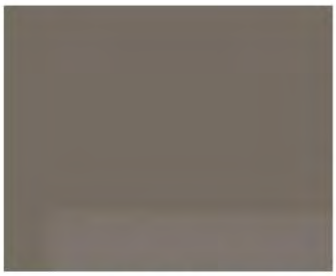
PLANIT CONSULTING

TERRESTRIAL FLORA AND FAUNA ASSESSMENT

TWEED COAST ROAD, KINGS FOREST

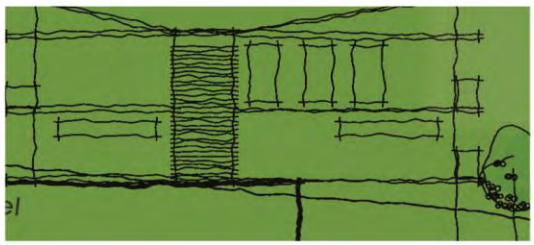
Lot 7 DP875447

Prepared for LEDA DEVELOPMENTS Pty Ltd








Planit Consulting Pty Ltd

NOVEMBER 2014

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1.0 INTRODUCTION

Planit Consulting has been commissioned by Leda Developments Pty Ltd to prepare a Terrestrial Flora and Fauna Assessment Report relating to the proposed Kings Forest service station located at Kings Forest as generally depicted in Figure 1.

The Flora and Fauna Assessment documents flora, fauna and habitat studies undertaken over the site, an analysis of ecologically significant areas (and subsequent constraints to development if present) and provides design and management recommendations to be implemented in association with the proposal.

The proposal is for a service station as depicted in Figure 2 (Attachment 1).

FIGURE 1 – SITE LOCATION (SOURCE: NEARMAP, 2014)

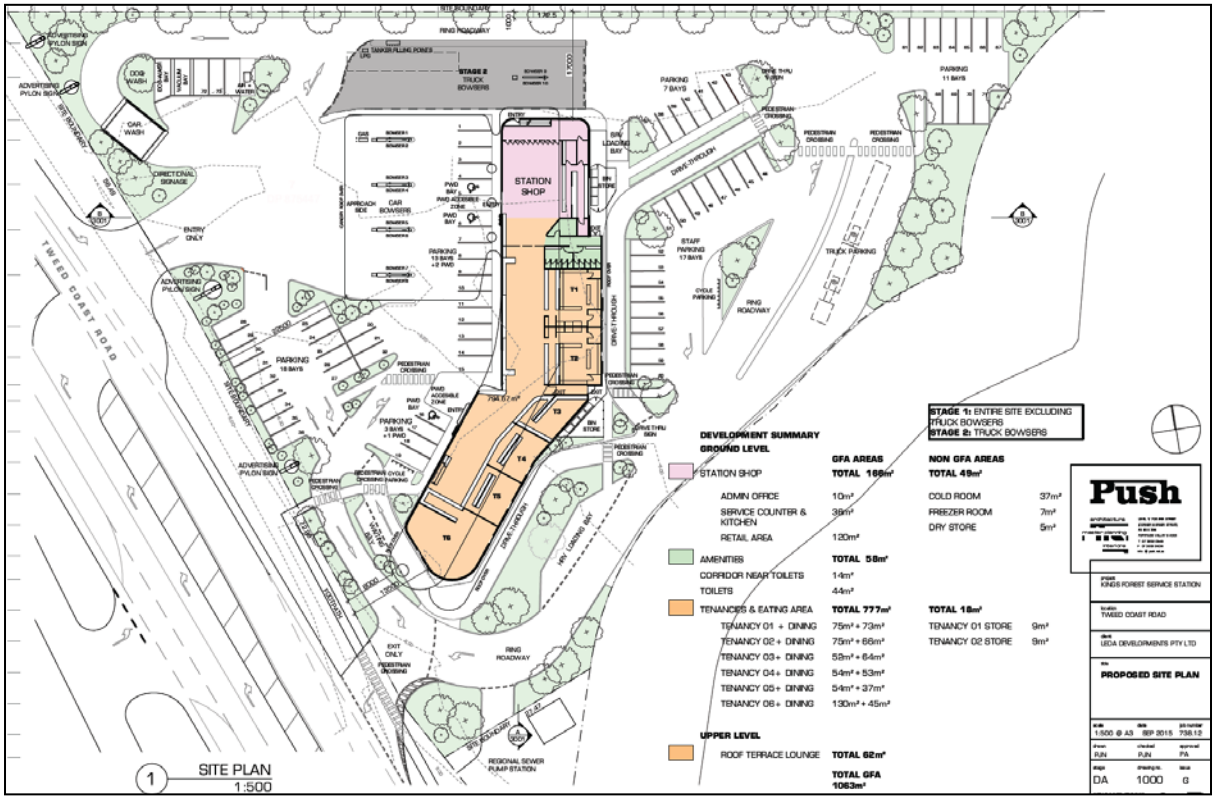

FIGURE 2 – PROPOSED SERVICE STATION PLAN

2.0 SITE DESCRIPTION & LOCATION

The development is located within Lot 7 on DP875447 and is accessed from Tweed Coast Road within the suburb of Kings Forest. This allotment shall be hereafter referred to as '*the site*'. The site is currently vacant with no infrastructures present.

In accordance with SEPP (Major Development) 2005 the site is zoned 2(c) urban expansion and 7(a) Environmental Protection (Wetlands and Littoral Rainforests) (Figure 3).

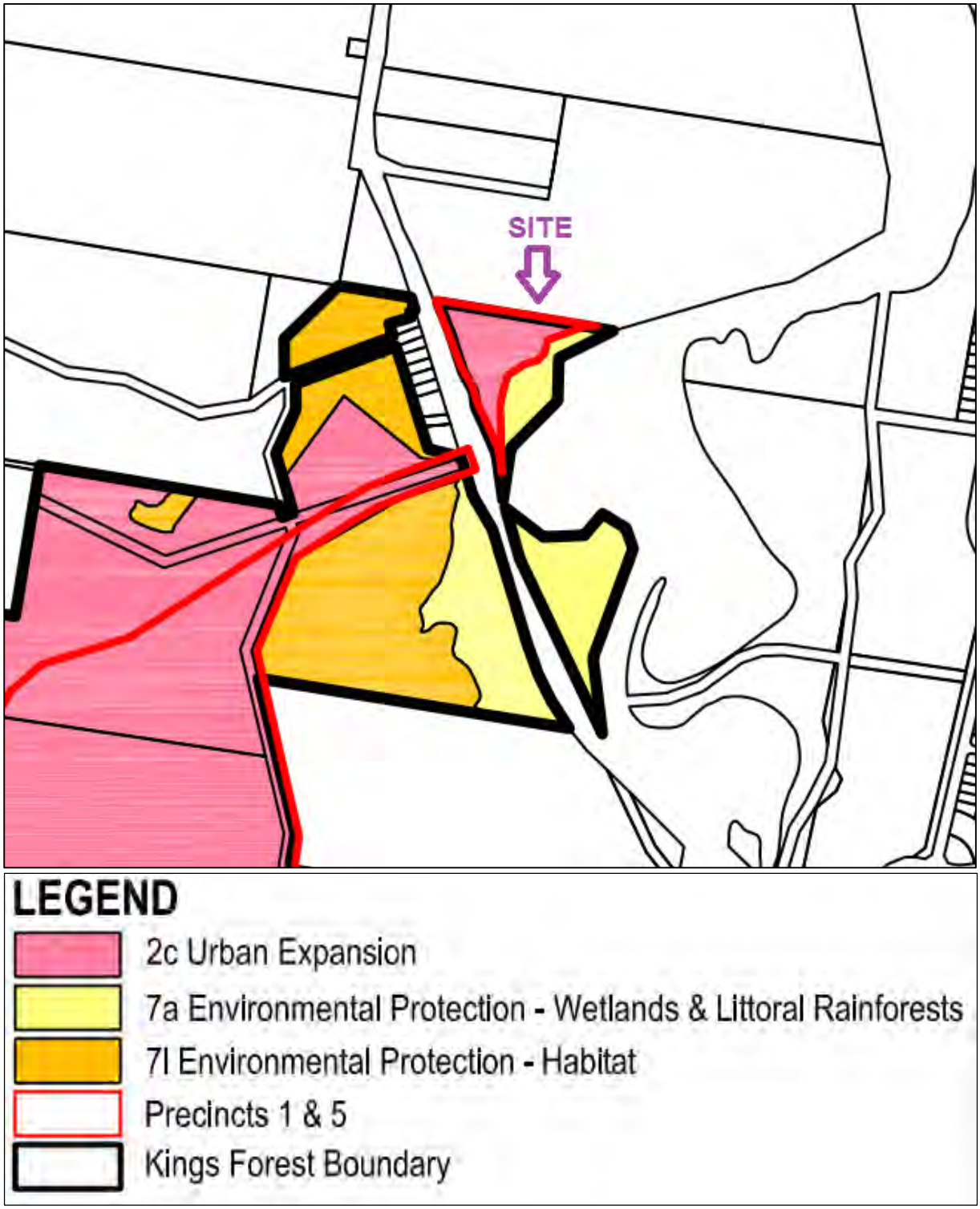

FIGURE 3 – SEPP (MAJOR DEVELOPMENT) 2005 KINGS FOREST ZONING MAP (SOURCE: JWA, 2011)

The site is located within precinct 1 of the Kings Forest Concept plan (MP06-0318) and is identified as employment land; 50m ecological buffer and environmental protection land (Figure 4A).

The proposed Service Station is located wholly within the footprint approved for the rural supplies business.

Development has previously been approved (MP 08_0194) (Figure 4B) on site for the purpose of rural supplies business.

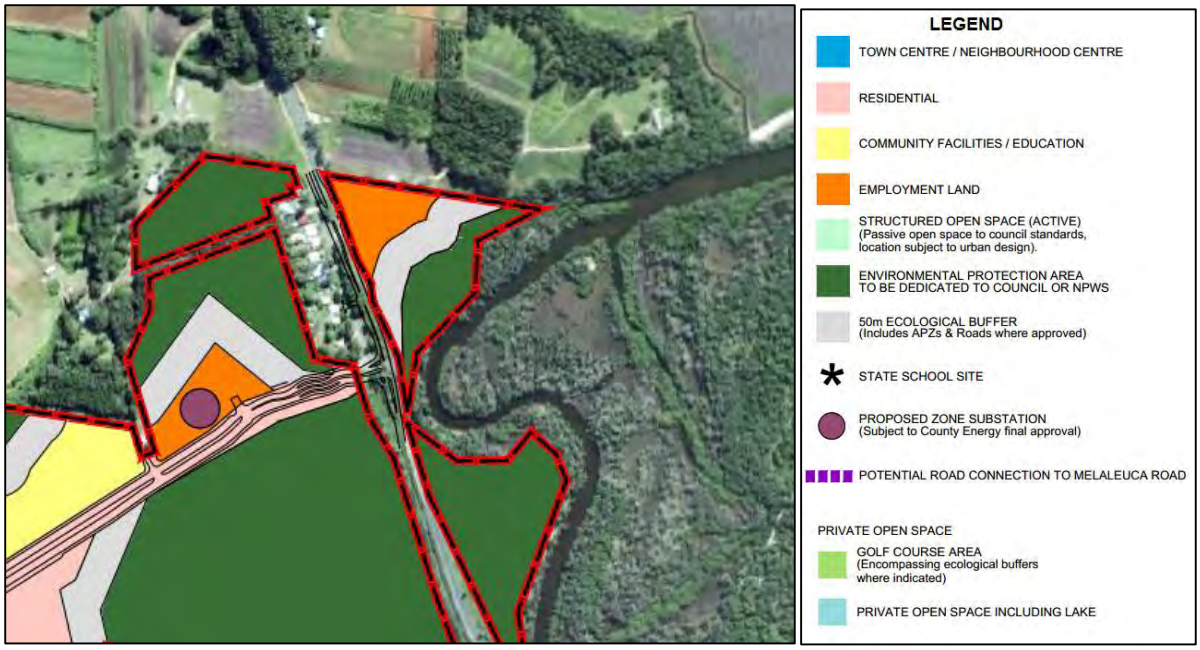

FIGURE 4A – REVISED CONCEPT PLAN (SOURCE: RPS, 2012)

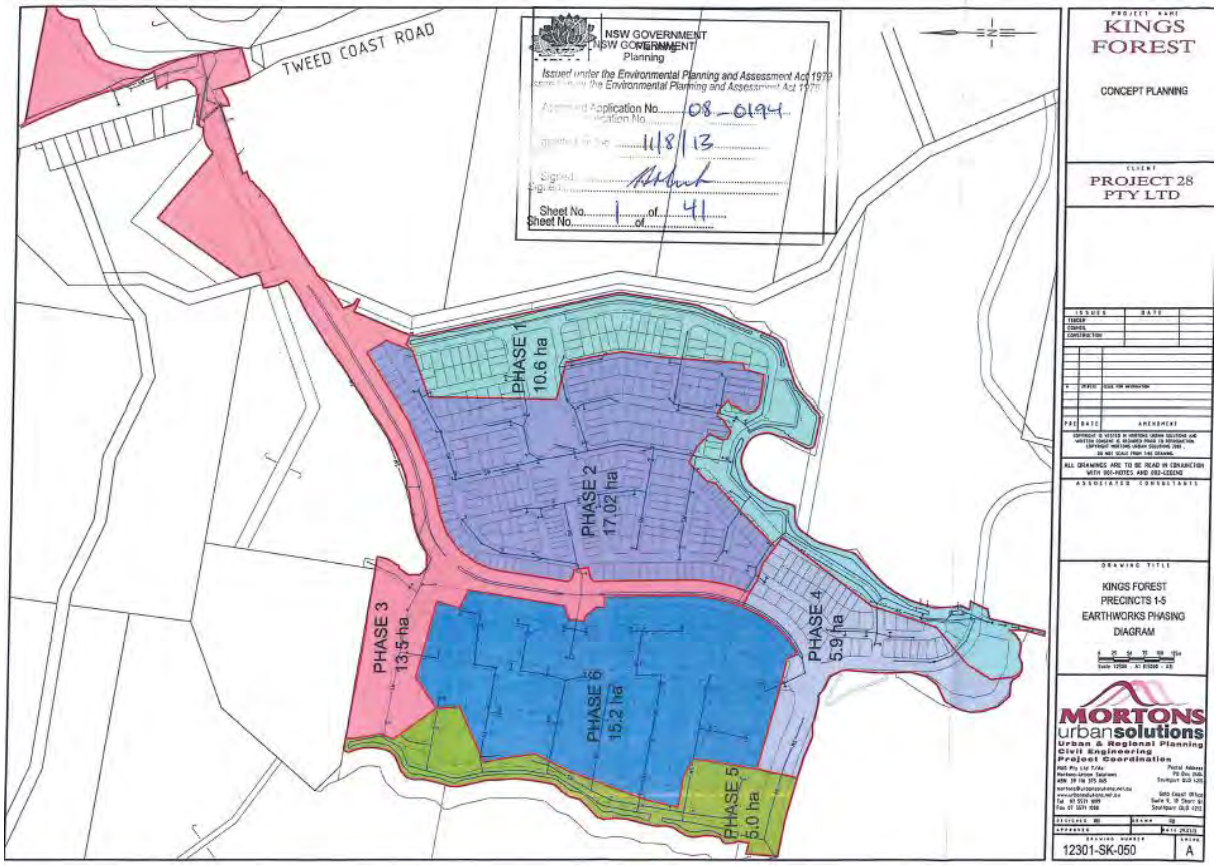

FIGURE 4B – APPROVED KINGS FOREST CONCEPT PLAN

2.1 SOIL LANDSCAPES

A review of the 'Soil Landscapes of the Murwillumbah Tweed Heads' (Morland, 1996) notes two soil landscapes over the site (refer Figure 5):

Aeolian Soil Landscapes
Aeolian landscapes have accumulated by deposition of sand-sized particles by wind action. Aeolian landscapes include dunefields, dunes, blowouts, sand sheets and lunettes. This group consists of the following soil landscape units: Bogangar (bo), Kingscliff (ki) and Wooyung (wy). Pottsville (po) is considered an Aeolian/Swamp landscape.

Estuarine Soil Landscapes
Estuarine landscapes occur where rivers and streams enter large bodies of water such as the sea or inland lakes. Channel flow is dissipated and is also modified by wave and/ or tidal action. Soil materials may be influenced by saline conditions. Estuarine soil landscapes include estuaries, deltas, tidal creeks and tidal flats. This group consists of the following soil landscape units: Cobaki (cb) and Ukerabagh (uk). Tweed (tw) is considered an Estuarine/Alluvial landscape

- Kingscliff (ki): mapped the entire site with the exception of a small section in the east

Location: Level to gently undulating sand sheets and minor beach ridges of the inner barrier system, occurring throughout the Tweed-Byron Coast.
Geology: Aeolian and marine quartz sand sheets and dunes of the inner Pleistocene inner barrier system.
Topography: Extremely low, level to gently undulating beach ridge plains and sand sheets. Elevation is generally 1-5m. Slopes range from 0-2% and relief is 1-2m.
Soils: deep (>200cm) generally well-drained podzols.

- Cobaki variant (cba): mapped to the east of the site in association with Cudgen Creek

Location: Narrow interbarrier creek floodplains along Cudgen, Cudgera and Mooball Creeks consisting of mixed estuarine and Aeolian materials.
Geology: Quaternary estuarine alluvium consisting of Holocene and Pleistocene in-fill materials-clay, silt, sand and gravel occur, but organic materials dominate the surface
Topography: Level, extensive (1-2km) marine plains and estuarine in-fills of extremely low relief (<2m). Slopes are <1% and elevation is generally 0-3m, much of this landscape being extratidal flats.
Soils: Generally Humic Gleys and Peats overlying inner barrier sediments and estuarine muds (Morand 1996; 149-150 + map).

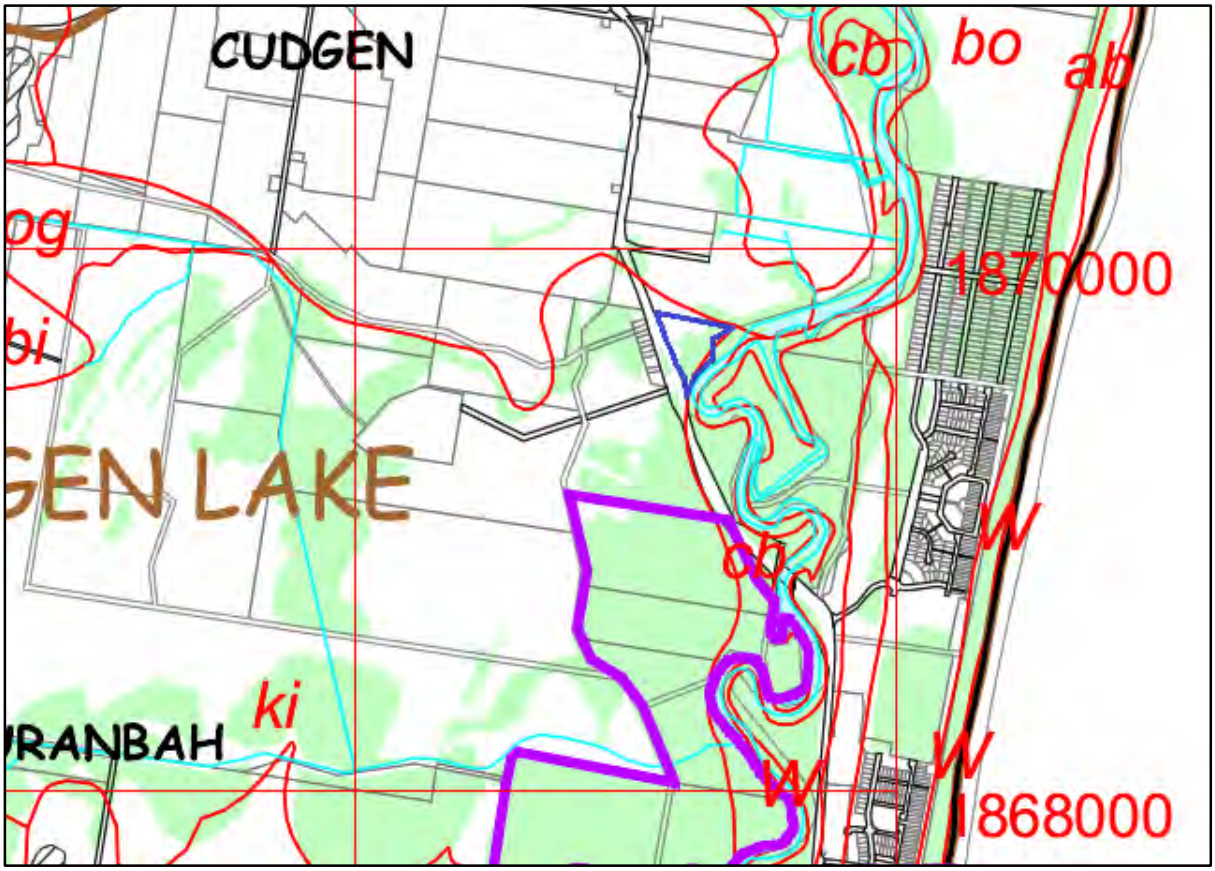

FIGURE 5 – SOIL LANDSCAPE, STEEP LAND AND DRAINAGE LINES MAPPING (TVMP, 2005)

3.0 VEGETATION ASSESSMENT

- Desktop analysis including:

I. Review of Council's Planning Scheme Mapping & Associated Reporting (i.e. Tweed LEP 2000, 2014 Maps, Draft LEP Amendment No 21 Mapping, Tweed VMP Maps 1-7)

II. Review of existing vegetation community documentation to confirm dominant elements, forest descriptions and conservation status of mapped forested remnants/ecosystems including:

- Forestry Commission NSW (1989) *Research Note 17: Forest Types in NSW*.
- National Parks and Wildlife Service (1999) *Forest ecosystem classification and mapping for the upper and lower north east cra regions*. CRA Unit-Northern Zone.
- DECC (2008) *BioMetric: Terrestrial Biodiversity Tool for the NSW Property Vegetation Planning System: Definitions of Vegetation Types for CMA Areas* (online @ http://www.environment.nsw.gov.au/projects/Biometric Tool.htm)
- Keith, D. (2004) *Ocean Shores to Desert Dunes*. The native vegetation of NSW. DECC, Hurstville.
- Ecograph (2004) *Tweed Vegetation Management Strategy*. Ecograph, Limpinwood.
- Sheringham, P.R., Dr. Benwell, A., Gilmour, P., Graham, M.S., Westaway, J., Weber, L., Bailey, D., & Price, R. (2008). *Targeted Vegetation Survey of Floodplains and Lower Slopes on the Far North Coast*. A report prepared by the Department of Environment

and Climate Change for the Comprehensive Coastal Assessment. Department of Environment and Climate Change (NSW), Coffs Harbour, NSW.

III. Review of threatened flora species and endangered ecological communities listed as occurring within the Murwillumbah (Qld - Southeast Hills and Ranges) CMA sub-region of the Northern Rivers CMA (http://threatenedspecies.environment.nsw.gov.au/tsprofile/cma_subregion_list.aspx?id=15

IV. Review of threatened flora species and endangered ecological communities listed as occurring within the Murwillumbah (Qld - Southeast Hills and Ranges) CMA sub-region of the Northern Rivers CMA (http://threatenedspecies.environment.nsw.gov.au/tsprofile/cma_subregion_list.aspx?id=15

V. Review of search of the Atlas of NSW Wildlife database within a search area 10km surrounding the site to review threatened plant records

VI. Review of Environment Australia Protected Matters data within a search area 10km surrounding the site to review threatened plant records

VII. Review of SEPP Mapping (Coastal Wetlands, Littoral Rainforest) mapping to determine the indicative presence/absence of regional forest ecosystems reflective of wetland (marine, estuarine, riverine, lacustrine and/or palustrine) communities and/or Littoral Rainforests.

VIII. Review of selected ecological surveys previously undertaken in the locality including:

Aspect North, 2005, *Flora and Fauna Assessment, Grazing of Cudgen Paddock, Kings Forest.* A report for Leda Developments Pty Ltd.

Callaghan, J., de Jong, C. & Mitchell, D., 2005. *Kings Forest Ecological Assessment*. Report prepared for Tweed Shire Council by the Australian Koala Foundation.

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James Warren & Associates, 2013, *Request For Additional Information – Preliminary Documentation Lot 76, 272, 323 & 326 DP 755701; Lot 6 DP 875446; Lot 2 DP 819015; Lot 1 DP 706497; Lot 40 DP 7482; Lot 37A DP 13727; Lot 38A DP 13727; Lot 38B DP*

13727; Lot 1 DP 129737; Lot 1 DP 781633; Lot 7 DP 8750447 Kings Forest. A Report Prepared For Project 28 Pty Ltd.

Kingston M.B., Turnbull J.W., Hall P.W., 2004. *Tweed Vegetation Management Strategy 2004*. Report prepared for Tweed Shire Council by Ecograph.

Landpartners P/L (2008) *Vegetation Management Plan Kings* Forest. Landpartners P/L, Ballina.

Milledge, D., R., 1989, *A Survey Of The Vertebrate Fauna OF The Kings Forest Area And Adjacent Natural Habitats*, South Kingscliff, NSW. Prepared For Forsite Landscape Architects And Planners Pty Ltd

Milledge, D. (2005) The Natural and Scientific Significance of the Southern part of the Kings Forest Lands. A report prepared for the Department of Environment and Conservation.

Planit Consulting (2009) *Koala Survey Of Lands Located At Depot Road, Cudgen including: Lots 76, 272, 323 & 326 DP 755701, Lot 6 DP875446, Lot 2 DP 819015, Lot 1 DP 706497, Lot 40 DP 7482, Lot 38a DP 137213, Lot 38b DP139737, Lot 1 DP 12973, Lot 1 DP 781633, Lot 7 DP 875447 & Lot 37a DP 13727 Prepared For Leda Developments P/L*. Planit, Nobby Beach

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SMEC, 2006, *Draft Peer Review of Ecological Issues: Kings Forest Estate*. Prepared for Tweed Shire Council

Warren J. (2000) *Species impact statement for the proposed Kings Forest development.* Prepared for Nauri Gold Coast.

IX. Review of the following legislation to ensure the latest lists of threatened species and communities were noted as well as investigating the existence of any relevant recovery plans, threat abatement plans, key threatening processes or any preliminary determinations which may be applicable to the site and/or the proposed use/action:

- *Threatened Species Conservation Act (1995)*
- *Environment Protection and Biodiversity Conservation Act (1999)*

- *Site survey including:*

Random Meander/Diversity Searches: Random searches within each vegetation community were undertaken recording all species observed was undertaken in accordance with Cropper (1993) and DEC (2004). Knowledge of known habitat of protected and uncommon floral species was utilized to target such species.

The above survey techniques were applied to determine the following:

- Validate or modify existing vegetation mapping;
- Meet minimum Council and State Government vegetation/survey requirements;
- Identify floral species existing within the site;

- Measure and/or estimate Crown Cover (Walker and Hopkins, 1998, Nelder, 2004. EPA, 2005) to determine vegetation structure designations;
- Identify average height of canopy trees;
- Identify the incidence of senescent trees;
- Determine species dominance within ecologically dominant layer;
- Determine incidence of weed invasion and disturbance over the site and within vegetation strata;
- Determine incidence of species listed as endangered, vulnerable or rare under the *Threatened Species Conservation Act;*
- Determine incidence of species listed as endangered or vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999*

In undertaking the site survey works focus was given to the development footprint and immediate surrounding areas (50m) with a more general inspection of areas beyond these limits.

3.1 VEGETATION SURVEY RESULTS

Vegetation within the subject site has been previously mapped by Australia Koala Foundation 2004.

Three vegetation communities have been mapped as occurring within the subject site (Figures 6 and 7).

The north east section of the site has been mapped as *Substantially Cleared of Native Vegetation* and occupies ~1.4043ha of the site. It is noted that the majority of the proposed service station occurs within this vegetation community. Images illustrating this community is displayed within Figure 9.

The central portions of the site has been mapped as *Littoral Rainforest* and occupies ~0.9481ha of the subject site. Images illustrating this community is displayed within Figure 10.

Areas within the western sections of the site has been mapped as *Broad-leaved Paperbark Closed Forest to Woodland* (Swamp Sclerophyll Floodplain Firest) and occupies ~1.4796ha of the site. A small area of this vegetation community is also mapped as occurring within the central section of the site, west of the littoral rainforest. This small area of paperbark forest will be required to be removed to facilitate the proposal. All areas of swamp sclerophyll forest east of the littoral rainforest will be retained. Images illustrating this community is displayed within Figure 11.

During recent site visits, these vegetation communities have been investigated and groundtruthed (Figure 8). It is concluded that vegetation communities as mapped within Figure 6 accurately represents the vegetation communities on site.

A detailed description of the vegetation communities located within the subject site is depicted within Australian Koala Foundation (2005) Kings Forest Ecological Assessment Prepared for Tweed Shire Council.

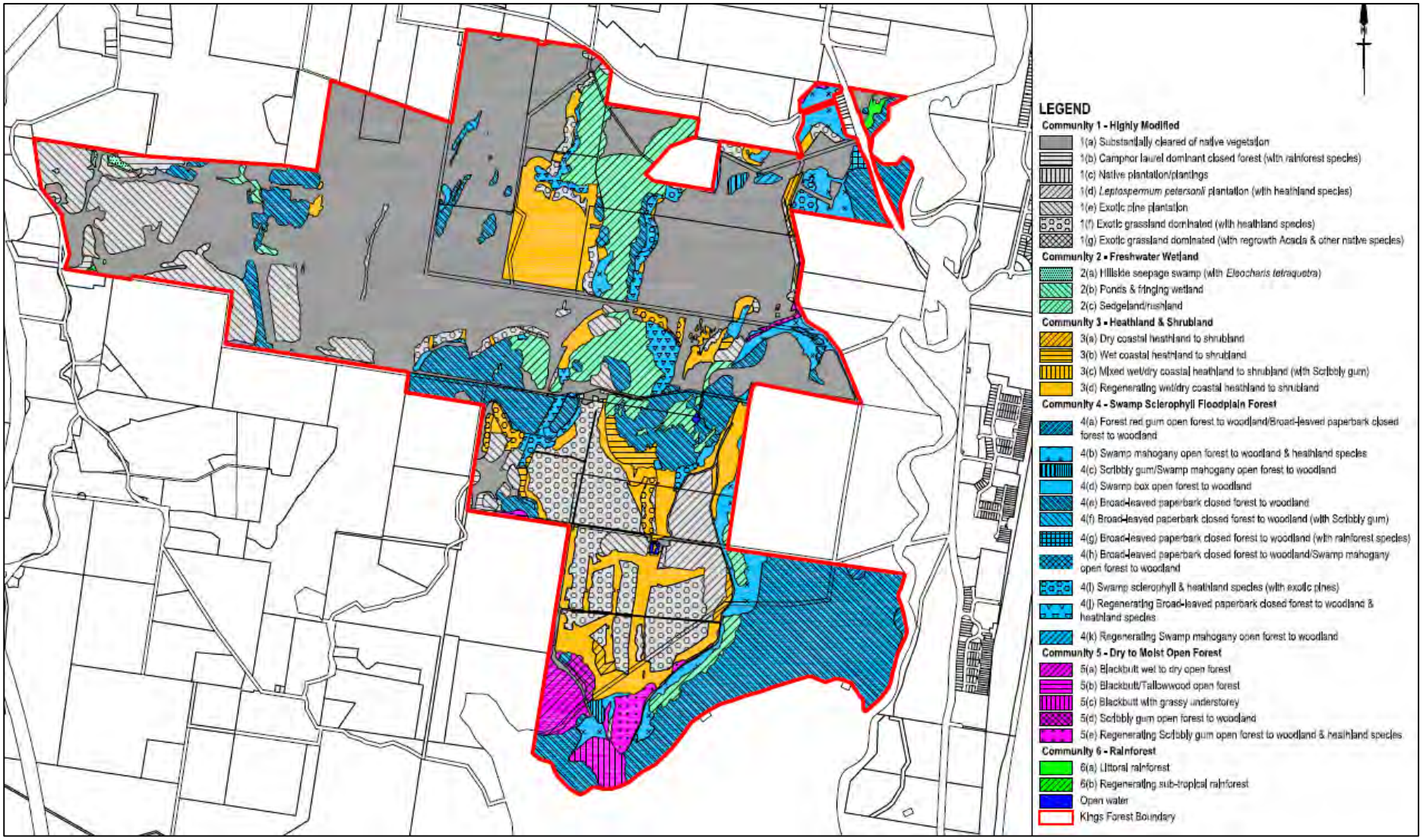

FIGURE 6 – VEGETATION COMMUNITIES WITHIN KINGS FOREST PRECINCT (Source: JWA, 2013)

FIGURE 7 - Mapped Vegetation Communities Within The Subject Site (Information Sourced From JWA, 2013)

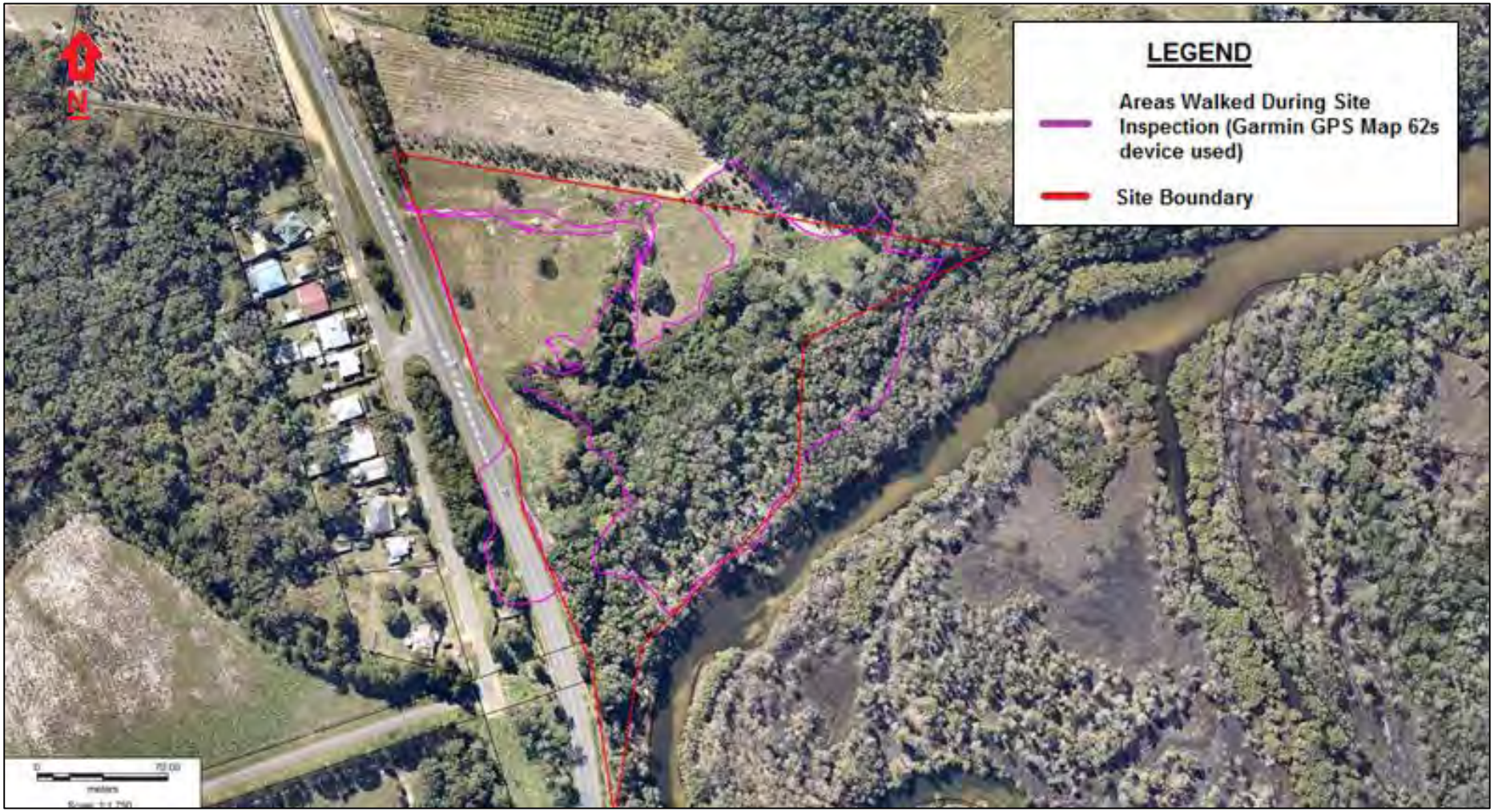

FIGURE 8 – MEANDER MAP ILLUSTRATING AREAS INVESTIGATED DURING SITE GROUNDTRUTHING/INSPECTION

FIGURE 9 – VEGETATION WITHIN MAPPED COMMUNITY *SUBSTANTIALLY CLEARED OF NATIVE VEGETATION*

FIGURE 10 – VEGETATION WITHIN MAPPED *LITTORAL RAINFOREST*

FIGURE 11 – VEGETATION WITHIN MAPPED VEGETATION COMMUNITY *BROAD-LEAVED PAPERBARK CLOSED FOREST TO WOODLAND*

4.0 FAUNA ASSESSMENT

This section describes the site's fauna and associated habitat as identified through surveying.

