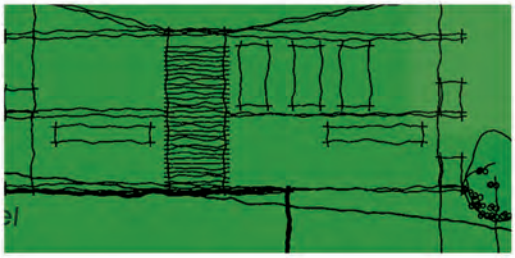
PLANIT
CONSULTING

Ecological Site Assessment

Lot 5 DP 880917
Shara Boulevarde,
Ocean Shores North NSW
for Byron Shire Council





Prepared By Planit Consulting Pty Ltd - December 2013

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ECOLOGICAL SITE ASSESSMENT

1.0 PROJECT INTRODUCTION

Planit Consulting Pty Ltd has been commissioned to provide an ecological site assessment of the land located at Lot 5 DP 880917, Shara Blvd, Ocean Shores North. This report has been prepared to identify key site opportunities and constraints, assess potential impacts and analyse the development footprint and site layout.

1.1 Study Contributors

Adam Smith – Coordination
John Bruun (B.Env.Mng+Dip.Hrt) – Ecology
Morgan Hamilton (B.Env.Sci) – Environmental Scientist
Micheal Hallinan – Wildlife Manager (Lic)
Donna Douthwaite (Dip.Hrt) – Field Assistant

This assessment has examined the relevant criteria to enable an understanding of what flora, fauna, and ecological interactions are present on site. This information has been used in order to provide initial findings on the ecological impacts and develop environmental management strategies that will assist in planning, site layout, rehabilitation strategies and future landscaping of the site specifically relating to a proposal for sporting and recreational use. The information contained within this report will assist in guiding the proposed works in an environmentally considerate direction in relation to the proposed development. This report identifies a range of assessment details, involving the analysis of the following ecological components:

- Botanical surveys
- Vegetation types present
- Condition of vegetation
- Vegetation mapping
- Habitat analysis
- Habitat corridor value
- Fauna surveys
- Presence of fauna species
- Ecological significant areas
- Impact analysis of the proposed actions

1.2 Proposed Land Use – Sporting Fields

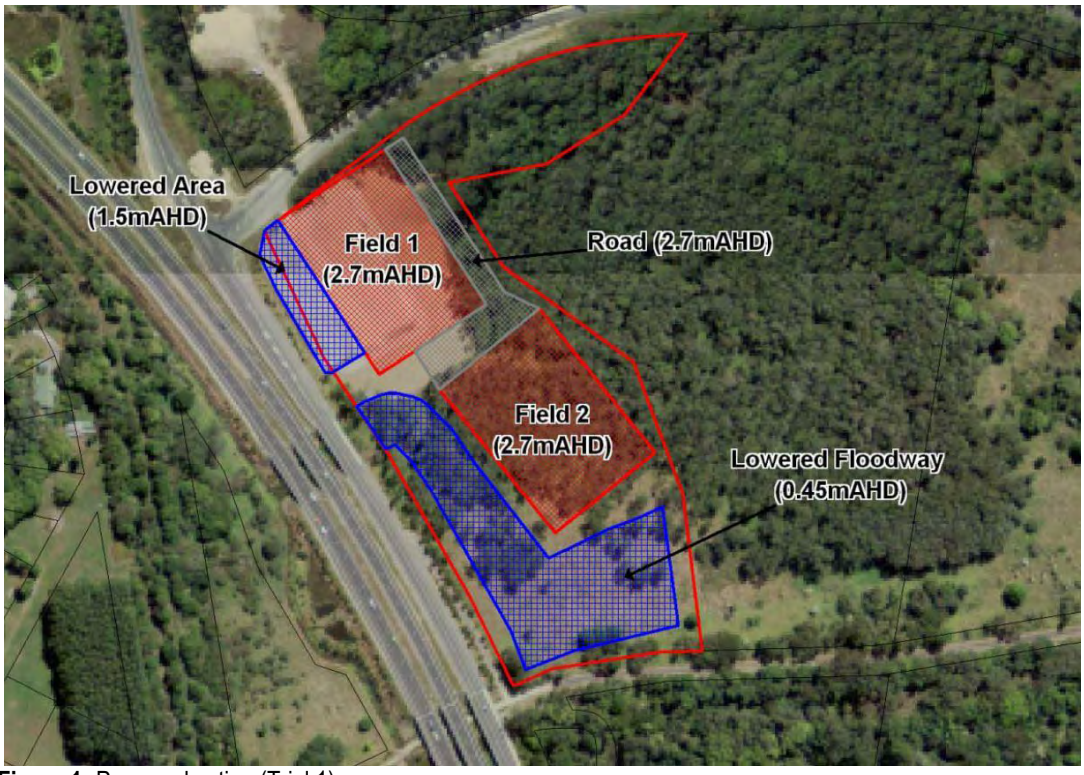

Figure 1: Proposed action (Trial 1)

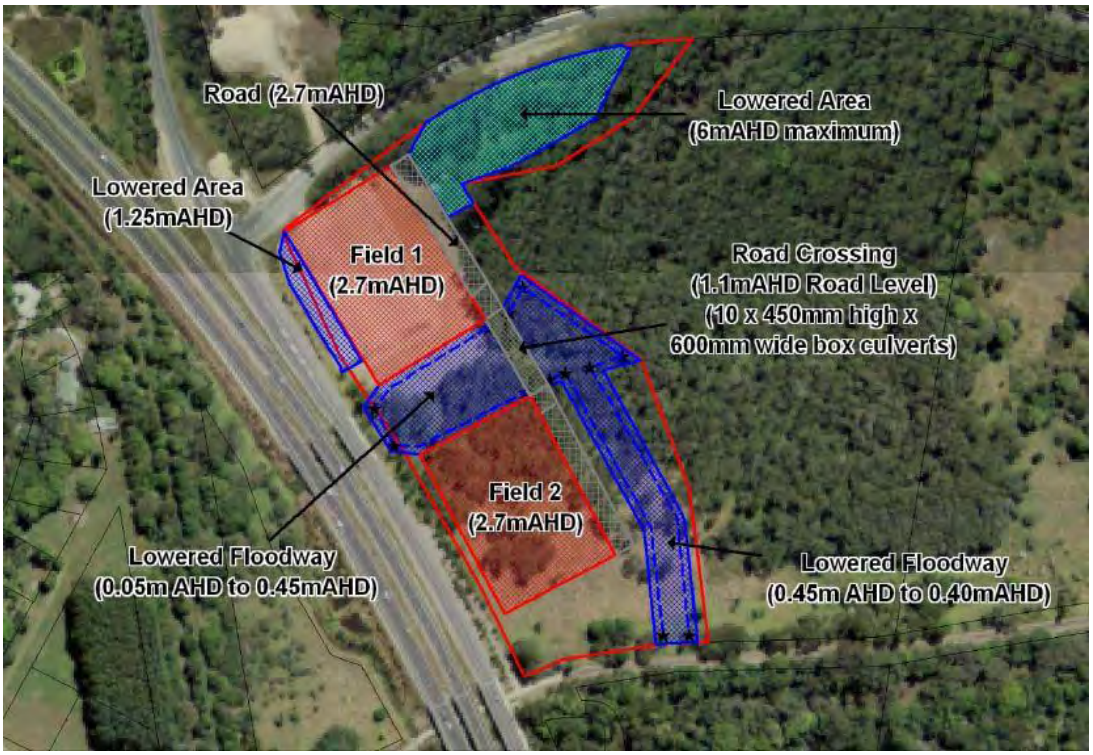

Figure 2: Proposed action (Trial 2)

1.3 Executive Summary

The site has been allocated into five 5 distinct vegetation communities incorporating eco-tone transitions, this vegetation mosaic occurrence creates various habitat opportunities for flora and fauna by diversity of influencing factors.

2.6 ha (33%) of the site has been filled in the north western portion and is highly disturbed by past earthworks. This portion and has therefore aligned itself with the development proposal to support recreational and community infrastructure

However 3.14 ha (40%) of the site is classified as Endangered Ecological Community and 2.6 ha is E.Piliuaris which is known a primary Koala Habitat.

The site layout is critical to increase the ecological outcomes and subsequent planning approval process. The Stormwater and site layout has been assessed and impact calculation presented to determine the most suitable site layout. The Study has also provided a conceptual layout from an ecological perspective for consideration.

The site is located on the fringe of a larger intact habitat corridor which includes the national park, this peripheral location reduces the impact on the bioregional corridor.

The 7 part test has been conducted and considerations have been made relating to 21 specific threatened species that are likely to or may utlise the site. (Refer to section 7). The result demonstrates that the current proposed actions will influence threatening process but are highly unlikely to increase extinction pressures on any local population of endangered ecological community.

Habitat potentials for threatened plant species occurs in the far north eastern corner of the site.

The proposal will be required to support threaten species recovery programs and assist in achieving a net biodiversity gain. On this matter the proposal will be strengthened by specific restoration ecology principle being applied to the subject site, including targeted habitat functions for specific threatened species

The removal of the EEC (2.5 ha) is likely to be subject to offset constraints. This will include acquisition op property with similar and degraded characteristics suitable to conserve and restore Swamp Sclerophyll Forest, this is usually subject to flooding, is under 50 year flood levels and therefore is usually not prime developable land, therefore reducing acquisition costs.

This may be influenced by a 1:10 offset ratio, but with strong investment on site restoration it may be negotiated to 1:5 and still meet the intent of legislation.

The results of the impact assessment conclude that trial 1 site layout is the preferred option when considering approval pathways and offset costs for environmental panning legislation.

VEGETATION DESKTOP ANALYSIS

1.4 Methodology

Provisions of the desktop analysis:

- National Parks and Wildlife Service Atlas related maps and past studies
- Byron Shire Council Local Environment Plan and overlay maps
- Literature Reviews

1.5 Database Analysis & Literature Review

Overlay maps and data sources available for the site through the Byron Shire Council, National Parks and Wildlife Service Atlas and Department of Environment and Climate Change have been reviewed to provide current and historic records of environmental planning considerations related to the subject site.

1.5.1 Byron Local Environment Plan 1988

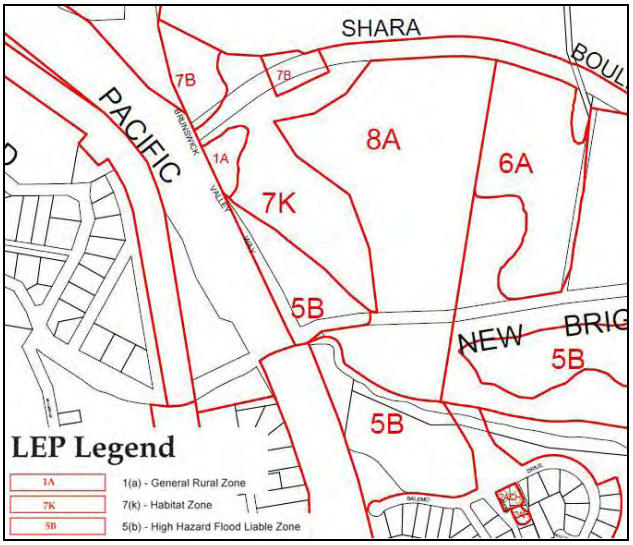

Figure 3: Byron Local Environment Plan '1988'

Under the Byron Local Environment Plan 1988 the subject site is mapped as:

- 1(a) 'General Rural Zone'
- 5(b) 'High Hazard Flood Liable Zone'
- 7(k) Habitat Zone

1.5.2 Surrounding Reserves

Figure 4: Surrounding nature reserves and environmental parks

Reserves surrounding the subject site include:

- Billinudgel Nature Reserve located approximately 2km to the north of the
- Brunswick Heads Nature Reserve 3km to the south of the site.

1.5.3 Vegetation Type

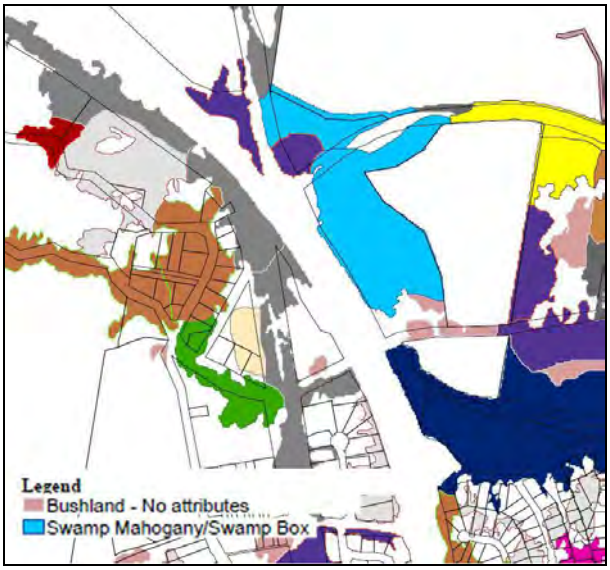

Figure 5: Byron Shire Council vegetation mapping overlay

The vegetation on the subject site is mapped as Swamp Mahogany/Swamp Box with a small portion mapped as Bushland – no attributes under the Byron Shire Council vegetation mapping overlay.

1.5.4 High Conservation Value Vegetation

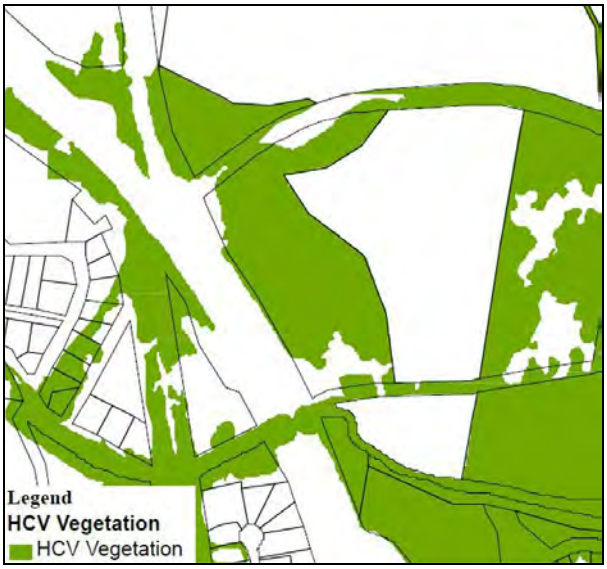

Figure 6: Byron Shire Council HCV mapping overlay

The majority of the subject site is mapped as High Conservation Value vegetation by the Byron Shire Council HCV overlay.

1.5.5 Koala Habitat

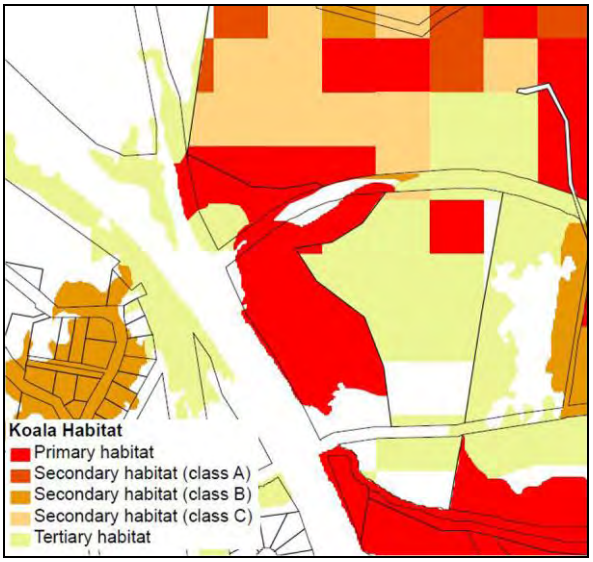

Figure 7: Byron Shire Council Koala Habitat mapping overlay

The majority of the subject site is mapped as Primary Koala Habitat by the Byron Shire Council Koala Habitat overlay.

1.5.6 Threatened Fauna Habitat

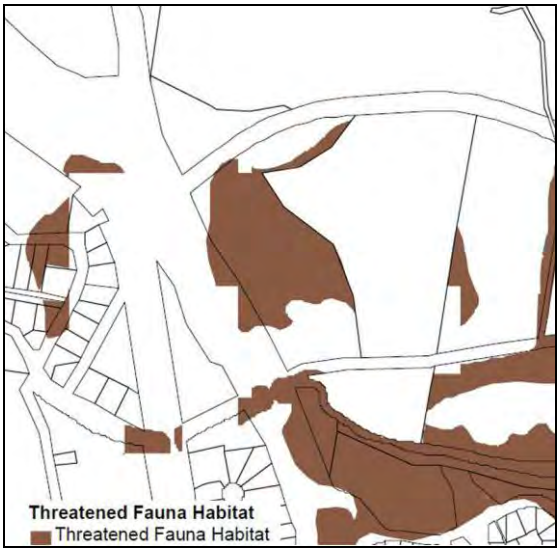

Figure 8: Byron Shire Council Threatened Habitat mapping overlay

The majority of the subject site is mapped as Threatened Fauna Habitat by the Byron Shire Council mapping overlay.

