Biodiversity Study- South Jerrabomberra

Prepared for
Queanbeyan City Council

May 2014

DOCUMENT TRACKING

Item	Detail
Project Name	Biodiversity Study – South Jerrabomberra 2014
Project Number	13CANECO-0015
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Status	Final
Version Number	1
Last saved on	**30 May 2014**
Cover photo	*Swainsona recta*, South Jerrabomberra 2013 (Ryan Smithers), *Aprasia parapulchella* South Jerrabomberra 2013 (Andrew Palmer-Brodie), *Ctenotus orientalis*, South Jerrabomberra 2013 (Andrew Palmer-Brodie)

This report should be cited as 'Eco Logical Australia 2014. *Biodiversity Study – South Jerrabomberra*. Prepared for Queanbeyan City Council

ACKNOWLEDGEMENTS

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Template 20/11/13

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Abbreviations

Abbreviation	Description
BBAM	BioBanking Assessment Methodology
BCAM	Biodiversity Certification Assessment Methodology
DGOSEH	Derived Grasslands of the South Eastern Highlands and South East Corner
EEC	Endangered Ecological Community
ELA	Eco Logical Australia
EP&A	Environmental Planning and Assessment Act 1979
EPBC	Environment Protection and Biodiversity Conservation Act 1999
GSM	*Synemon plana* (Golden Sun Moth)
HBT	Hollow Bearing Tree
HCV	High Conservation Value
KMA	Kevin Mills and Associates
LCV	Low Conservation Value
MCV	Moderate Conservation Value
OEH	NSW Office of Environment & Heritage
PTWL	*Aprasia parapulchella* (Pink-tailed Worm Lizard)
RBVT	Revised Biometric Vegetation Type
RSBGSGOF	Red Stringybark - Brittle Gum – Inland Scribbly Gum dry open forest on skeletal soils of the tablelands, South Eastern Highlands
RSRBLBOF	Red Stringybark – Red Box – Long-leaved Box – Scribbly Gum Shrub-tussock grass open forest of the southern section of the NSW South Western Slopes Bioregion
SLL	*Delma impar* (Striped Legless Lizard)
TEC	Threatened Ecological Community
TSC	Threatened Species Conservation Act 1995
VMP	Vegetation Management Plan
QCC	Queanbeyan City Council
YBRGGW	Yellow Box – Red Gum Grassy Woodland

1 Introduction

Eco Logical Australia (ELA) was contracted in 2013 by Queanbeyan City Council (QCC) to undertake a study to assess biodiversity values across three lots at South Jerrabomberra. This study will inform the future planning process and potential re-zoning of the study area for residential development.

1.1 Study area

The study area covers approximately 140 hectares in South Jerrabomberra, which is located close to Queanbeyan, on the border between NSW and the ACT, as identified in **Figure 1**. The study area abuts the newly rezoned area of South Tralee and is bounded to the west by the railway line and south and east by the Tralee Hills. It consists of three parcels of privately owned land.

The study area sits on the cusp of the Canberra Plains and the Molonglo Ranges Mitchell Landscapes (Mitchell 2002) with the eastern most section of the study area falling into the Molonglo Ranges landscape as the elevation rises. The Canberra Plains which dominate the study area are typically characterised by shallow stony loams on the steeper slopes with stony harsh red-brown to yellow texture contrast soils on lower areas and alluvial fans.

1.2 Study aims

This study aims to undertake an assessment of the biodiversity values of the study area, in part by using the New South Wales (NSW) BioBanking Assessment Methodology (BBAM). Specifically, the study aims to:

- Undertake a gap analysis to identify what information compliant with BBAM is available for the study area.
- Undertake a biodiversity assessment of the study area using BBAM, including targeted surveys for selected threatened species.
- Identify areas of high, moderate and low conservation value across the study area.
- Provide quantitative BBAM data to QCC which is sufficient to inform potential future rezoning proposals.

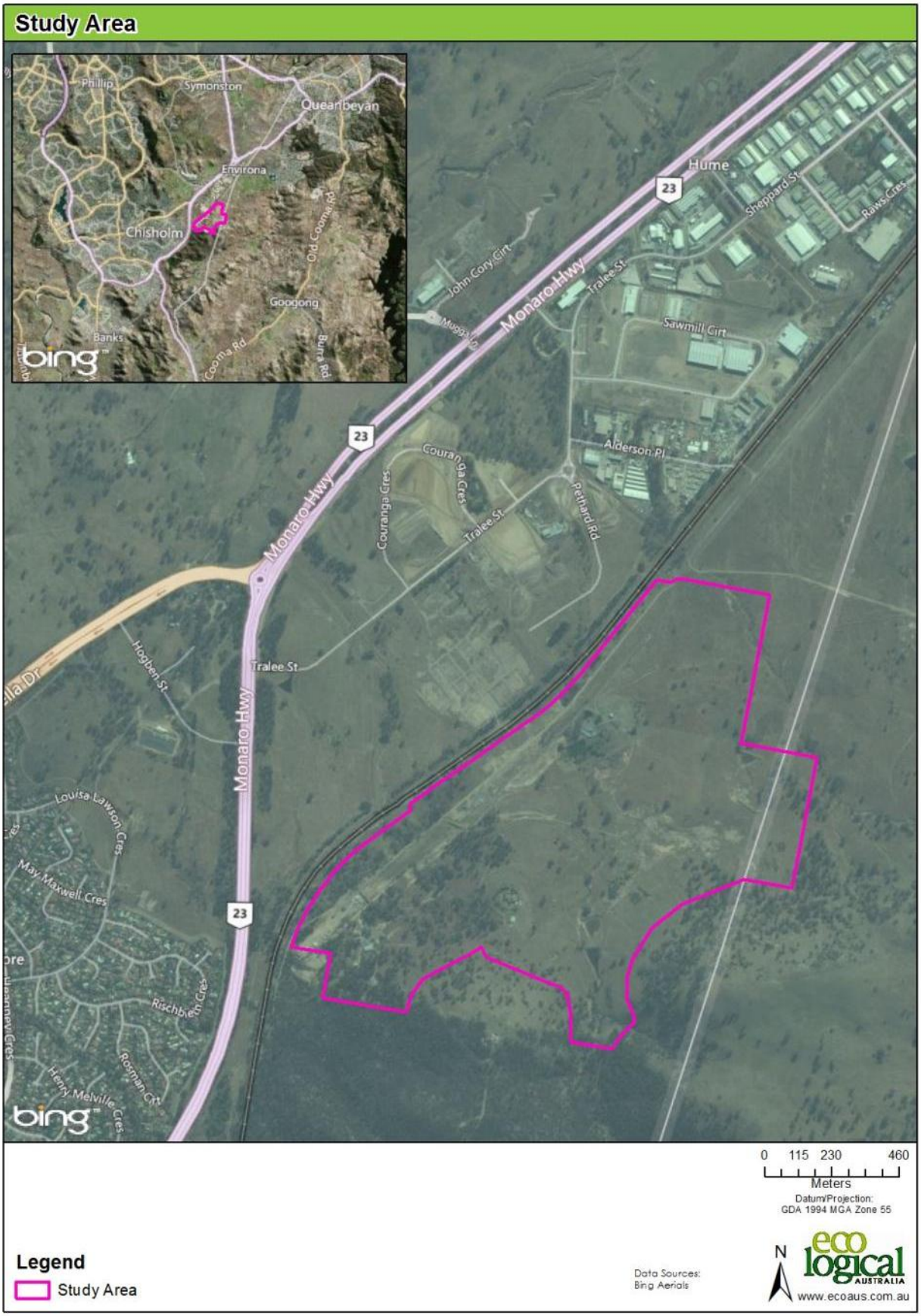

Figure 1: Study area

1.3 Background & legislative context

QCC have received gateway planning approval to amend the *Queanbeyan Local Environmental Plan (South Tralee) 2012* at South Jerrabomberra. Part of the approval for the gateway is to obtain further information on the biodiversity values of the study area prior to public exhibition of the proposal. The study area was excluded by the 2008 Queanbeyan Biodiversity Study, but parts of the study area have been surveyed by ELA and other consultants in recent years.

The study area is currently zoned environmental protection / conservation under two separate environmental planning instruments, *Yarrowlumla LEP 2002* and *Queanbeyan LEP 2012*. It is QCC's intention to proceed with rezoning the land to facilitate urban development.

State and federal environmental legislation governs the protection and conservation of threatened species and ecological communities amongst other matters. The legislation governing these matters establishes a number of requirements surrounding the assessment of development proposals. While this is not directly relevant to the re-zoning application at South Jerrabomberra, proposed land use changes should be cognisant of the legislative requirements that future development may be subject to, in order to ensure that potential risks and constraints are identified as early in the planning process as practical.

To this end, this report has a focus on the species and ecological communities listed under state and Commonwealth legislation to ensure that potential development constraints are adequately identified. Of relevance to identification of constraints, the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) establishes a requirement for Australian Government environmental assessment and approval for actions which have the potential to result in a significant impact to a Matter of National Environmental Significance (Matters of NES) protected under the Act, including nationally threatened species and ecological communities. The Commonwealth Department of the Environment (DotE) is responsible for administering the EPBC Act. Actions that may have a significant impact on a matter of NES must be referred to DotE for assessment and approval under the EPBC Act.

At a state level, the *Environmental Planning and Assessment Act 1979* (EP&A Act) is the principle planning legislation for NSW, providing a framework for the overall environmental planning and assessment of development proposals. The EP&A Act places a duty on the determining authority to adequately address a range of environmental matters including the likely impact to threatened species, populations and communities.

Under Section 117 (2) of the EP&A Act the Minister for Planning issues directions that planning authorities such as local councils must take into consideration during the preparation of planning proposals. Direction 2 (2.1) - Environment Protection Zones is of relevance to this re-zoning proposal and is discussed further in **Section 6**.

The NSW *Threatened Species Conservation Act 1995* (TSC Act) aims to protect and encourage the recovery of threatened species, populations and communities listed under the Act and operates in conjunction with the EP&A Act. An alternative pathway to assessment under the EP&A Act exists with Biobanking under Part 7A of the TSC Act. If a proponent decides to undertake a Biobanking assessment and obtain a Biobanking statement this replaces the usual threatened species assessment process under the EP&A Act. Biobanking assessments are required to be undertaken by suitably qualified practitioners in accordance BBAM.

Similarly, Biodiversity Certification provides an alternate assessment pathway given effect through an amendment to the TSC Act. Biodiversity Certification allows local government in areas with high

development pressure, to provide for the protection of biodiversity, including threatened species at the strategic planning stage. By streamlining the current biodiversity assessment process, Biocertification provides the opportunity to replace site by site, development by development assessment of threatened species with a landscape-wide strategic assessment.

Biocertification is used to help identify areas of high conservation value which need protection, and areas that are less constrained and suitable for development. The process provides for a range of options to offset biodiversity impacts, should this be required, to enable development of an identified area. Biodiversity must be 'maintained or improved' for certification to be conferred by the Minister for Environment and Heritage.

Once Biodiversity Certification is provided over a defined area, development may proceed without the usual environmental assessment requirements under the EP&A Act.

2 Methodology

This biodiversity study was undertaken using a combination of the BBAM, and a conservation significance assessment. The BBAM was used to map the vegetation types and condition within the study area and to determine which threatened species required targeted survey. The conservation significance assessment considered additional biodiversity values, such as Matters of NES, which may not be directly included in the application of the BBAM.

The BBAM enables a quantitative assessment of a proposals ability to meet the "improve or maintain" principle with respect to impacts on biodiversity values. While this study utilised the BBAM to inform the targeted surveys and the conservation significance assessment, this study did not undertake a Biobanking Assessment nor assess the proposed re-zoning against the "improve or maintain" test. However, surveys undertaken for this assessment were consistent with the BBAM, and the data provided in this report can be utilised in the future to inform an assessment through the Biobanking or Biocertification Tools if required.

2.1 Desktop review

A desktop review of the relevant literature (previous ecological assessment reports) and spatial data associated with the study area was undertaken. Spatial data was collated from previous ecological assessments as well as point data extracted from the NSW Wildlife Atlas. The review included the following sources, which include studies undertaken throughout the South Jerrabomberra and Tralee area since 2003:

- Eco Logical Australia, 2010, Draft Tralee Station Ecological Assessment, prepared for Urbis on behalf of Sandra Walsh (Tralee Station)
- URS, 2004, Additional Flora and Fauna Surveys for Tralee Release Area
- Kevin Mills and Associates (KMA), 2006, Flora and Fauna assessment Tralee station, City of Queanbeyan, prepared for Sandra Walsh (Tralee Station)
- Kevin Mills & Associates (KMA), 2013, Flora and Fauna Survey, Morrison and Forrest Properties, City of Queanbeyan. Report prepared for The Village Building Company.
- Biosis, 2003, A natural heritage assessment of 'Tralee', Queanbeyan, NSW, commissioned by Queanbeyan City Council
- Protected Matters Search Tool
- NSW Bionet, Atlas of NSW Wildlife.

Studies undertaken within the local area identified the presence of a number of species and ecological communities listed as threatened under the EPBC and TSC Acts. Studies undertaken specifically within the study area to date are limited to the report prepared by ELA (2010), and the recent report prepared by KMA (2013). The surveys undertaken by ELA (2010) covered a larger area than the current study area and the survey effort undertaken within the current study area was not considered sufficient to meet the BBAM. Similarly, surveys by KMA (2013) were focussed on a smaller portion of the study area.

2.2 Landscape context

The landscape context assessment utilised a combination of methods from the BBAM and the Biodiversity Certification Assessment Methodology (BCAM).

A landscape assessment was undertaken in accordance with the BBAM to provide an indication of the impacts of developing the study area in the context of the surrounding vegetation. To undertake the landscape assessment, two circles of 100 ha and 1000 ha respectively are overlaid over the study area. The 1000 ha circle is used to assess the percentage of native vegetation cover at a landscape scale. Similarly, the 100 ha circle is used to assess the percentage of native vegetation cover at a local scale. The landscape assessment is required to assess Landscape Value, which is utilised in the BBAM to determine the species credit species which require targeted survey within the study area. Further detail regarding the application and methodology of the landscape assessment is available in the BBAM.

Species credits are the class of biodiversity credit created (where conservation measures are applied) or required for threatened species that cannot be reliably predicted based on habitat surrogates. The BBAM requires targeted survey within the study area for those species considered to be 'species credit' species, which may be impacted by any future development.

