



2 September 2010

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**ASSESSMENT OF REVISED LAYOUT OF PROPOSED PARKSIDE
DEVELOPMENT**

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Dear Peter

The purpose of this letter is to assess the suitability the revised layout for the proposed rezoning at 'Parkside', Kings Ave, Terrigal, in relation to ecological values.

Cumberland Ecology has assessed the flora and fauna habitat values of three areas at Parkside proposed for zoning modifications based upon the revised layout. A description of the flora and fauna habitat values of these three areas is provided within **Appendix A** to this letter.

The revised layout minimises the removal of old growth trees along the north western boundary of the subject land and provides a large buffer around the Lowland Rainforest endangered ecological community. The development footprint has also been reduced within the vegetated central portion of the site and expanded within a partially cleared area along the eastern boundary. Photographs from the surveys are located within **Appendix B**.

The revised layout achieves a better ecological outcome than previous layouts as it minimises the amount of forest vegetation removed and expands into cleared areas, which have less ecological value.

If you have any queries about this assessment or require more information, please contact either myself or Katrina Wolf on 9868 1933.

Yours sincerely

David Robertson

David Robertson

Director

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Appendix A

Ecological Assessment of Revised Layout

A.1 Introduction

A.1.1 Purpose

The purpose of this report is to assess the suitability the revised layout for the proposed rezoning at 'Parkside', Kings Ave, Terrigal, in relation to ecological values.

The objectives of the report are to:

- Describe the condition of habitat within additional land proposed to be included within the development footprint;
- Map additional hollows recorded in newly surveys areas; and
- Provide a discussion of the revised layout in relation to ecological values.

A.1.2 Background

Crighton Properties is proposing the rezoning of Lot 2 DP 1111392, Lot 8 DP 876102, Lot 202 DP 831864, Lot 4 DP 37914 and Lot 1 DP 381971 at 'Parkside', Terrigal (hereafter referred to as the subject lands). An ecological assessment, based upon the original development layout, was conducted on the subject lands in 2007 and 2008 by Conacher Environmental Group. The layout was amended in early 2010, to include additional areas within land zoned for Private Conservation to increase the area of offsets. The most recent amendments to the layout, following discussions with Gosford Council, the Department of Environment, Climate Change and Water and Hunter-Central Rivers Catchment Management Authority, has resulted in the revision of the development layout to minimise impacts to ecological values. The revised layout includes a reduction of development along the western boundary (Lot 202 DP 831864), an expansion of development along the eastern boundary (Lot 4 DP 37914) and inclusion of additional conservation land in the central portion of the subject lands (Lot 1 DP 381971). **Figure A.1** shows the revised layout for the proposed rezoning.

