1400-1480 Elizabeth Drive, Cecil Park - Biodiversity Assessment

Western Sydney Town Centre

ecological AUSTRALIA
A TETRA TECH COMPANY

1300 646 131
www.ecoaus.com.au

DOCUMENT TRACKING

Project Name	1400-1480 Elizabeth Drive, Cecil Park - Biodiversity Assessment
Project Number	12737
Project Manager	Rebecca Ben-Haim
Prepared by	Rebecca Ben-Haim
Reviewed by	David Bonjer
Approved by	David Bonjer
Status	**Final**
Version Number	**1**
Last saved on	**20 March 2019**

This report should be cited as 'Eco Logical Australia 2019. *1400-1480 Elizabeth Drive, Cecil Park - Biodiversity Assessment* . Prepared for Western Sydney Town Centre.'

ACKNOWLEDGEMENTS

This document has been prepared by Eco Logical Australia Pty Ltd with support from Western Sydney Town Centre

Template 2.8.1

Contents

List of Figures

List of Tables

Abbreviations

Abbreviation	Description
BC Act 2016	NSW Biodiversity Conservation Act 2016
Coastal Management SEPP 2018	State Environmental Planning Policy (Coastal Management) 2018
DA	Development Application
DP&E	NSW Department of Planning and Environment
ELA	Eco Logical Australia
EP&A Act 1979	NSW Environmental Protection and Assessment Act 1979
EPBC Act 1999	Commonwealth Environmental Protection and Biodiversity Conservation Act 1999
FM Act 1994	Fisheries Management Act 1994
GIS	Geographic Information System
GPS	Global Positioning System
Growth Centres SEPP 2006	*State Environmental Planning Policy (Sydney Region Growth Centres) 2006*
KFH	Key Fish Habitat
Koala Habitat Protection SEPP	State Environmental Planning Policy No 44 – Koala Habitat Protection
Liverpool LEP 2008	Liverpool Local Environmental Plan 2008
MNES	Matters of National Environmental Significance
PCT	Plant Community Type
RMS	Roads and Maritimes Services
SAII	Serious and Irreversible Impact
SEARs	Secretary's Environmental Assessment Requirements
SSD	State Significant Development
SSDA	State Significant Development Application
TECs	Threatened Ecological Communities
TSC Act 1995	NSW Threatened Species Conservation Act 1995
VRZ	Vegetated Riparian Zone
WM Act 2000	NSW Water Management Act 2000

1. Introduction

Eco Logical Australia (ELA) was engaged by Western Sydney Town Centre (WSTC) to provide a biodiversity assessment to accompany a Planning Proposal for the rezoning of 1400-1480 Elizabeth Drive, Cecil Park (Figure 1).

WSTC seek to lodge a Planning Proposal to amend the current zoning to one that enables industrial land uses on the land and introduce appropriate development standards. A preliminary concept plan has been prepared (Figure 2), however this is subject to further design. The concept has two development areas and acknowledges the Roads and Maritimes Services (RMS) land acquisition for the future M12 Motorway corridor.

This report outlines the biodiversity values present across the study area, determined from a desktop literature review. Potential future ecological impacts were assessed in relation to State and Commonwealth legislation, namely the NSW *Biodiversity Conservation Act 2016* (BC Act 2016) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999). For the purposes of the Planning Proposal, this report describes the biodiversity values of the study area that may be affected by subsequent development and the likely requirements for assessment at the Development Application (DA) stage. The report is a desktop assessment based on existing literature – no field survey has been undertaken.

