

LEGEND

- Proposed Revegetation Areas
- Proposed Natural Regeneration Areas
- Retained Vegetation
- Proposed Extent of Works
- Site Outline

SOURCE:
 Regen/Reveg - James Warren & Associates Pty Ltd
 Extent of Works - Michel Group Services
 (Ref: 6400-162F.dwg)
 Aerial - Michel Group Services (Ref: 6400-197.dwg)
 - photo taken March 2010

0 500m
 SCALE: 1 : 12 500 @ A3

JAMES WARREN & ASSOCIATES PTY LIMITED
 Environmental Consultants

CLIENT
 Leda Developments Pty Ltd
 PROJECT
 Revised Assessment of Significance
 Sandy Lane Re-alignment & Cobaki Parkway
 Missing Link, Cobaki Lakes, Cobaki, NSW
 Tweed Shire Council

FIGURE 11
 PREPARED: BW
 DATE: 05 April 2013
 FILE: 97038_SA_BaseRD.dwg

TITLE
**REGENERATION
 & REVEGETATION
 AREAS**

over the entire Cobaki site during suitable conditions (i.e. localised flooding after periods of heavy rainfall).

The removal of a small area of potential forage habitat (i.e. small drainage lines) will be removed from the Subject site for the road construction. Given the high mobility of this species, the loss of potential foraging habitat is not considered significant in relation to the local distribution of habitat for this species.

Approximately 2 hectares of additional Freshwater wetland habitat will be created on the Subject site. Furthermore, 6.77 hectares of Swamp sclerophyll forest will be regenerated/revegetated on the Subject site (**FIGURE 11**) in accordance with the Revised Site Regeneration and Revegetation Plan (JWA 2013a). In total, 8.77ha of rehabilitation works on the Subject site will result in the creation of suitable forage habitat for the Black-necked stork to partly offset the loss of 78.76ha.

Additionally, Leda Manorstead Pty Ltd is currently in negotiations with OEH with a view to securing appropriate off-site offsets for the removal of degraded Freshwater wetland vegetation from the Subject site.

Vegetation within the south-eastern portion of the Subject site will be retained and rehabilitated in accordance with the Revised Saltmarsh Rehabilitation Plan (JWA 2013b). This area covers 54.63 hectares and currently provides suitable forage habitat for the Black-necked stork and will continue to do so in the long term.

Likelihood of local extinction

The removal of a small area of potential forage habitat from the Subject site is not considered to represent a significant impact in relation to the distribution of habitat for the local population of this species.

With the adoption of the above amelioration measures it is considered that the proposed development is highly unlikely to result in the local extinction of this species.

It is considered that, with the adoption of recommended management practices, the proposed development is unlikely to result in the local extinction of this species.

3.2.2.3 *Brolga (Grus rubicunda)*

Extent of local population

The Brolga was formerly found across Australia, except for the south-east corner, Tasmania and the south-western third of the country. It is still abundant in the northern tropics, but very sparse across the southern part of its range. The NPWS database (June 2010) contains no records of this species within 10kms of the Subject site or within the Tweed LGA. This species has been recorded from wetlands adjacent to the Subject site (EcoPro 2004) (**FIGURE 9**) but despite extensive searches on the Subject site (JWA 2000 - 2007) the species has not been subsequently sighted.

Species Attributes and Life-cycle Characteristics

Brolgas occur around shallow swamps and swamp margins, floodplains, grasslands and pastoral lands, usually in pairs or parties (NPWS 2002). Though they often feed in dry grassland or ploughed paddocks or even desert claypans, they are dependent on wetlands too, especially shallow swamps. They feed mainly on the tubers of sedges which they dig from up to 15cm underground with their long bills, and will also take grain, molluscs and insects, and can be a pest in cereal crops (Readers Digest 1997).

Habitat on the Cobaki Site

It is estimated that as much as 140.60 hectares of potential forage habitat occurs on site at times of suitable environmental conditions such as localised flooding after periods of heavy rainfall.

Direct and Indirect Impacts from the Proposed Development

The NSW NPWS lists the following threats for this species:

- At least in former times, Brolgas were poisoned and shot because of their feeding incursions into crops, following drainage of swamps; and
- Loss of wetland habitat through clearing and draining for flood mitigation and agriculture.

The removal of a small area of potential forage habitat (i.e. small drainage lines) will be removed from the Subject site for the road construction. Given the high mobility of this species, the loss of potential foraging habitat is not considered significant in relation to the local or regional distribution of habitat for this species.

Likelihood of local extinction

Approximately 2 hectares of additional Freshwater wetland habitat will be created on the Subject site. Furthermore, 6.77 hectares of Swamp sclerophyll forest will be regenerated/revegetated on the Subject site (**FIGURE 11**) in accordance with the Revised Site Regeneration and Revegetation Plan (JWA 2013a). These areas and additional off-site offsets will provide suitable habitat for this species in the long-term and offset the loss of habitat.

Additionally, 54.63 hectares of vegetation within the south-eastern portion of the Subject site will be retained and rehabilitated in accordance with the Revised Saltmarsh Rehabilitation Plan (JWA 2013b) (**FIGURE 11**). This area currently provides suitable forage habitat for the Brolga and will continue to do so in the long term.

The removal of a small area of potential forage habitat from the Subject site is not considered to represent a significant impact in relation to the distribution of habitat for the local population of this species.

It is considered that, with the adoption of recommended management practices, the proposed development is unlikely to result in the local extinction of this species.

3.2.2.4 Collared kingfisher (*Todiramphus chloris*)***Extent of the local population***

The NPWS database (June 2010) contains fifty-nine (59) records of the Collared kingfisher within 10kms of the Subject site. Sixty-one (61) records occur within the Tweed LGA. This species has been recorded from the Cobaki Broadwater adjacent to the Subject site (EcoPro 2004) (**FIGURE 9**). However, extensive searches on the Subject site (JWA 2000 - 2007) have failed to record this species.

Suitable habitat for this species is considered to be comprised of undisturbed mangrove communities on and adjacent to the Subject site. Potential habitat for this species occurs within the low-lying eastern and south-eastern portions of the Subject site, particularly in association with the Cobaki Broadwater. It is estimated that

approximately 5.66 hectares of potential habitat for this species occurs on the Subject site.

The local population for this species is considered to be comprised of all individuals recorded within the locality of the Cobaki Lakes site as well as any individuals within adjoining areas (contiguous or otherwise) that are known or likely to use habitat in the study area.

Stages of the life-cycle affected by the proposed development

The Collared kingfisher is virtually restricted to mangroves and other estuarine habitats and mainly occurs about the mouths of the larger coastal rivers. It is frequently observed perched on rock walls, jetties, piles and tidal flats and sometimes occurs in parks and gardens along foreshores (NPWS 2002).

The Collared kingfisher picks up its food - crustaceans, small fish, worms, insects, reptiles and other small tidal animals - from the surface of muds and shallow pools exposed by low tide (Readers Digest 1997). Nests are usually in a hollow in a mangrove tree or drilled into termite nests in a large eucalypt or paperbark adjacent to mangroves (NPWS 2002).

The NPWS Threatened Species Unit discusses the following threats for the Collared kingfisher:

- Destruction of old mangrove stands for tourist, residential and infrastructure development;
- Loss of large coastal trees containing hollows or termite nests;
- Pollution of estuaries and accumulation of agricultural herbicide and pesticide residues; and
- Use of pesticides to protect tourist and residential developments.

The proposed road construction will not result in disturbance of or the removal of potential habitat for this species. Overall, impacts on this species are considered to be relatively low and are likely to be restricted to potential noise disturbance during construction.

Likelihood of local extinction

The potential disturbance of this species during construction is not considered to represent a significant impact. It is considered that the proposed development is unlikely to result in the local extinction of this species.

3.2.2.5 Large footed myotis (*Myotis macropus*)

Extent of the local population

The NPWS database (June 2010) contains four (4) records of this species within 10kms of the Subject site. Nineteen (19) records occur within the Tweed LGA. This species has been recorded during surveys adjacent to the Subject site (EcoPro 2004) (FIGURE 9). However, numerous surveys on the Subject site (JWA 2000 - 2007) have failed to record this species.

