MAINTENANCE OF COFFS HARBOUR REGIONAL AIRPORT OBSTACLE LIMITATION SURFACES; ASSESSMENT OF ECOLOGICAL IMPACT

Report prepared for

Epic Environmental

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Signed on behalf of Terrestria Pty Ltd

Dr Andrew Daniel
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MAINTENANCE OF CHRA OLS

ASSESSMENT OF ECOLOGICAL IMPACT

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Abbreviations

BNMU	Boambee Creek/Newport's Creek Management Unit
CASA	Civil Aviation Safety Authority
CHCC	Coffs Harbour City Council
CHRA	Coffs Harbour Regional Airport
DotE	Commonwealth Department of the Environment
EEC	Endangered Ecological Community (TSC Act)
EIS	Environmental Impact Statement
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
FM Act	NSW *Fisheries Management Act 1994*
LEP 2013	Coffs Harbour City Council Local Environment Plan 2013
LGA	Local Government Area
MNES	Matters of National Environmental Significance
NP&W Act	NSW *National Parks and Wildlife Act 1974*
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
OLS	Obstacle Limitation Surface
PMST	EPBC Act Online Protected Matters Search Tool
PoM	Plan of Management
SEPP	NSW State Environmental Planning Policy (State and Regional Development) 2011
TEC	Threatened Ecological Community (EPBC Act)
TSC Act	NSW *Threatened Species Conservation Act 1995*
VMP	Vegetation Management Plan
WONS	Weeds of National Significance

1 INTRODUCTION

1.1 BACKGROUND AND PURPOSE

Coffs Harbour City Council (CHCC) owns and operates the Coffs Harbour Regional Airport (CHRA) (Figure 1.1) and, as the determining authority for lands under CHCC control, must maintain obligations both in regards the management of Obstacle Limitation Surfaces (OLS) and the Boambee Creek/Newport's Creek Management Unit (BNMU), as under Section 92 of the *Crown Lands Act 1989*. CHCC also owns lands within the BNMU that it manages under the *Local Government Act 1993*.

The CHRA is certified and as a result, CHCC is responsible for discharging obligations set by the Civil Aviation Safety Authority (CASA) under the Manual of Standards Part 139 – Aerodromes and the Civil Aviation Safety Regulations (1998). CHCC has acquired easements over a number of Crown Lands for the specific purposes of accessing and managing vegetation to maintain compliance with CASA OLS requirements. In addition, the management of vegetation for OLS purposes has never been considered under the provisions of the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This assessment is to consider environmental matters with regards to lands adjacent to the CHRA. The assessment will focus on lands impacted through the management of OLS to ensure CHCC is operating in accordance with relevant legislation. The highlighted OLS areas shown in Figure 1.2, (Study area) are the focus of on-ground studies. The larger Project area is derived from the Plan of Management for the BNMU (Eco Logical Australia, 2009a) (Figure 1.1) and is the focus of a broader assessment of the monitoring of management targets within the CHRA Vegetation Management Plan (VMP) (Eco Logical Australia, 2009b).

Management of OLS occurs on lands surrounding the CHRA located to the south of Coffs Harbour, including sites adjacent to Boambee Creek, Newport Creek, west of Hogbin Drive and east of the Northcoast Rail Line (Figure 1.2).

The aim of the assessment is to validate whether the environmental information on lands managed for OLS purposes are current or require updating and to undertake any environmental investigations that need to be completed in order to properly inform this assessment.

The objectives of the environmental investigations are to:

- Update existing baseline environmental information for the State-owned land and specifically the status and condition of the site's flora, fauna, and cultural heritage;
- Undertake a review of published documentation and a desktop study of flora and fauna relevant to the biodiversity study area, identifying species and communities that may be present;
- Conduct a field survey (flora survey and fauna habitat assessment) of the study area, with particular attention to species, populations and ecological communities listed under the EPBC Act, *Threatened Species Conservation Act 1995* (TSC Act) and *Fisheries Management Act 1994* (FM Act);
- Identify the national, state and regional significance of these biodiversity values in the broader environmental context of the area surrounding the site;
- Identify measures for managing threatened biota at the site; and
- Make recommendations for possible future site survey program(s) for vegetation communities, flora and fauna.

0 1.25 2.5 5 7.5 10 Kilometers

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Site Location

FIGURE 1.1

Site Location

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1.2 SCOPE

The scope of this environmental assessment has been guided by needs of the CHCC to discharge their obligations under Commonwealth and State legislative framework. The scope of works comprised:

- A desktop review of relevant ecological assessments within and adjacent to the Study area;
- Conduct a review of standard biodiversity database searches to ascertain the presence of local populations of threatened species, populations and ecological communities including:
    - The EPBC Act Protected Matters Online Search Tool (accessed 2 June 2016) (**Appendix A**)
    - The New South Wales (NSW) Office of Environment and Heritage (OEH) Atlas of NSW Wildlife Bionet database (accessed 31 May 2016) (**Appendix B**) and
    - The NSW OEH Vegetation Information System (VIS) online mapping tool
- An assessment of the legislative status of plant species, fauna species and vegetation communities identified on the Project area with reference to the TSC Act and EPBC Act;
- An assessment of the potential of the proposed activities to have a significant impact on threatened species, populations or ecological communities identified during field surveys or predicted to occur on the subject site in accordance with Section 5A of the EP&A Act;
- Provide an informal assessment of management activities prescribed in the BNMU VMP (Eco Logical Australia, 2009b); and
- Recommend measures that may be required to mitigate predicted impacts on flora and fauna.

1.3 SITE DESCRIPTION

The Coffs Coast State Park's BNMU is an area of approximately 241 hectares in the Coffs Harbour Local Government Area (LGA) located around 2.2 kilometres south-east of Coffs Harbour (**Figure 1.2**). The site is bounded by Boambee Beach and a section of the North Coast railway line to the east, Boambee Creek to the south, Newport's Creek and Hogbin Drive to the west and Christmas Bells Drive to the north. The surrounding land uses include the Coffs Harbour Racecourse and Rifle Range to the north, the Coffs Harbour Golf Course and urban development to the north-west, and scattered State Environmental Planning Policy (SEPP) 14 wetlands to the west and south.

Under the CHCC Local Environment Plan 2013 (LEP 2013) the BNMU consists of Lot 1 DP 709734, Lots 1 and 2 DP 704273, Pt Lot 1 DP 708738 and Pt Portion 227. The BNMU is largely zoned as 5A - 'Special Uses'. Areas to the south of the BNMU are zoned 7A - 'Environment Protection Habitat and Catchment', and scattered areas of Koala *Phascolarctos cinereus* 'Primary Habitat' exist throughout the site. A privately-owned in-holding where a landholder resides in the south-west portion of the BNMU is zoned 6A - 'Open Space Public Recreation', as are other sections within the BNMU. Crown land also exists within the BNMU, such as a triangular portion of land located to the west of Hogbin Road (Lot 386, DP 820641) which is mainly zoned 7A. Crown road reserves also exist within the BNMU (adapted from Eco Logical Australia, 2009a).

The OLS (**Figure 1.2**) area that is the focus of this study comprises some 43 ha of land concentrated around the southern end of the main runway, with minor components west of Hogbin Drive (7 ha just north of Airport Drive) and an area on the easterly margin of the airport (4 ha) (**Figure 1.1**).

0 0.1 0.2 0.4 0.6 0.8 Kilometers

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- BMNU
- OLS
- Vegetation clearing on foredune

FIGURE 1.2

Location and Extent of BNMU and OLS

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2 METHODOLOGY

2.1 REVIEW OF PREVIOUS ECOLOGICAL REPORTS AND MAPPING

A desktop literature review was required to identify the location and extent of previous known field surveys and the known constraints within the Project area. The desktop review also evaluated the presence and likelihood of occurrence of threatened species, populations and ecological communities listed under both the TSC Act and EPBC Act within the Project area. The following reports were reviewed:

- Coffs Harbour Regional Airport Upgrading Environmental Impact Statement (CHRA EIS), Terrestrial Flora and Fauna (Austeco, 1997);
- Coffs Coast State Park – Boambee Creek/Newport's Creek Management Unit Plan of Management (PoM) (Eco Logical Australia, 2009a);
- Coffs Harbour Regional Airport Lands, PoM and Vegetation Management Plan (Eco Logical Australia, 2009b);
- Coffs Harbour LGA Vegetation mapping 1996 and 2005;
- Biodiversity Conservation Lands for the Mid North Coast Regional Strategy; and
- State Government Mapping State Environmental Planning Policies.

2.2 DESKTOP ECOLOGICAL CONSTRAINTS MAPPING

A desktop database review of existing ecological information was carried out prior to the fieldworks. The results of these searches built up a picture of the species and communities considered under threat that may possibly occur within the locality. Detailed expert profiling of the species and communities is used to assess the likelihood of occurrence of these species within the project area and likely habitats in which they may occur. This work was used to focus survey efforts and develop field work programs.

2.3 FIELD ASSESSMENTS

Ecological surveys are required to establish the presence or absence of threatened species and communities listed under State and Commonwealth legislation. A five-day/four night onsite survey was undertaken comprising a vegetation assessment (using the methods detailed below), and fauna assessment including small mammal trapping, non-invasive survey methods and habitat assessments.

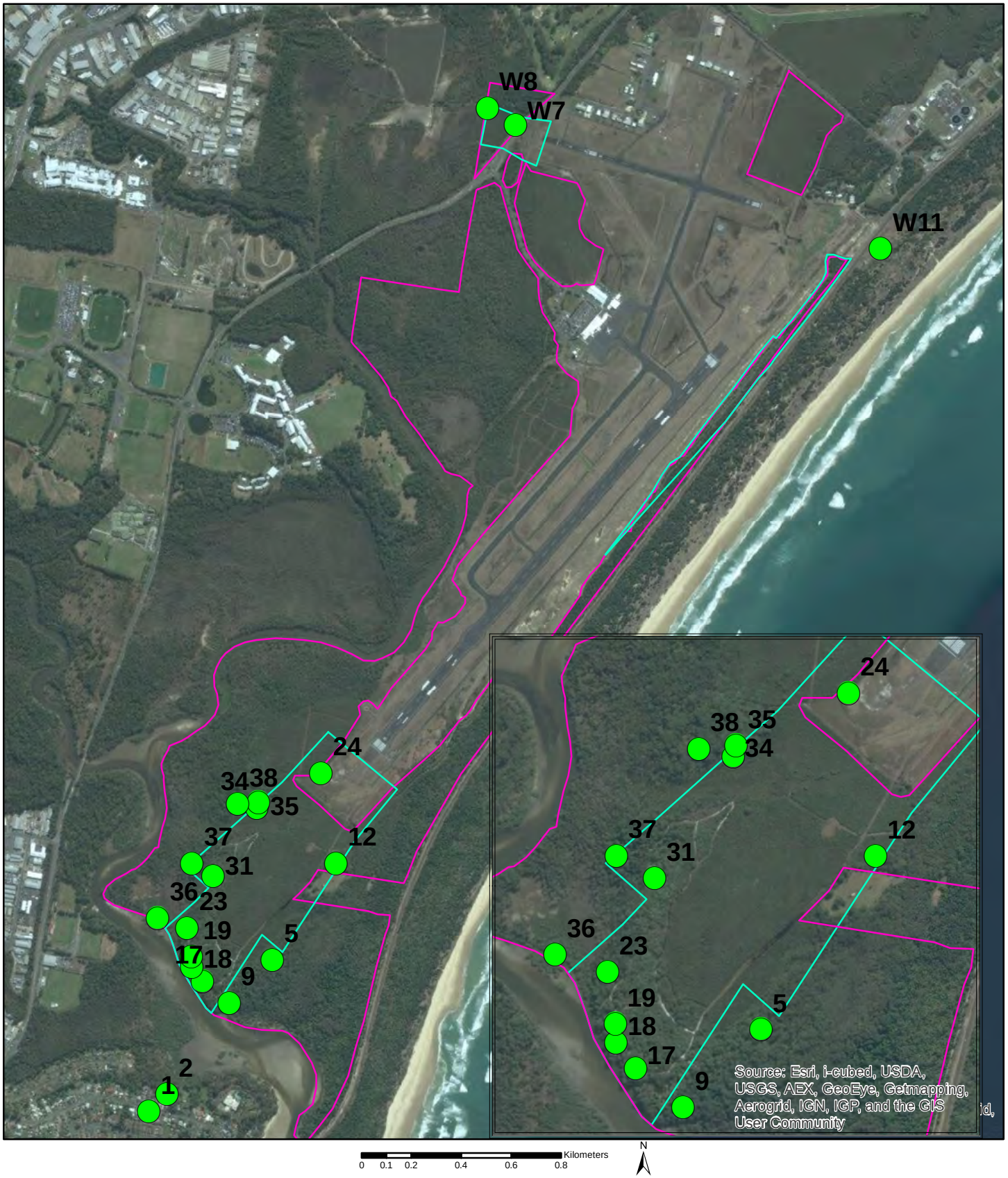
A review of the current (reference mapping) high resolution vegetation mapping was carried out during the field assessment. Line work downloaded from the NSW spatial data catalogue was uploaded into ArcPad on a Motion F5 field laptop. Vegetation polygon delineation accuracy and vegetation community attribution was informally reviewed whilst traversing the site.

