

BLACKWOOD ECOLOGICAL SERVICES



Vegetation Management Plan Lennox Head (Coastal)

Ballina Shire Council
August 2018

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1 INTRODUCTION

1.1 Background

Ballina Shire Council (BSC) and Lennox Head Landcare Inc. have engaged Blackwood Ecological Services to prepare a Vegetation Management Plan (VMP) for Public Reserves located along the coastal escarpment from Sharpes Beach to Seven Mile Beach, Lennox Head. The VMP is required to upgrade and consolidate several older plans. Significant restoration works have been undertaken across much of the project area since the preparation of these plans and the revised VMP is to account for these site changes.

A version of this VMP was produced in June 2017. This current version has been revised to reflect recent changes in environmental legislation in NSW.

1.2 The Subject site

The Subject site includes both council managed land and crown land located along the coastal escarpment from Sharpes Creek north to Seven Mile Beach, Lennox Head. The location and extent of the site is illustrated in **FIGURE A.1** and an aerial view is provided in **FIGURE A.2** in **APPENDIX A**. It includes coastal vegetation from Sharpes Creek in the south to the Ballina-Byron LGA boundary, north of Lake Ainsworth.

1.3 Aims and objectives

The aim of this VMP is to provide strategies, actions and a works schedule to assist in the restoration of the structure, function, integrity and dynamics of the native vegetation communities across the Subject site as well as reconstruct severely degraded zones, and continue to manage all areas with respect to their ecological and cultural values.

The objectives of the VMP and its recommended works are to:

- assess the current condition of site vegetation and determine the regeneration potential;
- provide updated information on weed species, distribution, weed control and restoration techniques;
- provide information on threatened species and endangered communities known to occur within the Subject site;
- identify and assess threats that are contributing to the degradation of vegetation communities;
- make recommendations for the restoration, and where necessary reconstruction, of the vegetation communities;
- make recommendations for the enhancement of threatened fauna habitat;
- suggest best practice methods to undertake vegetation restoration with the aim of maintaining dune stability and improving resistance to erosion;
- suggest appropriate generic weed control methods, adapting these as required to be suitable for works in culturally sensitive areas;
- recommend strategies to consolidate the existing vegetation through the planting of local native species in areas where natural regeneration is least likely to occur (i.e. sites that are highly disturbed and/or physically compacted);
- increase public awareness of the importance of coastal vegetation and encourage local stewardship for the area;
- act as a supporting document for further funding;
- offer guidelines for regulatory action by BSC where needed to adequately protect vegetation communities; and

- assist fauna/flora corridor development and improve habitat connectivity north to south along the coastline as well as westwards to the Lennox Head Nature Reserve and Ballina Nature Reserve.

1.4 Consultation

As part of the preparation of this VMP consultation has been undertaken with the following groups/stakeholders:

- Ballina Shire Council (BSC)
- Lennox Head Landcare Inc. (LHL)
- Ballina Coast Care (BCC)
- Jali Local Aboriginal Land Council.
- The Ballina Shire Council Aboriginal Community Committee (BSCACC)

The groups listed above were also invited to provide comment on the draft report.

1.5 Structure of this report

This report provides information on the following aspects of the VMP project area:

Chapter 2

- Background information on the VMP project area including zoning, previous VMPs, active landcare groups and bush regeneration contracts. Also includes a discussion of relevant approved and proposed developments within the VMP project area.

Chapter 3

- Background information on Aboriginal history within the VMP project area and protocols for undertaking vegetation management works within areas of cultural significance.

Chapter 4

- Relevant weed legislation including known Priority weeds and Weeds of National Significance (WoNS) which occur in the VMP project area.

Chapter 5

- Details on vegetation communities which occur in the VMP Project area as well as threatened species/communities known to occur in the VMP project area. Brief discussion on threatened fauna habitat and threatened fauna species previously recorded within the Ballina LGA.

Chapter 6

- Brief overview of relevant infrastructure and visitor services located within the VMP project area and discussion on the management and maintenance of such facilities.

Chapter 7

- Discussion of various vegetation management issues often encountered when undertaking bush regeneration works as well as recommended guidelines for best practice.

Chapter 8

- Delineation of works zones and recommendations on various work activities to be undertaken and relevant responsibilities.

Chapter 9

- Monitoring and record keeping requirements.

Chapter 10

- References.

2 SITE BACKGROUND

2.1 Introduction

This section provides background information about the VMP project area including climate, zoning, geomorphology, previous management plans, active volunteer landcare groups, current bush regeneration contracts and approved and proposed developments.

2.2 Climate

The region has a warm temperate climate with a pronounced summer/autumn “wet” season and “dry” mild winters. Rainfall is strongly seasonal with approximately 60% of the annual average rainfall (of 1791mm) falling in the months of January to May. March is traditionally the wettest month with 215mm and September the driest with 64mm. The warmest month is January with an average maximum temperature of 28.2°C and July the coldest with average maximum temperatures around 20°C (Bureau of Meteorology 2014). Frosts are generally absent in the immediate coastal strip. The prevailing wind is from the south-east, however there are strong northerly winds throughout the summer months (BSC 2003).

2.3 Land tenure and management requirements

The Subject site is located within the Ballina Local Government Area (LGA) and is subject to the Ballina Local Environmental Plan 1987 (BLEP 1987) and the BLEP 2012. The entire extent of the Subject site is identified as a deferred matter under the BLEP 2012 and is therefore still subject to the BLEP 1987. **FIGURE A.3** in **APPENDIX A** illustrates the zonings applicable across the Subject site. **TABLE 1** below provides a summary of each applicable zoning including the objectives and development restrictions. **TABLE 2** details the land tenures applicable to the VMP project area and includes Council owned land some of which is classified for community purposes as well as Crown land and leased private land. Land tenures are illustrated in **FIGURE A.4** of **APPENDIX A**.



TABLE 1
BLEP ZONES APPLICABLE TO THE SUBJECT SITE

Zone	Primary objectives	Notes
BLEP 1987		
7(a)Environmental Protection - Wetlands	The primary objectives are: (a) to protect and conserve significant wetlands, and (b) to prohibit development which could destroy or damage a wetland ecosystem.	No development is permitted without development consent.
7(d)Environmental Protection – Scenic escarpment	The primary objectives are: (a) to protect and enhance those areas of particular scenic value to the Shire of Ballina, and (b) to minimise soil erosion from escarpment areas and prevent development in geologically hazardous areas.	Agriculture (other than feed lots, piggeries, poultry farms, stock homes and other intensive keeping of animals and not including the erection of buildings) is permitted without development consent.
7(f)Environmental Protection – Coastal lands	The primary objectives are: (a) to protect environmentally sensitive coastal lands, and (b) to prevent development which would adversely affect or be adversely affected, in both the short and long term, by the coastal processes.	No development is permitted without development consent.
7(l)Environmental Protection - Habitat	The primary objective is to protect areas of particular habitat significance.	No development is permitted without development consent.

TABLE 2
LAND TENURES APPLICABLE TO THE VMP PROJECT AREA

Parcel No.	Lot	Section	Plan	Owner	Classification	Crown Reserve
682	3		590466	Ballina Shire Council	Managed	
878	2		241434	The State of NSW	Managed	
921	8		785148	Ballina Shire Council	Community	R3146
923	5		241434	Ballina Shire Council	Managed	
949	3		573196	Ballina Shire Council	Community	R3067
954	128		755684	Ballina Shire Council	Managed	
1441	120		29654	Ballina Shire Council	Community	
7512	1		509389	Planning & Infrastructure	Managed	
8373	62		755725	The State of NSW	Managed	
15354	2		592045	Ballina Shire Council	Managed	
15361	1		592045	Ballina Shire Council	Managed	
16371	171		880609	Ballina Shire Council	Community	
17147	7004		96435	The State of NSW		
17148	7005		96435	The State of NSW		
17685	7001		1052251	Ballina Shire Council	Managed	
17686	7002		1052251	The State of NSW		
17687	7006		1052252	The State of NSW	Managed	
17876	7035		1063864	Ballina Shire Council	Managed	R3106
17879	7011		1063876	Ballina Shire Council	Managed	
17881	7031		1063878	Ballina Shire Council	Managed	
17882	7033		1063883	Ballina Shire Council	Managed	
17885	7032		1063896	The State of NSW	Managed	
17887	7026		1064254	Ballina Shire Council	Managed	
17888	7027		1064266	Ballina Shire Council	Managed	
17895	7029		1064319	Ballina Shire Council	Managed	R3106
17897	7003		1065854	The State of NSW		
17898	7008		1065855	The State of NSW		
17899	7009		1065855	Ballina Shire Council	Managed	
51690	1	1	11687	Ballina Shire Council	Community	R3068
51696	2	1	11687	Ballina Shire Council	Community	R3068
51697	3	1	11687	Ballina Shire Council	Community	R3068
51698	4	1	11687	Ballina Shire Council	Community	R3068
51700	11	1	11687	Ballina Shire Council	Community	R3068
51702	13	1	11687	Ballina Shire Council	Community	R3068
51783	140		755725	The State of NSW		
1000368	7040		1071319	Ballina Shire Council	Managed	
1000369	7039		1071328	Ballina Shire Council	Managed	
1000373	7038		1071434	Ballina Shire Council	Managed	
1001315	7017		1113619	The State of NSW		
1001816	7300		1122060	The State of NSW		
1002312	1		1115145	Ballina Shire Council	Managed	
1002313	2		1115145	Ballina Shire Council	Managed	
1002314	3		1115145	Ballina Shire Council	Managed	
1004037	7302		1157002	The State of NSW		
1004890	5		1184436	Dr PW & Mrs RM Stewart	Community (Leased)	
1001319	7016		1113629	The State of NSW		
1004889	4		1184436	Dr PW & Mrs RM Stewart	Community (Leased)	

2.4 Coastal Management SEPP

The Coastal Management SEPP consolidates the superseded SEPP 14 (Coastal Wetlands), SEPP 26 (Littoral Rainforests) and SEPP 71 (Coastal Protection). The Coastal Management SEPP outlines a range of development controls that aim to help protect and manage our sensitive coastal environments, manage risks from coastal hazards, and support appropriate urban development. Development controls for the mapped coastal wetlands and littoral rainforests area aim to continue existing protections for these important ecological communities

A large SEPP Coastal wetland area is located to the west of Lake Ainsworth and extends up to the northern edge of the project area. It comprises areas of wet heathland and swamp paperbark located along The Coast Road. Several subzones located within the VMP project area occur within or partially overlap this SEPP wetland area:

- the majority of subzone 9c (west of Lake Ainsworth);
- the majority of subzone 10d; and
- the northern section of zone 10b (east of The Coast Road).

The SEPP Coastal wetland proximity area extends into subzones 9a and 9b and the northern section of subzone 10a. An area of SEPP Coastal wetland is located on the western side of the Coast Road north west of Iron Peg. The proximity area for this wetland extends into subzone 3a and the southern section of subzone 3b.

One area of SEPP Littoral Rainforest occurs within the VMP project area on the eastern side of The Coast Road at the southern end of Boulder Beach within an area of remnant vegetation in subzone 3b. A number of additional SEPP Coastal wetland and SEPP Littoral rainforest are located within the wider study area on the western side of The Coast Road. SEPP Littoral rainforest proximity areas extend into subzones 3b and 3c and the northern end of subzones 10b and 10c.

FIGURE A.5 shows the location of SEPP Coastal wetland and SEPP Littoral rainforest areas within the VMP Project area.

2.5 Geomorphology

The following information was obtained for the previous VMPs prepared by EnvITE. Geomorphology of the VMP project area is discussed from south to north.

According to Morand (1994), beach landscapes of mainland and barrier beaches and associated foredunes and hind dunes are of Quaternary (Holocene) sands. The limitations of this landscape are its non-cohesive nature, highly permeable soils of low fertility and a low water holding capacity. There is an extreme wind and wave erosion hazard and localised steep slopes. Boulder Beach is covered with basalt boulders that blanket most of the intertidal area. The relatively short distance between the headlands and abundance of boulders does not allow an extensive fine-grained depositional environment to develop.

The headland of Lennox Head measures 65m at its highest point and falls abruptly to the sea. The majority of the Lennox Point study area is based on shallow ferrosol soils overlying Lismore Basalts. In places the site slopes steeply and is susceptible to mass movement. This generally consists of flows and debris slides (Morand, 1994). Morand (1994) goes on to state that Foundation Hazard is high in these landscapes and that there is high to severe limitations for Urban or Rural capability. This is due to steep slopes, mass movement hazard, shallow soils, non-cohesive soils and localised waterlogging. However, as growth media, these soils are known to be of moderate to high suitability. The soils are very well structured, self-mulching, with high organic content, nutrient

capacities and cation exchange capacity. Available water-holding capacity is moderate while available phosphorus can be low (Morand, 1994).

Seven Mile Beach is formed upon Quaternary (Holocene) beach and dune sand. The beach itself consists predominantly of coarse grained quartz sand with some shell fragments deposited by wave action. The dunes consist of fine to coarse grained aeolian quartz sands (Morand, 1994). The topography of Seven Mile Beach, and in particular the foredunes, is subject to continual changes in response to wave energy and tidal dynamics. The beach is prone to severe wave attack during high seas and wind erosion can create blowouts, particularly in beach access areas.

Lake Ainsworth is a perched lake consisting of aquifer fed waters trapped above a layer of impervious coffee rock (indurated sand) (AWACS, 1996). The study area lies on an extensive coastal heath interrupted by ancient Pleistocene dunes and Melaleuca wetlands (Morand, 1994). This Pleistocene barrier is presumed to be of the last Interglacial Age (C120 000 years old) (AWACS, 1996) and is made up of sands and clays deposited by marine and estuarine sedimentation. Groundwater immediately to the west of Lake Ainsworth flows away from the lake towards the Newrybar Swamp. It has been concluded that the groundwater divide around the lake coincides approximately with the boundary of the surface water catchment (AWACS, 1996).

2.6 Historical land uses

Various past land management practices, operations and developments have had a lasting impact on site vegetation and landform. Historical information was obtained from the previous VMP's prepared by EnviTE and is summarised below:

- Mineral sandmining was carried out along Seven Mile Beach from the 1930's to 1970's and has altered the structure of the dunes.
- Heathland to the north of Lake Ainsworth was regularly burnt up until the 1960s to protect newly established homes around the lake.
- Recreational pursuits in and around Lake Ainsworth saw the clearing of riparian and littoral vegetation along the eastern and southern portions of the lake.
- Erosion control works along Seven Mile Beach within the vicinity of Lennox Head township.
- Vegetation clearing associated with the development of residential and commercial properties.
- Lennox Point was cleared of vegetation in the early 1900's and was used for grazing at times until the 1970s when the land was acquired by BSC.
- Hydrological alterations associated with stormwater impacts from adjacent residential estate developments.
- Sandmining at the northern end of Boulder Beach has resulted in the complete removal of the dunal system.

2.7 Literature review

2.7.1 Previous vegetation management plans

A number of management plans have been prepared previously for the Subject site. Significant restoration works have been undertaken based upon the recommendations made in these plans and they provide a detailed background on site condition and history.

2.7.1.1 Sharpes Creek to Shag Rock Vegetation Management Plan (Envite 2004)

This VMP provides strategies, methods and a prioritised work program for restoration of coastal vegetation, east of The Coast Road from Sharpes Beach to Shag Rock. Vegetation along this stretch

of coast is described in detail and includes coastal dune grasslands, littoral rainforest, coastal shrubland and wetland habitats. Key threats to this vegetation identified in the report include weed infestation, informal pedestrian and vehicular tracks, erosion, altered hydrological regimes, development pressure, illegal camping, rubbish dumping, uncontrolled domestic animals and bushfires. Flora surveys undertaken recorded one threatened flora species Red Lilly pillie (at the southern edge of the patch of SEPP Littoral Rainforest at the southern end of Boulder Beach) and three rare species *Cordyline congesta*, *Tapinosperma pseudojambosa* and *Plectranthus cremnus*. Three main work zones and a number of smaller sub-zones are outlined in the VMP.

2.7.1.2 Lennox Point Vegetation Management Plan (Envite 2006)

This plan was prepared to update the original plan prepared in 2002 and guide specific actions and new works as a result of funding provided by the Northern Rivers Catchment Management Authority (NRCMA). The plan provides a detailed description of existing vegetation including grasslands, wetlands, littoral rainforest and coastal heath. The majority of vegetation is in a disturbed and fragmented state due to past clearing, grazing and subsequent weed infestation as well as informal access tracks. The plan proposes to gradually and systematically remove weed species (dominate species being Lantana and Bitou bush) allowing native habitat to regenerate. In areas where natural regeneration is unlikely, the planting of appropriate native species is recommended. Site assessment included a flora survey. No threatened flora species were recorded but the following threatened species were noted as occurring in the vicinity of Lennox Head Stinking Cryptocarya, White Laceflower and Scented Acronychia. The rare native species *Plectranthus cremnus*, was located but in fewer numbers than is seen on nearby southern headlands. While no detailed fauna survey was undertaken reference is made to a number of threatened fauna species known from the locality including Osprey, Sooty Oystercatcher, Beach Stone Curlew, Black-winged Petrel and Jabiru.

2.7.1.3 Seven Mile Beach (Precinct 2) Beachfront Management Plan (Envite 2005)

This VMP covers the section of coastal dune vegetation along Pacific Parade from the public toilets, south of Byron Street, to Ross Street in the north. This area is divided into five zones (boundaries are delineated by the location of cross streets) and comprises a mosaic of maintained lawn areas with patches of ageing/dead trees (mostly Coast banksia and Horse-tail she-oak), tall exotic grasses, Norfolk Pine and Pandanus. Small windshorn remnants of Littoral rainforest are present towards the northern end of the VMP project area. No threatened flora species were recorded during the surveys along this section of coastline. Key weed species identified include Bitou bush, Madeira vine, Turkey rhubarb, Yucca and Coastal morning glory. Primary threats to vegetation noted in the plan include uncontrolled and inappropriate beach access, erosion, stormwater outlets, weed infestation and the Pandanus planthopper. Rock armouring and dune forming fences have been installed to assist with the accumulation of wind blown sand, particularly along the southern section where foredune vegetation is lacking. The northern section of foredune is in better condition with a dominant cover of Spinifex.

2.7.1.4 Lake Ainsworth Vegetation Management Plan (Envite and WetlandCare Australia 2007)

This VMP covers the area around Lake Ainsworth and is bound to the west by a fire-trail amongst the extensive heathland, dune vegetation to the east, the Sport and Recreation Camp to the north and the Caravan Park to the south. The plan outlines a series of guidelines relating to the protection and enhancement of both terrestrial and aquatic vegetation within this area. The western side of Lake Ainsworth is noted to be in good condition with minimal weed presence, while other areas around the lake are subject to extensive recreational usage which has resulted in heavily modified vegetation. Management of the aquatic vegetation within the lake is addressed including the

mechanical removal of Yellow waterlily and Salvinia as well as the planting of several semi-aquatic species in shallow areas (<1.5m) around the western side of the lake.

2.7.1.5 Seven Mile Beach (Central) Vegetation Management Plan (Envite 2007)

This VMP covers an extensive area of relatively intact vegetation north of Lake Ainsworth up to the Ballina-Byron LGA boundary. Vegetation within this area comprises mostly of Wallum heath, with bands of littoral rainforest and coastal shrubland along the eastern edge and a small grove of Eucalypts in the north-western corner. Vegetation was noted as being in good order with low disturbance and subsequent weed presence. The report notes that aerial spraying of Bitou bush, as well as aerial native seeding, has been successful through the dune areas and allowed native vegetation to proliferate. Weeds were mostly found to be confined to Zone 4 located adjacent to The Coast Road in the north-western corner of the site.

2.7.2 Bitou Bush TAP site plans

Extensive work has been undertaken to control Bitou Bush along the study area coastline as part of the Bitou Bush Threat Abatement Plan (TAP) funding. Aerial spraying and follow-up efforts by landcare and contractors has significantly reduced the extent of Bitou bush infestation within the study area. Follow-up work throughout the treated areas is required to ensure the long-term control of this Weed of National Significance (WONS) within the study area.

There are still dense persisting patches of Bitou Bush in some areas of the VMP Project area including cliff ledges of Lennox Head and the escarpment on the western side of The Coast Road opposite the surfer's carpark. Minor infestations also occur across areas of Lennox Head, Boulder Beach, Lennox Point and along Seven Mile Beach around the Sport and Recreation Centre. These areas are discussed in more detail in the relevant subzone tables in Section 8.

2.7.3 Plans of management relevant to the VMP area

The following provides a summary of previous plans of management which have been prepared for sections of the VMP project area and are of relevance to the restoration and rehabilitation of site vegetation. Plans are listed in reverse chronological order with the most recent first.

2.7.3.1 Lake Ainsworth south eastern precinct concept plan (BSC 2016)

The aim of the Lake Ainsworth south eastern precinct project is to enhance the overall amenity of the precinct, provide improved environmental outcomes and increase the areas available as open space for relaxation, picnics and recreation (BSC 2016). The concept plan outlines a series of major changes to the area including closure of the eastern road, closure of public toilets near the off-leash dog exercise area, proposed future relocation of the surf club to the south and new carparking facilities. The eastern road is to be converted to passive open space with pedestrian access provided along the existing overhead powerline corridor. Rehabilitation works throughout the precinct are detailed with the aim of consolidating lake and beach access points. Additional picnic and BBQ facilities are proposed as well as the planting of mature shade trees in some areas. The key design principles outlined in the concept plan have been incorporated into the relevant management zones of this VMP.

2.7.3.2 Lennox Point wetland restoration strategy (Blackwood Ecology 2015)

This five-year plan was prepared for a 9150m² area of freshwater wetland and adjacent fringing vegetation located at the southern end of Seven Mile Beach, Lennox Head. The area has been designated as an offsite compensation site for the Ballina Heights Estate development. The aim of the plan is to restore areas of freshwater wetland which provide habitat for the threatened species Hairy joint grass and revegetate an area of littoral rainforest located above the wetland. Onsite works in this area have commenced and are being undertaken by East Coast Bush Regeneration

Pty Ltd.

2.7.3.3 Sharpes Beach Master Plan

Blackwood Ecology undertook an Ecological Assessment for the proposed upgrade of the Sharpes Beach carpark in 2012. The plan includes:

- A hard surfaced carpark area providing parking for about 80 vehicles.
- Additional gravel reinforced grass carpark areas (to the north).
- A unisex toilet, storeroom, viewing deck and beach shower.
- A surf life-saving observation tower.
- Picnic facilities.
- Walking tracks to provide access to the beach and north to the Coast Road underpass.
- An emergency vehicle access track to the beach.
- Associated infrastructure including drainage works and fencing.
- An upgraded intersection with the Coast Road.

Any proposed restoration works within the vicinity of Sharpes Beach carpark should take into consideration the design of the masterplan.

2.7.3.4 Ballina Coastal Reserve Plan of Management (Amendment) (BSC 2011)

A Plan of Management (PoM) was developed for the coastal Crown lands within the Ballina Shire, north of the Richmond River. The PoM recommends the creation of a single Reserve for Public Recreation and Coastal Environmental Protection under Section 87 of the Crown Lands Act 1989. The Government gazettal notifications occurred in August 2004, and Ballina Shire Council was appointed Reserve Trust Manager. The PoM outlines a number of management objectives addressing the issues in the reserve together with the strategies and actions to achieve these objectives.

2.7.3.5 Lennox Foreshore Parkland Sheets 1 & 2 (2011)

This document provides a schematic landscape plan for the Lennox Head foreshore area from just north of Lennox Street to the public toilets opposite the shops. The plan outlines the location of visitor facilities, beach access paths, parking areas, grassland areas, rehabilitation areas, proposed mature tree plantings, fences etc. These have been taken into consideration in the preparation of this VMP.

2.7.3.6 Ballina Coastal Reserve Precinct Plans 1-3 (BSC 2009)

Precinct plans 1, 2 and 3 cover the VMP project area and detail specific priority actions based upon recommendations made in the Ballina Coastal Reserve Plan of Management. The priority actions detailed in these plans are listed below:

- Precinct Plan 1 (North Seven Mile Beach to Lake Ainsworth): The priority actions identified for the Precinct are the relocation of the beach vehicle access track, closure of vehicle tracks through the dunes, on-going native vegetation and habitat management and the desire for an increased enforcement of the regulations relating to beach usage.
- Precinct Plan 2 (Lake Ainsworth to Lennox Point (Shag Rock)): The major issue identified in this Precinct is the threat posed by natural coastal erosion. A range of short and long term actions are recommended that may be undertaken to provide short term alleviation of this concern. These include hard works, vegetation and dune management and educating beach users to the benefits of foreshore management. Upgrades are recommended for Pat Morton lookout.
- Precinct Plan 3 (Shag Rock to Sharpes Beach): The priority management actions identified by the Committee were improvement of facilities at Sharpe's Beach including stormwater

management, the provision of improved pedestrian and traffic access and a desire for additional infrastructure to cater to the large number of visitors, native vegetation management of high conservation value areas and coastal erosion.

A number of these management actions have been implemented since the preparation of these plans.

2.7.3.7 Lennox Headland Masterplan (BSC 2006)

This document provides a summary of the proposed infrastructure upgrades associated with the Lennox Point Vegetation Management Plan and the Lennox Headland Masterplan. These include a number of actions such as the construction of an ‘upper lookout area’, whale watching platforms, rainforest walk, seascape loop, public toilets, vegetation restoration works, signage and safety fences. Many of these actions have since been implemented or are currently being implemented and have been incorporated into this VMP.

2.7.3.8 Lake Ainsworth Management Plan (Geolink & BSC 2002)

This plan provides a framework for the effective management of Lake Ainsworth with the overall objective of achieving an integrated, balanced, responsible and ecologically sustainable use of the area in the future. The plan identifies a number of key issues and management actions which are directly relevant to this VMP including:

- rehabilitate coastal dunes to provide a buffer for the lake;
- control the spread of water primrose and other aquatic weeds;
- rehabilitate and restore areas infested with terrestrial weeds;
- target introduced fauna species for the eradication;
- enhance current riparian flora management strategies and ensure revegetation works utilise species that are tolerant to infrequent but potentially prolonged periods of inundation; and
- continue aeration practices to reduce incidence of algal blooms and investigate other strategies to improve water quality such as sediment capping, biomanipulation, sediment removal etc.

These and other management actions relating to traffic management, recreation and aboriginal heritage have been taken into consideration as part of the preparation of this VMP.

2.8 Volunteer landcare groups

Lennox Head Landcare manages seven sites in the VMP project area. These include:

- Two locations along Seven Mile Beach – Dune vegetation from Lennox Head surf club north to the Lake Ainsworth Sport and Recreational Centre entrance. Secondly, sections of wind sheared littoral rainforest along the eastern edge of Pacific Parade around Williams Street are also targeted for invasive weeds.
- Two locations at Lennox Point – End of Dress Circle Drive and surfers stairs
- Skennars Head
- Boulder Beach
- Lake Ainsworth - foreshore

Lennox Head Landcare working bees at each of these sites are generally regular and rotational with individual volunteers overseen by a volunteer site supervisor at each of the sites. New volunteers are always welcome.

Extensive works have been undertaken across the lower sections of Lennox Point including major



weed control and revegetation with local native species. Community planting days are often held in this area as part of the long-term revegetation project.

Lennox Head Landcare also undertake aquatic weed control within Lake Ainsworth as well as regular monitoring of water quality within the lake and surrounding tributaries.

2.9 Current bush regeneration contracts

There are currently five bush regeneration companies working over seven sites within the VMP project area. These include:

- East Coast Bush Regeneration is currently undertaking weed control works across the lower sections of Lennox Point. The work area includes an offset compensation site for the Ballina Heights Estate (refer to Section 2.6.3.2).
- Phillippe Binetruy – Seven Mile Beach Sport and Recreation Camp area.
- Bushland Restoration Services (BRS) – Coastal Fontainea and *Themeda australis* management at Lennox Point, Lennox Headland and Skennars Head.
- Darren Bailey – Seven Mile Beach Bitou Bush control.
- Basically Bush Restoration (BBR) – Lennox Headland planting maintenance.

It should be noted that these contracts can change annually.

2.10 Current and proposed developments of relevance to this VMP

2.10.1 Coastal Recreational Path

The construction of a coastal walking path which extends along the coastal escarpment and hind dunes from Pat Morton lookout at Lennox Head to south Angels Beach has been approved with construction of several sections of asphalt path and raised boardwalk recently completed. The majority of the path will extend along existing informal tracks with some widening to occur in places. New sections of path have recently been completed between Flat Rock and Sharpes Beach car park and south of the Angels Beach carpark. A new section of pathway will also be required behind Boulder Beach wetland. Blackwood Ecological Services have completed a detailed ecological assessment for the proposed path (2013b). Compensation works are required to offset native vegetation loss resulting from the works. A contractor has recently been appointed and restoration works have commenced north of Sharpes Creek as far as the Sharpes Beach carpark. Planning of any further compensation works within the VMP project area should take into consideration the management recommendations outlined in this plan.

2.10.2 Shared Path East and West

A shared path to be utilised by cyclists and pedestrians has also been approved and some sections within the project area have been constructed. The Shared Path (West) has been constructed and links existing paths at Silver Gull Drive in East Ballina with North Creek Road/Amber Drive in Lennox Head via the Skennars Head development. The Shared Path (East) would extend south from Pat Morton Lookout at Lennox Head to Skennars Head Road. Blackwood Ecological Services have completed detailed ecological assessments for both these proposed shared paths (2013c, 2013d & 2012). Compensation works are required to offset native vegetation loss resulting from the works. Planning of any compensation works within the VMP Project area should take into consideration the management recommendations outlined in this plan.

APPENDIX A includes mapping of the Coastal Recreational Path and Shared Path routes.



2.11 Crown Land Management Act 2016

The Crown Land Management Act 2016 (CLM Act) commenced on 1 July 2018, introducing legislation to govern the management of Crown land in NSW.

The CLM Act introduces significant changes to the management of Crown land by councils. Specifically, Councils will now manage their dedicated or reserved land as if it were public land under the Local Government Act 1993 (LG Act). Most of this land is expected to be classified as “community land” under the LG Act, meaning that councils will be required to have plans of management in place for the land. The CLM Act provides a transition period of 3 years from commencement for councils to have these plans in place.

There will remain some marked difference for the management of Crown land and the management of ‘public land’ under the LG Act as a result of additional statutory requirements provided by the CLM Act, which will be reflected in guidance provided to councils. This primarily relates to the management of native title responsibilities on Crown reserves.

3 ABORIGINAL CULTURAL HERITAGE MANAGEMENT

3.1 Introduction

This section discusses the indigenous heritage values associated with the study area and outlines specific management measures relevant to ensuring the long-term protection of these values and places.

3.2 Aboriginal History in the VMP project area

The following information was obtained from the previous VMPs prepared by EnviTE.

A well preserved Bora Ring is located in Gibbon Street in Lennox Head. This ceremonial site for the Nyangbul people (a sub-group of the Bundjalung) and the adjacent well established workshop areas, campsites and middens bear witness to long occupation and was declared an Aboriginal Place under the management of the National Parks and Wildlife Service (NPWS) in 1973.