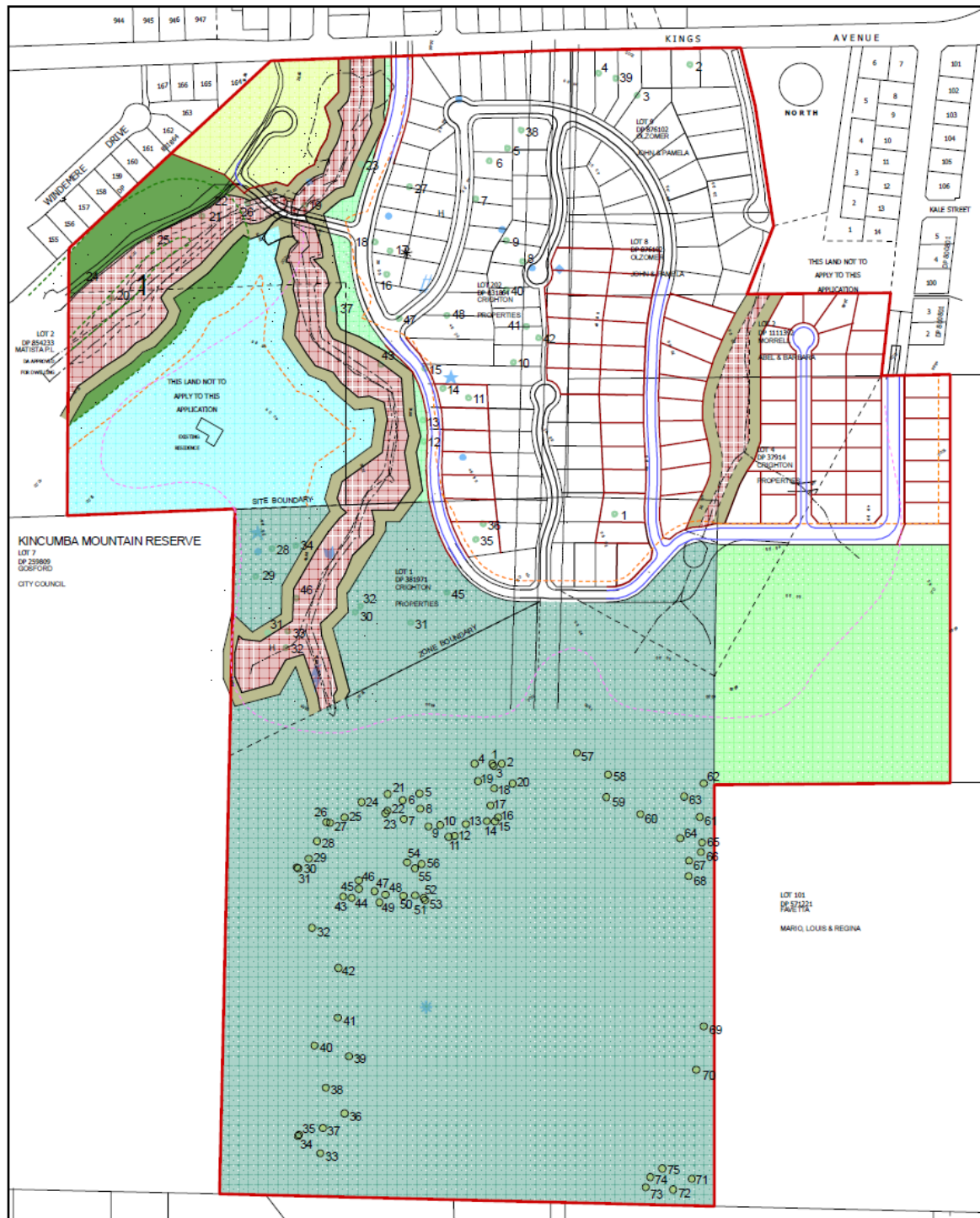


FIGURE A.1 REVISED LAYOUT

A.2 Methodology

A.2.1 Introduction

Flora and fauna habitat surveys were undertaken on 31 August 2010. These surveys were undertaken in three areas of the subject lands, as shown in **Figure A.2**. Survey areas A and B are located within Lot 202 and survey area B is located within Lot 4.