1.5.7 Wildlife Corridors

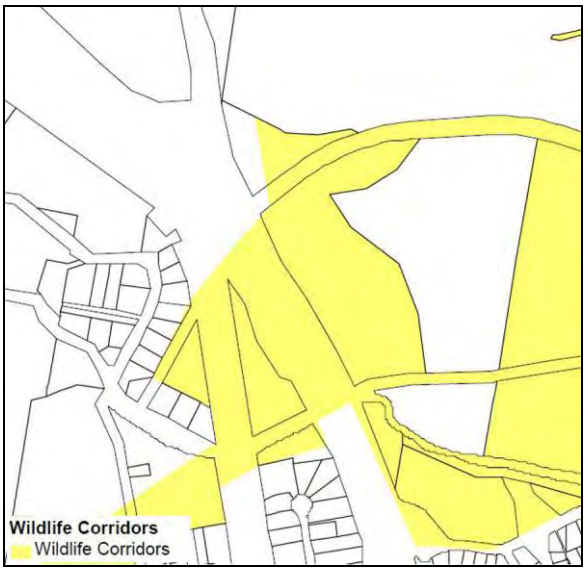

Figure 9: Byron Shire Council Wildlife Corridor mapping overlay

The entire subject site is mapped as a Wildlife Corridor by the Byron Shire Council overlay.

1.5.8 Eco Wetland

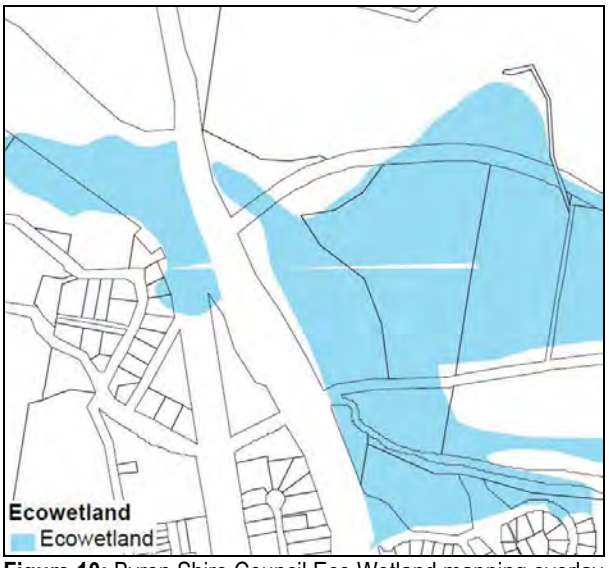

Figure 10: Byron Shire Council Eco Wetland mapping overlay

The majority of the subject site is mapped as an Eco Wetland by the Byron Shire Council Eco Wetland mapping overlay.

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1.5.9 National Parks

Figure 9: Byron Shire Council National Park mapping overlay

The land surrounding the subject site to the north, east and south is mapped as Marshalls Creek National Park by the Byron Shire Council mapping overlay.

1.5.10 Key Fish Habitat

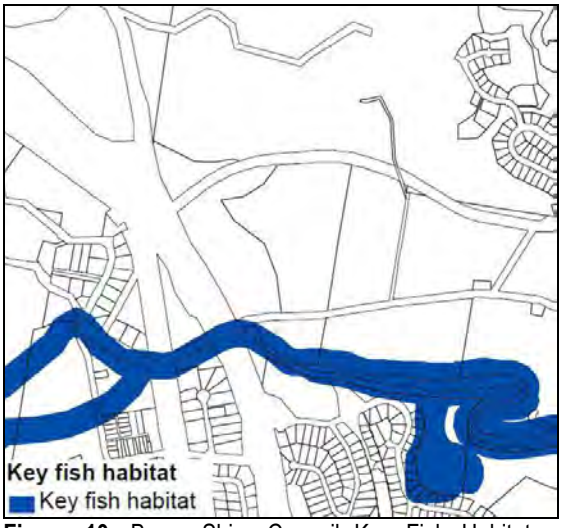


Figure 10: Byron Shire Council Key Fish Habitat mapping overlay

Marshalls Creek to the south of the subject site is mapped as Key Fish Habitat by the Byron Shire Council.

VEGETATION ASSESSMENT

1.6 Introduction

This section of the report provides the details, methods and results from the vegetation surveys. This process allows the vegetation association present on site to be identified and mapped, as well as providing detailed analysis of the sites ecological value by the assessment of various parameters.

The area surrounding the subject site consists of intact National park to the north and east, whilst Marshalls Creek runs adjacent the southern boundary. The subject site is bordered by the M1 Pacific Highway and Brunswick Valley Way directly to the east. The vegetation community directly adjacent of the subject site to the east is described as degraded drainage swale with regrowth Acacia and Eucalypt – 5 -10 years

The study has surveyed the vegetation and has been assessed to contain five (5) vegetation association's (Refer to Appendix 1) these are described as;

- **Vegetation Community 1** – Open *Setaria sphacelata* Grassland with mixed pioneer, exotic annuals and woody weeds
- **Vegetation Community 2** – Mid-dense to dense *Carex appressa Gahnia aspera* sedgeland
- **Vegetation Community 3** – Mid-dense Pioneer regeneration complex/ rainforest planting
- **Vegetation Community 4** – Mid-dense *Eucalyptus pilularis*, *Lophostemon confertis* forest with developing rainforest understory
- **Vegetation Community 5** – Mid dense *Eucalyptus robusta*, *Melaleuca quinquenervia* swamp scleropyll forest

1.7 Vegetation Survey Methodology

The onsite vegetation survey areas were selected by considering environmental factors that influence vegetation growth and development; which include:

- Landscape location - Ridgeline / Gully
- Creek systems
- Hill face aspect - N.E.S.W
- Elevation
- Aerial photography
- Community Distribution

A Reference Site Field Survey Form, scaled site plans, a GPS recorder and camera were used to record data that is relevant to the ecological assessment. This included plant identification, structural analysis and diversity characterization, which enable establishment of:

- Vegetation Communities
- Height Estimates
- Percentage Foliage Cover
- Canopy cover

- Canopy age estimation
- Weed invasion
- Diversity assessment
- Disturbance / Impacts
- Conservation assessment

1.8 Vegetation Community 1 – *Grassland (VC 1)*

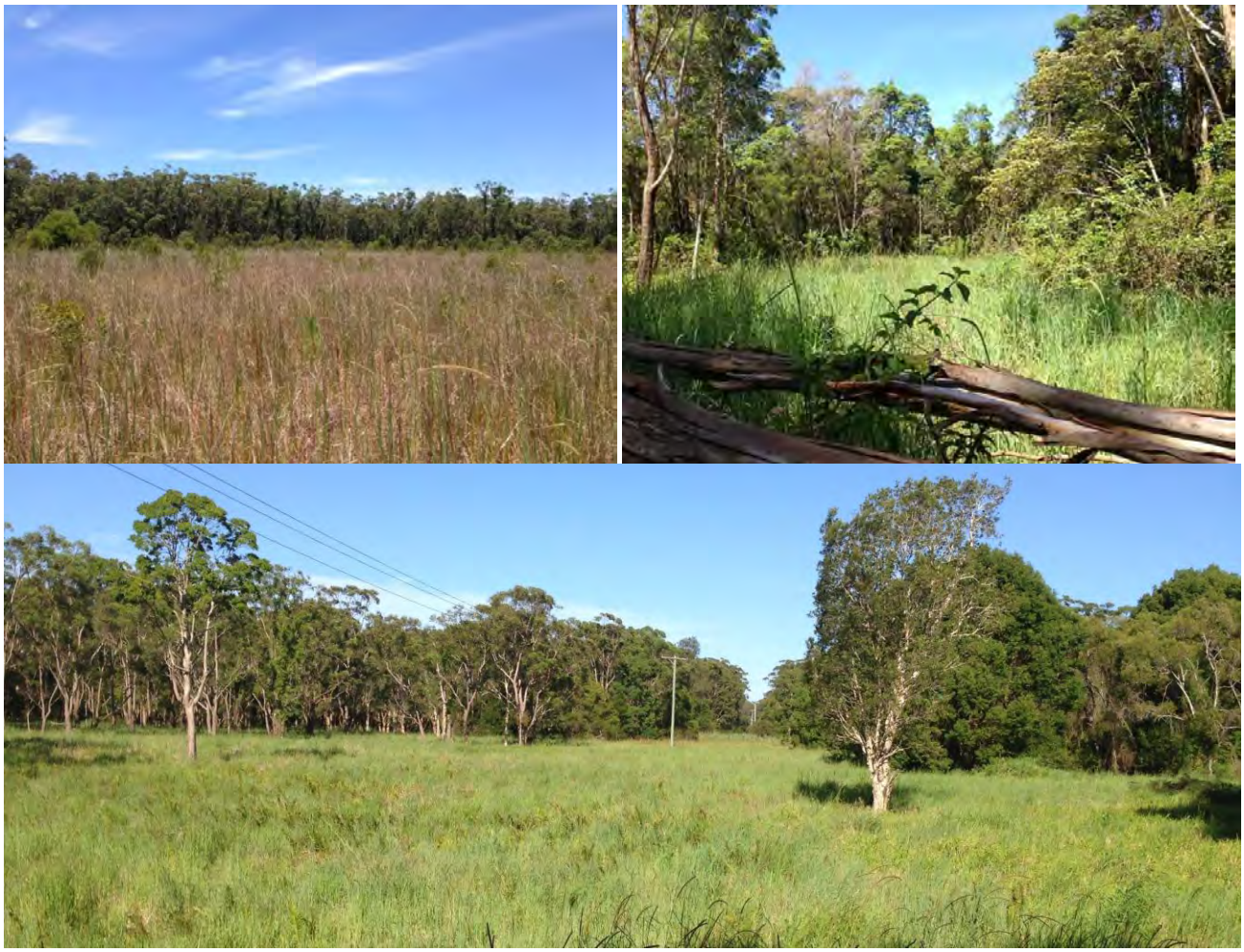


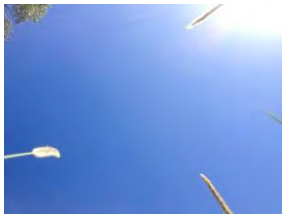
Photo 1, 2 & 3: Vegetation Community 1 - Grassland

1.8.1 Location description

This vegetation community occurs within three portions of the subject site:

- The filled/levelled pad in the north-west corner
- The existing cleared area generally located to the north-east
- The existing cleared area generally located to the south

1.8.2 Canopy layer description



0% The canopy layer is absent

1.8.3 Mid layer description

The mid layer is absent.

1.8.4 Ground layer description

The ground layer has a coverage of 30% - 60% and a height of 1m – 1.5m. The age of the layer dominants is estimated between 1 - 5 years. Some pioneer species (*Acacia sp.*) are regenerating in a scattered distribution throughout VC 1.

The mixed ground layer consists of native and exotic species including *Lomandra hystrix* (Mat rush), *Sphagneticola trilobata* (Singapore daisy), *Ageratina adenophora* (Crofton's weed), and mixed native/exotic vine species including *Kennedia rubicunda* (Dusky coral pea), *Neonotonia wightii* (Glycine) and *Ipomoea indica* (Morning glory).

1.8.5 Leaf litter cover & depth

Leaf litter cover is mostly absent

1.8.6 Weed presence & coverage

The community is dominated by weed grasses including *Setaria sphacelata* (South African pigeon grass), *Paspalum mandiocanum* (Broad-leaved paspalum) and *Melinis minutiflora* (Molasses grass). *Lantana camara* (Lantana), *Ipomoea indica* (Morning glory) and other woody/vine species are scattered throughout areas of VC1.

1.8.7 Disturbance

VC1 is highly modified and disturbed with past clearing, farming. The area to the north-west of the site has been filled and levelled.

1.8.8 Habitat indicators

Ranging areas, protection for reptiles, small avian species and terrestrial mammals, grazing and predator opportunities.

1.8.9 Biodiversity

Low

1.8.10 Conservation attributes

The vegetation community is highly modified and does not represent the pre-existing or regeneration ecological community.

1.9 Vegetation Community 2 – *Sedgeland (VC 2)*


Photo 4 & 5: Vegetation Community 2 - Sedgeland

1.9.1 Location description

This vegetation community occurs within a narrow drainage line in the northern-western portion of the subject site

1.9.2 Canopy layer description

0% The canopy layer is absent

1.9.3 Mid layer description

The mid layer is absent.

1.9.4 Ground layer description

The ground layer is dominated by a mix of species including *Carex appressa*, (Tall sedge) *Gahnia aspera* (Rough saw-sedge*) G.clarkei* (Tall saw-sedge), *Lomandra hystrix* (Mat rush) *Phragmites australis* (Common reed) with emergent isolated juvenile weed species including *Erythrina crista-galli* (Coral tree) and *Pinus Elliottii* (Slash pine). Sub-dominant species include *Dianella caerulea* (Blue flax-lilly) and *Juncus polyanthemus* (Manyhead rush).

The ground coverage is between 90% - 100% with very minimal exposed soil. It has a height of 0.8m – 1.5m. The age of the ground layer dominants is estimated between 3 - 5 years.

Other species present in the ground layer include *Persicaria strigosa* (Persicaria), *Sphagneticola trilobata* (Singapore daisy) and *Melinis minutiflora* (Molasses grass), *Juncus polyanthemus* (Manyhead rush) and *Ageratum houstonianum* (Blue billy-goat weed).

VC 2 displays evidence of natural successions with the occurrence of juvenile *Lophostemon Suavelones* and *Eucalyptus Robusta,* these are isolated and intermittent throughout VC2. The encroachment of *Pinus eliotti* Slash Pine seedlings is also evident.

1.9.5 Leaf litter cover & depth

Minimal leaf litter cover in VC 2, no mature trees present. However there is a dense matt of dried molasses grass/persicaria sp. covering areas of the drainage line.

1.9.6 Weed presence & coverage

Moderate to low weed coverage consisting mostly of *Sphagneticola trilobata* (Singapore daisy), *Melinis minutiflora* (Molasses grass) *Ageratum houstonianum* (Blue billy-goat weed) and pasture grasses.

1.9.7 Disturbance

Field indicators suggest the area has been disturbed/modified by past land use possibly including cut, fill and replanting.

1.9.8 Habitat indicators

Protection, roosting, flowering, seasonal water source, ranging areas and minor grazing opportunities.

1.9.9 Biodiversity

Low / Moderate

1.9.10 Conservation attributes

The occurrence of the plant *Phragmites australis* provides field indicators of potentially acidic conditions, therefore may provide potential habitat opportunities for *Crinia tinnula* (Wallum froglet) which persists in disturbed areas. It also provides a water way connecting different vegetation communities.

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1.10 Vegetation Community 3 – *Modified Riparian Zone*


Photo 6 & 7: Vegetation Community 3 - Modified Riparian Zone

1.10.1 Location description

This vegetation community occurs in a narrow strip in the north-east of the subject site.

1.10.2 Canopy layer description

The canopy coverage is 40% - 50% and a height of 6m - 8m. The age of the canopy layer dominant species is estimated between 3 - 7 years based on species growth characteristics.

The canopy layer is dominated by a mix of *Casuarina glauca* (Swamp oak), *Glochidion sumatranum* (Umbrella cheese tree), *Cupaniopsis anacardioides* (Tuckeroo), *Ficus macrophylla* (Moreton Bay Fig), *Jagera pseudorhus* (Foambark), *Lophostemon confertus* (Brushbox), *Acacia melanoxylon* (Black wattle), *Callistemon salignus* (Willow bottlebrush), *Melaleuca quinquenervia* (Broad-leaved paperbark) and *Guioa semiglauca* (Guioa).

1.10.3 Mid layer description

The mid layer is mostly absent/sparse and consists of *Hovea acutifolia* (Hovea) and *Dodonaea triquetra* (Large-leaved hop bush).

1.10.4 Ground layer description

The native ground layer consist of a mid-dense, mixed native/exotic layer including *Lomandra hystrix* (Mat rush), *Dianella caerulea* (Blue Flax-lily), *Pteridium esculentum* (Bracken fern) *Sphagneticola trilobata* (Singapore daisy), *Ageratum houstonianum* (Blue billy-goat weed) and *Blechnum cartilagineum* (Gristle fern).

1.10.5 Leaf litter cover & depth

Average cover is 0 - 30 % with a depth ranging from 0 – 2 cm.

1.10.6 Weed presence & coverage

The dominant weed coverage is within ground layer with occurrence of dense patches of *Sphagneticola trilobata* (Singapore daisy) minor occurrences of other weeds including *Ipomoea indica* (Morning glory), *Ipomoea cairica* (Coastal morning glory), *Ageratum houstonianum* (Blue billy-goat weed), *Lantana camara* (Lantana), *Melinis minutiflora* (Molasses Grass), *Passiflora suberosa* (Corky Passionfruit) *Senna pendula* (Winter Senna), *Setaria sphacelata* (South African pigeon grass), *Solanum mauritianum* (Tobacco Bush) and *Solanum seaforthianum* (Brazilian nightshade)

1.10.7 Disturbance

The area has impacted by past land use and has been planted with endemic native species in the last five years.

1.10.8 Habitat indicators

Flowering and fruiting, canopy species, protection, roosting, feed trees, ranging areas, eco-tone between the drainage line and intact eucalypt forest.

1.10.9 Biodiversity

Low / moderate

1.10.10 Conservation attributes

Regenerating / planted rainforest species provide developing habitat opportunities for a range of fauna species.

1.11 Vegetation Community 4 – *Eucalyptus pilularis Forest (VC 4)*


Photo 8 & 9: Vegetation Community 4 - *Eucalyptus pilularis* Forest

1.11.1 Location description

This vegetation community occurs within the north-eastern portion of the subject site.

1.11.2 Canopy layer description

The canopy coverage is 30% - 70% with a height of 30m - 35m. The age of the canopy layer dominant species is estimated between 20 - 50 years with isolated old growth specimens over 80 years based on species morphology and growth habit.