Jolander Nayutah from the Gungil Jindabah Centre at Southern Cross University (Lismore) has advised that Lake Ainsworth to the north of town is the subject of a dreaming story. This refers to three Bundjalung brothers, which has been documented by NPWS officers (AWACS, 1996). The lake was also known to contain large eels and turtles in the past that would have supplemented other food resources such as the Pipi (*Plebidonax deltoides*) and seasonal mass gatherings of spawning mullet, tailor and salmon.

Midden sites have also been recorded to the north and south of Seven Mile Beach on old remnant dunes behind the beach and small deposits of *Turbinidae* sp. shells have been uncovered near the old four-wheel-drive beach access track by Dunecare workers.

Quartz was reportedly mined at Iron Peg for cutting tools.

3.3 Aboriginal relics

The Ballina Shire Council Aboriginal Community Committee (BSCACC) has recently been established as the consultative body for indigenous related matters within the Ballina Shire.

Consultation with the BSCACC should occur prior to undertaking any works that involve disturbance of the ground surface (with the exception of planting works) to determine if any identified sites/ objects have been recorded under the Aboriginal Heritage Information System (AHIMS) and to determine subsequent management/ consultation requirements to ensure their protection.

While the proposed works will create minimal disturbance, artefacts or shell middens could be encountered during restoration works. In the event that any Aboriginal artefacts, skeletal remains or shell midden materials are encountered, works are to stop and the Sites Officer is to be notified immediately. Works are not to commence until the Sites Officer gives his or her approval. This includes emergency beach track erosion works.

4 RELEVANT WEED LEGISLATION & LISTS

4.1 Introduction

This section provides details on licencing and training required for working around threatened species, TECs and/or indigenous heritage items/places. In addition, information is given on priority weed legislation relevant to this VMP and provides background information on different weed categories.

4.2 Definition

The use of the term ‘exotic species’ or ‘weed’ in this VMP applies to any species which is considered invasive and does not belong in a specific area. This includes both non-local native species and exotic species.

4.3 Weed Species Categories

Weeds are often classed in broad groups depending on their characteristics and types of threats they pose. Several different categories of weeds (priority weeds, environmental weeds, WONS, National Environmental Alert List Weeds) are recognised at a national, state, regional (catchment) and local level as described below.

4.3.1 Priority weeds

Consistent with new Commonwealth biosecurity measures, NSW has reformed its weed, pest and disease legislation. The NSW Biosecurity Strategy 2013-2021 and NSW Biosecurity Act (2015) provide a framework for safeguarding primary industries, natural environments and communities from a range of pests, diseases and weeds. The NSW Biosecurity Act (2015) repeals the Noxious Weeds Act (1993).

The North Coast Regional Strategic Weed Management Plan has been developed in response to these reforms and lists priority weeds for the North Coast area. The regional weed management categories are summarised in **TABLE 3**.

TABLE 3
REGIONAL WEED MANAGEMENT OBJECTIVES

State Objective	Priority Weed	Control requirements
Preventions		Species not known to be present in the region. High likelihood of arrival in the region.
Eradication		Present to a limited extent only with a high feasibility of coordinated control.
Containment		These weeds have a limited distribution in the region. While broad scale elimination is not practicable, minimisation of the biosecurity risk posed by these weeds is reasonably practicable.
Asset protection		These weeds are widely distributed in some areas of the State. Unlikely to be eradicated or contained. Effort is focussed on reducing weed threats to protect priority high value assets.
Additional concern	species of	These species are a high priority for asset protection. Many are actively managed under a number of current programs, or are commercial species with a manageable biosecurity risk. It is not feasible to contain or eradicate these species, however minimising their impacts is reasonably practicable.

Priority weeds declared for the Ballina Shire Council area which occur within the VMP project area include:

- African boxthorn [*Lycium ferocissimum*] Asset protection
- Ground asparagus [*Asparagus aethiopicus*] Asset protection

- Camphor laurel [*Cinnamomum camphora*] Asset protection
- Crofton weed [*Ageratina adenophora*] Asset protection
- Groundsel [*Baccharis halimifolia*] Containment
- Prickly pear [*Opuntia* sp.] Asset protection
- Bitou bush [*Chrysanthemoides monilifera* ssp. *rotundata*] Containment
- Lantana [*Lantana camara*] Asset protection
- Yellow bells [*Tecoma stans*] Containment
- Salvinia [*Salvinia molesta*] Asset protection
- Water hyacinth [*Eichhornia crassipes*] Containment

4.3.2 Environmental Weeds

Environmental weeds are defined as non-indigenous plant species that have invaded (or have the potential to invade) natural ecosystems and threaten (or have potential to threaten) environmental and/or conservation assets. Invasions of environmental weeds often reduce plant diversity and result in a loss of habitat for native animals (Muys, 2001). Environmental weeds can be declared priority weeds however a number of serious environmental weeds are not included in the classifications of the Biosecurity Act. Environmental weeds can also be Australian native species that are not local (indigenous) to an area but have the potential to damage the local plant community.

4.3.3 Weeds of National Significance (WoNS)

Thirty two WoNS have been identified by the Commonwealth Government based on their invasiveness, potential for spread and environmental, social and economic impacts. A list of 20 WoNS was endorsed in 1999 and a further 12 were added in 2012. WoNS known to occur within the VMP area include:

- Madeira vine
- Ground asparagus fern
- Bitou bush
- Lantana
- African boxthorn
- Prickly pear
- Water hyacinth
- Salvinia
- Fireweed

4.3.4 National Environmental Alert List Weeds

Under the National Weeds Strategy, 28 environmental weeds were identified National Environmental Alert Weeds. Alert Weeds are non-native plant species that are in the early stages of establishment and have the potential to become a significant threat to biodiversity if they are not managed. None of the listed weeds were recorded within the VMP Project area at the time of the survey.

5 SITE DESCRIPTION, ECOLOGICAL VALUES AND CONSTRAINTS

5.1 Introduction

This section provides details on the ecological attributes and values of the Subject site including vegetation communities, Threatened Ecological Communities (TECs), threatened species, threatened fauna habitats and priority weeds. Information in this section was obtained during the site surveys undertaken in May 2016. Additional information has been collated from a variety of sources including but not limited to:

- Previous VMPs applicable to the Subject site;
- Previous ecological assessments undertaken by Blackwood Ecological Services within the Subject site including detailed flora and fauna surveys undertaken for the proposed Coastal Recreational Path (Angels Beach to Lennox Head);
- Vegetation mapping provided by BSC; and
- NSW Wildlife Atlas

5.2 Flora species

A native species list has been generated for the VMP project area and is provided in **APPENDIX J**. This list has been compiled from a number of sources including:

- previous Envite VMPs for the area;
- LHL native species lists; and
- previous flora surveys undertaken within the VMP area by Blackwood ES, including those for the Coastal Recreation Path (CRP).

It should be noted that this list may not be exhaustive and additional species should be added as required once accurately identified.

5.3 Vegetation communities

Seven main vegetation communities were identified across the Subject site and are outlined in **TABLE 4**. Mapping of the vegetation communities across the project area has been divided into relevant management zones. These are discussed further in Section 8. **APPENDIX A** includes vegetation mapping for the project area.

**TABLE 4
VEGETATION TYPES LOCATED WITHIN THE VMP PROJECT AREA**

Vegetation Class	Vegetation Type
1 Coastal grasslands/herblands	1a <i>Themeda australis</i> dominant grassland
	1b Blady grass dominant grassland
	1c Foredune grassland/herbland (<i>Spinifex</i> / <i>Pigface</i> / <i>Goats foot convolvulus</i> / <i>Dune bean</i>)
	1d Exotic dominant grassland
2 Coastal shrubland to open woodland/forest	2a Coast banksia dominant
	2b Mixed native species (<i>Coast banksia</i> / <i>Screw pine</i> / <i>Horsetail oak</i> / <i>Swamp oak</i> / <i>Coastal wattle</i>)
	2c Coastal cypress pine forest
	2d Exotic dominant (<i>Bitou bush</i> / <i>Lantana</i>)
3 Littoral rainforest	3a Mid-high closed Littoral rainforest
	3b Regenerating/disturbed Littoral rainforest
	3c Littoral rainforest restoration plantings

4	Coastal floodplain wetlands	4a	Tall grassland/rushland (Native reed/Cumbungi)
5	Coastal swamp forest	5a	Swamp sclerophyll woodland/forest (Broad-leaved paperbark +/- Swamp mahogany)
6	Heathland	6a	Wallum sand heath (Wallum banksia with mixed species)
7	Cleared/managed areas	7a	Modified vegetation/unvegetated

5.3.1 Coastal grasslands

5.3.1.1 *Themeda australis* dominant grassland

This vegetation type occurs along exposed coastal headlands within the central section of the VMP project area. The largest intact areas of *Themeda australis* grassland are present along the coastal escarpment east of Skennars Head (Whites Head) and along sections of the headland south of the Pat Morton Lookout. Smaller patches of this community also occur outside these areas at Iron Peg and Lennox Point. In areas dominated by exotic grassland, small patches of *Themeda australis* grassland were mostly restricted to the windswept, seaward edge of the headlands and along the edge of the existing track. High winds along the cliff edge and mowing of the existing grass track are likely to reduce competition by exotic grasses in these areas allowing *Themeda australis* to dominate. The community is described as a low closed tussock grassland dominated by Kangaroo grass (*Themeda australis*). Other native species noted within this community include Dune bean (*Vigna marina*), Centella (*Centella asiatica*), Stinking pennywort (*Hydrocotyle laxiflora*), Blady grass (*Imperata cylindrica*), *Senecio pinnatifolius*, *Plectranthus cremnus*, Woolly glycine (*Glycine tomentella*), Knobby clubrush (*Isolepis nodosa*), Slender riceflower (*Pimelea linifolia*), Golden everlasting (*Xerochrysum bracteatum*), Angled lobelia (*Lobelia alata*), *Rostellularia adscendens*, Slender flat sedge (*Cyperus gracilis*), Bunchy sedge (*C. polystachyos*) and Blown grass (*Lachnagrostis filiformis*). Common exotic species include Buffalo grass (*Stenotaphrum secundatum*), Kikuyu (*Pennisetum clandestinum*) and Fireweed (*Senecio madagascariensis*). In areas where Blady grass dominates, the vegetation was classed as Type 1b and where exotic grasses dominate the vegetation was classed as Type 1d. The low-growing herb, *Plectranthus cremnus*, which was recorded at a number of locations throughout this community, is listed as a ROTAP species.



PLATE 1
Themeda australis
grassland on
coastal
headlands

5.3.1.2 Blady grass dominant grassland

This vegetation type describes mid-high grassland areas dominated by Blady grass. This vegetation type occurs as small patches within the VMP project area and its presence typically indicates previous disturbance. It occurs to the south of the Pat Morton Lookout and Iron Peg as well as

amongst Spinifex dominant foredune vegetation along Seven Mile Beach where it occurs as a mosaic with exotic dominant grassland.



PLATE 2
Blady
grass
dominant
patch
along hind
dune
north of
Lake
Ainsworth

5.3.1.3 Foredune vegetation

This community type describes foredune vegetation occurring along the beaches within the Study area including Sharpes Beach and Seven-Mile Beach. Vegetation is characterised by a low open grassland/herbland/low shrubland dominated by Coastal spinifex (*Spinifex sericeus*) with Pigface (*Carpobrotus glaucescens*), Goats foot convolvulus (*Ipomoea brasiliensis*), Dune bean (*Vigna marina*), Blady grass (*Imperata cylindrica*), Prickly couch (*Zoysia macrantha*) and *Melanthera biflora*. Vegetation cover is sparse where erosional forces dominate. The extent of the exotic species Bitou bush has been reduced in recent years as a result of ongoing weed control works but it is still prevalent in areas.



PLATE 3
Foredune
vegetation
along
Seven Mile
Beach

5.3.1.4 Exotic dominant grassland

This vegetation type occurs across large sections of the coastal escarpment and disturbed foreshore areas of Seven Mile beach. This community includes areas managed for recreation as well as untended patches and is often interspersed with areas of Community type 1a.

Characteristic grasses in this community type include Buffalo grass (*Stenotaphrum secundatum*) and Kikuyu (*Pennisetum clandestinum*) with Summer grass (*Digitaria ciliaris*) and Molasses grass (*Melinis minutiflora*) also occurring in areas around the wetland area at Boulder Beach and Durban grass (*Dactyloctenium australe*) in dunal vegetation along Seven Mile Beach. Low thickets of Lantana, Bitou bush and scattered Veined verbena (*Verbena rigida*) were common in this vegetation type. The native species Snake vine (*Stephania japonica* var. *discolour*), Melanthera (*Melanthera biflora*), Coastal wattle (*Acacia sophorae*) and Blady grass (*Imperata cylindrica*) were also common.

This community also occurs along the existing grass tracks within the Subject site, primarily south of the Pat Morton Lookout and south of Iron Peg. In these areas the characteristic species include African lovegrass (*Eragrostis curvula*) and Parramatta grass (*Sporobolus africanus*) both of which are capable of growing in compacted soils and commonly occur along walking tracks. Other species present to a lesser extent include Paspalum (*Paspalum dilatatum*), Prairie grass (*Bromus catharticus*) and Couch (*Cynodon dactylon*).

5.3.2 Coastal shrubland to open woodland/forest

5.3.2.1 Coast banksia open forest/woodland/shrubland

This community is common throughout the Study area and is characteristic of well-drained beach ridges and dunes often occurring behind more exposed Spinifex communities on the foredune. The community is characterised by a canopy dominated by Coast banksia (*Banksia integrifolia*) which may form a windsheared shrubland on more exposed beaches or a taller open forest in less exposed sites. Coast banksia communities typically include a developing Littoral rainforest component to varying extents, with Tuckeroo often present in the canopy layer.

Associated tree and shrub species vary greatly across the Subject site depending upon disturbance history, exposure, soil depth and landform location. Disturbed areas may comprise dense thickets of Coastal wattle, Lantana and Bitou bush with scattered Coast banksia.



PLATE 4
Areas of Coast Banksia dominant coastal shrubland with Coastal wattle understorey.

5.3.2.2 Mixed coastal woodland/shrubland(Coast banksia/ Screw pine/ Horsetail she oak / Swamp oak/ Coastal wattle)

The community type describes areas of mixed native vegetation along beachfronts and dune systems where Coast banksia is co-dominant with other native species including Pandanus (*Pandanus tectorius* var. *australianus*), Horsetail oak (*Casuarina equisetifolia*), Black she-oak (*Allocasuarina littoralis*), Coastal cypress pine, Swamp oak (*C. glauca*), Tuckeroo and Coastal wattle (*Acacia longifolia* subsp. *sophorae*). This community typically has a patchy distribution within the Study area. Associated groundcover species vary between sites but typically include Beach spinifex (*Spinifex sericeus*) and Pigface (*Carpobrotus glaucescens*) on exposed dunes and soft herbs and grasses such as Commelina (*Commelina cyanea*) and Basket grass (*Oplismenus aemulus*) at less exposed sites. Exotic grasses are also common in this community.

This community also includes relatively isolated patches of individual species, particularly Pandanus and Horsetail she-oak.



PLATE 5
Area of
Pandanus at
the northern
end of
Sharpe's Beach

5.3.2.3 Type 2c Coast Cypress Pine open forest

Description and location

This community type is more common further down the coast south of Flat Rock and throughout East Ballina where it occurs in patches amongst residential development and in the reserve system. It is less common in the current project area with the most extensive area being a relatively small patch on the eastern side of the Coast Road toward the very north of the project area. Here it forms a near monoculture with Tuckeroo and Beach acronychia present on the margins and Bracken with some Bitou bush and Ground asparagus present in the understorey. This area has been disturbed by trailbike use.



PLATE 6
Area of Coastal
cypress in the
north of the
project area

5.3.2.4 Type 2d Exotic dominant (Bitou bush/Lantana)

Exotic species occur within the majority of vegetation types within the Study area but are generally present as invasive species within an intact or developing native vegetation community type. In some discrete areas patches of vegetation are dominated by exotic species forming Lantana shrubland, Bitou bush shrubland and exotic grassland. These communities typically have some native vegetation component, with Coast wattle, Tuckeroo and Coast banksia saplings growing amongst headland and foredune Lantana/Bitou bush communities.

Bitou bush infestations in particular have been reduced in recent years by aerial spraying and seeding and on ground works.



PLATE 7
Lantana
patch in
foredune
vegetation

5.3.3 Littoral rainforest types

5.3.3.1 Introduction

Littoral rainforest communities occur along coastal dunes as well as in more protected areas behind foredunes where there is still some influence from salt laden winds. This community type would have dominated much of the foredunes and headlands in the project area where it occurs as a lower wind-sheared canopy as well as better-drained protected areas behind the dunes, where the canopy is higher and species diversity greater. In some areas Coastal banksia dominates the canopy, or is co-dominant with Tuckeroo, with a developing Littoral rainforest component in the understorey. Tuckeroo and Guioa are common canopy species in areas of more advanced regrowth. Littoral rainforest grades into Swamp sclerophyll forest in poorly drained dune swales and into drier heathy mixed forest upslope.

Littoral rainforest areas comprise a variety of rainforest species including Tuckeroo (*Cupaniopsis anacardioides*), Beach alectryon (*Alectryon coriaceus*), Beach acronychia (*Acronychia imperforata*), Three-veined cryptocarya (*Cryptocarya triplinervis*), Umbrella cheese tree (*Glochidion sumatranum*), Guioa (*Guioa semiglauca*), Duboisia (*Duboisia myoporoides*), Lilly pilly (*Acmena smithii*), Blue lilly pilly (*Syzygium oleosum*), Yellow pear fruit (*Mischocarpus pyriformis*), Brown kurrajong (*Commersonia bartramia*), Coogera (*Arytera divaricata*) and Coast canthium (*Cyclophyllum coprosmoides*). The native vines Austral sarsparilla (*Smilax australis*), Water vine (*Cissus antarctica*) and Five-fingered water vine (*C. hypoglauca*) are common throughout, particularly around disturbed edges. The groundcover includes a diversity of species and is dependent upon the extent of weed and vine infestation. Species commonly recorded include Blue flax lily (*Dianella caerulea*), Spiny-headed matrush (*Lomandra longifolia*), Bracken (*Pteridium esculentum*), Pastel flower (*Pseuderanthemum variabile*), Commelina (*Commelina cyanea*), Palm lilies (*Cordylina* spp.) and Basket grass (*Oplismenus aemulus*).

Littoral rainforest communities provide habitat for threatened flora species including White laceflower (*Archidendron hendersonii*), Scented acronychia (*Acronychia littoralis*), Durobby (*Syzygium moorei*) and Stinking cryptocarya (*Cryptocarya foetida*).

5.3.3.2 Type 3a Mid-high closed Littoral rainforest

This community type describes areas of well-developed Mid-high closed littoral rainforest within the Subject site, the majority of which is in good condition. Areas of this community occur throughout the project area, including behind Boulder Beach, south of Iron Peg, at Pat Morton lookout and along Seven Mile Beach north of Lake Ainsworth.



PLATE 8
Littoral
rainforest along
Seven Mile
Beach.

5.3.3.3 Type 3b Regenerating/disturbed Littoral rainforest

Description and location

A number of areas within the Subject site that were cleared in the past for sand mining as well as grazing now comprise regenerating littoral rainforest species, particularly in areas where landcare works are being undertaken to reduce densities of weeds such as Lantana. This community is characterised by an open forest of common littoral rainforest species including Tuckeroo (*Cupaniopsis anacardioides*), Guioa (*Guioa semiglanca*), Macaranga (*Macaranga tanarius*) and Three-veined cryptocarya (*Cryptocarya triplinervis*), often with a diversity of regenerating littoral rainforest species in the understorey. More disturbed patches may consist of a closed or open shrubland with emergent rainforest trees and dense patches of exotic species in the understorey.



PLATE 9
Regenerating
littoral
rainforest at
Lennox
Point.

5.3.3.4 Type 3c Littoral rainforest restoration plantings

Description and location

This community type describes planted areas of littoral rainforest species south of Pat Morton Lookout and at Lennox Point. This area has been divided into management sections by the

Landcare group and is being slowly regenerated in stages. Plantings vary in age and density with the earliest most established plantings occurring approximately 30 years ago and recent plantings being undertaken within the last year. More established areas consist of a dense uniform shrub or tree layer between 4 and 7m tall and comprise common littoral rainforest species such as Macaranga (*Macaranga tanarius*), Guioa (*Guioa semiglauca*), Duboisia (*Duboisia myoporoides*), Lilly pilly (*Acmena smithii*), Blue lilly pilly (*Syzygium oleosum*) and Tuckeroo (*Cupaniopsis anacardioides*). Groundcover vegetation in these areas is limited. Less established areas comprise scattered plantings with tree guards amongst a dense groundcover of exotic grasses and herbs.



PLATE 10
Established plantings at Pat Morton Lookout on left and less established plantings shown on right.

5.3.4 Type 4a Tall grassland/rushland (Native reed/Cumbungi)

Description and location

This community describes vegetation within the large wetland area behind Boulder Beach and west of Iron peg as well as small patches of wetland vegetation within Sharpes Creek and at Lennox Point.

Wetland vegetation at Boulder Beach is dominated by Cumbungi (*Typha orientalis*) in deep water with Native Reed (*Phragmites australis*) occurring in shallower areas. Open water areas comprise scattered aquatic species including Eleocharis acuta, Water snowflake (*Nymphoides indica*), Cape waterlily (*Nymphaea capensis*), Water ribbons (*Triglochin procera*), Azolla (*Azolla pinnata*) and Frogsmouth (*Philydrum lanuginosum*). Fringing areas of the wetland comprise Water primrose (*Ludwigia peploides* subsp. *montevidensis*), Smartweed (*Persicaria decipiens*), Spotted knotweed (*Persicaria strigosa*), Knobby clubrush (*Isolepis nodosa*), Water couch (*Paspalum distichum*) and Saltwater couch (*Sporobolus virginicus*) on shallow margins. The exotic grasses Para grass (*Urochloa mutica*) and Molasses grass (*Melinis minutiflora*) occur around the wetland edge.

Sharpes Creek is an ephemeral creek (which flows in wet periods and is dry at other times). The creek is fed from the south-west and travels through a Melaleuca wetland on the eastern side of the Coast Road and discharges into the sea. The creek bed supports a colony of Native Reed (*Phragmites australis*) between 2-3m tall with occasional Swamp oak (*Casuarina glauca*), Broad-leaved paperbark (*Melaleuca quinquenervia*) and Swamp hibiscus (*Hibiscus diversifolius*) along the creek edge.



PLATE 11
Freshwater
wetland
located
behind
Boulder
Beach

West of Iron Peg is an area of Phragmites and Cumbungi with weedy grassy margins and scattered Broad-leaved paperbark. At Lennox Point patches of Phragmites and Cumbungi occur close to the lower walking track. These areas support patches of Hairy joint grass.

5.3.5 Type 5a Mid-high Swamp sclerophyll woodland/forest (Broad-leaved paperbark +/- Swamp mahogany)

Areas of Broad-leaved paperbark dominated swamp forest would historically have occurred throughout low-lying poorly drained areas of the project area. Today this community occurs behind Sharpes Creek, to the north and south of rainforest vegetation at Boulder Beach, around Lake Ainsworth and in dune swales within heathland areas to the north. Broad-leaved paperbark is the dominant species with occasional areas containing Swamp mahogany and some Scribbly gum in drier areas on the margins.



PLATE 12
Broad-
leaved
paperbark
dominated
swamp
forest along
the Coast
Road

5.3.6 Type 6a Wallum sand heath (Wallum banksia with mixed species)

Areas of Wallum sand heath are the dominant vegetation type north of Lake Ainsworth, where this community occurs behind littoral rainforest on the dunes, grading into paperbark forest in the dune swales. This community type includes pools that support *Lepironia*, *Baumea* and other sedge species (mapped as Community 6b).



**PLATE
13**
Heathland
north of
Lake
Ainsworth

5.3.7 Type 7a Modified vegetation/unvegetated

This community type describes other areas of land within the project area including areas managed as garden or landscaping and lawn areas.

5.4 Endangered ecological communities

5.4.1 State listed TECs

A total of four TECs listed under the NSW Biodiversity Conservation Act (2016) occur within the VMP project area in various states of intactness and condition. These are discussed in more detail below. Areas of TEC and developing TEC were mapped within the VMP project area and are illustrated in **FIGURE A.6** in **APPENDIX A**.

5.4.1.1 Littoral rainforest TEC

Littoral Rainforest is generally a closed forest (at least 70% canopy cover), the structure and composition of which is strongly influenced by its proximity to the ocean with exposed patches having a wind-sheared effect and sheltered sites (e.g. behind the southern Boulder Beach dune) being characterised by a taller canopy. The plant species of this community are predominantly rainforest species however scattered emergent individuals of sclerophyll species, such as Coast banksia, occur in many stands. Of the sub-alliances described in the EEC identification guidelines, vegetation within the VMP project area is best described by Sub-alliance 17: Tuckeroo (*Cupaniopsis anacardioides*). This sub-alliance is typically well developed and occurs on deep sand that is more exposed to salt-spray, north from Port Stephens. Common weeds found to occur in this TEC

within the VMP project area include Bitou bush, Coastal Morning glory, Passionfruit species, Winter senna and Lantana.

5.4.1.2 Swamp sclerophyll forest on coastal floodplains TEC

This TEC is generally found close to standing water on soils that are either waterlogged or subject to periodic flooding or inundation. It is usually an open to closed forest with a shrubby or reedy/ferny understorey. Characteristic tree species within the north coast area include Swamp Mahogany (*Eucalyptus robusta*) and Broadleaved paperbark (*Melaleuca quinquenervia*). The Scientific Committee's final determination of the Swamp Sclerophyll Forest does not delineate between higher and lower quality remnants of this community.

Within the VMP project area this TEC consists almost exclusively of Broad-leaved paperbark with only a small area of Swamp mahogany present in the north-western corner of the VMP project area. This TEC predominately occurs around Lake Ainsworth and amongst wet heathland to the north and west. Smaller patches also occur within low-lying drainage swales along The Coast Road west of Boulder Beach. Areas in the northern section of the project area are in good condition however the structure of the community has been modified around the southern and eastern edges of Lake Ainsworth where past clearing has occurred. Some weed incursion is evident in smaller patches to the south, specifically around disturbed edges. Common weeds found to occur in this TEC within the VMP project area include Umbrella tree, Coastal morning glory, Groundsel and Lantana.

5.4.1.3 Themeda grassland on seaciffs and coastal headlands TEC

This TEC occurs on seaciffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner bioregion ecological community. Overall, the TEC has a highly restricted geographic distribution comprising small, but widely scattered patches. Vegetation in Community type 1a is consistent with the description of the TEC *Themeda grassland on coastal headlands*. Within the VMP project area this community occurs along the coastal escarpment at Lennox Point, around Pat Morton Lookout, south of Lennox Head and between Iron Peg and Sharpes Beach. The distribution and condition of this community varies from large *Themeda australis* dominant patches with a variety of native herbs to scattered small occurrences amongst Buffalo dominant grassland. Competition by Buffalo grass has had an effect on the distribution of this TEC in the VMP project area with the majority of *Themeda* occurring along exposed cliff edges and along the edge of the existing track where slashing reduces competition by Buffalo grass.

5.4.1.4 Freshwater wetlands TEC

This TEC is associated with coastal areas subject to periodic flooding and in which standing fresh water persists for at least part of the year in most years. Freshwater wetlands typically occur below 20 m elevation on level areas and are dominated by herbaceous plants and have very few woody species. The structure and composition of the community varies both spatially and temporally depending on the water regime. As standing water becomes deeper or more permanent, amphibious and emergent plants become less abundant, while floating and submerged aquatic herbs become more abundant.

This TEC occurs at Sharpes Creek, behind Iron Peg, behind Boulder Beach, at Lennox Point and amongst wet heathland in the north. The TEC at Sharpes Creek is relatively small in size and restricted to the creek bed and an adjacent low-lying area which is likely to be inundated intermittently. Behind Iron Peg there is a low-lying old paddock south-west of private residence. This area is highly degraded comprising a mosaic of Common reed, Cumbungi, Parra grass, Setaria and Green panic dependent upon frequency of inundation. At Boulder Beach the TEC comprises

floating and submerged aquatic plants in deeper sections with dense stands of Native reed and Cumbungi around the perimeter. This area is in good condition although a number of exotic species are present. The Lennox Point wetland consists of a core wetland area of Cumbungi and Common reed with associated wetland herbs and ferns. The core wetland area is fringed with wetland species heavily infested in parts with exotic species. Areas in the north comprise dense open stands of sedgeland amongst wet heath.

5.4.2 Commonwealth listed TECs

Two Commonwealth listed Threatened Ecological Communities (TECs) listed under the Environment Protection and Biodiversity Conservation Act 1999 occur within the VMP project area.

5.4.2.1 Littoral Rainforest and Coastal Vine Thickets of Eastern Australia TEC

Littoral Rainforest and Coastal Vine Thickets of Eastern Australia TEC is listed as critically endangered under the EPBC Act and comprises areas of littoral rainforest/vine thicket within 2km of the coast that have a closed canopy. It is naturally distributed as a series of disjunct and localised stands occurring on a range of landforms derived from coastal processes. In order to meet the definition of the TEC a number of condition criteria must be met including:

- Minimum patch size of 0.1ha,
- Cover of transformer weeds is 70% or less
- The patch must have:
 - At least 25% native plant species diversity characteristic of the TEC in that bioregion
 - OR
 - At least 30% canopy cover of one rainforest canopy (either tree or shrub) species (excluding Banksia and Eucalyptus species that may be part of the ecological community).

The areas of Littoral rainforest within the VMP Project area which are likely to meet the condition criteria include the large patch of SEPP Littoral Rainforest behind Boulder Beach, an area of regenerating littoral rainforest/vine thicket north of Boulder Beach, established littoral rainforest plantings at Lennox Head and littoral rainforest along dunes of Seven Mile Beach north of Camp Drewe.

5.4.2.2 Coastal swamp oak (*Casuarina glauca*) forest of NSW and SEQ ecological community

Coastal swamp oak (*Casuarina glauca*) forest of NSW and SEQ ecological community is listed as endangered under the EPBC Act and occurs in sub-tropical, sub-humid and temperate climatic zones from north of Gladstone in Queensland to Bermagui in southern New South Wales. It consists of a canopy dominated by Swamp oak and is typically found on coastal flats, floodplains, drainage lines, lake margins, wetlands and estuarine fringes where soils are at least occasionally saturated, water-logged or inundated.

Key diagnostic characteristics of this community type are:

- Occurs from south-east Queensland to southern NSW within the South Eastern Queensland, NSW North Coast, Sydney Basin, or South East Corner bioregions.
- Occurs in coastal catchments at elevations up to 50 m ASL, typically less than 20 m ASL, on coastal flats, floodplains, drainage lines, lake margins, wetlands and estuarine fringes where soils are at least occasionally saturated, water-logged or inundated. There are also minor occurrences on coastal dune swales or flats, particularly deflated dunes and dune soaks.

- Occurs on soils derived from unconsolidated sediments (including alluvium), typically hydrosols (grey-black clay-loam and/or sandy loam soils) and sometimes organosols (peaty soils). It may occur in transitional soils (or catenas) where shallow unconsolidated sediments border lithic substrates.
- Has an open woodland, woodland, forest, or closed forest structure, with a tree canopy that has a total crown cover of at least 10 per cent.
- Has a canopy of trees dominated by *Casuarina glauca*.

Minimum patch size for this TEC type is 0.5ha, although vegetation within patches can be discontinuous.