Large-footed myotis generally roost close to water in caves, mine shafts, hollow-bearing trees, stormwater channels, buildings, under bridges and in dense foliage. They

forage over streams and pools catching insects and small fish. Potential forage habitat for this species is generally restricted to the adjacent Cobaki Broadwater, however, foraging may occur along drainage lines in the proposed construction area of the 'Missing Link'.

The local population for this species would be considered to be all individuals recorded on the Cobaki Lakes site as well as any individuals within adjoining areas (contiguous or otherwise) that are known or likely to use habitat in the study area.

Stages of the life-cycle affected by the proposed development

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis was based on local expert knowledge and identified breeding and sheltering habitat for the Large-footed myotis as consisting of any forested riparian and adjacent vegetation around water bodies and coastal lakes and streams greater than first order streams. Breeding is in hollows, as well as under bridges and in caves. The Large-footed myotis forages in still water bodies with associated vegetation (tree line) feeding on aquatic and other flying insects, and small fish.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Large-footed myotis, with the following results:

- Clearing - habitat loss (riparian vegetation) and fragmentation
- Use of chemicals - mosquito control, pesticides
- Grazing
- Altered hydrology - sedimentation and altered flow
- Bridge removal
- Eutrophication from grazing, agriculture and sewage
- Dams
- Logging - loss of hollows
- Frequent burning
- Recreational activities - fly fishing, boating
- Weeds
- Fish (trout)

The Large-footed myotis is likely to forage widely over the locality, particularly along Cobaki Creek and over the nearby Cobaki Broadwater. The most likely impacts to bats from the proposed road construction would be from noise and vehicle movements adjacent to roosting areas. Potential roost habitat is best represented by consolidated vegetation within Environmental Protection Zones, and development of urban zoned land is likely to have little impact on available roost sites.

Likelihood of local extinction

The removal of a small area of potential habitat (i.e. small drainage lines) from the Subject site is not considered to represent a significant impact in relation to the distribution of habitat for the local population of this species.

It is considered that the proposed development is unlikely to result in the local extinction of this species.

3.2.2.6 Wallum froglet (*Crinia tinnula*)

The NPWS database (June 2010) contains two hundred and eight (208) records of this species within 10kms of the Subject site. Two hundred and thirty-six (236) records occur within the Tweed LGA. Wallum froglets have been recorded within Paperbark areas, sedgelands and in the main drainage channel and adjacent sedgeland in the east of the property. This species has also been recorded in a numerous locations adjacent to the Subject site (EcoPro 2004) (FIGURE 9) and is very widespread. The local population is estimated to comprise approximately 10,000 individuals (Hero *et al.* 2001).

Wallum Froglets are found only in acid paperbark swamps and sedge swamps of the coastal 'wallum' country (FIGURE 12). The species is a late winter breeder. Males call in choruses from within sedge tussocks or at the water edge.

NSW NPWS lists the following threats to this species:

- Destruction and degradation of coastal wetlands as a result of roadworks, coastal developments and sandmining;
- Reduction of water quality and modification to acidity in coastal wetlands; and
- Grazing and associated frequent burning of coastal wetlands.

Core habitat for this species is considered to be comprised of undisturbed wet heathland and wetland communities adjacent to the Subject site whilst remaining habitats (i.e. adjoining areas of grassland and slashed areas) are considered to provide forage habitat when inundated during wet periods. Due to a history of disturbance to wetland communities on the Subject site, only 2.5ha of core habitat is considered to occur. However, approximately 79.12 hectares of potential forage habitat occurs, as this area becomes inundated during suitable weather conditions (i.e. localised flooding after periods of heavy rainfall).

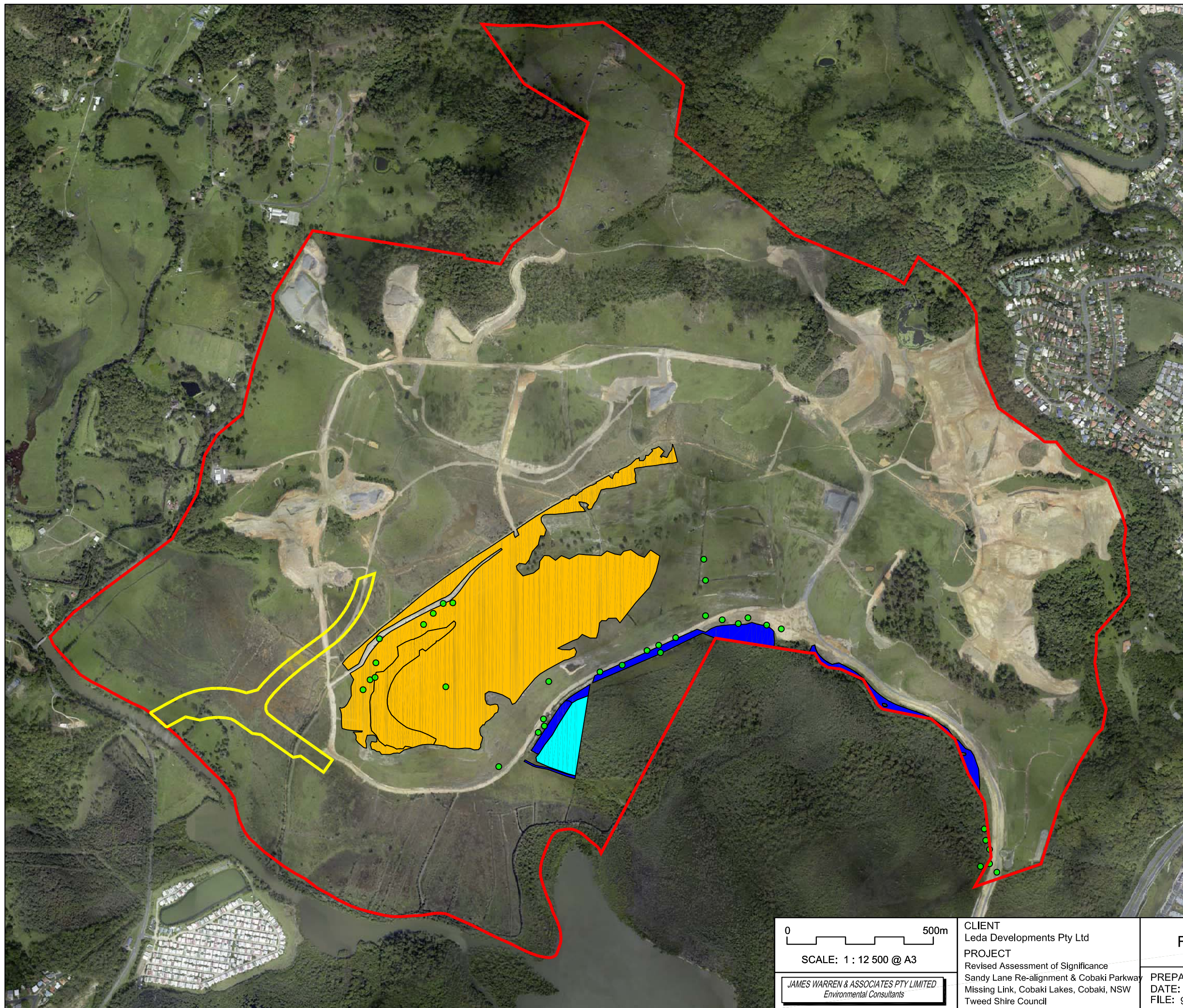
Potential Impacts from the development

The proposed development may result in the direct mortality of individuals during construction due to either habitat loss or machinery impact. However, the loss of some individuals and habitat during construction is unlikely to significantly impact upon the local population of Wallum froglets. The proposed development will not remove or modify any area considered to provide core habitat for the Wallum froglet (i.e. breeding habitat, refuge habitat).