A connectivity assessment, which is a component of the Biodiversity Certification Assessment Methodology (BCAM), was also undertaken to characterise the potential connectivity across the study area and into the surrounding landscape, as well as an assessment of local, regional and state biodiversity links (biolinks). The connectivity assessment maps connectivity within the study area only based on the distribution of moderate to good condition vegetation as defined under the BBAM. It is noted that there will be additional areas of connectivity present within the broader landscape.

A state or regional biolink provides important linkages across the landscape at a state or regional scale. These biolinks are comprised of corridors identified in a plan approved by the Director General or are riparian corridors surrounding a major creek or river (>30m in width). A local biolink can be comprised of a riparian corridor surrounding a minor creek or watercourse (20m in width) but may also be comprised of patches of native vegetation in moderate to good condition which are larger than 1 ha and separated by less than 30m. The study area was assessed to identify if any state, regional or local biolinks are present.

2.3 Biometric plots and vegetation mapping

The vegetation within the study area was mapped in accordance with the BBAM. The vegetation within the study area was stratified into vegetation types and condition class categories collectively termed vegetation zones. The BBAM defines a vegetation zone as a relatively homogenous area that is of the same vegetation type and broad condition state. Vegetation types were determined using the Revised Biometric Vegetation Types (RBVT) (DECC 2008).

Between 5th and 11th November 2013 the study area was assessed and vegetation zones mapped. A total of 18 vegetation quadrats were completed across the ten vegetation zones that were identified within the study area.

The vegetation quadrats comprised a 0.1 ha quadrat (50 m x 20 m) within which a range of vegetation structure and abundance attributes and habitat features were assessed. Habitat features assessed included the number of hollow bearing trees and length of fallen dead timber greater than 10 cm diameter. The projected foliage cover of each vegetation stratum and the abundance of exotic flora was assessed along a 50 m transect through the centre of the quadrat. A 0.04 ha (20 m x 20 m) quadrat, where all vascular flora species were recorded, was nested within the 0.1 ha quadrat.

The location of the vegetation quadrats is identified in **Figure 2.**

2.3.1 Vegetation condition classification

The native vegetation within the study area was classified into one of two condition classes as per the BBAM. The vegetation was classified as either 'Low' or 'Moderate – Good' as follows:

Low condition is defined under the BBAM as:

1. *woody native vegetation with native over-storey percent foliage cover less than 25% of the lower value of the over-storey percent foliage cover benchmark for that vegetation type, and:*
   - less than 50% of ground cover vegetation is indigenous species, or
   - greater than 90% of ground cover vegetation is cleared.
2. *native grassland, wetland or herbfield where:*
   - less than 50% of ground cover vegetation is indigenous species, or
   - more than 90% of ground cover vegetation is cleared.

Note: *Vegetation which is not in low condition is considered to be in 'moderate to good' condition*.

2.4 Targeted survey

The results of the vegetation surveys and landscape assessments were used to determine the species credit species which require targeted survey within the study area, in order to comply with the BBAM.

The list of species credit species requiring targeted survey was reduced following discussions with OEH. *Eucalyptus aggregata, Rulingia prostrata* and *Dillwynia glaucula* were determined to be highly unlikely to occur within the study area. In consultation with OEH it was decided that targeted surveys would be undertaken for the following species:

- *Aprasia parapulchella* (Pink-tailed Worm Lizard)
- *Delma impar* (Striped Legless Lizard)
- *Synemon plana* (Golden Sun Moth)
- *Rutidosis leptorrhynchoides* (Button Wrinkle-wort)
- *Lepidium hyssopifolium* (Basalt Peppercress)
- *Swainsona sericea* (Silky Swainson Pea)
- *Swainsona recta* (Small Purple Pea)

The location of the targeted surveys undertaken for each species are identified in **Figure 2.** The survey methodology utilised for each species is outlined in further detail below. The BBAM requires that threatened species surveys area undertaken in accordance with the Threatened Biodiversity Survey and Assessment (TBSA) Guidelines (DEC 2004). The threatened species surveys undertaken for this study area and their compliance with the TBSA guidelines are summarised in Table 1.

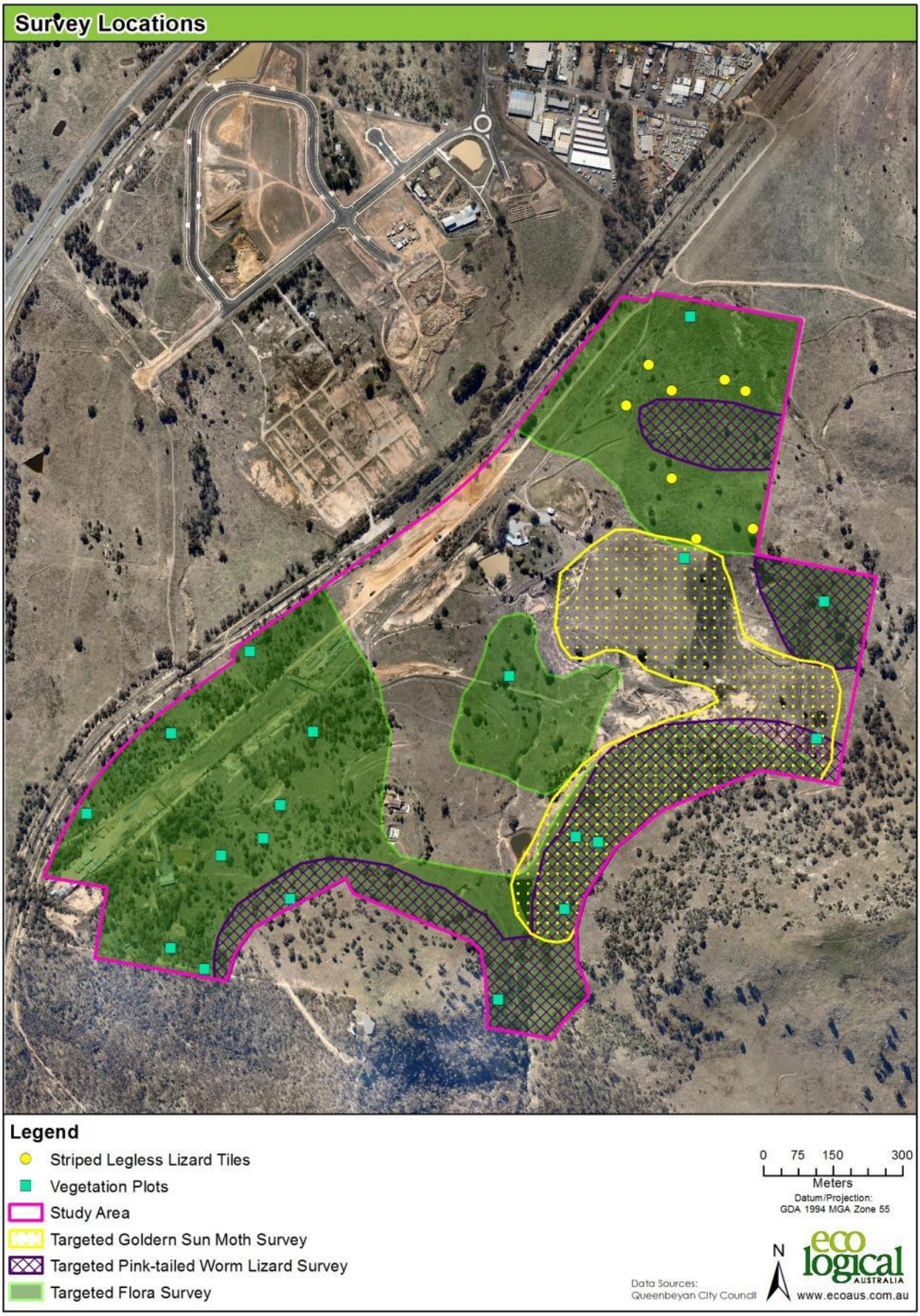

Figure 2: Survey locations

Table 1: Targeted survey methods and effort for species credit species during the survey period

Method	Date	Effort employed for this study	TBSA guidelines (appropriate survey options)
Golden Sun Moth Survey	3rd-4th December 2013	Opportunistic observations in areas of potential habitat	No TBSA guidelines issued. Commonwealth survey guidelines indicate that surveys should be undertaken over four days at approximately weekly intervals during the flying season (late October to early January) during suitable conditions: • Warm to hot day • Warmest part the day (10 a.m. to 2 p.m.) • Clear or mostly cloudless sky • Still or relatively still wind conditions during the survey period • At least two days since rain.
	12th December 2013	Random meander transects by one observer between 10 a.m. and 2 p.m.	
	13th December 2013	Random meander transects by one observer between 10 a.m. and 2 p.m.	
	10th January 2013	Random meander transects by one observer between 10 a.m. and 2 p.m.	
Striped Legless Lizard Survey	4th December 2013 – 27th January 2014	400 tiles, checked 10 times = 4000 tile checks	TBSA guidelines indicate that habitat searches and pitfall traps should be utilised. The use of tiles was discussed and supported by OEH prior to undertaking the field surveys.
Threatened flora survey	15th October 2013	10 person hours (OEH)	Random meander = 30 mins One per stratification unit <2 ha; Two per 5-20 ha stratification unit: Three per 51-250 ha;
	8th November 2013	Two observers, 7 hours = a total of 14 person hours	
	3rd December 2013	Two observers, 7 hours = a total of 14 person hours	
	4th December 2013	Two observers, 7 hours = a total of 14 person hours	
Pink-tailed Worm Lizard survey	6th December 2013	Two observers, 7 hours = a total of 14 person hours	30 min searches on two separate days targeting specific habitats

2.4.1 Pink-tailed Worm Lizard

Surveys for the Pink-tailed Worm Lizard (PTWL) were undertaken using rock-rolling in areas of potential habitat. Rock rolling involves the careful turning over and replacing ('rolling') of partially embedded rocks. Larger rocks and boulders were avoided due to the risk of increased disturbance.

Areas of potential habitat for the species consist of areas containing an abundance of semi-embedded rocks. Suitable habitat is usually characterised by a native grass cover, few trees and sites usually have a good solar aspect. The species is primarily fossorial (ground-dwelling) in nature and utilises rocks as thermoregulation sites. Typically suitable rocks may vary in size from 10-30 cm, usually have a flattened bottom and typically contain ant burrows or burrows of other arthropods such as scorpions.

In areas of potential habitat, rocks were rolled by two ecologists. A total of 200 rocks were rolled at each site unless evidence of the species was detected sooner. Evidence of the species may be either

individuals of the species, or skin sloughs from the species. A GPS point was taken for any site at which evidence of the species was recorded. The survey conditions were ideal with surveys being undertaken during relatively cool weather following recent rainfall.

2.4.2 Striped Legless Lizard

Surveys for the Striped Legless Lizard (SLL) were undertaken using an artificial shelter survey technique in areas of potential habitat. Using this method, standard roof tiles were laid in areas of potential habitat in grids of 50 tiles as recommended in the Commonwealth Survey Guidelines for Australia's Threatened Reptiles (SEWPaC, 2011). The roof riles replicate thermoregulation sites such as rocks. A total of eight grids were established (400 tiles) across the area identified as containing potential habitat. The tiles were left in place for one week prior to the first check. Following the one week rest period, the tiles were checked on average twice a week between 2nd December 2013 and the 27th January 2014 (excluding the weeks 23rd-30th December).

Checks were undertaken during suitable weather conditions, and were undertaken between 7:30 a.m. and 9:00 a.m. depending on the weather conditions such as the ambient temperature and degree of cloudiness.

2.4.3 Golden Sun Moth

Targeted surveys for the Golden Sun Moth (GSM) were conducted across the potential habitat within the study area. Potential habitat for the species typically consists of grassland areas containing a high proportion of native perennial tussock grasses such as *Austrostipa scabra, Austrostipa bigeniculata* and *Rytidosperma spp*.

A meandering traverse technique was used, which involved walking across the study area so that all likely habitat is surveyed for flying males. Walking facilitates the 'flushing' of moths into flight to improve the chance of detecting the species.

The survey was repeated on three days that had suitable flying conditions. While this is one targeted survey session short of what is ideally required, additional opportunistic surveys were also undertaken on a further two days during December concurrent with the flora surveys during suitable times and conditions.

2.4.4 Threatened flora

Targeted surveys for *Lepidium hyssopifolium* and *Rutidosis leptorrhynchoides* were discussed with Rainer Rehwinkel (Ecosystems and Threatened Species Regional Operations Group OEH) and were conducted using active searches within potential habitat. Active searches were conducted by two ecologists over a single day for each species and during the target species flowering period. *Lepidium hyssopifolium* is known to flower during November and December while *Rutidosis leptorrhynchoides* flowers between October and March.

Surveys for *Lepidium hyssopifolium* targeted disturbed areas, such as, drip lines of plantings and paddock trees, or areas containing *Pinus* sp. or *Exocarpos cupressiformis.* Surveys for *Rutidosis leptorrhynchoides* targeted patches of better condition vegetation.

Surveys for *Swainsona sericea* and *Swainson recta* were undertaken during October (OEH), and November 2013 (ELA). Surveys for *Swainsona sericea* and *Swainson recta* targeted patches of better condition vegetation.

2.5 Assessment of conservation significance

The assessment of conservation significance combines threatened biodiversity records and significant habitat characteristics within the study area with the specific requirements of relevant state and local government planning instruments, as a rational for assigning areas as high, medium or low conservation value. The classification of high, moderate and low conservation value (which takes into account multiple values as outlined below) should not be confused with the vegetation condition classification which is outlined in **Section 2.3.1,** and is a component of the BBAM. The conservation significance assessment includes consideration of:

- how rare a vegetation community is
- the condition of vegetation remnants, including the type and severity of disturbance
- connectivity between remnants on and off site
- the size of the vegetation remnant
- the value of the remnant as threatened species habitat.

2.5.1 High conservation value

Areas assigned as high conservation value (HCV) are mapped as such as:

- They support threatened ecological communities (TECs) or over-cleared vegetation types with high floristic diversity and recovery potential.
- They contribute to connectivity between habitats within and beyond the study area.
- They are known to support threatened fauna species and or important habitat resources i.e. partially imbedded rock or hollow bearing trees.
- They provide known habitat for threatened flora.
- They contribute to a state or regional biolink.

