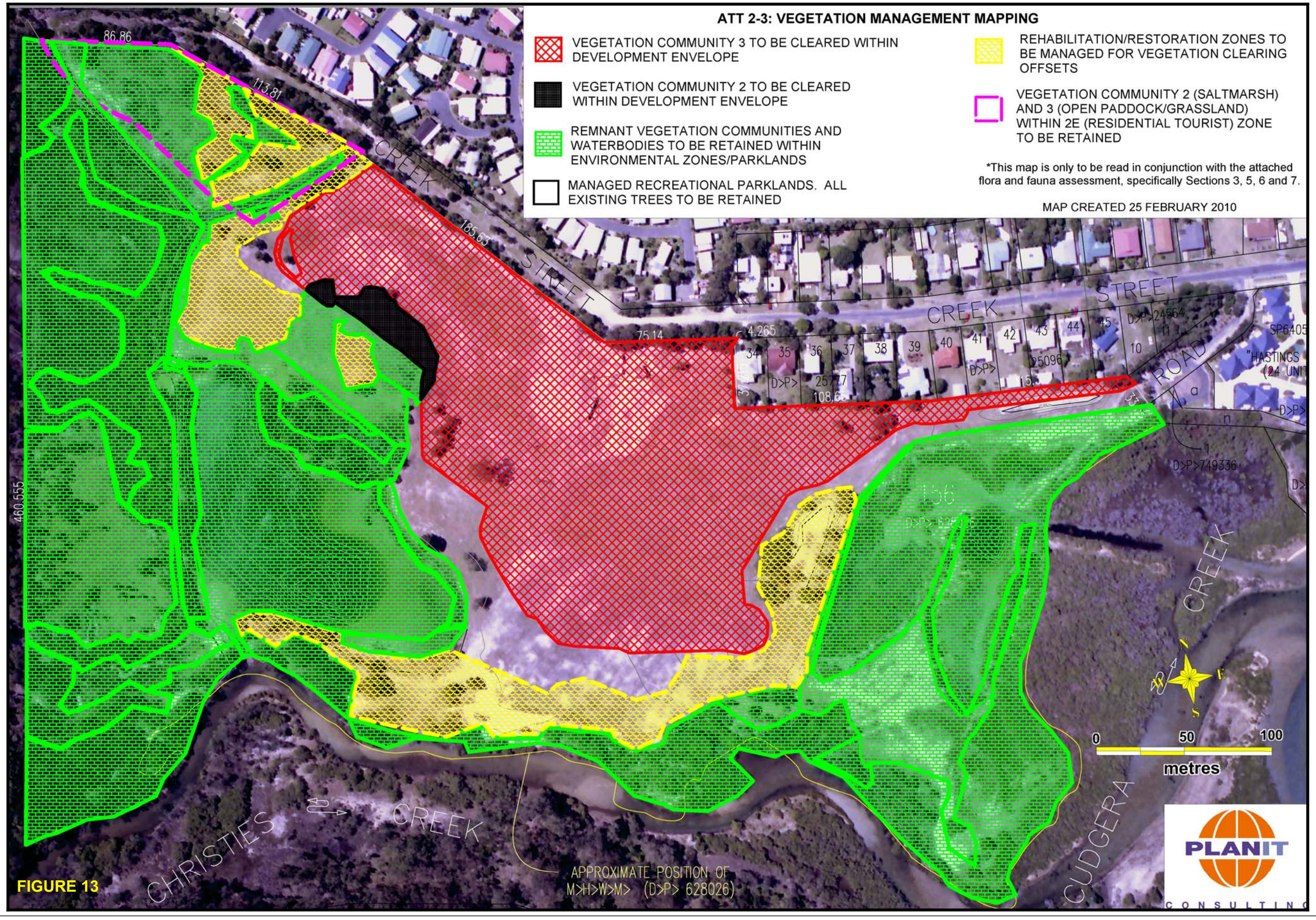

ATT 2-3: VEGETATION MANAGEMENT MAPPING
VEGETATION COMMUNITY 3 TO BE CLEARED WITHIN DEVELOPMENT ENVELOPE
VEGETATION COMMUNITY 2 TO BE CLEARED WITHIN DEVELOPMENT ENVELOPE
REMNANT VEGETATION COMMUNITIES AND WATERBODIES TO BE RETAINED WITHIN ENVIRONMENTAL ZONES/PARKLANDS
MANAGED RECREATIONAL PARKLANDS. ALL EXISTING TREES TO BE RETAINED
REHABILITATION/RESTORATION ZONES TO BE MANAGED FOR VEGETATION CLEARING OFFSETS
VEGETATION COMMUNITY 2 (SALTMARSH) AND 3 (OPEN PADDOCK/GRASSLAND) WITHIN 2E (RESIDENTIAL TOURIST) ZONE TO BE RETAINED
*This map is only to be read in conjunction with the attached flora and fauna assessment, specifically Sections 3, 5, 6 and 7.
MAP CREATED 25 FEBRUARY 2010
86.86
113.81
CREEK
STREET
185.63
75.14
4.265
CREEK
STREET
ROAD
460.555
CHRISTIES
CREEK
APPROXIMATE POSITION OF M>H>W>M> (D>P> 628026)
CUDGERA
CREEK
0
50
100
metres
PLANIT
CONSULTING