Additional impacts may include:

- Alteration of water quality in drainage lines due to soil runoff from the construction site.
- Alteration of hydrology of the drainage lines due to construction.
- Contamination or reduction of water quality in drainage lines due to runoff from chemicals or debris (fertilisers, etc.).
- Introduction of weed species into core habitat areas.
- Increased competition from disturbance-adapted native, domestic and introduced fauna (such as Cane toads, Noisy miners, foxes, dogs, cats, rats, etc.).

Offsets for the removal of highly degraded Freshwater wetland vegetation from the Subject site will include the following:

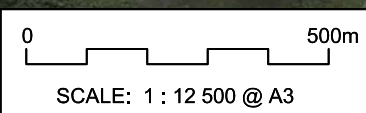


LEGEND

- Wallum froglet (*Crinia tinnula*) Locations
- Wallum froglet (*Crinia tinnula*) Core Habitat
 - Identified Wallum froglet (*Crinia tinnula*) Forage Habitat
 - Potential Wallum froglet (*Crinia tinnula*) Forage Habitat (see note)
 - Proposed Extent of Works
 - Site Outline

Note: Drainage lines and low lying areas in this portion of the site are considered foraging habitat. The exact location and extent of foraging habitat in this area will be the subject of detailed assessment at the DA stage.

SOURCE:
 Frogs - James Warren & Associates Pty Ltd
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 Aerial - Michel Group Services (Ref: 6400-197.dwg)
 - photo taken March 2010



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FIGURE 12
 PREPARED: BW
 DATE: 20 July 2010
 FILE: 97038_SA_BaseRD.dwg

TITLE
**WALLUM FROGLET
 LOCATIONS &
 HABITAT**

1. Recreation of approximately 2ha of high quality wetland habitats. These compensatory Freshwater wetlands will be offline from the stormwater treatment train and will also be specifically designed to provide core (breeding) habitat for the Wallum froglet. Revegetation and management of Freshwater wetlands will occur in accordance with a Freshwater Wetland Compensatory Habitat Management Plan (SMEC 2012); and
2. Leda Manorstead Pty Ltd is currently in negotiations with OEH with a view to securing appropriate off-site offsets.

Furthermore, 6.77 hectares of Swamp sclerophyll forest will be regenerated/revegetated on the Subject site (**FIGURE 11**) in accordance with the Revised Site Regeneration and Revegetation Plan (JWA 2013a) and these areas are likely to provide suitable forage habitat for this species and partially offset any loss of forage habitat. In total, 8.77ha of rehabilitation works on the Subject site will result in the creation of suitable forage habitat for the Wallum froglet to partly offset the loss of 66.47ha. The remaining offset will be provided off-site.

A detailed Stormwater Management Plan has been prepared for the Subject site utilising current best-practice management techniques which will ensure no adverse impacts on the hydrology of the current core habitat.

Likelihood of local extinction

The construction of core habitat areas will result with the implementation of a detailed Wallum froglet Compensatory Habitat Plan at the development application stage. With the creation of core habitat and the implementation of a detailed Storm Water Management Plan it is considered that the proposed development is highly unlikely to result in the local extinction of this species.

- (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.***

Thirty-five (35) endangered populations have been identified under the *TSC Act*. The following five (5) endangered populations occur in north-eastern NSW:

- Long-nosed potoroo population, Cobaki Lakes and Tweed Heads West;
- Emu population in the NSW North Coast Bioregion and Port Stephens LGA;
- Low growing form of *Zieria smithii*, Diggers Head;
- Narrow-leaved red gum in the Greater Taree LGA;
- *Glycine clandestina* (Broad-leaf form) in the Nambucca LGA.

The proposed action will not have an adverse effect on any of these endangered populations.

- (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.*

Not Applicable for Threatened fauna

- (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*

A summary of impacts on habitat for each Threatened fauna species recorded on the Subject site is provided in TABLE 5. Habitat has been considered as the area occupied by Threatened flora species as well as the area potentially providing opportunities for establishment of additional individuals.

It is worth noting that suitable habitat for Threatened flora to be removed from the Subject site occurs within existing 2(c) zoned land (i.e. Urban Expansion), land proposed to be rezoned as 2(c), or land that may otherwise be cleared in accordance with existing use rights.

**TABLE 5
POTENTIAL LOSS OF THREATENED FAUNA HABITAT FROM COBAKI LAKES**

Common Name	Botanical Name	Area of existing habitat over entire site	Area of habitat to be removed/ modified
Black-necked stork	<i>Ephippiorhynchus asiaticus</i>	142.47 hectares	1.56 hectares (1.1%)
Brolga	<i>Grus rubicunda</i>	142.47 hectares	1.56 hectares (1.1%)
Collared kingfisher	<i>Todiramphus chloris</i>	5.66 hectares	Nil (0%)
Large-footed myotis	<i>Myotis adversus</i>	2.33 hectares	0.80 hectares (34.33%)
Koala	<i>Phascolarctos cinereus</i>	39.27 hectares	3 trees (0%)
Wallum froglet	<i>Crinia tinnula</i>	82.86 hectares	Core habitat - Nil (0%) Forage habitat - 1.56 hectares (1.8%)

- (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*

Habitat for Threatened fauna species is already highly fragmented and has had a history of disturbance from land clearing and grazing activities on the Subject site. The Proposed Cobaki Lakes development has been designed to utilise disturbed areas of the

Subject site and is unlikely to contribute significantly to an increase in the fragmentation of native vegetation communities. Existing habitat areas providing movement opportunities will be retained. Additionally, proposed rehabilitation works on the Cobaki Lakes site in accordance with the Revised Site Regeneration & Revegetation Plan (JWA 2013a) will ensure suitable movement opportunities are maintained for all native flora and fauna species throughout the site.

Other relevant plans include:

- Revised Saltmarsh Rehabilitation Plan (JWA 2013b);
- Vegetation Management Plan (JWA 2009); and
- Revised Fauna Management Plan (JWA 2013).

(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.*

Most of the vegetation to be removed consists of highly disturbed vegetation. The importance of this vegetation is minor when compared to the areas of suitable habitat proposed to be retained, protected and rehabilitated on the Cobaki Lakes site. The assessment of the importance of the habitat to be removed has taken into consideration the stages of the Threatened faunas' life cycles and how reproductive success may be affected. It is considered that, with the adoption of recommended amelioration and management measures, the proposed development will not affect the life cycle or reproductive success of any identified Threatened fauna species.

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

Critical habitat areas listed under the *Threatened Species Conservation Act (1995)* currently consist of habitat for Mitchell's rainforest snail in Stott's Island Nature Reserve, and habitat for the Little penguin population in Sydney's North Harbour.

There will be no adverse effects on any critical habitat listed, in the Register of critical habitat in NSW, from the action proposed.

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

An Approved Recovery Plan has been prepared for the Koala. The Recovery Plan lists the following specific recovery objectives:

- To conserve Koalas in their existing habitat;
- To rehabilitate and restore Koala habitat and populations;
- To develop a better understanding of the conservation biology of Koalas;
- To ensure that the community has access to factual information about the distribution, conservation and management of Koalas at a national, state and local scale;
- To manage captive, sick or injured Koalas and orphaned wild Koalas to ensure consistent and high standards of care;
- To manage over-browsing to prevent both Koala starvation and ecosystem damage in discrete patches of habitat; and

- To co-ordinate, promote the implementation, and monitor the effectiveness of the NSW Koala Recovery Plan across NSW.

It is considered that the proposed development is consistent with the objectives and actions of the Recovery Plan for the Koala.

No Threat Abatement Plans exist for any of the Threatened species considered a possible occurrence on the Subject site.

A range of protection measures have been proposed with the objective of retaining and protecting areas of habitat on the site for Threatened fauna species and reducing impacts on Threatened fauna wherever possible. With the implementation of these measures it is considered that Threatened flora species will continue to persist on the site following the road construction.

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

A “threatening process” means a process that threatens, or may have the capability to threaten, the survival or evolutionary development of a species, population or ecological community. Key Threatening Processes have been listed in Schedule 3 of the *TSC Act (1995)*.