Swamp oak occurs in several vegetation communities in the project area where it is present in very small patches or as a secondary species in areas of Broad-leaved paperbark forest or mixed coastal shrubland. The project area does not include areas where this community occurs in extensive stands dominated by Swamp oak as is typical elsewhere in the wider locality particularly where there is some saline influenced groundwater on alluvial soils.

5.5 Threatened flora species

5.5.1 Species known to occur within the VMP project area

TABLE 5 lists the threatened flora species known to occur within the VMP project area. This list of threatened species was compiled from a number of sources including NSW Wildlife Atlas, site surveys, Lennox Head Landcare, previous VMPs and ecological assessments. Protocols for working around Threatened flora species are detailed in Section 7. Any new sightings of listed Threatened flora species or identification of a new Threatened flora species is to be reported to the BSC Natural Resource Officer and Lennox Head Landcare Inc. A sample may need to be sent to the NSW Herbarium for identification.

TABLE 5

THREATENED FLORA SPECIES KNOWN FROM THE VMP PROJECT AREA

Species	Distribution and Habitat	Known occurrence in VMP project area
White lace flower <i>Archidendron hendersonii</i> TSC: V	This species occurs in north-east NSW on a variety of soils including coastal sands and those derived from basalt and metasediments. It occurs in riverine and lowland subtropical rainforest and littoral rainforest.	This species was recorded within the SEPP Littoral Rainforest area behind Boulder Beach by Blackwood Ecology as part of surveys undertaken for the CRP in 2011. It may also occur in other areas of Littoral rainforest within the VMP project area, particularly north of Lake Ainsworth. This species also occurs in a number of locations south of the VMP project area near the Flat Rock Tent Park and in the vicinity of The Coast Road, near Angels Beach North. Blackwood Ecology has previously recorded this species at the western end of the coast escarpment between North Creek Road and The Coast Road.
Scented acronychia <i>Acronychia littoralis</i> TSC: E EPBC: E	Scented Acronychia is found between Fraser Island in Queensland and Port Macquarie on the north coast of NSW. It occurs in littoral rainforest on sand.	The NSW Wildlife atlas shows one record of this species west of Lake Ainsworth within the VMP project area. Several additional records are also shown within close proximity to the northern boundary of the VMP project area. This species has also been recorded in previous surveys by Blackwood Ecology to the south of the project area around Angels Beach.
Hairy joint grass <i>Arthraxon hispidus</i> TSC: V EPBC: V	Moisture and shade-loving grass, found in or on the edges of rainforest and in wet eucalypt forest, often near creeks, swamps or seepage areas.	This species is known to occur within the Lennox Point wetland. It is commonly recorded in the locality, predominately to the west of The Coast Road.
Red Lilly pilly <i>Syzygium bodgkinsoniae</i> TSC: V EPBC: V	Usually found in riverine and subtropical rainforest on rich alluvial or basaltic soils.	This species was recorded in 2004 by Envite at the southern edge of the patch of SEPP Littoral Rainforest at the southern end of Boulder Beach.
Coastal fontainea <i>Fontainea oraria</i> TSC: CE EPBC: E	Original population of this species is known to occur in four locations near Lennox Head. These sites occur within a 600 m radius and the total population comprises ten adults and 45 seedlings and juveniles.	The original population is not within the VMP project area however, this population has been expanded through planting of 200 seedlings within the VMP project area. Plantings have been undertaken at several locations at Lennox Point, Lennox Headland at several locations including in the world environment day community tree planting event and within littoral rainforest south of Iron Peg.

5.5.2 Species which may occur in the VMP Project area

Based upon previous surveys, consultation³ and the literature review there are number of additional threatened species known to occur within the immediate Study area which were not recorded within the VMP project area during the survey. These include:

- **Stinking cryptocarya** (*Cryptocarya foetida*) – This species occurs in Littoral rainforest, primarily on sandy soils. The species is known to occur south of the VMP project area. Ballina Coastcare Inc. reports that there is a large mature Stinking cryptocarya to the south-west of the Flat Rock Tent Park which flowers every 3 to 4 years with the last flowering occurring approximately 3 years ago. As a result there are a number of Stinking cryptocarya seedlings within the surrounding area (Black Head to Sharpes Creek) approximately 15-40cm tall. The NPWS Wildlife Atlas also shows 12 records of this species in areas of Littoral rainforest west and north of the VMP project area.
- **Durobby** (*Syzygium moorei*) - This species is known to occur in three locations north of Black Head, around Angels Beach. An older mature individual occurs outside the Shaws Bay café and may be the source tree of the other known occurrences. The NPWS Wildlife Atlas also shows two records of this species to the north of the VMP project area.
- **Necklace pod** (*Sophora tomentosa*) - Two known locations south of the VMP project area, one at Lighthouse Beach and one between Black Head and Flat Rock (source: Ballina Coastcare Inc.).
- **Rusty plum** (*Niemeyera whitei*) - One medium height self-sown individual occurs near Black Head (source: Ballina Coastcare Inc.). The NPWS Wildlife Atlas also shows 4 records of this species in areas of Littoral rainforest north of the VMP project area.
- **Rough-shelled bush nut** (*Macadamia tetraphylla*) - Blackwood Ecology has previously recorded this species at the western end of the coast escarpment between North Creek Road and The Coast Road. The NPWS Wildlife Atlas shows 18 records of this species to the west and north of the VMP project area.
- **Arrow-head vine** (*Tinospora tinosporoides*) – Blackwood Ecology has previously recorded this species within disturbed patches of littoral rainforest to the west of The Coast Road in line with Shag Rock.

5.6 Threatened fauna and habitats

5.6.1 Threatened fauna

A large number of Threatened fauna species have been previously recorded within the Ballina Shire Local Government Area (LGA) according to the NSW Wildlife Atlas database. A list of those species is provided in **TABLE 6** below. Species restricted to marine environments have been excluded from this list.

TABLE 6
NSW WILDLIFE ATLAS DATABASE RECORDS OF THREATENED FAUNA
RECORDED WITHIN THE BALLINA LGA

Common Name	Scientific Name	NSW Status	Commonwealth Status	No. of records
Amphibians				
Pouched Frog	<i>Assa darlingtoni</i>	V,P		1
Wallum Froglet	<i>Crinia tinnula</i>	V,P		87
Green and Golden Bell Frog	<i>Litoria aurea</i>	E1,P	V	2

³ All Ballina Coastcare Inc. records of threatened species have been verified through specimens, by either the NSW or Queensland Herbariums, or else through competent local professional botanists/ecologists.

Common Name	Scientific Name	NSW Status	Commonwealth Status	No. of records
Olongburra Frog	<i>Litoria olongburensis</i>	V,P	V	15
Reptiles				
Three-toed Snake-tooth Skink	<i>Coeranoscincus reticulatus</i>	V,P	V	1
White-crowned Snake	<i>Cacophis harriettae</i>	V,P		1
Birds				
White-bellied sea-eagle	<i>Haliaeetus leucogaster</i>	V,P		91
Magpie Goose	<i>Anseranas semipalmata</i>	V,P		5
Freckled Duck	<i>Stictonetta naevosa</i>	V,P		2
Wompoo Fruit-Dove	<i>Ptilinopus magnificus</i>	V,P		49
Rose-crowned Fruit-Dove	<i>Ptilinopus regina</i>	V,P		104
Superb Fruit-Dove	<i>Ptilinopus superbus</i>	V,P		4
Marbled Frogmouth	<i>Podargus ocellatus</i>	V,P		1
Black-necked Stork	<i>Ephippiorhynchus asiaticus</i>	E1,P		102
Australasian Bittern	<i>Botaurus poiciloptilus</i>	E1,P	E	6
Black Bittern	<i>Ixobrychus flavicollis</i>	V,P		6
Spotted Harrier	<i>Circus assimilis</i>	V,P		21
Red Goshawk	<i>Erythrotriorchis radiatus</i>	E4A,P	V	6
Little Eagle	<i>Hieraaetus morphnoides</i>	V,P		24
Eastern Osprey	<i>Pandion cristatus</i>	V,P		195
Black Falcon	<i>Falco subniger</i>	V,P		1
Brolga	<i>Grus rubicunda</i>	V,P		9
Pale-vented Bush-hen	<i>Amaurornis moluccana</i>	V,P		15
Bush Stone-curlew	<i>Burbinus grallarius</i>	E1,P		8
Beach Stone-curlew	<i>Esacus magnirostris</i>	E4A,P		27
Sooty Oystercatcher	<i>Haematopus fuliginosus</i>	V,P		28
Pied Oystercatcher	<i>Haematopus longirostris</i>	E1,P		428
Greater Sand-plover	<i>Charadrius leschenaultii</i>	V,P	MBA	41
Lesser Sand-plover	<i>Charadrius mongolus</i>	V,P	MBA	62
Comb-crested Jacana	<i>Irediparra gallinacea</i>	V,P		9
Australian Painted Snipe	<i>Rostratula australis</i>	E1,P	E	1
Sanderling	<i>Calidris alba</i>	V,P	MBA	33
Curlew Sandpiper	<i>Calidris ferruginea</i>	E1,P	CE, MBA	122
Great Knot	<i>Calidris tenuirostris</i>	V,P	MBA	77
Broad-billed Sandpiper	<i>Limicola falcinellus</i>	V,P	MBA	9
Black-tailed Godwit	<i>Limosa limosa</i>	V,P	MBA	18
Terek Sandpiper	<i>Xenus cinereus</i>	V,P	MBA	92
Red-backed Button-quail	<i>Turnix maculosus</i>	V,P		2
White Tern	<i>Gygis alba</i>	V,P		2
Sooty Tern	<i>Onychoprion fuscata</i>	V,P		8
Grey Ternlet	<i>Procelsterna cerulea</i>	V,P		1
Little Tern	<i>Sternula albifrons</i>	E1,P	MBA	119

Common Name	Scientific Name	NSW Status	Commonwealth Status	No. of records
Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>	V,P		8
Little Lorikeet	<i>Glossopsitta pusilla</i>	V,P		3
Eastern Ground Parrot	<i>Pezoporus wallicus wallicus</i>	V,P		4
Powerful Owl	<i>Ninox strenua</i>	V,P		1
Eastern Grass Owl	<i>Tyto longimembris</i>	V,P		55
Masked Owl	<i>Tyto novaehollandiae</i>	V,P		5
Sooty Owl	<i>Tyto tenebricosa</i>	V,P		2
Collared Kingfisher	<i>Todiramphus chloris</i>	V,P		2
Albert's Lyrebird	<i>Menura alberti</i>	V,P		51
Mangrove Honeyeater	<i>Lichenostomus fasciocularis</i>	V,P		15
Grey-crowned Babbler (eastern subspecies)	<i>Pomatostomus temporalis temporalis</i>	V,P		25
Varied Sittella	<i>Daphoenositta chrysoptera</i>	V,P		33
Barred Cuckoo-shrike	<i>Coracina lineata</i>	V,P		7
White-eared Monarch	<i>Carterornis leucotis</i>	V,P		13
Mammals				
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	V,P	E	11
Brush-tailed Phascogale	<i>Phascogale tapoatafa</i>	V,P		1
Common Planigale	<i>Planigale maculata</i>	V,P		20
Koala	<i>Phascolarctos cinereus</i>	V,P	V	399
Squirrel Glider	<i>Petaurus norfolcensis</i>	V,P		6
Long-nosed Potoroo	<i>Potorous tridactylus</i>	V,P	V	25
Red-legged Pademelon	<i>Thylogale stigmatica</i>	V,P		7
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	V,P	V	85
Common Blossom-bat	<i>Syconycteris australis</i>	V,P		10
Yellow-bellied Sheathtail-bat	<i>Saccolaimus flaviventris</i>	V,P		1
Eastern Freetail-bat	<i>Mormopterus norfolkensis</i>	V,P		1
Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>	V,P		1
Little Bentwing-bat	<i>Miniopterus australis</i>	V,P		40
Eastern Bentwing-bat	<i>Miniopterus schreibersii oceanensis</i>	V,P		6
Southern Myotis	<i>Myotis macropus</i>	V,P		5
Eastern Long-eared Bat	<i>Nyctophilus bifax</i>	V,P		20
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>	V,P		6
New Holland Mouse	<i>Pseudomys novaehollandiae</i>	P	V	1
Hastings River Mouse	<i>Pseudomys oralis</i>	E1,P	E	1
Insects				
Atlas Rainforest Ground-beetle	<i>Nurus atlas</i>	E1		3
Southern Pink Underwing Moth	<i>Phyllodes imperialis southern subspecies</i>	E1	E	19
Gastropods				
Mitchell's Rainforest Snail	<i>Thersites mitchellae</i>	E1	CE	3

KEY

5.6.2 Discussion of threatened fauna habitat within the VMP project area

5.6.2.1 Introduction

The VMP project area provides a contrast of vegetation community types that together support a range of habitat types for native fauna, including threatened (NSW BC Act 1995 & Commonwealth EPBC Act 1999) species. Movement opportunities for fauna through the Study area are limited by fragmentation of native vegetation, cleared lands, development and roads, although there is a discontinuous corridor of vegetation along the coastal strip.

In the southern part of the project area and beyond, the forested corridor is largely intact from Angels Beach in the south to Sharpes Beach and from Iron Peg to Pat Morton Lookout the corridor is more patchy. For less mobile fauna species, the open stretch behind Sharpes Beach as well as grassy headlands represent a barrier to movement.

Seven Mile Beach and the Lennox Head township provide little corridor habitat but from Lake Ainsworth north extensive areas of heathland and developing littoral rainforest along the hinddune provide continuous habitat for many species as far north as Broken Head.

5.6.2.2 Aquatic habitats

Aquatic habitats occur in association with Sharpes Creek, the wetland area at Boulder Beach and intermittently formed pools in localised Paperbark swamp depressions within vegetation south of Flat Rock. Lake Ainsworth provides the most significant area of aquatic habitat in the project area, with seasonally inundated pools in the northern wallum heathlands also of high value.

Sharpes Creek drains Paperbark forest east of the Coast road to the beach south of the Sharpes Beach carpark. The channel is relatively well defined through the paperbark forest and then is shallower and grown over with sedges and grasses closer to the beach.

At the northern end of Boulder Beach, a small coastal lagoon receives water drained from a generally grassy wetland area west of the Coast road that flows beneath the Coast road into swampy grassland and rushland. The lagoon is not open to the sea but flows over the rocky beachfront when overfull. Paperbark patches south of Flat Rock generally do not hold standing water but rapidly fill following heavy rains. In some areas, the construction of a low raised bund along the western side of the existing track has altered existing hydrological flow patterns.

Studies of aquatic vertebrate fauna and invertebrates have indicated that Lake Ainsworth supports a moderate diversity of species, including common freshwater fish species, two species of freshwater turtle/tortoise (Geolink 2002). Lake Ainsworth is fed by heathland and paperbark areas to the north and west. In these habitats, pools within low lying swales expand during rainfall events and the low pH wallum waters provide habitat for suitably adapted aquatic invertebrates, fish and other species.

Connectivity for aquatic species is poor, with drainage networks providing limited opportunities for aquatic species to move between areas of aquatic habitat. The Subject site is considered to provide only marginal and temporary habitat for native fish and other aquatic species.

5.6.2.3 Amphibians

Habitat for amphibians within the Study area is generally confined to low-lying areas of Paperbark

forest, small patches of wetland and adjoining areas of littoral rainforest, with roadside drains and localised depressions also providing habitat. Grassy headlands, foredunes and areas of drier coastal scrub are generally too exposed to provide amphibian habitat.

The Wallum froglet (*Crinia tinnula*) is the only threatened amphibian species likely to occur, with low lying Paperbark areas north and south of Flat Rock Tent Park providing the best areas of potential habitat in the south. North of Lake Ainsworth, low lying wallum habitats provide high quality habitat for amphibians, particularly the acid frogs including the Threatened Wallum froglet and Wallum sedgefrog (*Litoria olongburensis*).

5.6.2.4 Reptiles

The Study area provides a contrast of habitat types that represent good quality habitat for reptiles, although fragmentation, past clearing and disturbance and roadkill are likely to be factors in limiting reptile diversity, with species relying on larger tracts of habitat or highly sensitive to disturbance unlikely to occur south of Lake Ainsworth. Extensive areas of heathland north of Lake Ainsworth provide high quality habitat for many reptile species.

Threatened reptile species are unlikely to occur, with likely common species including the Eastern water dragon, Eastern blue-tongued lizard, Land mullet, Robust ctenotus, Yellow-faced whip snake, Carpet python, Green tree snake, Red-bellied black snake, Brown snake, Small-eyed snake, Burton's legless lizard, Lace monitor, Bandy bandy, *Ramphotyphlops nigrescens* (blind snake) and various smaller skinks.

5.6.2.5 Birds

The juxtaposition of habitat types within a relatively small area can be expected to contribute toward a high diversity of bird species over the course of the seasons. Birds known from the area include coastal and oceanic birds (e.g. Oystercatchers, cormorants, shorebirds, terns and gulls), raptors (Osprey, Brahminy kite, Whistling kite), grassbirds (e.g. wrens, finches, Golden-headed cisticola) wetland birds (ducks, grebes, Purple swamphen) and birds typical of rainforest habitats (e.g. Noisy pitta, Eastern yellow robin, Varied triller, shrike-thrushes) as well as habitat generalists and open country birds (e.g. honeyeaters, lorikeets and rosellas, butcherbirds) and migratory species (e.g. Dollarbird, Rufous fantail, cuckoos and Spangled drongo).

Birds requiring large tree hollows for nesting are unlikely to be common in the Study area. Additional nomadic and migratory species would be expected to occur at certain times of the year, including shorebird species at Flat Rock and some ocean beaches to the north such as the terns, Red-necked stint, Ruddy turnstones, Wandering tattler, Whimbrel and Red-capped plovers.

The extensive area of heathland and paperbark habitats north of Lake Ainsworth are of high value to birds, especially nectarivorous species such as honeyeaters. The Threatened Ground parrot and Eastern grass owl may occur within these vegetation types.

Other Threatened species that may occur within the project area include rainforest birds such as the Barred cuckoo-shrike, White-eared monarch and Rose-crowned fruit-dove. Ongoing vegetation rehabilitation works will continue to improve habitat values for these species. The Osprey is a common sighting along this section of coast. Beach habitats provide habitat for the Pied oystercatcher and Little tern, with dune rehabilitation and protection works improving habitat values for these species. A diversity of threatened shorebird species have been recorded at Flat Rock and the surrounding beach including the Sooty oystercatcher, Lesser and Great sandplover, Sanderling, Little tern, Godwits and the Terek sandpiper (Hans Lutter of Birdlife Australia pers

comm., June 2014).

5.6.2.6 Mammals

Habitat fragmentation and disturbance history is likely to limit mammal diversity as well, with mammals found in larger tracts of coastal vegetation, such as the Sugar glider and Eastern chestnut mouse, unlikely to occur south of Lake Ainsworth, with areas of heathland to the north providing potential habitat. Mammals relying on larger tree hollows are unlikely to breed in the area. The Common planigale has been recorded within a small patch of planted rainforest at Pat Morton Lookout and is also known from forest behind Boulder Beach (Ian Gaskell, pers comm., October 2011) and around Lake Ainsworth (Geolink 2002). Other mammal species occurring in the area include the Swamp wallaby, Northern brown bandicoot, Short-beaked echidna, Bush rat, Swamp rat, Black rat and Brushtail possum. Swamp wallabies are regularly seen over Lennox Headland through to Sharpes Headland as well as hind dune areas of Seven Mile Beach north of Lake Ainsworth. The Northern brown bandicoot is frequently observed behind Boulder Beach by Lennox Head Landcare as well as antechinus around Lake Ainsworth and along Seven Mile Beach.

Additional mammal species considered likely to occur include the, Mountain brushtail possum, Brown antechinus and Ringtail possum. Roadkill along The Coast Road is also likely to be a factor limiting mammal populations in the study area.

Ongoing vegetation rehabilitation works will continue to improve habitat values for threatened fauna including the Common blossom bat, Common planigale, Little bent-wing bat, Greater broad-nosed bat and Southern myotis.

6 INFRASTRUCTURE MANAGEMENT AND VISITOR FACILITIES

6.1 Introduction

This section discusses and recommends the management and maintenance of council infrastructure within the VMP project area as well as existing visitor/community facilities and services.

6.2 Walkways and cycleways including beach access tracks

The VMP project area contains a vast network of walkways and beach access tracks which were generally found to be in good order during the surveys with limited erosion issues noted. The Coastal Recreational Path is currently being developed in stages and once complete will allow pedestrian access along the length of the VMP project area and link Lennox Head, Skennars Head and East Ballina. Subsequently, a number of informal paths along the coastal escarpment will be rehabilitated as access is streamlined along the newly formalised path. In addition a shared path for pedestrians and cyclists is also being constructed in stages and once finalised will link East Ballina with Lennox Head via Pat Morton Lookout (eastern route) or Skennars Head Road (western route). The location of the Shared Path West and Coastal Recreational Path are shown in **FIGURE A.7** of **APPENDIX A**.

Formalised pedestrian walkways and the consolidation of lake and beach access points are also planned as part of the Lake Ainsworth south eastern precinct concept plan and the Lennox Head foreshore parkland masterplan. The installation of stairs along the track from Pat Morton Lookout down to the point is also planned.

Boardwalks have been constructed in recent years from Pat Morton Lookout down to Dress Circle Drive and along the foreshore to the southern end of Seven Mile Beach. Stairways have also been constructed from Pat Morton Lookout to the upper lookouts on Lennox Head and from the surfer's carpark down to Lennox Point.

Bushland and beach access tracks managed by BSC and volunteer groups have been assigned an identity number and are shown in **FIGURE A.8** of **APPENDIX A**.

Consolidating the vast network of formal and informal paths will reduce maintenance costs in the long-term and reduce opportunities for weed species incursion along edges. Any future consolidation plans should be undertaken in consultation with Lennox Head Landcare Inc. as landcare workers have recognised maintenance and access trails for managing dunal forests. Wiring/fencing along beach access tracks as well as handrails should be maintained to ensure longevity and safety. Plastic board and chain tracking and step maintenance or construction may be required on an as needs basis for steep bushland and beach access tracks to mitigate continuing erosion.

BSC's open space and reserves bushland and beach access track maintenance guidelines are included in **APPENDIX C**. These guidelines stipulate specific maintenance requirements for the aerial corridor and ground along managed tracks as well as the frequency of maintenance requirements.

6.3 Emergency services including 4WD accesses to beaches

Beach access ramps for four-wheel drive emergency vehicles are provided at Sharpes Beach and along Seven Mile Beach (at Rutherford Street dune boat ramp, SLSC and recreational 4WD access point). Access to the shore of Boulder Beach is also possible for emergency vehicles along the



central beach track off The Coast Road. Note that some access ramps may sometimes be closed as required for maintenance, beach safety and regulatory purposes. Only authorised 4WD vehicles by BSC (includes licensed commercial fishermen) as the reserve trust manager and emergency vehicles are permitted along the southern end of Seven Mile Beach and on Sharpes Beach and Boulder Beach.

Authorised and emergency 4WD access exists also on Lennox headland and the North Lennox Hind Dune Fire Trail and associated fire trail network on the western boundary of the VMP project area along Seven Mile Beach.

Recreational 4WD vehicles are only permitted to access Seven Mile Beach (up to council boundary) with a valid permit. Access to the beach is via Camp Drewe Road, north of the Lake Ainsworth Sport and Recreational Facility. BSC's website provides detailed information regarding the purchase of permits and responsibilities of the permit holder. Permit holders should refer to the website as well as the BSC policy document *Four Wheel Drive Beach Access - Seven Mile Beach (4WD Beach Permit)* for more information. Permit holders are required to maintain a 10m buffer distance from vegetated dunes.

Gates, bollards, signage and barriers should be maintained regularly on all beach and bushland trails and added where required to ensure the whole VMP project area is protected from unauthorised 4WD access.

6.4 Public toilets

Public toilets are provided at Pat Morton Lookout, Lennox Head foreshore (opposite shops), Lake Ainsworth (near the surf club and on the southern shore near the caravan park) and at the northern pedestrian access to Seven Mile Beach (dog exercise area). The Lake Ainsworth south eastern precinct concept plan states that the toilets located near the off leash dog access track may eventually be removed, however this will depend on ongoing use of these facilities, along with improvements to the existing toilet facilities near the surf club. The Lennox Head foreshore toilets located opposite the shops are to be replaced with a new building with 3 unisex toilets as per the Lennox Head Foreshore Parkland Masterplan (2011). Public toilets are also planned for Sharpes Beach as part of the Sharpes Beach carpark Master Plan.

All toilet facilities should be maintained as required.

6.5 Picnic and BBQ areas

BBQ facilities are located at the southern end of Lake Ainsworth. Picnic shelters are provided at Lennox Head township and Lake Ainsworth. An upgrade to the existing facilities along Lennox Head foreshore is scheduled as per the masterplan for this area. In addition new picnic and BBQ facilities are outlined in the Lake Ainsworth south eastern precinct concept plan. These facilities should be maintained as part of Council's regular maintenance program.

6.6 Car parks

Car park facilities are provided throughout the VMP project area at the various beaches and headlands. Sharpes Beach car park is due to be upgraded with a formal parking area and associated landscaping. A new grassed carpark (cnr Camp Drewe Rd and Pacific Pde) and street side parking (along Ross St) have recently been constructed as part of the Lake Ainsworth south east precinct plan. This is to accommodate for the loss of parking associated with the future closure of the eastern road.

6.7 Seating and viewing platforms

Seating and viewing platforms are provided throughout the VMP project area at various scenic locations, beach fronts and parklands. Maintain and replace as required all viewing platform structures to be safe and functional and maintain existing ocean views east of the viewing structures by carefully pruning below the railing height to ensure continued views. Any natural or assisted revegetation works to be undertaken within the coastal views of existing viewing platforms needs to be undertaken so as not to impede the views in the future through the planting of low growing species on the eastward side of viewing platforms.

6.8 Dog exercise areas

A designated off-leash dog exercise area is provided on Seven Mile Beach, north of Lake Ainsworth via the old 4WD access point. With the proposed closure of the eastern road in this area dog owners will be required to walk their dogs on a leash until they reach the off-leash area north of the Surf Club. The Lake Ainsworth south eastern precinct concept plan is planning to provide dog washing facilities to prevent owners from washing their dogs in the Lake.

Dogs are prohibited from the northern end of Sharpes Beach (during summer when the beach is patrolled), Seven Mile Beach (south of the identified beach access track just north of the SLSC), Lake Ainsworth and surrounding foreshore and the North Lennox Head Hind Dune Fire Trail. Dogs are permitted outside these areas must be on a leash at all times. Refer to BSC's website for all updated dog exercise areas and mapping.

Dog litter facilities should be provided where appropriate and maintained/emptied on a regular basis as required. Appropriate signage should also be installed/maintained to inform dog owners of regulated areas. Specific effort to enforce dog restrictions along prohibited beaches, especially Flat Rock reef and Lake Ainsworth, should be undertaken to prevent impacts on shorebird populations, particularly during pre-migratory and breeding periods.

7 VEGETATION MANAGEMENT ISSUES & GUIDELINES

7.1 Introduction

This section provides details on specific management issues which may be encountered in the field and which are of relevance to on-ground works and the success of such works.

7.2 Tree vandalism

Tree vandalism may occur adjacent to any of the urban subdivisions near the VMP project area. Tree vandalism can be addressed via Ballina Council's "Urban Vegetation on Public Land" policy that does not tolerate unauthorised works or tree vandalism and will take site specific responses. Once an investigation has confirmed vandalism enforcement action may be pursued. Actions may include community notification and education, compensatory actions and deterrent (sign/view screen) installation at the vandalised area until restoration/replacement occurs.

7.3 Vegetation/Rubbish dumping

At the time of the site survey, vegetation rubbish dumps were noted around the Sport and Recreation Centre and at the entrance to the 4WD vehicle access track to Seven Mile Beach. These are highlighted and addressed in the relevant management zones discussed in Section 8. Appropriate signage should be installed where required to assist in addressing this issue.

7.4 Erosion

Coastlines within the VMP project area are subject to ongoing change and erosion. These include:

- Beach erosion and associated access tracks and viewing platforms resulting from storms including extreme wave and wind energies as well as high tides and currents
- Dune erosion as a result of people movements, wind and water runoff
- Track erosion as a result of people movements and water runoff.

These processes continually shape the beach and dunal profiles and can cause erosion where vegetation cover is lacking and sand is exposed. Landcare groups are assisting with the recovery and planting of native vegetation on dune areas where exposed areas occur as a result of Bitou bush control. All works planned within the fragile dunal environment should take into consideration the likelihood of erosion to occur following weed control and undertake works in a staged manner followed by supplementary planting where natural regeneration is slow or lacking.

Adjustment of beach track gradients by hand or machine may be required at times to maintain beach accesses without further damage to the dune environment. Additionally formed and structural pathway surface materials such as asphalt, concrete, metal and board and chain may need lengthening or removing of sections as beach sand heights alter and dunes accrete and recede. Lifting of board and chains and removing excess sand and forest vegetation litter off tracks may occasionally be required. In addition, storm events that cause dangerous and impassable forest and track conditions may require pruning and felling of dangerous trees and chopping to ground to discourage trellis's for weeds and speed up decomposition. Unsafe viewing platforms resulting from severe beach erosion following major storm events may also require removal, relocation or rebuilding within the fragile dune environment.

Localised erosion also occurs around the shores of Lake Ainsworth including in areas where visitors access the water for swimming.

7.4.1 Beach recession and sea-level rise

Projected sea-level rise will impact upon areas discussed within this VMP over time. A long term

shoreline retreat assessment was undertaken as part of the Ballina Shire Coastline Hazard Definition Study Final Report (WBM 2003). The report states that Sharpes Beach is likely to experience relative stability into the future although medium term shifts of sand from one end of the beach to the other can be expected in response to variation in the prevailing wave climate (beach rotation). A nominal allowance of 10m recession is recommended for planning purposes to account for such processes on top of other short term erosion and sea level rise influences. At Boulder Beach, the study recommends a best estimate recession rate of 0.2m/yr with upper and lower limits of 0.3m/yr and 0.1m/yr respectively.

Lennox Head and Seven Mile Beach have experienced significant erosion over many years and various protective works have been carried out in the past along the southern sections of Seven Mile Beach in the vicinity of Lennox Head township and Lake Ainsworth. In broad terms, general recession could be expected with higher rates in the southern hooks of the embayments and lower rates at the northern ends of the compartments. However, the potential for long term recession to be realised at Lennox Head (southern end of Seven Mile Beach) is dependent on the stability and maintenance of the existing seawalls. The study concludes a long term recession rate of 0.5m/yr for the central southern sections of Seven Mile Beach and a rate of 0.3m/yr for the northern section near the Ballina-Byron LGA boundary.

In general, an increase in native vegetation cover particularly on the dunes will assist in mitigating the impacts of sea-level rise. Vegetation management activities may need to adapt to any foreshore recession, impacts from storm events etc. As part of BSC ongoing coastline management studies and plans, specific protection measures may be required in the event of severe erosion hazards.

7.5 Fire regimes

The project area includes areas of native vegetation that have adapted over time to particular fire regimes from wildfire and historical seasonal burning of vegetation by the Bundjalung people. This is of particular importance to heathland habitats north of Lake Ainsworth. Suppression of wildfires and cessation or interruption of historical seasonal burning regimes can result in vegetation communities changing over time with lower fire adapted heathland vegetation developing into taller sclerophyll forest where conditions are suitable.

