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25 August 2020

**Re: Ecological Constraints Assessment, Lot 240 // DP 828854 (105 Cooby Rd), Tullimbar.**

Dear Ryhan,

Please find below an outline of the ecological values and constraints made during a site visit at 105 Cooby Road (Lot 240 // DP 828854), Tullimbar, NSW, hereafter referred to as the 'study area' (**Figure 1**).

### **Background and purpose of report**

This report assesses the ecological constraints of the study area which is located within the Shellharbour Local Government Area (LGA). The study area is zoned as a Deferred Matter (DM) under the Shellharbour Local Environmental Plan (LEP) 2013. This report is intended to accompany a Planning Proposal to rezone the land. The study area covers the entire the lot (29.1 ha).

This report provides an assessment of the ecological values and constraints in the study area to inform possible future development. The report assesses threatened species that may use the study area and are found in the area, the native vegetation communities and conservation value of the study area.

### **Methods**

#### *Literature review and database analysis*

A site-specific literature and database review were undertaken prior to the field survey and the preparation of this report. This included desktop analysis of aerial photography and review of regional scale information from the following sources:

- NSW Planning Viewer (NSW Dept. of Planning and Environment 2018)
- BioNet Atlas of NSW Wildlife (NSW Office of Environment and Heritage 2018)
- Protected Matters Search Tool (Commonwealth Department of the Environment and Energy 2018)
- SIX Maps (LPI 2018)
- Native Vegetation of South East NSW (Tozer et al. 2006)
- NSW Vegetation Information System (OEH 2018)

Threatened species, populations and migratory species recorded within 5 km of the subject site were consolidated in a search of the Atlas of NSW Wildlife (BioNet) (OEH 2018). Their likelihood of occurrence was assessed by:

- review of location and date of recent (<5 years) and historical (>5-20 years) records
- review of available habitat within the subject site and surrounding areas
- review of the scientific literature pertaining to each species and population
- applying expert knowledge of each species

Following a review of available habitat within the subject site, the potential for each threatened species, population and/or migratory species to occur was considered. The potential for species to use the site and to be affected directly or indirectly by the proposed action were considered as either:

- “Recent record” = species has been recorded in the subject site a within the past 5 years
- “High” = species has previously been recorded in the subject site (>5 years ago) or in proximity to (for mobile species), and/or habitat is present that is likely to be used by a local population
- “Moderate” = suitable habitat for a species is present onsite but no evidence of a species detected and relatively high number of recent records (5-20 years) within 5 km of the study area or species is highly mobile
- “Low” = suitable habitat for a species is present onsite but limited or highly degraded, no evidence of a species detected and relatively low number of recent records within 5 km of the study area
- “Not present” – suitable habitat for the species is not present onsite or adequate survey has determined species does not occur in the subject site

### Field survey

Site inspection was conducted by Lucas McKinnon (Principal Ecologist) over approximately 2 hours. The area was traversed on foot and the location of hollow bearing trees recorded using a handheld GPS.

A second site inspection was conducted by Lucas McKinnon (Principal Ecologist), John Gollan (Senior Ecologist), Joel Nicholson (Ecologist) and Declan Moylan (Ecologist). The condition of the vegetation within the study area was sampled within six survey plots in accordance with the BAM (OEH 2017). Using the plot data, a Vegetation Integrity (VI) Score for six vegetation zones within the study area was calculated and utilised to inform estimates of biodiversity credit requirements. It should be noted that in this assessment, we assume that the seventh vegetation zone, ‘Exotic grassland’, will not require offsetting. Collection of data in this zone will be required to confirm, but from experience and collection of plot data in similar zones nearby to the study area, the Vegetation Integrity Score will be below ‘15’ and therefore will not require offsetting.

## Results

### Vegetation

Native vegetation within 5 km of the study area was assessed using a desktop GIS analysis (**Figure 2**). The vegetation mapping by Tozer et al. (2006) revealed that much of the native vegetation in the area has been cleared (~66% or 5,690 ha). The remaining vegetation is mostly found along the eastern slopes of the Illawarra Escarpment. Portions of largely intact native vegetation also remain in the low rolling hills to the south of the area.

Tozer et al. (2006) regional vegetation mapping recorded three vegetation types in the study area, which have been converted into Plant Community Types following OEH (2018) (**Figure 3**), these are:

- Forest Red Gum - Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion (PCT 838),
- Whalebone Tree - Native Quince dry subtropical rainforest on dry fertile slopes, southern Sydney Basin Bioregion (PCT 1300), and
- Sydney Blue Gum x Bangalay - Lilly Pilly moist forest in gullies and on sheltered slopes, southern Sydney Basin Bioregion (PCT 1245).

Field assessment confirmed the presence of all three native vegetation communities within the study area.

The remainder of the study area consists of cleared land (13.80 ha), which is managed for livestock grazing (**Figure 4**). Dominant exotic grasses and herbaceous weeds in the cleared area included *Cenchrus clandestinus*\* (Kikuyu Grass), *Cynodon dactylon*\* (Couch) and *Sida rhombifolia*\* (Paddy's Lucerne) (**Figure 5**).

All native vegetation communities have been further classified based on their condition. Field assessments identified three distinct condition classes of Forest Red Gum – Thin-leaved Stringybark grassy woodland: 'disturbed/shrubby', 'underscrubbed' or 'scattered paddock trees'. The other native vegetation communities were found in a 'disturbed/shrubby' state (**Figure 6**, **Figure 7** and **Figure 8**).

'Forest Red Gum – Thin-leaved Stringybark grassy woodland' typically occurred on the flatter margins of the intact areas of native vegetation. Vegetation in the centre and east of the study area was more consistent with 'Whalebone Tree – Native Quince dry subtropical rainforest' but also contained large areas of weeds and exotics (**Figure 9**). In the north of the study area, there are areas with a mature *Eucalyptus quadrangulata* (White-topped Box) canopy with a mesic understorey, which have been mapped as Sydney Blue Gum X Bangalay – Lilly Pilly moist forest (**Figure 10**).

Forest Red Gum – Thin-leaved Stringybark grassy woodland is a component of Illawarra Lowlands Grassy Woodland (ILGW), which is listed as an Endangered Ecological Community (EEC) under the NSW *Biodiversity Conservation Act 2016* (BC Act) and part of the Critically EEC 'Illawarra and South Coast Lowlands Forest' listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Whalebone Tree – Native Quince dry subtropical rainforest' is listed as Illawarra Subtropical Rainforest (ISTRF) EEC (BC Act).

The Conservation Advice for Illawarra and South Coast Lowlands Forest and Woodland (TSSC 2016) provides condition thresholds for when a patch retains sufficient conservation value to be considered as a Matter of National Environmental Significance (MNES) (**Appendix A**). A review of the approved Conservation Advice (TSSC 2016) concluded that the Illawarra and South Coast Lowland Forest and Woodland does meet the condition to be categorised as a MNES, and will require assessment in accordance with the Significant Impact Guidelines (DoE 2013).

Illawarra Subtropical Rainforest is not listed as an MNES under the EPBC Act.

### Threatened species

A search of the Atlas of NSW Wildlife (OEH 2018) indicated that twenty-three threatened species have previously been recorded within a 5 km radius of the study area (**Appendix B**). This consists of 14 fauna and nine flora (**Figure 13**). Three threatened species have previously been recorded within the study area; one microbat; *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat), and two threatened flora; *Cynanchum elegans* (White-flowered Wax Plant) and *Zieria granulata* (Illawarra Zieria). Eastern Bentwing-bat is listed as 'vulnerable' under the BC Act. Both flora species are listed as 'endangered' under the BC Act and EPBC Act.

Seven threatened or migratory bird species have been recorded in the area, all of which are >600 m from the study area. The closest record was *Petroica phoenicea* (Flame Robin) which was documented approximately 600 m to the north east of the study area in 2012. The Flame Robin is listed as 'vulnerable' under the BC Act. *Daphoenositta chrysoptera* (Varied Sittella) was the next closest record, approximately 900 m from the study area in 2009 and is also listed as 'vulnerable' under the BC Act. There are few records of these species in the area and they have 'low' likelihood of using the study area.