Key Threatening Processes (Schedule 3):

- Invasion and establishment of exotic vines and scramblers
- Invasion of native plant communities by bitou bush & boneseed
- Invasion of native plant communities by exotic perennial grasses
- Invasion, establishment and spread of *Lantana camara*
- Competition and grazing by the feral European rabbit
- Competition and habitat degradation by feral goats
- Competition from feral honeybees
- Herbivory and environmental degradation caused by feral deer
- Importation of red imported fire ants into NSW
- Introduction of the large earth bumblebee (*Bombus terrestris*)
- Invasion and establishment of the Cane Toad
- Invasion of the yellow crazy ant (*Anoplolepis gracilipes*)
- Predation by feral cats
- Predation by the European Red Fox
- Predation by the Plague Minnow (*Gambusia holbrooki*)
- Predation by the ship rat (*Rattus rattus*) on Lord Howe Island
- Predation, habitat degradation, competition and disease transmission by Feral Pigs (*Sus scrofa*)
- Alteration to the natural flow regimes of rivers, streams, floodplains & wetlands
- Bushrock Removal
- Clearing of native vegetation
- Alteration of habitat following subsidence due to longwall mining
- Ecological consequences of high frequency fires
- Human-caused Climate Change
- Loss and/or degradation of sites used for hill-topping by butterflies
- Loss of Hollow-bearing Trees
- Removal of dead wood and dead trees

- Infection by Psittacine circoviral (beak & feather) disease affecting endangered psittacine species
- Infection of frogs by amphibian chytrid fungus causing the disease chytridiomycosis
- Infection of native plants by *Phytophthora cinnamomi*
- Death or injury to marine species following capture in shark control programs on ocean beaches
- Entanglement in, or ingestion of anthropogenic debris in marine and estuarine environments

The proposed road construction has the potential to result in an increase in the **'Invasion and establishment of exotic vines and scramblers'**, **'Invasion of native plant communities by exotic perennial grasses'** and **'Invasion, establishment and spread of *Lantana camara*'**. A Revised Site Regeneration & Revegetation Plan (JWA 2013a) has been prepared for the Cobaki Lakes development and will ensure that these key threatening processes are not exacerbated.

The proposed development has the potential to result in an increase in the **'Invasion and establishment of the Cane Toad'**, **'Predation by feral cats'** and **'Predation by the European Red Fox'**. A Revised Fauna Management Plan (JWA 2013) has been prepared for the Cobaki Lakes development and will ensure that these key threatening processes are not exacerbated.

The proposed development has the potential to result in an increase in the **'Alteration to the natural flow regimes of rivers, streams, floodplains & wetlands'**. A detailed Stormwater Management Plan has been prepared for the proposed development (Gilbert & Sutherland 2008) and will ensure that this key threatening processes is not exacerbated.

The proposed development will contribute towards the **'Clearing of native vegetation'**, a key threatening process listed on Schedule 3 of the *TSC Act (1995)*. The final determination of the NSW Scientific Committee notes that clearing of native vegetation is recognised as a major factor contributing to loss of biological diversity, with impacts such as: destruction of habitat; fragmentation of habitat; riparian zone degradation; increased greenhouse gas emissions; increased habitat for invasive species; loss of leaf litter layer; loss or disruption of ecological function (e.g. loss of populations of pollinators or seed dispersers) and changes to soil biota.

Habitat loss is the main threatening process affecting all subject species. The Proposed development will make a minor contribution towards the loss of habitat in the region. However, as previously discussed, the majority of vegetation to be lost has been highly disturbed by past land use activities.

The proposed development has the potential to result in an increase in the **'Ecological consequences of high frequency fires'**. A Bushfire Management Plan has been prepared by a suitably qualified firm to ensure that this key threatening processes is not exacerbated.

The proposed development has the potential to result in an increase in the **'Loss of Hollow-bearing Trees'** and **'Removal of dead wood and dead trees'**. The Revised Fauna Management Plan (JWA 2013) includes the following measures to ensure this key threatening process is not exacerbated:

- Any hollow-bearing trees within the urban zoned land should be retained where possible (or included within buffers, open space, etc.);

- Intact hollow limbs will be collected for redistribution in the conservation and regeneration areas of the site. Hollow limbs may be stored until appropriate locations within these areas have been identified by the Site Ecologist. These logs shall be positioned so that a fire hazard is not created; and
- Installation of wildlife boxes for bats, birds & other mammals (where appropriate).

3.2.3 Results of Assessment of Significance

On the basis of this assessment, it is considered that the proposed road construction will not result in any significant impacts on Threatened fauna recorded or predicted to occur within the area.

3.3 Flora

None of the Threatened flora species recorded on or adjacent to the Cobaki Lakes site occur, or are considered likely to occur, in the area of the road construction (FIGURES 13 & 14). Therefore, an Assessment of Significance has not been completed for these species.

3.4 Endangered Ecological Communities (EEC's)

3.4.1 Background

Three (3) Endangered Ecological Communities (EEC's) will be impacted by the proposed construction of the southern portion of Sandy Lane and the Missing Link as follows (FIGURE 15):

- Freshwater wetlands,
- Swamp Oak Floodplain Forest; and
- Coastal Saltmarsh.

An Assessment of Significance (7-part test equivalence) has been completed for each. The assessment has been completed in accordance with the *Threatened Species Assessment Guidelines: The Assessment of Significance* prepared by DECC (2007).

3.4.2 Factors for consideration

- (a) *In the case of a Threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.*

Not applicable for EEC's.

- (b) *In the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.*



- LEGEND**
- Marblewood (*Acacia bakeri*)
 - Fine-leaved tuckeroo (*Lepiderema pulchella*)
 - Spiny gardenia (*Randia moorei*)
 - Yiel yiel (*Grevillea hilliana*)
 - Coolamon (*Syzygium moorei*)
 - Brush cassia (*Cassia brewsteri* var. *marksiana*)
 - Scented acronychia (*Acronychia littoralis*)
 - Green-leaved rose walnut (*Endiandra muelleri* subsp. *bracteata*)
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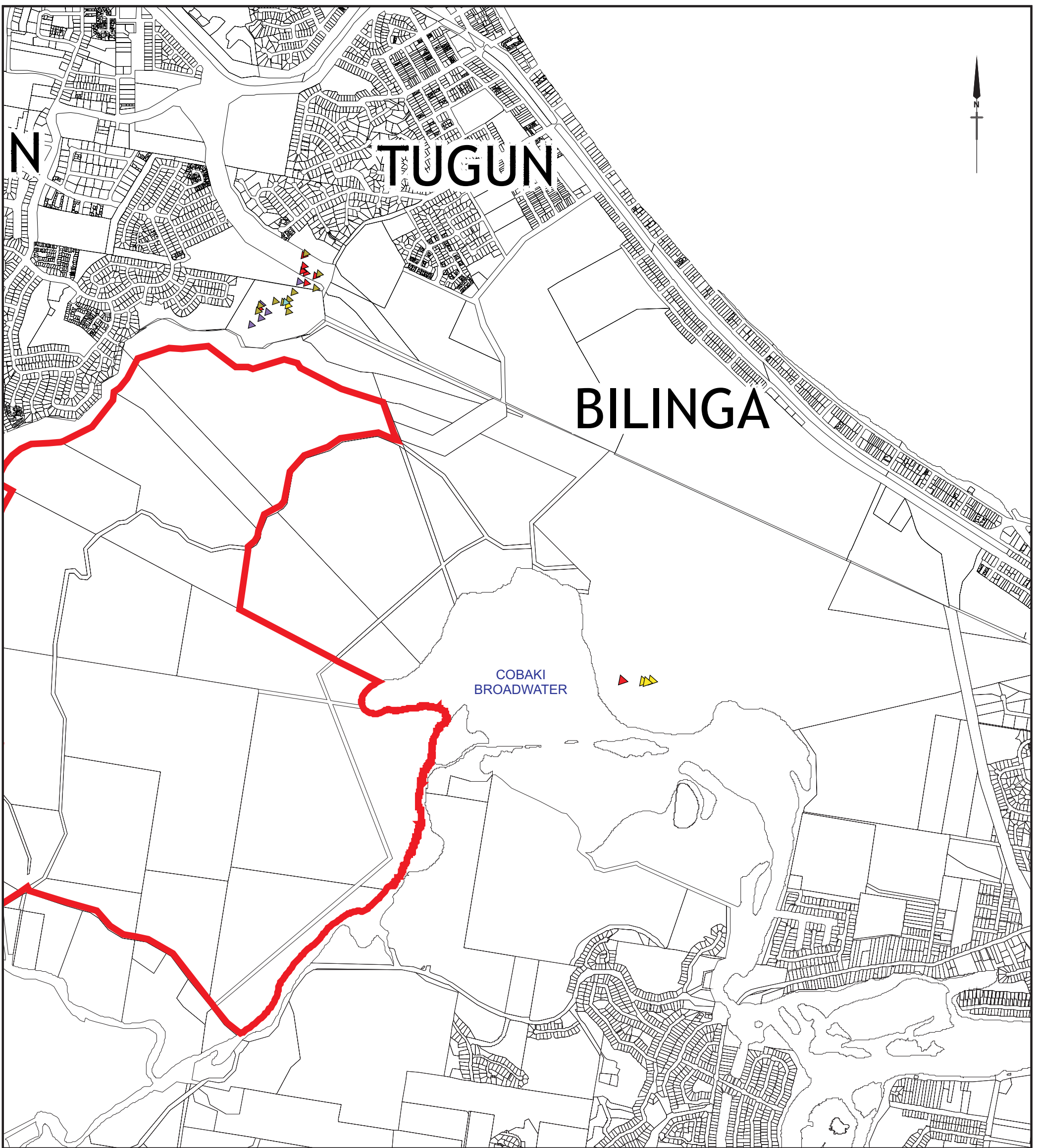
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FIGURE 13
 PREPARED: BW
 DATE: 20 July 2010
 FILE: 97038_SA_BaseRD.dwg