Future management of these heathland areas, as well as grassy headland communities, should take into account the use of fire as a management tool where appropriate and aim to approximate where possible the historical seasonal burning regime. Controlled fire should be introduced as an ecological management option to control weeds and deter expanding tree seedling growth to maintain the Themeda TEC and provide consistency with historical use/vegetation community layout of the land pre 1860.

7.6 Guidelines for working around threatened species

A number of threatened species and endangered ecological communities are known to occur within the Subject site. These are discussed in further detail in Section 5. Those undertaking works in areas where threatened species occur or within a TEC may require a Section 132C licence (application for a scientific licence for the purpose of bush regeneration) under the National Parks and Wildlife Act 1974 (NPW Act). A checklist for bush regeneration activities in the habitat of threatened species, endangered populations and EECs has been prepared by the NPWS Northern Directorate and is provided in **APPENDIX D**. This checklist outlines specific methodology to be employed around threatened species such as buffer distances and the gradual removal of weeds which provide habitat for threatened fauna. It also stipulates that all workers carrying out bush regeneration works will be supervised by a trained and experienced co-ordinator with recognised certification or a minimum 2 years' experience.

All volunteers are to be briefed on threatened flora species prior to undertaking any works across the Subject site. This is to be the responsibility of the landcare supervisor. Qualified bush regenerators are to be adequately experienced, licensed and knowledgeable on such species.

The identification of any additional threatened species within the Subject site is to be reported to BSC's Natural Resource Officer. A sample may need to be sent to the NSW Herbarium for positive identification. Any new sightings are to be added to BSC's database as well as the flora database managed by Lennox Head Landcare.

7.7 Pandanus

Pandanus trees within the Ballina Shire area are currently at risk from dieback due to a sap-sucking insect known as the "planthopper" (*Jamella australiae*) which is native to North Queensland. Infestations have been located in both Lennox Head and East Ballina and Ballina Shire Council is actively controlling these infestations. It is recommended that sightings of planthopper be reported to Ballina Shire Council for treatment and monitoring.

A number of Pandanus trees in certain areas have recently died and a possible fungal virus may be responsible, although accurate identification of what type is difficult. Affected Pandanus should be chopped down and contained in the area so as not to spread the virus.

7.8 Norfolk Island pines

A number of Norfolk Island pines occur across the VMP project area in varying stages of maturity. This species was commonly planted along coastal areas of NSW up until recent years when the use of local native species has taken precedence. The removal of any Norfolk Island pines from within the VMP project area should be undertaken in consultation with BSC and each pine should be assessed upon its cultural significance. From an ecological perspective this species should be removed where they occur amongst native vegetation and in areas designated as restoration zones. Their retention in areas designated as recreational/parkland space may be considered appropriate, particularly where they have cultural or aesthetic value. The removal of any Norfolk Island Pine's by chainsaw must be undertaken only by Ballina Council's approved and qualified operators.

7.9 Hang gliders

Hang gliders have two launch areas at Lennox Head. The main launch area north-east of the carpark at Pat Morton Lookout and a light wind take off point which is located further up the steps at a higher point on the cliff edge. Hang gliders require a sheer canopy below the launch areas to reduce turbulence during take-off and landing as well as an emergency landing zone at the base of the point should the wind suddenly drop. These requirements have been factored into the vegetation management measures for zone 5 (refer to Section 8.5).

7.10 Best practice guidelines and other requirements

The following requirements are to be adhered to in all management zones:

- All weed control and planting works are to be undertaken by suitably qualified and/or experienced Bush regenerators and/or under the supervision of trained and experienced landcare personnel.
- Bush regenerators are to follow best practice guidelines as detailed in **APPENDIX E**.
- Bush regenerators are to complete Daily record sheets. The BSC Bush Regeneration and Herbicide Record Sheet is included in **APPENDIX F**. Daily record sheets are to be submitted electronically for recording purposes to BSC quarterly or as a project area is completed.

- Any appointed nursery contractors for supply of plantings are to follow hygiene protocols in order to reduce the potential for pathogens, bacteria, pests and weeds being inadvertently introduced to the site. In particular, nursery's should ensure no plants showing signs of Myrtle rust are delivered to the site.
- All monitoring should be undertaken by a suitably qualified ecologist (refer to Section 9).
- Weed management is to be in accordance with the Weed Control Guidelines (**APPENDIX G**).
- Any planting is to be undertaken in accordance with the Guide to Planting (**APPENDIX H**).
- Any planting works to be undertaken within the VMP project area should utilise seedlings sourced from local provenance seed, cuttings or other propagation materials. Local provenance may be defined on a species by species basis in relation to ecological principles allowing for species diversity and landscape factors.

8 MANAGEMENT ZONES

The VMP project area has been divided into ten management zones based primarily upon location and existing defined boundaries such as roads and tracks. The location of zones is presented in **FIGURE A.9** of **APPENDIX A**. Consideration was also given to current landcare and contractor jurisdictions as well as long-term land use objectives and management actions. The ten management zones have then been split into a number of subzones based upon vegetation communities, condition and management requirements.

Each subzone has been given a condition rating as detailed below in **TABLE 7**. The same scale used in the EnvITE VMPs has been utilised to maintain consistency and allow an assessment of changes in weed dominance over time.

TABLE 7
CONDITION RATING OF SUBZONES

Rating	Condition
1	Weed dominated, native trees absent or dead.
2	Weed dominated with a few emergent native trees and shrubs.
3	Has structure of forest or original vegetation type with heavy weed infestation leading to rapid decline.
4	Has structure of forest or original vegetation type with heavy weed but some natural regeneration.
5	Has structure of original vegetation type with a number of stratum, healthy but threatened by encroaching weeds.
6	Vegetation in good order, sporadic weeds.
7	Forest or system self-sustaining, needs no assistance.

This chapter has been split into ten sections with each section dedicated towards one management zone. Each section provides detailed information on the relevant management zone including:

- Map of each zone and delineation of subzones
- Mapping and description of vegetation communities
- Discussion on ecological values including TECs, threatened flora and fauna
- Progress since previous VMP (where applicable)
- Current condition of vegetation and degree of weed infestation
- Vegetation management recommendations including priorities and designation of responsibilities
- General recommendations relating to infrastructure management and other non-vegetation related issues
- List of exotic species noted during the survey. A general cover abundance score was assigned to each species across the zone based upon the following system:
 - + <5% one or a few individuals
 - 1 <5% many individuals
 - 2 6-25%
 - 3 26-50%
 - 4 51-75%
 - 5 76-100%

A priority rating of low, medium or high is given to each vegetation management recommendation in the following tables. The intent of the priority ratings is to provide a relative comparison of the importance of various actions described within each sub zone. Highest priority has been applied where highly invasive weeds are threatening previously worked areas or are at an early stage of



infestation where control/eradication from the subzone could be achieved quickly and with minimal resources. Priority ratings have also been assigned based upon the consideration of priority areas across the entire VMP project area and where resources would best be utilised. All ongoing weed control works within previously worked areas should be afforded important priority to prevent re-establishment.



8.1 Zone 1 – Sharpes Beach

Geographic location/extent of zone: Dunal vegetation from Sharpes Creek north to the Pandanus grove at the northern end of Sharpes Beach near the pedestrian underpass. Subzones identified in the EnviTE VMP (2004) have been consolidated based upon existing vegetation structure, and subsequently the type of management required. (Refer to **FIGURE A.10** in **APPENDIX A**).

Main vegetation communities in zone (refer to **FIGURE A.10** in **APPENDIX A**)

The incipient dune is dominated by Coastal spinifex with dune creepers. Beyond this coastal wattle is dominant as a low shrubland, below scattered Coast Banksia trees, a number of which are senescing/dead. Open areas occur where previous Bitou bush control has been undertaken. The southern end contains mature and regenerating littoral rainforest species, mainly Tuckeroo and Guioa and some patches of low vine thicket dominated by Water vine.

Ecological values

The southern section of the zone comprises a number of regenerating littoral rainforest species. Given time this community will almost certainly develop into Littoral Rainforest TEC (BC Act 2016). The NSW Wildlife Atlas database shows previous records for Sanderling, Little tern, Pied oystercatcher and Sooty oystercatcher in the vicinity of Flat Rock and along Sharpes Beach. No records for threatened flora species in zone.

Progress since previous VMP (EnviTE 2004)

Significant control of Bitou bush has been undertaken through this zone since the preparation of the previous VMP in 2004. Ballina Coast Care do not currently undertake regular works in this area. The group is planning to reassess their work program in this area following the opening of the recently completed pathway through this section.

General recommendations for zone

An upgrade of Sharpes Beach carpark is currently in the planning process and includes formalisation of the existing carpark, construction of amenities block, observation tower, associated walking paths and stormwater treatment works and a vehicle access track. Open areas surrounding the carpark are subject to landscaping as part of this upgrade and have not been included in this VMP. Any works undertaken in areas surrounding the carpark should take into consideration the proposed upgrade plan.

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
1a	<p>Coastal vegetation along the narrow dune from Sharpes Creek to Sharpes Beach carpark. The incipient dune is in good condition dominated by Spinifex and dune creepers. The foredune comprises scattered Coast banksia amongst a predominately Coastal wattle shrubland, thanks to past control of Bitou bush. The southern end of the subzone contains littoral rainforest elements with a number of mature and regenerating Tuckeroo and Guioa along with other common littoral rainforest species.</p> <p>The CRP has recently been constructed from Flat Rock carpark to Sharpes Beach carpark and compensatory works have commenced within this subzone.</p>	4-5	<p>Continue ongoing control and maintenance of Bitou bush. Undertake weed control works throughout foredune as part of compensatory offset program for CRP. Common weeds noted include Lantana, Corky passionfruit, Coastal morning glory, Turkey rhubarb, exotic grasses and annuals. Natural regeneration potential within the subzone is considered to be high. However, disturbed areas along the western boundary of the subzone may require planting if natural regeneration is lacking.</p>	Medium	BCC
			<p>Rehabilitation of disturbed edges along the CRP will be required once works are complete and may include planting of low growing species. Undertake spraying of exotic annuals along disturbed edges.</p>	High	BCC or BSC contractor
			<p>A large dense patch of Water vine occurs at the southern end of the subzone which is smothering native saplings and inhibiting natural regeneration. This vine should be suppressed to allow establishment of the canopy.</p>	Low	BCC or BSC contractor
			<p>Smaller Norfolk Pines which occur in areas of native vegetation should be treated/removed. Consultation with the adjoining property owner should be undertaken regarding the possibility of removing larger Norfolk Pines planted along the western boundary.</p>	Low	BSC contractor
1b	<p>Dune vegetation in front of the Sharpes Beach carpark. Incipient dune is in good condition comprising Spinifex with dune creepers. Disturbed areas comprise a mix of native and exotic species. The northern end of the dune comprises mostly exotic grasses with exotic Pennywort and Siratro. The southern part of the dune comprises a mostly native shrubland of</p>	2-4	<p>Encourage development of native groundcovers/shrubs by gradually spraying exotic grasses and expanding native patches. Planting of coastal dune species may be required along the northern section of dune where natural regeneration is lacking.</p>	Low	BCC or BSC contractors
			<p>Control major environmental weeds including Lantana, Bitou bush, Coastal morning glory and Turkey rhubarb.</p>	Medium	BCC or BSC contractors

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
	Coast banksia, Coastal wattle, Pandanus and Horse-tail she-oak. Any works in this area should take into consideration the proposed Sharpes Beach carpark upgrade and associated landscape plan.				
1c	Area north of Sharpes Beach carpark to Pandanus grove near the pedestrian underpass. The Envite report (2004) notes that this area was once subject to car parking and comprises shallow compact soils supporting only grassland. The area is still dominated by exotic grasses, primarily Buffalo, Kikuyu and Couch although Melanthera and patches of Coastal wattle have since developed in some areas. The Sharpes Beach carpark upgrade includes a gravel reinforced grass carpark, picnic facilities, beach access track and walking trail within this subzone.	2	This area is considered to be of low priority for rehabilitation works and should be maintained as a grassland/herbland. However, major environmental weeds noted in the area should be controlled at this stage to prevent longer term problems including Prickly pear, Bitou, Lantana and possibly Turkey rhubarb (minimal occurrence noted). Other common weeds noted such as Siratro, Pennywort and Coastal morning glory could be tackled as part of a longer term goal to convert the area to Coast banksia/Coastal wattle shrubland once resources are available and/or as part of the carpark upgrade.	Low	LHL or BSC contractors

List of exotic species recorded in Zone 1 during surveys

Family	Botanical Name	Common Name	Cover/abundance across Zone 1
Apiaceae	<i>Hydrocotyle bonariensis</i>	Exotic pennywort	1
Araucariaceae	<i>Araucaria heterophylla</i>	Norfolk island pine	+
Asteraceae	<i>Ambrosia artemisiifolia</i>	Annual ragweed	1
Asteraceae	<i>Bidens pilosa</i>	Cobblers pegs	1
Asteraceae	<i>Chrysanthemoides monilifera</i>	Bitou bush	1
Asteraceae	<i>Tagetes minuta</i>	Stinking roger	1
Cactaceae	<i>Opuntia stricta</i>	Prickly pear	+
Convolvulaceae	<i>Ipomoea cairica</i>	Coastal morning glory	1
Fabaceae	<i>Macropitilium atropurpureum</i>	Siratro	1-2

Family	Botanical Name	Common Name	Cover/abundance across Zone 1
Passifloraceae	<i>Passiflora suberosa</i>	Corky passionfruit	1
Passifloraceae	<i>Passiflora subpeltata</i>	White passionflower	1
Poaceae	<i>Chloris gayana</i>	Rhodes grass	1
Poaceae	<i>Pennisetum clandestinum</i>	Kikuyu	2
Poaceae	<i>Setaria sphacelata</i>	Setaria	1
Poaceae	<i>Stenotaphrum secundatum</i>	Buffalo grass	2
Polygonaceae	<i>Acetosa sagittata</i>	Turkey rhubarb	+
Solanaceae	<i>Physalis peruviana</i>	Cape gooseberry	+
Solanaceae	<i>Solanum dulcumara</i>	Climbing nightshade	+
Solanaceae	<i>Solanum nigrum</i>	Black-berry nightshade	1
Verbenaceae	<i>Lantana camara</i>	Lantana	1

8.2 Zone 2 – Whites Head, Skennars Head and Iron Peg

Geographic location/extent of zone: Extends north from the Pandanus grove (near pedestrian underpass at northern end of Sharpes Beach), across Whites Head, Skennars Head to Iron Peg carpark. Refer to **FIGURE A.10** in **APPENDIX A**.

Main vegetation communities in zone (refer to **FIGURE A.10** in **APPENDIX A**)

Exposed headlands are dominated by native and exotic grassland types, including *Themeda australis*, Blady grass, *Ischaemum triticeum*, Buffalo and Kikuyu. Sheltered areas of Skennars Head comprise Coast banksia open woodland/forest with recent planting of littoral rainforest species in open areas. A Cottonwood grove and associated littoral rainforest regrowth/planting occurs south of Iron peg where two dwellings once occurred. Landcare efforts have assisted with the restoration and expansion of this area.

Ecological values

Whites Head comprises significant areas of quality *Themeda australis* grassland TEC with a high proportion of native herbs and creepers including a large population of the ROTAP *Plectranthus cremnus*. This TEC also occurs along exposed cliff edges of Skennars Head and Iron Peg. Established areas of littoral rainforest south of Iron Peg are likely to comply with the description of Littoral Rainforest TEC under the BC Act. Trial plantings of the critically endangered Coastal fontainea have been undertaken in this area of established vegetation. The NSW Wildlife Atlas database shows previous records for Flesh-footed shearwater and Sooty tern in the vicinity of Skennars Head.

General recommendations for zone

Localised erosion is occurring along informal pedestrian tracks in some areas and should be addressed following the construction of the CRP through this zone. The wooden stairway leading down to Iron Peg may be removed as part of the CRP upgrade. A stormwater inspection point has recently been installed on the western side of the track on Skennars Head (refer to photo in **APPENDIX I**). Consultation with BSC should be undertaken regarding the restoration of disturbed areas around this point.

Proactively manage the suitable siting of the least ecologically damaging downhill mountain bike track to mitigate increasing popularity and new tracks being made impacting on restoration efforts.

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
2a	<p>This subzone comprises a mosaic of exotic and native grassland with sporadic patches of Coast banksia, Pandanus and Coastal wattle. Extensive areas of high quality <i>Themeda australis</i> dominant grassland occur across sections of the headland. These areas also comprise a number of native herbs and creepers including native Fireweed, Rice flower, Yellow beach bean and a large population of the ROTAP <i>Plectranthus crennus</i>. Patches of native Blady grass and <i>Ischaemum triticeum</i> also occur in the southern part of the subzone. Buffalo and Kikuyu dominant grasslands occur in disturbed areas along track edges, beneath isolated trees/shrubs and less exposed sections of headland.</p> <p>Historic photos (refer to photo in APPENDIX B) suggest that the more exposed edges of Whites Head and Skennars Head have always been vegetated by native grassland with coastal shrubland/rainforest occurring along the western edges.</p>	4	<p>This subzone is to be managed as a <i>Themeda australis</i> grassland protection zone with the long-term goal of converting exotic grassland to <i>Themeda australis</i> grassland. In the absence of fire, coastal shrubs/trees are likely to germinate and may compromise the value of this TEC. Therefore it may be appropriate to remove isolated trees/shrubs, particularly where these occur amongst <i>Themeda australis</i> grassland. Alternatively, introduce controlled fire as an ecological methodology option to weed and deter expanding tree seedling growth to protect the Themeda TEC and be consistent with historical use/vegetation community layout of the land pre 1860.</p> <p>Continue control of environmental weeds, such as Lantana, Coastal rosemary, Siratro etc., specifically where they occur amongst native grassland. Extensive areas of Siratro were noted through parts of the subzone. This species should be suppressed to prevent it establishing in areas of native grassland, particularly where native herbs are present (which would preclude the use of Metsulfuron methyl).</p> <p>Continue to gradually expand areas of native grassland by spraying exotic grasses around the edges. Pegging the interface between these communities may be useful to monitor the success of spray treatments. Look for opportunities to link <i>Themeda australis</i> patches. Investigate opportunities for the direct seeding and/or planting of <i>Themeda australis</i>. Monitor the success or otherwise of these initiatives.</p> <p>Address erosion around the Pandanus grove once the CRP is constructed through this area and informal tracks are rehabilitated.</p>	<p>Low</p> <p>Medium</p> <p>Medium</p> <p>Low</p>	<p>BSC contractor</p> <p>BSC contractor</p> <p>BSC contractor</p> <p>BSC</p>

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
			Examine dispersal of cut grass from mower used on mown walking track (32-39) and develop a method that will limit cuttings of exotic grass landing on Themeda colonies e.g mow in one direction only.	High	BSC
2b	<p>Southern section of subzone comprises patches of Coast banksia woodland amongst open areas dominated by exotic grasses (Kikuyu). <i>Themeda australis</i> continues to dominate exposed areas along the cliff edge. A high proportion of exotics occur amongst the Coast banksia, particularly along the edge of The Coast Road. Common exotic species noted include Senna, Lantana, Coastal morning glory, Tobacco, Corky passionfruit, White passionfruit and Siratro.</p> <p>An extensive patch of Cottonwood and regenerating/planted littoral rainforest occurs in the northern part of the subzone which is more sheltered. This area has benefitted greatly from landcare efforts since the preparation of the Envite VMP in 2004. Core areas comprise a dense native canopy with limited weed presence.</p> <p>Recent plantings have been undertaken in open grassy areas to the south of this patch, amongst stands of Coast banksia.</p> <p>Historic photos (refer to photo in APPENDIX B) suggest that the more exposed edges of Whites Head and Skennars Head have always been vegetated by native grassland with coastal shrubland occurring along the western edges.</p>	5	<p>The long-term goal in this subzone is to protect existing areas of littoral rainforest/Coast banksia and consolidate this vegetation type in areas west of the existing pedestrian track. Areas of <i>Themeda australis</i> grassland are to be protected along the cliff edges and expanded where appropriate to meet the eastern edge of the pedestrian track.</p> <p>Consolidate stands of Coast banksia by expanding plantings in open areas. Preparation of additional planting areas will require comprehensive weed control where exotics dominate (along edge of The Coast Road). The vegetation line should be expanded to the western edge of the path where appropriate to reduce exotic grass cover. Maintain existing plantings by spraying annuals and maintaining guards. Undertake comprehensive weed control within stands of Coast banksia and suppress native vines where they are inhibiting development of canopy trees. Treat scattered Norfolk Island pines as appropriate.</p> <p>Expand areas of <i>Themeda australis</i> grassland as per management recommendations detailed in subzone 2a.</p> <p>Continue ongoing weed control and maintenance in core areas of littoral rainforest and Cottonwood. Maintain old plantings around the edge of the patch to increase success (along western side of track). A number of these are currently being smothered by grasses and require guards to be reinstated. Natural regeneration of littoral rainforest species is supplementing plantings in this area.</p>	<p>Low</p> <p>Medium</p> <p>Low</p> <p>High</p>	<p>BSC contractor</p> <p>LHL and BSC contractor</p> <p>BSC contractor</p> <p>LHL</p>

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
			<p>Control small infestations of Madeira vine along western side of track</p> <p>Wire guards used for plantings are to be used and reused as needed until unusable due to rust then removed offsite as waste.</p> <p>Large area of Lantana has recently been sprayed on the eastern side of the track within the gully. Monitor weed presence in this area and undertake follow-up treatment as required. Planting of littoral rainforest/coastal species may be required if resilience is low.</p> <p>A number of the Pandanus located along the eastern side of the track at foot of the headland have died, possibly a result of a new, unknown fungal virus which has killed several Pandanus along the coast. While a number of Pandanus seedlings are present, planting in exposed areas with littoral rainforest/coastal species may be required down the track should the remaining Pandanus be affected.</p>	<p>High</p> <p>Low</p> <p>Medium</p> <p>Low</p>	<p>LHL</p> <p>LHL</p> <p>LHL</p> <p>LHL</p>
2c	<p>Iron peg headland comprises <i>Themeda australis</i> grassland in exposed areas with patches of Rhodes grass and Kikuyu in disturbed areas and sheltered locations. Small patches of Coast banksia occur on the southern side of the headland. Vegetation on the northern side of the private property is in good condition comprising a dense stand of Melanthera, Pigface and Blady grass. Beyond this wind-sheared Coast banksia, Coastal wattle and Tuckeroo occur on the southern side of the walking track. The lower edge comprises an open grassland with a mix of <i>Ischaemum triticeum</i>, Snake vine, Kikuyu, Couch</p>	5	<p>Monitor and control exotic grasses where they are encroaching upon areas of native grassland.</p> <p>A large, mature Winter senna (in seed) was noted along the northern boundary of the private property. This should be treated along with smaller wind-sheared Winter senna occurring amongst Coast banksia.</p> <p>Sporadic Ground asparagus and Turkey rhubarb occur along open areas either side of the track and should be treated to suppress their spread.</p>	<p>Low</p> <p>Medium</p> <p>Low</p>	<p>LHL or BSC contractor</p> <p>LHL or BSC contractor</p> <p>LHL or BSC contractor</p>

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
	and <i>Melanthera</i> . The boundary of this subzone is defined by the start of wind-sheared littoral rainforest (mostly Tuckeroo) along the walking track.				

List of exotic species recorded in Zone 2 during surveys

Family	Botanical Name	Common Name	Cover/abundance across Zone 2
Araliaceae	<i>Schefflera actinophylla</i> *	Umbrella tree	+
Araucariaceae	<i>Araucaria heterophylla</i>	Norfolk island pine	+
Arecaceae	<i>Archontophoenix alexandrae</i>	Alexander palm	+
Asparagaceae	<i>Asparagus aethiopicus</i> *	Ground asparagus fern	+
Asteraceae	<i>Ageratum houstonianum</i>	Blue billygoat weed	1
Asteraceae	<i>Bidens pilosa</i>	Cobblers peg	1
Asteraceae	<i>Chrysanthemoides monilifera</i> *	Bitou bush	+
Asteraceae	<i>Cirsium vulgare</i>	Spear thistle	1
Asteraceae	<i>Conyza</i> sp.*	Fleabane	1
Asteraceae	<i>Delairea odorata</i>	Cape ivy	1
Basellaceae	<i>Anredera cordifolia</i>	Madeira vine	+
Caesalpinioideae	<i>Senna pendula</i> var. <i>glabrata</i>	Winter senna	1
Commelinaceae	<i>Commelina benghalensis</i> *	Hairy commelina	1
Convolvulaceae	<i>Ipomoea cairica</i> *	Coastal morning glory	1
Fabaceae	<i>Macroptilium atropurpureum</i>	Siratro	1-2
Hibisceae	<i>Hibiscus</i> sp.	exotic hibiscus	+
Laminaceae	<i>Westringia fruticosa</i>	Coastal rosemary	+
Passifloraceae	<i>Passiflora suberosa</i>	Corky passionfruit	1
Passifloraceae	<i>Passiflora subpeltata</i>	White passionflower	1
Poaceae	<i>Chloris gayana</i> *	Rhodes grass	1

Family	Botanical Name	Common Name	Cover/abundance across Zone 2
Poaceae	<i>Melinis minutiflora</i> *	Molasses grass	2
Poaceae	<i>Paspalum dilatatum</i>	Paspalum	1
Poaceae	<i>Pennisetum clandestinum</i> *	Kikuyu grass	1-2
Poaceae	<i>Stenotaphrum secundatum</i>	Buffalo grass	2
Rutaceae	<i>Murraya paniculata</i> *	Mock orange	+
Solanaceae	<i>Solanum seaforthianum</i>	Climbing Nightshade	1
Solanaceae	<i>Solanum mauritianum</i>	Wild tobacco tree	1
Verbenaceae	<i>Lantana camara</i> *	Lantana	1-2
Verbenaceae	<i>Verbena bonariensis</i>	Purpletop	1

8.3 Zone 3 – Boulder Beach

Geographic location/extent of zone: Bound in the south by Rocky Point Road and in the north by the mown access track, BSC reference 31-36. (refer to **FIGURE A.10 and A.11** in **APPENDIX A**).

Main vegetation communities in zone (refer to **FIGURE A.10 and A.11** in **APPENDIX A**)

Zone 3 comprises a variety of vegetation communities, the dominant being littoral rainforest, although it is in varying stages of development and condition. Established areas of littoral rainforest occur behind the southern Boulder Beach dune system. This core area is being expanded by local landcare through weed suppression and planting behind Boulder Beach wetland. Older littoral rainforest plantings also occur in the northern part of the zone above the man-made drainage swale. Low-lying areas subject to frequent inundation comprise wetland vegetation of Native reed, Cumbungi, Prickly couch with the exotic Parra grass and Green Panic common in surrounding areas subject to less frequent inundation. Sections of Broad-leaved paperbark also occur around the fringes of wetland areas. Coastal shrubland containing Coast banksia, Coastal wattle, Pandanus and Horse-tail she-oak occurs in more exposed areas along Boulder Beach, this vegetation type being highly degraded with a proportion of exotic species.

Ecological values

Zone 3 comprises areas of Littoral rainforest TEC, Freshwater wetland TEC, Swamp sclerophyll forest TEC as well as some sections of littoral rainforest which are likely to meet the criteria of the TEC Littoral Rainforest and Coastal Vine Thickets of Eastern Australia (EPBC Act). The Threatened species White laceflower and Red lilly pilly have been recorded within vegetated areas behind Boulder Beach. Other littoral rainforest species which may be present include Scented acronychia, Durobby and Stinking cryptocarya. The Vulnerable listed Common Planigale has also been recorded within vegetated areas behind Boulder Beach. The area may also provide habitat for Threatened bird species including Fruit-doves, White-eared monarch, Yellow-eyed cuckoo shrike as well as the Common blossom bat and several microchiropteran bat species.

Progress since previous VMP (Envite 2004)

Extensive works have been undertaken throughout some areas of this zone since the previous VMP prepared in 2004 by Envite. Works have concentrated on restoring areas of littoral rainforest on the southern and northern sides of the Boulder Beach central access track through a program of weed suppression and planting.

General recommendations for zone

Any proposed restoration works should take into account the proposed location of the CRP. At this stage the path is planned to extend through coastal shrubland, west of the Boulder Beach wetland. The Boulder Beach area has been highlighted as a potential offset site for compensatory works associated with the construction of the northern section of the CRP. Any compensatory works should be undertaken in accordance with this VMP and in consultation with LHL.

Slashing/mowing of grassed access paths should be undertaken on a regular basis to reduce the spread of exotic grass seed.