FIGURE 13

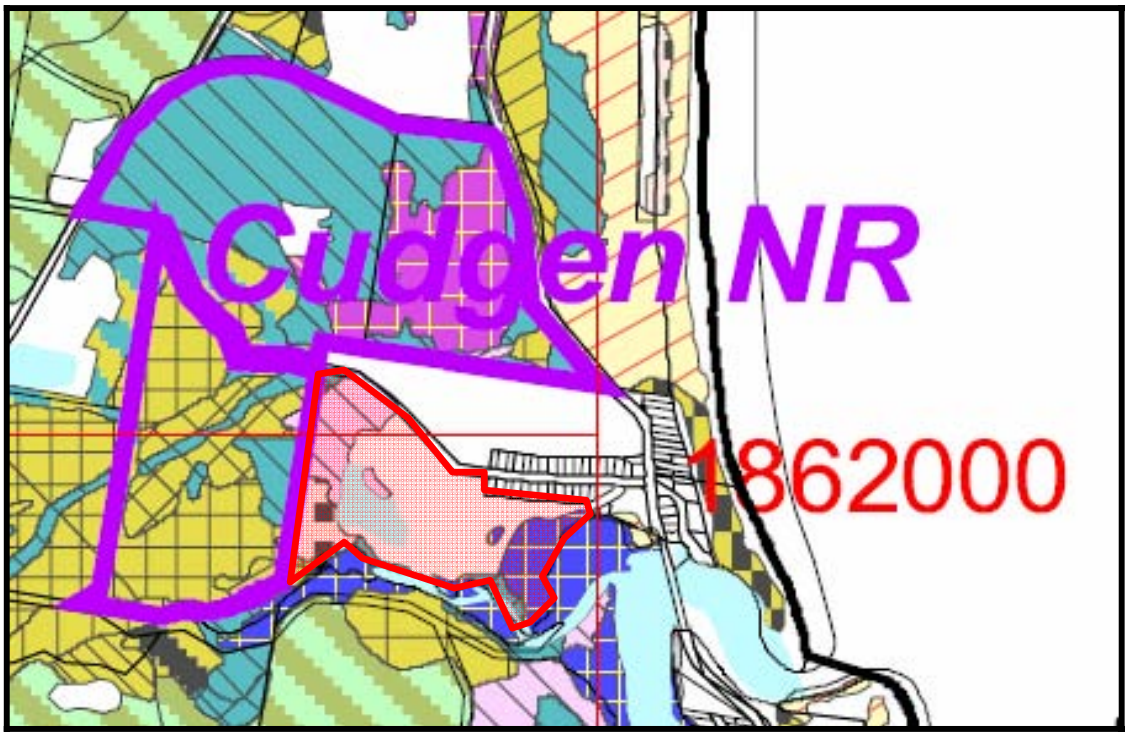


FIGURE 14: TWEED VMP MAP 2 COMMUNITIES WITHIN STUDY AREA

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

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

(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"

Within the site it is considered that Communities 1-2 & 4-9 represent potential or recorded habitat for listed threatened fauna. These communities occupy ~10.43ha (including the open waterbody) of the site, mostly below HAT. A review of Section 3.2 above notes that these habitats (excluding open water bodies) are considered to cover 39461ha of the UNE bioregion and 2983ha of the Tweed Shire.

As such, it is considered unlikely that the noted vegetation communities represent a significant area of habitat in relation to the local and regional distribution of those listed habitats.

Furthermore, it is noted that the development will result in the modification of ~4.26 of open paddock/grassland with scattered trees (Community 3) and a small area (~1341sqm) of Saltwater Couch (Community 2). These areas (to be modified) are not considered to represent a significant area of 'habitat for the recorded or potentially occurring threatened species.

Reviewing the above and (a) and (c) as previously discussed, the areas to be modified are not considered to represent a 'significant area of habitat' for the recorded or potentially occurring threatened species or occurring endangered ecological communities.

In assessing the potential for habitats of threatened species, populations or ecological communities to become fragmented or isolated to such an extent that the long-term survival of the said species, population or community is at risk, the following is to be considered:

- 'Interconnecting or proximate areas of habitat' (which may be at risk of being fragmented or isolated from other habitat areas) are considered to be two or more habitat areas where currently an individual can move between the two. Such areas could become 'isolated' in the event that the development negates future potential movement of individuals between the two habitats. This could occur through the clearance of habitat, creation of physical impediments (i.e.

roads, fences) or potential impacts to behaviour (fauna) which may restrict future movements.

- For threatened species, in reviewing whether isolation may occur, consideration must be given to the movement values of the site and surrounds for particular species, the mobility of threatened species, connectivity of habitats within and external to the site and the degree to which the proposal may significantly disrupt these patterns.

- Consideration should be given to the dispersal and genetic exchange mechanisms of individual species and whether the isolation of currently interconnecting or proximate areas of habitat for threatened species, communities or populations will adversely affect the maintenance of gene flow and the ability to sustain viable populations (DEC, 2005).

The development is proposed largely within Community 3 (Open grassland/paddock with scattered trees) within the northern and central portions of the site over an area of ~4.4ha. The remaining ~13.48 hectares (comprised of Communities 1-2 & 4-9 plus remaining areas of Community 3) will be protected within a continuous 'open space' designation aligned east-west linking Christies Creek to the Cudgen Reserve. It is considered that this zone will allow for the continued movement/dispersal of recorded (and potentially occurring) fauna species.

Additionally, the majority of the recorded and potentially occurring threatened species are considered to be highly mobile occupying large home ranges or dispersal ability (particularly avifauna) and are unlikely to be precluded from using the habitats of the site or adjacent habitats as a result of the proposal. Potentially occurring threatened terrestrial fauna occupying smaller ranges (i.e. frogs, planigale etc) if present are likely to be restricted to the western forested areas (Communities 4-7) which are contiguous with extensive similar habitat within the Cudgen Reserve.

Reviewing the above, it is considered that the proposal will not result in a significant area of habitat for a threatened species, population or ecological community to become isolated from currently interconnecting or proximate areas of habitat for threatened species, populations or ecological communities. Further the proposal is unlikely to adversely impact upon or alienate movement corridors or limit dispersal options for any threatened species.

(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 development is unlikely to affect 'critical habitat' areas.