TITLE
 LOCATION OF
 THREATENED
 FLORA



- Legend**
- ▲ *Archidendron hendersonii*
 - ▲ *Cryptocarya foetida*
 - ▲ *Lepiderema pulchella*
 - ▲ *Macadamia tetraphylla*
 - ▲ *Syzygium moorei*
 - Subject Site

0 500m
1 : 20 000

SOURCE: Tugun Bypass Species Impact Statement (Dec 2004) Figure 4.5

SCALE: 1 : 20 000 @ A3

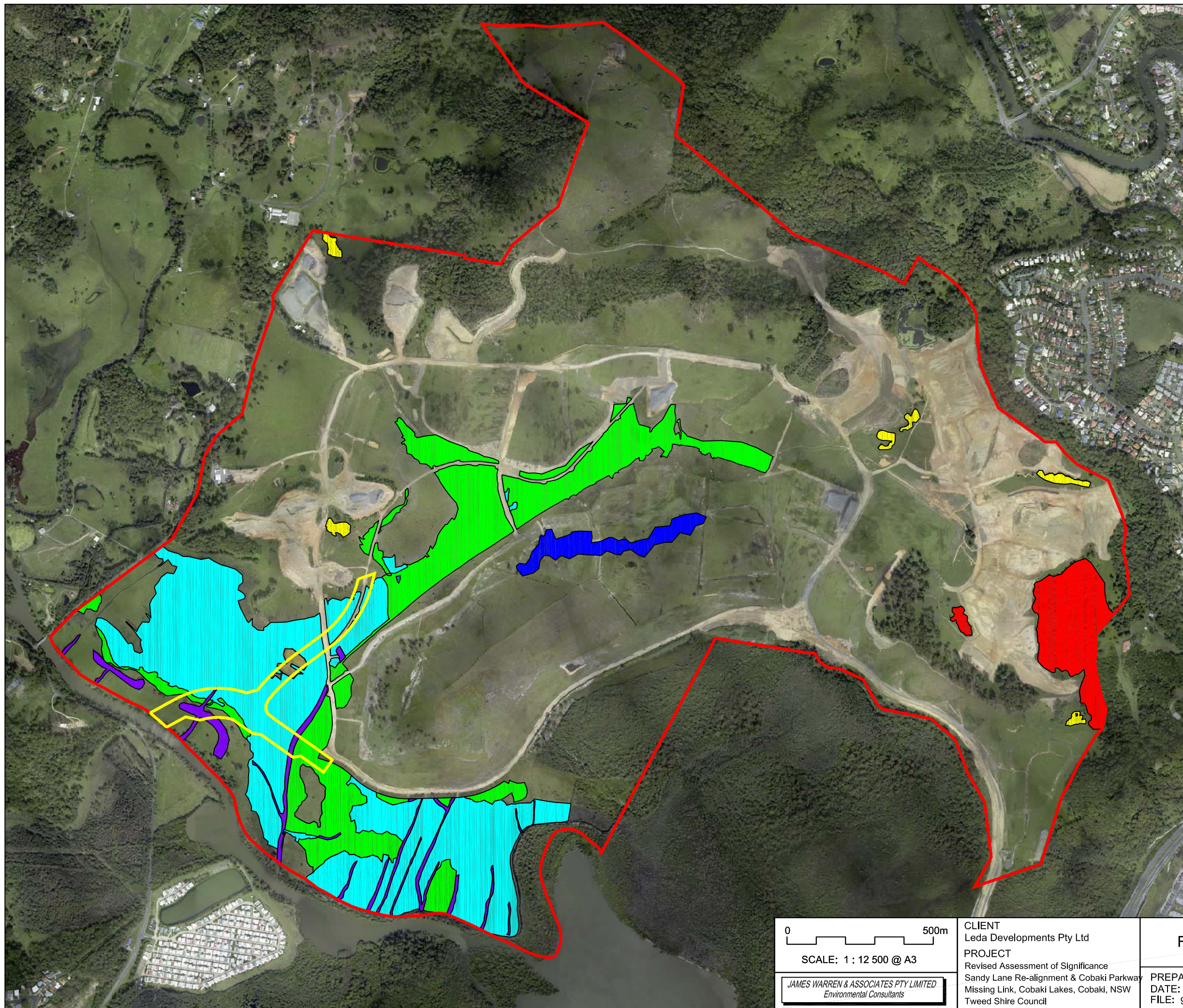
JAMES WARREN & ASSOCIATES PTY LIMITED
Environmental Consultants

CLIENT
Leda Developments Pty Ltd
PROJECT
Revised Assessment of Significance
Sandy Lane Re-alignment & Cobaki Parkway
Missing Link, Cobaki Lakes, Cobaki, NSW
Shire of Tweed

FIGURE 14

PREPARED: BW
DATE: 14 July 2010
FILE: 97038_SA_Bypass Flora.cdr

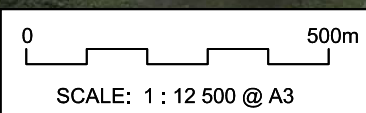
TITLE
**LOCATION OF
THREATENED FLORA
ADJACENT TO
SUBJECT SITE**



LEGEND

- Lowland Rainforest
- Lowland Rainforest on Floodplain
- Swamp Sclerophyll Forest on Floodplain
- Swamp Oak Floodplain Forest
- Freshwater Wetland (Degraded)
- Saltmarsh
- Proposed Extent of Works
- Site Outline

SOURCE:
 EEC's - James Warren & Associates Pty Ltd
 Extent of Works - Michel Group Services
 (Ref: 6400-162F.dwg)
 Aerial - Michel Group Services (Ref: 6400-197.dwg)
 - photo taken March 2010



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 Missing Link, Cobaki Lakes, Cobaki, NSW
 Tweed Shire Council

FIGURE 15
 PREPARED: BW
 DATE: 20 July 2010
 FILE: 97038_SA_BaseRD.dwg

TITLE
**ENDANGERED
 ECOLOGICAL
 COMMUNITIES**

Not applicable for EEC's.

(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*

A plan showing the locations of EEC's in relation to the proposed road construction is shown in **FIGURE 15**. A summary of impacts on EEC's recorded on the Cobaki Lakes site is provided in **TABLE 6**. It should be noted that the local occurrence of EEC's includes adjacent contiguous areas which maintain the movement of individuals and exchange of genetic material, however, the calculation below were available for the Cobaki Lakes site only.