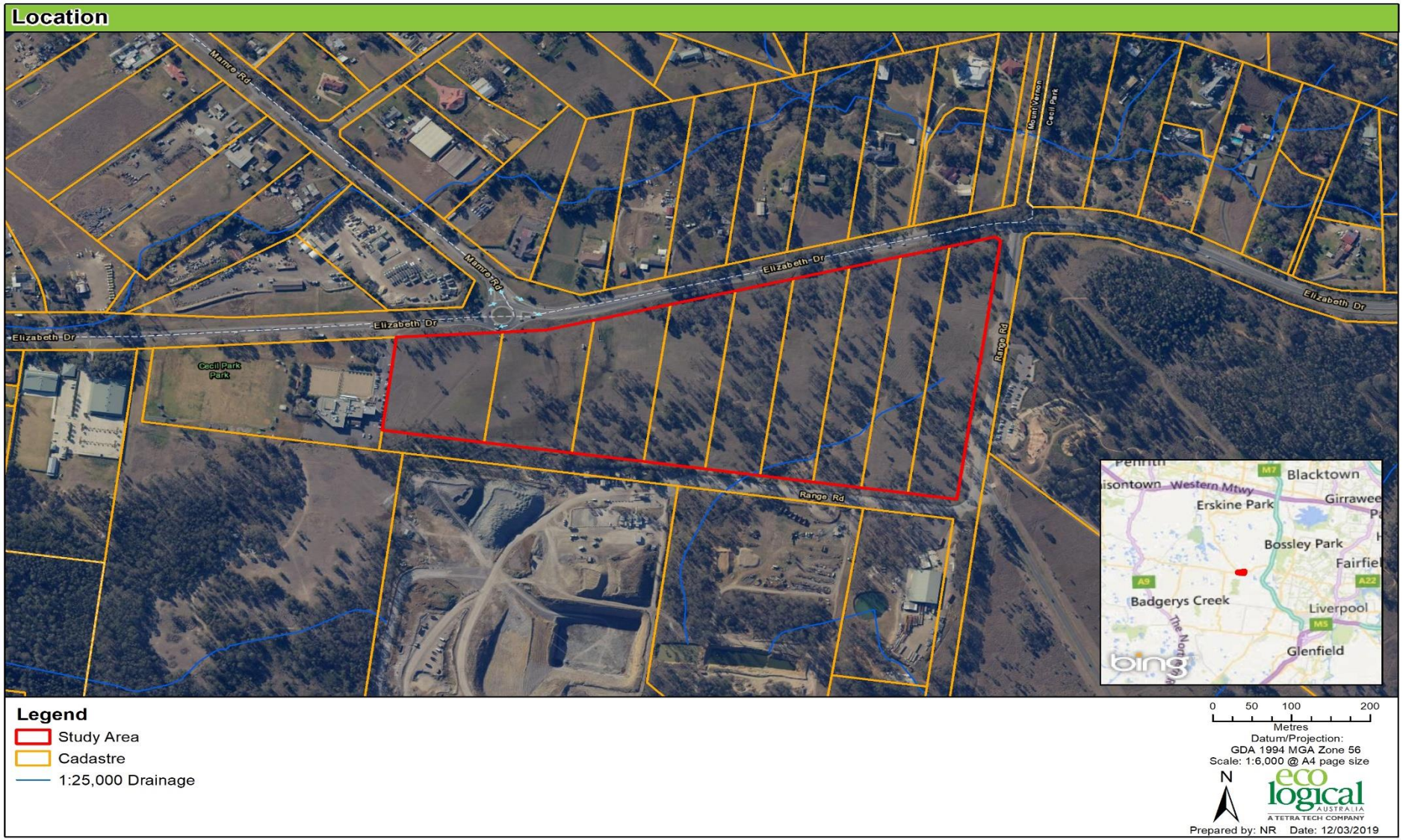

Figure 1: Location of study area

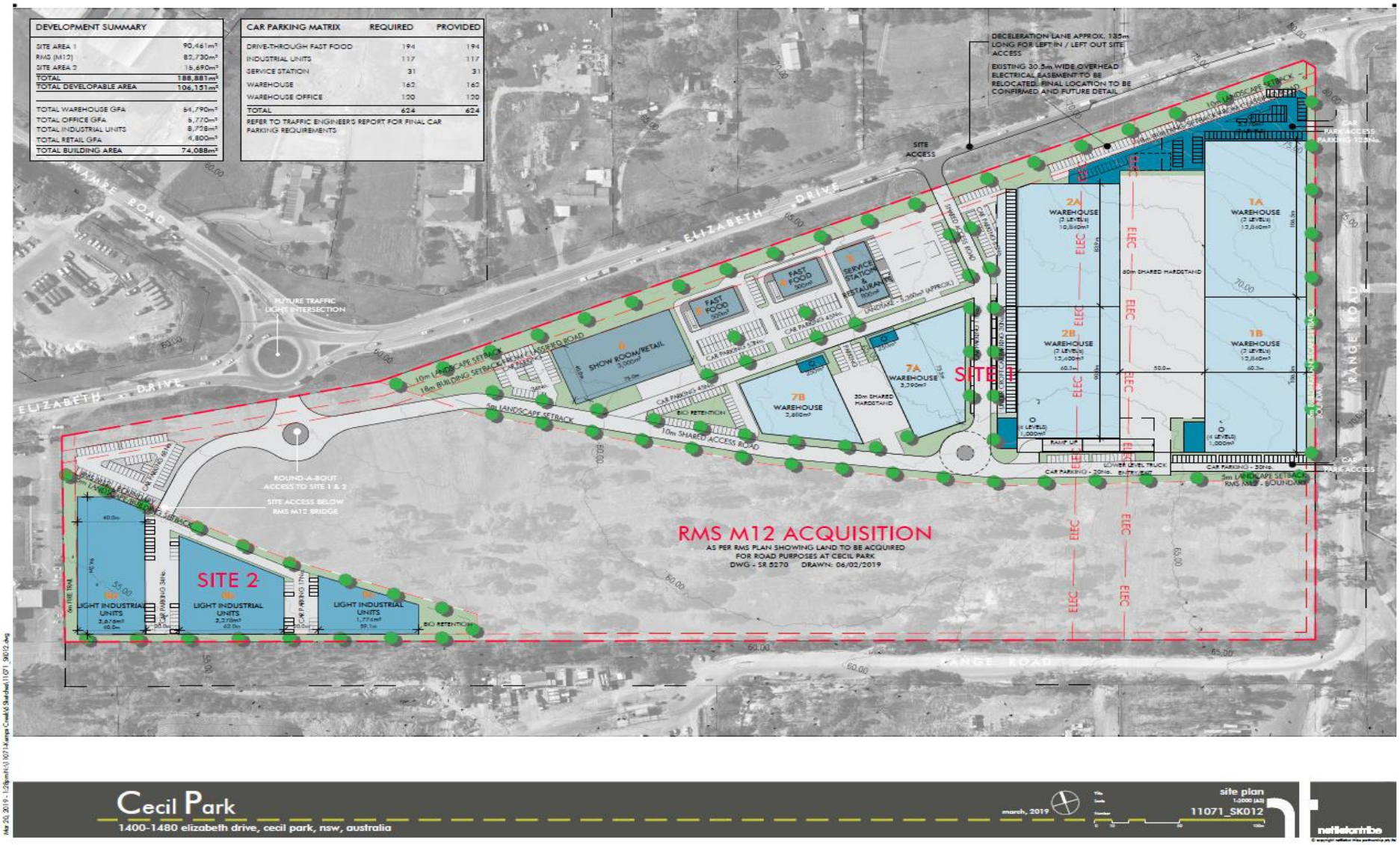

Figure 2 Indicative layout plan

2. Legislative Context

Table 1: Legislative context

Name	Relevance to the project
	Commonwealth
Environmental Protection and Biodiversity Conservation Act 1999	The Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999) aims to protect Matters of National Environmental Significance (MNES), including vegetation communities and species listed under the EPBC Act. If a development is likely to have a significant impact on MNES, it is likely to be considered a 'Controlled Action' by the Commonwealth and requires assessment and approval by the Commonwealth in order to proceed. On 28th February 2012, the Commonwealth Minister for the Environment announced that the program of development activities within the Growth Centres was approved under the EPBC Act Strategic Assessment process. Specifically, all actions associated with the development of the Western Sydney Growth Centres as described in the Sydney Growth Centres Strategic Assessment Program Report (Nov 2010) have been assessed at the strategic level and approved in regard to their impact on the following Matters of National Environmental Significance: • World Heritage Properties • National Heritage Places • Wetlands of International Importance • Listed threatened species and communities • Listed migratory species These decisions indicate that the Commonwealth is satisfied that the conservation and development outcomes that will be achieved through the Western Sydney Growth Centres Program will satisfy their requirements for environmental protection under the EPBC Act. Provided that development activity proceeds in accordance with the Growth Centres requirements (such as the Biodiversity Certification Order, the Growth Centres SEPP and DCPs, Growth Centres Development Code etc.) there is no requirement to assess the impact of development activities on MNES within the Growth Centres and no requirement for referral of activities to the Commonwealth Department of Environment. As the entirety of the study area is biodiversity certified, no further assessment to MNES are required to be considered.
	State
Biodiversity Conservation Act 2016	The subject site is biodiversity certified under the *Order to confer biodiversity certification on the State Environmental Planning Policy (Sydney Region Growth Centres) 2006*. The certification is described in Part 7 of Schedule 7 to the TSC Act 1995 and is subject to conditions contained in the Order. The TSC Act 1995 was repealed and replaced by the BC Act 2016 on 25 August 2017.The biodiversity certification and its conditions were carried over into the new BC Act (see Section 43 of the *Biodiversity Conservation (Savings and Transitional) Regulation* 2017). During precinct planning, biodiversity information is considered, principally to ensure that the precinct plan is consistent with the conditions in the biodiversity certification Order, such as the need to protect 2000 hectares of native vegetation. This target is based on the hectares of vegetation on non-certified land. As the site is entirely certified, none of the vegetation on it was assumed to contribute to the 2000 ha target. Section 8.4(2) of the BC Act 2016 describes the effect of biodiversity certification in relation to development under Part 4 of the EP&A Act 1979 (including State Significant

Name	Relevance to the project
	Development) and states *'an assessment of the likely impact on biodiversity of development on biodiversity certified land is not required for the purposes of Part 4 of the EP&A Act 1979*'. Provided the site remains biodiversity certified no further assessment of biodiversity values will be required at the DA stage.
Fisheries Management Act 1994	The FM Act 1994 governs the management of fish and their habitat in NSW. The Schedules of the Act list key threatening processes and threatened species. The FM Act 1994 regulates the provision of permits required in relation to harm to protected marine vegetation (seagrass, macroalgae, mangroves and saltmarsh), dredging, reclamation or obstruction of fish passage on or adjacent to Key Fish Habitat (KFH). This includes direct and indirect impacts, whether temporary or permanent. The subject site does not contain a waterway mapped as 'Key Fish Habitat' or a waterway that contains a threatened species record and therefore the FM Act is unlikely to be relevant to precinct planning or subsequent development applications.
Water Management Act 2000 (WM Act 2000)	The aim of the WM Act 2000 is to provide sustainable and integrated management of the state's water for the benefit for both present and future generations. If a local development under Part 4 of the EP&A Act 1979 is proposed on 'waterfront land', it is considered a Controlled Activity and requires an approval under s91 of the WM Act 2000. A hydroline has been mapped on the subject site. Field survey is required to determine whether the hydroline meets the definition of a watercourse and therefore whether the WM Act will be relevant at the DA stage. If the DA is to be assessed under s4.41(1)(g) of the EP&A Act 1979, an approval under the WM Act 2000 will not be required, but it is likely that the SEARs will require assessment of riparian impacts and mitigation measures.
	Planning Instruments
State Environmental Planning Policy (Coastal Management) 2018 (Coastal Management SEPP 2018)	The proposed development is not located on land subject to the Coastal Management SEPP 2018.
State Environmental Planning Policy (Sydney Region Growth Centres) 2006	In accordance with the Draft Growth Centres Conservation Plan (DP&E, 2007), the study areas was originally mapped as having native vegetation (Figure 3). However, this vegetation was assumed to be removed and offset via the Growth Centres Special Infrastructure Contribution.
State Environmental Planning Policy No 44 – Koala Habitat Protection (Koala Habitat Protection SEPP)	The proposed development is located within a Local Government Area (LGA) to which the Koala Habitat Protection SEPP applies. However, in accordance with Section 8.4(2) of the BC Act 2016, it is assumed that any impact on biodiversity, including koala habitat, is not required on biodiversity certified land.
Liverpool Local Environment Plan 2008 (Liverpool LEP 2008)	The subject site is currently zoned as RU4 (Primary Production Small Lots) under the Liverpool LEP 2008. The subject site is not affected by the Environmentally Sensitive Land layer in Liverpool LEP.