A.2.2 Flora Survey

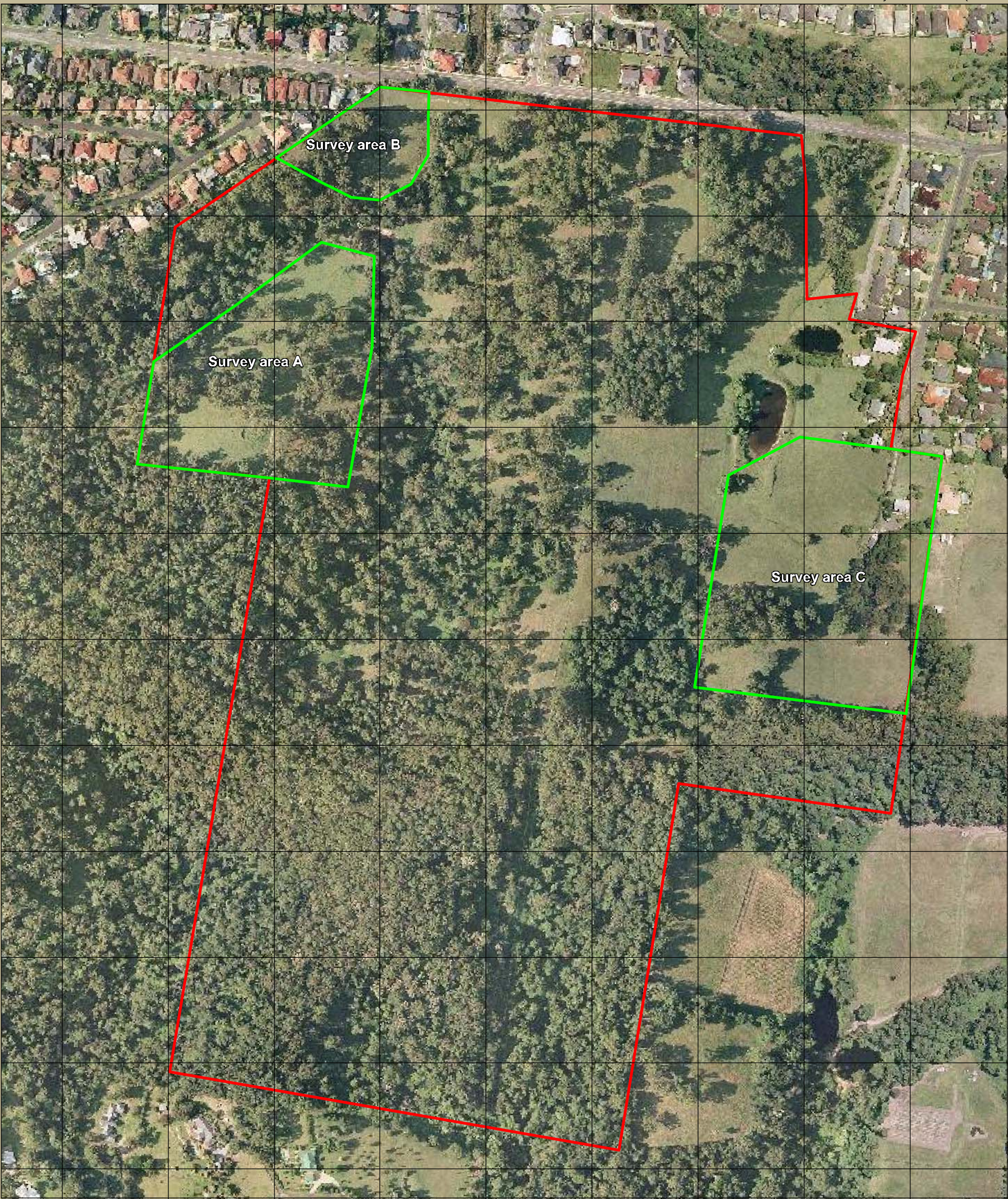
Flora surveys were undertaken within each of the three survey areas in order to obtain an overview of the nature and distribution of the vegetation. Patches of similar vegetation were delineated on an aerial photograph and subsequently surveyed. Information collected within each patch included dominant species within each strata and the percentage of exotic species occurring in each stratum. This information was used to determine the condition of the vegetation within the patch. The vegetation was also checked to see if they conformed to previous vegetation mapping of the subject lands.

A.2.3 Hollow-bearing Tree Assessment

Hollow-bearing tree assessments were undertaken within each of the three survey areas to determine the abundance of hollows within these areas. A random meander was undertaken within the treed portions of the survey areas to detect hollows. Information collected from each hollow-bearing tree included the tree species, height, diameter at breast height (DBH), and spread, and the location and width of hollow. Photographs of each hollow-bearing tree were taken, and the location of each tree recorded with a GPS.

A.2.4 Fauna Habitat Assessment

A general fauna habitat assessment was undertaken within each of the survey areas. These assessments included consideration of important indicators of habitat condition and complexity including the occurrence of microhabitats such as tree hollows, fallen logs, bush rock and wetland areas such as creeks and soaks. Structural features considered included the nature and extent of the understorey and ground stratum and extent of canopy. Tree hollows were used as a general indication of habitat quality for arboreal fauna such as hollow-dwelling mammal, birds and bats.



