



RESPONSE TO THE DIRECTOR GENERAL'S
ENVIRONMENTAL ASSESSMENT REQUIREMENTS

FLORA AND FAUNA ASSESSMENT

**Lots 1, 2 & 3 DP 29748
and
Lot 4 Section 1 DP 31209
Cypress Crescent, Cabarita**

MARCH 2010

**A REPORT PREPARED FOR
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1 INTRODUCTION

1.1 Background

James Warren and Associates (JWA) have been engaged by Darryl Anderson Consulting Pty Ltd to complete a Flora and Fauna Assessment for land comprised of Lots 1, 2 & 3 DP 29748 and Lot 4 Section 1 DP 31209, corner of Tweed Coast Road and Cypress Crescent, Cabarita NSW.

Director General's Environmental Assessment Requirements (DGEAR's) were issued on the 26th May 2009. The Flora & Fauna Assessment has been prepared in response to the relevant DGEAR's and has involved the following:

- Mapping and ground truthing vegetation units and determining their conservation status with reference to the Comprehensive Regional Assessment completed for NSW Forest and Non-forest ecosystems as part of the Regional Forestry Agreement (RFA) process (CRA Unit 1999), and with reference to the Tweed Vegetation Management Strategy (2004);
- Searching for and recording flora species listed under the Threatened Species Conservation Act 1995 (TSC Act), ROTAP (Briggs & Leigh 1996), and assessing the occurrence of Endangered Ecological Communities (EECs);
- Determining the suite of fauna listed under the TSC Act that occur in the locality and assessing their potential occurrence in the subject site;
- Assessing habitat provided by the site in relation to adjacent habitat (i.e. Cudgen Nature Reserve) and making an assessment of the corridor value of the site;
- Addressing statutory requirements as stated within the DGEAR's; and
- Presenting the report in a format that addresses the DGEAR's.

1.2 Locality

The Locality is defined as the area within a 10km radius of the Subject site. The Locality therefore extends from Wooyung in the south to Kingscliff in the north and the coastal, urban centre of Bogangar and Cabarita Beach in the east to Mooball National Park in the west (**FIGURE 1**).

Prominent features in the locality include Cudgen Lake, Round Mountain, Pottsville wetland, Cudgen Creek, Clothiers Creek, Reserve Creek, Cudgera Creek, Sheens Creek, Mooball Creek, Crabbes Creek and the coastline. Dominant habitat types are Wetlands, Heathlands and Dry Sclerophyll Forest.

Land uses within the locality include agriculture (principally cane production on the alluvial plains and banana production on the slopes), tourism, forestry and urban development.

There are two (2) dedicated conservation reserves in the locality:

- The Cudgen Nature Reserve is 671ha in area and is located immediately to the north of the Subject site.



- Mooball National Park is a 1,130ha area of wet sclerophyll forest and subtropical rainforest located approximately 9 kms to the south-west of the Subject site.

State Wetlands numbers 43-56 occur in the locality (**FIGURE 2**). These wetlands are protected by State Environmental Planning Policy No. 14 - Coastal Wetlands (SEPP 14).

Littoral Rainforests numbers 4,5A, 6, 9, 10, 10A and 11 occur in the locality. These wetlands are protected by State Environmental Planning Policy No. 26 - Littoral Rainforest (SEPP 26) (**FIGURE 3**).

1.3 The Subject Site

The Subject site is situated northwest of Cabarita Beach and is comprised of Lots 1, 2 & 3 DP 29748 and Lot 4 Section 1 DP 31209 (**FIGURE 4**). Cudgen Nature Reserve occurs adjacent to the northern property boundary (**FIGURE 4**) and Cabarita Foreshore Reserve occurs to the east (**FIGURE 5**).

The site is presently occupied by a caravan park, established in the 1960's, comprised of 24 van sites and an amenities block. The site is cleared of almost all of the original native vegetation and now consists of managed lawns and a few scattered trees.

1.4 Land Use Zones

The property is zoned 2(e) Residential Tourist zone and surrounding zonings include 2(a) and 2 (b) (**FIGURE 5**).

1.5 The Proposed Development

The proposed development involves the demolition of the existing permanent structures on the site and the erection of a new three storey, mixed use, multi dwelling housing and tourist accommodation building comprising 23 units and basement parking for 49 vehicles (**FIGURE 6**).

1.6 Literature Review

A number of reports and other sources of information were reviewed in the course of this assessment. These include:

- Australian Wetlands (2004) Draft Tweed Coast Estuaries Management Plan 2004 - 2008. Cudgen, Cudgera and Mooball Creeks. A report prepared for Tweed Shire Council.
- NSW Department of Lands (2005) Lot 490 Draft Plan of Management.
- NSW Department of Lands (2006) Lot 490 Expressions of interest: Ecotourism Development South Kingscliff.
- Kingston, M. B., Turnbull, J. W. & Hall, P. W. (2004) Tweed Vegetation Management Strategy. Prepared for Tweed Shire Council by Ecograph.



- JWA (2000) Flora and Fauna Assessment. Rezoning of land on the Black Rocks Estate, Pottsville.
- JWA (2001) Flora and Fauna Assessment. Black Rocks Stages 8, 9, 10.
- JWA (2000) Flora and Fauna Assessment. Hastings Point Trunk Water Main.
- JWA (2000) Species Impact Statement. Kings Forest.
- JWA (2000) Species Impact Statement for the Proposed Development of Seabreeze Estate on Lot 4 DP803030 Pottsville. A Report to Metricon (QLD) PTY LTD.
- Milledge, D.R (1988) A Summary of the Vertebrate Fauna of the Round Mountain - Cudgen Lake Area. A Report to the National Parks and Wildlife Service, Northern Region, Grafton.

1.7 Structure of Assessment

The Ecological Assessment and associated documents have been prepared in response to DGEARs as follows:

SECTION 1 - Introduction, background and relevant site information

SECTION 2 - Responses to DGEARs

SECTION 3 - Summary of Impacts, Mitigation and Offsets

APPENDIX 1 - Flora Assessment

APPENDIX 2 - Site Species List

APPENDIX 3 - Fauna Assessment



2 DIRECTOR GENERAL'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

2.1 Background

On 26th May 2009 the Department of Planning (DoP) issued Director General's Environmental Assessment Requirements (DGEAR's) for the Environmental Assessment of the Project Application for the proposed development. Under section 3A of the *Environmental Planning & Assessment Act 1979* (EPA Act 1979), a major projects application was lodged with the Department of Planning in December 2008. The application number is MP 09_0016.

The following requirements, relevant to native flora and fauna, have been listed by the Director General for environmental assessment.

Section 9 - Flora and Fauna

- 9.1 Assess the potential direct and indirect impacts of the development on flora and fauna and the CNR taking into consideration impacts on any threatened species, populations, endangered ecological communities and/or critical habitat and any relevant recovery plan in accordance with DECC's Guidelines for Threatened Species Assessment (2005). Describe the actions that will be taken to avoid or mitigate impacts or compensate unavoidable impacts on these species, where relevant.
- 9.2 Assess the effect a net increase in the future resident population may have on the Cudgen Nature Reserve through likely increases in visitation and recreational use.

Each of these requirements will be addressed in the following sections of this report.

2.2 Compliance with Relevant Legislation

The NSW *Threatened Species Conservation Act 1995* (TSC Act 1995) requires that the planning and development approval process for development and other activities have regard to the potential for adverse impacts on Threatened flora and fauna species and their habitats.

In July 2005 the NSW Department of Environment and Conservation (DEC) and NSW Department of Primary Industries (DPI) drafted Guidelines for Threatened Species Assessment. These guidelines identify factors that must be considered when assessing potential impacts on Threatened species, populations, or ecological communities, or their habitats for development applications assessed under part 3A of the EPA Act 1979.

This assessment has been completed in accordance with the DEC & DPI (2005) Draft guidelines. APPENDIX 1 of the guidelines includes recommendations for the structure and content of the threatened species assessment. A summary of compliance with the guidelines is contained in **TABLE 1** below.



TABLE 1
COMPLIANCE WITH THE GUIDELINES FOR THREATENED SPECIES ASSESSMENT

Section	Purpose	Compliance
Introduction	Sets the scene of the study	- The author of the study and who it was commissioned by is included in SECTION 1.1. - A detailed description of the proposal is included in SECTION 1.5. - The regional context, location, geology, soils, landforms, disturbance history and other relevant information relating to stratification requirements is provided in SECTION 1.2
Methods	Details the desktop and field survey methods employed. The technical information should be sufficiently detailed to enable the field survey to be replicated. The choice of field methods and extent of survey should be justified, and any constraints noted.	- The methods utilised in this assessment are contained in Appendix 1 and 3. - Descriptions of vegetation types in terms of structure and floristics, and a list of the dominant plant species in each growth stratum (trees, midstorey and groundcover) is included in Appendix 1. - An assessment of the suitability of the site as habitat for species, populations and ecological communities of conservation significance has been completed in Appendix 3. - Descriptions of survey techniques utilised during the flora assessment are contained in Appendix 1, and during the fauna assessment in Appendix 3.
Results	Displays the findings of the study	- A list of all flora species recorded from the subject site is contained in Appendix 2. - A list of all fauna species recorded is contained in Appendix 3. - A list of all Threatened species, populations, and ecological communities recorded or known to occur in the locality is provided in Appendix 1 and 3. - Maps of environmental features, vegetation types and habitat types are provided (FIGURES 2, 3, 4 & 7).
Impact Evaluation	Describe context and intensity of impacts	The potential impacts of the proposed development on, Plant communities, EECs, Fauna and threatened Fauna, Section 2.2 and 2.3)



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Section	Purpose	Compliance
Mitigation	Discuss measures to minimise impacts	The potential impacts of the proposed development on, Plant communities, EECs, Fauna and threatened Fauna, Section 2.2.)
Conclusion	Discuss the results	A summary of the information collected, including statements on the likely presence/absence of threatened biodiversity, and the general habitat value of the study area is provided in SECTION 2 . This section also includes statements as to the likely impacts on key population thresholds.
References	Cites publications used in the report	A list of references is provided on Page 21 .
Appendices	Collates detailed information in the back of the report and allows the main body of the report to be concise	Appendices and supporting documentation to the main report are included in Appendix 1, 2 and 3 .



2.3 Assess the potential direct and indirect impacts of the development on flora and fauna and the Cudgen Nature Reserve.

2.3.1 Introduction

This section will consider impacts on any threatened species, populations, endangered ecological communities and/or critical habitat and any relevant recovery plan in accordance with Department of Environment & Climate Change's (DECC) Guidelines for Threatened Species Assessment (2005). Actions that will be taken to avoid or mitigate impacts or compensate unavoidable impacts on these species will also be assessed and discussed.

2.3.2 Summary of Existing Flora and Fauna Values

2.3.2.1 Flora Values

A detailed flora survey was undertaken of the entire site. The assessment including location, methods, composition and extent of the vegetation communities and a species list is provided (**APPENDIX 1 and 2**).

The flora assessment recorded:

- two (2) vegetation communities; and
- twenty-nine (29) flora species.

No threatened flora species were recorded.

2.3.2.2 Fauna values

A fauna survey was undertaken of the entire site. In addition to recording fauna observed, habitat was assessed to determine which fauna species use, or are likely to use, the site. The assessment including location, methods and a discussion of the results is provided (**APPENDIX 3**).

The fauna survey recorded:

- five (5) bird species; and
- No mammals, reptiles or amphibians.

No threatened fauna species were recorded.