The methodology applied to arrive at the species list is outlined and significant species have been identified where relevant.

The development proposal has also been evaluated against these findings.

Surveying was conducted on the 18th of November 2014.

4.1 METHODOLOGY

To classify and identify fauna species which occur or may occur on site, the following methodology was applied:

- Desktop analysis including:
  - *I.* Review of Council's Planning Scheme Mapping & Associated Reporting (i.e. Tweed LEP 2000, 2014 Maps, Draft LEP Amendment No 21 Mapping, Tweed VMP Maps 1-7)
  - *II.* Review of threatened fauna species and endangered populations listed as occurring within the Murwillumbah (Qld - Southeast Hills and Ranges) CMA sub-region of the Northern Rivers CMA (http://threatenedspecies.environment.nsw.gov.au/tsprofile/cma_subregion_list.aspx?id=15
  - *III.* Review of search of the Atlas of NSW Wildlife database within a search area 10km surrounding the site to review threatened plant records
  - *IV.* Review of selected ecological surveys/reports previously undertaken in the locality including:

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Callaghan, J., de Jong, C. & Mitchell, D., 2005. *Kings Forest Ecological Assessment*. Report prepared for Tweed Shire Council by the Australian Koala Foundation.

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SMEC, 2006, *Draft Peer Review of Ecological Issues: Kings Forest Estate*. Prepared for Tweed Shire Council

Warren J. (2000) *Species impact statement for the proposed Kings Forest development.* Prepared for Nauri Gold Coast.

Weather conditions were warm with temperatures ranging from 18.7°C to 27.7°C. No rainfall occurred during survey events of the site.

4.2.1 DIURNAL SURVEY

- Binocular search and identification of all fauna heard or sighted;
- Opportunistic sightings/audible identifications were conducted and recorded whilst all survey works were being undertaken;
- Bird identification surveys were conducted in association with dawn and dusk activity and comprised walked transects through each vegetation community;

Duration: 1 x dawn (30 mins) 1 x dusk (30 mins)
Ground track/trace survey was performed including:

- Scat/pellet examination
- Scratch/trace examination of trees
- Diggings, burrow, trace and track examination
- Humus/crevice examination
- Examination and assessment of tree hollows, hanging bark, termite mounds, flowering and nesting trees etc

Duration: Opportunistic during other survey works

Ground strata searches and rock/timber/leaf litter rolls and examination for reptiles and Frogs.
Duration: 1 x 30 minutes during the middle of the day

4.2.2 NOCTURNAL SURVEY

Nocturnal survey included the following survey techniques:

- Audible survey for calls, scratching and landings;
- Naked eye observation utilising dawn/dusk/moon light for bats and fauna returning to potential nest/shelter areas (i.e. stagwatching).

Duration: 1 x dusk/evenings

Spotlighting utilising:

- Short duration- long distance white light, and
- Long duration- short distance red light

Duration on foot: 1 night for 120 minutes per night

Amplified call recording/playback for avifauna, mammals and amphibians. Playback of pre-recorded calls included the following species:

- Wallum Froglet
- Olongburra Frog
- Wompoo Fruit-dove
- Rose-crowned Fruit-dove
- Black-necked Stork
- Red Goshawk
- Pale-vented Bush-hen
- Glossy Black-cockatoo
- Eastern Grass Owl
- Masked Owl
- Powerful Owl
- Bush Stone-curlew
- Eastern Osprey
- Koala
- Spotted-tailed Quoll
- Black Bittern
- Squirrel Glider
- Regent Honeyeater
- Magpie Goose
- Collared Kingfisher

- White-eared Monarch

Each call playback session comprised of the following:

- A 5 min listening period for un-elicited fauna calls
- A 5min call playback for relevant species on a 25W Toa Megaphone
- A 10min search/spotlight for fauna at the playback site

Depending on the targeted species playback was undertaken at dusk and after dark.
The approximate locations of fauna survey plots (for defined methods such as call playback and spotlighting) across the site are depicted in Attachment 3.

4.2.3 SURVEY LIMITATIONS

Whilst the duration of flora surveys and inspections of the property are considered appropriate in the context of the modified habitat and small size of the site, undetected threatened or other native flora species may be present on the property. Seasonal surveys would also be necessary to detect flora species that are dormant or inconspicuous for part of the year if present (i.e. from the Asteraceae, Orchidaceae, Cyperaceae, Poaceae etc). Some of these species (dormant or non-flowering) may have been undetected or under-represented within the survey period.. Further ungerminated seed of various species may have been present within the soil seed bank.

Whilst the duration and sampling methodology of the fauna survey is considered appropriate, it is acknowledged that the entire seasonal fauna assemblage is unlikely to be recorded. It is also accepted that although assessments of habitat and species ecology does provide an additional measure to anticipate the presence of species (as a surrogate for its actual observation), there is no absolute certainty to the absence of a species from marginal or potential habitat.

Additionally, there may be some species that may utilise the habitats within the site but have remained undetected due to their rarity, elusive nature or the sporadic utilisation of the habitats (i.e. the Long-nosed Potoroo, Common Planigale and Dunnart are elusive species that are difficult to trap or observe directly; the Black-necked Stork, Powerful Owl, Spotted-tail Quoll and Red Goshawk may only visit an area occasionally within a much larger home-range; the Swift Parrot and Regent Honeyeater may only visit an area during peak flowering periods etc).

The conclusions of this report are therefore based upon data available at the time and the results of field works undertaken and are therefore indicative of the environmental condition of the site at the time of sampling, including the presence or otherwise of species. At should be acknowledged that site conditions, including the presence of threatened species, can change over time.

The above limitations have been taken into account and the likelihood of threatened such species occurring within the site assessed through habitat assessment, records of the species within the locality and aspects of species ecology (refer Section 6).

4.2.4 LICENCING

The following issued licences were held by the surveyors at the time of surveying:

TABLE 1: Relevant Licences

Authority	Licence/Permit	Title	Expiration	Permit No.

NSW DPI Animal Care & Ethics Committee	Animal Research Approval	Fauna Surveying, Trapping & Release	30 June 2015	14/1971
NSW DPI Animal Care & Ethics Committee	Animal Research Authority	Fauna Surveying, Trapping & Release	30 June 2015	14/1971
NSW National Parks & Wildlife Service	Scientific Licence	Ecological Survey	31 May 2015	S100142
QLD EPA/DEHP	Scientific Purposes Permit	Wildlife Research	7 August 2019	WISP14894213
QLD DEEDI Animal Ethics	Scientific Use Registration	Scientific Use Registration	14 February 2015	Reg No. 241
QLD DAAF Animal Ethics	Community Access AEC	Fauna Surveying	31 May 2017	CA 2014/05/762
QLD DEHP	Rehabilitation Permit NC(Administration)R 2006	Observe or relocate protected animals	16 May 2016	WIRP12736113

4.3 HABITAT ASSESSMENT

Prior to the commencement of the abovementioned survey works on site a broad habitat assessment was conducted in association with vegetation survey works. The purpose of this overview was to determine which species were likely to be present based on available habitat components and to target areas for detailed surveying of protected fauna species. The site incorporated the following broad habitat features as a result of previous land use, vegetation types (refer Section 3), surrounding uses and hydraulic regime:

TABLE 2: Habitat Elements Summary

Habitat Element/Feature	Comment
Presence of hollow bearing trees	No hollow-bearing trees were observed within the subject site.
Presence of koala habitat and/or favoured koala trees	Although abundant within the locality, no favoured koala trees were recorded on the subject site.
Presence of caves, culverts or disused buildings suitable for roosting of microchiropteran bat species	Absent from the subject site
Presence of megabat roosting sites	Absent. The nearest known flying fox roost site is located within Terranora Broadwater ('Big Island') approximately 5km north of the subject site

Habitat Element/Feature	Comment
Presence of scratches or feeding scars on tree trunks	Possum scratch marks were observed on several trees within the littoral rainforest area. No evidence of feeding scars on tree trunks were however recorded.
Presence of creeklines, estuaries, mudflats, mangroves and/or riparian vegetation	Cudgen Creek and associated vegetation recorded
Presence of dams, ponds, lakes and/or other natural or constructed permanent water sources	Permanent water available via Cudgen Creek
Presence of dense understory and ground cover vegetation	Common throughout littoral rainforest and swamp sclerophyll forest within the subject site.
Presence of deep leaf litter layer and/or debris (fallen logs etc)	Leaf litter layer commonly associated with littoral rainforest present. Several large limbs and fallen logs encountered.
Presence of fruiting flora species	Present in association with the littoral rainforest. Species includes typical fruiting species such as Tuckeroo, Glochidion, Figs, Elaeocarpus ect.
Presence of flowering species	Typical prolific flowering trees (acacia, melaleuca, banksia ect) present.
Presence of large stick nests indicative of raptor presence	Known within the locality however not observed on site.
Presence of rocky outcrops and/or extensive exposed rocky areas favouring reptile populations	Generally absent

Site Survey Results

The following section(s) list the fauna species recorded on the subject site during detailed surveying and lists the methods by which each species was identified. Results are grouped by the Class of species recorded. Those techniques utilised to record fauna are listed below and correlate with the acronyms included within the Survey Methods column of the grouped Survey Results tables.

Survey Method Codes:

O Direct Observation
SL Direct Observation with Spotlight
Sc Scat
C Call (Audible) Detection and/or response to playback
Scrt Scratch
Sh Shell/Shell Fragment/Skeleton
Trk Track/Trace

Ana ANABAT Detection

* All birds were either directly observed through diurnal survey, spotlighting or call identification.
** Introduced/feral species
*** Recorded in areas adjacent the study area or circling overhead

Table 3: Amphibian Species

Family	Scientific Name	Common Name	Method
Bufonidae	***Bufo marinus*	Cane toad	SL
Hylidae	*Litoria Fallax*	Common Reed Frog	C, SL
Hylidae	*Litoria nasuta*	Rocket Frog	C, SL
Limnodynastidae	*Limnodynastes peronii*	Striped Marshfrog	SL
Myobatrachidae	*Crinia signifera*	Clicking Froglet	C
Myobatrachidae	*Crinia parinsignifera*	Beeping Froglet	C

Table 4: Reptile Species

Family	Scientific Name	Common Name	Method
Agamidae	*Intellagama lesueurii*	Water Dragon	O
Colubridae	*Boiga irregularis*	Brown Treesnake	SL
Elapidae	*Pseudechis porphyriacus*	Red-bellied Blacksnake	O
Gekkonidae	***Hemidactylus frenatus*	Asian House Gecko	SL
Scincidae	*Cryptoblepharus virgatus (syn pulcher)*	Wall Skink	O,T
Scincidae	*Ctenotus robustus*	Eastern Striped Skink	O
Scincidae	*Lampropholis delicata*	Grass Skink	O,T
Varanidae	*Varanus varius*	Gooana	O

Table 5: Mammal Species

Family	Scientific Name	Common Name	Method
Canidae	***Vulpes vulpes*	Fox***	SL
Canidae	*Canis lupus familliaris*	Dog***	O
Leporidae	***Lepus europaeus*	Hare	SL
Macropodidae	*Macropus giganteus*	Eastern Grey Kangaroo	Trk
Peramelidae	*Isoodon macrourus*	Bandicoot	Trk
Phalangeridae	*Trichosurus vulpecula*	Brushtail Possum	SL
Pseudocheiridae	*Pseudocheirus peregrines*	Ringtail Possum***	SL
Pteripodidae	*Pteropus alecto*	Black Flying-fox***	SL

Table 6: Bird Species

Family	Species Name	Common Name
Acanthizidae	*Sericornis frontalis*	White-browed Scrub-wren
Accipitriformes	*Haliastur indus*	Brahminy Kite***
Accipitriformes	*Haliastur sphenurus*	Whistling Kite***
Anatidae	*Anas superciliosa*	Pacific Black Duck
Anatidae	*Chenonetta jubata*	Australian wood duck
Ardeidae	*Ardea ibis*	Cattle Egret***
Ardeidae	*Egretta novaehollandiae*	White-faced Heron

Family	Species Name	Common Name
Artamidae	*Cracticus nigrogularis*	Pied butcherbird
Artamidae	*Cracticus torquatus*	Grey butcherbird
Artamidae	*Gymnorhina tibicen*	Australian magpie
Artamidae	*Strepera graculina*	Pied Currawong
Cacatuidae	*Cacatua galerita*	Sulphur-crested cockatoo
Cacatuidae	*Cacatua roseicapilla*	Galah
Campephagidae	*Coracina novaehollandiae*	Black-faced cuckoo-shrike
Charadriidae	*Vanellus miles*	Masked Lapwing
Cisticolidae	*Cisticola exilis*	Golden-headed cisticola
Columbidae	*Geopelia striata*	Peaceful Dove
Columbidae	*Ocyphaps lophotes*	Crested Pigeon
Columbidae	*Macropygia amboinensis*	Brown cuckoo-dove
Coraciidae	*Eurystomus orientalis*	Dollarbird
Corvidae	*Corvus orru*	Torresian crow
Cuculidae	*Centropus phasianinus*	Pheasant coucal
Estrildidae	*Neochimia temporalis*	Red-browed Finch
Halcyonidae	*Dacelo novaeguineae*	Laughing kookaburra
Hirundinidae	*Hirundo neoxena*	Welcome swallow
Maluridae	*Malurus lamberti*	Variegated Fairy-wren
Megaluridae	*Megalurus timoriensis*	Tawny Grassbird
Meliphagidae	*Lichmera indistincta*	Brown honeyeater
Meliphagidae	*Entomyzon cyanotis*	Blue-faced Honeyeater
Meliphagidae	*Manorina melanocephala*	**Noisy miner
Meliphagidae	*Meliphaga lewinii*	Lewins Honeyeater
Meliphagidae	*Myzomela sanguinolenta*	Scarlet honeyeater
Meliphagidae	*Philemon citreogularis*	Little Friarbird
Meliphagidae	*Philemon corniculatus*	Noisy friarbird
Meropidae	*Merops ornatus*	Rainbow Bee-eater
Monarchidae	*Grallina cyanoleuca*	Magpie lark
Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush
Pachycephalidae	*Pachycephala rufiventris*	Rufous whistler
Pelecanidae	*Pelecanus conspicillatus*	***Australian Pelican
Passeridae	*Passer domesticus*	Sparrow**
Pardalotidae	*Pardalotus striatus*	Striated Pardalote
Podargidae	*Podargus strigoides*	Tawny Frogmouth
Psittacidae	*Platycercus adscitus*	Pale-headed Rosella
Psittacidae	*Trichoglossus chlorolepidotus*	Scaly-breasted lorikeet
Psittacidae	*Trichoglossus haematodus*	Rainbow lorikeet
Rhipiduridae	*Rhipidura fuliginosa*	Grey fantail
Rhipiduridae	*Rhipidura leucophrys*	Willie wagtail
Threskiornithidae	*Threskiornis molucca*	Ibis
Timaliidae	*Zosterops lateralis*	Silvereye

4.4 DISCUSSION OF SURVEY RESULTS

4.4.1 BIRDS

Forty-nine (49) species of bird were recorded during surveys of the subject site. No species scheduled as endangered or vulnerable under the *Threatened Species Conservation Act 1995* or *Environment Protection and Biodiversity Conservation Act 1999* were recorded on the site during fauna survey works.

The majority of bird species recorded from within and adjacent the site are diurnal species including:

- Insectivores which forage for invertebrates in the leaves, branches and bark of trees, in the air spaces provided by canopy gaps, and amongst litter, woody debris and groundcovers (i.e. fairy wrens, fantails, scrubwren etc)
- Nectar feeders (i.e. lorikeets, honeyeaters, miners etc)
- Large omnivores (i.e. butcherbirds, magpies, crows etc)
- Waterbirds (pelicans, ducks, egrets etc)
- Granivores (Doves, Pigeons)
- Raptors (Kites)

A significant review of literature relating to the habitats and niche requirements of avifauna utilising eucalypt woodlands and forests was undertaken by McElhinny (2000) in association with NSW NPWS. This review notes that "the bird species occurring in eucalypt woodlands and forests belong to a variety of foraging groups, reflecting the diversity of resources which these vertebrates can utilise. A large proportion of birds are insectivorous, foraging for invertebrates in the leaves, branches and bark of eucalypts, in the air spaces provided by canopy gaps, and amongst litter and woody debris (Woinarski *et al.* 1997). There is also a diversity of bird species which feed on nectar and exudates such as manna, honeydew and sap (Recher *et al.* 1985). A small proportion of birds feed on eucalypt seeds, and only a very few species are capable of digesting pollen. Frugivorous birds are rare and there are no leaf eating birds (Landsberg and Cork 1997). In addition to food resources, birds utilise sites for nesting and shelter, either in the form of suitable tree hollows, or appropriate foliage or ground cover arrangements (Recher *et al.* 1991).

The most productive habitats for birds appear to be those providing a range of resources which can support a variety of different foraging groups (Bauer *et al.* 2000). This is most likely to occur where there is a diversity of vegetation strata available as foraging substrates (Gilmore 1985, Loyn 1985, Recher 1969, MacArthur and MacArthur 1961). In Australian temperate forests and woodlands different strata tend to reflect differences at the levels of plant life form (forb, shrub or tree) and plant genus. This provides different kinds of food (nectar, fruit, seeds) and foliage thereby increasing the diversity of foraging opportunities for bird species (Recher 1985).

Six habitat components have been consistently identified as important resource bases for birds (Recher *et al.* 1998, Woinarski *et al.* 1997, Traill 1993, Recher 1991, Gilmore 1985):

- Foliage; a source of exudates and invertebrates;
- Flowers; a source of nectar and invertebrates
- Bark; a source of exudates and invertebrates
- The ground layer, including ground vegetation, litter, logs and coarse woody debris; - a source of invertebrates and small vertebrates;
- Air spaces; within and between canopy strata - a source of invertebrates;
- Hollow bearing trees; for nesting and shelter" (McElhinny, 2000: 20).

It is considered that the site exhibits habitat suitable for a wide variety of native bird species due to the different variety of vegetation communities and site characteristics.

The nectarivorous guild was well represented and is generally well established within local paperbark and coastal forests favouring this avifauna group. Meliphagids were regularly encountered during survey works, in particularly within the littoral rainforest community.

The expansive tracts of eucalypt forest and rainforest present within the locality incorporating moderate densities of hollow bearing trees (observed offsite) provides potential habitat for a variety of nocturnal avifauna, although no suitable hollow-bearing trees or owls were encountered on site during suvey works. Large forest owls (Masked and Eastern Grass) are

also known from the locality and must be considered potential occurrences within the areas given suitable habitat for known prey species.

Suitable habitat for species associated with dense ground strata was abundant in association with the littoral rainforest and parts of the swamp sclerophyll forest which contained a deep leaf litter layer, and groundcovers containing rushes, sedges and grasses and thick shrub layer in areas. A reasonable diversity of ground, low and shrub level foliage gleaners/pouncers and sallyers were recorded from these areas including Silvereyes, Fantails, Fairy-wrens, and Grassbirds

The adjacent Cudgen Creek has resulted in the recording of common waterfowl such as Pelicans, Ducks, Egrets and Herons. Diurnal coastal raptors were also noted to be common in the locality and were recorded circling over the creek. No raptor nests were observed on-site.

The open grassland/modified areas where the proposed service station development footprint is proposed provides suitable habitat for common territorial species (Crow, Magpie, Minor) and edge-specialist species (Kookaburra, Butcherbird, Magpie) which were frequently recorded on site.

4.4.2 MAMMALS

A total of seven (7) mammal species were recorded on the subject site during surveying works. No species scheduled as endangered or vulnerable under the *Threatened Species Conservation Act 1995* or *Environment Protection and Biodiversity Conservation Act 1999* were recorded on the site during fauna survey works

Ground-dwellings Mammals

All terrestrial mammals require vegetated cover for shelter and to facilitate movement. Small terrestrial mammals prefer areas within a complex vegetation structure which is dense within the lower strata and subsequently provides shelter/nesting sites and refuge from predators. Larger terrestrial mammals (larger wallabies, kangaroos) also generally require dense cover for refuge but tend to favour more open areas for grazing/feeding.

Suitable structural forest variation and dense understory components were generally present over the entire site (excluding the cleared/modified areas) and are abundant within the locality including the Cudgen Nature Reserve. Common native and introduced ground dwelling mammals such as Bandicoots and Hares were recorded and a considered to occur in abundance within the locality. Scats from an Eastern Grey Kangaroo was recorded within the cleared/modified area of the site. A domestic dog and a fox were observed offsite within the neighbouring property. A very small area of potential habitat for terrestrial mammals will be modified in association with the proposed development.

Arboreal Mammals

Arboreal mammals previously noted to occur within the vicinity of the site are all noted to be hollow dependent with the exception of the the Ringtail Possum (which does utilize hollows but will also construct leaf dreys) (Strahan eds, 2002; Gibbons and Lindenmayer, 2002). It is widely accepted that a reduction in senescent trees is a limiting factor in hollow dependent arboreal mammal populations (Smith and Lindenmayer, 1998; Gibbons and Lindenmayer, 2002; Lindenmayer, 2002; Lunney, 1987).

Within the surrounding locality exists an abundance of hollow bearing trees (HBT) with associated Eucalypt forest. No hollow-bearing trees were however recorded within the subject site which may deter arboreal mammals from the site. Nevertheless, a brush-tailed Possum was observed within the littoral rainforest on a Cheese Tree. A Ringtail Possum was observed within a eucalypt in the property adjacent to the subject.

The habitat value for hollow-dependent arboreal mammals is accordingly considered to be high within the locality. The following species were encountered during nocturnal survey:

- Ring-tailed Possum (1 individual recorded)
- Brush-tailed Possum (1 individual recorded)

Koala foraging resources and associated eucalypt forest/woodland was not recorded on the subject site, although is abundant within the locality.

Flying Mammals

Megachiropteran bats (Black Flying Fox) were recorded flying low over the site although none were encountered entering the site during the survey period (Paperbark comprise the bulk of the vegetation biomass for the site and was not flowering during survey).

The presence of additional mega-bats (Grey-headed Flying Fox, Blossom Bat) may occur during peak flowering periods. The development as proposed will not result in a significant reduction of the existing local foraging base for the mega-bats given that few mature flowering/fruiting trees will be removed.

No flying fox roosts were encountered with the closest known roosts being associated within within the Terranora Broadwater ('Big Island') approximately 5km north of the subject site. Deposits of guano/excrement below mature trees were also not encountered further supporting the hypothesis that bat species do not roost on site.

The presence of swamp sclerophyll forest and a variety of flowering species indicates that microchiropteran bats are likely to forage on site.

Although not permanent waterbodies are present within the subject site, the adjacent Cudgen Creek provides potential habitat for species which favour foraging over waterbodies for insects (eg. Southern Myotis ect.). These species may utilise the site as a flyaway between surrounding environments

Species such as Sheathtails, Freetails, Wattled and Bentwing Bats are commonly recorded within the Kings Forest/Cudgen area and have the potential to forage on site.

A review of the bats recorded within the locality indicates that tree cavities and caves/crevices are necessary for roosting/breeding. In addition to providing shelter, maternity places and retreats for hibernation, roosts are also important places for social interactions among bats. The availability of suitable roosts is therefore critical for the survival of forest bats (Herr, 1998). Within the site it is considered that cave/mine potential breeding sites are absent. Additionally, hollow-bearing trees were also absent within the subject site, although present within the locality.

In addition to the above, it is noted that several bat species (i.e. Large-eared Pied Bat, Eastern Bentwing, Little Bentwing, Southern Myotis etc) may regularly roost in man-made

structures such as bridges (Hoye, 2009; Bat Advisory Recovery Team, 2001; TSC, 2010). Such structures too are absent from this site.

4.4.3 REPTILES

A total of eight (8) reptile species were recorded on the subject site. No species listed as endangered or vulnerable under the *Threatened Species Conservation Act 1995* or *Environment Protection and Biodiversity Conservation Act 1999* were recorded on the site during fauna survey works.

Within the site, a variety of lizards were recorded all of which are considered to be common species. Several individuals were encountered within the ground layer of the cleared/modified areas and the littoral rainforest which incorporates fallen timber, logs and general organic debris. A juvenile Lace Monitor was recorded within a Swamp Oak in close proximity to Cudgen Creek.

Two snake species were recorded within the subject site. A brown tree snake was observed within the littoral rainforest community during spotlighting events while a Red-bellied Black Snake was observed beneath a paperbark within the cleared/modified area of the site.

The presence of eucalypt woodlands in the locality would indicate that common species such as the spotted python, carpet python and whip snakes may also occur.

Those encountered are considered to be common occurrences within the locality and will be minimally affected by the proposal via modification of the existing ground refuge within the small area occupied by the development envelope.

4.4.4 AMPHIBIANS

Four (4) species of native frog and one (1) introduced toad were recorded on the subject site. No species listed as vulnerable under the *Threatened Species Conservation Act 1995* were recorded on the site during fauna survey works.

The Clicking Froglet and the Beeping Froglet were recorded vocalising offsite within the neighbouring property to the north of the site. An individual Northern Banjo Frog was recorded within the leaf debris of the littoral rainforest during spotlighting. A Green tree frog was also observed within the littoral rainforest during spotlighting. The introduced Cane was regularly observed throughout the site.

Amphibians typically require a series of permanently wet or damp habitats (streams, moist understorey, dams, depressions etc) to disperse (it is noted however that they will disperse across additional areas during prolonged wet weather) and require access to various breeding sites on a seasonal basis.

Negative impacts to continued amphibian survival within local and regional areas can occur when appropriate breeding sites and habitats are isolated, thus separating breeding individuals and access to alternate food resources. This is particularly relevant for rare and threatened species, which are usually already geographically isolated from similar populations. In this regard it is noted that the drainage lines of the site are connected to melaleuca dominated wetlands occurring to the northeast of the site.

The Wallum Froglet and Wallum Sedgefrog failed to respond to amplified call recording/playback. Given the site's absence of preferred acidic swamp type habitat, it is considered unlikely that these scheduled species utilise the subject site.

The recorded frog species recorded can be attributed to adult and breeding habitat guilds (per Ecotone, 2007) based upon habitat information (Cogger, 1992; Robinson, 1998; Barker et al, 1995) and breeding information (Anstis, 2002, Tyler, 1999).

TABLE 7: FROG HABITAT GUILDS			
Species	**Common Name**	**Adult Habitat**	**Breeding Habitat**
Crinia parinsignifera	Beeping froglet	Ground	Ephemeral pool/lentic. Still waterbodies such as flooded road verges, paddocks and smaller ponds.
Crinia signifera	Clicking froglet	Ground	Ephemeral pool/lentic. Temporary to semi-permanent flooded ditches, streams, grassland, or permanent ponds and dams. Highly adaptable and will breed in sites associated with human habitation.
Litoria caerulea	Green Treefrog	tree frog & ground	Ephemeral pool/lentic. Highly adaptable. Roadside ditches, flooded grassland. Ponds, swamps and water troughs.
Limnodynastes terraereginae	Northern Banjo Frog	Ground	The species occurs in a variety of habitats along the edges of permanent streams, dams, swamps and other areas of static water including roadside depressions. There must be cover in the form of grass and other dense vegetation. Breeding commences about October and continues until May (Hero, et al, 2004)

It is considered that the removal/modification of already cleared/modified areas of the site and minor areas within mapped littoral rainforest (~0.0677ha) will not significantly impact amphibian species.

5.0 DISCUSSION OF RECORDED & POTENTIALLY OCCURRING SCHEDULED COMMUNITIES, POPULATIONS AND SPECIES OF CONSERVATION SIGNIFICANCE

Following a review of the flora and fauna assessments, the following further discussions of ecological significance have been prepared:

5.1 ENDANGERED ECOLOGICAL COMMUNITIES

Endangered ecological communities are listed under Schedule 1, Part 3 of the *Threatened Species Conservation Act 1995*, while threatened ecological communities are listed under the *Environment Protection and Biodiversity Conservation Act 1999* as critically endangered, endangered and vulnerable.

Two potential endangered ecological communities have been recorded on the subject site:

Table 8 – Recorded Endangered Ecological Communities

EEC	SITE VEGETATION COMMUNITY
LITTORAL RAINFOREST IN THE NSW NORTH COAST, SYDNEY BASIN AND SOUTH EAST CORNER BIOREGIONS	~0.9481ha
SWAMP SCLEROPHYLL FOREST ON COASTAL FLOODPLAINS OF THE NEW SOUTH WALES NORTH COAST, SYDNEY	~1.4796ha

BASIN AND SOUTH EAST CORNER BIOREGIONS	

As previously stated, the proposal will require to removal of approximately 0.0677ha of littoral rainforest. This is considered insignificant considering 0.8804ha will be retained within the subject site. Additionally, it is proposed that revegetation works will provide 0.33ha of littoral rainforest within the subject site (refer to Section 8).

5.2 ENDANGERED POPULATIONS

Endangered populations are listed under Schedule 1, Part 2 of the *Threatened Species Conservation Act 1995*. No endangered populations are considered to occur on or proximate to the study area with the closest being the 'Cobaki Lakes and Tweed Heads West population of the Long-nosed Potoroo *Potorous tridactylus* (Kerr 1792) in the Tweed local government area.'

This population is assessed in detail within Bali et al (2003) and is remote from the location of this site.

5.3 THREATENED FLORA SPECIES

No flora species listed as endangered or vulnerable under Schedules 1 and 2 of the *Threatened Species Conservation Act 1995* or listed as critically endangered, endangered, vulnerable or conservation dependant under the *Environment protection and Biodiversity Conservation Act 1999* were observed within the site.

A search of the *NPWS 'Atlas of NSW Wildlife' [2014]* has determined that eleven (11) species of threatened flora have been previously recorded within the locality (search area North: -28.23 West: 153.51 East: 153.62 South: -28.33). Active searches throughout the occurring vegetation communities throughout the site were undertaken to locate the presence or absence of these species which are tabulated below.

Based on habitat assessment and the known distribution of these species within the NENSW bioregion, a number of these are considered unlikely to be present within the site. It is considered suitable habitat for these may be present but given the site conditions they do not occur and were not detected during field survey.

It is noted that Green-leaved Rose Walnut (*Endiandra muelleri subsp. bracteata*) specimen has been historically recorded within the road reserve external to the subject site (refer Figure 12). This specimen was not recorded during the recent site inspection and has not been seen since 2006 (JWA, 2012).

