reporting and review of the terms of the agreement will be the responsibility of the current owner of the BioBank site i.e. should Walker Corporation choose to transfer the ownership of the Biobank site, the new owner would assume all responsibility for the implementation of the requirements of the BioBank Agreement.

6.5 Is an Improve or Maintain Outcome Achieved?

Subject to the Director-Generals consideration and approval of the red flag variation request (**Section 4**) an improve or maintain outcome can be achieved by the purchase and retirement of credits from the proposed on-site and off-site BioBank sites (**Table 23**).

6.6 Statement of commitments

The following is a summary of the commitments made throughout this biocertification assessment and application.

1. A Biocertification Agreement will be entered into between Walker Corporation and the Minister for the Environment stating that
    a. A Biobanking Agreement / Biodiversity Stewardship Agreement (Maquariedale Rd Biobank site) for the 40.35 ha of land owned by Walker Corporation (Part Lot 1 DP 1218358) proposed for conservation measures within the BCAA will be submitted for registration within 6 months of the date of biocertification being conferred
    b. Walker Corporation will commence 'active' management of the proposed Macquariedale Rd Biobank Site within 30 days of conferral of biocertification and will not commence any development until the Biobank Agreement identified in point (a) above has been submitted for registration
    c. Walker Corporation will retire the credits required for Stage 1 of development as shown in **Figure 14** and **Table 23** within 3 months of the later of the registration of the Biobank site/ Biodiversity Stewardship site by OEH / BCT or commencement of development in Stage 1
    d. Walker Corporation will retire the credits required for Stage 2 of development as shown in **Figure 14** and **Table 23** prior to the commencement of development in Stage 2
    e. Walker Corporation will retire the credits required for Stage 3 of development as shown in **Figure 14** and **Table 23** prior to the commencement of development in Stage 3.

2. Walker Corporation will prepare and implement a Construction Environment Management Plan for vegetation clearing within the BCAA to guide the development outlined in this biocertification assessment and ensure that all direct and indirect impacts (e.g. APZs, utilities, access, stormwater run-off etc) are contained within the development footprint and appropriate mitigation measures are

put in place to minimise indirect impacts to threatened fauna including Koala. Specifically, this will address the management of the land proposed for conservation measures and its buffer such that surrounding roads will be fully curbed and guttered with no stormwater being discharged directly into the conservation areas.

In addition, the CEMP will include, but not be limited to:

- temporary and permanent protective fencing will be erected around all areas identified for conservation prior to clearing activities to minimise any inadvertent damage
- a fauna pre-clearance protocol
- retention of HBTs where possible and practical
- where practical and possible, habitat values (e.g. logs, stags, hollows) from trees that are removed in the development area will be salvaged for fauna habitat values in the proposed Biobank site
- a de-watering plan for any farm dams that are removed

Table 23: Proposed schedule of retirement of ecosystem and species credits

The requirements for the retirement of credits from the on-site offset set are expressed in this strategy as credits calculated using the BCAM. As the offset site will be secured as a Biodiversity Stewardship site, it will be the credits calculated using the BAM 2018 that are actually retired. The credit requirement in BCAM credits expressed in this strategy will be converted into an equivalent amount of BBAM 2014 / BAM 2016 credits. This conversion will be based on the proportion of the BCAM credits required to be retired for each credit type i.e. if 30% of BCAM credit type X is required to be retired then 30% of BBAM 2014 / BAM 2016 credit type X will be retired' Further, as the on-site BioBank site is within the BCAA, any surplus credits generated will also be retired and will not be available to use for other offsets.

Management of the on-site BioBank site will occur prior to the commencement of any clearing of vegetation.

Time after conferral of certification	Area (& %) of HN528 Impacted	Area (& %) of HN556 Impacted	Number of ecosystem credits to retire	No of species credits to retire
Within 6 months of conferral of biocertification	Submission of application to register on-site BioBank Agreement / Biodiversity Stewardship site Agreement which will generate the 'equivalent' of 415 ecosystem credits for HN556, 122 species credits for Cumberland Land Snail and 238 species credits for Koala. These credits have been calculated using BCAM and will be converted into an equivalent amount of BBAM 2014/BAM 2016 credits.			
Within 30 days of the date of conferral of biocertification	Walker Corporation will commence active management of the proposed Macquariedale Biobank site within 30 days of the date that biocertification is conferred and prior to the commencement of Stage 1 of development			
Within 3 months of the later of the date of registration of the Macquariedale Rd Biobank site or commencement of Stage 1 works Likely 12- 18 months after conferral)	1.87 ha (46.63%) 38 credits required	0.74 ha (11.18 %) 22 credits required	60 of the HN556 ecosystem credits from the on-site BioBank site	100% of BCAM Cumberland Land Snail credits and 100% of BCAM Koala credits from the on-site BioBank site