HCV areas are the highest priority for conservation and should ideally be overwhelmingly retained and protected within any proposed rezoning.

2.5.2 Moderate conservation value

Areas assigned as moderate conservation value (MCV) are mapped as such as:

- They support TECs or over-cleared vegetation types in highly modified condition with lower floristic diversity, substantial weed infestation, and low to moderate recovery potential i.e. requiring substantial long-term recovery efforts.
- They provide marginal habitat value for threatened species, though would contribute to the overall extent of habitat and connectivity.
- They contribute to a local biolink.

MCV areas are a lower priority for retention and conservation than HCV areas.

2.5.3 Low conservation value

Areas assigned as low conservation value (LCV) are mapped as such as:

- They support highly modified vegetation communities which have negligible recovery potential and which are of negligible conservation significance.
- They provide negligible habitat for threatened species due to the level of disturbance and comparatively fewer habitat resources.

LCV areas should be the focus of any future rezoning for residential development.

3 Results

3.1 Disturbances

The central and northern portions of the study area have been heavily modified through a history of clearing, grazing, weed infestation, and substantial soil erosion. The study area also contains three dwellings, sheds, internal roads, as well as three dams along the main drainage line which traverses the study area. As a result of these historic and ongoing disturbances there is a high cover and diversity of weeds across much of the study area.

A partially constructed abandoned airstrip dissects the large patch of vegetation in the south-western parts of the study area. The construction of the air strip, and associated earthworks have substantially altered the natural ecological and hydrological processes that would have characterised that area.

3.2 Vegetation mapping and condition assessment

The vegetation within the study area was stratified into ten vegetation zones comprising four different RBVTs (**Figure 3, Table 2**). The vegetation within the study area ranged in condition from highly degraded exotic dominated pastures, through to intact, floristically diverse vegetation which met the requirements for listing as a TEC. The majority of the vegetation on site is considered to be in moderate to good condition as defined by the BBAM (**Figure 4**)

A description of the vegetation zones within the study area and the constituent vegetation type and condition is presented in subsequent sections. The best fit RBVT was chosen in instances where the vegetation on site did not accurately match the vegetation types available under the BBAM. For example, zones 2, 3, 8 and 9 correlate well with u66 mealy Bundy – Red Stringybark grass-forb mid-high forest of Armstrong et al 2013. However no equivalent vegetation RBVT exists. As such, Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest on skeletal hills of the tablelands, South Eastern Highlands was selected as the best fit RBVT, based on species composition and landscape position.

Similarly, Zone 6 and 10 represent an ecotone between the “dry forest” and the Box Gum Woodland, which does not correlate particularly well with any RBVT. Red Stringybark - Red Box - Long-leaved Box - Scribbly Gum shrub - tussock grass open forest of the southern section of the NSW South Western Slopes Bioregion (Benson 290) was selected as the best fit RBVT, as the community is dominated by Red Box, Scribbly Gum and Long-leaved Box with a mixed shrubby/grassy understorey and groundcover.

The zone ancillary code provides a general description of the condition of the vegetation within the zone. Apart from the exotic grassland, the vegetation within each zone meets the definition for moderate to good condition under the BBAM. However, it is considered that while zones 4 and 5 are considered moderate to good condition under the BBAM, this classification overstates the value of the vegetation in these zones which is very highly modified and weedy with low recovery potential. Whilst typically more than 50% of the ground cover vegetation within zones 4 and 5 is native, it is typically comprised of only a few very hardy and disturbance tolerant native grasses and forbs.

Table 2: Vegetation zones within the study area

Zone	Revised biometric vegetation type	Ancillary code	Formation	Class	Condition
1	Yellow box – Blakely's Red Gum Grassy Woodland on the tablelands, South Eastern Highlands	Very weedy	Grassy Woodlands	Southern Tablelands Grassy Woodlands	Moderate to good
2	Red Stringybark – Brittle Gum – Inland Scribbly Gum dry open forest on skeletal hills of the tablelands, South Eastern Highlands	Patchy cover and moderately grazed	Dry Sclerophyll forest (Shrubby subformation)	Southern Tablelands Dry Sclerophyll Forests	Moderate to good
3	Red Stringybark – Brittle Gum – Inland Scribbly Gum dry open forest on skeletal hills of the tablelands, South Eastern Highlands	Derived grassland with moderate native diversity and high weed cover	Dry Sclerophyll forest (Shrubby subformation)	Southern Tablelands Dry Sclerophyll Forests	Moderate to good
4	Derived Grasslands of the South Eastern Highlands and South East corner	Heavily weedy native pasture	Grassland	Temperate montane grasslands	Moderate to good
5	Derived Grasslands of the South Eastern Highlands and South East corner	Lomandra longifolia/ Carex appressa community	Grassland	Temperate montane grasslands	Moderate to good
6	Red Stringybark – Red Box – Long Leaved Box – Scribbly Gum shrub tussock grass open forest of the southern section of the NSW South West Slopes Bioregion (Benson 290)	Weedy	Dry Sclerophyll Forests (Shrub/grass subformation)	Upper Riverina Dry Sclerophyll Forests	Moderate to good
7	Yellow box – Blakely's Red Gum Grassy Woodland on the tablelands, South Eastern Highlands	Good condition woodland	Grassy Woodlands	Southern Tablelands Grassy Woodlands	Moderate to good
8	Red Stringybark – Brittle Gum – Inland Scribbly Gum dry open forest on skeletal hills of the tablelands, South Eastern Highlands	Derived grassland with moderate native diversity and low weed cover	Dry Sclerophyll forest (Shrubby subformation)	Southern Tablelands Dry Sclerophyll Forests	Moderate to good
9	Red Stringybark – Brittle Gum – Inland Scribbly Gum dry open forest on skeletal hills of the tablelands, South Eastern Highlands	Good condition dry sclerophyll forest	Dry Sclerophyll forest (Shrubby subformation)	Southern Tablelands Dry Sclerophyll Forests	Moderate to good
10	Red Stringybark – Red Box – Long Leaved Box – Scribbly Gum shrub tussock grass open forest of the southern section of the NSW South West Slopes Bioregion (Benson 290)	Good condition dry sclerophyll forest	Dry Sclerophyll Forests (Shrub/grass subformation)	Upper Riverina Dry Sclerophyll Forests	Moderate to good

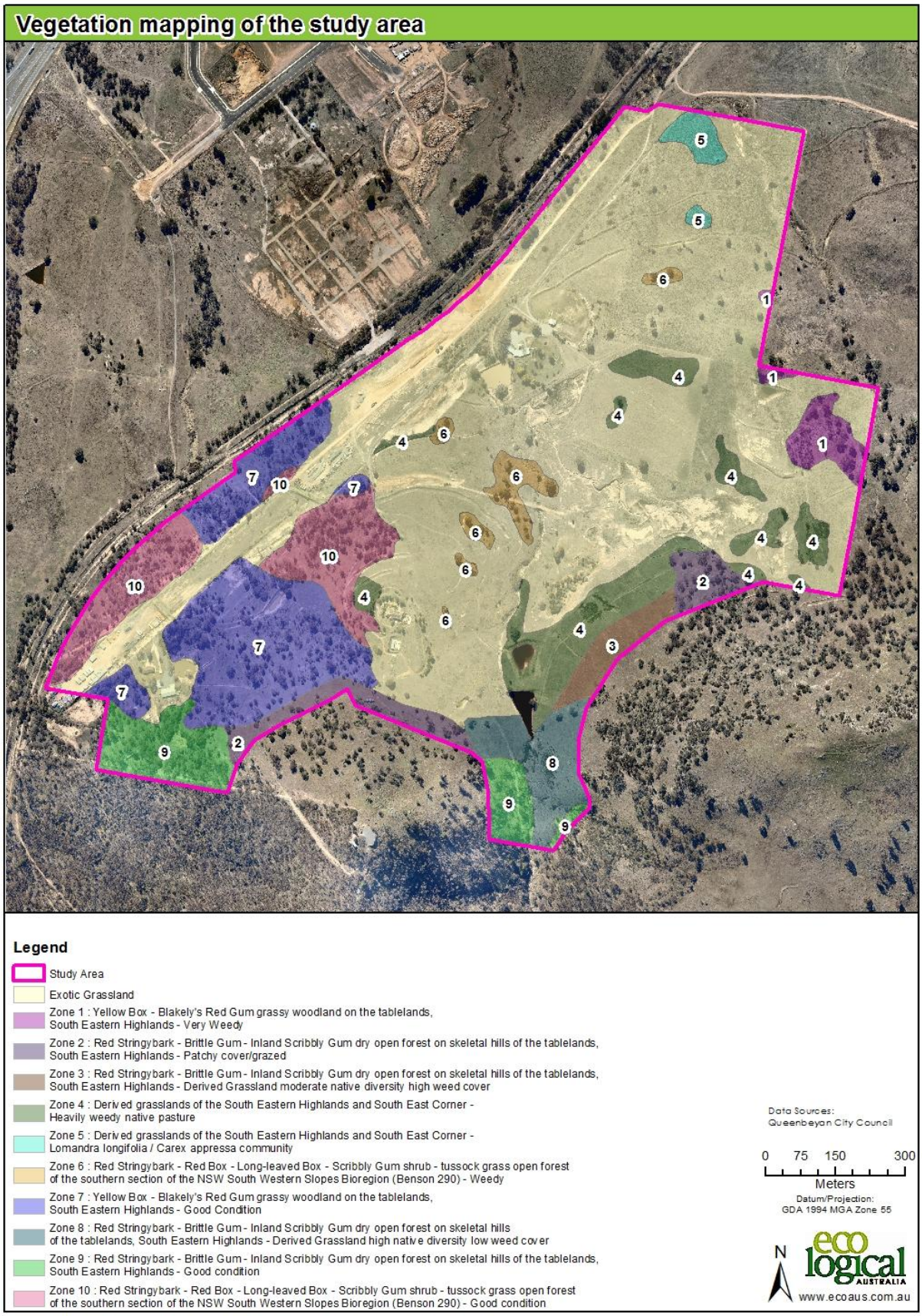

Figure 3: Vegetation mapping

Figure 4: Vegetation condition within the study area

3.2.1 Zone 1

Vegetation Type	Yellow Box – Blakely's Red Gum Grassy Woodland on the Southern Tablelands, South Eastern Highlands.
Ancillary Code	Very weedy.
Description	This zone was present in the north-east of the study area, as a larger patch and two small patches. The patches occur on the eastern boundary of the study area and are surrounded by exotic grassland. The zone is characterised by a dominance of *Eucalyptus blakelyi* (Blakely's Red Gum), *E. melliodora* (Yellow Box) or *E. bridgesiana* (Apple Box) with moderate diversity of native forbs but a high dominance of annual exotic species.
Overstorey	Dominant canopy species include *Eucalyptus blakelyi* and *E. brigesiana*.
Midstorey	The mid-storey is sparse and is characterised by *Exocarpos cupressiformis* (Native Cherry) and regenerating overstorey species.
Groundcovers	Common native groundcover species include *Tricoryne elatior, Wahlenbergia communis, Lomandra spp., Convolvulus erubescens, Cheilanthes sieberi, Austrostipa scabra* and *Bothriochloa macra.*
TEC	White Box – Yellow Box – Blakely's Red Gum Grassy Woodlands and Derived Native Grassland (TSC and EPBC listed).

Figure 5: Zone 1 is characterised by very weedy Yellow Box – Blakely's Red Gum Grassy Woodland on the Southern Tablelands, South Eastern Highlands.

3.2.2 Zone 2

Vegetation Type	Red Stringybark – Brittle Gum – Inland Scribbly Gum dry open forest on skeletal hills of the tablelands, South Eastern Highlands.
Ancillary Code	Patchy cover and moderately grazed.
Description	This zone is located along the southern and south-eastern boundaries of the study area. The zone is located on skeletal hills and grades into Yellow Box – Blakely's Red Gum Grassy Woodland on the lower slopes. The zone is characterised by *Eucalyptus macrorhyncha* (Red Stringybark), *E. mannifera* (Brittle Gum) and *E. rossii* (Inland Scribbly Gum) in the overstorey.
Overstorey	Dominant canopy species include *Eucalyptus macrorhyncha*, *E. mannifera* and *E. rossii*.
Midstorey	The midstorey is sparse, and is dominated by *Allocasuarina verticillata* (Drooping She-Oak).
Groundcovers	Common groundcover species include *Austrostipa scabra, Cheilanthes sieberi, Wahlenbergia communis.*
TEC	Not listed.

Figure 6: Zone 2 comprises Red Stringybark – Brittle Gum – Inland Scribbly Gum dry open forest on skeletal hills of the tablelands, South Eastern Highlands with a sparse overstorey and midstorey and patchy groundcover

3.2.3 Zone 3

Vegetation Type	Red Stringybark – Brittle Gum – Inland Scribbly Gum dry open forest on skeletal hills of the tablelands, South Eastern highlands.
Ancillary Code	Derived grassland with moderate native diversity and high weed cover.
Description	This zone is located in a single patch along the south-eastern boundary of the study area. The zone contains an abundance of shallowly embedded rocks in some parts. The zone lacks an overstorey and midstorey. The groundcover is dominated by a mix of native tussock grasses and forbs with a high abundance of exotic species.
Overstorey	Canopy species are absent.
Midstorey	Midstorey species are absent.
Groundcovers	Common groundcover species include *Aristida ramosa, Austrostipa scabra, Bothriochloa macra, Rytidosperma spp., Acaena ovina, Cheilanthes sieberi*, and *Convolvulus erubescens.*
TEC	Not listed.