The development 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)

(sourced online at http://www.nationalparks.nsw.gov.au/npws.nsf/ Content/Critical +habitat+protection+by+doctype)

(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:

- Draft Koala Recovery Plan
- Large Forest Owls Draft Recovery Plan

(online at http://www.nationalparks.nsw.gov.au/npws.nsf/Content/Recovery+plans)

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 proposed development 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 development as proposed 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). It is considered that the following TAP is relevant to the site:

- Invasion of native plant communities by bitou bush/boneseed (2004)

In association with the development it is proposed that the majority of the site containing native vegetation communities will be dedicated as public open space. As part of this asset handover it is proposed that weed removal and native plant revegetation works be undertaken to eradicate current infestations of Bitou Bush, reduce the propagule base (which may spread into offsite vegetation communities) and stabilised treatment zones with native plantings.

As such, it is considered that the development as proposed 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):

Key threatening process	Type of threat	Comments
Invasion and establishment of **exotic vines and scramblers**	Weed	Exotic vines occasionally recorded onsite. These species will be progressively removed in association with site development.
Invasion of native plant communities by **bitou bush & boneseed**	Weed	Boneseed was recorded onsite. This species will be removed in association with site development.
Invasion of native plant communities by **exotic perennial grasses**	Weed	N/A
Invasion, establishment and spread of Lantana camara	Weed	Lantana was recorded onsite. This species will be progressively removed in association with site development.
Competition and grazing by the **feral European rabbit**	Pest animal	N/A
Competition and habitat degradation by feral goats	Pest animal	N/A
Competition from **feral honeybees**	Pest animal	N/A
Herbivory and environmental degradation caused by **feral deer**	Pest animal	N/A
Importation of **red imported fire ants** into NSW	Pest animal	N/A
Introduction of the **large earth bumblebee** (*Bombus terrestris*)	Pest animal	N/A
Invasion and establishment of the **Cane Toad**	Pest animal	The cane toad was recorded onsite. Development of the site will reduce the potential habitat for this species onsite although it may continue to occur as it is highly suited to urban environments.
Invasion of the **yellow crazy ant** (*Anoplolepis gracilipes*)	Pest animal	N/A
Predation by **feral cats**	Pest animal	N/A
Predation by the **European Red Fox**	Pest animal	N/A
Predation by the **Plague Minnow** (*Gambusia holbrooki*)	Pest animal	N/A
Predation by the **ship rat (*Rattus rattus*) on Lord Howe Island**	Pest animal	N/A
Predation, habitat degradation, competition and disease transmission by **Feral Pigs** (*Sus scrofa*)	Pest animal	N/A
Alteration to the natural flow regimes of rivers, streams, floodplains & wetlands.	Habitat loss/change	N/A

Bushrock Removal	Habitat loss/change	N/A
Clearing of native vegetation	Habitat loss/change	Refer below
Alteration of habitat following **subsidence due to longwall mining**	Habitat loss/change	N/A
Ecological consequences of **high frequency fires**	Habitat loss/change	N/A
Human-caused **Climate Change**	Habitat loss/change	The introduction of residential uses will result in a minor incremental increase in this KTP.
Loss and/or degradation of **sites used for hill-topping by butterflies**	Habitat loss/change	N/A
Loss of Hollow-bearing Trees - key threatening process	Habitat loss/change	Two dead stag trees and one blue gum bearing hollows will be removed in association with the proposal. This is not considered to be a significant proportion of the potential hollow bearing trees of the local area. To offset the loss it is proposed to install fauna boxes within the southwestern retained forests which are interconnected to the extensive habitats of the Cudgen Reserve.
Removal of **dead wood and dead trees**	Habitat loss/change	N/A
Infection by **Psittacine circoviral (beak & feather) disease** affecting endangered psittacine species	Disease	N/A
Infection of frogs by amphibian chytrid fungus causing the disease chytridiomycosis	Disease	N/A
Infection of native plants by *Phytophthora cinnamomi*	Disease	N/A
Death or injury to marine species following capture in **shark control programs on ocean beaches**	Other threat	N/A
Entanglement in, or injestion of **anthropogenic debris in marine and esturine environments**	Other threat	N/A

The proposed development of the site will involve clearing of some native vegetation (including clearing of one or more strata within a stand of native vegetation) to facilitate the development.

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 the development proposal notes that modification will be primarily restricted to cleared/pasture areas and as such it is considered that 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 region.

Conclusion

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

6.1.2 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 approximately 17.9ha in area and located within the Tweed 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

Whilst trees from the above list (*E. tereticornis, E. robusta*) do occur on site they do not represent 15% or greater of the total number of trees present within the upper and lower strata of noted vegetation communities.

As such it is considered that the land does not represent potential koala habitat as defined.

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.' No direct observations of Koalas were made on the site during survey works (either in 2003 or 2006), although scats were recorded.

As such, it is contended that the land is not core koala habitat as defined.

It is, however, noted that the adjacent Cudgen Reserve is considered to be such a core habitat. The NPWS PoM for the Cudgen Nature Reserve (1998) identifies that 'a significant koala population resides in and around Cudgen Nature Reserve.' The POM also states that 'in a regional context the Reserve plays a significant role in contributing to the largest single area of relatively contiguous habitat for koalas remaining on the Tweed Coast (CZP, 1995).

The development as proposed will result the width of protected areas (for conservation purposes) at the southeastern corner of the Cudgen Reserve where it shares a common boundary with the site (by 145m [north] to 560m [south]).