Time after conferral of certification	Area (& %) of HN528 Impacted	Area (& %) of HN556 Impacted	Number of ecosystem credits to retire	No of species credits to retire
Before commencement of any clearing of vegetation in Stage 2 (North of Macquariedale Rd). Likely between 18-24 months after conferral)	1.14 ha (28.43 %) 23 credits required	3.43 ha (51.81 %) 100 credits required	123 of the HN556 ecosystem credits from the on-site BioBank site.	Purchase and retirement of the remaining 20 Koala species credits.
Before commencement of any clearing of vegetation in Stag 3 (North of Oval). Likely between 24 and 30 months after conferral)	1.00 ha (24.94 %) 20 credits required	2.45 ha (37.01 %) 71 credits required	91 HN556 ecosystem credits from the on-site BioBank	
Total	4.01 ha (100%) 82 credits	6.62 ha (100%) 193 credits	The equivalent of 275 HN556 and HN528 BCAM Credits	The equivalent of 122 BCAM Cumberland Land Snail Credits. The equivalent of 258 BCAM Koala Credits

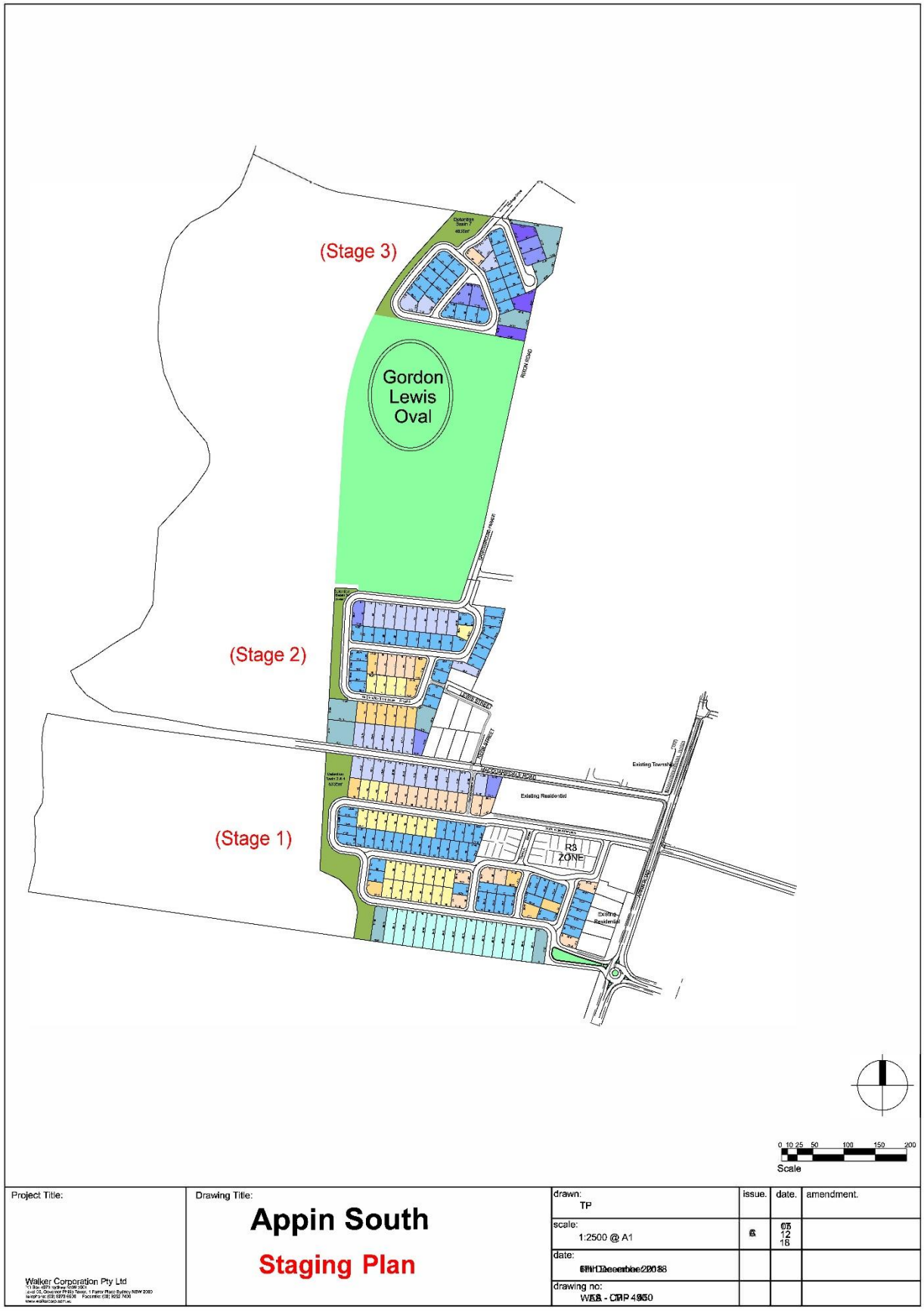

Figure 14: Development areas and Stages

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Ambrose Ecological Services 2011 *Fauna survey and assessment – approved residential rezoning and subdivision of rural land, corner of Rixon and Appin Roads, North Appin.*

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DECC 2008 *Vegetation Types Database*, NSW Department of Environment and Climate Change, Sydney. Available http://www.environment.gov.au/biobanking/VegTypeDatabase.html

DECC 2008a *BioBanking Assessment Methodology*. NSW Department of Environment and Climate Change, Sydney.