Surveys for State listed threatened species (under the TSC Act) were conducted where possible to the Draft *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (DEC, 2004). Final Scientific Committee Determinations listed under the TSC and EPBC Acts were reviewed to assess whether any of the recorded vegetation communities were classified as either Endangered Ecological Communities (EECs) under the TSC Act or Threatened Ecological Communities (TECs) under the EPBC Act.

All flora species recorded were identified as far as practicable to species and subspecies level within the tree height reduction areas (Figure 2.1) and incidental species were recorded whilst traversing the site. It is noted here that tall dense heath layers prevented casual searching of the balance of the BNMU. Incidental species records were limited to traverses of tree height reduction survey areas and along existing tracks. When a plant could not be identified accurately in the field, a voucher sample was collected, together with notes on habitat, form and height. Collected samples were later identified using a stereo-zoom microscope and botanical texts. Botanical nomenclature followed the Harden series of Flora of NSW Volumes 1-4 (including revised Volumes 1 and 2) (Harden, 2000).

The methods for sampling fauna during the onsite survey included the following:

- A five-day (4 night) survey was carried out targeting the New Holland Mouse using small mammal trapping (baited type A Elliott traps). The species is known to inhabit heath vegetation and vegetated sand dunes and was considered to have potential to occur in the study area. Three trap lines comprising 25 traps were placed where suitable habitat was identified within the main OLS area in the southern extent of the site (Figure 2.2);
- Timed 20-minute bird surveys across a 2 ha area (early morning and late afternoon surveys) at trap sites and opportunistically throughout Study area;
- Searches for frogs and reptiles under leaf litter, debris, logs and rocks carried out at trap sites and opportunistically throughout Study area;
- Passive recording of microbat calls overnight (6 pm to 6 am) using the Anabat recording system at three sites where suitable flyways were identified. No trapping techniques were utilised for the survey, however the recording and identification of microbat calls is considered sufficient to identify the threatened microbat species likely to occur in the area;
- One night of spotlighting (four person hours) in the early evening for nocturnal mammals including call playback for owl species;
- Daytime searches for Koalas and evidence of Koala presence (scats and tree scratches); and
- Habitat in the focus areas was assessed for suitability to provide resources for threatened terrestrial fauna. Habitat characteristics assessed included tree hollow abundance, evidence of nesting, leaf litter, large woody debris and weed invasion.



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- Tree reduction flora survey areas
- BMNU
- OLS

FIGURE 2.1

Tree Height Reduction Flora Survey Areas

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- Transect end points
- BMNU
- OLS

FIGURE 2.2

Location of Elliott Trap lines

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2.4 CULTURAL HERITAGE

Cultural heritage issues arising from the current proposal were investigated and managed by Everick Consultants from Coffs Harbour. In order to identify CHCC's general obligations with regards to Cultural Heritage, the following actions were undertaken:

- A review of current cultural heritage and planning legislation;
- Undertake an Aboriginal Heritage Information Management System and heritage database search to identify recorded Aboriginal sites within the Airport;
- Review existing archaeological assessments; and
- Provide advice on the requirements for heritage assessment under the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales*.

3 RESULTS

3.1 DESKTOP RESULTS

3.1.1 Review of Previous Ecological Reports

Coffs Harbour Regional Airport Upgrading EIS; Terrestrial Flora and Fauna (1997)

Ecological surveys were carried out in 1997 on CHRA lands by Austeco as part of impact assessment investigations for proposed airport expansion plans (Austeco, 1997). This survey found that seven vegetation communities and fauna habitats occur, including littoral rainforest, dune forest/tall shrubland, dry sclerophyll forest, swamp forest, wet heath, sedgeland and grassland. The report noted that wet heath and dune shrubland supporting Common Blossom Bat *Syconycteris australis*, and swamp forest communities supporting Koala, were the most sensitive and locally significant fauna habitats. Wet heaths around the airport have regional (local) conservation significance because of their relatively large size, good condition, and poor representation elsewhere in the region.

The survey established seven comprehensive fauna survey sites in the range of habitats available, as well as general techniques (such as bird surveys and spotlighting) carried out where suitable across the CHRA lands. The survey recorded a total of 104 species of terrestrial vertebrates, comprising four frogs, six reptiles, 70 birds and 24 mammal species (refer Appendix C for a compiled list of fauna found within the CHRA). Six of these species were listed as Vulnerable under the TSC Act at the time:

- Koala was identified at three survey sites located around the southern end of the main CHRA runway;
- Common Blossom Bat was detected in heath habitat located directly south of the main CHRA runway;
- Eastern Freetail-bat *Mormopterus norfolkensis*;
- Little Bentwing-bat *Miniopterus australis*;
- Eastern Bentwing-bat *Miniopterus schreibersii oceanensis*; and
- Barred Cuckoo-shrike *Coracina lineata*.

The EIS investigations in 1997 occurred prior to the commencement of the EPBC Act in 1999 and as such threatened species or vegetation communities listed under this Act were not addressed. It is considered there is a need for further on-ground surveys to assess the possible presence of flora and fauna species listed under State/Commonwealth legislation that would possibly trigger avoidance, management or offsetting requirements. For instance, there is the possible presence of Lowland Subtropical Rainforest on Floodplain, an endangered ecological community and a number of listed flora species (under the TSC Act).

The rainforest identified within the EIS as regenerating within the dune swales (Austeco, 1997) together with the mapped rainforest area are two notable areas that could be considered as a TEC – "Lowland Rainforest of Subtropical Australia" - and may trigger referral under the EPBC Act. In addition, there are several flora species known to occur within the locality that are listed under the EPBC Act.

Since the original survey, Koala has been listed as vulnerable under the EPBC Act. Grey-headed Flying-fox *Pteropus poliocephalus* was also detected and this species is now listed as Vulnerable under the TSC and

EPBC Acts. An additional species detected, Varied Sittella *Daphoenositta chrysoptera*, is now listed as Vulnerable under the TSC Act.

Coffs Coast State Park – Boambee Creek/Newport's Creek Management Unit Plan of Management

The BNMU Plan of Management (PoM) (Eco Logical Australia, 2009a) provides a PoM for the specified Crown Reserves, areas of State Park and areas designated to become State Park land within the BNMU, and a Management Strategy for specified Council-owned operational lands within the BNMU. The PoM includes a VMP, a Bushfire Management Strategy and an Action Plan.

Coffs Harbour Regional Airport Lands, Vegetation Management Plan

The CHRA VMP (Eco Logical Australia, 2009b) identifies six examples of five different EECs listed under the NSW TSC Act. Potential impacts on these communities will require on-ground assessment:

- Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions;
- Swamp oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions;
- Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions;
- Sub-tropical Coastal Floodplain Forest of the NSW North Coast bioregion; and
- Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions.

Approximately 40% of the mapped vegetation within the CHRA area is considered to be EEC.

Three threatened flora species listed under the TSC Act were recorded during this survey: Scented Acronychia *Acronychia littoralis* (Endangered); Floyd's Grass *Alexfloydia repens* (Endangered); and Slender Screw Fern *Lindsaea incisa* (Endangered).

Key weed species within the CHRA which are considered to be both high priority and difficult species to control were found to be:

- Lantana *Lantana camara*;
- Bitou Bush *Chrysanthemoides monilifera* subsp. *rotundata*;
- Mickey Mouse Plant *Ochna serrulata*;
- Groundsel Bush *Baccharis halimifolia*; and
- Blackberry *Rubus fruticosus*.

Most of the vegetation was considered to be in good condition with a relatively low abundance of weed species, with the exception of the Coastal Banksia Low Open Forest immediately to the west of the railway line which was weedy and in average condition.

A review of the CHRA VMP was recommended to take place 5 years after its development (Eco Logical Australia, 2009b). The success of key aspects of the plan that should be reviewed on-ground include:

- Review of suggested revegetation works for the southern portion of the SEPP 26 littoral rainforest;
- Review of condition of the SEPP 26 Littoral Rainforest;

- Quaternary sands area of Coastal Banksia Low Open Forest, restoration including the development of coastal rainforest within the dune valleys;
- Review of Blackbutt *Eucalyptus pilularis* pruning within the OLS at the southern end of the runway;
- Review of works associated with dune height changes within the northern part of the runway;
- Weed control within the Project boundary;
- Review of ongoing slashing and/or lopping works may impact on areas of SEPP 14 wetland along Boambee Creek, in the southerly portion of the CHRA; and
- The presence and distribution of the three threatened flora species; *Acronychia littoralis*, *Alexfloydia repens* and *Lindsaea incisa*, including the fencing of the *A. littoralis* population.

3.1.2 Vegetation Mapping

Coffs Harbour LGA Vegetation 1996 and 2005

The vegetation of Coffs Harbour City LGA, excluding National Parks and State Forest tenure, but including all remnant vegetation over 0.5 ha was mapped and classified into type and units in 1996 by Mark Fisher for CHCC. In 2005 Penny Kendall mapped the LGA addition area in the north that took in part of the former Pristine Shire Council around Red Rock and Corindi. Both mapping layers have been merged into this one dataset for ease of use (Figure 3.1).

Biodiversity Conservation Lands for the Mid North Coast Regional Strategy

The Biodiversity Conservation Lands dataset has been compiled for the Mid North Coast and interpreted as presenting planning constraints at three scales:

- State: Areas identified as of state significance in recognition of a related state or federal conservation policy or program;
- Regional: Areas identified as of regional significance generally in recognition of a related state policy or program or as providing buffers to state significant lands; and
- Local: Areas recognised through local conservation zoning and including all remnant vegetation.

The principles for deriving conservation constraints are as follows:

- A twenty five-year planning horizon was adopted for identifying Biodiversity Conservation Lands and opportunities;
- State, regional and local significance classes for conservation constraints are adopted and spatially delineated;
- Biodiversity features are presented as constraints with limited or no transferability. Irreplaceability of significant features is generally low and in situ conservation is generally required. The level of irreplaceability for each feature is noted in the metadata proformas; and
- Biodiversity Conservation Lands will generally be identified across the landscape regardless of current tenure or zoning.

The Biodiversity Conservation Lands is complete for all LGAs along the coast from Tweed Heads to Gosford.

Purpose: The Biodiversity Conservation Lands is the primary source of OEH contribution to regional planning. Biodiversity forecasting tools have also been developed by OEH to support regional planning. They can

contribute to increasing the value of existing mapped layers, comparing alternative development or conservation scenarios, and assessing planning documents against biodiversity indicators.

State Government Mapping State Environmental Planning Policy and TSC Act.

Mapping shows that there are areas of SEPP 14 wetlands fringing Newport's and Boambee Creeks (Figure 3.2). Coastal Wetlands (State Environmental Planning Policy No. 14) - SEPP 14 places planning and development controls under the EP&A Act over the wetlands.

A small patch of SEPP 26 Littoral Rainforest is located south east of the BNMU and OLS activities at the southern end of the airport runway just behind the coastal banksia on Holocene dunes.

Mapped EECs (as listed under the TSC Act) located in the CHRA area are largely swamp/wetland and saltmarsh communities associated with Newport's and Boambee Creeks. These communities include:

- Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner bioregions;
- Subtropical Coastal Floodplain Forest of the NSW North Coast bioregion;
- Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions;
- Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions; and
- Lowland Rainforest in the NSW North Coast and Sydney Basin bioregions.

