Proposed Aged Care Facility
Lot 155 & Lot 188 Wilson Rd
Macksville NSW.

Flora and Fauna
Preliminary Investigations

November 2004

OzeECOmanagement Pty Ltd

(Environmental Solutions)

Proposed Aged Care Facility

Lot 155 & 188 Wilson Rd Macksville NSW

Development plan-755537

Parish-Bowra

County-Raleigh

Local Government Area-Nambucca

Topographic Sheet-Macksville 9436

Flora and Fauna Preliminary Investigations

Draft Report

DISCLAIMER: This report is indicative in its content, with due care taken to ensure the content contains data and interpretation that is both current at the time of publication and factual in its intent. Those persons who are involved in the use of the contents of this report should rely on their own research.

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1 Introduction

1.1 Background

This preliminary assessment of flora and fauna examines the potential significance of habitats and species that occur within or adjacent to the development site of the proposed Macksville Aged Care Facility. OzeEcomanagement P/L has prepared this report on behalf of Smyth Maher & Associates P/L.

The study area in this case is defined by the property boundaries of two (2) landholdings known as Lot 155 and Lot 188 Wilson Road Macksville NSW (Figure 1). The study locality is defined as the land within a 10-kilometre radius of the study area (as per NPWS 1995). The study area is located within the NSW North Coast Bioregion as identified by Thackway & Cresswell (1995).

Both lots combined, total 57.3 hectares in size with Lot 155 being 16.79 hectares and Lot 188 being 40.51 hectares.

Within this report, reference is given to the following legislation:

- *Environmental Planning and Assessment Act 1979* (EP&A Act);
- *Threatened Species Conservation Act 1995* (TSC Act);
- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- State Environmental Planning Policy No. 14 – Coastal Wetlands (SEPP 14);
- State Environmental Planning Policy No. 26 – Littoral Rainforests (SEPP 26); and
- State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44).

There is no requirement to address the provisions of the *Native Vegetation Conservation Act 1997* (NVC Act) within this proposal.

The broad intent of this report is to summarise the results of previously published studies pertaining to the study locality, describe the floral and faunal assemblages of the study area and provide commentary as to the ecological significance of the vegetation present. The report concludes with a preliminary analysis of inherent ecological constraints and opportunities of the study area.

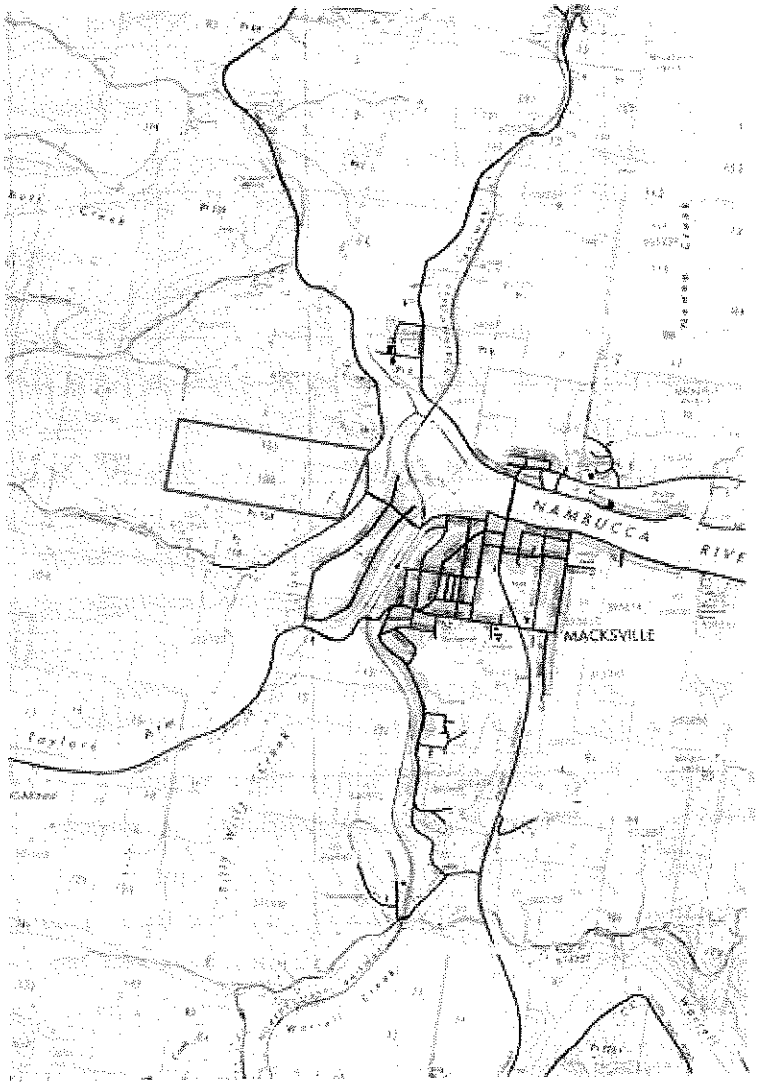
The general objectives of this report were to:

- Preliminarily describe the biological environment of the study area in relation to flora and fauna;
- Determine the potential presence of threatened species, endangered ecological communities or endangered populations and their habitats within the study area; and
- Identify and describe the inherent ecological constraints and opportunities within the study area.

The ecological studies have been conducted in a number of stages:

- The first stage was the review of ecological literature pertaining to the study area, with an emphasis on the recorded locations of threatened and significant species and communities;
- A preliminary habitat assessment was then conducted within the study area to delineate the nature of the habitats present and identify notable fauna habitat features;
- The third stage was the determination of potential subject species. Potential subject species are defined as those threatened species considered likely to occur within the habitats present in the study area (NPWS 1995);
- An analysis of the flora species and vegetation communities within the study area was conducted; and
- The final stage included the documentation of commentary relating to the ecological constraints and opportunities within the study area and the need for additional investigations and reporting.

Figure 1: Study area



1.2 Limitations

Limitations to the investigative methods utilised in this report have been recognised and wherever possible, mitigated. These potential limitations included the following:

- Records held by other sources are only representative of the area at the time of sampling and are not personally guaranteed by ozECOmanagement P/L;
- Literature review relies on available literature at the time of the compilation of the report; and
- Field surveys conducted for this study were based on preliminary methods and were not exhaustive or comprehensive in their nature.

1.3 Proposed works

It is proposed to establish an aged care facility within the study area. This proposal will require the construction of associated site infrastructure, including any roads, bushfire asset protection zones and services. A final development layout has not been determined at this stage of the investigation and assessment.

2 Literature Review

In order to assess the significance of flora and fauna associated with the proposed development a literature review was conducted as part of the desktop survey reviewing available data.

Threatened flora and fauna records within the study locality (a ten (10) kilometre radius of the study area) were sourced from the following:

- NPWS Atlas of NSW Wildlife Database for the Macksville 1:100,000 Topographic Map sheet (9436);
- Discussions with environmental staff at Nambucca Shire Council; and
- 2003/ 2004 Nambucca State of the Environment Report.

2.1 Threatened flora

Seven threatened floral species are previously recorded within the Macksville Map sheet. These species are listed below in Table 1.

Table 1: Threatened flora species of the Macksville Map sheet

Scientific name		Common name
APOCYNACEAE	*Parsonsia dorrigoensis*	Milky Silkpod
ASCLEPIADACEAE	*Marsdenia longiloba*	-
FABACEAE	*Acacia chrysotricha*	-
MYRTACEAE	*Melaleuca groveana*	-
RHAMNACEAE	*Pomaderris queenslandica*	-
RUTACEAE	*Acronychia littoralis*	Scented Acronychia
SAPOTACEAE	*Amorphospermum whitei*	Rusty Plum

Of these, four (4) threatened flora species have been recorded within 10-kilometres of the study area. These species are listed below in Table 2.

No threatened flora species have been previously recorded within the study area.

Table 2: Local Threatened Floral Species

Scientific name		Common name	Details of local records		
			Status	Year	Locality
ASCLEPIADACEAE	*Marsdenia longiloba*	-	E1	2000	Nambucca SF
MYRTACEAE	*Melaleuca groveana*	-	V	1998	-
RUTACEAE	*Acronychia littoralis*	Scented Acronychia	E1	2001	-
SAPOTACEAE	*Amorphospermum whitei*	Rusty Plum	V	1900	-

2.2 Regional floral significance

The Nambucca State of the Environment Report 2003/2004 identifies seven (7) vegetation types as being poorly conserved and significant on a regional basis. A further ten (10) other vegetation types are considered important due to their wildlife values across the Nambucca LGA. These communities are listed below:

Poorly conserved and significant on a regional basis

- Forest red-gum forests and woodlands
- Scribbly gum/blackbutt forests and woodlands
- Flooded gum very tall open forests
- River and Grey Mangrove closed forests/woodlands
- Brush box/flooded gum very tall open forests
- *Juncus sp* closed sedgeland/grassland
- Brushbox low closed forest

Important vegetation communities due to their wildlife habitat values

- Flooded gum forests
- Brushbox forests
- Littoral rainforests
- Blackbutt tall wet forests
- Mangroves
- Red gum forests
- Melaleuca forests and woodlands
- Banksia woodlands and shrublands
- Wetland areas
- Riparian zones

Further, the Department of Environment and Conservation has published a list of regionally significant ecosystems within the NSW North Coast region, as part of the Comprehensive Regional Assessment (CRA) process. These lists have been considered in this report.