Habitat features in the study area consist of cleared land, woody weeds, farm dams, hollow bearing trees and three native vegetation communities. Almost half of the study area has been cleared (approximately 48% cover or 14.0 ha) and is dominated by exotic pasture grasses. The remainder of the study area consists of woody weeds (4.13 ha), three farm dams (0.22 ha) and three native vegetation communities (10.9 ha). Throughout the study area, mid-story vegetation, when present, consists of either sparse natives or the woody weed, *Lantana camara*\* (Lantana). Furthermore, 13 hollow bearing trees were recorded. These are likely to provide habitat for native arboreal fauna, including mammals, amphibians, reptiles and birds.

The study area contains microbat roosting/breeding and foraging habitat, including hollow bearing trees and sources of water (i.e. farm dams). A number of threatened microbats recorded within the area are likely to use these resources. Within the study area, Eastern Bentwing-bat was previously recorded near the largest farm dam in 2001, but this species would only use the study area for foraging as they breed and roost in caves and man-made structures.

### Riparian corridors

Two main watercourses occur within the study area, both of which are impeded by dams used for watering stock (**Figure 4**). In the western half of the study area, three 1<sup>st</sup> order streams converge into a 2<sup>nd</sup> order stream (Strahler 1953 in DPI 2012), which flow in a north-easterly direction, eventually draining to Hazleton Creek (~400 m north of the area). In the



eastern half of the site, a second 1<sup>st</sup> order watercourse also flows in a north-easterly direction and drains to Hazleton Creek.

DPI (2012) guidelines require a Vegetated Riparian Zone (VRZ) either side of mapped drainage lines, which are 20 m either side measured from the Top of Bank for 2<sup>nd</sup> order and 10 m for 1<sup>st</sup> order drainage lines.

Field validation of these streams found discernible bed and banks on the upper reach of the 2<sup>nd</sup> order drainage line (upstream of the dam), however, there were no bed/banks on the 1<sup>st</sup> order watercourses (**Figure 11** and **Figure 12**). At the time of survey, the dams had some aquatic and emergent vegetation and it is likely that these dams have habitat value for native species.

### Conservation values in the study area

Vegetation communities have been separated based upon their condition and conservation value. Maps illustrating the proposed lot layout and ecological constraints are in **Figure 14** and **Figure 15**. Given the modified condition of the study area, the native vegetation is generally in a 'moderate' condition state, but areas of 'high' conservation significance have also been mapped. Whilst heavily modified, the EEC/CEECs are generally consolidated with good connectivity to the south, contain recent threatened flora records and have 'high' ecological value. In addition, hollow bearing trees are of 'high' ecological value as they are a limited resource that take more than 100 years to form and provide habitat for hollow dependant threatened fauna, particularly microbats.

Native vegetation which is not an EEC and farm dams have 'moderate' conservation significance and represent a 'moderate' ecological constraint. Cleared land and weedy/exotic patches of vegetation are mapped as 'low' conservation significance and ecological constraint.

### Biodiversity Options

An estimated credit outcome has been determined (**Table 1**). Based on the current proposal, PCT 838 and PCT 1300 will require 30 and five credits, respectively. These credits will have to be secured elsewhere in the market. The price per credit for each PCT based on the Biodiversity Offset Payment Calculator (BOPC) are provided in **Table 2**.

**Table 1: Credit outcome of the proposal.**

Plant community type (PCT)	Plot	Vegetation zone	Development area	
			Area (ha)	Credits required*
Forest Red Gum - Thin-leaved Stringybark grassy woodland on coastal lowlands, southern Sydney Basin Bioregion (PCT838/ SR545)	BAM 2	Underscrubbed	0.31	5
	BAM 4	Disturbed/Shrubby	0.76	11
	BAM 5	SPT	0.13	0
	BAM 6	Weeds and Exotics	1.64	14

Plant community type (PCT)	Plot	Vegetation zone	Development area	
			Area (ha)	Credits required*
Sydney Blue Gum x Bangalay - Lilly Pilly moist (PCT1245/SR652)	BAM 3	Disturbed/Shrubby	0.45	0
Whalebone Tree – Native Quince dry subtropical rainforest on dry fertile slopes. Southern Sydney Basin Bioregion (PCT1300/SR662)	BAM 1	Disturbed/Shrubby	0.40	5
Dam	NA	NA	0.06	NA
<b>Total</b>			<b>3.75</b>	<b>35</b>

Table 2: Price per credit of PCTs found within the study area.

Plant community type (PCT)	BOPC Price per credit (August 2020)
838	\$20,827.23
1245	\$5,059.63
1300	\$8,770.31

## Conclusions and recommendations

Desktop analysis and field survey found that the study area predominantly consists of land that is of 'low' conservation significance (i.e. the cleared land and weeds/exotics). However, due the presence of ILGW, Illawarra Subtropical Rainforest EEC, recent threatened flora records and hollow bearing trees, there are parts of the study area that represent a 'high' ecological constraint. Hollow bearing trees should be retained as part of lots, where possible. Consolidated patches of retained vegetation should be considered for E-zoning, particularly where threatened flora and hollow bearing trees are recorded.

Mapped watercourses occur in the study area but only the upper reach of the 2<sup>nd</sup> order stream appears to have some discernible bed and bank. Development within 40 m a watercourse will require a Controlled Activity Approval under the NSW *Water Management Act 2000*, which may require reinstatement of a 20 m VRZ either side of TOB (i.e. a 40 m Riparian Corridor) and development of a Vegetation Management Plan.

The indicative lot layout with building envelopes provided (ISC00004) suggests that the majority of the ILGW, Illawarra Subtropical Rainforest EEC will be retained. Additionally, no

threatened flora records will be directly impacted and ten of the 11 hollow bearing trees will be retained (**Figure 14** and **Figure 15**).

Vegetation integrity plots were collected during the field surveys (shown in **Figure 16**) which enabled an assessment of the credit outcomes with respect to the impact area and validated vegetation (**Figure 17** and **Figure 18**). Based on the current proposal, PCT 838 and PCT 1300 will require offsetting (**Table 1**).

If you would like to discuss any of the above comments and recommendations further, please contact me on the below details.

Your sincerely,

Lucas Mckinnon

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## References

Australian Government Department of the Environment and Energy (2018) Species Profile and Threats Database. Accessed at: <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>

NSW Department of Primary Industries (DPI) (2012). Guidelines for development on waterfront land.

NSW Office of Environment and Heritage (OEH) (2018). Atlas of NSW Wildlife. Accessed at: <http://www.bionet.nsw.gov.au/>

NSW Office of Environment and Heritage (OEH) (2018). Threatened Biodiversity Profile Search. Accessed at: <http://www.environment.nsw.gov.au/threatenedspeciesapp/>

NSW Office of Environment and Heritage (OEH) (2017). Illawarra Subtropical Rainforest in the Sydney Basin Bioregion - profile. Accessed at: <http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10427>

NSW Government 2016. Biodiversity Conservation Act 2016 No 63. Accessed at: <https://www.legislation.nsw.gov.au/#/view/act/2016/63>

PlantNET (The NSW Plant Information Network System) (2016). Royal Botanic Gardens and Domain Trust, Sydney. Accessed at: <http://plantnet.rbgsyd.nsw.gov.au>

Tozer, M.G., Turner, K., Simpson, C., Keith, D.A., Beukers, P., MacKenzie, B., Tindall, D. & Pennay, C. (2006). Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands. NSW Department of Environment and Conservation & NSW Department of Natural Resources.



