Lot 66 in DP 551005
Moonee Beach

‘Moonee Waters’
Residential Development & Conservation Reserve

Flora & Fauna Assessment

August 2006

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SYNOPSIS

Background and proposal

The subject site (Lot 66 in DP 551005 Moonee Beach) is located in the Coffs Harbour Local Government Area (LGA), and occupies an area of approximately 102 hectares. The site is located to the immediate south of the village of Moonee Beach, approximately half way between Coffs Harbour and the village of Woolgoolga.

The subject site, along with other land in the vicinity, has been the subject of several previous investigations and *Reports*. The subject site is located within an area of land being considered by Coffs Harbour City Council (CHCC) in respect of conservation values and development opportunities within the LGA, as part of a proposed *Development Control Plan* (DCP) for the Moonee area.

Approximately 69.05ha (68%) of the subject site is currently zoned 2(a) – Residential/Tourism, with the remainder zoned 7(a) – Environmental Protection (Coffs Harbour *Local Environmental Plan 2000*). The zoning of the land was revised by CHCC in 2000, in a process which substantially confirmed the extent and distribution of the Residential/Tourism land (76.3ha in LEP 1998 and 69.05ha in LEP 2000). This confirmation in 2000 by CHCC of the majority of land on the site in the Residential/Tourism zone was adopted notwithstanding the heightened levels of awareness concerning biodiversity conservation within Council at that time.

A *Development Concept* for the subject site has been prepared, with residential development on the more elevated portions of land, and the possibility[1] of a mixed tourism/residential development on land zoned for those purposes near the frontal dune. This approach would leave virtually all of the low-lying swamp forest and wetland communities on the site intact, and involves only approximately 30% of the subject site, and just 44% of the land zoned for such purposes.

The proposed development also includes an array of measures to protect retained vegetation and communities on the site, and native habitats and resources in the vicinity. In particular, the proposal includes management of the dedicated Conservation Reserve on the site (which occupies approximately 70% of the land) in perpetuity for conservation purposes. The Conservation Reserve is to be the subject of a *Vegetation Management Plan* to be implemented through a community title arrangement.

[1] It should be noted that the toruism/residential option for the southeastern corner of the site is not proposed to be pursued during the initial phases of the project. Rather, that area of the site which has been zoned for this purpose (on and behind the frontal dune at the southeastern corner of the site) would be considered in concert with the development of adjoining cleared land to the south.

Information Base and Site Characteristics

In addition to a substantial number of site inspections and visits, the subject site and adjacent lands have been investigated for flora and fauna on several occasions (the results of which are incorporated into this *Report*), including:

- a previous investigation of the subject by Yarranbella Environment Services (undated);
- several studies undertaken in the Moonee area for CHCC (Clancy 1989, 1990; Fisher *et al* 1996; G & V Clancy 1998; Ecograph 2002);
- a comprehensive investigation of the land to the immediate south (Parker 2004);
- a detailed investigation of flora and vegetation, which is incorporated into this *Report*; and
- two detailed fauna surveys of the land (Sandpiper 2003; this *Report*).

The subject site supports a mosaic of vegetation and plant communities including:

- sedgelands and estuarine wetlands in the eastern and northern parts of the land;
- swamp forest communities in low-lying portions through the central parts of the land;
- moist forest and riparian communities on the lower slopes and in drainage lines; and
- dry forest and woodland communities on the plateaus and upper slopes.

The subject land is essentially fully vegetated, with the exception of the cleared electricity transmission line. Most of the vegetation on the subject site is in relatively good condition, although there has been some formation of tracks, disturbance by previous mining, vehicular access and the dumping of urban refuse, and long-term timber harvesting. Nevertheless, weed infestations are generally low, except along tracks and the transmission line, and adjacent to the Pacific Highway. In addition, the land behind the frontal dune was mined for heavy minerals in the 1960s and 1970s, and now supports some areas of weed infestation.

Several of the plant communities in the low-lying parts of the subject site (the wetlands, estuarine vegetation and swamp forest communities) have been listed as "*endangered ecological communities*" on the *NSW Threatened Species Conservation Act 1995* (TSC Act). Whilst other vegetation on the site is also regarded as of regional conservation value, none is particularly restricted in distribution or regarded as of high conservation value.

Two threatened plant species have been recorded on and immediately adjacent to the subject site, following intensive surveys over a substantial period. The Rusty Plum *Amorphospermum whitei* and the Moonee Quassia were recorded as scattered individuals in the northern part of the subject site, in areas of moist Coastal Blackbutt Forest in the vicinity of the northern boundary (within the Conservation Reserve).

A number of threatened fauna species have been recorded on the site, including:

- the Osprey, Square-tailed Kite, Regent Honeyeater and Glossy Black Cockatoo;
- the Grey-headed Flying Fox, Yellow-bellied Glider, Koala, Comon Planigale and Common Blossom Bat; and
- the Eastern Freetail Bat, Little and Common Bent-wing Bats, Golden-tipped Bat, Yellow-bellied Sheathtail Bat and Large-footed Myotis.

Most of the threatened fauna species recorded on the subject site are highly mobile and wide-ranging, with the exception of the Koala, Yellow-bellied Glider and Green-thighed Frog. Consequently, the site represents only a small part of the available habitat for these species within their home ranges and in this location generally. For most of these species, the areas of the site which are to be affected constitute only a small part of the habitat for even individuals of the species.

For species such as the Koala, Yellow-bellied Glider and Green-thighed Frog, substantial areas of suitable or potemtial habitat are to be retained within the extensive Conservation Reserve on the site. Neither these, or any other threatened fauna species, will be deprived of habitat or resources as a result of the development proposed on the site.

Further, although a number of other threatened fauna and flora species could occur on the subject site (some of which have been recorded in the locality), there are no relevant resources of restricted or limited distribution present. As noted above, most of those communities and resources on the site which are regarded as of particular value are to be retained whereas those in the drier communities are of substantially greater distribution and abundance, and are consequently of lesser conservation values.

Impact Assessment

The proposed residential and tourism development of the subject site (as documented in the *Development Concept*) has been considered with respect to Section 5A (s.5A) of the *NSW Environmental Planning & Assessment Act 1979* (EP&A Act). With regard to those threatened flora and fauna species which have been recorded on the subject site, there is not "*likely*" to be a "*significant effect*" imposed as a consequence of the development, because of:

- the retention of substantial areas of habitat and resources both on the subject site and in the general locality;
- the extent of suitable resources and habitats in the locality and region;
- the mobility and distributional range of those species; and
- the impact amelioration and environmental management measures proposed.

Similarly, the proposed development is not "*likely*" to impose a "*significant effect*" upon any of the swamp forest, estuarine or wetland communities which have been listed as "*endangered ecological communities*" on the TSC Act. The majority of those plant communities are to be retained, and the development design (and specifically the stormwater management measures) are intended to protect areas of those retained plant communities on the subject site.

Given the foregoing, there is no requirement for the preparation of a *Species Impact Statement* (SIS) for the proposed development at Moonee Beach.

Consideration of the proposed development with respect to s.79C of the EP&A Act leads to the conclusion that the proposed development is both appropriate and reasonable with respect to impacts generally on the "*natural environment*". On balance, the proposed development facilitates a reasonable and appropriate use of the subject site, whilst maintaining the important environmental attributes which are present.

With respect to *State Environmental Planning Policy No. 14 – Coastal Wetlands* (SEPP 14), the proposed residential development on the subject site at Moonee Beach has been located to avoid the SEPP 14 Wetland which has been mapped on the site. The two areas of

proposed residential development (in the northwest and central south of the subject site) are located at a distance of between 20m and 50m from the SEPP 14 Wetland.

Development of the tourism site on the subject site (in the southeastern corner) would potentially involve activities up to the boundary of the SEPP 14 Wetland. This element of the development of the subject site (if pursued) would require a comprehensive analysis of and avoidance of impacts on the SEPP 14 Wetland. Whilst development of that portion of the subject site would not provide a setback from or buffer to the SEPP 14 Wetland, appropriate management of the development and associated activities can be implemented to avoid the imposition of adverse impacts upon the Wetland.

With respect to *State Environmental Policy No. 44 - Koala Habitat* (SEPP 44), the subject site does not constitute "*potential koala habitat*", as it does not support a canopy containing more than 15% of the listed Koala food tree species. Consequently, the subject site cannot constitute "*core koala habitat*" pursuant to SEPP 44, and this *Policy* does not pose an impediment to development of the site as envisaged in the *Development Concept*. Nevertheless, the Coffs Harbour Koala Plan of Management will be implemented as appropriate within the Conservation Reserve on the site, and ongoing monitoring of Koalas will be a feature of the VMP for the Conservation Reserve.

With respect to the *Coffs Coast Regional Park* (CCRP) which has recently been created under the auspices of the Department of Environment & Conservation (DEC), the overwhelming majority of development on the subject site is located at some considerable distance from that Park. Pedestrian access through the subject site and through the CCRP to the beach or the headland, would be designed and constructed in consultation with the DEC and CHCC, to ensure protection of the relevant attributes of the CCRP.

In addition, management of the Conservation Reserve on the subject site will contribute to management of the CCRP by the removal of areas of weed infestation. It is anticipated that consultation would be required to facilitate appropriate management of the CCRP to remove areas of dense weed infestation within that portion of land.

It is noted that the DEC has an expectation of 50m setback of development activities from the CCRP. This expectation has no statutory backing, however, and is not regarded as necessary (depending on the implementation of appropriate management measures to avoid disturbance to the CCRP). Indeed, provision of a 50m setback from the CCRP along the coast would prevent development of the southeastern section of the subject site. The *Development Concept* does not provide any details of development activities in that portion of the site, and the potential for development of that area of land would be the subject of further negotiations between the landowner, CHCC and the DEC.

With respect to the *Coffs Harbour City Vegetation Strategy*, it is noted that the majority of the subject site is mapped as *High Value Vegetation* or *Very High Value Vegetation.* However, the proposed development retains most of the vegetation on the subject site, and constitutes an appropriate compromise between development opportunities and conservation goals.

Basis for Impact Assessment

That the subject site at Moonee Beach has conservation value is accepted. The subject site is almost entirely vegetated, with only relatively small areas of previous disturbance or serious environmental degradation. However, biodiversity conservation significance is not uniformly distributed across the subject land.

In particular, it is noted that the low-lying portions of the subject site at Moonee Beach are of the highest conservation value or significance. These portions of the site support plant

communities which are regarded as of particular conservation value or significance, as demonstrated by the listing of most of the swamp forest communities and the freshwater wetlands on the subject site as "*endangered ecological communities*" in the TSC Act. By contrast, the dry forest communities are not identified as of such conservation value or significance, although representative examples of these drier communities will also be retained within the Conservation Reserve.

Given those circumstances, and the distribution of threatened biota on the subject site, it is both possible and appropriate to identify different levels of conservation constraint to potential developments across the subject site. That has been the basis upon which the *Development Concept* for development of the site has been generated, with vegetation of the lower biodiversity conservation values being identified for development purposes. It is of note that this approach reflects both the current statutory regime, and is in accordance with the land zonings provided over the subject site by CHCC in 2000.

Given all of the relevant considerations (both ecological and statutory), the *Development Concept* for the subject site at Moonee Beach clearly constitutes an appropriate and reasonable balance between development rights, expectations and needs and the goals of biodiversity conservation. The proposal involves development of those portions of the subject site which are of lower biodiversity conservation value (involving only 44% of the land which is zoned for development purposes) and the retention and protection of approximately 70% of the land (71.75ha) for biodiversity conservation purposes. That result represents an appropriate, reasonable and sustainable outcome on the subject site in terms of biodiversity, economic and social outcomes.

Impact Amelioration and Environmental Management

In addition to the retention and management in perpetuity of the Conservation Reserve on the site (occupying approximately 70% of the land), the proposal involves a range of impact amelioration and environmental management measures including:

- the use of "*water-sensitive urban design*" principles (as documented in the *Report* by Patterson Britton & Partners) which include bioretention swales, rainwater tanks, water quality management and the maintenance of hydrologic regimes:
- the collection and re-use of vegetation and other natural resources (logs, tree-hollows *etc*) from development portions of the site;
- the use of a peripheral road system to provide for appropriate bush fire protection and access by fire fighters when required;
- the provision of dedicated and sensitively designed and located public access (pedestrian and bicycle paths, elevated boardwalks) across the subject site;
- a preparation of a detailed *Vegetation Management Plan* (VMP) for the Conservation Reserve and its implementation in perpetuity;
- the preparation of a *Community Title Management Plan* for the conserved portions of the site to ensure their appropriate management and protection *in perpetuity*; and
- the implementation of appropriate measures during construction activities to avoid the discharge of wastes, pollutants, chemicals or rubbish into retained areas of vegetation.

LOT 66 DP 551005
MOONEE BEACH

PROPOSED RESIDENTIAL & TOURIST DEVELOPMENT
'MOONEE WATERS'

FLORA & FAUNA ASSESSMENT

August 2006

PART A	**INTRODUCTION and INFORMATION BASE**

1 INTRODUCTION

1.1 Background

The subject site (Lot 66 in DP 551005 Moonee Beach) is located in the Coffs Harbour Local Government Area (Figure 1) and occupies an area of approximately 102 hectares. The site extends from the Pacific Highway in the west to Crown (state owned) land along the coast in the east, and from a tributary of Moonee Creek in the north southwards to a fire trail on a Crown road reserve (Figure 2).

The site is variously zoned 2(e) - Residential Tourist, 7(a) - Environmental Protection (Habitat and Catchment) and 6(a) - Public Recreation (Figure 3), pursuant to Coffs Harbour *Local Environmental Plan* 2000 (LEP 2000). It is of special relevance and note that the extent of the residential land on the subject site was confirmed by CHCC in 2000, despite ecological and environmental considerations being of particular relevance in Council's deliberations at that time.

The development concept detailed in the *Development Concept* (Figure 4) which has been prepared for the subject site at Moonee Beach (the 'Moonee Waters' project), which is the subject of this *Flora & Fauna Assessment Report,* is the result of extensive consideration of the environmental, flooding and physical constraints on the land. Of particular relevance in this regard have been matters relating to aquatic (marine and freshwater habitats), the presence on the site of a wetland listed on SEPP 14[2] and species, communities and/or habitats of conservation significance (particularly with respect to threatened biota listed on the TSC Act).

1.2 Statutory and Environmental Approach

The development design which has been generated for the project as indicated in the *Development Concept* (Figure 4), has not sought to maximise development opportunities within the appropriately zoned lands on the subject site (Figure 5). Conversely, the approach has been to recognise the relevant environmental constraints to development activities and to provide an appropriate balance between development objectives and conservation of environmental values.

[2] SEPP 14 is *State Environmental Planning Policy No. 14 – Coastal Wetlands*.

The approach which has been adopted in designing the proposed development of the Moonee Beach site has included detailed consideration of:

- the physical and biological attributes of the land as a primary determinant of any constraints to development activities on the land. In particular, the *Development Concept* was derived as a result of the biodiversity constraints identified by Gunninah, and several potential development areas on the site were removed specifically to generate a more desirable environmental outcome;
- the current zonings of the land and the history of changes to those zonings;
- relevant statutes and environmental planning instruments (including the EP&A Act, TSC Act, FM Act, SEPP 14, SEP 26, SEP 44, LEP 2000 and the CHCC *Vegetation Conservation Strategy*)[3]; and
- the application of 'best practice' approaches to stormwater management, urban design (including 'water-sensitive urban design'), bushfire protection requirements and environmental management.

1.3 Flora & Fauna Assessment

This *Flora & Fauna Assessment Report:*

- collates information obtained during various investigations of the subject site by various investigations over several years (see below and in the Bibliography);
- incorporates data obtained from dedicated flora and fauna investigations and surveys conducted on the site for this project:
- considers the significance of impacts which would or may be imposed by the proposed residential and tourist developments with regard to relevant statutes and planning instruments; and
- considers the appropriate impact amelioration and environmental management measures incorporated into the development proposal.

2 INFORMATION BASE

The subject site and other lands in the immediate vicinity have been investigated for flora and fauna on several occasions over approximately 17 years:

- several investigations of the subject site and other land in the vicinity commissioned by Coffs Harbour City Council (CHCC), including part of a series of flora and fauna surveys around Moonee Beach (Clancy 1989, 1990; G & V Clancy 1998), and vegetation mapping of the site as part of the *Coffs Harbour Conservation Strategy* (Fisher *et al* 1996; Ecograph 2002);
- a detailed flora and fauna survey of the land to the immediate south (the North Sapphire Beach project) by Peter Parker Environmental Consultants (2004);
- a previous site-specific investigation by Yarranbella Environment Services (undated);
- a detailed flora and vegetation investigation and analysis, which is incorporated into this *Assessment Report*;
- a detailed *Fauna Survey & Assessment Report* (undertaken independently by Sandpiper Ecological Surveys in 2003), which is appended to this *Report* as

[3] See the *Glossary* for full titles of these statutes and instruments.

Appendix 3; and

- a supplementary fauna survey undertaken in April 2006 by Michael Welsh (ecological consultant), which is attached to this *Report* as Appendix 4.

In addition, a number of field inspections have been conducted on the subject site over the period between 2003 and 2005 by Mr F Dominic Fanning and Mr Gary Leonard of Gunninah Environmental Consultants, in collaboration with others involved in the development design. Included amongst these was a supplementary site investigation in July 2005, in the company of Mr Paul Anink of Marine Pollution Research (MPR), to survey aquatic habitats and watercourses and to provide additional site information regarding flora and fauna in general.

It should be also be noted that Gunninah Environmental Consultants has considerable experience in the Coffs Harbour area as a result both of a substantial number of investigations undertaken previously in this locality and because of the local experience of Mr Gary Leonard.

2.1 Flora Surveys and Investigations

Baseline Information

A desktop review was undertaken prior to the flora surveys to obtain information regarding native vegetation and flora species in the locality. This involved examination of topographic maps and aerial photographs of the subject site and surrounding lands, searches of flora databases, and an appraisal of relevant literature and previous flora studies prepared for vegetation in the locality and region.

A search of the NSW National Parks & Wildlife Service (NPWS) Wildlife Atlas for threatened flora species previously recorded within a 10km radius of the study area was also conducted. Vegetation mapping of the site prepared by Fisher *et al* (1996) and interpreted by Ecograph (2002), as part of the *CHCC Vegetation Conservation Strategy*, was obtained from Council.

Reviewed texts include Tweedie *et al* (1995), Fisher *et al* (1996), Griffith (1993) and Hager & Benson (1992) for flora descriptions, and NPWS (1994, 2000) for threatened and vulnerable flora species. A previous study of the subject site by Yarranbella Environment Services (undated) was also considered, and the findings incorporated into this *Report*.