2.3 Threatened Fauna

Forty-two (42) threatened fauna species have been previously recorded within the Macksville 1:100,000 topographic Map sheet. This includes seventeen (17) mammal species, as well as three (3) frogs, three (3) reptiles and nineteen (19) avian (bird) species. These species are listed below in Table 3.

Table 3: Threatened fauna species of the Macksville Map sheet

Scientific Name		Common name
Mammalia		
DASYURIDAE	*Dasyurus maculatus*	Spotted-tailed Quoll
	Phascogale tapoatafa	Brush-tail phascogale
MACROPODIDAE	*Macropus parma*	Parma wallaby
	Thylogale stigmatica	Red-legged Pademelon
PETAURIDAE	*Petaurus australis*	Yellow-bellied Glider
	Petaurus norfolcensis	Squirrel glider
PHASCOLARCTIDAE	*Phascolarctos cinereus*	Koala
POTOROIDAE	*Aepyprymnus rufescens*	Rufous Bettong
	Potorous tridactylus	Long-nosed Potoroo
PTEROPODIDAE	*Pteropus poliocephalus*	Grey-headed Flying Fox
	Syconycteris australis	Common Blossom bat
VESPERTILLONIDAE	*Falsistrellus tasmaniensis*	Eastern False Pipistrelle
	Kerivoula papuensis	Golden-tipped Bat
	Miniopterus australis	Little Bentwing-Bat
	Miniopterus schreibersii oceanensis	Eastern Bent-wing bat
	Myotis adversus	Large-footed Myotis
	Scoteanax rueppellii	Greater Broad-nosed Batt
Amphibia		
HYLIDAE	*Litoria aurea*	Green and Golden Bell Frog
MYOBATRACHIDAE	*Mixophyes iterates*	Giant Barred Frog
	Philoria sphagnicola	Sphagnum Frog
Reptilia		
CHELONIIDAE	*Caretta caretta*	Loggerhead Turtle
	Chelonia mydas	Green Turtle

Scientific Name		Common name
ELAPIDAE	*Hoplocephalus stephensii*	Stephens' Banded Snake
Aves		
ACCIPITRIDAE	*Lophoictinia isura*	Square-tailed Kite
	Pandion haliaetus	Osprey
ARDEIDAE	*Ixobrychus flavicollis*	Black Bittern
ATRICHORNITHIDAE	*Atrichornis rufescens*	Rufous Scrub-bird
BURHINIDAE	*Esacus neglectus*	Bush Stone-curlew
CACATUIDAE	*Calyptorhynchus banksii*	Red-tailed Black-cockatoo
	Calyptorhynchus lathami	Glossy Black-cockatoo
CAMPENAGIDAE	*Coracina lineata*	Barred Cuckoo-shrike
CICONIIDAE	*Ephippiorhynchus asiaticus*	Black-necked Stork
COLUMBIDAE	*Ptilinopus magnificus*	Wompoo Fruit-Dove
	Ptilinopus superbus	Superb Fruit-Dove
GRUIDAE	*Grus rubicundus*	Brolga
HAEMATOPODIDAE	*Haematopodidae fuliginosus*	Sooty Oystercatcher
	Haematopodidae longirostris	Pied Oystercatcher
LARIDAE	*Sterna albifrons*	Little tern
MELIPHAGIDAE	*Xanthomyza phrygia*	Regent honeyeater
STRIGIDAE	*Ninox strenua*	Powerful Owl
TYTONIDAE	*Tyto novaehollandiae*	Masked Owl
	Tyto tenebricosa	Sooty Owl

Of the above, eight (8) threatened fauna species have been previously recorded within 10-kilometres of the study area. Those species recorded within the study locality are listed in Table 4. No threatened fauna species have been previously recorded within the study area.

Table 4: Local Threatened Fauna Species

Scientific name	Common name	Details of local records		
		Status	Year	Locality
Xanthomyza phrygia	Regent honeyeater	E1	1995	Macksville
Ninox strenua	Powerful Owl	V	2000	-
Tyto novaehollandiae	Masked Owl	V	1999	-
Litoria aurea	Green and Golden Bell Frog	E1	1975	Macksville
Phascogale tapoatafa	Brush-tail phascogale	V	1998,2001,2002	Scott's Head
Phascolarctos cinereus	Koala	V	1974 -1984	Macksville
Pteropus poliocephalus	Grey-headed Flying Fox	V	2003	Newee Creek
Miniopterus australis	Little Bentwing-Bat	V	1999	-

3 Preliminary Habitat Assessment and Field Surveys

3.1 Methodology

A preliminary assessment of habitat was conducted on the 5th November 2004. Field investigations consisted of a general traverse over the study area by both foot and four-wheel drive vehicle. The habitat attributes investigated and described included the following:

- Structural vegetation types and dominant species;
- The presence of large mature trees, stag trees and hollow-bearing trees;
- Densities of understory or shrub and groundcover;
- Presence of fallen timber;
- Presence of rock outcrops;
- Presence of caves, mines or tunnels;
- Presence of rainforest, wetland or other significant habitat;
- Presence of wet areas, waterbodies;
- Presence of special threatened fauna species feeding resources
- Assessment of previous landuse; and
- Extent of movement corridors and refugia.

The extent and location of separate vegetation and habitat units was mapped on a plan of the study area.

A more detailed analysis of the vegetation communities of the study area was undertaken on the 13th November 2004. This involved foot-based traverses of representative portions of the habitats and vegetation communities across the study area. These field surveys intended to expand upon the preliminary habitat evaluation. Key features of this stage of the surveys included the refinement of the preliminary description and mapping of separate vegetation community types, the mapping of wetlands across the study area and the documentation of separate faunal habitat types. Furthermore, the list of locally recorded threatened species generated from the review of ecological literature was used in conjunction with the results of the habitat assessment to generate a list of potential subject species. Potential subject species are defined as "*those threatened species that are considered likely to occur within the habitats of the study area.*"

Factors considered in the determination of whether a species satisfies the definition of a potential subject species includes:

- The study area falling within the known distributional range of the species;
- The study area providing vegetation communities of a structural type preferred by the species; and
- The habitats of the study area providing those attributes required by the species for lifecycle activities (shelter, breeding, feeding, movement).

From the habitat assessment program, it was possible to:

- Identify the parts of the site that contain potentially significant habitats for threatened species and ecology/ biodiversity;
- Generate a list of threatened flora and fauna species and endangered ecological communities that have the potential to occur within the study area; and
- Contribute to the rational and effective planning of the proposed development through the identification of ecological constraints and opportunities.

3.2 General description

The study area occupies a total of 57.3-hectares of land on the floodplain of the Nambucca River, west of Macksville. Topographically, much of the study area is low-lying (below 10-metres ASL) and flat to undulating in landform. Relief and slope rises in the central and western portions of the study area and the site attains an elevation of 30-metres ASL in the southwest. These areas are associated with low ridges over the river floodplain. Taylors Arm and the Nambucca River dominate the hydrology and receive all surface run-off from the study area. Taylors Arm forms the eastern boundary of the study area. A broad, swampy lowland, which receives tidal influence from the River, is located in the northern portion of the land. This area is designated as SEPP 14 Coastal Wetland. Several small tributaries are located in the study area and drain the low ridges. The most substantial of these is located in the west of the study area. All of these drainage lines would flow intermittently in response to local rainfall. Five farm dams have been established over the study area to provide stock water.

3.3 Preliminary vegetation community description and habitat analysis

Seven (7) structural vegetation community types occur within the study area. Descriptions of these communities are provided below, along with the range of faunal habitat attributes within each community:

Table 5: Vegetation communities One.