The canopy layer is dominated by tall *Eucalyptus pilularis* (Blackbutt) and *Lophostemon confertus* (Brushbox) with sub-dominant *Lophostemon suaveolens* (Swamp box), *Eucalyptus robusta* (Swamp mahogany), *Eucalyptus crebra* (Narrow-leaved ironbark) and *Corymbia intermedia* (Pink bloodwood).

This vegetation community provides clear evidence of a wet sclerophyll components including vines and developing rainforest understorey on the cooler moister aspects. VC 1 includes the most diverse vegetation on the subject site located in the far north eastern corner.

1.11.3 Mid layer description

The mid-sparse to mid-dense mid layer consists of mixed native/exotic species including *Lantana camara* (Lantana), *Melicope elleryana* (Pink euodia), *Acacia longissima* (Narrow-leaved Wattle) *Glochidion sumatranum* (Umbrella cheese tree), *Solanum mauritianum* (Wild tobacco bush), *Archontophoenix cunninghamiana* (Bangalow palm) *Ficus coronata* (Creek sandpaper fig) *Alphitonia excelsa* (Red ash) *Guioa semiglauca* (Guioa), *Wilkiea huegeliana* (Veiny wilkia) and *Jagera pseudorhus* var. *pseudorhus* (Foambark).

1.11.4 Ground layer description

The mid-dense ground layer consists of mixed native/exotic species including *Paspalum mandiocanum* (Broadleaf paspalum) *Dianella caerulea* (Blue Flax-lily) *Passiflora suberosa* (Corky passionfruit) *Parsonsia straminea* (Common silkpod) *Eustrephus latifolius* (Wombat berry) *Geitonoplesium cymosum* (Scrambling lilly), *Lomandra hystrix* (Mat-rush), *Rubus parvifolius* (Native Raspberry) and *Pteridium esculentum* (Bracken).

1.11.5 Leaf litter cover & depth

Cover ranges between 30 - 100% with a shallow depth ranging from 0 – 2 cm.

1.11.6 Weed presence & coverage

The weed presence is concentrated in the ground and mid layer with *Paspalum mandiocanum* (Broadleaf paspalum), *Lantana camara* (Lantana), *Passiflora suberosa* (Corky Passionfruit) *Senna pendula* (Winter Senna) *Setaria sphacelata* (South African pigeon grass), *Solanum mauritianum* (Tobacco Bush) and *Cinnamomum camphora* (Camphor laurel).

1.11.7 Disturbance / Impacts

Site based indicators suggest the area has been impacted by past land clearing, historical logging, rubbish dumping, edge effects and introduced plant species.

1.11.8 Habitat indicators

Flowering canopy species, protection, roosting, feed trees fruiting specimens, ranging areas, minor grazing opportunities, predatory surveying, base food web organisms,

Mature *Eucalyptus* sp. provide habitat potentials for a range of arboreal mammals, monotromes , micro & macro chiropterans, bird species, amphibians and reptiles

1.11.9 Biodiversity

Moderate

1.11.10 Conservation attributes

VC4 is classified as primary koala habitat based on dominant Eucalypt types, however wet sclerophyll understorey reduce its core habitat provision.

VC4 provides habitat corridor functions and contains isolated old growth species and (potentially) threatened tree species.

1.12 Vegetation Community 5 – *Swamp Sclerophyll Forest*


Photo 10 & 11: Vegetation Community 5 – Swamp Sclerophyll Forest

1.12.1 Location description

This vegetation community occurs generally through the middle portion of the site.

1.12.2 Canopy layer description

The canopy coverage varies between 40% - 80% with a height of 12m - 15m. The age of the canopy layer dominant species is estimated between 20 – 50 years (age based on species morphology and growth habit).

The canopy layer is dominated by *Eucalyptus robusta* (Swamp mahogany) and *Melaleuca quinquenervia* (Broad-leaved paperbark).

VC 5 also displays a clear transition in dominant species with only sight change in elevation, (under 1m) The western side recorded higher ratios of *E.robusta* and eastern side with lower elevation a clearly mixed dominance of *M.quinquenervia* and *E.robusta*.

1.12.3 Mid layer description

The mid-sparse mid layer consists of mixed native/exotic species including *Erythrina crista-galli* (Coral tree), *Melicope elleryana* (Pink euodia), *Ficus coronata* (Creek sandpaper fig), *Parsonsia straminea* (Common silkpod) and *Glochidion ferdinandi* (Cheese tree).

1.12.4 Ground layer description

The dense ground layer consists of mixed native exotic species predominantly *Blechnum cartilagineum* (Gristle fern) and *Setaria sphacelata* (South African pigeon grass).

1.12.5 Leaf litter cover & depth

Cover 50-80% with a depth ranging from 0 – 2 cm.

1.12.6 Weed presence & coverage

Weed species are concentrated in the ground layer with mid-dense *Setaria sphacelata* (South African pigeon grass) and present in the the mid layer with scattered *Erythrina crista-galli* (Coral tree).

1.12.7 Disturbance

Site based indicators suggest the area has been impacted by past land clearing, farming, edge effects and introduced plant species.

1.12.8 Habitat indicators

Flowering canopy species, protection, roosting, feed trees fruiting and flowering, ranging areas and minor grazing opportunities.

1.12.9 Biodiversity

Low / Moderate.

1.12.10 Conservation attributes

This area is classified as an *Endangered Ecological Community* (EEC) and is primary koala habitat. It provides wetland habitat.

1.13 Plant Species Recorded in Surveys

Refer to Appendix 4: Botanical Survey

FAUNA ASSESSMENT

1.14 Introduction

The purpose of this fauna assessment is to provide details of the fauna that utilise the habitat on the subject site and the probability of their occurrence on site. It will assess the habitat values and relationships between the vegetation and fauna. This assessment also focuses on various conditions such as the effect of transitional environments, geographical locations, seasonality and the ecological role of the dominant vegetation has on the potential for fauna species. This fauna assessment also identifies the habitat corridor potential within the subject site and in relation to surrounding bio-regional areas.

1.15 Methodology

Provisions of the desktop analysis:

- National Parks and Wildlife Service Atlas related maps and past studies
- Byron Shire Council Local Environment Plan and overlay maps
- Byron Shire Council Environmental Values
- Literature Reviews

1.15.1 Koala Mapping Review

Analysis of the Byron Shire Council Koala Habitat mapping of the subject site has determined the following;

- The site contains vegetation that is mapped as primary habitat
- The site provides core habitat features
- The site provides linkages for koala migrations
- The site investigation also produced opportunistic evidence of Koala activity and the vegetation types present (i *E. Robusta* & *Corymbia* sp.) & Secondary Trees *M.quinquinervia*, *L.suaveolens, L.confertus* on site are koala food trees.

This information has also been verified with onsite investigations to determine the significance of the site in relation to (SEPP) State Environmental Planning Policy No. 44 – Koala Habitat Protection.

1.15.2 Threatened Fauna Species

Refer to Appendix 6:

Fauna listed as Endangered (E) and Vulnerable (V) under the Threatened Species Conservation Act that have been recorded within in a 10km² area centered on the site.

1.16 Methods - Summary

Various methods have been undertaken to depict a clear representation of the fauna species that utilize the subject site. The fauna survey & assessment incorporates the following procedures:

1.16.1 Desktop Analysis

Provisions of the desktop analysis:

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- Byron Bay Environmental Values mapping
- Bionet Database
- Local Area Plans
- Planning Scheme and Overlay Maps
- Literature Reviews

1.16.2 On site Surveys:

- Fauna Trapping / Catching
- Diurnal Search
- Bird Surveys
- Nocturnal Spotlight Searches
- Frog call playbacks

The methods of recording the fauna identified in the surveys have been presented as follows:

- T = Trapped, S = Sited, E = Direct Evidence, C = Call
- Fauna Probability Assessment
- On site habitat comparison for each individual fauna species
- Vegetation / Fauna correlations
- Opportunistic records

These procedures have produced a well researched analysis of the fauna utilizing the subject site, provides relevant information to be incorporated into the recommended management strategies to limit any impacts that may be incurred by the development proposal.

1.16.3 Method 1: Fauna Trapping & Catching

The fauna trapping and catching was conducted from the 16.12.13 to the 20.11.13 in various eco-systems across the subject site. The results of these trapping and catching procedures has been referenced for this report, they were undertaken as follows.

Trapping Site 1 – A line of five (5) box traps (Elliott Traps) and three (3) cage traps cage traps were placed.

Trapping Site 2 – A line of five (5) box traps (Elliott Traps) and four (4) cage traps cage traps were placed.

Trapping Site 3 – A line of five (5) box traps (Elliott Traps) and three (3) cage traps cage traps were placed.

Trapping Site 3 – A line of five (5) box traps (Elliott Traps) and three (3) cage traps cage traps were placed.

Trapping Site 5 – A line of two (2) box traps (Elliott Traps) and one (1) cage trap cage traps was placed.

Trapping Site 6 – A single camera trap was placed.

Trapping Site 7 - A line of four (4) pitfall traps was placed.

A.M check and id of Pit Fall Traps: Release and clean trap lines.
P.M check and id of Pit Fall Traps: Release and clean traps lines.
A.M check and id of Elliot Cage Traps: Release, clean, reset.
P.M check and id of Elliot Cage Traps: Release, clean, reset.
A.M check and id of Small Cage Traps: Release, clean, reset.
P.M check and id of Small Cage Traps: Release, clean, reset.

Each Elliott and cage trap was spaced approximately 10 metres apart they were baited with a mixture of honey, rolled oats and smooth peanut butter formed into a ball. No bait was placed in pitfall traps (due to possible ant infestations). Fresh bait was provided if bait was eaten or removed. Additionally, leaf litter was placed into all Elliott Traps and all traps were positioned in areas to reduce exposure. For example, Elliott Traps were positioned in the areas of trees/grasses/debris etc and cage traps were in covered vegetated areas.

1.16.4 Method 2: Diurnal Search

This was undertaken between the 16.12.13 to the 20.11.13 It involved a thorough search through each of the vegetation communities for evidence of fauna use, including scratch marks, presence of scats, nests, digs, tracks or other evidence and direct observations of fauna species utilizing the site.

1.16.5 Method 3: Bird Surveys

Within each vegetation association, birds were recorded for 30 minutes and any calls were identified from field resources. The bird surveys were conducted during the early evening during the 16.12.13 to the 20.11.13 to determine the bird species and their populations that utilize the subject site. The survey recorded bird sightings and calls. The results are presented in the Fauna Assessment Plan (Appendix 3).

1.16.6 Method 4: Nocturnal Spotlight Search

The nocturnal spotlighting search were conducted on the evenings of the 17.11.13 and on the 18.12.13 to identify fauna groups which utilize the site at night. This involved the use of high powered spotlights that surveyed the entire sight and then focused on any larger tree species and ground layers.

1.16.7 Method 6: Frog Call Playback

A frog call survey was conducted on the 17.12.13 & the 18.12.1.3. The surveys were conducted in the evening between 7.00 pm and 8.00 pm approximately 1 week from a significant rain event.

1.16.8 Method 7: Motion Sensor Cameras

Motion sensor cameras were set up in locations display habitat indicators and fauna use.

1.16.9 Method 8: Opportunistic Records

Past studies around the area and other information that relates to the site has also been referenced to generate a further understanding of the ecological interactions of the subject site. Information was also gathered at various site meetings and site visits relating to other components of the development application.

1.16.10 Limitations of Techniques Used for the Fauna Assessment

Limitations are evident in the time period of the fauna surveys, as they were conducted in periods that occurred in early summer (December). As changes occur in vegetation through seasons, so too does the fauna that use them. Therefore, various fauna species will utilize the site at various times based on seasonality. The frog call playbacks occurred approximately one week after a rain event, this provides relatively good conditions, however during and directly after the rain event may produce more accurate results.

For these reasons, the flora and fauna surveys, habitat features, literature and database reviews are correlated together to produce a Fauna Probability Assessment. This provides a comprehensive understanding of the Mammals, Reptiles, Birds, and Amphibians that occur or are likely to utilize the subject site.

1.16.11 Fauna Assessment Results

Table 1: Species recorded during site fauna assessment

Class	Family	*Scientific Name*	Common name	Method
AMPHIBIANS				
amphibians	Bufonidae	*Rhinella marina*	cane toad	Visual
amphibians	Hylidae	*Litoria fallax*	eastern sedgefrog	Heard calling
amphibians	Myobatrachidae	*Limnodynastes peronii*	striped marshfrog	Heard calling
BIRDS				
birds	Alcedinidae	*Dacelo novaeguineae*	laughing kookaburra	Visual
birds	Ardeidae	*Bubulcus ibis*	cattle egret	Visual
birds	Artamidae	*Gymnorhina tibicen*	Australian magpie	Visual
birds	Artamidae	*Strepera graculina*	pied currawong	Heard calling
birds	Cacatuidae	*Cacatua galerita*	sulphur-crested cockatoo	Heard calling
birds	Cacatuidae	*Calyptorhynchus funereus*	yellow-tailed black-cockatoo	Visual
birds	Coraciidae	*Eurystomus orientalis*	dollarbird	Visual
birds	Corvidae	*Corvus orru*	Torresian crow	Visual
birds	Cuculidae	*Centropus phasianinus*	pheasant coucal	Visual
birds	Dicruridae	*Dicrurus bracteatus*	spangled drongo	Visual
birds	Estrildidae	*Neochmia temporalis*	red-browed finch	Visual
birds	Maluridae	*Malurus cyaneus*	superb fairy-wren	Visual
birds	Meliphagidae	*Meliphaga lewinii*	Lewin's honeyeater	Heard calling
birds	Monarchidae	*Grallina cyanoleuca*	magpie-lark	Visual
birds	Rhipiduridae	*Rhipidura albiscapa*	grey fantail	Visual
birds	Rhipiduridae	*Rhipidura leucophrys*	willie wagtail	Visual
MAMMALS				
mammals	Dasyuridae	*Antechinus stuartii*	brown antechinus	Elliott Trap
mammals	Dasyuridae	*Antechinus subtropicus*	subtropical antechinus	Elliott Trap
mammals	Macropodidae	*Thylogale stigmatica*	red-legged pademelon	Camera trap
mammals	Macropodidae	*Wallabia bicolor*	swamp wallaby	Camera trap

mammals	Muridae	*Melomys cervinipes*	fawn-footed melomys	Elliott Trap
mammals	Muridae	*Mus musculus*	house mouse	Elliott Trap
mammals	Muridae	*Rattus fuscipes*	bush rat	Elliott Trap
mammals	Peramelidae	*Isoodon macrourus*	northern brown bandicoot	Diggings
mammals	Pseudocheiridae	*Pseudocheirus peregrinus*	common ringtail possum	Scats
mammals	Vespertilionidae	*Myotis adversus*	large-footed myotis	Visual
REPTILES				
reptiles	Agamidae	*Physignathus lesueurii*	eastern water dragon	Roadkill
reptiles	Agamidae	*Pogona barbata*	bearded dragon	Visual
reptiles	Scincidae	*Calyptotis scutirostrum*	Scute-snouted calyptotis	Pitfall trap

1.16.12 Trapping and Catching Program – 16/12/2013 – 20/12/2013 results

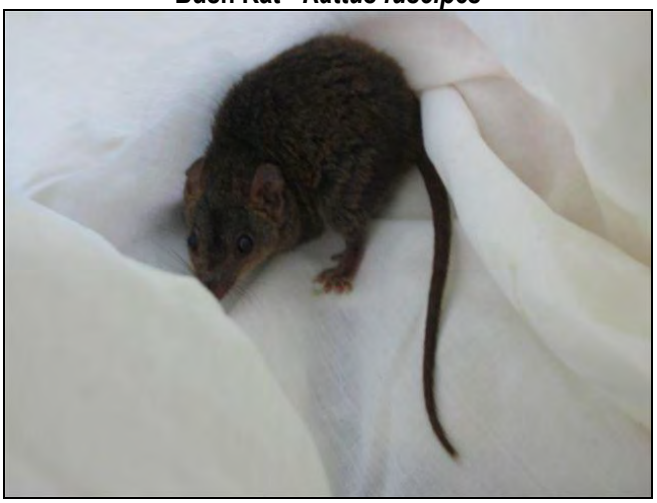
Brown Antechinus - *Antechinus stuartii*

Subtropical Antechinus - *Antechinus subtropicus*

Fawn-footed Melomys - *Melomys cervipes*

House Mouse - *Mus musculus*

Bush Rat - *Rattus fuscipes*



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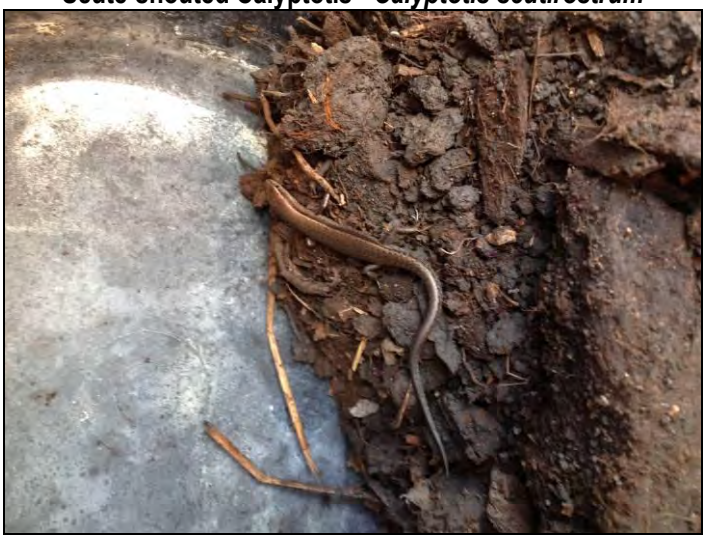
Red-legged pademelon (unconfirmed) - *Thylogale stigmatica*