Previous Investigations of Flora and Vegetation

Other flora investigations have also been undertaken both on the subject site at Moonee Beach and on adjoining and surrounding lands. Investigations undertaken on behalf of CHCC include:

- flora and fauna surveys undertaken in the Moonee area (Clancy 1989, 1990);
- the mapping of vegetation of the Coffs Harbour City Council LGA (Fisher *et al* 1996; Ecograph 2002); and
- a *Flora & Fauna Assessment* for the Moonee Release Area (G & V Clancy 1998).

The flora and fauna surveys by Clancy on and in the vicinity of the subject site (1989) indicate that field investigations were undertaken between the 11th of August and the 14th of September 1989, although there is no indication as to the intensity of surveys undertaken on the subject site itself.

A further investigation of lands at Moonee generally, including on the subject site, was

undertaken by G & V Clancy (in 1998) over a period including the 8th to the 11th of June and the 30th of June to the 1st of July 1998. Again, there are no details regarding the investigations undertaken on the subject site, although the provision of mapped records in the *Report* indicates that at least the site was inspected.

The mapping and vegetation of the CHCC area (Fisher *et al* 1996) identifies a detailed survey method approach involving;

- aerial photograph interpretation (API);
- stratification of survey sites; and
- a sampling procedure utilising methods identified in the Natural Resources Audit Council (NRAC) *Guidelines*. The surveys were undertaken over a period of seven months between August 1995 and March 1996 (Fisher *et al* 1996), although no details of the investigation of any specific sites within the subject land are provided.

Flora Surveys Undertaken for this Report

Following the initial site inspection in mid 2002, a detailed walked survey of the subject site was undertaken on the 11th, 12th and 13th of October 2002. A large aerial photograph of the study area was used to during the survey, and all stands of vegetation within the site were located and inspected.

The botanical surveys have utilised both the 'Random Meander Technique' method of Cropper (1993) and relevant techniques outlined by York *et al* (1991). The surveys were conducted to determine the location, condition and extent of plant communities, and the location and an inventory of plant species on the site. The vegetation types present are described according to the classifications used by the Forestry Commission of New South Wales (1989) and Tweedie *et al* (1995) in the regional context, and Fisher *et al* (1996) in the local context.

Specific searches were also undertaken for plant species of conservation significance using the 'Random Meander Technique' (Cropper 1993), which involves the selection of areas of potential habitat for particular species and the conduct of dedicated searches within those areas. The species for which searches were undertaken were determined by reference to the NPWS database, Tweedie *et al* (1995) and Fisher *et al* (1996). Species of particular interest included the Rusty Plum *Amorphospermum whitei* and *Quassia* sp. A 'Moonee Creek', as well as threatened ground orchids known to occur in the locality.

The timing of the main flora survey may have reduced the likelihood of detecting some flora species, including cryptic species such as *Cryptostylis hunteriana* (which is only visible for a few weeks when flowering) and *Phaius australis* (which is only visible for a few months). To compensate, targeted searches for these species were undertaken subsequently by returning to the site and searching appropriate habitats twice per month between October 2002 and February 2003. Additional surveys of the flora and vegetation of the site have been conducted by Mr Gary Leonard on a variety of occasions between 2004 and 2006.

2.2 Fauna Surveys and Investigations

Baseline Information

A search of the NSW National Parks & Wildlife Service (NPWS) Wildlife Atlas for threatened fauna species previously recorded within a 10km radius of the study area was also

conducted. Published data on the distributions of threatened and vulnerable fauna species by the NPWS (1995, 2000) were also considered.

The NPWS Wildlife Atlas records are not provided to a high level of accuracy, and therefore cannot be verified as having occurred on the subject site at Moonee Beach. However, all records obtained in the near vicinity are treated as if they may have been obtained from the subject site at Moonee Beach (dependant on the presence of suitable habitat).

It is apparent from conversations with CHCC officers that other observations (some opportunistic or anecdotal) of native fauna have been undertaken on the subject land or on adjoining lands over a number of years. Whilst those investigations have not been documented, a number of observations of native fauna from the subject site and adjoining lands are known.

Previous Investigations for Fauna

A number of fauna surveys have been conducted on the subject site and/or on adjacent lands over an extended period including:

- the Moonee flora and fauna surveys undertaken by Clancy (1989,1990) for CHCC;
- the *Flora & Fauna Assessment* for the Moonee Release Area undertaken by G & V Clancy in 1998) for CHCC. These investigations involved:
    - direct observation and aural records of birds;
    - mist-netting of birds;
    - diurnal observations, spotlighting, trapping and carcass identification;
    - direct observations of reptiles and amphibians; and
    - identification of road kills; and
- the investigations by Parker (2004) on the immediately adjacent land to the south, which included observations over a number of site inspections in late 2003 and early 2004 (*ie* during the summer months).

The investigations by Clancy were undertaken between the 11th of August and the 14th of September 1989 (in that part of the Moonee Beach study area which includes the subject site), between the 9th of November and the 7th of December 1989 (for other portions of the Moonee study area), and between the 8th and 11th of June and the 30th of June and 1st of July 1998 (G & V Clancy 1998).

Dedicated Surveys for this Report

The subject site has been inspected on at least seven occasions by Mr F Dominic Fanning of Gunninah Environmental Consultants between 2002 and 2006. These investigations, whilst generally consisting of only walked surveys over the whole or part of a day, provide information regarding relevant habitats and resources for native fauna, as well as records of individual fauna species sighted.

A comprehensive investigation of fauna and fauna habitats was undertaken between the 18th and 23rd of July 2003 (Sandpiper 2003; Appendix 3). The weather conditions during the survey period were mild to warm, and considered suitable for detecting most of the species likely to frequent the site.

A substantial array of specific fauna survey methods were implemented on the subject site at Moonee Beach by Sandpiper (Appendix 3), including:

- diurnal bird surveys, reptile surveys and habitat assessments;
- the use of hair-tubes to indirectly survey for native mammals;
- the use of cage traps and elliott traps (both tree-mounted and terrestrial) to survey for native fauna; generally, but particular for terrestrials and scansorial mammals;
- installation of pit-fall traps to survey for small reptiles, amphibians and small terrestrial mammals;
- the use of call playback to survey for forest owls and arboreal mammals;
- dusk censuses for nocturnal species leaving their diurnal roost or nest sites;
- the use of harp traps and Anabat recorders to survey for microchiropteran bats; and
- extensive spotlighting transects of the subject site.

A supplementary fauna investigation was undertaken on the subject site at Moonee Beach in April 2006 (Appendix 4), between the 3rd and the 9th of April inclusive. These additional investigations were undertaken to target a range of native biota which are more likely to occur on the subject site during the warmer parts of the year, or species which become more cryptic or which move away during the cooler months.

The supplementary fauna investigations in 2006 (Appendix 4) included a variety of survey techniques including:

- spotlight surveys over six evenings for a total of 23.3 person-hours;
- the use of pitfall traps for small terrestrial species (24 pit-nights);
- the deployment of harp traps for microchiropteran bats (10 trap-nights);
- the deployment of Elliott traps (both A and B sizes) located in trees and on the ground, involving a total of X trap-nights;
- stag-watching for arboreal mammals and microchiropteran bats (by two ecologists on one evening);
- diurnal bird and herpetological searches;
- Koala scat surveys over a total of approximately 17.5 person-hours within the development areas on the site;
- call playback for forest owl species and the Yellow-bellied Glider (2 evenings for one hour per evening); and
- Anabat surveys for microchiropteran bats over a total of 34.5 hours.

Information regarding fauna on the site, particularly threatened species, which has been proferred by others (including officers of CHCC and of DEC) and/or requested by Gunninah for the preparation of this *Report* has also been included where available.

2.3 Survey Limitations

Dedicated and broad-scale surveys of the flora and vegetation of the subject site have been conducted on many occasions over a range of seasonal and climatic circumstances. Whilst it is doubtless possible that additional threatened flora species would be located on the site, the investigations conducted to date have been substantial and comprehensive.

Whilst the fauna surveys of the subject site at Moonee Beach have some limitations (as do all fauna surveys other than those with the opportunities provided by unlimited time and budget constraints), they have also been thorough and relatively intense. In addition to the investigations conducted for the 'Moonee Waters' project, this *Report* relies on other observations by various observers at different times and historical data (see Bibliography).

Analysis of the landscape and habitat attributes of the site, based on the experience of the principal author and others involved in the investigations, has also contributed to the site and impact assessment. Other information (such as sub-regional vegetation mapping and databases) is also important in the analysis of conservation values.

It is also a relevant consideration that the proposal does not involve the removal in totality of any habitats or resources from the subject site. Consequently, it is not likely that any threatened biota would be excluded from the site as a result of the actions proposed.

3 SITE DESCRIPTION

3.1 Landscape Elements

The subject site occupies an area of land (of 102.02ha) at Moonee Beach on the coast of NSW, to the north of Coffs Harbour. Elevations on the site range from 10m in the western part of the site (near the Pacific Highway) and 15m in the southwestern part of the site to sea level along the tributary to Moonee Creek which is (located along the northern boundary of the site).

The topography of the subject site is level to slightly inclined, with drainage generally to the east and north. The site essentially has three main landscape elements:

- the elevated portions of the site in the west and southwest, located essentially within the 2(e) - Residential and Tourist Zones;
- substantial areas of low-lying and flood-prone land through the centre of the site, in the north (adjoining the tributary to Moonee Creek) and along the watercourses in the southwestern parts of the site. A substantial proportion of this part of the subject site is zoned 7(a) - Environmental Protection, although significant areas in the southwestern parts of site are located with the 2(e) zoned lands; and
- the frontal dune, which is zoned 2(e) in its southern part and 7(a) in the north.

3.2 Soils

Large-scale mapping of soil landscape groups by Milford (1999) indicates the occurrence of a number of soil types including:

- the Newports Creek soil landscape group over a large proportion of the site;
- smaller areas of the Goolawah soil landscape group along the eastern part of the site;
- soils of the Look-At-Me-Now, Ulong and Moonee soil landscape groups in the north; and
- soils of the Coffs Harbour and Toormina soil landscape groups in the southeast.

Characteristics of the various soil types are provided by Milford (1999):

- swamp soils of the Newports Creek group are derived from Holocene alluvium, and consist of deep poorly drained yellow podzolic soils and humic gleys. This soil type occurs along the drainage lines and watercourses:
- beach soils of the Goolawah group, which consist of deep well-drained siliceous sands and holocene quartz beach sands, as well as medium aeolian sands where dunes are formed. This soil group extends along the eastern boundary of the subject site;
- soils of the Coffs Harbour group which occur on Pleistocene sand plains, and consist of deep moderately to poorly drained podzols with sandy acid peats and peaty podzols in swamps. Estuarine soils of the Toormina group occur on very low intertidal mudflats and sandflats, and consist of estuarine sands and muds. Small areas of soils derived from the Coffs Harbour and Toormina group occur in the southeastern section of the subject site;

- soils of the Look-At-Me-Now group occur are derived from Late Carboniferous metasediments, on the headland in the northeast corner of the subject site;
- erosional soils of the Ulong group are derived from late Carboniferous metasediments, and occur on undulating to rolling low hills. This soil group occurs in a narrow section to the west of the headland; and
- further to the west, on low-lying land, is a narrow section of soils derived from the Moonee group. Soils of the Moonee group consist of transferral soil materials from upslope metasediments, and mainly consist of poorly drained humic gleys (Milford 1999).

3.3 Broad Vegetation Characteristics

A discussed in detail below, the whole of the subject site is vegetated with a range of plant communities ranging from sedgelands to tall open coastal forest (Figure 6).

The vegetation is generally in good to excellent condition, although there has been ongoing logging of the coastal forest vegetation over a long period, and there are a number of access tracks through the site (which are used for the dumping of rubbish and vehicles). A cleared or slashed transmission line is also located on the western side of the subject site, parallel to the Pacific Highway. In addition, a band of the site behind the frontal dune was mined for heavy minerals in the 1960s and 1970s.

4 FLORA & VEGETATION

4.1 Plant Species

An inventory of plant species was compiled during the botanical surveys and investigations undertaken for this project (Appendix 1) of plants including both native and introduced plant species recorded on the site. The frequency of occurrence within the broad three vegetation groups is included for all species. Data from other investigations on the site (see Bibliography) have also been included in the inventory, where accurate data are available.

A total of 296 native plant species were recorded on the subject land, including one threatened species and one species of regional conservation significance (Appendix 1). Seven weed species which are listed as noxious in the Coffs Harbour City LGA were also recorded on the subject site, and an additional 47 introduced species have also been recorded (Appendix 1).

As detailed below, two threatened plant species (listed on the TSC Act) have been recorded on the subject site at Moonee Beach (Figure 6);

- the Rusty Plum *Amorphosperum whitei* was recorded in moist Blackbutt forest with a mesic understorey in or close to the northern parts of the subject site, on the creek flats immediately south of the tributary to Moonee Creek located along the northern boundary of the site and also extends along the tributary to the west; and
- the Moonee Quassia (*Quassia* Sp. A 'Moonee Beach') which was also located along the banks of the northern tributary to Moonee Creek on the northern side of the site. This population also extends across the Pacific Highway to the west.

One plant species of regional conservation significance (the Climbing Maidenhair *Lygodium microphyllum*) was also recorded in stands of paperbark forest on the site. According to

Harden (2000), this species is "*not common*" and occurs "*north from Iluka*", but it has not been listed as a threatened species on the TSC Act.

4.2 Plant Communities

Continuous stands of native vegetation cover most of the subject site (Figure 6), except along the powerline easement, existing tracks and fire-trails, and in previously disturbed (including mined) areas of the site. Other activities on the subject site have included long-term logging, rubbish and vehicle dumping, and some apparent areas of previous sand-mining activities.

Large-scale vegetation mapping for the CHCC *Vegetation Conservation Strategy* identified 12 plant communities on the site (Figure 7), whilst the detailed mapping for this *Report* indicates the location and extent of 14 plant communities on the subject site (Figure 6). Plant communities mapped in this study which were not included in the CHCC mapping include Turpentine Open Forest (in the northwest of the study area), Coastal Riparian Open Forest (in the southwest) and Coastal Red Gum Forest (along a section of the estuarine margins).

The plant communities present on the subject site at Moonee Beach (Table 1) are divided into five main vegetation types:

- dry forest communities, including those dominated by Blackbutt, Forest Red Gum and Turpentine;
- swamp forest and moist woodland communities, including those characterised by Swamp Paperbark, Swamp Mahogany and Swamp Oak, and narrow bands of Flooded Gum;
- sedgeland and rushland communities in the low-lying portions of the site;
- vegetation on the foredunes;
- saltmarsh and mangrove communities; and
- small areas of rainforest vegetation.

4.2.1 Dry Forest Communities

This group of plant communities includes:

- substantial tracts of the Dry Blackbutt Open Forest to Tall Open Forest vegetation (Map Unit N44a of Fisher *et al* 1996); and:
- small areas of several other varieties, including the Coastal Red Gum Forest and Turpentine Open Forest. These vegetation types are described as Map Units N1A and SF49 (Fisher *et al* 1996).

The tree canopy within the dry forest communities is up to 30m in height, although more typically reaches 25m in height dependent on disturbance history and the age class of the canopy trees. The canopy cover varies from less than 20% to more than 45%, with occasional patches of higher canopy cover.

The understorey and midstorey layers vary according to previous levels of disturbance and consist of juvenile and young trees, areas of she-oak and a relatively low density of shrubs (except where weed species are present). The groundcover layer is generally sparse, consisting of a range of forbs, grasses and ferns.

Common canopy species include the Blackbutt, Red Mahogany, Pink Bloodwood and Smooth-barked Apple, with smaller stands of dry forest dominated by Turpentine or Forest Red Gum (Figure 6). Common small tree species include Brush Daphne, Black Oak, Forest Oak and Rose Myrtle.

Common sedge and grass species include the Mat-rush, Basket Grass, Weeping Grass and Kangaroo Grass, with patches of fern species including Bracken, False Bracken and Rasp Fern.

The dry forest communities occupy all of the more elevated portions of subject site, including all of the northwestern quadrant. Small areas of these dry forest communities are also located along the southern boundary (western half) of the subject site, with a second large area (predominantly of Blackbutt Open Forest) located in the central southern part of the site (Figure 6).

Most of the dry forest vegetation within the subject site is characterised by a canopy of Blackbutt, and conforms to map unit N44a of Fisher *et al* (1996). The Blackbutt Open Forest vegetation occupies most of the northwestern quadrant of the subject site, as well as the bulk of the elevated land in the southern portion of the site. Small parts of the Blackbutt community on lower lying portions of the land (particularly along the northern boundary) appear to conform more closely to the moist Blackbutt (N7) community of Fisher *et al* (1996).

The dry Blackbutt community on coastal flats is identified by Fisher et al (1996) as being "*related to coastal sand deposits*", and occupies the higher lands on these deposits adjacent to the swamp forest communities which occupy the lower portions of the subject site.

A stand of open forest which contains a large proportion of Turpentine is located within the northwestern stand of Dry Blackbutt Open Forest. According to Fisher *et al* (1996), Map Unit SF49 is an association of Turpentine with Flooded Gum, Grey Ironbark, Brushbox and Pink Bloodwood, and "*occupies a wide range of sites in small patches along the coastal plain*".

A small stand of Forest Red Gum Woodland was identified along a section of the 'northern' tributary of Moonee Creek, opposite the Moonee Caravan Park (Figure 6). Although mapping by Fisher *et al* (1996) does not indicate the occurrence of Map Units N1a and N1b (Coastal Forest Red Gum) on the subject site, there are several small stands to the north of the Caravan Park.

4.2.2 Swamp Forest and Moist Woodland Communities

This community type includes the Swamp Paperbark, Swamp Mahogany and Swamp Oak, and Flooded Gum Open Forest and Woodland communities (Figure 6), which have been described as Map Units N50, N26a, N52 and N52a by (Fisher *et al (*1996). These vegetation types include two "*endangered ecological communities*" listed on the TSC Act (see below). In addition, areas characterised by the Flooded Gum are located at the interface between some areas of swamp forest vegetation and drier forest communities.

The Swamp Forest and Moist Woodland communities are generally dense, with trees reaching 15-20m (rarely to 25m in height). The canopy cover is generally dense except along community edges, with a Folage Projective Cover (FPC) varying from 35% to more than 50%. The shrub and small tree understorey extends to a height of 12m, and there is a generally dense groundcover of ferns, forbs, sedges and some grasses.