It is also worth noting that areas of EEC to be removed from the Subject site occur within existing 2(c) zoned land (i.e. Urban Expansion), land proposed to be rezoned as 2(c), or land that may otherwise be cleared in accordance with existing use rights.

TABLE 6
POTENTIAL LOSS OF EEC'S FROM THE ROAD CONSTRUCTION AREA

EEC Description	Area of existing EEC on entire site	Area of EEC to be removed for road construction (% of occurrence on entire site)
Freshwater wetlands	35.39ha	1.13ha (3.2%)
Swamp oak floodplain forest	4.52ha	0.52ha (11.5%)
Coastal saltmarsh	54.63ha	4.27ha (7.8%)

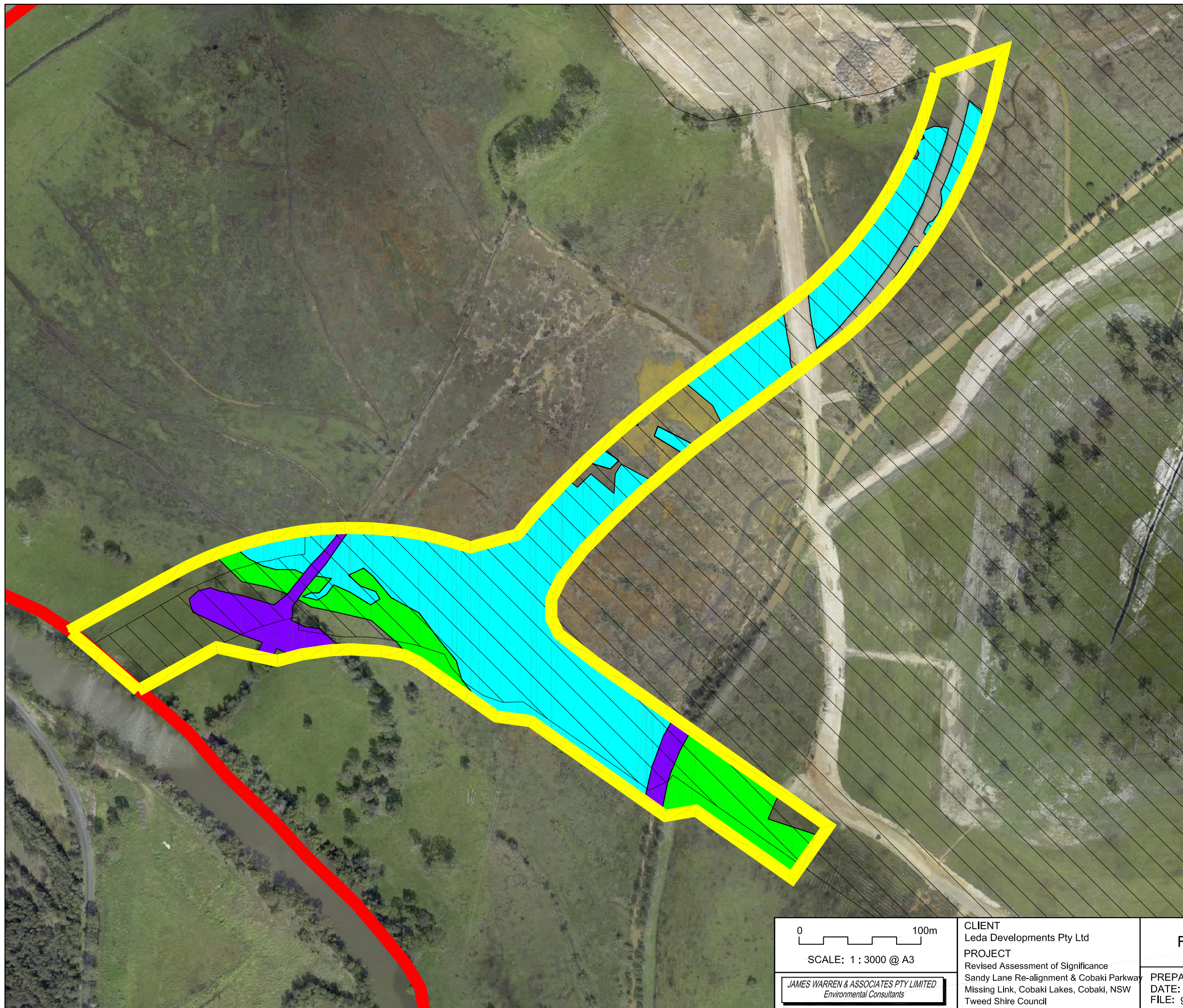
The risk of extinction of an EEC relates to the likelihood that the local occurrence of EEC will become extinct either in the short term or the long term as a result of direct or indirect impacts.

Freshwater wetlands

This EEC covers a total area of approximately 35.39 hectares (**FIGURE 15**). The area of Freshwater wetland in the eastern portion of the site (i.e. Community 10) has been impacted by adjacent earthworks for the formation of Cobaki Parkway. It is worth noting that the location of the road reserve is fixed by Tweed Council planning as a future four lane arterial road funded by the Section 94 Development Contribution Scheme. Additionally, the large area of Freshwater wetland in the central portion of the site (i.e. Community 14) has been heavily degraded by past and existing land use including drain construction and maintenance, grazing and slashing.

In total, 1.13 hectares of Freshwater wetland (3.2%) will be lost from the Subject site as a direct result of the road construction (**FIGURE 16**). The removal of this area of degraded Freshwater wetland from the Subject site is not considered to represent a significant impact in relation to the regional distribution of this community.

Swamp oak floodplain forest



LEGEND

- Lowland Rainforest
- Lowland Rainforest on Floodplain
- Swamp Sclerophyll Forest on Floodplain
- Swamp Oak Floodplain Forest
- Freshwater Wetland (Degraded)
- Saltmarsh
- Proposed Development Areas
- Proposed Extent of Works
- Site Outline

SOURCE:
 EEC's - James Warren & Associates Pty Ltd
 Extent of Works - Michel Group Services
 (Ref: 6400-162F.dwg)
 Impact Area - Design Forum Architects
 (Ref: DA 01.01 E Master Plan.dwg)
 Aerial - Michel Group Services (Ref: 6400-197.dwg)
 - photo taken March 2010

0 100m
 SCALE: 1 : 3000 @ A3
 JAMES WARREN & ASSOCIATES PTY LIMITED
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 PROJECT
 Revised Assessment of Significance
 Sandy Lane Re-alignment & Cobaki Parkway
 Missing Link, Cobaki Lakes, Cobaki, NSW
 Tweed Shire Council

FIGURE 16
 PREPARED: BW
 DATE: 05 April 2013
 FILE: 97038_SA_BaseRD.dwg

TITLE
**IMPACT ON
 ENDANGERED
 ECOLOGICAL
 COMMUNITIES**

This EEC occurs in the south-eastern portion of the Subject site in association with drainage lines and covers an area of approximately 4.52 hectares (**FIGURE 15**). This community occurs in an area that is currently subject to tidal inundation via the main constructed drain in this portion of the site (i.e. Dunn's drain) and also through a breach in the constructed levy bank adjacent to the creek. It is worth noting that this community occurs as linear stands of trees along the edges of constructed drains. Additionally, this area is currently actively grazed by cattle under existing use rights (i.e. routine agricultural activities) which has resulted in the prevalence of introduced grasses and common agricultural weeds in some areas.

In total, 0.52ha hectares of Swamp oak floodplain (11.5%) will be lost from the Subject site as a direct result of the road construction (**FIGURE 16**). The removal of this small area of Swamp oak floodplain forest from the Subject site is not considered to represent a significant impact in relation to the regional distribution of this community.