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NPWS 2002 *Native vegetation of the Cumberland Plain, Western Sydney Vegetation Community, Condition and Conservation Significance Mapping*. NSW National Parks and Wildlife Service, Sydney.

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Travers Bushfire and Ecology 2014a *Ecological Assessment Proposed Residential Rezoning Macquariedale Road, Appin.*

Travers Bushfire and Ecology 2014b *Cumberland Land Snail (*Meridolum corneovirens*) survey and habitat mapping – Macquariedale and Elladale Roads, Appin. Prepared by Travers bushfire and ecology, 5 August 2014.*

Travers Bushfire and Ecology 2018 Addendum Koala Survey Reports at Macquariedale Road, Appin. *Prepared by Travers bushfire and ecology, 28 November 2018 and 13 December 2018 for Walker Corporation Pty Ltd.*

Tozer, M. 2003 *The Native Vegetation of the Cumberland Plain, Western Sydney: Systematic Classification and Field Identification of Communities.* Cunninghamia (8): 1-75.

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Wollondilly Shire Council (2014) Planning proposal to amend Wollondilly Local Environment Plan 2011, Macquariedale Road, Appin, August 2014.

Wollondilly Shire Council (2017) Planning proposal to amend Wollondilly Local Environment Plan 2011, Macquariedale Road, Appin, November 2017.

Appendix A: Project Staff CVs

The following are brief curriculum vitae's for the key project staff.

Robert Humphries – Project Manager

CURRICULUM VITAE

Robert Humphries

MANAGER, BIOBANKING AND BIOCERTIFICATION OFFSETS PROGRAMS

QUALIFICATIONS

- Bachelor of Applied Science, Ballarat C.A.E 1983-85.
- Master of Applied Science (Research) University of Ballarat 1986-89.

Robert is an ecologist, environmental planner and project manager with over 25 years experience. Since graduating with Bachelors and Masters Degrees in wildlife management in 1985, Robert has worked mainly in the public sector with the Department of Environment and Conservation (Victoria) 1988-1996 and NSW National Parks and Wildlife Service, now NSW Office of the Environment & Heritage 1996-2006. Robert joined Eco Logical Australia in March 2008.

Robert was the Manager of the Threatened Species Section of the NSW Department of Conservation and Environment for over 10 years and has extensive experience of the NSW Threatened Species and Environmental Planning legislation, Government policy, the biodiversity of the Greater Sydney and Hunter Regions and the new biodiversity certification and biobanking provisions.

Robert was a member of the Biobanking Ministerial Reference Group from 2007-2012 and is the lead trainer in the BioBanking and Biodiversity Certification Accredited Assessor Training program.

RELEVANT PROJECT EXPERIENCE

BioCertification Assessments

Have completed or are currently undertaking formal Biodiversity Certification Assessments for:-

- Mount Gilead Urban Release Area (Campbelltown City Council)
- Port Macquarie Airport Master Plan (Port Macquarie- Hastings Council)
- Tuncurry State Significant Site (Urban Growth NSW)
- Emerald Hills Urban Release Area (Camden City Council). Assessment completed and reviewed by OEH
- Warnervale Town Centre (Wyong Council)(Approved March 2014)
- Broulee and South Moruya Urban Release Areas (Eurobodalla Shire Council)(Approved September 2014)

Have completed informal Biodiversity Certification Assessments for

- Ralston Avenue, Belrose for Metropolitan Local Aboriginal Land Council (August 2013)
- Greater Sancrox Area for Port Macquarie –Hastings Council (August 2013)
- Glenning Valley Urban Release Area (Travers Ecology and Glenning Valley Partnership 2011);

- Kings Hill Urban Release Area, Port Stephens LGA (Mondell Property Group and Hunter Land 2011);
- Ingleside Release Area, Pittwater/Warringah LGAs (Urban Growth NSW 2011)
- Darkinjung Local Aboriginal Land Council (North Wyong Structure Area)
- Yallah-Marshall Mount Urban Release Area (Wollongong City Council)
- Whitebridge Investigation Area (Urban Growth NSW 2011)
- Balmoral Urban Release Area, north west Sydney (Urban Growth NSW 2013)