3. Methodology

3.1 Literature Review and Database Search

A review of readily available databases pertaining to the ecology and environmental features of the study area and surrounding area, and existing vegetation mapping was conducted to identify records of threatened species, populations and communities and their potential habitat. Databases and vegetation mapping that were reviewed included:

- BioNet (Atlas of NSW Wildlife) database search (5 km) threatened species, populations and ecological communities listed under the BC Act 2016 (March 2019).
- EPBC Act 1999 Protected Matters Search Tool (5 km) for threatened and migratory species, populations and ecological communities listed under the Commonwealth EPBC Act 1999 (March 2019)
- Aerial mapping and vegetation mapping (OEH 2013) to assess the extent of vegetation including mapped TECs listed under the BC Act 2016 and / or EPBC Act 1999.

Aerial photography (Bing Maps and Google Earth) of the study area and surrounds were also used to investigate the extent of vegetation cover and landscape features. In addition, relevant Geographic Information System (GIS) datasets (soil, geology, drainage) were reviewed.

4. Results

4.1 Vegetation Mapping and Plant Community Types

Previous vegetation mapping (OEH 2013) indicated that the site contains two vegetation communities: Shale Plains Woodland and Shale Hills Woodland (Figure 4). Table 2 below shows the mapped vegetation communities and their listing under both the BC Act 2016 and EPBC Act 1999.

5.38 hectares of vegetation on the site was mapped in the Draft Growth Centres Conservation Plan (2007) (Figure 3).

The vegetation on site is not identified on the NSW Office of Environment and Heritage 'Biodiversity Investment Opportunities map' (BioMap).

Table 2 Vegetation Communities present within the Study Area

Vegetation Community	PCT and Number	Listing under the BC Act	Listing under the EPBC Act	Area (ha)
Shale Plains Woodland (Cumberland Plain Woodland)	Grey Box-Forest Red Gum Grassy Woodland on Flats of the Cumberland Plain, Sydney Basin (849)	CE	CE	0.12
Shale Hills Woodland (Cumberland Plain Woodland)	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion (850)	CE	CE	10.34

CE = Critically Endangered

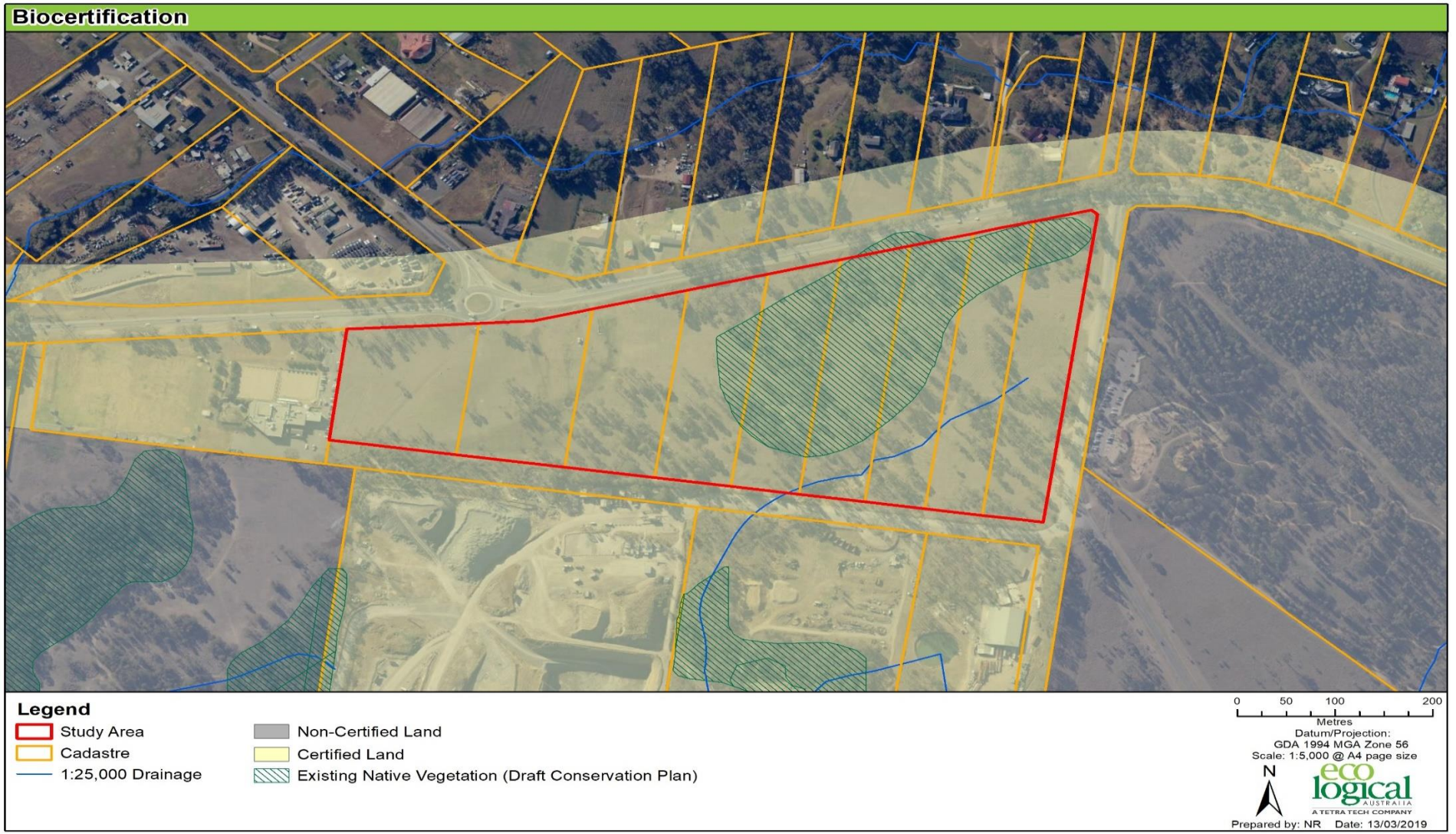

Figure 3: Biodiversity certified lands and native vegetation as mapped in the Draft Growth Centres Conservation Plan (2007)