Scute-snouted Calyptotis - *Calyptotis scutirostrum*



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Eastern Water Dragon - *Physignathus lesueurii*

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1.16.13 Fauna Probability Assessment

FAUNA PROBABILITY ASSESSMENT

Rating = 0 - 5	Status		Endemicity
0 - The species has no chance of occurring on the site.	**E1** - Endangered (Threatened Species Conservation Act.)		**N** - N.S.W.
1 - The species is unlikely to utilise the site.	**E2** - Endangered Population (Threatened Species Conservation Act)		**A** - Other Australian States
2 - The species may utilise the site on rare and opportunistic occasions.	**E4** - Presumed Extinct (Threatened Species Conservation Act.)		**I** - International
3 - The species is likely to utilise the site.	**E4a** - Critically Endangered (Threatened Species Conservation Act.)	✓	Indicator
4 - The species was recorded on site but core habitat requirements are not present.	**V** - Vulnerable (Threatened Species Conservation Act.)		
5 - The species was recorded on site and habitat requirements are present.	**P** - Protected (National Parks & Wildlife Act)		
	U - Unprotected (National Parks & Wildlife Act)		

Class	Family	*Scientific Name*	Common name	Habitat Description	Status	Endemicity	Recorded in 10km radius of site	Habitat conditions present on site	Probalility 0-5
AMPHIBIANS									
amphibians	hylidae	*Litoria olongburensis*	wallum tree frog	Reed beds with wallum heath	V	NA	✓	✓	3
amphibians	Myobatrachidae	*Crinia tinnula*	wallum froglet	Rare and restrictedswamps, ponds and soaks surrounded by papererbark forest or heathland.	V	NA	✓	✓	3
BIRDS									
birds	Accipitridae	*Lophoictinia isura*	square-tailed kite	Rare, scattered, sedentary or partly migratory.Found in eucalypt woodland open forest and heathland.	V	NA	✓	✓	2
birds	Anseranatidae	*Anseranas semipalmata*	magpie goose	Not common on coastal wetlands, was endangered now increasing, swamps, wet grasslands and dams.	V	NA	✓	✓	2
birds	Campephagidae	*Coracina lineata*	barred cuckoo-shrike	Common in far N, uncommon in S, locally nomadic. Found in coastal rainforest and vine scrubs, nearby eucalypts, paperbarks, plantations and tropical gardens.	V	NA	✓	✓	3
birds	Monarchidae	*Monarcha leucotis*	white-eared monarch	Rainforests, mangroves , water courses	V	NA	✓	✓	3
birds	Petroicidae	*Petroica boodang*	scarlet robin	Common, dispersive or locally migratory seasonal movements. Inhabits forests, woodlands, heavier vegetation when breeding and more open and cleared in autumn and winter.	V	NA	✓	✓	2
birds	Strigidae	*Ninox connivens*	barking owl	Uncommon, Open country with stands of trees, tree lined watercourse, paperbark swamp	V	NA	✓	✓	2
birds	Tytonidae	*Tyto capensis*	Grass Owl	tall grass, including grass tussocks in swampy areas, grassy plains, swampy heath, and cane grass, or sedges on flood plains.	V	NA	✓	✓	3
birds	Tytonidae	*Tyto novaehollandiae*	masked owl	Uncommon, roosts in heavy forest, hunting over open woodland and farm land	V	NA	✓	✓	2
birds	Tytonidae	*Tyto tenebricosa*	sooty owl	Territorial, sedentary, rarely seen, probably quite common in rugged optimum habitat. Prefers tall wet eucalypt forests of coastal ranges.	V	NA		✓	2
MAMMALS									
mammals	Dasyuridae	*Planigale maculata*	common planigale	varied habitat, forests, farmlands, woodlands	V	NA	✓	✓	3
mammals	Molossidae	*Mormopterus beccarii*	Beccari's freetail-bat	Apparently reasonably common, several colonies known from local houses.	V	NA	✓	✓	3
mammals	Molossidae	*Mormopterus norfolkensis*	eastern freetail-bat	Uncommon, little is known about the ecology of this bat in the region. Found in open forests and woodland.	V	NA	✓	✓	3
mammals	Phascolarctidae	*Phascolarctos cinereus*	koala	Open forests eucalypt forests woodlands, rainforets. Grey Gum, Tallowwood, Blue Gum.	V	NA	✓	✓	3
mammals	Potoroidae	*Potorous tridactylus*	long-nosed potoroo	Pacthy distribution in along east coast Inhabits dense forests and coastal wallum, requires dense cover for shelter and adjacent to more open foraging sites. Not strictly nocturnal , mostly soliary, makes runways through vegetation which it will follow	V	NA	✓	✓	3
mammals	Pteropodidae	*Pteropus poliocephalus*	grey-headed flying-fox	Common and widespread. Able to co-exist with people provided roosting sites are secure.Found in eucalypt forest, rainforest, paperbark forest, parks and gardens. Usually roosts in mangroves.	V	NA	✓	✓	3
mammals	Pteropodidae	*Syconycteris australis*	common blossom-bat	Uncommon, but perhaps widespread, visiting paperbark forests, heaths and rainforests.	V	NA	✓	✓	3
mammals	Vespertilionidae	*Miniopterus australis*	little bentwing-bat	Common and widespread in open forest, farmland and suburbia.	V	NA	✓	✓	3
mammals	Vespertilionidae	*Miniopterus schreibersii oceanensis*	eastern bent-wing bat	Probably uncommon, prefers open forests and rainforests.	V	NA	✓	✓	3
mammals	Vespertilionidae	*Scoteanax rueppellii*	greater broad-nosed bat	Probably uncommon, prefers open forests and rainforests.	V	NA	✓	✓	3

SEVEN Part Test Threatened Species Impact Assessment

Threatened species impact assessment is a requirement of Section 5A of the Environmental Planning and Assessment Act. This assessment considers the impact of development activities and actions on threatened species, populations or ecological communities identified by the *Threatened Species Conservation Act 1995* (TSC Act) and the *Fisheries Management Act 1994* (FM Act).

The following assessment will address the 'seven part test' to determine the likely effect of the proposal on the ecology of the subject site and the listed threatened species, populations or communities. It will identify the factors of assessment and respond in consideration of the development proposal and required actions, ecology of the subject site and listed threatened species, populations or communities.

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

The desktop analysis identified that 49 threatened fauna species have been recorded in a 10 km radius of the subject site. These 49 species were then investigated and correlated to the habitat conditions present on the subject site.

The fauna probability assessment identified twenty one (21) threatened species likely to utilise the site or may utilise the site on occasions.

To address this section of the test a detailed review of the threatened species is outlined below to ensure appropriate consideration has been made.

Wallum Tree Frog (*Litoria olongburenis* - V)

Is an acid frog that typically associated with coastal and oligotrophic (nutrient poor) and acidic (pH between 3.5 and 6.0) Water is typically clear, still and tannin stained. In general, vegetation types where the species may occur include wet and dry heath lands, sedgelands, woodlands and forests.
vegetation structure between suitable habitat typespecies frequently occurs in areas of sedge swamp habitat in preference to wet heath and, to a greater extent, dry heath

Suitable breeding habitats occur in acidic, permanent to ephemeral, freshwater wetlands with emergent vegetation, most notably sedges, reeds or ferns, and occasionally Melaleuca (paperbark) woodlands. These wetlands (wallum swamps, bogs, lakes or creeks), which are considered habitats critical to the survival of the species, typically overlie deep, low-nutrient, sandy soils where groundwater levels are characteristically high, wet heathlands, most sedgelands Corymbia spp., Banksia integrifolia, Callitris columellaris, Acacia spp open-forest to low closed forest on beach ridges usually in southern half of bioregion (especially Melaleuca quinquenervia dominated vegetation.

The species is likely to utilise the site. The proposal will not cause significant threats to the survival of this species, however it is noted that the habitat on site is likely to be used for breeding purposes of this species.

Wallum Froglet (*Crinia tinnula* - V)

The wallum froglet is restricted to freshwater swamps in lowland coastal areas and is found in associated vegetation communities such as heath, sedge land and woodland on nutrient-poor sandy soils. Acidic swamps and lakes in these areas provide essential breeding habitat for wallum-dependent frog species. The wallum froglet has also been observed in disturbed heath habitat.

The wallum froglet only occurs in lowland coastal habitats in south-east Queensland and north-east New South Wales The species range once extended from just north of Bundaberg in Queensland to the Sydney area in New South Wales. It favours coastal heath land and requires acidic conditions for breeding.

This habitat criteria is orent on the subject site through the ephemeral sedgeland drainage line and the Swamp Schlopyll Community. It is noted that the west protion fo the EEC contains significantly less M.quinquinervia therefore reducing the habitat suitability of this portion of the vegetation community.

The site is located 2.3 km from the coast, the species is likely to utilise the site. The proposal is unlikely to cause significant threats to the survival of this species, however it is noted that the habitat on site is used for breeding purposes of this species.

Square-tailed kite (*Lophoictinia isura* - R)

Rare, scattered, sedentary or partly migratory. Found in eucalypt woodland open forest, pandanus, gallery forest and heathland, often gilding over at tree top level.

This species has been recorded within 10km of the site. As this species is a predatory ranging bird it may survey the site at times for prey items, habitat or feeding.

Magpie Goose *(Anseranas semipalmata – V)*

Mainly found in shallow wetlands (less than 1 m deep) with dense growth of rushes or sedges.
It is also often seen walking and grazing on land feeds on grasses, bulbs and rhizomes. Often seen in trios or flocks on shallow wetlands, dry ephemeral swamps, wet grasslands and floodplains; roosts in tall vegetation.

Activities are centred on wetlands, floodplains of rivers and large shallow wetlands formed by run-off; breeding can occur in both summer and winter dominated rainfall areas and is strongly influenced by water level; most breeding now occurs in monsoonal areas

The site may at times be used in the lower flood plain grassland occurring in the south of the site. The proposal will not cause significant threats to the survival of this species.

Barred cuckoo-shrike Coracina lineata– (V)

Rainforest, eucalypt forests and woodlands, clearings in secondary growth, swamp woodlands and timber along watercourses. They are usually seen in pairs or small flocks foraging among foliage of trees for insects and fruit. They are active birds, frequently moving from tree to tree.

The subject site contains this species habitat preferences. It may range into the site from more intact vegetation to the east. The proposal will not cause significant threats to the survival of this species

White-eared Monarch Monarcha leucotis

In NSW this species occurs primarily in coastal rainforest, swamp forest and wet eucalypt forest.
It appears to favour rainforest edges where trees are frequently covered with vines and through the canopy of more extensive patches of rainforest.

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The site contains this vegetation type including specific. This species is likely to use the site. The proposal will not cause significant threats to the survival of this species

Scarlet robin Petroica boodang – (V)

Dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Scarlet Robin habitat usually contains abundant logs and fallen timber: these are important components of its habitat. a resident in forests and woodlands, but some adults and young birds disperse to more open habitats after breeding.

The site contains a various requirements to support this species including a scattered distribution of ground log hollows. The habitat requirements will be reduce by the development. The proposal will not cause significant threats to the survival of this species.

Eastern Grass Owl (Tyto longimembris) – Vulnerable

This species is adapted for life on the ground, and normally hides in long grass. May breed semi-colonially or groups up to several dozen may hunt in the same area. Are specialist hunters of small rodents and rarely take any other prey. The nest is on the ground in dense tussocks of grass or sedges, usually well away from trees. The nest is a flimsy platform of grasses which soon becomes trampled and obliterated.

It is enveloped in grasses and is approached by a series of tunnels, usually at least three, which the Owls make by pushing their way through on foot. One of these is normally the main one and the grass at its entrance becomes flattened from repeated landing and departures.

The site contains a vegetation comities to support this species, it may utilise the site. The proposed action will reduce its habitat but is unlikely to adversely affect the lifecycle of this species.

Masked Owl (*Tyto novaehollandiae*) – Vulnerable

The Australian Masked Owl inhabits scrubland and timbered areas. In Australia they are seldom found more than 300 km inland. They roost and nest in large tree hollows near foraging areas. They are nocturnal and their prey includes rodents, reptiles, birds, insects and bandicoots.

As this species has a large ranging area it may at times survey the site. The proposal will not cause significant threat to the survival of this species

Sooty Owl (Tyto tenebricosa - R)

Is a species that occurs in wet sclerophyll forest of coastal ranges, especially in steep vegetated gullies. Territorial, sedentary, rarely seen, probably quite common in rugged optimum habitat. Prefers tall wet eucalypt forests of coastal ranges.

This species is likely to utilise the site as a component in its larger ranging area. The proposed action will not adversely affect the lifecycle of this species.

Common Planigale (Planigale maculate) – Vulnerable

The Common Planigale occupies a range of habitats Including rainforests, sclerophyll forests, savannah woodlands, heathlands, sedgelands, grasslands and rocky areas. Broadly speaking, habitat selection appears primarily dependent upon the availability of Ground cover, presumably for protection from predators.

The subject site provides habitat conditions that may be utilised by this species. However the site and the proposal do not remove any core habitat requirements that will threaten this species.

Beccari's Freetail-bat (*Mormopterus beccarii*) – Vulnerable

Its build is muscular with triangular-shaped ears and thick, elastic wing membranes. It usually roosts in tree hollows and forages through a wide range of vegetation types from rainforest to open woodland and is often recorded along water courses. It is widely distributed across northern Australia and colonies have been identified in house roofs within urban areas of QLD and within the Murwillumbah area.

The subject site does not provide the core habitat requirements for this species, and contains no hollow-bearing trees or caves. The proposed action will not adversely affect the lifecycle of this species.

Koala (Phascolarctos cinereus – Vulnerable

Is restricted to habitat that provides their staple food source of Eucalyptus trees. Populations of Koala require a substantial area of Eucalypt forest. Open (structurally complex with mixture young/mature/old growth, especially 30-80cm dbh), mixed rich in number and species diversity of food trees, eucalypt forest and woodland at lower altitude in undulating country on relatively deep and usually high nutrient soil (main species - Eucalyptus tereticornis, E. fibrosa, E. propinqua; E. umbra, E. grandis, E. microcorys, E. tindaliae, E. resinifera, E. populnea; E. robusta, E. nigra, E. signata).

The subject site provides a food source trees in various stages of vegetative growth including old growth and mature tree specimens over 30 years that are compatible to the Koalas dietary requirements.

No direct evidence has been recorded of the Koala, (awaiting full fauna survey results). Its occurrence on site may be opportunistic and rare as a component of the larger intact vegetation to the north, east and south. The species has been recorded as in substantial decline in the local bio region and therefore the action will increase threats and survival pressures on the species, however the proposed clearing action and its size is unlikely to cause its extinction or place significant threats to cause its extinction.

Long-Nosed Potoroo (Potorous tridactylus – V)

Has a patchy distribution along the east coast Inhabits dense forests and coastal wallum, requires dense cover for shelter and adjacent to more open foraging sites. Not strictly nocturnal, mostly solitary, makes runways through vegetation which it will follow, builds squat of vegetation beneath dense vegetation. The sites understorey vegetations more suited to this species in the northern and eastern point of the site. There are thickets of Lantana that may provide suitable cover, the species may utilise the site and the proposal will not cause a unlikely.

Grey-headed Flying-fox (Pteropus poliocephalus) – Vulnerable

Australia's largest bat they are distributed along the east coast of Australia. They occur 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, often in mangrove swamps.

The proposed action will have no adverse affect to core habitat for roosting or feeding of this species and hence pose no threat to the lifecycle of this species.

Common Blossom Bat (Syconycteris australis) - Vulnerable

It is an adaptable species found in a variety of forest habitats including tropical moist forest, moss forest, dry sclerophyll woodland, eucalypt forest, and Melaleuca swamps, it can also be found adjacent to heathland-type habitats.

The subject site contains habitat that is suitable to support this species. The proposal will not remove any of this core habitat and will not cause any threaten to the survival of this species.

Little bentwing-bat (Miniopterus australis) - V

Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas.

Little Bentwing-bats 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. They often share roosting sites with the Common Bentwing-bat and, in winter, the two species may form mixed clusters.

In NSW the largest maternity colony is in close association with a large maternity colony of Eastern Bentwing-bats (Miniopterus schreibersii) and appears to depend on the large colony to provide the high temperatures needed to rear its young. Only five nursery sites /maternity colonies are known in Australia.

The lack of site roosting and hollow bearing opportunities reduce the likely hood for this species occurrence, it may range through the site for feeding. The proposal will not remove any of this core habitat and will not cause any significant threat to the survival of this species.

Eastern bent-wing bat (Miniopterus schreibersii oceanensis) - V

Prefers open forests and rainforests. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. Maternity caves have very specific temperature and humidity regimes. At other times of the year, populations disperse within about 300 km range of maternity caves. Breeding or roosting colonies can number from 100 to 150,000 individuals. Hunt in forested areas, catching moths and other flying insects above the tree tops.

The lack of site roosting and hollow bearing opportunities reduce the likely hood for this species occurrence, it may range through the site for feeding. The proposal will not remove any of this core habitat and will not cause any significant threat to the survival of this species.

Greater broad-nosed bat (Scoteanax rueppellii) - V

Utilises 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. Although this species usually roosts in tree hollows, it has also been found in buildings. Forages after sunset, flying slowly and directly along creek and river corridors. 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; this

species has been known to eat other bat species. Little is known of its reproductive cycle, however a single young is born in January; prior to birth, females congregate at maternity sites located in suitable trees.
The lack of site roosting and hollow bearing opportunities reduce the likely hood for this species occurrence, it may range through the site for feeding and use the scattered intermittent remnant hollow bearing trees. The proposal will not remove any of this core habitat and will not cause any significant threat to the survival of this species.