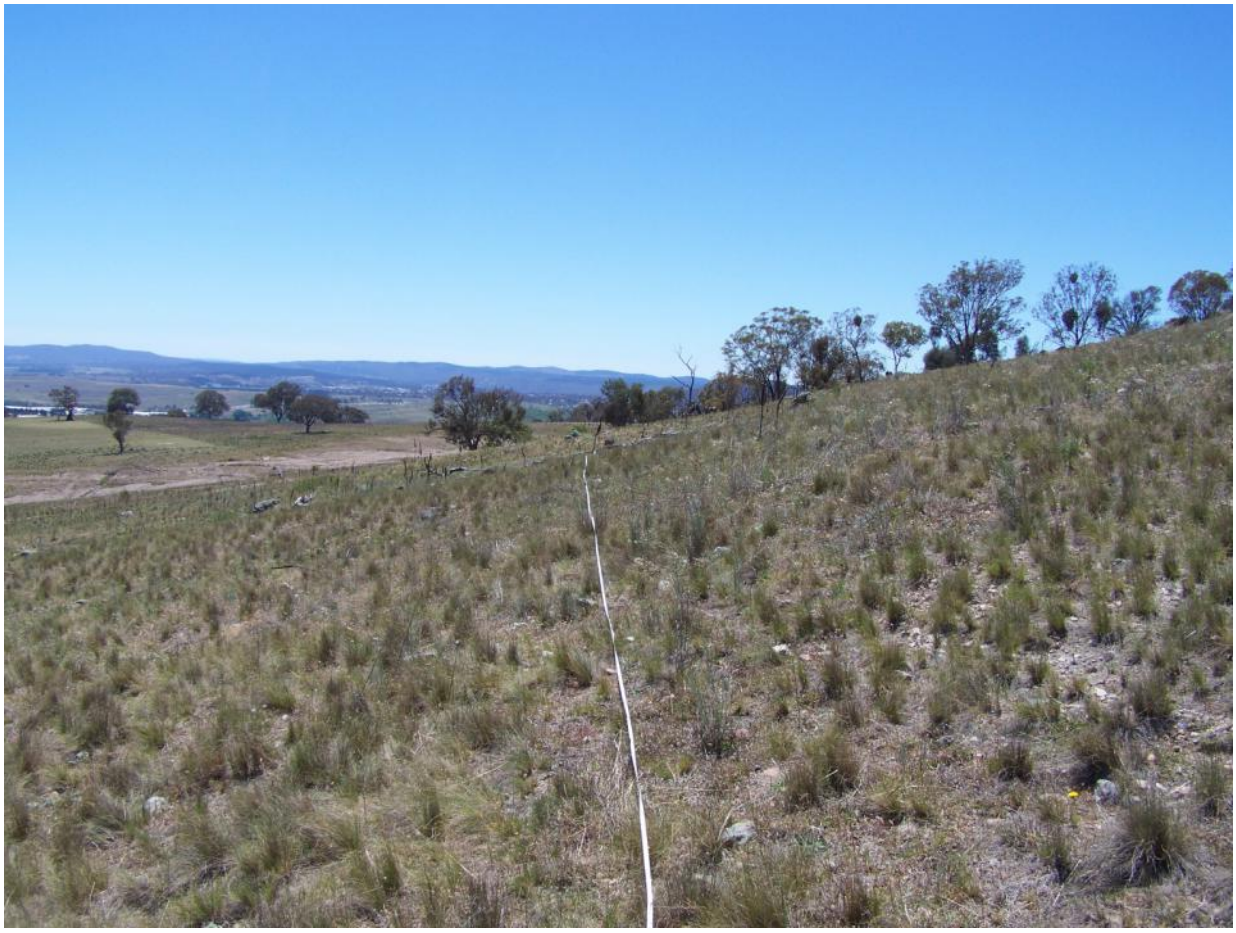

Figure 7: Zone 3 comprises a grassland derived from the clearing of Red Stringybark – Brittle Gum – Inland Scribbly Gum dry open forest on skeletal hills of the tablelands, South Eastern highlands.

3.2.4 Zone 4

Vegetation Type	Derived Grasslands of the South Eastern highlands and south east corner.
Ancillary Code	Heavily weedy native pasture.
Description	This zone occurs in scattered patches through the lower lying central portions of the study area. The zone is a derived grassland community characterised by native tussock grasses and herbs with a high abundance of exotic species.
Overstorey	Canopy is absent.
Midstorey	Midstorey is absent.
Groundcovers	Common native groundcover species include *Rytidosperma caespitosa, R. carphoides, Austrostipa scabra, Bothriochloa macra, Aristida ramosa* and *Cheilanthes sieberi.*
TEC	Derived Grassland listed under the TSC Act as a component of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland TEC, but not listed under the EPBC Act.

Figure 8: Zone 4 comprises a very weedy derived grassland

3.2.5 Zone 5

Vegetation Type	Derived Grasslands of the South Eastern highlands and South East corner.
Ancillary Code	*Lomandra longifolia/Carex appressa* community.
Description	This zone occurs as discrete patches in the north of the study area. The community is a derived grassland community lacking a canopy or midstorey. The community is dominated by *Lomandra longifolia* and*Carex appressa* to the exclusion of many other species including native tussock grasses.
Overstorey	Canopy species are absent
Midstorey	Midstorey is absent.
Groundcovers	Common groundcover species include *Lomandra longifolia* and *Carex appressa* and a range of weeds.
TEC	Derived Grassland listed under the TSC Act as a component of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland TEC, but not listed under the EPBC Act.

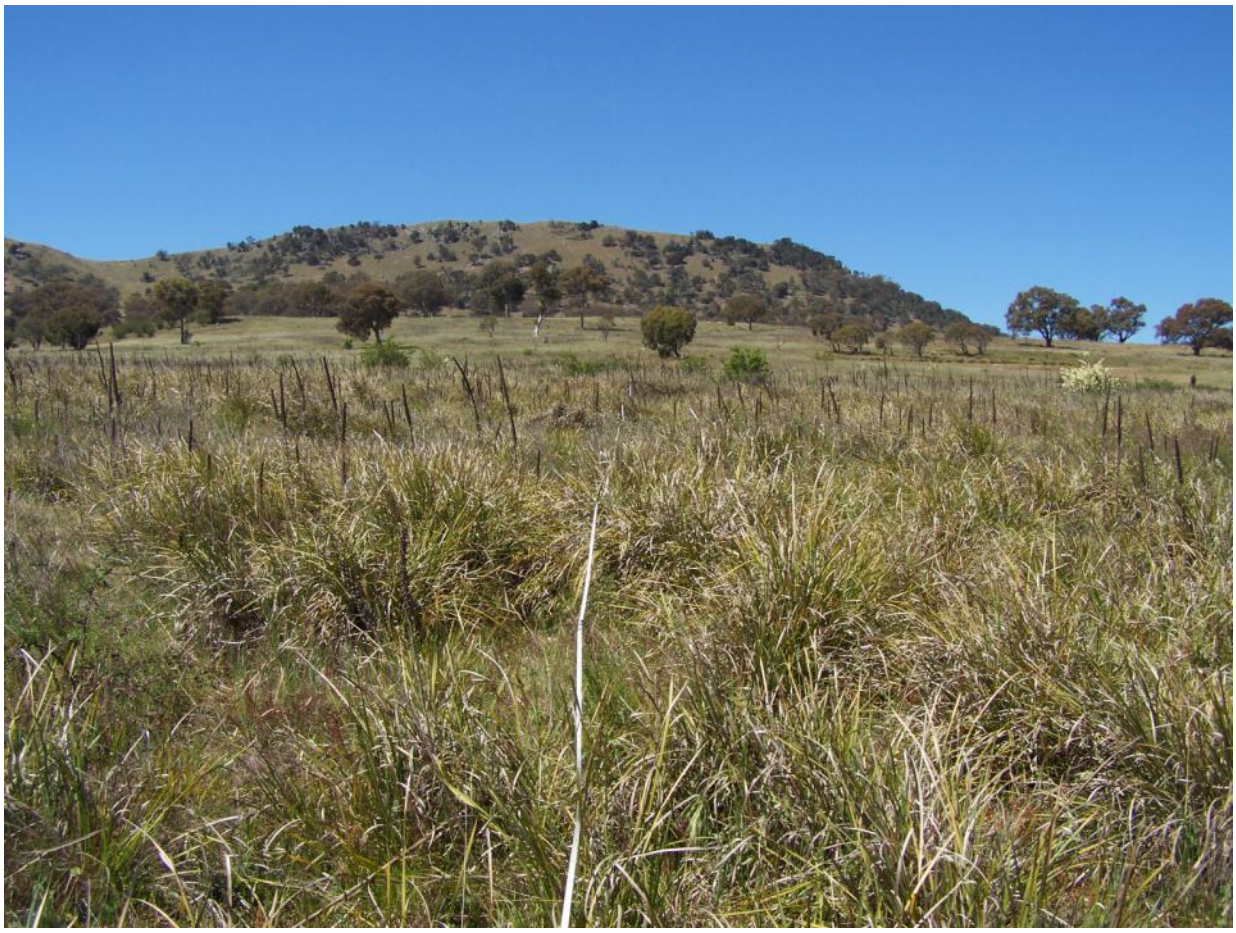

Figure 9: Zone 5 comprises a very weedy derived grassland which is unusual in that *Lomandra longifolia* and *Carex appressa* are dominant.

3.2.6 Zone 6

Vegetation Type	Red Stringybark – Red Box – Long leaved Box – Scribbly Gum shrub tussock grass open forest of the southern section of the NSW South West Slopes Bioregion (Benson 290).
Ancillary Code	Weedy.
Description	This zone occurs as scattered patches through the central sections of the study area. The zone is characterised by scattered trees with a sparse midstorey and a weedy ground layer. This zone represents a degraded form of Zone 10.
Overstorey	Dominant canopy species include *Eucalyptus nortonii* and *E. rossii.*
Midstorey	The midstorey is predominantly absent, however a low midstorey of *Melichrus urceolatus* and *Xerochrysum viscosum* exist in some places.
Groundcovers	Common groundcover species include *Austrostipa scabra, Bothriochloa macra, Chrysocephalum apiculatum, Convolvulus erubescens* and *Lomandra filiformis.*
TEC	Not listed.

Figure 10: Zone 6 is characterised by small highly modified remnants of the Red Stringybark – Red Box – Long leaved Box – Scribbly Gum shrub tussock grass open forest of the southern section of the NSW South West Slopes Bioregion (Benson 290) RBVT.

3.2.7 Zone 7

Vegetation Type	Yellow Box – Blakely's Red Gum Grassy Woodland on the tablelands, South Eastern Highlands.
Ancillary Code	Good condition woodland.
Description	This zone is characterised by good condition Yellow Box – Blakely's Red Gum Grassy woodland and is predominantly located in the southern sections of the study area. The zone has been historically separated by the partial construction of an airstrip and residential holdings. A large contiguous patch of the zone is well connected with dry sclerophyll forest communities outside of the study area.
Overstorey	Dominant canopy species include *Eucalyptus melliodora & E. blakelyi.*
Midstorey	The midstorey is variable with some areas containing a low shrubby midstorey dominated by *Melichrus urceolatus*. The midstorey is also characterised by regenerating canopy species.
Groundcovers	Common groundcover species include *Rytidosperma spp, Austrostipa scabra, Bothriochloa macra, Cheilanthes sieberi, Chrysocephalum apiculatum, Gonocarpus tetragynus* and *Haloragis heterophylla.*
TEC	White Box – Yellow Box – Blakely's Red Gum Grassy Woodland Derived Native Grasslands (TSC and EPBC).

Figure 11: Zone 7 comprises regenerating Yellow Box – Blakely's Red Gum Grassy Woodland on the tablelands, South Eastern Highlands which is floristically diverse and relatively weed free.

3.2.8 Zone 8

Vegetation Type	Red Stringybark – Brittle Gum – Inland Scribbly Gum dry open forest on skeletal hills of the tablelands, South Eastern highlands.
Ancillary Code	Derived Grassland with moderate native diversity and low weed cover.
Description	This zone is a derived grassland community which occurs in the southern corner of the study area. The zone has a moderate diversity of native tussock grasses, herbs and shrubs interspersed with a substantial amount of surface rock. The zone grades into Black Cypress Pine woodland, drooping She-oak woodland and Red Stringybark – Brittle Gum – Inland Scribbly Gum dry open forest. The exotic weed cover in this zone is low.
Overstorey	Canopy species are predominantly absent, the occasional *Eucalyptus nortonii* remains in some instances.
Midstorey	A sparse low midstorey dominated by *Melichrus urceolatus*, *Brachyloma daphnoides* and *Hibbertia obtusiflora* is present.
Groundcovers	A diverse ground cover is present with common groundcover species including *Gonocarpus tetragynus, Aristida ramosa, Rytidosperma spp, Austrostipa scabra, Bothriochloa macra, Chrysocephalum apiculatum, Enneapogon nigricans, Tricoryne elatior, Themeda australis* and *Pimelea curviflora.*
TEC	Not listed

Figure 12: Zone 8 comprises a grassland derived from the clearing of Red Stringybark – Brittle Gum – Inland Scribbly Gum dry open forest on skeletal hills of the tablelands, South Eastern highlands.

3.2.9 Zone 9

Vegetation Type	Red Stringybark – Brittle Gum – Inland Scribbly Gum dry open forest on skeletal hills of the tablelands, South Eastern highlands.
Ancillary Code	Good condition dry sclerophyll forest.
Description	This zone occurs in the south of the study area along the main drainage line and on the upper slopes in the southern most section. The zone grades into Yellow Box – Blakely's Red Gum Grassy Woodland on the lower slopes.
Overstorey	Dominant canopy species include *Eucalyptus nortonii*, *E. polyanthemos, E. rossii* & *E. melliodora.*
Midstorey	A low shrubby midstorey is present, with dominant species including *Brachyloma daphnoides, Leucopogon microphyllus, Lissanthe strigosa,* and *Melichrus urceolatus*. A taller midstorey comprising regenerating canopy species and *Acacia dealbata* was also present.
Groundcovers	A sparse grassy understory was present with common native groundcover species including *Aristida ramosa and Austrostipa scabra.*
TEC	Not listed.

Figure 13: Zone 9 comprises relatively undisturbed Red Stringybark – Brittle Gum – Inland Scribbly Gum dry open forest on skeletal hills of the tablelands, South Eastern highlands.

3.2.10 Zone 10

Vegetation Type	Red Stringybark – red Box – Long Leaved Box – Scribbly Gum shrub tussock grass open forest of the southern section of the NSW South West slopes Bioregion (Benson 290).
Ancillary Code	Good condition dry sclerophyll forest.
Description	This zone occurs in the south-western parts of the study area as two large patches contiguous with surrounding vegetation. The community has been fragmented by the partial construction of an airstrip. The community grades into Yellow Box – Blakely's Red Gum woodland on the lower slopes.
Overstorey	Dominant canopy species include *Eucalyptus polyanthemos* & *E. rossii.*
Midstorey	Dominant mid-storey species include *Exocarpos cupressiformis, Acacia dealbata, Brachyloma daphnoides, Leucopogon microphyllus* & *Melichrus urceolatus.*
Groundcovers	Common groundcover species *include Rytidosperma spp., Austrostipa scabra, Bothriochloa macra, Cheilanthes sieberi, Chrysocephalum apiculatum, Hydrocotyle laxiflora, Hypericum gramineum* and *Tricoryne elatior.*
EEC	Not listed.