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

6.1.3 SEPP 14 COASTAL WETLANDS

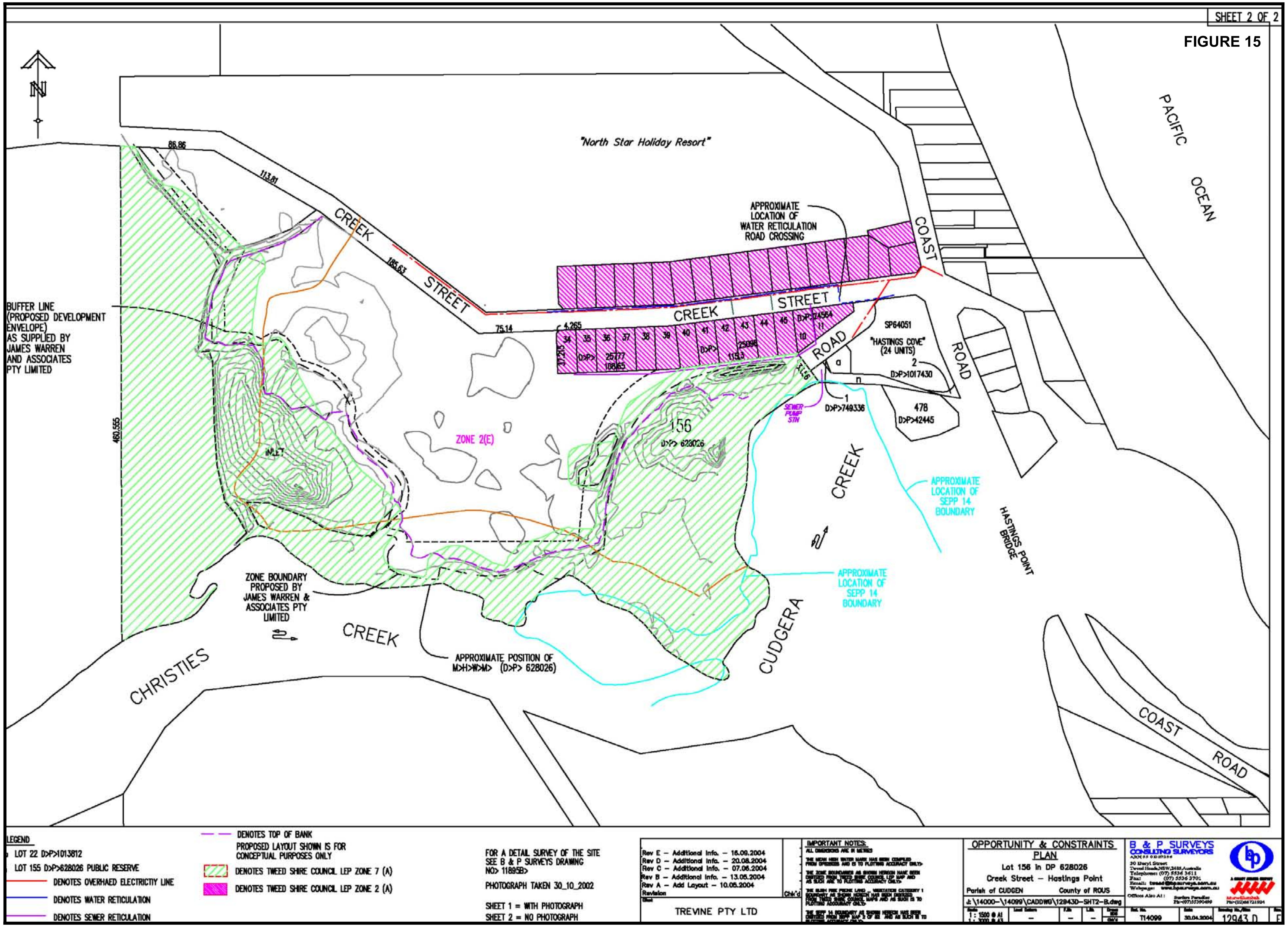
State Environmental Planning Policy No. 14 aims to preserve and protect coastal wetlands in the environmental and economic interest of the State. It does this by defining any development that involves clearing, draining or filling wetlands, or constructing levees on wetlands to be designated development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

The water bodies of Christies and Cudgera Creeks are mapped as a SEPP14 wetland and will be buffered from development impacts through the retention of existing riparian vegetation. Potential secondary water quality related impacts have been addressed by Opus Qantec McWIlliam in the hydraulic and water quality assessments.

Buffers between the development envelope and the mapped SEPP 14 line range from 70 to >160m in width. It is also noted that in association with the previous LEP study over the site that the rezoning protected identified important estuarine and wetland vegetation and a 10-20m buffer zone within the 7a (environmental protection) zone and from the 2e (residential/tourist) zone. The proposed layout is consistent with this previous studies and the adopted LEP. Additional protection to environments contained within the 2E zone under this LEP will be occasioned by this development proposal.

6.1.4 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). The site is not mapped as containing SEPP 26 littoral rainforest and no such communities were recorded during inspection.