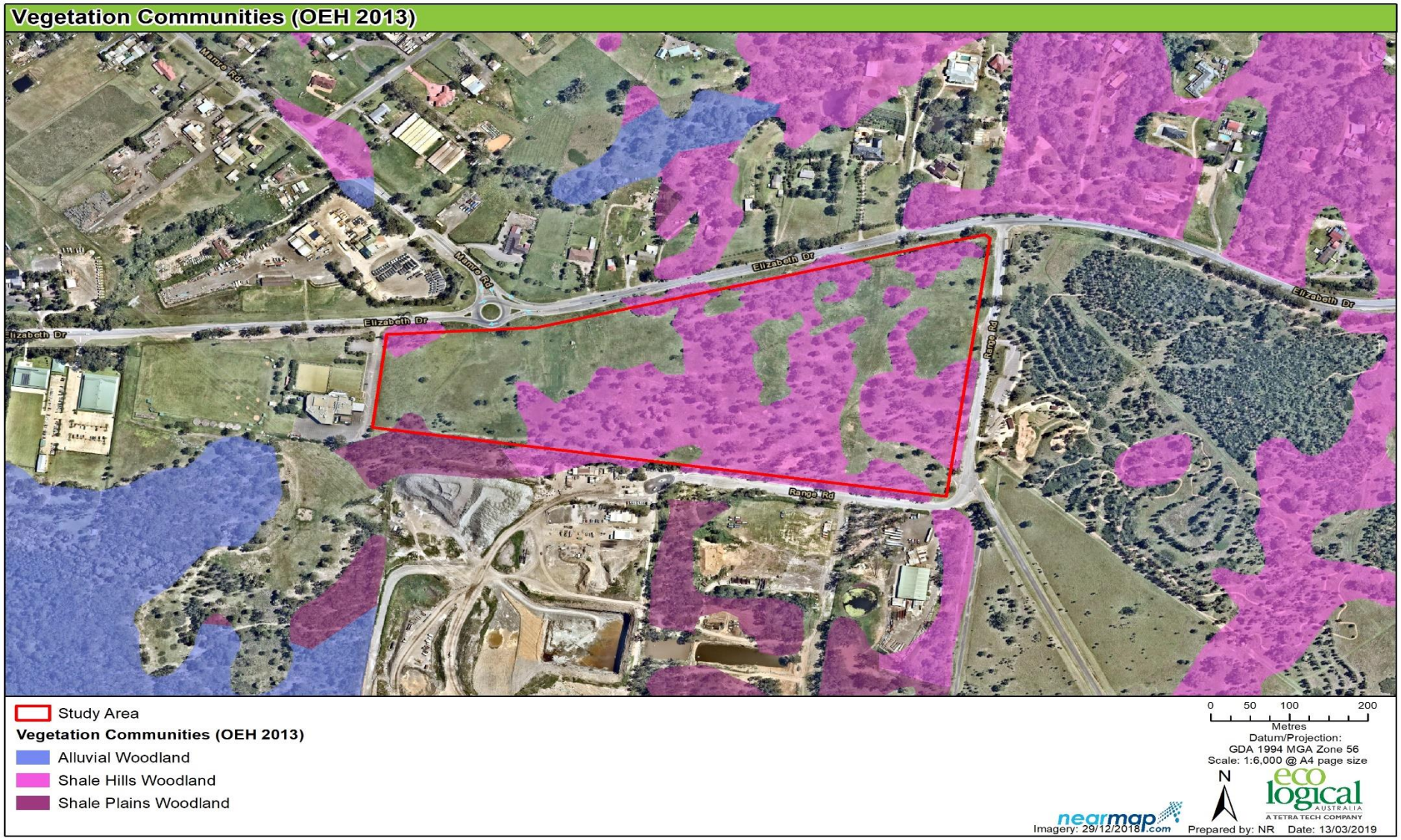

Figure 4: Vegetation communities within the study area (OEH, 2013)

4.2 Threatened Flora and Fauna

A search for threatened species using the Protected Matters Search Tool and Atlas of NSW Wildlife (within a 5 km buffer around the study area) and the review of literature identified a number of threatened flora species, threatened fauna and migratory species.

The literature review identified 21 threatened flora species and 31 threatened fauna species listed under the BC Act 2016 or EPBC Act 1999, which have the potential to occur within a 5 km radius of the study area. An assessment of the likelihood of occurrence of threatened species within the study area is in Appendix A and was used to guide the site inspection methodology. The likelihood of occurrence provided in Appendix A represents the assessment following the site inspection results.

The results of the Protected Matters Search Tool, which have been included in Appendix A, includes species based on habitat modelling and species records. Therefore, not all species listed in Appendix A are shown on the maps in this report. The Atlas of NSW Wildlife database records of flora and fauna site are shown in Figure 5. It should be noted that some sensitive species cannot be displayed at this resolution.

As shown in Figure 5, the NSW Wildlife Atlas contains one threatened fauna species record within the study, that being the Cumberland Plain Land Snail. Other threatened fauna species have been recorded in proximity to the study area such as the Eastern Freetail-bat and the Varied Sittella. Threatened flora species in proximity to the study area include *Grevillea juniperina* subsp. *juniperina*.

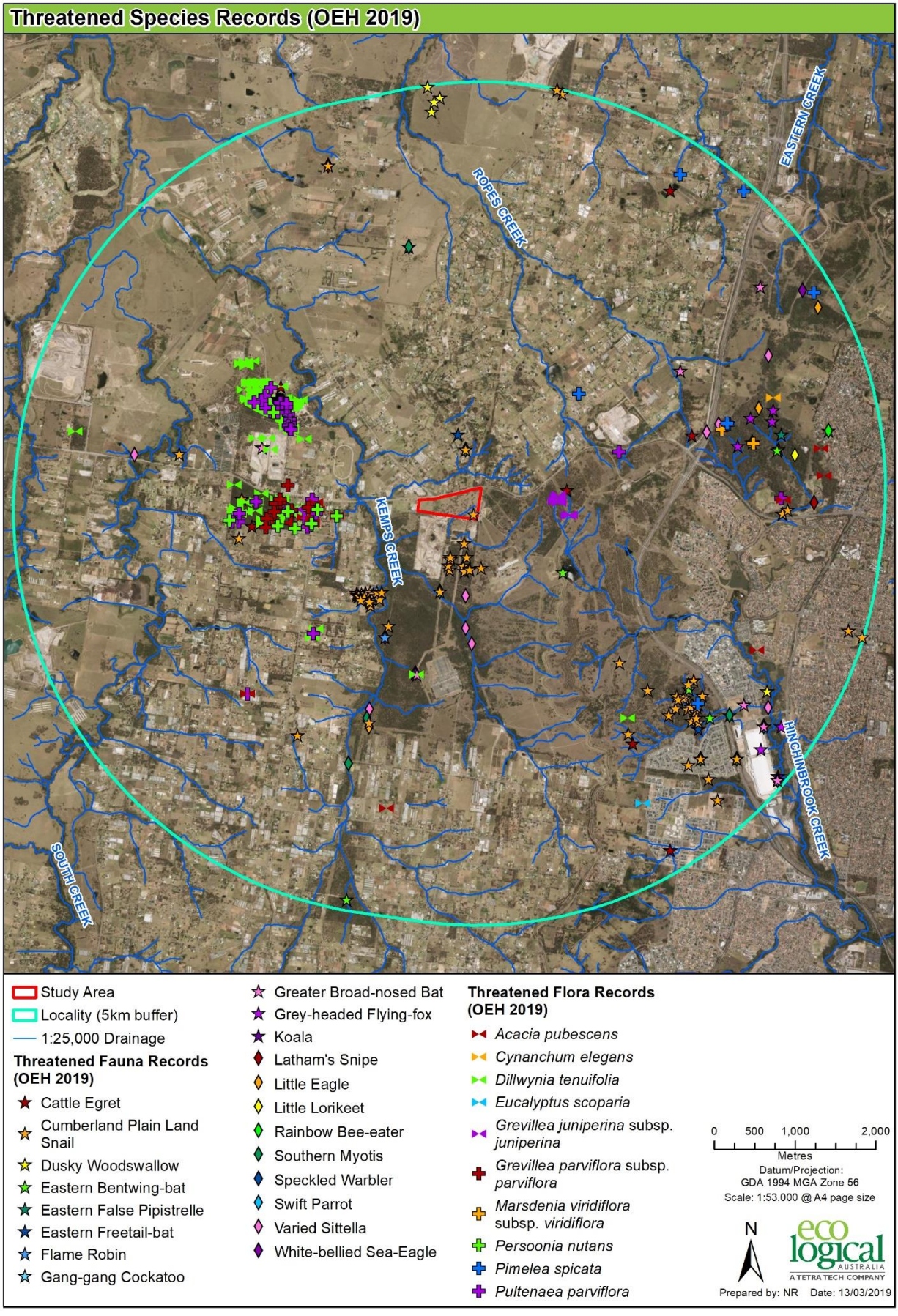

Figure 5: Wildlife Atlas (Bionet) threatened species records in proximity to study area

4.3 Riparian Land

To the south-east of the study area, the 1: 25,000 topographic maps showed a first order watercourse, according to the Strahler system (Figure 6). The *Guidelines for Controlled Activities on Waterfront Land – Riparian Corridors* (NRAR, 2018) state that watercourses should have riparian zones that area measured from the top of bank on each side of the watercourse (Table 3):

Table 3: Riparian Corridor Matrix

Stream Order	Vegetated Riparian Zone (VRZ)
1st	10 m
2nd	20 m
3rd	30 m
4th +	40 m

Ground-truthing will be required to determine the condition of the first order creek in and to determine if it meets the definition of a 'river' as defined under the WM Act 2000.