Figure 14: Zone 10 comprises good condition Red Stringybark – Red Box – Long Leaved Box – Scribbly Gum shrub tussock grass open forest of the southern section of the NSW South West Slopes Bioregion (Benson 290) which typically has a sparse shrub cover and grassy groundcover.

3.2.11 Species richness and hollow-bearing trees

The vegetation quadrats cumulatively recorded 163 flora species, comprising 109 native species and 54 exotics. Thirty native species were recorded in each quadrat on average with the highest number of native species (49) recorded in Zone 10 (*Red Stringybark – Red Box – Long-leaved Box – Scribbly Gum Shrub-tussock grass open forest of the southern section of the NSW South Western Slopes Bioregion*) and the lowest number (7) recorded in Zone 4 (*Derived Grasslands of the South Eastern Highlands and South East Corner*).

The number of hollow bearing trees across the property was generally low, however in some vegetation types such as *Red Stringybark – Red Box – Long-leaved Box – Scribbly Gum Shrub-tussock grass open forest of the southern section of the NSW South Western Slopes Bioregion* hollows were locally abundant. A summary of the quadrat statistics is provided in **Appendix B**.

The desktop assessment identified that a number of threatened species are known to occur in the local area (**Table** 3). In addition, the previous ecological studies identified a number of threatened species as having potential to occur within the study area. The spatial data associated with the records displayed in **Table 3** is presented in **Figure 15**.

Table 3: Species known to occur within the local area

Common name	Latin name	EPBC status	TSC status
Pink-tailed Worm Lizard	*Aprasia parapulchella*	Vulnerable	Vulnerable
Hooded Robin	*Melanodryas cucullata*	Not listed	Vulnerable
Diamond Firetail	*Stagonopleura guttata*	Not listed	Vulnerable
Speckled Warbler	*Chthonicola sagittata*	Not listed	Vulnerable
Golden Sun Moth	*Synemon plana*	Critically endangered	Endangered
Hoary Sunray	*Leucochrysum albicans var. tricolor*	Endangered	Not listed
Small Purple Pea	*Swainsona recta*	Endangered	Endangered

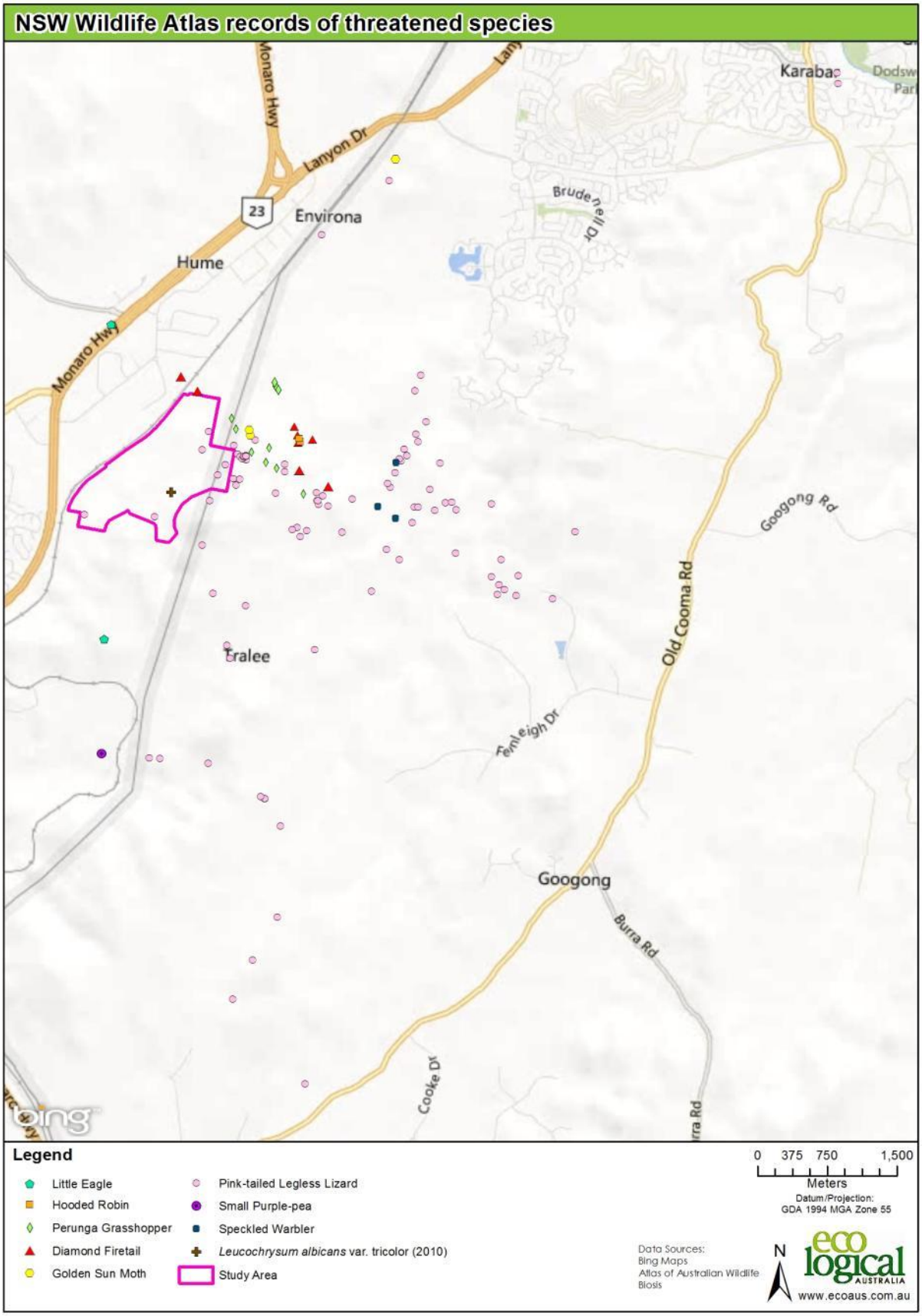

Figure 15: Summary of threatened species records (NSW Wildlife Atlas)

3.3 Landscape assessment & biolinks

The majority of the study area occurs within the Canberra Plains Mitchell Landscape, with a small part of the study area in the Molonglo Ranges Mitchell Landscape (**Appendix A: Figure 21**).

The landscape assessment used circles with a radius of 1784 m (1000 ha) and 564 m (100 ha) to assess the surrounding vegetation cover at a landscape and local scale respectively. Due to the size of the study area, only one 1,000 ha circle (and therefore one 100 ha circle) was required to assess the local and regional vegetation. The amount of vegetation within the 100 ha and 1,000 ha assessment circles was calculated using ArcGIS. The vegetation was digitised at a scale of 1:10,000. The landscape assessment identified that 379 ha of native vegetation cover is present within the 1000 ha circle and 63 ha present within the 100 ha circle.

A connectivity assessment was also conducted, which identified that connectivity runs along the south-eastern boundary of the study area linking areas of remnant vegetation to the south and north-east (**Appendix A:, Figure 20**). The assessment of connectivity is intended to provide a visual guide only, and it is noted that the connectivity mapped is likely to extend outside of the study area in a number of directions. Currently, the most limiting width within the corridor is approximately 300 m, which classifies the corridor into the >100-500 m linkage width class. The most limited section was identified outside of the study area to the north-east.

A number of small local biolinks were identified within the study area surrounding minor creek or drainage lines. Of particular note, a local biolink runs along the length of a minor creek which traverses the study area. This creek is currently in poor condition with little riparian vegetation. Local biolinks have been classified as of moderate conservation significance as outlined in **Section 2.5.2**. The study area is also encompassed within a Regional Biolink which was identified in the Queanbeyan Biodiversity Study (BES, 2008).

3.4 Targeted survey results

A summary of the results of the targeted threatened flora and fauna survey undertaken within the study area for this assessment is presented in the following sections.

3.4.1 Threatened fauna

Aprasia parapulchella (Pink-tailed Worm Lizard)

The targeted PTWL surveys identified the species at five sites scattered broadly across the study area, and skin sloughs of the species at a further six sites (**Figure 16**). Multiple individuals were recorded sheltering under a single rock on some occasions. The rocks recorded as being utilised by the species ranged in size from approximately 10 cm wide to more than 30 cm wide. Images of some of the individuals recorded are presented in **Appendix E:**.

The presence of the species within the study area has been well established and the species has been widely recorded to the east of the study area (**Figure 15**). Based on the extensive distribution of the species within the study area and surrounds, the species should be considered to be likely to be present in any area containing potential habitat i.e. shallowly embedded rocks.

Delma impar (Striped Legless Lizard)

Despite targeted surveys over a period of two months no evidence of the species occurring within the study area was recorded. The habitat within the study area is considered to be marginal at best as it is does not contain the preferred structural habitat characteristics or groundcover grasses and forbs favoured by the species. Given the results of the targeted surveys it is considered highly unlikely that

the species occurs within the study area. This finding is consistent with the findings of previous studies (KMA, 2013).

Synemon plana (Golden Sun Moth)

Targeted surveys for the GSM were undertaken on three occasions between December and January. While this is one targeted survey session short of the Commonwealth guidelines, additional opportunistic surveys were also undertaken on a further two days during December, concurrent with the flora surveys. These surveys were undertaken during suitable times and conditions.

The species was not observed within the study area during the targeted surveys. The potential habitat within the study area is considered to be low quality given the high proportion of exotic and perennial annual species including an abundance of *Nassella trichotoma* (Serrated Tussock), which limits the inter tussock spacing required by this species. While the habitat does contain *Austrostipa bigeniculata* and *Rytidosperma* species, these species, which are known to be important habitat indicators for the GSM, are not dominant. Based on these factors, and that the species was not recorded during surveys, it is considered unlikely that the species occurs within the study area. This finding is consistent with the findings of previous studies (KMA, 2013).

Opportunistic sightings

The Diamond Firetail was opportunistically recorded within the study area during the surveys. The species is listed as Vulnerable under the TSC Act. Previous studies (Biosis, 2003) identified the Diamond Firetail, and also the Hooded Robin as occurring on the South Tralee property to the north of the study area. These species are ecosystem species under the BBAM, and thus do not require targeted survey.

A total of 12 reptile species were also recorded opportunistically during the surveys. A list of species recorded is provided in **Appendix C**.

3.4.2 Threatened flora

The surveys identified the presence of both *Swainsona sericea* (Silky Swainson Pea) and *S. recta* (Small Purple Pea) within the study area as well as *Leucochrysum albicans* var*. tricolor* (Hoary Sunray).

L. albicans var *tricolor* and *S. recta* are both listed as Endangered under the EPBC Act. *S. sericea* is listed as Vulnerable under the TSC Act.

Swainsona sericea (Silky Swainson-pea)

S. sericea was recorded at a number of locations across the study area. Surveys undertaken by staff from OEH identified the species at five locations, predominantly along the southern and eastern edges of the study area. Subsequent surveys by ELA identified the species at a further two locations in the southern parts of the study area.

Swainsona recta (Small purple-pea)

S. recta was recorded at a single location in the south-western corner of the study area. Two individuals were located within a small patch of YBRGGW with a shrubby understory (**Appendix B**). The two individuals are located approximately 250 m from a known population within the railway corridor to the east.

Leucochrysum albicans var. tricolor (Hoary Sunray)

L. albicans var. *tricolor* individuals were extensively distributed across the south-western portion of the study area through areas containing YBRGGW and RSRBLBOF. The species was locally abundant through this area with thousands of individuals recorded. A small patch of the species also occurs to the immediate west of the dwelling on the Forrest property. A report by ELA (2010) also identified a single individual of the species in the south-eastern corner of the study area (ELA, 2010)

Lepidium hyssopifolium (Basalt Peppercress)

The surveys did not record the presence of *L. hyssopifolium* within the study area.

Rutidosis leptorrhynchoides (Button Wrinkle-wort)

The surveys did not record the presence of *R. leptorrhynchoides* within the study area.

3.5 Red flags

As defined in the BBAM a red flag is an area that contains biodiversity conservation values due to:

- the presence of threatened species
- a TEC listed under state or federal legislation
- or the presence of a highly cleared vegetation type.

The Red flags identified as present within the study area are outlined in **Table 4** below and illustrated in **Figure 16** & **Figure 17**.