Coastal saltmarsh

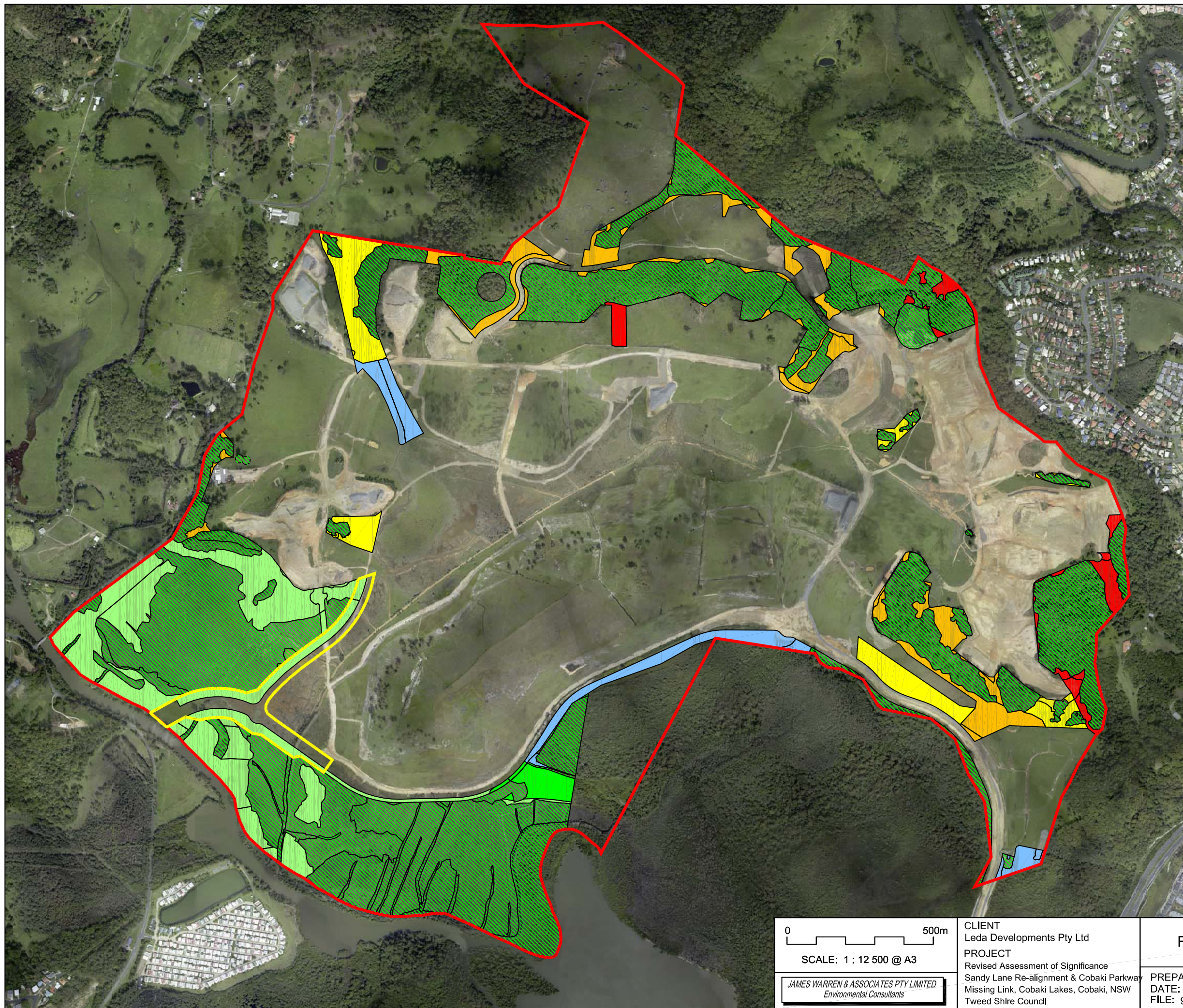
This EEC occurs in the south-eastern portion of the Subject site adjacent to Cobaki Creek and covers an area of approximately 54.63 hectares (**FIGURE 15**). This area is currently subject to tidal inundation via the main constructed drain in this portion of the site (i.e. Dunn's drain) and also through a breach in the constructed levy bank adjacent to the creek. It is worth noting that this area is currently actively grazed by cattle, and slashed in some areas, under existing use rights (i.e. routine agricultural activities). This has resulted in the prevalence of introduced grasses and common agricultural weeds in some areas.

In total, 4.27 hectares of Coastal saltmarsh (7.8%) will be lost from the Subject site as a direct result of road construction (**FIGURE 16**). The removal of this small area of degraded Coastal saltmarsh from the Subject site is not considered to represent a significant impact in relation to the regional distribution of this community.

JWA (2013a) have prepared a Revised Site Regeneration & Revegetation Plan (SRRP) for the Cobaki Lakes site. The SRRP proposes revegetation/rehabilitation measures aimed at addressing a number of vegetation/habitat management issues, including the management, rehabilitation and protection of EEC's. The objectives of the SRRP are to:

- Provide a plan for the revegetation and regeneration of the Cobaki Lakes site;
- Identify areas of retained vegetation that will be maintained through weed control and general maintenance;
- Identify areas that will be rehabilitated using natural regeneration or enhancement plantings;
- Provide management guidelines for the revegetation, natural regeneration and weed control to be implemented;
- Outline a maintenance and monitoring program for the site; and
- Provide management guidelines for the on-going conservation of vegetation on the site.

This Plan principally applies to those parts of the site zoned as Environmental Protection, or as Ecological Buffers, and identifies areas where active restoration and rehabilitation measures are proposed to offset any removal of EEC's and to enhance retained vegetation communities throughout the site. Proposed offsets for EEC's are depicted in **FIGURE 17**.



LEGEND

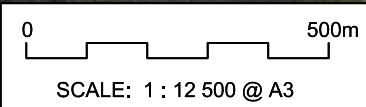
ENDANGERED ECOLOGICAL COMMUNITIES (EEC) OFFSET AREAS

- Lowland Rainforest
- Lowland Rainforest on Floodplain
- Swamp Sclerophyll Forest on Floodplain
- Freshwater Wetland
- Swamp Sheoak Floodplain Forest / Saltmarsh

OTHER

- Mixed Sclerophyll Forest
- Retained Vegetation
- Proposed Extent of Works
- Site Outline

SOURCE:
 EEC's - James Warren & Associates Pty Ltd
 Extent of Works - Michel Group Services
 (Ref: 6400-162F.dwg)
 Aerial - Michel Group Services (Ref: 6400-197.dwg)
 - photo taken March 2010



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 Revised Assessment of Significance
 Sandy Lane Re-alignment & Cobaki Parkway
 Missing Link, Cobaki Lakes, Cobaki, NSW
 Tweed Shire Council

FIGURE 17
 PREPARED: BW
 DATE: 05 April 2013
 FILE: 97038_SA_BaseRD.dwg

TITLE
**ENDANGERED
 ECOLOGICAL
 COMMUNITIES
 OFFSET AREAS**

The removal of a small area of EEC from the Subject site is not considered to represent a significant impact in relation to local occurrence of the above EEC's. It is considered that, with the adoption of recommended management practices, the proposed development is highly unlikely to result in the local extinction of any of the EEC's identified on the Cobaki Lakes site.

- (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.*

The composition of an EEC refers to both the plant and animal species present, and the physical structure of the EEC. The following documents have been prepared to ensure that the composition and ecological function of EEC's on the Subject site are not significantly impacted by development:

- Revised Site Regeneration & Revegetation Plan (JWA 2013a);
- Revised Saltmarsh Rehabilitation Plan (JWA 2013b);
- Vegetation Management Plan (JWA 2009).

The major amelioration strategy for EEC's on the Subject site is the retention and long-term protection of these vegetation communities within Environmental Protection Areas.

The Revised Site Regeneration & Revegetation Plan (JWA 2013a) outlines the various measures to ensure that the retained EEC's are adequately managed. Revegetation/regeneration will be completed in accordance with this plan to offset any loss of EEC's (FIGURE 17). A summary of proposed EEC offsets is provided below.