Vegetation Community	1. Turpentine/ Bloodwood Very Open Forest (Logged)
Location	This community is located in the southwestern corner of the study area, where it occupies the middle and lower slopes of the drier ridges. It extends in a band approximately 160-metres from the rear boundary of the land and grades into the drainage-impeded lowlands containing Swamp Forest and Low Closed Forest.
Structure/ Description	There are several emergents above the forest canopy, which are old-growth trees of immense size and habitat value. These trees extend to approximately 35-metres or more in height. Such old-growth trees include Blackbutt (*Eucalyptus pilularis*) and Pink Bloodwood (*Corymbia intermedia*), with trunk diameters to 2-metres. The forest canopy is between 16 and 24-metres in height at a cover density of 10 to 30%. The heavy logging regime that has affected this community has significantly reduced the inherent canopy cover below its natural density and created significant canopy gaps across the community. This is a very mixed community, with both drier and more moist influences. Consequently, canopy species diversity is very high. Turpentine (*Syncarpia glomulifera*), Pink Bloodwood as well as Tallowwood (*Eucalyptus microcorys*) and a Mahogany (*Eucalyptus* sp.) dominate the community. Also present are Flooded Gum (*Eucalyptus grandis*), Blackbutt, an Ironbark (*Eucalyptus* sp.) and Swamp Brushbox (*Lophostemon suaveolens*). A small tree/ tall shrub stratum is present in this community. It grows to between 8 and 12-metres at a sparse to moderate cover density. This also contains a diversity of influences and comprises drier and more moist species. This includes Forest Oak (*Allocasuarina torulosa*) in drier areas, rainforest species such as Red Ash (*Alphitonia excelsa*), Foambark Tree (*Jagera pseudorhus*), Cheese Tree (*Glochidion ferdinandi*), Sweet Pittosporum (*Pittosporum undulatum*) and Native Hibiscus (*Hibiscus heterophyllous*) and swamp species such as Swamp Oak (*Casuarina glauca*) and Willow Bottlebrush (*Callistemon linearis*). The shrub layer tends to be sparse to moderate in density and grows to 4-metres in height. It is predominantly dry in nature and includes species such as Dolly Bush (*Ozothamnus diosmifolius*), Sally Wattle (*Acacia floribunda*), a bipinnate Wattle (*Acacia* sp.) and Cordyline (*Cordyline stricta*). However, the exotic species, Lantana (*Lantana camara*) is the predominant shrub species in this community. The groundcover ranges from sparse/ absent on the dry and exposed slopes to dense in sheltered aspects and drainage lines. Groundcovers grow to 1-metre in height and include a diversity of species, such as gahnia and ferns. Twiners, such as Appleberry (*Billardieria scandens*) and Wonga Vine (*Pandorea pandorana*) are also present.
Habitat trees	Logging has placed significant pressures on the presence of mature trees. Nevertheless, several old-growth/ over-mature trees are present in this community, including one Blackbutt of 2-m trunk diameter and Pink Bloodwoods of 1-m and 1.5-m trunk diameters. These trees contain abundant hollows. Furthermore, the mature trees elsewhere across this community were observed to contain numerous small cavities and hollows that may be utilised by dependent fauna. Also, there are several standing dead trees present. Consequently, there appear sufficient resources within this community to support populations of hollow-dependent fauna.
Tree Size Classes	As mentioned above, there are several old-growth specimens present with trunk diameters at breast height of between 1 and 2-metres. These are outstanding habitat features. Visual assessment suggests that tree size classes (trunk diameters) predominantly range between 0.2 and 0.5-m across this community, with some slightly larger specimens of 0.6 to 0.8-m. Tree size class has been heavily influenced by the heavy logging regime, which has depleted millable timber, but also appears to have felled mature specimens that have not been utilised.

Vegetation Community	1. Turpentine/ Bloodwood Very Open Forest (Logged)
Shrub and Groundcover	There is considerable diversity in the shrub and groundcover layer, which is also influenced by natural recruitment following the cessation of logging. Hence, this stratum of the vegetation contains relict shrubs as well as pioneer species and young seedlings of canopy tree species. Lantana, which is facilitated by logging and disturbance, is particularly common.
Fallen timber	Fallen timber is abundant and present in enhanced densities because of the logging activities. This includes felled mature trees as well as logging waste (crowns and trunk bases) and natural limb-fall. Some of the felled timber has been heaped in windrows.
Rock outcrops	There are no substantial rock outcrops within this community.
Caves, mines, tunnels	There are no caves; mines or tunnels and dependent species would not be present.
Significant fauna habitats	There are rainforest elements within the sub-tree layer of this vegetation as well as swamp forest/ wetland elements on the lower slopes and drainage line floor. This community contains special feed trees potentially utilised by the Koala and Glossy Black Cockatoo. Furthermore, there is a nest tree, identified as either a White-bellied Sea-Eagle (*Haliaeetus leucogaster*) or less likely, the Osprey (*Pandion haliaetus*) within the old-growth Blackbutt. This is located at GDA490161 6603165, in the central west of the study area. The White-bellied Sea-Eagle is listed on international migratory bird agreements and the Osprey is a threatened species (TSC Act).
Wet areas/ waterbodies	The drainage line in this community is a defined channel, but does not contain standing water and would flow only during local rain events. The community grades into Swamp Forest, where standing, surface water is present.
Land-use impacts	The most obvious impact has been logging, which has been conducted without regard to sustainable or sound silvicultural principles. It has created extensive canopy gaps and caused heavy modification of the structure of the community. Nevertheless, sound post-logging, natural regeneration is occurring. In addition, there is evidence of impacts caused by unrestricted cattle access (grazing, soil decline, track creation) and weed invasion. A track has been created around the fenceline at the edge of this habitat. There is evidence of past fire events, but fire has not been a recent influence on this community. This has allowed a regeneration of pioneer rainforest species.
Corridors or refugia	This community may comprise a portion of the habitat that extends from the river through to drier forests of the Rhones Creek area, to the west. In this manner, it may form part of a corridor for altitudinal migratory fauna species, especially those that move from drier elevated forests to riverine swamps and lowlands. The community, despite its disturbance, contains features of refuge value such as old-growth trees and hollows and may provide an important local faunal habitat.
Vegetation significance	This community, in places, may meet the definition of Sub-tropical Coastal Floodplain Forest or River-Flat Eucalypt Forest, which have been preliminarily listed on the TSC Act as Endangered Ecological Communities. Obviously, any remnant on the lower Nambucca River floodplain could be considered locally under-represented and therefore of potentially high value. In relation to the CRA for the North Coast region, it is very difficult to ascribe this type to a defined community, because of its diversity and complexity. Consequently, the community is of high vegetation significance.
Faunal significance	Despite its logging impacts and history of disturbance, several elements suggest this community is of high conservation value for fauna. It contains old-growth trees of outstanding value, including one, which contains a White-bellied Sea-Eagle or Osprey nest. Further, the community forms part of a local or sub-regional wildlife corridor and contains hollows, which are infrequently represented on the adjacent swampy lowlands and therefore may be preferentially utilised by dependent species.
Overall conservation value	This community is of **HIGH** overall conservation value.