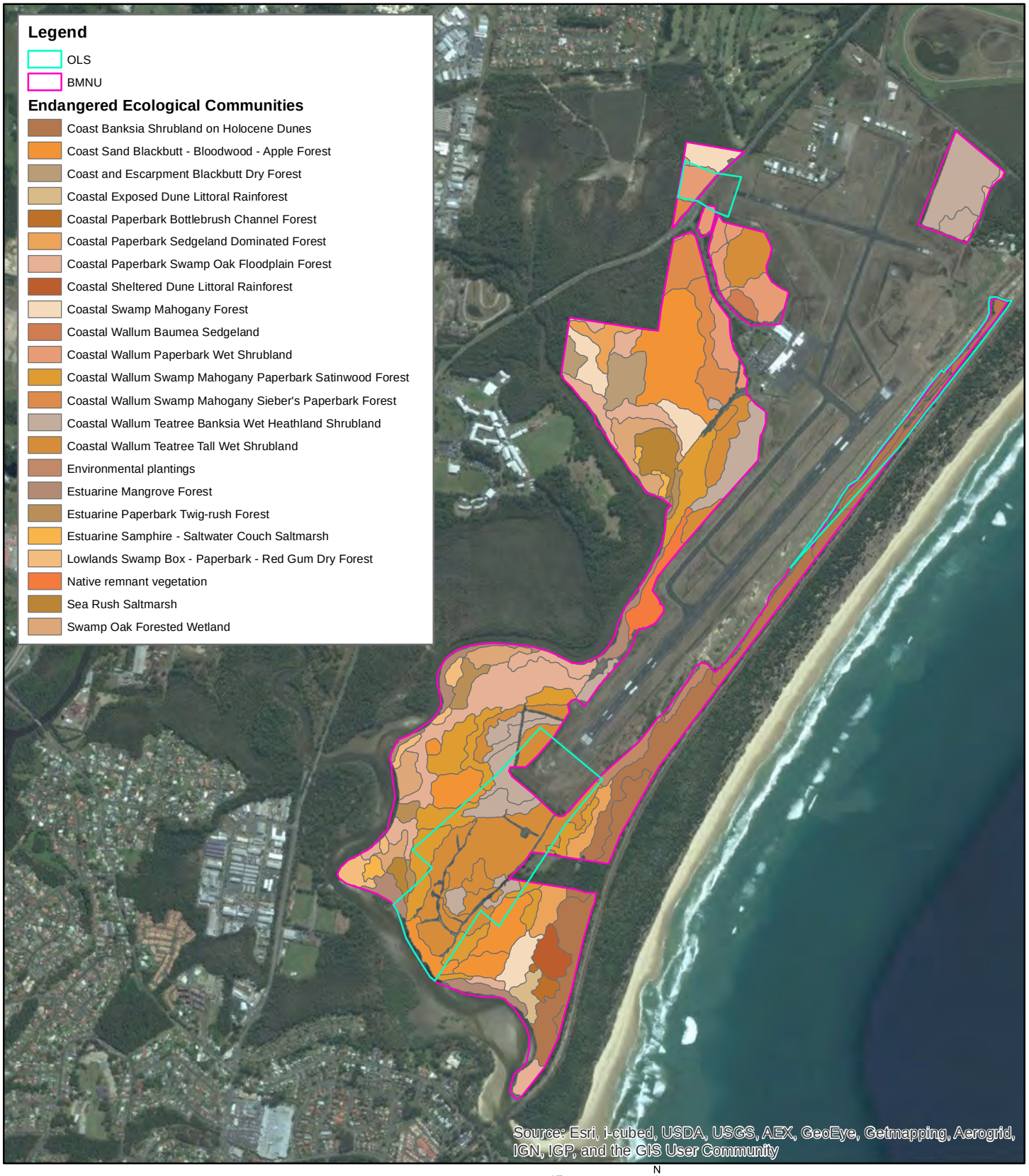

FIGURE 3.1
Coffs Harbour LGA Vegetation Mapping 2005

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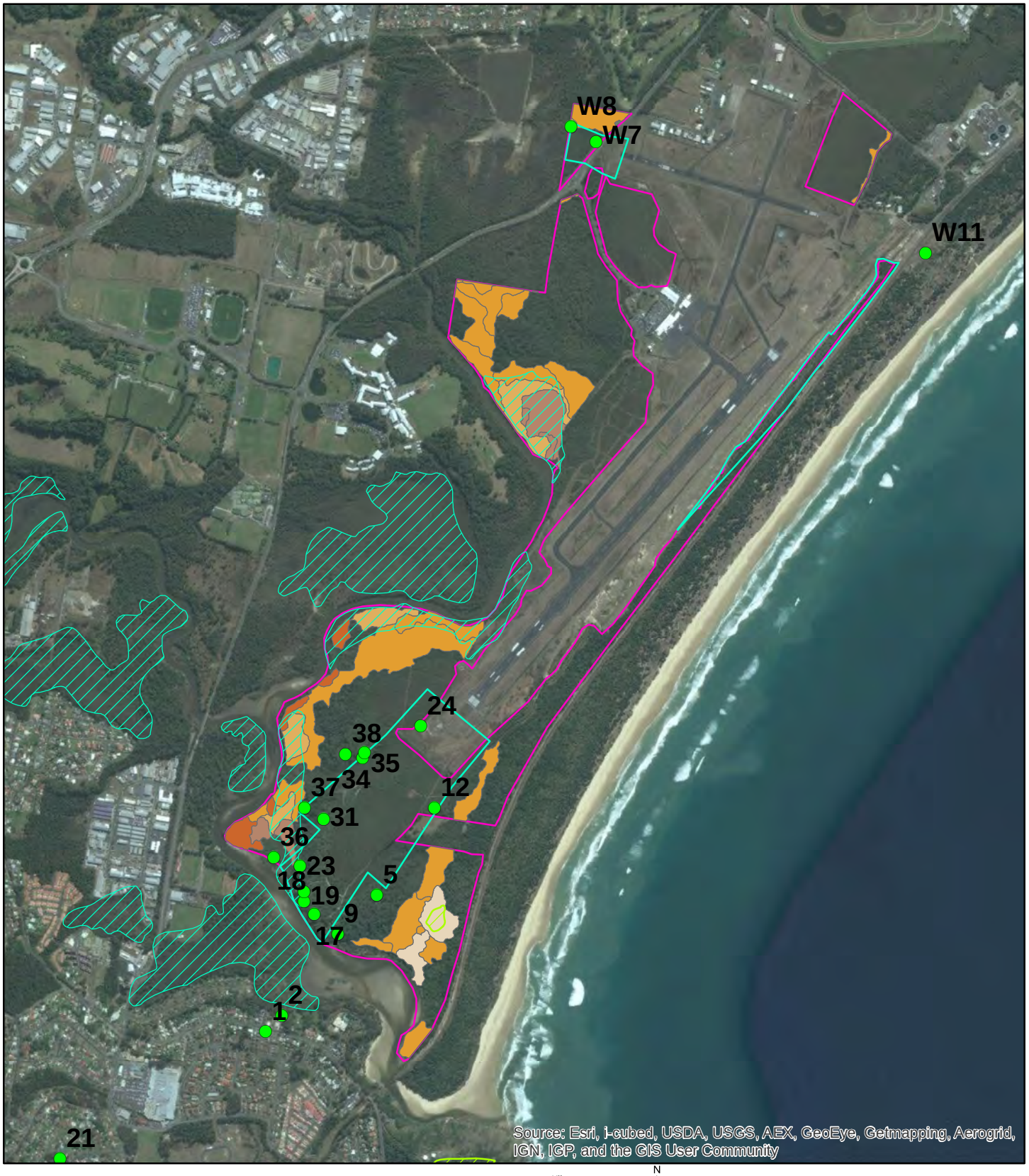

Legend

- BMNU
- OLS
- SEPP26
- SEPP14

Endangered Ecological Communities

- Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner bioregions EEC
- Lowland Rainforest in the NSW North Coast and Sydney Basin bioregions EEC
- Subtropical Coastal Floodplain Forest of the NSW North Coast bioregion EEC
- Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions EEC
- Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions EEC

FIGURE 3.2
SEPP and EEC Mapping of the BNMU

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3.1.3 Database Search Results

Matters of National Environmental Significance – Commonwealth Marine Area

The results of the EPBC Act Online Protected Matters Search Tool (10 km radius) indicate the Study area occurs adjacent to the Exclusive Economic Zone and Territorial sea which is a Commonwealth Marine Area under the EPBC Act. The proposed activities will have no impact on this area and it is not discussed further.

Threatened Ecological Communities

Three TECs were identified as being potentially present by the Protected Matters search:

- Littoral Rainforest and Coastal Vine Thickets of Eastern Australia (Critically Endangered);
- Lowland Rainforest of Subtropical Australia (Critically Endangered); and
- Subtropical and Temperate Coastal Saltmarsh (Vulnerable).

Significant Flora Species

The results of the BioNet and Protected Matters Database Searches (5km) (Appendix A and B) identified 38 flora species listed as conservation significant under the provisions of the EPBC Act and/or the TSC Act in the Study area or surrounds (Table 3.1). The relevance of these results with regard to the proposed actions in the Study area are discussed in Section 3.2.5.

Table 3.1: Threatened species predicted to occur through database searches

Species	TSC Act*	EPBC Act*	Source
Acronychia littoralis Scented Acronychia	E	E	Bionet/PMST
Alexfloydia repens Floyd's Grass	E		Bionet
Allocasuarina defungens Dwarf Heath Casuarina	E	E	Bionet/PMST
Arthraxon hispidus Hairy Jointgrass	V	V	Bionet/PMST
Boronia umbellata Orara Boronia	V		Bionet
Corynocarpus rupestris subsp. *Rupestris* Glenugie Karaka	V	V	Bionet/PMST
Cryptocarya foetida Stinking Cryptocarya	V	V	PMST
Cryptostylis hunteriana Leafless Tongue-orchid	V	V	PMST
Cynanchum elegans White-flowered Wax Plant	E	E	PMST
Diospyros mabacea Red-fruited Ebony	E	E	Bionet/PMST
Diploglottis campbellii Small-leaved Tamarind	E	E	Bionet/PMST
Diuris praecox Rough Doubletail	V		Bionet
Eidothea hardeniana	E		Bionet

Species	TSC Act*	EPBC Act*	Source
Nightcap Oak			
Eleocharis tetraquetra Square-stemmed Spike-rush	PE		Bionet
Endiandra floydii Crystal Creek Walnut	E	E	Bionet/PMST
Endiandra hayesii Rusty Rose Walnut	V	V	Bionet/PMST
Hakea archaeoides Big Nellie Hakea	V		Bionet
Haloragis exalata subsp. velutina *Tall Velvet Sea-berry*	V	V	PMST
Lindsaea incisa Slender Screw Fern	E		Bionet
Macadamia tetraphylla Rough-shelled Bush Nut	V		Bionet
Marsdenia longiloba Slender Marsdenia	E	V	Bionet/PMST
Myrsine richmondensis *Purple-leaf Muttonwood*	E	E	PMST
Niemeyera whitei Rusty Plum, Plum Boxwood	V		Bionet
Oberonia complanata Yellow-flowered King of the Fairies	E		Bionet
Parsonsia dorrigoensis	V	E	PMST
Peristeranthus hillii Brown Fairy-chain Orchid	V		Bionet
Persicaria elatior Tall Knotweed	V	V	Bionet/PMST
Phaius australis Southern Swamp Orchid	V	E	Bionet/PMST
Pultenaea maritima Coast Headland Pea	V		Bionet
Quassia sp. Mooney Creek Moonee Quassia	E	E	Bionet/PMST
Sarcochilus fitzgeraldii Ravine Orchid	V		Bionet
Senna acclinis	E		VMP
Sophora tomentosa Silverbush	E		Bionet
Thesium australe Austral Toadflax	V	V	Bionet/PMST
Tylophora woollsii	E	E	PMST
Typhonium sp. aff. brownii	E		VMP
Uromyrtus australis Peach Myrtle	E	E	Bionet
Zieria prostrata	E	E	PMST

*Abbreviations: E1 and E = Endangered, E4 = Presumed Extinct, E4A = Critically Endangered, V = vulnerable, PE = presumed extinct

Significant Fauna Species

The OEH's Bionet database search provided a total of 332 species of terrestrial vertebrates recorded within an approximate 5 km radius of the Study area, comprising 23 frogs, 29 reptiles, 220 birds and 60 mammal species (refer Appendix A and B for the database search results). The EPBC Online search predicted the presence of a further seven species listed as threatened under the EPBC Act. Note, this does not include fauna species from the searches that are either entirely marine (e.g. cetaceans), or pelagic bird species that do not normally occur on or over the mainland. These species are not considered further in this assessment given their habitat requirements and have been summarised in Table 2 of Appendix D.

Sixty-nine conservation significant terrestrial vertebrate species are known or predicted to occur within a 5 km radius of the Study area based on the database searches (Appendix D). This includes 55 species listed as Endangered, Vulnerable or Near Threatened under the TSC Act and/or EPBC Act. The remaining 14 species are listed as Migratory bird species under the EPBC Act. The searches also provided two species of conservation significant invertebrates recorded or predicted to occur in the Study area and surrounds. The relevance of these results with regard to their occurrence the Study area are discussed in Section 3.2.9 and summarised in Table 1 in Appendix D.

3.2 FIELD RESULTS

3.2.1 Review of Vegetation Mapping within the study area

The delineation of vegetation communities from the Coffs Harbour LGA Vegetation 2005 mapping was found to generally delineate the vegetation community distributions on the ground, whilst vegetation community type attributions of the polygons described the communities present (**Figure 3.1**). The location of SEPP 14 wetlands and SEPP 26 Rainforest were generally correct (**Table 3.2**; **Figure 3.2**). A single TEC - "Lowland Rainforest of Subtropical Australia" - is located just behind the Holocene dune on the south easterly margin of the BNMU and south-east of any OLS activity. This community corresponds with the TSC Act-listed EEC - "Lowland Rainforest in the NSW North Coast and Sydney Basin bioregions."

Table 3.2: Vegetation communities mapped within the BNMU (Coffs Harbour LGA Vegetation 2005)

Vegetation Community	Community Code	Present in OLS
Coast and Escarpment Blackbutt Dry Forest	CH_DOF01	
Coast Banksia Shrubland on Holocene Dunes	CH_H01	
Coast Sand Blackbutt - Bloodwood - Apple Forest	CH_DOF09	X
Coastal Exposed Dune Littoral Rainforest	CH_RF07	
Coastal Paperbark Bottlebrush Channel Forest	CH_FrW03	
Coastal Paperbark Sedgeland Dominated Forest	CH_FrW04	
Coastal Paperbark Swamp Oak Floodplain Forest	CH_FrW01	
Coastal Sheltered Dune Littoral Rainforest	CH_RF13	
Coastal Swamp Mahogany Forest	CH_FrW02	
Coastal Wallum Baumea Sedgeland	CH_FW04	
Coastal Wallum Paperbark Wet Shrubland	CH_FW05	
Coastal Wallum Swamp Mahogany Paperbark Satinwood Forest	CH_FrW06	X
Coastal Wallum Swamp Mahogany Sieber's Paperbark Forest	CH_FrW09	
Coastal Wallum Teatree Banksia Wet Heathland Shrubland	CH_FW01	X
Coastal Wallum Teatree Tall Wet Shrubland	CH_FW06	X
Environmental plantings	CH_P03	
Estuarine Mangrove Forest	CH_SW01	X
Estuarine Paperbark Twig-rush Forest	CH_FrW11	
Estuarine Samphire - Saltwater Couch Saltmarsh	CH_SW07	
Lowlands Swamp Box - Paperbark - Red Gum Dry Forest	CH_DOF06	
Native remnant vegetation	CH_NRV01	
Sea Rush Saltmarsh	CH_SW06	
Swamp Oak Forested Wetland	CH_FrW10	
Coastal Banksia Shrubland on Holocene Dunes	CH_H01	

N.B. Community codes are those assigned to polygons within the vegetation community mapping layer. These codes are used as a shorthand within Table 3.3 and 3.4

3.2.2 Vegetation community condition

Vegetation communities within the OLS and more broadly the traversed areas of the BNMU were in good condition. Low nutrient substrates combined with limited access has led to low exotic species invasion (see Section 3.1.12). Tracks used to access the area for pruning of trees are causing some erosion issues and avoidance of boggy areas are increasing track widths in places. Some tracks have been temporarily closed to allow for recovery. In general, the effects of pruning to reduce tree heights within the OLS cause minor losses in condition. The trees that have been pruned appear to have recovered with little to no evidence of fungal infections. In some instances, the limbs removed from trees are substantial in size and amount, and represent an accumulating pile of timber that is decomposing very slowly. The cutting of removed limbs into shorter sections to increase contact area with the ground will accelerate decomposition and increase their role in habitat creation and nutrient recycling.