SHEET 2 OF 2
FIGURE 15
"North Star Holiday Resort"
PACIFIC OCEAN
CREEK STREET
COAST ROAD
APPROXIMATE LOCATION OF WATER RETICULATION ROAD CROSSING
BUFFER LINE (PROPOSED DEVELOPMENT ENVELOPE) AS SUPPLIED BY JAMES WARREN AND ASSOCIATES PTY LIMITED
SP64051
"HASTINGS COVE" (24 UNITS)
D>P>1017430
D>P>749336
D>P>42445
SEWER PUMP STN
ZONE 2(E)
INLET
156
D>P> 628026
CREEK
APPROXIMATE LOCATION OF SEPP 14 BOUNDARY
HASTINGS POINT BRIDGE
ZONE BOUNDARY PROPOSED BY JAMES WARREN & ASSOCIATES PTY LIMITED
CHRISTIES CREEK
CUDGERA
APPROXIMATE POSITION OF M>H>W>M> (D>P> 628026)
LEGEND
LOT 22 D>P>1013812
LOT 155 D>P>628026 PUBLIC RESERVE
DENOTES OVERHAED ELECTRICITY LINE
DENOTES WATER RETICULATION
DENOTES SEWER RETICULATION
DENOTES TOP OF BANK
PROPOSED LAYOUT SHOWN IS FOR CONCEPTUAL PURPOSES ONLY
DENOTES TWEED SHIRE COUNCIL LEP ZONE 7 (A)
DENOTES TWEED SHIRE COUNCIL LEP ZONE 2 (A)
FOR A DETAIL SURVEY OF THE SITE SEE B & P SURVEYS DRAWING NO> 11895B>
PHOTOGRAPH TAKEN 30_10_2002
SHEET 1 = WITH PHOTOGRAPH
SHEET 2 = NO PHOTOGRAPH
Rev E – Additional Info. – 16.09.2004
Rev D – Additional Info. – 20.08.2004
Rev C – Additional Info. – 07.06.2004
Rev B – Additional Info. – 13.05.2004
Rev A – Add Layout – 10.05.2004
TREVINE PTY LTD
IMPORTANT NOTES:
OPPORTUNITY & CONSTRAINTS PLAN
Lot 156 in DP 628026
Creek Street – Hastings Point
Parish of CUDGEN
County of ROUS
B & P SURVEYS
CONSULTING SURVEYORS
T14099
12943 D

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 & 2008) 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.

A number of threatened species have been found (or are considered potential occurrences) within the subject site and individuals of these species may be impacted through the removal of vegetation or disturbance to habitat. Areas of endangered ecological communities (EECs) are also present which have the potential to be affected through indirect impacts (i.e. changes to hydrology, edge effects, inappropriate or no management of weeds and pest animals). Significance assessments for these EECs and 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, threatened plants or threatened animals (as summarized below).

TABLE 16: SUMMARY OF SPECIES/COMMUNITIES FOR WHICH SIGNIFICANCE TESTS WERE UNDERTAKEN

TYPE	TSC ACT	LIKELY TO BE SIGNIFICANTLY AFFECTED BY PROPOSED ACTION?
Endangered Ecological Community		
Swamp Sclerophyll Forest On Coastal Floodplains Of The Nsw North Coast, Sydney Basin And South East Corner Bioregions	E	No
Swamp Oak Floodplain Forest Of The Nsw North Coast, Sydney Basin And South East Corner Bioregions	E	No
Subtropical Coastal Floodplain Forest Of The Nsw North Coast Bioregion	E	No
Coastal Saltmarsh In The Nsw North Coast, Sydney Basin And South East Corner Bioregions	E	No

SUMMARY OF SPECIES/COMMUNITIES FOR WHICH SIGNIFICANCE TESTS WERE UNDERTAKEN		
TYPE	**TSC ACT**	**LIKELY TO BE SIGNIFICANTLY AFFECTED BY PROPOSED ACTION?**
Threatened Animals		
Osprey	V	No
Black-necked Stork	E1	No
Little Bentwing Bat	V	No
Grey Headed Flying Fox	V	No
Black Flying Fox	V	No
Common Blossom Bat	V	No
Eastern Bentwing Bat	V	No
Koala	V	No
Glossy Black Cockatoo	V	No

Although the potential impacts of the proposed action on threatened biodiversity are not considered significant (as summarized above and discussed in detail within Section 6), mitigation measures are proposed to manage potential impacts (refer Section 8).

7.2 CLEARING OF VEGETATION COMMUNITIES

Clearing of vegetation (native and exotic) will be the major direct impact associated with the intended residential development. Clearing is recognized as a key threatening process under the TSCA 1995. The proposed development will result in the removal of ~4.4ha of existing vegetation from the site in association with the filling and leveling required to deliver the proposed residential uses and the construction of services and buildings.

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. It is to be acknowledged that native trees (43 in total) within the modified paddock/pasture areas and native species will be lost. 1341sqm of salt couch community will also be removed.

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

TABLE 17: CLEARING OF VEGETATION COMMUNITIES AS A RESULT OF THE PROPOSAL				
Mapped Community	**EEC?**	**Approx. extent within site (HA)**	**Approx. extent to be cleared (HA)**	**Approx % remaining**
COMMUNITY 1: LOW CLOSED FOREST (MANGROVE) [T5D]	NO	3.68	0	100
COMMUNITY 2: LOW/MID-HIGH CLOSED GRASSLAND (SALTWATER COUCH) [G1D]	YES	1.64	0.1341	91
COMMUNITY 3: LOW/MID-HIGH CLOSED GRASSLAND/PADDOCK (PASTURE GRASSLAND W/ SCATTERED TREES) [G1D]	NO	7.47	4.26	42.9*
COMMUNITY 4:TALL-VERY TALL RUSHLAND (SALT RUSH) [R4D]	YES	1.23	0	100
COMMUNITY 5: MID-HIGH/TALL SEDGELAND/RUSHLAND (BARE TWIGRUSH) [R3D]	YES	0.977	0	100
COMMUNITY 6: VERY TALL OPEN FOREST (PINK BLOODWOOD/BRUSHBOX) [T8M]	YES	0.523	0	100
COMMUNITY 7: VERY TALL OPEN FOREST (BROAD-LEAVED PAPERBARK) [T8M]	YES	0.33	0	100
COMMUNITY 8: MID-HIGH/TALL OPEN FOREST (SWAMP OAK) [T6M]	YES	0.693	0	100
COMMUNITY 9: OPEN WATER	NO	1.36	0	100
TOTAL		**17.9**	**4.4**	**75.4**

* In association with proposed rehabilitation/restoration works it is considered that over time Community 3 with be replaced to the benefit of retained native vegetation communities and as part of offset initiatives. Such action is considered necessary to reduce the potential exotic grass/weed propagule base and thereby deliver low-maintenance environmental parks (i.e. reduced weed management effort required over time as a result of a much lower abundance of weeds in the open areas with potential to spread to the environmental areas).