Table 6: Vegetation community Two

Vegetation Community	2. Swamp Mahogany/ Prickly-leaved Paperbark Swamp Forest
Location	This community is located in the northwestern corner of the study area, where it occupies the upper freshwater section of the low-lying, drainage-impeded swamp that extends through to Taylors Arm. It flanks the very flat, low-lying land at the junction of two drainage lines and contains areas of standing surface water for extended periods.
Structure/ Description	The canopy is between 14 and 18-metres in height at a cover density of 40 to 60%. Prickly-leaved Paperbark (*Melaleuca styphelioides*) and Swamp Mahogany (*Eucalyptus robusta*) clearly dominate this community, along with Flooded Gum and Swamp Oak. Some elements of the adjacent forest type extend into this community within the small tree/ tall shrub stratum. It grows to between 6 and 10-metres at a sparse cover density (due to the inherent density of the canopy). Present in this layer are regenerating canopy trees as well as Red Ash Foambark Tree, Sandpaper Fig (*Ficus coronata*) and Native Hibiscus. The shrub layer also tends to be sparse (this is due to the density of the groundcover) and grows to 2-metres in height. It contains species such as Cockspur Thorn (*Maclura cochinchinensis*). Groundcovers grow to 1.5-metres in height at a dense cover density. This layer includes a diversity of species, but is clearly dominated by Gahnia (*Gahnia* sp.), with other wetland plants such as Woolly Frogsmouth (*Philydrum lanuginosum*), various sedges and rushes and Carex (*Carex* sp.). It also includes Soft Bracken (*Calochlaena dubia*), Cunjevoi, Cordyline and Native Raspberry (*Rubus hillii*).
Habitat trees	Some very large and mature Swamp Mahogany and Flooded Gum are present in this habitat, which contain some small-sized hollows and cavities. The occasional standing dead tree is also present. Despite this, hollows are infrequent within this community.
Tree Size Classes	Swamp Mahogany trees in this community generally range between 0.3 and 0.6-m in trunk diameter at breast height, with the occasional specimen to 1-m. This is within the largest average size of this species, which reflects the maturity of the community.
Shrub and Groundcover	As mentioned, shrubs are sparse but the groundcover is very dense and relatively diverse, despite Gahnia comprising the dominant species. The groundcover layer contains wetland elements of value for dependent fauna species.
Fallen timber	Fallen timber is well represented in this community.
Rock outcrops	There are no substantial rock outcrops.
Caves, mines, tunnels	There are no caves, mines or tunnels.
Significant fauna habitats	There are some limited rainforest elements within the sub-tree layer of this vegetation and very well developed swamp forest/ wetland elements. This community contains special feed trees potentially utilised by the Koala (Swamp Mahogany, Flooded Gum) at densities greater than 15% of the tree strata of the vegetation and therefore constitutes Potential Koala Habitat in accordance with SEPP44.
Wet areas/ waterbodies	The community occupies very low-lying, drainage-impeded land and contains standing surface water, even during extended dry periods. These waters would provide outstanding quality habitats for a range of aquatic or semi-aquatic species, including frogs such as the threatened Wallum Froglet (*Crinia tinnula*) or Green-thighed Frog (*Litoria brevipalmata*).
Land-use impacts	This community appears relatively undamaged from land use effects. There is evidence of some cattle access for grazing, shelter or access to water, which has created tracks and the pugging of soil. The recent logging of the adjacent dry forest has extended into the periphery of this community and some Swamp Mahogany has been harvested. There is very little, if any, weed invasion of this very high quality habitat type.
Corridors or refugia	This community also comprises a portion of the habitat that extends from the river through to drier forests of the Rhones Creek area, to the west. In this manner, it may form part of a corridor for altitudinal migratory fauna species, especially those that move from drier elevated forests to riverine swamps and lowlands. The community contains features of refuge value such as wetlands, mature trees and hollows and may provide an important local faunal habitat.
Vegetation significance	This community appears to meet the definition of Swamp Sclerophyll Forest, which has been preliminarily listed on the TSC Act as an Endangered Ecological Community. Obviously, any remnant on the lower Nambucca River floodplain could be considered locally under-represented and therefore of potentially high value. In relation to the CRA for the North Coast region, this community is considered "*regionally vulnerable.*" Consequently, the community is of high vegetation significance.

Vegetation Community	**2. Swamp Mahogany/ Prickly-leaved Paperbark Swamp Forest**
Faunal significance	This community provides very important swamp forest habitat values for frogs and other dependent fauna and constitutes potential Koala habitat. Further, the community forms part of a local or sub-regional wildlife corridor and contains hollows. It is of high faunal habitat significance.
Overall conservation value	This community is of **HIGH** overall conservation value.

Table 7: Vegetation community Three

Vegetation Community	3. Prickly-leaved Paperbark/ Willow Bottlebrush Low Closed Forest with Emergents
Location	This community is located in a narrow and linear band that extends along the upper, eastern periphery of the Swamp Mahogany/ Prickly-leaved Paperbark Swamp Forest and part of the Turpentine/ Bloodwood Very Open Forest. It occupies the lower slope and free-draining portion of the drainage line in the northwestern portion of the study area.
Structure/ Description	This community contains a sparse to moderate (in places) emergent layer to 22-metres that includes species from the adjacent communities, such as Swamp Mahogany, Tallowwood, Ironbark, Turpentine and Pink Bloodwood. The canopy is typically between 8 and 12-metres in height at a cover density of 40 to 60%. Prickly-leaved Paperbark and Willow Bottlebrus h clearly dominate this community, along with the occasional Swamp Oak and eucalypt from the adjacent forest types. The shrub layer is moderate in cover density and grows to 2-metres in height. It is dominated by dry species such as Dolly Bush, Lantana, young canopy species and the bipinnate wattle. Juvenile Camphor Laurel (*Cinnamomum camphora*) is particularly common in this community. Groundcover is dense and grows to 1. -metre in height. This layer includes a diversity of species, but is clearly dominated by Gahnia as well as Soft Bracken and Cordyline. Twiners are also present in this community.
Habitat trees	This is a transitional, regrowth community and habitat trees/ hollow -bearing trees are sparse and infrequent. The occasional small cavity may be present in some of the emergent tree features.
Tree Size Classes	Tree size classes are relatively small because of the regrowth nature of this community type. Emergent trees tend to be within the 0.2 to 0.4-m trunk diameter class.
Shrub and Groundcover	This layer of the habitat is diverse and relatively mixed and may provide a range of values for dependent fauna.
Fallen timber	Fallen timber is sparsely represented in this community.
Rock outcrops	There are no substantial rock outcrops.
Caves, mines, tunnels	There are no caves, mines or tunnels.
Significant fauna habitats	There are some limited rainforest and swamp forest/ wetland elements in this community. This community contains special feed trees potentially utilised by the Koala (Swamp Mahogany, Tallowwood) and forms a buffer to more ecologically important communities.
Wet areas/ waterbodies	The community flanks a drainage-line and an area of low -lying swamp. It therefore contains aquatic habitats for dependent species. Further, it would act as an important water quality buffer between the cleared grassland and the swamp forest types.
Land-use Impacts	This community appears to be a transitional forest that is regenerating from former disturbance. There are overt grazing and recent logging pressures on parts of this community as well as weed invasion.
Corridors or refugia	This community comprises a portion of the habitat that extends from the river through to drier forests of the Rhones Creek area, to the west. In this manner, it may form part of a corridor for altitudinal migratory fauna species, especially those that move from drier elevated forests to riverine swamps and lowlands. The community contains some features of refuge value such as wetlands but may also function more importantly as an ecological buffer to the habitats adjacent to it.
Vegetation significance	The regrowth and transitional nature of this community reduces its inherent value, although there is some evidence to suggest that it may meet the criteria for Swamp Sclerophyll Forest, which have been preliminarily listed as Endangered Ecological Communities on the TSC Act.
Faunal significance	This community provides some swamp forest habitat values for frogs and other dependent fauna and includes Koala feeding habitat. Further, the community forms part of a local or sub-regional wildlife corridor and acts as an important buffer to adjacent vegetation types. It is of moderate to high faunal habitat significance.
Overall conservation value	This community is of **MODERATE to HIGH** overall conservation value.

Table 8: Vegetation community Four.

Vegetation Community	4. Swamp Oak Swamp Forest
Location	This community is located in the central north of the study area, where it occupies the middle drainage-impeded lowland swamp that extends through to Taylors Arm. The waters in this section are tidal and saline/ brackish. This community dominates the middle swamp, downstream of the freshwater Swamp Mahogany/ Prickly-leaved Paperbark Swamp Forest and upstream of the Estuarine Open Water community.
Structure/ Description	The canopy is between 8 and 12-metres in height at a cover density of at least 60%. Swamp Oak is the sole community dominant, although there is a very sparse canopy/ sub-canopy of Swamp Mahogany, Flooded Gum, Willow Bottlebrush and Prickly-leaved Paperbark at the periphery of this community. Shrubs are absent, due to the density and influence of the Swamp Oak canopy. Groundcover is either absent and the land surface dominated by Swamp Oak needles or open water or there is a moderate to dense groundcover layer of Juncus (*Juncus* sp.), as well as Typha (*Typha* sp.) and a range of other wetland plant species. Snake Vine (*Stephania japonica*) is present as a twiner within this community.
Habitat trees	Very few habitat trees are present in this community.
Tree Size Classes	Swamp Oak tree trunk diameters at breast height range from 0.1 to 0.2m, with the occasional larger specimen to 0.4-m. There is a high tree density, w hich has promoted much competition for resources and trees are lean as a consequence.
Shrub and Groundcover	As mentioned, there is a well-developed, aquatic wetland and mixed open water assemblage dominating the groundcover and shrubs are absent.
Fallen timber	Fallen timber is only sparsely to moderately represented in this community.
Rock outcrops	There are no substantial rock outcrops.
Caves, mines, tunnels	There are no caves, mines or tunnels.
Significant fauna habitats	There are very well developed swamp forest and wetland attributes within this community, which are outstanding value resources for dependent fauna, such as waterbirds and waders.
Wet areas/ waterbodies	The community occupies tidal, lowlands and saline/ brackish waters are present throughout. The habitat would be significantly utilised by waders and waterbirds, potentially including threatened species.
Land-use impacts	Grazing and perhaps some historical clearing pressures, especially at its periphery, have negatively influenced this community. Cattle access to this community causes pugging of the land surface and may expose potential acid sulfate soils (PASS) to oxidation. Iron-staining indicative of PASS is present in this community
Corridors or refugia	This community also comprises a portion of the habitat that extends from the river through to drier forests of the Rhones Creek area, to the west. In this manner, it may form part of a corridor for altitudinal migratory fauna species, especially those that move from drier elevated forests to riverine swamps and lowlands. The community contains features of refuge value such as wetlands and may provide an important local faunal habitat.
Vegetation significance	This community meets the definition of Swamp Oak Floodplain Forest, which has been preliminarily listed on the TSC Act as an Endangered Ecological Community. In relation to the CRA for the North Coast region, this community is considered "*regionally vulnerable*." SEPP 14 applies to this community type. Consequently, the community is of high vegetation significance.
Faunal significance	This community provides very important estuarine swamp forest habitat values for dependent fauna. Further, the community forms part of a local or sub-regional wildlife corridor. It is of high faunal habitat significance.
Overall conservation value	This community is of **HIGH** overall conservation value.