Five (5) Threatened fauna species were predicted to potentially occur on the subject site over time, based on the availability of suitable habitat within the adjacent Cudgen Nature Reserve. These species are as follows:

- Common blossom bat (*Syconycteris australis*)
- Common planigale (*Planigale maculata*)
- Grey-headed flying-fox (*Pteropus poliocephalus*)
- Little bent-wing bat (*Miniopterus australis*)
- Eastern pygmy possum (*Cercartetus nanus*)



2.3.3 Impacts and Amelioration

2.3.3.1 Introduction

This section examines the likely impacts of the proposed development with regard to the native flora and fauna on the site. Where appropriate, avoidance or mitigation and compensatory measures are discussed.

2.3.3.2 Plant Communities

Impacts

The proposed development will not result in the loss of any native vegetation on the site of the proposed development. The existing cleared land to the immediate north of the site, currently used as a fire break, will be maintained as the APZ for the proposed 3 storey building. There will be no clearing required in the APZ area. Although, there will be no direct impacts on the adjacent Cudgen Nature Reserve, six gates are planned along the northern boundary fence providing access directly into the cleared area of the nature reserve and ultimately to the beach. This access may result in a range of potential impacts of the native vegetation communities:

Potential impacts on adjacent native vegetation communities include:

- Potential for degradation of retained areas of vegetation by the introduction of weeds;
- Occupation of the site may increase the risk of fire release into the surrounding bushland;
- Residents may create walking tracks through adjacent bushland areas. This may result in direct loss of vegetation, change in vegetation structure and increased opportunities for weed and disturbance adapted animals; and
- Increased light, noise and activity may cause reclusive species to move away from habitat edges.

Avoidance or Mitigation

The proposed development will avoid any significant direct impacts on native vegetation communities as the site is generally clear of native vegetation.

However, the following mitigation measures for the proposed development should be implemented to mitigate against potential indirect impacts:

- Protection of the vegetated areas of the Cudgen Nature Reserve during the construction phase of the development. A temporary mesh fence will prevent machinery, construction rubbish and contractors from entering the Reserve.
- The cleared area of the reserve should not be used for vehicular access or for storage of building or landscaping materials;
- Weeds should be controlled on the development site;
- Landscape plantings should include a majority of native species that will provide forage habitat for nectarivorous and frugivorous birds and bats; and
- Use of known environmental weeds (e.g. Umbrella tree) should be avoided in landscaped areas.



Compensation

NPWS should be consulted and consideration should be given to the following:

- Prohibitive and educational signage on the edge of the Banksia community in the Cudgen Nature Reserve; and
- The construction of one formalised path providing access to the beach.

2.3.3.3 Fauna

Impacts

The development is proposed in an area of cleared and disturbed vegetation. Native fauna species currently utilising the site are likely to be restricted to highly mobile and disturbance adapted species. Potential impacts as a result of the development may include:

- A reduction in opportunities for fauna movement through the site;
- Development of the subject site may favour native and introduced disturbance adapted competitors. For example, Cane toads may out-compete other Amphibians and Reptiles, aggressive open country bird species (e.g. Noisy miner, Crow, Pied currawong) may out-compete other birds, and non-native mammals (Black rat and House mouse) may out-compete other native small mammals).
- Increased light, noise and activity may cause reclusive species to move away from habitat edges within the adjoining Cudgen Nature Reserve.

Avoidance or mitigation

The proposed development will avoid any significant direct impacts on native fauna species as the site is generally clear of native vegetation.

However, the following mitigation measures for the proposed development should be implemented to mitigate against potential indirect impacts:

- Landscape plantings should include a majority of native species;
- Landscape and landfill materials should be sourced from a supplier where Cane toads do not occur;
- Appropriate disposal of rubbish and food scraps reduces opportunities for non-native predators and disturbance adapted competitors.

Compensation

NPWS should be consulted and consideration should be give to the following:

- Prohibitive and educational signage on the edge of the Banksia community in the adjacent Cudgen Nature Reserve; and
- The construction of one formalised path providing access to the beach.



2.3.4 Key Thresholds Assessment

2.3.4.1 Background

Assessments of significance (TSC Act) are not required as the project is being assessed under Part 3A of the Environmental Planning and Assessment Act 1979, however the Department of Environment and Climate Change and the Department of Primary Industries have provided guidelines for assessing impacts through assessing key thresholds with the response to a set of questions (DEC & DPI 2005).

2.3.4.2 Flora

No Threatened flora species were recorded on the subject site.

2.3.4.3 Endangered Ecological Communities (EECs)

No EECs were recorded on the Subject site.

2.3.4.4 Fauna

No Threatened fauna species were recorded on the subject site. However, five (5) Threatened fauna species were considered possible occurrences on the subject site over time, due to the availability of suitable habitat within the adjacent Cudgen Nature Reserve, and will be assessed.

a) Will the proposal, including actions to avoid or mitigate impacts or compensate to prevent unavoidable impacts, maintain or improve biodiversity values?

Biodiversity should be considered on three (3) levels:

- Genetic diversity - the variation of the genes within a species.
- Species diversity - the number of different types of plants and animals.
- Ecosystem diversity - this is the variety habitats on earth.

The proposed development will maintain Biodiversity on all of these levels. The proposed development will utilise the land currently used as a caravan park. This land has a significant disturbance history and has no native vegetation remains.

b) Is the proposal likely to reduce the long-term viability of a local population of the species, population, or ecological community?

&

c) Is the proposal likely to accelerate the extinction of the species, population or ecological community or place it at risk?

Common blossom bat

Extent of the local population

The NPWS database contained sixteen (16) records of this species within 10km of the site, and two (2) records from the CNR.

The NPWS online database contained twenty-five (25) sightings of this species in the Tweed LGA.



Stages of the life-cycle affected by the proposed development

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis identified breeding and sheltering sites for Common blossom bat as consisting of subtropical and littoral rainforest. This species breeds twice, in the coastal complex and riverine rainforest in spring and in the coastal complex in autumn. It needs a diverse array of nectivorous plant communities nearby. The Common blossom bat forages in a diverse range of nectar producing plant communities year round; occasionally eating some rainforest fruits.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Common blossom bat, with the following results:

1 st order disturbances	Clearing - habitat loss Management burns, including illegal
2 nd order disturbances	Clearing resulting in fragmentation, increasing predation and decreasing food availability Wildfire Apiary Weed invasion Drainage of swamps Sand mining
3 rd order disturbances	Logging of coastal sclerophyll forests with Banksia understorey Aerial spraying of bitou bush
4 th order disturbances	Sand dune disturbance from recreational 4WDs
5 th order disturbances	Barbed wire fences Introduced predators

Likelihood of local extinction

No vegetation (i.e. potential forage trees - mostly Heath-leaved Banksia) will be lost. No potential roost habitat will be lost. Substantial potential forage habitat occurs to the north within the Cudgen Nature Reserve.

The long term viability of this species, on a local level, will not be reduced by the proposed development.

The Proposal is unlikely to accelerate the extinction of this species or place it at risk.

Common planigale

Extent of the local population

The NPWS database contained fifteen (15) records of this species within 10km of the site, and two (2) records from the CNR.

The NPWS online database contained thirty (30) sightings of this species in the Tweed LGA.

Stages of the life-cycle affected by the proposed development

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis identified breeding and sheltering sites for Planigales as consisting of nests of eucalypt leaves in logs or under bark, in cracks in the soil or in grass



tussocks. Nests were also located in building debris. The Common planigale forages in dry sclerophyll, swamp sclerophyll, heathland and grassland at the ecotone with rainforest in areas with dense leaf litter or ground cover.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Common planigale, with the following results:

1 st order disturbances	Predation by cats Loss of habitat
2 nd order disturbances	Altered fire regimes Baiting for dingoes
3 rd order disturbances	Exotic competitors
4 th order disturbances	Predation by cane toads

Likelihood of local extinction

No potential habitat for this species will be lost as a result of the proposed development. Substantial potential forage habitat occurs to the north within the Cudgen Nature Reserve.

The long term viability of this species, on a local level, will not be reduced by the proposed development.

The Proposal is unlikely to accelerate the extinction of this species or place it at risk.

Grey-headed flying-fox

Extent of the local population

The NPWS database contained eleven (11) records of this species within 10km of the site, and eleven (11) records from the CNR.

The NPWS online database contained one hundred and ninety (190) sightings of this species in the Tweed LGA.

Stages of the life-cycle affected by the proposed development

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis identified breeding and sheltering sites for the Grey-headed flying fox as consisting of mainly rainforest and moist riparian forest with a complex mosaic of rainforest, swamp and sclerophyll forest resources less than 40-50km from roost. There is high site fidelity with roosts often in riverine rainforest. The Grey-headed flying fox forages in subtropical rainforest with a mosaic of resources - rainforest fruit, nectar and pollen. The Grey-headed flying fox is less restricted to rainforest remnants than the Black flying fox.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Grey-headed flying fox, with the following results:

1 st order disturbances	Clearing - habitat loss
2 nd order disturbances	Direct disturbance to camps Drainage of swamps
3 rd order disturbances	Powerlines Logging of Sclerophyll



	Management burns Shooting
4 th order disturbances	Clearing resulting in fragmentation Wildfire
5 th order disturbances	Disease - lyssavirus Apiary Barbed wire fences Weed invasion
6 th order disturbances	Climate change

Likelihood of local extinction

No vegetation (i.e. potential forage trees - mostly Heath-leaved Banksia) will be lost. No potential roost habitat will be lost. Substantial potential forage habitat occurs to the north within the Cudgen Nature Reserve.

The long term viability of this species, on a local level, will not be reduced by the proposed development.

The Proposal is unlikely to accelerate the extinction of this species or place it at risk.

Little bent-wing bat

Extent of the local population

The NPWS database contained eighty two (82) records of this species within 10km of the site, and six (6) records from the CNR.

The NPWS online database contained fifty-four (54) sightings of this species in the Tweed LGA.

Stages of the life-cycle affected by the proposed development

As part of the RFA process, Environment Australia (1999) conducted an analysis of the responses of forest fauna to various forms of land cover disturbance in the North-east region. The analysis identified breeding sites for Little bent-wing bat as consisting of limestone caves, where it usually occurs in association with the Common bent-wing bat. It congregates in high numbers in maternity roost (in 1000's). It also shelters in a range of artificial structures including culverts, drains, mines etc. The Little bent-wing bat forages on flying insects in forested areas, predominantly swamp forest, moist eucalypt forest, rainforest and some dry forests.

The RFA analysis (Environment Australia 1999) ranked the significance of various forms of disturbance for the Little bent-wing bat, with the following results:

1 st order disturbances	Clearing - habitat loss
2 nd order disturbances	Disturbance to camps/caves by limestone mining (cave collapse, altered air flow, noise, dust etc) and recreational activities.
3 rd order disturbances	Clearing - fragmentation Logging - loss of foraging habitat Frequent burning Altered hydrology/microclimate - old growth-regrowth
4 th order disturbances	Grazing Wildfire



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	Pesticides
5 th order disturbances	Introduced predators

Likelihood of local extinction

No potential roost or forage habitat will be lost. Substantial potential forage habitat occurs to the north within the Cudgen Nature Reserve. Additionally, this species is known to forage in urban environments.

The long term viability of this species, on a local level, will not be reduced by the proposed development.

The Proposal is unlikely to accelerate the extinction of this species or place it at risk.

d) Will the proposal adversely affect critical habitat?

Critical habitats are areas of land that are critical to the survival of a particular threatened species, population or ecological communities. Critical habitat areas are listed under the Threatened Species Conservation Act (1995). There is currently no habitat listed or recommend for any of the species or EECs found on the subjects site.