7.3 IMPACTS TO FAUNA HABITAT

The proposal will involve the clearing of ~4.4ha of native and exotic vegetation to deliver the residential and tourist development as proposed. These proposed vegetation removal/modification works are not considered to represent a significant impact upon the endemic fauna assemblage of the site or local/sub-regional populations. A relatively low diversity of fauna was recorded or predicted to occur within the areas to be disturbed.

Due to the small size of the development envelope, significant habitats to be retained and the existence of extensive areas of similar habitat within local and regional areas, the proposed vegetation disturbance is not considered to be a significant impact to fauna values.

It is acknowledged that the clearing of vegetation will impact upon fauna habitat elements including loss of feeding resources, removal of dead timber (fallen and standing), removal of low levels of ground strata, debris and leaf-litter. Such elements are necessary (depending upon species) for shelter, refuge from predators, feeding, temperature regulation and breeding. Typical additional impacts associated with vegetation clearing on fauna and associated habitat include:

- Overall loss of standing biomass and reduction in flora species abundance/diversity
- Mortality as a result of construction activities (removal/disturbance of nests, hollows, burrows and general habitat)
- Loss of habitat complexity from the clearance zones including loss of potential foraging and nesting/roosting resources
- Increased potential from 'edge effects' to retained remnants (on or offsite)
- Disturbance of species behaviour (i.e. some species are less tolerant to human presence or a higher level of human activity and may abandon currently utilized habitats)
- Reduction of potential fauna movement linkages throughout the overall landscape
- Alteration to the fauna assemblage (some species tolerant to modified habitats (i.e. rats, minors, crows etc) may dominant the newly created niches and displace species from adjacent vegetated remnants)

It is to be noted that all potential habitats elements from within the development envelope will initially be lost. This complete loss of existing habitat is necessary to deliver the residential and use as proposed.

Following stabilization and development a modified habitat zone (i.e. residential areas with gardens beds, streetscape and planted) will be restored within the disturbance area. This zone however is likely to only favour common species, generally aves (i.e. common birds tolerant to human proximity. Additional recreated habitats of higher structural and floristic diversity will be associated with the proposed revegetation of the Christies Creek riparian zone.

7.4 FAUNA MORTALITY/INJURY

Any level of vegetation clearing, construction or earthworks modification undertaken has the potential to kill or injure fauna species. Whilst potential does exist for dispersal of numerous species (particularly avifauna) to retained habitats, less dispersive species or species not tolerant to a surrounding human interface may become trapped within the construction zone during earthworks.

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.

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 previous sections it is considered that the areas to be developed are currently dominated by open and fragmented habitats with contiguous units of remnant vegetation along the southern and western boundaries. These contiguous remnants link the estuarine and riparian habitats of the site to the adjacent Cudgen Reserve which is ultimately connected to the Round Mountain Nature Reserve through connected remnant vegetation. As the proposal is situated within a largely cleared area it is considered that it will not introduce a barrier or significant impediment to continued fauna movement throughout the riparian zone and to offsite reserved habitats. Rehabilitation and restoration of the riparian zone of Christies Creek within currently fragmented areas will strengthen and improve the viability of the existing riparian zone over time.

As such whilst local vegetation will be lost, it is not considered that a significant impact to fauna movements within the locality will result through habitat fragmentation and creation of barriers (i.e. the residential/tourist development), due to the planned retention and enhancement of the riparian and western remnants adjacent the Cudgen Reserve.

Whilst the development proposes to retain a large, inter-connect riparian remnant of significant vegetation/fauna habitat, the risk of an increase intrusion of 'edge' into retained zones is present. However, it is considered that the major impacts associated with 'edge effects' are already present within these areas as follows:

- Currently the native vegetation remnants exhibit a high edge: area ratio and are exposed to edge impacts. The development does not propose further fragmentation or an increase in the ratio of edge: area.
- Existing remnants exhibit weed growth which, without appropriate management, is likely to threaten their continued viability regardless of site development.
- Common territorial species of fauna have been recorded from all areas of the existing native vegetation remnants regardless of separation from the perimeter of the community

Notwithstanding, the following design and management initiatives are proposed in association with site development to progressively reduce the impact of 'edge effects' on the retained, interconnected native vegetation remnants:

- A weed management plan shall be prepared for the retained vegetation communities (refer Figure 13) to progressively remove existing infestations
- A rehabilitation/restoration plan shall be prepared for the retained vegetation communities (refer Figure 13) to progressively revegetate areas from which weeds are removed and to restore the currently cleared 'offset' zones (refer Figure 13) and thus reduce the 'edge:area ratio' of the resultant inter-connected communities

7.6 ESTABLISHMENT OF WEEDS

Modification (i.e. clearing, earthworks, development) to the site will result in a change of microclimate (i.e. altered temperature regimes, increased light levels, greater wind speeds) which may increase the germination and establishment of exotic species. This is likely to occur within the development envelope and edge affected areas of retained remnants. It is widely accepted that an increase in weed abundance is detrimental to the existing viability of any bushland remnant and has an impact upon flora and fauna assemblages alike.

As discussed in this report, weeds are present across the site both within modified and remnant native vegetation communities. In this regard it is considered that the development, as proposed, may have a beneficial impact with regard to weed presence (and potential future dispersal) within the locality due to the removal of an area (4.26ha) of potential propagule base (i.e. the pasture/paddock area). However, introduction of residents who may illegally dump garden waste within environmental areas thereby increasing weed spread is also a potential impact in association with the development.

Within the site, the retained significant areas are likely to be benefited by the progressive management of existing weed infestations.