Review Summary (a)

The review concludes that the proposed development and actions wis unlikely to adversely affect the lifecycle of a threatened species identified for this site. The breeding opportunists for the wallum sedge fro and Wallum froglet re present, however the size of reduction is unlikely to threatened local population extinctions to occur.

Therefore the proposed action is unlikely to have a adverse effect on the lifecycle of a threatened species or risking extinction to any of these species.

The development proposal and approval process may be required to considered specific habitat creation within any proposed offset strategy.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the lifecycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction

No endangered populations have been identified on or in the immediate vicinity of the subject site. No habitat requirements for endangered populations have been identified on the subject site and the proposed development and actions are highly unlikely to have adverse effects on the lifecycle of an endangered population. Therefore the proposed development will not have adverse effect on an endangered population that will risk extinction.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

An endangered ecological has been identified to occur on the subject site. Described as Swamp Sclerophyll Forest

The proposed actions will not threaten extinction through impacts to the extent or composition of an endangered ecological community. The proposed action will reduce the EEC on site by 2.55 hectares and this will increase disturbance impacts on connecting EEC to the east.

Therefore the actions will reduce the total EEC of the local area but is highly unlikely to cause any risk of extinction due to the small geographic size of the clearance area.

(d) in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

Assessment of the site has concluded that the site does not contain the core breeding and species survival habitat requirements for any threatened species. The site may be utilised by threatened fauna species including 2 amphibians, 9 birds, 5 mammals and 4 bat species. The proposed actions will not have adverse effect to the potential for these species to utilise the site on rare or opportunistic occasions as there will negligible impacts to any core habitat requirements in relation to the survival of these.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposal will cause fragmentation of small pockets of vegetation to remaining on site, however it is located on the fringe of a larger intact vegetation and ecosystem that will remain and be influenced by potential edge effects after development.

Therefore, the proposed action will not cause any significant fragmentation or adverse effects to threatened species habitat on or within the vicinity of the subject site resulting in isolation of threatened species habitat. (Refer to the Section 8 Habitat Corridor Assessment)

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

The sites most significant impact on threatened species is to the EEC. The species impact and effect on populations will only be moderate and localised. The proposal for the site also protects habitat that forms part of local regional or national links; therefore the proposed action will have minimal adverse effects to the long-term survival of any threatened species, populations or ecological communities within the locality.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)

The proposed actions for the subject site will have only minor impacts on habitat that supports and assist the threatened species. Actions should also include to the habitat within its locality and standard mitigation measures to reduce environmental impacts of development. This will be implemented to control adverse effects of the proposed works within the site.

Isolation and the size of adverse effects of the proposed action makes it unlikely that the action will have any direct or indirect adverse effect to significantly influence extinction pressures on any critical habitat communities.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

Assessment of the site and fauna probability assessment has identified threatened species which are likely to or may utilise the site. The threatened species profiles, recovery plans and relevant threat abatement plan objectives will be effected and slightly compromised by the proposed action. If the project is to be generally be consistent with the relevant plans and strategies for the conservation and recovery of threatened species know to the region restoration ad net biodiversity gain opportunities must be explored to increase the strength of the proposal.

For the development to meet the intent of the various threatened species recovery plans, then targeted restoration works both on site and off site are likely including the creation and enhancement of ecosystem's that support the EEC lost and species that relay upon it.

The proposed action has the potential to provide results complimentary to recovery pans. This can only be achieved by investment into restoration ecology, including significant on ground works and the creation of habitat types both on and off site. If these actions are included with the development actions the intent of recovery plans and threatened species will be supported, whilst providing community infrastructure and recreational outcomes.

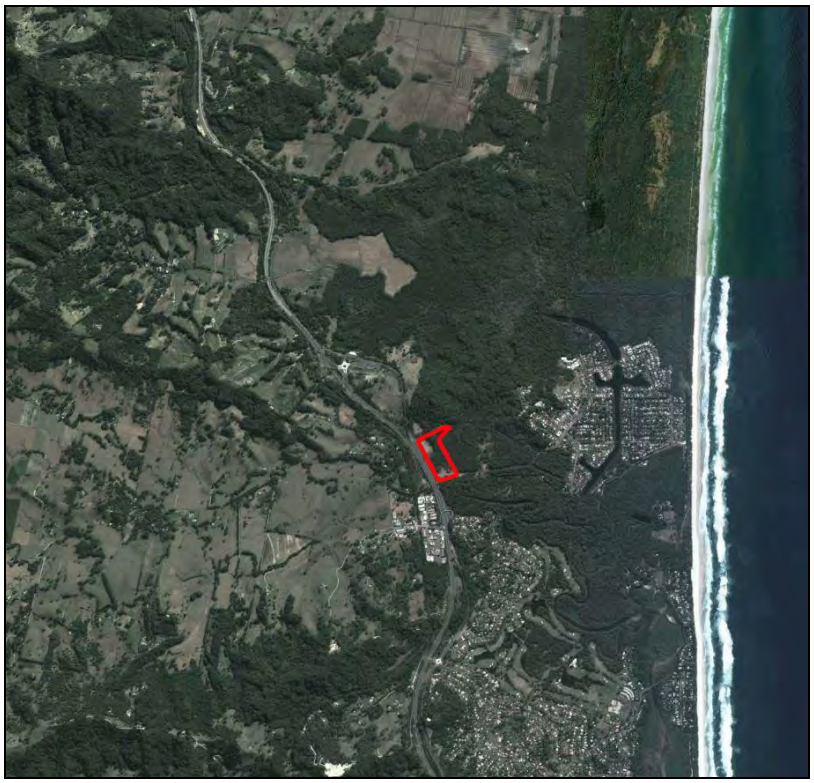
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

A key threatening process threatens or may threaten the survival, abundance or evolutionary development of a native species or ecological community.

The proposed action will influence a key threatening process defined as land clearance, however the actions will not significantly increase the impact of a key threatening process, as it does not require broad land clearance as defined by the key threatening process description. The proposed action will be impacting a small peripheral stand of EEC 2.55 hectares and 1.1 hectares of Koala Habitat and previously cleared areas of the site.

The proposed action is also highly unlikely to promote or increase any key threatening process related to injury or fatality of a threatened species, degradation or loss of habitat and biodiversity or transmission of disease or increased predation in relation to exotic species or human activities. The proposed development is unlikely to result in a significant effect or increase of any identified key threatening process leading to species or community extinctions.

HABITAT CORRIDOR ASSESSMENT



The site is a component of the larger bioregional habitat corridor aligning in a dominant north south direction. To the north and east the subject site is directly connected to intact national park that occurs across the lower ranges, gullies &

ridgelines and connects onto the coastal littoral forest. The south of the site is connected to Marshalls Creek and is fully connected to the coastal vegetation in the south of the bio region.

Marshalls Creek to the west is semi fragmented by the highway; however civil construction techniques and bridge design have provided degraded links under the bridge to provide both aquatic and terrestrial connectivity.

The west of the site is fragmented by the M1 highway which provides and physical barrier to terrestrial migration to the rural farm lands and vegetated ranges further west.

The subject site is located on the peripheral fringe of the larger bioregional habitat corridor, therefore reducing potential impacts and risk associated with the subject sites corridor function if the vegetation is removed.

IMPACT ASSESSMENT

1.17 Development Layout

The following information asses the impact of Trial 1 site layout and Trial 2 site layout as extracted from the storm water management plan produced by BMT WBM 18/11/2013.

1.18 Key Environmental Considerations

- The site contains 3.14 hectares of Endangered Ecological Community
- The site contains 1.27 + 3.14 (4.41) hectares of Primary Koala Habitat
- The site contains isolated old growth tree specimens
- The site is likely to provide habitat for specific threatened fauna species
- The site is directly connected to a national park
- The subject site is mapped with various environmental overlays described by the local government planning scheme as
    - Wildlife Corridor
    - Ecological Wetland
    - Adjacent a National Park
    - Adjacent Key Fish Habitat Creek System
    - Habitat Zone
    - High Conservation Value
    - Primary Koala Habitat
    - Threatened Habitat Area
- Site surveys and scaled mapping indicate that the extent of this mapping will be reduced in most of the cases listed above. Therefore impacts on these mapping overlay areas is actually less that originally indicated.

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1.19 Trial 1 - Proposed Development Layout - Impact Analysis

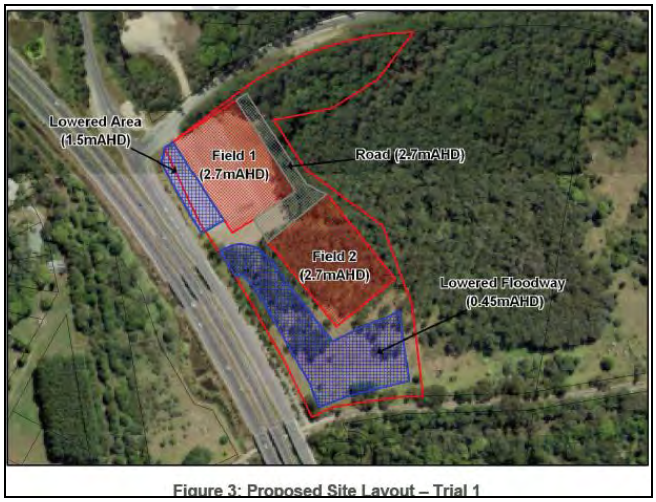

Figure 3: Proposed Site Layout – Trial 1

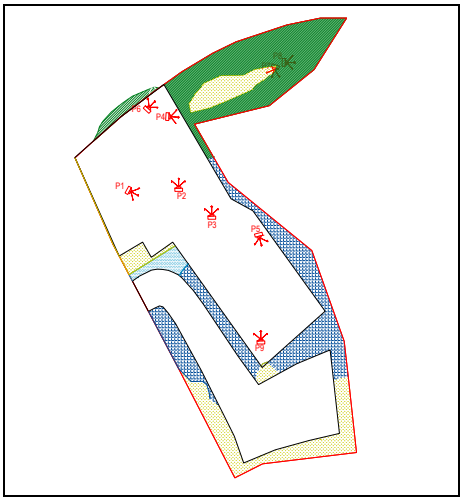

Figure site layout and impact footprint

1.20 Trial 1 Impact Assessment Calculations

TRIAL 1 - IMPACT ASSESSMNET CALCULATIONS						
Veg Com	**Area m2**	**% of site**	**Cleared Impact Area m2**	**Area to remain m2**	**% lost**	**Foot print % allocated**
VC1	26078.2	33%	17737.2	8341	68%	36%
VC2	6529.2	8%	5585.2	944	86%	11%
VC3	1850.7	2%	1850.7	0	100%	4%
VC4	12727.1	16%	2616.9	10110.2	21%	5%
VC5	31364.1	40%	21637.7	9726.4	69%	44%
Total	**78549.3**	**100%**	**49427.7**	**29121.6**		

Approximately 4.94 hectares of the subject site is required to accommodate the development proposal.

44% of the foot print has been allocated on an Endangered Ecological Community VC 5. This is the most ecological significant system of the site.

This proposal will remove 2.16 hectares (69.0 %) of the EEC.

5% of the footprint occurs on VC 4.

This proposal will remove 0.26 hectares (21%) of the vc 4 *E.pilularis* Eucalypt Forest.

This proposal allocates 36.0% of the development footprint on low value exotic grassland.

This proposal will conserve 31% (0.97ha) of EEC and 79% (1.01 ha) of the *E.plilularis* Forest.

The proposal will require the removal of individual old growth trees.

This proposal will conserve the most biological diverse area of the site.

This proposal will conserve the threatened tree species

The impact on the larger bioregional corridor is on the periphery

The site is reduced in connectivity to the east by the highway.

The site has been identified to provide minor ranging and feeding opportunities to listed threatened species.

1.21 Trial 2 - Proposed Development Layout - Impact Analysis

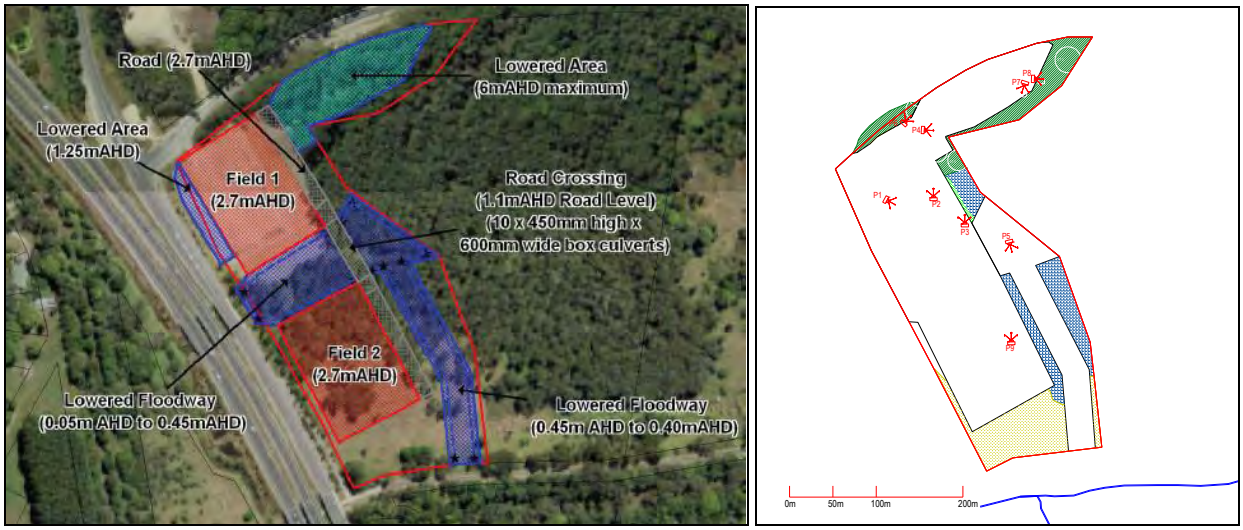

Figure site layout and impact footprint

1.22 Trial 2 Impact Assessment Calculations

TRIAL 2 - IMPACT ASSESSMNET CALCULATIONS						
Veg Com	**Area m2**	**% of site**	**Cleared Impact Area m2**	**Area to remain m2**	**% lost**	**Foot print % allocated**
VC1	26078.2	33%	18859.3	7218.9	72%	31%
VC2	6529.2	8%	6529.2	0	100%	11%
VC3	1850.7	2%	1627.6	223.1	88%	3%
VC4	12727.1	16%	7784.5	4942.6	61%	13%
VC5	31364.1	40%	25501.5	5862.6	81%	42%
Total	**78549.3**	**100%**	**60302.1**	**18247.2**		

Approximately 6.03 hectares of the subject site is required to accommodate the development proposal.

42% of the foot print has been allocated on an Endangered Ecological Community VC 5. This is the most ecological significant system of the site.

This proposal will remove 2.55 hectares (81.0 %) of the EEC.

13% of the footprint occurs on VC 4.

This proposal will remove 0.78 hectares (61%) of the VC 4 *E.pilularis* Eucalypt Forest.

This proposal allocates 31.0% of the development footprint on low value exotic grassland.

This proposal will conserve 19% (0.97ha) of EEC, which will be fragmented & degraded and 39% (0.49 ha) of the *E.plilularis* Forest

The proposal will require the removal of old growth trees.

This proposal impact and disturb the most biological diverse area of the site.

This proposal will conserve the threatened tree species.

The impact on the bioregional corridor is on the periphery.

The site has been identified to provide minor ranging and feeding opportunities to listed threatened species.

1.23 Results – Comparison Summary

Comparison	Foot print size m2	Area required
TRIAL 1	49427.7	63%
TRIAL 2	60302.1	77%

Trial 1 requires 4.94 hectares (63%) of the subject site.

This presents the least ecological impact of the trials and is the preferred ecological outcome of the two proposals.

Trial 2 has been identified by the proponent as the preferred site layout due to flood management agenda, however it requires 6.03 hectares (77%) of the subject site and will cause the most ecological impact and creates increased fragmentation and disturbance.

Both trials require the removal of Endangered Ecological Community (VC5).

1.24 Opportunities

It is recognised that the subject site does not provide suitable areas to adequately offset the impacts resulting form the current proposed development.

A justification may be argued utilising the information regarding the essential recreation / community infrastructure provided by such a development. This community outcome will strengthen the justification on the clearing of an Endangered Ecological Community.

Investigation will be required to identify opportunities to provide alternative solutions and legislative pathways to accommodate the proposed development.

This will include options for creating net biodiversity gain. To achieve this and meet the intent of applicable legislation it is likely that additional land acquisition will be required to identify existing and potential sites for conservation and restoration of the swamp Sclerophyll EEC.

This process will also likely require restoration inputs of 3 years including maintenance & monitoring to offset the impact of the proposed development. It is recommended that this pathway and option is reviewed and a cost benefit analysis is conducted on the potential options to allow for the development proposal, including feasibility studies.

If this offset strategy cannot be achieved then changes to the site layout is likely to be required to minimise the impact to the areas of the subject site and create a approval pathway for the site as constrained by the state planning policy.