- Subject lands
- Survey area

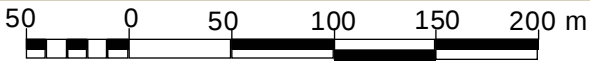


Figure A.2 Survey areas

A.3 Results

A.3.1 Survey Area A

Vegetation within survey area A is comprised of the vegetation community Grassland with Scattered Trees. The flatter portion of the survey area adjacent to the creekline has few trees and the groundcover is dominated by exotic species (**Photograph 1**). The sloping areas of the survey has scattered mature and old growth trees, with a higher proportion of native species concentrated under denser canopy (**Photograph 2**).

The dominant canopy tree within this community is *Eucalyptus pilularis* (Blackbutt). Small trees within this community include *Syncarpia glomulifera* (Turpentine) and *Acacia schinoides* (Green Cedar Wattle). The exotic *Lantana camara* (Lantana) is present within the shrub layer, however, shrubs are largely absent. Within the flatter portions of the community, exotic species comprise nearly 100% of the cover, and within the treed portions, exotic cover is approximately 80%. Dominant exotic species include *Axonopus fissifolius* (Narrow-leaved Carpet Grass), *Paspalum dilatatum* (Paspalum), *Hypochaeris radicata* (Catsear), *Senecio madagascariensis* (Fireweed) and the pasture species *Cynodon dactylon* (Common Couch). Native groundcover species recorded in the treed portions of this community include *Microlaena stipoides* (Weeping Grass), *Pteridium esculentum* (Bracken), *Oplismenus aemulus* and *Sigesbeckia orientalis* (Indian weed). Climbers recorded in this community include *Smilax australis* (Lawyer Vine), *Hibbertia scandens* (Climbing Guinea Flower) *Stephania japonica* var. *discolour* (Snake Vine).

The vegetation within survey area A is generally sparse, with a grassy understorey. The vegetation within survey area A is well connected with adjacent areas of vegetation. A number of sandstone outcrops were recorded on the slope amongst the treed area. A number of hollows were recorded within survey area A, as shown in **Figure A.3**. The age class of the trees within this area are more likely to support the development of hollows. The hollows recorded within this area have the potential to provide nesting and roosting habitat for arboreal mammals, birds and microchiropteran bats. Sulphur-crested Cockatoos (*Cacatua galerita*) were observed occupying one of the hollows.

A.3.2 Survey Area B

The following vegetation communities occur within survey area C:

- Narrabeen Coastal Blackbutt Forest; and
- Grassland with Scattered Trees.

Narrabeen Coastal Blackbutt Forest occurs within the western half of survey area B and is comprised of stand of mature and old growth trees with a grassy understorey (**Photograph 3**). The canopy is dominated by *Eucalyptus pilularis* (Blackbutt), *Eucalyptus saligna* (Sydney Blue Gum) and *Eucalyptus deanei* (Mountain Blue Gum). Species within the small tree stratum include *Syncarpia glomulifera* (Turpentine) and *Acacia schinoides* (Green Cedar Wattle). Shrubs recorded within this area include the exotic *Lantana camara* (Lantana) and the native *Backhousia myrtifolia* (Grey Myrtle). Groundcover species include the native *Microlaena stipoides* (Weeping Grass), *Lomandra longifolia* (Spiny-headed Mat-rush) and *Echinopogon caespitosus* (Bushy Hedgehog-grass), and the exotic *Hypochaeris radicata* (Catsear). Vines recorded within this community include the native *Smilax australis* (Lawyer Vine), *Stephania*

japonica var. *discolour* (Snake Vine) and *Billardiera scandens* (Hairy Apple Berry), and the exotic *Rubus fruticosus* (Blackberry).

Grassland with Scattered Trees occurs within the eastern half of survey area B and includes a stand of regenerating trees (**Photograph 3**). The stand of regenerating trees occurs on fill material is largely comprised of *Eucalyptus acmenoides* (White Mahogany) and *Acacia schinoides* (Green Cedar Wattle). Common groundcover species include the exotic *Axonopus fissifolius* (Narrow-leafed Carpet Grass), *Pennisetum clandestinum* (Kikuyu Grass), *Andropogon virginicus* (Whisky Grass), *Paspalum dilatatum* (Paspalum), *Senecio madagascariensis* (Fireweed) and *Hypochaeris radicata* (Catsear).