Common canopy species include the Swamp Oak, Broad-leaved Paperbark, Swamp Mahogany and Pink Bloodwood, with smaller tree species including Pink Tips, Blueberry Ash, Smooth Cheese Tree and several paperbarks. Common fern species include Bracken, False

Bracken and Rasp Fern, and common sedges include Settler's Flax, Mat-rush and Saw-sedge. Vine species include Twining Guinea Flower, Native Sarsparilla, Wombat Berry and Native Grape.

The Swamp Forest and Moist Woodland communities are distributed through the central eastern part of the subject site, and in a band along the main drainage lines in the southwestern part of the site. In many instances, these moist communities are intermingled, forming a mosaic with some patches dominated by paperbarks and other patches dominated by Swamp She-oak.

The major bands of this vegetation type are located through the central, southern and southwesten parts of the subject site, and occupy much of the low-lying land. Localised concentrations of various canopy species (including Swamp She-oak, Swamp Mahogany, Swamp Paperbark and occasionally Flooded Gum) are scattered throughout the major distribution of the most common plant communities (Figure 6).

A stand of Swamp Mahogany Open Forest is present in the central part of the northern section of the subject site, extending from the southern banks of the tributary of Moonee Creek along the northern boundary of the site, and merging with Sedgeland/Rushland at the southern end. Swamp Mahogany is the most common canopy species in this stand, with occasional Red Mahogany, Swamp Turpentine and Forest Red Gum. This plant community is described by *Fisher et al* (1996) as Map Unit N52.

An additional small stand of vegetation which follows a broad drainage line was tentatively identified as Coastal Riparian Open Forest, although this plant community was not included in the study area by Fisher *et al* (1996) or by Ecograph. Fisher *et al* (1996) consider that this plant community only occurs "*west of the Pacific Highway*". The most common canopy species in this stand is Flooded Gum, with occasional Blackbutt and Tallow-wood. The understorey consists of mesic species including paperbarks, Black Wattle, Guioa and Scentless Rosewood.

Three small stands of tall open forest which include a large proportion of Flooded Gum were also identified in the northwest of the subject site (Figure 6). Other canopy species within these stands include Tallow-wood and Brushbox, and the number of mesic species in the understorey indicate an affinity with Map Unit N52a (Fisher *et al* 1996).

4.2.3 Sedgeland/Rushland Community

This community type includes Map Units SG6402 and SG6502 (Fisher *et al* 1996), and conforms to an "*endangered ecological community*" listed on the TSC Act (see below).

The Sedgeland/Rushland community (Figure 6) is characterised by dense sedges to 1.5m in height with scattered shrubs to 2m and occasional emergent trees to 8m in height.

The most common sedge species include Bare Twig-rush, Soft Twig-rush, Tussock Sedge and Bog-rush. Common herb and forb species include Water Peppers, Woolly Frogmouth, Native Reed and Buttercup. Emergent tree and shrub species include Wallum Bottlebrush, Broad-leaved Paperbark and Swamp Oak.

The largest continuous stands of this vegetation type occur on flat low-lying ground through the northeastern part of the subject site, mostly within the mapped SEPP 14 wetland (Figure 6). Components of this vegetation type also occur as an understorey in some swamp forest stands.

4.2.4 Mangrove/Saltmarsh Complex

The Mangrove/Saltmarsh Complex is identified by Fisher *et* al (1996) as Map Units SG2502 and SG6102, and occupies coastal creeks and estuaries on the site and north of the site (Figure 6).

A narrow band of Mangrove/Saltmarsh Complex also extends along a small estuary which drains into the tributary of Moonee Creek located along the northern boundary of the subject site. Components of this plant community, especially small patches of or isolated mangroves, also extend into the adjacent Sedgeland/Rushland, and along the northern tributary.

The mangrove community occurs as scattered trees within saltmarsh patches and along tidal edges of the watercourses and estuary, with a canopy varying from 0% to 35% cover. In areas dominated by mangroves, there are no understorey species, but at slightly more elevated sites an understorey of saltmarsh species is present.

Grey Mangrove forms a narrow band along the tidal edge, while grasses such as *Zoysia macrantha* and *Sporobolus* spp. grow in association with the sedge and rush species which also occur in the adjacent Sedgeland/Rushland.

The Mangrove/Saltmarsh Complex is located along the northern boundary of the subject site approximately over its eastern half, as well as along a tidal estuary in the northern central part of the subject site. This community type occupies only a very small proportion of the subject site at Moonee Beach.

4.2.5 Foredune Complex

This community type includes a mosaic of vegetation types (grassland, shrubland and tall shrubland) and is described as Map Unit N75a by Fisher *et al* (1996).

Much of the Foredune Complex is characterised by shrubs and small trees, varying in height from 1m to 8m. Density is also highly variable, according to the age class of existing vegetation and the species present, and the FPC varies between 15% and 70%. The groundcover mostly consists of a dense cover of grasses to 1.2m in height.

Common shrub species include Coast Banksia and Coast Wattle, with other shrub species including the introduced Coast Tea-tree, Bitou Bush and Lantana. Small trees include Tuckeroo and Beach Oak. Groundcover species include the native Kangaroo Grass and Spinifex, as well as a range of introduced grass species (particularly patches of the highly invasive Molasses Grass).

This plant community occurs as a continuous band along the eastern section of the subject site (Figure 6). The Foredune Complex generally merges to the west either with Swamp Paperbark, Swamp Mahogany or Swamp Oak stands or with Sedgeland/Rushland.

4.2.6 Headland Heath and Grassland

A narrow band of Headland Heath and Grassland (Map Units SG3602 and SG3513 of Fisher *et al*) is present in the northeastern part of the subject site (Figure 6).

A large stand of the Headland Heath and Grassland community is located on Moonee Headland, and mainly consists of a dense sward of Kangaroo Grass with prostrate shrub species. On steeper slopes, shrubs including Coast Banksia, Black Oak and Swamp Oak

are present, either as isolated individuals or in small clumps. Where shrubs occur, Fisher *et al* (1996) describe the plant community as SG3513.

This area was searched for several plant species of conservation significance known to occupy this habitat type, including *Zieria prostrata, Pultenaea maritima, Thesium australe, Plectranthus cremnus* and *Chamaesyce psammogeton.* None of these species was recorded on the subject site itself, but substantial stands *Pultenaea maritima* are present on the Moonee Headland.

4.2.7 Tuckeroo Littoral Rainforest

This community type includes Map Unit LR 17 (Fisher *et al* 1996), and an adjoining small area of Headland Brush Box - Map Unit LR18 (Fisher *et al* (1996).

The Tuckeroo Littoral Rainforest community is characterised by a canopy layer varying in height from 5m to 15m, with an FPC varying between 25% and 75%. In places where the tree canopy is dense there is little or no understorey or groundcover, but in more open spaces there is a groundcover of sparse grasses, herbs and sedges.

Common tree species include the Tuckeroo and Three-veined Laurel, and other tree species include the Coast Banksia, Swamp Oak and Brush Cherry. The most common understorey species is Coast Wattle, and groundcovers (in the more open areas) consist mostly of species such as Kangaroo Grass, Snake Vine and White Supplejack.

The best example of this plant community is located on the northern boundary of the site (Figure 6) across Moonee Creek from the Caravan Park. This stand of Tuckeroo Littoral Rainforest merges to the east with a small stand of Map Unit LR18 - Headland Brushbox.

A small narrow band of Map Unit RF53 - Brushbox Closed Forest occurs in the northwest of the subject site, along the banks of the tributary of Moonee Creek. In both Brushbox plant communities, Brushbox is the most common canopy species.

Table 1. Vegetation types recorded by Gunninah on the subject site at Moonee Beach, with corresponding types identified by Fisher *et al* (1996).

Veg Type	**Description**	**Location on the Subject Site**
SG3513	Headland Heath and Grassland (some trees)	Extending from Moonee Headland southwards along hind dune; highly degraded on site
SG6302	Headland Heath and Grassland (no trees)	Mostly reserved on Moonee Headland
N75A	Foredune Complex	South from Moonee Headland, extending along the foredune; substantially mined in the 1960s and 1970s
SG2502	Mangrove/Saltmarsh Complex	Estuarine conditions at mouth of tributary of Moonee Creek adjacent to northern limit of Sedgeland/Rushland; along northern part of main watercourse (intermittently) through SEPP 14 wetland
LR17	Tuckeroo Littoral Rainforest	Southern side of tributary of Moonee Creek, adjacent to foot-bridge
LR18	Headland Brushbox Closed Forest	Small patch on southern banks of tributary of Moonee Creek
N52	Swamp Mahogany Open Forest	South banks of tributary of Moonee Creek; margins of swamp vegetation
N50	Swamp Paperbark/ Swamp Mahogany/ Swamp Oak Open Forest and Woodland	Large continuous stands on low-lying land through the eastern and central parts of the subject site
N44A	Dry Blackbutt Open Forest	Large continuous stands in northwest and central southern parts of the site; also along the tributary of Moonee Creek at the northern boundary of the site
N1A#	Coastal Red Gum Forest	Small patches on shoreline, opposite caravan park (larger stands on northern side of Moonee Creek)
N27	Flooded Gum Open Forest	Moonee Creek, south of Parish Close and small bands through central western part of the site
SF49#	Turpentine Open Forest	Northwestern quadrant of the site
RV1#	Coastal Riparian Open Forest	Drainage line flowing south to north through the middle of the subject site
RF53	Brushbox Closed Forest	Banks of tributary to Moonee Creek along the northwestern boundary of the site
N20a	Broad-leaved Paperbark	Along drainage line in the southwest and in low-lying land in the eastern part of the site
SG6502	Sedgeland/Rushland	Broad patch in the northeastern part of the site through part of the SEPP 14 Wetland

* Sources: Fisher, Body and Gill (1996) or as listed on the TSC Act
\# included in mapping by Ecograph

4.3 Conservation Significance

4.3.1 Plant Species

Two plant species of state conservation significance (the Rusty Plum *Amorphospermum whitei* and the Moonee Quassia *Quassia* sp. B 'Moonee Beach') have been recorded on the subject site during the dedicated surveys on the site. No other threatened plant species have been recorded on the site, although it is possible that several other species are present.

The Rusty Plum has a ROTAP rating of 3RCa and is listed on the TSC Act as a "*threatened species*". This species occurs in rainforest and wet sclerophyll forest from north of the Macleay River to southeastern Queensland. The Rusty Plum may grow as a small or medium-sized tree, and has been recorded in the locality at Pine Creek State Forest, Bruxner Park, Woolgoolga Creek and Waihou Forest Reserves (Floyd 1989). Tweedie *et al* (1995) observe that this species "*appears to be common in the logged wet sclerophyll forests that have regenerated over the past 20-30 years*" in the Coffs Harbour-Urunga Management Area.

Specimens of the Rusty Plum were located in areas of Blackbutt Forest with mesic understorey in the northern part of and/or to the north of the subject site (Figure 6). All specimens were located on the low flats immediately south of the tributary to Moonee Creek located along the north of the subject site.

The Moonee Quassia *Quassia* sp. B 'Moonee Beach' is listed on the TSC Act as a "*threatened species*". This species is restricted to a very small distributional range (from Moonee north to Grafton, and occurs along watercourses in moist forest and riparian vegetation.

Specimens of the Moonee Quassia were located along the banks of the tributary to Moonee Creek located along the north of the subject site. Specimens are also located along the tributary to the west (beyond the Pacific Highway) and there are previous records further upstream along the watercourses in the area.

Appendix 2 describes the preferred habitat of other threatened plant species previously recorded in the region, and considers the likelihood of their occurrence within existing vegetation on the subject site, beyond any areas proposed for development activities.

4.3.2 Plant Communities

Five of the plant communities recorded on the subject site at Moonee Beach are now listed on the TSC Act as "*endangered ecological communities*" or appear to constitute examples of those communities:

- the stands of Swamp Oak Forest appear to conform to the *Final Determination* for Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions (SOFF);
- areas of Swamp Mahogany Open Forest and Swamp Paperbark/Swamp Mahogany/Swamp Oak Open Forest appear mostly to conform to the *Final Determination* for the Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions (SSFCF), although some of this vegetation type on the more elevated land may not constitute that community;
- the sedgeland vegetation may conform to the *Final Determination* for the Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions (FWCF). There is, however, the

possibility that this vegetation type on the subject site is located on a coastal sandplain, and is thereby excluded from the FWCF community (see *Final Determination* by the NSW Scientific Committee). The vegetation on the subject site has been regarded as the FWCF community in this *Report* on a precautionary basis, however, and has been assessed in terms of s.5A of the EP&A Act on that basis;

- the areas of Tuckeroo Littoral Rainforest, Headland Brush Box and Brush Box Closed Forest along Moonee Creek conform to the *Final Determination* for the Littoral Rainforest in the NSW North Coast Sydney Basin and South East Corner Bioregions (LRF) community; and
- the areas of Saltmarsh conform to the *Final Determination* for the Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions (CSM) community.

All of the "*endangered ecological communities*" which are located on or may be present on the subject site at Moonee Beach are located on the low-lying land and/or on the periphery of the subject land. The listing of those communities as "*endangered ecological communities*" post-dated the generation of the basic constraints to development opportunities on the subject land at Moonee Beach by the proponent and the project team. Those plant communities and vegetation types have been recognised from the outset of this project as being of high conservation value, and had substantially been excluded from the proposed development area.

Consideration of the relevant factors of Section 5A of the EP&A Act with respect to "*endangered ecological communities*" has been undertaken in detail with respect to the proposed development of the land at Moonee Beach (Appendix 5). Given the extensive areas devoted to conservation within the subject land (occupying virtually all of the low-lying land on the site and the plant communities contained thereon), the proposed development is not "*likely*" to constitute a "*significant effect*" upon any such "*endangered ecological communities*".

Furthermore, the proposed development will incorporate substantial measures for the management and protection of those communities (as discussed in greater detail in Part C of this *Report*). The majority of the subject land (approximately 70% or 71.75ha) is to be retained for conservation purposes, and that area of the land occupies most of the low-lying parts of the site. Those areas contain virtually all of the stands of "*endangered ecological communities*" identified on the subject land, signifying the high conservation value of these portions of the site.

Table 2. Conservation values of the vegetation types recorded by Gunninah on the subject site at Moonee Beach.

Veg Type	Description	Conservation Significance*		
		Table 6	**Chapter 4.1**	**EEC**
SG3513	Headland Heath and Grassland (some trees)		Regionally significant	
SG6302	Headland Heath and Grassland (no trees)		Regionally significant	
N75A	Foredune Complex			
SG2502	Mangrove/Saltmarsh Complex			In part - CSM
LR17	Tuckeroo Littoral Rainforest	GT25 4	Locally significant	LRF
LR18	Headland Brushbox Closed Forest	LT10 - 25 2	Regionally significant	LRF
N52	Swamp Mahogany Open Forest	LT25 - GT25 4	Koala	SSFCF
N50	Swamp Paperbark/ Swamp Mahogany/ Swamp Oak Open Forest and Woodland	LT25 - GT25 4	Koala	SSFCF SOFF
N44A	Dry Blackbutt Open Forest	LT5 - 10 2	Regionally significant; Koala	
N1A#	Coastal Red Gum Forest	LT5 - 10 2	Regionally significant; Koala	
N27	Flooded Gum Open Forest	LT5 - 10 2	Regionally significant; Koala	
SF49#	Turpentine Open Forest	LT1 - 5 2	Regionally significant	
RV1#	Coastal Riparian Open Forest		Locally significant; Koala	
RF53	Brushbox Closed Forest		Regionally significant; Koala	LRF
N20a	Broad-leaved Paperbark	LT25 - GT25 4	Koala	SSFCF
SG6502	Sedgeland/Rushland		Locally significant	FWCF ?

* Sources: Fisher, Body and Gill (1996) or as listed on the TSC Act

\# included in mapping by Ecograph

Table 6 (Fisher *et al* 1996)

LT 1, 5, 10, 25	Less than 1%, 5%, 10%, 25% reserved
GT25	Greater than 25% reserved
2	Inadequately conserved over all of its range
4	Adequately conserved

Chapter 4.1 (Fisher *et al* 1996)

Regionally significant (Hager & Benson 1994)	
Koala	Plant communities with Koala browse trees

EEC Endangered Ecological Communities (as listed on the TSC Act)

5 FAUNA & FAUNA HABITATS

5.1 Fauna Habitats and Resources

The fauna habitats of the subject site at Moonee Beach, within the range of plant communities present, provide a broad array of features and resources of relevance to different groups of native fauna. Given the nature of the site and its location, however, a number of habitat types and features typical of the locality (such as rock outcrops, tall closed forest and rocky headlands) are not available on the subject site.

There are eight broad habitat types on the subject site:

- littoral rainforest, which is confined to a narrow band of vegetation in the northeast. This habitat provides resources for a variety of frugivorous species (including fruit-doves, bowerbirds and flying foxes), as well as dense cover providing shelter for an array of small bird species and terrestrial fauna;
- moist open forest vegetation in the riparian zones around the wetlands and along drainage lines. This habitat type provides resources for frugivorous fauna, as well as potential foraging resources for the Koala and tree-hollows for hollow-dependent fauna species. The varied mid-storey and groundcover elements of this habitat type provide specific resources for a range of bird species, and for several reptiles and terrestrial mammals;
- dry open forest, which is typical of most of the proposed development area of the subject site. This community and habitat type also provides foraging resources for the Koala (though no evidence for this species was recorded from the site), as well as for other terrestrial mammals birds and bats. Large hollow-bearing trees are not particularly common, and most of the tree-hollows present are small to moderate in size, effectively restricting certain species from utilising this portion of the site for denning or nesting purposes. However, there are a number of large hollow-bearing trees on the subject site. This habitat also provides resources for terrestrial fauna as well as an array of canopy birds, and foraging resources for microchiropteran bats;
- swamp forest communities, which occur on the low-lying land and around the periphery of the sedgelands and wetlands on the site. This habitat type includes areas of dense groundcover (often of sedges) of potential value for a range of reptiles, amphibians and some terrestrial mammals. There are very few hollow-bearing trees present in this habitat type;
- sedgeland, which is restricted to the lowest wetland areas on the site, and provides habitat and resources for a range of small terrestrial mammals, amphibians and some bird species. This habitat is also likely to be utilised by a range of raptors for hunting purposes;
- coastal shrubland, in which the Coast Banksia is the dominant canopy species, providing foraging resources for a range of nectarivorous bird species, as well as the Common Blossom Bat and Grey-headed Flying Fox. A range of small terrestrial mammal and reptiles species are also likely to be present in this habitat type;
- estuarine habitats along the northern boundary and into the central northern part of the site of the subject site. This habitat is extensive off the site to the north, and provides a range of resources for species depending on mangroves, tidal flats and saltmarshes, and estuarine habitats; and
- watercourses and ponds. These occur either where physical disturbance to the land (*eg* the construction of roads) has created semi-permanent ponding or as ephemeral ponds in the drainage lines and low-lying areas following rain.