1.25 Preferred Ecological Site Layout

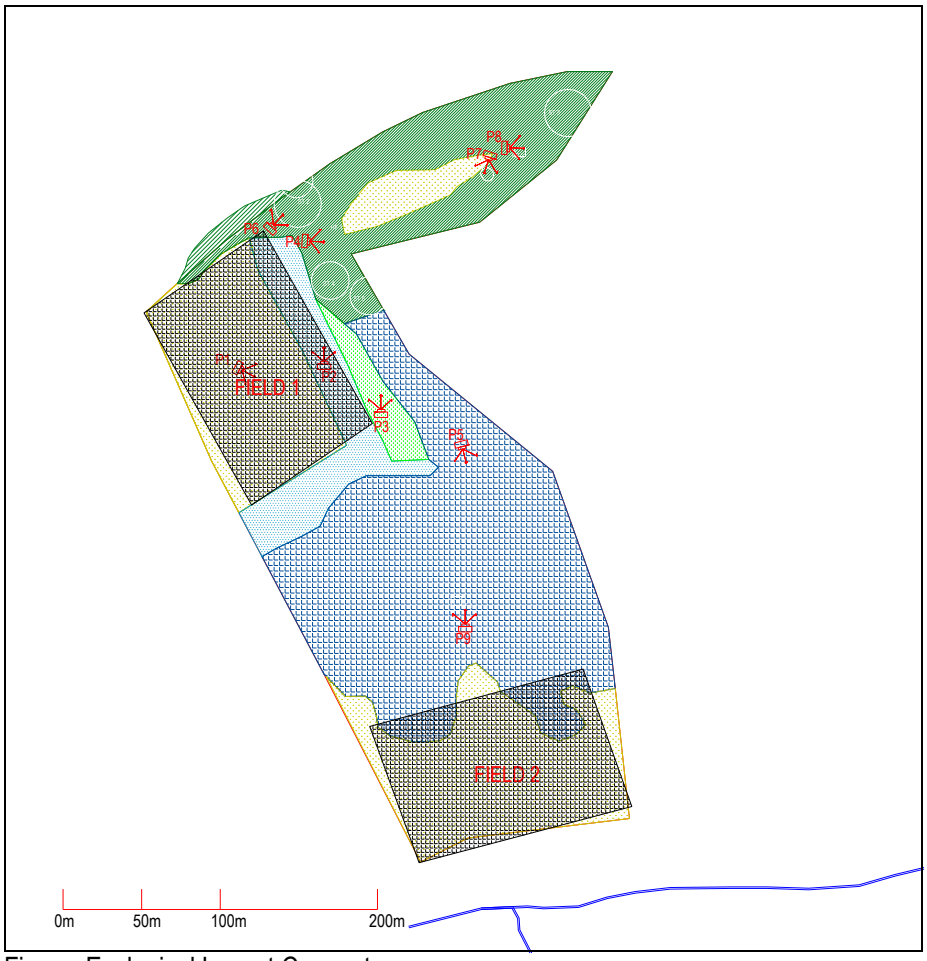

Figure: Ecological Layout Concept

This figure illustrates the locations of the sports fields allocated from an ecological perspective only. This concept would achieve a more satisfactory ecological outcome and significantly increase compliance with the intent of planning legislation and local planning polices. However it does not consider any other constraint planning.

APPENDIX 1 – VEGETATION COMMUNITIES PLAN

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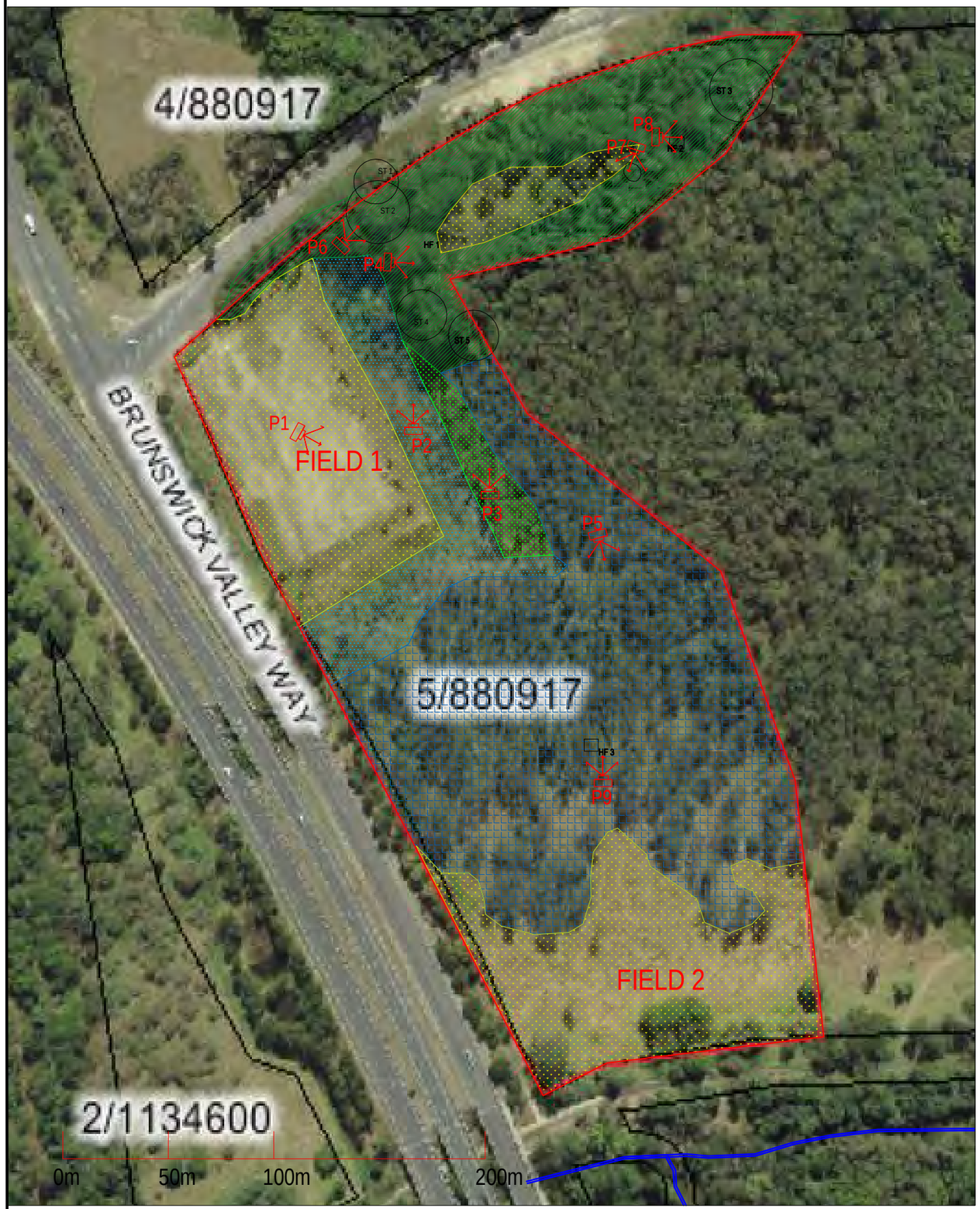

- VC 1 - GRASSLAND
- VC 2 - SEDGE LAND
- VC 3 - MODIFIED RIPARIAN ZONE
- VC 4 - EUCALYPT PILULARIS FOREST
- VC 5 - SWAMP SCLEROPHYLL FOREST (EEC)
- CREEK SYSTEM
- SIGNIFCANT TREE
- HABITAT FEATURE
- RUBBISH
- PHOTO

P1 - VEGETATION COMMUNITY 1

P2 - VEGETATION COMMUNITY 2

P3 - VEGETATION COMMUNITY 3

P4 - VEGETATION COMMUNITY 4

P5 - VEGETATION COMMUNITY 5

P6 - SIGNIFICANT TREE

P7 - LITTER

P8 - HABITAT FEATURE

P9 - HABITAT FEATURE

CLIENT	PROJECT	TITLE	REGISTER
		VEGETATION COMMUNITIES PLAN	Issue / Amendment / Date / Checked
SHEET DETAILS		DRAWING INFORMATION	ASSOCIATED CONSULTANTS
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APPENDIX 2 – IMPACT ASSESSMENT PLAN

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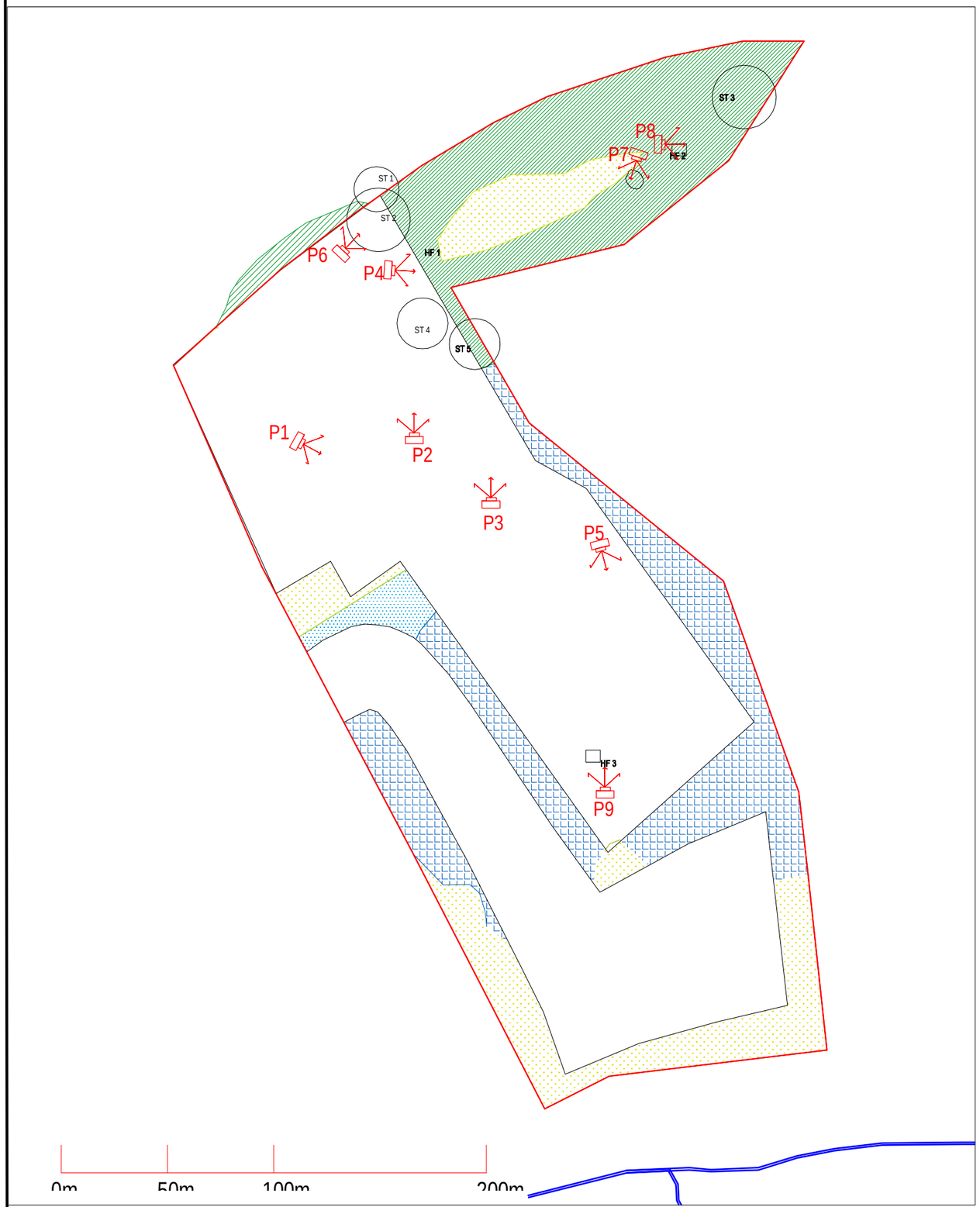

- VC 1 - GRASSLAND
- VC 2 - SEDGE LAND
- VC 3 - MODIFIED RIPARIAN ZONE
- VC 4 - EUCALYPT PILULARIS FOREST
- VC 5 - SWAMP SCLEROPHYLL FOREST (EEC)
- CREEK SYSTEM
- SIGNIFCANT TREE
- HABITAT FEATURE
- RUBBISH
- PHOTO

Figure 3: Proposed Site Layout – Trial 1

TRIAL 1 - IMPACT ASSESSMNET CALCULATIONS						
Veg Com	**Area m2**	**% of site**	**Cleared Impact Area m2**	**Area to remain m2**	**% lost**	**Foot print % allocated**
VC1	26078.2	33%	17737.2	8341	68%	36%
VC2	6529.2	8%	5585.2	944	86%	11%
VC3	1850.7	2%	1850.7	0	100%	4%
VC4	12727.1	16%	2616.9	10110.2	21%	5%
VC5	31364.1	40%	21637.7	9726.4	69%	44%
Total	**78549.3**	**100%**	**49427.7**	**29121.6**		

CLIENT

PROJECT

TITLE
FLOOD TRIAL 1
IMPACT ASSESSMENT PLAN

REGISTER

Issue	Amendment	Date	Checked

ASSOCIATED CONSULTANTS

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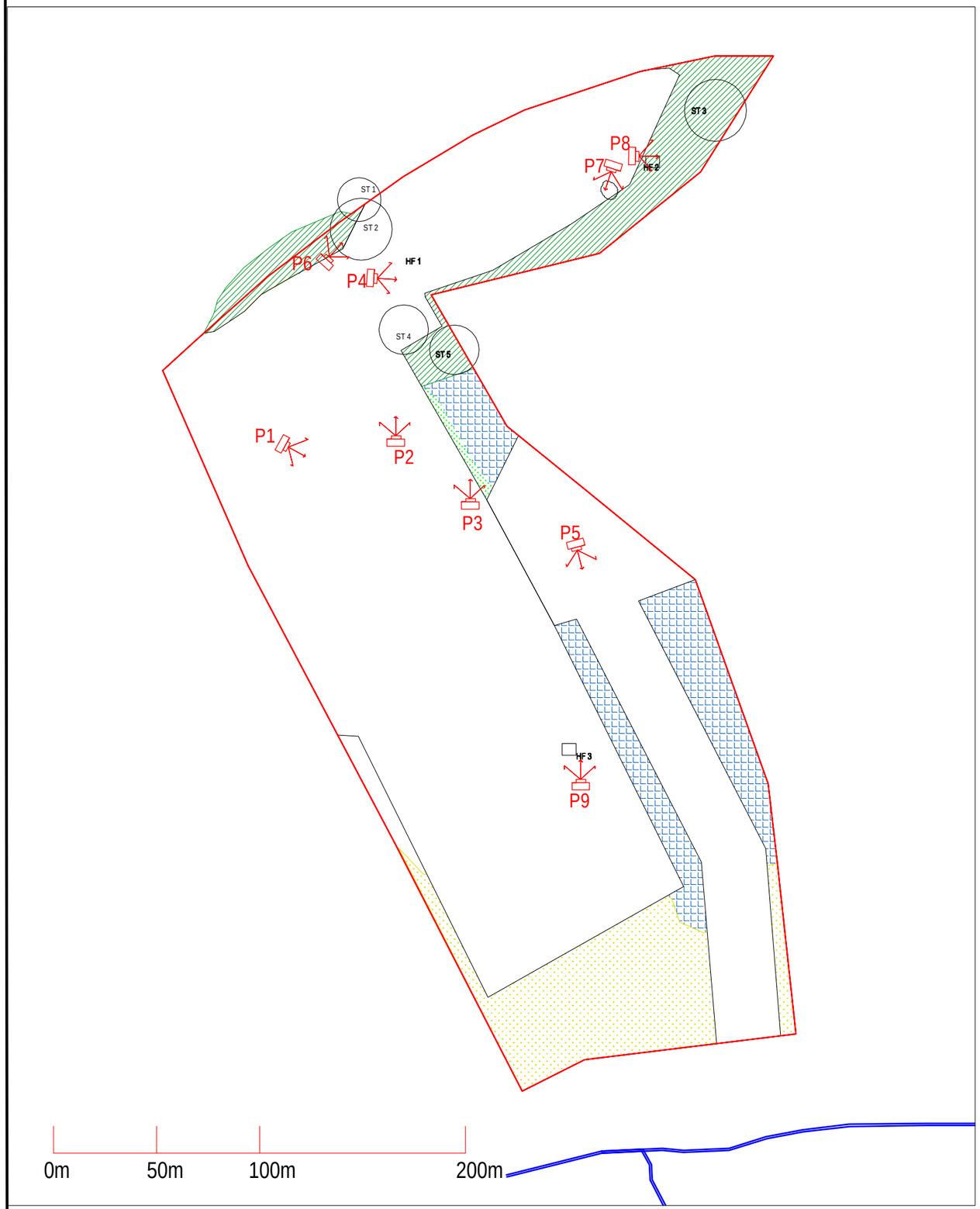