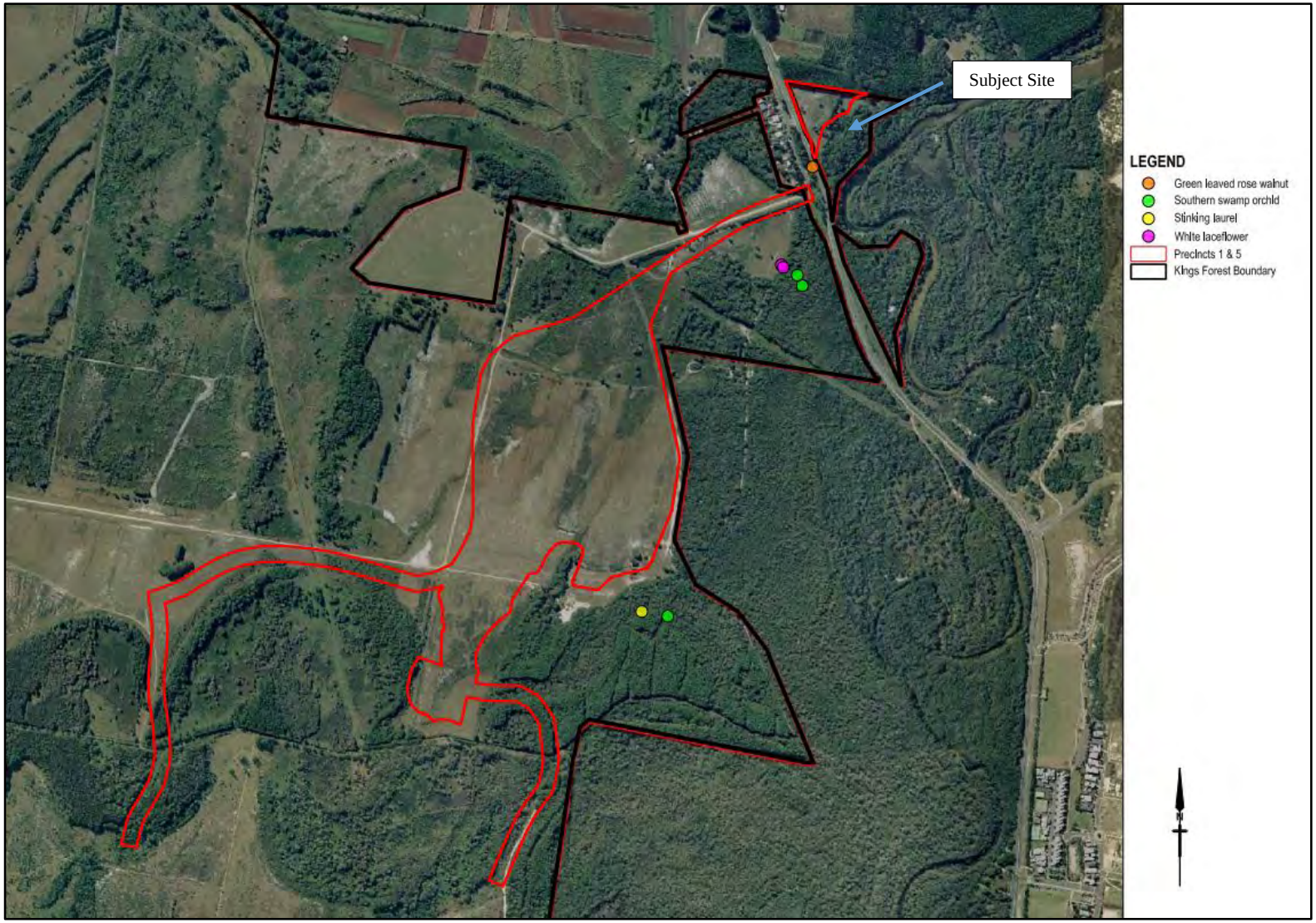

FIGURE 12 – RECORDED SCHEDULED FLORA SPECIES (SOURCE: LANDPARTNERS 2005, JWA, 2012)

Table 9: Potentially Occurring Threatened Fauna Species		
Species	**Notes**	**Potential for species or associated habitat to be impacted upon by proposal**
Square-stemmed Spike-rush (*Eleocharis tetraquetra*)	This species of spike rush is found in damp locations on stream edges and in and on the margins of freshwater swamps from four locations in NSW proximate to Boambee, Fortis Creek, Copmanhurst and Murwillumbah (DECC, 2005; NPWS, 1999).	Not recorded during site inspections. Additionally, the species has not been previously recorded on the subject site by other environmental consultants. It is expected that the proposal will not impact the species.
Sand Spurge (*Chamaesyce psammogeton*)	Sand Spurge is found sparsely along the coast from south of Jervis Bay (at Currarong, Culburra and Seven Mile Beach National Park) to Queensland (and Lord Howe Island) where it grows on fore-dunes and exposed headlands, often with Spinifex (*Spinifex sericeus*) [DECC, 2005 online @ http://www.threatenedspecies .environment.nsw.gov.au/tsprofile/profile.aspx?id=10160].	Not recorded during site inspections. Additionally, the species has not been previously recorded on the subject site by other environmental consultants. It is expected that the proposal will not impact the species.
Brush Cassia (*Cassia brewsteri var. marksiana*)	This species is known from Brunswick Heads, around Murwillumbah, and north into south-east Queensland as far as Beenleigh where it occurs within Littoral and riverine rainforest, and in regrowth vegetation on farmland and along roadsides (DECC., 2005)	Not recorded during site inspections. Additionally, the species has not been previously recorded on the subject site by other environmental consultants. It is expected that the proposal will not impact the species.
Thorny Pea (*Desmodium acanthocladum*)	This species is known from dry rainforest and the fringes of riverine subtropical rainforest in the Lismore area, and there are also records from near Grafton, Coraki, Casino and the Mount Warning area (DEC, 2005).	Not recorded during site inspections. Additionally, the species has not been previously recorded on the subject site by other environmental consultants. It is expected that the proposal will not impact the species.
Marblewood (*Acacia bakeri*)	*Acacia bakeri*has a restricted distribution in north-east New South Wales and south-east Queensland and is found In or near lowland subtropical rainforest, in adjacent eucalypt forest and in regrowth of both (DEH, 2012 online @http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10004)	Not recorded during site inspections. Additionally, the species has not been previously recorded on the subject site by other environmental consultants. It is expected that the proposal will not impact the species.

White Lace Flower (*Archidendron hendersonii*)	This tree is has been recorded from riverine and lowland subtropical rainforest and littoral rainforest from north Queensland south to the Richmond River in north-east NSW. It is found on a variety of soils including coastal sands and those derived from basalt and metasediments (DECC, 2005). This species is also known from pasture areas associated with deep red soils within the Billambil Valley (pers. obs.)	Not recorded during site inspections. Additionally, the species has not been previously recorded on the subject site by other environmental consultants. It is expected that the proposal will not impact the species.
Queensland Xylosma (*Xylosma terrae-reginae*)	This species is known from six populations in NE NSW north of Lismore where it occurs in association with Littoral and Sub-tropical Rainforest (NPWS, 2004). Of the six populations only two populations in conservation reserves, at Broken Head and Brunswick Heads Nature Reserves. Individual populations are small and the best estimate of the total population in New South Wales is less than 250 mature individuals (NSW Scientific Committee, 2000 online @ http://www.environment.nsw.gov.au/determinations/XylosmaTerraeReginaeEndSpListing.htm).	Not recorded during site inspections. Additionally, the species has not been previously recorded on the subject site by other environmental consultants. It is expected that the proposal will not impact the species.
Stinking Cryptocarya (*Cryptocarya foetida*)	Stinking Cryptocarya is known from Iluka, NSW, to Fraser Island and east of Gympie, southern Queensland where it occurs within littoral rainforest, usually on sandy soils, but mature trees are also known on basalt soils. (DECC, 2005; DSEWPC, 2008)	Not recorded during site inspections. Additionally, the species has not been previously recorded on the subject site by other environmental consultants. It is expected that the proposal will not impact the species.
Rusty Rose Walnut (*Endiandra hayesii*)	'The literature states that the Rusty Rose Walnut has a restricted distribution in northern NSW and southern Queensland (Hyland 1989). The type specimen is from Minyon Falls in Nightcap National Park. Records nominally of this species are clustered in the Border Ranges, Nightcap Ranges and surrounds, and at a few scattered near-coastal locations. Harden (2002) gives the Clarence River as the southern limit. In Queensland, the species is apparently very rare, with locations reported by Barry and Thomas (1994) only at Burleigh Heads, Tallebudgera and Springbrook. Records for the combined taxa (E. hayesii and E. muelleri subsp. Bracteata) are usually from the poorer soils derived from sedimentary, metamorphic or acid volcanic rocks. Vegetation includes subtropical and warm temperate rainforests and Brush Box forests, including regrowth and highly modified forms of these habitats' (NPWS, 2004: 5).	Not recorded during site inspections. Additionally, the species has not been previously recorded on the subject site by other environmental consultants. It is expected that the proposal will not impact the species.
Fraser's Screw Fern (*Lindsaea fraseri*)	This species occurs within poorly drained, infertile soils in swamp forest or open eucalypt forest, usually as part of a ferny understorey. In NSW it is known only from two areas – near Hastings Point on the Tweed coast and in the Pillar Valley east of Grafton (DEC, 2005 online @ http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/ profile.aspx?id=10481)	Not recorded during site inspections. Additionally, the species has not been previously recorded on the subject site by other environmental consultants. It is expected that the proposal will not impact the species.

Durobby (*Syzygium moorei*)	The Durobby occurs in warm, protected, fertile soils in riverine and gully rainforests at low altitudes, along sections of the Richmond, Brunswick and Tweed Rivers in NSW, as well as at three sites in Upper Mudgeeraba Creek and Upper Tallebudgera Creek in south-east Queensland (Floyd, 1989). Rose Apple is most commonly found in Subtropical Rainforest *Argyrodendron trifoliatum* Alliance, including sub-alliance 1 (*Argyrodendron trifoliatum*) on lowland krasnozem; suballiance 2 (*Toona-Flindersia* spp.) on lowland alluvium; and sub-alliance 6 (*Archontophoenix-Livistona*) on alluvium with excess moisture (Floyd, 1990). Stands of the *A. trifoliatum* Alliance originally occurred on the best potential agricultural land, so consequently was mostly cleared, with the exception of small patches occurring in floodprone, stony or poorly drained soils (DSEWPC, 2008:1-2).	Not recorded during site inspections. Additionally, the species has not been previously recorded on the subject site by other environmental consultants. It is expected that the proposal will not impact the species.
Pink Nodding Orchid (*Geodorum densiflorum*)	This orchid is found in dry sclerophyll forest, often on coastal sand, at lower altitudes, north from the Macleay River on the north coast of NSW (NPWS, 2004 online at http://www.nationalparks.nsw.gov.au /npws.nsf/Content/Geodorum+densiflorum +a+terrestrial+orchid+-+endangered+species+listing)	Not recorded during site inspections. Additionally, the species has not been previously recorded on the subject site by other environmental consultants. It is expected that the proposal will not impact the species.
Brown Fairy-chain Orchid (*Peristeranthus hillii*)	In NSW this orchid is restricted to coastal and near-coastal environments, particularly Littoral and Lowland Rainforest north from Port Macquarie (DEC, 2005)	Not recorded during site inspections. Additionally, the species has not been previously recorded on the subject site by other environmental consultants. It is expected that the proposal will not impact the species.
Southern Swamp Orchid (*Phaius australis*)	'The Lesser Swamp-orchid is commonly associated with coastal wet heath/sedgeland wetlands (Barry 2005), swampy grassland or swampy forest (NSW DECCW 2005iw) and often where Broad-leaved Paperbark or Swamp Mahogany are found (NH NSW 2006; Sparshott & Bostock 1993). Typically, the Lesser Swamp-orchid is restricted to the swampforest margins, where it occurs in swamp sclerophyll forest (Broadleaved Paperbark/Swamp Mahogany/Swamp Box (*Lophostemon suaveolens*)), swampy rainforest (often with sclerophyll 34mergent), or fringing open forest. It is often associated with rainforest elements such as Bangalow Palm (*Archontophoenix cunninghamiana*) or Cabbage Tree Palm (*Livistona australis*) (Benwell 1994b; Bishop 1996; Weston in Harden 1993)' [DoE, 2013 online @ http://www.environment.gov.au/cgibin/ sprat/public/publicspecies.pl?taxon_id=5872]	Not recorded during site inspections. Additionally, the species has not been previously recorded on the subject site by other environmental consultants. It is expected that the proposal will not impact the species. .
Lemon-scented Grass (*Elyonurus citreus*)	Within NSW this species grows in sandy soils near rivers or along the coast in wallum areas or sand dunes from localities south of Casino, north-west of Grafton, near Cudgen Lake on the Tweed coast and in Yuraygir National Park (DECC, 2005 online @ http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10267)	Not recorded during site inspections. Additionally, the species has not been previously recorded on the subject site by other environmental consultants.

		It is expected that the proposal will not impact the species.
White Yiel Yiel (*Grevillea hilliana*)	*Grevillea hilliana* grows in subtropical rainforest, often on basic igneous substrates. It is found north of Brunswick Heads on the north coast of NSW and in Queensland (Makinson in Harden et al. 2000). The only populations currently known in NSW are in the areas of Brunswick Heads and Tweed Heads, in small remnant areas of vegetation (NSW Scientific Committee online @ http://www.environment.nsw.gov.au/determinations/GrevilleaHillianaEndSpListing.htm).	Not recorded during site inspections. Additionally, the species has not been previously recorded on the subject site by other environmental consultants. It is expected that the proposal will not impact the species.
Rough-shelled Bush Nut (*Macadamia tetraphylla*)	This species of nut tree is confined chiefly to the Richmond and Tweed Rivers in north-east NSW, extending just across the border into Queensland where it occurs within subtropical rainforest, particularly on basaltic soils. (Williams, Harden and McDonald, UNE, 1984; DECC, 2005). The species is also commonly noted as a paddock tree on soils of basaltic influence and as an ornamental or orchard tree associated with residential and/or rural activities (pers.obs.).	Not recorded during site inspections. Additionally, the species has not been previously recorded on the subject site by other environmental consultants. It is expected that the proposal will not impact the species.
Oldenlandia galioides	This species is known from the margins of seasonally inundated wetlands in paperbark swamps and Forest Red Gum (*E.tereticornis)* Woodlands (NSW Dept. Env. & Cons., 2005). In north-east NSW it is known from Whiporie State Forest south of Casino and one location in the Tweed district (DECC, 2005 online @ http://www.threatenedspecies.environment. Nsw.gov.au/tsprofile/ profile.aspx?id=10397)	Not recorded during site inspections. Additionally, the species has not been previously recorded on the subject site by other environmental consultants. It is expected that the proposal will not impact the species.
Spiny Gardenia (*Randia moorei*)	The known range of the Spiny Gardenia extends from Lismore on the north coast of NSW, northwards to the Logan River, southern Queensland (Quinn *et al.* 1995). The Spiny Gardenia occurs in subtropical, riverine, littoral and dry rainforest and sometimes along moist scrubby watercourses. In NSW the species is often found in Hoop Pine (*Araucaria cunninghamii*) – Brush Box (*Lophostemon confertus*) forest with other rainforest elements present in the understorey. Although plants are typically found within rainforest or in Hoop Pine – Brush Box forest, at Terranora in Tweed Shire and on the southern slopes of Mount Chincogan in Byron Shire, the Spiny Gardenia occurs as a scattered remnant shrub in open grazing land that was formerly rainforest (NPWS, 2004: 3-4).	Not recorded during site inspections. Additionally, the species has not been previously recorded on the subject site by other environmental consultants. It is expected that the proposal will not impact the species.
Scented Acronychia (*Acronychia littoralis*)	Scented Acronychia occurs from Fraser Island in Queensland to Port Macquarie in NSW. In 1996, the species occurred at 42 sites (Benwell, 1996). Most populations occur in NSW, between Ballina and Tweed Heads. The two Queensland populations include two trees at the Gold Coast and a few individuals in Great Sandy National Park (NP) (EPA, 2007). In NSW, populations are conserved in Bongil Bongil NP, Bundjalung NP, Broken Head Nature Reserve (NR), Cape Byron NR, Brunswick Heads NR, Cudgen Lake NR and Cooloola NP.	Not recorded during site inspections. Additionally, the species has not been previously recorded on the subject site by other environmental consultants. It is expected that the proposal will not impact the species.

	Scented Acronychia is found on sand in humid, high rainfall zones (greater than 1600 mm), within 2 km of the ocean. The species occurs in transition zones between littoral rainforest and swamp sclerophyll forest; between littoral and coastal cypress pine communities; and margins of littoral forest and cleared land (Harden, 2002). Associated species include *Lophostemon confertus*, *Banksia integrifolia*, *Callitris columellaris*, *Araucaria cunninghamii*, *Eucalyptus intermedia* and *Melaleuca quinquenervia* (Benwell, 1996). Former habitat has been reduced as a result of coastal development, sand mining, waterlogging and land clearing for agriculture (Hunter et al., 1992; Benwell, 1996) [in DSEWPC, 2008:1-2]	
Smooth Tuckeroo (*Cupaniopsis serrata*)	The species occurs in Queensland northern NSW, where it is confined to subtropical and dry rainforest within the Tweed Valley (online @ http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10192).	Not recorded during site inspections. Additionally, the species has not been previously recorded on the subject site by other environmental consultants. It is expected that the proposal will not impact the species.
Small-leaved Tamarind (*Diploglottis campbellii*)	"The forest types in which the species occurs varies from lowland subtropical rainforest to drier subtropical rainforest with a *Lophostemon confertus* (Brush Box) open overstorey. Hunter *et al*. (1992) showed that the species occurs on basalt-derived soils and also on poorer soils such as those derived from quartz monzonite" (NPWS, 2004: 6).	Not recorded during site inspections. Additionally, the species has not been previously recorded on the subject site by other environmental consultants. It is expected that the proposal will not impact the species.
Fine-leaved Tuckeroo (*Lepiderema pulchella*)	This species occurs within Lowland subtropical rainforest and is largely confined to infertile metasediments in the Tweed Valley (NPWS, 2002).	Not recorded during site inspections. Additionally, the species has not been previously recorded on the subject site by other environmental consultants. It is expected that the proposal will not impact the species.
Gympie Stinger (*Dendrocnide moroides*)	The gympie stinger occurs in lowland rainforest, especially in gaps or other disturbed sites from north Queensland, where it is fairly common, south to the Clarence River in north-east NSW. It is very rare in the southern-most part of its range (DECC, 2005)	Not recorded during site inspections. Additionally, the species has not been previously recorded on the subject site by other environmental consultants. It is expected that the proposal will not impact the species.

Green-leaved Rose Walnut (*Endiandra muelleri subsp. Bracteata*)*	According to the literature the Green-leaved Rose Walnut is known from north-eastern NSW, north from the Clarence River (where a specimen from Maclean was employed in Hyland's 1989 description) to southern and central Queensland (Hyland 1989). Records for the taxa are usually from the poorer soils derived from sedimentary, metamorphic or acid volcanic rocks. Vegetation includes subtropical and warm temperate rainforests and Brush Box forests, including regrowth and highly modified forms of these habitats. The altitude varies from near sea-level to 800 m (DEC 2004)	Historically recorded within the road reserve external to the site, however was not recorded during the recent site survey. Specimen has not been recorded since 2006 despite several site surveys conducted by other environmental consultants. It is expected that the proposal will not impact the species.

*The Green-leaved Rose Walnut (*Endiandra muelleri subsp. Bracteata*) is not listed within the NSW BIONET records as occurring within 10km of the site, however a historic record of a specimen occurring within the road reserve external to the site indicates that the species occurs within the locality.

5.3 THREATENED FAUNA SPECIES

A search of the *NPWS 'Atlas of NSW Wildlife' [2014]* has determined that fifty-three (53) species of threatened flora have been previously recorded within the locality (search area North: -28.23 West: 153.51 East: 153.62 South: -28.33). No species scheduled under the *Threatened Species Conservation Act 1995* were recorded during the site surveys. Additionally, no scheduled species were recorded on the subject site by other environmental consultants.

A review of available habitats and the ecology of the database listed species (i.e. range, preferred habitat, home range etc) indicate that it is unlikely that all of these previously recorded species in the region would rely on the habitats of the subject site or be significantly affected by the proposal.

Subsequently several such threatened species are considered unlikely to be significantly affected by the proposal for one or more of the following reasons:

- core habitats were not recorded in the study area
- resources used by the species are unlikely to be adversely affected or only likely to be minimally affected by the proposal.

Details of such species requirements and reasons for not considering impacts to these species further are contained within the below Table. A number of threatened species have been excluded from discussion in the below table where they are considered reasonably unlikely occurrences due to the following:

- Being a marine reptile or mammal (i.e. whale, turtle, seal)
- Being a pelagic seabird or intertidal zone coastal bird (i.e tern, albatross, oystercatcher)

For species considered a potential occurrence (based upon distribution, database recording, suitable habitat present etc) or which were recorded within or directly adjacent the site during either survey period and for which it is considered that the species may be significantly affected by the proposal (i.e. impact on feeding, roosting, nesting, behaviour and associated habitat), the seven-part test of significance has been performed in Section 6 of this report.

Notwithstanding, all the species tabled below were targeted during the fauna survey or were reviewed in the context of documented ecology and available habitats.

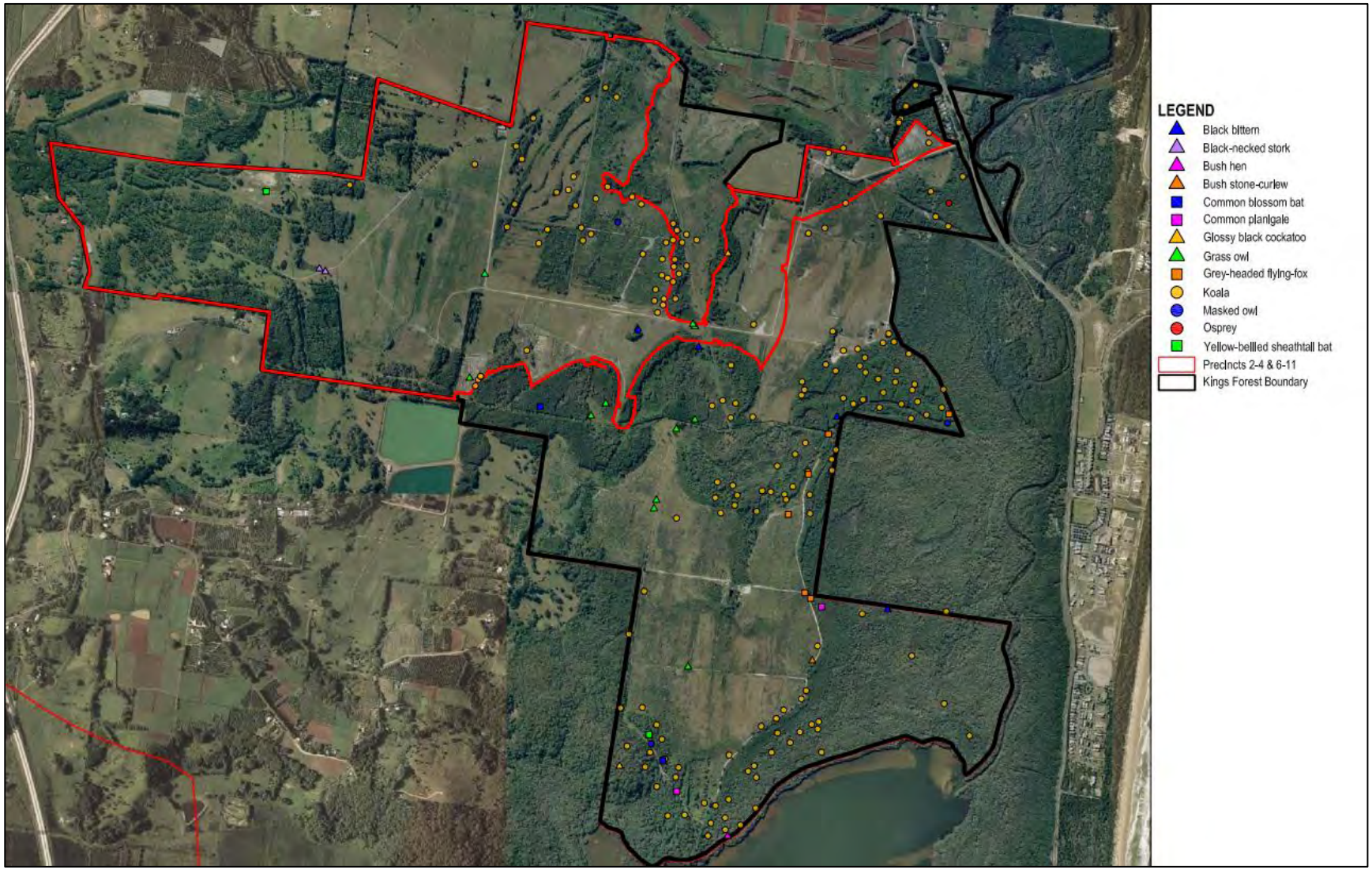

FIGURE 13 – PREVIOUSLY RECORDED THREATENED FAUNA (SOURCE: JWA, 2011)

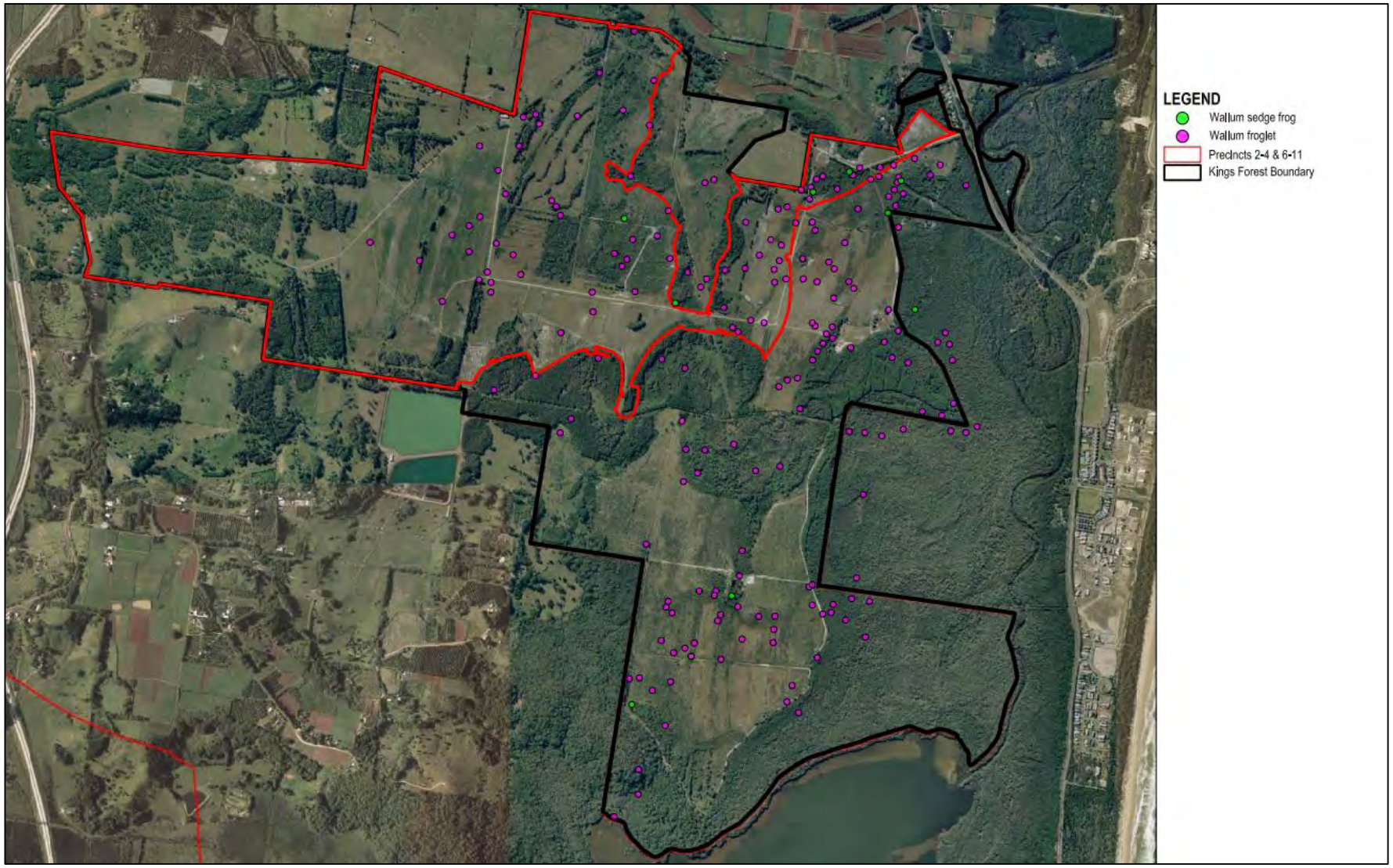

FIGURE 14 – PREVIOUSLY RECORDED THREATENED AMPHIBIANS (SOURCE: JWA, 2011)

Table 10: Potentially Occurring Threatened Fauna Species			
Species	**Potential occurrence based upon known habitat and range**	**Notes**	**Potential for species or associated habitat to be impacted upon by proposal**
Wallum Froglet (*Crinia tinnula*)	Unlikely	This species of wallum frog is found along drainage lines in sub-coastal wet heath, in acid paperbark (*Melaleuca*) swamps, and sedge swamps associated with sandy coastal plains (but rarely from around coastal lakes) and low slopes below 40m altitude and above areas of tidal influence (Ehmann, 1997; Meyer et al, 2006). The habitats in which the wallum froglet species breed are typically oligotrophic (i.e. nutrient poor), tannin-stained and acidic ((pH 4.3-5.2) [QPWS 2001; Meyer et al. 2006; McDonald et al, 2009; Hines et al, 2004]. These attributes may render wallum frog breeding habitat unsuitable for related species (i.e. the common sedgefrog *Litoria fallax*, striped rocketfrog *L. nasuta*, clicking froglet *C. signifera* and beeping froglet *C. parinsignifera*). This could explain why wallum frog species and related species seldom occur together" (Ingram and Corben, 1975; Straughan, 1966 in Myer et al, 2006: 16). The coastal distribution occurs as far north as Litabella National Park on the southeast coast of Queensland south to Kurnell in mid-eastern New South and also upon a number of offshore islands including Fraser Island, Bribie Island, Moreton Island and North Stradbroke Island (BCC, 2010). Breeding usually occurs in autumn or early winter, but has been recorded in all seasons following rain with males vocalising from the base of sedges near water or atop matted sedges (McDonald et al, 2009; Meyer et al, 2006). A regionally significant population of the species is noted to occur within a wide variety of habitats investigated in association with the Tugun Bypass SIS (PB, 2004; Hero et al, 2001). Known habitat broadly encompasses the following vegetation communities: Slashed Heathland, Wet Heathland, Swamp Mahogany Forest, Swamp Mahogany–Brushbox Forest, Littoral Rainforest, Swamp Paperbark Forest and other moist forest types. Breeding is confined to slow-moving water less than 1.5 metres deep within the pH range of 3.0 to 5.2 (PB 2004; 4.23). Potential habitat for the Wallum Froglet is considered to be absent from the site due to the absence of preferred acidic swamps. Low lying areas in association with the swamp sclerophyll forest (paperbark) is tidal which does not represent Wallum Froglet habitat. The species was not recorded during the recent site visit. Wallum froglet is however known to occur within the Kings Forest area with a large number recorded within previous ecological surveys of the site (Figure 14). It is considered that the service station will not significantly impact this species.	Not recorded on site Preferred habitat is considered to be absent from the site. It is considered that the proposed service station will not significantly impact the species.

Wallum Sedge-frog (*Litoria olongburensis*)	Unlikely	This species is known from a variety of coastal sandy vegetation communities associated with wallam (banksia) including heathland, sedgeland, melaleuca forest/woodland and ephemeral wetlands with a preference for acidic (low pH) seasonally inundated sedge swamps for breeding. The known distribution includes such lowland coastal zones from Fraser Island (southeast QLD) to Yuraygir National Park (north-east NSW) including several offshore islands such as Fraser Island, Bribie Island, Moreton Island and North Stradbroke Island (DSEWPC, 2011; Meyer et al, 2006; BSC, 2010). A review of the modeled distribution of *Litoria olongburensis* (DSEWPC, 2011) notes that the species is neither mapped as 'known/likely to occur' nor 'may occur' on the mainland between approximately Tugun and Beerwah. At swamp sites, the Wallum Sedge Frog can be found sheltering amongst sedges, reeds and ferns all year round (Anstis 2002; Ehmann 1997; Ingram & Corben, 1975; James, 1996; Lewis & Goldingay, 2005; Liem & Ingram, 1977; Neilson, 2000 in DSEWPC, 2012). During wet periods the frog can be found on emergent vegetation (rushes, sedges, ferns) whilst during drier periods it may be found at the base of such vegetation (BSC, 2010). Breeding occurs after rain in spring, summer and autumn within acidic, permanent to ephemeral freshwater wetlands with emergent vegetation, most notably sedges, reeds or ferns in still water 0.5-1.5m deep (Hines et al, 2004). 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 (Wallum Sedge Frog Workshop 2010 in DSEWPC, 2012; Meyer et al, 2006). Consequently, numerous survey guidelines indicate that searches for the species are best undertaken during the warmer months as activity may be increased. It is noted, however, that studies undertaken over a four year period in northeastern NSW (Lewis and Goldingay, 2005) resulted in counts of individuals of *Litoria olongburensis* being higher in winter than in summer. Additional activity information obtained noted that counts of adults were negatively influenced by rain during the previous day, but positively influenced by rain the previous week. Counts of juveniles were influenced by rain during the previous three months (Lewis and Goldingay, 2005). A significant population of the species is noted to occur within restricted wallum habitats on Gold Coast airport lands investigated in association with the Tugun Bypass SIS (PB, 2004; Hero et al, 2001; BAAM, 2005). Breeding habitat is characterised by low pH and relatively deep pools with some capacity to retain water for longer periods with six ponds of breeding importance located proximate to the Gold Coast Airport (Hero et al, 2001). It is noted that purpose built frog ponds established adjacent the airport site have been re- colinised by the wallum sedgefrog post construction of the Tugun Bypass (QDTMR, 2007). "The context of the Tugun population with respect to other populations of the frog is as follows: • It is an isolated population that is 30-40km to the north of the nearest known population in the Pottsville Area, New South Wales and 45 km to the nearest known population in the north, North Stradbroke Island, Queensland. • It also most likely occurs on South Stradbroke Island, which is about 16km north of Tugun. • The nearest known mainland population in Queensland is at Beerwah about 100km to the north. However, it is known from in between on the major Moreton Bay Islands of Bribie, Moreton and North	Not recorded on site Preferred habitat is considered absent from the site. It is considered that the proposed service station will not significantly impact the species.

		Stradbroke. The Stradbroke Islands were apparently connected to each other and the mainland at Southport during European memory. Like the Wallum Froglet, potential habitat for the Wallum Sedge-frog is considered to be absent from the site due to the absence of preferred acidic swamps. Low lying areas in association with the swamp sclerophyll forest (paperbark) is tidal which does not represent Wallum Froglet habitat. The species was not recorded during the recent site visit. Wallum froglet is however known to occur within the Kings Forest area with a large number recorded within previous ecological surveys of the site (Figure 14). It is considered that the service station will not significantly impact this species.	
Magpie Goose (*Anseranas semipalmata*)	Possible	This species favours coastal wetlands and swamps with prolific reed/sedge growth mostly within northern Australia (NPWS, 2002; Tulloch et al, 1981). Breeding is confined to the northern areas in association with large floodplains of creeks/rivers generally within 80km of the coast (Frith and Davies, 1961). Dense sedge/rush growth within shallow waters in these locations is favoured for nest formation (Tulloch et al, 1981; Bayliss and Yeoman, 1990). Foraging within grazed paddocks and breeding within constructed stormwater wetlands has also been observed at Carrara on the Gold Coast (pers. obs.). Potential habitat for the Magpie Goose is considered present in association with Cudgen Creek estuarine zone and swamp sclerophyll forest (paperbark). The species was however not observed during the recent site survey. Additionally, the species was not recorded within the King Forest precinct during previous survey events by other environmental consultants. As Cudgen Creek and the majority will be significantly buffered from the proposed development, no significant impact is expect to occur to the Magpie Goose.	Not recorded on site Marginal habitat is considered present, however won't be impacted by the proposal due to a significant buffer. No significant impact is expected to occur to the species as a result from the service station proposal
Wompoo Fruit-dove (*Ptilinopus magnificus*)	Possible	'In NSW, the Wompoo Fruit-dove occurs in patches of subtropical rainforest and adjoining wet sclerophyll habitats (Recher *et al.* 1995; Higgins & Davies 1996) but has also been recorded using single trees in farmland (Hawkins *in litt.* 2009). They appear to be most abundant in warmer, mature rainforests dominated by *Ficus* spp. (Recher *et al.* 1995; Hawkins *in litt.* 2009) and less common in fragments. Moran *et al.* (2004) classified the Wompoo Fruit-dove as a 'decreaser' on the basis that it was significantly more common in extensive rainforest (2.65 birds per count) than in remnants (1.00 bird per count) or regrowth (0 birds per count). Breeding of the Wompoo Fruit-dove takes place from late winter to mid-summer; varying in response to suitable weather conditions. Both sexes share in the construction of the nest which is a small, sturdy, flat platform made from twigs and is usually positioned low in the tree, between 2-10 m from the ground (Recher *et al.* 1995). As an obligate frugivore it requires a high availability of fruiting materials which it generally feeds on in the high canopy (Recher et al, 1995) but the species will also secure food in the lower storeys of the forest	Not recorded on site. Modification of an insignificant area of potential habitat will occur. This species is considered unlikely to be significantly impacted by the proposal. .