Freshwater ponds and watercourses provide habitat for a range of amphibian species as well as resources for several bird and reptile species. Some microchiropteran bats would also utilise larger ponds as foraging sites.

In addition to the general array of native fauna recorded on or likely to occur on the site, eleven threatened fauna species have been recorded on the site at Moonee Beach, and an additional twenty-five have been recorded in the general vicinity.

5.2 Fauna Species

A total of 149 native fauna species have been recorded on the subject site, as well as one introduced mammal species (Clancy 1989; G & V Clancy 1998; Sandpiper 2003). These include 12 amphibians, 8 reptiles, 32 native mammal species and 97 bird species (Appendices 3 and 4).

Additional fauna species have been recorded in the vicinity (Clancy 1989; G & V Clancy 1998; Parker 2004; Appendices 3 and 4) and several of these could occur on the subject site as well. Given the size and nature of the subject site, it is considered likely that a number of additional fauna species would be recorded during either additional surveys or over a range of seasonal and climatic conditions.

5.3 Conservation Significance

5.3.1 Species Recorded on the Site

A total of 15 threatened fauna species have been recorded on the subject site (G & V Clancy 1998; Sandpiper 2003; Appendices 3 and 4), although a few of the microchiropteran bat records are tentative. Many of the threatened species are highly mobile and wide-ranging bird and bat species, and only one (the Regent Honeyeater) is an "*endangered*" species (the remaining 14 are "*vulnerable*" and are therefore of somewhat less concern). Many of these species are also common in their respective home ranges and on the north coast of NSW.

Osprey

The Osprey was regularly observed flying over the site, and a nest tree is located in an open paddock to the immediate south of the site (*pers obs*; Parker 2004). In addition, an Osprey has been observed perching on the site (G & V Clancy 1998). However, there is no evidence of nesting by the Osprey within the subject site, and there are no particularly suitable NEST trees present for this species.

Square-tailed Kite

The Square-tailed Kite was also recorded flying over the site in 2003 (Appendix 3), but no nests of this species have been recorded on the site or in the vicinity.

Glossy Black Cockatoo

The Glossy Black Cockatoo was identified by the presence of chewed cones of the Forest She-oaks at several locations on the site. There are only scattered suitable tree-hollows for this species, however, which requires very large hollows for nesting purposes. Conversely, an individual (or individuals) were recorded roosting at night in a Tallow-wood either on the subject site or nearby (G & V Clancy 1998). The species has also been recorded near

Moonee Beach Road, and "*would be expected to move throughout the vegetated areas*" of this part of the coast (G & V Clancy 1998).

The site contains areas of clearly suitable habitat for the Glossy Black Cockatoo, particularly including dry forest and the margins of the swamp forest communities where there is a layer of suitable foraging resources (particularly the Forest Oak and Black She-oak). Suitable habitat is distributed widely in the drier forest types over the subject site, particularly in the western and southwestern parts of the land.

Grey-headed Flying Fox

The Grey-headed Flying Fox was recorded by spotlighting and calls during evening feeding activities. No roost sites or 'camps' of this species have been recorded on the subject site, although individuals or small groups could temporarily camp on the site.

Foraging resources for the Grey-headed Flying Fox are particularly provided by the flowering paperbarks and banksias, and by some of the eucalypts on the site. Existing trees in the small areas of rainforest also provide limited resources for this species on the site.

Common Blossom Bat

The Common Blossom Bat was recorded foraging on Coast Banksias behind the frontal dune and elsewhere on the subject site. This species has also been recorded from a number of other localities in the vicinity (Clancy 1990; G & V Clancy 1998), and it is noted that the "*flowering eucalypts and paperbarks on the site are likely to be important for this species*" (G & V Clancy 1998).

The littoral rainforest provides some limited (although marginal) potential roosting habitat for this species. However, the relevant resources are not restricted to the subject site, and will substantially be retained in the extensive Conservation Reserve on the site at Moonee Beach.

Eastern Freetail Bat

The Eastern Freetail Bat roosts in tree-hollows and under loose bark. In addition to potential roosting resources, the subject site provides extensive areas of suitable foraging habitat (in the various forest and woodland communities) for this species, as does the locality generally.

Common and Little Bent-wing Bats

The Common and Little Bent-wing Bats, which were recorded through the forest habitats on the site, and are expected to occur widely throughout the region. The subject site provides suitable foraging resources (by virtue of the extensive areas of forest and woodland) but no caves, tunnels or other resources for roosting.

Large-footed Myotis

The Large-footed Myotis also utilises caves, tunnels and bridges for roosting purposes. In addition to providing no roost sites for this species, the subject site contains few bodies of open water over which the Large-footed Myotis feeds.

However, this species could doubtless utilise the small ponds which are present on occasions and the ponds along southern boundary for foraging, as well as the culverts under the Pacific Highway (west of the site) for roosting.

The Yellow-bellied Glider

The Yellow-bellied Glider was apparently recorded in the southwestern part of the subject site (G & V Clancy 1998). It is suggested in that *Report* that this species could "*be expected to occur throughout the sites taller forest*", although that forest type is not preferred by the Yellow-bellied Glider. It was not recorded despite the extensive fauna surveys and investigations undertaken in 2003 (Appendix 3) or in 2006 (Appendix 4).

It should be noted that the Yellow-bellied Glider tends to prefer somewhat moister and taller forest communities than those present over most of the subject site (Smith *et al* 1995), and this species is known to occupy tall moist forest in valleys within the State Forests to the west (Smith *et al* 1995).

Given those considerations, the site is not considered optimal habitat for or a 'critical' resource for the Yellow-bellied Glider.

Regent Honeyeater

The Regent Honeyeater had been recorded "*in swamp open forest. in 1985*" (G & V Clancy 1998). As noted in that *Report*, the Regent Honeyeater "*is known to frequent stands of Swamp Mahogany during the winter*", although it is not reasonable to surmise that the subject site "*may provide essential non breeding season feeding habitat for this inland breeding species*" as stated in the *Report* (G & V Clancy 1998).

Whilst the subject site at Moonee Beach does support stands of Swamp Mahogany, these could not be regarded *per se* as "*essential non-breeding season habitat*". In any case, most of the Swamp Mahogany on the subject site is to be retained as part of the *Development Concept*.

Koala

The Koala was recorded on the subject site in 2006 (Appendix 4), and there are previous records on the subject site in 1970 and 1975 (*Yarranbella* undated). There have also been two recent records on the Pacific Highway west of the subject site (G & V Clancy 1998), of which one at least was a road kill.

Most of the resources of highest value for the Koala (particularly stands of Swamp Mahogany) are located within the low-lying portions of the subject site at Moonee Beach. The Dry Open Blackbutt Forest is generally of lower value for the Koala, as it primarily contains tree species which are regarded as of considerably less value as food resources for this species. The subject site was mapped as "*secondary habitat*" for the Koala by CHCC (Figure 10).

As a consequence of the development design, the majority of food trees for the Koala will be retained and substantial corridors of vegetation will be retained through the site to facilitate Koala movements. Given those considerations, the proposed development of the subject site is not of concern with respect to the Koala.

Common Planigale

The Common Planigale is most commonly recorded in coastal areas in swamp forest communities and moist forest communities with a dense groundcover, often of sedges. Whilst the Common Planigale also utilises other forest communities, the dense groundcover typical of swamp forest communities and wallum heath appears to be a critical element of suitable habitat for this species.

The swamp forest vegetation on the subject site provides potentially suitable habitat for the Common Planigale. This species was been recorded in the swamp forest vegetation in the northeastern part of the subject site, and it could potentially be present throughout the extensive areas of low-lying land. These are located within the Conservation Reserve proposed for the subject site.

Green-thighed Frog

This species also occupies a range of forest habitats, although more commonly the moist forest types, swamp forest and rainforest communities (Ehmann 1997; Cogger 2000; DEC 2006). Potentially suitable habitat for the Green-thighed Frog is present on the subject site at Moonee Beach, although primarily in portions of the subject site which are to be retained for conservation purposes.

5.3.2 Species Recorded in the Vicinity

A range of other threatened fauna species could potentially occur on the subject site (Appendices 3 and 4), as several records have been obtained in the vicinity (Clancy 1989; G & V Clancy 1989).

Estuarine Species

Estuarine species (such as the Black-necked Stork, Beach Stone-curlew, Pied and Sooty Oystercatchers and Little Tern) could use the small areas of estuarine habitats on the subject site as part of their home ranges in this locality. These species have not been recorded from the subject site, but have been recorded from the Moonee Creek estuary or along the coast nearby.

The subject site contains only a very small area of potentially suitable habitat for these species. In particular, the Little Tern is not likely to utilise the subject site to any significant extent (if at all), and the Pied and Sooty Oystercatchers are only likely to utilise the fringes of the mangrove vegetation to some extent. The Black-necked Stork may utilise the main watercourse through the SEPP 14 wetland and the estuarine habitats to some extent, but the area of suitable habitat for this species on the subject site is only limited. Similar considerations apply to the Beach Stone-curlew.

All of the potential habitats for these species on the subject site at Moonee Beach are to be retained in the current development design. Consequently, even if individuals of these species do utilise the subject site on occasion, the proposed development will not represent an impediment to their continuing use of the site.

Rainforest Species

Several species dependent on rainforest resources (including the Wompoo and Rose-crowned Fruit-doves, the Superb Fruit-dove, Double-eyed Fig Parrot and Barred Cuckoo-Shrike) have been recorded in the general vicinity of the subject site at Moonee Beach. However, no individuals have been recorded on the site itself over several years of observations by a number of investigations (both dedicated and opportunistic).

The area of Littoral Rainforest on and adjacent to the northern boundary of the subject site (on the Moonee Creek estuary) provides suitable habitat for these species. Development of the subject site as proposed would not remove any habitat or resources for these rainforest-dependent species.

Swift Parrot

The Swift Parrot had been recorded at the Moonee Beach Caravan Park in 1997 and 1998 (G & V Clancy 1998), but has not been sighted on the subject site. This species breeds in Tasmania and is a migrant during autumn and winter to mainland Australia.

The subject site at Moonee Beach provides foraging resources for the Swift Parrot, but these generally are located in portions of the subject site which are to be retained for conservation purposes. As a consequence, even if the Swift Parrrot utilises the subject site on occasions, suitable resources will be retained.

Forest Owls

The Masked and Powerful Owls utilise tall forest communities in the general region. No individuals of either of these species have been recorded from the subject site at Moonee Beach, although individuals could potentially use the site as part of a much larger home range.

Given the extent of the home ranges of both of these large forest owl species, development of the subject site at Moonee Beach as proposed would not impose any significant adverse impacts upon them, even if individuals do utilise the subject site.

Black Bittern

The Black Bittern "*has been recorded along a branch of Sugar Mill Creek north of Fairview Road"* (G & V Clancy 1998) in the vicinity of the site. This species utilises dense riparian vegetation and reedbeds along watercourses, and could potentially occur within the riparian vegetation along the major watercourses through the site.

All of the watercourses and riparian vegetation within the subject site at Moonee Beach are to be retained. Consequently, habitat for the Black Bittern will be retained and protected, in the event that this species does utilise the subject site.

Brush-tailed Phascogale and Tiger Quoll

The Brush-tailed Phascogale and the Tiger Quoll have both been recorded in the locality, but there is no evidence for their presence on the subject site at Moonee Beach. Whilst the Phascogale may utilise the Dry Blackbutt Open Forest, the Tiger Quoll is more likely to occur in moist forest communities.

For both of these species, vegetation on the subject site at Moonee Beach constitutes potential habitat. However, neither species has been recorded either on the subject site or immediately adjacent to it in any investigations (see Bibliography). The probable significance of the site with respect to these species must therefore be regarded as low.

Furthermore, given that approximately 70% of the subject site is to be retained in a naturally vegetated condition (including areas of suitable habitat), it must be assumed that these species would continue to use the site if they currently do so.

Giant Barred Frog

The Giant Barred Frog was recorded in 1998 to the northwest of the subject site (G & V Clancy 1998). The watercourses through the subject site provide some suitable habitat for the species, particularly in the upper reaches nearer the Pacific Highway.

Given that all of the major watercourses are to be retained in broad habitat bands through the subject site, any potentially suitable habitat for the Giant Barred Frog will be retained.

Stephens's Banded Snake

This species utilises a range of forest communities including rainforest and moist and dry schlerophyll forest (Gilmore & Parnaby 1994). Particular resources of relevance for Stephen's Banded Snake include patches of decorticating bark and tree-hollows, both of which occur in moderate densities on the subject site at Moonee Beach.

Whilst no specimens of Stephen's Banded Snake have been recorded on the site, it is possible that individuals of this species are present.

As noted by Sandpiper (Appendix 3), the "*moist open forest and swamp forest habitats in the study area are likely to provide suitable habitat resources for this species*". Whilst the dry open forest communities may also provide potential habitat, substantial areas of potentially suitable habitat for Stephen's Banded Snake are to be retained on the subject site at Moonee Beach.

Collared Kingfisher

The Collared Kingfisher utilises mangrove forest along large tidal creeks and estuaries, and nests in arboreal termite mounds (Schodde & Tidemann 1986). The estuarine mangrove forests along Moonee Creek and along its small estuarine tributary within the northern parts of the subject site provide potential habitat for the Collared Kingfisher. However, no specimens of this species have been recorded in this locality (see Bibliography).

The estuarine mangrove habitats on the subject site and in the Moonee Creek estuary provide potentially suitable habitat for the Collared Kingfisher, although no arboreal termite nests (for nesting) were observed. In any case, the potentially suitable habitat and resources for the Collared Kingfisher are located in those portions of the subject site which are to be retained for conservation purposes.

Eastern Grass Owl

The Eastern Grass Owl utilises areas of tall dense coastal grassland and wallum heath, as well as areas of sugar cane and other crops and the margins of coastal swamps (Macjiewski 1997). The subject site does not support particularly suitable habitat for the Eastern Grass Owl, although it is potentially possible for individuals to utilise the sedgelands present in the central northeastern part of the site. However, this community is not of particular value for the Eastern Grass Owl.

It is not considered likely that this species is present on the subject site at Moonee Beach. In any case, all of the potentially suitable habitat for the Eastern Grass Owl will be protected within the Conservation Reserve on the subject site.

Squirrel Glider

The Squirrel Glider has been recorded in the Moonee Nature Reserve to the north of the subject site. However, this species was not recorded on the subject site at Moonee Beach itself despite the implementation of appropriate survey techniques (spotlighting and tree-mounted elliot trapping).

The Squirrel Glider occupies dry sclerophyll forests, particularly those with an understorey of banksias (which provide a significant foraging resource). Whilst the subject site at Moonee

Beach contains large areas of dry sclerophyll forest, these are not generally characterised by a midstorey or understorey component of banksias or wattles. Squirrel Gliders are also reliant on tree-hollows for denning and protection.

The subject site at Moonee Beach provides potentially suitable habitat (by way of dry sclerophyll forest) and tree-hollows suitable for denning or shelter. However, the species has not been recorded on the subject site and the forest types are not regarded as optimal for this species.

Eastern Pygmy Possum

The Eastern Pygmy Possum utilises a range of forest and heathland communities, and typically relies on a range of shrub species (including banksias, wattles, bottle-brushes and other similar flowering species) for foraging (both of nectar and insects).

Whilst the subject site provides some potentially suitable resources for the Eastern Pygmy Possum, none of the vegetation types would be regarded optimal habitat for this species.

Conclusions

Although no evidence for any of these additional fauna species has been recorded from the subject site, suitable habitat is present on the site for many of these species. In many instances, the habitats and resources present are only of marginal potential value and/or the species are highly mobile and wide-ranging. In other instances, habitats and potentially suitable resources are either restricted to portions of the site which are to be retained and conserved or are widely distributed in the general locality and well conserved in the state forests and Conservation Reserves of the north coast of NSW.

As noted above, no individuals of any of these additional threatened fauna species have been recorded on the subject site during any of the investigations undertaken to date.

5.3.3 Endangered Populations

No "*endangered populations*" or "*endangered ecological communities*" of any fauna species are currently listed in the vicinity of the subject site at Moonee Beach.

6 BASIS for IMPACT ASSESSMENT

The approach which has been adopted to the generation of a *Development Concept* for conservation and development on the subject site at Moonee Beach has been one of seeking an appropriate balance between conservation goals and aspirations and development opportunities and expectations.

This approach has involved the consideration on the one hand of the requirements for and desirability of biodiversity conservation on the subject site (and in the locality and region) and on the other hand of the needs (both social and economic) and the reasonable expectations for development opportunities on the subject site (based in no small part on the land zonings provided by Coffs Harbour City Council in 2000).

It is recognised and acknowledged that residential (and other) development activities will in many instances (such as on the subject site at Moonee Beach), impose adverse impacts upon some elements of the natural environment. It is also recognised and acknowledged that biodiversity conservation is a relevant and proper goal for the appropriate use of land within the state and nation.

The approach which is adopted for this project, and by the principal author generally, is one of seeking an appropriate balance between these two (sometimes) conflicting objectives. To that end, it is critically important to identify the relative conservation values of different portions of the subject site and of the plant communities and ecosystems contained thereon.

It is patently clear that different ecological communities and ecosystems have different conservation values and different sensitivity levels. The recent listing by the NSW Scientific Committee of swamp forest and freshwater wetland communities along coastal NSW reflects their perceived levels of biodiversity value as well as the perceived or assumed levels of threat.

In that regard, it is to be noted that the *Development Concept* for development of the subject site at Moonee Beach had identified the swamp forest and freshwater wetland communities on the low-lying land as a primary constraint to development activities at the outset of the project. This approach was adopted considerably in advance of the listing of those plant communities as "*endangered ecological communities*" on the TSC Act. Those areas of vegetation were identified as of high conservation value in 2002, whilst the communities were only listed on the TSC Act in December 2004.

By contrast, the areas of dry forest communities which are present have been identified as of lower conservation value. Whilst these communities contain some resources and habitat features of value for native biota, those resources and features are more widespread and better protected than those present in the swamp forest and freshwater communities. As a consequence, the focus of development activities on the subject site was confined to the two largest portions of dry forest vegetation on the site. It should also be noted that areas of dry forest communities are to be retained in other parts of the site, and the resources and features of particular value (such as hollow-bearing trees) are widespread and abundant in the locality and region generally.