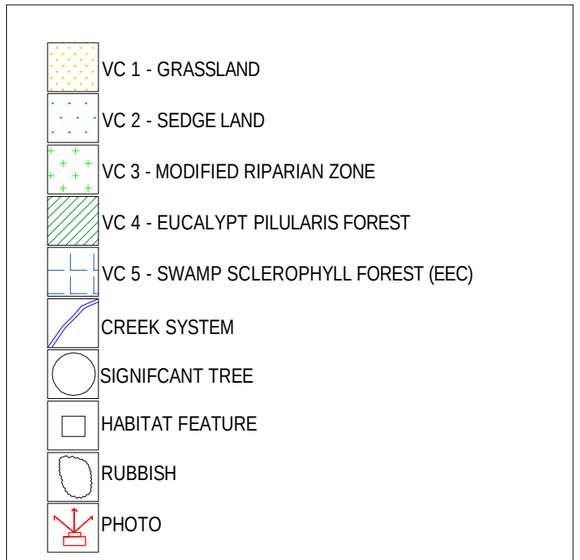

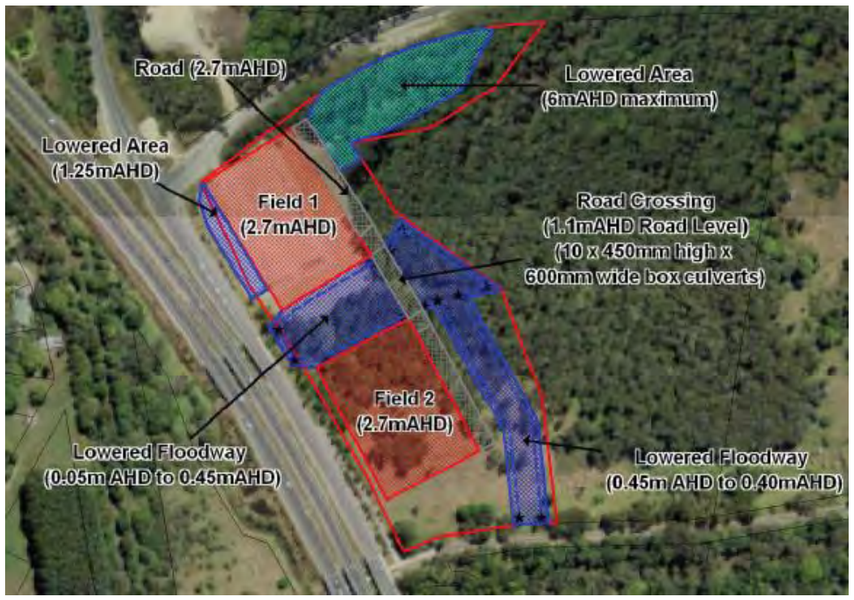

TRIAL 2 - IMPACT ASSESSMNET CALCULATIONS

Veg Com	Area m2	% of site	Cleared Impact Area m2	Area to remain m2	% lost	Foot print % allocated
VC1	26078.2	33%	18859.3	7218.9	72%	31%
VC2	6529.2	8%	6529.2	0	100%	11%
VC3	1850.7	2%	1627.6	223.1	88%	3%
VC4	12727.1	16%	7784.5	4942.6	61%	13%
VC5	31364.1	40%	25501.5	5862.6	81%	42%
Total	**78549.3**	**100%**	**60302.1**	**18247.2**		

CLIENT

PROJECT

TITLE

FLOOD TRIAL 2 IMPACT ASSESSMNET PLAN

REGISTER

Issue	Amendment	Date	Checked

ASSOCIATED CONSULTANTS

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PROJECT NO.	DRAWING NO.	ISSUE

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APPENDIX 3 – FAUNA PLAN

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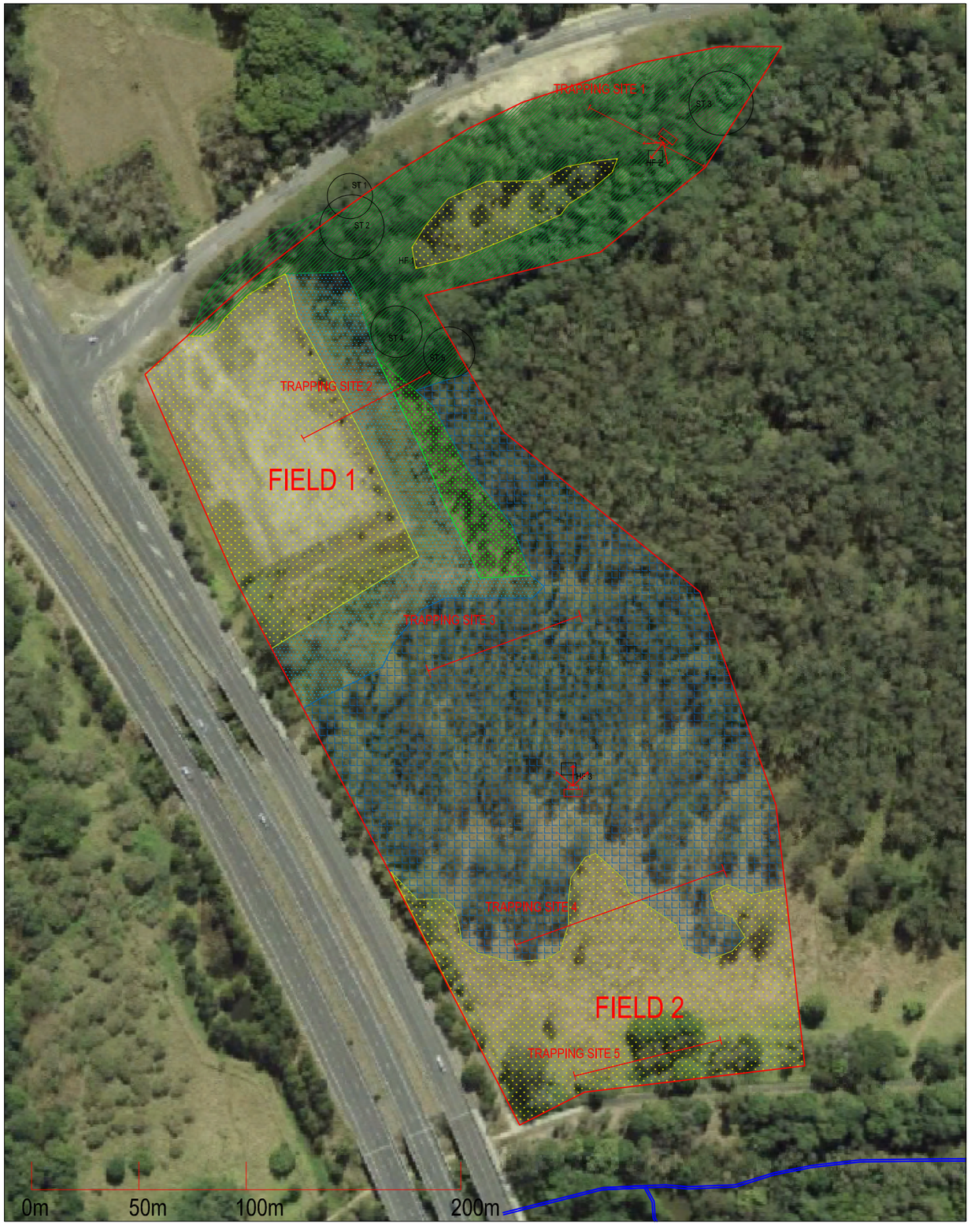

FAUNA TRAPPING TRANSECT

MOTION CAMERA

SIGNIFICANT TREE

HABITAT FEATURE

CLIENT	PROJECT	TITLE	REGISTER	ASSOCIATED CONSULTANTS
		FAUNA SURVEY PLAN	Issue / Amendment / Date / Checked	

SHEET DETAILS

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All construction works are to comply with local regulatory authorities and building codes.

DRAWING INFORMATION

DESIGN	DRAWN	DATE	SCALE

PROJECT NO.	DRAWING NO.	ISSUE

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APPENDIX 4 – BOTANICAL SURVEY

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Botanical Survey Results

Family	Scientific Name	Exotic	Common Name	NSW status	VC1	VC2	VC3	VC4	VC5
Amaryllidaceae	*Crinum pedunculatum*		Swamp Lily			*		*	
Amaryllidaceae	*Hymenocallis littoralis*	*	Spider Lilly				*		
Apocynaceae	*Parsonsia straminea*		Common Silkpod		*	*	*	*	*
Araliaceae	*Schefflera actinophylla*	*	Umbrella Tree				*	*	*
Arecaceae	*Archontophoenix alexandrae*	*	Alexandra Palm			*	*	*	*
Arecaceae	*Archontophoenix cunninghamiana*		Bangalow Palm	P		*	*	*	*
Arecaceae	*Calamus muelleri*		Southern Lawyer Cane	P				*	
Arecaceae	*Philodendron domesticum*	*	Large-leave Philodendron					*	
Aspleniaceae	*Asplenium australasicum*		Bird's Nest Fern	P				*	
Asteliaceae	*Cordyline congesta*						*	*	
Asteraceae	*Ageratina adenophora*	*C4	Crofton Weed		*	*	*	*	*
Asteraceae	*Ageratum houstonianum*	*	Blue Billy-goat Weed		*	*	*		*
Asteraceae	*Ambrosia artemisiifolia*	*C5	Annual Ragweed		*	*	*		
Asteraceae	*Baccharis halimifolia*	*C3	Groundsel Bush		*	*	*		
Asteraceae	*Bidens pilosa*	*	Cobbler's Pegs		*	*	*		
Asteraceae	*Conyza bonariensis*	*	Flaxleaf Fleabane		*	*	*		
Asteraceae	*Conyza sumatrensis*	*	Tall Fleabane		*	*	*		
Asteraceae	*Crassocephalum crepidioides*	*	Thickhead		*				
Asteraceae	*Sphagneticola trilobata*	*	Singapore Daisy		*	*	*	*	*
Asteraceae	*Taraxacum officinale*	*	Dandelion		*	*			
Blechnaceae	*Blechnum cartilagineum*		Gristle Fern			*	*	*	*
Casuarinaceae	*Casuarina cunninghamiana*		Swamp Oak			*	*		
Casuarinaceae	*Casuarina glauca*		Swamp Oak			*	*	*	*
Convolvulaceae	*Ipomoea cairica*	*	Coastal Morning Glory		*	*	*	*	
Convolvulaceae	*Ipomoea indica*	*	Morning Glory		*	*	*	*	*
Cyperaceae	*Carex appressa*		Tall Sedge			*	*		*
Cyperaceae	*Carex fascicularis*		Tall Sedge			*	*		*
Cyperaceae	*Cyperus brevifolius*	*	Mullumbimby Couch		*	*	*	*	*

Cyperaceae	*Gahnia aspera*		Rough Saw-sedge			*	*		*
Cyperaceae	*Gahnia clarkei*		Tall Saw-sedge			*	*		*
Dennstaedtiaceae	*Pteridium esculentum*		Bracken			*	*	*	*
Elaeocarpaceae	*Elaeocarpus obovatus*		Hard Quandong					*	
Euphorbiaceae	*Homalanthus populifolius*		Bleed Heart					*	
Euphorbiaceae	*Macaranga tanarius*		Blush Macaranga		*	*	*	*	
Euphorbiaceae	*Mallotus philippensis*		Red Kamala			*	*	*	
Fabaceae (Caesalpinioideae)	*Senna pendula var. glabrata*	*	Winter Senna			*	*	*	
Fabaceae (Caesalpinioideae)	*Senna septemtrionalis*	*	Arsenic Bush		*	*	*	*	*
Fabaceae (Faboideae)	*Crotalaria lanceolata*	*	Rattlepod		*	*	*		
Fabaceae (Faboideae)	*Desmodium uncinatum*	*	Silver-leaf Desmodium						
Fabaceae (Faboideae)	*Erythrina crista-galli*	*	Coral tree		*	*	*		
Fabaceae (Faboideae)	*Hardenbergia violacea*		False Sarsaparilla					*	
Fabaceae (Faboideae)	*Hovea acutifolia*						*	*	
Fabaceae (Faboideae)	*Kennedia rubicunda*		Dusky Coral Pea			*	*		
Fabaceae (Faboideae)	*Macroptilium atropurpureum*	*	Siratro		*	*	*	*	
Fabaceae (Faboideae)	*Neonotonia wightii*		Glycine		*	*	*	*	
Fabaceae (Mimosoideae)	*Acacia aulacocarpa*				*	*			
Fabaceae (Mimosoideae)	*Acacia longifolia subsp. sophorae*		Coastal Wattle		*	*			
Fabaceae (Mimosoideae)	*Acacia longissima*		Long-leaf Wattle		*	*			
Fabaceae (Mimosoideae)	*Acacia melanoxylon*		Blackwood		*	*			
Juncaceae	*Juncus polyanthemus*					*			*
Lauraceae	*Cinnamomum camphora*	*C4	Camphor Laurel			*	*	*	
Lauraceae	*Endiandra discolor*		Rose Walnut					*	
Lauraceae	*Endiandra globosa*		Black Walnut					*	
Lauraceae	*Endiandra sieberi*		Hard Corkwood					*	*
Lomandraceae	*Lomandra hystrix*		Mat-rush		*	*	*	*	*
Lomandraceae	*Lomandra longifolia*		Spiny-headed Mat-rush		*	*	*	*	*
Luzuriagaceae	*Eustrephus latifolius*		Wombat Berry					*	*
Luzuriagaceae	*Geitonoplesium cymosum*		Scrambling Lily					*	*

Lycopodiaceae	*Lycopodiella cernua*		Scrambling Clubmoss		*	*	*	*	*
Lycopodiaceae	*Lygodium microphyllum*		Climbing Snake Fern					*	*
Malvaceae	*Hibiscus heterophyllus*		Native Rosella				*	*	
Melastomataceae	*Melastoma affine*		Blue Tongue				*	*	
Meliaceae	*Dysoxylum fraserianum*		Rosewood					*	
Menispermaceae	*Stephania japonica var. discolor*		Snake Vine					*	
Monimiaceae	*Wilkiea huegeliana*		Veiny Wilkiea					*	
Moraceae	*Ficus coronata*		Creek Sandpaper Fig			*	*	*	*
Moraceae	*Ficus watkinsiana*		Strangling Fig				*	*	
Moraceae	*Maclura cochinchinensis*		Cockspur Thorn					*	
Moraceae	*Trophis scandens*		Burny Vine					*	
Myrtaceae	*Acmena hemilampra subsp. hemilampra*		Broad-leaved Lilly Pilly					*	
Myrtaceae	*Callistemon salignus*		Willow Bottlebrush			*	*		*
Myrtaceae	*Corymbia intermedia*		Pink Bloodwood					*	
Myrtaceae	*Eucalyptus crebra*		Narrow-leaved Ironbark					*	
Myrtaceae	*Eucalyptus pilularis*		Blackbutt			*	*	*	*
Myrtaceae	*Eucalyptus robusta*		Swamp Mahogany			*	*	*	*
Myrtaceae	*Eucalyptus tereticornis*		Forest Red Gum					*	*
Myrtaceae	*Leptospermum liversidgei*		Olive Tea-tree			*	*	*	*
Myrtaceae	*Lophostemon confertus*		Brush Box			*	*	*	
Myrtaceae	*Lophostemon suaveolens*		Swamp Mahogany, Swamp			*	*	*	*
Myrtaceae	*Melaleuca quinquenervia*		Broad-leaved Paperbark			*	*	*	*
Oleaceae	*Ligustrum sinense*	*C4	Small-leaved Privet					*	
Passifloraceae	*Passiflora edulis*	*	Common Passionfruit					*	
Passifloraceae	*Passiflora suberosa*	*	Cork Passionfruit					*	*
Passifloraceae	*Passiflora subpeltata*	*	White Passionflower					*	
Phormiaceae	*Dianella caerulea*		Blue Flax-lily			*	*	*	*
Phyllanthaceae	*Glochidion ferdinandi*		Cheese Tree			*	*	*	*
Phyllanthaceae	*Glochidion sumatranum*		Umbrella Cheese Tree			*	*	*	*
Pinaceae	*Pinus elliottii*	*	Slash Pine		*	*	*		

Poaceae	*Andropogon virginicus*	*	Whisky Grass		*	*	*		
Poaceae	*Cymbopogon refractus*		Barbed Wire Grass		*	*	*	*	*
Poaceae	*Melinis minutiflora*	*	Molasses Grass		*	*			*
Poaceae	*Melinis repens*	*	Red Natal Grass		*	*		*	*
Poaceae	*Oplismenus aemulus*		Basket Grass				*	*	
Poaceae	*Oplismenus imbecillis*		Basket Grass					*	*
Poaceae	*Paspalum mandiocanum*	*	Broadleaf Paspalum		*	*	*	*	*
Poaceae	*Pennisetum purpureum*	*	Bana Grass		*				
Poaceae	*Phragmites australis*		Common Reed			*	*		*
Poaceae	*Setaria sphacelata*	*	South African Pigeon Grass		*	*	.		
Polygonaceae	*Persicaria strigosa*		Persicaria			*	*		*
Ranunculaceae	*Clematis aristata*		Old Man's Beard				*	*	
Rhamnaceae	*Alphitonia excelsa*		Red Ash				*	*	
Rosaceae	*Rubus moluccanus var. trilobus*		Molucca Bramble					*	
Rosaceae	*Rubus parvifolius*		Native Raspberry				*	*	*
Rutaceae	*Melicope elleryana*		Pink-flowered Doughwood				*	*	*
Sapindaceae	*Dodonaea triquetra*		Large-leaf Hop-bush				*	*	*
Sapindaceae	*Guioa semiglauca*		Guioa				*	*	
Sapindaceae	*Jagera pseudorhus var. pseudorhus*		Foambark Tree			*	*	*	
Smilacaceae	*Smilax australis*		Lawyer Vine					*	*
Solanaceae	*Solanum mauritianum*	*	Wild Tobacco Bush		*	*	*	*	
Solanaceae	*Solanum nigrum*	*	Black-berry Nightshade			*	*		
Sterculiaceae	*Commersonia bartramia*		Brown Kurrajong				*	*	
Verbenaceae	*Lantana camara*	* C4, W	Lantana		*	*	*	*	*
Verbenaceae	*Verbena bonariensis*	*	Purpletop		*	*	*	*	*

Code	Description	Definition under the NPW Act 1974, the TSC Act 1995, the FM Act 1994 No. 38, or the SSDP.
P	Protected	Refers to fauna not listed in Schedule 11 of the NPW Act 1974.
P 13	Protected Native Plants	Refers to flora listed in Schedule 13 of the NPW Act 1974.