2.4 Assess the effect a net increase in the future resident population may have on the Cudgen Nature Reserve through likely increases in visitation and recreational use.

2.6.1 Introduction

The Cudgen Nature Reserve Plan of Management (CNRPoM) (NPWS 1998) establishes the scheme of operations for the reserve. In accordance with the provisions of Section 76 of the *National Parks and Wildlife Act, 1974*, the plan was adopted in November 1998. The strategies outlined in the plan have been devised following detailed consideration of public submissions received on the CNR Land Management Issues Paper (released in October 1996) and the CNRPoM (released in August 1997).

The coastal section of the Reserve is the only substantial portion of coastal lands, between Bogangar and Kingscliff, in public ownership. However, most of this area was subjected to sandmining and the current vegetation is a result of post-mining revegetation activities.

This section will consider the impact of the proposed development on Cudgen Nature Reserve (CNR) having particular consideration for the CNRPoM (NPWS 1998).

2.6.2 Cudgen Nature Reserve Plan of Management

The Cudgen Nature Reserve Plan of Management (NPWS 1998) is part of a system of management developed by the National Parks and Wildlife Service. The system includes the National Parks and Wildlife Act, management policies, established conservation and recreation philosophies, and strategic planning at corporate, Regional and District levels.

The plan identifies Cudgen Nature Reserve as part of the largest remnant of native vegetation on the Tweed Coast. It is of local, regional and state significance for its natural values, coastal landscapes and provision of significant habitat for native wildlife. Nature conservation is the primary focus of management for the Reserve, with emphasis to be given to rehabilitation of disturbed lands and improvement of the Cudgen Lake ecosystem through an improvement in water quality.

The plan lists specific objectives for Cudgen Nature Reserve which includes providing minimum impact public access to designated areas for appropriate nature based recreation so that the natural and cultural values of the Reserve are not threatened.

2.6.3 Possible Impacts on Cudgen Nature Reserve

Cudgen Nature Reserve shares a common boundary with the proposed development (**FIGURE 4**). There is a strip of cleared land, currently used as a fire break, just inside the Cudgen Nature Reserve to the north of the proposed development. The proposed 3 storey building is set back 8m from the common boundary. The existing cleared land and the building set back are proposed as the Asset Protection Zone (APZ). There are six gates planned along the northern boundary fence, of the development, providing access directly into the cleared area of the nature reserve and ultimately to the beach.



This access may result in a range of potential impacts on the Cudgen Nature Reserve. These impacts are as follows:

- Residents from the site may create walking tracks through the Cudgen Nature Reserve, resulting in direct loss of vegetation, reduced visitation by pollinators and dispersal vectors, changes in vegetation structure, and increased opportunities for weeds and disturbance-adapted pest species.
- Occupation of the site may increase the risk of fire release into the Cudgen Nature Reserve.
- Occupation of the site may cause an increase in local populations of invasive pest species (e.g. rats, cane-toads, foxes) and invasive weeds. Residents of the site may dump rubbish and garden wastes into or near the Nature Reserve, encouraging pest species and allowing the release of weed species, parasites and diseases into the Cudgen Nature Reserve.
- Degradation of the vegetation in the Cudgen Nature Reserve by the introduction of weeds;
- Landscape species may escape to retained areas of vegetation; and
- Increased light and noise from the site may disturb the more reclusive species, in effect increasing the penetration of edge effects into the CNR.

2.6.4 Avoidance of impacts for Cudgen Nature Reserve

The following measures are suggested to avoid impacts on the Cudgen Nature Reserve:

- Protection of the vegetated areas of the Cudgen Nature Reserve during the construction phase of the development. A temporary mesh fence will prevent machinery, construction rubbish and contractors from entering the Reserve.
- Signage should be erected - first temporary, then in consultation with NPWS. Consideration should be given to permanent signage prohibiting entry into the Nature Reserve except under conditions designated by the CNRPoM. Signage should have an educational theme illustrating the nature values of the reserve.
- The cleared area of the reserve should not be used for vehicular access or for storage of building or landscaping materials;
- Weeds should be controlled on the development site; and
- Known environmental weeds should be avoided in any landscaping of the development site.

2.6.5 Mitigation for Cudgen Lake Nature Reserve

In accordance with the CNRPoM the following mitigation measures should be considered:

- Prohibitive and educational signage at the edge of the Banksia woodland community within the Cudgen Nature Reserve;
- Information brochures about the reserve to promote public understanding and appreciation of the natural and cultural values of the reserve.
- The construction of one formalised path providing access to the beach in consultation with NPWS;
- The implementation of weed control programs and regeneration works; and



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- Negotiations with NPWS about the responsibility of a fuel management regime in the APZ within the Cudgen Nature Reserve.



3 SUMMARY AND CONCLUSIONS

James Warren and Associates (JWA) have been engaged by Darryl Anderson Consulting Pty Ltd to complete a Flora and Fauna Assessment for land comprised of Lots 1, 2 & 3 DP 29748 and Lot 4 Section 1 DP 31209 Corner of Tweed Coast Road and Cypress Crescent, Cabarita NSW.

The proposed development was declared a Major Project and is subject to Assessment under Part 3(a) of the Environmental and planning Assessment Act 1979. Director General's Environmental Assessment Requirements (DGEAR's) were issued on the 26th May 2009.

A number of State Wetlands (SEPP 14), Littoral Rainforest patches (SEPP 26) occur in the area. The Cudgen Nature Reserve occurs adjacent to the northern property boundary and Cabarita Foreshore Reserve occurs to the east.

The site is presently occupied by a caravan park, established in the 1960's is cleared of almost all of the original native vegetation and now consists of managed lawns and a few scattered trees.

The proposed development involves the demolition of the existing permanent structures on the site and the erection of a new three storey, mixed use, multi dwelling housing and tourist accommodation building comprising 23 units and basement parking for 49 vehicles.

In addition to the subject site, this assessment included a survey of a 100m strip, within CNR adjacent to the subject site boundary.

A detailed flora and fauna survey recorded two (2) vegetation communities, twenty-nine (29) flora species and five (5) bird species. No threatened flora, fauna species or Endangered Ecological Communities were recorded. However, Five (5) Threatened fauna species were considered possible occurrences on the Subject site over time due to the presence of suitable habitat within the adjoining Reserve.

In accordance with the 1st DGEAR, JWA concluded that the proposal will: maintain or improve biodiversity; will not reduce, on a local level, the long term viability or accelerate the extinction of any species or adversely affect critical habitat.

In accordance with the 2nd DGEAR, JWA assessed the effect a "net increase in the future resident population may have on the CNR through likely increases in visitation and recreational use." It was concluded that the proposed development may have a minor impact on the Cudgen Nature Reserve. Avoidance and mitigation strategies have been suggested in compliance with the CNR Plan of Management.



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APPENDIX 1

FLORA ASSESSMENT



1 FLORA ASSESSMENT

1.1 Introduction

The following describes the vegetation communities occurring within the subject site. Community descriptions follow Walker & Hopkins (1990). These communities and their conservation status are also discussed with reference to the Comprehensive Regional Assessments (CRA) classification (NPWS 1999) and vegetation classifications used in the Tweed Vegetation Management Strategy (Ecograph 2004).

1.2 Methods

1.2.1 NPWS and EPBC Database Search

Searches of the NPWS (DECC 2009) and EPBC (DEWHA 2009) databases were completed (September 2009) to find records of State and Commonwealth Threatened species¹ within 10km of the Subject Site.

1.2.2 Site Survey

A survey was completed at the subject site on the 7th October 2009 by two (2) scientists utilising random meander searches (Cropper 1993) and a general plant species list was compiled. A total of three (3) hours flora survey was undertaken.

Mapping of vegetation communities was achieved using 1:1000 (2005) aerial photography, GPS and cadastral bases with relevant survey points.

1.3 Results

1.3.1 NPWS and EPBC Database Search

A search of the NPWS and EPBC Database revealed fifty (50) Threatened Flora species within 10km of the Subject site (TABLE 1).

TABLE 1
THREATENED FLORA SPECIES WITHIN 10 KM OF THE SITE

Common name	Botanical name
Arrow-head Vine	<i>Tinospora tinoporoides</i>
Basket fern	<i>Drynaria rigidula</i>
Brown fairy chain orchid	<i>Peristeranthus hillii</i>
Brush cassia	<i>Cassia brewsteri</i> var. <i>marksiana</i>
Clear Milkvine	<i>Marsdenia longiloba</i>
Common name	Botanical name
Crystal creek walnut	<i>Endiandra floydii</i>
Davidson's Plum	<i>Davidsonia jerseyana</i>
Durobby	<i>Syzygium moorei</i>
Fine-leaved tuckeroo	<i>Lepiderema pulchella</i>
Fraser's screw fern	<i>Lindsaea fraseri</i>
Green-leaved rose walnut	<i>Endiandra muelleri</i> subsp. <i>bracteata</i>

¹ As listed within schedules of the TSC Act (1995) and EPBC Act (1999).



Common name	Botanical name
Gympie stinger	<i>Dendrocnide moroides</i>
Hairy Jointgrass	<i>Arthraxon hispidus</i>
Hairy Quandong	<i>Elaeocarpus williamsianus</i>
Heart-leaved Bosistoa	<i>Bosistoa selwynii</i>
Lemon-scented grass	<i>Elyonurus citreus</i>
Marbled Balogia, Jointed Baloghia	<i>Baloghia marmorata</i>
Marblewood	<i>Acacia bakeri</i>
Minute Orchid, Ribbon-root Orchid	<i>Taeniophyllum muelleri</i>
Monkey Nut, Bopple Nut	<i>Hicksbeachia pinnatifolia</i>
Narrow-leaf finger fern	<i>Grammitis stenophylla</i>
Pink nodding orchid	<i>Geodorum densiflorum</i>
Queensland Xylosma	<i>Xylosma terrae-reginae</i>
Red boppel nut	<i>Hicksbeachia pinnatifolia</i>
Red lilly pilly	<i>Syzygium hodgkinsoniae</i>
Red-fruited Ebony	<i>Diospyros mabacea</i>
Rough-shelled bush nut	<i>Macadamia tetraphylla</i>
Rusty plum	<i>Amorphospermum whitei</i>
Rusty Rose Walnut	<i>Endiandra hayesii</i>
Sand spurge	<i>Chamaesyce psammogeton</i>
Scented acronychia	<i>Acronychia littoralis</i>
Short-footed screw fern	<i>Lindsaea brachypoda</i>
Silverbush	<i>Sophora tomentosa</i>
Small-leaved Tamarind	<i>Diploglottis campbellii</i>
Smooth Davidsonia, Smooth Davidson's Plum	<i>Davidsonia johnsonii</i>
Southern Ochrosia	<i>Ochrosia moorei</i>
Southern swamp orchid	<i>Phaius australis</i>
Spiny gardenia	<i>Randia moorei</i>
Square-stemmed Spike-rush	<i>Eleocharis tetraquetra</i>
Stinking Cryptocarya	<i>Cryptocarya foetida</i>
Swamp foxglove	<i>Centranthera cochinchinensis</i>
Sweet false galium	<i>Hedyotis galioides</i>
Sweet Myrtle, Small-leaved Myrtle	<i>Gossia fragrantissima</i>
Thorny pea	<i>Desmodium acanthocladum</i>
Three-leaved Bosistoa	<i>Bosistoa transversa</i>
White Lace Flower	<i>Archidendron hendersonii</i>
Xylosma	<i>Xylosma terrae-reginae</i>
Yeil Yeil	<i>Grevillea hilliana</i>
Yellow satinheart	<i>Bosistoa transversa</i>

1.3.2 Site Survey

The survey recorded the following:

- Two (2) vegetation communities were identified on the site (**FIGURE 7**)
- Twenty-nine (29) flora species (**APPENDIX 2**)
- No threatened species (TSC Act)
- No ROTAP Species (Briggs & Leigh 1996)



1.3.3 Community Descriptions

1.3.3.1 Community 1 - Mid-high open woodland (*Banksia integrifolia* and *Leptospermum laevigatum* +/- Mixed species)

Location and area

This community is found adjacent to the subject site at the boundary of the Cudgen Nature Reserve.