3.2.3 Extant flora species within the study area

In total, 281 flora species were observed within the Project area (OLS), as listed in Appendix C. This is an opportunistic flora species list as not all habitats were thoroughly surveyed during the field investigations. Of these species, 34 (12%) are exotic. Weed species are scarce through most of the site (refer Section 3.1.12). No threatened flora species listed under the EPBC or TSC acts were recorded (refer Section 3.1.11).

3.2.4 Tree height reduction survey areas

A total of 16 tree height reduction areas were surveyed (Figure 3.1). The tree species, tree height and flora species found within a radius of 20 m of the tree base are presented for all survey areas in Appendix E. Trees 1 and 2 were located within the suburban areas on the south bank of Boambee Creek and were not surveyed.

No threatened flora species listed under the EPBC or TSC acts were recorded from within any of the tree height reduction survey areas. Habitat for two threatened species listed under the TSC Act, Leafless Tongue-orchid *Cryptostylis hunteriana* (Vulnerable) and Slender Screw Fern *Lindsaea incisa* (Endangered) occur within the survey areas. These species may have remained undetected due to their cryptic growth habit and the dense nature of the ground layers.

Two species of plant, listed under the NP&W Act were found under Tree 9. The Christmas Orchid *Calanthe triplicata* is listed as a Group 4 plant under Part 2, Whole plants (NP&W Act), whilst the Elkhorn *Platycerium* bifurcatum is listed as Group 1 plants under Part 2 (NP&W Act).

The removal of the upper extremities of these trees will have minor impacts on the extant native flora or floristic community functioning in the long-term. Impacts from the accessing of the trees and the impact of pruned limbs on shrub and ground layers may have a localised impact in the short-term only. The practise of pruning trees within the OLS has occurred for decades and many of the trees within the forested communities show signs of having been pruned in the past. The shrub and ground layers within the immediate vicinity of the previously pruned trees show minor impacts from the pruning activity. In contrast, vehicle tracks made to access these trees represent a greater impact on adjacent floristic ecological functioning and should be kept to a minimum.

If new vehicle tracks are required, the potential impacts on threatened communities and the possible presence of threatened flora species should be reviewed through track specific surveys.

3.2.5 Presence and distribution of Threatened flora species within the study area

No flora species listed as threatened under the TSC Act or the EPBC Act were found to occur within any of the tree height reduction survey areas or the balance of the OLS areas. Table 3.3 reviews the possible occurrence of threatened flora species within the BNMU and the OLS areas. Analysis of habitat requirements for these species compared with extant on-ground communities suggests that there is suitable habitat within the BNMU area for twenty-three of the threatened species listed as occurring within the local landscape. Of these, sixteen species could possibly occur within the OLS Study areas. Review of threatened flora species habitat and life-histories suggests that it unlikely that 14 of these species remain undetected within the tree height reduction survey areas (Table 3.3). Due to their small size and cryptic nature it is possible that Slender Screw Fern and Leafless Tongue-orchid occur, but were not detected. Slender Screw Fern is listed as Endangered under the TSC Act, whilst Leafless Tongue-orchid is listed as Vulnerable under both the TSC Act and the EPBC Act.

Four species of plant, common in parts of the OLS Study areas are listed under Schedule 13 of the NP&W Act. Christmas Bells is listed as a Group 4 plant under Schedule 13; Protected Native Plants, Part 1, Plant parts used in the cut-flower industry. Christmas Orchid *Calanthe triplicata* is listed as a Group 4 plant under Part 2; Whole plants, whilst the Staghorn and Elkhorn *Platycerium* spp. are listed as Group 1 plants under Part 2. Species listed under Schedule 13 may not be harvested or used for commercial purposes without obtaining a license from Office of Environment and Heritage.

Table 3.3: Likelihood of Threatened flora species occurring within the Project and Study areas

Species*	Habitat	Likelihood of presence within BNMU	Likelihood of presence within OLS
Acronychia littoralis Scented Acronychia TSC Act = E EPBC Act = E	Grows in littoral rainforest on sand.	Present (VMP)	Present
Alexfloydia repens Floyd's Grass TSC Act = E	Grows in moist understorey of *Casuarina glauca* forest and also in the king tide zone above mangrove forest; confined to the Coffs Harbour district, rare.	Present (VMP)	Unlikely
Allocasuarina defungens Dwarf Heath Casuarina TSC Act = E EPBC Act = E	Dwarf Heath Casuarina grows mainly in tall heath on sand, but can also occur on clay soils and sandstone. The species also extends onto exposed nearby-coastal hills or headlands adjacent to sandplains.	Unlikely	Unlikely
Arthraxon hispidus Hairy Joint grass TSC Act = V EPBC Act = V	Grows in rainforest and riparian areas often near creeks or swamps. In south-east Queensland, Hairy-joint Grass has also been recorded growing around freshwater springs on coastal foreshore dunes, in shaded small gullies, on creek banks, and on sandy alluvium in creek beds in open forests.	Possible	Possible Medium quality habitat occurs in CH_DOF09 CH_FrW06 CH_FW01 CH_FW06
Boronia umbellata Orara Boronia TSC Act = V	Occurs in coastal ranges, in sclerophyll forest on sandstone & metasediments at 100-600 m alt. It also occurs in (or is likely to occur in) heath, mainly at low to medium altitudes. Variable geology and soils are favoured.	Possible	Medium quality habitat occurs in CH_FW01
Corynocarpus rupestris subsp. *Rupestris* Glenugie Karaka TSC Act = V EPBC Act = V	Dry rainforest on steep basalt boulder slopes. Soil is scarce but relatively high in nutrients and very well-drained.	Unlikely	Unlikely
Cryptocarya foetida Stinking Cryptocarya TSC Act = V EPBC Act = V	Scattered in littoral rainforest.	Possible	Unlikely poor quality habitat occurs in CH_DOF09 CH_FrW06
Cryptostylis hunteriana Leafless Tongue-orchid TSC Act = V EPBC Act = V	Grows in swamp-heath on sandy soils, chiefly in coastal districts.	Possible	Possible Good quality habitat occurs in CH_FW01 CH_FW06
Cynanchum elegans *White-flowered Wax Plant* TSC Act = E EPBC Act = E	Recorded from rainforest gullies scrub and scree slopes. Occurs on a variety of lithologies and soil types, usually on steep slopes with varying degrees of soil fertility. from near sea level to about 600 m. occurs mainly at the ecotone between dry subtropical rainforest and sclerophyll forest/woodland communities.	Unlikely	Unlikely
Diospyros mabacea Red-fruited Ebony TSC Act = E EPBC Act = E	In lowland subtropical rainforest; rare, confined to the Tweed Valley.	Possible	Unlikely

Species*	Habitat	Likelihood of presence within BNMU	Likelihood of presence within OLS
Diploglottis campbellii Small-leaved Tamarind TSC Act = E EPBC Act = E	Habitat of this species is not narrowly defined as it ranges from low altitude alluvial riverbanks to elevated rocky slopes. Soils are derived from volcanic material, and range from mixed alluvium to skeletal soils on steep slopes. In luxuriant lowland subtropical rainforest to drier subtropical rainforest with a Brushbox open overstorey.	Unlikely	Unlikely
Diuris praecox Rough Doubletail TSC Act = V EPBC Act = NL	Grows on hills and slopes of near-coastal districts, in open heathy forests which have a grassy to fairly dense understorey.	Unlikely	Unlikely
Eidothea hardeniana Nightcap Oak TSC Act = E EPBC Act = NL	Grows in simple notophyll/microphyll vine forest warm temperate rainforest on rhyolite geology.	Unlikely	Unlikely
Eleocharis tetraquetra Square-stemmed Spike-rush TSC Act = PE EPBC Act = NL	Wetland margins and swamps.	Possible	Unlikely
Endiandra floydii Crystal Creek Walnut TSC Act = E EPBC Act = E	Warm temperate or subtropical rainforest with Brush Box overstorey, and in regrowth rainforest and Camphor Laurel forest. Most locations are on soils derived from paleozoic metamorphics, sometimes with basalt nearby. A small number of sites are on alluvium or sand. Sheltered locations are apparently preferred, and landforms including ridgelines, slopes, gullies and creek flats have been documented.	Possible	Unlikely
Endiandra hayesii Rusty Rose Walnut TSC Act = V EPBC Act = V	Found in lowland subtropical rainforest on sedimentary soils and alluvium in cool, moist, sheltered valleys; locally abundant.	Possible	Unlikely
Hakea archaeoides Big Nellie Hakea TSC Act = V	Found on steep, rocky, sheltered slopes and in deep gullies in open eucalypt forest. Commonly occurs at the interface of dry eucalypt forest and gully communities.	Unlikely	Unlikely
Haloragis exalata subsp. velutina *Tall Velvet Sea-berry* TSC Act = V EPBC Act = V	In NSW, it often occurs in damp places near watercourses and in woodland on steep rocky slopes. In Queensland, it occurs in rainforest and rainforest margins and adjacent grassland and open grassy woodland above 500 metres altitude.	Unlikely	Unlikely
Lindsaea incisa Slender Screw Fern TSC Act = E	In damp sandy places in open forest.	Present (VMP)	Possible good quality habitat occurs in CH_DOF09 CH_FrW06

Species*	Habitat	Likelihood of presence within BNMU	Likelihood of presence within OLS
Macadamia tetraphylla Rough-shelled Bush Nut TSC Act = V	Grows in subtropical rainforest in coastal areas.	Possible	Unlikely
Marsdenia longiloba Slender Marsdenia TSC Act = E EPBC Act = V	Subtropical and warm temperate rainforest, lowland moist eucalypt forest adjoining rainforest and, sometimes, in areas with rock outcrops.	Possible	Possible medium quality habitat occurs in CH_DOF09 CH_FrW06
Myrsine richmondensis *Purple-leaf Muttonwood* TSC Act = E EPBC Act = E	Occurs in tall open sclerophyll forest with a rainforest subcanopy, swamp sclerophyll open forest and on the margins of subtropical rainforest.	Possible	Possible medium quality habitat occurs in CH_DOF09 CH_FrW06
Niemeyera whitei Rusty Plum, Plum Boxwood TSC Act = V	Found in gully, warm temperate or littoral rainforests and the adjacent understorey of moist eucalypt forest. It occurs on poorer soils in areas below 600 m above sea level.	Possible	Possible medium to poor quality habitat occurs in CH_DOF09 CH_FrW06
Oberonia complanata Yellow-flowered King of the Fairies TSC Act = E	This species grows on trees and rocks in littoral rainforest, subtropical rainforest, dry rainforest, wet or dry eucalypt forests, dunes (including stabilised sands), stream-side areas, swampy forests and mangroves.	Possible	Possible medium quality habitat occurs in CH_DOF09 CH_FrW06
Parsonsia dorrigoensis TSC Act = V EPBC Act = E	Grows in subtropical and warm-temperate rainforest and sclerophyll forest.	Possible	Possible medium quality habitat occurs in CH_DOF09 CH_FrW06
Peristeranthus hillii Brown Fairy-chain Orchid TSC Act = V	Grows on trees and woody climbers in rainforest, particularly in littoral rainforest. Occurs mainly in highland rainforests in tropical regions, and in subtropical regions in coastal and near-coastal rainforests, especially on ridgetops and slopes in drier forests.	Possible	Unlikely
Persicaria elatior Tall Knotweed TSC Act = V EPBC Act = V	This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	Possible	Possible poor quality habitat occurs in CH_DOF09 CH_FrW06
Phaius australis Southern Swamp Orchid TSC Act = V EPBC Act =E	Commonly associated with coastal wet heath/sedgeland wetlands, swampy grassland or swampy forest and often where Broad-leaved Paperbark or Swamp Mahogany are found. Typically, the Lesser Swamp-orchid is restricted to the swamp-forest margins, where it occurs in swamp sclerophyll forest - Broad-leaved Paperbark/Swamp Mahogany/Swamp Box *Lophostemon suaveolens*, swampy rainforest (often with sclerophyll emergents), or fringing open forest. It is often associated with rainforest elements such as Bangalow Palm *Archontophoenix cunninghamiana* or Cabbage Tree Palm.	Possible	Possible good quality habitat occurs in CH_DOF09 CH_FrW06
Pultenaea maritima Coast Headland Pea TSC Act = V EPBC Act = NL	Restricted to grasslands on exposed coastal headlands.	Unlikely	Unlikely