Biodiversity Offset Strategies

- North West & South West Growth Centres Biodiversity Offset Strategy for Sydney Water Infrastructure developments (May 2013)
- Biodiversity Offset Strategy for the proposed extension of the Pine Dale Mine (Enhance Place Pty Ltd, July 2013)
- Biodiversity Offset Strategy for proposed Stage 1 Modification, Moolarben Coal Mine (Yancoal, May 2013)
- Biodiversity Offset Strategy for Crudine Wind Farm (Wind Prospect CWP Pty Ltd – 2012)
- Biodiversity Offset Strategy for Sapphire Wind Farm (Wind Prospect CWP Pty Ltd – 2011)
- Biodiversity Offset Strategy for Boco Rock Wind Farm (Wind Prospect CWP Pty Ltd – 2011)
- Improve or Maintain Biodiversity Offset Strategy for Kings Hill Urban Release Area, Port Stephens LGA (Mondell Property Group, 2011)
- Biodiversity offset strategy for proposed Narrabri Coal mine (Narrabri Coal Operations Pty Ltd, 2011)
- Biodiversity offset strategy for proposed modification to Rocglen Coal Mine (Whitehaven Coal Pty Ltd, 2010)
- Biodiversity offset strategy for proposed Werris Creek LOM Coal Mine (Werris Creek Coal Pty Ltd, 2010)
- Biodiversity offset strategy for the South West Rail Link (Transport Construction Authority, 2010)
- Biodiversity offset strategy for the Richmond Rail Line duplication (Transport Construction Authority, 2011)
- Biodiversity offset strategy for the Camden Valley Way Upgrade (NSW RTA, 2011)
- Biodiversity Offset Strategy for the Oxley Highway Upgrade, Port Macquarie (NSW RTA, 2010)
- Preparation of Offset Strategy and package for the Kingsgrove to Revesby Quadruplication Project (2008/09 K2RQ/TIDC Alliance)

Biobank Site Assessments and Registrations

- 80 ha site at Salamander for Port Stephens Shire Council (Assessment currently being assessed by OEH)
- Two Biobank sites (100 ha) in Western Sydney Parklands as an amendment to the existing Cecil Hills Biobank Site (Agreement No. 120 registered August 2014)
- 54 ha proposed Biobank at the Oaks on the Cumberland Plain (Private landholder) (Agreement No. 100, registered in September 2013)
- 69 ha proposed Biobank for Shoalhaven City Council at (Agreement No. 101, registered in June 2013)
- 45 ha proposed Biobank for Lake Macquarie City Council at Belmont (Agreement No. 103, registered in June 2013)
- 51 ha site west of Camden on the Cumberland Plain (Private landholder) (Agreement No. 88, registered in January 2013)
- 25 ha site west of Camden on the Cumberland Plain (Private landholder) (Agreement No. 3, registered in January 2011).
- 24 ha site in western Sydney (Western Sydney Parklands Trust). (Agreement No. 70, registered in February 2012).
- 10 ha site at Belrose (WSN Environmental Solutions) (Agreement No. 55, registered in March 2012)
- 1,500 ha site near Gunnedah to offset an approved Coal mine (Whitehaven Coal) (Agreement No. 43, registered in August 2012).

Jennie Powell – Senior Field Ecologist – Credit Calculations,

CURRICULUM VITAE

Jennie Powell

SENIOR CONSULTANT

QUALIFICATIONS

- Bachelor of Natural Resource Management (Honours), University of New England.
- Certificate IV in Workplace Training and Assessment
- Accredited BioBanking and Biocertification Assessor

Jennie is an ecologist, trainer and natural resource manager with extensive experience in the fields of environmental impact assessment, strategic biodiversity planning and ecological restoration programs. She joined Eco Logical Australia in early 2010 after working for over twenty years in a number of environmental planning and management roles with local government in northern Sydney. As such, she is very familiar with the organisational structure and operating environment of local government and has a broad range of experience working within cross organisational project teams including community, local and state government representatives on natural area management and biodiversity planning issues.

Jennie has also been a part-time teacher at TAFE for 18 years delivering diploma and advanced diploma subjects including Environmental Legislation, Principles and Practices of Ecologically Sustainable Development, and Environmental Auditing and bush-regeneration courses. Jennie has been the lead teacher in the delivery of the last 28 BioBanking Assessor Accreditation Courses and 10 BioBanking re-accreditation courses and has presented training focussing on biodiversity awareness and ecological impact assessment to local government employees in regional and metropolitan locations. She has well developed skills in the areas of environmental impact assessment, plant identification, vegetation mapping and classification, bushland restoration and vegetation resilience assessments.

Her work with Eco logical Australia has included project managing a number of Biobanking and Biocertification Assessments including two of the first Biobank assessments in NSW, preparing Biodiversity Strategies and Natural Asset Management Plans for local government, setting up monitoring sites to assess the impact of mountain-bike and horse-riding in National Parks, undertaking audits of biodiversity offset strategies for two coal mines, updating vegetation mapping and threatened species inventories for local government and preparation of detailed works plans for land management trainees to implement in natural areas.