		(Higgins & Davies 1996). The Wompoo Fruit-dove selectively forages on species that are more common in well-developed rainforest than in regrowth. Fruit is taken from palms (Arecaceae), vines (Vitaceae) and trees in the families Araliaceae, Cunoniaceae, Ebenaceae, Elaeocarpaceae, Lauraceae, Meliaceae, Moraceae, Myrtaceae, Oleaceae, Pennantiaceae, Rutaceae and Sapindaceae (Innis 1989; Milledge & Bower *in litt.* 2009). Individual mature paddock trees such as figs (*Ficus* spp.) may also be visited during fruiting (Milledge & Bower *in litt.* 2009). The Wompoo Fruit-dove does not travel large distances, but rather moves around in small localised areas in response to food availability and nesting requirements (Higgins & Davies 1996). Nevertheless, the species has a seasonal altitudinal migration, spending time in upland forests during summer and moving to lower elevations during winter (Milledge & Bower *in litt.* 2009). Occasionally, particularly during autumn and winter when rainforest fruit is scarce, individuals will move up to 15 km to temporarily occupy more open country (Higgins & Davies 1996). The species has an estimated home range requirement of approximately 20 ha when breeding (Milledge & Bower *in litt.* 2009).' [in NSW Scientific Committee, 2010:3-4]. Potential habitat occurs on site for the Wompoo Fruit-dove in association with littoral rainforest containing fruiting trees (Figs, Tuckeroo ect.). The species was not recorded on site during site investigations. Additionally, the species was not recorded within the King Forest precinct during previous survey events by other environmental consultants. The removal of ~0.0677ha of littoral rainforest is expected to not significantly impact the local population of the Wompoo Fruit-dove.	
Rose-crowned Fruit-dove (*Ptilinopus regina*)	Possible	'The Rose-crowned Fruit-dove inhabits rainforests, especially with vines, and also nearby sclerophyll forests and coastal scrub with abundant fruiting trees or shrubs. The species occurs in small remnants and regrowth patches, and in Camphor Laurel-privet regrowth in farmland. It has a wider habitat and dietary tolerance than the larger, more specialised Wompoo Fruit-dove, which is more restricted to fig-rich rainforest (Higgins & Davies 1996). The Rose-crowned Fruit-dove is not restricted to lowland, larger and denser rainforest, or to northern lowland and basswood forests in winter (Recher *et al.* 1995), but also occurs in the same types as recorded by Recher *et al.* (1995) for the Wompoo, in other moist forest and woodland with abundant fruiting trees, and occasionally in parks and gardens with fruiting trees (Higgins & Davies 1996). The Rose-crowned Fruit-dove feeds on fleshy fruits of rainforest trees, palms and vines, especially native figs, and of introduced weeds such as *Cinnamomum camphora* (Camphor Laurel), privets, *Phytolacca octandra* (Inkweed), *Solanum mauritianum* (Tobacco Bush) and *Lantana camara* (Lantana)' [in NSW Scientific Committee, 2008: 2]. The species is considered a partial migrant and moves north in autumn/winter and returning in spring/summer to breed (Recher et al, 1995). Marginal habitat occurs on site for the Rose-crowned Fruit-dove in association with littoral rainforest containing fruiting trees (Figs, Tuckeroo ect). The species has however been recorded within the Kings	Not recorded on site. Modification of an insignificant area of potential habitat will occur. This species is considered unlikely to be significantly impacted by the proposal.

		Forest precinct by other environmental consultants. The removal of ~0.0677ha of littoral rainforest is expected to not significantly impact the local population of the Rose-crowned Fruit-dove.	
Black-necked Stork (*Ephippiorhynchus asiaticus*)	Possible	The species is generally associated with wetlands, mudflats, mangroves, swamps and floodplains while it may also sometimes be found in open woodland environs where a grassy understorey is present (NPWS, 2002, Readers Digest, 2002; DEC, 2005). Irrigated lands are also occasionally a foraging resource and it has also been recorded foraging in artificial wetlands of sewerage treatment plants (ERM, 2001). Although not observed during the site inspection, marginal habitat occurs on site for the Black-necked Stork in association with Cudgen Creek estuarine zone. The species is however known to occur within the Kings Forest precinct and has been recorded by other environmental consultants (Figure 13). As Cudgen Creek will be significantly buffered from the proposal, no significant impact is expected to occur to the Black-necked Stork.	Not Recorded on site Marginal habitat is considered present, however won't be impacted by the proposal due to a significant buffer between the development. The species is considered unlikely to be significantly impacted by the proposal
Black Bittern (*Ixobrychus flavicollis*)	Possible	The species is widely distributed throughout the coastal regions of Australia but is more common in the northern extent of the country. Within its distribution, the species shows a preference for densely vegetated areas within terrestrial and aquatic wetlands. It has been recorded from a variety of vegetation types (including grassland, mangroves, wet sclerophyll forest, rainforest) where permanent water is present (Marchant & Higgins, 1990; Simpson & Day, 1996; NPWS, 2001). In northern NSW black bitterns are most often recorded in riparian habitats along fresh or brackish streams, although the species is also known to utilise drains, permanently inundated swamp forest, and freshwater wetlands (Sandpiper Ecological Surveys, 2003). Marginal habitat occurs on site in association with Cudgen Creek estuarine zone. The species was however not recorded during site inspections. The species is however known to occur within the Kings Forest precinct and was observed previously approximately 1.5km southwest of the subject site (Figure 13). As potential habitat in association with Cudgen Creek will be significantly buffered from the proposed service station, no significant impact is expected to occur towards the Black bittern.	Not recorded on site Marginal habitat is considered present, however won't be impacted by the proposal due to a significant buffer between development. The species is considered unlikely to be significantly impacted by the proposal.
Spotted Harrier (*Circus assimilis*)	Possible	'The Spotted Harrier occurs throughout the Australian mainland, except in densely forested or wooded habitats of the coast, escarpment and ranges, and rarely in Tasmania (Barrett *et al.* 2003). Individuals disperse widely in NSW and comprise a single population. The Spotted Harrier occurs in grassy open woodland including acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe (*e.g.* chenopods) (Marchant and Higgins 1993; Aumann 2001a). It is found mostly commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland	Not recorded on site. Modification of an insignificant area of potential habitat will occur.

		wetlands. The species builds a stick nest in a tree and lays eggs in spring (or sometimes autumn), with young remaining in the nest for several months. The diet of the Spotted Harrier includes terrestrial mammals, birds and reptiles, occasionally large insects and rarely carrion (Marchant and Higgins 1993; Aumann 2001b). It was formerly heavily dependent on rabbits, but following the spread of rabbit calicivirus disease, and consequent decline in rabbit numbers by 65-85% in the arid and semi-arid zones (*e.g.* Falkenberg *et al.* 2000; Sharp *et al.* 2002), this harrier is increasingly dependent on native prey. Most of its former native mammalian prey species in inland NSW are extinct (*e.g.* bandicoots, bettongs and rodents: Van Dyck and Strahan 2008). Many of the remaining key prey species (*e.g.* terrestrial grassland birds such as quail, button-quail, pipits, larks and songlarks) require ground cover and are sensitive to habitat degradation from grazing (Marchant and Higgins 1993).' [DECC online @ http://npws.nsw.gov.au/determinations/spottedharrierpd.htm] As the species utilises a wide range of habitat, it is considered that the site provides potential habitat for the Spotted Harrier. The species was however not recorded on site during recent site inspections or by other environmental consultants. It is expected that the removal of 1.127ha will not significantly impact the species as the locality provides similar habitat in abundance. It is expected that the proposed revegetation works will provide potential Spotted Harrier habitat in the future.	This species is considered unlikely to be significantly impacted by the proposal.
Little Eagle (*Hieraaetus morphnoides*)	Possible	The Little Eagle occupies habitats rich in prey within open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used (Marchant and Higgins 1993; Aumann 2001a). For nest sites it requires a tall living tree within a remnant patch, where pairs build a large stick nest in winter and lay in early spring. Young fledge in early summer. It eats birds, reptiles and mammals, occasionally adding large insects and carrion (Marchant and Higgins 1993; Aumann 2001b; Debus et al. 2007). It was formerly heavily dependent on rabbits, but following the spread of rabbit calicivirus disease, and consequent decline in rabbit numbers by 65-85% in the arid and semi-arid zones (Sharp et al. 2002), the eagle is increasingly dependent on native prey. Most of its former native mammalian prey species in inland NSW are extinct (terrestrial mammals of rabbit size or smaller, e.g. large rodents, bandicoots, bettongs, juvenile hare-wallabies and nailtail wallabies: Van Dyck and Strahan 2008). The Little Eagle is distributed throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment (Marchant and Higgins 1993). It occurs as a single population throughout NSW. The population in New Guinea is now classified as a separate species, the Papuan Booted Eagle Hieraaetus weiskei (Lerner and Mindell 2005). As the species utilises a wide variety of habitats, it is considered that the site potentially provides Little Eagle habitat. The species was however not recorded during site inspections. Additionally, the species was not recorded within the Kings Forest precinct by other environmental consultants. The	Not recorded on site. Modification of an insignificant area of potential habitat will occur. This species is considered unlikely to be significantly impacted by the proposal.

		removal/modification of 1.1270ha is considered insignificant and is not expected to significantly impact the species.	
Eastern Osprey (*Pandion cristatus*)	Possible	This species is associated with waterbased habitats including estuaries, coastal wetlands, rivers and streams. The Osprey is predominately a coastal raptor frequenting estuaries, bays, inlets, islands and rocky cliffs within all Australian states except for Tasmania and sporadically within Victoria (DEC, 2005; NPWS, 2002). It is noted however, that the species sometimes inhabits inland islands (Pizzey and Knight, 1997; Readers Digest, 2002). Within suitable environment it usually constructs a nest in an overhanging large tree or upon elevated man-made structures such as platforms or telegraph poles. The species preys almost exclusively on fish by usually hunting alone and traversing the water's surface for prey which it secures by swooping over the waters surface or plunging below (Readers Digest, 2002; Clancy, 2005). Studies of prey middens on Lizard Island within the Great Barrier Reef also noted that occasional Terns and crustaceans are sourced for food (Smith, 1985). Whilst expansive favoured habitat for the Osprey occurs in the locality (in association with the foreshore and Cudgen Creek), the species is unlikely to frequent the habitats of the site given the absence of habitat for prey species. Additionally, no raptor nests were recorded on site during site inspections. The species was recorded within the Kings Forest precinct approximately 400m southwest of the subject site (Figure 13). It is considered unlikely that the proposal will significantly impact the Osprey.	Not Recorded on site. Preferred habitat is considered absent from the subject site. The species is considered unlikely to be significantly impacted by the proposal.
Pale-vented Bush Hen (*Amaurornis moluccana*)	Possible	This species favors coastal rivers and inlets from the Clarence River, north. It prefers densely overgrown margins of permanent terrestrial freshwater wetlands such as creeks and rivers, billabongs, ponds, swamps, waterholes, dams, lakes and roadside ditches (Muranyi and Baverstock, 1996). Three Bush-hens were recorded from Swamp Mahogany Forest in areas NE of the Cobaki Broadwater in association with fauna survey works undertaken in association with the Tugan Bypass SIS (Ecopro, 2004). PB (2008) has also recorded the bush hen at Banora Point within early regrowth rainforest west of Martinelli Avenue. Potential bush hen habitat is considered absent from the site given the absence of permanent freshwater wetlands. The species was not observed on site during recent site inspections. The species has however been recorded within the Kings Forest precinct by other environmental consultants (Figure 13). The proposal is unlikely to significantly impact the species.	Not recorded on site. Preferred habitat is considered absent from the site. The species is considered unlikely to be significantly impacted by the proposal.
Bush Stone-curlew (*Burhinus grallarius*)	Possible	This species is widespread throughout predominately coastal Australia where its preferred habitat consists of open forest-woodlands containing a grassy understorey with fallen timber and leaf litter (Readers Digest, 2002; NPWS, 2006). Foraging however, has been noted to occur over a broader spectrum of habitats including paddocks, grasslands, domestic areas (gardens, sports fields, [golf courses, residential areas pers. obs] etc), estuarine areas (mudflats, saltmarsh, mangrove forest, swamp oak, melaleuca forest) (NPWS, 1999; 2006).	Not recorded on site. Modification of an insignificant area of potential habitat will occur.

		As the species utilises a wide variety of habitats (including modified/cleared areas) it is considered that the site potentially provides Bush Stone-curlew habitat. The species was not recorded on site during site investigations. The species has however been recorded within the Kings Forest precinct (Figure 13). The proposal will remove only a small fraction of potential Bush Stone-curlew habitat in comparison to the locality and the surrounding conservation networks. The Bush Stone-curlew was not recorded during survey works. The proposed replantation	The species is considered unlikely to be significantly impacted by the proposal.
Beach Stone-curlew (*Esacus magnirostris*)	Possible	This species is distributed throughout coastal western, northern and eastern Australia from Norwest Cape to the Manning River (Readers Digest, 2002). Within this area it utilised open beaches, islands, reefs and sand/mudflats (NPWS, 2005; 1999; 2002) where it forages on crabs and other hard shelled marine invertebrates (Readers Digest, 2002). Marginal habitat occurs on site for the Beach Stone-curlew in association with Cudgen Creek estuarine zone. The species was not recorded during recent site inspections. Additionally, the species has not been recorded within the Kings Forest precinct by other environmental consultants. As the potential beach stone-curlew habitat will be buffered from the proposed service station, no impact is expected on the species.	Not recorded on site. Marginal habitat is considered present, however won't be impacted by the proposal due to a significant buffer between development The species is considered unlikely to be significantly impacted by the proposal
Glossy Black-cockatoo (*Calyptorhynchus lathami*)	Unlikely	Glossy Black Cockatoos are uncommon parrots found in scattered localities in the forests and woodlands of eastern Australia and Kangaroo Island (Forshaw, 1981). The eastern subspecies of Glossy Black Cockatoos seems thinly distributed through its range with the highest densities occurring in south-eastern Queensland and north-eastern New South Wales (Forshaw, 1989). The main habitat of the eastern subspecies is *Eucalyptus* woodlands and forest with moderate-high densities of *Allocasuarina* which are required for feeding (Clout, 1989; Park & Borsboom, 1996; Forshaw & Cooper, 1989; Crome & Shields, 1992; Cleland & Sims, 1968; Garnett, 1992b; Blakers *et al*, 1984). Suitable senescent trees (large hollow within a live or dead Eucalypt: 10-20m, Depth: 40-120cm, Entry: ~21cm: Inside Dia: ~23cm (Forshaw, 1981; Gibbons & Lindenmayer, 2002)) are also required for nesting. Potential habitat for the Glossy Black-cockatoo is considered absent from the site given the absence of preferred feed trees and hollow-bearing trees. The species is however known to occur within the Kings Forest precinct and was recorded approximately 1.5km west of the subject site (Figure 13). It is expected that the proposed service station development will not significantly impact the Glossy Black-cockatoo.	Not recorded on site. Preferred habitat is considered absent from the subject site. The species is considered unlikely to be significantly impacted by the proposal
Eastern Grass Owl (*Tyto longimembris*)	Possible	This species is generally recorded within tussock-grasslands but has also been noted to occur within heathland, swamps, coastal dunes, tree-lined creeks, treeless plains, mangrove fringes, grassy gaps between trees and crops and sugar cane plantation (Garnett and Crowley 2000; Pizzey and Knight, 1997). Within these habitats it sources a wide range of prey including birds, insects and terrestrial mammals. However, it feeds predominately on rodents and its population numbers can fluctuate wildly with the rise and fall of prey populations (Olsend and Doran, 2002). The fall of primary prey species following plague	Not recorded on site. Modification of an insignificant area of potential habitat will occur.

		events (during which owl breeding increases) can result in widespread dispersal by the Owls with starvation also noted as the forage base reduces (Debus et al, 1998). Potential habitat occurs on site for the species in association with open grassland which may provide habitat for prey species. The species was however not observed on site during previous survey events. The species is known to occur within the Kings Forest precinct and has been recorded several times approximately 1.5km southwest of the subject site (Figure 13). It is expected that the proposal will not significantly impact the species given the abundance of similar habitat within the locality.	The species is considered unlikely to be significantly impacted by the proposal
Collared Kingfisher (*Todiramphus chloris*)	Possible	This species is recorded in coastal Australia from Shark Bay to the Clarence River where it is almost exclusively associated with mangrove and estuarine areas (NPWS, 2005; Readers Digest, 2002). DEH (2012) notes: • Collared Kingfishers are virtually restricted to mangrove associations of estuaries, inlets, sheltered bays and islands, and the tidal flats and littoral zone bordering mangroves • They sometimes occur in terrestrial forests or woodlands bordering mangroves, where they will nest in holes in trees or in arboreal termitaria. They are sometimes seen in streets or gardens in built-up areas bordering mangrove vegetation. • Nests are usually in holes in trunks of large, live or dead mangrove trees, though they sometimes nest in hollows or in arboreal termite nests in large eucalypts or paperbarks adjacent to mangroves or estuarine foraging habitats. • They are often seen perched on rock walls, jetties, piles or on the ground on tidal flats. They also sometimes occur in parks and gardens along foreshores. • Mostly take food from the ground, from the surface of mud and sand, mainly along seaward fringe of mangroves. Sometimes take food from shallow water or from air. • The diet consists mostly of crustaceans, especially crabs, but they also take insects, small fish, and lizards. They have also been reported to occasionally take young birds. • Breeding is usually in spring and summer, with clutches observed in NSW in September to December, and young birds from October to January. Birds usually lay three eggs, but clutches of two to four recorded. Young leave the nest about 1 month after hatching. Marginal habitat for the Collared Kingfisher occurs on site in association with Cudgen Creek estuarine zone. The species was however not observed on site during site inspections, and was not recorded during previous survey events by other environmental consultants. As Cudgen Creek will be significantly buffered from the proposed development, it is considered unlikely that the proposed service station will significantly impact the species.	Not recorded on site. Marginal habitat is considered present, however won't be impacted by the proposal due to a significant buffer between development The species is considered unlikely to be significantly impacted by the proposal
White-eared Monarch (*Carterornis leucotis*)	Possible	This species generally occurs within Coastal/Subtropical/Littoral Rainforests and occasionally Eucalypt/Riparian Forest, Mangroves and Swamp Sclerophyll with mesomorphic understorey along the eastern coast of Australia from Cape York to the Tweed River (Readers Digest, 2002; DEC, 2005). In	Not recorded on site. Modification of an insignificant area of

		NSW, White-eared Monarchs occurs in rainforest, especially drier types, such as littoral rainforest, as well as wet and dry sclerophyll forests, swamp forest and regrowth forest. • They appear to prefer the ecotone between rainforest and other open vegetation types or the edges of rainforest, such as along roads. • They are highly active when foraging, characteristically sallying, hovering and fluttering around the outer foliage of rainforest trees. They are usually observed high in the canopy or subcanopy. • They eat insects, but their diet is not well studied. • They breed from about September to March, usually nesting high in the canopy, and often at the edge of patches of rainforest. (DEH, 2012 online@ http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10540) Potential habitat for the White-eared Monarch occurs on site in association with littoral rainforest, swamp sclerophyll forest and the Cudgen Creek estuarine zone. The species was however not observed during site inspections. Additionally, the species was not recorded on site during previous survey works of the site by other environmental consultants. It is considered that the removal of 0.0685ha of potential habitat will not significantly impact the species given the abundance of similar habitat within the locality. The majority of preferred habitat occurring on site will be significantly buffered from the proposed service station.	potential habitat will occur. The species is considered unlikely to be significantly impacted by the proposal
Spotted-tailed Quoll (*Dasyurus maculatus*)	Unlikely	The species has been recorded from a wide range of habitats such as rainforest, open forest, woodland, coastal heathland, and inland riparian forest (Edgar and Belcher, 2002; Forest Practices Board, 2002). Additional habitat requirements include suitable den sites (such as hollow logs, tree hollows, rock outcrops or caves) and an abundance of food (such as birds and small mammals) (NSWNPWS, 1999; Edgar & Belcher, 2001; Belcher, 2000; Jones & Ross, 1996). Habitat range for males has been estimated to be as large as 2000-2200 hectares per individual, while for females, which are more protective of their dens, this value is considerably less at between 700-850 hectares per individual (Belcher, 2000; NPWS, 1999). In addition Quolls are known to frequently swap dens and disperse large distances on any one night. A radio-tracking survey performed by Andrew (2005) noted that quolls generally moved to a new den each day and 90% of stays for females and 76% of stays for males were for a single day. Population density is therefore naturally quite low and has been estimated at 1 individual per 3 km^2 even within optimal 'core' habitat (Jones & Rose, 1996). Whilst potential habitat is present in the form of the littoral rainforest, rocky outcrops/caves providing potential denning were not encountered on site. The quoll was not observed on site during site inspections As the quoll is identified as occurring within the locality (Atlas of Living Australia) its traversal of the study area cannot be discounted due to typically large occupied ranges and high daily dispersal potential. Given its large range and the absence of suitable dens, the modification of 0.0677ha of potential habitat is considered unlikely to significantly impact the species.	Not recorded on site. Modification of an insignificant area of potential habitat will occur. The species is considered unlikely to be significantly impacted by the proposal
Common Planigale (*Planigale maculata*)	Possible	This species is known to 'inhabit a broad range of habitats incorporating a dense ground cover layer including rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas (Redhead in Strahan, 2002; Lewis, 2005). In northern NSW, it has been suggested that their distribution often	Not Recorded.

		corresponds with the low lying flat and undulating areas of the coastal plains often near intensively settled areas (Gilmore and Parnaby 1994 in Lewis, 2005). *Planigale maculata* is an unspecialised predator foraging mainly on insects, other invertebrates, small vertebrates, and occasionally nectar (Callaghan *et al.* 2005 and references therein). *Planigale maculata* is generally most active from slightly before dusk to before sunrise, interspersed with rest periods and periods of high activity, and is capable of eating the equivalent of its own body weight in food daily (Van Dyck 1979). In contrast, Van Dyck (1979) also notes that *P. maculata* has the ability to enter torpor in response to cold weather or food deprivation. Introduced predators of *P. maculata* include cats (Redhead 1995) and dogs (Fleay 1981) with foxes also considered likely predators (Callaghan *et al* 2005). There is currently little movement data available for *P. maculata* although other members of this genus are widely recognised as having a shifting home range in response to local climatic conditions and food resources (Denny 1982; Read, 1982; 1988; and Miller 1998; in Lewis 2004)' (and in Hannah, 2007: 5) A small population of the species has been recently recorded on the northern banks of the Cobaki Broadwater in association with Swamp Mahogany/Brushbox Forest (Ecopro, 2004; Lewis Ecological Surveys, 2004). The species is also known from the Koala Beach landholdings further to the southeast (Hannah, 2007). As the Common Planigale is known to occur in a wide variety of habitat types, the entire site possesses potential habitat for the species. The species was not encountered during site inspections. The species has however been recorded within the Kings Forest precinct by other environmental consultants (Figure 13). The proposal will remove only a small fraction (1.127ha) of potential habitat which is insignificant in comparison to the locality and surrounding conservation networks. It is expected that the proposal will not significantly impact the species.	Modification of an insignificant area of potential habitat will occur. The species is considered unlikely to be significantly impacted by the proposal
Koala (*Phascolarctos cinereus*)	Unlikely	This species primarily occurs within Eucalypt Forest and Woodlands containing a suitable density of favoured food trees within coastal eastern and southeastern Australia. Preferred habitat generally contains a high percentage of primary food trees although underlying geology and soil type can be an important factor. Eucalypt Forests associated with drainage lines and floodplains of richer soil types (i.e. moisture and nutrients) can also be favoured due to feed trees containing higher levels of nutrients and less potential for toxicity (Hindell & Lee, 1990; Moore & Foley, 2000). Within SEQLD six primary foraging trees were identified by Pahl (1993); Tallowwood (*Eucalyptus microcorys*), Blue Gum (*E. tereticornis*), Scribbly Gum (*E. racemosa*), Grey Gum (*E. propinqua*), Red Mahogany (*E. resinifera*) and White Stringybark (*E. tindaliae*). Further research undertaken by Phillips & Callaghan (1996) in Tweed Shire indicates that Swamp Mahogany (*E. robusta*) and Blue Gum (*E. tereticornis*) [including hybrids of the two] on alluvial deposits and Quaternary and Neranleigh-Fernvale Group geomorphologies were considered to be primary habitats. Areas with sub-dominance of these species on Neranleigh-Fernvale alliances supporting Blue Gum (*E. tereticornis*), Tallowwood (*E. microcorys*) and/or Grey Gum (*E. propinqua*) comprise secondary habitat or primary habitat depending on the density of the latter two species. Phillips & Callaghan (1998) also noted Tallowwood to be a primary	Not recorded. Preferred habitat is considered absent from the site. The species is considered unlikely to be significantly impacted by the proposal

browse species and two types of Grey Gum (*E. propinqua, E. biturbinata)* to be secondary browse species in Currumbin.

Recent studies (Biolink, 2007) indicate that *Eucalyptus tereticornis, E. microcorys* and *E. propinqua/E. biturbinata* are the most preferred koala food trees throughout the Gold Coast LGA. Within the Tweed Coast Swamp Mahogany *Eucalyptus robusta* and Forest Red Gum *E. tereticornis* are the most preferred tree species with Tallowwood *E. microcorys* and Grey Gum *E. propinqua* being the next most preferred (Biolink, 2011).

Within utilized Eucalypt Forest habitat the koala spends most of its time in distinct home-ranges which may overlap if available habitat area is reduced. Males are territorial but a dominance-hierarchy exists and they may attack during the summer breeding season. Home ranges of the species are considered to be large and can vary dependent upon habitat quality and extent. Studies have shown various home range sizes exist with the males usually larger than the female (Male 135ha, Female: 110ha [Ellis et al, 2002], Male: 34.4ha, Female: 15ha [White, 1999]).

A review of a number of published scientific reports notes that Koala density generally ranges between 0.02 and 1.26 animals per hectare. Densities are considered to vary dependent upon habitat quality, size, connectivity, presence of impediments to movement (stock fences, dogs, roads etc).

Source	Study Location	Habitat Type	Additional Comments	Koala/ha
Dique et al, 2003	Southeast QLD Pine Rivers Shire	Tall shrubby open forest (Tertiary surfaces) and Tall open forest upon metamorphics	Stratified by two habitat descriptions 'urban' and 'bushland'	0-0.76

Dique et al, 2004	Southeast QLD Koala Coast ~375sqm of Redland, Logan and Brisbane City shires	Eucalypt Forests. Predominately RE 12.9-10.4 & 12.11.5	Study stratified by habitat descriptions: 'urban', 'remnant bushland', 'bushland' and 'other'. Remnant and bushland areas further stratified by proximity to the centre of the study area (high density=close to centre, low density=further away)	Range 0.02-1.26 Urban: 0.17 +/- 0.013 High remnant: 0.70 +/-0.023 Low remnant: 0.20 +-/0.014 High bushland: 0.30+/-0.006 Low bushland: 0.11 +/-0.007 Other: 0	

Source	Study Location	Habitat Type	Additional Comments	Koala/ha
White and Kunst 1990	Southeast QLD Sheldon	Eucalypt Forest		0.4 (0.3-0.46)
Sullivan et a 2004	Southwest QLD	Eucalypt Forest/woodland within the mulgalands	Habitat stratified by floristics and landzone.	0.0007-2.513
Biolink 2007	Coombabah Koala Habitat Area	Mapped gold coast city vegetation (per Ryan et al, 2003) filtered to exclude communities not containing eucalypts	Spot assessment technique for koala faecal pellets. Not based upon koala observation transects per *Dique, 2003; EPA, 2005.*	0.22+/-0.04

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<tr><td>Biolink 2007</td><td>Coomera-Pimpama Koala Habitat Area</td><td>Mapped gold coast city vegetation (per Ryan et al, 2003) filtered to exclude communities not containing eucalypts</td><td>Spot assessment technique for koala faecal pellets. Not based upon koala observation transects per Dique, 2003; EPA, 2005.</td><td>0.23+/-0.03</td></tr>
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Given the absence of Eucalypt species on site, it is considered unlikely that the Koala utilises that subject site. The species was not observed during site inspections of the site. Additionally, the species was not recorded on site during previous survey works by other environmental consultants. The species is however known to occur within the Kings Forest precinct and has been recorded on many occasions (Figure 13). It is considered that the proposal will not significantly impact the species given the absence of preferred habitat within the site. It is expected that the proposed replantation works will provide potential Koala habitat in the future.
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<td>Eastern Pygmy-possum (Cercartetus nanus)</td>
<td>Possible</td>
<td>The pygmy possum is found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest (DEC, 2005).

It is considered that favoured habitat for the possum is absent from the site and it was not recorded during survey works.
The habitat requirements of the barking owl is summarized in NPWS (2003: 4) from Kavanagh et al. (1995a), Debus (1997) and Higgins (1999):

The Barking Owl lives in forests and woodlands of tropical, temperate and semi-arid zones. Its habitat is typically dominated by eucalypts, often red gum species and, in the tropics, paperbarks Melaleuca species. It usually roosts in or under dense foliage in large trees including rainforest species of streamside gallery forests, River She-oak Casuarina cunninghamiana, other Casuarina and Allocasuarina species, eucalypts, Angophora or Acacia species. Roost sites are often near watercourses or wetlands. It typically breeds in hollows of large eucalypts or paperbarks, usually near watercourses or wetlands. Barking Owls have been recorded in remnants of forest and woodland and in clumps of trees at farms, towns and golf courses. DECC (2005) notes that large home ranges of 30-200 hectares are occupied by the owl.

Given its broad range in habitat, marginal habitat occurs on site in association with littoral rainforest and swamp sclerophyll forest. The species was however not observed during site inspections of the site. Additionally, the species was not recorded by other environmental consultants. The removal of ~0.0685ha of potential habitat is not expected to cause a significant impact towards the species. It is expected that the proposed offset works will provide potential Eastern Pygmy-possum habitat in the future.</td>
<td>Not recorded on site.

Modification of an insignificant area of potential habitat will occur.