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
3a	<p>Low-lying old paddock south-west of private residence. Area is highly degraded comprising a mosaic of Common reed, Cumbungi, Parra grass, Setaria and Green panic dependent upon frequency of inundation. Occasional emergent Coast banksia, Broad-leaved paperbark and Coastal wattle are present. Wild Tobacco bush is prevalent along the disturbed road edge.</p> <p>No works have been undertaken in this area since preparation of the Envite VMP (2004). As noted in the Envite report the area was most likely once occupied by Broad-leaved paperbark.</p>	2	<p>Significant resources will be required to restore this area over a number of years. Any planned restoration works should start along the northern boundary of the subzone, expanding upon and consolidating existing Broad-leaved paperbark. The north-western section of the subzone seems to be subject to more frequent inundation and contains a greater proportion of native wetland species. This would also serve to increase the Littoral rainforest buffer and protect core areas of littoral rainforest to the north. Restoration of the area would also serve to provide a link between landcare sites at Boulder Beach and Iron Peg.</p> <p>Given the highly disturbed nature of the site it is recommended that contractors undertake primary weed control works. Planting may then follow once weeds have been suppressed and be undertaken by landcare groups in a staged manner. Revegetation species should be guided by topography with Broad-leaved paperbark primarily used in low-lying areas, transitioning to Coast banksia/littoral rainforest species in elevated areas along the southern and eastern edges.</p>	<p>Low (when sufficient resources available)</p> <p>Low (when sufficient resources available)</p>	<p>LHL and BSC contractor</p> <p>LHL and BSC contractor</p>
3b	<p>Areas of littoral rainforest south of the Boulder Beach access track. Core areas comprise a diverse assemblage of littoral rainforest species with a closed mature canopy. Littoral rainforest plantings have been undertaken since 2004 in an open grassy area to the west of the SEPP Littoral rainforest area, near The Coast Road. The north-eastern part of the subzone is more open with senescing Coast banksia and a number of dead paperbarks amongst pockets of exotic grasses (Molasses/Whisky grass) and regenerating littoral rainforest.</p>	2-7	<p>Continue ongoing maintenance of plantings, a number of these were being smothered by exotic grasses at the time of the inspection.</p> <p>Continue ongoing weed maintenance around plantings and established areas of littoral rainforest. Exotic species noted include Ground asparagus, Corky passionfruit and Senna. Corky passionfruit in particular was observed encroaching into better areas of littoral rainforest and should be suppressed.</p> <p>Continue to expand core areas of littoral rainforest through</p>	<p>High</p> <p>High</p> <p>Medium</p>	<p>LHL</p> <p>LHL</p> <p>LHL</p>

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
			<p>a succession of weed suppression, planting and assisted natural regeneration. Slash/spray dense exotic grasses prior to planting. Work to link pockets of regenerating littoral rainforest in the north-eastern section. Control Lantana and Bitou bush growing amongst these stands of trees. Undertake plantings on the leeward side of regenerating pockets to protect from high winds and gradually expand vegetation from west to east. Plantings should utilise littoral rainforest species. The use of Broad-leaved paperbark should be restricted to low-lying wet areas. Given the number of dead individuals in the north-eastern section, this area may no longer be suitable for this species. The same may be said for Coast banksia.</p> <p>Native vines, particularly Parsonsia, should be suppressed in areas where they are becoming so prolific that they are limiting regeneration and smothering saplings. They should be trimmed back around native saplings until the canopy is re-established.</p> <p>Drill and inject mature Camphor laurel where appropriate, ie. amongst regenerating native vegetation. Any large vines climbing Camphor laurel should also be injected to prevent damage to surrounding vegetation from falling limbs.</p>	<p>High</p> <p>Medium</p>	<p>LHL</p> <p>BSC contractor</p>
3c	Subzone extends north of the Boulder Beach access track and includes established areas of littoral rainforest along the western portion and Coast banksia open woodland in the east. Coast banksia occurs amongst pockets of regenerating littoral rainforest and open areas dominated by Molasses. Regenerating species include Coastal wattle, Guioa, Midginberry, Pink euodia, Sweet pittosporum, Umbrella cheese tree, Beach	2-6	<p>Continue ongoing weed control in established areas along the western fringe including White passionfruit, Corky passionfruit, Siratro, Senna and Ground asparagus.</p> <p>Several mature Camphor laurels occur in both established vegetation and along the eastern edge where recent plantings have been undertaken, some of which are reshooting following treatment. These should be re-treated and additional Camphor laurel should be drilled/injected</p>	<p>High</p> <p>Medium</p>	<p>LHL</p> <p>BSC contractor</p>

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
	<p>acronychia and Tuckeroo. A number of the Coast banksia have died, possibly as a result of the 2009 cyclone or due to exposure, old age or changes in local hydrology. Recent plantings of littoral rainforest species have been undertaken in open grassland areas along the eastern edge of established littoral rainforest in efforts to expand this area. An extensive patch of Bats-wing fern occurs in the central northern part of the subzone and extends into Broad-leaved paperbark and wetland habitats further north/north-west (subzone 3d).</p>		<p>where they occur around plantings and regenerating littoral rainforest species as they are likely to inhibit their establishment. Larger vines such as Parsonsia should also be drilled where they are climbing mature Camphor laurel as their weight is likely to bring down limbs once these trees are treated.</p> <p>Suppress native vines where they are inhibiting establishment of the canopy and smothering saplings.</p> <p>Follow general planting strategy as per recommendations in subzone 3b.</p> <p>Control woody weeds amongst regenerating littoral rainforest in the eastern section including Senna, Lantana, Bitou bush.</p>	<p>High</p> <p>Medium</p> <p>High</p>	<p>LHL</p> <p>LHL</p> <p>LHL</p>
3d	<p>This subzone encompasses all low-lying areas of zone 3 including Boulder Beach wetland in the east, the drainage swale extending from The Coast Road and surrounding wet grassland habitats to the north and south.</p> <p>Within this zone Native reed and Cumbungi are common in areas of frequent inundation and surround areas of open standing water. A band of Prickly couch occurs along the western side of Boulder Beach wetland and adjoins regenerating littoral rainforest in subzone 3c. Sporadic occurrences of Swamp hibiscus, Knobby club-rush, Cumbungi, Cyperus spp., and Knotweed were noted in this area.</p> <p>The exotic Parra grass dominates beyond these</p>	2	<p>Restoration of this subzone will require considerable resources over a number of years given the degraded nature of the site.</p> <p>Planting following weed control should be undertaken in stages and progress from elevated areas towards lower lying areas and aim to link existing patches of native vegetation. Species to be utilised should be dictated by any indicator species present, most likely littoral rainforest in elevated areas and Swamp paperbark species in low-lying areas. Coast banksia and Coastal wattle may also be appropriate in exposed areas. Herbicides registered for use around waterways are to be utilised near open water.</p> <p>Control small occurrences of Bitou bush and Prickly pear noted amongst Prickly couch surrounding Boulder Beach wetland.</p>	<p>Low (dependent upon available resources)</p> <p>Medium</p>	<p>BSC contractor (primary works) followed by LHL (planting)</p> <p>LHL</p>

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
	areas where inundation is less frequent, along with Green panic, Lantana, Senna and Bitou bush.				
3e	<p>Coastal shrubland in the north-eastern part of the zone bound by low-lying wetland habitats to the south and west and a mown access track in the north. Vegetation comprises wind sheared Coast banksia and Coastal wattle with some Swamp oak along the eastern edge. Behind this are patches of Tuckeroo and Coast banksia amongst exotics including Tobacco, Bitou bush, Lantana, Green panic, Senna, Coastal morning glory and Inkweed.</p> <p>Buffalo grass is dominant along the foreshore with Melanthera, Coastal jack bean and Pigface.</p>	3	Carry out initial comprehensive weed control works. This would include targeting invasive vines and woody weeds. Weed control works should start around existing patches of native trees and work outwards. Planting may be required if resilience is low. Planting should utilise littoral rainforest species as well as Coast banksia and Coastal wattle in exposed areas along the eastern edge.	Low (dependent upon funding)	BSC contractor or LHL
3f	<p>Established littoral rainforest plantings along the northern side of the drainage swale. Dominant species include Broad-leaved paperbark, Pink euodia, Umbrella cheese tree, Swamp oak and Brown kurrajong. A ferny groundlayer occurs beneath areas of intact canopy.</p> <p>Any works in this subzone, particularly open areas in the west should take into consideration the location of the proposed Shared path east.</p>	2-6	<p>Continue ongoing weed maintenance, spraying exotic grasses and annuals where gaps occur in the canopy and around forest edges.</p> <p>Spray exotic grasses (Molasses) in open areas in the western part of the subzone. Undertake planting of littoral rainforest species if resilience is low.</p>	Medium Low	LHL LHL

List of exotic species recorded in Zone 3 during surveys

Family	Botanical Name	Common Name	Cover/abundance across Zone 3
Apocynaceae	<i>Gomphocarpus physocarpus</i>	Balloon cotton bush	+
Asparagaceae	<i>Asparagus aethiopicus*</i>	Ground asparagus fern	1

Family	Botanical Name	Common Name	Cover/abundance across Zone 3
Asteraceae	<i>Ageratina adenophora</i> *	Crofton weed	1
Asteraceae	<i>Ambrosia artemisiifolia</i> *	Annual ragweed	1
Asteraceae	<i>Baccharis halimifolia</i>	Groundsel bush	+
Asteraceae	<i>Bidens pilosa</i> *	Cobblers pegs	1
Asteraceae	<i>Ageratum boustonianum</i>	Blue billygoat weed	1
Asteraceae	<i>Chrysanthemoides monilifera</i> *	Bitou bush	1-2
Asteraceae	<i>Conyza</i> sp.*	Fleabane	1
Cactaceae	<i>Opuntia stricta</i>	Prickly pear	+
Caesalpinioideae	<i>Senna pendula</i> var. <i>glabrata</i> *	Winter senna	1
Commelinaceae	<i>Commelina benghalensis</i> *	Hairy commelina	1
Convolvulaceae	<i>Ipomoea cairica</i> *	Coastal morning glory	1
Fabaceae	<i>Macroptilium atropurpureum</i>	Siratro	1
Lauraceae	<i>Cinnamomum camphora</i>	Camphor laurel	2
Malvaceae	<i>Sida rhombifolia</i>	Paddy's lucerne	+
Passifloraceae	<i>Passiflora suberosa</i>	Corky passionfruit	1
Passifloraceae	<i>Passiflora subpeltata</i> *	White passionflower	1
Phytolaccaceae	<i>Phytolacca octandra</i>	Inkweed	1
Poaceae	<i>Andropogon virginicus</i>	Whisky grass	1
Poaceae	<i>Melinis minutiflora</i>	Molasses grass	3
Poaceae	<i>Panicum maximum</i> var. <i>trichoglume</i>	Green panic	2
Poaceae	<i>Paspalum dilatatum</i>	Paspalum	1
Poaceae	<i>Pennisetum clandestinum</i> *	Kikuyu grass	1
Poaceae	<i>Setaria sphacelata</i>	Setaria	1
Poaceae	<i>Stenotaphrum secundatum</i>	Buffalo grass	1
Poaceae	<i>Urochloa mutica</i>	Para grass	3
Solanaceae	<i>Solanum mauritianum</i> *	Wild tobacco tree	1
Verbenaceae	<i>Lantana camara</i> *	Lantana	1
Verbenaceae	<i>Verbena bonariensis</i>	Purpletop	1



8.4 Zone 4 – Lennox Head

Geographic location/extent of zone: This zone includes established areas of vegetation across the top of Lennox Head south to the mown access track, BSC reference 31-36. This zone has been split into three subzones based upon management requirements and vegetation type (refer to **FIGURE A.11 in APPENDIX A**).

Main vegetation communities in zone (refer to **FIGURE A.11 in APPENDIX A**)

The eastern edge of the zone comprises areas of *Themeda australis* grassland amongst exotic grassland dominated by Buffalo and Kikuyu. West of the walking track the zone comprises mostly littoral rainforest types in varying stages of development and integrity. Extensive littoral rainforest plantings have been undertaken across this area in stages from 1980 to 2014 (refer to **FIGURE XX**). An older area of Coast banksia forest was also planted in 1980 in the north-western section of the zone. Unplanted areas typically comprise exotic grassland with patches of regenerating littoral rainforest and woody weeds.

Historical photos of Lennox Head (refer to photo in **APPENDIX B**) illustrate that the cliff edges were always occupied by *Themeda australis* grassland with a distinct line of vegetation further west. The photo also shows that the upper most tip of Lennox Head was vegetated, most likely with littoral rainforest. Restoration efforts within this zone are aimed at replicating this original state with native grassland extending from the cliff edges to the walking track and littoral rainforest to the west of the track.

Ecological values

Weed control works have greatly improved the ecological values of this zone, specifically through the removal of Lantana and Bitou bush and the extensive plantings which have been undertaken. The zone comprises areas of *Themeda australis* grassland on coastal headlands TEC listed under the BC Act as well as the ROTAP *Plectranthus cremnus*. The zone also comprises Littoral Rainforest TEC (BC Act), better areas of which are likely to meet the condition thresholds of the TEC Littoral Rainforest and Coastal Vine Thickets of Eastern Australia (EPBC Act). Given time to establish, plantings across the zone will further the extent of this TEC and provide habitat for a number of threatened flora and fauna species known to occur within littoral rainforest habitats. The Vulnerable state listed Common planigale has been recorded within the older patch of littoral rainforest on the tip of the headland. Continued restoration works will provide significant habitat for this species and provide an important corridor to larger areas of habitat at Boulder Beach.

Works since previous VMP (Envite 2006)

Significant works have been undertaken since the previous VMP prepared by Envite in 2006. Extensive control of dense Lantana and Bitou bush shrubland has occurred followed by large scale plantings of littoral rainforest species. A formal stairway has also been constructed from Pat Morton lookout to the upper lookout areas where soil erosion was a significant problem along the old track.

General recommendations for zone

Recent trimming of branches along tracks 31-32 and 31-33 was noted at the time of the inspection. Trimmed branches were mostly dumped along the track edge, many of which were large in size. This is likely to make slashing of the track edges difficult and encourage dense weed growth amongst woody debris. Investigate options of mulching branches if access for a mulcher permits or chopping branches into smaller sections and placing on the inside of vegetated areas. Maintenance of the aerial corridor along tracks should be undertaken on a regular basis to reduce the amount of biomass needing to be managed. Track vegetation maintenance is to be conducted in accordance with updated track maintenance guidelines in **APPENDIX C**.

The site inspection noted that a number of the fenced planting areas were set back some way from the edge of mown tracks. These areas were dominated by tall exotic grasses (Molasses mostly) and other exotic weeds. Consider bringing the fenced edge of planting areas up to the edge of existing tracks to reduce exotic grass cover along track edges.

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
4a	<p>This subzone covers the seaward edge of the headland, east of the walking track. The area comprises quality patches of <i>Themeda australis</i> grassland with native herbs, predominately along cliff edges. Exotic grasses, Buffalo and Kikuyu, prevail to the west of the walking track but also occur sporadically on the eastern side, particularly in the northern part of the subzone.</p> <p>The location of the walking track (BSC ref: 31-34) was moved further west a couple of years ago. The old track is slowly being covered by grasses although this path is still being utilised by walkers and links to a number of smaller informal tracks around the cliff edge.</p>	4	<p>This subzone is to be managed as a <i>Themeda australis</i> grassland protection zone with the long-term goal of converting exotic grassland to <i>Themeda australis</i> grassland. In the absence of fire, coastal shrubs/trees are likely to germinate and may compromise the value of this TEC. Therefore it may be appropriate to remove isolated trees/shrubs, particularly where these occur amongst <i>Themeda australis</i> grassland. Alternatively, introduce controlled fire as an ecological methodology option to weed and deter expanding tree seedling growth to protect the Themeda TEC and be consistent with historical use/vegetation community layout of the land pre 1860.</p>	Low	BSC contractor
			<p>Gradually expand areas of native grassland by spraying exotic grasses around the edges. Pegging the interface between these communities may be useful to monitor the success of spray treatments. Look for opportunities to link <i>Themeda australis</i> patches. Investigate opportunities for the direct seeding and/or planting of <i>Themeda australis</i>. Monitor the success or otherwise of these initiatives.</p>	Medium	BSC contractor
			<p>Aim to consolidate the myriad of informal tracks, perhaps retaining the cliff edge track but directing walkers away</p>	Low	BSC

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
			<p>from the old walking track and onto the newer track further west. Investigate opportunities for interpretive signage regarding the <i>Themeda australis</i> grassland and its endangered state as well as the cryptic herbs and rare <i>Plectranthus cremnus</i> which occur within this community.</p> <p>Examine dispersal of cut grass from mower used on mown walking track (31-34) and develop a method that will limit cuttings of exotic grass landing on Themeda colonies e.g mow in one direction only.</p>	High	BSC
4b	<p>This subzone covers more recently planted areas and future planting areas.</p> <p>Vegetation within this zone comprises planted littoral rainforest, small pockets of naturally regenerating littoral rainforest, isolated trees and exotic vegetation.</p>	2-4	<p>Planted areas require adequate maintenance to suppress exotic species and ensure the greatest chance of success. Funding secured as part of the yearly planting program should allow for regular maintenance until plantings become established (approximately 5 years). A number of the planted areas were being smothered by dense weed growth at the time of the site inspection. The weed 'Farmers friend' is regularly left by contractors amongst plantings temporarily until shaded by canopy to assist with wallaby security through deterred vision upon seedlings and if fencing breaches occur.</p> <p>In general, future planting areas should be planned in a north to south and east to west direction. This ensures weed propagules are not being continually blown into planted areas (from the east) and will serve to buffer plantings as trees become established along the eastern edge.</p> <p>Future funding should be targeted towards controlling woody weeds, exotic grasses and vines amongst larger areas of regenerating littoral rainforest eg: vegetation along track 31-32 and between tracks 31-35 and 31-36. This will assist with the natural expansion of these areas. In particular, Camphor laurels should be drilled/injected where they</p>	<p>High</p> <p>High</p> <p>Medium</p>	<p>BSC contractor</p> <p>BSC</p> <p>BSC contractor</p>

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
			occur amongst established patches of native vegetation.		
4c	<p>This subzone includes established and semi-established planted areas where the canopy is predominately intact and/or dominated by native species.</p> <p>It includes older areas of littoral rainforest established in 1980 as well as the tall Coast banksia forest on the lee ward side of the headland.</p> <p>Several areas of Littoral rainforest plantings established prior to 2010 are also included in this subzone.</p>	5-6	<p>Continue ongoing weed maintenance in this subzone.</p> <p>Consolidate any gaps in the vegetation through additional embellishment plantings where natural regeneration is lacking.</p> <p>Drill/inject mature Camphor laurels amongst established vegetation.</p>	<p>High</p> <p>Medium</p> <p>Medium</p>	<p>BSC contractor</p> <p>LHL</p> <p>BSC contractor</p>

List of exotic species recorded in Zone 4 during surveys

Family	Botanical Name	Common Name	Cover/abundance across Zone 6
Apocynaceae	<i>Gomphocarpus physocarpus</i>	Balloon cotton bush	+
Asparagaceae	<i>Asparagus aethiopicus</i> *	Ground asparagus fern	+
Asteraceae	<i>Ageratina adenophora</i> *	Crofton weed	1
Asteraceae	<i>Ageratum houstonianum</i> *	Blue billygoat weed	1
Asteraceae	<i>Ambrosia artemisiifolia</i> *	Annual ragweed	1
Asteraceae	<i>Baccharis halimifolia</i> *	Groundsel bush	+
Asteraceae	<i>Bidens pilosa</i> *	Cobblers pegs	1
Asteraceae	<i>Chrysanthemoides monilifera</i> *	Bitou bush	1
Asteraceae	<i>Conyza</i> sp.*	Fleabane	1
Caesalpinioidae	<i>Senna pendula</i> var. <i>glabrata</i> *	Winter senna	1-2
Convolvulaceae	<i>Ipomoea cairica</i> *	Coastal morning glory	2
Fabaceae	<i>Desmodium uncinatum</i> *	Silver-leaved desmodium	1
Fabaceae	<i>Macroptilium atropurpureum</i>	Sirat	1
Lauraceae	<i>Cinnamomum camphora</i> *	Camphor laurel	2
Ochnaceae	<i>Ochna serrulata</i> *	Mickey mouse plant	+



Family	Botanical Name	Common Name	Cover/abundance across Zone 6
Passifloraceae	<i>Passiflora suberosa</i> *	Corky passionfruit	1
Passifloraceae	<i>Passiflora subpeltata</i> *	White passionflower	1
Poaceae	<i>Chloris gayana</i> *	Rhodes grass	1
Poaceae	<i>Eragrostis tenuifolia</i> *	Elastic grass	1
Poaceae	<i>Melinis minutiflora</i> *	Molasses grass	3
Poaceae	<i>Paspalum dilatatum</i> *	Paspalum	1
Poaceae	<i>Pennisetum clandestinum</i> *	Kikuyu grass	2
Poaceae	<i>Setaria sphacelata</i>	Setaria	1
Poaceae	<i>Stenotaphrum secundatum</i>	Buffalo grass	2-3
Solanaceae	<i>Solanum mauritianum</i> *	Wild tobacco tree	1-2
Verbenaceae	<i>Lantana camara</i> *	Lantana	1-2

8.5 Zone 5 – Pat Morton Lookout and Lennox Point

Geographic location/extent of zone: This zone includes Pat Morton Lookout and areas of Lennox Point up to the end of Dress Circle Drive. This zone has been split into eight subzones based upon vegetation type and management requirements (refer to **FIGURE A.11** in **APPENDIX A**).

Main vegetation communities in zone (refer to **FIGURE A.11** in **APPENDIX A**)

This zone comprises a great diversity of vegetation types including littoral rainforest, wetland types, native *Themeda australis* grassland and coastal shrubland comprising Pandanus, Coast banksia and Coast wattle.

Ecological values

This area is generally in the early stages of rehabilitation following the cessation of grazing, with extensive areas of weedy grassland supporting pockets of regrowth littoral rainforest, coast banksia shrubland and wetland. Ecological values are nascent but varied, with developing areas of a number of TEC types including Littoral rainforest, Themeda grassland and Freshwater wetland. The area supports patches of Hairy joint grass as well as cluster plantings of Coastal fontainea. Fauna habitats are not well developed but will in time provide the potential for expansion of populations of rainforest birds and other species from forested areas at Pat Morton lookout, including the Common planigale.

Works since the previous VMP (EnviTE 2006)

Extensive work has been undertaken through this zone by LHL, contractors and as a result of World Environment Day Community planting. Older littoral rainforest plantings are establishing well and more recent plantings have been undertaken at the western end. Infestations of Yucca and Prickly pear along the waters edge have been targeted and receive regular follow-up maintenance. Additional works are also being undertaken by bush regeneration contractors at the eastern wetland and surrounding areas as part of an offset plan for Ballina Heights Estate. Formalised pathways to Pat Morton lookout and from the surfers carpark to the water have also been constructed.

General recommendations for zone:

This zone provides a number of challenges for restoration with a diversity of weed species present, a number of target ecological communities across the zone and difficulties in establishing plantings as a result of high levels of exposure to strong salt-laden winds and channelled floodwater runoff during storm events. There are also a series of landowner and recreational pressures on the site, including maintaining the hang glider take off and emergency landing zones and consideration of views from the lookout and private residences.

Rehabilitation works in recent years have progressed well, with the wetland and surrounding area subject to an ongoing maintenance and tree planting program managed by contractors and landcare teams working from the north-western end of the zone to establish *Themeda* grassland and low windsheared littoral rainforest patches. Rehabilitation works should continue as planned, extending from the north-western end around the wetland and allowing for expansion of existing patches of littoral rainforest and Coast banksia shrubland.

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
5a	Cliff terraces of Lennox Head, mostly dominated by Bitou bush.	1	Significant resources will be required to restore this area over a number of years. Long-term goal of eradicating Bitou bush from cliff ledges and promoting native species such as <i>Themeda australis</i> . Examine options to treat Bitou bush on cliff ledges as aerial spraying in this area is likely to be difficult. Option to utilise bush regeneration contractors with appropriate qualifications for abseiling work or investigate option of utilising new technology using drones or helicopters with directional spray units may also be appropriate.	Low	BSC contractor
5b	Pat Morton lookout and hang glider launch zone Pat Morton lookout comprises open areas of mown grassland (<i>Themeda australis</i> and exotic) amongst planted gardens and individual trees. Hang gliders launch from the grassed area on the eastern side of the carpark or from a light wind take off point located up the stairs at a higher vantage point along the cliff.	N/A	This subzone is to be managed for recreational purposes.	High	BSC contractor
			A 100m wide radius below the lower take off point is to be managed as a grassed area with any shrubs or trees removed to reduce turbulence. Similarly the existing shear slope located below the light wind take off point is to be maintained. At the light wind take off some canopy pruning and sculpting will be required to the side and below on emerging trees to encourage a smooth canopy growth form for wind shear to minimise turbulence along with pruning or removal of trees for wingtip access upon entering the take off. Weeds should be controlled in these treeless areas and the establishment of native grasses (<i>Themeda australis</i>), herbs and creepers should be encouraged to reduce erosion potential. Contractors should have abseiling qualifications for working on cliff slopes where required.	Medium	BSC contractor
			Control Lantana located along the eastern side of the steps. Areas around Pat Morton Lookout should be maintained as required through slashing and weeding of garden beds.	As required	BSC

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
5c	Hang glider emergency landing zone, located below the Pat Morton take off point at the base of the slope.	N/A	This 20-30m wide area is to be managed as an emergency landing zone for hang gliders. The area is to be maintained as a low sedgeland/grassland and any shrub or tree species are to be controlled. Exotic species should also be controlled and native sedges/grasses encouraged.	High	BSC contractor
5d	<p>This subzone includes low-lying wetland habitats and is split into two parts. The eastern part consists of a core wetland area of Cumbungi and Common reed with associated wetland herbs and ferns. The core wetland area is fringed with wetland species heavily infested in parts with exotic grasses, Bitou bush, Crofton weed, Coastal morning glory, Lantana, Groundsel bush and various annuals.</p> <p>The western part of the subzone covers low lying pockets of Common reed and Cumbungi amongst wet grassland and areas of Singapore daisy. These areas occur along the southern edge of the pathway where water becomes trapped following heavy rains. A dense stand of Cunjevoi as well as scattered Swamp hibiscus also occur.</p>	3-4	<p>Works in the eastern wetland area are currently in progress as part of a 5-yr compensatory plan for the Ballina Heights Estate. The threatened species Hairy joint grass has been recorded in the wetland and the offset plan is to restore habitat for this species within the wetland through weed control works and planting of littoral rainforest species in the surrounding area (subzone 5e).</p> <p>Undertake targeted control of invasive weed species in the western part of the subzone including Groundsel, Bitou bush, Coastal morning glory and Singapore daisy. Investigate options to revegetate areas around the Cumbungi and Native reed with Swamp paperbark or Swamp oak as appropriate. The threatened species Hairy joint grass was recorded in this area during the surveys.</p>	<p>High (in progress)</p> <p>Low (dependent upon funding)</p>	<p>BSC contractor</p> <p>LHL or BSC contractor</p>
5e	This subzone includes all areas of zone 5 which currently comprise littoral rainforest or are proposed to be converted to littoral rainforest. Several areas of this subzone have been planted and now contain established littoral rainforest with sporadic weeds. Other areas comprise regenerating patches of littoral rainforest (mainly Tuckeroo, Guioa and Sweet pittosporum) amongst exotic vegetation.	3-6	<p>The long-term plan is to convert this entire subzone to littoral rainforest habitats.</p> <p>Continue ongoing weed maintenance in areas of established plantings. Ensure maintenance of less established plantings is undertaken on a regular basis to suppress exotics and ensure the greatest chance of success. Maintain guards and fences as required and then remove.</p> <p>Work around regenerating patches of littoral rainforest and free them of woody weeds and vines. Look at opportunities to link patches and expand outwards.</p>	<p>High</p> <p>Medium</p>	<p>LHL or BSC contractor</p> <p>LHL or BSC contractor</p>

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
			<p>Undertake additional planting of littoral rainforest species in open areas where natural regeneration is lacking and/or to increase species diversity.</p> <p>Continue maintenance and monitoring of critically endangered Coastal fontainea individuals planted in this subzone.</p> <p>Remove Norfolk Island pines in consultation with BSC.</p>	<p>Medium</p> <p>High</p> <p>Low</p>	<p>LHL</p> <p>LHL</p> <p>LHL and BSC</p>
5f	Seaward side of boardwalk along shoreline up to the shelter. This area is to be managed for pedestrian and emergency vehicle access. Vegetation on the seaward edge is to be maintained as an open area with scattered trees.	2	<p>Continue ongoing inspection and control of Yucca and Prickly pear, particularly following storm surges.</p> <p>Spray areas of Singapore daisy using Metsulfuron methyl to avoid dieback of native grasses in this area.</p> <p>Expand existing areas of <i>Themeda australis</i>.</p> <p>Maintain a clear aerial corridor for emergency vehicle access.</p> <p>Remove Norfolk Island pines in consultation with BSC.</p>	<p>High</p> <p>Medium</p> <p>Low</p> <p>High (as required)</p> <p>Low</p>	<p>LHL</p> <p>BSC contractor</p> <p>LHL</p> <p>BSC</p> <p>BSC contractor</p>
5g	This subzone occurs along the eastern edge of the maintained grass easement in front of residences along Pinnacle Row. LHL have already well begun extensive weed removal and zoned plantings with littoral rainforest/wetland down the bottom and groundcovers and shrubs at the upper end towards the houses. Mixed <i>Themeda australis</i> and littoral rainforest/wetland restoration would have most likely originally existed here and is occurring already through natural regeneration (weed removal) and with landcare zoned plantings.	3	<p>Continue ongoing weed maintenance and planting maintenance as required. Replace any failed plantings and install guards should browsing become an issue.</p>	<p>Medium</p>	<p>LHL</p>

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
	This subzone is to be restored as a mixed vegetation area with <i>Themeda australis</i> /shrubland in higher areas and rainforest/wetland areas in lower subzone dependent upon inundation.				
5h	This subzone covers the mown easement along the seaward edge of residences along Pinnacle Row.	1	Maintain easement as required through slashing. Undertake slashing so as to limit cuttings of exotic grass landing on Themeda colonies in subzone 5g e.g mow in one direction only.	As required	BSC

List of exotic species known to occur in Zone 5 (Source: LHL)

Family	Botanical Name	Common Name	Cover/abundance across Zone 5
Agavaceae	<i>Agave americana</i>	Yucca or Agave	1
Apocynaceae	<i>Araujia sericifera</i>	Moth Vine	1
Apocynaceae	<i>Asclepias curassavica</i>	Redhead Cotton Bush	1
Apocynaceae	<i>Gomphocarpus physocarpus</i>	Balloon Cotton Bush	1
Araceae	<i>Syngonium podophyllum</i>	Arrowhead Plant	1
Araliaceae	<i>Schefflera actinophylla</i> *	Umbrella tree	1
Araucariaceae	<i>Araucaria heterophylla</i>	Norfolk Island Pine	2
Arecaceae	<i>Archontophoenix alexandrae</i>	Alexandra Palm	1
Arecaceae	<i>Syagrus romanzoffiana</i>	Cocos Palm or Queen Palm	1
Asparagaceae	<i>Asparagus aethiopicus</i> *	Ground asparagus fern	1
Asteraceae	<i>Ageratum houstonianum</i>	Blue Billygoat Weed	2
Asteraceae	<i>Ageritina adenophora</i>	Crofton Weed	2
Asteraceae	<i>Ageritina riparia</i>	Mistflower	1
Asteraceae	<i>Baccharis halimifolia</i>	Groundsel Bush	2
Asteraceae	<i>Bidens pilosa</i> *	Cobblers pegs	1
Asteraceae	<i>Chrysanthemoides monilifera</i> ssp. <i>rotunda</i>	Bitou Bush	2
Asteraceae	<i>Cirsium vulgare</i>	Spear Thistle	1

Family	Botanical Name	Common Name	Cover/abundance across Zone 5
Asteraceae	<i>Conyza sp.*</i>	Fleabane	1
Asteraceae	<i>Crassocephalum crepidioides</i>	Thickhead	1
Asteraceae	<i>Delaria odorata</i>	Cape Ivy	1
Asteraceae	<i>Erechtites valerianifolius</i>	Brazilian Fireweed	1
Asteraceae	<i>Galinsoga pariflora</i>	Potato Weed or Galinsoga	1
Asteraceae	<i>Hypochaeris radicata</i>	Fatweed or Cat's Ear	1
Asteraceae	<i>Senecio madagascariensis</i>	Fireweed	1
Asteraceae	<i>Sphagneticola trilobata*</i>	Singapore daisy	2-3
Asteraceae	<i>Tagetes minuta</i>	Stinking Roger	1
Basellaceae	<i>Anredera cordifolia*</i>	Madeira vine	1
Cactaceae	<i>Opuntia stricta</i>	Prickly Pear	1
Cactaceae	<i>Pereskia aculeata</i>	Babados Gooseberry	1
Caesalpinoideae	<i>Senna pendula var. glabrata*</i>	Winter senna	1
Cannaceae	<i>Canna indica</i>	Canna Lily	1
Caprifoliaceae	<i>Lonicera japonica</i>	Japanese Honeysuckle	1
Casuarinaceae	<i>Allocasuarina equisetifolia</i>	Horsetail Sheoak	1
Chenopodiaceae	<i>Chenopodium ambrosioides</i>	Mexicam Tea	1
Commelinaceae	<i>Commelina benghalensis*</i>	Hairy commelina	1
Commelinaceae	<i>Tradescantia flumenensis</i>	Wandering jew	1
Convolvulaceae	<i>Ipomoea cairica*</i>	Coastal morning glory	2
Davalliaceae	<i>Nephrolepis cordifolia*</i>	Fishbone fern	1
Euphorbiaceae	<i>Euphorbia cathophora</i>	Painted Spurge	1
Fabaceae	<i>Crotalaria lanceolata ssp. Lanceolata</i>	Lance-leaf Rattlepod	1
Fabaceae	<i>Macroptilium atropurpureum</i>	Siratro	1
Lamiaceae	<i>Salvia coccinea</i>	Red Salvia	1
Lauraceae	<i>Cinnamomum camphora*</i>	Camphor laurel	1
Malvaceae	<i>Sida rhombifolia*</i>	Paddy's lucerne	1
Myrtaceae	<i>Eugenia uniflora</i>	Brazilian Cherry	1

Family	Botanical Name	Common Name	Cover/abundance across Zone 5
Myrtaceae	<i>Leptospermum laevigatum</i>	Coastal Tee-tree	1
Myrtaceae	<i>Psidium guajava</i>	Common Guava	1
Ochnaceae	<i>Ochna serrulata*</i>	Mickey mouse plant	1
Passifloraceae	<i>Passiflora subpeltata</i>	White Passionfruit	2
Passifloraceae	<i>Passiflora suberosa</i>	Corky Passionfruit	1
Phytolaccaceae	<i>Rivina humilis</i>	Coral Berry	1
Poaceae	<i>Axonopus sp</i>	Carpet Grass	1
Poaceae	<i>Bromus catharticus</i>	Prarie Grass	1
Poaceae	<i>Chloris gayana</i>	Rhodes Grass	1
Poaceae	<i>Melinis minutiflora</i>	Molasses Grass	2
Poaceae	<i>Melinis repens</i>	Red Natal Grass	2
Poaceae	<i>Paspalum dilatatum*</i>	Paspalum	1
Poaceae	<i>Pennisetum cladestinum</i>	Kikuyu	1
Poaceae	<i>Pennisetum purpureum</i>	Bana Grass or Elephant Grass	2
Poaceae	<i>Sorghum halepense</i>	Johnson Grass or Sorghum	1
Poaceae	<i>Urochloa mutica</i>	Para Grass	1
Polygonaceae	<i>Acetosa sagittata</i>	Turkey Rhubarb	1
Polygonaceae	<i>Pesicaria sp.</i>	Smart Weed	1
Rutaceae	<i>Murraya paniculata</i>	Orange Jessamine or Mock Orange	1
Solanaceae	<i>Lycium ferocissimum</i>	African Box Thorn	1
Solanaceae	<i>Physalis angulata (syn. P. minima)</i>	Wild Gooseberry	1
Solanaceae	<i>Physalis peruviana</i>	Cape Gooseberry	1
Solanaceae	<i>Solanum mauritianum</i>	Wild Tobacco	1
Solanaceae	<i>Solanum seaforthianum</i>	Climbing Nightshade	1
Verbenaceae	<i>Lantana camara*</i>	Lantana	2
Verbenaceae	<i>Verbena sp.</i>	Purple Top	1

8.6 Zone 6 – Escarpment west of The Coast Road

Geographic location/extent of zone: Triangular area of vegetation located on the western side of The Coast Road opposite the surfers carpark just north of Pat Morton lookout (refer to **FIGURE A.11** in **APPENDIX A**).