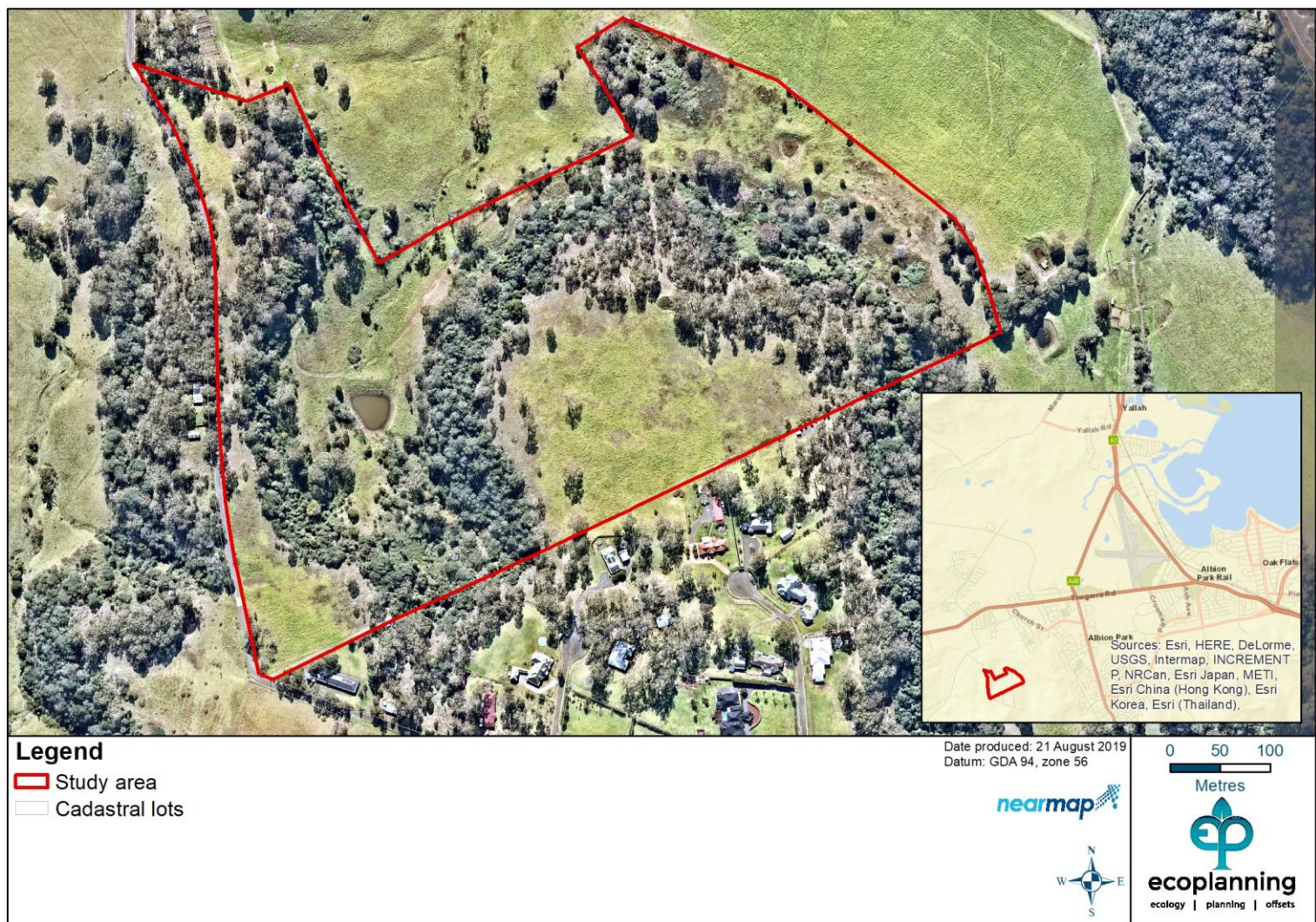


Figure 1: Study area.





Figure 2: Native vegetation within 5 km of the study area (Tozer et al. 2006).



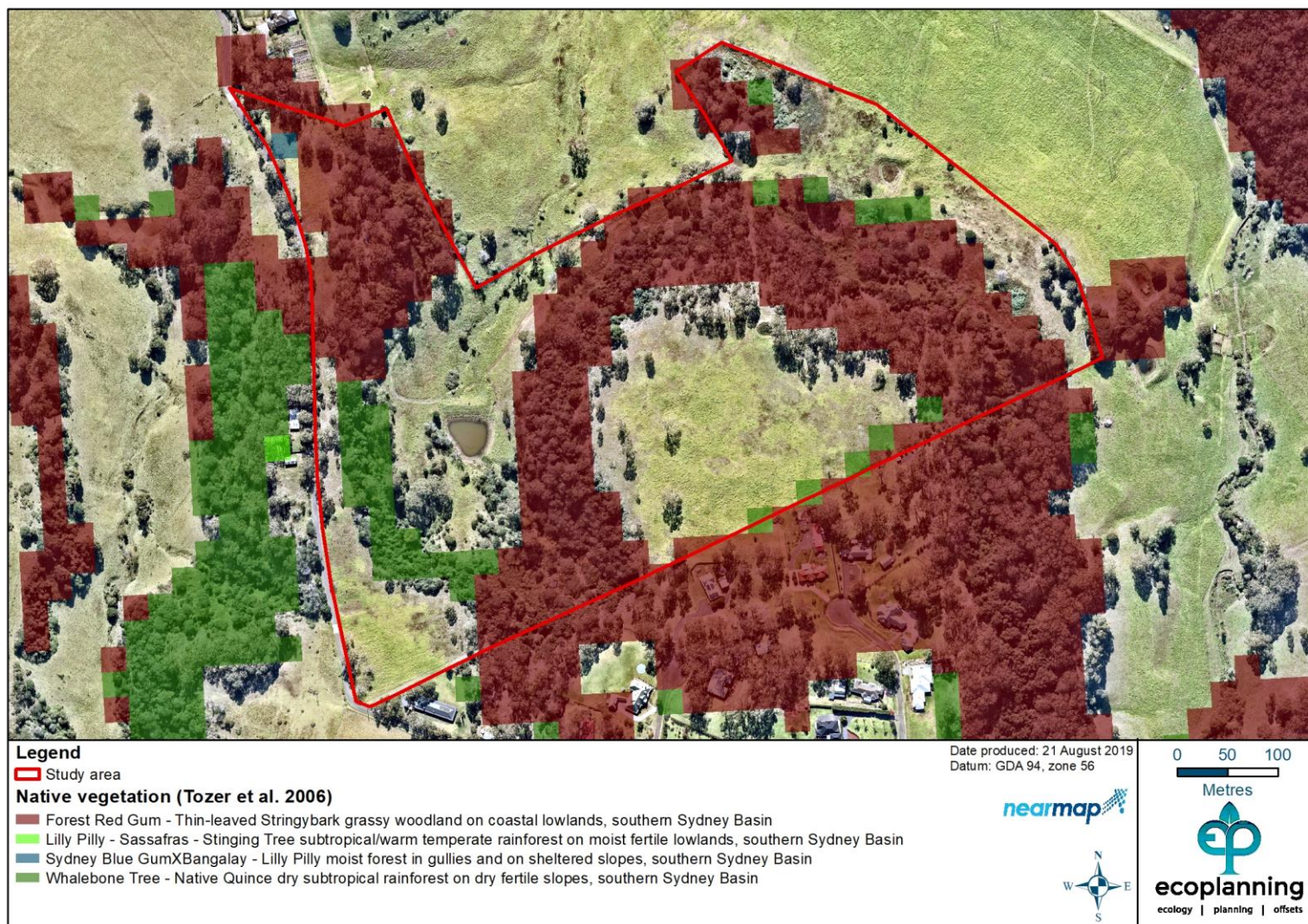


Figure 3: Desktop assessment of vegetation mapping in the study area (Tozer et al. 2006).