RELEVANT EXPERIENCE

Strategic Biodiversity Planning and Management

- Preparation of Biodiversity Strategies, Community and Crown Land Plans of Management, Natural Area Policies, and Development Control Plans supporting the NSW Standard LEP template for Local Government

Biobanking, BioCertification and Major Projects (FBA) Methodologies

- Contracted by OEH to prepare the BBAM 2014 and FBA Operational Manuals (OEH 2015)
- Development and Delivery of OEH Biobank/BioCertification and FBA Accredited Assessor Training Course (2009-2015, OEH)
- Preparation of five formal Biobank Site Assessments and a number of indicative Biobank/offset assessments
- Preparation of three Biocertification Assessments

Environmental Impact Assessment using IoM methods

- Developed and delivered training to local government on ecological impact assessment including the preparation of Review of Environmental Factors
- Preparation of Environmental Impact Assessments in accordance with Part 4 and Part 5 (review of environmental factors) of the NSW *Environmental Planning and Assessment Act* 1979 focussing on ecological impacts
- Development of procedure/checklists for activities potentially impacting native vegetation
- Preparation of Council reports and consent conditions for development proposals
- Representation in the Land and Environment Court on biodiversity conservation and management issues

Ecological Restoration/Land Management Programs

- Preparation of vegetation management strategies
- Costing management actions and preparation of management action plans for biobank sites

Vivian Hamilton, Senior GIS Officer

CURRICULUM VITAE

Vivian Hamilton

SENIOR ENVIRONMENTAL CONSULTANT

QUALIFICATIONS

- Bachelor of Environmental Management Macquarie University – 2007
- Completed the BioBanking and Biocertification Assessor Accreditation Training Course (AHCLPW503A), OEH
- Completed Biodiversity Offsets Scheme Training, OEH - 2018

Vivian has completed a Bachelor of Environmental Management at Macquarie University and has been with Eco Logical Australia for over 9 years. Vivian has also worked in technical policy within government, in the Forestry Branch of the NSW Environment Protection Authority. She has been involved in a wide variety of projects ranging from local, regional, and to statewide scales such as the: NSW Natural Resources Commission River Red Gum assessment; refinement of the Mitchell Landscapes data layer; NSW State of the Parks mapping; and North West Rail Link Ecological and Riparian Assessment.

Vivian has a multidisciplinary background with a range of specialized technical skills that include: high quality map design and production, aerial photograph interpretation, environmental modeling, and spatial data analysis. Having completed the Biodiversity Offsets Scheme Training Course, she is able to apply GIS along with the methodology to undertake caclulations and mapping for assessments.

RELEVANT PROJECT EXPERIENCE

Biobanking and Biocertification Assessments

- Department of Planning and Environment, Ingleside - Biodiversity Certification Assessment (In Progress)
- Department of Planing and Environment, Wilton and Menangle Offset Analysis (In Progress)
- Halloran Trust, Jervis Bay and Sussex Inlet - Biodiversity Certification Assessment, Major Project and Biobank Agreement (In Progress)
- Holcim, Albion Park - Biobank Agreement (In Progress)
- Hornsby Shire Council, Arcadia and Waitara – Biobank Agreements (In Progress)
- Hydro Aluminium, Kurri Kurri Smelter – Biodiversity Certification Assessment (In Progress)
- Macquariedale Road, Appin – Biodiversity Assessment & Biocertification Strategy (In Progress)
- Northern Beaches Council, Ingleside Chase Reserve – Biobank Agreement (Submitted – In Progress)
- Office of Environment and Heritage - Preparation of the BBAM 2014 and FBA Operational Manuals
- Office of Environment and Heritage - Development of Material and Marker for OEH Biobank/BioCertification and FBA Accredited Assessor 2015 Training Courses
- Office of Environment and Heritage, Linking Landscapes – Narrawallee Biobank Agreement (Approved)
- Ralston Avenue, Belrose – Biodiversity Certification Assessment (In Progress)

Bushfire Management Plans

- Bunya Precinct 4 Bushfire Attack Level Assessment
- Moolarben Coal Operations, Bushfire Management Plan

- Oran Park, Bushfire Attack Level Assessment
- Ravensworth Operations, Bushfire Management Plan
- Thales Australia, Mulwala Bushfire Management Plan
- Wilpinjong Coal, Barrigan Valley Extension Bushfire Management Plan

Ecological Assessments

- Beacon Hill Retirement Village SIS
- Department of Planning, Area 20 Precinct Planning Biodiversity Study
- Marsden Park Employment Precinct Ecological Assessment
- Schofields Precinct Biodiversity Project
- Transport NSW, North West Rail Link Ecological and Riparian Assessment
- Wind Prospect - Boco Rock, Crudine and Sapphire Wind Farm Ecological Assessments