7.7 CHANGES TO HYDROLOGY AND WATER QUALITY

The construction of residential development has the potential to alter surface runoff and groundwater hydrology as well as resulting in an increase in annual pollutant loads entering the downstream waterways. Certain vegetation communities and EECs (i.e. saltmarsh, mangroves, swamp sclerophyll, swamp oak) are sensitive to changes in natural flow regimes and increased pollutant levels, particularly sedimentation in the case of mangroves.

Increasing the area of hard stand across the site would reduce groundwater recharge. Lowering groundwater levels has the potential to reduce flows to creeks, springs and wetlands which can potentially affect the lower wetland communities. Disturbances to acid sulfate soils can also result in downstream reduction in water quality.

8.0 MEASURES TO AVOID AND MINIMISE ECOLOGICAL IMPACTS

8.1 PROTECTION & AVOIDANCE

A range of development scenarios were considered in the planning of this development with the inclusion of ecological, hydraulic, traffic and planning constraints as they became identified during the reporting process. In association with this terrestrial flora and fauna assessment the design has been progressively amended to avoid areas of high significance and to respond to issues raised by the DoP. The areas to be retained are largely reflective of endangered ecological communities, inter-tidal environments and/or riparian communities. These areas are displayed within Figure 13.

In addition the development as proposed (refer Attachment 1) avoids removal of 4655sqm of the Coastal Saltmarsh EEC and 109 native trees within the paddock/pasture that are currently located in the 2E zone (west of the proposed development envelope).

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 development as proposed. To ensure that clearing impacts do not occur outside of the designated development and construction zone it will be necessary to clearly identify and mark the boundaries of the environmental and buffer areas onsite prior to construction. Such boundaries are to be protected via high visibility fencing, sediment fencing and signage identifying that no construction activities (including temporary storage, stockpiling, vehicle movement etc) are permitted beyond.

Within the designated development/construction zone 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 birds nests and/or hollows (suitable for arboreal mammal or bat nesting) to be undertaken prior to felling works. A wildlife spotter catcher is to be utilized 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 environmental zones.

8.2.2 IMPACTS ASSOCIATED WITH EDGE EFFECTS

The following design and management initiatives are proposed in association with site development to progressively reduce the impact of ‘edge effects’ on the retained, interconnected native vegetation remnants:

- A weed management plan shall be prepared for the retained vegetation communities (refer Figure 13) to progressively remove existing infestations
- A rehabilitation/restoration plan shall be prepared for the retained vegetation communities (refer Figure 13) to progressively revegetate areas from which weeds are removed and to restore the currently cleared 'offset' zones (refer Figure 13) and thus reduce the 'edge:area ratio' of the resultant inter-connected communities

8.2.3 WEED MANAGEMENT

A weed management plan shall be prepared for the retained vegetation communities and restoration/rehabilitation areas (refer Figure 13) to progressively remove existing infestations. Weed control across the entire site will be necessary during the construction phase and following the establishment of the residential development.

Control techniques will vary depending upon the species being targeted and its location within the site. In areas of low significance (i.e. streetscape, stockpiles, batters, general development zone) broad scale application of herbicide or mechanical removal will be appropriate. Within the environmental zones more selective removal techniques (i.e. cut stump, stem application etc) and spot application of a non-residual herbicide (i.e. roundup bioactive) will be necessary.

8.2.4 MANAGEMENT OF CONSTRUCTION AND OPERATIONAL PHASE WATER QUALITY IMPACTS

A stormwater quality management plan for the operational and construction phases of the project has been prepared by Qantec McWilliams. This plan calls for temporary and permanent sediment/erosion controls and stormwater quality improvement devices to ensure all stormwater is treated to appropriate standards prior to discharge to the downstream receiving environments.

Qantec McWilliams have also undertaken a hydraulic report demonstrating that impacts receiving environments will be minimal with an acid sulfate soils management plan also to be implemented to reduce potential downstream impacts.

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 development:

8.3.1 REVEGETATION & RESTORATION OF DISTURBED AREAS

DEVELOPMENT ENVELOPE

Revegetation within the development envelope shall be undertaken following construction and establishment of the residential use. This is to include the following:

- Use of native trees which may provide potential foraging resources for threatened birds and bats within the streetscape and recreational areas of the parklands/open space. This planting should focus upon fruiting rainforest trees and banksias

- Native wetland plants should be utilised within stormwater quality devices (i.e. bioretention basins/swales) to promote future use by native frogs and birds. Planting is to include aquatic/semi-aquatic native ground covers and shrubs in addition to trees

ENVIRONMENTAL ZONES

A rehabilitation/restoration plan shall be prepared for the retained vegetation communities and rehabililtation/restoration zones (refer Figure 13) to progressively revegetate currently disturbed areas and areas from which weeds are removed. This plan shall incorporate species lists and modules to be replanted and focus upon riparian, rainforest and swamp sclerophyll community types.

8.3.2 PROVISION OF ALTERNATE BAT/BIRD ROOSTING SITES

Nest boxes for bats and birds shall be installed within the retained environmental zones to provide potential breeding sites for threatened species of the locality. Quantities and designs of the proposed boxes shall be documented within the future rehabilitation/restoration plan.

8.3.3 PROVISION OF RAPTOR NESTING SITE

An additional raptor pole shall be installed within the environmental zone to offset the loss of the large blue gum from the site.