Table 9: Vegetation community Five

Vegetation Community	5. Estuarine Open Water with fringing Swamp Oak/ Mangrove
Location	This community is located in the northeast corner of the study area, where the low-lying, tidal-influenced drainage line nears Taylors Arm. It is dominated by defined channels of open water, with fringing aquatic and swamp forest vegetation.
Structure/ Description	This community is dominated by shallow to moderately-deep open water, with fringing vegetation equivalent to the Swamp Oak Swamp Forest community described earlier as well as the occasional Grey Mangrove (*Avicennia marina*) also present.
Habitat trees	Very few habitat trees are present in this community.
Tree Size Classes	Swamp Oak tree trunk diameters at breast height range from 0.1 to 0.2m, with the occasional larger specimen to 0.4-m
Shrub and Groundcover	This component of the vegetation is not well developed given the open water that predominates the community.
Fallen timber	Fallen timber is only sparsely represented in this community.
Rock outcrops	There are no substantial rock outcrops.
Caves, mines, tunnels	There are no caves, mines or tunnels.
Significant fauna habitats	Estuarine open waters are very important faunal habitats for waterbirds and waders as well as aquatic and marine species, such as fish, crabs and prawns.
Wet areas/ waterbodies	The community occupies tidal, lowlands and saline/ brackish waters are present across varying depths. The habitat would be significantly utilised by waders and waterbirds, potentially including threatened species.
Land-use impacts	There have been some effects of cattle access at the periphery of this community and historical hydrological modifications may have resulted from the construction of the adjacent road or stabilisation of the Taylors Arm riverbank. Nevertheless, it remains in relatively good condition.
Corridors or refugia	This community also comprises a portion of the habitat that extends from the river through to drier forests of the Rhones Creek area, to the west. It may form part of a corridor for altitudinal migratory fauna species, especially those that move from drier elevated forests to riverine swamps and lowlands. The community contains features of refuge value such as wetlands and may provide an important local faunal habitat.
Vegetation significance	This community meets the definition of Swamp Oak Floodplain Forest, which has been preliminarily listed on the TSC Act as an Endangered Ecological Community. In relation to the CRA for the North Coast region, this community is considered "*regionally vulnerable*" SEPP 14 applies to this community type. Consequently, the community is of high vegetation significance.
Faunal significance	This community provides very important estuarine habitat values for dependent fauna. Further, the community forms part of a local or sub-regional wildlife corridor. It is of high faunal habitat significance.
Overall conservation value	This community is of **HIGH** overall conservation value.

Table 10: Vegetation community Six

Vegetation Community	6. Saltmarsh (Grazed)
Location	This community is located in one small area in the far northeast corner of the study area, where large tides inundate adjacent low -lying lands. A second very small area of degraded saltmarsh also occurs between the Swamp Oak Swamp Forest community and the Pasture Grassland on the central drainage line.
Structure/ Description	This community is dominated by Salt Couch (*Pseudoraphis spinescens.*), with some invasive pasture grasses impinging on the edge of the community. It grows to less than 0.2-metres in height, with limited floristic diversity. Areas of open water and some muds were also present.
Habitat trees	No trees are present in this community.
Tree Size Classes	Not applicable.
Shrub and Groundcover	Shrubs are absent and the Salt Couch provides a high quality resource for dependent species, such as migratory waders.
Fallen timber	Fallen timber is absent from this community.
Rock outcrops	There are no rock outcrops.
Caves, mines, tunnels	There are no caves, mines or tunnels.
Significant fauna habitats	Coastal saltmarsh is a highly significant faunal community type and is extensively utilised by waders and waterbirds, as well as other aquatic invertebrates. Pairs of Pied Stilts and Masked Lapwings were observed using this community during the study.
Wet areas/ waterbodies	The community occupies periodically inundated tidal lowlands and supports fluctuating saline water levels of significant value for dependent species.
Land-use impacts	Unrestricted cattle access has heavily degraded and modified this community and caused soil structural disruption and potential liberation of acid sulfate products. The community has also been encroached and invaded by pasture grasses at its periphery. Despite this degradation, it is an important community type and provides significant habitat for dependent fauna.
Corridors or refugia	The community contains features of significant refuge value and may provide an important local faunal habitat.
Vegetation significance	This community is a derivative of Coastal Saltmarsh, which is listed as an Endangered Ecological Community within NSW. It is therefore legislatively protected by the TSC Act.
Faunal significance	This community provides very important faunal habitat values for transient and migratory fauna.
Overall conservation value	This community is of **HIGH** overall conservation value.

Table 11: Vegetation community Seven

Vegetation Community	7. Cleared Pasture/ Grassland
Location	This community occupies the majority of the study area, with the exception of the swamp forests in the north and the dry open forests in the west. It is an artificial community type.
Structure/ Description	This community is structurally simple and artificial. It has been formed through clearing, grazing, suppression of regeneration and pasture improvement (ripping, seeding, fertilising). Occasional relict trees, retained predominantly for shade, are present, including species such as Grey Gum (Eucalyptus propinqua), Flooded Gum, Tallowwood and Blackbutt. These are predominantly mature specimens and are very sparsely scattered across the western portion of this community type. Mature and regenerating Camphor Laurel also comprises the occasional and scattered emergent in this community. The community is essentially dominated by introduced pasture grass species and weeds of pasture. Occasional small and isolated stands of Prickly-leaved Paperbark, Willow Bottlebrush and Swamp Brushbox also occur on drainage features. Occasional figs are also present, planted within tree stumps. There is also some ornamental landscape plantings near the old homestead and sheds in the east of the study area.
Habitat trees	Six habitat trees are located in this community: ▪ H1 Flooded Gum – 1 small trunk hollow and 1 small limb hollow (GDA 490570 6603363) ▪ H2 Dead Tree – numerous small limb and trunk hollows (GDA490604 6603474) ▪ H3 Tallowwood – Koala food tree (GDA 490476 6603295); ▪ H4 Grey Gum – Koala food tree (GDA 490453 6603317); ▪ H5 Dead Tree – various small limb hollows (GDA 490450 6603160); and ▪ H8 Blackbutt – potential limb hollows (GDA 490407 6603120). These may provide some values for dependent fauna, particularly as den and nest sites for hollow-dependent species.
Tree Size Classes	The relict trees tend to be mature specimens, but as mentioned, are very sparsely distributed across the landscape.
Shrub and Groundcover	Exotic pasture grasses and weeds of pasture form the highly modified and simplified groundcover vegetation.
Fallen timber	Fallen timber is only sparsely represented in this community.
Rock outcrops	There are no substantial rock outcrops.
Caves, mines, tunnels	There are no caves, mines or tunnels.
Significant fauna habitats	The occasional relict habitat tree features are of potential faunal habitat significance.
Wet areas/ waterbodies	Various farm dams are present in this community type, which would provide habitats for some frog species. The following dams were assessed within the grassland community: ▪ Dam 1 – damaged wall and isolated in paddock, relatively small in extent and vegetated with wet pasture grasses and some open water; ▪ Dam 2 – very small in area and damaged by stock, highly turbid, with little aquatic vegetation; ▪ Dam 3 – small in area and with damaged wall that links the dam to the adjacent brackish swamp; gambusia present in large numbers and stock access has caused damage and turbidity; no fringing aquatic vegetation, but Rush present in middle; limited value for frog species; ▪ Dam 4 – very small in area and degraded by cattle; little aquatic vegetation and turbid; of low value for frog species; and ▪ Dam 5 – relatively large and heavily vegetated with various aquatic species, including rushes, juncus and some paperbarks, with wet pasture at the periphery; there is some iron-staining indicative of PASS and gambusia is present; nevertheless, this dam provides potential Green and Golden Bell Frog habitat.
Land-use impacts	This community is created by heavy, sustained and significant land use pressures and land use activities. Natural habitat values are more or less absent as a consequence of these pressures, which include clearing, suppression of regeneration, grazing, weed invasion, pasture improvement, fertilising, soil structure decline, etc.
Corridors or refugia	This community contains little corridor or refugia value, with the exception of the occasional relict habitat tree present across the landscape.
Vegetation significance	This artificial community is of low vegetation community significance.
Faunal significance	Overall, this community is of low faunal habitat significance, although the relict habitat trees may provide some specific habitat values.