Environmental Assessment and Mapping

- DEWHA, Hunter Spatial Offsets
- Hunter Development Corporation, Hunter Catchment – Biodiversity Sensitivity Analysis
- Manly Council, Natural Assets Survey
- North West and South West Growth Centres Sensitivity Mapping
- NSW Natural Resources Commission, River red gum forests assessment, mapping and modelling of conservation significance for river red gum forests in the Riverina
- NSW Natural Resources Commission, South-western cypress state forests assessment
- Office of Environment and Heritage, Refining Mitchell Landscapes
- Office of Environment and Heritage, State of the Parks Mapping
- Port Stephens Council, Conservation Assessment Database
- Wollondilly Shire Council, Vegetation Prioritisation Analysis

Environmental Planning and Policy

- Bankstown City Council, Crest to Lansdowne Final Masterplan
- Bidjigal Reserve Plan of Management
- Campbelltown City Council, Park Central Plan of Management
- City of Ryde, Review of Environmental Protection Zones - Ryde Riverside Reserve & Putney Park
- City of Ryde, Review of Environmental Protection Zones - Shrimpton's Creek Parklands
- Dargan Creek Reserve Plan of Management
- Parramatta City Council, Ponds Subiaco Creek Masterplan
- Parramatta Park Cycleways Review of Environmental Factors
- Planning NSW, Western Sydney Biorestoration Strategy Mapping
- South and Ropes Creeks Monitoring and On-ground Biodiversity Restoration Contracts
- Strathfield Council, Local Environmental Plan and Zoning Update
- Tallawarra Lands Part 3A Concept Plan

Vegetation Management Plans

- Camden Lakeside Ecological Assessment and Vegetation Management Plan
- Gregory Hills Vegetation Management Plan
- Hunter Water Corporation, LHRWI Tree Planting for Carbon Offset

Appendix B: Planning proposal application

Walker Corporation 2013 Planning Proposal Rezoning Application. Lot 201 Dp7492272, Lot 1 Dp 558807, Lot 1 Dp 209779, Lot 1 Dp 529457, Lot 2 Dp 529457, Lot 3 Dp 209779 Macquariedale Road, Appin. Prepared by Walker Corporation Pty Limited, September 2013.

Wollondilly Shire Council 2014. Planning proposal to amend Wollondilly Local Environment Plan 2011, Macquariedale Road, Appin.

Wollondilly Shire Council 2017. Planning proposal to amend Wollondilly Local Environment Plan 2011, Macquariedale Road, Appin.

Provided as separate documents.

Appendix C: Response to Submissions Report

To be prepared following WSC determination of planning proposal and Biocertification Application.

Appendix D: Ecological Assessment Report – Maquariedale Road

Travers Bushfire and Ecology 2014a. *Ecological Assessment Proposed Residential Rezoning Macquariedale Road, Appin.*

Travers Bushfire and Ecology 2018 Addendum Koala Survey Report at Macquariedale Road, Appin. *Prepared by Travers bushfire and ecology, 28 November 2018 for Walker Corporation Pty Ltd.*

Provided as a separate documents.

Appendix E: Ecological Assessment Report – Elladale Road

Travers Bushfire and Ecology 2014b. *Cumberland Land Snail (*Meridolum corneovirens*) survey and habitat mapping – Macquariedale and Elladale Roads, Appin. Prepared by Travers bushfire and ecology, 5 August 2014.*

Provided as a separate document

Appendix F: Assessment of Candidate Species

The table below lists the **species credit species**) that were filtered into the BCAA by the biocertification credit calculator version 1.9 and validated as species credit species against the threatened species profile ecological data from the BioNet Atlas of NSW Wildlife (Step 1 of section 4.3 of the BCAM). The months of survey specified for these species by the calculator are also identified in the table. At this stage of the candidate species assessment, additional species are added to the list if they have been recently listed in the TSC Act, there are records on the NSW Wildlife Atlas or have been recorded in past ecological surveys/reports (Step 2 of section 4.3 of the BCAM). The Wildlife Atlas search undertaken by Travers bushfire and ecology (2014) in 2012 and updated by ELA in 2014 did not identify any additional species to be added to the table. The following two columns (Accredited Assessor Opinion and Reason/Justification) culls the list of candidate species for further assessment and the second last column (Targeted Survey required for BCAM) identifies only those species that require further assessment (Step 3 of section 4.3 of the BCAM). The final column identifies whether Travers bushfire and ecology (2014) recorded the species during the targeted field undertaken on the lands proposed for biocertification (Step 5 of section 4.3 of the BCAM). Only one candidate species, Cumberland Plain Land Snail was confirmed on-site. A species polygon which includes the location of this species and the specific habitat components associated with this species was mapped for Cumberland Plain Land Snail.