Species*	Habitat	Likelihood of presence within BNMU	Likelihood of presence within OLS
Quassia sp. Moonee Quassia TSC Act = E EPBC Act = E	At coastal sites in wet sclerophyll forest, typically comprising canopy species such as Tallowwood *Eucalyptus microcorys*, Brushbox *Lophostemon confertus*, Turpentine *Syncarpia glomulifera*, and Forest Oak *Allocasuarina torulosa*. This wet forest habitat usually supports a varying density and diversity of rainforest understorey species.	Possible	Possible medium quality habitat occurs in CH_DOF09 CH_FrW06
Sarcochilus fitzgeraldii Ravine Orchid TSC Act = V	Found in the coastal subtropical rainforests and open forests.	Unlikely	Unlikely
Senna acclinis TSC Act = E	Found in rainforest margins in association with Burdekin Plum *Pleiogynium timorense* and open forests in association with Flooded Gum *Eucalyptus grandis*, Turpentine and Red Ash *Alphitonia excelsa*, in soils derived from basalt and metamorphic rocks and at altitudes of 100 - 660 m.	Unlikely	Unlikely
Sophora tomentosa Silverbush TSC Act = E	Restricted to elevations slightly above mean sea level. Grows on beaches and in beach forest.	Possible	Possible medium quality habitat occurs in CH_H01
Thesium australe Austral Toadflax TSC Act = V EPBC Act = V	In grassland and grassy woodlands.	Unlikely	Unlikely
Tylophora woollsii TSC Act = E EPBC Act = E	Grows in wet sclerophyll forest and rainforest in the Clouds Creek area near Nymboida and in sclerophyll forest near Parramatta.	Unlikely	Unlikely
Typhonium sp. aff. Brownii TSC Act = E	confined to the ranges up to 30km west of Woolgoolga and Coffs Harbour from Flooded Gum forest.	Unlikely	Unlikely
Uromyrtus australis Peach Myrtle TSC Act = E EPBC Act = E	Occurs in a very specialised habitat, being restricted to high rainfall, high altitude areas on Nimbin Rhyolite geology in the Nightcap Range and nearby areas in north east NSW (particularly Jerusalem Mountain to Koonyum Range).	Unlikely	Unlikely
Zieria prostrata TSC Act = E EPBC Act = E	Restricted to low coastal heaths, near Coffs Harbour; rare.	Possible	Possible medium quality habitat occurs in CH_FW01 CH_FW06

*Abbreviations: E1 and E = Endangered, E4 = Presumed Extinct, E4A = Critically Endangered, V = vulnerable, PE = presumed extinct. Community codes used in column 4 are referenced in Table 3.2

Table 3.4: Detectability of Threatened flora species that have potential to occur within the OLS and tree height reduction survey areas.

Species	Likelihood of presence within OLS	Detectability
Arthraxon hispidus Hairy Joint grass	Possible Medium quality habitat occurs in CH_DOF09 CH_FrW06 CH_FW01 CH_FW06	Slender decumbent perennial, rooting at the lower nodes. Leaves with sheath usually 1–3 cm long. Usually forms mats where present. Possibly remains undetected within the balance of OLS. Unlikely to have been present within tree height reduction survey areas.
Boronia umbellata Orara Boronia	Possible Medium quality habitat occurs in CH_FW01	Shrub around 1 m high Possibly remains undetected within the balance of OLS. Unlikely to have been present within tree height reduction survey areas.
Cryptocarya foetida Stinking Cryptocarya	Possible Poor quality habitat occurs in CH_DOF09 CH_FrW06	Small to medium-sized tree Possibly remains undetected within the balance of OLS. Unlikely to have been present within tree height reduction survey areas.
Cryptostylis hunteriana Leafless Tongue-orchid	Possible Good quality habitat occurs in CH_FW01 CH_FW06	Leafless, saprophytic terrestrial herb, Flowering: December–February Possibly remains undetected within the balance of OLS. Possibly remains undetected within tree height reduction survey areas.
Marsdenia longiloba Slender Marsdenia	Possible medium quality habitat occurs in CH_DOF09 CH_FrW06	Slender climber, latex clear, watery. Possibly remains undetected within the balance of OLS. Unlikely to have been present within tree height reduction survey areas.
Myrsine richmondensis Purple-leaf Muttonwood	Possible medium quality habitat occurs in CH_DOF09 CH_FrW06	Shrub or small tree. Possibly remains undetected within the balance of OLS. Unlikely to have been present within tree height reduction survey areas.
Niemeyera whitei Rusty Plum, Plum Boxwood	Possible medium to poor quality habitat occurs in CH_DOF09 CH_FrW06	Small to medium-sized tree. Possibly remains undetected within the balance of OLS. Unlikely to have been present within tree height reduction survey areas.

Species	Likelihood of presence within OLS	Detectability
Oberonia complanata Yellow-flowered King of the Fairies	Possible medium quality habitat occurs in CH_DOF09 CH_FrW06	Epiphyte with 1-many shoots in a tight clump. Possibly remains undetected within the balance of OLS. Unlikely to have been present within tree height reduction survey areas.
Parsonsia dorrigoensis	Possible medium quality habitat occurs in CH_DOF09 CH_FrW06	Climber to 4 m high with slender twining stems, latex milky. Possibly remains undetected within the balance of OLS. Unlikely to have been present within tree height reduction survey areas.
Persicaria elatior Tall Knotweed	Possible poor quality habitat occurs in CH_DOF09 CH_FrW06	Erect herb to 90 cm high Possibly remains undetected within the balance of OLS. Unlikely to have been present within tree height reduction survey areas.
Phaius australis Southern Swamp Orchid	Possible good quality habitat occurs in CH_DOF09 CH_FrW06	Terrestrial to c. 2 m high Possibly remains undetected within the balance of OLS. Unlikely to have been present within tree height reduction survey areas.
Quassia sp. Mooney Creek Moonee Quassia	Possible medium quality habitat occurs in CH_DOF09 CH_FrW06	A shrub to 2 metres Possibly remains undetected within the balance of OLS. Unlikely to have been present within tree height reduction survey areas.
Sophora tomentosa Silverbush	Possible medium quality habitat occurs in CH_H01	Shrub or small tree to 5 m high Possibly remains undetected within the balance of OLS. Unlikely to have been present within tree height reduction survey areas.
Zieria prostrata	Possible medium quality habitat occurs in CH_FW01 CH_FW06	Prostrate shrub forming mats 0.5 m diameter Possibly remains undetected within the balance of OLS. Unlikely to have been present within tree height reduction survey areas.
Acronychia littoralis Scented Acronychia	Present	Small tree to 6 m high Occurs within the balance of OLS. Unlikely to have been present within tree height reduction survey areas.

Species	Likelihood of presence within OLS	Detectability
Lindsaea incisa Slender Screw Fern	Possible good quality habitat occurs in CH_DOF09 CH_FrW06 (Present)	Rhizome creeping; Fronds not tufted, 10–30 cm long. Occurs within the balance of OLS. Possibly remains undetected within tree height reduction survey areas.

Community codes used in column 2 are referenced in Table 3.2

3.2.6 Presence and distribution of exotic flora species within the study area

Thirty-five of the 281 (12%) flora species recorded during the survey are exotic species. Of these species seven are listed as noxious weeds under the *Noxious Weeds Act 1993* (NW Act) and two are listed as weeds of national significance (WONS) (Table 3.4). Two of the weed species listed under the NW Act are classified as Class 3 weeds and are prescribed as "Regionally Controlled Weed - The plant must be fully and continuously suppressed and destroyed." The remaining five species are classified as Class 4 weeds and are prescribed as "Locally Controlled Weed - The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread."

There are few weed concerns within the OLS areas. The presence of *Ardisia crenata* within the Blackbutt communities at the southern end of the southern OLS area requires monitoring. Whilst not at nuisance levels current timely intervention and removal of these individuals could prevent nuisance growth and more expensive interventions later. The presence of Fishbone Fern *Nephrolepis cordifolia* and Bitou bush *Chrysanthemoides monilifera subsp. rotundata* within the Holocene dune communities in the eastern areas is a concern. However, there is evidence of chemical control of Fishbone Fern in this area already. Several other weeds occur within this community at low levels; *Senna pendula var. glabrata, Solanum mauritianum, Schefflera actinophylla, Rubus fruiticosus sens. lat., Ochna serrulata* and *Lantana camara*, although none of these species are presently of concern and appear to have been controlled by active intervention. Bitou Bush is emanating from the neighbouring rail corridor and efforts to control this weed within this area should be encouraged. Management of weeds is adequately addressed within the existing Weed Management Plan that is part of the CHRA VMP (Eco Logical Australia, 2009b).

Table 3.5: Exotic Flora Species that occur within the study area

Family	Scientific Name	Noxious Weeds	WONS
Asteraceae	*Baccharis halimifolia*	3	
Fabaceae (Faboideae)	*Erythrina sykesii (crusti gallii)*	3	
Asparagaceae	*Asparagus aethiopicus*	4	
Asparagaceae	*Asparagus plumosus*	4	
Asteraceae	*Senecio madagascariensis*	4	
Asteraceae	*Chrysanthemoides monilifera subsp. rotundata*	4	WONS
Verbenaceae	*Lantana camara*	4	WONS
Apiaceae	*Cyclospermum leptophyllum*	E	
Arecaceae	*Syagrus romanzoffiana*	E	
Asteraceae	*Ageratina riparia*	E	
Asteraceae	*Ageratum conyzoides subsp. conyzoides*	E	
Asteraceae	*Ageratum houstonianum*	E	
Asteraceae	*Bidens pilosa*	E	
Asteraceae	*Cirsium vulgare*	E	
Asteraceae	*Conyza bonariensis*	E	
Asteraceae	*Conyza parva*	E	
Asteraceae	*Hypochaeris radicata*	E	
Asteraceae	*Sonchus oleraceus*	E	
Asteraceae	*Tagetes minuta*	E	
Convolvulaceae	*Ipomoea cairica*	E	
Davalliaceae	*Nephrolepis cordifolia*	E	
Fabaceae	*Cajanus cajan*	E	
Fabaceae (Caesalpinioideae)	*Senna pendula var. glabrata*	E	
Lauraceae	*Cinnamomum camphora*	E	
Myrsinaceae	*Ardisia crenata*	E	
Ochnaceae	*Ochna serrulata*	E	
Passifloraceae	*Passiflora suberosa*	E	
Phytolaccaceae	*Phytolacca octandra*	E	
Poaceae	*Andropogon virginicus*	E	
Poaceae	*Chloris gayana*	E	
Poaceae	*Melinis repens*	E	
Polygalaceae	*Polygala paniculata*	E	
Solanaceae	*Solanum mauritianum*	E	
Solanaceae	*Solanum seaforthianum*	E	

E = Environmental (not listed at State or federal level))

3.2.7 Extant Fauna Species within the Study Area

A total of 119 terrestrial vertebrate species were recorded during the field surveys, including two frog, 98 bird and 19 mammal species. A full list of species recorded during this survey and the previous 1997 survey is provided in Appendix C. The July 2016 survey recorded an additional 49 species not recorded in the previous survey (42 birds and seven mammals).

Given the time of year (winter) conditions for locating frogs and reptiles were unsuitable. On the other hand, the bird community may have been enhanced by winter migrants from southern Australia and upland habitats. Of the 19 mammal species recorded six were microbat species identified by microbat call recording with a further two megabat species (flying-foxes) identified during spotlighting activity. The small ground mammal fauna was diverse with five species recorded during Elliott trapping including four rodents and one dasyurid marsupial (Brown Antechinus *Antechinus stuartii*).

Four introduced species were recorded onsite including Dog *Canis lupus lupus*, Red Fox *Vulpes vulpes*, Brown Hare *Lepus capensis* and Spotted Turtle-dove *Streptopelia chinensis*. Of these Red Fox is a declared pest species in NSW under the *Local Land Services Act 2013.* All land managers in NSW, whether on public or private land, have an obligation to control declared pest species on their land.

3.2.8 Fauna Habitat Values

The habitat factors described herein largely refer to the area of focus for the majority of the proposed tree pruning activity and where fauna trapping was carried out (refer Figure 2.2 for locations). Much of the northern section of this area was dominated by dense wallum heath with few if any taller trees. Habitat in the south of Study area often featured a rainforest dominated mid-storey with a patchy wallum heath ground layer. Where the ground layer is open a heavy leaf litter was often observed in these areas.

The dense wallum heath will provide suitable shelter habitat for a range of fauna including small bird species and medium sized to small ground mammals. In particular, this habitat may provide protection for these species from feral predators such as Cats *Felis catus* and Red Fox. Seasonal flowering plants and trees in eucalypt forest, and in particular the heath areas, will provide abundant foraging resources for small gliders, nectivorous bats and a range of nectivorous bird species such as honeyeaters. This was evident at the time of the survey when flowering Banksias were abundant and attracting a range of birds and flying-foxes. Fruiting rainforest tree species may provide seasonal resources for a range of rainforest birds such as fruit-doves and bowerbirds and will also provide resources for flying-fox species.