Vegetation Community	**7. Cleared Pasture/ Grassland**
Overall conservation value	This community is of **LOW** value.

3.4 Determination of Potential Subject Species

The local threatened flora and fauna species as well as those threatened species that have a distributional range including the study area have been considered as potential subject species (ie. having a reasonable chance of utilising the study area for lifecycle purposes). This is tabulated below:

Table: 12 Potential local threatened flora

Threatened Flora Species	Likelihood of Occurrence
Parsonsia dorrigoensis	This species occurs in sub-tropical and warm temperate rainforest, especially on rainforest edges and margins and has an altitudinal range of 150 to 800-m. It is not expected to occur in the study area due to the lack of rainforest community types.
Marsdenia longiloba	This species is restricted to rainforest types and is not expected to occur within the study area.
Acacia chrysotricha	This species is known only from sites in the vicinity of Bellingen from within wet sclerophyll forest and eucalypt plantation. It is not a potential subject species.
Melaleuca groveana	This species prefers moderate attitudes and occurs within heath, usually on rocky crevices or scree slopes. It is not likely to occur in the study area.
Pomaderris queenslandica	Pomaderris queenslandica has not been recorded within 10-km of the study area and favours dry sclerophyll forest or woodland types. It is deemed an unlikely inhabitant of the study area and not considered a potential subject species.
Acronychia littoralis	This species appears restricted to littoral rainforest communities and is not expected within the study area.
Amorphospermum whitei	This species occupies littoral rainforest and sub-tropical rainforest types. It is not a potential subject species.

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Table 13: Potential local threatened fauna

Threatened Fauna Species	Likelihood of Occurrence
Spotted-tailed Quoll	There is some potential for this species to utilise the Open Forest and Swamp Forest types, although it does have a very large home range. It is considered a potential subject species.
Brush-tail Phascogale	The open forest provides suitable habitat for this species and it is a potential subject species.
Parma Wallaby	The preferred and typical habitats of this species do not occur within the study area. It tends to prefer more elevated moist forests with adjacent grassy open forests for foraging. It is not likely to occur in the study area.
Red-legged Pademelon	The preferred rainforest habitats of this species are absent from the study area and this species is not likely to occur.
Yellow-bellied Glider	There is some potential for the Yellow-bellied Glider to occupy the mature open forests in the west of the study area as it contains sufficient hollows and habitat elements for this species. It must be considered as a potential subject species.
Squirrel Glider	The Squirrel Glider may utilise the open forests and adjacent swamp forests for lifecycle purposes. It must be considered a potential subject species.
Koala	There are sufficient preferred food trees present in the open forest and the Swamp Mahogany/ Paperbark swamp forest to support individuals and populations of this species.
Rufous Bettong	The habitats of the study area appear to lack the dense grassy groundcover preferred by this species. It is not reasonably expected in the study area.
Long-nosed Potoroo	This species has the potential to inhabit the study area, particularly within the communities with dense gahnia groundcover. It is a potential subject species.
Grey-headed Flying Fox	The study area provides potential habitat for this species.
Common Blossom Bat	The habitat elements preferred by this species are absent from the study area and the species is not considered a likely inhabitant.
Eastern False Pipistrelle	The species may inhabit the study area for denning and foraging purposes and is considered a potential subject species.
Golden-tipped Bat	The habitat does not appear suitable for this rainforest/ moist forest species. It is not considered a potential subject species.
Little Bent-wing Bat	This species would not roost on the study area but is likely to use the study area for foraging purposes. It is a potential subject species.
Eastern Bent-wing Bat	This is a potential subject species and may utilise the study area for foraging purposes.
Large-footed Myotis	No roosting structure is present, but this species may utilise the study area for foraging purposes, particularly the open water/ estuarine communities in the northeast.
Greater Broad-nosed Bat	Suitable habitat elements are present and this species is a likely inhabitant of the study area.
Green and Golden Bell Frog	Suitable waterbodies are present for this species, especially the marge artificial dam in the eastern portion of the site. It is a potential subject species.
Giant Barred Frog	Suitable habitat for this species does not occur within the study area.
Sphagnum Frog	The habitat is not suitable for this species, which prefers higher elevation sites. It is not a potential subject species.
Loggerhead Turtle	This marine species would not occur in the study area.
Green Turtle	This marine species would not occur in the study area.
Stephens' Banded Snake	Very marginal but potential habitat does occur within the study area. This is a potential subject species.
Square-tailed Kite	The open forest and swamp forest habitat types may provide some foraging and limited nesting opportunities for this wide-ranging species.
Osprey	A large nest present in the west of the study area may be of this species (or the White-bellied Sea-Eagle). There is potential foraging resources and stick nest resources on the study area and it is a potential subject species.
Black Bittern	High quality potential habitat does occur on the study area for this species, which is a potential inhabitant.
Rufous Scrub-bird	The preferred habitat of this species is absent and it is not considered a potential subject species.
Bush Stone-curlew	Potential habitat does exist on the sudy area and while the land use intensity may have reduced the quality of the habitat available, there is still some potential for this species to occur.

Threatened Fauna Species	Likelihood of Occurrence
Red-tailed Black-cockatoo	The Red-tailed Black Cockatoo would not occur in the study area.
Glossy Black-cockatoo	Potential breeding and feeding resources for this species are restricted to the open forest in the west of the study area. This is a potential subject species.
Barred Cuckoo-shrike	Fruit-bearing resources are represented in the study area and there is some potential visitation by this species.
Black-necked Stork	Suitable wetland and wet grassland habitat occurs on the study area for this species and some visitation could be reasonably expected. The Black-necked Stork is a potential subject species.
Wompoo Fruit-Dove	Fruit-bearing resources are represented in the study area and there is some potential visitation by this species.
Superb Fruit-Dove	Fruit-bearing resources are represented in the study area and there is some potential visitation by this species.
Brolga	The Brolga may utilise the wetland habitats of the study area and hence is considered a potential subject species.
Sooty Oystercatcher	Suitable habitat is not present and this species is deemed unlikely to occur.
Pied Oystercatcher	Marginal estuarine habitats are present in the study area and the Pied Oystercatcher is deemed a potential subject species.
Little Tern	The habitat of this species is absent from the study area and the adjacent estuaries and sandy beaches would be preferred. It is not deemed a potential subject species.
Regent Honeyeater	Suitable winter-flowering eucalypts are well represented in swamp and open forests and this species may visit the study area on a transient basis. It is a potential subject species.
Powerful Owl	There is suitable habitat for this species within the open forest community type and it is considered a potential subject species.
Masked Owl	High quality potential habitat occurs in the study area for this species and it is considered likely to occur.
Sooty Owl	Marginal yet potential habitat does occur in the open forest and mature swamp forest of the study area for this species. It must be considered a potential subject species.

Further, the following threatened species are deemed potential study area inhabitants despite the lack of documented local records or records from the Macksville 1:100,000 Map sheet, because their distributional range includes the study area and because the species habitat requirements match those present within the study area.