Description

Community 1 is disturbed and degraded by many weed species. Coast banksia and Coast teatree are scattered throughout, either individually or as small patches (**FIGURE 7**). Other species occurring include Pandanus, Coastal Geebung, Blue lilly pilly, Coastal wattle and Macaranga. In addition to the post-mining planted species (i.e. Coastal wattle, Banksia and Coast Tea-tree) there appears to be a planted strip of more 'attractive' garden natives along the edge of the Cudgen Nature Reserve (i.e. Tuckeroos, Three-veined laurel and Pandanus).

The under-storey contains Lomandra, Bracken fern and many dead Tea-tree branches. The ground has an abundant amount of banksia leaf litter and is scattered with garbage.

Conservation status

There is no suitable analogue to this community considered in the Regional Forestry Agreement (RFA) report, however Non-Forest Ecosystem 5 (Banksia) is descriptive for the Coast banksia component within this community.

Under the TVMS (2004) this community is best described by Vegetation Code 1008 (Post-mining Regeneration), which also contains elements of Vegetation Code 310 (Banksia Dry Sclerophyll Open Forest to Shrubland). Banksia Forest is regarded as adequately conserved within the Tweed Shire.

1.3.3.2 Community 2 - Grassland with scattered trees

This community occurs in the cleared patch adjacent to the subject site and within the boundary of the Cudgen Nature Reserve. The grass is maintained (mown) and the scattered trees include Umbrella tree (Native of N. Qld), Silky Oak, Cheese tree, Oleander (exotic) and Macaranga.

Conservation Status

There is no appropriate CRA classification for this community. Individual trees are planted and a low conservation value.



APPENDIX 2

FLORA SPECIES RECORDED ON THE SITE

Grouping and Family	Botanical Name	Common Name
Proteaceae	<i>Grevillea robusta</i>	Silky Oak
Apocynaceae	<i>Nerium oleander</i>	Oleander
Dennstaedtiaceae	<i>Pteridium esculentum</i>	Bracken fern
Fabaceae	<i>Acacia sophorae</i>	Coastal wattle
Casuarinaceae	<i>Allocasuarina littoralis</i>	Black she-oak
Proteaceae	<i>Banksia integrifolia</i>	Coast banksia
Lauraceae	<i>Cinnamomum camphora</i> *	Camphor laurel
Myrtaceae	<i>Austromyrtus dulcis</i>	Midgen Berry
Lauraceae	<i>Cryptocarya triplinervis</i> var. <i>triplinervis</i>	Three-veined laurel
Sapindaceae	<i>Cupaniopsis anacardioides</i>	Tuckeroo
Poaceae	<i>Cynodon dactylon</i>	Couch grass
Hemerocallidaceae	<i>Dianella caerulea</i>	Blue flax lilly
Euphorbiaceae	<i>Glochidion ferdinandi</i> var. <i>ferdinandi</i>	Cheese tree
Solanaceae	<i>Solanum seaforthianum</i>	Climbing nightshade
Dilleniaceae	<i>Hibbertia scandens</i>	Climbing guinea flower
Poaceae	<i>Imperata cylindrica</i>	Blady grass
Myrtaceae	<i>Leptospermum laevigatum</i>	Coastal teatree
Lomandraceae	<i>Lomandra longifolia</i>	Spiny-headed Mat-rush
Euphorbiaceae	<i>Macaranga tanarius</i>	Macaranga
Moraceae	<i>Maclura cochinchinensis</i>	Cockspur
Pandanaceae	<i>Pandanus tectorius</i> var. <i>australianus</i>	Screw Pine
Proteaceae	<i>Persoonia stradbrokeensis</i>	Broad-leaved geebung
Araliaceae	<i>Polyscias elegans</i>	Celerywood
Dracenaceae	<i>Sansevieria trifasciata</i> *	Mother-in-laws tongue
Araliaceae	<i>Schefflera actinophylla</i> *	Umbrella Tree
Anacardiaceae	<i>Schinus terebinthifolia</i> *	Broad-leaf pepper tree
Menispermaceae	<i>Stephania japonica</i> var. <i>discolor</i>	Snake vine
Arecaceae	<i>Syagrus romanzoffiana</i> *	Cocos palm
Myrtaceae	<i>Syzygium oleosum</i>	Blue lilly pillly



APPENDIX 3

FAUNA ASSESSMENT



1 FAUNA ASSESSMENT

1.1 Introduction

This section includes a description of the methods used in determining which fauna species use, or are likely to use, the Study area and a discussion of the results of the Fauna assessment.

1.2 Methods

1.2.1 NPWS and EPBC Database Search

Searches of the NPWS (DECC 2009) and EPBC (DEWHA 2009) databases were completed (September 2009) to find records of State and Commonwealth Threatened species² within 10km of the Subject site.

1.2.2 Literature Review

A comprehensive literature review was completed using a number of sources to identify records of Threatened species in the locality.

1.2.3 Habitat Assessment for significant species

Site habitats were assessed to determine their value for native fauna species. This assessment was completed in conjunction with the flora survey. The assessment focused on identifying habitat features associated with Threatened species as well as other native fauna groups. Particular attention was paid to habitat features such as:

- The presence of mature trees with hollows, fissures and/or other suitable roosting/nesting places;
- The presence of Koala food trees;
- The presence of preferred Glossy black cockatoo feed trees (Forest oak and/or Black she-oak);
- The presence of Yellow-bellied glider feeding scars;
- Condition, flow and water quality of drainage lines and bodies of water;
- Areas of dense vegetation;
- Presence of hollow logs/debris and areas of dense leaf litter;
- Presence of fruiting flora species;
- Presence of blossoming flora species, particularly winter-flowering species;
- Vegetation connectivity and proximity to neighbouring areas of intact vegetation; and
- Presence of caves and man-made structures suitable as microchiropteran bat roost sites.

² As listed within schedules of the *TSC Act (1995)* and *EPBC Act (1999)*.



1.2.4 Fauna Survey

A survey was completed at the subject site, in conjunction with the flora survey. A total of three (3) hours flora survey was undertaken.

The following survey techniques were utilised in the assessment:

- Opportunistic Sightings - The 'random meander' technique (Cropper 1993) was used to traverse the site. All incidental records of fauna utilising the study area were recorded.
- Active Searching - Logs, sheets of tin, cardboard, bark and leaves were overturned in search of reptiles and amphibians while incidentally traversing the site. Diggings and signs of droppings were searched for. The site was actively searched for scats and bones. Active observation of bird activity was undertaken during the site visit.

1.3 Results and Discussion

1.3.1 NPWS and EPBC Database Search

The results of the search of the NPWS and EPBC database are shown in TABLE 1.

TABLE 1
NPWS AND EPBC DATABASE RECORDS OF THREATENED FAUNA SPECIES
WITHIN 10 KM

Common Name	Scientific Name
Australian Painted Snipe	<i>Rostratula australis</i>
Black bittern	<i>Ixobrychus flavicollis</i>
Black-breasted Button-quail	<i>Turnix melanogaster</i>
Black-browed albatross	<i>Thalassarche melanophris</i>
Black-necked stork	<i>Xenorhynchus asiaticus</i>
Black-throated Finch (southern)	<i>Poephila cincta cincta</i>
Blue Whale	<i>Balaenoptera musculus</i>
Bush hen	<i>Amaurornis olivacea</i>
Bush Stone-curlew	<i>Burhinus grallarius</i>
Campbell Albatross	<i>Thalassarche melanophris impavida</i>
Collared kingfisher	<i>Todiramphus chloris</i>
Common blossom bat	<i>Syconycteris australis</i>
Common planigale	<i>Planigale maculate</i>
Coxen's Fig-Parrot	<i>Cyclopsitta diophthalma coxeni</i>
Eastern bentwing-bat	<i>Miniopterus schreibersii oceanensis</i>
Eastern Freetail-bat	<i>Mormopterus norfolkensis</i>



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Eastern long-eared bat	<i>Nyctophilus bifax</i>
Eastern pygmy-possum	<i>Cercartetus nanus</i>
Flesh-footed shearwater	<i>Puffinus carneipes</i>
Glossy black-cockatoo	<i>Calyptorhynchus lathami</i>
Grass owl	<i>Tyto capensis</i>
Great knot	<i>Calidris tenuirostris</i>
Great White Shark	<i>Carcharodon carcharias</i>
Green Sawfish	<i>Pristis zijsron</i>
Green turtle	<i>Chelonia mydas</i>
Grey Nurse Shark (east coast population)	<i>Carcharias taurus (east coast population)</i>
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>
Humpback Whale	<i>Megaptera novaeangliae</i>
Kermadec Petrel (western)	<i>Pterodroma neglecta neglecta</i>
Koala	<i>Phascolarctos cinereus</i>
Large-eared Pied Bat, Large Pied Bat	<i>Chalinolobus dwyeri</i>
Large-footed myotis	<i>Myotis macropus</i>
Leatherback Turtle	<i>Dermochelys coriacea</i>
Little bentwing bat	<i>Miniopterus australis</i>
Little tern	<i>Sterna albifrons</i>
Loggerhead turtle	<i>Caretta caretta</i>
Long-nosed Potoroo (SE mainland)	<i>Potorous tridactylus tridactylus</i>
Long-nosed potoroo, Cobaki Lakes and Tweed Heads West Population	<i>Potorous tridactylus</i>
Magpie goose	<i>Anseranas semipalmata</i>
Mitchell's Rainforest Snail	<i>Thersites mitchellae</i>
Northern Giant-Petrel	<i>Macronectes halli</i>
Osprey	<i>Pandion haliaetus</i>
Pied oystercatcher	<i>Haematopus longirostris</i>
Red-tailed black-cockatoo	<i>Calyptorhynchus banksii</i>
Regent Honeyeater	<i>Xanthomyza Phrygia</i>
Rose-crowned fruit dove	<i>Ptilinopus regina</i>
Sanderling	<i>Calidris alba</i>
School Shark	<i>Galeorhinus galeus</i>
Sooty oystercatcher	<i>Haematopus fuliginosus</i>
Southern Barred Frog, Giant Barred Frog	<i>Mixophyes iteratus</i>
Southern Giant-Petrel	<i>Macronectes giganteus</i>
Southern Right Whale	<i>Eubalaena australis</i>
Spotted-tailed quoll	<i>Dasyurus maculates</i>



Swift Parrot	<i>Lathamus discolor</i>
Three-toed Snake-tooth Skink	<i>Coeranoscincus reticulatus</i>
Tristan Albatross	<i>Diomedea exulans exulans</i>
Wallum froglet	<i>Crinia tinnula</i>
Wallum Sedge Frog	<i>Litoria olongburensis</i>
White Turn	<i>Gygis alba</i>
White-eared monarch	<i>Monarcha leucotis</i>
Wompoo fruit-dove	<i>Ptilinopus magnificus</i>

1.3.2 Literature Review

Aspect North (2003, 2005)

The Aspect North Flora and Fauna Assessment at South Kingscliff, which occurs approximately 7km to the north of the site recorded two (2) Threatened species: Pied oystercatcher (*Haemotopus longirostris*) and Osprey (*Pandion haliaetus*).