Table 4: Red flags recorded within the study area

Common name	Latin name	EPBC Act listing	TSC Act listing
Small Purple-pea	*Swainsona recta*	Endangered	Endangered
Silky Swainson Pea	*Swainsona sericea*	Not listed	Vulnerable
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grasslands		Critically Endangered	Endangered

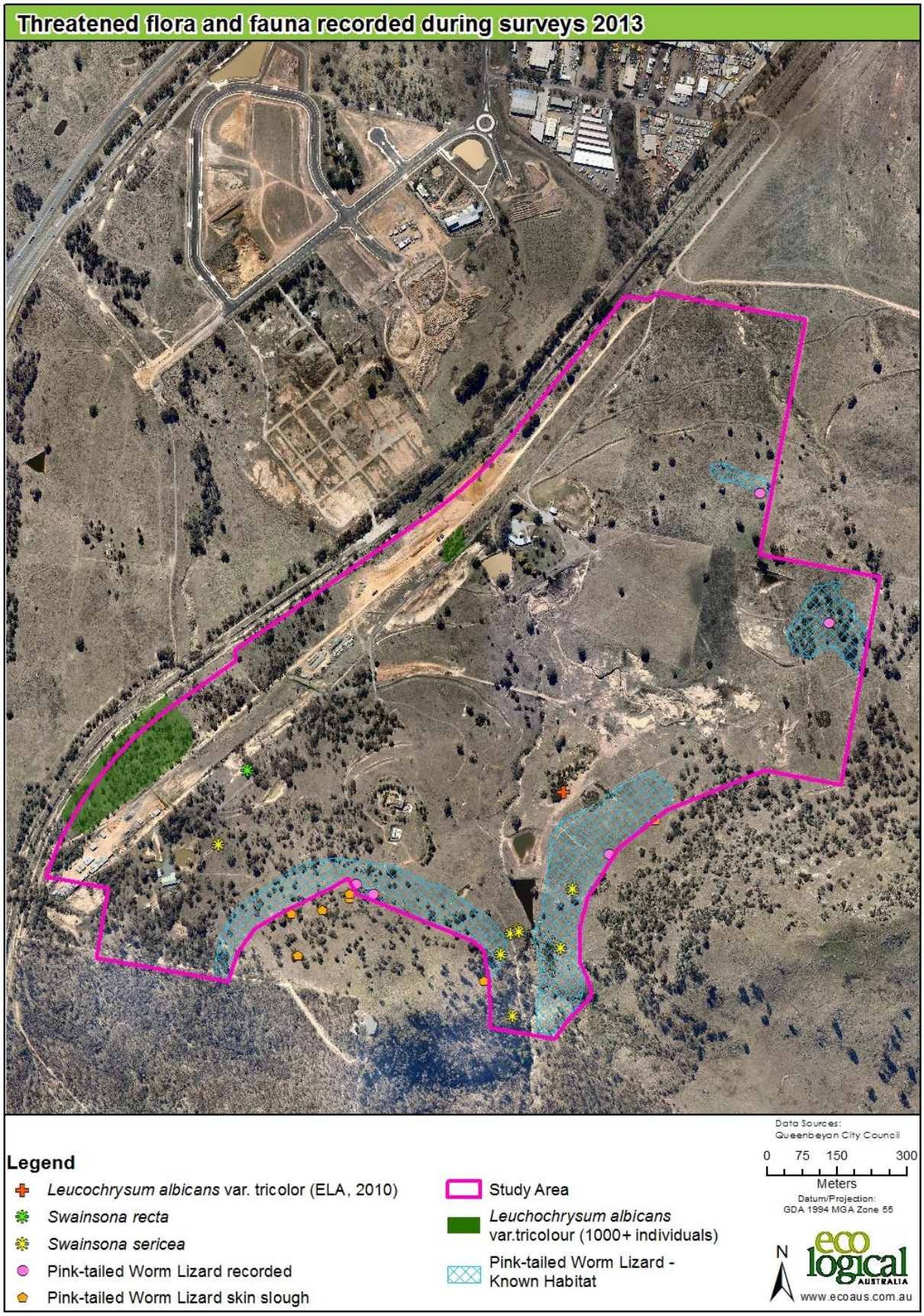

Figure 16: Flora and fauna survey results

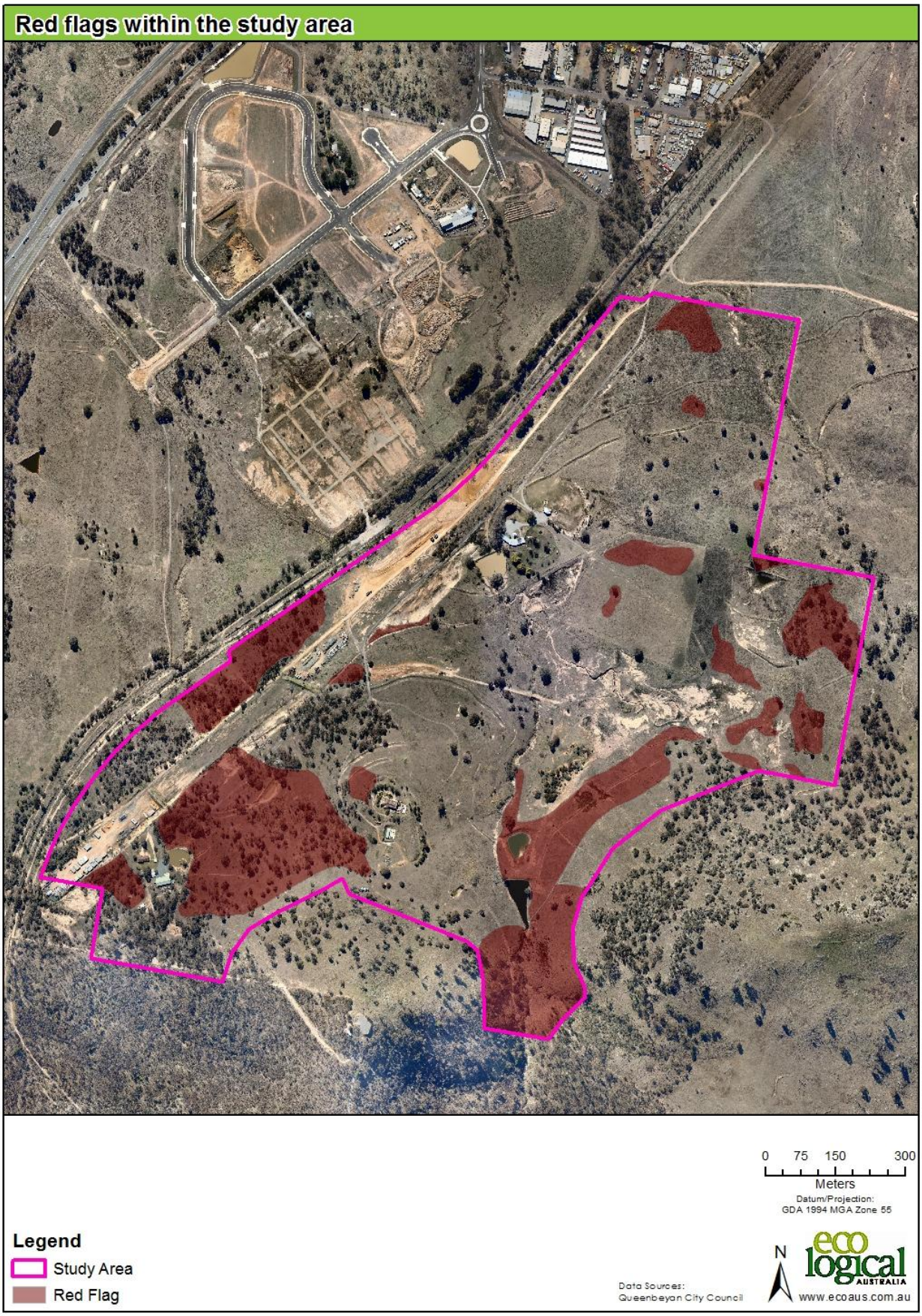

Figure 17: Red flags identified within the study area

4 Assessment of conservation significance

4.1 Conservation significance

An assessment of conservation significance (**Figure** 18) was undertaken which provides a description of the relative conservation value areas across the study area based on factors such as vegetation condition, whether or not the vegetation is a listed TEC, provides habitat for threatened species, or has connectivity values, as described in **Section 2.5**. The results of the assessment of conservation significance are discussed below.

4.1.1 High conservation value

High conservation value (HCV) areas occur predominantly as a single polygon which stretches from the south-western corner, through the south of the study area and along the eastern boundary of the study area (**Figure** 18). These areas were mapped as HCV due to the presence of the following biodiversity values:

- Floristically diverse and relatively weed free White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Grasslands.
- Known Pink –tailed Worm Lizard habitat.
- The presence of threatened flora species i.e Leucochrysum albicans var. tricolor, Swainsona sericea and Swainsona recta.

A total of 35.3 ha of HCV was mapped within the study area.

4.1.2 Moderate conservation value

Moderate conservation value (MCV) areas occur primarily as scattered patches throughout the central portion of the study area. These areas were mapped as MCV due to the presence of the following biodiversity values:

- Derived grasslands from White Box – Yellow Box – Blakely's Red Gum Grassy Woodland which are in moderate to good condition under the BBAM, but which comprise highly weedy native pasture with low recovery potential and thus lower conservation significance
- Relatively common native vegetation types in moderate to good condition
- Local biolinks associated with riparian areas along minor creeks and drainage lines

A total of 26.5 ha of MCV was mapped within the study area boundaries. A portion of the southernmost extent of the abandoned airstrip has been classified as MCV as it provides connectivity potential between existing remnants of HCV.

4.1.3 Low conservation value

The remaining areas within the study area (**Figure** 18) are considered to be LCV as they are characterised by the following values:

- Bare ground or predominately exotic pastures.
- Unsuitable habitats for threatened flora.
- Negligible habitat resources for threatened fauna.

A total of 82.8 ha of LCV was mapped within the study area boundaries.

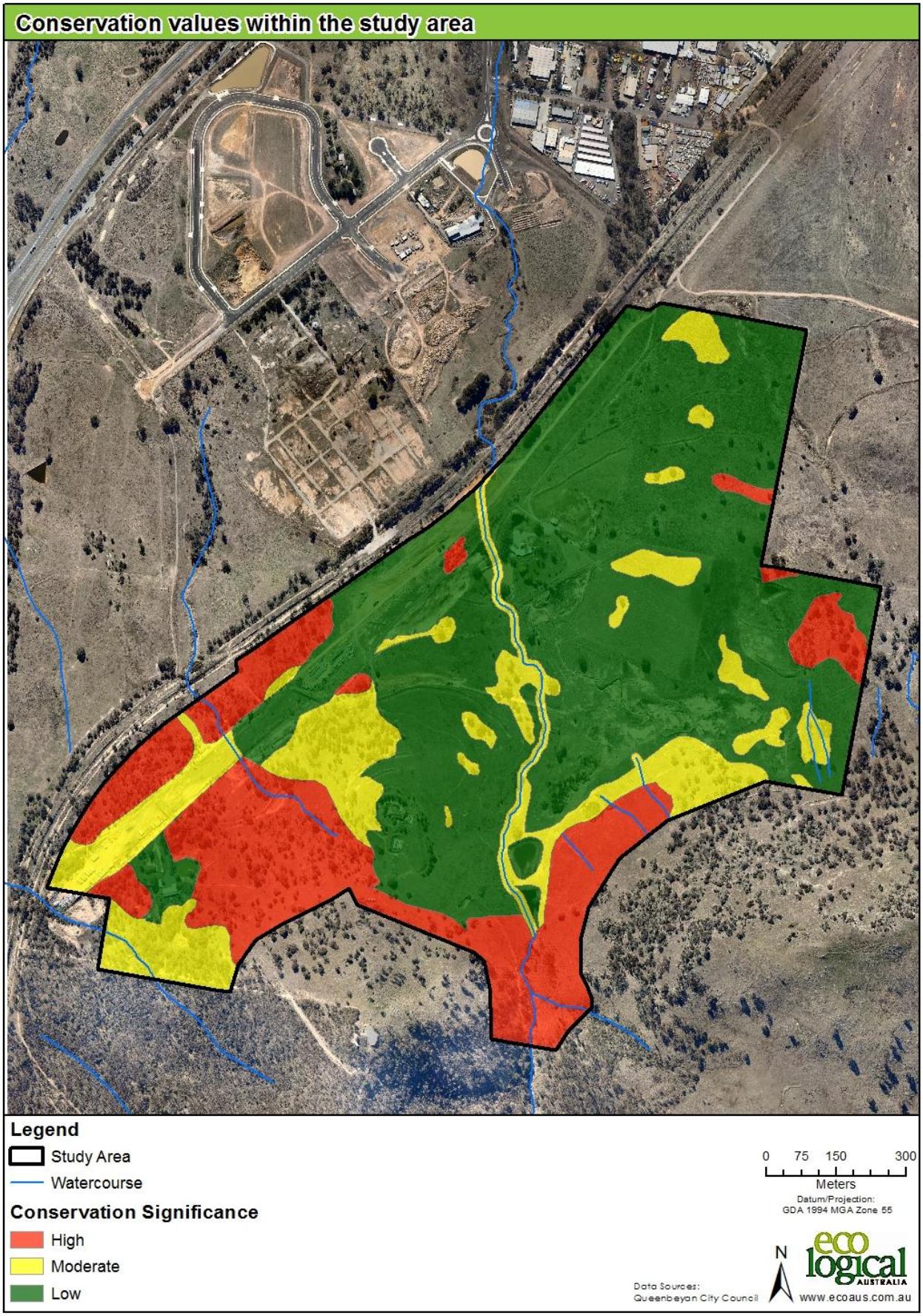

Figure 18 Conservation significance

5 Options moving forward

5.1 Development constraints

This study has identified that approximately 44% of the study area comprises HCV or MCV. The bulk of the HCV and MCV areas occur in the south-western, southern and eastern extremities of the study area. However there are patches of HCV, and particularly MCV in the central and northern parts of the study area, although they are typically relatively small and isolated from other HCV or MCV areas. Whilst the areas of MCV, and more so HCV, provide a constraint to future development, limited development of MCV and HCV areas may be appropriate as long as it is appropriately offset.

For example, zones 4 & 5 are derived grasslands in moderate to good condition which may have formed a component of the Yellow Box – Blakely's Red Gum Grassy Woodland TEC, and as such they are considered a red flag under the BBAM. However, they are only considered to comprise MCV as they represent a highly degraded form of the community with negligible recovery potential or other biodiversity values. As such, zones 4 and 5 should not significantly constrain future development. Similarly, other small and isolated occurrences of HCV and MCV should not necessarily constrain future development within the study area, where they can be appropriately offset.

It should be noted that any action which has the potential to result in a significant impact to a matter of National Environmental Significance listed under the EPBC Act (for example, the Small Purple Pea, Box – Gum Woodland, Hoary Sunray or the Pink-tailed Worm Lizard) will require referral to the Department of the Environment for consideration.

5.2 Future use of biometric information

As QCC have been provided with Gateway Approval for the proposed re-zoning, following the completion of this and other concurrent studies, QCC could enter negotiations and liaison with the relevant landholders to enter into the biobanking assessment process, or utilise the data obtained during this assessment to inform a Biodiversity Certification Assessment.

Biodiversity Certification provides planning authorities such as QCC with a streamlined approach to assessing potential development areas at a strategic level and enables secure biodiversity offsets to be attained for any impacts to biodiversity as a result of the proposed development. Following conferral of Biocertification, the standard site by site threatened species assessments required for individual development applications are not required under the EP&A Act.

It should be noted that under the BBAM and BCAM, a proposal can meet the maintain or improve test required if the Director General of the NSW Department of Premier and Cabinet (DPC) decides that the impacts on red flag areas may be offset and grants consent for a minor variation to the BBAM or BCAM.

5.3 Application of section 117 directives

Under Section 117 (2) of the EP&A Act the Minister for Planning issues directions that planning authorities such as local councils must take into consideration during the preparation of planning proposals. Direction 2.1 (Environmental Protection Zones) was implemented to protect and conserve environmentally sensitive areas. The direction is applicable to all planning authorities such as QCC and is applicable to any new planning proposal.