- Painted Snipe (*Rostratula benghalensis*)
- Wallum Froglet (*Crinia tinnula*)
- Green-thighed Frog (*Litoria brevipalmata*)
- Magpie Goose (*Anseranas semipalmata*)
- Australasian Bittern (*Botaurus poiciloptilus*)
- Barking Owl (*Ninox connivens*)
- Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*)

Therefore, the list of potential subject species at this stage of the investigation and the study area habitats in which they may occur is tabled below:

Table 14: Potential subject species

Threatened Fauna Species	Open Forest	SM/PB Swamp Forest	SO Swamp Forest	Estuarine Open Water	Salt-marsh	Cleared Grassland
Spotted-tailed Quoll	3	3	3			
Brush-tail Phascogale	3					
Yellow-bellied Glider	3					
Squirrel Glider	3					
Koala	3	3				
Long-nosed Potoroo	3	3				
Grey-headed Flying Fox	3	3				
Yellow-bellied Sheathtail Bat	3	3	3	3	3	3
Eastern False Pipistrelle	3	3				
Little Bent-wing Bat	3	3	3	3		
Eastern Bent-wing Bat	3	3	3	3		
Large-footed Myotis	3	3	3	3	3	
Greater Broad-nosed Bat	3	3	3			
Wallum Froglet		3				
Green-thighed Frog		3				
Green and Golden Bell Frog						3
Stephens' Banded Snake	3	3				
Square-tailed Kite	3	3	3			
Osprey	3	3	3	3		
Magpie Goose				3	3	
Australasian Bittern		3	3	3		
Black Bittern		3	3	3		
Painted Snipe				3	3	
Bush Stone-curlew			3	3	3	
Glossy Black-cockatoo	3					
Barred Cuckoo-shrike	3	3				
Black-necked Stork			3	3	3	3
Wompoo Fruit-Dove	3	3				
Superb Fruit-Dove	3	3				
Brolga			3	3	3	
Pied Oystercatcher				3		
Regent Honeyeater	3	3				
Barking Owl	3	3	3			
Powerful Owl	3	3				
Masked Owl	3	3	3			
Sooty Owl	3	3				
TOTAL POTENTIAL SPP.	**25**	**25**	**15**	**13**	**7**	**3**

3.5 Endangered Populations and Ecological Communities

The following endangered populations may potentially relate to the study area and would need to be considered within the development of the proposal and the assessment of the activity:

- *Glycine clandestina* (broad leaf form) in the Nambucca LGA

The following endangered ecological communities are present within the study area:

- Coastal Saltmarsh on the NSW North Coast Bioregion

The following preliminarily listed endangered ecological communities does/ may relate to habitats present in the study area:

- Swamp Sclerophyll Forest on Coastal Floodplain in the NSW North Coast Bioregion
- River-flat Eucalypt Forest on Coastal Floodplain in the NSW North Coast Bioregion
- Sub-tropical Coastal Floodplain Forest on the NSW North Coast Bioregion
- Swamp Oak Floodplain Forest on the NSW North Coast Bioregion

3.6 Faunal Species Identified

The field surveys and inspections conducted to date have identified the following fauna species:

	Scientific name	Common name	
Mammalia	-	Bandicoot	
	Bos taurus	Cattle	
Amphibia	*Adelotus brevis*	Tusked Frog	
Reptillia	*Chelodina longicollis*	Eastern Snake-necked Turtle	
	Varanus varius	Lace Monitor	
	Physignathus lesueurii	Eastern Water Dragon	
	Lampropholis delicata	Delicate Skink	
Aves	*Cygnus atratus*	Black Swan	
	Anas castanea	Chestnut Teal	
	Chenonetta jubata	Maned Duck	
	Anas superciliosa	Pacific Black Duck	Breeding
	Anhinga melanogaster	Darter	
	Phalacrocorax sulcirostris	Little Black Cormorant	
	Phalacrocorax carbo	Great Cormorant	
	Platalea regia	Royal Spoonbill	
	Ardea ibis	Cattle Egret	
	Egretta garzetta	Little egret	
	Haliaeetus leucogaster	White-bellied Sea-Eagle	Possible nest
	Pandion haliaetus	Osprey	Possible nest
	Porphyrio porphyrio	Purple Swamphen	
	Gallinula tenebrosa	Dusky Moorhen	
	Himantopus himantopus	Black-winged Stilt	
	Vanellus miles	Masked Lapwing	
	Platycerus examius	Eastern Rosella	
	Dacelo novaeguineae	Laughing Kookaburra	
	Eurystomus orientalis	Dollar Bird	
	Cormobates leucophaeus	White-throated Treecreeper	
	Malurus cyaneus	Superb Blue-wren	
	Pardalotus punctatus	Spotted Pardalote	
	Pachycephala rufiventris	Rufous Whistler	
	Pachycephala punctata	Golden Whistler	
	Psophodes olivaceus	Eastern Whipbird	
	Coracina tenuirostris	Cicadabird	
	Coracina novaehollandiae	Black-faced Cuckoo-shrike	
	Sphecotheres tristis	Figbird	
	Gymnorhina tibicen	Australian Magpie	

3.7 Floral Species Identified

	Scientific Name	Common name
AGAVACEAE	*Cordyline stricta*	Cordyline
ARACEAE	*Alocasia brisbanensis*	Cunjevoi
ASTERACEAE	*Senecio madagascariensis**	Fireweed
	Ozothamnus diosmifolius	Dolly Bush
BIGNONIACEAE	*Pandorea pandorana*	Wonga vine
CASURINACEAE	*Casuarina glauca*	Swamp oak
	Casuarina torulosa	Forest oak
CELASTRACEAE	*Denhamia celastroides*	Denhamia
CYPERACEAE	*Carex sp*	
	Gahania sp	Sawsedges
EUPHORBIACEAE	*Breynia oblongifolia*	Dwarf apple
	Glochidion ferdinandi	Cheese Tree
FABACEAE	*Trifolium repens**	White clover
JUNCACEAE	*Juncus sp*	
JUNCAGINACEAE	*Triglochin sp*	
LAURACEAE	*Cinnamomum camphora**	Camphor laurel
MALVACEAE	*Hibiscus heterophyllus*	Hibiscus
	*Sida rhombifolia **	Paddys lucerne
MELIACEAE	*Synoum glandulosum*	Scentless rosewood
MENISPERMACEAE	*Stephania japonica*	Snake vine
MIMOSACEAE	*Acacia floribunda*	Sally wattle
MOREACEAE	*Ficus coronata*	Creek-sandpaper Fig
	Ficus sp	
	Maclura cochinchinensis	Cockspur thorn
MYRTACEAE	*Callistemon linearis*	Willow Bottlebrush
	Corymbia intermedia	Pink Bloodwood
	Eucalyptus pilularis	Blackbutt
	Eucalyptus grandis	Flooded gum
	Eucalyptus microcorys	Tallowood
	Eucalyptus propinqua	Grey gum
	Eucalyptus robusta	Swamp mahogany
	Eucalyptus sp	Mahogany
	Eucalyptus sp	Ironbark
	Lophostemon suaveolens	Swamp Brushbox
	Melaleuca quinqinervea	Swamp Paperbark
	Melaleuca styphelioides	Prickly-leaved Paperbark
	Syncarpia glomulifera	Turpentine

	Scientific Name	Common name
OCHNACEAE	*Ochna serrulata* *	Mickey Mouse plant
OLEACEAE	*Notelaea sp.*	Mock olive
PHILESIACEAE	*Eustrephus latifolius*	Wombat berry
PHILYDRACEAE	*Philydrum lanuginosum*	Wooly frogsmouth
PITTOSPARACEAE	*Pittosporum undulatum*	Sweet pittosporum
	Billardiera scandens	Apple berry
POACEAE	*Imperata cylindrica*	Blady grass
	Phragmites australis	Common reed
	Pennisetum clandestinum *	Kikuyu
	Pseudoraphis spinescens	Saltwater couch
RHAMNACEAE	*Alphitonia excelsa*	Red Ash
ROSACEAE	*Rubus hillii*	Native raspberry
RUTACEAE	*Acronychia oblongifolia*	Common Acronychia
	Zieria sp.	Zieria
SAPINDACEAE	*Cupaniopsis anacardioides*	Tuckeroo
SOLANACEAE	*Solanum mauritianum* *	Wild tobacco
TYPHACEAE	*Typha sp*	
VERBENACEAE	*Avicennia marina*	Grey Mangrove
	Clerodendrum tomentosum	Hairy Clerodendrum
	Lantana camara (Orange and Pink form)	Lantana

* Introduced.

Note: The flora listed is not a complete list of vegetation occurring within the study area but is only representative of the sampling conducted during preliminary investigations.

4 Discussion

The preliminary surveys conducted to date have recognised that the study area contains a range of ecological constraints and opportunities to development. It is strongly encouraged that these preliminary surveys be considered within the refinement of the design of the proposed aged care facility in order to streamline the development assessment process and adopt sound ecological strategies within the development layout. These ecological constraints and opportunities are discussed below:

- The Estuarine Open Water with fringing Swamp Oak/ Mangrove, Swamp Oak Swamp Forest and Saltmarsh that occurs in a band within the northern portion of the study area satisfies the definition and is protected under the provisions of SEPP 14. Furthermore, Coastal Saltmarsh is listed as an Endangered Ecological Community within NSW on the TSC Act and Swamp Oak Floodplain Forest as present on this study area has been also preliminarily listed as an Endangered Ecological Community. These areas are highly significant and must be protected within the development layout, along with a suitable buffer such that the water quality, integrity and structure of these communities are protected, maintained and enhanced. Any works that have the potential to impact on SEPP 14 requires the preparation of an EIS. Therefore, sufficient attention should be given to identifying the possible negative effects of the proposed development and mitigating those actions through protective safeguards. This should include consideration of water quality and run-off rates.
- The Swamp Mahogany/ Prickly-leaved Paperbark Forest in the northwest corner of the study area has been preliminarily listed as an endangered ecological community on the TSC Act and contains potential Koala habitat in accordance with SEPP 44. This land is also very low-lying and contains surface water. It is in a very intact state and possesses a high degree of naturalness. It also provides potential habitat for an estimated 25 threatened fauna species. This community is heavily constrained and should be preserved in its present state, free from direct and indirect impacts of the proposed development. This should include the protection and management of an ecological buffer between the proposed development and this community. This buffer includes the Willow Bottlebrush/ Prickly-leaved Paperbark Low Closed Forest with emergents, which also contains potential ecological values that should be preserved.