Tree hollows were observed to be rare, and for the most part small, in the eucalypt dominated habitat on the site. Hollows provide roosting habitat for a range of arboreal mammals and bird species such as parrots. These appeared largely suitable only for smaller species on the site. Fallen woody debris was common in the eucalypt dominated areas. This appeared to be the result of past pruning activity and as a result the observed debris was in varying states of decay. Fallen woody debris may provide shelter to a range of fauna including frogs, small reptiles including skinks and snakes, and small ground mammals such as rodents and dasyurid marsupials.

A generally narrow band of mangroves lines Boambee Creek, although some saline saltpan habitat also occurs north of trap line 1. These areas provide differing shelter and foraging resources that are suitable for a range of coastal species, including migratory waders and shorebirds.

3.2.9 Presence of Threatened Fauna Species

The July 2016 survey located eight species currently listed as conservation significant (Endangered, Vulnerable or Migratory) under the TSC Act and/or EPBC Act, as did the 1997 survey (refer **Appendix A**). A total of 12 conservation species were recorded across both surveys. It should also be noted the majority of native fauna species are listed as Protected under the NP&W Act.

An analysis was carried out of the conservation significant fauna species predicted to occur on the site from the desktop review of database search results. The analysis of impact has been based on the assumption that significant fauna species which have good quality habitat and recent localised sighting records existing within the Study area are present unless evidence to the contrary exists.

Four categories were used to classify the likelihood of a threatened fauna species being present within the Study area based on the desktop research and on-site observations. Categories were defined as: Known (confirmed during field assessments); Likely (suitable habitat observed during onsite survey and/or known records within CHRA lands); Potential (possibility of suitable habitat or limited records of the species occurring around the Project area); and Unlikely (no suitable habitat and/or not known to occur within the local region).

Of the 55 terrestrial fauna species identified from the desktop survey, 20 species are considered as 'likely' or 'known' to occur in the CHRA study area (**Table 3.6**). A number of other conservation significant species are considered to have some potential to occur sporadically within the Study area (refer **Appendix C** for the entire review of species occurrence in the CHRA Study area). However, these species are not considered to have core habitat in the CHRA area, do not have records occurring within CHRA lands, and as such are not expected to be impacted by the Project and are not considered any further.

Brief descriptions of the species predicted to occur in the CHRA are provided in the following sections.

Table 3.6: Threatened species predicted or known to occur in the Study area

Scientific name	Common name	Status[1]		Data source[2]			
		TSC Act	EPBC Act	Bionet records	PMST	Austeco 1997	July 2016
Frogs							
Crinia tinnula	Wallum Froglet	V		25			
Birds							
Pandion cristatus	Eastern Osprey	V	M	63	X		
Haemantopus longirostris	Pied Oystercatcher	E		20			X
Glossopsitta pusilla	Little Lorikeet	V		17			X
Daphoenositta chrysoptera	Varied Sittella	V		18		X	X
Hirundapus caudacutus	White-throated Needletail		M	18	X		
Apus pacificus	Fork-tailed Swift		M	1	X		
Monarcha melanopsis	Black-faced Monarch		M	41	X	X	X
Symposiachrus trivirgatus	Spectacled Monarch		M	48	X		
Myiagra cyanoleuca	Satin Flycatcher		M		X		
Rhipidura rufifrons	Rufous Fantail		M	38	X	X	
Mammals							
Planigale maculata	Common Planigale	V		1			

Scientific name	Common name	Status[1]		Data source[2]			
		TSC Act	EPBC Act	Bionet records	PMST	Austeco 1997	July 2016
Petaurus norfolcensis	Squirrel Glider	V		6			
Phascolarctos cinereus	Koala	V	V	509	X	X	
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	55	X		X
Syconycteris australis	Common Blossom-bat	V		6		X	
Mormopterus norfolkensis	Eastern Freetail-bat	V		1		X	
Miniopterus australis	Little Bentwing Bat	V		18		X	X
Miniopterus orianae oceanensis	Common Bentwing Bat	V		6		X	X
Pseudomys novaehollandiae	New Holland Mouse		V	1	X		X

1: Status: E = Endangered; V = Vulnerable; M = Migratory 2: Database source: Bionet = NSW Bionet database; PM = EPBC Protected Matters online search tool.

3.2.10 Threatened Species descriptions – EPBC Act Species

Koala

Status: Vulnerable – TSC Act and EPBC Act.

Occurrence in the study area: Koalas were observed at three sites during the Austeco survey of the CHRA in 1997, two of which were observed in Swamp Mahogany *Eucalyptus robusta* forest. Swamp Mahogany is considered a primary feed tree species for Koala in the region (AKF, 2015). There are over 500 Bionet database records of Koala from a 5 km radius of the site. Despite this no Koalas and no signs of presence (tree scratches or scats) were observed on the site during the CHRA survey. Nevertheless, a cautious approach has been taken for this assessment and it is considered likely to occur in the Study area.

Ecology and habitat: Koalas have a distinct association with eucalypt woodland and forest habitat types containing suitable food trees (Hume and Esson, 1993; Moore and Foley, 2000; Martin et al., 2008). Koala's are not necessarily restricted to bushland or remnant areas and are known to exist and breed within farmland and the urban environment (Dique et al., 2004). Similarly, movement is not confined to vegetated corridors, as they also move across cleared rural land and through suburbs (Martin et al., 2008). They use a variety of trees, including many non-eucalypts, for feeding, shelter and breeding purposes (Dique et al., 2004; Martin et al., 2008).

They are known to have localised preferences throughout their range, selecting some tree species over others (Pahl and Hume, 1990). They are also known to favour individual trees and this has been suggested to be a response to a variety of factors including high leaf moisture content, high leaf nitrogen content (which is often related to low fibre content making leaves more palatable) and low levels of chemicals compounds which are expressed by eucalypts to resist herbivory (Pahl and Hume, 1990; Hume and Esson, 1993; and Moore and Foley, 2000).

Distribution and breeding: Koalas occur throughout northeast, central and south east Queensland, extending south through Victoria into South Australia and Kangaroo Island. Breeding occurs in spring/summer when males become territorial, attacking and fighting rivals and using loud bellows to advertise their presence (Martin et al., 2008). Young permanently leave the females pouch after seven months, but continue to ride on the mothers back until 12 months and the beginning of a new breeding season. After this time adolescent females may remain in the natal habitat, but males generally disperse to new territories between 1-3 years of age (Dique et al., 2003; Martin et al., 2008).

Threats: Current threats to Koalas include habitat destruction and fragmentation, bushfire and disease. Populations around urban/populated areas are also at increased risk of mortality due to dog attack and road strike (Maxwell et al., 1996).

Grey-headed Flying-fox

Status: Vulnerable – TSC Act and EPBC Act.

Occurrence in the study area: This species was commonly seen feeding largely in flowering Banksias during spotlighting surveys on the July 2016 site visit. There is a well-known permanent flying-fox roost or camp site located on Coffs Creek approximately 2.5 km north of the CHRA.

Ecology and habitat: Two habitat characteristics are important for Grey-headed Flying-foxes - foraging resources and roosting sites. As the species is a canopy-feeding frugivore and nectarivore, they seasonally utilise a variety of vegetation types including rainforests, open eucalypt forests, woodlands, melaleuca swamps and banksia woodlands.

Roosts are commonly within dense vegetation close to water, primarily rainforest patches, stands of melaleuca, mangroves or riparian vegetation (Nelson, 1965), but colonies may use exotic vegetation in urban areas (Birt et al., 1998). The species congregates in large camps of up to 200,000 individuals from early until late summer, with the number of bats within a camp being influenced by the availability of blossom in the surrounding area. Adults normally disperse during the winter and can migrate up to 750 km as individuals or small groups, with the young forming winter camps (Churchill, 2008).

Distribution and breeding: Regular or frequently used camps have been located between Rockhampton in Queensland south to around Mallacoota in East Gippsland, Victoria. Less consistent records extend the south range of the species to Warrnambool, Victoria (Duncan et al., 1999). They are generally recorded between the coast and the western slopes of the Great Dividing Range. Recent surveys have located camps of this species as far north as the Mackay region, with several records further south between Gladstone and Bundaberg, Queensland (Roberts et al., 2008). Despite one regular camp in Melbourne (Menkhorst, 1995), the southern range of the species appears to have considerably retracted (Duncan et al., 1999).

Breeding occurs during the spring months when food resources are at their most plentiful.

Threats: Grey-headed Flying-foxes are subject to several threatening processes, the most severe being loss of habitat. It has been suggested that this resulted in a 50% decline in the population by the 1930s (Duncan et al., 1999). The loss of habitat, particularly important habitat such as reliable winter resources along the east coast, has continued to lead to population decline. The species will also forage within commercial fruit farms, sometimes significantly reducing their yield. This has resulted in direct culling or the destruction of camps by harassment. Other threatening processes include accumulation of lethal levels of lead in urban areas (Hariono et al., 1993), electrocution on overhead powerlines, which kills disproportionately high numbers of lactating females (Duncan et al., 1999), and conversion of old-growth forests and woodlands to young, even-aged stands due to too-frequent burning (NPWS, 2002).

New Holland Mouse

Status: Vulnerable – EPBC Act only.

Occurrence in the study area: A single individual was recorded in an Elliott trap at Site 1 during the survey. The habitat at Site was composed of Swamp Mahogany forest with a tall evergreen shrub layer and a dense ground layer of wallum heath species. There is a single previous database record of the species from the wider area surrounding the CHRA.

Ecology and habitat: Small nocturnal rodent with an omnivorous diet ranging across invertebrates, fungi, seeds, roots, stems and other plant tissues. They are a burrowing species tending to occur where there are soft substrates or top soils are deep (Wilson and Laidlaw, 2003), particularly coastal sandy habitats. The species occurs in open heathland, woodland with a heath understorey and on vegetated sand dunes (Woinarski et al., 2014).

The species occurrence in suitable habitat is thought to be associated with fire frequency, although this appears to vary across its range. There is also evidence that populations may be strongly impacted by rainfall. Studies on the species have shown a longer breeding season (Kemper, 1980) or increased population abundance associated with above average rainfall (Fox et al., 1993).

Distribution and breeding: New Holland Mouse is found at scattered locations from Tasmania north to south-east Queensland. It is largely coastal but has also been known to occur at isolated sites up to 300 km inland. Fossil evidence suggests the species has undergone a substantial range contraction since European settlement (Woinarski et al., 2014).

In Victoria and Tasmania breeding occurs in the summer months. Breeding in NSW occurs from August to March although breeding varies across years. Population in NSW have a longer breeding season with up to six litters recorded (Woinarski et al., 2014).

Threats: The main threats to the species are inappropriate fire management and predation, particularly by feral cats. Other damaging processes include habitat degradation through weed invasion and livestock grazing activity.

Plate 1: New Holland Mouse trapped within CHRA Study area – July 2016

Threatened Species Descriptions – TSC Act only

Wallum Froglet - Vulnerable

The Wallum Froglet is one of the so-called 'acid frogs' (Ingram and Corben, 1975) that breed in low pH freshwater swamps on low nutrient soils, usually deep sands. Typical of their breeding medium is the 'black' water that is organically stained and acidic (Coaldrake, 1962). Vegetation within suitable areas varies, and includes heathland, sedgeland, Melaleuca swamp, and Banksia woodland (Hines et al., 1999). The species occurs from south-east Queensland south to Kurnell, in southern Sydney (OEH, 2016).

This is a winter calling frog. The species was not recorded during the July 2016 survey or the previous Austeco survey in 1997. There are 25 Bionet database records within 5 km radius of the site and there is suitable wallum habitat for the species to occur.

Eastern Osprey - Vulnerable

The Eastern Osprey is found along the entire Australian coastline and may occur far inland on rivers and lakes, particularly in wet years (Debus, 1998). In New South Wales, breeding populations are confined to the north and central coasts. This species feeds on fish, foraging in rivers, lakes, estuaries and inshore coastal waters. Breeding pairs require nesting sites near suitable foraging areas. Nest sites include tall trees and artificial structures such as power poles and towers (NPWS, 2002).

Eastern Osprey was not recorded onsite, however there are 63 Bionet database records from the wider area and the species is likely to occur. There is no suitable nesting habitat in the CHRA Study area and the species is more likely to forage along Boambee Creek.

Pied Oystercatcher - Endangered

Pied Oystercatcher is a familiar coastal wader occurring on tidal mudflats including estuaries, sand beaches, sand spits and sandbars. The nest is a shallow scrape directly on the sand on the beach itself or adjacent low growth (Pizzey and Knight, 2012). Nest predation by introduced predators and degradation of habitat by human recreational activity are a threat to this species. Pied Oystercatcher occurs along the entire New South Wales coast. There are thought to be 200 breeding pairs in the State (OEH, 2016).

A pair of Pied Oystercatcher were observed foraging in Boambee Creek during the July 2016 survey. There is no nesting habitat available in the study area.

Little Lorikeet - Vulnerable

Small, lorikeet that may be found in a variety of flowering eucalypt woodlands (particularly along watercourses), including individual trees in paddocks. Like other lorikeets it is largely a nectar and pollen feeder. It is nomadic, following eucalypt flowering events. It may be found along the entire New South Wales coast as far west as Dubbo and Albury (OEH, 2016).

The species was observed onsite during the 2016 survey. This is a relatively common (although not as common as other lorikeet species) and widespread species.