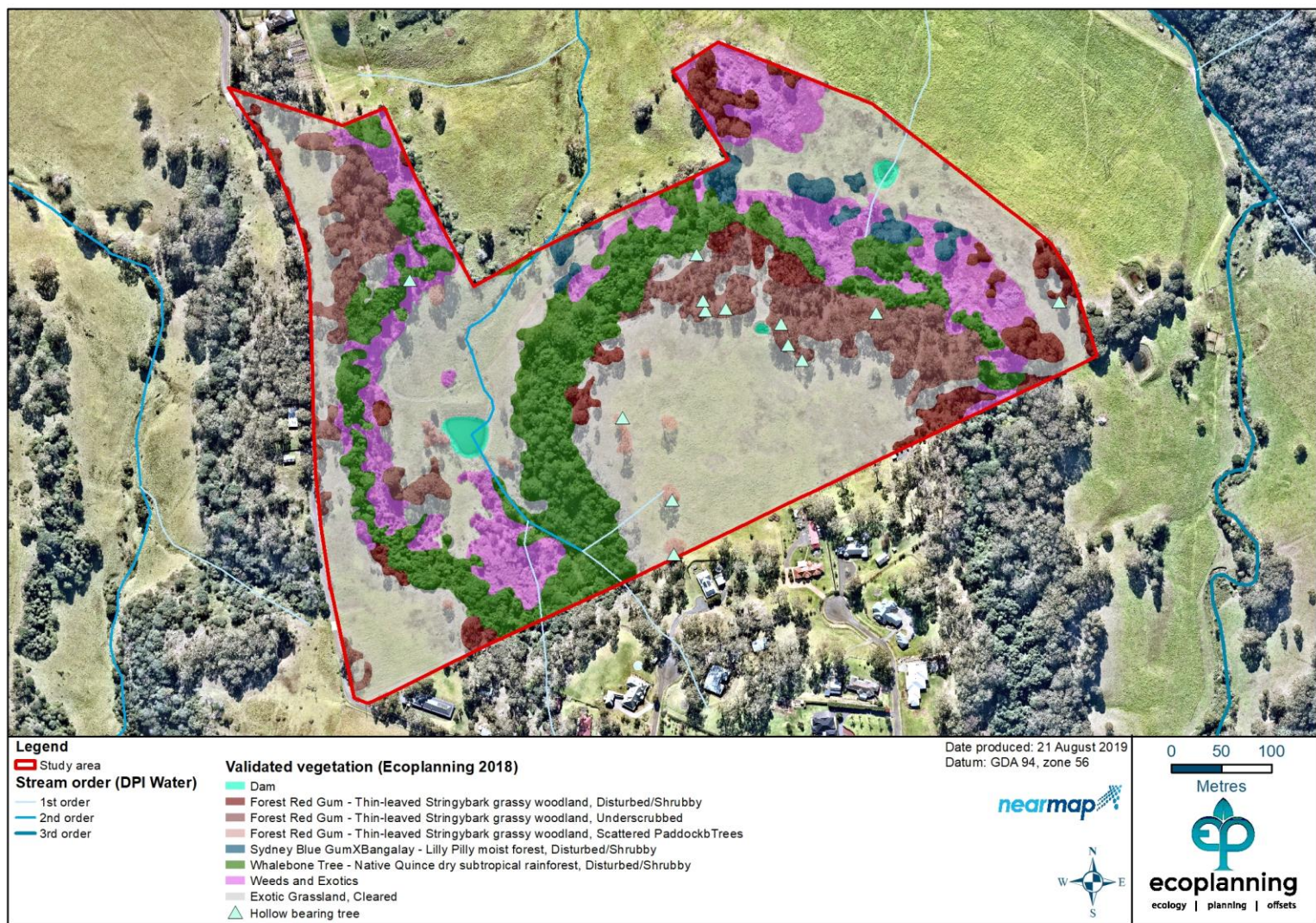


Figure 4: Field validated vegetation and hollow bearing trees, including mapped drainage lines.





**Figure 5: Cleared exotic grassland.**



**Figure 6: Forest Red Gum – Thin-leaved Stringybark – disturbed / shrubby.**





**Figure 7: Forest Red Gum – Thin-leaved Stringybark – underscrubbed.**



**Figure 8: Forest Red Gum – Thin-leaved Stringybark – scattered paddock trees.**





**Figure 9: Whalebone – Native Quince subtropical rainforest – disturbed shrubby.**



**Figure 10: Sydney Blue Gum X Bangalay – Lilly Pilly Moist forest – disturbed / shrubby.**





**Figure 11: A large farm dam mapped along a 2<sup>nd</sup> order drainage line, draining along right of photo.**



**Figure 12: Farm dam mapped along 1<sup>st</sup> order drainage line in the north-east of the study area.**



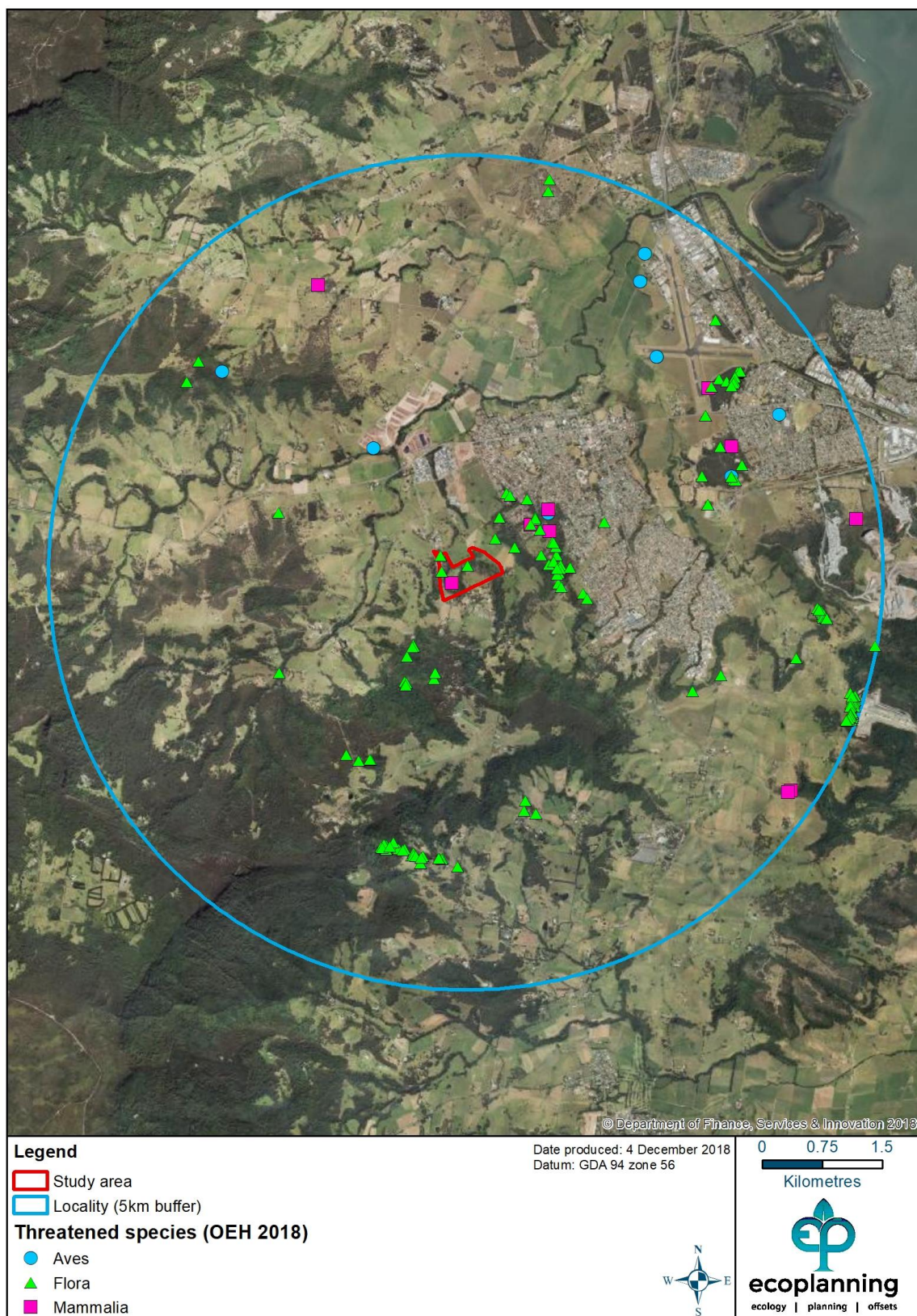


Figure 13: Threatened species within 5 km of the study area (OEH 2018).