The vegetation within survey area B is generally sparse, with a grassy understorey. An access road to an adjoining property bisects the area. Grazing and slashing within survey area B has reduced the structure complexity of the vegetation. Leaf litter and fallen branches provide shelter habitat for common reptile species. The age class of the trees within this area is more likely to support the development of hollows, however no hollows were recorded.

A.3.3 Survey Area C

The following vegetation communities occur within survey area C:

- Coastal Narrabeen Moist Forest;
- Narrabeen Coastal Blackbutt Forest; and
- Grassland with Scattered Trees.

Coastal Narrabeen Moist Forest occurs on the eastern boundary of survey area C. This area is largely comprised of regenerating trees, with older trees occurring down slope, and has an open grassy understorey (**Photograph 5**). Dominant canopy species in this community are *Eucalyptus pilularis* (Blackbutt) and *Eucalyptus acmenoides* (White Mahogany). The small tree stratum is a mix of native and exotic species including *Syncarpia glomulifera* (Turpentine), *Acacia schinoides* (Green Cedar Wattle), *Cinnamomum camphora* (Camphor Laurel) and *Ligustrum sinense* (Small-leaved Privet). Although largely absent, shrubs recorded within this area include the exotic *Lantana camara* (Lantana) and the native *Pittosporum multiflorum* (Orange Thorn). Approximately 60% of the groundcover is comprised of exotic species, which is dominated by *Ehrharta erecta* (Panic Veldtgrass). Native species recorded in the groundcover include *Geranium homeanum*, *Pellaea falcata* (Sickle Fern) and *Entolasia stricta* (Wiry Panic). Climbers recorded in this community include the native *Geitonoplesium cymosum* (Scrambling Lily) and *Parsonsia straminea* (Common Silkpod), and the exotic *Rubus fruticosus* (Blackberry).

Narrabeen Coastal Blackbutt Forest occurs on the western boundary of survey area C. This area is comprised of a mixed age class of trees, with scattered old growth trees, and has an open understorey (**Photograph 6**). Dominant trees in this community include *Eucalyptus pilularis* (Blackbutt), *Syncarpia glomulifera* (Turpentine) and *Eucalyptus acmenoides* (White Mahogany). Small trees in this community include *Eucalyptus pilularis* (Blackbutt) and *Acmena smithii* (Lilly Pilly). Shrubs include *Lantana camara* (Lantana) and *Phyllanthus gunnii*. The groundcover is comprised of a mix of native and exotic species. Native species in the groundcover include *Microlaena stipoides* (Weeping Grass), *Pteridium esculentum* (Bracken)

and *Carex appressa* (Tall Sedge). Exotic species in the groundcover include *Axonopus fissifolius* (Narrow-leafed Carpet Grass), *Sida rhombifolia* (Paddy's Lucerne) and the pasture species *Cynodon dactylon* (Common Couch). Climbers recorded in this community include the native *Stephania japonica* var. *discolour* (Snake Vine) and *Clematis glycinoides* (Headache Vine), and the exotic *Rubus fruticosus* (Blackberry).

Grassland with Scattered Trees dominates survey area C (**Photograph 7**). The trees recorded within this community include a mix of native and exotic species. Common groundcover species include *Sida rhombifolia* (Paddy's Lucerne), *Senecio madagascariensis* (Fireweed), *Axonopus fissifolius* (Narrow-leafed Carpet Grass), *Paspalum dilatatum* (Paspalum), and the pasture species *Cynodon dactylon* (Common Couch). The noxious weed *Sporobolus fertilis* (Giant Parramatta Grass) is also present within this community.

Grazing and slashing within survey area C has reduced the structure complexity of the vegetation. Leaf litter, fallen branches and small rocky outcrops provide shelter habitat for common reptile species. A small drainage line occurs within the northern portion of the cleared area which is intermittently wet. This drainage line would provide some habitat for frog species.