It is also to be noted that consideration of flora and fauna values in the Moonee Beach area, prepared on behalf of CHCC (Clancy 1989, 1990; G & V Clancy 1998), also identified the low-lying areas of these lands as of particular value. Whilst the moist communities are

identified as of high conservation value by Clancy (1989), the dry sclerophyll forest communities are not so identified.

By contrast, the *Report* of Fisher *et al* (1996) and Ecograph (2002) also identify the Dry Blackbutt Open Forest community (Map Unit N44a) as of conservation value and significance. However, this assessment is not reflected in the TSC Act listings of "*endangered ecological communities*", and is applied (by those authors) only to the Coffs Harbour LGA. Whilst it is appreciated that CHCC has jurisdiction only over areas within its own LGA boundaries, those boundaries are entirely artificial and bear no relation whatsoever to the ecological distributions of plant communities or species, or their habitats. Conservation on an LGA basis is invalid ecologically, although it is accepted that land use planning needs to be implemented on that basis.

Given all of the relevant considerations (ecological, planning, statutory and social/economic), it has been determined that the dry open forest communities on the subject site at Moonee Beach are of the lowest relative ecological value, and provide the best and most appropriate opportunities for development activities. The approach adopted in the *Development Concept* for the subject site will not remove all of the dry open forest communities present, but will retain essentially all of the moist and low-lying lands which are occupied by those plant communities and ecosystems regarded as of the highest ecological and biodiversity conservation value.

This approach, as noted above, is considered to represent an appropriate and reasonable balance between development opportunities and conservation desires and goals on the subject site at Moonee Beach.

The retention of the majority of the subject site (approximately 70% of the 102ha) as a dedicated Conservation Reserve, and its management in perpetuity for biodiversity conservation purposes, is of significance in addressing the impacts of the proposal on the natural environment in general and on threatened biota in particular. The Reserve area contains the overwhelming majority of the moist and swamp communities on the site, as well as all of the watercourses and examples of the drier forest communities. Thus, no habitats or environmental resources or features will be removed in totality from the subject site.

The commitment to management of the Conservation Reserve for conservation purposes in perpetuity, through a *Vegetation Management Plan* and a community title arrangement, also represents a significant and substantial contribution to biodiversity conservation in the locality. In addition to ensuring that a "*significant effect*" is not likely to be imposed on any threatened biota, that commitment offsets the loss of some vegetation and habitat from the site, and secures a substantial portion of land for biodiversity conservation purposes at no cost to the public purse (including both state and local governments).

7 SECTION 5A of the EP&A ACT

7.1 General Considerations

The TSC Act has modified the EP&A Act by, *inter alia*, including a requirement in Section 5A (s.5A) to determine "*whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats*". The eight factors of s.5A "*must be taken into account*" by a consent or determining authority when considering a development proposal or *Development Application*, particularly in administering Sections 78, 79C and 112 of the EP&A Act.

Section 5A of the EP&A Act has recently been amended by the *NSW Threatened Species Amendment Act 2002* (TSAA Act) by modifying the Factors which "*must be taken into account*" in determining "*whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats*". The amended s.5A contains seven Factors which "*must be taken into account*", replacing the eight Factors which were included in the original s.5A assessment.

This *Report*, and the Appendix which contains the detailed s.5A *Assessment of Significance* or relevant threatened biota (Appendix 5) address the amended version of Section 5A and the relevant Factors contained therein.

It is of particular note that the *Guidelines* prepared by the Department of Environment & Conservation (DEC) regarding the interpretation and application of the amended s.5A state *inter alia* that the "*assessment of significance*" should <u>not</u> be considered a "*pass or fail test*". Rather, the *Guidelines* state that "*all Factors must be considered and an overall conclusion must be drawn from all Factors in combination*".

In addition, the "*local population*" of any threatened species and the "*local occurrence*" of any relevant "*endangered ecological communities*" is assumed (for the purposes of this *Report*) to involve areas of suitable habitat on the subject site as well as contiguous areas of suitable habitat on surrounding lands, and (in the case of wide-ranging species such as the Powerful and Masked Owls, microchiropteran bats and the Grey-headed Flying Fox) considered to extend over the home range of a conceivable "*local population*" of those species. As discussed in detail in Appendix 4, confinement of the "*local population*" of such threatened species to the "*study area*", as defined in the DEC *Guidelines*, is ecologically inappropriate and untenable.

It is critical to note that Factors (a), (b) and (c) of s.5A addresses the likelihood of a "*viable local population*" of threatened species or a "*local occurrence*" of endangered ecological communities being "*placed at risk of <u>extinction</u>*" (emphasis added).

In this regard, it is not sufficient that a "*proposed action*" would reduce the size of a population or the extent of habitat for or an "*occurrence*" of such relevant threatened biota, but that those biota be rendered "*<u>likely</u>*" (emphasis added) to become <u>extinct</u> in that locality as a consequence of the "*action proposed*".

In this regard, it is also critical to note that it is not the risk of "*extinction*" of a "*threatened species, population or ecological community*" within the boundaries of the subject site that is of relevance. Rather, the likelihood of extinction relates to the "*local population*" of threatened species or the "*local occurrence*" of a commnuity (*ie* including that located on other lands beyond the subject site).

Furthermore, given the ecological ramifications of the definition of "*study area*" (as discussed above), it is also not appropriate to consider the likelihood of "*extinction*" of such biota in

terms solely of the "*study area*" (unless that area is determined by ecological rather than cadastral features).

These considerations are of critical importance in properly addressing s.5A of the EP&A Act. An inappropriate focus on the subject site and its immediate environs, or a focus on general adverse impacts upon threatened biota (rather than "*extinction*"), would lead to an invalid and inappropriate application of s.5A of the EP&A Act.

7.2 Threatened Biota Recorded on the Site

As detailed above, fifteen threatened fauna and two threatened plant species have been recorded on the subject site at Moonee Beach (see Chapters 4 and 5 of this *Report*). For each of these species, a dedicated s.5A *Assessment of Significance* has been prepared (Appendix 5) which indicates the likelihood or otherwise of a "*significant effect*" being imposed upon the relevant species.

In addition, five "*endangered ecological communities*" have been recorded on the subject site:

- Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions;
- Swamp Schleropyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions;
- Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions;
- Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions; and
- Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions.

Each of these communities are located primarily within the low-lying parts of the subject site, except the Littoral Rainforest which is located in the northeastern part of the site. Most or all of these communities are to be retained and protected within the substantial Conservation Reserve within the site. These communities have also been the subject of a dedicated s.5A *Assessment of Significance* (Appendix 5).

In the case of all of these threatened species and endangered ecological communities, it is concluded that there is not "*likely*" to be a "*significant effect*" as a result of the proposed development at Moonee Beach (Appendix 5). This conclusion is based on:

- the extent of vegetation to be reserved on the subject site itself;
- in particular with respect to "*endangered ecological communities*", the retention of the overall majority of those communities within the substantial conservation reserve on the subject site;
- the implementation of a community title and long-term management regime on the site to ensure that retained vegetation and the conservation reserve is appropriately managed for biodiversity conservation purposes;
- the extreme unlikelihood of any "*viable local population*" of threatened species or the "*local occurrence*" of any "*endangered ecological community*" being "*placed at risk of extinction*" (emphasis added). In this regard, it is critical to note that a reduction in the extent of or in the numbers of, or in the extent of habitat of, threatened biota cannot be regarded as representing a threat of a "*risk of extinction*" (emphasis added);

- the retention of habitat and resources for all of the relevant threatened biota which have been recorded on the subject site or which could reasonably be expected to occur on occasions;
- the small number of individuals of any species which would be likely to be affected by the proposed development;
- the extent of habitat in the locality which would provide for the viability and survival of any "*viable local population*" of the relevant threatened fauna and flora species; and
- the mobility of most of the threatened fauna species of relevance.

A range of other threatened fauna species could potentially occur on the subject site as individuals or in small groups on occasions. Species such as the Powerful and Masked Owls, and a number of threatened microchiropteran bats and other threatened bird or mammal species, could potentially utilise the site on occasions or on a seasonal basis. Indeed, individuals of several of these species are considered highly likely to occur on the site on occasions given their presence in the vicinity (see Chapter 5).

However, many of these additional species are highly mobile and/or occupy substantial home ranges. The forest owls occupy territories of up to 1000ha, the Grey-headed Flying Fox can travel 50km or more in an evening, and the microchiropteran bats forage up to 15km (and perhaps more) from their roost sites each evening. For other species, the site provides only limited habitat or resources which are otherwise widely available.

Alternatively (or additionally) many of those species utilise habitats and resources which are concentrated in the low-lying portions of the site, and which will therefore be protected as part of the *Development Concept* design. Consideration of s.5A of the EP&A Act (as discussed below) indicates that the proposed development is not "*likely*" to impose a "*significant effect*" on any of these "*threatened species .. or their habitats*".

Given the detailed consideration of the relevant Factors of s.5A of the EP&A Act contained in Appendix 4 of this *Report* for threatened biota which have been recorded on the subject site, it is not considered "*likely*" that a "*significant effect*" would be imposed by the subdivision and development of the subject site as proposed.

Given the substantial extent of habitat and ecosystems which are to be retained on the subject site and managed in perpetuity for conservation purposes, and on the basis of the information currently available, it cannot reasonably be concluded that a "*significant effect*" would be "*likely*" to be imposed on any such biota.

7.3 Other Possible Threatened Biota

The seven factors of s.5A of the EP&A Act have been considered to determine the potential for "*a significant effect*" to be imposed on threatened biota other than those recorded on the site (which are addressed in Appendix 5). Species which have been considered in this regard include those additional threatened fauna species addressed in Chapter 5 of this *Report,* as well as the Scented Acronychia.

Factor a – Threatened Species

There is no evidence for the presence of a "*viable local population*" of any additional threatened species on the subject site, although several of those additional species (see Chapter 5) have been recorded in the vicinity and are likely to utilise resources on the subject site. Furthermore, it is not likely that any such "*population*" (if present on the site and in the

vicinity) would be dependent solely or even substantially upon those parts of the subject site proposed for development activities.

It is possible that adverse impacts could be imposed on individuals of some threatened species, and indeed it is even possible that adverse impacts will be imposed upon a "*viable local population*" of some threatened species. However, development of the subject site is not "*likely*" to involve a "*viable local population*" of any threatened species (even if present) being placed "*at risk of extinction*" (emphasis added), pursuant to Factor (a) of s.5A of the EP&A Act.

Factor b – Endangered Populations

There is no relevant "*endangered population*" of any flora and fauna species listed on the TSC Act present on the subject site or known to occur in the general vicinity.

Factor c – Endangered Ecological Communities

Five "*endangered ecological communities*" have been recorded on the subject site, and have been addressed in detail in Appendix 5 of this *Report*, with respect to Section 5A of the EP&A Act.

None of the other vegetation on the subject site is listed as an "*endangered ecological community*".

Factor d – Habitat of Threatened Biota

Factor d of s.5A of the EP&A Act requires consideration of a number of matters with respect to the habitat of threatened biota. With respect to those threatened biota which could potentially occur on the subject site at Moonee Beach (but which have not been recorded):

- there is the potential for some habitat "*to be removed or modified as a result of the action proposed*" but other suitable habitat for those threatened biota will remain on the subject site following subdivision and development as currently proposed. In the absence of data regarding the presence of any of these additional threatened biota, no detailed assessment of the "*extent to which habitat is likely to be removed or modified*" is possible. Conversely, it is possible to assert that no habitat types or features will be removed entirely from the subject site itself, or from the vegetation present in the general locality. In any case, the absence of evidence for the presence of any such additional biota suggests that the habitat present is not of particular consequence;
- whilst development of the subject site as proposed will involve some fragmentation of habitat on the site itself, the future development footprint has been designed specifically to avoid the isolation or fragmentation of areas of habitat from other areas of potential suitable habitat for threatened and other native biota. In this regard, it is of significance to note that the Pacific Highway (which forms the western boundary of the subject site) is due to be upgraded in the forseeable future to a dual carriageway 4-lane road, which will constitute a significant barrier to movements from most native fauna species. The upgraded Highway will constitute a more significant fragmentation and isolation issue than development of the subject site as proposed. The proposed development, given those considerations, is not likely to fragment or isolate areas of habitat for the

additional threatened biota which might be present "*from other areas of habitat*"; and

- it cannot reasonably be asserted that habitat on the subject site is of "*importance ... to the long-term survival*" of threatened biota which have not been recorded on the site. As a consequence, the potential habitat for such biota which is "*to be removed, modified, fragmented or isolated*" cannot be regarded as of particular "*importance*" to any such biota.

In this regard, it is significant to note that:

- none of these additional threatened biota are likely to be restricted to the subject site itself or to the areas proposed for development purposes;
- the distribution of habitats and resources is not restricted to those portions of the subject site which are proposed for development activities;
- the proposed development involves retention of approximately 70% of the subject site in a dedicated Conservation Reserve which is to be managed in perpetuity for conservation purposes;
- the Conservation Reserve will contain representative examples of all of the habitats and resources which are present on the subject site at the current time, including examples of the dry forest communities;
- the Conservation Reserve incorporates broad bands of vegetation across the subject site (along the eastern side from the northern boundary to the southern boundary, to the southwest, and along the northern boundary from the western side to the eastern side) which provide 'corridors' or bands of vegetation and habitat and connectivity to vegetation on other lands to the north, south and west; and
- there are substantial other areas of native vegetation along the coast and foothills in the vicinity of the subject site which will continue to provide habitat and resources for those threatened biota which may occur on the subject site at Moonee.

Factor e – Critical Habitat

There is no relevant "*critical habitat*" for any threatened biota currently declared within NSW.

Factor f – Recovery Plans and Threat Abatement Plans

Final draft *Recovery Plans* have been prepared by the DEC in respect of the Koala, Yellow-bellied Glider and Moonee Quassia. These species have all been recorded on the subject site at Moonee, and the *Recovery Plans* are addressed, where relevant, in the consideration of s.5A of the EP&A Act for each species (Appendix 5).

A *Recovery Plan* has also been prepared for the large forest owls. None of these species has been recorded on the subject site at Moonee, but with their large home ranges and wide-ranging habits, and their high mobility, it is reasonable to assume that individuals of some of these species (particularly the Powerful Owl and Masked Owl) would utilise the subject site on occasion.

Whilst a specific s.5A *Assessment of Significance* has not been prepared for each of these species in Appendix 5, the relevant considerations of s.5A have been considered for each of the large forest owls, and the relevant requirements of the *Recovery Plan* have been considered in preparing the VMP for long-term management of the Conservation Reserve.

Given the size of the Reserve and the extent of resources to be retained within it, it is considered that the proposed development of the subject site at Moonee Beach has appropriately addressed the *Recovery Plan* for large forest owls.

Threat Abatement Plans have been prepared for 'predation by the Plague Minnow', 'predation by the Red Fox', and a draft *Threat Abatement Plan* has been prepared for 'invasion by the Bitou Bush'. The proposed development at Moonee Beach will not encourage predation by the Plague Minnow or the Red Fox, as these species are either already present on the subject site or likely to occur. Design elements of the project will ensure that there is no encouragement of populations of the Plague Minnow within the subject site, and that predation by the Red Fox is not encouraged.

The proposed management of the Conservation Reserve will incorporate specific measures to remove Bitou Bush from the Conservation Reserve on the site. This situation contrasts with existing circumstances in which there is little incentive to remove Bitou Bush from the site, and no apparent control of or removal of Bitou Bush from the adjoining Coast Reserve.

Factor g – Key Threatening Processes

The proposed development on the site at Moonee Beach would involve the removal of native vegetation from the development area on the subject site. That activity would constitute the "*clearing of native vegetation*", which has been listed as a "*key threatening process*" on the TSC Act. However, the removal of vegetation for the proposed development is not likely to place any threatened biota "*at risk of extinction*" (emphasis added) even in terms of the subject site in isolation, notwithstanding the likelihood of some adverse impacts being imposed on some individuals of some relevant biota.

There are a substantial number of other "*key threatening processes*" which are or could be of relevance to the proposed development of the subject site at Moonee Beach, although many of these "*processes*" are not likely to be exacerbated by the proposed development of the site. Potentially relevant additional "*key threatening processes*" and their relevance to the proposal at Moonee Beach are considered briefly below.

- "*Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands*".

  The proposed development will not affect the "*natural flow regimes*" of the relevant elements of the site by virtue of the stormwater management and control measures which are to be incorporated into the development as currently designed. In addition, the size of the relevant catchments, and the small contribution by runoff from the subject site to the "*natural flow regimes*" within these systems, is also of relevance.

  Water quality and flow controls have been incorporated into the development design (Patterson Britton 2005), and the appropriate management of water has been a key element in the design of the project.

- "*Competition from feral honeybees".*

  The proposed development would not exacerbate this "*key threatening process*" in any way.

- "*Ecological consequences of high frequency fires*".

  Again, the proposed development does not involve any activities or intent to increase the frequency of fires on the subject site. Indeed, passive surveillance of the Conservation Reserve on the subject site will be increased, and the

management of retained vegetation by the local community will limit any such potential.

- "*Infection of frogs by amphibian chytrid fungus causing the disease Chytridiomycosis*".

  Appropriate management of stormwater discharges from the subject site is intended *inter alia* to limited or prevent any exacerbation of this "*key threatening process*". The size of the Conservation Reserve on the subject site, and the implementation of a comprehensive *Management Plan*, would also mitigate against any exacerbation of this "*process*".

- "*Invasion of native plant communities by Bitou Bush and Boneseed*".

  The Bitou Bush is present at high densities along the foredune and in plant communities immediately adjacent to it on the eastern side of the subject site. There are also patches of Bitou Bush infestation scattered throughout the subject site. Development of the site will directly remove some of these infestations of Bitou Bush, and implementation of a comprehensive *Management Plan* for the Conservation Reserve on the subject site will focus *inter alia* on the removal of Bitou Bush from the site in its totality.

  In addition, it should be noted that the adjoining Coffs Coast Regional Park (CCRP), which is currently administered by the DEC, supports very high infestations of the Bitou Bush. Management and control of these infestations, in consultation with the DEC, would be necessary to prevent re-infestation of the subject site from the CCRP, following implementation of the comprehensive *Management Plan* on the subject site;

- "*Invasion of native plant communities by exotic perennial grasses*".