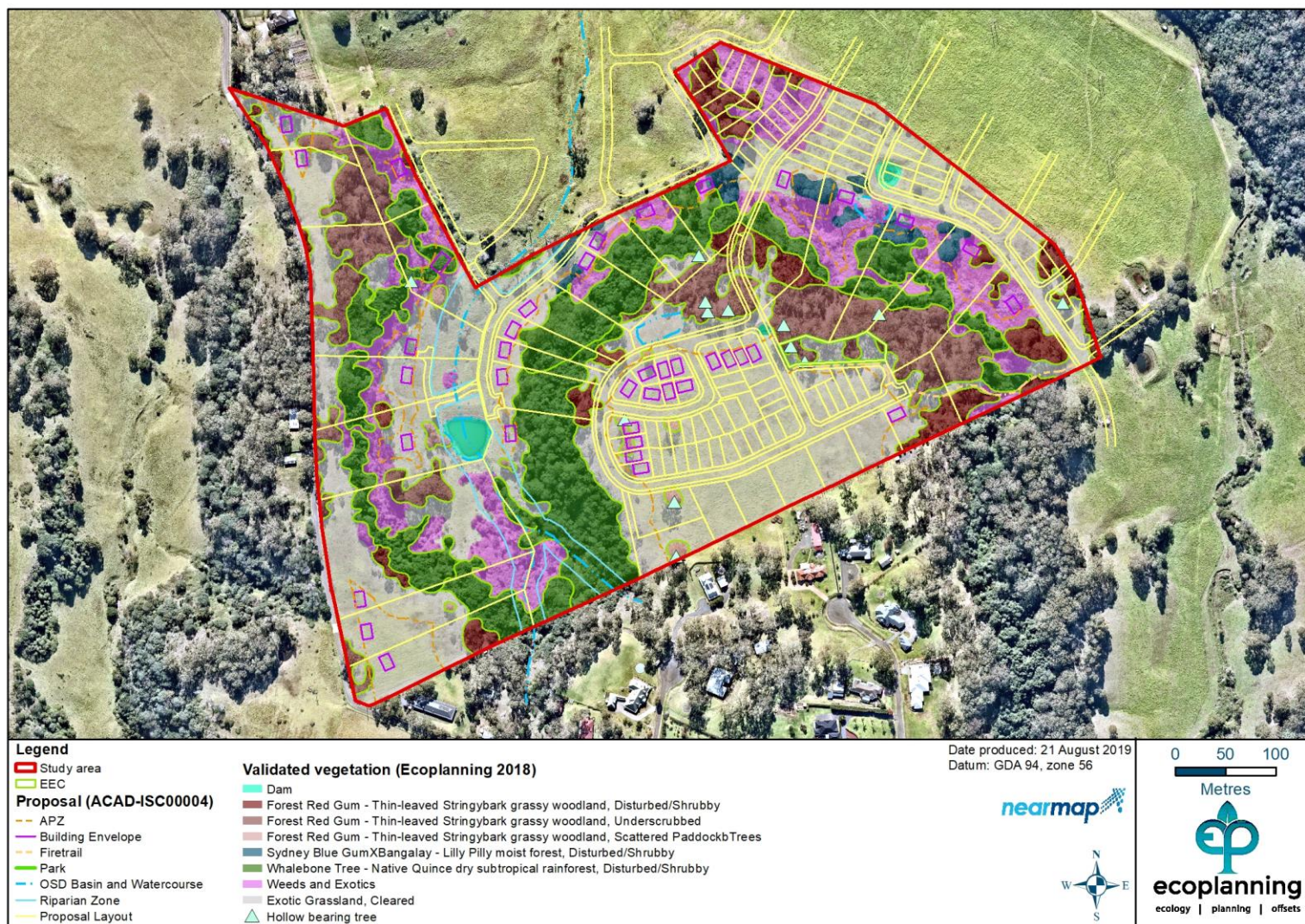


Figure 14: Field validated vegetation, Ecologically Endangered Communities (EEC) and hollow bearing trees.



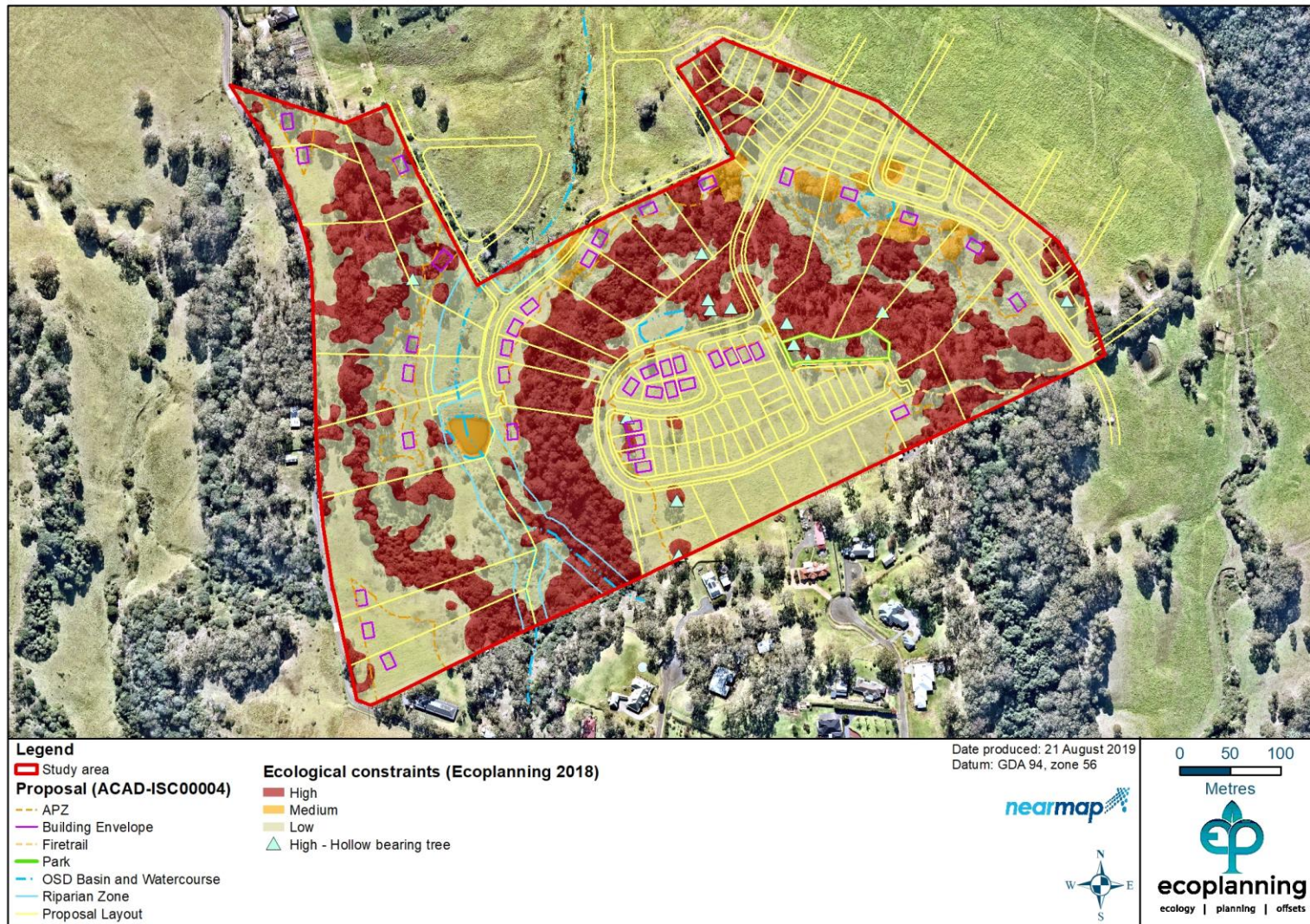


Figure 15: Ecological constraints with proposed lot layout.