The species is considered unlikely to be significantly impacted by the proposal</td>
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</table>

Long-nosed Potoroo (*Potorous tridactylus*)	Possible	Long-nosed Potoroos are generally restricted to areas with an annual rainfall greater than 760 mm where they inhabit dry and wet sclerophyll forests and woodland with a heathy understorey (Johnson in Strahan, 2002; DEC, 2005). The preferred habitat in north eastern NSW is dry and wet open shrubland (Mason 1997, DEC, 2005, Johnston in Strahan, 2002). In all habitats the species requires relatively thick groundcover growing on friable soils (Bennett, 1993). Within these areas the Potoroo digs for its food the main component of which is hypogeal fungi with other important items including hard-bodied arthropods, vascular plant tissues, seeds and fleshy fruits (Bennett & Baxter, 1989; Claridge et al, 1993). It is also noted that a small, disjunct population of Potoroos exists in a small area of Crown land between the northern shore of Cobaki Broadwater and the NSW-Queensland border (Bali et al, 2003; Ecopro, 2004; Warren & Associates, 1992; Hero, 2001). The extensive 2003 survey undertaken by Bali et al notes that "within the Cobaki area, potoroos were most frequently trapped in Scribbly Gum Mallee Heathland followed by, Tree Broom Heathland, Scribbly Gum/Swamp Mahogany Forest, Black She-oak Heathland, Swamp Mahogany Forest and Scribbly Gum Forest. Our results suggest that potoroos prefer Scribbly Gum Mallee Heathland with an understorey of sedges and grasses such as *Restio* spp., *Lomandra* spp. and *Gahnia* spp., which is found along both sides of the Cobaki Lakes" (Bali et al, 2003: 16). Marginal habitat occurs on site in association with swamp sclerophyll forest and littoral rainforest. The species was however not observed during site inspections of the site. The species has been recorded within the Kings Forest precinct by other environmental consultants (Milledge, 1989). The removal of 0.0685ha of potential habitat is expected to not significantly impact the species given the abundance of similar habitat within the locality.	Not recorded. Modification of an insignificant area of potential habitat will occur. The species is considered unlikely to be significantly impacted by the proposal
Grey-headed Flying-fox (*Pteropus poliocephalus*)	Possible	The Grey-headed Flying-fox inhabits subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps (Eby, 1995). Urban gardens and cultivated fruit crops also provide habitat for this species (NSW NPWS 1999c). Grey-headed Flying-foxes forage on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca, Banksia (Eby, 2000) and fruits of rainforest trees and vines (NSW NPWS 1999c). During periods when native food is limited, Grey-headed Flying-foxes disperse from colonial roosts, often foraging in cultivated gardens and fruit crops (NSW NPWS 1999c). This species roosts in large aggregations or camps in close proximity (20 km or less) to a regular food source, often in stands of riparian rainforest, Paperbark or Casuarina forest (Eby, 1995). This species is a canopy-feeding frugivore, blossom-eater and nectarivore of rainforests, open forests, woodlands, Melaleuca swamps and Banksia woodlands. As such, it plays an important ecosystem function by providing a means of seed dispersal and pollination for many indigenous tree species (Eby 1996; Pallin 2000). Grey-headed Flying-foxes roost in large aggregations in the exposed branches of canopy trees (Ratcliffe 1931, Nelson 1965a, Parry-Jones and Augee 1992). The locations of camps are generally stable through time, and several sites have documented histories that exceed 100 years (Lunney and Moon 1997). Camps provide resting habitat, sites of social interactions and refuge for animals during significant phases of their annual cycle, such as birth, lactation and conception (Parry-Jones and Augee 1992, 2001).	Not recorded. Modification of an insignificant area of potential habitat will occur. The species is considered unlikely to be significantly impacted by the proposal

		On the basis of current knowledge, roosting habitat that meets at least one of the following criteria can be explicitly identified as habitat critical to survival, or essential habitat, for Greyheaded Flying-foxes. Roosting habitat that: 1. is used as a camp either continuously or seasonally in > 50% of years 2. has been used as a camp at least once in 10 years (beginning in 1995) and is known to have contained > 10 000 individuals, unless such habitat has been used only as a temporary refuge, and the use has been of limited duration (i.e. in the order of days rather than weeks or months) 3. has been used as a camp at least once in 10 years (beginning in 1995) and is known to have contained > 2 500 individuals, including reproductive females during the final stages of pregnancy, during lactation, or during the period of conception (i.e. September to May) (in DECCW, 2009) Although not recorded on site, potential feed trees are present on site in association with flowering and fruiting species (melaleucas, banksias ect) and are considered a likely occurrence during flowering and fruiting periods. The flying-fox was not recorded utilising the subject site during previous survey events by other environmental consultants. The species has however been recorded within the Kings Forest precinct by other environmental consultants (Figure 13). No roosting sites were observed within the subject site, although a colony site occurs within the Terranora Broadwater ('Big Island') approximately 5km north of the subject site. The majority of potential habitat will be retained on site. The removal of approximately 0.0685ha of potential foraging habitat is not expected to significantly impact the species. Similar foraging type habitat is known to occur in abundance within the locality. It is expected that the proposed replantation works will provide potential flying-fox foraging habitat in the future.	
Common Blossom-bat (*Syconycteris australis*)	Possible	This species is one of the smallest members of the flying fox family (Pteropodidae) and is considered to be a specialist pollen feeder favouring Banksia, Melaleuca, Callistemon and certain species of Eucalypt (Strahan eds, 2002). Required habitats include Coastal rainforest, heathlands and Melaleuca swamps. Roosting is noted to occur in Littoral Rainforest with foraging occurring in proximate heathland and melaleuca forest primarily on the flowers of Banksia integrifolia (Law, 1993; 1994; 1996) Potential habitat occurs on site in association with all flowering flora species on site (melaleucas, banksias ect). The species was not recorded during site inspections. The species has however been recorded within the Kings Forest precinct by other environmental consultants (Figure 13). It is expected that the removal of 0.0685ha of potential foraging habitat (swamp schlerophyll forest and littoral rainforest) will not significantly impact the species, given the abundance of similar habitat within the locality. . It is expected that the proposed replantation works will provide potential habitat for the blossom-bat in the future.	Not recorded. Modification of an insignificant area of potential habitat will occur. The species is considered unlikely to be significantly impacted by the proposal
Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*)	Possible	This species of bats utilises most habitats across its wide distribution and hunts over the canopy in forested areas and lower within mallee or open country (DECC, 2005). Roosting may occur within hollow trees and buildings and also within caves and derelict mines (NPWS, 2004; Richards in Van Dyck and Strahan, 2008). DECC (2005) notes that in treeless areas the sheathtail bat is known to utilise mammal burrows.	Not recorded. Modification of an insignificant area of

		This species of bat is known to utilise a wide variety of habitats (including treeless areas) and it has been recorded further to the east (Kingscliff) by Kendall & Kendall (2008). As the species utilises most habitats, the subject site may provide potential habitat for the species. Although recorded within the Kings Forest precinct (Figure 13), the species has not been previously recorded on the subject site. Potential roosting/nesting habitat is considered absent from the site. It is expected that the modification/removal of ~1.127ha of potential habitat will not significantly impact the species given the abundance of similar habitat within the locality, and that the majority of potential habitat on site will be retained.	potential habitat will occur. The species is considered unlikely to be significantly impacted by the proposal
Beccari's Freetail-bat (*Mormopterus beccarii*)	Possible	This species is present in a wide variety of habitats ranging from arid and semi-arid areas, through savanna type habitats to forested areas, including tropical moist forest. It seems to use fragmented habitat remnants (M. Pennay pers. comm.). It can be found in urban areas (Bonaccorso 1998). This species roosts in tree hollows and caves, and has been found roosting in buildings in colonies of up to 50 animals (Bonaccorso 1998; McKenzie and Bullen 2008). Their diet is predominantly moths and beetles that they catch above the canopy or along watercourses and they can consume large numbers of insects that are pests to humans and crops (Hall, 2009) As the species utilises most habitats, the subject site may provide potential habitat for the species. The species has not been previously recorded on the subject site by other environmental consultants. Potential roosting/nesting habitat is considered absent from the site. It is expected that the modification/removal of ~1.127ha of potential habitat will not significantly impact the species given the abundance of similar habitat within the locality, and that the majority of potential habitat on site will be retained.	Not recorded. Modification of an insignificant area of potential habitat will occur. The species is considered unlikely to be significantly impacted by the proposal
Eastern Freetail-bat (*Mormopterus norfolkensis*)	Possible	This species has been recorded in dry eucalypt forest and coastal woodlands but individuals have been captured in riparian zones in rainforest and wet sclerophyll forest and mangrove forests east of the Great Dividing Range (Allison and Hoye, 1995; DEC, 2005). An extensive study near Coffs Harbour found it to be more active on the upper slopes where flyways are large than along creeklines (Hoye, Law and Allison in Van Dyck and Strahan, 2008). The species forages upon insects above the forest canopy or at forest edges (Allison, 1983). It is known to roost in tree hollow, particularly in hollow spouts, but occasionally found in buildings (Gilmore and Parnaby, 1994; Allison and Hoye, 1995; DEC, 2005). Recent stuides performed by McConville et al (2013) indicate that mangrove habitats may also provide important roost sites. Marginal habitat occurs on site in association with littoral rainforest, wet sclerophyll forest and Cudgen Creek estuarine zone. No hollow bearing trees were observed within the clearing zone. The removal/modification of approximately 0.0685ha of potential habitat is considered unlikely to significantly impact the species given the abundance of similar habitat within the locality and that the majority of preferred habitat on site will be retained and buffered from the proposed development. It is expected that the proposed replantation works will provide potential freetail-bat habitat in the future.	Not recorded. Modification of an insignificant area of potential habitat will occur. The species is considered unlikely to be significantly impacted by the proposal

Little Bentwing-bat (*Miniopterus australis*)	Possible	This species utilises well-timbered habitats including rainforest, *Melaleuca* swamps and dry sclerophyll forests where it It feeds on insects within the canopy and requires caves, mines, stormwater drains and/or tree hollows to roost (Strahan eds, 2002). DECC (2005) note the following additional particulars with regard to the little bentwing bat: • Maternity colonies form in spring. Males and juveniles disperse in summer. • Only five nursery sites /maternity colonies are known in Australia. • 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 Common Bentwing-bats (*M. schreibersii*) and appears to depend on the large colony to provide the high temperatures needed to rear its young. All forested areas of the site (littoral rainforest and swamp sclerophyll forest) are considered to represent potential habitat for the little bentwing bat although roosting sites were not observed. Surrounding forested areas within the locality and within nearby conservation networks (Cudgen Nature Reserve) is considered to provide potential habitat for the species, but at a much larger scale in comparison to the subject site. Although not recorded within the subject site, the species has previously been recorded within the Kings Forest precinct (JWA, 2000). It is considered that the removal of 0.0685ha (littoral rainforest and swamp sclerophyll forest) will not significantly impact the species. The majority of preferred habitat on site will be retained. It is expected that the proposed offset works will provide potential freetail-bat habitat in the future.	Not recorded. Modification of an insignificant area of potential habitat will occur. The species is considered unlikely to be significantly impacted by the proposal
Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*)	Possible	This species usually forages on insects within intact, well timbered forest complexes and have been found to roost within caves, tunnels, stormwater culverts or disused mining areas (Strahan eds, 2002; DEH, 2005). They utilise a broad range of habits including wet and dry sclerophyll forest, open woodland, paperbark forests, rainforests and open grasslands (North & Pasic, 2006). Twelve known maternity roost sites occur within its distribution ranging from tens of thousands to >100000 individuals. The known large roost sites are located in limestone and sandstone caves, abandoned gold mines, concrete bunkers and lava tubes. Outside the breeding season the eastern bentwing often selects cool areas within caves, mines, tunnels, drains and bridges (Hoye & Hall in Van Dyck & Strahan, 2008). All forested habitats of the site (littoral rainforest and swamp sclerophyll forest) represent potential habitat for the eastern bentwing bat which is also known to forage over modified habitats such as grasslands although significant roosting/breeding areas are considered to be absent. The species has not been	Not recorded. Modification of an insignificant area of potential habitat will occur. The species is considered unlikely to be significantly impacted by the proposal

		previously recorded on the site by other environmental consultants. The removal of ~0.0685ha will not significantly impact the species.	
Southern Myotis (*Myotis macropus*)	Possible	The Myotis roosts within caves, tunnels, hollow-bearing trees, bridges, buildings and dense tree foliage always in close proximity to permanent water (NPWS, 2002; Richards, 2002). Breeding colonies may consist of 10-15 individuals or occasionally up to several hundred. Within breeding colonies small clusters are made where a male establishes a territory from which other males are actively excluded and breeding females are protected. Outside of breeding males roost solitarily within a defended zone or established a small group of up to 20 males. The species forages over waterbodies where it scoops insects and small fish from the water surface or catches insects aerially (DEH, 2005; Menkhorst, 1996; Richards, 2002). It has been recorded foraging over small creeks, coastal rivers, estuaries, lakes and inland rivers (Law & Anderson, 1999) and other smaller waterbodies including farm dams (Law et al, 1998). Potential habitat is considered to occur in association with swamp sclerophyll forest (while inundated) which may provide foraging opportunities. The Cudgen Creek estuarine zone also provides potential foraging habitat for the species. It is noted that these areas will not be impacted by the proposal and will be significantly buffered from the development footprint. Although not recorded within the subject site, the species has been previously recorded within the Kings Forest precinct by other environmental consultants (JWA, 2000). It is considered that the proposal will not significantly impact the species.	Not recorded. Modification of an insignificant area of potential habitat will occur. The species is considered unlikely to be significantly impacted by the proposal
Eastern Long-eared Bat (*Nyctophilus bifax*)	Possible	This species of bat inhabits lowland subtropical rainforest and wet and swamp eucalypt forest, extending into adjacent moist eucalypt forest with coastal rainforest and patches of coastal scrub particularly favoured (DEC, 2005; NPWS, 2002). Roosting occurs within tree-hollows, under bark and/or palm fronds and within dense foliage with a seasonal shift in roost sites from rainforest edges (summer) to the rainforest interior (winter) (NPWS, 2002; Parnaby in Strahan, 2002; Lunney et al, 1995). All forested areas of the site (littoral rainforest and swamp sclerophyll forest) is considered to provide potential habitat for the eastern long-eared bat. Although no hollow-bearing trees were observed, marginal potential roosting habitat occurs in association with paperbark and palms species on site. No roosting sites were however recorded. The species has not been recorded within the subject site, or within the Kings Forest precinct by other environmental consultants. It is considered that the removal of ~0.0685ha will not significantly impact the species.	Not recorded. Modification of an insignificant area of potential habitat will occur. The species is considered unlikely to be significantly impacted by the proposal
Mitchell's Rainforest Snail (*Thersites mitchellae*)	Possible	This species was formally widely distributed on coastal alluvia between the Richmond and Tweed Rivers (Stanisic, 1998, 2000; NSWNPWS, 2001). NPWS previously funded surveying within northern NSW to determine the extant distribution of the species in relation to its historical distribution. Surveys conducted (1998-2000) have provided limited success with only one robust population being recorded within the region at Stotts Island and evidence of marginal populations present at four additional sites (Stanisic 1998, 2000). An additional population was more recently discovered within Swamp Sclerophyll Forest in Kingscliff (Planit 2002, Stanisic 2003). Within its range the species is restricted to lowland subtropical	Not recorded. Modification of an insignificant area of potential habitat will occur.

		rainforest and swamp sclerophyll forest with a rainforest understorey, typically on alluvial soils with a basaltic influence (NPWS, 2001, Stanisic 2002). It is considered that the site falls within the known range of the snail and potential habitat occurs on site in association with littoral rainforest and swamp sclerophyll forest. No snails (or shells) were observed within the subject site during site inspections. Additionally, the species was not recorded on site during previous survey works of the site. It is expected that the removal of 0.0685ha will not significantly impact the species. The proposed revegetation works will provide potential habitat for the species.	The species is considered unlikely to be significantly impacted by the proposal
Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)*	Possible	This species is known from Tasmania and the mainland where it inhabits wet sclerophyll and coastal mallee. Preference is shown for tall, wet forests with an canopy layer of more than 20m and a dense understorey and in association with larger patches of forest with small patches typically avoided. Roosting generally occurs within hollow bearing eucalypts in groups of 3-80, usually in single sex group with roost swapping occurring on most nights. Roosting has also been recorded in caves (Jenolan NSW) and old buildings (Law, Herr, and Phillips in Van Dyck and Strahan, 2008; Churchill, 2008; DEH, 2014; Wildcare Aust., 2013; Kitchener, Caputi and Jones, 1986). All forested areas of the site is considered to provide potential eastern false pipistrelle habitat. The absence of hollow-bearing trees may however deter the species from the site. Although recorded within the Kings Forest precinct (JWA, 2000), the species has not been previously recorded on the subject site by other environmental consultants. No significant impact is expected to occur to the species as a result from the service station.	Not recorded. Modification of an insignificant area of potential habitat will occur. The species is considered unlikely to be significantly impacted by the proposal
Masked Owl (*Tyto novaehollandiae*) *	Possible	The Masked Owl lives in eucalypt forests and woodlands from the coast, where it is most abundant, to the western plains (Kavanagh 2002b in NPWS, 2005). Within suitable habitat that species occupies a range of 5-10km^2 where it forages mostly upon rodents and marsupials although this may be supplemented by bandicoots, arboreal mammals (Sugar Glider, Common Ringtail Possum) and some birds with introduced rodents and rabbits becoming important in disturbed environments (Debus, 1993, Kavanagh, 1996; NPWS, 2005). Habitats containing stands of large, hollow bearing eucalypts are also critical to roosting and nesting (NPWS, 2005; Kavanagh and Murray, 1996). Given the owl's large range and preferred prey is known to occur on site, the site is considered to provide potential masked owl habitat. Roosting/nesting is considered unlikely to occur on site given no suitable hollow-bearing trees were recorded. The species was not recorded within the subject site during site investigations. The species has however been recorded within the Kings Forest precinct by other environmental consultants (Figure 13). It is considered that the removal of ~1.127ha will not significantly impact the masked owl. The proposed replantation works will provide potential masked owl habitat within the future.	Not recorded. Modification of an insignificant area of potential habitat will occur. The species is considered unlikely to be significantly impacted by the proposal

* Although the Eastern False Pipistrelle and Masked Owl were not recorded within the NPWS database as occurring within 5km of the site, the species have been previously recorded within the Kings Forest precinct by other environmental consultants

6.0 STATUTORY CONSIDERATIONS – THE 7-PART TEST OF SIGNIFICANCE

Further to the provisions of Schedules 1 and 2 of the *Threatened Species Conservation Act 1995*, Section 5A of the *Environmental Planning and Assessment Act 1979* (the '7-Part Test') is applied to assess any potentially adverse impacts of the site-proposal on threatened species, populations and/or communities occurring within the site or surrounding locality.

The Assessment of Significance is not a 'pass/fail' test or technique based on a scoring system. Instead, the outcome of each factor needs to be considered as to whether effects are likely and whether they are significant (NPWS 1996a).

It is further noted that a positive finding in respect of one or more factors of the 7-part test of significance does not necessarily lead to the conclusion that an SIS is then required (Talbot in Gales Holdings Pty Ltd v Tweed Shire Council [2006] NSWLEC 212). Rather it allows consideration as to whether a particular effect may be present or occur as a result of the development and whether that effect is likely to be significant.

The 7-Part Test is applied to scheduled flora, fauna, populations and communities (where applicable) to assess potentially adverse impacts of the proposal on threatened species, populations or communities identified on or likely to utilise the site based on available habitat components, geography and local environmental conditions.

Note that threatened species, populations and/or communities have been excluded from this assessment where:

- No direct observations of threatened species, populations or communities were made on the site during survey works;
- No previous sightings of threatened species, populations or communities within a 10-kilometre radius of the site have been registered within the NPWS database and scheduled under the *Threatened Species Conservation Act 1995*; and
- An abundance of primary habitat requirements for said species are not located on or within the locality of the proposal (refer previous sections)
- Potential habitat (feeding, roosting, nesting or refuge) will not be or will be minimally affected by the proposal (refer previous sections)

As such it is considered that, of the scheduled species, populations and/or communities described previously within this report, the following ten species of threatened fauna and one endangered ecological communities were recorded on the site or are considered potential occurrences within the area based upon available habitat components and may have the potential to be significantly affected through any development of the site.

Table 11: Threatened Species and Communities Subject to 7-part Test	
Ecological Communities	[LITTORAL RAINFOREST IN THE NSW NORTH COAST, SYDNEY BASIN AND SOUTH EAST CORNER BIOREGIONS]
	[SWAMP SCLEROPHYLL FOREST ON COASTAL FLOODPLAINS OF THE NSW NORTH COAST, SYDNEY BASIN AND SOUTH EAST CORNER]
Populations	N/A
Flora	N/A

Fauna	Black Bittern (*Ixobrychus flavicollis*)
	Black-necked Stork (*Ephippiorhynchus asiaticus*)
	Pale-vented Bush Hen (*Amaurornis moluccana*)
	Bush-stone Curlew (*Burhinus grallarius*)
	Common Blossom Bat (*Syconycteris australis*)
	Common Planigale (*Planigale maculata*)
	Glossy Black-cockatoo (*Calyptorhynchus lathami*)
	Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)
	Eastern Grass Owl (*Tyto longimembris*)
	Grey-headed Flying-fox (*Pteropus poliocephalus*)
	Koala (*Phascolarctos cinereus*)
	Little Bent-wing Bat (*Miniopterus australis*)
	Long-nosed Potoroo (*Potorous tridactylus*)
	Masked Owl (*Tyto novaehollandiae*)
	Osprey (*Pandion haliaetus*)
	Rose-crowned Fruit-dove (*Ptillinopus regina*)
	Southern Myotis (*Myotis macropus*)
	Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*)
	Wallum Froglet (*Crinia tinnula*)
	Wallum Sedge-frog (*Litoria olongburensis*)

6.1.1 FACTORS OF ASSESSMENT 7-PART TEST

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

The National Parks and Wildlife Service (NPWS) describe a local population as one *"that occurs within the study area, unless the existence of contiguous or proximal occupied habitat and the movement of individuals or exchange of genetic material across the boundary of the study area can be demonstrated."*

DECC (2007) & DPI (2008) further expands the local population definition to include:

- The *local population* of a threatened *plant* species comprises those individuals occurring in the study area or the cluster of individuals that extend into habitat adjoining and contiguous with the study area that could reasonably be expected to be cross-pollinating with those in the study area.
- The *local population* of *resident fauna* species comprises those individuals known or likely to occur in the study area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area.
- The *local population* of *migratory or nomadic fauna* species comprises those individuals that are likely to occur in the study area from time to time.
- DECC (2007) & DPI (2008) further states that the key assessment for this component is the "risk of extinction of the local population. The risk of extinction will increase if any factor operates to reduce population size or reproduction success." It is further noted that any known or presumed local population should be assumed to be viable for the purpose of this assessment unless otherwise proven.

<u>Megachiropterans (Grey-headed Flying-fox and Common Blossom Bat)</u>

Grey-headed Flying-fox

Local Population

As the noted mega-bat species are considered to be wide ranging in the region, it is considered that they are not genetically isolated on the subject site and form part populations within the wider region. This species is well known from the locality and is known to roost within Terranora Broadwater ('Big Island') approximately 5km north of the subject.

Although not recorded within the development site, the Grey-headed Flying-fox has been previously recorded within the Kings Forest precinct and is likely to occur on site during flowering and fruiting periods. The NPWS database contains thirty-four (34) records of the species within 10km of the site.

Common Blossom Bat

Although not recorded within the subject site, this species has been recorded within the Kings Forest precinct. The NPWS database contains eight (8) records of this species within 10km of the site.

Stages of lifecycle potentially affected by development

Species	Habitat Preference	Roosting/Breeding
Grey-headed Flying-fox	The Grey-headed Flying-fox inhabits subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps (Eby, 1995). Urban gardens and cultivated fruit crops also provide habitat for this species (NSW NPWS 1999c). Grey-headed Flying-foxes forage on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca, Banksia (Eby, 2000) and fruits of rainforest trees and vines (NSW NPWS 1999c). During periods when native food is limited, Grey-headed Flying-foxes disperse from colonial roosts, often foraging in cultivated gardens and fruit crops (NSW NPWS 1999c). This species is a canopy-feeding frugivore, blossom-eater and nectarivore of rainforests, open forests, woodlands, Melaleuca swamps and Banksia woodlands. As such, it plays an important ecosystem function by providing a means of seed dispersal and pollination for many indigenous tree species (Eby 1996; Pallin 2000).	This species roosts in large aggregations or camps in close proximity (20 km or less) to a regular food source, often in stands of riparian rainforest, Paperbark or Casuarina forest (Eby, 1995). Camps provide resting habitat, sites of social interactions and refuge for animals during significant phases of their annual cycle, such as birth, lactation and conception (Parry-Jones and Augee 1992, 2001). "Roosting habitat critical to survival: Grey-headed Flying-foxes roost in large aggregations in the exposed branches of canopy trees (Ratcliffe 1931, Nelson 1965a, Parry-Jones and Augee 1992). The locations of camps are generally stable through time, and several sites have documented histories that exceed 100 years (Lunney and Moon 1997). Camps provide resting habitat, sites of social interactions and refuge for animals during significant phases of their annual cycle, such as birth, lactation and conception (Parry-Jones and Augee 1992, 2001). On the basis of current knowledge, roosting habitat that meets at least one of the following criteria can be explicitly identified as habitat critical to survival, or essential habitat, for Greyheaded Flying-foxes. Roosting habitat that: 1. is used as a camp either continuously or seasonally in > 50% of years 2. has been used as a camp at least once in 10 years (beginning in 1995) and is known to have contained > 10 000 individuals, unless such habitat has been used only as a temporary refuge, and the use has been of limited duration (i.e. in the order of days rather than weeks or months) 3. has been used as a camp at least once in 10 years (beginning in 1995) and is known to have contained > 2 500 individuals, including reproductive females during the final stages of pregnancy, during lactation, or during the period of conception (i.e. September to May) (in DECCW, 2009)

Common Blossom Bat	This species is one of the smallest members of the flying fox family (Pteropodidae) and is considered to be a specialist pollen feeder favouring Banksia, Melaleuca, Callistemon and certain species of Eucalypt (Strahan eds, 2002). Required habitats include Coastal rainforest, heathlands and Melaleuca swamps.	They roost only in rainforest, most commonly in the sub-canopy but occasionally in the canopy. Roosts are among large leaves (sometimes dead), often on the growing tips of samplings or among dense vines (Churchill, 2008)

A review of the available habitats of the site indicates that general potential foraging habitats (flowering and fruiting trees) are available within the majority of the site (with the exception of the cleared areas). Although the site features foraging habitat for the Grey-headed Flying-fox and Common Blossom Bat, it must also be considered that the majority of the locality also provides foraging habitat for these species.

Cudgen Nature Reserve is located approximately 500m south of the subject site and provides approximately 671ha of protected areas which features preferable foraging and roosting habitat for the species.

The proposal will remove approximately 0.0685ha (littoral rainforest and swamp sclerophyll forest) of marginal megabat habitat from the site with the majority retained. Furthermore, as no roost sites were recorded within the site, it is considered that breeding requirements will not be disturbed as a part of the proposal. It is highly unlikely that the removal of this vegetation will significantly impact the Grey-headed Flying-fox and Common Blossom Bat population within the locality.

The proposed revegetation works will provide additional potential habitat for these species.

Likelihood of Local Extinction

Reviewing the above, it is considered unlikely that the proposal will disrupt the lifecycle of the local population of the discussed megabats to the point that they are at risk of extinction.

Threatened Microchiropteran Bats (Yellow-bellied Sheathtail Bat, Little Bent-wing Bat, Southern Myotis and Eastern False Pipistrelle)

As the noted micro-bat species are considered to be wide ranging in the region, it is considered that they are not genetically isolated on the subject site and form part of populations within the wider region.

Yellow-bellied Sheathtail Bat

Although not recorded within the subject site, this species has been recorded within the Kings Forest precinct. The NPWS database contains three (3) records of this species within 10km of the site.

Little Bent-wing Bat

Although not recorded within the subject site, this species has been recorded within the Kings Forest precinct. The NPWS database contains eleven (11) records of this species within 10km of the site.

Southern Myotis

Although not recorded within the subject site, this species has been recorded within the Kings Forest precinct. The NPWS database contains seven (7) records of this species within 10km of the site.

Eastern False Pipistrelle

Although not recorded within the subject site, this species has been recorded within the Kings Forest precinct. The NPWS database does not contain any records of the species as occurring within 10km of the site.

Species	Habitat Preference	Roosting/Breeding
Yellow-bellied Sheathtail Bat	This species of bats utilises most habitats across its wide distribution and hunts over the canopy in forested areas and lower within mallee or open country (DECC, 2005).	Roosting may occur within hollow trees and buildings and also within caves and derelict mines (NPWS, 2004; Richards in Van Dyck and Strahan, 2008). DECC (2005) notes that in treeless areas the sheathtail bat is known to utilise mammal burrows.
Little Bent-wing Bat	This species utilises well-timbered habitats including rainforest, *Melaleuca* swamps and dry sclerophyll forests where it feeds on insects within the canopy.	DECC (2005) note the following particulars with regard to the little bentwing bat: • Maternity colonies form in spring. Males and juveniles disperse in summer. • Only five nursery sites /maternity colonies are known in Australia. • 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 • 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 Common Bentwing-bats (M. schreibersii) and appears to depend on the large colony to provide the high

		temperatures needed to rear its young.
Southern Myotis	It forages over waterbodies where it scoops insects and small fish from the water surface or catches insects aerially (DEH, 2005; Menkhorst, 1996; Richards, 2002). It has been recorded foraging over small creeks, coastal rivers, estuaries, lakes and inland rivers (Law & Anderson, 1999) and other smaller waterbodies including farm dams (Law et al, 1998).	The Myotis roosts within caves, tunnels, hollow-bearing trees, bridges, buildings and dense tree foliage always in close proximity to permanent water (NPWS, 2002; Richards, 2002).
Eastern False Pipistrelle	This species is known from Tasmania and the mainland where it inhabits wet sclerophyll and coastal mallee. Preference is shown for tall, wet forests with an canopy layer of more than 20m and a dense understorey and in association with larger patches of forest with small patches typically avoided	Roosting generally occurs within hollow bearing eucalypts in groups of 3-80, usually in single sex group with roost swapping occurring on most nights. Roosting has also been recorded in caves (Jenolan NSW) and old buildings (Law, Herr, and Phillips in Van Dyck and Strahan, 2008; Churchill, 2008; DEH, 2014; Wildcare Aust., 2013; Kitchener, Caputi and Jones, 1986).

A review of the existing habitats indicates that the site provides potential habitat (littoral rainforest and swamp sclerophyll forest (paperbark)) for the Yellow-bellied Sheathtail Bat, Little Bent-wing Bat and Eastern False Pipistrelle. It is also likely that these species utilise the site as a flyaway between surrounding environments. Although not observed on site, suitable foraging habitat for the Sothern Myotis (permanent waterbodies) occurs in association with Swamp sclerophyll forest during inundation periods, and areas associated with Cudgen Creek.

A review of the above species indicates the tree cavities and caves/crevices are necessary for roosting/breeding. In addition to providing shelter, maternity places and retreats for hibernation, roosts are also important places for social interactions among bats. The availability of suitable roosts is therefore critical for forest bat survival (Herr, 1998).

Within the subject site it is considered that cave/mine potential breeding sites are absent. No hollow-bearing trees are located within the proposed modification/clearing areas. The removal of ~0.0685ha is unlikely to significantly impact these species considering the majority of potential habitat within the site will be retained, and 651ha of preferred habitat occurs within the protected Cudgen Nature Reserve approximately 500m south of the site.

Likelihood of Local Extinction

Reviewing the above, it is considered unlikely that the proposal will disrupt the lifecycle of the local population of the discussed micro-bat to the point that they are at risk of extinction.

Koala

As the Koala is wide ranging in the region, it is considered that it is not genetically isolated on the subject site and would form part of a population within the wider region.

Although the Koala was not recorded within the subject site, it is wide spread within the locality and has been recorded numerous times within the Kings Forest precinct. The NPWS database contains 133 records of this species within 10km of the site.

Stages of Lifecycle potentially affected by development

The Koala primarily occurs within Eucalypt Forest and Woodlands containing a suitable density of favoured food trees within coastal eastern and southeastern Australia. Preferred habitat generally contains a high percentage of primary food trees although underlying geology and soil type can be an important factor. Eucalypt Forests associated with drainage lines and floodplains of richer soil types (i.e. moisture and nutrients) can also be favoured due to feed trees containing higher levels of nutrients and less potential for toxicity (Hindell & Lee, 1990; Moore & Foley, 2000).

Within SEQLD six primary foraging trees were identified by Pahl (1993); Tallowwood (*Eucalyptus microcorys*), Blue Gum (*E. tereticornis*), Scribbly Gum (*E. racemosa*), Grey Gum (*E. propinqua*), Red Mahogany (*E. resinifera*) and White Stringybark (*E. tindaliae*). Further research undertaken by Phillips & Callaghan (1996) in Tweed Shire indicates that Swamp Mahogany (*E. robusta*) and Blue Gum (*E. tereticornis*) [including hybrids of the two] on alluvial deposits and Quaternary and Neranleigh- Fernvale Group geomorphologies were considered to be primary habitats. Areas with sub-dominance of these species on Neranleigh-Fernvale alliances supporting Blue Gum (*E. tereticornis*), Tallowwood (*E. microcorys*) and/or Grey Gum (*E. propinqua*) comprise secondary habitat or primary habitat depending on the density of the latter two species. Phillips & Callaghan (1998) also noted Tallowwood to be a primary browse species and two types of Grey Gum (*E. propinqua, E. biturbinata)* to be secondary browse species in Currumbin.

Recent studies (Biolink, 2007) indicate that *Eucalyptus tereticornis, E. microcorys* and *E. propinqua/E. biturbinata* are the most preferred koala food trees throughout the Gold Coast LGA. Within the Tweed Coast Swamp Mahogany *Eucalyptus robusta* and Forest Red Gum *E. tereticornis* are the most preferred tree species with Tallowwood *E. microcorys* and Grey Gum *E. propinqua* being the next most preferred (Biolink, 2011).

Within utilized Eucalypt Forest habitat the koala spends most of its time in distinct home-ranges which may overlap if available habitat area is reduced. Males are territorial but a dominance-hierarchy exists and they may attack during the summer breeding season. Home ranges of the species are considered to be large and can vary dependent upon habitat quality and extent. Studies have shown various home range sizes exist with the males usually larger than the female (Male 135ha, Female: 110ha [Ellis et al, 2002], Male: 34.4ha, Female: 15ha [White, 1999]).

A review of a number of published scientific reports notes that Koala density generally ranges between 0.02 and 1.26 animals per hectare. Densities are considered to vary dependent upon habitat quality, size, connectivity, presence of impediments to movement (stock fences, dogs, roads etc).

Source	Study Location	Habitat Type	Additional Comments	Koala/ha
Dique et al, 2003	Southeast QLD Pine Rivers Shire	Tall shrubby open forest (Tertiary surfaces) and Tall open forest upon metamorphics	Stratified by two habitat descriptions 'urban' and 'bushland'	0-0.76
Dique et al, 2004	Southeast QLD Koala Coast ~375sqm of	Eucalypt Forests. Predominately RE 12.9-10.4 & 12.11.5	Study stratified by habitat descriptions:	Range 0.02-1.26 Urban: 0.17 +/-0.013

	Redland, Logan and Brisbane City shires		'urban', 'remnant bushland', 'bushland' and 'other'. Remnant and bushland areas further stratified by proximity to the centre of the study area (high density=close to centre, low density=further away)	High remnant: 0.70 +/-0.023 Low remnant: 0.20 +-/0.014 High bushland: 0.30+/-0.006 Low bushland: 0.11 +/-0.007 Other: 0
White and Kunst	Southeast QLD Sheldon	Eucalypt Forest		0.4 (0.3-0.46)
Sullivan et a 2004	Southwest QLD	Eucalypt Forest/woodland within the mulgalands	Habitat stratified by floristics and landzone.	0.0007-2.513
Biolink 2007	Coombabah Koala Habitat Area	Mapped gold coast city vegetation (per Ryan et al, 2003) filtered to exclude communities not containing eucalypts	Spot assessment technique for koala faecal pellets. Not based upon koala observation transects per *Dique, 2003; EPA, 2005.*	0.22+/-0.04
Biolink 2007	Coomera-Pimpama Koala Habitat Area	Mapped gold coast city vegetation (per Ryan et al, 2003) filtered to exclude communities not containing eucalypts	Spot assessment technique for koala faecal pellets. Not based upon koala observation transects per *Dique, 2003; EPA, 2005.*	0.23+/-0.03

No koalas were observed during the recent site inspection. Additionally, no koalas have been recorded within the subject site during previous survey events. No preferred koala feed trees were recorded within the subject site.

In association with the proposal, no areas of potential koala habitat (Eucalypt Forest) will be modified for the proposed service station. No trees within the impact zone were observed to contain koalas, koala trace or scats.

Vegetation communities within the locality and the adjacent Cudgen Nature Reserve provides more preferable habitat, at a larger scale in comparison to the subject site. The removal of ~1.127ha of unfavourable koala habitat will not significantly impact the Koala.

PREDATION/DISRUPTION BY FERAL/DOMESTIC ANIMALS

Mortality of koalas as a result of dog attacks is considered to be a key conservation concern for koala management with some studies reporting that dog attacks account for between 5% and 40% of total recorded mortalities (McAlpine et al, 2007). Within the 'koala coast' of SEQLD an average of 300 koalas each year die as a result of dog attacks (EPA, 2006). Studies into dispersal patterns of koalas undertaken by Dique et al (2003) indicates that in addition to mortality the presence of dogs within or proximate to koala habitats is likely to disrupt behaviour and associated dispersal options which can lead to those impacts discussed in 5.2 above.

While not as widely studied it is considered that presence of feral species such as dingoes or foxes within utilised habitat may have a similar impact to koala mortality and dispersal behaviour as domestic dogs. The recovery plan for koalas (NPWS, 2003) lists the key threatening process 'Predation by the Red Fox *Vulpes vulpes*' as being relevant to the koala.

To mitigate the potential impact of domestic animals on resident fauna the following measures are recommended:

- Imposition of a 'dog and cat restriction' covenant as follows:
  - Dogs and cats on the allotment shall not be permitted unrestrained in areas external to the designated service station development envelope

MORTALITY ASSOCIATED WITH BUSHFIRE

High-intensity wildfires pose a threat to koalas, particularly where refuge habitat is not available. High-intensity fires burn the canopy and can cause the death or injury of koalas and a reduction in the availability of foraging habitat. In addition, fast-moving fires fanned by strong winds reduce the ability for koalas to escape to refuge areas (NPWS, 2003: 23).

To reduce the potential risk of fire spread from inappropriate burning of waste/garden refuse following measures are proposed:

- Prohibition of lighting of fires external to the service station

MORTALITY ASSOCIATED WITH ROADWAYS

It is widely accepted that koala mortality associated with vehicle strike on roadways intersecting or proximate to habitat represents a serious through to the ongoing viability of populations (Dique et al, 2003; NPWS, 2003; McAlpine et al, 2007; EPA, 2006). Vehicle strikes are heightened where arterial and other roads bisect bushland, remnant bushland or urban habitat areas, resulting in high mortality of resident koalas, or limited success of dispersing animals that must cross roads to reach suitable habitat and mates (Dique *et al*. 2003 in EPA, 2007). NPWS (2003) note that habitat bisecting roadways are particularly likely to lead to increased vehicle strike on koalas where traffic volume is high, speeds exceed 60km/hr, where visibility of road edges is reduced and/or where lighting is absent.

In this instance it is considered that whilst additional daily vehicle movements will occur on the subject, no significant increase in koala road-kill is expected to occur due to the characteristics of the proposal. It is recommended that speed bumps are to be installed within the service station to reduce the risks of roadstrikes.

Likelihood of Local Extinction

Reviewing the above, it is considered unlikely that the proposal will disrupt the lifecycle of koala populations to the point that they are at risk of extinction.