JWA (2000)

JWA recorded a number of Threatened fauna species during the survey program for the southern portion of the Black Rocks Estate, Pottsville which occurs approximately 6km to the south of the site. These species include the following:

- Osprey (*Pandion haliaetus*)
- Koala (*Phascolarctos cinereus*)
- Common planigale (*Planigale maculata*)
- Black flying-fox (*Pteropus alecto*)
- Grey-headed flying-fox (*Pteropus poliocephalus*)
- Common blossom bat
- Eastern long-eared bat
- Little bent-wing bat (*Miniopterus australis*)
- Greater broad-nosed bat

JWA (1999) a

JWA completed numerous studies as part of the Casuarina development (Kings Beach) which occurs approximately 3km north of the site. Threatened fauna recorded included the Black flying fox and Common blossom bat.

JWA (1999) b

JWA completed fauna surveys for the Kings Forest Estate which occur approximately 2.5km north-west of the site. Threatened fauna species recorded included the following:

- Wallum froglet (*Crinia tinnula*)
- Wallum tree frog (*Litoria olongburensis*)
- Eastern grass owl (*Tyto capensis*)
- Glossy black cockatoo (*Calyptorhynchus lathami*)
- Masked owl (*Tyto novaehollandiae*)



- Bush hen (*Gallinula olivacea*)
- Black bittern (*Ixobrychus flavicollis*)
- Osprey (*Pandion haliaetus*)
- Common planigale (*Planigale maculata*)
- Koala (*Phascolarctos cinereus*)
- Black flying fox (*Pteropus alecto*)
- Grey-headed flying fox (*Pteropus poliocephalus*)
- Common blossom bat (*Syconycteris australis*)
- Little bent-wing bat (*Miniopterus australis*)
- Yellow-bellied sheath-tail bat (*Saccolaimus flaviventris*)
- Great pipistrelle (*Falsistrellus tasmaniensis*)
- The Rose-crowned fruit dove was subsequently recorded in the Study area (W. Moffitt, pers. comm.).

Richards (1999)

As part of the Kings Beach assessment, Dr. Greg Richards completed a detailed report on the Common blossom bat (1999) involving targeted mist netting at a number of sites in two trapping sessions (April and June). A total of eight (8) Blossom bats were captured in the April survey, and a further thirty-seven (37) captured in the June survey, with five (5) captured Blossom bats fitted with radio-tracking transmitters to ascertain where individuals were roosting in the locality. Several of the bats fitted with radio transmitters were unable to be successfully tracked, while others were found to roost within CNR, Cudgen Lake and Wollumbin scout camp. The report concluded that:

- Banksia inflorescences are a primary food supply for this species, particularly in mid-winter months;
- Areas of high density Banksia (either numbers of trees or numbers of inflorescences) support resident populations, in the sense that they have a strong site fidelity in such areas;
- Areas of low density Banksia support transient individuals; and
- Roost sites in this area include littoral rainforest and Melaleuca swamps.

Australian Wetlands (2004)

The Draft Tweed Coast Estuaries Management Plan was prepared by Australian Wetlands in May 2004 and noted that twenty-seven (27) bird species have been recorded foraging along Cudgen Creek, including four (4) Threatened species: Osprey, Mangrove kingfisher and Sooty and Pied oystercatchers.

A further seventy-two (72) bird species have been recorded in remnant rainforest and parks around Cudgen Creek, including three (3) Threatened species: Rose-crowned fruit dove, Glossy black cockatoo and White-eared monarch.

Cudgen Nature Reserve

The NPWS Wildlife database (DECC 2009) records the following threatened species for CNR.

Amphibians

- *Crinia tinnula* Wallum Froglet



Birds

- | | |
|-----------------------------------|-------------------------|
| • <i>Pandion haliaetus</i> | Osprey |
| • <i>Anseranas semipalmata</i> | Magpie Goose |
| • <i>Ixobrychus flavicollis</i> | Black Bittern |
| • <i>Calyptorhynchus lathamii</i> | Glossy Black-Cockatoo |
| • <i>Ptilinopus magnificus</i> | Wompoo Fruit-Dove |
| • <i>Ptilinopus regina</i> | Rose-crowned Fruit-Dove |
| • <i>Monarcha leucotis</i> | White-eared Monarch |
| • <i>Sterna albifrons</i> | Little Tern |
| • <i>Amaurornis olivaceus</i> | Bush-hen |
| • <i>Calidris tenuirostris</i> | Great Knot |

Mammals

- | | |
|---------------------------------|----------------------|
| • <i>Dasyurus maculatus</i> | Spotted-tailed Quoll |
| • <i>Planigale maculata</i> | Common Planigale |
| • <i>Phascolarctos cinereus</i> | Koala |
| • <i>Pteropus poliocephalus</i> | Grey-headed |
| • Flying-fox | Common Blossom-bat |
| • <i>Miniopterus australis</i> | Little Bentwing-bat |

Reptiles

- | | |
|--------------------------|-------------------|
| • <i>Caretta caretta</i> | Loggerhead Turtle |
| • <i>Chelonia mydas</i> | Green Turtle |

1.3.3 Fauna Habitat

Amphibians

Amphibians occurring in the region are poikilothermic, predominantly insectivorous and generally require free water for reproduction, with the exception of two highland genera (*Assa darlingtoni* and *Philoria* spp.) The habitat requirements of most species are unlikely to be determined by forest cover or floristics, but are more strongly influenced by factors such as climate, distance to water bodies, riparian vegetation, hydrological and morphological characteristics of water bodies and the availability of suitable micro-habitat for aestivation and shelter.

The majority of species that occur within the region lay eggs in or near temporary or permanent water bodies and rely on free water for larval development and metamorphosis. Of these species, only a few are dependent on forested habitats beyond the riparian zone or beyond areas of temporary inundation. These species include the Red-eyed tree frog (*Litoria chloris*), Leseuer's frog (*Litoria leseueri*), Fletcher's frog (*Lechriodus fletcheri*) and the Barred frogs of the *Mixophyes* genus.

Grasslands provide suitable habitat for a range of Amphibian species, particularly along drainage depressions and soaks. Species commonly encountered in grassland communities include the Common eastern froglet, Eastern sign bearing froglet, Striped marsh frog, Spotted grass frog, Eastern dwarf tree frog, Rocket frog, Whistling tree frog and Cane toad.

The study site is likely to provide poor quality habitat for frogs. The grassland and Banksia woodland is highly disturbed and has no low-lying areas or waterbodies close by.



Reptiles

As reptiles are poikilothermic, and predominantly insectivorous or carnivorous, their habitat requirements are less directly determined by vegetation species composition than other taxa which feed directly on plants. Reptile distributions are strongly influenced by structural characteristics of the vegetation, climate and other factors affecting thermoregulation such as shade and availability of shelter and basking sites (Smith *et al* 1994).

In a survey of the moist forest herpetofauna of North-eastern NSW, Smith *et al* (1989) found that few species discriminated between rainforest and wet sclerophyll forest, however, most species exhibited a response to differences in elevation and the availability of microhabitat components and other substrates.

The availability of microhabitats, of varying thermal properties is particularly important for most reptile species, as behavioural thermoregulation (regulation of body heat) is important in controlling critical body functions such as digestion, foraging activity and reproduction.

Reptile diversity and abundance is often (but not always) significantly higher in drier habitat types, particularly those with a wide variety of ground substrate microhabitats. This contrasts markedly with the distribution patterns of birds, and most mammals.

The single limiting factor in terms of species diversity in coastal vegetation is the lack of shelter sites (eg. logs, tree hollows and decorticated bark). Such habitat components characterise eucalypt forests and woodlands, where species diversity may be much higher, depending on disturbance factors.

The study site may provide habitat for a number of disturbance adapted species such as:

- Common Dwarf Skink (*Menetia greyii*)
- Wall skink (*Cryptoblepharus virgatus*)
- Common garden skink (*Lampropholis delicata*)
- Pale-flecked Garden Sunskink (*Lampropholis guichenoti*)
- Bearded dragon (*Pogona barbata*)

Birds

The significance of near coastal environments of the N.S.W. Far North Coast and South-East Queensland as over-wintering habitat for migratory birds has been established by many observers and bird banders including Keast (1968), Robertson (1973), Gravatt (1974), Porter (1982) and Robertson and Woodall (1983). These patterns may be attributable to the relatively high winter temperatures and long growing season of this region compared with the rest of south-eastern Australia (Fitzpatrick and Nix 1973; Edwards 1979; Nix 1982; Specht *et al* 1981).

Many insectivorous birds from higher latitudes and elevation reside over-winter in the locality. These include species such as the Fantail cuckoo, Sacred kingfisher, Rainbow bee-eater, Noisy pitta, Tree martin, Black-faced cuckoo-shrike, Cicada



bird, Golden whistler, Rufous whistler, Rose robin, Grey fantail, White-throated gerygone, Silvereye, Olive-backed oriole and Spangled drongo.

Birds such as honeyeaters and lorikeets are Blossom nomads (*ibid.*). These birds move locally in response to variation in the availability of nectar and or pollen, important components in their diet. Porter (1982) highlights the importance of Forest red gum, Broad-leaved paperbark and Coast banksia for Scaly-breasted and Rainbow lorikeets as these species flower during the lorikeet's winter breeding period. A sequence of important nectar bearing plants in the genera Eucalyptus, Banksia, Melaleuca and Callistemon provide a continuity of food for nectarivorous birds.

A reasonable diversity of birds is likely to occur in the general locality, given the diversity of vegetation types (Littoral rainforests, heaths, Paperbark forests and CNR).

Mammals

Small terrestrial mammals generally occur in highest densities in association with a complex vegetation structure. A dense understorey layer, which provides shelter from predators and provides nesting opportunities, is particularly important.

In general medium-large terrestrial mammals such as macropods select habitats which provide a dense cover for shelter and refuge and open areas for feeding. The larger species tend to occupy drier more open habitats: the smaller species, moister and more densely vegetated habitats.

All Arboreal mammals that occur in the region (with the exception of the Koala) utilise tree hollows for nesting and shelter (although the Common ringtail possum is not dependent on hollows). Smith & Lindenmeyer (1988) consider that shortage of nest hollows is likely to limit arboreal mammal populations where density of hollow bearing trees is less than 2 to 8 trees per hectare.

Arboreal folivores (e.g. Common ringtail possum, Greater glider) are widespread and abundant but exhibit local variation in response to such factors as tree species composition, foliage protein and fibre levels, leaf toughness, toxins, forest structure and the availability of shelter sites. Arboreal folivores are expected to be most abundant in areas of high productivity, high soil fertility and moderate climate, in conjunction with adequate shelter and suitable foraging substrate.

Arboreal nectarivore/insectivores feed on a wide variety of plant and insect exudates including the nectar of flowering eucalypts, and shrubs such as Banksia and Acacia sp. These species also feed extensively on insects, particularly under the shedding bark of eucalypts. The distribution of nectarivore/insectivores is considered to be related to the abundance of nectar and pollen producing plants, the abundance of bark shedding eucalypts which harbour insect prey, and the occurrence of sap and gum exudate producing trees (Sap feed trees) and shrubs (e.g. Acacia sp.). Arboreal nectarivores and insectivores are generally hollow dependent species.



Insectivorous bats like insectivorous birds overlap considerably in diet and broad vegetation preferences (Hall 1981), but specialise in foraging in specific layers or substrates within the forest (Crome and Richards 1988).