Under Direction 2.1, QCC is required to include provisions that facilitate the protection and conservation of environmentally sensitive areas in any new planning proposal, for example measures that protect

ecologically sensitive areas, as well as measures to mitigate and manage potential impacts resulting from the development of the study area following the re-zoning process. Specifically, under the Direction, a planning proposal must not reduce the environmental protection standards that apply to the subject land in any area zoned as Environmental Protection.

Direction 2.1 has provisions which enable a planning authority to develop a planning proposal which is contrary to this direction if a study is undertaken which provides adequate consideration of the need to protect and conserve environmentally sensitive areas which are influenced by the planning proposal.

This study has assessed the conservation value of ecologically sensitive areas within the study area and classified the study area into areas of low, moderate and high conservation value. The protection of high and moderate conservation values within the study area, coupled with a comprehensive suite of mitigation and management measures as part of any proposed development may be sufficient to meet the requirements of Direction 2.1 with the approval of the Director General or their delegate. Where high and moderate conservation values will not be protected, appropriate offsets should be provided to ensure that the proposal meets the 'maintain and improve' test. To this end, a series of planning recommendations including mitigation and management measures have been outlined in **Section 6** of this report to provide opportunity to protect, minimise and mitigate any impact to ecologically sensitive areas as a result of the rezoning and subsequent development of the study area.

6 Planning recommendations

In order to facilitate the re-zoning of the South Jerrabomberra study area in a manner that is cognisant of its biodiversity values and the current legislative frameworks pertaining to the study area, a series of planning recommendations are outlined below. These recommendations have been developed to largely protect areas of ecological sensitivity and to provide options to mitigate and manage potential indirect impacts resulting from potential future development.

These include, but are not limited to:

- Impacts to ecologically sensitive areas through recreational use.
- Increased weed invasion and garden escapees.
- Predation and disturbance of fauna by domestic animals.
- Facilitation of predation opportunities by feral animals.
- Increased bushfire risk.
- Impacts associated with bushfire hazard reduction processes.
- Illegal dumping.

The development of a preferred concept plan which integrates mitigation measures to minimise impacts associated within any future development will be key to reducing the impacts to surrounding areas of MCV and HCV in the long term. Potential mitigation and management measures which should be considered for inclusion in any preferred concept plan for the study area include, but are not limited to:

- The concentration of future development within areas of LCV.
- Protection of the majority of the HCV areas across the study area. Where it may be appropriate to impact on HCV areas, such as some of the small and isolated patches of HCV that occur in the study area, then appropriate offsets should be provided.
- Protection of the MCV areas across the study area. Where it may be appropriate to impact on MCV areas then appropriate offsets should be provided.
- The strategic re-establishment of connectivity between the remnant vegetation on either side of the airstrip. This does not need to involve the entire airstrip but a strategic section(s) to re-establish this local biolink.
- Application of appropriate buffer zones around proposed development to minimise impacts to MCV & HCV areas through measures such as the incorporation of fringing urban parkland and the placement of all Asset Protection Zones outside areas of MCV & HCV.
- Development of a Vegetation Management Plan (VMP) to control weed spread and allocate funding and responsibility for the long-term management of retained vegetation within the study area.
- Retention and management of drainage lines and riparian areas and appropriate buffer zones in accordance with the VMP.

References

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Eco Logical Australia, 2010, *Draft Tralee Station Ecological Assessment*, Prepared for Urbis on behalf of Sandra Walsh (Tralee Station).

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Appendix A: Landscape context maps

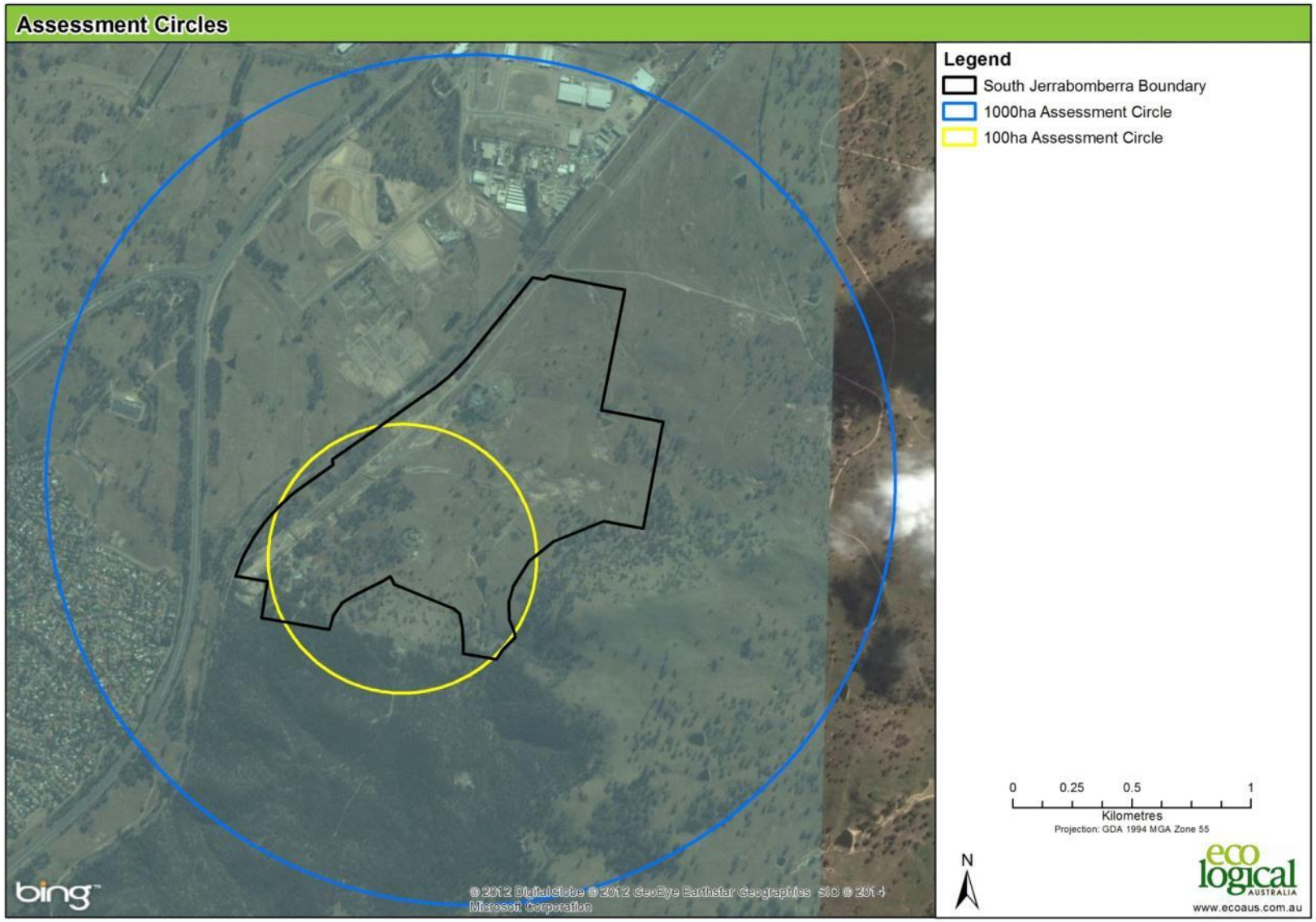

Figure 19: Assessment circles

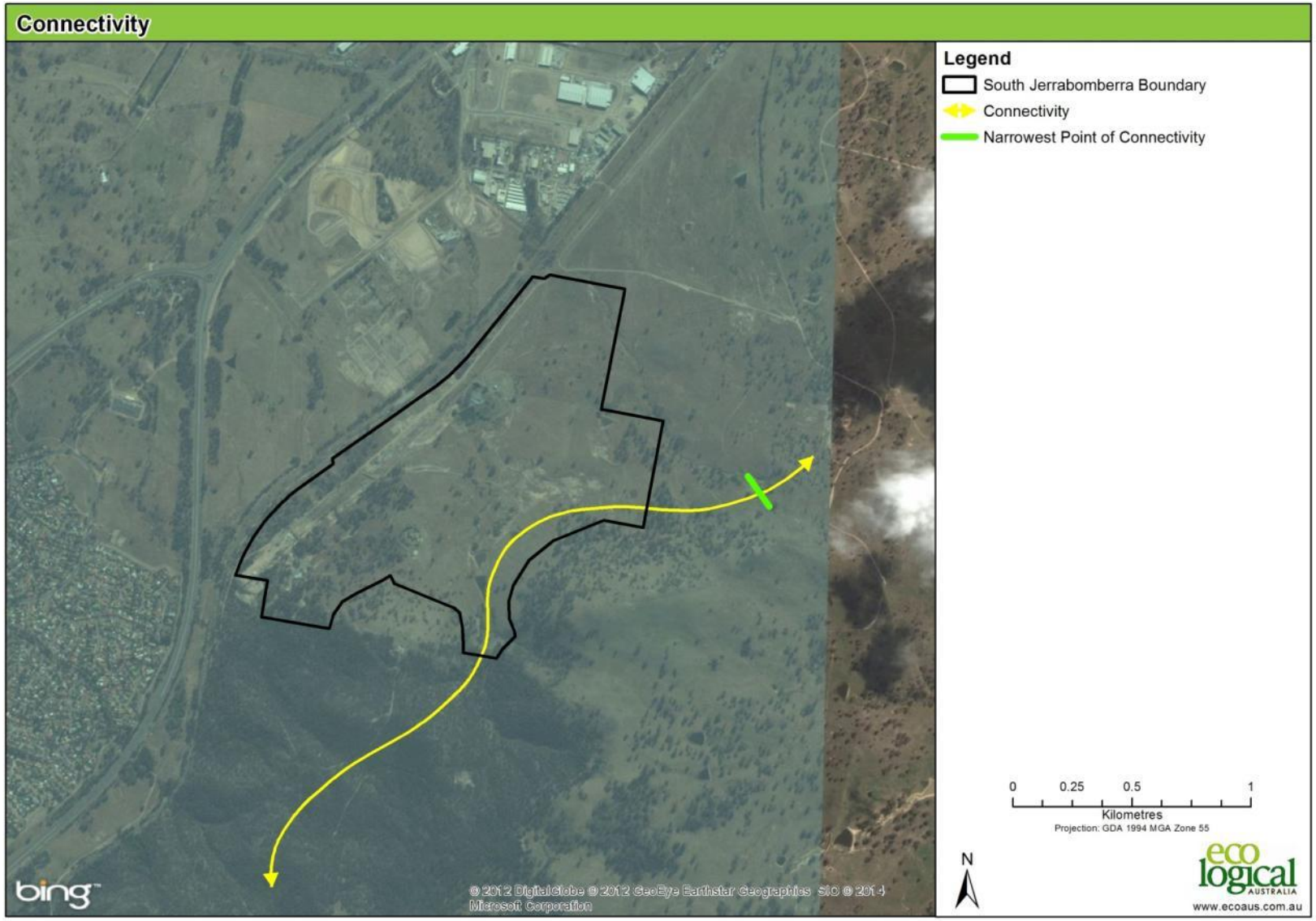

Figure 20: Connectivity assessment

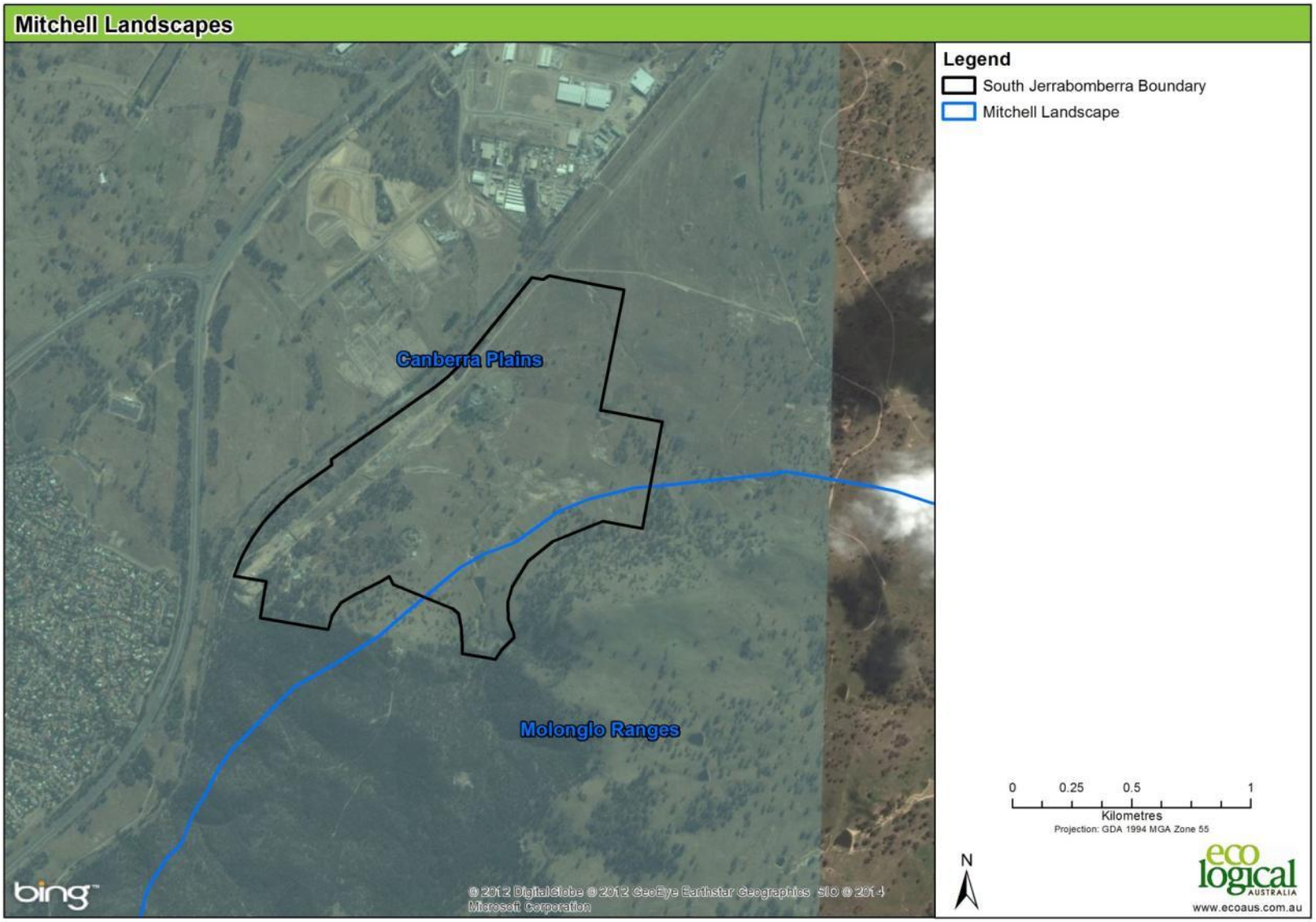

Figure 21: Mitchell Landscapes (Mitchell 2002)