8.4 OFFSET OF RESIDUAL IMPACTS

Many of the potential impacts of the development on terrestrial flora and fauna values have been either avoided or minimized through the design process (i.e. retention and buffering) or considered to be adequately mitigated or managed (i.e. through the implementation of management plans). Impacts that cannot or are not proposed to be mitigated (in the context of development consistent with the planning designation) are considered to be residual impacts. The following residual impacts will occur as a result of this development proposal:

- Loss of 4.26ha of Vegetation Community 3 (Low/Mid-High Closed Grassland/Paddock [Pasture Grassland W/ Scattered Trees]). Whilst the majority of this community contains exotic grasses/weeds, native trees and groundcovers will be removed. The native trees located within the development envelope to be removed include:

- Paperbarks (*Melealeuca quinquenervia*) x 21
- Swampbox (*Lophostemon suaveolens*) x 6
- Blue Gum (*Eucalyptus tereticornis*) x 12
- Black She-oak (*Allocasuarina littoralis*) x 1
- Two dead stags (one containing a small strangling fig)

- Loss of 1341sqm of Community 2 (Low/Mid-High Open-Closed Grassland [Saltwater Couch]). This community is an endangered ecological community.

- Loss of a variety of fauna habitats associated with the above communities

- Loss of native flora species which may provide potential foraging resources or secondary habitat for the threatened fauna describe in Section 5.4

The following design and management measures are considered to be appropriate compensation of the residual impacts of the proposed development:

- Avoidance of 4655sqm of the Coastal Saltmarsh EEC and 109 native trees within the paddock/pasture that are currently located in the 2E zone (north-western areas of the site). ~3500sqm of predominately pasture grassland (also with regenerating native species) beneath and adjacent the 109 trees to be retained within the 2e zone shall also be avoided

- Additional areas to those considered in the existing Tweed LEP for the site (i.e. within the 2e zone) shall be protected through the provision of environmental zonings

- The retained native vegetation communities (8.94ha excludes lake surface and the saltmarsh area to be removed) which currently exhibit varying levels of degradation through exotic plant infestation shall be managed for conservation (i.e. weed management and revegetation/rehabilitation)

- Revegetation/restoration of 1.94ha of current Community 3 (Low/Mid-High Closed Grassland/Paddock [Pasture Grassland W/ Scattered Trees]) shall occur (refer Figure 13). Revegetation shall be focus upon re-creating endangered ecological communities (i.e. Subtropical Coastal Floodplain Forest, Swamp Oak Floodplain Forest and Swamp Sclerophyll Forest on Coastal Floodplains)

9.0 SUMMARY & CONCLUSIONS

Planit Consulting have been engaged by Walter Elliot Holdings to undertake a flora and fauna assessment of Lot 156 on DP628026 located at Creek Street, Hastings Point. The assessment has included the following:

- Review of James Warren & Associates (2003) Analysis of Environmental Constraints Lot 156 Creek Street Hastings Point
- 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
- Targeted survey for threatened flora species
- Providing an ecological site 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 SEPP 44-Koala Habitat Protection

The subject land covers an area of 17.9 hectares of which approximately 4.4 hectares will be occupied by the development with the remainder set aside as open space. The development envelope is occupied by paddocked grassland with scattered native trees and some minor areas of Saltwater Couch. The proposal which involves the construction of residential uses will require the removal of all vegetation within the development envelope. As discussed within this report this is not considered to be a significant environmental impact.

The areas of the site to be retained contain several vegetation communities/ecosystems of significance which mostly occur below HAT. The majority of these communities (which includes marine habitats, rush/sedgelands and three types of sclerophyll forest [Casuarina, Pink Bloodwood/Brushbox, Paperbark]) are considered to be of ecological significance as a result of one or more of the following:

- Being a wetland environment (freshwater or marine)
- Representing riparian communities fringing Christies or Cudgen Creeks
- Being representative of a rare or vulnerable forest ecosystem (Upper Northeast Bioregion) or being a regionally significant vegetation community (Tweed Shire)
- Being representative of an Endangered Ecological Community

As such, the development has been designed to provide significant protection to native vegetation communities with only 1341sqm of currently slashed saltcouch central to the pasture/paddock to be modified. The balance of the development envelope shall be situated within the largely cleared pasture/paddock. As an acceptable offset to the loss of native vegetation it is proposed that an additional ~8100sqm of land contained within the 2e (residential/tourist) zone not be developed and be set aside for environmental purposes (i.e. within public open space or 7a (environmental protection) zoning. These lands to be protected include 4655sqm of the Coastal Saltmarsh 'endangered ecological community' and 109 native trees. As part of the offsets offered 1.94ha of currently modified/grassland habitats will be revegetated/rehabilitated to increase the extent of endangered ecological communities, broaden the width of riparian vegetation to Christies Creek and close current areas of fragmentation within inter-connected native remnants.

The flora survey of the site which identified the nine mapped vegetation community also resulted in the recording of 152 species of flora. None of the species recorded are listed as endangered or vulnerable under the *Threatened Species Conservation Act 1995.*

The fauna survey of the site (and immediately adjacent areas) resulted in the recording of 65 species of bird, 5 reptiles, 6 amphibians and 8 mammals (or evidence of their previous presence).

Of these species six (Osprey, Glossy Black Cockatoo, Black-necked Stork, Koala, Grey Headed Flying-fox, Little Bentwing Bat) are listed as endangered or vulnerable within 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 the six recorded species plus an additional three species which are considered possible occurrences on site and may have the potential to be impacted as a result of the proposal. Section 5A was also conducted for the recorded Endangered Ecological Communities. 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. 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 development proposal is considered unlikely to significantly affect fauna and associated habitat it will result in the minor loss of local habitat for native species through tree removal and development construction. In this regard recommendations have been included in this report regarding the management of habitats to be retained and the revegetation of native plants (including targeted foraging resources for threatened species) to partially offset losses.

10.0 ATTACHMENTS

Attachment 1: Site Plans
Attachment 2: Vegetation Community Mapping
Attachment 3: Flora Species List
Attachment 4: Fauna Survey Location Mapping
Attachment 5: NPWS Database Records
Attachment 6: Rehabilitation Plan

11.0 REFERENCES/BIBLIOGRAPHY

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