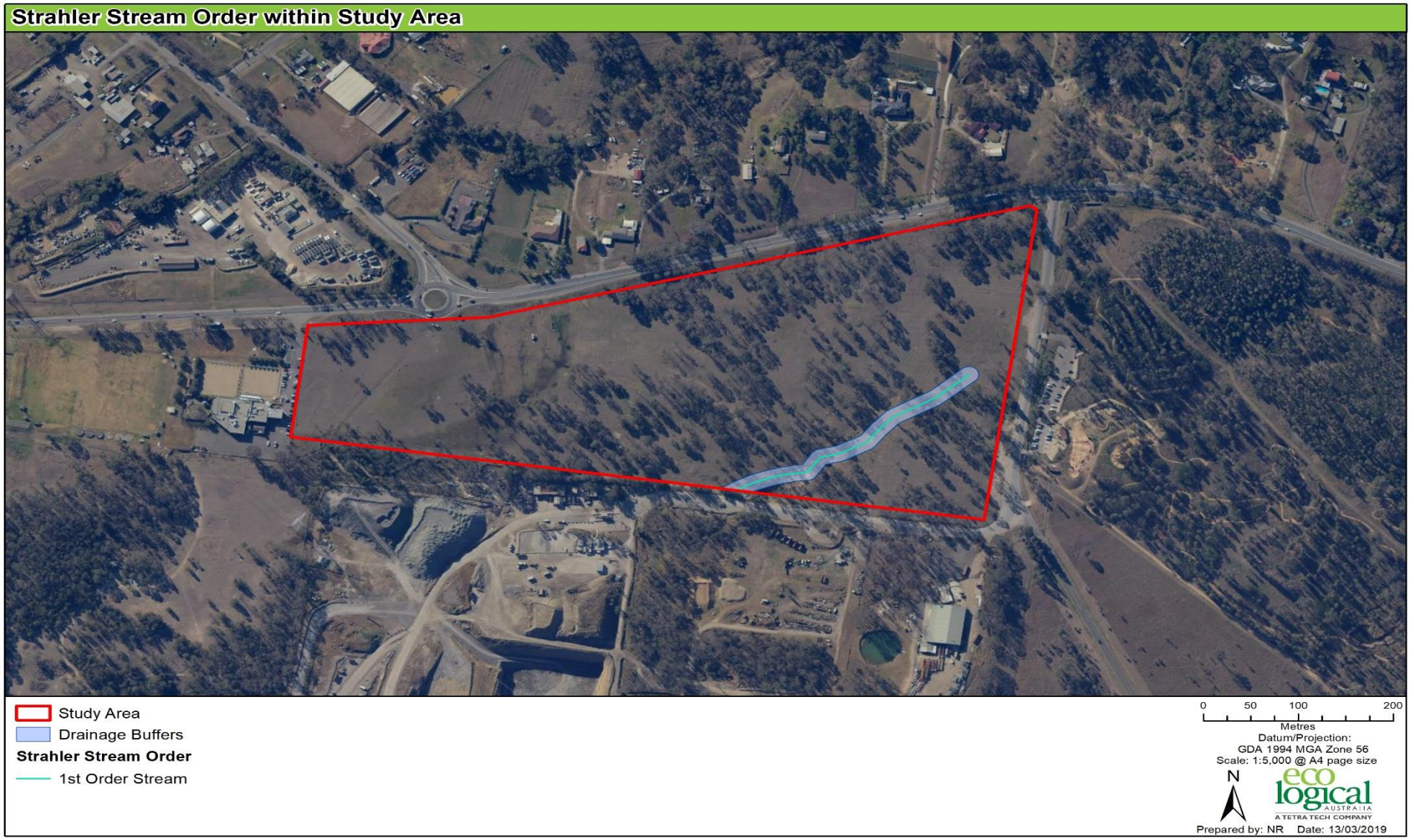

Figure 6: Mapped watercourses within the study area and required Vegetated Riparian Buffers

5. Impact Assessment

5.1 Direct Impacts to Ecosystems

Whilst the rezoning of land itself does not result in impacts to biodiversity, the rezoning is proposed to allow for future use of the subject site for development and infrastructure.

If the entire site was developed for industrial use and infrastructure, 10.46 ha of native vegetation would be impacted. The loss of this vegetation has been assumed via the Biodiversity Certification. The offset for this impact is achieved via income generated by the Special infrastructure Contribution (payable at the DA stage) and its expenditure in accordance with the Growth Centres Biodiversity Offset Program.

If the M12 corridor was acquired by the NSW Roads and Maritime Services, the amount of clearing required for the industrial development would be reduced.

Table 4: Direct impacts to native vegetation and threatened ecological communities

Vegetation Community	PCT ID	PCT Name	Direct Impact (ha)
Shale Plains Woodland (Cumberland Plain Woodland)	849	Grey Box – Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (Cumberland Plain Woodland in the Sydney Basin Bioregion)	0.12
Shale Hills Woodland (Cumberland Plain Woodland)	850	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion (Cumberland Plain Woodland in the Sydney Basin Bioregion)	10.34

5.2 Riparian Land

Field survey will need to determine if the first order creek to the south-east of the study area meets the definition of a ‘river’ under the WM Act 2000. If it is determined that it does meet the definition, works within 40 m of this creek would require a Controlled Activity Approval at the DA stage. Development is permitted in the outer 50% VRZ if a 1:1 riparian offset compensation is applied, as per the NRAR guidelines. If field survey confirms that it does not meet the definition of a river – and NRAR agree, no further assessment would be required.

6. Conclusion

Two PCTs were identified within the study area, which are both consistent with the TEC Cumberland Plain Woodland. Cumberland Plain Woodland is listed as critically endangered under both the BC Act 2016 and EPBC Act 1999.

The Threatened Species Wildlife Atlas search (Bionet) determined that there have been previously records of one threatened fauna species within the study area, that being the Cumberland Plain Land Snail.

If all vegetation within the study area is cleared, there would be a loss of 10.46 ha of native vegetation, 5.36 ha of which was mapped as native vegetation in the Draft Growth Centres Conservation Plan 2007. The loss of this vegetation was assumed by the Biodiversity Certification Order and is offset via the Growth Centres Biodiversity Offset Program.

This impact will not trigger entry into the Biodiversity Offset Scheme in accordance with the BC Act 2016 nor will it be considered a Controlled Action in accordance with the EPBC Act 1999 as the study area is wholly biodiversity certified in accordance with the Sydney Growth Centres SEPP 2006. Biodiversity impacts, as a result of future development, will therefore not need to be considered at the DA stage unless the Precinct Plan determines to protect additional native vegetation and the Biodiversity Certification maps are updated.

7. References

Department of Planning and Environment, 2007. Growth Centres Draft Conservation Plan.

Natural Resources Access Regulator, 2018. Guidelines for Controlled Activities on Waterfront Land – Riparian Corridors. NSW Department of Industry. Available online: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/156865/NRAR-Guidelines-for-controlled-activities-on-waterfront-land-Riparian-corridors.pdf

Appendix A Likelihood of Occurrence Table

An assessment of likelihood of occurrence was made for threatened and migratory species identified from the database search. Five terms for the likelihood of occurrence of species are used in this report. This assessment was based on database or other records, presence or absence of suitable habitat, features of the proposal site, results of the site inspection and professional judgement. Some Migratory or Marine species identified from the Commonwealth database search have been excluded from the assessment, due to lack of habitat. The terms for likelihood of occurrence are defined below:

- "yes" - the species was or has been observed on the site
- "likely" = a medium to high probability that a species uses the site
- "potential" = suitable habitat for a species occurs on the site, but there is insufficient information to categorise the species as likely to occur, or unlikely to occur
- "unlikely" = a very low to low probability that a species uses the site
- "no" = habitat on site and in the vicinity is unsuitable for the species.

An assessment of significance was conducted for threatened species or ecological communities that were recorded within the site or had a higher likelihood of occurring and were not recorded during the site visit and that potential to be significantly impacted. It is noted that some threatened fauna species that are highly mobile, wide ranging and vagrant may use portions of the site intermittently for foraging. For these fauna species, the habitat present and likely to be impacted is not considered to be important to the threatened species, particularly in relation to the amount of similar habitat remaining in the surrounding landscape. As such, an assessment of significance in reference to State or Commonwealth legislation was not considered necessary.

Note, that assessments for the likelihood of occurrence were made both prior to site inspection and following site inspection. The pre-survey assessments were performed to determine which species were "affected species", and hence determine which sorts of habitat to look for during site inspection. The post-survey assessments to determine "final affected species" were made after observing the available habitat in the site and are depicted in the table below.

The records column refers to the number of records occurring within 5 km of the study area, as provided by the NSW Wildlife Atlas (BioNet) database search.

Information provided in the habitat associations' column has primarily been extracted (and modified) from the Commonwealth Species Profile and Threats Database and the NSW Threatened Species Profiles.