Small native mammals are unlikely to occur at high densities on the subject site or the adjacent edge of the CNR. The disturbed nature of vegetation and a significant edge effect is likely to have promoted the occurrence of two introduced rodents, the Black rat (*Rattus rattus*) and House mouse (*Mus musculus*). The Brown antechinus (*Antechinus stuartii*) and Bush rat (*Rattus fuscipes*) may also occur, although at lower densities than their introduced congeners.

1.3.4 Possible Occurrences of Threatened Species in the Study Area

Based on the assessment of habitats in the Study area (i.e. Grassland and adjacent Banksia woodland), Threatened fauna species known from the locality were assessed for the likelihood of their occurrence in the Study area (TABLE 2). A rating of *Likely* was given for those species where breeding or high quality habitat is present on the site; a rating of *Possible* was given for those species where suitable foraging or roosting habitat is present on the site; and a rating of *Unlikely* was given for species where no suitable habitat occurs on the site.

The following oceanic and coastal species will not occur in the Study area and are not considered in the table:

- Black-browed albatross
- Flesh-footed shearwater
- Green turtle
- Humpback Whale
- Little turn
- Loggerhead turtle
- Northern giant-petrel
- Sooty and Pied oystercatcher
- Sanderling
- White tern

TABLE 2
THREATENED FAUNA SPECIES CONSIDERED AS POSSIBLE OR LIKELY OCCURRENCE

Species	Likelihood of occurrence in the Study area	Notes
Black bitten (<i>Ixobrychus flavicollis</i>)	Unlikely	This species occurs in coastal and sub-coastal areas of south-western, northern and eastern Australia. It is usually found in dense vegetation fringing and in streams, swamps, tidal creeks and mudflats, particularly amongst swamp she-oaks and mangroves.
Black-necked stork (<i>Ephippiorhynchus asiaticus</i>)	Unlikely	This species is widespread in northern Australia and sparse in coastal eastern Australia from Qld to southern NSW. It inhabits swamps, mangroves, mudflats, dry floodplains and irrigated land. It occasionally forages in open grassy woodland.



Flora & Fauna Assessment - Cypress Crescent, Cabarita

Species	Likelihood of occurrence in the Study area	Notes
Bush stone-curlew (<i>Burhinus grallarius</i>)	Unlikely	This species is rare east of the Great Divide except for isolated populations along the north coast. It forages and breeds in open-grassed woodlands or sparsely treed rangelands, often with a non-existent shrub layer and abundant leaf litter.
Bush-hen (<i>Amaurornis olivaceus</i>)	Unlikely	The Bush-hen occurs in coastal northern Australia and through eastern Qld to the NSW north coast. It inhabits a variety of coastal wetlands from mangroves, lagoons and swamps, to river margins and creeks running through rainforest.
Collared kingfisher (<i>Todiramphus chloris</i>)	Unlikely	The Collared kingfisher is most commonly observed in the Tweed River estuary in NSW. It is virtually restricted to mangroves and other estuarine habitats in Australia, mainly about the mouths of the larger coastal rivers. Mangrove communities along Cudgen Creek provide suitable habitat for this species. There are no Mangroves on the subject site but the Collared kingfisher may nest in hollows or termites nests in large eucalypt or paperbark trees near mangrove communities.
Common blossom bat (<i>Syconycteris australis</i>)	Possible	Common blossom bats occur in coastal areas of north-east NSW and eastern Qld. They often roost in littoral rainforest and feed on flowers in adjacent heathland and paperbark swamps.
Common planigale (<i>Planigale maculata</i>)	Possible	This species occurs in coastal north-east NSW. It occupies a wide range of habitats from rainforest, sclerophyll forest, grasslands, marshlands, rocky areas and even some suburban areas, and usually occurs close to water.
Eastern bent-wing bat (<i>Miniopterus schreibersii oceanensis</i>)	Unlikely	This species occurs throughout eastern Australia. It generally occupies caves and tunnels during the day, but may occasionally roost singularly or in small collectives under the bark of mature paperbark trees.
Eastern Free-tail-bat	Unlikely	This species is sparsely distributed in coastal eastern Australia, from approximately Sydney to Fraser Island. This is a poorly known species for which specific habitat requirements are not known. Inferences from wing morphology and echo-location call design suggest that it forages in more open environments. This species has been recorded from forest types ranging from rainforest to dry sclerophyll forest and woodland, but most records are from dry sclerophyll forest and woodland.
Eastern long-eared bat (<i>Nyctophilus bifax</i>)	Unlikely	This species occurs from Cape York through eastern Qld to the far north-east corner of NSW. It inhabits lowland subtropical rainforest and wet and swamp eucalypt forest, extending into adjacent moist eucalypt forest.



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Species	Likelihood of occurrence in the Study area	Notes
Eastern pygmy-possum	Possible	The Eastern Pygmy-possum is found in south-eastern Australia, from southern Queensland to eastern South Australia and in Tasmania. Found in a broad range of habitats from rainforest through sclerophyll forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest. Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; an important pollinator of heathland plants such as banksias; soft fruits are eaten when flowers are unavailable. Also feeds on insects.
Glossy black cockatoo (<i>Calyptorhynchus lathami</i>)	Unlikely	Found in coastal forests and open inland woodland in eastern Australia. The Glossy black-cockatoos distribution is limited to habitat which contains sufficient seed reserves of their three favoured species of food trees: <i>Allocasuarina littoralis</i> , <i>A. torulosa</i> and <i>A. verticillata</i> (Forshaw 1981) and suitable large hollow bearing trees for nesting.
Grass owl (<i>Tyto capensis</i>)	Unlikely	The Grass owl occupies coastal heath and grassland across northern Australia (Reader's Digest 1993). In NSW they are more likely to be found in the north-east. Suitable habitat for this species does not occur on the subject site.
Grey-headed flying-fox (<i>Pteropus poliocephalus</i>)	Possible	This species occurs from central eastern Qld south to Vic. In NSW they mainly occur in coastal areas and along river valleys. They typically roost in conspicuous camps in lowland rainforest and swamp forest, often in isolated remnants or on islands in rivers. They forage on fruit, nectar and pollen in rainforests and eucalypt forests. Coast banksia on the site offers suitable forage habitat for this species.
Koala (<i>Phascolarctos cinereus</i>)	Unlikely	The Koala occurs in eucalypt woodlands and forests throughout eastern Australia. They inhabit areas where there are appropriate food trees.
Large-footed myotis (<i>Myotis macropus</i>)	Unlikely	This species is distributed throughout eastern Australia. It forages over bodies of water ranging from rainforest streams to large lakes and reservoirs. It roosts during the day in caves, mines, tunnels, tree hollows and under bridges.
Little bent-wing bat (<i>Miniopterus australis</i>)	Possible	This species occurs in coastal north-east NSW and eastern Qld. It inhabits moist eucalypt forest, rainforest and dense coastal scrub. It generally occupies caves and tunnels during the day, and may occasionally roost singularly or in small collectives under the bark of mature paperbark trees.
Long-nosed potoroo (<i>Potorous tridactylus</i>)	Unlikely	This species occurs in coastal areas from the Gladstone area in Qld to south-west Vic and are regarded as uncommon north of Sydney. They inhabit a range of vegetation communities including rainforest, moist and dry forests, and heathlands.



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Species	Likelihood of occurrence in the Study area	Notes
Magpie goose (<i>Anseranas semipalmata</i>)	Unlikely	The Magpie goose occurs mainly in coastal and sub-coastal areas of northern Australia. The species is now a rare vagrant in NSW. It generally inhabits open lakes, swamps and permanent wetlands which are dominated by rush and sedge vegetation, with grasslands nearby.
Olongburra frog	Unlikely	Olongburra Frogs occur in coastal areas from Fraser Island in south-east Queensland to Yuraygir National Park south of Grafton in northern NSW. They are usually found amongst sedges and rushes in coastal wetlands such as paperbark swamps and sedge swamps of the coastal "wallum" country (NPWS 2002).
Osprey (<i>Pandion haliaetus</i>)	Unlikely	Two (2) Ospreys were sighted in flight above the site during the survey. This raptor is thinly distributed in coastal Australia. It nests in singularly overtopping, generally dead trees. The Osprey hunts in coastal rivers, estuaries and streams and may gather nesting material from nearby forests.
Red-tailed black-cockatoo (<i>Calyptorhynchus banksii</i>)	Unlikely	In NSW this species occurs on the north-west slopes and plains, and another small isolated population is found in the coastal north-east. It inhabits open forest and woodland of primarily eucalypts, particularly near or along watercourses.
Regent honeyeater (<i>Xanthomyza phrygia</i>)	Unlikely	In NSW this species is found predominately along the western slopes of the Great divide, and less commonly along the coast. It occupies dry open forest and woodland with an abundance of nectar-producing eucalypts, particularly box-ironbark woodland in the west and Swamp mahogany forests on the coast.
Rose-crowned fruit-dove (<i>Ptilinopus regina</i>)	Unlikely	One (1) Rose-crowned fruit-dove was recorded on the south eastern portion of the site. The Rose-crowned fruit-dove occurs along the coast and the ranges of Qld and eastern NSW. It occurs mainly in subtropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest, where fruit is plentiful.
Spotted tailed quoll	Unlikely	The range of the Spotted-tailed Quoll has contracted to the east coast of NSW, Tasmania, eastern Victoria and north-eastern Queensland. Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites. Mostly nocturnal consuming a variety of prey, including gliders, possums, small wallabies, rats, birds, bandicoots, rabbits and insects; also eats carrion and takes domestic fowl.
Wallum froglet (<i>Crinia tinnula</i>)	Unlikely	The Wallum froglet is found in coastal areas from south-east Qld to the central coast of NSW. It is found only in acid Paperbark swamps and sedge swamps of the coastal 'wallum' country.



Flora & Fauna Assessment - Cypress Crescent, Cabarita

Species	Likelihood of occurrence in the Study area	Notes
White-eared monarch (<i>Monarcha leucotis</i>)	Unlikely	This species is restricted to eastern Qld and the NSW north coast. It occurs primarily in coastal rainforest, swamp forest and wet eucalypt forest and appears to prefer forest edges.
Wompoo fruit dove (<i>Ptilinopus magnificus</i>)	Unlikely	This species is found along the coast and coastal ranges from Cape York to the Hunter River in NSW. It occurs in rainforests, low-elevation moist eucalypt forest and brushbox forests. They most often occur in mature forests, but are also found in remnant and regenerating forest.