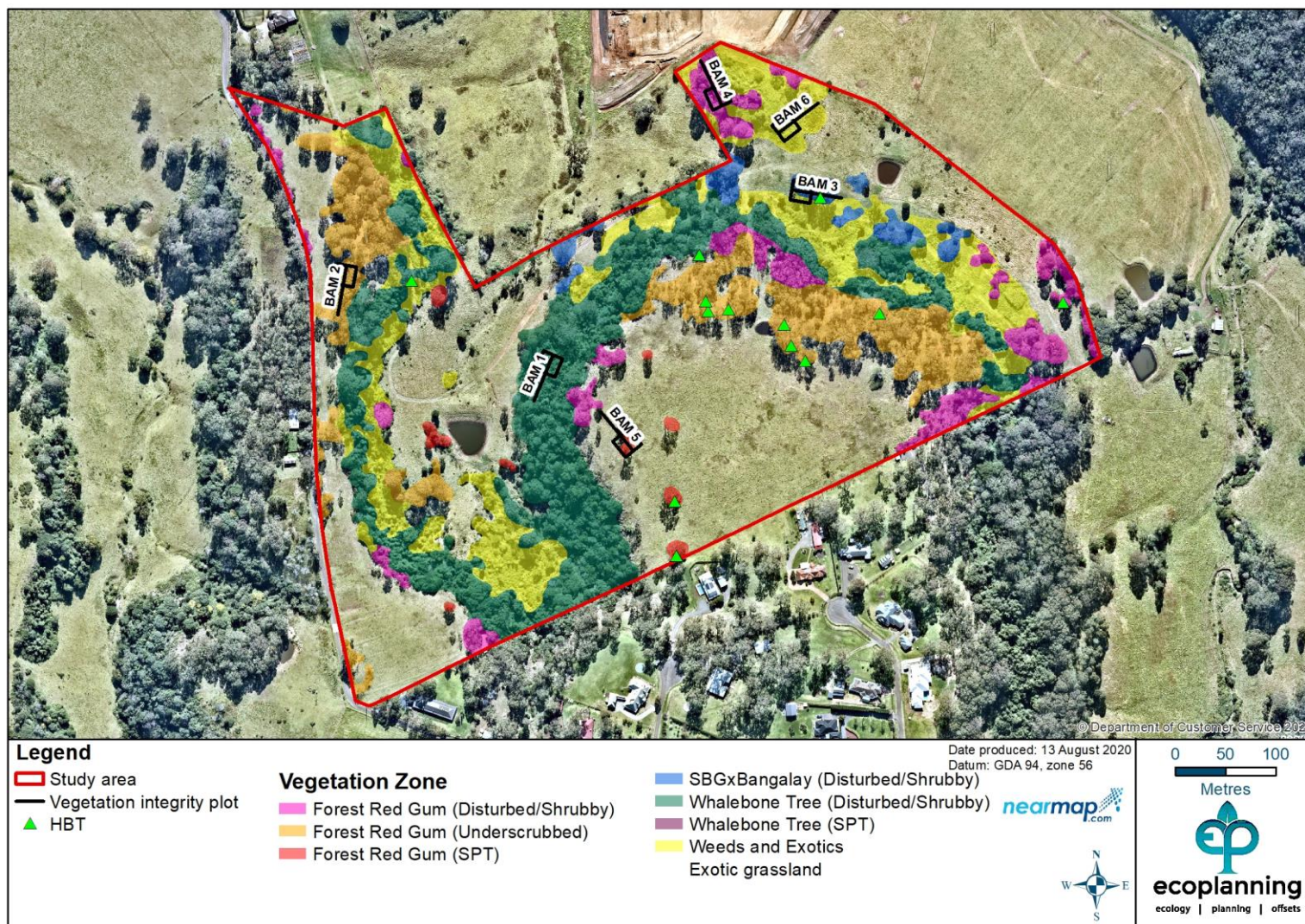


Figure 16: BAM plot locations.



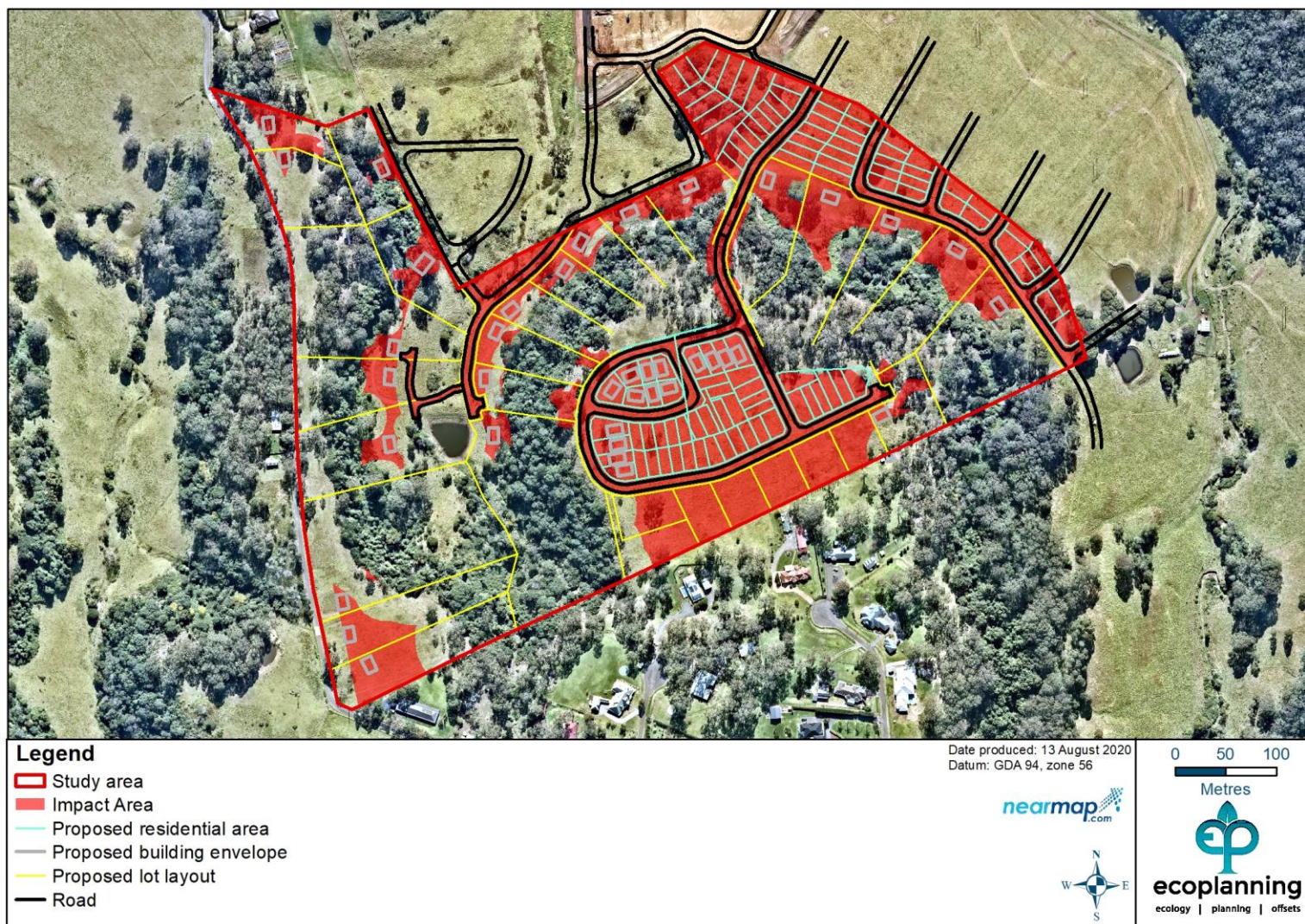


Figure 17: Area impacted by proposed works.