Table 5: Likelihood of occurrence of threatened ecological communities

Name	BC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Castlereagh Scribbly Gum and Agnes Banks Woodland	V	E	Occurs almost exclusively on soils derived from Tertiary alluvium, or on sites located on adjoining shale or Holocene alluvium. Often adjacent to and on slightly higher ground than Castlereagh Ironbark Forest or Shale Gravel Transition Forest in the Sydney Basin Bioregion. Dominated by *Eucalyptus parramattensis* subsp. *parramattensis*, *Angophora bakeri* and *E. sclerophylla.* A small tree stratum of *Melaleuca decora* is sometimes present, generally in areas with poorer drainage. It has a well-developed shrub stratum consisting of sclerophyllous species such as *Banksia spinulosa* var. *spinulosa, Melaleuca nodosa, Hakea sericea* and *H. dactyloides* (multi-stemmed form). The ground stratum consists of a diverse range of forbs including *Themeda australis, Entolasia stricta*, *Cyathochaeta diandra, Dianella revoluta* subsp. *revoluta, Stylidium graminifolium*, *Platysace ericoides*, *Laxmannia gracilis* and *Aristida warburgii.*	Potential. However, not previously mapped (OEH, 2013)
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland	E	E	The structure of the community may vary from open forests to low woodlands, scrubs or reedlands with scattered trees. It has a dense to sparse tree layer in which *Casuarina glauca* (swamp oak) is the dominant species northwards from Bermagui. Other trees including *Acmena smithii* (lilly pilly), *Glochidion spp.* (cheese trees) and *Melaleuca spp.* (paperbarks) may be present as subordinate species and are found most frequently in stands of the community northwards from Gosford. *Melaleuca ericifolia* is the only abundant tree in this community south of Bermagui. The understorey is characterised by frequent occurrences of vines, *Parsonsia straminea, Geitonoplesium cymosum* and *Stephania japonica var. discolor,* a sparse cover of shrubs, and a continuous groundcover of forbs, sedges, grasses and leaf litter. The composition of the ground stratum varies depending on levels of salinity in the groundwater.	Potential. However, not previously mapped (OEH, 2013)
Cooks River / Castlereagh Ironbark Forest	E	CE	Associated with silts, clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains. The structure of the community may vary from tall open forests (>40m) to woodlands. The most widespread and abundant dominant trees include *Eucalyptus tereticornis* (forest red gum), *E. amplifolia* (cabbage gum), *Angophora floribunda* (rough-barked apple) and *A. subvelutina* (broad-leaved apple). *Eucalyptus baueriana* (blue box), *E. botryoides* (bangalay) and *E. elata* (river peppermint) may be common south from Sydney. *E. ovata* (swamp gum) occurs on the far south coast, *E. saligna* (Sydney blue gum) and *E. grandis* (flooded gum) may occur north of Sydney, while *E. benthamii* is restricted to the Hawkesbury floodplain. A layer of small trees may be present, including *Melaleuca decora, M. styphelioides* (prickly-leaved teatree), *Backhousia myrtifolia* (grey myrtle), *Melia azadarach* (white cedar), *Casuarina cunninghamiana* (river oak) and *C. glauca* (swamp oak). Scattered shrubs include *Bursaria spinosa, Solanum prinophyllum, Rubus parvifolius, Breynia oblongifolia,*	Potential. However, not previously mapped (OEH, 2013)

Name	BC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
			Ozothamnus diosmifolius, Hymenanthera dentata, Acacia floribunda and *Phyllanthus gunnii.* The groundcover is composed of abundant forbs, scramblers and grasses.	
Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest	CE	CE	Has an open forest structure and occurs primarily where shallow deposits from ancient river systems overlay shale soils, but also associated with localised concentrations of iron-hardened gravel. A transition plant community which grades into Cumberland Plain Woodland where the influence of gravel soil declines, and grades into Cooks River/Castlereagh Ironbark Forest or Castlereagh Scribbly Gum Woodland where gravel deposits are thick. Was not recorded during the site inspection s.	Likely. Previously mapped within study area (OEH, 2013)
Western Sydney Dry Rainforest and Moist Woodland on Shale	E	CE	A dry vine scrub community of the Cumberland Plain, western Sydney. Canopy trees include Prickly Paperbark (*Melaleuca styphelioides*), Hickory Wattle (*Acacia implexa*) and Native Quince (*Alectryon subcinereus*). Many rainforest species occur in the shrub layer, such as Mock Olive (*Notelaea longifolia*), Hairy Clerodendrum (*Clerodendrum tomentosum*) and Yellow Pittosporum *(Pittosporum revolutum*). The shrub layer combines with vines, such as Gum Vine (*Aphanopetalum resinosum*), Wonga Vine (*Pandorea pandorana*) and Slender Grape (*Cayratia clematidea*) to form dense thickets in sheltered locations	Unlikely. Not previously mapped (OEH, 2013)

Table 6: Likelihood of occurrence of fauna species recorded within a 5 km radius of the study area

Scientific Name	Common Name	BC Status	EPBC Status	Habitat	Records within 5 km Radius	Likelihood of Occurrence
				Amphibians		
Heleioporus australiacus	Giant Burrowing Frog	V	V	Forages in woodlands, wet heath, dry and wet sclerophyll forest (Ehmann 1997). Associated with semi-permanent to ephemeral sand or rock-based streams, where the soil is soft and sandy so that burrows can be constructed.	0	Unlikely.
Litoria aurea	Green and Golden Bell Frog	E	V	It can utilise a variety of natural and man-made waterbodies such as coastal swamps, marshes, lakes, other estuary wetlands, riverine floodplain wetlands, stormwater detention basins, farm dams, bunded areas, drains, ditches and other structures capable of storing water. Permanent swamps and ponds with established fringing vegetation (e.g. *Typha* sp. and spikerushes–*Eleocharis* sp.) adjacent to open grassland areas for foraging and free from predatory fish such as Mosquito Fish (*Gambusia holbrooki*) are also.	0	Unlikely.
Litoria raniformis	Southern Bell Frog	E	V	In NSW, only known to exist in isolated populations in the Coleambally Irrigation Area, the Lowbidgee floodplain and around Lake Victoria. A few recent unconfirmed records have also been made in the Murray Irrigation Area. Permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps or billabongs along floodplains and river valleys. Also found in irrigated rice crops.	0	Unlikely.
				Aves		
Anthochaera phrygia	Regent Honeyeater	CE	E & M	Associated with temperate eucalypt woodland and open forest including forest edges, wooded farmland and urban areas with mature eucalypts, and riparian	0	Potential.

Scientific Name	Common Name	BC Status	EPBC Status	Habitat	Records within 5 km Radius	Likelihood of Occurrence
				forests of River Oak (*C. cunninghamiana*). It primarily feeds on nectar from box and ironbark eucalypts and occasionally from Banksia's and mistletoes. It is reliant on locally abundant nectar sources with different flowering times to provide reliable supply of nectar. Suitable habitat likely to be present within the Precinct.		
Apus pacificus	Fork-tailed Swift	P	C, J, K	Sometimes travels with Needletails. Varied habitat with a possible tendency to more arid areas but also over coasts and urban areas.	0	Unlikely.
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V, P	-	The Dusky Woodswallow is found in open forests and woodlands and may be seen along roadsides and on golf courses. The Dusky Woodswallow nests colonially in 'neighbourhoods'. The nest is a loose bowl of twigs, grass and roots, lined with fine grass, and is placed in a tree fork, behind bark, in a stump hollow or in a fence post, about 1 m - 10 m above the ground.	6	Potential.
Ardea ibis	Cattle Egret	P	C, J	Grasslands, wooded lands and terrestrial wetlands.	15	Potential.
Botaurus poiciloptilus	Australasian Bittern	E	E	Occurs in terrestrial wetlands with tall dense vegetation, occasionally estuarine habitats, reedbeds, swamps, streams, and estuaries.	0	Unlikely.
Calidris ferruginea	Curlew Sandpiper	E	CE, M	Littoral and estuarine habitats, including intertidal mudflats, non-tidal swamps, lakes and lagoons on the coast and sometimes inland.	0	Unlikely.
Callocephalon fimbriatum	Gang-gang Cockatoo	V, P	-	Tall mountain forests and woodlands in summer; in winter, may occur at lower altitudes in open eucalypt forests and woodlands, and urban areas.	1	Potential.
Chthonicola sagittata	Speckled Warbler	V, P	-	*Eucalyptus*-dominated communities with a grassy understorey and sparse shrub layer, often on rocky ridges or in gullies.	1	Potential.