Main vegetation communities in zone (refer to **FIGURE A.11** in **APPENDIX A**)

The predominant vegetation community located in Zone 6 is Littoral rainforest and Coast banksia open forest, although it is in a highly degraded state.

Ecological values

This area comprises Littoral Rainforest TEC (BC Act) although it is highly degraded and dominated by exotic species. Significant restoration works are being undertaken along this coastal escarpment further north where a SEPP Littoral rainforest area occurs. A number of threatened flora species are known to occur within or adjacent to this SEPP Littoral rainforest area and may also occur within the zone including White laceflower and Rough shelled bush nut. The critically endangered Coastal fontainea occurs within the local area and the site provides suitable habitat for this species.

General recommendations for zone:

While no works have previously been undertaken in this zone, the restoration of this area would provide a link between work zones further west along the escarpment and vegetated areas of Lennox Point and Lennox Head. Weed control efforts would also benefit surrounding areas by reducing weed seed source.

Given the steep nature of the escarpment some areas of the zone may require abseiling equipment for access. Contractors are to be suitably qualified for this type of work.

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
6a	Highly disturbed littoral rainforest along the wind sheared escarpment with Coast banksia, Tuckeroo, Guioa and Sweet pittosporum dominant. The exotic Bitou bush is common across the zone. Other common weeds noted include Umbrella tree, Senna, White passionfruit, Lantana, Siratro, African boxthorn, Tobacco, Cocos palm, Crofton, Rhodes grass, Molasses grass, Setaria and Coastal morning glory.	3-4	<p>Significant resources will be required to restore this area over a number of years. Any planned restoration works should start from better quality areas in the west and work towards the east.</p> <p>Follow up weed control will be needed for at least 5 years. Investigate whether landcare would be interested in maintaining the zone once initial works have been completed (dependent upon access and slope).</p>	Medium (dependent upon funding)	<p>BSC contractor</p> <p>BSC contractor/volunteers</p>

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:

List of exotic species recorded in Zone 6 during surveys

Family	Botanical Name	Common Name	Cover/abundance across Zone 6
Araliaceae	<i>Schefflera actinophylla</i> *	Umbrella tree	1
Arecaceae	<i>Syagrus romanzoffiana</i> *	Cocos palm	+
Asparagaceae	<i>Asparagus aethiopicus</i> *	Ground asparagus fern	1
Asteraceae	<i>Ageratina adenophora</i> *	Crofton weed	1
Asteraceae	<i>Bidens pilosa</i> *	Cobblers pegs	1
Asteraceae	<i>Chrysanthemoides monilifera</i> *	Bitou bush	3
Asteraceae	<i>Conyza</i> sp.*	Fleabane	1
Caesalpinoideae	<i>Senna pendula</i> var. <i>glabrata</i> *	Winter senna	2
Convolvulaceae	<i>Ipomoea cairica</i> *	Coastal morning glory	1-2
Fabaceae	<i>Macroptilium atropurpureum</i>	Siratro	1
Lauraceae	<i>Cinnamomum camphora</i> *	Camphor laurel	1
Passifloraceae	<i>Passiflora suberosa</i> *	Corky passionfruit	1
Passifloraceae	<i>Passiflora subpeltata</i> *	White passionflower	1
Poaceae	<i>Chloris gayana</i> *	Rhodes grass	1
Poaceae	<i>Melinis minutiflora</i> *	Molasses grass	1
Poaceae	<i>Paspalum dilatatum</i> *	Paspalum	1
Poaceae	<i>Setaria sphacelata</i>	Setaria	1
Solanaceae	<i>Lycium ferocissimum</i> *	African boxthorn	+
Solanaceae	<i>Solanum mauritianum</i> *	Wild tobacco tree	1
Verbenaceae	<i>Lantana camara</i> *	Lantana	2

8.7 Zone 7 – Lennox Head Foreshore

Geographic location/extent of zone: Extends along the foreshore of Seven Mile beach, south from the Lennox Head surfclub to the end of the boardwalk at the end of Dress Circle Drive. Foreshore areas located on private property have not been included in this VMP. This zone has been split into three subzones, primarily based upon management recommendations (refer to **FIGURE A.12** in **APPENDIX A**).

Main vegetation communities in zone (refer to **FIGURE A.12** in **APPENDIX A**)

The incipient dune is generally in good condition within the zone and is dominated by Spinifex with dune creepers. Fore-dune areas contain a mix of native and exotic grassland with sections of dense Melanthera shrubland and patches of Coastal wattle and Coast banksia. Larger patches of wind-sheared Coast banksia, Tuckeroo, Beach alectryon and Three-veined laurel occur in the northern part of the zone while foreshore areas in front of the Lennox village centre comprise mown grassland with scattered trees. The southern part of the zone is highly degraded and suffers from heavy weed infestation.

Ecological values

Small patches of wind sheared Tuckeroo near the end of Williams Street are likely to meet the description of the TEC *Littoral rainforest* as listed under the BC Act. Coastal dune vegetation in general provides protection against erosional forces and also provides dense habitat cover for native fauna species.

Works since previous VMP (EnviTE 2005)

Lennox Head Landcare is actively working in dune areas of this zone from the Foam restaurant (41 Pacific Parade) north to the surf club. Landcare have undertaken significant weed control and dune protection works in this area since the preparation of the previous VMP in 2005. Bitou bush across the fore-dune has been suppressed as well as large infestations of Turkey rhubarb.

General recommendations for zone:

- Norfolk Island pines, and other planted non-local native species, should be removed where they occur amongst native vegetation or in designated restoration zones, as appropriate. Pines located within recreational areas and landscaped zones may be retained.
- Any revegetation works proposed along the dune system should be undertaken in consultation with adjacent residents.
- Any trimmed branches should be removed from site, mulched or cut into smaller pieces and placed inside vegetated patches. Trimming of vegetation along tracks and around carparking areas should be undertaken in accordance with the updated Track maintenance guidelines Appendix C.

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
7a	<p>No previous works have been undertaken within this subzone and consequently dune vegetation is minimal and dominated by weeds. Dune is predominately unnaturally constructed with mixed soils and rock.</p> <p>Dunes are dominated by exotic grasses primarily kikuyu, Para grass, Setaria and <i>Eragrostis</i> sp. Other common exotics include Hydrocotyle, Turkey rhubarb, Siratro and Coastal morning glory. Hind dune areas lack woody vegetation except for a small section south of the carparking area. This section has been planted in the past with exotics, primarily Hibiscus (exotic), although some Pandanus and Coast banksia also occur. Exotics are common on the hind dune and include Yucca's, Senna, Umbrella tree, Brazilian cherry, Corky passionfruit, Lantana, Coastal morning glory and White passionfruit.</p>	2	<p>Works in this subzone are dependent upon funding and resource availability. Long-term funding would be required as well as cooperation from adjacent landholders.</p> <p>Undertake comprehensive weed control works targeting invasive vines and woody weeds around existing Coast banksia, Coastal wattle and Pandanus. Treat other invasive weeds including Yuccas, Brazilian cherry, Canna lilly, Senna, Umbrella tree and planted exotics (Hibiscus, Frangipani and Poinsettia).</p> <p>Dune revegetation may need to consider potential conflict with existing residential views. Consultation will be required if revegetation works are proposed. Residents should be informed regarding the long-term benefits of protecting the dune environment. Revegetation could utilise low growing native dune species on the foredune and dune crest such as Melanthera, Spinifex, Blady grass, Isolepis and dune creepers. Hind dune areas could be revegetated with Coastal wattle where appropriate.</p> <p>Any dune revegetation works will also need to consider the approved Coastal Zone Management Plan management actions with regards to dune stabilisation and heights.</p>	<p>Medium (dependent upon funding)</p> <p>Low (dependent upon funding)</p>	<p>LHL or BSC contractor</p> <p>LHL</p>
7b	<p>This subzone extends from the public toilets opposite the shops north to the Pandanus Grove opposite No. 25 Pacific Parade (just north of Lennox Street). This subzone is to be managed for recreational purposes and comprises mown grassland with scattered trees and islands of vegetation.</p> <p>Fenced foredune areas comprise Spinifex, Goats foot, Melanthera, Kikuyu, Coastal morning glory</p>	2	<p>Landscaping and management of vegetation in this subzone to be undertaken in accordance with the Lennox Head Foreshore Parkland Master Plan.</p> <p>Continue mowing regime within parkland areas.</p> <p>Treat isolated patch of Madeira noted along dune fence.</p>	<p>As required</p> <p>As required</p> <p>Medium</p>	<p>BSC</p> <p>BSC</p> <p>LHL</p>

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
	and Couch.				
7c	<p>This subzone extends from the Pandanus grove (opposite No.25 Pacific Parade) to the Lennox Head Surf club. This area is to be managed as more of a natural vegetation community (than subzone 2b) with smaller pockets of open space linked by a maintained grass track.</p> <p>The incipient dune is in good condition thanks to LHL and comprises Spinifex, Blady grass, Coast wattle and dune creepers. Patches of exotic Kikuyu are still persistent, more so at the southern end of the subzone. Turkey rhubarb and Prickly pear are still persistent in some areas as is Hydrocotyle, Coastal morning glory, Ground asparagus, Fishbone fern, Canna lilly and Siratro. Dune crests and hind dune areas comprise Coast banksia, Pandanus, Tuckeroo and Norfolk Island pine.</p>	4	<p>Continue ongoing weed maintenance in previously worked areas.</p> <p>Planted ornamental species or non-local native species should be removed where they occur in fenced or native vegetation areas such as Strelitzia, Coast rosemary, Norfolk Island Pine, Yucca, exotic Hibiscus and exotic palms.</p> <p>Consolidate pockets of vegetation where sparse through additional plantings and link patches where appropriate. Fence pockets or create defined edges for the slasher.</p> <p>Several small occurrences of Madeira vine were noted and should be controlled. Mother-in-laws tongue was also noted and should be targeted.</p> <p>Investigate opportunities to develop wind sheared Coast banksia and Coastal wattle along the swale behind the incipient dune where exotic grassland occurs.</p> <p>Continue maintenance of existing beach access tracks and mown N-S track. Deter pedestrians from any informal tracks with the use of fencing/brushmatting as appropriate.</p>	<p>High</p> <p>Medium</p> <p>Low</p> <p>High</p> <p>Low</p> <p>High</p>	<p>LHL</p> <p>LHL</p> <p>LHL</p> <p>LHL</p> <p>LHL and BSC</p> <p>BSC and LHL</p>

List of exotic species recorded in Zone 7 during surveys

Family	Botanical Name	Common Name	Cover/abundance across Zone 7
Agavaceae	<i>Agave sp.</i>	Yucca	+
Apiaceae	<i>Hydrocotyle bonariensis</i>	Exotic pennywort	1
Apocynaceae	<i>Plumeria sp.</i>	Frangipani	+
Araliaceae	<i>Schefflera actinophylla*</i>	Umbrella tree	+

Family	Botanical Name	Common Name	Cover/abundance across Zone 7
Araucariaceae	<i>Araucaria heterophylla</i>	Norfolk pine	1-2
Arecaceae	<i>Syagrus romanoffiana</i> *	Cocos palm	+
Asparagaceae	<i>Asparagus aethiopicus</i> *	Ground asparagus fern	+
Asteraceae	<i>Bidens pilosa</i> *	Cobblers pegs	1
Asteraceae	<i>Chrysanthemoides monilifera</i> *	Bitou bush	1
Asteraceae	<i>Conyza</i> sp.*	Fleabane	1
Basellaceae	<i>Anredera cordifolia</i> *	Madeira vine	+
Caesalpinioideae	<i>Senna pendula</i> var. <i>glabrata</i> *	Winter senna	1
Cannaceae	<i>Canna indica</i> *	Canna lily	+
Convolvulaceae	<i>Ipomoea cairica</i> *	Coastal morning glory	1
Davalliaceae	<i>Nephrolepis cordifolia</i> *	Fishbone fern	1
Dracenaceae	<i>Sansevieria trifasciata</i> *	Mother-in-laws tongue	+
Euphorbiaceae	<i>Euphorbia cyathophora</i> *	Painted spurge	1
Euphorbiaceae	<i>Euphorbia</i> sp.	Poinsettia	+
Fabaceae	<i>Macroptilium atropurpureum</i>	Siratro	1
Hibisceae	<i>Hibiscus</i> sp.	Hibiscus (exotic)	+
Laminaceae	<i>Westringia fruticosa</i> *	Coastal rosemary	+
Lauraceae	<i>Cinnamomum camphora</i> *	Camphor laurel	+
Myrtaceae	<i>Eugenia uniflora</i> *	Brazilian cherry	+
Passifloraceae	<i>Passiflora suberosa</i> *	Corky passionfruit	1
Passifloraceae	<i>Passiflora subpeltata</i> *	White passionflower	1
Poaceae	<i>Cynodon dactylon</i>	Couch	1
Poaceae	<i>Paspalum dilatatum</i> *	Paspalum	1
Poaceae	<i>Pennisetum clandestinum</i> *	Kikuyu grass	2
Poaceae	<i>Stenotaphrum secundatum</i>	Buffalo grass	1
Poaceae	<i>Setaria sphacelata</i> *	Setaria	1
Poaceae	<i>Urochloa mutica</i>	Para grass	1
Polygonaceae	<i>Acetosa sagittata</i>	Turkey rhubarb	1
Strelitziaceae	<i>Strelitzia</i> sp.*	Bird of paradise	+
Verbenaceae	<i>Lantana camara</i> *	Lantana	1

8.8 Zone 8 – Lake Ainsworth and surrounds

Geographic location/extent of zone: This zone extends along Seven Mile Beach from the surf club north to the 4WD vehicle access. It includes vegetation surrounding Lake Ainsworth and the Sport and Recreation Centre, extending west to Camp Drewe Road. This zone has been split into four subzones based upon vegetation type and condition (refer to **FIGURE A.12** in **APPENDIX A**)

Main vegetation communities in zone (refer to **FIGURE A.12** in **APPENDIX A**)

Vegetation along Seven Mile Beach comprises Spinifex on the incipient dune with Blady grass and dune creepers and is generally in good condition. Foredune and hind dune areas comprise Coast banksia woodland/open forest with Tuckeroo and other regenerating littoral rainforest species common on protected hind dunes. Vegetation surrounding Lake Ainsworth is dominated by Broad-leaved paperbark with occasional Swamp oak and Tuckeroo. Coastal wattle and *Ischaemum triticeum* are common in the understorey. Patches of Cumbungi, Native reed, Jointed twig-rush and Grey rush fringe the lake along with a number of emergent and floating water plants including Azolla, Mexican waterlily, Snowflake, *Persicaria* spp., Swamp hibiscus, Water primrose, Water ribbon, Water hyacinth and Salvinia. Swamp paperbark forest extends through low-lying areas north of Lake Ainsworth up to Camp Drewe Road. Vegetation to the west of Lake Ainsworth comprises dry sclerophyll woodland dominated by Wallum banksia with Coast banksia, Tuckeroo and groves of Pink bloodwood.

Ecological values

The zone comprises Littoral Rainforest TEC (BC Act), better areas of which are likely to meet the condition thresholds of the TEC Littoral Rainforest and Coastal Vine Thickets of Eastern Australia (EPBC Act). Areas of swamp paperbark forest would also meet the definition of Swamp sclerophyll forest TEC (BC Act). Lake Ainsworth is one of the few freshwater lowland dune lakes in northern NSW and provides important fauna habitat. Vegetation surrounding the lake serves as an important buffer for the lake, filtering runoff and thus improving the water quality of the lake. Significant changes are proposed around the southern and eastern areas of Lake Ainsworth to improve water quality of the lake and provide enhanced opportunities for recreation in these areas. Closure of the eastern road and conversion of this area to open parkland will further enhance the ecological values of this unique environment.

Progress since previous VMP (EnviTE 2007)

LHL have undertaken extensive works in sections of the zone. They undertake regular work along the dune from the surf club north to the Sport and Recreation Centre entrance as well as along the western side of Lake Ainsworth. Works in these areas is now limited to follow-up weed maintenance and planting in open areas and edge planting. LHL have also been active with controlling the aquatic weed Water hyacinth throughout Lake Ainsworth.

General recommendations for zone:

Vegetation surrounding the Sport & Recreation Centre is of high conservation value and is currently threatened by significant infestations of highly invasive exotic species. The majority of these areas comprise diverse native species and structural integrity and are likely to have high resilience. Restoration of these areas is considered a high priority, particularly subzone 8b which would serve to link areas of quality dune vegetation to the north

and south. This subzone will continue to be an ongoing source of weed propagule input unless cooperation is sought with the Sport and Recreation Centre to control invasive species occurring at the site.

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
8a	<p>Dunal vegetation along Seven Mile Beach from the surf club to the Sport & Recreation entrance. Incipient dune comprises Spinifex and Blady grass with native vines and herbs. Coastal wattle and Coast Banksia dominate the foredune. The hind dune comprises greater diversity and complexity with littoral rainforest species occurring amongst a Coast banksia forest.</p> <p>Extensive works have been undertaken throughout this zone by landcare groups and weeds are generally confined to the groundlayer. Sporadic weeds noted include Ground asparagus, Coastal morning glory, Bitou bush, Turkey rhubarb, exotic grasses and annuals.</p>	6	<p>Continue volunteer maintenance program. Target Bitou bush seedlings, Ground asparagus fern, Turkey rhubarb, Coastal morning glory, Durban grass, Ehrharta etc. Suppress native vines where they are smothering native saplings or suppressing natural regeneration.</p> <p>Plant open areas where regeneration is lacking with suitable littoral rainforest species. Continue to utilise edge plantings of groundcovers such as Dianella to limit spread of exotic grasses.</p> <p>Undertake consultation with the manager of the Sport & Rec regarding the control of weeds encroaching from their land, specifically along the boundary of the landcare work zone and around the entrance to the centre. Controlling weeds along this interface is an ongoing battle for LHL. Plantings around the entrance of the centre should utilise local native species and planted exotics should be removed.</p>	<p>High</p> <p>Low</p> <p>Medium</p>	<p>LHL</p> <p>LHL</p> <p>BSC and LHL and Sport and Recreation Centre</p>
8b	<p>Dunal vegetation along Seven Mile Beach from the Sport & Recreation entrance north to the 4WD vehicle beach access track. Limited weed control works have been undertaken through this subzone in the past.</p> <p>The incipient dune comprises the same Spinifex/Blady complex as subzone 8a but with a greater occurrence of exotics including Turkey rhubarb, Bitou bush, Prickly pear, Pennywort, Durban grass etc. Coast banksia and Coastal</p>	4	<p>Significant resources will be required to restore this area over a number of years. Any planned restoration works would need to be undertaken in conjunction with the Sport & Recreation Centre grounds staff. It is recommended that grounds staff undertake onsite training with LHL or bush regen contractors if they are to be responsible for weed management. Vegetation surrounding the Centre comprises a high diversity and abundance of invasive weeds which are threatening native vegetation communities along the dune.</p> <p>Dumping of vegetation waste (incl. invasive weeds) and</p>	<p>High (dependent upon funding and cooperation with SRC)</p>	<p>BSC, LHL and SRC</p>

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
	<p>wattle occur across the foredune however weed density in this area is high. Common exotics noted include Ground asparagus, Lantana, Bitou bush, Turkey rhubarb, Prickly pear, Climbing nightshade etc. The hind dune comprises a good diversity of littoral rainforest species amongst a Coast banksia canopy although weeds dominate the groundlayer and midstorey in much of the subzone. Common weeds include Ground asparagus, Senna, Yucca, Umbrella tree, exotic grasses, Tobacco, Fishbone fern, Coastal tea tree, Corky passionfruit, etc.</p>		<p>lawn clippings within the dune environment (adjacent to the eastern boundary of the Sport & Recreation Centre) was noted during the survey. This area needs to be targeted to prevent the spread of weeds from this area and groundsmen should be educated regarding the consequences of such actions. A single, mature flowering ochna was noted in this area and should be treated to prevent its spread.</p> <p>Control outbreak of hybrid Mother-of-millions near the Sport and Recreation Centre beach access way. Ongoing maintenance in this area will be required to continually suppress this species.</p>	<p>High</p> <p>High</p>	<p>BSC, LHL and SRC</p> <p>BSC contractor, LHL or SRC</p>
8c	<p>This subzone includes Lake Ainsworth and its surrounding riparian zone. Vegetation within this zone comprises Swamp paperbark forest in various degrees of condition. The southern and eastern edge of the lake are typically utilised for recreational purposes and paperbark in these areas typically occurs amongst open grassland or in fenced vegetation areas. Paperbark along the western shore and extending to the north is in good condition with Blechnum and rushes common in the understorey.</p> <p>A number of vegetation management measures including actions to address erosion along the foreshore are detailed in the Lake Ainsworth Recreation Precinct concept plan.</p>	6	<p>Continue ongoing weed management around foreshore areas. Sporadic weeds noted along the eastern and southern shores include Coastal morning glory, Blue billy goat, Siratro, Alexander palm, exotic Pennywort and exotic grasses. A mature Groundsel bush was also noted in a fenced area approximately half way along the eastern side of the lake. Continue ongoing control for this species. A fruiting <i>Ardisia elliptica</i> was also noted along the southern riparian edge of the lake and should be controlled with follow-up to treat any seedlings. Norfolk Island pines occurring within fenced vegetation areas should be treated in consultation with BSC.</p> <p>Continue to monitor and control aquatic weeds as they reoccur, particularly Water hyacinth.</p> <p>Riparian restoration works and erosion stabilisation works outlined should be implemented in line with the Lake Ainsworth Recreation Precinct concept plan once approved.</p>	<p>High</p> <p>High</p>	<p>LHL</p> <p>LHL and BSC</p>

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
8d	<p>This subzone includes vegetation located on the western side of Lake Ainsworth, up to Camp Drewe Road. Vegetation in this area comprises dry sclerophyll woodland dominated by Wallum banksia with Coast banksia, Tuckeroo and groves of Pink bloodwood. Vegetation is in good condition with exotics generally restricted to the edge of Camp Drewe Rd and along walking tracks. This sclerophyll woodland gives way to low, dry heathland in the northern part of the subzone (north of Sport & Recreation Centre).</p> <p>Exotics noted along Camp Drewe Road include Lantana, Siratro, Coastal morning glory, Umbrella tree, Crofton, Senna, Corky passionfruit, White passionfruit and exotic grasses.</p> <p>Dumping of garden refuse noted near rear Sport & Recreation Centre and along road entrance to 4WD vehicle beach access.</p>	6	<p>LHL to continue ongoing weed maintenance through core areas. Weeds noted include Corky passionfruit, Whisky grass and Paspalum along track edges.</p> <p>Climbing philodendron noted at track entrance off Camp Drewe Road. Treat and monitor location.</p> <p>Deter walkers away from informal tracks through brushmatting and/or planting of low growing spiky plants such as Lomandra.</p> <p>There is likely to be an increase in traffic along Camp Drewe Road once the eastern road is closed, primarily vehicles and coaches accessing the Sport & Recreation Centre. It may be worth leaving non-invasive exotics along the Eastern edge of Camp Drewe Road to buffer core areas of vegetation. Maintenance along the inside edge will be required periodically to ensure weeds do not encroach into these areas. Consider embellishment plantings where vegetation is sparse to bolster this buffer zone and deter informal access.</p> <p>Encourage Sport and Recreation Centre to remove dumped vegetative waste at rear entrance. Consider enhancing this entrance with native plantings, particularly if this is to become the main entrance to the centre.</p> <p>Implement management procedures to prevent further dumping near the 4WD beach access point. This may include signage, cameras, fencing, etc.</p>	<p>High</p> <p>High</p> <p>Low</p> <p>Low</p> <p>Low</p> <p>Low</p>	<p>LHL</p> <p>LHL</p> <p>LHL</p> <p>LHL</p> <p>SRC and BSC</p> <p>BSC</p>

List of exotic species recorded in Zone 8 during surveys

Family	Botanical Name	Common Name	Cover/abundance across Zone 5
Agavaceae	<i>Agave americana</i>	Yucca or Agave	+
Apiaceae	<i>Hydrocotyle bonariensis</i>	exotic pennywort	1
Araliaceae	<i>Schefflera actinophylla</i> *	Umbrella tree	1
Araucariaceae	<i>Araucaria heterophylla</i>	Norfolk Island Pine	+
Arecaceae	<i>Archontophoenix alexandrae</i>	Alexandra Palm	+
Asparagaceae	<i>Asparagus aethiopicus</i> *	Ground asparagus fern	2
Asteraceae	<i>Ageratum houstonianum</i>	Blue Billygoat Weed	1
Asteraceae	<i>Baccharis halimifolia</i>	Groundsel Bush	+
Asteraceae	<i>Bidens pilosa</i> *	Cobblers pegs	1
Asteraceae	<i>Chrysanthemoides monilifera ssp. rotunda</i>	Bitou Bush	1
Asteraceae	<i>Cirsium vulgare</i>	Spear Thistle	+
Asteraceae	<i>Conyza sp.</i> *	Fleabane	1
Asteraceae	<i>Crassocephalum crepidioides</i>	Thickhead	1
Asteraceae	<i>Hypochaeris radicata</i>	Fatweed or Cat's Ear	1
Basellaceae	<i>Anredera cordifolia</i> *	Madeira vine	
Cactaceae	<i>Opuntia stricta</i>	Prickly Pear	+
Caesalpinioideae	<i>Senna pendula var. glabrata</i> *	Winter senna	2
Cannaceae	<i>Canna indica</i>	Canna Lily	+
Convolvulaceae	<i>Ipomoea cairica</i> *	Coastal morning glory	2
Crassulaceae	<i>Bryophyllum x houghtonii</i>	hybrid Mother-of-millions	+
Davalliaceae	<i>Nephrolepis cordifolia</i> *	Fishbone fern	1
Fabaceae	<i>Macroptilium atropurpureum</i>	Siratro	1
Lauraceae	<i>Cinnamomum camphora</i> *	Camphor laurel	1
Malvaceae	<i>Sida rhombifolia</i> *	Paddy's lucerne	1
Myrtaceae	<i>Leptospermum laevigatum</i>	Coastal Tee-tree	1
Nymphaeaceae	<i>Nymphaea sp.</i>	Exotic waterlily	1
Ochnaceae	<i>Ochna serrulata</i> *	Mickey mouse plant	+
Passifloraceae	<i>Passiflora subpeltata</i>	White Passionfruit	1
Passifloraceae	<i>Passiflora suberosa</i>	Corky Passionfruit	2
Poaceae	<i>Axonopus sp</i>	Carpet Grass	1



Family	Botanical Name	Common Name	Cover/abundance across Zone 5
Poaceae	<i>Bromus catharticus</i>	Prarie Grass	+
Poaceae	<i>Chloris gayana</i>	Rhodes Grass	1
Poaceae	<i>Melinis minutiflora</i>	Molasses Grass	+
Poaceae	<i>Paspalum dilatatum*</i>	Paspalum	2
Poaceae	<i>Pennisetum cladestinum</i>	Kikuyu	2
Poaceae	<i>Dactyloctenium australe</i>	Durban grass	2
Poaceae	<i>Ehrharta erecta</i>	Panic veldt grass	1
Poaceae	<i>Stenotaphrum secundatum</i>	Buffalo grass	2
Polygonaceae	<i>Acetosa sagittata</i>	Turkey Rhubarb	1
Primulaceae	<i>Ardisia elliptica</i>	Ardisia	+
Salviniaceae	<i>Salvinia molesta</i>	Salvinia	2
Solanaceae	<i>Solanum mauritianum</i>	Wild Tobacco	1
Solanaceae	<i>Solanum seaforthianum</i>	Climbing Nightshade	2
Verbenaceae	<i>Lantana camara*</i>	Lantana	1

8.9 Zone 9 – West of Camp Drewe Road

Geographic location/extent of zone: This zone includes council owned land west of Camp Drewe Road. This zone has been split into three subzones based upon vegetation type and fire trail boundaries (refer to **FIGURE A.12** in **APPENDIX A**)

Main vegetation communities in zone (refer to **FIGURE A.12** in **APPENDIX A**)

Zone 9 comprises extensive areas of wet and dry heathland as well as smaller areas of Swamp paperbark forest and tall Gahnia sedgeland.