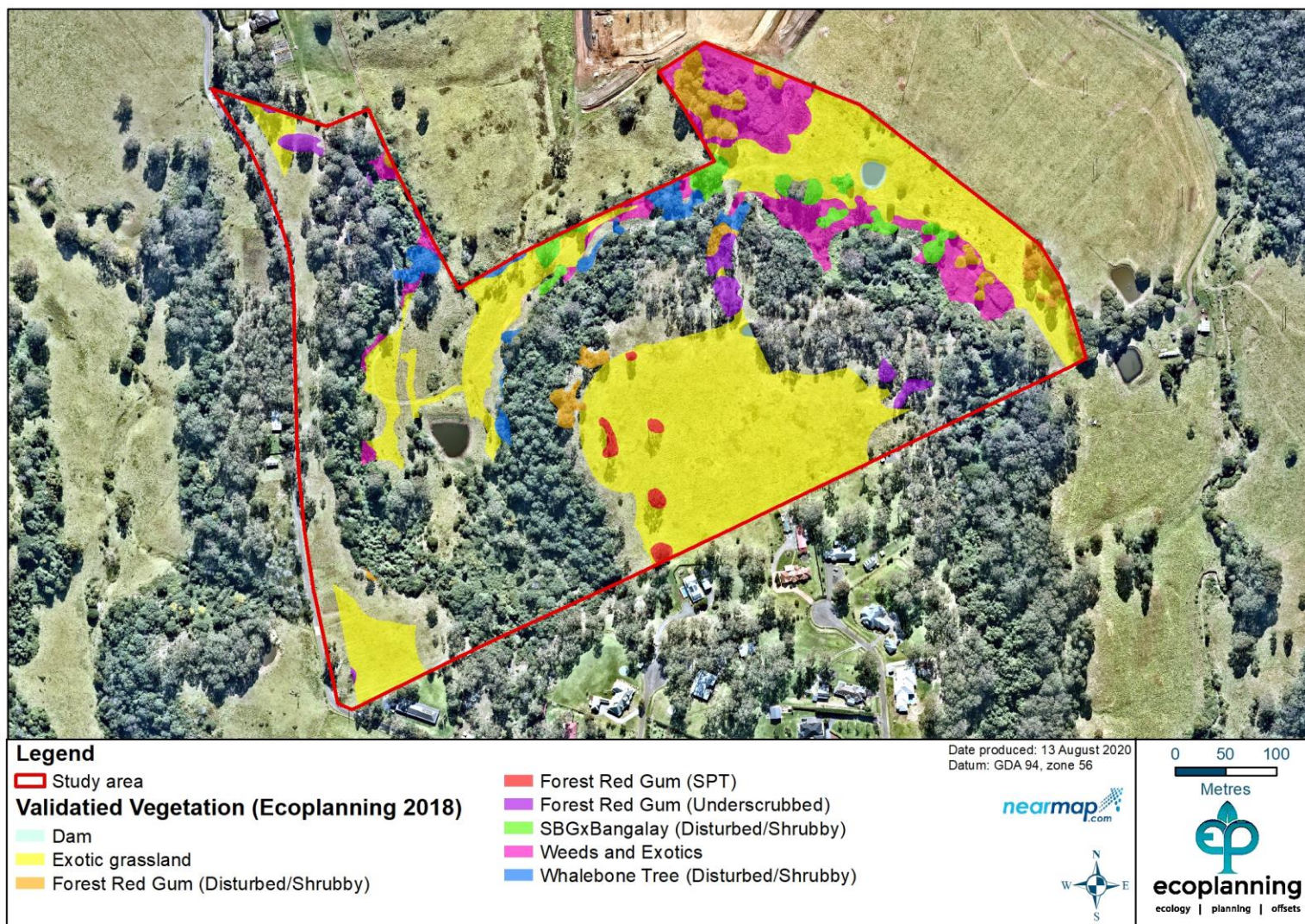


Figure 18: Vegetation communities within the impact area.



## Appendix A: EPBC Act condition categories, rationale and thresholds for Illawarra and South Coast Lowland Forest and Woodland.

Category and rationale	Patch size thresholds	Biotic thresholds		
<b>A. High condition class</b> A larger patch with good quality native understorey and/or many very large trees	≥2 ha	50% of its total understorey vegetation cover* is comprised of native species (exotic annuals are excluded from this assessment) <b>AND</b>		
		At least 6 native plant species per 0.5 ha in the ground layer	<b>OR</b>	The patch has at least ten trees that are either very large (at least 60cm diameter at breast height dbh) <b>OR</b> have hollows.
<b>B. High condition class</b> A patch with very good quality native understorey with a species rich ground layer	≥0.5 ha	At least 70% of the understorey vegetation cover* is comprised of native species (exotic annuals are excluded from this assessment) <b>AND</b> with at least 10 native plant species per 0.5 ha in the ground layer		
<b>C. Moderate condition class</b> A patch with good quality native understorey	≥0.5 ha	At least 50% of its total understorey vegetation cover* is comprised of native species (exotic annuals are excluded from this assessment) and with at least 6 native plant species per 0.5 ha in the ground layer		
<b>D. Moderate condition class</b> A patch that makes other important ecological contributions	≥0.5 ha	At least 30% of total perennial understorey vegetative cover is comprised of native species <b>AND</b>		
		the patch is contiguous** with another patch of native vegetation *** (at least 1 ha in area)	<b>OR</b>	the patch has at least one large locally indigenous tree (at least 60 cm diameter at breast height (dbh)), <b>OR</b> at least one tree with hollows
<b>Notes:</b> <i>*Perennial understorey vegetation cover includes vascular plant species of both the ground layer and the shrub layer (where present) with a life-cycle of more than two growing seasons. The ground layer includes herbs (graminoids and forbs) and low (≤0.5 m) shrubs, but does not include annuals, cryptogams, leaf litter or exposed soil.</i> <i>**Contiguous with another patch of native vegetation means the patch is continuous with or in close proximity (within 100 m) to another area of native vegetation.</i> <i>***'Native vegetation' refers to areas where ≥50% of the perennial vegetation cover is comprised of native plant species.</i>				

## Appendix B: Species likelihood of occurrence

Scientific Name (Common Name)	Legal Status	Distribution	Habitat and Ecology	No. of records	Closest record and date	Most recent and proximity	Likelihood of occurrence	
							Before (survey)	After (survey)
KINGDOM: Animalia; CLASS: Aves								
<i>Calyptrorhynchus lathamii</i>  Glossy Black- Cockatoo	BC Act: V	The species is uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina.	Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. <i>Allocasuarina littoralis</i> ) and <i>A. torulosa</i> are important foods. Feeds almost exclusively on the seeds of several species of she-oak (Casuarina and Allocasuarina species), shredding the cones with the massive bill.	1	4.0 km (1999)	1999 (4.0 km)	Low	Low
<i>Circus assimilis</i>  Spotted Harrier	BC Act: V	The Spotted Harrier occurs throughout the Australian mainland, except in densely forested or wooded habitats of the coast, escarpment and ranges, and rarely in Tasmania. Individuals disperse widely in NSW and comprise a single population.	Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands.	1	3.9 km (2013)	2013 (3.9 km)	Low	Low
<i>Daphoenositta chrysoptera</i>  Varied Sittella	BC Act: V	The species inhabits most of mainland Australia except the treeless deserts and open grasslands. Distribution in NSW is nearly continuous from the coast to the far west. The Varied Sittella's population size in NSW is uncertain but is believed to have undergone a moderate reduction over the past several decades.	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	1	0.90 km (2009)	2009 0.90 km	Low	Low
<i>Petroica phoenicea</i>  Flame Robin	BC Act: V	South east Queensland to south east South Australia and also in Tasmania and south west Western Australia. In NSW, it occurs from the coast to the inland slopes.	Dry eucalypt forests and woodlands in both mature and regrowth vegetation. The understorey is usually open and grassy with few scattered shrubs. Some adults and young birds disperse to more open habitats after breeding. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Habitat	1	0.63 km (2012)	2012 (0.63 km)	Low	Low

Scientific Name (Common Name)	Legal Status	Distribution	Habitat and Ecology	No. of records	Closest record and date	Most recent and proximity	Likelihood of occurrence	
							Before (survey)	After (survey)
			usually contains abundant logs and fallen timber.					
<b>KINGDOM: Animalia; CLASS: Mammalia</b>								
<i>Chalinolobus dwyeri</i> Large-eared Pied Bat	BC Act: V EPBC Act: V	From Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW. There are scattered records from the New England Tablelands and North West Slopes.	Mostly found in dry sclerophyll forests and woodlands, but also in rainforest fringes and subalpine woodlands (Churchill 2008; Hoyer and Schulz 2008). The species is linked to 58 vegetation classes. Roosts in caves, Fairy Martin nests and mines, and beneath rock overhangs. Most likely to hibernate during the cooler months (Churchill 2008). Only one maternity roost is known within a sandstone cave (Pennay 2008).	1	3.6 km (2015)	2015 (3.6 km)	High	High
<i>Falsistrellus tasmaniensis</i> Eastern False Pipistrelle	BC Act: V	The Eastern False Pipistrelle is found on the south-east coast and ranges of Australia, from southern Queensland to Victoria and Tasmania.	Prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings. Hunts beetles, moths, weevils and other flying insects above or just below the tree canopy. Hibernates in winter. Females are pregnant in late spring to early summer.	1	0.63 km (2012)	2012 (0.63 km)	High	High
<i>Miniopterus australis</i> Little Bentwing-bat	BC Act: V	East coast and ranges of Australia from Cape York in Queensland to Wollongong in NSW.	Generally found in well-timbered moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats. Roosting sites are often shared with the Eastern Bentwing-bat and, in winter, the two species may form mixed clusters.	4	0.63 km (2012)	2015 (4.5 km)	High	High
<i>Miniopterus schreibersii oceanensis</i>	BC Act: V	Along the east and north-west coasts of Australia.	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures.	8	0.0 km (2001)	2015 (4.5 km)	High	High