Wallum Froglet

As the Wallum Froglet is considered to be wide ranging in the locality, it is considered that it is not genetically isolated on the subject site and form part of a population within the wider region. Although not recorded within the subject site, the species is known to occur within the locality and has been recorded on numerous occasions within the Kings Forest precinct. The NPWS database contains 211 records of this species within 10km of the site.

Stages of lifecycle potentially affected by development

The Wallum Froglet is one of four wallum-dependent 'acid' frog species that specifically breed in acidic (low pH) waters along the central eastern coast of Australia. The Wallum Froglet is the only species of acid frog to continue breeding throughout the winter months. Breeding occurs in low nutrient, acidic (pH < 6), tannin-stained ephemeral ponds and swamps associated with coastal banksia, melaleuca, wet heath and/or adjacent eucalypt

forest/woodland (Meyer et al., 2005). Male frogs call from secluded positions at the bases of sedges near water or atop matted sedges (Meyer et al., 2005). Female frogs attach their eggs to submerged vegetation, and lay an average of 80 eggs per clutch. Tadpoles may take between two to six months to develop into frogs (Straughan & Main, 1966; Anstis, 2002; Meyer et al., 2005).

During non-breeding periods, wallum froglets may disperse into nearby eucalypt forest. During the day, wallum froglets can be found sheltering in crayfish burrows as well as under leaf litter, sometimes well away from water (Straughan & Main, 1966; Cogger, et al., 1983; Baker et al., 1995; McFarland, 2007).

An adult Wallum Froglet's diet consists of several species of arthropods, whereas the tadpole diet consists of sediment and algae (Cogger et al., 1983; Anstis, 2002).

No potential Wallum Froglet habitat was recorded within the subject site. The mapped Swamp Sclerophyll forest on site is tidally influenced and does not represent acidic waters in which the species requires.

In regards to the proposal, no Wallum Froglet habitat is expected to be impacted by the proposal. Additionally, no Wallum Froglet habitat was observed within the subject site.

Likelihood of Local Extinction

Reviewing the above, it is considered unlikely that the proposal will disrupt the lifecycle of Wallum Froglet populations to the point that they are at risk of extinction. Although the Froglet is known to occur within the Kings Forest precinct, the subject site itself is considered to not contain potential habitat for the species.

Bush Stone Curlew

As the Bush Stone Curlew is considered to be wide ranging in the locality and utilises a wide range of habitat types, it is considered that it is not genetically isolated on the subject site and form part of a population within the wider region.
Local Population

Although not recorded within the subject site, the species has been recorded within the Kings Forest precinct.

The following bush stone curlew recordings are noted from the locality:

- Within the Northstar Holiday Resort (TSC, 2011).
- Within North Pottsville (SKM, 2003).
- Within the Creek Street road reserve [western end] at Hastings Point (Planit, 2011).
- From locality database records (Birds Australia/Royal Australasian Ornithologists Union, 2011)
- From locality database records (NPWS Wildlife Atlas, 2011)
- From within the Kings Forest 'Cudgen Paddock' in scattered Scribbly gum on the margin of regrowth heathland (Landpartners, 2008; Aspect North, 2005).
- From a small population within the Koala Beach residential estate (Koala Beach Wildlife and Habitat Management Committee, 2009; DEC, 2006)

DEC (2006) notes that breeding pairs of bush stone curlew are generally sedentary within home ranges estimated to be 250-600ha for foraging year round, with a core of 10-25ha during breeding. Home ranges are likely to be highly variable in size, depending on the type of habitat,

resource availability and level of disturbance within the area' (DEC, 2006; App4 pg 1). Extensive areas of potential habitat are available in the locality, particularly within the Cudgen Nature Reserve.

The NPWS database contains six (6) records of this species within 10km of the site.

Stages of lifecycle potentially affect by development

The habitat and breeding preferences, as outlined by NSW NPWS, of the curlew are tabulated below:

Habitat Preference	Roosting/Breeding
This species is widespread throughout predominately coastal Australia where its preferred habitat consists of open forest-woodlands containing a grassy understorey with fallen timber and leaf litter (Readers Digest, 2002; NPWS, 2006). Foraging however, has been noted to occur over a broader spectrum of habitats including paddocks, grasslands, domestic areas (gardens, sports fields, [golf courses, residential areas pers. obs] etc), estuarine areas (mudflats, saltmarsh, mangrove forest, swamp oak, melaleuca forest) (NPWS, 1999; 2006). In NSW, Bush Stone-curlews occur in lowland grassy woodland and open forest. Habitat is described by broad ground and understorey structural features and is not necessarily associated with any particular vegetation communities. In general, habitat occurs in open woodlands with few, if any, shrubs, and short, sparse grasses of less than 15cm in height, with scattered fallen timber, leaf litter and bare ground present. In coastal areas, structurally similar elements of tidal and estuarine communities provide suitable habitat, for example Bush Stone curlews are recorded within Casuarina woodlands, saltmarsh and mangroves (Price 2004). The important structural elements of Bush Stone-curlew habitat appear to be: o a low sparse ground cover o some fallen timber and leaf litter o a general lack of a shrubby understorey o open woodlands (DECC, 2006: 8)	The Bush Stone-curlew nests on the ground, near dead timber, usually under trees within open woodlands that have an understorey of short grass or among brushwood (Wilson 1989 in NPWS, 1999). The nest site is typically in or near the edge of open grassy woodland or within a cleared paddock where there is good visibility across the surrounding lands (Johnson and Baker-Gabb 1994 in DECC, 2006).

With regard to the above, it is considered that all areas (~3.832ha) of the site represent potential habitat for the bush stone curlew. However, similar to the site, it must also be considered that the majority of the locality also provides potential habitat for the curlew (obviously excluding impervious areas and open water surfaces).

It is noted that the proposed service station involves the removal/modification of ~1.127ha of potential habitat. It is considered that this reduction in potential habitat is considered unlikely to represent a significant reduction of potential curlew habitats on the site and locality. The majority of habitat present on site will be retained.

Likelihood of Local Extinction

Reviewing the above, it is considered unlikely that the proposed development will disrupt the lifecycle of bush stone-curlew populations to the point that they are at risk of extinction.

<u>Glossy Black-cockatoo</u>

As the cockatoo is considered to be wide ranging in the region, it is considered that it is not genetically isolated on the subject site and form part of a population within the wider region.

Local Population
Although not recorded within the subject site, the species has been recorded within the Kings Forest precinct during previous survey works by other environmental consultants. The NPWS database contains ten (10) records of this species within 10km of the site.

Stages of lifecycle potentially affected by development
Calyptorhynchus lathami are uncommon parrots found in scattered localities in the forests and woodlands of eastern Australia and Kangaroo Island (Forshaw, 1981). The eastern subspecies of Glossy Black Cockatoos seems thinly distributed through its range with the highest densities occurring in south-eastern Queensland and north-eastern New South Wales (Forshaw, 1989).

The main habitat of the eastern subspecies is *Eucalyptus* woodlands and forest with moderate-high densities of *Allocasuarina* which are required for feeding (Clout, 1989; Park & Borsboom, 1996; Forshaw & Cooper, 1989; Crome & Shields, 1992; Cleland & Sims, 1968; Garnett, 1992b; Blakers *et al*, 1984). Suitable senescent trees (large hollow within a live or dead Eucalypt: 10-20m, Depth: 40-120cm, Entry: ~21cm: Inside Dia: ~23cm (Forshaw, 1981; Gibbons & Lindenmayer, 2002)) are also required for nesting.

Although present in abundance within the locality, the site does not contain areas of eucalypt forest/woodland. Within the site, no large trees bearing suitably sized hollows were encountered. Additionally, no preferred forage trees (*Allocasuarina spp.*) were encountered within the subject site.

In association with the proposed service station:

- No trees bearing suitably sized hollows providing potential nesting sites for the GBC will be removed
- No fruit bearing ages Allocasuarina spp providing potential foraging resources will be removed
- ~1.127ha of unfavourable habitat will be removed/modified.

As no nesting sites or potential forage trees will be affected by the proposal it is considered unlikely that a significant impact to the GBC will occur. Notwithstanding it is recommended that planting of Eucalypt Species be performed on the site (external to the proposed service station) to:

- Compensate the loss of native trees from the site

- Provide potential nesting/roosting habitat for the species in the future

Likelihood of Local Extinction
Reviewing the above, it is considered unlikely that the proposal will disrupt the lifecycle of the local population of the Glossy Black Cockatoo to the point that it is at risk of extinction.

<u>Rose-crowned Fruit-dove</u>

As the Fruit-dove is considered to be wide ranging in the region, it is considered that it is not genetically isolated on the subject site and forms part of a population within the wider region.

Local Population

Although not recorded within the subject site, the species has been previously recorded within the Kings Forest precinct by other environmental consultants. The NPWS database contains three (3) records of this species within 10 kilometres of the site.

Stages of lifecycle potentially affected by development
The habitat and breeding preferences of the fruit-dove are tabulated below:

Habitat Preference	Roosting/Breeding
This species generally occurs within sub-tropical rainforest, camphor laurel and occasionally wet sclerophyll and swamp forests which contain suitable fruiting species for foraging (DEC, 2005; Recher et al, 1995). As an obligate frugivore a high proportion of fruiting species (figs, lillipillis, laurels etc) is necessary and as such rainforest habitats are favoured (Recher et al, 1995; Innis, 1989).	The species is considered a partial migrant and moves north in autumn/winter and returning in spring/summer to breed. The nest consists of a platform of sticks and vines within dense vegetation usually with 6m of the ground (Recher et al, 1995).

Potential habitat for the species occurs on site in association with littoral rainforest and wet sclerophyll forest (paperbark). Fruiting trees providing potential forage resources are also present on site (figs, fruiting vines, ect). Extensive fruiting resources are also present adjacent the site in the Cudgen Reserve and habitats of the locality retained in private ownership.

The proposed development will result in the removal of a small percentage of native fruiting trees (~0.0677ha) from the site with the majority retained. The removal is not considered to be a significant reduction in the regional foraging base for the Rose-crowned Fruit-dove. Furthermore, as no fruit-dove nests were recorded within the site, it is considered that breeding requirements will not be disturbed as part of the proposal.

Likelihood of Local Extinction

Reviewing the above, it is considered unlikely that the proposed action will disrupt the lifecycle of local fruit-dove populations to the point that they are at risk of extinction.

Wallum Sedge-frog

As the Wallum Sedge-frog is considered to be wide ranging in the locality, it is considered that it is not genetically isolated on the subject site and form part of a population within the wider region.

Local Population

Although not recorded within the subject site, the species is known to occur within the locality and has been recorded on numerous occasions within the Kings Forest precinct. The NPWS database contains 3 records of this species within 10km of the site.

Stages of lifecycle potentially affected by development

This species is known from a variety of coastal sandy vegetation communities associated with wallam (banksia) including heathland, sedgeland, melaleuca forest/woodland and ephemeral wetlands with a preference for acidic (low pH) seasonally inundated sedge swamps for breeding.

Breeding occurs after rain in spring, summer and autumn within acidic, permanent to ephemeral freshwater wetlands with emergent vegetation, most notably sedges, reeds or ferns in still water 0.5-1.5m deep (Hines et al, 2004). 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 (Wallum Sedge Frog Workshop 2010 in DSEWPC, 2012; Meyer et al, 2006).

At swamp sites, the Wallum Sedge Frog can be found sheltering amongst sedges, reeds and ferns all year round (Anstis 2002; Ehmann 1997; Ingram & Corben, 1975; James, 1996; Lewis & Goldingay, 2005; Liem & Ingram, 1977; Neilson, 2000 in DSEWPC, 2012). During wet periods the frog can be found on emergent vegetation (rushes, sedges, ferns) whilst during drier periods it may be found at the base of such vegetation (BSC, 2010).

No potential Wallum Sedge-frog habitat was recorded within the subject site. The mapped Swamp Sclerophyll forest on site is tidally influenced and does not represent acidic waters in which the species requires.

In regards to the proposal, no Wallum Froglet habitat is expected to be impacted by the proposal. Additionally, no Wallum Froglet habitat was observed within the subject site.

Likelihood of Local Extinction

Reviewing the above, it is considered unlikely that the proposed action will disrupt the lifecycle of local Wallum Sedge-frog populations to the point that they are at risk of extinction.

Eastern Osprey

As the Eastern Osprey is considered to be wide ranging in the locality, it is considered that it is not genetically isolated on the subject site and form part of a population within the wider region.

Local Population

Although not recorded within the subject site, the species is known to occur within the locality and has been recorded on numerous occasions within the Kings Forest precinct. The NPWS database contains forty (40) records of this species within 10km of the site.

Stages of lifecycle potentially affected by development

This species is associated with waterbased habitats including estuaries, coastal wetlands, rivers and streams. The Osprey is predominately a coastal raptor frequenting estuaries, bays, inlets, islands and rocky cliffs within all Australian states except for Tasmania and sporadically within Victoria (DEC, 2005; NPWS, 2002). It is noted however, that the species sometimes inhabits inland islands (Pizzey and Knight, 1997; Readers Digest, 2002).

Within suitable environment it usually constructs a nest in an overhanging large tree or upon elevated man-made structures such as platforms or telegraph poles.

Expansive favoured habitat for the Osprey occurs in the locality (in association with the foreshore and river estuaries), however the site itself does not represent favourable habitat due to the absence of waterbased hunting grounds. As the site is immediately adjacent to Cudgen Creek, the species may traverse the site while hunting for prey. It is noted that

potential foraging habitat in association with Cudgen Creek will be significantly buffered from the proposed service station.

As no nesting sites will be affected and potential hunting areas (in association with Cudgen Creek) will be significantly buffered from the development, it is considered that the proposal will not

It is expected that the removal of ~1.127ha (non-favourable habitat) will not significantly impact the species.

Likelihood of Local Extinction

Reviewing the above, it is considered unlikely that the proposed action will disrupt the lifecycle of local Osprey populations to the point that they are at risk of extinction.

Masked Owl

As the Masked Owl is considered to be wide ranging in the locality, it is considered that it is not genetically isolated on the subject site and form part of a population within the wider region.

Local Population

Although not recorded within the subject site, the species is known to occur within the locality and has been recorded within the Kings Forest precinct. The NPWS database however has no records of this species occurring within 10km of the site.

Stages of lifecycle potentially affected by development

The Masked Owl lives in eucalypt forests and woodlands from the coast, where it is most abundant, to the western plains (Kavanagh 2002b in NPWS, 2005). Within suitable habitat that species occupies a range of 5-10km^2 where it forages mostly upon rodents and marsupials although this may be supplemented by bandicoots, arboreal mammals (Sugar Glider, Common Ringtail Possum) and some birds with introduced rodents and rabbits becoming important in disturbed environments (Debus, 1993, Kavanagh, 1996; NPWS, 2005).

Habitats containing stands of large, hollow bearing eucalypts are also critical to roosting and nesting (NPWS, 2005; Kavanagh and Murray, 1996).

Although abundant within the locality, preferred Masked Owl habitat in association with eucalypt forests/woodlands is not present within the subject site. Although the subject site is likely to contain prey species for the owl, it is also considered that the entire locality would too.

It is noted that the service station proposal involves the removal/modification of ~1.1270ha of vegetation of which represents low value habitat for the owl. It is considered that this reduction in potential foraging habitat is unlikely to significantly impact the species given its large range and more preferable habitat within the locality and surrounding conservation networks (Cudgen Nature Reserve).

It is considered that the replantation works will provide potential Masked Owl habitat in the future.

Likelihood of Local Extinction

Reviewing the above, it is considered unlikely that the proposed action will disrupt the lifecycle of local Masked Owl populations to the point that they are at risk of extinction.

Eastern Grass Owl

As the Masked Owl is considered to be wide ranging in the locality, it is considered that it is not genetically isolated on the subject site and form part of a population within the wider region.

Local Population

Although not recorded within the subject site, the species is known to occur within the locality and has been recorded within the Kings Forest precinct. The NPWS database contains twenty-two (22) records of this species within 10km of the site.

Stages of lifecycle potentially affected by development

This species is generally recorded within tussock-grasslands but has also been noted to occur within heathland, swamps, coastal dunes, tree-lined creeks, treeless plains, mangrove fringes, grassy gaps between trees and crops and sugar cane plantation (Garnett and Crowley 2000; Pizzey and Knight, 1997). Within these habitats it sources a wide range of prey including birds, insects and terrestrial mammals. However, it feeds predominately on rodents and its population numbers can fluctuate wildly with the rise and fall of prey populations (Olsend and Doran, 2002).

The species always breeds on the ground. Nests are found in trodden grass, and often accessed by tunnels through vegetation (OEH, 2014).

With regard to the above, it is considered that the entire site provides potential grass owl foraging habitat given that prey species is likely to occur. However, similar to the site, it must also be considered that the majority of the locality also provides potential habitat for the grass owl. Preferred tussock-grassland is however considered absent from the site, restricting nesting opportunities.

It is noted that the service station proposal will remove/modify ~1.127ha of potential foraging habitat for the species. It is considered that this reduction in potential habitat is considered unlikely to represent a significant reduction in potential grass owl habitats on the site and locality.

It is recommended that prior to the clearing/modification of the site, a suitably qualified spotter-catcher is to check all areas of grassed groundcover for potential grass owl nest.

Likelihood of Local Extinction

Reviewing the above, it is considered unlikely that the proposal will disrupt the lifecycle of the local population of the Grass Owl to the point that it is at risk of extinction.

Black Bittern

As the Black Bittern is considered to be wide ranging in the locality, it is considered that it is not genetically isolated on the subject site and form part of a population within the wider region.

Local Population

Although not recorded within the subject site, the species is known to occur within the locality and has been recorded within the Kings Forest precinct. The NPWS database contains four (4) records of this species within 10km of the site.

Stages of lifecycle potentially affected by development

The species is widely distributed throughout the coastal regions of Australia but is more common in the northern extent of the country. Within its distribution, the species shows a preference for densely vegetated areas within terrestrial and aquatic wetlands. It has been recorded from a variety of vegetation types (including grassland, mangroves, wet sclerophyll forest, rainforest) where permanent water is present (Marchant & Higgins, 1990; Simpson & Day, 1996; NPWS, 2001). In northern NSW black bitterns are most often recorded in riparian habitats along fresh or brackish streams, although the species is also known to utilise drains, permanently inundated swamp forest, and freshwater wetlands (Sandpiper Ecological Surveys, 2003).

Nests, built in spring are located on a branch overhanging water and consist of a bed of sticks and reeds on a base of larger sticks (OEH, 2014).

With regard to the above, it is considered that areas associated with the Cudgen Creek estuarine zone provides potential Black Bittern habitat. It is also considered that all areas of permanent water with dense vegetation (Cudgen Creek and Cudgen Lake).

As potential Black Bittern habitat (in association with Cudgen Creek estuarine zone) will be buffered from the proposed development, no impact is expected to occur to the species.

Black-necked Stork

As the Black Bittern is considered to be wide ranging in the locality, it is considered that it is not genetically isolated on the subject site and form part of a population within the wider region.

Local Population

Although not recorded within the subject site, the species is known to occur within the locality and has been recorded within the Kings Forest precinct. The NPWS database contains nine (9) records of this species within 10km of the site.

Stages of lifecycle potentially affected by development

The species is generally associated with wetlands, mudflats, mangroves, swamps and floodplains while it may also sometimes be found in open woodland environs where a grassy understorey is present (NPWS, 2002, Readers Digest, 2002; DEC, 2005).

In NSW, Jabirus usually nest in a tall, live and isolated paddock tree, but also in other trees, including paperbarks, or even lower shrubs within wetlands. The nest is a large platform, 1-2 m in diameter, made in a live or dead tree, in or near a freshwater swamp (DEC, 2005).

In regards to the subject site potential habitat occurs on site in association with Cudgen Creek estuarine zone. It is also considered that the majority of the locality also provides potential Black-necked Stork habitat given the abundance in estuarine and wetland habitats within the region (Cudgen Creek and Cudgen Lake).

It is noted that the preferred Black-necked Stork habitat will be significantly buffered from the development.

Given that no Black-necked Stork nests were observed within the proposed works zone, impacts associated with breeding is not expected to occur.

Given that the preferred Black-necked Stork habitat within the subject site will be retained and buffered by the development no significant impact is expected to occur to the species.

Likelihood of Local Extinction

Reviewing the above, it is considered unlikely that the proposal will disrupt the lifecycle of the local population of the Black-necked Stork to the point that it is at risk of extinction.

Pale Vented Bush Hen

As the Pale Vented Bush Hen is considered to be wide ranging in the locality, it is considered that it is not genetically isolated on the subject site and form part of a population within the wider region.

Local Population

Although not recorded within the subject site, the species is known to occur within the locality and has been recorded within the Kings Forest precinct. The NPWS database contains sixteen (16) records of this species within 10km of the site.

Stages of lifecycle potentially affected by development

This species favors coastal rivers and inlets from the Clarence River, north. It prefers densely overgrown margins of permanent terrestrial freshwater wetlands such as creeks and rivers, billabongs, ponds, swamps, waterholes, dams, lakes and roadside ditches (Muranyi and Baverstock, 1996).

The nest is a shallow bowl or cup of grass stems, often partly hooded, built close to the water in thick ground vegetation such as dense Blady Grass (*Imperata cylindrica*), mat rush (*Lomandra*) or reeds, often under or growing through shrubs or vine or beneath a tree (OEH, 2014).

In regard to the proposal site, it is considered that areas associated with the swamp sclerophyll forest and Cudgen Creek estuarine zone provides the subject site represents potential habitat for the Bush Hen. It is noted that these areas will be retained and buffered from the service station development.

Given that preferred Bush Hen habitat will be significantly buffered from the development, no significant impact is expected to occur to the Bush Hen.

Likelihood of Local Extinction

Reviewing the above, it is considered unlikely that the proposal will disrupt the lifecycle of the local population of the Bush Hen to the point that it is at risk of extinction.

Common Planigale

As the Common Planigale is considered to be wide ranging in the locality, it is considered that it is not genetically isolated on the subject site and form part of a population within the wider region.

Local Population

Although not recorded within the subject site, the species is known to occur within the locality and has been recorded within the Kings Forest precinct. The NPWS database contains four (4) records of this species within 10km of the site.

Stages of lifecycle potentially affected by development

This species is known to 'inhabit a broad range of habitats incorporating a dense ground cover layer including rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas (Redhead in Strahan, 2002; Lewis, 2005). In northern NSW, it has been suggested that their distribution often corresponds with the low lying flat and undulating areas of the coastal plains often near intensively settled areas (Gilmore and Parnaby 1994 in Lewis, 2005). *Planigale maculata* is an unspecialised predator foraging mainly on insects, other invertebrates, small vertebrates, and occasionally nectar (Callaghan *et al.* 2005 and references therein).

The female builds a nest lined with grass, eucalypt leaves or shredded bark (OEH, 2014)

Given that the species utilises a wide variety of habitat types, it is considered that the entire site provides potential Common Planigale habitat. The species may however deter from the cleared areas given its exposure to predators (owls, raptors). Although the subject site provides potential habitat for the planigale, it is considered that the majority of the locality also provides potential habitat, in particularly Cudgen Nature Reserve (~ 500m south of the subject site).

It is considered that the removal of ~1.127ha of potential common planigale habitat will not significantly impact the species.

It is considered that revegetation works will provide potential planigale habitat within the subject site for the future.

Likelihood of Local Extinction

Reviewing the above, it is considered unlikely that the proposal will disrupt the lifecycle of the local population of the Common Planigale to the point that it is at risk of extinction.

<u>Long-nosed Potoroo</u>

As the Long-nosed Potoroo is considered to be wide ranging in the locality, it is considered that it is not genetically isolated on the subject site and form part of a population within the wider region.

Local Population

Although not recorded within the subject site, the species is known to occur within the locality and has been recorded within the Kings Forest precinct. The NPWS database contains four (4) records of this species within 10km of the site.

Stages of lifecycle potentially affected by development

Long-nosed Potoroos are generally restricted to areas with an annual rainfall greater than 760 mm where they inhabit dry and wet sclerophyll forests and woodland with a heathy understorey (Johnson in Strahan, 2002; DEC, 2005). The preferred habitat in north eastern NSW is dry and wet open shrubland (Mason 1997, DEC, 2005, Johnston in Strahan, 2002). In all habitats the species requires relatively thick groundcover growing on friable soils (Bennett, 1993). Within these areas the Potoroo digs for its food the main component of which is hypogeal fungi with other important items including hard-bodied arthropods, vascular plant tissues, seeds and fleshy fruits (Bennett & Baxter, 1989; Claridge et al, 1993).

With regard to the above it is considered that areas associated with swamp sclerophyll forest and littoral rainforest provides potential long-nosed potoroo habitat

The majority of vegetation proposed to be removed for the service station development consists of a mosaic of exotic grassland, weed regrowth and regrowth. This area is unlikely to be utilised by the species as it lacks the dense midstorey that is preferred habitat. Minor areas of littoral rainforest (~0.0677ha) is proposed to be removed for the proposal.

It is considered that this reduction in potential habitat is considered unlikely to represent a significant reduction of potential potoroo habitats on the site and locality as more preferable habitat (dense midstorey layer within littoral rainforest and swamp sclerophyll forest) will be retained.

An individual species was recorded within the Kings Forest precinct in 1989 (Milledge, 1989). No long-nosed potoroos have been recorded within Kings Forest since. Given that it has been 25 years since a long-nosed potoroo recording, the species may be extinct within the locality.

Nevertheless, the proposed replantation works will provide potential potoroo habitat on site for the future.

Likelihood of Local Extinction

Reviewing the above, it is considered unlikely that the proposal will disrupt the lifecycle of the local population of the Long-nosed Potoroo to the point that it is at risk of extinction.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle 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,

N/A

No endangered fauna populations listed under Part 2 Schedule 1 of the *Threatened Species Conservation Act 1995* are located on or within the proximity of the site. As such, the proposed activity is unlikely to disrupt the lifecycle of any species constituting an endangered population or the viability of such a population. The endangered populations currently listed include the following:

Tusked Frog population in the Nandewar and New England Tablelands Bioregions

Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area

Gang-gang Cockatoo population in the Hornsby and Ku-ring-gai Local Government Areas

Glossy Black-Cockatoo, Riverina population

Little Penguin in the Manly Point Area (being the area on and near the shoreline from Cannae Point generally northward to the point near the intersection of Stuart Street and Oyama Cove Avenue, and extending 100 metres offshore from that shoreline)

White-browed Treecreeper population in Carrathool local government area south of the Lachlan River and Griffith local government area

Broad-toothed Rat at Barrington Tops in the local government areas of Gloucester, Scone and Dungog

Long-nosed Bandicoot, North Head

Squirrel Glider in the Wagga Wagga Local Government Area

Squirrel Glider on Barrenjoey Peninsula, north of Bushrangers Hill

Koala, Hawks Nest and Tea Gardens population

Koala in the Pittwater Local Government Area

Long-nosed Potoroo, Cobaki Lakes and Tweed Heads West population

(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,

DEC (2007) notes the following with regard to EECs:

Ecological communities are usually defined by two major components – the geographical distribution and the species composition which influences the physical structure and ecological function of the ecological community. The relative importance of the geographical distribution and the species composition varies according to the specific listed ecological community. Hence this factor provides for consideration of two criteria:

(i) local occurrence of the ecological community

(ii) modification of the ecological community's composition.

Interpretation of key terms used in this factor:

Local occurrence: the ecological community that occurs within the study area. However the local occurrence may include adjacent areas if the ecological community on the study area forms part of a larger contiguous area of that ecological community and the movement of individuals and exchange of genetic material across the boundary of the study area can be clearly demonstrated.

Risk of extinction: similar to the meaning set out in factor (a), this is the likelihood that the local occurrence of the ecological community will become extinct either in the short-term *or* in the long-term as a result of direct or indirect impacts on the ecological community, and includes changes to ecological function.

Composition: both the plant and animal species present, and the physical structure of the ecological community. Note that while many ecological communities are identified primarily by their vascular plant composition, an ecological community consists of all plants and animals as defined under the TSC and FM Acts that occur in that ecological community.

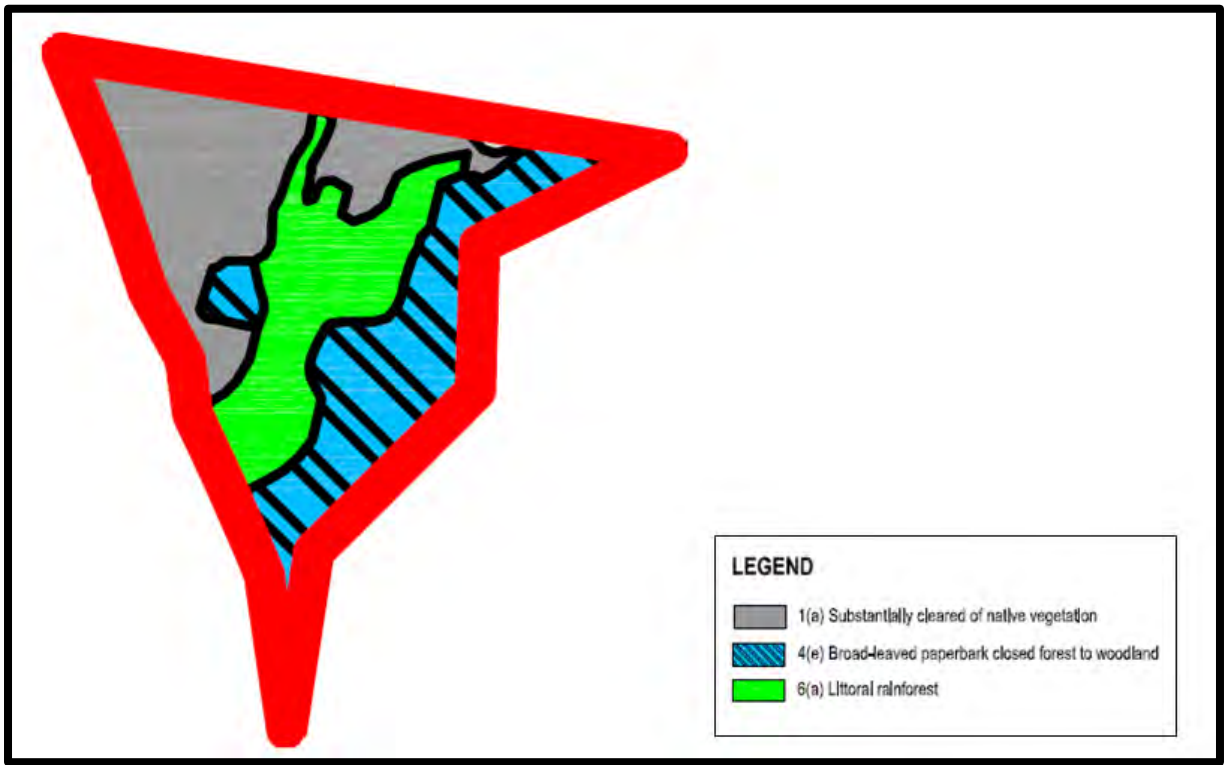


FIGURE 15 – MAPPED VEGETATION COMMUNITIES (JWA, 2011)

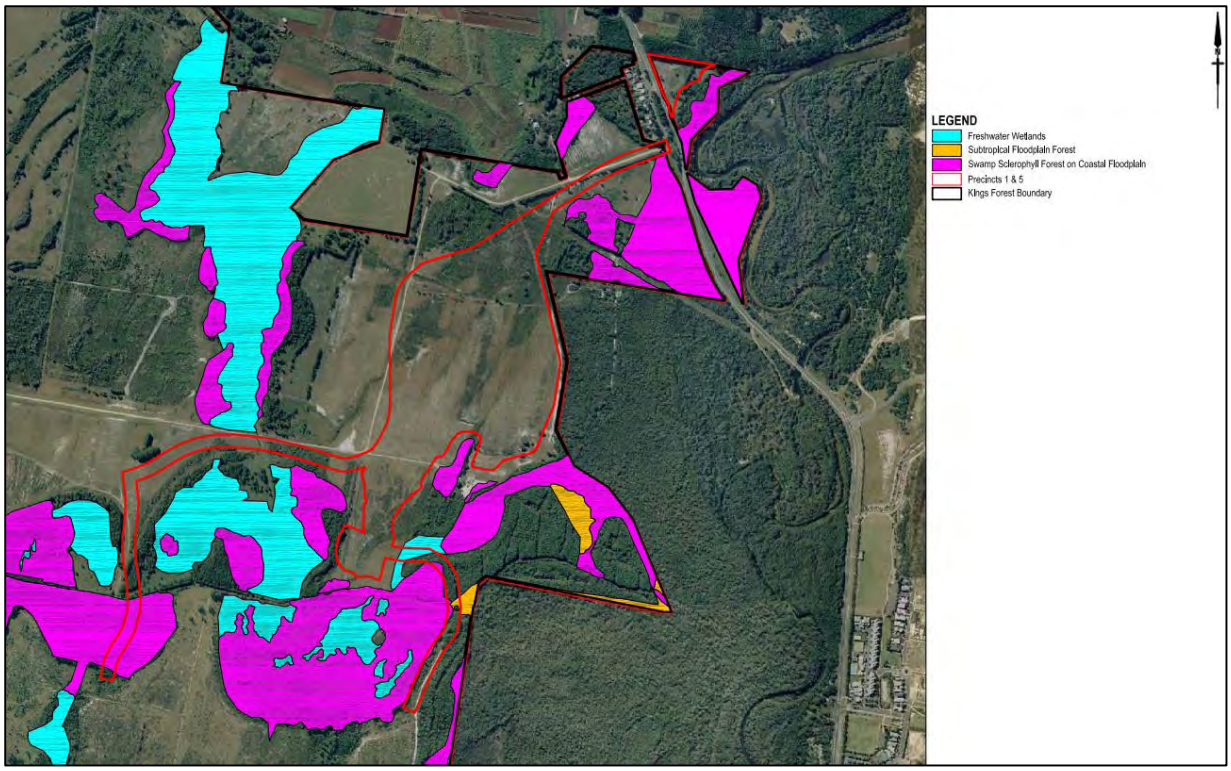


FIGURE 16 – MAPPED ENDANGERED ECOLOGICAL COMMUNITIES (SOURCE: JWA, 2011)

Reviewing the figures above, it is considered that two endangered ecological communities occur within the subject site.

LITTORAL RAINFOREST IN THE NSW NORTH COAST, SYDNEY BASIN AND SOUTH EAST CORNER BIOREGIONS

Although not mapped as an EEC (FigureS 15 & 16), it is concluded that mapped vegetation community *Littoral Rainforest* (Figures 15 & 16) is reflective of the above listed EEC as described by the Scientific Committee (Determination to make a minor amendment to Part 3 of Schedule 1 of the Threatened Species Conservation Act).

It is concluded that approximately ~0.9481ha of littoral rainforest occurs on the subject site. The proposal will remove approximately ~0.0677ha of littoral rainforest.

Vegetation removed will be compensated through revegetation/replantation works as described within Section 8.

Littoral rainforest external to the clearing zone will protected in accordance with the Vegetation Management Plan provided prior to works commencing.

Reviewing the above, it is expected that the proposed development will not significantly impact this EEC and will not result in a changed ecological function of values for fauna.