Varied Sittella - Vulnerable

This species can occur in most eucalypt forests, woodlands and acacia scrubs, particularly those with rough-barked species. It may also occur in disturbed areas such as golf courses and shelter belt vegetation and

parks if suitable trees are present. This species gleans arthropods from tree trunks and branches and tends to occur in breeding groups (Pizzey and Knight, 2012).

Varied Sittella was observed onsite during the 2016 survey and the 1997 Austeco survey of the CHRA. The species is sedentary and occurs across much of New South Wales.

Common Planigale - Vulnerable

The Common Planigale occupies a range of habitats from rain forests to sclerophyll forests and grasslands to marshlands and can survive in urban environments. For such a widespread animal its' habits are not well known (Burnett, 2008). It is a very small terrestrial marsupial that forages nocturnally amongst leaf litter and crevices for invertebrates and sometimes small skinks. In NSW it occurs north from the central New South Wales area.

There is a single Bionet database record from the wider area. Although not detected during either the current survey or the 1997 Austeco survey the species is difficult to detect. There is suitable habitat for the species and it is considered likely to occur.

Squirrel Glider - Vulnerable

Squirrel Gliders are associated with dry sclerophyll forests and woodlands dominated by either winter-flowering eucalypts, with an understorey of gum-producing acacias and/or an understorey of winter and autumn flowering banksias (Smith and Murray, 2003). They are also dependent on hollows for roosting and nesting. Hollows that are most regularly selected have a narrow entrance which broadens into a larger cavity.

Although Squirrel Glider occurs across a very wide area from Cape York south to Victoria its distribution has become severely fragmented. The species was not recorded during either the current survey or the 1997 Austeco survey. There are six records from the wider area and there is suitable habitat on the site where eucalypt forest may provide suitable tree hollows to support the roosting needs of the species.

Common Blossom-bat - Vulnerable

Common Blossom-bat typically feeds predominantly on nectar and blossom and they are regularly located foraging and feeding within coastal heathlands and forests where banksias are common. In the north of its range in particular, the species has also been recorded taking quantities of fruit and may utilise resources in rainforests. They roost among rainforest vegetation solitarily (Law and Spencer, 2008). It occurs along the east coast of Queensland south to central New South Wales.

The species was recorded during the 1997 Austeco survey of the CHRA although not during the current survey. There is abundant suitable heathland habitat for the species in the area.

Eastern Freetail-bat - Vulnerable

This species essentially has a coastal distribution and may be found along the entire coast of New South Wales. It occurs in sclerophyll forests and woodlands (particularly near riparian areas), paddock trees and mangroves. It roosts in tree hollows including in that of mature mangrove trees (Van dyck et al., 2013).

There is a single database record from the wider area. The species was recorded during the 1997 Austeco survey of the CHRA, although not during the current survey. There is suitable habitat for the species in the area in eucalypt forest and adjacent mangroves along Boambee Creek.

Little Bentwing Bat – Vulnerable; and Common Bentwing Bat – Vulnerable

Both of these species may occur in a variety of habitats including rainforest, sclerophyll forests and woodland and Melaleuca forests. They both roost in caves, mine shafts, tunnels and other suitable man-made structures such as road culverts and often share roost sites. Breeding or maternity roosts are usually in limestone or sandstone caves and are returned to each year. Little Bentwing Bat is found from Wollongong north to Cape York. Common Bentwing Bat is far more widespread extending south to Victoria and further inland (Van dyck et al., 2013).

Both species were detected using microbat call recording during the current survey and the 1997 Austeco survey of the CHRA. Calls of Little Bentwing Bat were much more common than that of Common Bentwing Bat for the July 2016 survey.

Migratory Species – EPBC Act

White-throated Needletail and Fork-tailed Swift

Status: Migratory – EPBC Act.

The White-throated Needletails and Fork-tailed Swift are widespread over eastern and south eastern Australia during the warmer months. Both species breed in eastern Asia and spend the non-breeding season mainly in Australia, and occasionally in New Guinea and New Zealand (Blakers et al., 1984; Higgins, 1999). White-throated Needletail arrives in eastern Australia in late October moving south along both sides of the Great Dividing Range as far south as Tasmania. Fork-tailed Swift also arrives in October but may occur throughout Australia (Higgins, 1999). Both are aerial foraging species and can occur over most habitats including heavily disturbed areas. They are commonly associated with storm fronts. White-throated Needletail is likely to be more common over the Project area, however both species may occur.

These species were not recorded but are widespread in the summer months and are considered likely to occur.

Rufous Fantail, Satin Flycatcher, Black-faced Monarch and Spectacled Monarch

Status: Migratory – EPBC Act.

All of these species are mostly found singly or in pairs in low dense vegetation, mainly in rainforests, but also in wet sclerophyll forests and other dense vegetation such as mangroves, drier sclerophyll forests, woodlands, parks and gardens (Higgins et al., 2006). They are usually seen foraging for invertebrates, mainly insects, within the low and middle levels of the forest within 5-15 m of the ground, where they disturb and catch prey in the foliage (Schodde and Tidemann, 1990; Higgins et al., 2006).

Three species are partially migratory and are widespread in eastern Australia from Cape York to north eastern New South Wales and migrating further south in summer. Many individuals are migratory, breeding in Australia and over wintering in north east Queensland, the Torres Strait Islands and New Guinea, while others are considered to be Queensland residents. Satin Flycatcher has a distinct migration pattern moving largely along the coast from New Guinea to south-east Australia (including Tasmania) in summer.

Black-faced Monarch was observed in the Project area during the site visit. There is suitable habitat for these species to occur in the Study area and surrounds. There are database records for all of the species occurring in the wider area, except Satin Flycatcher. It is considered likely these species periodically occur in the Project area.

3.3 CULTURAL HERITAGE

It is expected that the proposed pruning of trees within the OLS will constitute 'low impact activities' as defined under the NP&W Act. As such it is unlikely that the proposed activities would cause 'Harm'. The activity can therefore be undertaken without the need to consult the OEH or a consulting archaeologist. Generally, those who undertake activities of this nature will not be committing an offence, even if they inadvertently harm Aboriginal Objects (Appendix F).

Works conducted on the fore dune east of the rail line in an area outside of the BMNU and OLS (Figure 1.2), occurs within an area where a complex of shell occurs. Indeed, a complex of shell occurs throughout the aerodrome and particularly in the areas of sand dune. Works within these areas may result in disturbance to the middens, and as such have the potential to cause 'Harm' as defined by the NP&W Act. It is recommended that Council considers a baseline recording program to better understand the extent that the midden(s) have already been exposed and disturbed. This would provide a basis for an informed assessment of Harm, should there be an allegation in the future.

With respect to Aboriginal Site #22-1-0096 (Appendix F), it is noted from our conversation that the area south of the runway is clearly designated as an exclusion zone and that no further works will take place in this area. Having regard to the site card and the consultation notes, it is not clear that the views of the Aboriginal community with respect to this site are still current. Whilst the site is not formally declared an Aboriginal Place the provisions of the NPWA with respect to Harm do not strictly apply. However, this does not diminish the potential that disturbance of this area could be considered a breach of trust with the Aboriginal community. It is recommended that the aerodrome management undertakes an Aboriginal community consultation process to better understand contemporary Aboriginal views and knowledge of the site. This would provide an opportunity to discuss current management arrangements and to find a balance between conservation of the sites cultural values and the practical considerations of aerodrome operations. Declaration as an Aboriginal Place, as recommended in the original study, would have many benefits to both aerodrome management and the community.

4 DISCUSSION AND RECOMMENDATIONS

4.1 SITE ECOLOGICAL CONDITION

The BNMU and more specifically the OLS are generally in good ecological condition. The juxtaposition of the Study area with Newport's and Boambee Creeks creates a diverse range of ecotones between marine and freshwater environments that include; mangroves, saltmarsh, freshwater swamps and terrestrial forested communities. The predominance of sand substrates creates low nutrient communities with characteristic wallum understories. The diverse range of vegetation communities on sand substrates supports a diverse flora with 246 locally native species recorded.

Limited general public access to large areas of the BNMU and OLS combined with low nutrient environments have limited the incursion of exotic flora species. The presence of Ardisia *Ardisia crenata* within the Blackbutt forests of the southern OLS are of concern and requires monitoring, whilst invasion of Bitou Bush, from the rail corridor is of concern. In general, the implementation of the Weed Management Plan within the VMP (Eco Logical Australia, 2009b) will prevent weed infestations impeding ecological function.

Informal sand tracks across the BNMU have caused some degradation and avoidance of boggy areas by vehicles has widened tracks causing loss of the native vegetation communities. These issues are not serious and closure of tracks to encourage rehabilitation was observed. Some remedial works on the main north south track to the southern end of the OLS may be required to prevent further degradation.

The coastal vegetation communities that dominate the Study area are under pressure from coastal development throughout NSW, consequently five of the communities are listed as EECs under the TSC Act. In addition, habitat for 16 of the 38 threatened flora species known to occur locally, occurs within the Study area.

A single EPBC Act-listed TEC - "Lowland Rainforest of Subtropical Australia" - is located just behind the Holecene dune on the south easterly margin of the BNMU. This community is the same community described as the TSC Act-listed EEC - "Lowland Rainforest in the NSW North Coast and Sydney Basin bioregions". This community will not be impacted by the proposed activities.

4.2 POTENTIAL IMPACTS OF PROPOSED TREE HEIGHT REDUCTION

Tree height reduction has been practised within the OLS for decades and many eucalypts within the southern end of the OLS show signs of having been pruned. None of the pruned trees sighted exhibited signs of fungal infections or die back. The pruned branches appear to have been removed from site where there is sufficient vehicle access and shrub and ground layers in these areas are in good condition. Where large amounts of large branches have been left in areas inaccessible to vehicles there is some minor impacts on ground layers. This may be somewhat ameliorated by cutting the branches into shorter lengths to improve the amount of contact area with the ground thereby accelerating decomposition. The trees identified for the tree height reduction program include the following:

- Blackbutt *Eucalyptus pilularis* – nine trees;
- Swamp Mahogany *E. robusta* – three trees;
- Scribbly Gum *E. signata* – one tree;
- Swamp Box *Lophostemon suaveolens* – one tree; and

- Grey mangrove *Avicennia marina* - one tree.

None of the potentially present threatened flora species (as listed under the TSC and EPBC Acts) were found to occur within the tree height reduction survey areas. Of these, two species (Leafless Tongue-orchid and Slender Screw Fern) have possibly remained undetected due to their cryptic growth-form and the density of ground layers.

Several species listed under Schedule 13 of the NP&W Act were found within the vicinity of trees; Christmas Bells, Christmas Orchid, Staghorn and Elkhorn. Although this listing applies to harvesting and commercial use only it is recommended that consideration be given to avoiding impacts on these species where possible when planning pruning activities. In addition, Christmas Bells occurs along the length of the main north-south access track to the southern end of the OLS. Any activities in this area would impact on this species.

Of the threatened fauna species considered known or likely to occur in the area (refer Table 3.5) there may be minor localised impacts to some of these species:

- The program will require pruning of Swamp Mahogany (three trees). This species is considered a primary feed tree for Koala. Scribbly Gum (one tree targeted for pruning) is considered a secondary feed tree species for Koala. Should a Koala be present on a tree during pruning activities there is potential for individuals to suffer injury or mortality;
- Pruning of the eucalypt species may result in a minor reduction in the local availability of seasonal flowering resources for nectivorous species such as Little Lorikeet, Squirrel Glider and Grey-headed Flying-fox; and
- Pruning of the eucalypt species may impact hollows used for roosting for Squirrel Glider and Eastern Freetail Bat.

However, given the localised nature of these impacts (which have been ongoing over past years) and the availability of similar resources in the surrounding habitat, it is considered unlikely the tree height reduction program would have any more than a minor impact on these species at worst. Given previous pruning activity, no suitable tree hollows were observed on the target trees during the survey. It is recommended an appropriately qualified ecologist inspect trees prior to any pruning to ensure that no arboreal fauna is present on the trees.

4.3 LEGISLATIVE IMPACT ASSESSMENT REQUIREMENTS

4.3.1 New South Wales Legislation

The definition of 'clearing native vegetation' in the Coffs Harbour LEP 2013 refers to the definition in the *Native Vegetation Act 2003* (s7). This definition does not include the lopping or trimming of vegetation that does not kill the tree, and activities such as pruning, lopping or slashing of native groundcover, that do not kill the native vegetation, are not considered clearing. It is understood that the proposed activities related to the lopping or pruning of vegetation within the CHRA OLS areas are for ongoing safe operation of the airport, and that impacted vegetation will not be killed. Therefore, the activity is not considered 'clearing' and consent under the LEP 2013 is not considered necessary.

Despite the activity not requiring consent, Section 76(1) of the EP&A Act notes that an 'environmental assessment of the development' may nevertheless be required under Part 5 of the Act. Part 5 of the EP&A Act sets out the legislative requirements of the environmental assessment of 'activities'. The definition of 'activity' in the EP&A Act is broad and is set out in s110. It is considered that the proposed CHRA OLS lopping

and trimming is properly characterised as an 'activity' as it involves 'the carrying out of a work'. Therefore, Part 5 of the EP&A Act (covering environmental assessments) is still considered applicable.

Under s111 of the EP&A Act, determining authorities must 'examine and take into account, to the fullest extent possible, all matters affecting or likely to affect the environment by reason of that activity'. As such, while local and State legislation does not specify the requirement for a Review of Environmental Factors, CHCC must satisfy their environmental duty under s111 of the EP&A Act through some form of environmental review.