Ecological values

The majority of the zone comprises high quality vegetation with a diversity of native species and limited weed presence. Areas of swamp paperbark forest would also meet the definition of Swamp sclerophyll forest TEC (BC Act). The area provides high quality habitat for a number of fauna species with the area of heathland and paperbark habitats north of Lake Ainsworth are of particularly high value to birds, especially nectarivorous species such as honeyeaters, and other fauna. The Threatened Ground parrot and Eastern grass owl may occur within these vegetation types. Other Threatened fauna known or likely to occur in these habitats include Koala, Wallum froglet, Olongburra frog, Eastern grass owl and Common planigale.

Progress since previous VMP (EnviTE 2007)

The EnviTE report notes that weed control works were being undertaken at the time of the report along the urban interface including control of Yellow bells, Resurrection plant and Fishbone fern.

General recommendations for zone:

- Continue ongoing maintenance of tracks through slashing.
- Manage illegal access as required and ensure barriers to fire trails are locked.

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
9a	Heathland vegetation in this subzone is generally taller than areas of heath to the north most likely due to a lack of past fire history due to proximity of residences and the caravan park.	5-6	Undertake weed control works around edges of heath. Exotics noted include Bitou bush, White passionfruit, Mother-in-laws tongue, Elephant grass, Lantana, Cocos palm, Fishbone fern, Resurrection plant and exotic grasses.	Medium	LHL/BSC contractor/ Sport & Rec/Crown lands
	Vegetation in this area is generally in good condition with the exception of the residential interface and along track edges.		Encourage adjoining residents and caravan park management to remove potential environmental weeds from their landscaping such as Umbrella tree, Yuccas and	Medium	BSC

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
			Mother-in-laws tongue.		
9b	<p>Areas of dry heathland between the western fire trail and Camp Drewe Road. Wallum banksia dominates along with Grass trees.</p> <p>Heathland is in good condition with only sporadic exotic grasses along tracks eg. Whisky grass and Paspalum.</p> <p>A large clearing and associated tracks are located in the northern part of this subzone. The historical use of this area is unknown, although the presence of certain species such as White cedar, Agapanthus and Strelitzia suggest a residence was once located here. Tracks are slowly being recolonised by heath species although a number of exotics grasses were noted including Whisky grass, Red natal grass and Parramatta grass. The clearing comprises areas of dense buffalo grass with patches of Setaria, Bitou bush, Climbing nightshade, Lantana and Tobacco.</p>	7	<p>Treat weeds on edge of fire trail (mainly grasses) and monitor for weed incursion.</p> <p>Undertake weed control within cleared area to allow heath species to recolonise. Dense exotic grasses are currently inhibiting the establishment of heath species in this area. Supplementary planting may be required in disturbed areas where natural regeneration is lacking.</p>	<p>Low</p> <p>Low</p>	<p>LHL/BSC contractor/ Sport & Rec/Crown lands</p> <p>LHL/BSC contractor/ Sport & Rec/Crown lands</p>
9c	<p>Areas of wet heathland, Paperbark swamp and Gahnia sedgeland to the west of the fire trail.</p> <p>Vegetation is in good order with only very minor occurrence of weeds seen on track edges.</p> <p>This subzone is part of a larger SEPP14 wetland area which extends to the north along both sides of The Coast Road.</p>	7	Treat weeds on edge of fire trail (mainly grasses) and monitor for weed incursion.	Low	LHL/BSC contractor/ Sport & Rec/Crown lands

List of exotic species recorded in Zone 8 during surveys

Family	Botanical Name	Common Name	Cover/abundance across Zone 8
Araliaceae	<i>Schefflera actinophylla</i> *	Umbrella tree	+
Arecaceae	<i>Syagrus romanzoffiana</i> *	Cocos palm	+
Asteraceae	<i>Chrysanthemoides monilifera</i> *	Bitou bush	+
Crassulaceae	<i>Bryophyllum pinnatum</i>	Resurrection plant	+
Davalliaceae	<i>Nephrolepis cordifolia</i> *	Fishbone fern	1
Dracaenaceae	<i>Sansevieria trifasciata</i>	Mother-in-laws tongue	+
Passifloraceae	<i>Passiflora subpeltata</i> *	White passionflower	1
Poaceae	<i>Paspalum dilatatum</i> *	Paspalum	1
Poaceae	<i>Andropogon virginicus</i>	Whisky grass	1
Poaceae	<i>Melinis repens</i>	Red Natal Grass	1
Poaceae	<i>Stenotaphrum secundatum</i>	Buffalo grass	1
Poaceae	<i>Sporobolus africanus</i>	Parramatta grass	+
Poaceae	<i>Setaria sphacelata</i>	Setaria	1
Poaceae	<i>Pennisetum purpureum</i>	Bana Grass or Elephant Grass	+
Solanaceae	<i>Solanum mauritianum</i> *	Wild tobacco tree	+
Solanaceae	<i>Solanum seaforthianum</i>	Climbing Nightshade	1
Strelitziaceae	<i>Strelitzia nicolai</i>	Bird of Paradise	+
Verbenaceae	<i>Lantana camara</i> *	Lantana	+



8.10 Zone 10 – Northern Seven Mile Beach and heathland

Geographic location/extent of zone: Vegetation along Seven Mile Beach north of Camp Drewe and heathland along the northern council boundary east and west of The Coast Road. This zone has been split into four zones based upon vegetation type and degree of weed infestation (refer to **FIGURE A.13** in **APPENDIX A**)

Main vegetation communities in zone (refer to **FIGURE A.13** in **APPENDIX A**)

Zone 10 comprises a variety of vegetation communities, including coastal shrubland, dune grassland, littoral rainforest, dry heath, wet heath, swamp paperbark forest, dry sclerophyll forest (Scribbly gum with Swamp mahogany and Paperbark) and freshwater wallum wetlands.

Ecological values

Vegetation within Zone 10 supports high ecological values with several TECs and threatened species records in the vicinity. These include Littoral rainforest TEC, Swamp sclerophyll forest TEC, Freshwater wetland TEC and areas which are likely to meet the condition thresholds of the TEC Littoral Rainforest and Coastal Vine Thickets of Eastern Australia (EPBC Act). The area provides high quality habitat for a number of fauna species and extensive areas of heathland and paperbark habitats north of Lake Ainsworth are of high value to birds, especially nectarivorous species such as honeyeaters, and other fauna. The Threatened Ground parrot and Eastern grass owl may occur within these vegetation types. Other Threatened fauna known or likely to occur in these habitats include Koala, Wallum froglet, Olongburra frog, Eastern grass owl and Common planigale.

Vegetation within the zone is of a high quality with limited past disturbance and subsequent weed presence. Such extensive areas of intact coastal heathland, wallum wetland and swamp sclerophyll forest are rare in this section of the coast and have been extensively cleared and drained for housing, grazing, sugarcane and other landuses.

Progress since previous VMP (EnviTE 2005)

Significant work has been undertaken along the dunes targeting Bitou Bush and restoring dune vegetation via aerial spraying, seeding and on ground works.

General recommendations for zone:

The northern end of the emergency vehicle access track behind Seven Mile Beach is overgrown where it turns west and enters heathland. This section is no longer passable for vehicles.

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
10a	<p>Dune vegetation along Seven Mile Beach (predominately east of emergency vehicle track). Fore-dune areas comprise Spinifex and Blady grass with dune creepers. Beyond this Coast banksia and Coastal wattle are dominant with patches of Midginberry. This grades into Coast banksia forest on the hind dune with Tuckerroo, Duboisia, Lilly pilly, Monotoca, Coast wattle, Cheese tree, Beach acronychia and the vine Parsonsia being common. Narrow banks of Tuckerroo dominant littoral rainforest occur towards the northern end of the zone.</p> <p>Vegetation has greatly benefited from past Bitou bush treatments including aerial spraying, seedling and on ground follow up. Other weeds are generally sporadic through the area and restricted to track edges.</p>	6	<p>Undertake annual maintenance runs along the fore-dune, targeting Bitou bush and Prickly pear. Sporadic Bitou bush was noted along the fore-dune, primarily amongst Coastal wattle or below dune ledges (refer to photo in APPENDIX D).</p> <p>Treat other weeds as encountered, majority of which are concentrated along the road side including Tobacco, Umbrella, Camphor and exotic grasses.</p> <p>Where gaps occur along the front of the fore-dune and natural regeneration is poor consider planting.</p> <p>Monitor informal track use to ensure the recently installed boulders continue to deter vehicles. Spinifex and Coastal wattle are likely to recolonise these areas given time.</p> <p>Remove rubbish in hind dune as encountered.</p> <p>Maintain North Lennox Hind Dune Fire Trail as required and ensure hygiene of tractor/slasher to prevent the introduction of exotic grasses.</p>	<p>High</p> <p>High</p> <p>Low</p> <p>Medium</p> <p>Low</p> <p>High</p>	<p>BSC contractor/ Crown lands</p> <p>BSC contractor/ Crown lands</p> <p>LHL or BSC contractor/ Crown lands</p> <p>BSC/ Crown lands</p> <p>BSC contractor/ Crown lands</p> <p>BSC/Crown lands</p>
10b	<p>Areas of dry heath along the western side of the emergency vehicle track dominated by Wallum banksia and grass trees.</p> <p>Whisky grass is prevalent at old beehive sites and along the associated tracks. These areas are slowly being recolonised by heathland species.</p>	7	<p>Treat sporadic weeds along roadside edges and disused tracks, mostly exotic grasses.</p>	Low	<p>BSC contractor/ Crown lands</p>

Sub-zone	Vegetation Description	Condition	Vegetation Management Recommendations	Priority	Work to be performed by:
10c	This subzone includes low-lying areas of Swamp paperbark along The Coast Road which comprise a high number of exotic species. The EnviTE report notes that this area once contained a number of tracks entering heathland to the east and attracted illegal camping and dumping of garden refuse.	5	Control weeds as encountered along the roadside and previous access tracks. Exotics noted at the time of the inspection include Corky passionfruit, Siratro, Lantana, Senna, Elephant grass, Tobacco, Green panic, Setaria, Molasses, Crofton and herbaceous annuals. Weed density is greatest along the eastern side of The Coast Road. Monitor for weed incursion and treat as required. Monitor for dumping and remove as required. Continue regular maintenance of roadside slashing.	High Low As required	BSC contractor/ Crown lands BSC/ Crown lands BSC/Crown lands
10d	Mosaic of wet heathland, Swamp paperbark and dry sclerophyll forest (Scribbly gum with Swamp mahogany and Paperbark). The southern part of this subzone (along the northern side of private road off Coast Rd) is part of a SEPP14 wetland area and comprises areas of open water amongst sedgeland.	7	Treat weeds, mainly exotic grasses, on edge of private road and along The Coast Road. Monitor for weed incursions.	Low	BSC contractor /LHL/ Crown lands

List of exotic species recorded in Zone 10 during surveys

Family	Botanical Name	Common Name	Cover/abundance across Zone 10
Araliaceae	<i>Schefflera actinophylla</i> *	Umbrella tree	+
Asparagaceae	<i>Asparagus aethiopicus</i> *	Ground asparagus fern	+
Asteraceae	<i>Bidens pilosa</i> *	Cobblers pegs	1
Asteraceae	<i>Chrysanthemoides monilifera</i> *	Bitou bush	1
Asteraceae	<i>Conyza sp.</i> *	Fleabane	1
Asteraceae	<i>Ageratina adenophora</i> *	Crofton weed	1
Cactaceae	<i>Opuntia stricta</i>	Prickly pear	+
Caesalpinioideae	<i>Senna pendula var. glabrata</i>	Winter senna	1

Family	Botanical Name	Common Name	Cover/abundance across Zone 10
Convolvulaceae	<i>Ipomoea cairica</i> *	Coastal morning glory	1
Fabaceae	<i>Macropitilium atropurpureum</i> *	Siratro	1
Fabaceae	<i>Crotalaria lanceolata</i> ssp. <i>Lanceolata</i>	Lance-leaf Rattlepod	
Lauraceae	<i>Cinnamomum camphora</i> *	Camphor laurel	+
Passifloraceae	<i>Passiflora subpeltata</i> *	White passionflower	1
Passifloraceae	<i>Passiflora suberosa</i> *	Corky passionfruit	1
Poaceae	<i>Paspalum dilatatum</i> *	Paspalum	1
Poaceae	<i>Andropogon virginicus</i>	Whisky grass	1
Poaceae	<i>Cynodon dactylon</i>	Couch	1
Poaceae	<i>Stenotaphrum secundatum</i>	Buffalo grass	1
Poaceae	<i>Sporobolus africanus</i>	Parramatta grass	+
Poaceae	<i>Setaria sphacelata</i>	Setaria	1
Poaceae	<i>Panicum maximum</i> var. <i>trichoglume</i>	Green panic	1
Poaceae	<i>Melinis minutiflora</i>	Molasses Grass	+
Poaceae	<i>Chloris gayana</i>	Rhodes grass	+
Solanaceae	<i>Solanum mauritianum</i> *	Wild tobacco tree	+
Solanaceae	<i>Solanum seaforthianum</i>	Climbing Nightshade	1
Verbenaceae	<i>Lantana camara</i> *	Lantana	1

9 MONITORING AND RECORD KEEPING

9.1 Introduction

Monitoring of weed control works as well as daily record taking of works and chemical use should be undertaken as part of any vegetation management works undertaken within the VMP project area.

9.2 Monitoring

Monitoring/progress reports are often required as part of grant applications to ensure allocated funds are being spent as per the grant application and works are on schedule. BSC and Lennox Head Landcare have extensive experience preparing these monitoring reports for funds allocated within the VMP project area.

Additional monitoring may be required as part of a development consent, for example where offset works are being undertaken at the Lennox Point wetland for the Ballina Heights estate. Separate VMPs are typically prepared for these projects with specific details on works required in the offset area(s) and the maintenance and monitoring period required.

All monitoring, whether undertaken as part of a grant funding or development consent requirement, should include preparation of a monitoring report which is to be submitted to BSC and should generally include the following:

- Photographs from establish photopoints and/or any quantitative data collected from established quadrats/transects;
- Description of works performed since last monitoring event and map showing areas worked;
- Assessment of weed presence in worked areas;
- Assessment of natural recruitment and identification of areas requiring planting where this is lacking;
- Assessment of health and growth of any planted specimens, including details on losses and possible reasons for losses greater than 10%;
- Discussion on the effectiveness of weed control works and any possible areas for improvement;
- Discussion of any management problems or unforeseen issues which have arisen (eg. erosion/storm damage/dumping of green waste/vandalism/fire etc.);
- Identification of opportunities for improvement/additional works/volunteer involvement etc;

Monitoring is typically undertaken for a period of 5 years (or the length of the grant funding) with biannual monitoring events for the first two years and then annual monitoring events for the subsequent years.

9.3 Record keeping

Both volunteers and contractors are required to complete a Daily Record Sheet (DRS) for each day of works undertaken within the VMP project area. A copy of the BSC approved DRS is provided in **APPENDIX F**. The form includes details on the following:

- Names of personnel and hours worked;
- Weather conditions;
- Activities undertaken;
- Areas worked (and illustrated on a map);



- Herbicide usage and methods of application;
- Precautions taken to protect threatened species;

Completed forms should be submitted to BSC on a regular basis either quarterly or as required.



10 REFERENCES

Australian Water and Coastal Studies (AWACS). 1996. Lake Ainsworth Lake Processes Study. AWACS, Sydney.

Ballina Shire Council website (www.ballina.nsw.gov.au)

Big Scrub Rainforest Landcare Group (2008) Common Weeds of Sub-tropical Rainforests of Eastern Australia. BSRLG.

Blackwood Ecological Services (2013a) Ecological Assessment for the Coastal Recreational Path, East Ballina to Lennox Head, Final report

Blackwood Ecological Services (2013b) Ecological Assessment: Ballina to Lennox Head Shared Path Skennars Head Rd SEPP14 section. A report to NSW Public Works.

Blackwood Ecological Services (2013c) Ecological Assessment: Ballina to Lennox Shared Path west of The Coast Road (excluding SEPP14 section). A report to Ballina Shire Council.

Blackwood Ecological Services (2012) Ecological Assessment: Skennars Head Road to Pat Morton Lookout Shared Path. A report to NSW Public Works.

Bureau of Meteorology website (www.bom.gov.au)

Department of Land and Water Conservation 2003. Draft Ballina Coastal Reserve Plan of Management, DLWC, Lismore

Ensbey (2011) NSW Department of Primary Industries, Noxious and Environmental Weed Control Handbook 5th Edition.

Envite (2004) Sharpes Creek to Shag Rock Vegetation Management Plan

Envite (2006) Lennox Point Vegetation Management Plan

Envite (2005) Seven Mile Beach (Precinct 2) Beachfront Management Plan

Envite and WetlandCare Australia (2007) Lake Ainsworth Vegetation Management Plan

Envite (2007) Seven Mile Beach (Central) Vegetation Management Plan

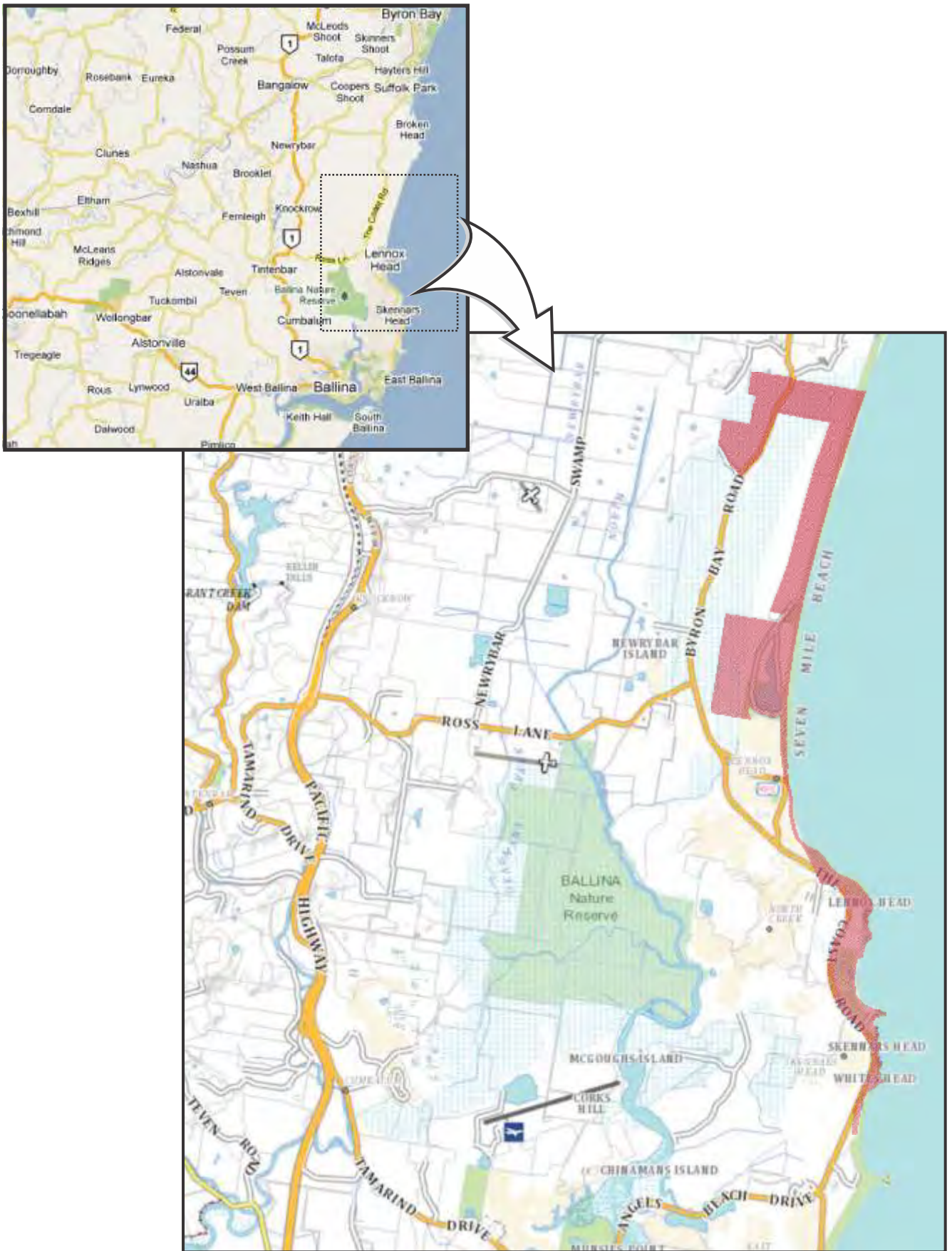
Morand D.T (1994). Soil Landscapes of the Lismore- Ballina 1:100000 sheet (Mullumbimby, Byron Bay, Casino Kyogle). Department of Conservation and Land Management, Soil Conservation Service.

NSW Office of Environment and Heritage website (www.environment.nsw.gov.au)

WBM Oceanics Australia (2003) Ballina Shire Coastline Hazard Definition Study Final Report. Prepared for Ballina Shire Council.

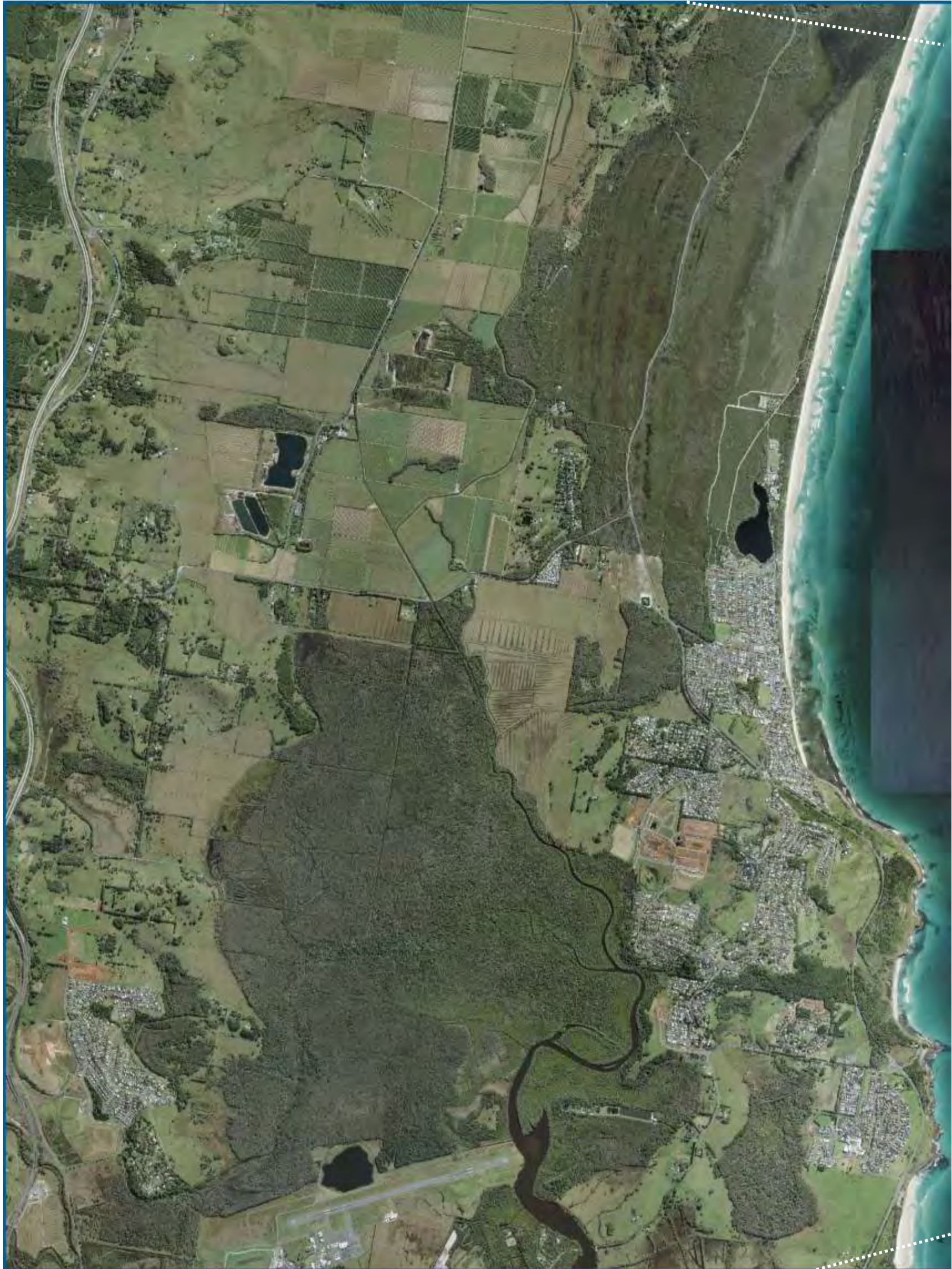
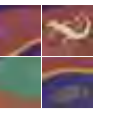
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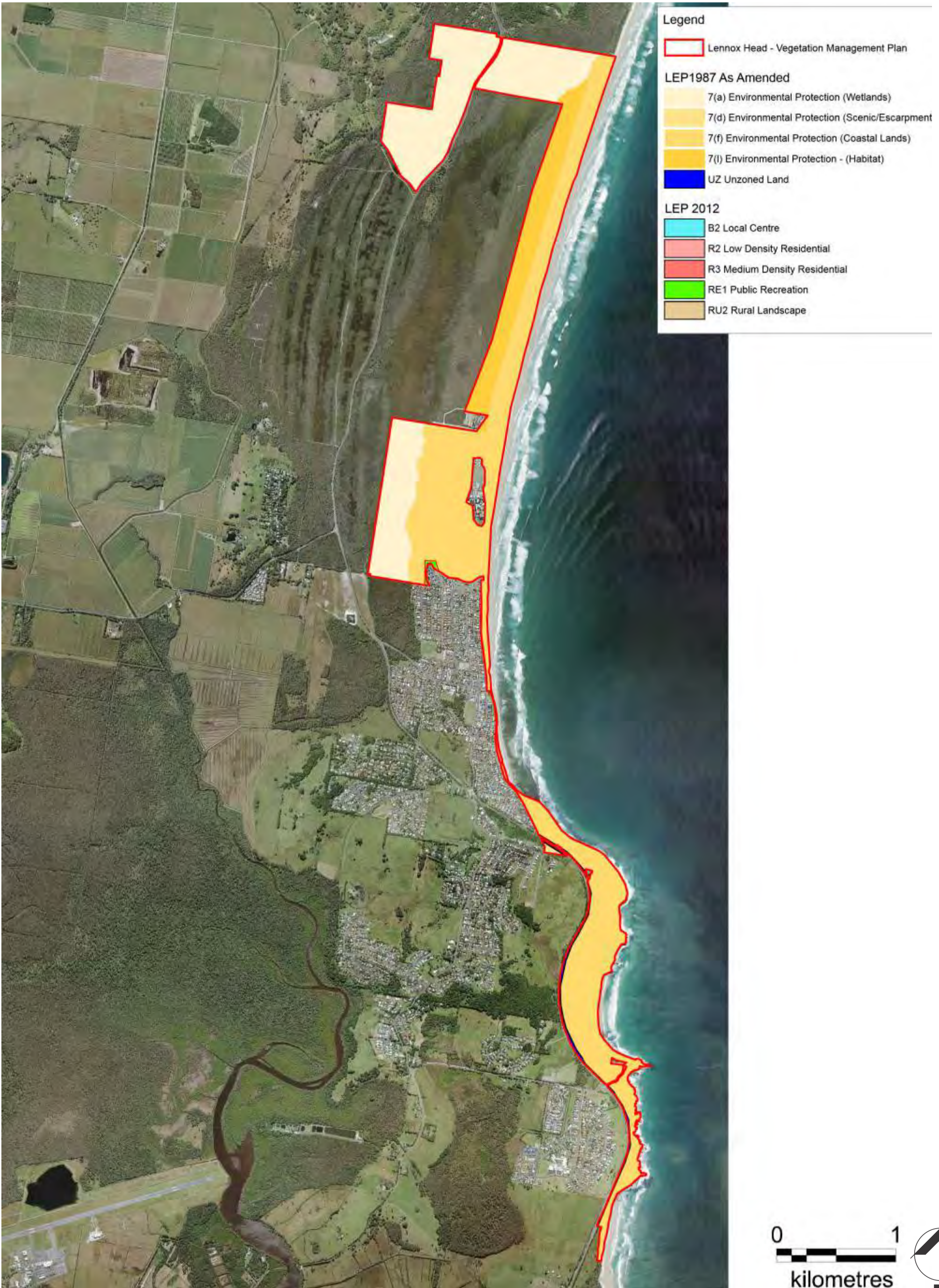
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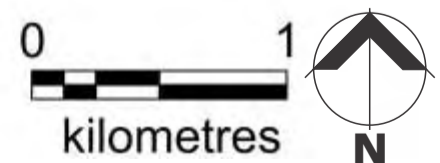
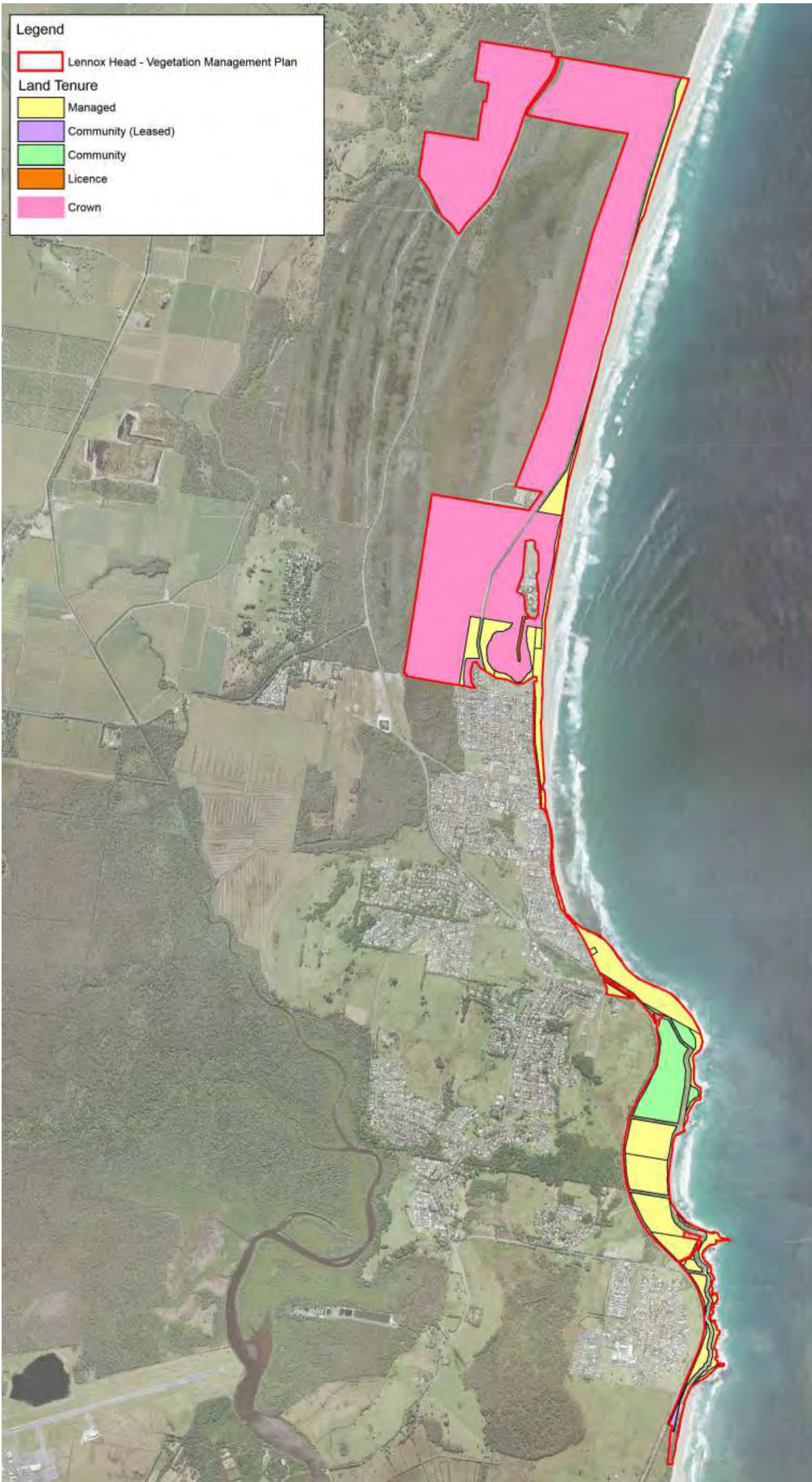