  The Molasses Grass is already present on the subject site and on the adjoining CCRP in localised but dense infestations. As is the case with the Bitou Bush, implementation of the *Management Plan* for the Conservation Reserve on the subject site would involve *inter alia* removal of this and other invading "*exotic perennial grasses*". Appropriate management of the CCRP will also be necessary to avoid re-infestation of the subject site by such species.

- "*Predation by the Plague Minnow Gambusa holbrooki"*.

  This species is already present in Sugar Mill Creek (Parker 2004; *pers obs*) and its removal from watercourses is highly problematic. Whilst it is not intended to implement a program of removing this species, the proposed development will not exacerbate the impact of the Plague Minnow on native biota. Stormwater detention ponds and any water features on the site will be designed so as to prevent colonisation by the Plague Minnow.

- "*Predation by the European Red Fox Vulpes vulpes"*.

  The proposed development of the subject site at Moonee Beach will not exacerbate the impacts of predation by this introduced predator.

- "*Predation by the feral Cat Felix cattus"*.

  As is the case with the European Red Fox, the proposed development will not exacerbate predation by this species. Responsible pet ownership will be promoted through the community title arrangement for the site.

- "*Cane Toad"*.

  The proposed development will not exacerbate this "*key threatening process*". Invasion of the site at some time in the future is essentially inevitable, and a program of Cane Toad removal can be implemented as appropriate.

- "*Lantana camara"*.

  Implementation of the comprehensive *Vegetation Management Plan* (VMP) for the Conservation Reserve on the subject site will focus *inter alia* on the removal of Lantana from the site in its totality.

- "*Competition and grazing by the feral European Rabbit"*.

  The proposed development will not exacerbate this "*key threatening process*".

- "*Removal of dead wood and dead trees*".

  The proposed development will involve some removal of "*dead wood and dead trees*" from the dry forest communities. However, the removal of dead trees will be limited to the development portion of the subject site, and those resources can be relocated (as logs) into portions of the Conservation Reserve. Thus, there will be no reduction in "*dead wood*", although the proposal will involve a modest reduction in "*dead trees*" on the subject site.

  In respect of the local and regional supply of these habitat features, however, the subject site represents only a minute proportion of those present in the locality and region.

Given those considerations, the proposed activity does not constitute a "*threatening process*", as defined in the TSC Act. Further, the proposed development will not exacerbate any of the potentially relevant listed "*key threatening processes*".

Conclusions

Given the detailed consideration of the eight factors of s.5A of the EP&A Act documented above, it cannot be construed as "*likely*" that the proposed development of the subject site at Moonee Beach would impose "*a significant effect on* [any] *threatened species, populations or ecological communities, or their habitats*". There is no requirement for the preparation of a *Species Impact Statement* (SIS) for the proposed development with respect to any threatened biota.

8 OTHER STATUTES & PLANNING INSTRUMENTS

8.1 General Considerations

In addition to Section 5A of the EP&A Act, which refers specifically to "*threatened species, populations and ecological communities, and their habitats*", a number of other statutory and policy considerations are relevant when addressing the potential impacts of the proposed development on the subject site at Moonee Beach. In addressing these relevant statutes, policies and planning instruments, relevant considerations have included:

- the extent of the Conservation Reserve on the subject site, which occupies approximately 70% of the land;
- the dedication of that Reserve in perpetuity and its management subject to a VMP and community title arrangement;
- the retention of representative examples of all ecological communities and habitat types within the subject site; and
- the design features of the proposed development and of the stormwater management and other relevant urban management features to limit impacts upon the natural environment and to maintain the biodiversity conservation values of the Conservation Reserve.

8.2 Section 79C of the EP&A Act

A noted above, the proposed development of the subject site at Moonee Beach will unavoidably involve the imposition of impacts upon the "*natural environment*". The site is largely covered by native forest, woodland and wetland vegetation, and development of the site will require the removal of some vegetation, and the displacement or loss of fauna from the development areas on the site.

However, the vegetation and the biota present within the development area on the subject site are generally broadly distributed in the locality and region, and are of the lowest relative conservation value in relation to other vegetation on the site.

As discussed above, the dry forest communities are clearly of less conservation significance than the swamp forest and wetland communities on the subject site (as reflected in the listings of *"endangered ecological communities*" by the NSW Scientific Committee on the TSC Act). Whilst Hager & Benson (1994) suggest that the Dry Blackbutt Forest on Coastal Sand is "*inadequately conserved over all of its range*", that classification regime is naturally conservative (having been prepared specifically for the purposes of conservation).

Furthermore, it could reasonably be assumed that essentially all coastal plant communities are "*inadequately conserved*", or at least are so considered, given the history of the east coast of NSW. However, those communities regarded as of the highest conservation significance or concern are listed by the NSW Scientific Committee as "*endangered ecological communities*". The Dry Blackbutt Open Forest community, and the other dry forest communities present on the subject site, are not so listed.

The majority of the significant and sensitive plant communities and areas of vegetation on the subject site have been identified for retention and protection in the development design. Those plant communities and ecosystems which have been identified as of the highest conservation value (*ie* those which have been listed as "*endangered ecological communities*" on the TSC Act) are almost entirely contained within the Conservation Reserve identified in the *Development Concept* on the subject site. This approach also protects the most significant habitats and resources present on the site for native (including threatened) biota.

The impacts which will be imposed by development of the site as proposed are not regarded as either unacceptable or unreasonable in terms of s.79C of the EP&A Act, because of:

- the extent of those plant communities and ecosystems which are to be affected throughout the locality and region;
- the relatively small area of land to be affected compared to the total size of the subject site and the extent of vegetation in the locality;
- the concentration of development activities within the most common plant communities, and those of the lowest conservation significance (by reference to the TSC Act); and
- the protection of most of the subject land (approximately 70%), including the most significant and sensitive environments, in a substantial Conservation Reserve on the site.

The proposed development at Moonee Beach provides for an appropriate balance between urban development requirements and conservation goals in respect of the considerations necessary pursuant to s.79C of the EP&A Act, as discussed at length above.

8.3 Coffs Harbour City Vegetation Strategy

The *Coffs Harbour City Vegetation Strategy* identifies a range of habitat and conservation values on land along the coastal portions of the Coffs Harbour LGA. The *Strategy* is intended to "*provide a clear and consistent framework for the conservation and management of native vegetation, consistent with the principles of Ecologically Sustainable Development, within the Coffs Harbour Local Government Area giving consideration to social, economic, agribusiness, environmental and cultural interests*".

The *Strategy* envisages the preparation and implementation of *Local* and *Regional Vegetation Management Plans* as part of the implementation of its goals, and the provision of a *Vegetation Conservation Development Control Plan* (DCP) and relevant amendments to the *Coffs Harbour Local Environment Plan 2000* (LEP 2000).

Most of the subject site at Moonee Beach has been mapped by Ecograph (ecological consultants to the Vegetation Study Working Group of CHCC) as vegetation of *High Value* or *Very High Value* (CHCC 2003). The estuarine habitats in the northern part of the subject site are mapped as *Medium Value* (Figure 8).

The mapping of areas of vegetation with various ecological status categories by Ecograph (2002) is based on the vegetation mapping of Coffs Harbour LGA (Fisher *et al* 1996), and the application of a matrix of ecological attributes to the various areas of vegetation.

There are, however, some concerns with the criteria which had been applied by Ecograph (2002) in terms of their breadth and compatibility with other conservation criteria applied on a state-wide and nation-wide basis. In addition, the criteria have failed to provide any reasonable means of differentiation between plant communities within a large site such as the subject site at Moonee Beach. Consequently, it is not possible using those criteria to differentiate between the various levels of ecological constraint or ecological value which apply to different plant communities on the subject site.

This concern is evident in the fact that those plant communities on the subject site listed as "*endangered ecological communities"* on the TSC Act are not accorded a higher status (in terms of the mapping by Ecograph 2002) than plant communities which are not listed as "*endangered ecological communities*", and which are consequently of lesser ecological or conservation concern. The Dry Coastal Blackbutt Open Forest community is clearly not of

the same conservation value as the various listed Swamp Forest communities. However, in the *Vegetation Strategy* mapping it has been accorded the same conservation status.

In order to determine the appropriateness of development on lands such as the subject site at Moonee Beach, it is necessary to assess the relative conservation values of the various plant communities present both within the site and in a local or regional context. The proposed development of the subject site has been designed to retain those habitats and vegetation types which are regarded as of the highest conservation significance, including the recently listed "*endangered ecological communities*" (see above). Development of the site is largely to be undertaken within vegetation which is better conserved and which is not regarded as of state conservation significance.

As discussed in some detail in Part B of this *Report*, the original approach to assessing the development potential of the subject site at Moonee Beach involved the identification of environmental and biodiversity conservation constraints on the site. In this regard, the low-lying swampy and wetland vegetation was identified in 2002 as of the highest conservation value and significance, and was determined to constitute a substantial and significant constraint to development opportunities. Notwithstanding the zoning of a substantial proportion of that vegetation for residential purposes by CHCC in LEP 2000, it was determined from the outset that essentially all of the low-lying portions of the site should be excluded from development activities.

The validity of this approach was corroborated and confirmed by the designation of most of those swamp forest and wetland plant communities by the NSW Scientific Committee as "*endangered ecological communities*" on the TSC Act in 2004. By contrast, the Dry Blackbutt Forest and associated communities were not considered for listing as, and have not been listed as, "*endangered ecological communities*" on the TSC Act.

In terms of the relative conservation values of vegetation and plant communities on the subject site at Moonee Beach therefore, the proposed development has sought to retain and protect those communities of higher conservation value and greater biodiversity significance. By contrast, the vegetation which is to be affected by the proposal is of lower conservation value, although that vegetation obviously still has some biodiversity conservation values.

It is to be noted that the *Vegetation Strategy* is not a prohibition on development activities within lands which are appropriately zoned. In this regard, substantial portions of the subject site were re-zoned or confirmed in their residential and tourist zoning categories in LEP 2000. The *Development Concept* has not sought to maximise development possibilities, but has sought to achieve an appropriate balance between development rights and expectations and conservation goals and responsibilities.

8.4 State Environmental Planning Policy No. 14 – Coastal Wetlands

State Environmental Planning Policy No.14 – Coastal Wetlands (SEPP 14) provides a set of detailed maps of wetlands which have been identified along the coast of NSW pursuant to the *Policy*. The *Policy* requires that activities within the SEPP 14 Wetlands (including clearing, construction of levees, draining or filling) can only be undertaken "*with the consent of the Council and the concurrence of the Director*". In addition, Clause 7(2) of SEPP 14 provides a number of matters which *"shall be taken into consideration*" by the Director of DoP in "*considering whether to grant concurrence*".

The *Development Concept* for the subject site at Moonee Beach does not specifically contemplate the conduct of any activities within the SEPP 14 Wetland which is present on the subject site (Figure 9). However, one option for access to the tourist zone in the southeastern portion of the subject site (should that ultimately be developed) would be along

the unformed but dedicated public road along the southern boundary of the subject site. That public road traverses the SEPP 14 Wetland (Figure 9).

In the event that development of the southeastern portion of the subject land and access along the road reserve is pursued, consideration would need to be given to the application of SEPP 14 and its assessment requirements.

It is to be noted that there is no requirement in SEPP 14 for any setbacks or buffers to SEPP 14 Wetlands. Consequently, development of the southeastern portion of the subject site would not be constrained by SEPP 14, except to the extent that no encroachment into the SEPP 14 Wetland would be proposed and that the management of stormwater discharges into the SEPP 14 Wetland would be regarded as an essential feature of the project.

Whilst it is acknowledged that some government agencies regard the provision of a 50m setback to SEPP 14 Wetlands as a desirable goal, there is no statutory requirement for such a setback. Furthermore, the issue of setbacks is neither certain nor generally based on sound scientific information, and is necessary generally in inverse relation to the implementation of appropriate management measures. This matter would, in any case, be the subject of further consultation should development of the southeastern portion of the subject site be pursued.

8.5 State Environmental Planning Policy No. 44 – Koala Habitat Protection

State Environmental Planning Policy No. 44 - Koala Habitat Protection (SEPP 44) aims to protect the Koala and its habitat by incorporating matters for consent authorities to consider during the assessment of relevant DAs. In particular, SEPP 44 contains definitions of "*potential koala habitat*" and "*core koala habitat*" to be applied in consideration of developments within Local Government Areas (LGAs) listed on Schedule 1 of the *Policy*.

The Coffs Harbour LGA is listed on Schedule 1 of the *Policy* as an area to which SEPP 44 applies.

Schedule 2 of SEPP 44 provides a list of tree species recognised as food trees utilised by the Koala. Tree species listed on Schedule 1 which are present on the subject site include the Swamp Mahagony, Forest Red Gum and Tallow-wood. However, the relevant tree species do not constitute more than 15% of the tree canopy over the subject site at Moonee Beach, and the site consequently does not constitute "*potential koala habitat*", as defined in SEPP 44[5].

As a consequence, the subject site cannot constitute "*core koala habitat*" pursuant to SEPP 44[6].

On the basis of recent (2006) data, there has been some relatively recent use of the site by Koalas, albeit at low density. However, the infrequency of records and the low and apparently occasional use of the site suggests that there is no "*resident population*" of Koalas on the site but that there is some peripheral use of the site by Koalas in the locality.

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[5] SEPP 44 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*".

[6] SEPP 44 defines "*core koala habitat*" as "*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*".

Given the absence of a "*resident population*" of Koalas, as defined in SEPP 44, the subject site at Moonee Beach does not constitute "*core koala habitat*" as defined in SEPP 44.

In any case, there is no requirement for the preparation of a site-specific *Koala Plan of Management* (KPoM) pursuant to SEPP 44 for the site because CHCC has adopted a KPoM for the whole LGA, which, by default, applies to the subject site.

8.6 Coffs Harbour City Koala Plan of Management

The *Koala Plan of Management* (KPoM) for the Coffs Harbour City LGA provides a *Management Plan* for Koalas which applies across the whole LGA to satisfy the requirements of SEPP 44.

The KPoM of CHCC has mapped most of the site at Moonee Beach (excluding the eastern parts) as *Secondary Habitat* for the Koala (Figure 10). That mapping, however, is at a coarse scale, and:

- includes substantial areas of vegetation which are of only limited value for the Koala (*eg* vegetation dominated by the Blackbutt); and
- excludes areas of high value Koala foraging resources (including the favoured Swamp Mahogany).

In any case, despite the limited evidence for Koala use of the site, most of the preferred foraging habitat for Koalas on the subject site will be retained within the extensive areas of conserved and protected lands. The majority of the subject site is to be retained as a Conservation Reserve, and most of the preferred food trees for the Koala are located within this portion of the site. In particular, the overwhelming majority of areas of the Swamp Mahogany will be retained across the site.

Consequently, the proposed development at Moonee Beach satisfies the aims and objectives of the Coffs Harbour *Koala Plan of Management*.

8.7 Fisheries Management Act

The *Fisheries Management Act 1994* (FM Act) requires the protection of native fish species and their habitats. The Act provides protection for a range of fish habitats, both freshwater and estuarine, and through a range of associated policies and guidelines provides for the maintenance of fish passage along watercourses.

The *Development Concept* for the proposed development at Moonee Beach, and the environmental studies and advice which informed that *Development Concept*, are based on the premise of satisfying all of the requirements of the FM Act. The proposal does not involve any construction activities within the watercourses across the site, and the two road crossings (one at the northwestern corner of the site across the tributary of Moonee Creek and the other near the western boundary, across Sugar Mill Creek) will be constructed so as to avoid any adverse impacts on fish habitats and to avoid any restrictions on fish movements.

Additionally, the water management regime for the proposal is designed to maintain water quality in the watercourses and to avoid altering flow regimes. Consequently, the proposed development will not adversely affect native fish species or their habitats, and will satisfy the aims and objectives of the FM Act.

8.8 Rivers & Foreshores Improvement Act

The Department of Natural Resources (DNR) administers the *Rivers & Foreshores Improvement Act 1948* (RFI Act) in respect of construction or excavation activities within 40m of "*protected waters*".

The RFI Act requires DNR approval of development activities that encroach within 40m of the upper bank of watercourses such as those on the subject site, and the provision of *General Terms of Agreement* as conditions of consent and a Part 3A Permit for any such works. The requirements of the RFI Act do not, however, apply to activities such as rezonings or subdivision designs, as these do not involve physical works on the site (although they do anticipate such activities).

The *Development Concept* for the subject site at Moonee has addressed the requirements of the RFI Act and the need to maintain aquatic and riparian habitats. In particular, the proposed development:

- is set back from the watercourses on the site;
- incorporates water management measures designed *inter alia* to protect the adjoining environment and to maintain water quality and flow regimes; and
- incorporates a VMP and community title arrangement for the management in perpetuity of the Conservation Reserve on the subject site, which includes the riparian zones on the site.

9 IMPACT AMELIORATION & ENVIRONMENTAL MANAGEMENT

The principal impact amelioration measure which is incorporated into the proposed development at Moonee Beach is the retention of the majority of the subject site (approximately 70%) for conservation purposes. The overwhelming majority of the low-lying land and associated vegetation is to be retained through the central parts of the site (Figure 5), including most of the stands of "*endangered ecological communities*" which are present on the land. The SEPP 14 Wetland on the subject site is also to be retained within this Conservation Reserve, as are representative examples of the drier forest communities in the southwest, west and north.

The Conservation Reserve is to be managed in perpetuity in accordance with a detailed *Vegetation Management Plan* (VMP), which will be administered and implemented by a community title body representing all landowners on the site, The VMP will include specific sections dealing with:

- protection of individuals of and the habitat of the two threatened plant species (the Rusty Plum and Moonee Quassia), including a protocol to prevent further damage and to control access, and a habitat rehabilitation program;
- protection of threatened fauna species and their habitats, including the identification of any special features and their protection and rehabilitation if required;
- Koalas and Koala habitat;
- weed removal and permanent control;
- the management generally of access through the Reserve; and
- the construction and maintenance of pedestrian and bicycle paths through the Reserve.

The proposed development has been confined to three portions of the site, occupying less than half of the land which was zoned in 2000 by Coffs Harbour City Council (CHCC) for urban residential and tourism purposes. The project involves 70% of the land being retained and managed for biodiversity conservation purposes and just 30% being developed, compared to the zoning by CHCC which promotes 70% of the land being developed with just 30% being identified for conservation.

Furthermore, development is to be confined to the higher parts of the site containing the less-sensitive vegetation, in areas of plant communities which are well-distributed along the east coast. The potential development of the southeastern part of the land (behind the frontal dune) is also located within vegetation which is well conserved on the north coast of NSW (noting also that the land had previously been mined for heavy minerals and parts of this area are heavily weed infested).