Freshwater wetlands

In total, approximately 2 hectares of Freshwater wetlands will be regenerated/revegetated on the Subject site (FIGURE 17) to offset the loss of 1.13 hectares as a direct result of the road construction, as well as any other loss from the site. Revegetation and management of Freshwater wetlands will occur in accordance with a Freshwater Wetland Compensatory Habitat Management Plan (SMEC 2012). The balance of the required offsets will be provided off-site. However, the location of these offsets is still being negotiated.

Swamp oak floodplain forest

The removal of approximately 0.52 hectares of the Swamp oak floodplain forest community from the Subject site will be mitigated by regenerating and revegetating compensatory Swamp oak communities on the Subject site. Approximately 5.88 hectares of Swamp oak floodplain forest will be revegetated to offset any loss of this EEC in accordance with the Revised Saltmarsh Rehabilitation Plan (JWA 2013b). Removal of cattle from the area and subsequent relinquishment of existing use rights is considered an integral component of the rehabilitation process.

Coastal saltmarsh

The removal of approximately 4.27 hectares of Saltmarsh communities from the Subject site will be ameliorated by regenerating and revegetating compensatory Saltmarsh communities on the Subject site. Approximately 64.28 hectares of Coastal saltmarsh will be naturally regenerated and in combination with approximately 20ha of revegetation, to offset any loss of this EEC in accordance with the Revised Saltmarsh Rehabilitation Plan (JWA 2013b). Removal of cattle from the area and subsequent

relinquishment of existing use rights is considered an integral component of the rehabilitation process.

With the adoption of recommended amelioration measures contained within these documents, it is considered that the proposed development will not have an adverse effect on the extent, or substantially modify the composition of any EEC such that the local occurrence is likely to be put at risk of extinction. Conversely, proposed rehabilitation works at the Subject site are likely to improve habitat diversity and connectivity across the Cobaki Lakes site.

(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*

A summary of impacts on EEC's recorded on the Subject site has been provided above. It is worth noting that areas of EEC to be removed from the Subject site occur within existing 2(c) zoned land (i.e. Urban Expansion), land proposed to be rezoned as 2(c), or land that may otherwise be cleared in accordance with existing use rights.

(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*

Areas of EEC on the Subject site are already highly fragmented and the site has had a history of disturbance from land clearing, grazing, forestry and other activities on the Subject site. The Proposed development has been designed to utilise disturbed areas of the Subject site and is unlikely to contribute significantly to an increase in the fragmentation of native vegetation communities. The development layout has also been designed to provide habitat linkages throughout the Cobaki Lakes site. These habitat linkages will ensure suitable movement opportunities are maintained for all native flora and fauna species throughout the site.

(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.*

Most of the vegetation to be removed consists of highly disturbed vegetation. The importance of this vegetation is minor when compared to the areas of suitable habitat proposed to be retained, protected and rehabilitated. The assessment of the importance of the habitat to be removed has taken into consideration the stages of relevant flora and fauna life cycles and how reproductive success may be affected. It is considered that, with the adoption of recommended amelioration and management measures, the proposed development will not significantly affect the life cycle or reproductive success of native flora and fauna species.

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

Critical habitat areas listed under the *Threatened Species Conservation Act (1995)* currently consist of habitat for Mitchell's rainforest snail in Stott's Island Nature Reserve, and habitat for the Little penguin population in Sydney's North Harbour.

There will be no adverse effects on any critical habitat listed, in the Register of critical habitat in NSW, from the action proposed.

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

No Recovery plans or relevant Threat Abatement Plans has been prepared for the EEC's occurring on the Subject site.

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

A "threatening process" means a process that threatens, or may have the capability to threaten, the survival or evolutionary development of a species, population or ecological community. Key Threatening Processes have been listed in Schedule 3 of the *TSC Act (1995)*.

Key Threatening Processes (Schedule 3):

- Invasion and establishment of exotic vines and scramblers
- Invasion of native plant communities by bitou bush & boneseed
- Invasion of native plant communities by exotic perennial grasses
- Invasion, establishment and spread of *Lantana camara*
- Competition and grazing by the feral European rabbit
- Competition and habitat degradation by feral goats
- Competition from feral honeybees
- Herbivory and environmental degradation caused by feral deer
- Importation of red imported fire ants into NSW
- Introduction of the large earth bumblebee (*Bombus terrestris*)
- Invasion and establishment of the Cane Toad
- Invasion of the yellow crazy ant (*Anoplolepis gracilipes*)
- Predation by feral cats
- Predation by the European Red Fox
- Predation by the Plague Minnow (*Gambusia holbrooki*)
- Predation by the ship rat (*Rattus rattus*) on Lord Howe Island
- Predation, habitat degradation, competition and disease transmission by Feral Pigs (*Sus scrofa*)
- Alteration to the natural flow regimes of rivers, streams, floodplains & wetlands
- Bushrock Removal
- Clearing of native vegetation
- Alteration of habitat following subsidence due to longwall mining
- Ecological consequences of high frequency fires
- Human-caused Climate Change
- Loss and/or degradation of sites used for hill-topping by butterflies
- Loss of Hollow-bearing Trees
- Removal of dead wood and dead trees
- Infection by Psittacine circoviral (beak & feather) disease affecting endangered psittacine species
- Infection of frogs by amphibian chytrid fungus causing the disease chytridiomycosis

- Infection of native plants by *Phytophthora cinnamomi*
- Death or injury to marine species following capture in shark control programs on ocean beaches
- Entanglement in, or ingestion of anthropogenic debris in marine and estuarine environments

The proposed road construction has the potential to result in an increase in the **'Invasion and establishment of exotic vines and scramblers'**, **'Invasion of native plant communities by exotic perennial grasses'** and **'Invasion, establishment and spread of *Lantana camara*'**. A Revised Site Regeneration & Revegetation Plan (JWA 2013a) has been prepared for the Cobaki Lakes development and will ensure that these key threatening processes are not exacerbated.

The proposed development has the potential to result in an increase in the **'Invasion and establishment of the Cane Toad'**, **'Predation by feral cats'** and **'Predation by the European Red Fox'**. A Revised Fauna Management Plan (JWA 2013) has been prepared for the Cobaki Lakes development and will ensure that these key threatening processes are not exacerbated.

The proposed development has the potential to result in an increase in the **'Alteration to the natural flow regimes of rivers, streams, floodplains & wetlands'**. A detailed Stormwater Management Plan has been prepared for the proposed development (Gilbert & Sutherland 2008) and will ensure that this key threatening processes is not exacerbated.

The proposed development will contribute towards the **'Clearing of native vegetation'**, a key threatening process listed on Schedule 3 of the *TSC Act (1995)*. The final determination of the NSW Scientific Committee notes that clearing of native vegetation is recognised as a major factor contributing to loss of biological diversity, with impacts such as: destruction of habitat; fragmentation of habitat; riparian zone degradation; increased greenhouse gas emissions; increased habitat for invasive species; loss of leaf litter layer; loss or disruption of ecological function (e.g. loss of populations of pollinators or seed dispersers) and changes to soil biota.

Habitat loss is the main threatening process affecting all subject species. The Proposed development will make a minor contribution towards the loss of habitat in the region. However, as previously discussed, the majority of vegetation to be lost has been highly disturbed by past land use activities.

The proposed development has the potential to result in an increase in the **'Ecological consequences of high frequency fires'**. A Bushfire Management Plan has been prepared by a suitably qualified firm to ensure that this key threatening processes is not exacerbated.

The proposed development has the potential to result in an increase in the **'Loss of Hollow-bearing Trees'** and **'Removal of dead wood and dead trees'**. The Revised Fauna Management Plan (JWA 2013) includes the following measures to ensure this key threatening process is not exacerbated:

- Any hollow-bearing trees within the urban zoned land should be retained where possible (or included within buffers, open space, etc.);
- Intact hollow limbs will be collected for redistribution in the conservation and regeneration areas of the site. Hollow limbs may be stored until appropriate locations within these areas have been identified by the Site Ecologist. These logs shall be positioned so that a fire hazard is not created; and

- Installation of wildlife boxes for bats, birds & other mammals (where appropriate).

3.4.3 Results of Assessment of Significance

On the basis of this assessment, it is considered that the proposed road construction will not result in any significant impacts on EEC's recorded within the construction area.

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