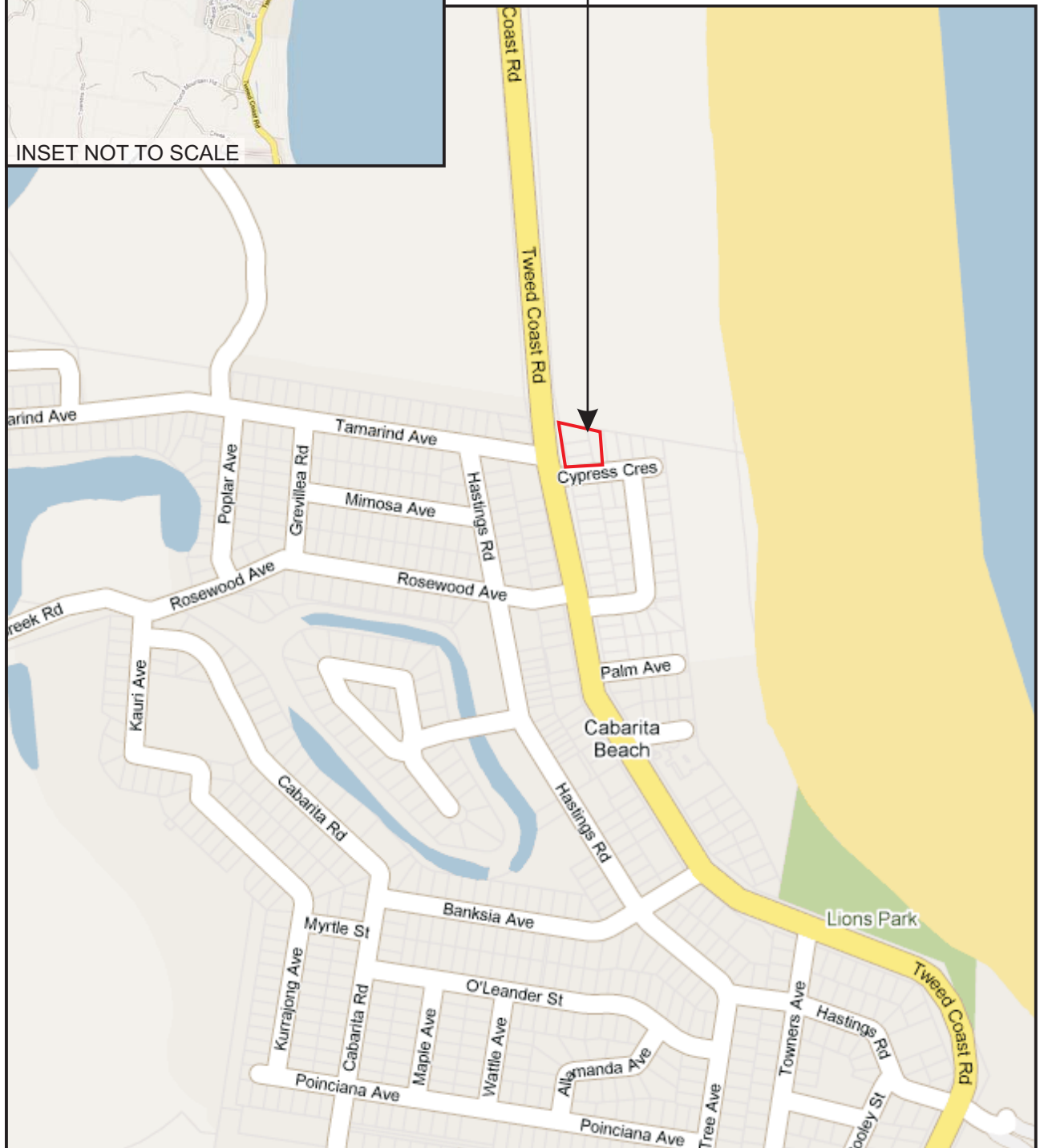
2.3.5 Results of Fauna Survey

The following observations were noted:

- A low diversity and abundance of birds was observed with only five (5) species recorded. These were: Superb fairy wren (*Malurus cyaneus*), Brush turkey (*Alectura lathami*), Little wattlebird (*Anthochaera chrysoptera*), White-cheeked honeyeater (*Phylidonyris nigra*) and White ibis (*Threskiornis molucca*).
- No reptiles, mammals or amphibians were recorded.



SUBJECT SITE



0 100m 200m

SOURCE: Google Maps

SCALE: 1 : 8000 @ A4

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Environmental Consultants

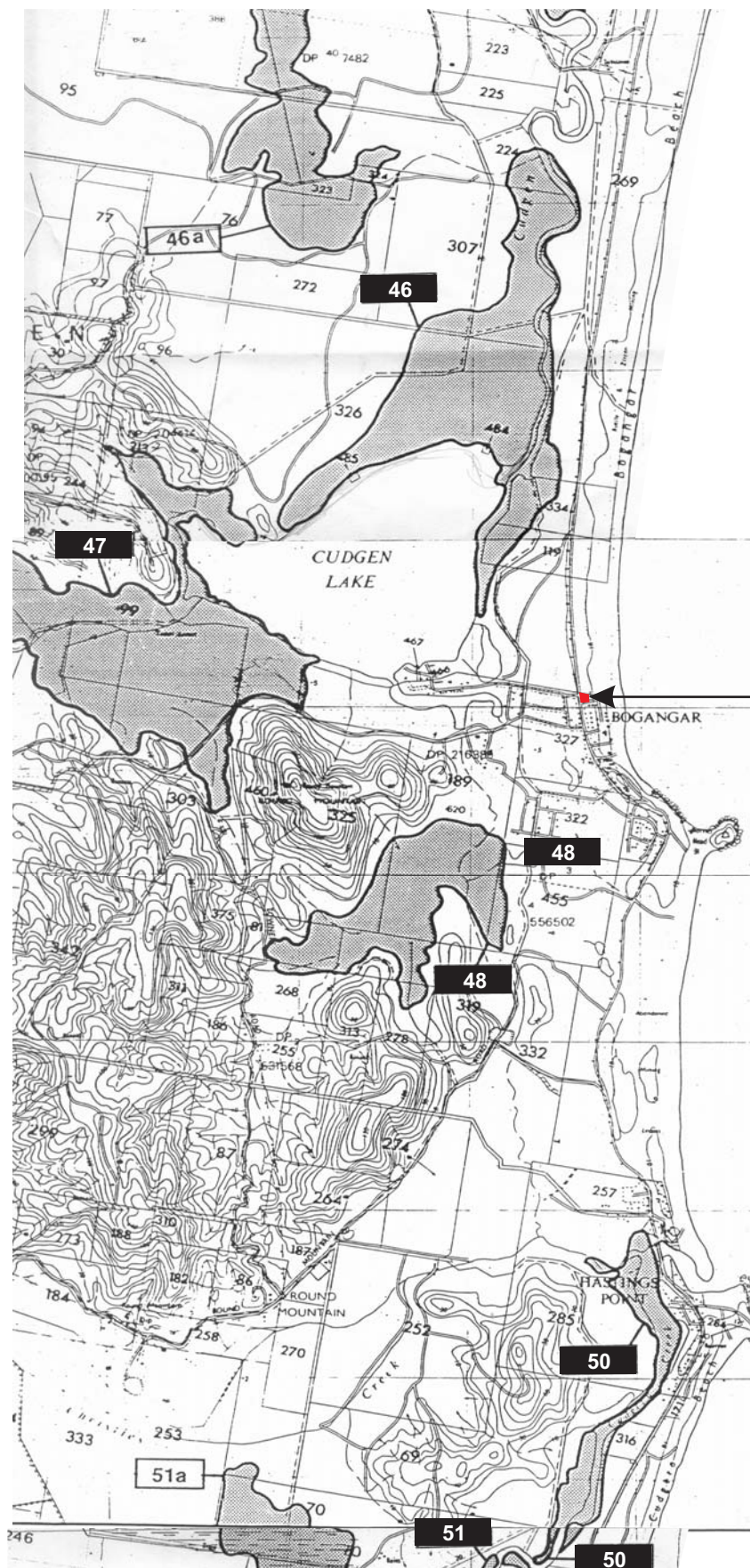
CLIENT
Hansen Developments
PROJECT
Lots 1, 2 & 3 Section 1 DP29748 & Lot 4
Section 1 DP32109
Cypress Crescent, Cabarita, NSW
Tweed Shire Council LGA

FIGURE 1

PREPARED: BW
DATE: 02 March 2010
FILE: N09013_Locality.cdr

TITLE

LOCALITY PLAN



SUBJECT SITE

Legend

-  Area subject to SEPP No. 14 (with index number)
-  Subject Site

0 1000m

SOURCE: State Env. Planning Policy No. 14
Amendment 11 Maps 2 & 3

SCALE: 1 : 40 000 @ A4

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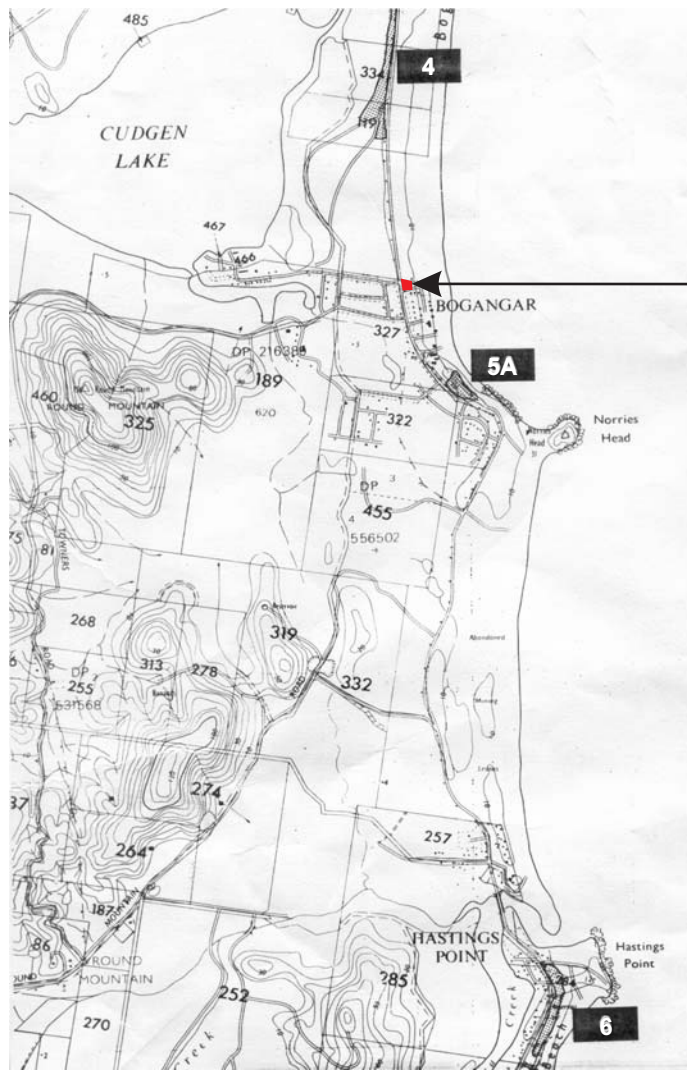
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FIGURE 2

PREPARED: BW
DATE: 02 March 2010
FILE: N09013_SEPP14.cdr

TITLE

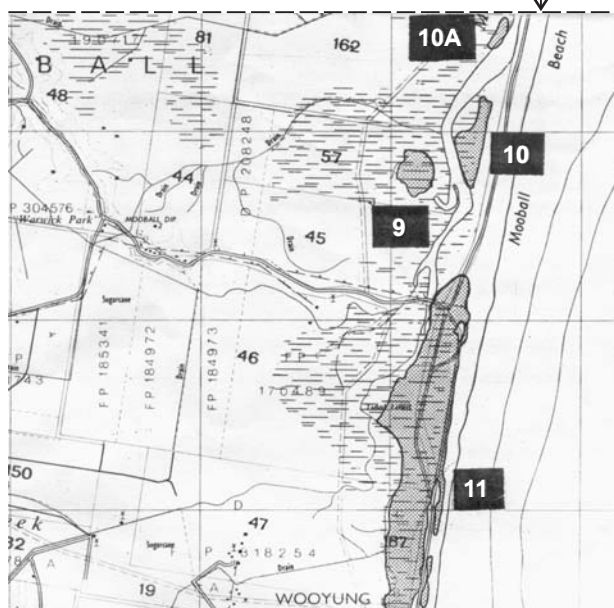
**SEPP No. 14
COASTAL
WETLANDS**



SUBJECT SITE



Approx. 5.5 km



Legend

-  Area subject to SEPP No. 26 (with index number)
-  Subject Site

0 1000m

SOURCE: State Env. Planning Policy No. 26
Amendment 1 Map 1

SCALE: 1 : 40 000 @ A4

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FIGURE 3

PREPARED: BW
DATE: 02 March 2010
FILE: N09013_SEPP26.cdr

TITLE

**SEPP No. 26
LITTORAL
RAINFORESTS**



- Legend**
- Subject Site
 - Cudgen Nature Reserve



0 25m

SOURCE: Tweed Shire Council Aerial Photograph (June 2004)