V	Vulnerable	Refers to fauna and flora species that are likely to become endangered unless the circumstances & factors threatening its survival or evolutionary development cease to operate (Schedule 2, TSC Act 1995).
E1	Endangered	unless the circumstances and factors threatening its survival or evolutionary developments cease to operate; or, its numbers have been reduced to such a critical level, or, its habitats have been so drastically reduced, that it is in immediate danger of extinction; or, it might already be extinct, but it is not presumed extinct (Schedule 1, part 1, TSC Act 1995).
E2	Endangered Population	Refers to a population where, in the opinion of the Scientific Committee, its numbers have been reduced to such a critical level, or its habitat has been so drastically reduced, that it is in immediate danger of extinction and it is not a population of a species already listed in Schedule 1, and: (a) it is disjunct and at or near the limit of its geographic range, or (b) it is or is likely to be genetically distinct, or (c) it is otherwise of significant conservation value. (Schedule 1, part 2, TSC Act 1995).
E4	Extinct	Refers to fauna and flora species that have not been located in nature during the preceding 50 years despite searching of known and likely habitats of that period (Schedule 1, part 4, TSC Act 1995).
E4A	Critically Endangered Species	Refers to a species that is eligible to be listed as a critically endangered species if, in the opinion of the Scientific Committee, it is facing an extremely high risk of extinction in New South Wales in the immediate future, as determined in accordance with criteria prescribed by the regulations. (Schedule 1a, part 1, TSC Act 1995).

NSW Weed status key

C5 =	**CLASS 5**	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be com
C4 =	**CLASS 4**	The plant must not be sold propagated or knowingly distributed
C3 =	**CLASS 3**	The plant must be fully and continuously suppressed and destroyed
C2 =	**CLASS 2**	The plant must be eradicated from the land and the land must be kept free of the pla
C1 =	**CLASS 1**	The plant must be eradicated from the land and the land must be kept free of the pla
W =	**WONS**	Weed Of National Significance

APPENDIX 5 – THREATENED FLORA WITHIN 10KM

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Threatened flora recorded within a 10km radius of the subjec

Kingdom	Class	Family	Scientific Name
Plantae	Flora	Acanthaceae	*Harnieria hygrophiloides*
Plantae	Flora	Apocynaceae	*Cynanchum elegans*
Plantae	Flora	Apocynaceae	*Marsdenia longiloba*
Plantae	Flora	Apocynaceae	*Ochrosia moorei*
Plantae	Flora	Apocynaceae	*Tylophora woollsii*
Plantae	Flora	Cunoniaceae	*Davidsonia johnsonii*
Plantae	Flora	Ebenaceae	*Diospyros mabacea*
Plantae	Flora	Fabaceae (Caesalpinioideae)	*Cassia brewsteri var. marksiana*
Plantae	Flora	Fabaceae (Caesalpinioideae)	*Senna acclinis*
Plantae	Flora	Flacourtiaceae	*Xylosma terrae-reginae*
Plantae	Flora	Lauraceae	*Endiandra floydii*
Plantae	Flora	Lauraceae	*Endiandra muelleri subsp. bracteata*
Plantae	Flora	Myrtaceae	*Gossia fragrantissima*
Plantae	Flora	Myrtaceae	*Uromyrtus australis*
Plantae	Flora	Phyllanthaceae	*Phyllanthus microcladus*
Plantae	Flora	Proteaceae	*Grevillea hilliana*
Plantae	Flora	Rubiaceae	*Randia moorei*
Plantae	Flora	Rutaceae	*Acronychia littoralis*
Plantae	Flora	Rutaceae	*Melicope vitiflora*
Plantae	Flora	Sapindaceae	*Diploglottis campbellii*
Plantae	Flora	Cunoniaceae	*^Davidsonia jerseyana*
Plantae	Flora	Orchidaceae	*^Geodorum densiflorum*
Plantae	Flora	Orchidaceae	*^Phaius australis*
Plantae	Flora	Elaeocarpaceae	*^^Elaeocarpus williamsianus*
Plantae	Flora	Lindsaeaceae	*^^Lindsaea brachypoda*
Plantae	Flora	Myrtaceae	*^^Choricarpia subargentea*
Plantae	Flora	Rubiaceae	*Knoxia sumatrensis*
Plantae	Flora	Proteaceae	*Macadamia integrifolia*
Plantae	Flora	Escalloniaceae	*Corokia whiteana*
Plantae	Flora	Fabaceae (Mimosoideae)	*Acacia bakeri*
Plantae	Flora	Fabaceae (Mimosoideae)	*Archidendron hendersonii*
Plantae	Flora	Lauraceae	*Cryptocarya foetida*
Plantae	Flora	Lauraceae	*Endiandra hayesii*
Plantae	Flora	Menispermaceae	*Tinospora tinosporoides*

Plantae	Flora	Myrtaceae	*Syzygium hodgkinsoniae*
Plantae	Flora	Myrtaceae	*Syzygium moorei*
Plantae	Flora	Poaceae	*Arthraxon hispidus*
Plantae	Flora	Proteaceae	*Floydia praealta*
Plantae	Flora	Proteaceae	*Hicksbeachia pinnatifolia*
Plantae	Flora	Proteaceae	*Macadamia tetraphylla*
Plantae	Flora	Rutaceae	*Bosistoa transversa*
Plantae	Flora	Sapotaceae	*Niemeyera whitei*
Plantae	Flora	Orchidaceae	*^Peristeranthus hillii*

P	Protected
P 13	Protected Native Plants
V	Vulnerable
E1	Endangered

E2	Endangered Population
E4	Extinct
E4A	Critically Endangered Species

ct site (NSW bionet)

Common Name	NSW status	Comm. status	Records
	E1,P		65
White-flowered Wax Plant	E1,P	E	1
Slender Marsdenia	E1,P	V	17
Southern Ochrosia	E1,P	E	2
Cryptic Forest Twiner	E1,P	E	1
Smooth Davidson's Plum	E1,P	E	1
Red-fruited Ebony	E1,P	E	3
Brush Cassia	E1,P		1
Rainforest Cassia	E1,P		1
Queensland Xylosma	E1,P		40
Crystal Creek Walnut	E1,P	E	101
Green-leaved Rose Walnut	E1,P		143
Sweet Myrtle	E1,P	E	24
Peach Myrtle	E1,P	E	1
Brush Sauropus	E1,P		2
White Yiel Yiel	E1,P		119
Spiny Gardenia	E1,P	E	279
Scented Acronychia	E1,P	E	85
Coast Euodia	E1,P		3
Small-leaved Tamarind	E1,P	E	1
Davidson's Plum	E1,P,2	E	215
Pink Nodding Orchid	E1,P,2		2
Southern Swamp Orchid	E1,P,2	E	1
Hairy Quandong	E1,P,3	E	7
Short-footed Screw Fern	E1,P,3		5
Giant Ironwood	E1,P,3		64
	E4,P		1
Macadamia Nut	P	V	1
Corokia	V,P	V	4
Marblewood	V,P		412
White Lace Flower	V,P		101
Stinking Cryptocarya	V,P	V	795
Rusty Rose Walnut	V,P	V	28
Arrow-head Vine	V,P	V	17

Red Lilly Pilly	V,P	V	29
Durobby	V,P	V	139
Hairy Jointgrass	V,P	V	1
Ball Nut	V,P	V	1
Red Boppel Nut	V,P	V	11
Rough-shelled Bush Nut	V,P	V	14
Yellow Satinheart	V,P	V	1
Rusty Plum, Plum Boxwood	V,P		1
Brown Fairy-chain Orchid	V,P,2		8

Refers to fauna not listed in Schedule 11 of the NPW Act 1974.

Refers to flora listed in Schedule 13 of the NPW Act 1974.

Refers to fauna and flora species that are likely to become endangered unless the circumstances & factors threatening its survival or evolutionary development cease to operate (Schedule 2, TSC Act 1995).

Refers to fauna and flora species that are likely to become extinct in nature in NSW unless the circumstances and factors threatening its survival or evolutionary developments cease to operate; or, its numbers have been reduced to such a critical level, or, its habitats have been so drastically reduced, that it is in immediate danger of extinction; or, it might already be extinct, but it is not presumed extinct (Schedule 1, part 1, TSC Act 1995).

Refers to a population where, in the opinion of the Scientific Committee, its numbers have been reduced to such a critical level, or its habitat has been so drastically reduced, that it is in immediate danger of extinction and it is not a population of a species already listed in Schedule 1, and: (a) it is disjunct and at or near the limit of its geographic range, or (b) it is or is likely to be genetically distinct, or (c) it is otherwise of significant conservation value. (Schedule 1, part 2, TSC Act 1995).

Refers to fauna and flora species that have not been located in nature during the preceding 50 years despite searching of known and likely habitats of that period (Schedule 1, part 4, TSC Act 1995).

Refers to a species that is eligible to be listed as a critically endangered species if, in the opinion of the Scientific Committee, it is facing an extremely high risk of extinction in New South Wales in the immediate future, as determined in accordance with criteria prescribed by the regulations. (Schedule 1a, part 1, TSC Act 1995).

APPENDIX 6 – THREATENED FAUNA WITHIN 10KM

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Threatened fauna species recorded within a 10km radius of the subject site (NSW bionet)

Family	Scientific Name	Common Name	NSW status
Hylidae	*Litoria olongburensis*	Olongburra Frog	V,P
Myobatrachidae	*Crinia tinnula*	Wallum Froglet	V,P
Accipitridae	*^^Lophoictinia isura*	Square-tailed Kite	V,P,3
Accipitridae	*^^Pandion cristatus*	Eastern Osprey	V,P,3
Alcedinidae	*Todiramphus chloris*	Collared Kingfisher	V,P
Anatidae	*Stictonetta naevosa*	Freckled Duck	V,P
Anseranatidae	*Anseranas semipalmata*	Magpie Goose	V,P
Ardeidae	*Botaurus poiciloptilus*	Australasian Bittern	E1,P
Ardeidae	*Ixobrychus flavicollis*	Black Bittern	V,P
Burhinidae	*Burhinus grallarius*	Bush Stone-curlew	E1,P
Burhinidae	*Esacus magnirostris*	Beach Stone-curlew	E4A,P
Cacatuidae	*^Calyptorhynchus lathami*	Glossy Black-Cockatoo	V,P,2
Campephagidae	*Coracina lineata*	Barred Cuckoo-shrike	V,P
Ciconiidae	*Ephippiorhynchus asiaticus*	Black-necked Stork	E1,P
Columbidae	*Ptilinopus regina*	Rose-crowned Fruit-Dove	V,P
Gruidae	*Grus rubicunda*	Brolga	V,P
Haematopodidae	*Haematopus fuliginosus*	Sooty Oystercatcher	V,P
Haematopodidae	*Haematopus longirostris*	Pied Oystercatcher	E1,P
Jacanidae	*Irediparra gallinacea*	Comb-crested Jacana	V,P
Laridae	*Gygis alba*	White Tern	V,P
Laridae	*Sternula albifrons*	Little Tern	E1,P
Meliphagidae	*Anthochaera phrygia*	Regent Honeyeater	E4A,P
Meliphagidae	*Lichenostomus fasciogularis*	Mangrove Honeyeater	V,P
Monarchidae	*Carterornis leucotis*	White-eared Monarch	V,P
Petroicidae	*Petroica boodang*	Scarlet Robin	V,P
Procellariidae	*Ardenna carneipes*	Flesh-footed Shearwater	V,P
Psittacidae	*^^Lathamus discolor*	Swift Parrot	E1,P,3
Psittacidae	*^Cyclopsitta diopthalma coxeni*	Coxen's Fig-Parrot	E4A,P,2
Psittacidae	*Glossopsitta pusilla*	Little Lorikeet	V,P
Rallidae	*Amaurornis moluccana*	Pale-vented Bush-hen	V,P
Tytonidae	*^^Tyto longimembris*	Eastern Grass Owl	V,P,3
Tytonidae	*^^Tyto novaehollandiae*	Masked Owl	V,P,3
Balaenopteridae	*Megaptera novaeangliae*	Humpback Whale	V,P
Dasyuridae	*Dasyurus maculatus*	Spotted-tailed Quoll	V,P
Dasyuridae	*Planigale maculata*	Common Planigale	V,P
Dugongidae	*Dugong dugon*	Dugong	E1,P
Molossidae	*Mormopterus beccarii*	Beccari's Freetail-bat	V,P
Molossidae	*Mormopterus norfolkensis*	Eastern Freetail-bat	V,P
Phascolarctidae	*Phascolarctos cinereus*	Koala	V,P
Potoroidae	*Potorous tridactylus*	Long-nosed Potoroo	V,P

Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	V,P
Pteropodidae	*Syconycteris australis*	Common Blossom-bat	V,P
Vespertilionidae	*Miniopterus australis*	Little Bentwing-bat	V,P
Vespertilionidae	*Miniopterus schreibersii oceanensis*	Eastern Bentwing-bat	V,P
Vespertilionidae	*Myotis macropus*	Southern Myotis	V,P
Vespertilionidae	*Nyctophilus bifax*	Eastern Long-eared Bat	V,P
Vespertilionidae	*Scoteanax rueppellii*	Greater Broad-nosed Bat	V,P
Cheloniidae	*Caretta caretta*	Loggerhead Turtle	E1,P
Cheloniidae	*Chelonia mydas*	Green Turtle	V,P

Code	Description	Definition under the NPW Act 1974, the TSC Act 1995, the FM Act 1994 No. 38, or the SSDP.
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P 13	Protected Native Plants	Refers to flora listed in Schedule 13 of the NPW Act 1974.
V	Vulnerable	Refers to fauna and flora species that are likely to become endangered unless the circumstances & factors threatening its survival or evolutionary development cease to operate (Schedule 2, TSC Act 1995).
E1	Endangered	Refers to fauna and flora species that are likely to become extinct in nature in NSW unless the circumstances and factors threatening its survival or evolutionary developments cease to operate; or, its numbers have been reduced to such a critical level, or its habitats have been so drastically reduced, that it is in immediate danger of extinction; or, it might already be extinct, but it is not presumed extinct (Schedule 1, part 1, TSC Act 1995).

E2	Endangered Population	Refers to a population where, in the opinion of the Scientific Committee, its numbers have been reduced to such a critical level, or its habitat has been so drastically reduced, that it is in immediate danger of extinction and it is not a population of a species already listed in Schedule 1, and: (a) it is disjunct and at or near the limit of its geographic range, or (b) it is or is likely to be genetically distinct, or (c) it is otherwise of significant conservation value. (Schedule 1, part 2, TSC Act 1995).
E4	Extinct	Refers to fauna and flora species that have not been located in nature during the preceding 50 years despite searching of known and likely habitats of that period (Schedule 1, part 4, TSC Act 1995).
E4A	Critically Endangered Species	Refers to a species that is eligible to be listed as a critically endangered species if, in the opinion of the Scientific Committee, it is facing an extremely high risk of extinction in New South Wales in the immediate future, as determined in accordance with criteria prescribed by the regulations. (Schedule 1a, part 1, TSC Act 1995).

APPENDIX 7 – FAUNA TRAPPING RECORDS

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FAUNA TRAPPING RECORD

Records:	Date traps opened	16-Dec-13	Date traps Closed	20-Dec-13

Trap Night:	1	2	3	4
Date	17/12/2013	18/12/2013	19/12/2013	20/12/2013
Max Temp	24.6	26.7	27.7	18.7
Min Temp	19.7	20.4	20.8	20.9
Wind Velocity km/h	11	20	24	6
Wind Direction	SSW	E	SE	N
Coud Cover	Minimal	Minimal	Minimal	Minimal
Precipitation	0.4	0	0	0
Moon		Full	Full	
Observer/s:	Michael Hallinan	Michael Hallinan	Michael Hallinan	M. Hallinan & M. Hamilton

Results	17/12/2013	18/12/2013	19/12/2013	20/12/2013
Elliott Traps	0	0	*Antechinus subtropicus*	*Antechinus stuartii*
			Mus musculus	*Rattus fuscipes*
				Mus musculus
Cage Traps	0	0	0	*Melomys cervinipes*
Pitfall	0	0	0	*Calyptotis scutirostrum*
Camera trap	0	0	0	*Thylogale stigmatica* or *Wallabia bicolor*
Spotlighting		*Myotis macropus*		
Frog Playback			*Litoria falla, Limnodynastes peronii*	*Litoria fallax*
Bird Survey		Pheasant coucal	Pheasant coucal	
		Spangled drongo	Spangled drongo	
		Whip bird	Whip bird	
		Lewin's honeyeater	Lewin's honeyeater	
		Yellow-tailed black cockatoo		
		Blue Fairy wren	Blue Fairy wren	
		Red Browed finch	Red Browed finch	
		Torresian crow	Torresian crow	
		Willy wagtail	Willy wagtail	
		Laughing Kookaburra	Laughing Kookaburra	
		Grey fantail	Grey fantail	
		Unidentified raptor		
		Dollar bird	Dollar bird	
		Currawong	Currawong	
Opportunistic records		*Physignathus lesueurii*		
	Pseudocheirus peregrinus			

Methods and effort					
22	Elliott traps oper	4	Nights	10	m apart
4	Pitfall traps oper	4	Nights	1.5	m apart
14	Cage traps open	4	Nights	10	m apart
1	Camera traps op	4	Nights	0	m apart
Spotlighting					
Frog playback					
Diurnal search					