SWAMP SCLEROPHYLL FOREST ON COASTAL FLOODPLAINS OF THE NSW NORTH COAST, SYDNEY BASIN AND SOUTH EAST CORNER BIOREGIONS

It is concluded that mapped vegetation community *broad-leaved paperbark closed forest to woodland* (Figures 15 & 16) within the eastern section of the site is reflective of the above listed EEC as described by the Scientific Committee.

In association with the proposed service station, no areas mapped as swamp sclerophyll forest on coastal floodplains (Figures 15 & 16) will be impacted/modified by the proposal and will be buffered considerably.

Reviewing the above, it is expected that the proposed development will not significantly impact this EEC and will not result in a changed ecological function of values for fauna.

Reviewing the above information, it is considered the construction of the service station as proposed is unlikely to have an adverse effect on the extent or substantially and adversely modify the composition of the two abovementioned endangered ecological communities such that its local occurrence is be placed at risk of extinction.

(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

(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

(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,

Habitat for a given threatened species, community or population is considered to be an area containing similar known (documented) habitat preferences for that species within the species' geographic distribution.

In assessing whether a significant area of the habitat of a threatened species, population or ecological community is to be modified or removed the following should be considered:

- The geographic range of the threatened species, population or ecological community and its known or documented occurrence within the region and locality;
- The relative scale and value of the habitat within the region and locality;
- The importance of the habitat (i.e. relationship to life cycle, reproductive success etc)

DEC (2005) indicates that a "quantitative and qualitative approach to assessing the extent to which habitat is likely to be removed or modified/degraded should consist of the following steps:

- an assessment of the amount of habitat of the threatened species, population or ecological community that occurs within the locality;
- an assessment of the amount of habitat of the threatened species, population or ecological community that occurs within the study area;
- an estimation of the area and quality that the habitat of the study area represents in relation to the local distribution of that habitat;
- An estimation of the area and quality of the habitat of the study area which is to be removed or modified by the proposed development or activity;
- a calculation of the amount of the habitat of the region that will be removed or modified by the proposed development, activity or action or indirectly by longer term impacts from the proposed development such as increased predation weed invasion, salinity etc;
- An estimation of the area and quality of the habitat of the region that will be removed or modified by the proposed development, activity or action; and
- an assessment of the ecological integrity of the habitat to be affected and of the habitat which will remain"

As discussed within this report it is considered that the site and study area represents potential and recorded habitat for the threatened species subject to this 7-part test.

The proposal seeks to remove/modify approximately 1.127ha of mapped vegetation within the subject site.

From this, ~1.0585ha is mapped as vegetation community *Substantially Cleared of Native Vegetation, ~0.0677ha* is mapped vegetation community *Littoral Rainforest,* and ~0.0008ha is mapped vegetation community *Broad-leaved Paperbark Closed Forest to Woodland.*

Survey works concluded that areas subject to clearing/modification as a result from the proposal represents marginal fauna habitat and is not significant within the region. No hollow-bearing trees are proposed to be removed to facilitate the development.

The proposal seeks to offset the proposed clearing through revegetation works as described within Section 8 below.

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

N/A. To date the only 'Critical Habitat Areas' within the state declared pursuant to the *Threatened Species Conservation Act 1995* are the Mitchell's Rainforest Snail Habitat of Stott's Island NR and Little Penguin Population habitat in Sydney's North Harbour (NPWS, 2005). The service station proposal is unlikely to affect 'critical habitat' areas.

The proposal is also considered unlikely to affect nominated 'critical habitat' areas which are pending determination by the Scientific Committee

- Bomaderry zieria within the Bomaderry bushland
- Eastern Suburbs Banksia Scrub Endangered Ecological Community
- Wollemia nobilis (the Wollemi pine)

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

Section 69(1) of the TSC Act requires that a public authority implement actions for which they are responsible and "must not make decisions that are inconsistent with the provisions in a recovery plan". In this regard it is considered important that the proposed development does not conflict with the objectives or actions listed within the recovery plan(s) for recorded or potentially occurring threatened species, populations or communities (as discussed within this report). Recovery plans associated with such threatened species or communities as discussed in this report include:

- Grey-headed Flying Fox (National) Recovery Plan
- Koala Recovery Plan
- Wallum Sedgefrog and other wallum-dependant frog species national recovery plan
- Bush-stone Curlew Recovery Plan

It is noted that under the EP&A Act, it is the responsibility of the consent or determining authority to form a view as to whether a proposed development or activity is likely to significantly affect threatened species, communities, populations or their habitat. This is achieved by undertaking an Assessment of Significance under Section 5A of the EP&A Act. In this regard, an assessment of significance has been conducted for the proposal which concludes that a species impact statement is not required. It is further concluded within this report that the proposal is unlikely to have a significant impact on recorded or potentially occurring threatened species, communities and their associated habitat.

As such, it is considered that the proposal is not in conflict with the objectives or actions of the listed recovery plans.

"Any process can be listed as a key threatening process (KTP) under schedule 3 of the NSW *Threatened Species Conservation Act 1995* (TSC Act), provided the process and its nomination meet the specific requirements and criteria established under the Act. A threat abatement plan or TAP is a statutory document prepared in accordance with the TSC Act, for a KTP listed under the Act. The TAP's principle aim is to reduce, abate or ameliorate the threat posed by the KTP to threatened species and ecological communities, or those species which may become threatened as a result of the KTP (DEC, 2004: vii). Existing TAPs include:

- Invasion of native plant communities by bitou bush/boneseed (2004)
- Predation by the red fox (2001)
- Predation by Gambusia holbrooki (plague minnow) (2003)

The bitou bush/boneseed was recorded within the subject site along the Cudgen Creek banks. Additionally, the red fox is encountered in the locality. The proposal is unlikely to exacerbate the impacts of the red fox on native wildlife and as such is not considered to be in conflict with the objectives or actions of the TAP.

As such, it is considered that the proposal is not in conflict with the objectives or actions of the listed threat abatement plans.

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.

The *Threatened Species Conservation Act 1995* defines a 'threatening process' as 'a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities.' Accordingly Key Threatening Processes are nominated within Schedule 3 of the Act and include the following (online @ http://www.threatenedspecies .environment.nsw.gov.au/tsprofile/home_threats.aspx):

THREATENING PROCESS	COMMENT
Alteration of habitat following subsidence due to longwall mining	Not applicable
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands	Not applicable
Anthropogenic climate change	Not applicable
Bushrock removal	Not applicable
Clearing of native vegetation	The proposal will involve clearing/modification of some native vegetation (including clearing of one or more strata within a stand of native vegetation). The NSW Scientific Committee notes in their final determination that 'clearing of native vegetation' is recognised as a major factor contributing to the loss of biological diversity and includes impacts such as the following: • Destruction of habitat results in loss of local populations of individual species • Fragmentation • Expansion of dryland salinity • Riparian zone degradation • Increased greenhouse gas emissions • Increased habitat for invasive species • Loss of leaf litter layer • Loss or disruption of ecological function • Changes to soil biota (NSW Scientific Committee, 2001) However, a review of this report notes that clearance will be restricted to areas of minor ecological significance and the level of clearing proposed is unlikely to significantly impact upon the viability of threatened fauna species and habitat values available within the site and surrounding locality. As indicated the mapped community *Substantially Cleared of Native Vegetation* is a disturbed / modified community the result of past clearing / seeding. It is not proposed to be retained and the proposal will remove majority of this vegetation community within the

	development footprint. The area to be removed is ~1.127ha. The development will remove approximately 0.0677ha of mapped vegetation community *Littoral Rainforest.* It is noted that this community is endangered. The removal of ~0.0677ha from 0.9481ha on site will not significantly impact this vegetation community in the locality. Additionally, the proposed replantation works will compensate the loss of ~0.0677ha of this community with the replantation of approximately ~0.33ha of littoral rainforest. Additionally, the proposal will remove approximately 0.0008ha of mapped vegetation community *Broad-leaved Paperbark Closed Forest to Woodland.* It is considered that this removal is insignificant considering there will be ~1.4788ha remaining on site. This clearing is principally modified/cleared areas and the proposal does not represent a significant impact.
Competition and grazing by the feral European rabbit (*Oryctolagus cuniculus*)	Not applicable
Competition and habitat degradation by feral goats (*Capra hircus*)	Not applicable
Competition from feral honey bees (*Apis mellifera*)	Not applicable
Death or injury to marine species following capture in shark control programs on ocean beaches	Not applicable
Entanglement in or ingestion of anthropogenic debris in marine and estuarine environments	Not applicable
Forest Eucalypt dieback associated with over-abundant psyllids and bell miners	Not applicable
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition	Not applicable
Herbivory and environmental degradation caused by feral deer	Not applicable
Importation of red imported fire ants (*Solenopsis invicta*)	Not applicable
Infection by psittacine circoviral (beak and feather) disease affecting endangered psittacine species and populations	Not applicable
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis	Not applicable
Infection of native plants by *Phytophthora cinnamomi*	Not applicable
Introduction and Establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae	Not applicable
Introduction of the large earth bumblebee (*Bombus terrestris*)	Not applicable
Invasion and establishment of exotic vines and scramblers	Several exotic vines were recorded onsite. These species should be removed in association with the proposal where they occur within the work zone.
Invasion and establishment of Scotch broom (*Cytisus scoparius*)	Not applicable
Invasion and establishment of the cane toad (*Bufo marinus*)	The cane toad was recorded onsite and is abundant within the locality. The proposal is unlikely to increase the impacts of this listed threatening process.

Invasion of native plant communities by African Olive *Olea europaea* L. subsp. *cuspidata*	Not applicable
Invasion, establishment and spread of *Lantana camara*	Lantana was recorded on site. The species should be removed in association with the proposal where it occurs within the works zone.
Invasion of native plant communities by *Chrysanthemoides monilifera* (bitou bush and boneseed)	Bitou Bush was recorded along the Cudgen Creek banks within the subject site. The species should be removed in association with the proposal where it occurs within the works zone.
Invasion of native plant communities by exotic perennial grasses	Not applicable
Invasion of the yellow crazy ant (*Anoplolepis gracilipes* (Fr. Smith)) into NSW	Not applicable
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants	Not applicable
Loss of hollow-bearing trees	Not applicable
Loss or degradation (or both) of sites used for hill-topping by butterflies	Not applicable
Predation and hybridisation of feral dogs (*Canis lupus familiaris*)	Although not recorded on site, feral dogs are known to occur within the locality. The proposal is unlikely to increase the impacts of this listed threatening process.
Predation by the European red fox (*Vulpes vulpes*)	Not applicable
Predation by the feral cat (*Felis catus*)	Although not recorded on site, feral cats are known to occur within the locality. The proposal is unlikely to increase the impacts of this listed threatening process
Predation by *Gambusia holbrooki* Girard, 1859 (plague minnow or mosquito fish)	Not applicable
Predation by the ship rat (*Rattus rattus*) on Lord Howe Island	Not applicable
Predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*)	Not applicable
Removal of dead wood and dead trees	Not applicable

CONCLUSION

Based upon the above assessments, it is considered that a Species Impact Statement (SIS) is not required.

6.2 SEPP 14 COASTAL WETLAND PROTECTION

State Environmental Planning Policy No. 14 aims to preserve and protect coastal wetlands in the environmental and economic interest of the State. It does this by defining any development that involves clearing, draining or filling wetlands, or constructing levees on wetlands to be designated development (EDO, 2007).

Mapping of the site (Figure 17) indicates that the eastern portion of the site is designated a SEPP 14 Coastal Wetland Protection. It is noted that the proposed service station development does not occur within these mapped areas and is considered unlikely to significantly impact these areas.

It is considered that the proposed service station is unlikely to impact upon the mapped SEPP 14 occurring east of the proposed development footprint. It is recommended that appropriate sediment and erosion controls are installed and maintained during construction works.

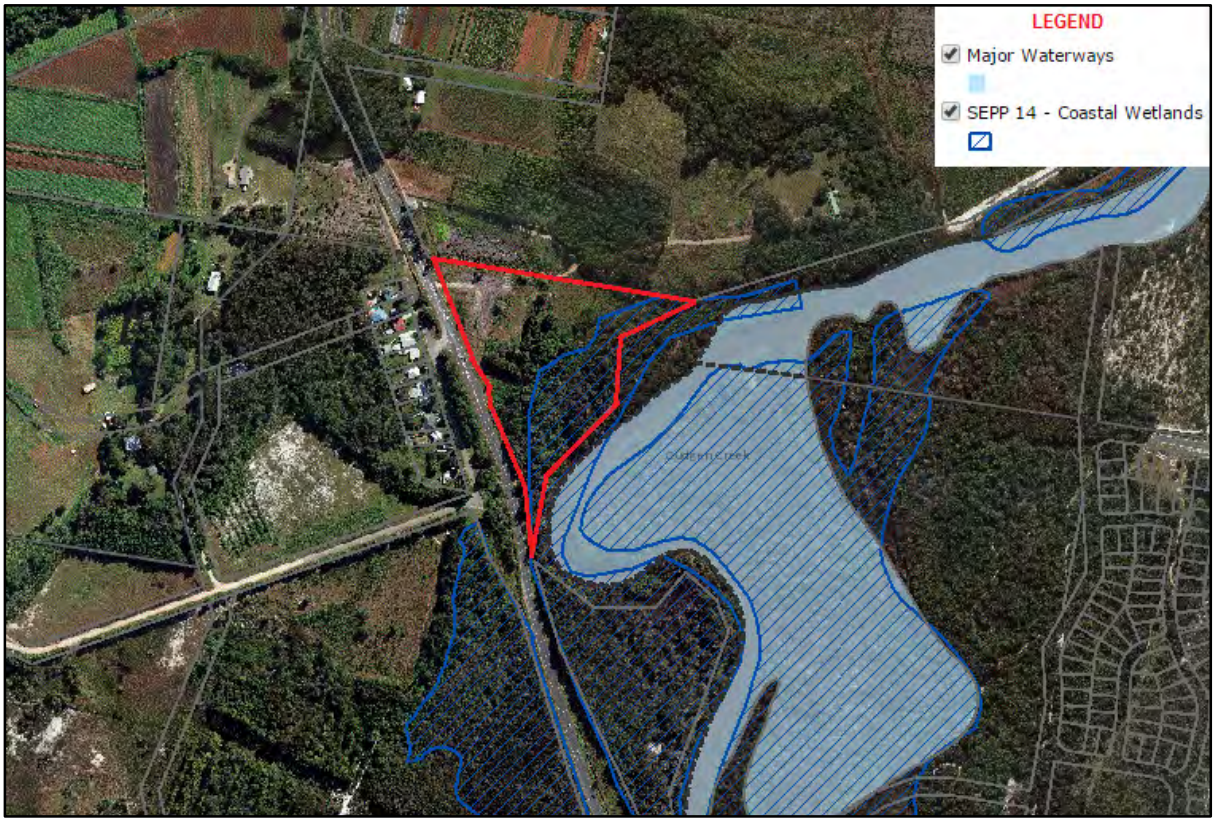


FIGURE 17 – TWEED LEP MAP: SEPP 14 & MAJOR WATERWAY (SOURCE: http://mapping.tweed.nsw.gov.au/planningservices/default.aspx)

6.3 SEPP 26 LITTORAL RAINFOREST

State Environmental Planning Policy No. 26 relates to development applications likely to damage or destroy littoral rainforest (rainforests in coastal areas) (EDO, 2007). In accordance to Tweed mapping, the site is not mapped as containing any littoral rainforest (Figure 18).

Reviewing mapped vegetation communities (Figure 19) and grountruthing of the site indicates that the site does contain littoral rainforest. In association with the proposed service station, ~0.0667ha of mapped littoral rainforest will be required to be removed/modified to facilitate the development.

These areas will be compensated and replanted as depicted within Section 8. The majority of mapped Littoral Rainforest will be retained on site (~0.8804ha)

It is concluded that the proposed service station will not significantly impact littoral rainforest on site.

FIGURE 18 – TWEED LEP MAP: SEPP 26 LITTORAL RAINFOREST (SOURCE: http://mapping.tweed.nsw.gov.au/planningservices/default.aspx)

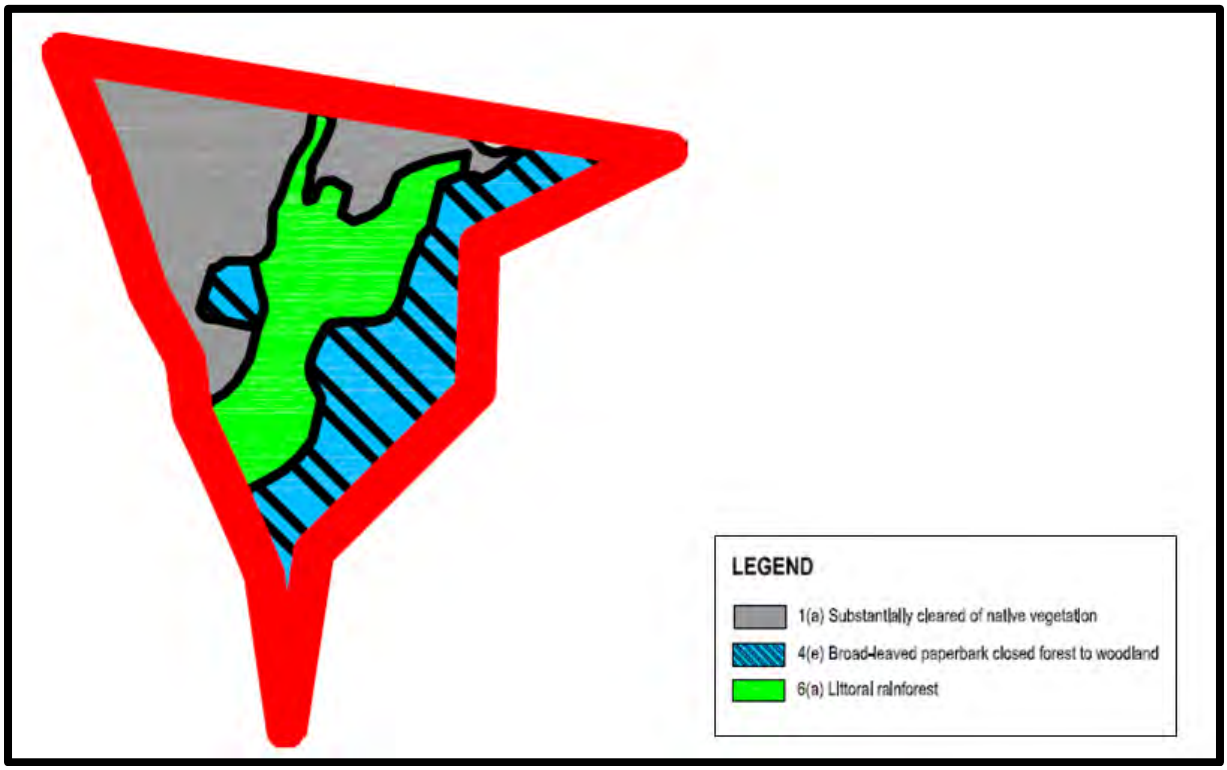


FIGURE 19 – MAPPED VEGETATION COMMUNITIES (JWA, 2011)

6.4 SEPP 44 KOALA HABITAT ASSESSMENTS

In February 1995 the NSW Department of Infrastructure, Planning and Natural Resources enacted the *State Environmental Planning Policy No. 44: Koala Habitat Protection*. This Policy 'aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline.'

In association with development applications and in areas where the policy applies a number of criteria are to be addressed to determine levels of assessment and to govern management considerations. The steps are as follows:

1. Does the Policy Apply?

Is the land greater than 1ha in size and located within one of the Local Government areas listed within Schedule 1 of SEPP 44?

Yes. The land is greater than 1ha in area and located within the Tweed Shire Local Government Area

2. Is the land potential koala habitat?

The SEPP defines 'potential koala habitat' as 'areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component.' The trees within Schedule 2 are tabulated below:

Scientific Name	Common Name
Eucalyptus tereticornis	Forest red gum
Eucalyptus microcorys	Tallowwood
Eucalyptus punctata	Grey Gum
Eucalyptus viminalis	Ribbon or manna gum
Eucalyptus camaldulensis	River red gum
Eucalyptus haemastoma	Broad leaved scribbly gum
Eucalyptus signata	Scribbly gum
Eucalyptus albens	White box
Eucalyptus populnea	Bimble box or poplar box
Eucalyptus robusta	Swamp mahogany

The subject site does not contain any of the species within the above table.

3. Is the land core koala habitat?

The SEPP defines 'core koala habitat' means 'an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population

4. Is there a requirement to prepare a Plan of Management for land containing core koala habitat?

No. It is considered that the site does not contain core Koala habitat as described.

7.0 SITE IMPACTS

This section of the report reviews the development proposal and likely resultant impact to flora, fauna and habitat value.

7.1 SIGNIFICANCE OF IMPACTS TO THREATENED SPECIES AND/OR COMMUNITIES

DEC (2005 & 2007) outline assessments relating to the significance of impacts of actions to threatened species, communities and populations. DEC (2005) notes that evaluation of impacts should involve not only the magnitude and extent of impacts, but also the significance of the impacts as related to the conservation importance of the habitat, individuals and populations likely to be affected.

Impacts are considered more significant if:

- Areas of high conservation value are affected.
- Individual animals and/or plants and/or subpopulations that are likely to be affected by a proposal play an important role in maintaining the long-term viability of the species, population or ecological community.
- Habitat features that are likely to be affected by a proposal play an important role in maintaining the long-term viability of the species, population or ecological community.
- The impacts are likely to be long-term in duration.
- The impacts are likely to be permanent and irreversible.

Although none were recorded within the subject site, Twenty (20) threatened species have been recorded within the Kings Forest area and individuals of these species may be impacted through the removal of vegetation or disturbance to habitat within the locality. Significance assessments for these threatened species have been undertaken in Section 6.

The significance assessments indicate that the proposed action is unlikely to have a significant impact on any EECs, endangered populations, critical habitats, threatened plants or threatened animals (as summarized below).

Table 12: SUMMARY OF SPECIES FOR WHICH SIGNIFICANCE TESTS WERE UNDERTAKEN

Type	TSC Act	Likely To Be Significantly Affected By Proposed Action?
Endangered Ecological Community		
LITTORAL RAINFOREST IN THE NSW NORTH COAST, SYDNEY BASIN AND SOUTH EAST CORNER BIOREGIONS	E	No
SWAMP SCLEROPHYLL FOREST ON COASTAL FLOODPLAIN IN THE NSW NORTH COAST, SYDNEY BASIN AND SOUTH EAST CORNER BIOREGIONS	E	No
Threatened Animals		
Black Bittern	V	No
Black-necked Stork	E	No
Pale Vented bush Hen	V	No
Bush Stone-curlew	E	No

Common Blossom Bat	V	No
Common Planigale	V	No
Glossy Black Cockatoo	V	No
Eastern Grass Owl	V	No
Grey-headed Flying-fox	V	No
Koala	V	No
Long-nosed Potoroo	V	No
Masked Owl	V	No
Eastern Osprey	V	No
Yellow-bellied Sheathtail Bat	V	No
Wallum Froglet	V	No
Wallum Sedge-frog	V	No
Little Bent-wing Bat	V	No
Southern Myotis	V	No
Eastern False Pipistrelle	V	No
Rose Crowned Fruit-dove	V	No

7.2 IMPACTS TO VEGETATION CLEARING

Clearing of vegetation (native and exotic) will be the major direct impact associated with the intended establishment of the dwelling envelope. Clearing is recognised as a key threatening process under the TSCA 1995.

The development will result in the removal/modification of ~1.127ha (Refer Figure 20, 22 and Attachment 5). Within these areas, it is proposed that 15 trees will be required to be removed to facilitate the proposal (Figure 21).

From this total ~1.0585ha is from the mapped vegetation community *Substantially Cleared of Native Vegetation*.

Additionally, the proposal will require the removal/modification of ~0.0677ha of mapped vegetation community *Littoral Rainforest,* as well as ~0.0008ha from mapped vegetation community *Broad-leaved Paperbark Closed Forest to Woodland*.

As discussed the development will remove/modify ~1.127ha. It is considered that these works will not have a significant environmental impact given that the majority of the development footprint occurs within highly modified areas of the site. The minor removal of ~0.0677ha of mapped littoral rainforest is not considered significant and will be compensated through replantation works. Additionally, the removal of ~0.0008ha of mapped broad-leaved paperbark closed forest will not have a significant impact considering the site contains upwards of 1.47ha of the same community.

Figure 20 - VEGETATION CLEARING PLAN

FIGURE 21 – TREES WITHIN CLEARING PROPOSED CLEARING ZONE

The site has been previously been approved for development (approved application no. 08-0194).

A summary of the proposed clearing rates for described communities associated with the dwelling envelope is s tabulated below:

Table 13: Clearing of Vegetation Communities As a Result of the Proposal

Mapped Community	EEC?	Approx. extent to be cleared (HA)	Approx. extent remaining (HA)
Substantially Cleared of Native Vegetation	No	~1.05	0.3458
Littoral Rainforest	Yes	~0.0677	0.8804
Broad-leaved Paperbark Closed Forest to Woodland	Yes	~0.0008	1.4788
TOTAL		~1.1108	3.832

Areas located within the development footprint have been illustrated within the images below:

FIGURE 22 – VEGETATION WITHIN PROPOSED CLEARING ZONE

7.3 IMPACTS TO FAUNA HABITAT

The proposal involves minor clearing of vegetation which it is considered does not constitute core or critical habitat for threatened species recorded in the locality. The minor forage area lost is insignificant to that found in the locality and is offset by revegetation works. Following stabilization and development a modified habitat zone (i.e. streetscape trees, lawn, buildings etc) will be restored within the disturbance area.

This zone however is likely to only favour common species ((i.e. common animals tolerant to human proximity). The remaining vegetation communities will be maintained in their existing state to retain fauna habitat across the site. No hollow-bearing trees are proposed to be removed for the development.

The proposed revegetation works will compensate the loss of ~1.127ha of potential fauna habitat by providing approximately ~0.33ha of littoral rainforest.

An evaluation of the clearing on threatened species is provided in section 6.

7.4 FAUNA MORTALITY/INJURY

Any level of vegetation clearing, construction or earthworks modification undertaken has the potential to kill or injure fauna species. The surveying work has identified that the majority of species recorded are highly mobile and with an appropriate fauna management plan it is unlikely impacts would arise.

7.5 HABITAT FRAGMENTATION, BARRIER EFFECTS AND EDGE EFFECTS

Habitat fragmentation is considered to be the division of a single area of habitat into two or more smaller habitats separated by a new habitat type in the area between the remaining fragments (PB, 2007). Often the dividing habitat is anthropogenic (i.e. crop, roadway, residential development etc) which limits continued interaction and movement of individuals between the new patches to varying degrees (i.e. birds may be still able to move between patches). Additionally the dividing habitat tends to favour a different assemblage of animals typically described as generalist and/or aggressive (i.e. crows, noisy minors, black rat). This is particularly relevant to urban development where domestic and feral species (cats, foxes, dogs) are favoured by the new habitat to the exclusion of native species.

The resultant habitat fragments or patches are also impacted as a result of a reduction in patch size, reduction in the 'interior' area and creation or expansion of the habitat 'edge.' Edge areas also typically favour aggressive and generalist species particularly in relation to exotic flora. Dominance of exotic flora or weeds can threatened the integrity of the 'interior' habitat thus expanding the edge further. Weed dominance also typically simplifies the structural and floristic diversity to the exclusion of numerous 'niches' and the fauna that occupy such spaces.

Many wildlife studies have shown how the relative abundance of fauna species changes with habitat fragment size (e.g. Ambuel and Temple 1983; Lynch and Whigham 1984; Robinson *et al.* 1997) with some species showing a greater abundance in smaller remnants, while others decrease or even disappear from remnants due to habitat fragmentation (Berry, 2001).

"Species can be grouped according to their response to edges. 'Edge' species are those that increase in abundance at habitat edges. Typically, these are habitat generalist or open-country species, and often they are species also found in greater numbers in small habitat remnants. In contrast, 'interior' species decrease in abundance or are absent from habitat edges; these are typically specialists, have large home ranges, inhabit large forest areas, and are rare or absent from small habitat remnants (Ambuel and Temple 1983; Ford *et al.* 1995; Canady 1997; Luck *et al.* 1999). For example, Catterall *et al.* (1991) found that in forest–suburb boundaries in Brisbane, forest-interior birds were typically smaller and insectivorous, while forest-edge species were usually larger and fed on open ground" (Berry, 2001: 240).

Some of the above and more commonly discussed impacts are summarized below:

Barrier effects "result when severed habitat connections restrict the movement of species (Yahner 1988). Barrier effects can result from relatively small-scale anthropogenic disjunction of habitat and may preclude dispersal or migration and disrupt population processes (e.g. Mansergh and Scotts 1989). The distance over which such effects operate may vary among species. For example, many bird species may be able to readily cross discontinuities in suitable habitat by using small remnants as stepping stones (e.g. Date *et al.* 1991). In contrast, forest-dependent mammals may be reluctant to cross relatively small areas of open habitat (e.g. Burnett 1992)" (Goldingah & Whelan, 1997:24-25)

Genetic isolation may occur when individuals from a previously connected population can no longer interbreed due to the creation of fragments and barrier effects. Such isolation can result in problems associated with inbreeding (and associated loss of genetic diversity and risk of disease, mutation, population crash), divergence and genetic drift.

"Edge effects may occur when a new boundary is established within an existing habitat, producing a change in the remaining habitat (Harris 1984). Abiotic and biotic factors may be responsible for an edge effect (Murcia 1995). Abiotic factors include changes in microclimate such as altered temperature regimes, increased light levels and greater wind speeds (e.g. Scougall *et al.* 1993). Changes in the nutrient status of the soil surrounding an edge may occur when remnant habitat occurs adjacent to agricultural land. Biotic factors include changes in the abundance of animals and plants. These may occur in response to the abiotic factors or because particular species are favoured by the close association of two different habitat types. Edges may promote access by predators to existing habitat, particularly those that favour boundaries between open and remnant habitat (Harris 1988). This may increase the vulnerability of species and lead to a decline in their abundance near the edge (Yahner 1988; Marini *et al.* 1995)" (Goldingah & Whelan, 1997:24)

As discussed in Section 5.6 above it is considered that the works are of a minor nature in the context of the regional terrestrial corridors in the locality and will remove modified/cleared areas which does not represent significant fauna habitats.

The proposal including revegetation ensures that the existing vegetation remnants will not be further fragmented.

Additionally, it is considered that the proposal will not introduce a new terrestrial fauna dispersal barrier or intensify an existing barrier as the works proposed are not constructing barriers such as fences between vegetation communities. The existing corridor value of the locality is therefore unlikely to be reduced by the proposal.

7.6 MORTALITY ASSOCIATED WITH ROADWAYS/VEHICLE STRIKE

Roads and traffic are widely accepted as having impacts upon terrestrial wildlife. "Roads cut across landscape features and divide wildlife habitats. Consequently, they are one of the main obstacles to the movement of land vertebrates (Yanes *et al.* 1995).

The implications of movement barriers to wildlife populations are considerable. Barriers tend to create metapopulations (subpopulations) where a road divides a large continuous population into smaller, partially isolated local populations (Forman and Alexander 1998). Small populations fluctuate in size more widely and have a higher probability of extinction than do large populations (van der Zande *et al.* 1980). In addition, disruption of population dispersal

(Mansergh and Scotts 1989) and recolonisation (Mader 1984; Andrews 1990) may result from the barrier-effect of roads.

Roads also result in vehicle collisions with wildlife (road-kill) and can represent a significant source of mortality for declining populations of some wildlife species (Harris and Gallagher 1989; Saunders 1990; Sheridan 1991; Scott *et al.* 1999).

It is widely accepted that terrestrial fauna (in particular koala) mortality associated with vehicle strike on roadways intersecting or proximate to habitat represents a serious through to the ongoing viability of populations (Dique et al, 2003; NPWS, 2003; McAlpine et al, 2007; EPA, 2006). Vehicle strikes are heightened where arterial and other roads bisect bushland, remnant bushland or urban habitat areas, resulting in high mortality of resident koalas, or limited success of dispersing animals that must cross roads to reach suitable habitat and mates (Dique *et al*. 2003 in EPA, 2007). NPWS (2003) note that habitat bisecting roadways are particularly likely to lead to increased vehicle strike where traffic volume is high, speeds exceed 60km/hr, where visibility of road edges is reduced and/or where lighting is absent.

Larger species or species with restricted distributions, or those regularly in contact with roads (e.g. migration paths or home ranges), are those most affected by road-kill (Bennett 1991; Forman and Alexander 1998) [in Taylor and Goldingay, 2003]". Morality rates can also be particularly high for species which are slow moving (i.e. arboreal mammals), those which become distracted by vehicle lights (i.e. kangaroos) and those which require many individual movements to cross the roadway (i.e. small reptiles and amphibians).

In this instance it is considered that additional daily vehicle movements will occur on the site and within the locality. Due to the nature of the proposal, it is considered that the number of vehicle strikes will not significantly increase. Nevertheless, it is recommended that speed bumps be installed to minimise the risks of vehicle strikes on site.

7.7 ESTABLISHMENT OF WEEDS

Weed invasion occurs when unwanted or exotic plants become established in native bushland via natural dispersal vectors such as wind, water, insects, birds and other animals, however, humans are by far the most effective and efficient vector of plants (Coutts-Smith and Downey, 2006; Randall, 2007 in TSSC, 2010). Humans may facilitate the direct introduction weeds by inappropriate garden dumping, via vehicles, imported agricultural products and stock rotation/movement. The potential impacts of weed invasion in Australia are well documented and summarized in TSSC (2010) including:

Genetic effects

Environmental weeds cause a decline in the number of genetically distinct sub-populations that make up a native species. It is reasonable to conclude that an associated reduction in the genetic diversity of the affected species is likely to result. The invasion of weeds may also affect the genetic diversity of native species through cross breeding or hybridisation, whereby foreign genes are introduced into local plant populations

Introduction of diseases

The introduction of weeds often results in the introduction of pathogens (fungi, nematodes, bacteria and viruses) that are associated with these plants in their natural range (ILDA, 2009).

Competition for resources

Competition between species is inevitable when more than one species occupy the same niche and have similar requirements for a limited resource (Cadotte, 2007). Weeds are known to compete with native plants for limited resources such as moisture, nutrients, sunlight, pollinators and space (Csurches and Edwards, 1998; Blood, 2001; Brunskill, 2002).

Prevention of recruitment

Growth of weeds can be sufficiently vigorous to reduce or prevent the establishment of native plant species (Csurches and Edwards, 1998)

Alteration of ecosystem processes

Invasive weeds are also capable of altering various ecosystem processes such as geomorphological processes, hydrological cycles, nutrient dynamics and disturbance regimes (Csurches and Edwards, 1998). Alterations to ecosystem processes can potentially influence many if not all species within a community (Vranjic et al., 2000).

Changes to abundance of indigenous fauna

Weeds that become invasive can both directly and indirectly change the abundance of indigenous fauna. Fauna such as the Richmond Birdwing Butterfly and *Petrogale persephone* (Proserpine Rock Wallaby) are directly impacted by escaped garden plants, Dutchman's Pipe (*Aristolochia elegans*) and Pink Periwinkle (*Catharanthus roseus*), respectively, both of which are attractive as a food source and yet toxic to them when consumed (Watts and Vidler, 2006). Indirectly, weeds impact indigenous fauna by altering the availability of suitable habitat, including food and shelter, and by creating habitats that harbour other pest species that can, in turn, have a detrimental effect.