SCALE: 1 : 1000 @ A4

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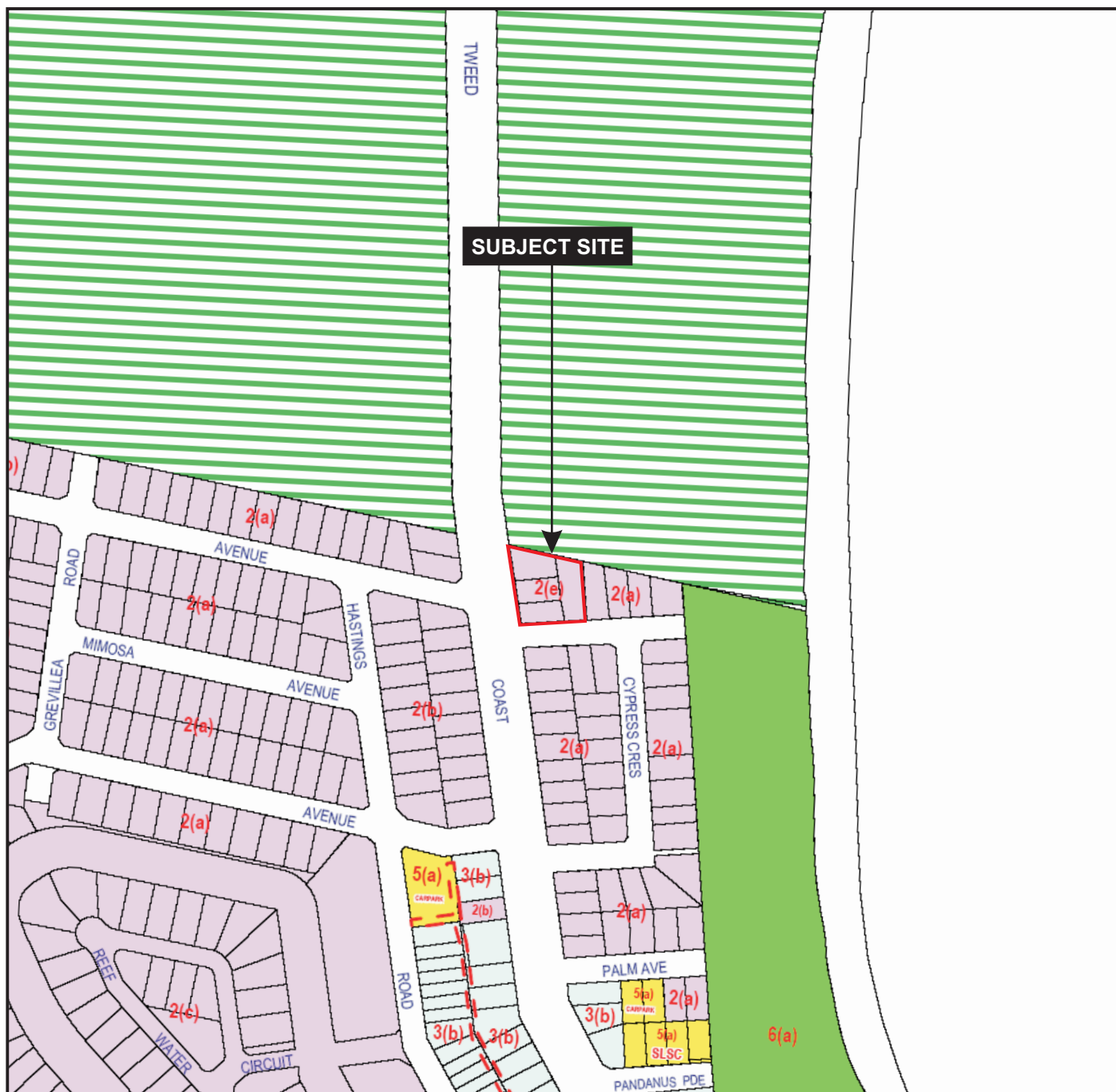
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FIGURE 4

PREPARED: BW
DATE: 02 March 2010
FILE: N09013_Aerial.cdr

TITLE

**AERIAL
PHOTOGRAPH**



1. RURAL

- 1(a) (a) RURAL
- 1(b) (b) AGRICULTURAL PROTECTION
- 1(b2) (b2) AGRICULTURAL PROTECTION
- 1(c) (c) RURAL LIVING

2. RESIDENTIAL

- 2(a) (a) LOW DENSITY RESIDENTIAL
- 2(b) (b) MEDIUM DENSITY RESIDENTIAL
- 2(c) (c) URBAN EXPANSION
- 2(d) (d) VILLAGE
- 2(e) (e) RESIDENTIAL TOURIST
- 2(f) (f) TOURISM

3. BUSINESS

- 3(a) (a) SUB-REGIONAL BUSINESS
- 3(b) (b) GENERAL BUSINESS
- 3(c) (c) COMMERCE & TRADE
- 3(d) (d) WATERFRONT ENTERPRISE
- 3(e) (e) SPECIAL TOURIST (Jack Evans Boatharbour)

4. INDUSTRIAL

- 4(a) (a) INDUSTRIAL

5. SPECIAL USES

- 5(a) (a) SPECIAL USES (SPECIAL PURPOSES INDICATED BY RED LETTERING)

6. OPEN SPACE

- 6(a) (a) OPEN SPACE
- 6(b) (b) RECREATION

7. ENVIRONMENTAL PROTECTION

- 7(a) (a) ENVIRONMENTAL PROTECTION (Wetlands & Littoral Rainforests)
- 7(b) (b) ENVIRONMENTAL PROTECTION (Scenic / Escarpment)
- 7(c) (c) ENVIRONMENTAL PROTECTION (Coastal Lands)
- 7(d) (d) ENVIRONMENTAL PROTECTION (Habitat)

8. NATIONAL PARKS / NATURE RESERVES

- 8(a) (a) NATIONAL PARKS & NATURE RESERVES

ADDITIONAL CONTROLS

- CLAUSE 37 (TRANSMISSION LINE CORRIDOR)
- CLAUSE 38 (FUTURE ROADS)
- CLAUSE 41 (HERITAGE CONSERVATION AREA)
- CLAUSE 52 (KINGS BEACH / KINGS FOREST / OSPREY NEST)
- CLAUSE 52 (BLACK ROCKS)
- CLAUSE 52 (POTTSVILLE)
- CLAUSE 52 (STORMWATER AND FILL)
- CLAUSE 52 (COBARI LAKES)
- CLAUSE 52 (EXISTING AND FUTURE DAM AREAS)
- CLAUSE 53 (SCHEDULE 3 ITEM)
- Subject Site

SOURCE: Tweed Local Environmental Plan 2000
Zoning Map No. 23

SCALE: 1 : 5000 @ A4

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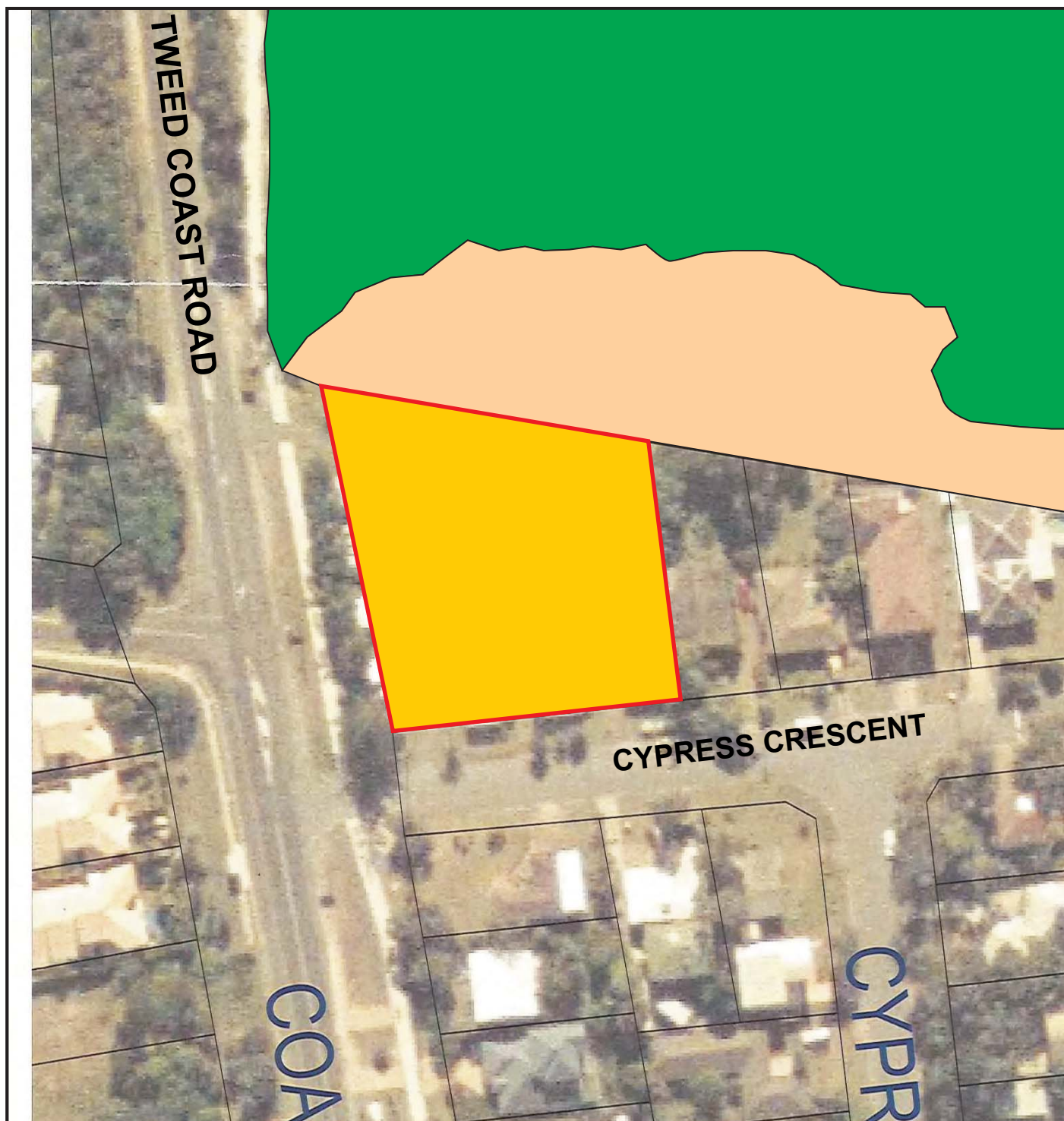
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FIGURE 5

PREPARED: BW
DATE: 02 March 2010
FILE: N09013_Zoning.cdr

TITLE

TWEED LEP
ZONING



Legend

- Banksia woodland (*Banksia integrifolia*)
- Grassland with scattered trees
- Caravan park
- Subject Site



0 25m

SOURCE: JWA Site Investigations; Tweed Shire Council Aerial Photograph (June 2004)

SCALE: 1 : 1000 @ A4

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FIGURE 7

PREPARED: BW
DATE: 02 March 2010
FILE: N09013_Veg.cdr

TITLE

**VEGETATION
COMMUNITIES**