Appendix B: Biometric plot data summary

Biometric plot No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Zone	**Zone 1^**	**Zone 2**	**Zone 3**	**Zone 4**			**Zone 5**	**Zone 6**	**Zone 7^**			**Zone 8**	**Zone 9**			**Zone 10**		
Plot	*A*	*A*	*A*	*A*	*B*	*C*	*A*	*A*	*A*	*B*	*C*	*A*	*A*	*B*	*C*	*A*	*B*	*C*
Native Plant Species Richness	21	28	23	18	7	13	9	27	31	40	35	32	47	41	46	49	39	37
Native Over-storey Cover (%)	16.5	1.2	0	0	0	0	0	0.2	19	0	2.5	0	16.1	31.5	19.5	27	0	0.2
Native Mid-storey Cover (%)	2.5	10	0	0	0	0	0	0	3.5	0.3	7.5	0	3.7	0.3	7	2	5	0
Native Ground Cover-grasses (%)	50	50	54	66	42	70	26	66	34	44	56	72	48	42	34	44	66	72
Native Ground Cover-shrubs (%)	0	0	0	0	0	0	0	0	0	8	2	8	24	28	26	2	10	26
Native Ground Cover-other (%)	28	10	14	6	6	2	48	2	32	40	28	42	6	24	30	32	10	42
Exotic Cover (%)	28	30	46	44	68	36	54	54	14	10	43	16	0	0	4	28	16	0
No. of Trees with Hollows	0	0	0	0	0	0	0	0	1 to 3	0	0	0	0	1	0	1	1	0
Over-storey Regeneration	1	1	0	0	0	0	0	1	1	0	1	1	1	1	1	1	1	1
Total Length of Fallen Logs (m)	58	35	4	0	0	0	0	0	8	0	121	2	21	73	16	21	33	13
Biometric Vegetation Type	YBBGRGW	RSBGSGOF		DGOSEH				RSRBLBOF	YBBGRGW			RSBGSGOF				RSRBLBOF		

Note: Biometric vegetation types are as follows:

YBBGRGW = Yellow Box – Blakely's Red Gum Grassy Woodland on the tablelands, South Eastern Highlands

RSBGSGOF = Red Stringybark - Brittle Gum – Inland Scribbly Gum dry open forest on skeletal soils of the tablelands, South Eastern Highlands

DGOSEH = Derived Grasslands of the South Eastern Highlands and South East Corner

RSRBLBOF = Red Stringybark – Red Box – Long-leaved Box – Scribbly Gum Shrub-tussock grass open forest of the southern section of the NSW South Western Slopes Bioregion

- ^ = Threatened Ecological Community

Appendix C: Species list

Native																		
Plot Number / **Species**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Acacia dealbata										1			1	1	1	1		
Acacia implexa															1			
Acacia sp.																		1
Acaena ovina		1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	
Allocasuarina verticillata		1							1				1					
Alternanthera sp.						1			1		1					1		
Amyema sp.										1			1					
Aristida ramosa		1	1	1		1						1	1	1		1		
Astroloma humifusum													1					1
Austrodanthonia caespitosa		1		1	1	1		1	1	1	1	1	1	1	1	1	1	1
Austrodanthonia carphoides		1	1	1	1	1		1	1	1							1	
Austrodanthonia racemosa	1	1	1						1	1	1		1			1	1	
Austrostipa bigeniculata																	1	
Austrostipa scabra	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Bothriochloa macra	1	1	1	1	1	1		1	1	1	1	1	1			1	1	1
Brachychiton populneus																	1	
Brachyloma daphnoides												1		1	1	1		1
Bracteantha viscosa				1				1				1	1	1		1		
Bulbine bulbosa										1	1						1	
Bursaria spinosa		1																

Native																		
Plot Number / **Species**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Bursaria spinosa subsp. lasiophylla													1					
Carex appressa											1							
Carex inversa	1					1	1	1	1		1		1	1		1		
Cassinia longifolia															1	1		
Cassinia quinquefaria														1		1	1	1
Cassinia sp.			1															
Cheilanthes sieberi	1	1	1	1		1	1	1	1	1	1	1	1		1	1	1	1
Chrysocephalum apiculatum		1	1					1	1	1	1	1	1	1	1	1	1	1
Convolvulus erubescens	1	1	1					1				1	1	1	1	1	1	
Crassula sieberiana		1	1	1	1			1										
Cryptandra amara										1								
Cymbonotus lawsonianus		1	1	1				1	1			1	1		1	1		
Cynoglossum suaveolens	1		1									1				1		
Daucus glochidiatus		1											1					
Desmodium varians		1	1	1				1	1			1	1	1	1	1	1	
Dianella revoluta							1			1							1	
Dichelachne sp.	1									1				1	1			1
Dillwynia sericea									1				1		1	1	1	
Diuris sulphurea														1		1		1
Drosera sp.										1								
Einadia nutans	1	1						1	1				1					1
Elymus scaber	1										1	1	1	1	1	1		
Enneapogon nigricans						1						1					1	
Epilobium sp.				1					1									

Native																		
Plot Number / **Species**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Eucalyptus blakelyi										1	1				1	1	1	
Eucalyptus bridgesiana	1																	
Eucalyptus melliodora	1								1						1			
Eucalyptus nortonii								1				1	1	1	1			
Eucalyptus polyanthemos		1								1				1		1	1	1
Eucalyptus rossii								1						1	1	1	1	1
Euchiton gymnocephalus											1		1			1		
Euchiton sphaericus									1					1				
Exocarpus cupressiformis	1														1	1	1	1
Geranium solanderi	1						1	1	1		1		1		1	1	1	
Glycine clandestina														1	1		1	
Glycine tabacina											1							
Gonocarpus tetragynus			1							1	1	1	1	1	1	1	1	1
Goodenia hederacea										1			1	1	1	1	1	
Haloragis heterophylla									1	1	1					1		
Hibbertia obtusifolia											1	1	1	1	1		1	1
Hovea linearis												1						
Hydrocotyle laxiflora	1	1					1	1	1		1		1	1	1	1	1	1
Hypericum gramineum									1		1	1	1	1	1	1	1	1
Joycea pallida														1	1			1
Juncus filicaulis			1						1	1	1					1		1
Laxmannia gracilis										1								
Lepidosperma laterale												1		1			1	
Leptorhynchos squamatus										1	1				1			1

Native																		
Plot Number / **Species**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Leucochrysum albicans																	1	
Leucopogon microphyllus																		1
Leucopogon microphyllus											1					1	1	
Leucopogon microphyllus var. microphyllus													1					
Lissanthe strigosa														1	1			
Lomandra filiformis	1		1	1	1			1	1	1	1	1	1	1	1	1	1	1
Lomandra longifolia							1			1				1	1			
Lomandra multiflora	1														1	1		1
Luzula densiflora										1					1	1		1
Melichrus urceolatus								1		1	1	1	1	1	1	1	1	1
Microlaena stipoides		1							1		1		1	1	1			
Microtis unifolia															1			
Opercularia aspera														1	1			
Oxalis perennans										1			1			1		
Panicum effusum																1		
Pimelea curviflora										1		1					1	
Plantago varia		1						1									1	
Poa sieberiana			1	1				1	1	1	1	1	1	1	1			1
Pteridium esculentum						1												
Pterostylis sp.																		1
Pultenaea procumbens														1				
Rumex brownii		1	1	1				1	1		1							
Schoenus apogon										1				1	1	1		1
Senecio quadridentatus	1	1	1	1				1	1			1	1					

Native																		
Plot Number / **Species**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Solanum cinereum		1																
Solenogyne dominii										1	1	1	1		1	1		
Styphelia triflora													1	1	1			1
Swainsona sericea													1					
Thelymitra sp.														1				1
Themeda australis				1						1	1	1					1	
Thysanotus tuberosus										1								
Tricoryne elatior	1	1							1	1	1	1	1	1	1	1	1	1
Triptilodiscus pygmaeus										1	1					1		
Vittadinia cuneata	1	1	1			1		1				1	1	1	1			1
Vittadinia muelleri		1	1					1	1	1	1	1	1				1	
Wahlenbergia communis	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1
Wahlenbergia gracilis										1								1
Wahlenbergia graniticola													1			1		1
Wahlenbergia stricta													1	1	1			
Wurmbea dioica										1						1		
Zornia dyctiocarpa																1		
Total Native Species	**21**	**28**	**23**	**18**	**7**	**13**	**9**	**27**	**31**	**40**	**35**	**32**	**46**	**41**	**46**	**49**	**39**	**37**

Exotic																		
Plot Number / **Species**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Acetosella vulgaris	1	1	1	1	1	1	1	1	1		1	1				1		
Aira sp.	1	1	1	1	1	1		1	1	1	1	1	1	1		1	1	1
Alternanthera sp		1																
Arctotheca calendula		1																
Avena barbata	1	1				1	1				1						1	1
Briza maxima									1	1	1							
Bromus diandrus	1	1				1	1	1	1		1							1
Bromus hordeaceus	1	1	1	1	1	1	1		1		1	1	1			1	1	
Bromus rubens	1	1				1		1										
Centaurium sp		1																
Chondrilla juncea	1	1	1	1	1	1	1	1			1	1	1			1		
Cirsium vulgare								1	1									
Conyza sp.	1	1				1					1		1					
Dactylis glomerata							1											
Echium plantagineum				1				1				1						
Eragrostis curvula	1				1	1	1											
Erodium sp.		1			1													
Gamochaeta americana					1													
Heliotropium amplexicaule									1									
Hirschfeldia incana	1	1					1	1	1									
Holcus lanatus							1				1							
Hordeum sp.	1	1			1													
Hypericum perforatum	1	1	1	1			1	1	1		1	1		1		1	1	
Hypochaeris glabra	1	1	1				1					1		1	1	1		

Exotic																		
Plot Number / **Species**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Hypochaeris radicata	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1
Lavender stoechas											1							
Lepidium africanum													1					
Lepidium sp.						1												
Linaria arvense		1	1	1					1		1	1	1					
Lolium perenne		1				1		1										1
Marrubium vulgare		1						1	1									
Modiola caroliniana									1									
Nassella trichotoma	1			1		1												
Onopordum acanthium												1						
Orobanche minor									1		1							
Oxalis sp.	1																	
Paronychia brasiliana	1	1	1	1	1	1	1	1	1		1		1			1		
Petrorhagia nanteuilii	1	1	1	1		1	1	1			1	1	1	1	1	1	1	1
Plantago lanceolata	1	1	1	1		1	1	1	1	1	1	1	1			1	1	
Prunus sp.																	1	
Pyracantha angustifolia									1									
Rosa rubiginosa	1	1					1	1	1				1		1	1	1	1
Rostraria cristata									1									
Rubus ulmifolius	1	1						1	1	1								
Silene gallica			1	1					1		1	1	1			1		
Solanum nigrum		1																
Taraxacum officinale						1	1						1					
Tolpis umbellata		1	1		1											1		

Exotic																		
Plot Number / **Species**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Tragopogon dubius							1											
Trifolium arvense	1	1	1	1	1	1		1				1	1			1		
Trifolium campestre	1	1	1	1	1				1		1				1		1	
Trifolium subterraneum	1			1				1										
Verbascum thapsus	1	1	1	1	1	1	1	1				1	1					
Verbena sp.									1									
Vulpia sp.	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1
Total Exotic Species	**26**	**31**	**17**	**18**	**15**	**20**	**19**	**21**	**24**	**6**	**20**	**16**	**16**	**6**	**6**	**15**	**10**	**8**

Reptiles	
Common name	Latin name
Pink-tailed Worm Lizard#	*Aprasia parapulchella*
Common Garden Skink	*Lamphrolis guichenoti*
Delicate Skink	*Lamphrolis delicata*
Robust Ctenotus	*Ctenotus robustus*
Eastern Ctenotus	*Ctenotus orientalis*
Copper-tailed Skink	*Ctenotus taeniolatus*
Boulenger;'s Skink	*Morethia boulengeri*
Eastern Bearded Dragon	*Pogona barbata*
Jacky Dragon	*Amphibolurus muricatus*
Red-bellied Black Snake	*Pseudechis porphyriacus*
Brown Snake	*Pseudonaja textilis*
Long necked Turtle	*Chelodina longicollis*

 # denotes listing under the EPBC & TSC Acts

Appendix D: Biometric site photos

Plate 1: Zone 1, Plot 1

Plate 2: Zone 2, Plot 1

Plate 3: Zone 3, Plot 1

Plate 4: Zone 4, Plot 1

Plate 5: Zone 4, Plot 2

Plate 6: Zone 4, Plot 3

Plate 7: Zone 5, Plot 1

Plate 8: Zone 6, Plot 1

Plate 9: Zone 7, Plot 1

Plate 10: Zone 7, Plot 2

Plate 11: Zone 7, Plot 3

No picture available

Plate 12: Zone 8, Plot 1

Plate 13: Zone 9, Plot 1

Plate 14: Zone 9, Plot 2

Plate 15: Zone 9, Plot 3

Plate 16: Zone 10, Plot 1

Plate 13: Zone 10, Plot 2

Plate 14: Zone 10, Plot 3

Appendix E: Fauna plates

Plate 1: Boulengers Skink (*Morethia boulengeri*)

Plate 2: Oriental Ctenotus (*Ctenotus orientalis*)

Plate 3: Pink-tailed Worm Lizard (*Aprasia parapulchella*)

Plate 4: Pink-tailed Worm Lizard

Plate 5: Pink-tailed Worm Lizard habitat

Plate 6: Pink-tailed Worm Lizard skin slough

Appendix F: Flora plates

Plate 1: Small Purple-pea (*Swainsona recta*)

Plate 2: Small Purple-pea (*Swainsona recta*)

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