- The Turpentine/ Bloodwood Very Open Forest is a relatively unique assemblage of plants within a heavily cleared floodplain that may also satisfy the definition of a preliminarily listed endangered ecological community on the TSC Act. It provides potential habitat for 25 threatened fauna species. It contains a nest tree of either the White-bellied Sea-Eagle (protected on international agreements) or the Osprey (threatened species), which requires a protection zone of 100-metres radius around the nest tree according to sound ecological planning principles. While this community has been heavily altered through logging, it has high recovery potential.
- The cleared grassland community is relatively unconstrained from an ecological perspective. It provides an appropriate land area in which to site the development. Protective safeguards can be adopted for the isolated habitat features of potential value that occur within this ecological community.

Consequently, the naturally vegetated landscapes of the study area possess demonstrable ecological constraints and the concept plan has recognised these constraints and appears to have largely sited the proposed facility within the cleared pasture grassland unit. This is positive. It is recommended that if the natural extent of the swamp forest, saltmarsh, low closed forest and open forest communities can be retained in their present state, and that the development and associated APZ is restricted to the existing cleared lands, that demonstrable impacts on threatened species would be avoided. This would be demonstrated through relatively expedient 8-part tests completed with reference to Section 5A of the EP&A Act and that an EIS would be avoided as the SEPP 14 wetlands would be protected. However, surveys would still be required for select target species to confirm these hypotheses.

Additional comments that should be considered within the finalisation of the preferred concept are outlined below:

- To protect the wetland, best practice water sensitive urban design should be incorporated into the plan. This should consider and include swale drainage, water tanks and detention basins. It is recommended that purpose-designed constructed wetlands be established on the major drainage lines within the study area. This may include a possible re-configuration of the existing main dam in the east.
- An appropriate ecological buffer be maintained between the development and the wetland, swamp forest and open forest types, in which passive or active recreational opportunities may be established (ie. walking trails, etc).
- All site landscaping utilise locally indigenous flora species wherever possible.
- The development aim to achieve a no net loss of hollows principle by replacing or re-establishing tree hollows removed from isolated habitat trees within the cleared grassland in the retained natural habitats of the study area.
- It is recommended that the proponent consider the means to protect the SEPP14 wetland, swamp forest and open forest habitats within effective conservation covenants that recognise the ecological values of these communities and may provide assistance for their sound management, protection and restoration. For example, these lands could be conserved under a Registered Property Agreement with the regional CMA or through a Voluntary Conservation Agreement with DEC. This would demonstrate the conservation ethic of the development and establish a partnership between the community and management and appropriate natural resource management agency. It would also potentially provide assistance for the management and protection of these sensitive and important habitats, whilst providing a resource of value to future residents through passive recreation (walking, bird-watching, etc).
- Further, it is suggested that a Bushland Management Plan be prepared and implemented to conserve and manage the retained habitats. All of the natural communities present are of high ecological value, but have been subjected to land use pressures such as logging and grazing. Sound protection of the study areas saltmarsh, swamp forest, estuarine open water, low closed forest and open forest would be a positive and proactive management measure, that would benefit future residents and the local catchment. This should commence with the removal of grazing pressures on sensitive habitats, such as saltmarsh and swamp forests.

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- Finally, it may be prudent and beneficial to conduct a workshop/ meeting between the design team for the development and the authors of this report in which to finalise an ecologically appropriate concept layout that responds to the inherent constraints and opportunities present in the study area.

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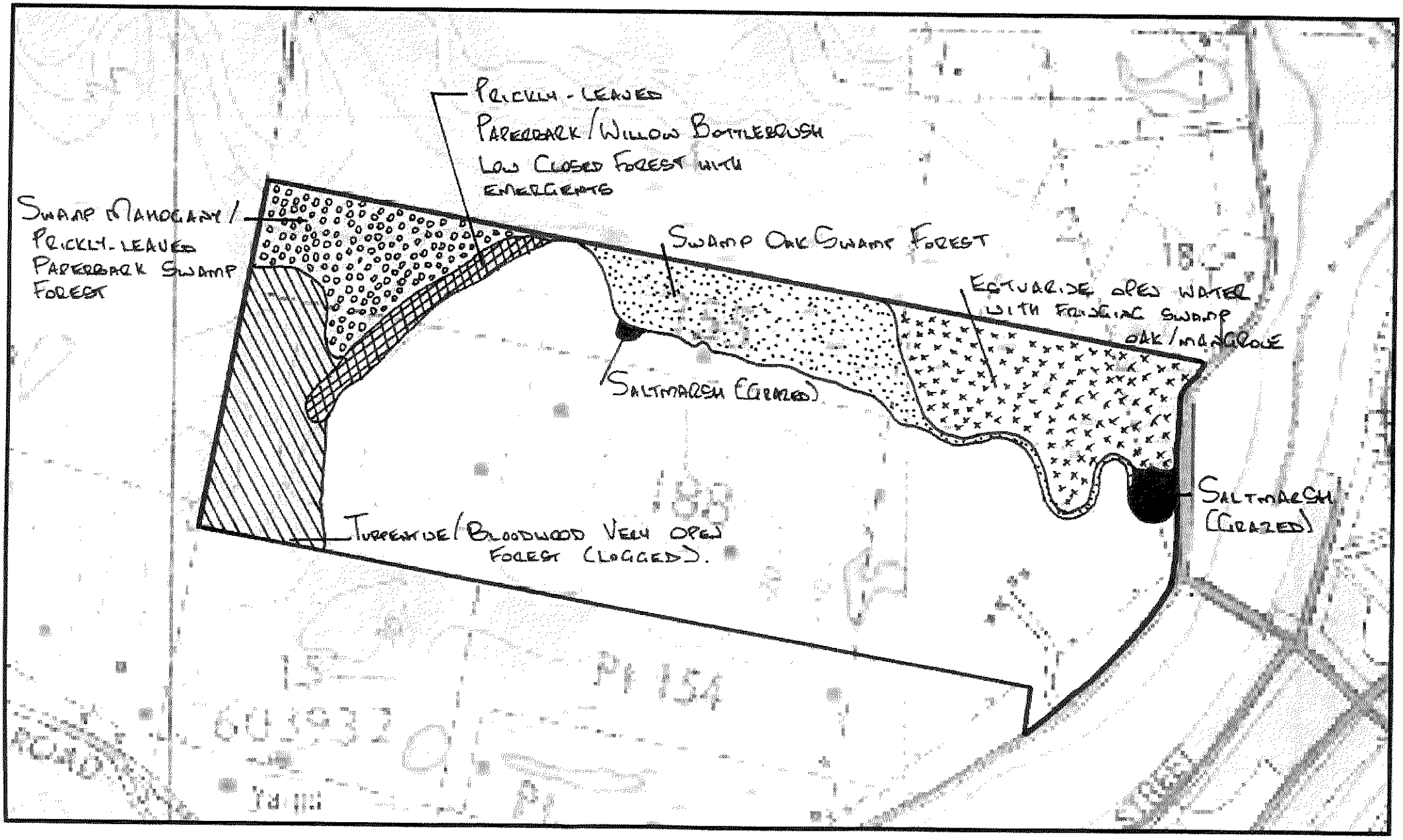
PRICKLY-LEAVED PAPERBARK/WILLOW BOTTLEBRUSH LOW CLOSED FOREST WITH EMERGENTS
SWAMP MAHOGANY/ PRICKLY-LEAVED PAPERBARK SWAMP FOREST
SWAMP OAK SWAMP FOREST
ESTUARINE OPEN WATER WITH FRINGING SWAMP OAK/MANGROVE
SALTMARSH (GRAZED)
SALTMARSH (GRAZED)
TURPENTINE/BLOODWOOD VERY OPEN FOREST (LOGGED).