Threatened Fauna

Scientific Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Accredited Assessor Opinion (Steps 1-6)	Reason/Justification	Targeted Survey Required for BCAM	Recorded On-site
Threatened Fauna																
Regent Honeyeater Anthochaera phrygia	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Yes	Yes	Yes	No	No nearby (10km) and/or recent records	Not Required	No
Cercartetus nanus Eastern Pygmy-possum	No	No	No	No	No	No	No	No	No	No	No	No	No	Habitat not suitable	Not Required	No
Chalinolobus dwyeri Large-eared Pied Bat (Breeding habitat – caves)	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Yes	Yes	Yes	No	No breeding habitat (caves)	Not Required	N/A
Heleioporus australiacus Giant Burrowing Frog	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	No	Habitat not suitable	Not Required	No
Hoplocephalus bungaroides (Broad-headed Snake)	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Unlikely	Habitat not suitable	No	No
Litoria littlejohni (Littlejohn's Tree Frog	Yes	Yes	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Unlikely	Habitat not suitable	No	No
Miniopterus australis Little Bentwing-bat (Breeding Habitat)	No	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	Yes	No	No breeding habitat (caves)	Not Required	N/A
Miniopterus schreibersii oceanensis Eastern Bentwing-bat (Breeding Habitat)	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	No	No breeding habitat (caves)	Not Required	N/A
Meridolum corneovirens Cumberland Plain Land Snail	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Known		Yes	Yes
Myotis macropus Southern Myotis (Breeding Habitat)	Yes	Yes	Yes	No	No	No	No	No	No	Yes	Yes	Yes	Potential	HBTs with riparian buffers	No – No riparian buffers to be impacted	No
Pezoporus wallicus wallicus (Ground Parrot)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Unlikely	Habitat not suitable	No	No
Phascolarctos cinereus Koala	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Potential	Preferred and secondary food trees	Yes	Yes
Pseudophryne australis (Red-crowned Toadlet)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Unlikely	Habitat not suitable	No	No
Pteropus poliocephalus Grey-headed Flying-fox (Breeding Habitat)	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	Known (Foraging)		Yes	No (Camps)
Varanus rosenbergi Rosenberg's Goanna	Yes	Yes	No	No	No	No	No	No	No	No	Yes	Yes	Potential		Yes	No

*Credits calculated for Koala on a precautionary basis due to records in the locality and presence of potential habitat (food trees). Expert report prepared for likelihood of Koalas being present in proposed on-site offset area.

Threatened Flora

Scientific Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Travers Likelihood Table	Accredited Assessor Opinion (Steps 1-6)	Reason/Justification	Targeted Survey Required for BCAM	Recorded On-site
Acacia bynoeana	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	Yes	Yes	Likely	Potential		Yes	No
Acacia gordonii	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Not Considered	Unlikely	No nearby (10km) and/or recent records	Not Required	No
Acacia pubescens	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Not Considered	Unlikely	No nearby (10km) and/or recent records	Not Required	No
Cynanchum elegans	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Potential		Yes	No
Dillwynia tenuifolia	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Not Considered	Unlikely	No nearby (10km) and/or recent records	Not Required	No
Epacris purpurascens var. purpurascens	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Likely	Likely		Yes	No
Eucalyptus sp. Cattai	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Not Considered	Unlikely	Not known from region	Not Required	No
Galium australe	Yes	Yes	Yes	No	No	No	No	No	No	No	Yes	Yes	Not Considered	Unlikely	Restricted to southern NSW. Taxonomy uncertain for records in Sydney area	Not Required	No
Grevillea juniperina subsp. juniperina	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Not Considered	Unlikely	No nearby (10km) and/or recent records	Not Required	No
Grevillea parviflora subsp. parviflora	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Likely	Likely		Yes	No
Grevillea parviflora subsp. supplicans	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Not Considered	Unlikely	Restricted to north-west of Sydney near Arcadia and Maroota - Marramarra Creek area	Not Required	No
Gyrostemon thesioides	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Unlikely	Unlikely	Habitat not consistent with known	Not Required	No
Hypsela sessiliflora	No	No	No	No	No	No	No	No	Yes	Yes	Yes	No	Not Considered	Unlikely	Only known from two sites in Penrith LGA	Not Required	No
Leucopogon exolasius	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Unlikely	Unlikely	Habitat not suitable	Not Required	No
Leucopogon fletcheri subsp. fletcheri	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Not Considered	Unlikely	Restricted to north-western Sydney between St Albans in north and Annangroive in south.	Not Required	No
Melaleuca deanei	Yes	Yes	No	No	No	No	No	No	No	No	No	Yes	Unlikely	Potential		Yes	No
Persoonia bargoensis	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No	Yes	Potential	Potential		Yes	No
Persoonia glaucescens	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Not Considered	Potential		Yes	No
Persoonia hirsuta	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No	Yes	Potential	Potential		Yes	No
Persoonia nutans	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Unlikely	Unlikely	Habitat not suitable	Not Required	No
Pimelea curviflora var. curviflora	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Potential	Potential		Yes	No
Pimelea spicata	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Potential	Potential		Yes	No
Pomaderris brunnea	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Unlikely	Potential		Yes	No
Pterostylis saxicola	No	No	No	No	No	No	No	No	Yes	Yes	Yes	No	Potential	Potential		Yes	No
Tetratheca glandulosa	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	No	Not Considered	Unlikely	No nearby (10km) and/or recent records	Not Required	No
Pultenaea aristata	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Unlikely	Unlikely	Habitat not suitable	Not required	No
Pultenaea pedunculata	No	No	No	No	No	No	No	No	Yes	Yes	Yes	No	Potential	Potential		Yes	No
Dillwynia tenuifolia - endangered population Kemps Creek	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Not Considered	No	Study area is not within defined population (Likely calculator error)	Not Required	No
Marsdenia viridiflora subsp. viridiflora - endangered population	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Not Considered	No	Study area is not within defined population Likely calculator error)	Not Required	No
Wahlenbergia multicaulis - endangered population	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Not Considered	No	Study area is not within defined population Likely calculator error)	Not Required	No
Syzgium paniculatum	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Unlikely	Unlikely	Habitat not suitable	No	No