Scientific Name (Common Name)	Legal Status	Distribution	Habitat and Ecology	No. of records	Closest record and date	Most recent and proximity	Likelihood of occurrence	
							Before (survey)	After (survey)
Eastern Bentwing-bat			They occur in a broad range of habitats including rainforest, wet and dry sclerophyll forest, paperbark forest and open grasslands. The species is linked to 74 vegetation classes. Forages for flying insects above the tree canopy and along waterways (Churchill 2008; Hoyer and Hall 2008).					
<i>Mormopterus norfolkensis</i> Eastern Freetail-bat	BC Act: V	Found along the east coast from south Queensland to southern NSW.	Dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures. Usually solitary but also recorded roosting communally, probably insectivorous.	3	3.2 km (2015)	2015 (3.6 km)	High	High
<i>Pteropus poliocephalus</i> Grey-headed Flying-fox	BC Act: V EPBC Act: V	Generally, found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia.	In subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	1	0.63 km (2012)	2012 (0.63 km)	High	High
<i>Scoteanax rueppellii</i> Greater Broad-nosed Bat	BC Act: V	Mainly in the gullies and river systems that drain the Great Dividing Range, from north-eastern Victoria to the Atherton Tableland. It extends to the coast over much of its range. In NSW it is widespread on the New England Tablelands, however, does not occur at altitudes above 500 m.	Uses a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Open woodland habitat and dry open forest suits the direct flight of this species as it searches for beetles and other large, slow-flying insects. Usually roosting in tree hollows, it has also been found in buildings.	1	4.5 km (2009)	2009 (4.5 km)	Moderate	Moderate
<b>KINGDOM: Plantae</b>								
<i>Chorizema parviflorum</i> <i>Chorizema parviflorum</i> Benth.	BC Act: E2	Recorded from between Austinmer and Albion Park	All known sites (excluding the site at Austinmer) occupy woodland or forest dominated by <i>Eucalyptus tereticornis</i> and/or <i>E. longifolia</i> . Found in coastal headland at	10	1.4 km (1997)	2016 (3.1 km)	Moderate	Not present

Scientific Name (Common Name)	Legal Status	Distribution	Habitat and Ecology	No. of records	Closest record and date	Most recent and proximity	Likelihood of occurrence	
							Before (survey)	After (survey)
in Wollongong and Shellharbour LGAs			Austinmer. Flowers from August to January, with seeds maturing from November.					
<i>Cynanchum elegans</i> White-flowered Wax Plant	BC Act: E1 EPBC Act: E	Restricted to eastern NSW, from Brunswick Heads on the north coast to Gerroa in the Illawarra region, and as far west as Merriwa in the upper Hunter River valley	Usually occurs on the edge of dry rainforest vegetation. Flowers from August to May, peaking in November.	14	0.0 km (2016)	2018 (0.6 km)	High	Known
<i>Daphnandra johnsonii</i> Illawarra Socketwood	BC Act: E1 EPBC Act: E	Restricted to the Illawarra region in the Shoalhaven, Kiama, Shellharbour and Wollongong LGAs.	Found in rocky hillsides and gullies of the Illawarra lowlands, occasionally extending onto the upper escarpment slopes. Found in rainforest and moist eucalypt forest. Associated soils are loams and clay loams derived from volcanic and fertile sedimentary rocks. Flowers briefly in September and early October with fruits taking 10 to 12 months to mature.	45	0.83 km (2016)	2018 (3.1 km)	Mod	Low
<i>Gossia acmenoides</i> <i>Gossia acmenoides</i> population in the Sydney Basin Bioregion south of the Georges River	BC Act: E2	Known from Shellharbour, Wollongong and Kiama LGAs and encompasses all occurrences south of the Georges River. This population is the southern most occurrence of the species and is approximately 175 km from the nearest population to the north in the Hunter region of NSW.	Found in subtropical and dry rainforest on the ranges and coastal plain of eastern Australia Estimated less than 100 mature plants, through approximately 30 sites. Occurring often as a single individual or small group. Flowers late spring to early autumn	1	1.0 km (2016)	2016 (1.0 km)	Low	Not present
<i>Irenepharsus trypherus</i> Illawarra Irene	BC Act: E1 EPBC Act: E	Recorded from 18 sites within the LGAs of Kiama, Shellharbour, Shoalhaven, Tallaganda, Wingecarribee, and Wollongong. Found at such places as Minnamurra Falls, the Jamberoo area, and Morton and Macquarie Pass National Parks.	Typically inhabits steep rocky slopes near cliff lines and ridge tops. Less typically found growing out of rock crevices or on narrow benches along cliff lines. The majority of sites are recorded from the upper slopes of the Illawarra escarpment, although the species has also been recorded from deep sandstone gorges of the Shoalhaven River.	5	0.2 km (2016)	2018 (1.1 km)	Low	Low
<i>Pimelea curviflora</i> var. <i>curviflora</i>	BC Act: V EPBC Act: V	Confined to the coastal area of the Sydney and Illawarra regions. Populations are known between	Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst	15	2.8 km (2014)	2016 (3.1 km)	Moderate	Low

Scientific Name (Common Name)	Legal Status	Distribution	Habitat and Ecology	No. of records	Closest record and date	Most recent and proximity	Likelihood of occurrence	
							Before (survey)	After (survey)
		northern Sydney and Maroota in the north-west. New population discovered at Croom Reserve near Albion Park in Shellharbour LGA in August 2011. Formerly recorded around the Parramatta River and Port Jackson region including Five Dock, Bellevue Hill and Manly.	woodlands. Also recorded in Illawarra Lowland Grassy Woodland habitat at Albion Park on the Illawarra coastal plain. Flowers October to May.					
<i>Pterostylis gibbosa</i> Illawarra Greenhood	BC Act: E1 EPBC Act: E	Known from a small number of populations in the Hunter region (Milbrodale), Illawarra region (Albion Park and Yallah) and Shoalhaven region (near Nowra). Apparently extinct in western Sydney where it was first collected (1803).	Found in open forest or woodland, on flat or gently sloping land with poor drainage. In the Illawarra region, the species grows in woodland. Near Nowra, the species grows in an open forest and in the Hunter region, the species grows in open woodland. Deciduous orchid that is only visible above ground between late summer and spring.	89	2.7 km (2017)	2017 (2.7 km)	Low	Not present
<i>Solanum celatum</i>	EPBC Act: E1	Found from Wollongong to just south of Nowra, and west to Bungonia. Majority of records are prior to 1960 and the majority of populations are likely to have been lost to clearing.	Grows in in rainforest clearings, or in wet sclerophyll forests. Flowers from August to October and produces fruit from December to January.	5	2.0 km (2010)	2016 (2.3 km)	Moderate	Low
<i>Zieria granulata</i> Illawarra Zieria	BC Act: E1 EPBC Act: E	Restricted to the Illawarra region where it is recorded from a number of sites. The species primarily occupies the coastal lowlands between Oak Flats and Toolijooa, in the local government areas of Shellharbour and Kiama. This is a range of approximately 22 km..	The typical habitat is dry ridge tops and rocky outcrops on shallow volcanic soils, usually on Bumbo Latite. Less frequently found on the moist slopes of the Illawarra escarpment and in low-lying areas on Quaternary sediments. Associated vegetation includes <i>Melaleuca armillaris</i> scrub, <i>Eucalyptus tereticornis</i> woodland and rainforest margins, although the species has been recorded from a number of other vegetation types. Most vegetation types are also listed as an EEC.	73	0.0 km (2010)	2018 (0.9 km)	Moderate	Recent record