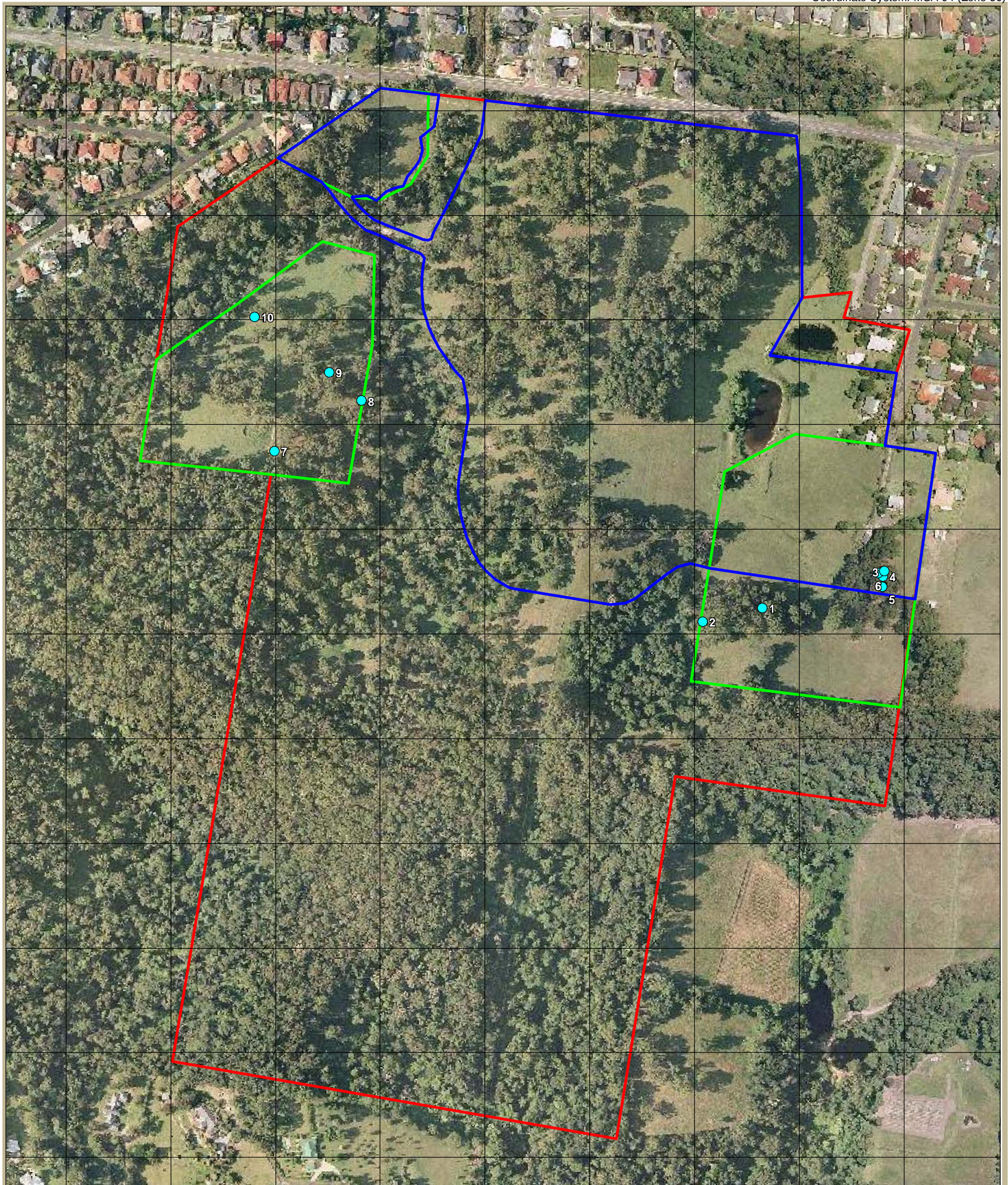
The more mature trees within Coastal Narrabeen Moist Forest and Narrabeen Coastal Blackbutt Forest have a greater potential to support hollows. A few hollows were recorded within survey area C, as shown in **Figure A.3**. The hollows recorded within this area have the potential to provide nesting and roosting habitat for small birds and microchiropteran bats.