Appendix G: Transect/plot data

Vegetation Zone 1: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin - MG (Canopy and Understorey)

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
7	15	2	26.5	93	2	1	1	0	1	0	295673	6213487	56
24	18	8	11.5	65	5	15	12	1	1	3	295932	6214217	56
25	15	8	22	35	3	7	55	0	1	8	295861	6214106	56

Vegetation Zone 2: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin - Low (Canopy Only)

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
48	4	15	3	1	0	0	95	0	1	0	295665	6213403	56

Vegetation Zone 3: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin - Low (Regrowth)

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
50	14	4	24	20	0	5	18	0	1	0	295675	6213212	56

Vegetation Zone 4: Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin – MG (Canopy and Understorey)

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
1	29	13.5	51.5	30	30	20	0	0	1	22	295337	6213604	56
2	30	25	38	15	12	25	0	2	1	17	295346	6213723	56

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
3	35	20	43.5	50	15	20	0	1	1	33	295413	6213821	56
4	31	11.5	32	12	10	8	0	1	1	6	295430	6213670	56
5	47	23	33	70	10	15	1	1	1	14	295449	6213527	56
11	45	29	27	45	20	20	0	0	1	40	295507	6213754	56
14	34	23.5	33.5	20	25	20	0	2	1	31	295434	6213946	56
15	35	14	28	35	20	30	0	3	1	28	295344	6214043	56
16	36	22	39	30	15	30	0.5	1	1	17	295349	6214169	56
17	18	26.5	38	15	5	35	0	1	1	9	295465	6214075	56
18	27	12	38	35	7	25	0	1	1	7	295516	6214183	56
19	32	16	21.5	30	25	25	0	3	1	25	295441	6214247	56
20	20	8	69	15	8	12	0	2	1	8	295557	6214303	56
27	25	21	37	80	8	5	2	0	1	30	295646	6214080	56
28	35	28	26	50	12	25	0.5	0	1	37	295170	6213432	56
29	41	26	27	20	17	60	1	4	1	26	295163	6213337	56
30	39	23.5	15.5	40	15	35	1	2	1	36	295176	6213209	56
31	26	22	71.5	55	10	10	0	2	1	20	295307	6213208	56
32	23	21.5	72	25	8	15	1	1	1	5	295346	6213298	56
33	34	13	28.5	50	20	20	0	0	1	25	295301	6213395	56
34	28	25	50	70	12	10	0.5	0	1	9	295442	6213409	56
36	27	20.5	44	25	20	5	2	1	1	4	295512	6213170	56
37	24	8.5	58	65	15	15	3	0	1	8	295465	6213244	56
39	32	26	31	55	7	25	0.5	1	1	15	295242	6213545	56
6	28	31	29	70	12	12	3	0	1	13	295574	6213484	56
8	20	11.5	33	80	3	7	7	1	1	7	295742	6213580	56
9	26	27	19	65	10	10	0	0	1	9	295644	6213589	56
22	28	32	36.5	35	8	35	0.5	0	1	27	295746	6214270	56
23	38	17	22	50	15	20	2	0	1	6	295841	6214202	56
26	25	17.5	31.5	60	12	25	0	0	1	33	295756	6214131	56

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
35	23	15	30	80	5	5	8	0	1	16	295607	6213412	56
38	20	31	15.5	55	15	5	3	0	1	4	295604	6213223	56
40	27	21	29.5	70	15	15	0	0	1	12	295680	6214174	56

Vegetation Zone 5: Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin – Low (DNG)

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Longitude	Latitude	Zone
46	15	0	0	75	3	3	15	0	0	0	295485	6213341	56

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