In addition to the sensitive design of the proposed development within areas of less significant vegetation on the subject site, an array of sensitive urban design elements have been incorporated into the development design, including:

- the use of "*water-sensitive urban design*" principles (as documented in the *Report* by Patterson Britton & Partners) which include:
  - the retention and detention of stormwater using rainwater tanks, and its appropriate treatment and discharge throughout the development;
  - the use of bioretention swales to distribute stormwater and allow for infiltration;

    - measures to minimise potable water demand (by using rainwater for certain purposes and by flow restrictors);
    - controls on water quality by the bioretention swales and gross pollutant traps; and
    - management of water quantities using infiltration throughout the development and in the bioretention swales and the collection of rainwater for indoor use and for irrigation;
- the use of bioretention swales (as discussed above) and strategically located stormwater infiltration at appropriate locations to maintain hydrologic regimes within swamp and wetland habitats near the boundaries of development activities;
- the collection and re-use of vegetation and other natural resources (logs, tree-hollows *etc*) to be removed from development portions of the site either within landscaping and rehabilitation programs on the site itself or elsewhere in the locality;
- the use of a peripheral road system to provide for appropriate bush fire protection and access by fire fighters when required;
- the provision of dedicated and sensitively designed and located public access (pedestrian and bicycle paths, elevated boardwalks) across the subject site;
- a commitment to the preparation of a detailed *Vegetation Management Plan* (VMP) for the subject site (following approval of the *Development Concept*) which will include both management principles and guidelines for the clearing and development phases and a program of rehabilitation and management for the retained Conservation Reserve;
- the preparation of a *Community Title Management Plan* for the conserved portions of the site to ensure their appropriate management and protection *in perpetuity*; and
- the implementation of appropriate measures during construction activities to avoid the discharge of wastes, pollutants, chemicals or rubbish into retained areas of vegetation.

10 CONCLUSIONS

The site for a proposed urban and tourism development at Moonee Beach, on the north coast of NSW, and other lands in the immediate vicinity, have been the subject of detailed flora and fauna investigations (Yarranbella undated; Clancy 1989, 1990; G & V Clancy 1998; Sandpiper 2003; Parker 2004; Gunninah this *Report*), as well as a number of field inspections and short investigations by the principal author of this *Report* and a botanical colleague (Mr Gary Leonard).

The subject site supports an array of plant communities and fauna habitats, and is divided into essentially four landscape units:

- the frontal dune and beach landscape on its eastern side;
- estuarine and mangrove habitats along its northern boundary and (to a limited extent) extending into the northern part of the site;
- low-lying and flood-prone land throughout much of the eastern portion of the site and in the central southwest; and
- more elevated land in the southwest and northwest, supporting dry open forest and woodland communities.

These latter portions of the site are the focus for most of the urban development proposed on the land at Moonee Beach. The plant communities present within these elevated portions of the land are less sensitive and are regarded as of lower conservation significance (see Bibliography). By contrast, much of the vegetation within the low-lying portions of the land and in the estuarine habitats is regarded as of state conservation significance, with several communities being listed as "*endangered ecological communities*" on the TSC Act.

The development design documented in the *Development Concept* for the subject site at Moonee Beach has recognised the significance of the low-lying lands and the "*endangered ecological communities*" present thereon. These communities were recognised in the original development design program for the site as of the highest conservation value and significance. That approach (which had been adopted in 2002 and 2003) has been confirmed and corroborated by the recent listings by the NSW Scientific Committee of the swamp forest and wetland communities as "*endangered ecological communities*" on the TSC Act.

As a consequence of the approach adopted for this project, the proposed development is confined to a total of 30.27ha (or approximately 30%) of the site. The remaining 71.75ha (or approximately 70% of the subject site) is to be retained for conservation and environmental management purposes. It should also be noted that the proposal occupies just 44% of the land within the subject site which was zoned for residential and tourism purposes by CHCC in 2000 (LEP 2000).

Development of the subject site as proposed will require the removal of dry forest and woodland vegetation from the development portions of the site and the implementation of environmental management measures to limit the potential for adverse impacts from eventual development of the land. Clearly, the development activities will involve the imposition of impacts upon the natural environment in general terms, and there will be some limited impacts on "*threatened species*" and "*endangered ecological communities*" listed on the TSC Act.

Notwithstanding the required removal of vegetation for development of the site in the current design, the proposed development of the subject site at Moonee Beach:

- is regarded as appropriate in terms of s.79C of the EP&A Act given the substantial area of vegetation to be retained on the subject site its (71.75ha or approximately 70% of the site), as well as the extent of vegetation in the general locality;
- is not "*likely*" to impose a "*significant effect*" on any "*threatened species, populations or ecological communities, or their habitats*" pursuant to s.5A of the EP&A Act. The potential for a "*significant effect*" to be imposed upon the fifteen threatened fauna species, two threatened plant species and five "*endangered ecological communities*" present on the subject site has been considered in detail (Appendix 5). The proposed retention and long term management of the majority of the site for conservation purposes, as well as the conservation of other lands in the locality, are regarded as sufficient to avoid the imposition of a "*significant effect*" upon any of these threatened biota or their habitats;
- does not require the preparation of a *Koala Plan of Management* pursuant to SEPP 44. Nevertheless, the extensive areas of land to be conserved on the subject site will retain substantial foraging resources for Koalas, should this species occur on the site;
- does not involve development within an SEPP 14 Wetland. Whilst the *Development Concept* identifies the patch of land zoned Residential/Tourist in the southeastern corner of the subject site for future development activities, there is currently no specific development design proposed for this portion of the site. The issue of setbacks to the SEPP 14 Wetland and/or access across it is to be resolved as part of any future development design for that portion of the subject land. None of the other proposed developments on the subject site will impose significant adverse impacts upon the SEPP 14 Wetland by virtue of the development design and the impact amelioration measures proposed;
- is an appropriate response to LEP 2000 given that less than half of the lands which are zoned for urban development and tourism are to be affected by the proposal whilst substantial areas of land which were zoned in 2000 for residential and tourism purposes are to be retained for conservation purposes instead; and
- appropriately addresses the *Coffs Harbour City Vegetation Strategy*. Whilst not retaining all of the vegetation identified in the *Strategy* as of *High* or *Very High Conservation Value*, the proposed development achieves an appropriate outcome and a suitable funding base for the long-term management of the substantial area of land (approximately 72ha) which is to be retained for conservation purposes.

On the basis of all the considerations outlined above and detailed in this *Flora & Fauna Assessment Report,* the proposed development of the subject site at Moonee Beach is regarded as an appropriate and reasonable response to the environmental constraints of the land. The proposed development design has been established specifically to limit the potential for adverse impacts upon significant or high value areas of vegetation and habitats on the subject site, and appropriate measures have been incorporated into the development design to protect the retained natural environment.

Most of the subject site (approximately 70%) is to be retained for conservation purposes. The overwhelming majority of the vegetation regarded as of the highest conservation significance (given its listing on the TSC Act) is to be retained and protected. Development is to be confined to the drier and less sensitive vegetation communities, which are not listed as of high conservation concern. Further, the project involves measures for the long-term conservation and management of the retained vegetation on the subject land.

Given the approach identified above, particularly the dedication and management in perpetuity of the substantial Conservation Reserve, the proposed development of the subject site at Moonee Beach constitutes an appropriate and reasonable balance between development aspirations and conservation goals on this large portion of land on the north coast of NSW.

GLOSSARY and DEFINITIONS

CHCC	Coffs Harbour City Council
DEC	NSW Department of Environment & Conservation
DoP	NSW Department of Planning
DNR	NSW Department of Natural Resources
EP&A Act	Environmental Planning & Assessment Act 1979
FM Act	Fisheries Management Act 1994
LEP 2000	Coffs Harbour City Council Local Environmental Plan 2000
LGA	Local Government Area
NPWS	NSW National Parks & Wildlife Service
NP&W Act	National Parks & Wildlife Act 1974
s.5A	Section 5A of the EP&A Act
s.79C	Section 79C of the EP&A Act
RFI Act	Rivers & Foreshores Improvement Act 1948
SEPP 14	State Environmental Planning Policy No.14 - Koala Habitat Protection
SEPP 26	State Environmental Planning Policy No.26 - Littoral Rainforest
SEPP 44	State Environmental Planning Policy No.44 – Koala Habitat Protection
SEPP 71	State Environmental Planning Policy No.71 – Coastal Protection
TSC Act	Threatened Species Conservation Act 1995
TSA Act	Threatened Species Legislation Amendment Act 2004
VMP	Vegetation Management Plan

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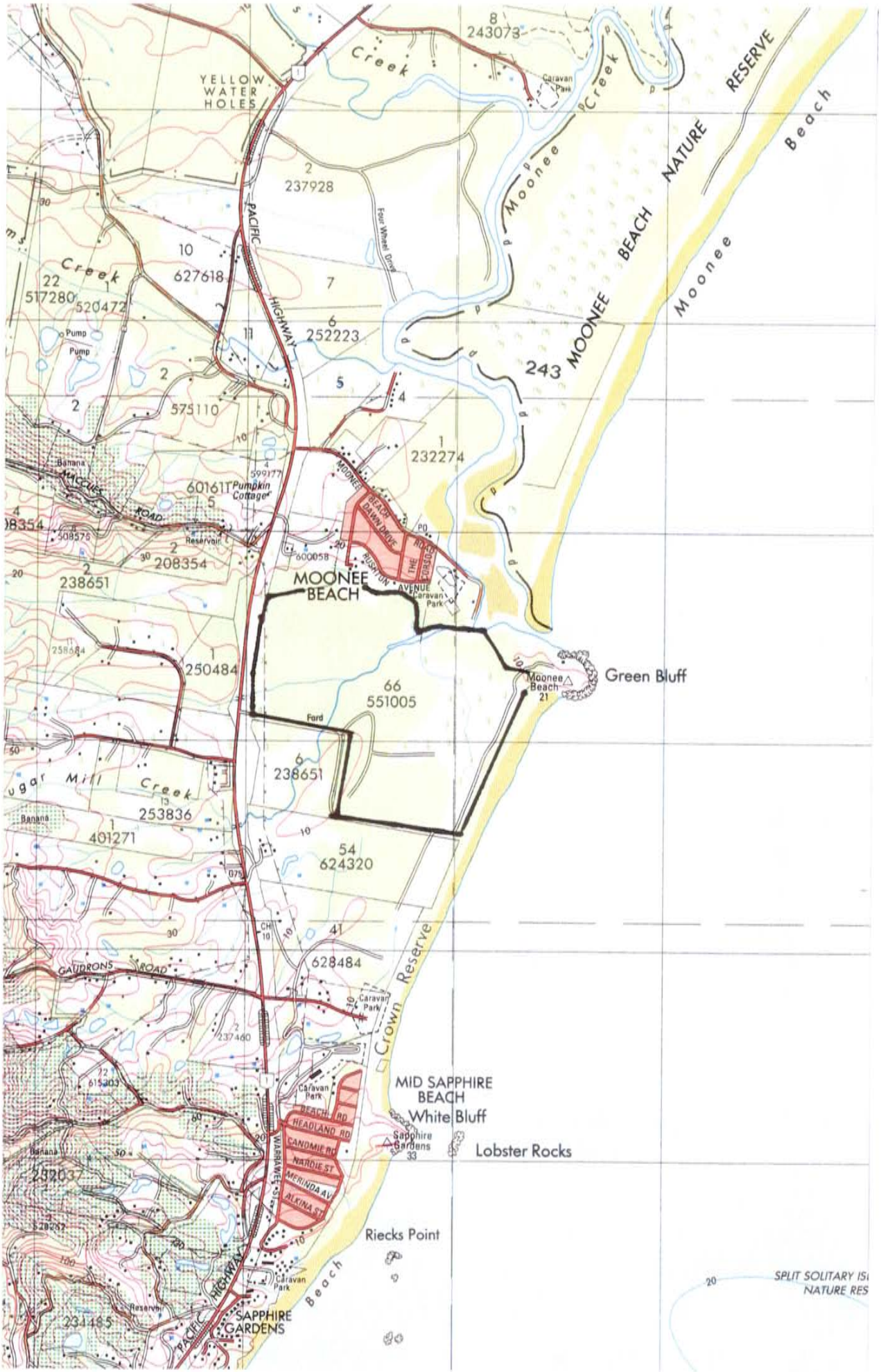


Figure 1

Location of the subject site at Moonee Beach and surrounding lands.

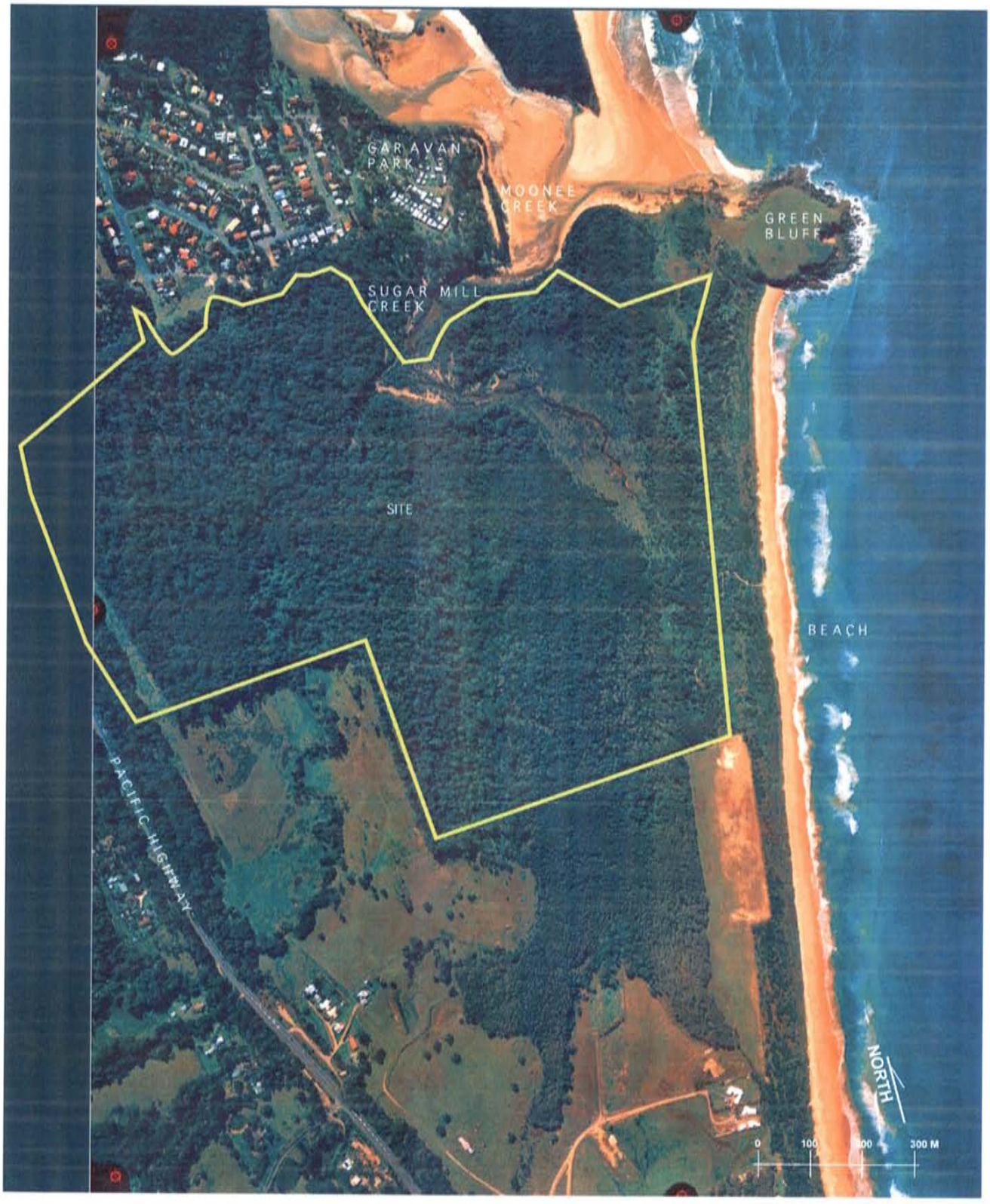


Figure 2

Aerial photograph of the subject site at Moonee Beach and its immediate environs.

Figure 3

Land zoning in CHCC LEP 2000.
Figure Courtesy of CHCC.