Scientific Name	Common Name	BC Status	EPBC Status	Habitat	Records within 5 km Radius	Likelihood of Occurrence
Daphoenositta chrysoptera	Varied Sittella	V, P	-	Distribution includes most of mainland Australia except deserts and open grasslands. Prefers eucalypt forests and woodlands with rough-barked species, or mature smooth-barked gums with dead branches, mallee and Acacia woodland. Feeds on arthropods from bark, dead branches, or small branches and twigs.	15	Potential.
Dasyomis brachypterus	Eastern Bristlebird	E1	E1	Habitat is characterised by dense, low vegetation and includes sedgeland, heathland, swampland, shrubland, sclerophyll forest and woodland, and rainforest, as well as open woodland with a heathy understorey. In northern NSW occurs in open forest with tussocky grass understorey.	0	Unlikely.
Haliaeetus leucogaster	White-bellied Sea-Eagle	V, P	C	Freshwater swamps, rivers, lakes, reservoirs, billabongs, saltmarsh and sewage ponds and coastal waters. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, forest and urban areas.	1	Potential.
Hieraaetus morphnoides	Little Eagle	V, P	-	Open eucalypt forest, woodland or open woodland, including sheoak or Acacia woodlands and riparian woodlands of interior NSW.	5	Potential.
Gallinago hardwickii	Latham's Snipe	P	C, J, K	A variety of permanent and ephemeral wetlands, preferring open fresh water wetlands with nearby cover. Occupies a variety of vegetation around wetlands including wetland grasses and open wooded swamps. Can occur in habitats that have saline or brackish water, such as saltmarsh, mangrove creeks, around bays and beaches, and at tidal rivers. They are regularly recorded in or around modified or artificial habitats including pasture, ploughed paddocks, irrigation channels and drainage ditches and sewage	2	Potential.

Scientific Name	Common Name	BC Status	EPBC Status	Habitat	Records within 5 km Radius	Likelihood of Occurrence
				and dairy farms. They can also occur in various sites close to humans or human activity (e.g. near roads, railways, airfields, commercial or industrial complexes).		
Glossopsitta pusilla	Little Lorikeet	V, P	-	Dry, open eucalypt forests and woodlands, including remnant woodland patches and roadside vegetation.	2	Potential.
Grantiella picta	Painted Honeyeater		V	A nomadic species that typically inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests with abundant mistletoe (DECC 2007). It is a specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias, preferring *Amyema* sp mistletoe (DECC 2007).	0	Unlikely.
Lathamus discolor	Swift Parrot	E	CE	Breeds in Tasmania between September and January. Migrates to mainland in autumn, where it forages on profuse flowering Eucalypts. Hence, in this region, autumn and winter flowering eucalypts are important for this species. Favoured feed trees include winter flowering species such as Swamp Mahogany (*Eucalyptus robusta*), Spotted Gum (*Corymbia maculata*), Red Bloodwood (*C. gummifera*), Mugga Ironbark (*E. sideroxylon*), and White Box (*E. albens*).	1	Potential.
Merops ornatus	Rainbow Bee-eater	P	M	Open forests and woodlands, shrublands, farmland, areas of human habitation, inland and coastal sand dune systems, heathland, sedgeland, vine forest and vine thicket.	1	Potential.
Numenius madagascariensis	Eastern Curlew	-	CE	Estuaries, bays, harbours, inlets and coastal lagoons, intertidal mudflats or sandflats, ocean beaches, coral reefs, rock platforms, saltmarsh, mangroves, freshwater/brackish lakes, saltworks and sewage farms.	0	Unlikely.

Scientific Name	Common Name	BC Status	EPBC Status	Habitat	Records within 5 km Radius	Likelihood of Occurrence
Petroica phoenicea	Flame Robin	V, P	-	Breeds in upland tall moist eucalypt forests and woodlands. In winter uses dry forests, open woodlands, heathlands, pastures and native grasslands. Occasionally occurs in temperate rainforest, herbfields, heathlands, shrublands and sedgelands at high altitudes.	2	Potential.
Rostratula australis	Australian Painted Snipe	-	E	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds (ibid.). Breeding is often in response to local conditions; generally, occurs from September to December. Roosts during the day in dense vegetation. Forages nocturnally on mud-flats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter (ibid.).	0	Unlikely.
			Gastropods			
Meridolum corneovirens	Cumberland Plain Land Snail	E1	-	Associated with open eucalypt forests, particularly Cumberland Plain Woodland described in Benson (1992). Found under fallen logs, debris and in bark and leaf litter around the trunk of gum trees or burrowing in loose soil around clumps of grass. Urban waste may also form suitable habitat.	86	Potential.
			Mammals (Excluding Bats)			
Dasyurus maculatus	Spotted-tailed Quoll	V	E	The Spotted-tailed Quoll inhabits a range of forest communities including wet and dry sclerophyll forests, coastal heathlands and rainforests (Mansergh 1984; DECC 2007j), more frequently recorded near the ecotones of closed and open forest and in NSW within 200km of the coast. Preferred habitat is mature wet	0	Unlikely.

Scientific Name	Common Name	BC Status	EPBC Status	Habitat	Records within 5 km Radius	Likelihood of Occurrence
				forest (Belcher 2000b; Green & Scarborough 1990; Watt 1993), especially in areas with rainfall 600 mm/year (Edgar & Belcher 2008; Mansergh 1984). Unlogged forest or forest that has been less disturbed by timber harvesting is also preferable (Catling et al. 1998, 2000). This species requires habitat features such as maternal den sites, an abundance of food (birds and small mammals) and large areas of relatively intact vegetation to forage in (DECC 2007). Maternal den sites are logs with cryptic entrances; rock outcrops; windrows; burrows (Environment Australia 2000).		
Petauroides volans	Greater Glider	-	V	The greater glider is an arboreal nocturnal marsupial, largely restricted to eucalypt forests and woodlands. It is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows. The greater glider favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species.	0	Unlikely.
Petrogale penicillata	Brush-tailed Rock-Wallaby	E1	V	Rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges.	0	Unlikely.
Phascolarctos cinereus	Koala	V	V	Associated with both wet and dry Eucalypt forest and woodland that contains a canopy cover of approximately 10 to 70%, with acceptable Eucalypt food trees. Some preferred Eucalyptus species are: *Eucalyptus tereticornis, E. punctata, E. cypellocarpa, E. viminalis.*	3	Unlikely.
Pseudomys novaehollandiae	New Holland Mouse	-	V	Open heathlands, woodlands and forests with a heathland understorey, vegetated sand dunes.	0	Unlikely.
				Mammals (Bats)		

Scientific Name	Common Name	BC Status	EPBC Status	Habitat	Records within 5 km Radius	Likelihood of Occurrence
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Wet and dry sclerophyll forests, Cyprus Pine dominated forest, woodland, sub-alpine woodland, edges of rainforests and sandstone outcrop country. Roosts in caves, rock overhangs and disused mine shafts.	0	Unlikely.
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V, P	-	Prefers moist habitats with trees taller than 20m. Roosts in tree hollows but has also been found roosting in buildings or under loose bark.	7	Potential.
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V, P	-	Associated with a range of habitats such as rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grassland. It forages above and below the tree canopy on small insects. Will utilise caves, old mines, and stormwater channels, under bridges and occasionally buildings for shelter.	9	Potential.
Mormopterus norfolkensis	Eastern Freetail-bat	V, P	-	Most records of this species are from dry eucalypt forest and woodland east of the Great Dividing Range. Individuals have, however, been recorded flying low over a rocky river in rainforest and wet sclerophyll forest and foraging in clearings at forest edges. Primarily roosts in hollows or behind loose bark in mature eucalypts but have been observed roosting in the roof of a hut.	14	Potential.
Myotis macropus	Southern Myotis	V, P		The Large-footed Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers. Will occupy most habitat types such as mangroves, paperbark swamps, riverine monsoon forest, rainforest, wet and dry sclerophyll forest, open woodland and River Red Gum woodland, as long as	11	Potential.