A.3.4 Hollow-bearing Trees

Hollow-bearing trees recorded in the current survey are shown in **Figure A.3**. The results of the hollow-bearing tree survey are shown in **Table 1**.

Table 1 HOLLOW-BEARING TREES

Tree	DBH (cm)	Spread (m)	Height (m)	Hollow
1. <i>Eucalyptus acmenoides</i>	120	15	22	Branch (0-5cm)
2. <i>Eucalyptus pilularis</i>	120	12	25	Branch (10-15cm)
3. <i>Eucalyptus siderophloia</i>	40	0	4	Broken Trunk (25-30cm)
4. <i>Eucalyptus siderophloia</i>	70	12	25	Split Trunk (5-10cm)
5. <i>Eucalyptus saligna</i>	100	12	25	Branch (0-5cm)
6. <i>Eucalyptus pilularis</i>	40	5	15	Split Trunk (10-15cm)
7. <i>Eucalyptus pilularis</i>	140	15	30	Split Trunk (5-10cm) Split Base (15-20cm)
8. <i>Eucalyptus pilularis</i>	120	8	25	Split Base (25-30cm)
9. <i>Eucalyptus pilularis</i>	80	10	25	Branch (15-20cm)
10. <i>Eucalyptus pilularis</i>	110	10	30	Split Trunk (0-5cm) Split Trunk (10-15cm) Branch (10-15cm)



- ▭ Subject lands
- ▭ Survey area
- ▭ Development footprint
- Hollow-bearing tree



Figure A.3 Hollow-bearing trees

A.4 Discussion and Conclusion

The revised layout reduces the footprint along the north western boundary and the central portion of the subject lands, and expands the footprint to the east. The previous development footprint occupied 20.1ha of the subject land. Under the revised layout, the development footprint would occupy 18.1ha of the subject land. **Table 1** shows the areas of each vegetation community to be removed under the original development layout and the current revised layout. The revised footprint occupies a greater area within the Grassland and Scattered Trees vegetation community mapped by Conacher Environment Group.

Table 2 AREAS OF EACH VEGETATION COMMUNITY PROPOSED TO BE REMOVED UNDER THE PREVIOUS DEVELOPMENT FOOTPRINT AND THE CURRENT REVISED DEVELOPMENT FOOTPRINT

Vegetation Community	Original Development Footprint (ha)	Current Revised Development Footprint (ha)
Coastal Warm Temperate Rainforest	0	0
Coastal Narrabeen Moist Forest	0.3	0.3
Narrabeen Coastal Blackbutt Forest	6.6	6.3
Disturbed Vegetation (regenerating)	3.3	1.2
Grassland with Scattered Trees	9.9	10.3
Total	20.1	18.1

Survey area A has previously been proposed for inclusion within a private conservation zoning. Surveys undertaken for this assessment show that the vegetation supports foraging and nesting habitat for a number of the threatened fauna species previously recorded on the subject lands. This area is also well connected with adjacent areas of vegetation. The portions of this survey area contained within the buffers for the riparian corridor is comprised of Grassland with Scattered Trees. These areas are proposed for revegetation, which will increase the ecological value and add to the conservation lands proposed for the project.

The current revised layout includes the exclusion of land to the north of the Lowland Rainforest endangered ecological community (EEC) and adjacent to survey area B from the development footprint. Inclusion of this area within the conservation lands provides a buffer to the EEC vegetation. In addition to this, the age class of the trees within this area are more likely to support the development of hollows, which provide nesting and roosting habitat for a number of the threatened species recorded on the subject lands. Some old growth trees will be removed within survey area A.

An area of vegetation along the northern boundary of Lot 1 (at the centre of the subject lands) has been included within the conservation lands under the revised layout. A number of hollows have been recorded within this area. This area of land is largely comprised of regenerating vegetation. Inclusion of this land within the conservation lands will allow for further regeneration of the vegetation, adding to the potential habitat for threatened fauna species.