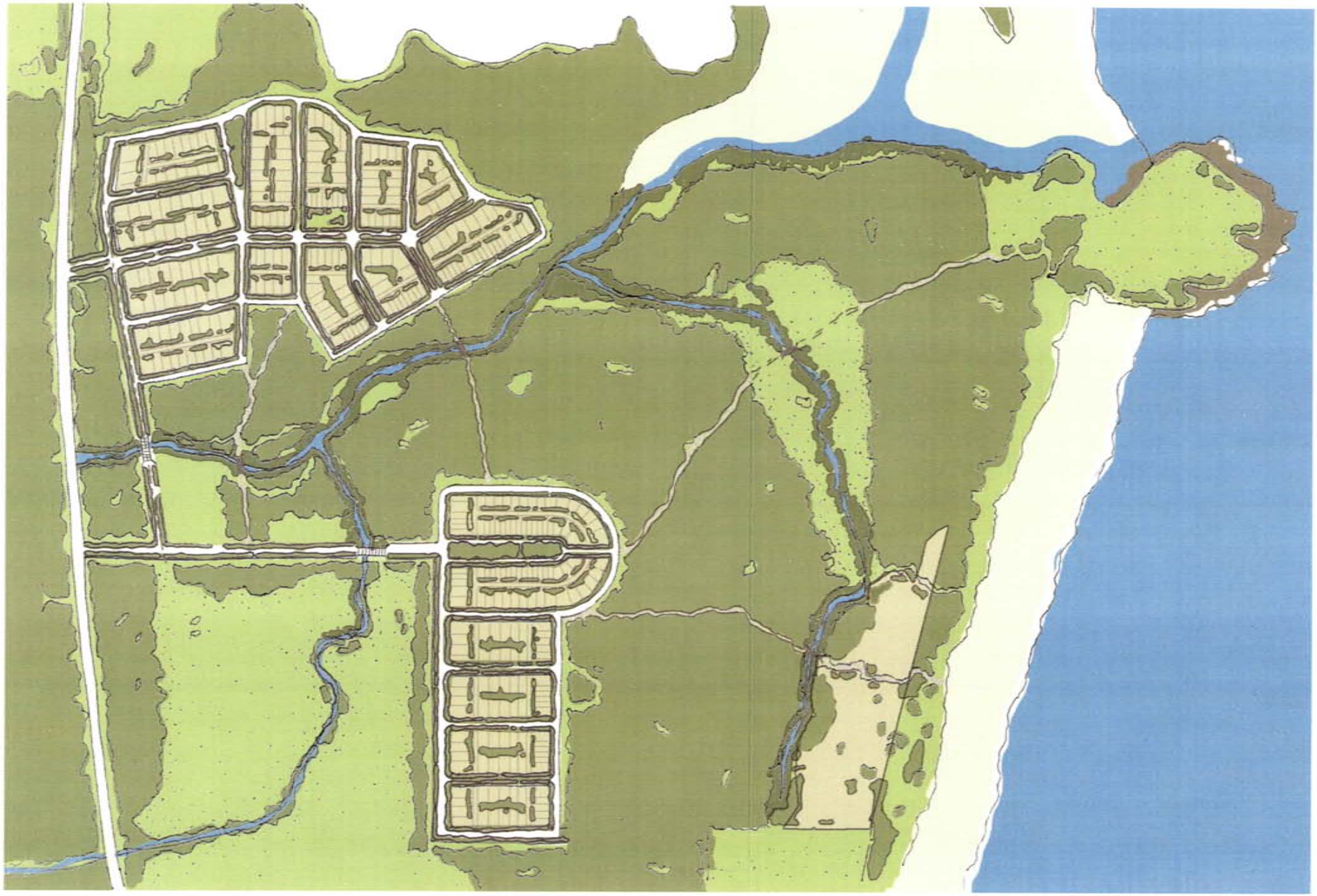
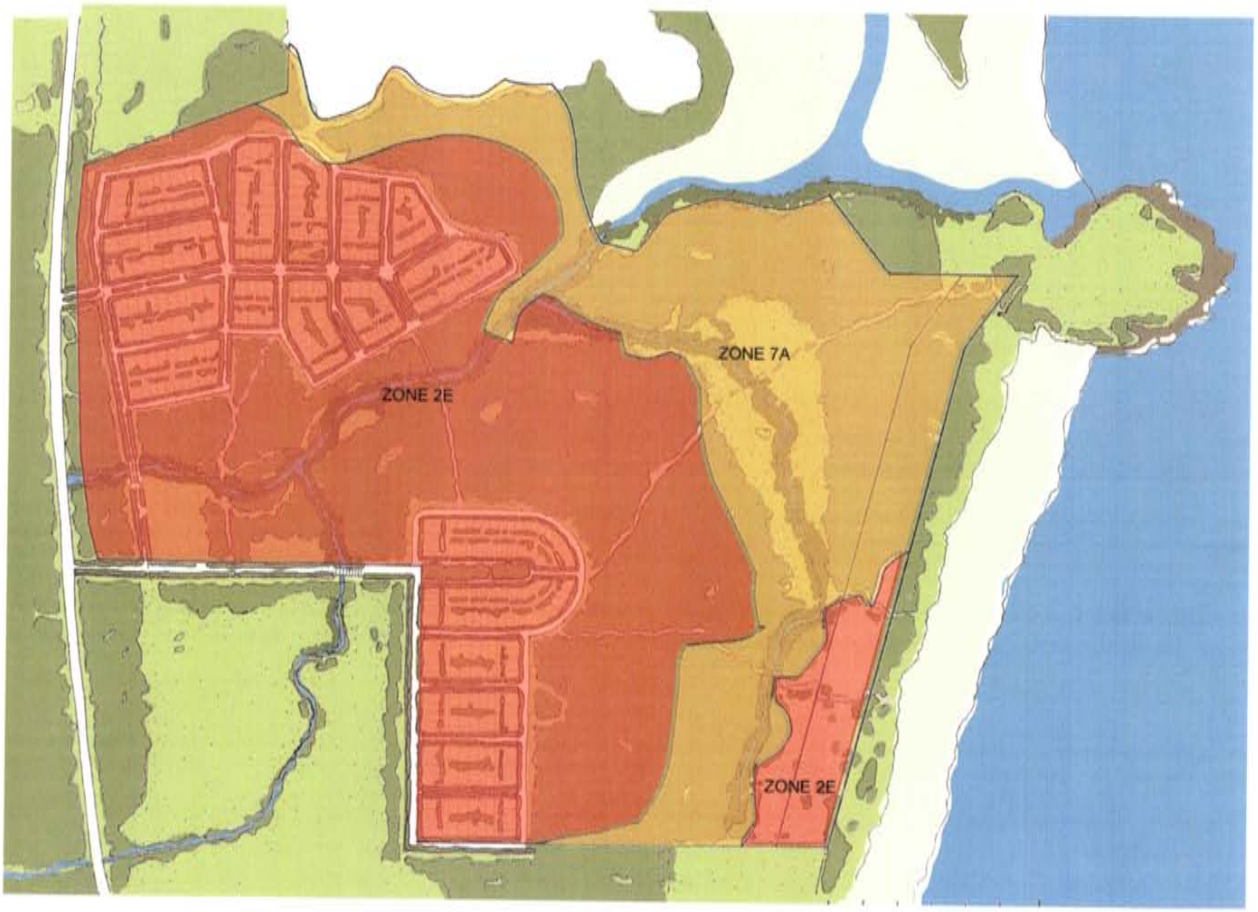


Figure 4

Development concept for the 'Moonee Waters' project at Moonee Beach.



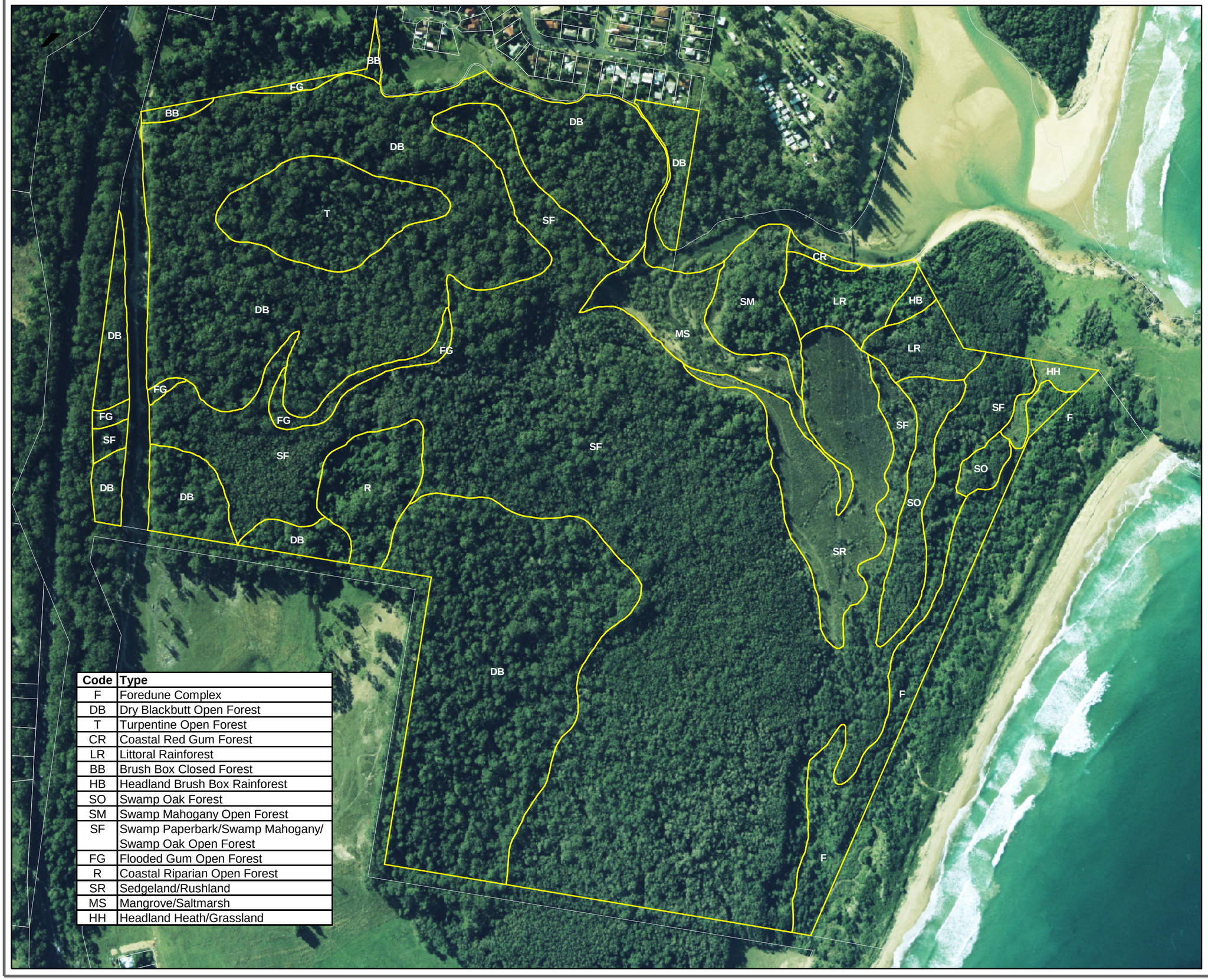
Note that neither the Master Plan outline nor the zoning boundaries are precise in this sketch. Despite the apparent encroachment of the Northern Precinct into the land zoned 7A in the north of the site, no such encroachment is intended or proposed.

Figure 5

Current land zonings on the subject site at Moonee Beach with an approximate overlay of the proposed development scheme.

Sketch courtesy of Annand Alcock Urban Design

LOT 66 in DP 551005 Moonee Beach - Extent of Vegetation Communities on the Site



Code	Type
F	Foredune Complex
DB	Dry Blackbutt Open Forest
T	Turpentine Open Forest
CR	Coastal Red Gum Forest
LR	Littoral Rainforest
BB	Brush Box Closed Forest
HB	Headland Brush Box Rainforest
SO	Swamp Oak Forest
SM	Swamp Mahogany Open Forest
SF	Swamp Paperbark/Swamp Mahogany/ Swamp Oak Open Forest
FG	Flooded Gum Open Forest
R	Coastal Riparian Open Forest
SR	Sedgeland/Rushland
MS	Mangrove/Saltmarsh
HH	Headland Heath/Grassland

PREPARED FOR:

Hillview Estates Pty Ltd

PREPARED BY:

WHELANS INSITES

0 25 50 100 150 200 250

Metres

NOTES:

DCDB © LPI 2006

Aerial photograph - Coffs Harbour City Council (2004)

Vegetation Digitised from Field Survey at a Plan Scale of 1:2500

Note - vegetation boundaries are approximate

Legend

Vegetation Communities

No.	Date	Revision Details

SCALE:	1:5,000 @A3
CO-ORDS:	MGA
DATUM:	NA
DATE OF PLAN:	13/04/2007
CHECKED BY/DATE:	13/04/2007
APPROVED BY/DATE:	13/04/2007
JOB REF:	D199
GIS REF:	D199-G-002.mxd

Figure 7

Vegetation mapping by CHCC.

Figure courtesy of CHCC .

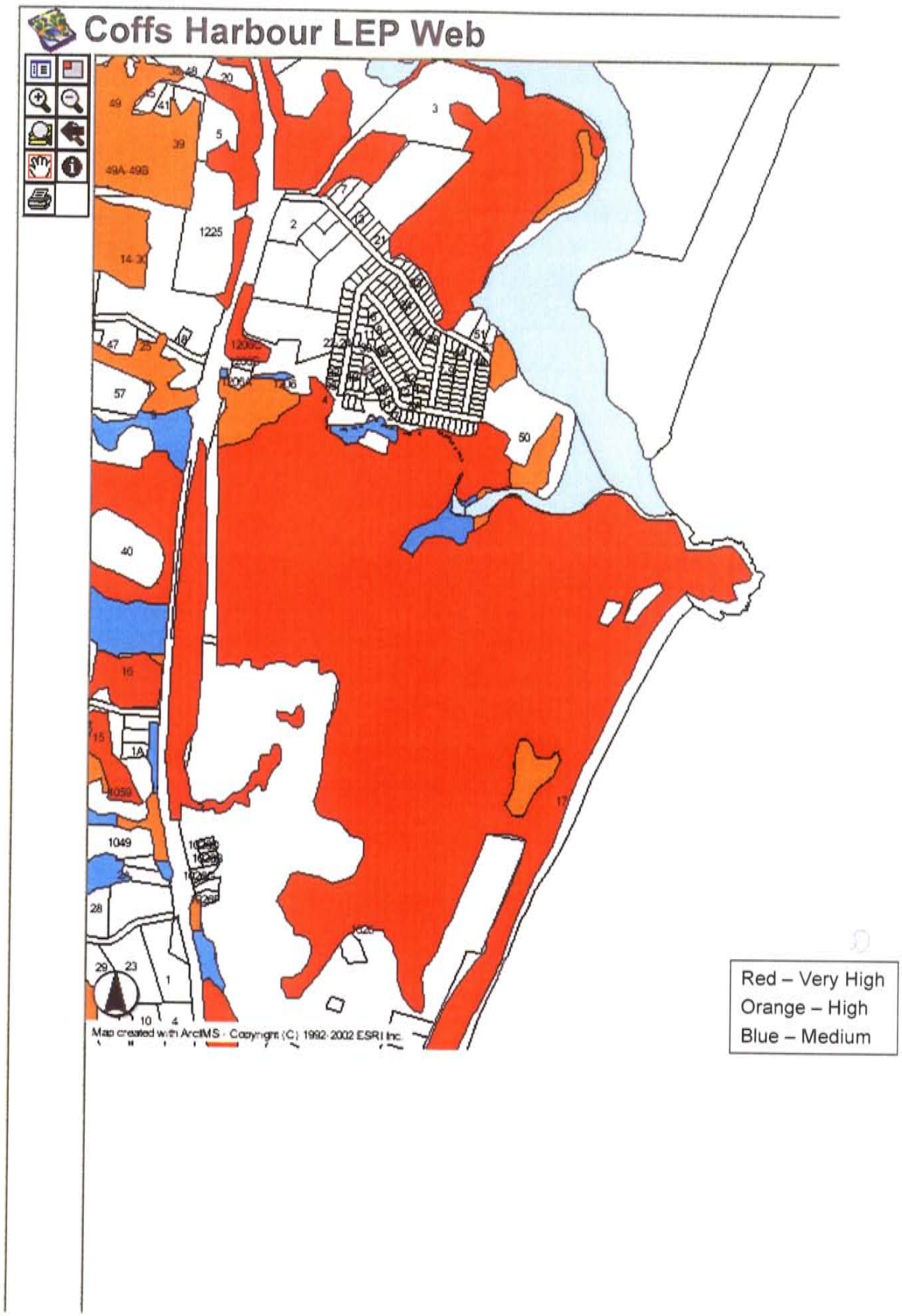


Figure 8

Conservation values ascribed in the CHCC Vegetation Strategy.

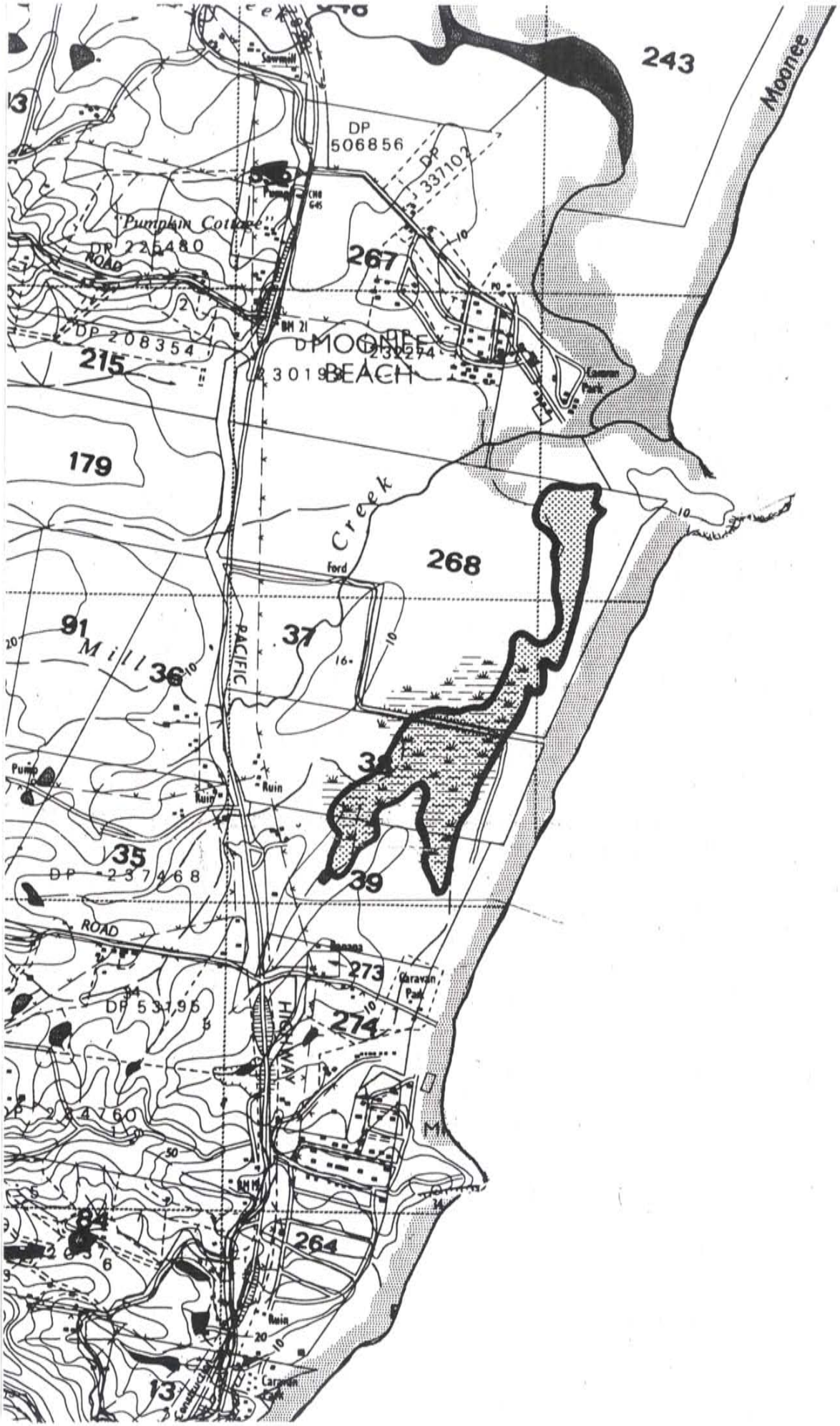


Figure 9

Location of the SEPP14 Wetland on the subject land and on land to the immediate south.

Figure 10

Koala habitat mapping by CHCC.
Figure courtesy of CHCC.