The objective of Section 5A of the EP&A Act, provides for a transparent assessment of the significance of proposed impacts upon threatened species, populations and ecological communities, and their habitats. The TSC Act revised the factors that need to be considered when assessing whether an action, development or activity is likely to significantly affect threatened species, populations or ecological communities, or their habitats, previously known as the '8-part test.' The changes affect s. 5A of the EP&A Act and s. 94 of the TSC Act. The factors that are assessed when determining if the impact is significant are:

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction;

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction;

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;

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

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

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality;

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

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan; and

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

Under the threatened species assessment guidelines, the assessment of significance is applied to species, populations and ecological communities listed on Schedules 1, 1A, 2, 4 and 4A of the TSC Act. A list of threatened species, populations and ecological communities which may be affected directly or indirectly by the proposed action, has been developed (Table 4.5).

There is no declared 'critical habitat' currently in force under sections 53-55 of the TSC Act on or near the Study area or surrounding lands. The proposed action of limited pruning of the target trees (15 identified) will not result in any habitat fragmentation or isolation, and will not impact the life cycle of any species to the extent a local population will be at risk of extinction. The activity is also unlikely to be inconsistent with the objectives or actions of any relevant species or community recovery plan, or threat abatement plan and does not constitute and is not part of a key threatening process and is not likely to result in the operation of, or increase the impact of a key threatening process. The likelihood that the current proposed activity will have a significant effect on populations of threatened species or EECs listed under the TSC Act is assessed in Table 4.5.

Table 4.5: Assessment of likely impacts on TSC Act threatened EECs, flora and fauna species as per Part 5 of the EP&A Act

Species (TSC Act Status)	Impact within Tree Height Reduction	Significance of Impact
Endangered Ecological Communities		
Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner bioregions;	No impact on extent of community No significant impact on the composition of the community	No significant impact
Subtropical Coastal Floodplain Forest of the NSW North Coast bioregion;	No impact on extent of community No significant impact on the composition of the community	No significant impact
Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions;	No impact on extent of community No significant impact on the composition of the community	No significant impact
Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions; and	No impact on extent of community No significant impact on the composition of the community	No significant impact
Lowland Rainforest in the NSW North Coast and Sydney Basin bioregions.	No impact on extent of community No significant impact on the composition of the community	No significant impact
Threatened Flora Species		
Acronychia littoralis Scented Acronychia (Endangered)	Not present No critical habitat present Impact to habitat minimal	No significant impact
Arthraxon hispidus Hairy Joint grass (Vulnerable)	Not present No critical habitat present Impact to habitat minimal	No significant impact
Boronia umbellata Orara Boronia (Vulnerable)	Not present No critical habitat present Impact to habitat minimal	No significant impact
Cryptocarya foetida *Stinking Cryptocarya* (Vulnerable)	Not present No critical habitat present Impact to habitat minimal	No significant impact
Cryptostylis hunteriana *Leafless Tongue-orchid* (Vulnerable)	Not found No critical habitat present Impact to habitat minimal	No significant impact
Lindsaea incisa Slender Screw Fern (Endangered)	Not found No critical habitat present Impact to habitat minimal	No significant impact
Marsdenia longiloba Slender Marsdenia (Endangered)	Not present No critical habitat present Impact to habitat minimal	No significant impact
Myrsine richmondensis *Purple-leaf Muttonwood* (Endangered)	Not present No critical habitat present Impact to habitat minimal	No significant impact
Niemeyera whitei Rusty Plum, Plum Boxwood (Vulnerable)	Not present No critical habitat present Impact to habitat minimal	No significant impact

Species (TSC Act Status)	Impact within Tree Height Reduction	Significance of Impact
Oberonia complanata Yellow-flowered King of the Fairies (Endangered)	Not present No critical habitat present Impact to habitat minimal	No significant impact
Parsonsia dorrigoensis (Vulnerable)	Not present No critical habitat present Impact to habitat minimal	No significant impact
Persicaria elatior Tall Knotweed (Vulnerable)	Not present No critical habitat present Impact to habitat minimal	No significant impact
Phaius australis Southern Swamp Orchid (Vulnerable)	Not present No critical habitat present Impact to habitat minimal	No significant impact
Quassia sp. Mooney Creek Moonee Quassia (Endangered)	Not present No critical habitat present Impact to habitat minimal	No significant impact
Sophora tomentosa Silverbush (Vulnerable)	Not present No critical habitat present Impact to habitat minimal	No significant impact
Zieria prostrata (Endangered)	Not present No critical habitat present Impact to habitat minimal	No significant impact
Threatened Fauna Species		
Crinia tinnula Wallum froglet (Vulnerable)	Not identified onsite during current or previous (1997) survey. Restricted to wallum heath habitat. Impacts restricted to overhead trees.	No significant impact
Pandion cristatus Eastern Osprey (Vulnerable)	Not identified onsite during current or previous (1997) survey. Only likely to forage along Boambee Creek. No impact to preferred habitat.	No significant impact
Haemantopus longirostris Pied Oystercatcher (Endangered)	Identified using preferred mudflat habitat on Boambee Creek. No nesting habitat onsite. No impact to preferred habitat.	No significant impact
Glossopsitta pusilla Little Lorikeet (Vulnerable)	Identified onsite during current survey. Impact restricted to minor reduction in potential seasonal forage area which are widespread in surrounding landscape.	No significant impact
Daphoenositta chrysoptera Varied Sittella (Vulnerable)	Identified onsite during current survey. Impact restricted to minor reduction in potential forage area (rough-barked tree species) which are widespread in surrounding landscape.	No significant impact
Planigale maculata Common Planigale (Vulnerable)	Not identified onsite during current or previous (1997) survey. Ground foraging species. Impacts restricted to overhead trees.	No significant impact
Petaurus norfolcensis Squirrel Glider (Vulnerable)	Not identified onsite during current or previous (1997) survey. Impact restricted to minor reduction in potential seasonal forage and roost trees (hollows) which are widespread in surrounding landscape.	No significant impact
Phascolarctos cinereus Koala (Vulnerable)	Not identified onsite during current survey but identified during previous (1997) survey. Impact restricted to minor reduction in potential forage area.	No significant impact

Species (TSC Act Status)	Impact within Tree Height Reduction	Significance of Impact
Pteropus poliocephalus Grey-headed Flying-fox (Vulnerable)	Identified onsite during current survey. No roost sites present. Impact restricted to minor reduction in potential seasonal forage area which are widespread in surrounding landscape.	No significant impact
Syconycteris australis Common Blossom Bat (Vulnerable)	Not identified onsite during current survey but identified during previous (1997) survey. Impact restricted to trees unlikely to be used for foraging or roosting.	No significant impact
Mormopterus norfolkensis Eastern Freetail Bat (Vulnerable)	Not identified onsite during current or previous (1997) survey. Impact restricted to minor reduction in potential roost trees (hollows) which are widespread in surrounding landscape.	No significant impact
Miniopterus australis Little Bentwing Bat (Vulnerable)	Identified onsite during current survey. Does not roost in tree hollows. No impact from proposed pruning activity.	No significant impact
Miniopterus orianae oceanensis Common Bentwing Bat (Vulnerable)	Identified onsite during current survey. Does not roost in tree hollows. No impact from proposed pruning activity.	No significant impact

Applying the eight (8) part test under Part 5 of the EP&A Act it was found that the low level of impact caused by pruning of trees is unlikely to cause any significant impacts on threatened species or vegetation communities potentially present within the OLS areas.

National Parks and Wildlife Act (1974)

The BMNU is located partially within the Coffs Coast State Park and as such the NP&W Act applies to impacts on flora and fauna species and communities listed under the TSC Act. Under the, Section 118D *Damage to habitat of threatened species, endangered populations or endangered ecological communities*, Part 1 (1) (NP&W Act), *a person must not damage any habitat of a threatened species, an endangered population or an endangered ecological community if the person knows that the habitat concerned is habitat of that kind*. However, under Section 118G (2) (i) any activity reasonably considered necessary to remove or reduce an imminent risk of serious personal injury or damage to property is a ***routine agricultural management activity*** and is therefore an exempt activity. There is therefore no requirement to obtain an approval for the proposed activities under the NP&W Act.

Fisheries Management Act (1994)

Tree number 36 is a Grey Mangrove *Avicenna marina* which is a mangrove and as such is protected under the FM Act. The activity of pruning of one grey mangrove Part 7 should not trigger the requirement for a permit under Part 7 - Protection of aquatic habitats, rather it is possible that a permit to harm (cut, remove, injure, destroy, shade etc) marine vegetation (saltmarshes, mangroves, seagrass and seaweeds), under Section 205 will be required.

5 CONCLUSION

Coffs Harbour City Council owns and operates the Coffs Harbour Regional Airport (CHRA) and must maintain obligations both in regards to the management of Obstacle Limitation Surfaces (OLS) and the Boambee Creek/Newport's Creek Management Unit (BNMU). This assessment considered ecological and cultural heritage matters with regards to lands adjacent to the CHRA, and whether the available environmental information on lands managed for OLS purposes was current or required updating, including undertaking any necessary environmental investigations. The assessment focussed on lands to be impacted through the management of OLS (through tree pruning) to ensure CHCC is operating in accordance with relevant legislation. The assessment included a review of published documentation and a desktop study of flora and fauna relevant to the CHRA area, and a five day onsite fauna and flora survey carried out in July 2016.

Vegetation mapping for the area shows there are several Endangered Ecological Communities (as Listed under the TSC Act) which are generally wetland communities associated with Boambee and Newport's Creeks that surround the OLS. Onsite observations confirmed that current vegetation mapping is generally correct. A single Threatened Ecological Community (as listed under the EPBC Act) is also present located behind coastal dunes to the east of the OLS area - Lowland Rainforest of Subtropical Australia. This community is also listed as an Endangered Ecological Community under the NSW TSC Act - Lowland Rainforest in the NSW North Coast and Sydney Basin bioregions. None of these listed communities are likely to be significantly impacted by the proposed activities.

The BNMU and more specifically the surveyed OLS areas are generally in good ecological condition. The juxtaposition of the Study area with Newport's and Boambee Creeks creates a diverse range of ecotones between marine and freshwater environments that include; mangroves, saltmarsh, freshwater swamps and terrestrial forested communities. The predominance of sand substrates creates low nutrient communities with a characteristic wallum heath understorey. The diverse range of vegetation communities on sand substrates supports a diverse flora with 246 native species recorded.

No Threatened flora species listed under the EPBC or TSC acts were recorded from within any of the tree height reduction survey areas. Habitat for two threatened species listed under the TSC Act, Leafless Tongue-orchid *Cryptostylis hunteriana* (Vulnerable) and Slender Screw Fern *Lindsaea incisa* (Endangered) occur within the survey areas and may have remained undetected due to their cryptic growth habit and the dense nature of the ground layers. Analysis of the desktop review and onsite observations suggest a further 16 threatened flora species may occur in the CHRA but none were detected within the vicinity of the proposed OLS activity. A further four species of plant listed under the NP&W Act were found to be common in parts of the survey area.

The onsite survey identified 119 fauna species including eight species listed as threatened (Endangered, Vulnerable or Migratory) under the TSC Act and/or EPBC Act. Based on the desktop review including previous survey results a further 12 species were considered as likely or known to occur in the CHRA. Two species listed as Vulnerable under the EPBC Act were identified on the site: New Holland Mouse *Pseudomys novaehollandiae*; and Grey-headed Flying-fox *Pteropus poliocephalus.* Koala *Phascolarctos cinereus,* also listed as Vulnerable under the EPBC Act (and TSC Act) is considered likely to occur in the area based on past presence in the area. Of the remaining species 11 are listed as Endangered or Vulnerable under the TSC Act and six are listed only as Migratory bird species under the EPBC act.

Tree height reduction has been practised within the OLS for decades and many eucalypts within the southern end of the OLS show signs of having been pruned. None of the pruned trees sighted exhibited

signs of fungal infections or die back. This survey identified 15 trees that will require pruning for OLS purposes.

The removal of the upper extremities of these trees will have very minor and localised impacts on the extant native flora or floristic community functioning in the long-term. Impacts from the accessing of the trees and the impact of pruned limbs on shrub and ground layers may have a localised impact in the short-term only. The practise of pruning trees within the OLS has occurred for decades and many of the trees within the forested communities shown signs of having been pruned in the past.

Similarly, impacts to threatened fauna and fauna in general are likely to be very minor and localised. There are no habitat values for threatened fauna present that are not available elsewhere and nearby. Many of the threatened fauna species considered likely or known to be present will not be impacted at all. A qualified ecologist should be present to inspect trees for fauna presence prior to any pruning activity.

An assessment of the OLS impacts on threatened vegetation communities, fauna and flora was carried out under NSW and Commonwealth legislative guidelines. No significant impacts to ecological values of concern are predicted for the OLS activities. As the OLS is located partially within the Coffs Coast State Park, the NP&W Act applies to impacts on flora and fauna species and communities listed under the TSC Act. However, the proposed activities are considered a 'routine agricultural management activity' for the purposes of the NP&W Act and therefore there is no requirement to obtain an approval for the proposed activities. The pruning of a single Grey Mangrove *Avicennia marina* for OLS purposes may require a permit under the *Fisheries Management Act 1994*.

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