Weed species are in abundance within this community, in particularly within the cleared/modified areas of the site which contains typical common pasture species and exotic grasses. Exotic vines species also frequent the site, smothering native flora. To minimise the potential future impact of unmitigated continued spread of these species it is considered appropriate that the existing infestation be eradicated in association with this proposal.

7.8 PREDATION/DISRUPTION BY CATS AND DOGS

Pest/domestic animals (i.e. foxes, dogs and cats) are noted to be established within the locality. Mortality of fauna (especially koalas) as a result of dog attacks is considered to be a key conservation concern for koala management with some studies reporting that dog attacks account for between 5% and 40% of total recorded mortalities (McAlpine et al, 2007). Within the 'koala coast' of SEQLD an average of 300 koalas each year die as a result of dog attacks (EPA, 2006).

Studies into dispersal patterns of koalas undertaken by Dique et al (2003) indicates that in addition to mortality the presence of dogs within or proximate to habitats is likely to disrupt behaviour and associated dispersal options which can lead to those impacts discussed in 7.5 above. The risk of predation can strongly alter the behaviour and activity of potential prey (Lima and Dill 1990). In assessing predation hazards, many species use remote cues of risk because of the dangers of direct encounters with predators, including avoidance of open areas (e.g. Banks et al. 1999) or changing the time that they forage (in Banks et al, 2003; 406). Wild dogs may also potentially carry diseases such as distemper and an array of parasites e.g. hydatids).

Cats also have direct impacts on native fauna through predation. 'They can kill vertebrates weighing as much as 3kg (Dickman 1996), but preferentially kill mammals weighing less than 220g and birds less than 200g. They also kill and eat reptiles, amphibians and invertebrates (Dickman 1996). Cats can also have indirect effects on native fauna by carrying and transmitting infectious diseases (DEH 2004). They are thought to have contributed to the extinction of many small to medium-sized mammals and ground-nesting birds in the arid zone, and to have seriously affected populations of bilby, mala and numbat (DEH 2004)'(DEWHA, 2008).

Due to the nature of the proposal, it is considered unlikely that an increase in predation by dogs/cats will occur within the subject site. It is recommended that all dogs utilising the proposed dog wash are to be on-leash at all times. No free-roaming of dogs are permitted within the subject site.

8.0 MEASURES TO AVOID AND MINIMISE ECOLOGICAL IMPACTS

8.1 PROTECTION & AVOIDANCE

The proposal seeks to avoid tree clearing through locating development in cleared areas and thus protecting the sites habitat. The design into these disturbed cleared spaces reduces fragmentation. These as well as a general locally endemic landscape requirement would ensure the sites values are protected.

The proposed vegetation to be removed are of a disturbed/cleared nature and do not provide significant ecological values. Minor clearing of littoral rainforest will be required to facilitate the proposed development.

As discussed in this report, the proposed works are considered unlikely to significantly impact upon any threatened flora/fauna species or endangered ecological communities occurring elsewhere within the locality. The minor impacts in association with littoral rainforest is compensated as depicted within Section 8.3 of this report.

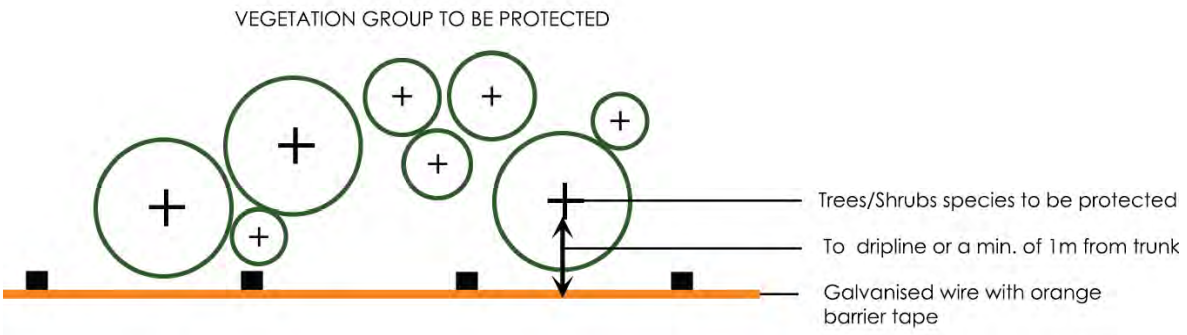
A Vegetation Management Plan will be provided prior to the commencement of works.

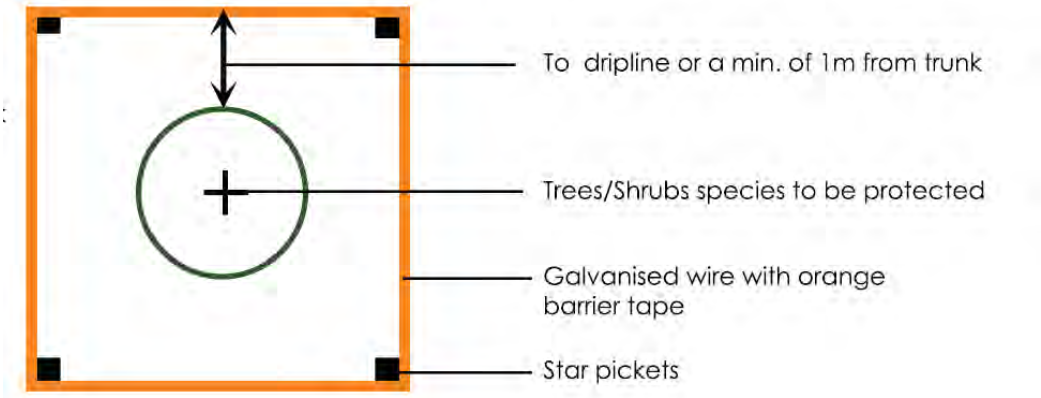
8.2 MITIGATION MEASURES

The following measures are proposed to mitigate potential impacts associated with site development:

8.2.1 IMPACT OF VEGETATION AND HABITAT CLEARING

Disturbance to areas of native and exotic vegetation as described in this report will be unavoidable to deliver the proposal. To ensure that clearing impacts do not occur outside of the designated construction zone it will be necessary to clearly identify and mark the boundaries the works zones onsite prior to construction. Such boundaries are to be protected via high visibility fencing, sediment fencing and/or signage identifying that no construction activities (including temporary storage, stockpiling, vehicle movement etc) are permitted beyond.





INDIVIDUAL TREE TO BE PROTECTED

FIGURE 23 – EXAMPLES OF VEGETATION PROTECTION FENCING

Within the designated service station works envelope identification of areas to be cleared are to be pre-assessed by an experienced ecologist and wildlife spotter/catcher. This pre-assessment shall allow for an inventory of trees bearing bird nests and/or other trees representing fauna habitat (if present) to be undertaken prior to felling works. A wildlife spotter catcher is to be utilised during all phases of clearing of the site to ensure safe dispersal and relocation of native fauna.

Salvageable habitat components such as hollow stems or ground logs shall also be stockpiled and randomly dispersed throughout the retained bushland external to the proposed development footprint.

Any pruning works is to be supervised.

8.2.3 TERRESTRIAL FAUNA DISPERSAL BARRIERS, BARRIER EFFECTS

As discussed in the previous sections the following measures are proposed to reduce the potential impact of the proposal on continued terrestrial fauna dispersal within the locality.

- Limited clearing of habitat which represents low ecological values to a small area at the edge of the existing semi-contiguous remnant

8.3 ENHANCEMENT & RESTORATION

The following actions are aimed at providing a level of enhancement to retained habitats and restoration of degraded areas of the site. These actions focus upon bush regeneration activities, replacing fauna habitats and restoring native vegetation biomass following construction:

8.3.1 REVEGETATION & RESTORATION OF DISTURBED AREAS

Following stabilisation and development, a modified habitat zone (i.e. residential areas with gardens beds, lawn, buildings etc) will be restored within the disturbance area. This zone however is likely to only favour common species ((i.e. common animals tolerant to human proximity).

To compensate the removal of ~0.0677ha of Littoral Rainforest, revegetation and restoration works will be performed within the designated areas of the site (refer to Figure 24 and 25). It is proposed that ~0.33ha will be revegetated within the buffer zone as depicted within Figure 25.

FIGURE 24 – IMAGES OF PROPOSED REVEGETATION AREA

Following completion of the earthworks within the service station development footprint, revegetation shall then be undertaken to re-introduce the Littoral Rainforest EEC. Such revegetation shall be focussed upon species typically encountered within the endangered ecological community affected (as illustrated within Table 14 below).

The species list contained within Table 14 below are considered effective and appropriate to restore the littoral rainforest on the Kings Forest site to EEC status. The areas proposed to be revegetated and the species list provided below are consistent with Kings Forest Stage 1 Management Plan (MP 08_0194).

Table 14: Species List for Revegetation Works

Scientific Name	Common Name
Tall Trees: Planting density = one plant/50m^2	
Acmena hemilampra	Broad-leaved Lilly Pilly
Archontophoenix cunninghamiana	Bangalow Palm
Litsea reticulata	Bolly Gum
Small / Medium Trees: Planting density = one plant/25m^2	
Syzygium smithii	Lilly Pilly
Alectryon coriaceus	Beach Alectryon
Cryptocarya glaucescens	Jackwood
Crytpocarya microneura	Murrogun
Cryptocarya triplinervis	Three-veined Cryptocarya
Cupaniopsis anacardioides	Tuckeroo

Dubosia myoporoides	Corkwood
Elaeocarpus obovatus	Hard quandong
Endiandra discolor	Rose Walnut
Endiandra sieberi	Hard Corkwood
Ficus coronata	Sandpaper Fig
Glochidion ferdinandi	Cheese Tree
Guioa semiglauca	Guioa
Melicope vitiflora	Northern Euodia
Mischocarpus pyriformis	Yellow Pear-fuit
Notelaea longifolia	Large Mock-olive
Pittosporum undulatum	Sweet pittosporum
Polyscias elegans	Celery Wood
Syzygium oleosum	Blue Lilly Pilly
Shrubs: Planting density = one plant/15m^2	
Acronychia oblongifolia	White Aspen
Acronychia imperforata	Logan Apple
Canthium coprosmoides	Coast Canthium
Cordyline stricta	Narrow-leaved Palm Lily
Lepidozamia peroffskyana	Peroffsky's Lepidozamia
Rapanea variabilis	Muttonwood
Tall Herbs / Rushes: Planting density = one plant/10m^2	
Alpinia caerulea	Native Ginger
Lomandra longifolia	Spiny-headed Mat-rush

FIGURE 25 – REPLANTATION PLAN (SOURCE: JWA, 2012)

8.3.2 WEED MANAGEMENT

It is recommended that treatment of weeds within the site (in particular within the retained vegetation) be undertaken.

Control techniques will vary depending upon the species being targeted and its location. In areas of low significance (i.e weed thickets external to bushland or drainage lines ect.) broad scale application of herbicide or mechanical removal techniques (i.e. cut stump, stem application, hand removal ect.) and spot application of a non-residual herbicide (i.e roundup bioactive) would be necessary.

In addition, a general weed propagule protocol should also be applied whereby vehicles and machinery is checked for vegetation material (particularly in tyres or chassis) prior to entry to the site. An exit inspection should also be undertaken to ensure materials is not removed from the site to an external bushland location.

Weed control will occur as part of the restoration/replantation works of the littoral rainforest. Monitoring and follow up control methods will occur:

- Six (6) weeks after primary weeding;
- Six (6) weeks after initial plant-out;
- Every six (6) months thereafter until completion of the monitoring for provisions of the flora monitoring

9.0 SUMMARY & CONCLUSIONS

Planit Consulting has been commissioned by Leda Developments Pty Ltd to prepare a terrestrial Flora and Fauna Assessment Report relating to the proposed Kings Forest service station located at Kings Forest. The development footprint incorporates Lot 7 DP875447 which is accessed by Tweed Coast Road. The assessment has included the following:

- Survey, ground truthing and mapping of vegetation communities and determining conservation status reflective of reference reports and onsite condition
- Survey for faunal species including an assessment of the site's habitat value
- Survey for threatened flora species
- Providing an flora and fauna assessment report identifying development constraints, impacts and mitigation methods for proposed activities
- Addressing statutory requirements including Section 5A of the Environmental Planning and Assessment Act and the required SEPP assessments.

Previous flora studies have occurred over the site and the Kings Forest Precinct and were ground-truthed during the recent site inspections. It was concluded that three (3) vegetation communities occur within the subject site (Substantially Cleared of Native Vegetation, Littoral Rainforest, and Broad-leaved Paperbark Closed Forest to Woodland). No species listed as endangered, vulnerable or threatened under the *Threatened Species Conservation Act 1995* were recorded on site.

Two Endangered Ecological Communities (Littoral Rainforest and Swamp Sclerophyll Forest on Coastal Floodplain). Minor areas of littoral rainforest (~0.0677ha) and swamp sclerophyll forest (~0.0008ha) will be required to be removed to facilitate the proposed service station.

Additionally, ~1.0585ha of mapped 'substantially cleared of native vegetation' will be required to be modified/removed to facilitate the proposal. It is noted that the majority of the site's vegetation will be retained.

As discussed in this report it is considered that these works will not have a significant environmental impact due to the highly modified nature of the areas to be affected. Minor clearing (~0.0677ha) of mapped littoral rainforest is not considered to cause a significant impact. The clearing does not result in fragmentation or increased edge effects given the existing configuration of the remnants.

To compensate the minor removal of littoral rainforest, it is proposed that approximately 0.33ha of littoral rainforest will be planted within the ecological buffer of the site.

The fauna survey of the study area (and immediately adjacent areas) resulted in the recording of 49 species of bird, 8 reptiles, 5 amphibians and 7 mammals (or evidence of their previous presence). No species recorded on the subject site are scheduled under the *Threatened Species Conservation Act 1995.*

A Section 5A of the *Environmental Planning and Assessment Act 1979* (the '7-Part Test of Significance') was conducted for twenty (20) previously recorded threatened fauna species within the Kings Forest precinct to determine whether the proposal may have the potential to impact the species. Section 5A was also conducted for the recorded Endangered Ecological Communities (Littoral Rainforest and Swamp Sclerophyll Forest on Coastal Floodplain).

The assessment concludes that the impacts of the proposed development are unlikely to threaten the viability of any local populations of the nominated species/communities and the proposal did not result in a significant impact. A species impact is therefore not required.

A SEPP 44 assessment was also conducted which concludes that the site does not contain core koala habitat. A Koala Management Plan is therefore not required.

Whilst the Kings Forest service station proposal is considered unlikely to significantly affect native flora, fauna, or associated habitat, it will result in minor loss of local habitat for native species through tree/vegetation removal.

In this regard recommendations have been included in this report regarding the management of works to minimize disruption to native fauna, minimize damage to retained vegetation and local weed management and revegetation to compensate for minor habitat losses.

10.0 ATTACHMENTS

ATTACHMENT 1: PROPOSED SERVICE STATION PLAN
ATTACHMENT 2: BROAD VEGETATION COMMUNITY MAP
ATTACHMENT 3: FAUNA SURVEY MAP
ATTACHMENT 4: NPWS ATLAS OF NSW WILDLIFE DATABASE SEARCH
ATTACHMENT 5: VEGETATION CLEARING PLAN
ATTACHMENT 6: PROPOSED OFFSET / REVEGETATION PLAN

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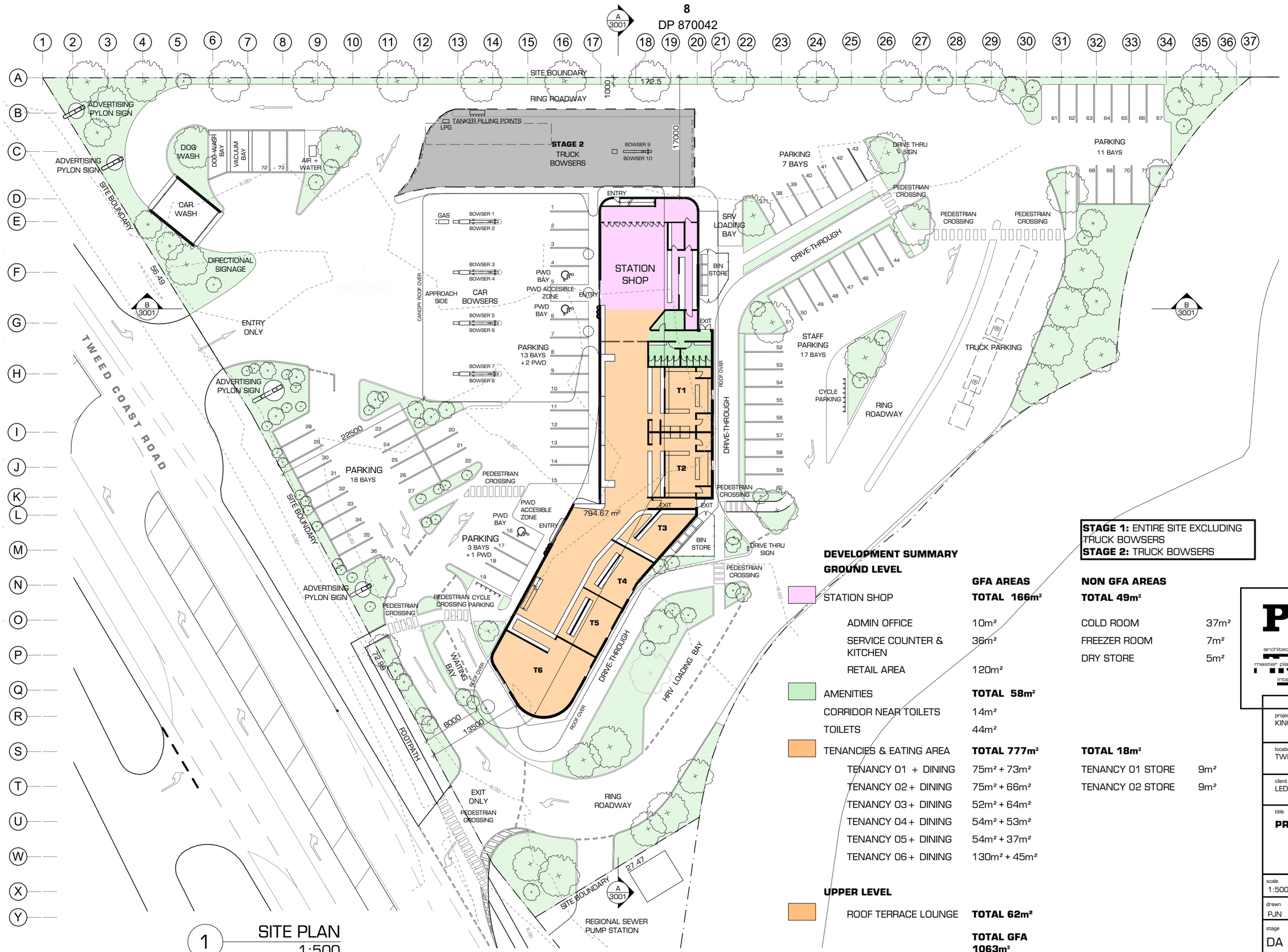
ATTACHMENT 1

PROPOSED SERVICE STATION PLAN

8
DP 870042



1 SITE PLAN 1:500

STAGE 1: ENTIRE SITE EXCLUDING TRUCK BOWSERS
STAGE 2: TRUCK BOWSERS

DEVELOPMENT SUMMARY

GROUND LEVEL

	GFA AREAS	NON GFA AREAS	
STATION SHOP	**TOTAL 166m²**	**TOTAL 49m²**	
ADMIN OFFICE	10m²	COLD ROOM	37m²
SERVICE COUNTER & KITCHEN	36m²	FREEZER ROOM	7m²
RETAIL AREA	120m²	DRY STORE	5m²
AMENITIES	**TOTAL 58m²**		
CORRIDOR NEAR TOILETS	14m²		
TOILETS	44m²		
TENANCIES & EATING AREA	**TOTAL 777m²**	**TOTAL 18m²**	
TENANCY 01 + DINING	75m² + 73m²	TENANCY 01 STORE	9m²
TENANCY 02 + DINING	75m² + 66m²	TENANCY 02 STORE	9m²
TENANCY 03 + DINING	52m² + 64m²		
TENANCY 04 + DINING	54m² + 53m²		
TENANCY 05 + DINING	54m² + 37m²		
TENANCY 06 + DINING	130m² + 45m²		

UPPER LEVEL

ROOF TERRACE LOUNGE	**TOTAL 62m²**

TOTAL GFA 1063m²

Push
architecture master planning interiors
LEVEL 1/ 702 ANN STREET (CORNER WARNER STREET)
PO BOX 726
FORTITUDE VALLEY Q 4006
T 07 3252 0949
F 07 3252 2636
info @ push.net.au

project: KINGS FOREST SERVICE STATION
location: TWEED COAST ROAD
client: LEDA DEVELOPMENTS PTY LTD
title: **PROPOSED SITE PLAN**

scale	date	job number
1:500 @ A3	SEP 2015	738.12
drawn: PJN	checked: PJN	approved: PA
stage: DA	drawing no.: 1000	issue: G

ABN 94 109 752 310

ATTACHMENT 2

BROAD VEGETATION COMMUNITY MAP

KINGS FOREST SERVICE STATION

VEGETATION COMMUNITIES PLAN

LEGEND

- SITE BOUNDARY
- 1(a) SUBSTANTIALLY CLEARED OF NATIVE VEGETATION | 14043m²
- 4(e) BROAD-LEAVED PAPERBARK CLOSED FOREST TO WOODLAND | 14796m²
- 6(a) LITTORAL RAINFOREST | 9481m²

PLANIT CONSULTING

PROJECT TITLE: KINGS FOREST SERVICE STATION

DRAWING TITLE: VEGETATION COMMUNITIES PLAN

BASE PROVIDED BY: N/A

CLIENT: LEDA DEVELOPMENT PTY LTD

NO	DATE	REVISION	BY
-	-	-	-

SCALE: 1/1500 @ A3

DESIGN: PLANIT CONSULTING

DRAWN: ZP

DATE: 12/2014

CHECKED: TR

DRAWING NO: KINGSFORESTSERVO_VEGCOMM

NORTH POINT:

SHEET NO: 01 OF 01

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Nobby Beach
PO Box 206 QLD 4218

Telephone: 07 5526 1500
Fax: 07 5526 1502
Email: admin@planitconsulting.com.au

ATTACHMENT 3

FAUNA SURVEY MAP

KINGS FOREST SERVICE STATION

FAUNA SURVEY TECHNIQUES

LEGEND

- SITE BOUNDARY
- SPOTLIGHT SEARCH
- PB — PLAY BACK

PLANIT CONSULTING

PROJECT TITLE: KINGS FOREST SERVICE STATION

DRAWING TITLE: FAUNA SURVEY TECHNIQUES

BASE PROVIDED BY: N/A

CLIENT: LEDA DEVELOPMENT PTY LTD

NO	DATE	REVISION	BY
-	-	-	-

SCALE: 1/1500 @ A3

DESIGN: PLANIT CONSULTING

DRAWN: ZP

DATE: 12/2014

CHECKED: TR

DRAWING NO: KINGSFORESTSERVO_FAUNASURVEY

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SHEET NO: 01 OF 01

ATTACHMENT 4

NPWS ATLAS OF NSW WILDLIFE DATABASE SEARCH

Data from the BioNet Atlas of NSW Wildlife website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions.

Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°; ^^ rounded to 0.01°).

Search criteria : Public Report of all Valid Records of Threatened (listed on TSC Act 1995) Entities in selected area [North: -28.23 West: 153.51 East: 153.62 South: -28.33] returned a total of 795 records of 67 species.

Report generated on 18/11/2014 10:13 AM

Kingdom	Class	Family	Species Code	Scientific Name	Common Name	NSW status	Comm. status	Records
Animalia	Amphibia	Myobatrachidae	3137	*Crinia tinnula*	Wallum Froglet	V,P		211
Animalia	Amphibia	Hylidae	3202	*Litoria olongburensis*	Olongburra Frog	V,P	V	3
Animalia	Reptilia	Cheloniidae	2004	*Caretta caretta*	Loggerhead Turtle	E1,P	E	7
Animalia	Reptilia	Cheloniidae	2007	*Chelonia mydas*	Green Turtle	V,P	V	5
Animalia	Aves	Anseranatidae	0199	*Anseranas semipalmata*	Magpie Goose	V,P		1
Animalia	Aves	Columbidae	0025	*Ptilinopus magnificusV*	Wompoo Fruit-Dove	V,P		2
Animalia	Aves	Columbidae	0021	*Ptilinopus regina*	Rose-crowned Fruit-Dove	V,P		3
Animalia	Aves	Diomedeidae	0086	*Diomedea exulans*	Wandering Albatross	E1,P	E,J	1
Animalia	Aves	Diomedeidae	0088	*Thalassarche melanophris*	Black-browed Albatross	V,P	V	1
Animalia	Aves	Procellariidae	0937	*Macronectes halli*	Northern Giant-Petrel	V,P	V	1
Animalia	Aves	Ciconiidae	0183	*Ephippiorhynchus asiaticus*	Black-necked Stork	E1,P		9
Animalia	Aves	Ardeidae	0196	*Ixobrychus flavicollis*	Black Bittern	V,P		4
Animalia	Aves	Accipitridae	0218	*Circus assimilis*	Spotted Harrier	V,P		1
Animalia	Aves	Accipitridae	0225	*Hieraaetus morphnoides*	Little Eagle	V,P		1
Animalia	Aves	Accipitridae	8739	*^^Pandion cristatus*	Eastern Osprey	V,P,3		40

Animalia	Aves	Rallidae	0053	*Amaurornis moluccana*	Pale-vented Bush-hen	V,P		16
Animalia	Aves	Burhinidae	0174	*Burhinus grallarius*	Bush Stone-curlew	E1,P		6
Animalia	Aves	Burhinidae	0175	*Esacus magnirostris*	Beach Stone-curlew	E4A,P		1
Animalia	Aves	Haematopodidae	0131	*Haematopus fuliginosus*	Sooty Oystercatcher	V,P		8
Animalia	Aves	Haematopodidae	0130	*Haematopus longirostris*	Pied Oystercatcher	E1,P		6
Animalia	Aves	Scolopacidae	0165	*Calidris tenuirostris*	Great Knot	V,P	C,J,K	3
Animalia	Aves	Laridae	0117	*Sternula albifrons*	Little Tern	E1,P	C,J,K	11
Animalia	Aves	Cacatuidae	0265	*^Calyptorhynchus lathami*	Glossy Black-Cockatoo	V,P,2		10
Animalia	Aves	Tytonidae	0252	*^^Tyto longimembris*	Eastern Grass Owl	V,P,3		22
Animalia	Aves	Alcedinidae	0327	*Todiramphus chloris*	Collared Kingfisher	V,P		6
Animalia	Aves	Monarchidae	0376	*Carterornis leucotis*	White-eared Monarch	V,P		1
Animalia	Mammalia	Dasyuridae	1008	*Dasyurus maculatus*	Spotted-tailed Quoll	V,P	E	1
Animalia	Mammalia	Dasyuridae	1045	*Planigale maculata*	Common Planigale	V,P		4
Animalia	Mammalia	Phascolarctidae	1162	*Phascolarctos cinereus*	Koala	V,P	V	133
Animalia	Mammalia	Burramyidae	1150	*Cercartetus nanus*	Eastern Pygmy-possum	V,P		1
Animalia	Mammalia	Potoroidae	1175	*Potorous tridactylus*	Long-nosed Potoroo	V,P	V	4
Animalia	Mammalia	Potoroidae	1175	*Potorous tridactylus*	Long-nosed Potoroo, Cobaki Lakes and Tweed Heads West population	E2,V,P	V	4
Animalia	Mammalia	Pteropodidae	1280	*Pteropus poliocephalus*	Grey-headed Flying-fox	V,P	V	34
Animalia	Mammalia	Pteropodidae	1294	*Syconycteris australis*	Common Blossom-bat	V,P		8
Animalia	Mammalia	Emballonuridae	1321	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	V,P		3
Animalia	Mammalia	Molossidae	1330	*Mormopterus beccarii*	Beccari's Freetail-bat	V,P		1

Animalia	Mammalia	Molossidae	1329	*Mormopterus norfolkensis*	Eastern Freetail-bat	V,P		1
Animalia	Mammalia	Vespertilionidae	1346	*Miniopterus australis*	Little Bentwing-bat	V,P		11
Animalia	Mammalia	Vespertilionidae	1834	*Miniopterus schreibersii oceanensis*	Eastern Bentwing-bat	V,P		4
Animalia	Mammalia	Vespertilionidae	1357	*Myotis macropus*	Southern Myotis	V,P		7
Animalia	Mammalia	Vespertilionidae	1336	*Nyctophilus bifax*	Eastern Long-eared Bat	V,P		3
Animalia	Mammalia	Balaenopteridae	1575	*Megaptera novaeangliae*	Humpback Whale	V,P	V	2
Animalia	Gastropoda	Camaenidae	I002	*Thersites mitchellae*	Mitchell's Rainforest Snail	E1	CE	71
Plantae	Flora	Cyperaceae	2423	*Eleocharis tetraquetra*	Square-stemmed Spike-rush	E1,P		2
Plantae	Flora	Euphorbiaceae	9851	*Chamaesyce psammogeton*	Sand Spurge	E1,P		1
Plantae	Flora	Fabaceae (Caesalpinioideae)	9296	*Cassia brewsteri var. marksiana*	Brush Cassia	E1,P		2
Plantae	Flora	Fabaceae (Faboideae)	2833	*Desmodium acanthocladum*	Thorny Pea	V,P	V	1
Plantae	Flora	Fabaceae (Mimosoideae)	3711	*Acacia bakeri*	Marblewood	V,P		1
Plantae	Flora	Fabaceae (Mimosoideae)	7757	*Archidendron hendersonii*	White Lace Flower	V,P		11
Plantae	Flora	Flacourtiaceae	3114	*Xylosma terrae-reginae*	Queensland Xylosma	E1,P		1

Plantae	Flora	Lauraceae	3477	*Cryptocarya foetida*	Stinking Cryptocarya	V,P	V	21
Plantae	Flora	Lauraceae	3491	*Endiandra hayesii*	Rusty Rose Walnut	V,P	V	2
Plantae	Flora	Lindsaeaceae	8129	*^^Lindsaea fraseri*	Fraser's Screw Fern	E1,P,3		2
Plantae	Flora	Myrtaceae	4292	*Syzygium moorei*	Durobby	V,P	V	7
Plantae	Flora	Orchidaceae	6672	*^Geodorum densiflorum*	Pink Nodding Orchid	E1,P,2		8
Plantae	Flora	Orchidaceae	4479	*^Peristeranthus hillii*	Brown Fairy-chain Orchid	V,P,2		5
Plantae	Flora	Orchidaceae	4480	*^Phaius australis*	Southern Swamp Orchid	E1,P,2	E	3
Plantae	Flora	Poaceae	9108	*Elyonurus citreus*	Lemon-scented Grass	E1,P		1
Plantae	Flora	Proteaceae	5372	*Grevillea hilliana*	White Yiel Yiel	E1,P		4
Plantae	Flora	Proteaceae	5446	*Macadamia tetraphylla*	Rough-shelled Bush Nut	V,P	V	9
Plantae	Flora	Rubiaceae	6449	*Oldenlandia galioides*		E1,P		2
Plantae	Flora	Rubiaceae	8297	*Randia moorei*	Spiny Gardenia	E1,P	E	6
Plantae	Flora	Rutaceae	6457	*Acronychia littoralis*	Scented Acronychia	E1,P	E	16
Plantae	Flora	Sapindaceae	5887	*Cupaniopsis serrata*	Smooth Tuckeroo	E1,P		1
Plantae	Flora	Sapindaceae	5889	*Diploglottis campbellii*	Small-leaved Tamarind	E1,P	E	6
Plantae	Flora	Sapindaceae	8291	*Lepiderema pulchella*	Fine-leaved Tuckeroo	V,P		9
Plantae	Flora	Urticaceae	6227	*Dendrocnide moroides*	Gympie Stinger	E1,P		2

ATTACHMENT 5

VEGETATION CLEARING PLAN

KINGS FOREST SERVICE STATION

PROPOSED TREE CLEARING PLAN

LEGEND

- SITE BOUNDARY
- EXTENT OF WORKS BOUNDARY
- PROPOSED TREE CLEARING AREA | 11,274m²

PLANIT CONSULTING

PROJECT TITLE: KINGS FOREST SERVICE STATION

DRAWING TITLE: PROPOSED TREE CLEARING PLAN

BASE PROVIDED BY: N/A

CLIENT: LEDA DEVELOPMENT PTY LTD

NO	DATE	REVISION	BY
-	-	-	-

SCALE: 1/1500 @ A3

DESIGN: PLANIT CONSULTING

DRAWN: ZP

DATE: 12/2014

CHECKED: TR

DRAWING NO: KINGSFORESTSERVO_TREECLEARING

NORTH POINT:

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Email: admin@planitconsulting.com.au

KINGS FOREST SERVICE STATION

VEGETATION SURVEY

LEGEND

- SITE BOUNDARY
- EXTENT OF WORKS BOUNDARY
- 01 BRUSHBOX (LOPHOSTEMON CONFERTUS)
- 02 2 x GEEBUNG (PERSOONIA STRADBROKENSIS)
- 03 2 x HARD CORKWOOD (ENDIANDRA SIEBERI)
- 04 AUSTRALIAN BLACKWOOD (ACACIA MELANOXLON)
- 05 BRUSHBOX (LOPHOSTEMON CONFERTUS)
- 06 4 x BROAD-LEAVED PAPERBARK (MELALUCA QUINQUENERVIA)
- 07 SLASH PINE (PINUS ELLIOTTII)
- 08 BROAD-LEAVED PAPERBARK (MELALUCA QUINQUENERVIA)
- 09 DUBOSIA (DUBOISIA MYOPOROIDES)
- 10 SLASH PINE (PINUS ELLIOTTII)

PLANIT CONSULTING

PROJECT TITLE: KINGS FOREST SERVICE STATION

DRAWING TITLE: VEGETATION SURVEY

BASE PROVIDED BY: N/A

CLIENT: LEDA DEVELOPMENT PTY LTD

NO	DATE	REVISION	BY
-	-	-	-

SCALE: 1/1500 @ A3

DESIGN: PLANIT CONSULTING

DRAWN: ZP

DATE: 12/2014

CHECKED: TR

DRAWING NO: KINGSFORESTSERVO_VEGSURVEY

NORTH POINT:

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ATTACHMENT 6

PROPOSED OFFSET / REVEGETATION PLAN

PRECINCT 1: LITTORAL RAINFOREST REVEGATION AREAS

MELALEUCA DRIVE, DURANBAH, NSW

SCALE:
DATE:
REV:

DRAWN: MT
CHECKED:
DRAWN NO:

Level 1 2247 Gold Coast Hwy
Nobby Beach
PO Box 206 Nobby Beach QLD 4218

Telephone: 07 5526 1500
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PLANIT CONSULTING