The development footprint has been expanded within survey area C in the eastern portion of the subject lands. Previous and current land uses has resulted in a reduction in the ecological value of the land within survey area C. Much of the vegetation has been cleared and these areas are currently comprised of exotic grassland. Some cleared areas within survey area C are to be included within the conservation lands and allowed to regenerate. Development within survey area C will include the removal of some hollow-bearing trees containing small hollows.

The revised layout achieves a better ecological outcome than previous layouts due to the minimisation of impacts to areas with higher ecological values. The current revised layout includes the implemented avoidance measures, such as reducing the development footprint within areas containing greater ecological values, such as buffers for EECs and old growth trees. Some areas with a high potential for regeneration have been included within the conservation lands. Where the development footprint has been expanded, it occurs within areas with lower ecological values.

Appendix B

Photographs



Photograph 1 Survey area A: Grassland with Scattered Trees on lower slope



Photograph 2 Survey area A: Grassland with Scattered Trees on upper slope



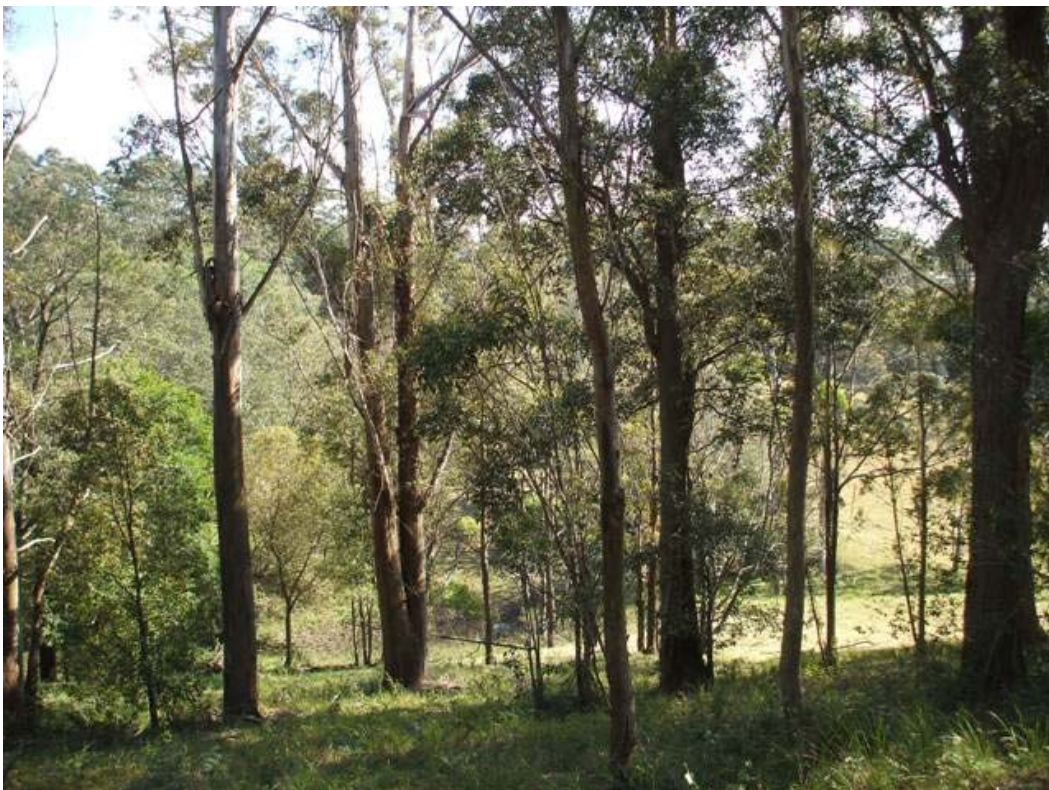
Photograph 3 Survey area B: Narrabeen Coastal Blackbutt Forest



Photograph 4 Survey area B: Grassland with Scattered Trees



Photograph 5 Survey area C: Coastal Narrabeen Moist Forest



Photograph 6 Survey area C: Narrabeen Coastal Blackbutt Forest



Photograph 7 Survey area C: Grassland with Scattered Trees