Scientific Name	Common Name	BC Status	EPBC Status	Habitat	Records within 5 km Radius	Likelihood of Occurrence
				they are close to water. While roosting (in groups of 10-15) it is most commonly associated with caves, this species has been observed to roost in tree hollows, amongst vegetation, in clumps of Pandanus, under bridges, in mines, tunnels and stormwater drains. It forages over streams, dams and pools catching insects and small fish by raking their feet across the water surface.		
Pteropus poliocephalus	Grey-headed Flying-fox	V, P	V	Inhabits a wide range of habitats including rainforest, mangroves, paperbark forests, wet and dry sclerophyll forests and cultivated areas. Camps are often located in gullies, typically close to water, in vegetation with a dense canopy.	19	Potential.
Scoteanax rueppellii	Greater Broad-nosed Bat	V, P	-	Associated with moist gullies in mature coastal forest, or rainforest, east of the Great Dividing Range, tending to be more frequently located in more productive forests. Within denser vegetation types, use is made of natural and man-made openings such as roads, creeks and small rivers, where it hawks backwards and forwards for prey.	8	Potential.

Table 7: Likelihood of occurrence of flora species recorded within a 5 km radius of the study area

Scientific Name	Common Name	BC Status	EPBC Status	Habitat	Records within 5 km Radius	Likelihood of Occurrence
Acacia bynoeana	Bynoe's Wattle	E	V	*Acacia bynoeana* is found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains and has recently been found in the Colymea and Parma Creek areas west of Nowra. It is found in heath and dry sclerophyll forest, typically on a sand or sandy clay substrate, often with ironstone gravels.	0	Unlikely.
Acacia pubescens	Downy Wattle	V	V	*Acacia pubescens* occurs on the NSW Central Coast in Western Sydney, mainly in the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon. It is associated with Cumberland Plains Woodlands, Shale / Gravel Forest and Shale / Sandstone Transition Forest growing on clay soils, often with ironstone gravel.	13	Unlikely.
Allocasuarina glareicola		-	E	*Allocasuarina glareicola* is primarily restricted to the Richmond district on the north-west Cumberland Plain, with an outlier population found at Voyager Point. It grows in Castlereagh woodland on lateritic soil.	0	Unlikely.
Cynanchum elegans	White-flowered Wax Plant	E	E	Dry rainforest; littoral rainforest; Leptospermum laevigatum-Banksia integrifolia subsp. integrifolia (Coastal Tea-tree– Coastal Banksia) coastal scrub; Eucalyptus tereticornis (Forest Red Gum) or Corymbia maculata (Spotted Gum) open forest and woodland; and Melaleuca armillaris (Bracelet Honeymyrtle) scrub.	1	Unlikely.
Dillwynia tenuifolia	-	V	-	Scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest, transitional areas where these communities adjoin Castlereagh	582	Potential.

Scientific Name	Common Name	BC Status	EPBC Status	Habitat	Records within 5 km Radius	Likelihood of Occurrence
				Scribbly Gum Woodland, and disturbed escarpment woodland on Narrabeen sandstone.		
Dillwynia tenuifolia	*Dillwynia tenuifolia*, Kemps Creek population	E2, V	-	Occurs in the area bounded by Western Road, Elizabeth Drive, Devonshire Road and Cross Street, Kemps Creek in the Liverpool Local Government Area. Transition from Castlereagh Ironbark Forest to Castlereagh Scribbly Gum Woodland.	51	Potential.
Eucalyptus scoparia	Wallangarra White Gum	E1	V	Open eucalypt forest, woodland and heaths on well-drained granite/rhyolite hilltops, slopes and rocky outcrops, typically at high altitudes.	1	Potential.
Genoplesium baueri	Yellow Gnat-orchid	V	E	Known from coastal areas from northern Sydney south to the Nowra district. Previous records from the Hunter Valley and Nelson Bay are now thought to be erroneous. Grows in shrubby woodland in open forest on shallow sandy soils and flowers from December to March.	0	Unlikely.
Grevillea juniperina subsp. juniperina	Juniper-leaved Grevillea	V	-	Cumberland Plain Woodland, Castlereagh Ironbark Woodland, Castlereagh Scribbly Gum Woodland and Shale/Gravel Transition Forest, on reddish clay to sandy soils derived from Wianamatta Shale and Tertiary alluvium.	12	Potential.
Grevillea parviflora subsp. parviflora	Small-flower Grevillea	V	V	Heath and shrubby woodland to open forest on sandy or light clay soils usually over thin shales.	14	Potential.
Marsdenia viridiflora subsp. viridiflora	*Marsdenia viridiflora* R. Br. subsp. *viridiflora* population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	E2	-	Vine thickets and open shale woodland.	2	Potential.

Scientific Name	Common Name	BC Status	EPBC Status	Habitat	Records within 5 km Radius	Likelihood of Occurrence
Persoonia hirsuta	Hairy Geebung	E1	E	Sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	0	Unlikely.
Persoonia nutans	Nodding Geebung	E1, P	E	Restricted to the Cumberland Plain in western Sydney, between Richmond in the north and Macquarie Fields in the south. Northern populations: sclerophyll forest and woodland (Agnes Banks Woodland, Castlereagh Scribbly Gum Woodland and Cooks River / Castlereagh Ironbark Forest) on aeolian and alluvial sediments. Southern populations: tertiary alluvium, shale sandstone transition communities and Cooks River / Castlereagh Ironbark Forest.	12	Potential.
Pimelea curviflora var. curviflora	-	V	V	Woodland, mostly on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes.	0	Unlikely.
Pimelea spicata	Spiked Rice-flower	E1	E	In western Sydney, *Pimelea spicata* occurs on an undulating topography of well-structured clay soils, derived from Wianamatta shale. It is associated with Cumberland Plains Woodland, in open woodland and grassland often in moist depressions or near creek lines. Has been located in disturbed areas that would have previously supported.	19	Potential.
Pomaderris brunnea	Rufous Pomaderris	E1	V	Moist woodland or forest on clay and alluvial soils of flood plains and creek lines.	0	Unlikely.
Pterostylis gibbosa	Illawarra Greenhood	-	E	Known from a small number of populations in the upper Hunter Valley (Milbrodale), the Illawarra region (Albion Park and Yallah) and near Nowra (DECC 2007). Plants grow in a variety of woodland and open forest communities with shallow rocky soils.	0	Unlikely.
Pterostylis saxicola	Sydney Plains Greenhood	E	E	Terrestrial orchid predominantly found in Hawkesbury Sandstone Gully Forest growing in small pockets of soil	0	Unlikely.

Scientific Name	Common Name	BC Status	EPBC Status	Habitat	Records within 5 km Radius	Likelihood of Occurrence
				that have formed in depressions in sandstone rock shelves. Known from Georges River National Park, Ingleburn, Holsworthy, Peter Meadows Creek, St Marys Tower.		
Pultenaea parviflora	-	E1	V	Endemic to the Cumberland Plain. Core distribution is from Windsor to Penrith and east to Dean Park. Outlier populations are recorded from Kemps Creek and Wilberforce. May be locally abundant, particularly within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays.	98	Potential.
Syzygium paniculatum	Magenta Lillypilly	V	V	This species occupies a narrow coastal area between Bulahdelah and Conjola State Forests in NSW. On the Central Coast, it occurs on Quaternary gravels, sands, silts and clays, in riparian gallery rainforests and remnant littoral rainforest communities. In the Ourimbah Creek valley, *S. paniculatum* occurs within gallery rainforest with *Alphitonia excelsa*, *Acmena smithii*, *Cryptocarya glaucescens*, *Toona ciliata*, *Syzygium oleosum* with emergent *Eucalyptus saligna*. At Wyrrabalong NP, *S. paniculatum* occurs in littoral rainforest as a co-dominant with *Ficus fraseri*, *Syzygium oleosum*, *Acmena smithii*, *Cassine australe*, and *Endiandra sieberi*.	0	Unlikely.
Thesium australe	Austral Toadflax	V	V	Widespread throughout the eastern third of NSW but most common on the North Western Slopes, Northern Tablelands and North Coast. Occurs in grassland or grassy woodland. Often found in damp sites in association with Kangaroo Grass (*Themeda australis*) (DECC 2007). The preferred soil type is a fertile loam derived from basalt although it occasionally occurs on metasediments and granite.	0	Unlikely.

ecological AUSTRALIA
A TETRA TECH COMPANY

SYSTEM CERTIFICATION ISO 9001 SGS
SYSTEM CERTIFICATION ISO 14001 SGS
SYSTEM CERTIFICATION AS 4801 SGS

1300 646 131
www.ecoaus.com.au