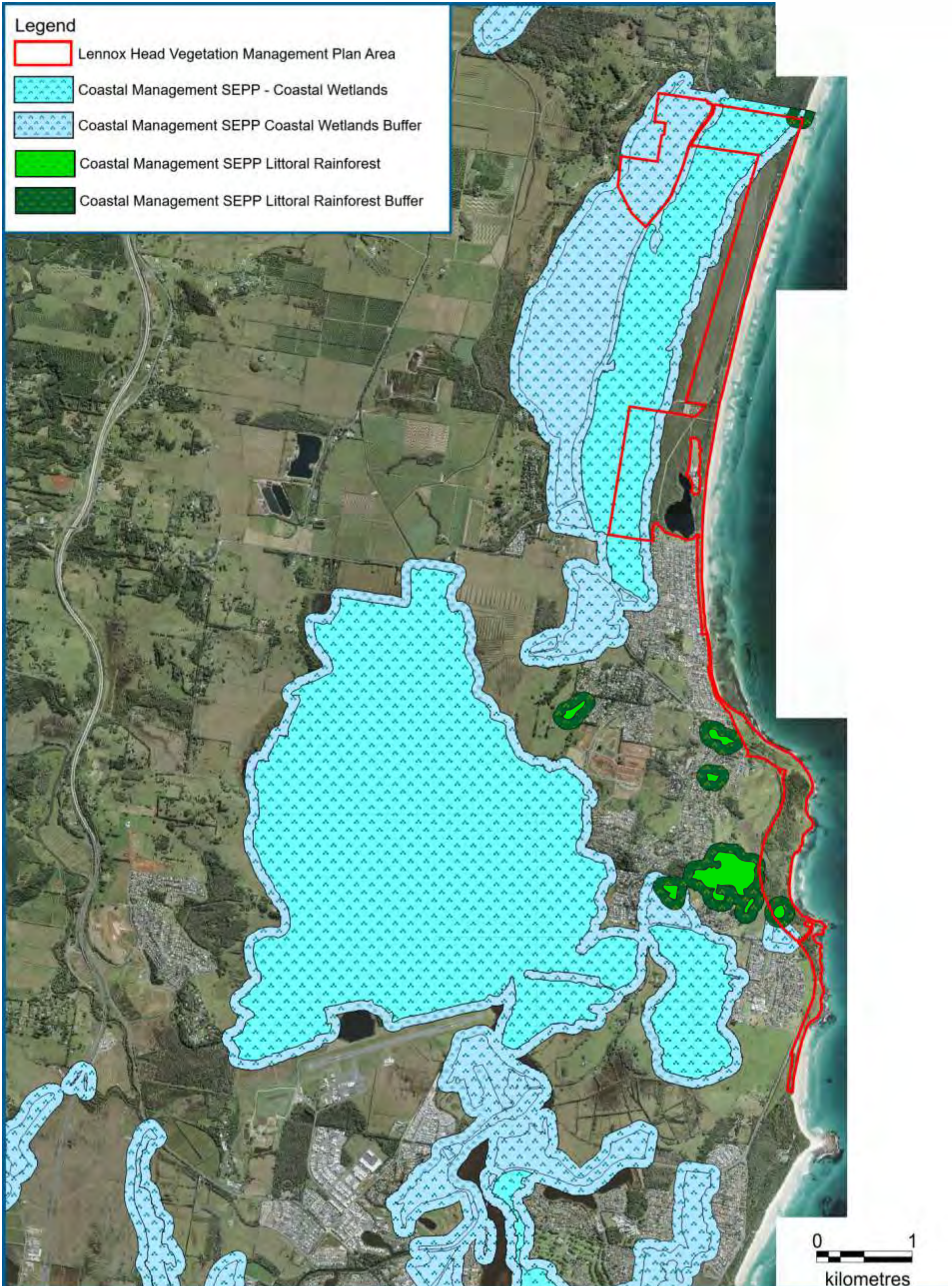
 VMP Subject site

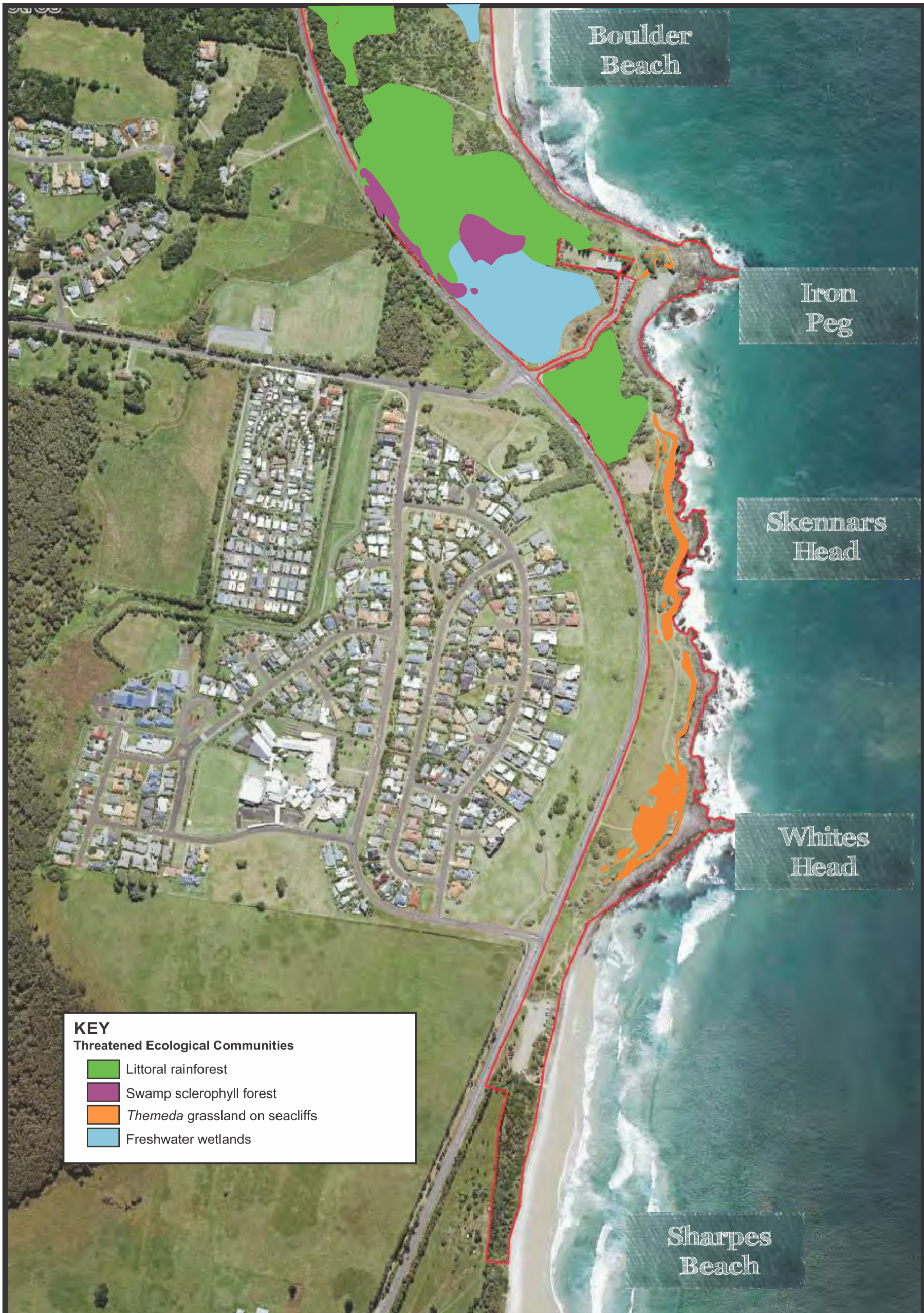




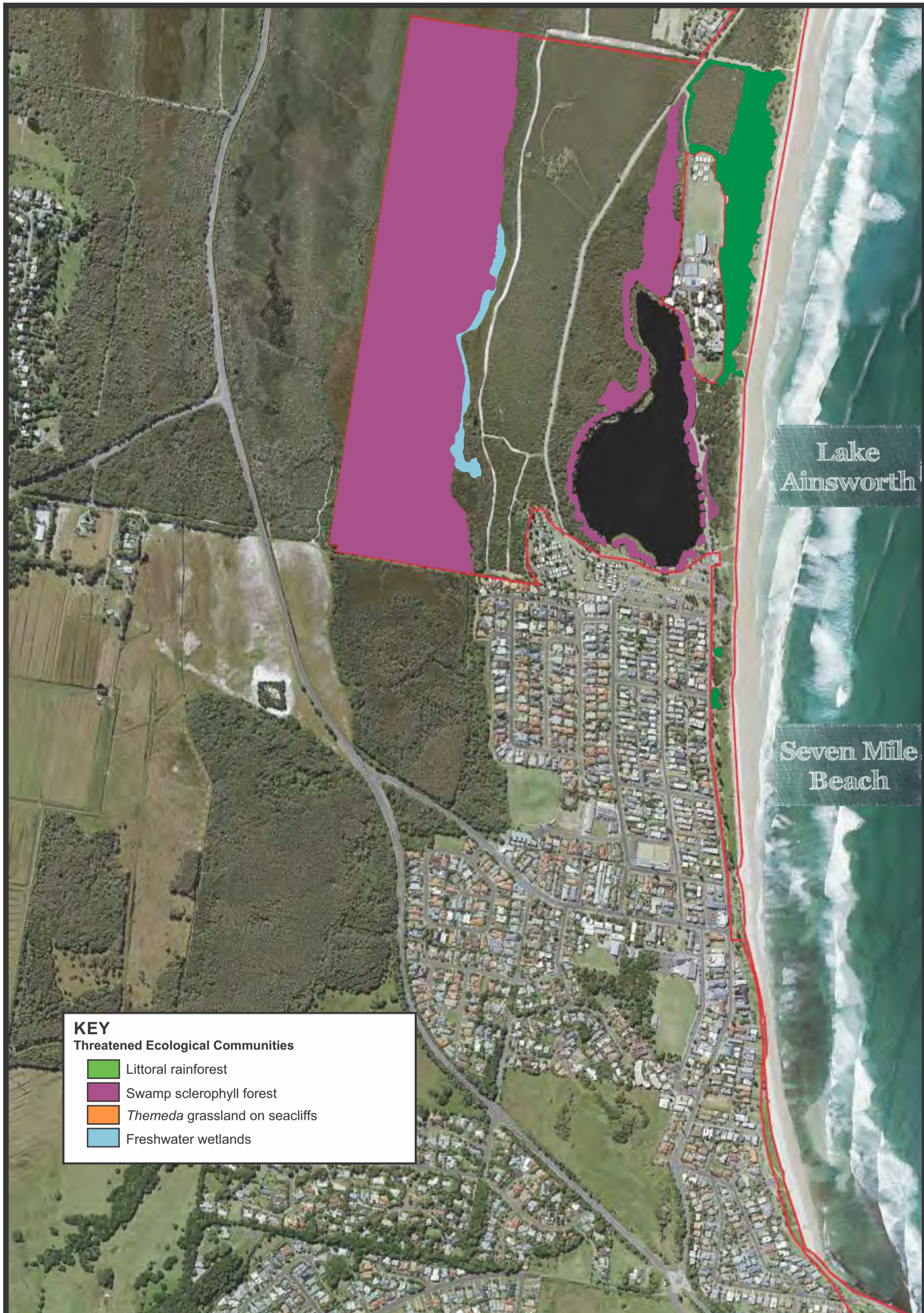


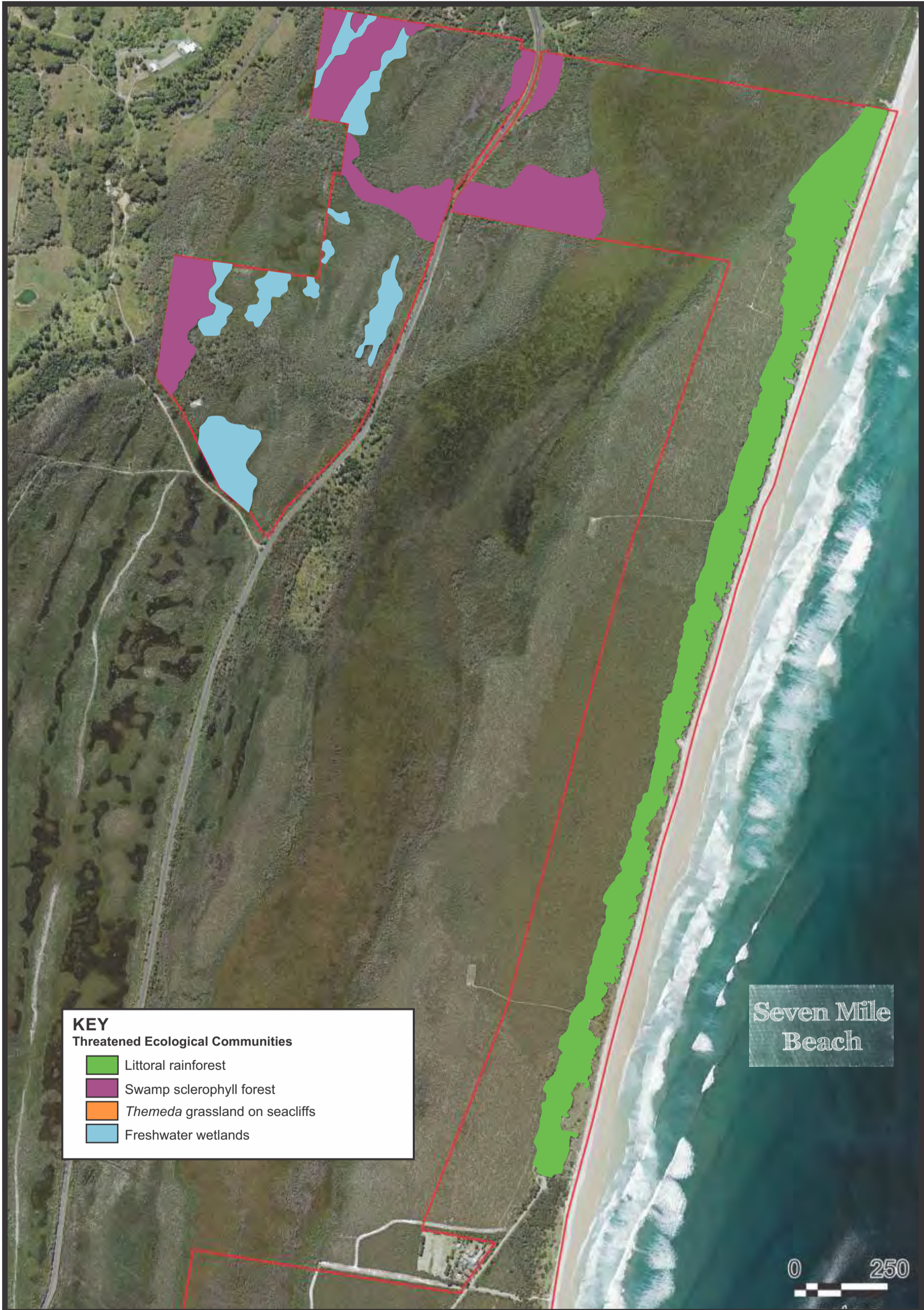








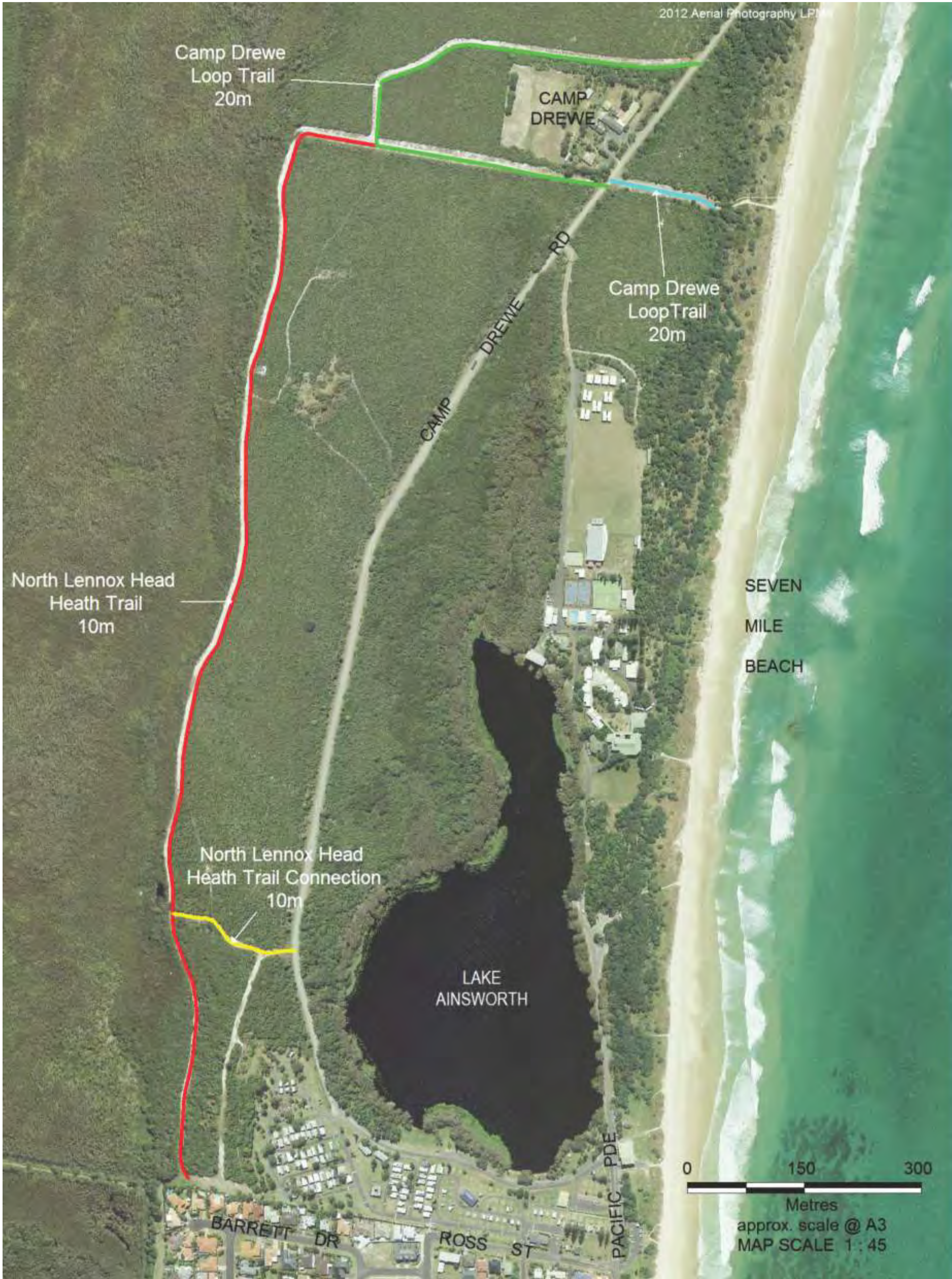




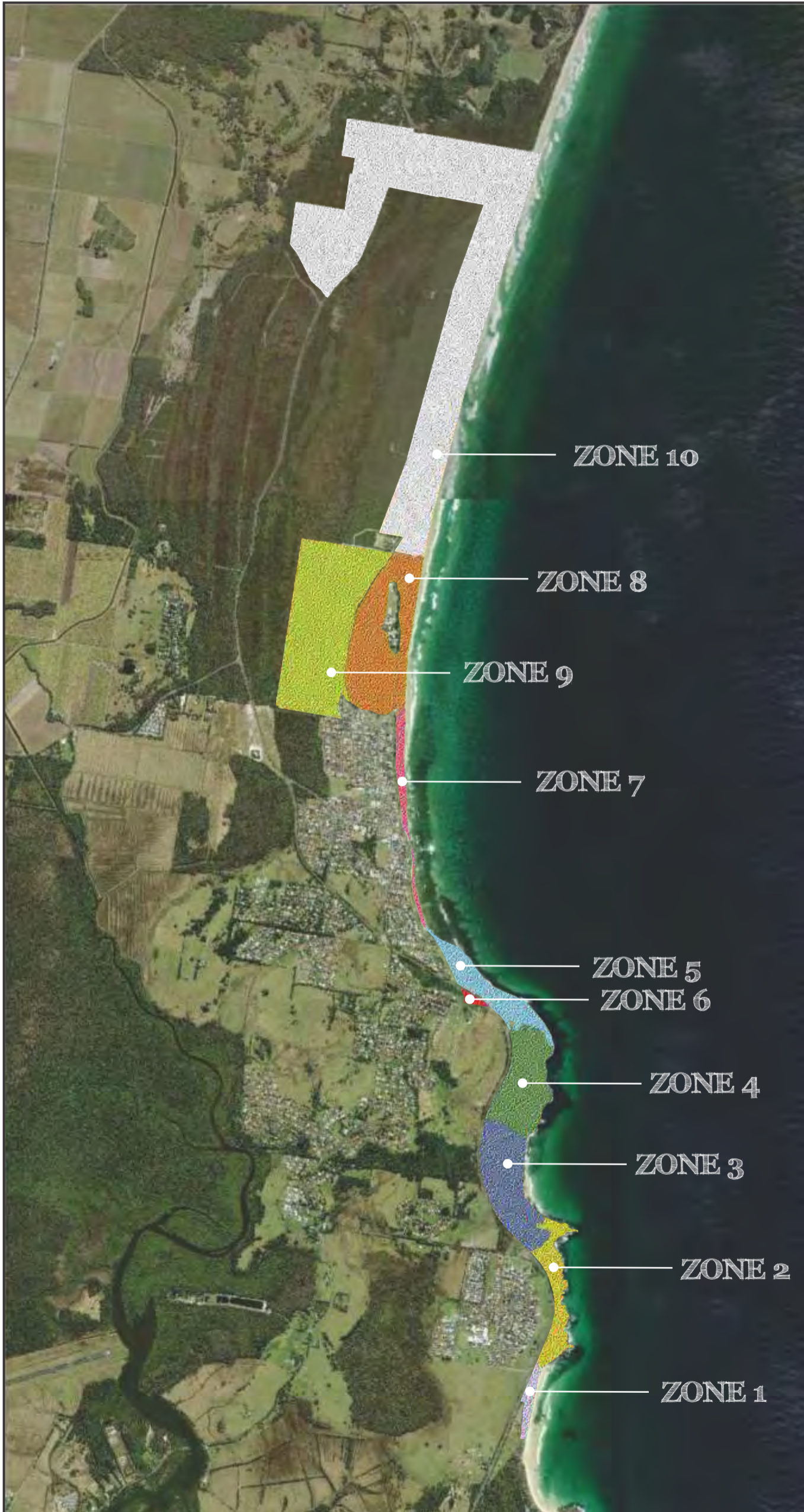








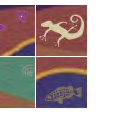


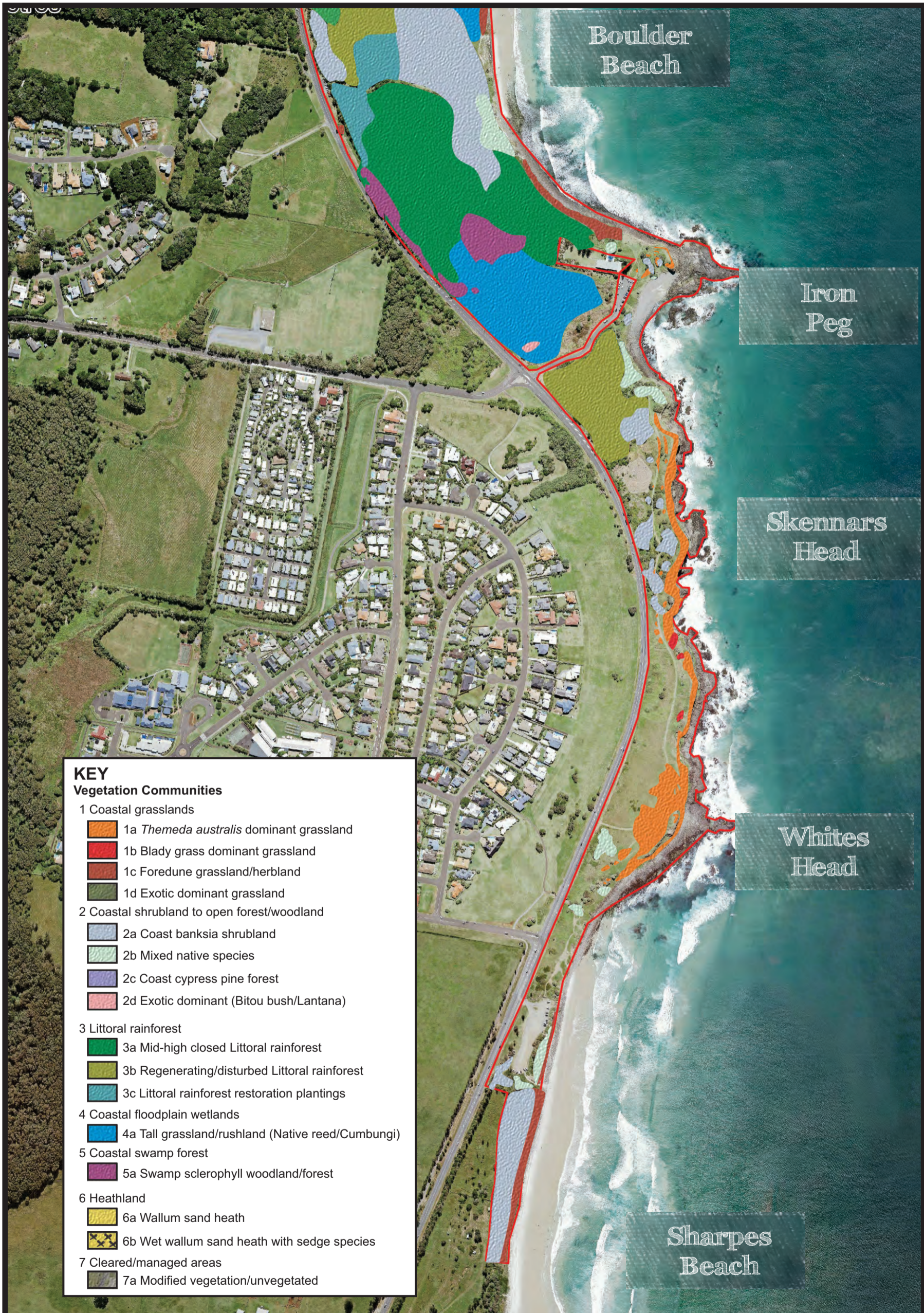




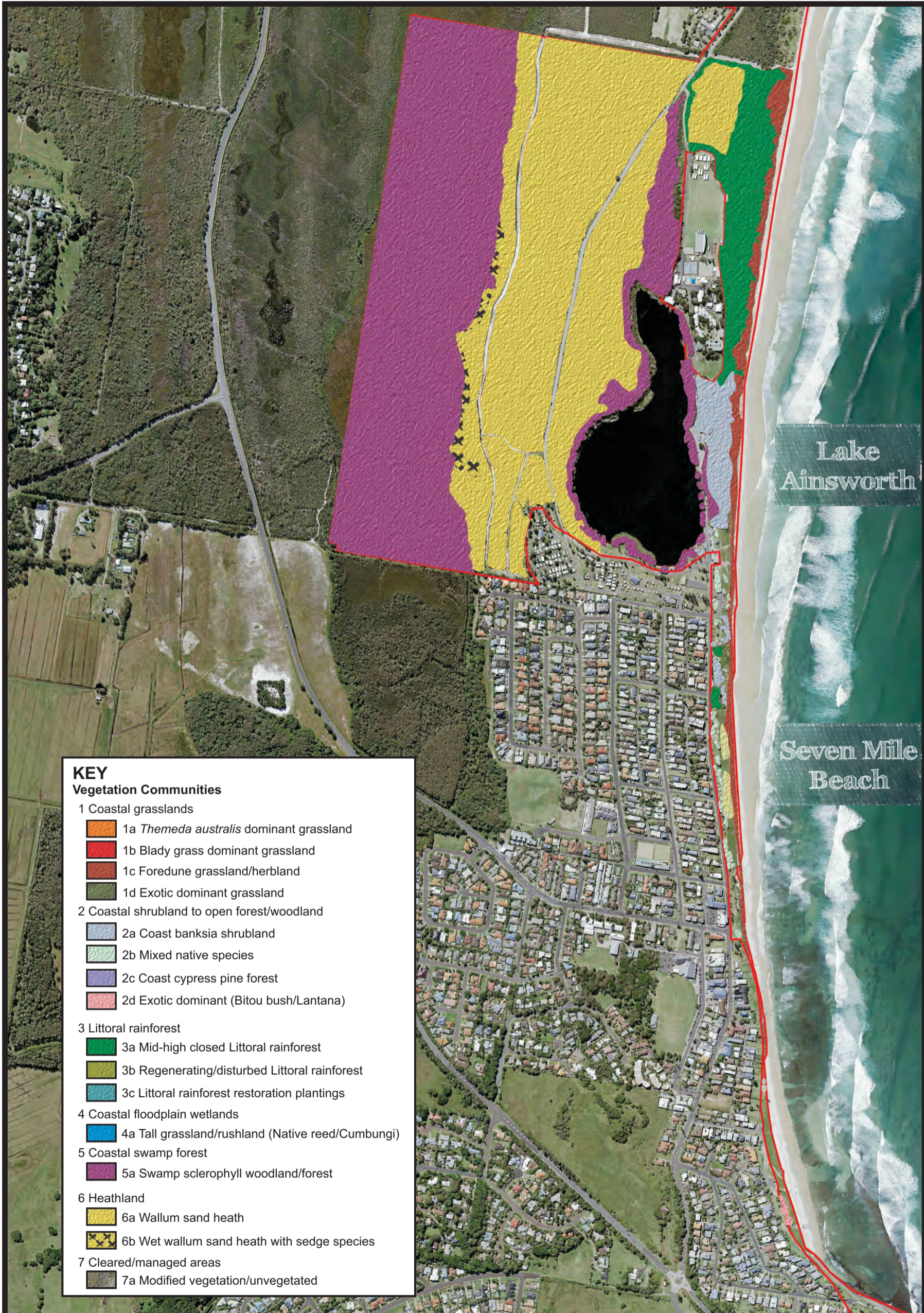


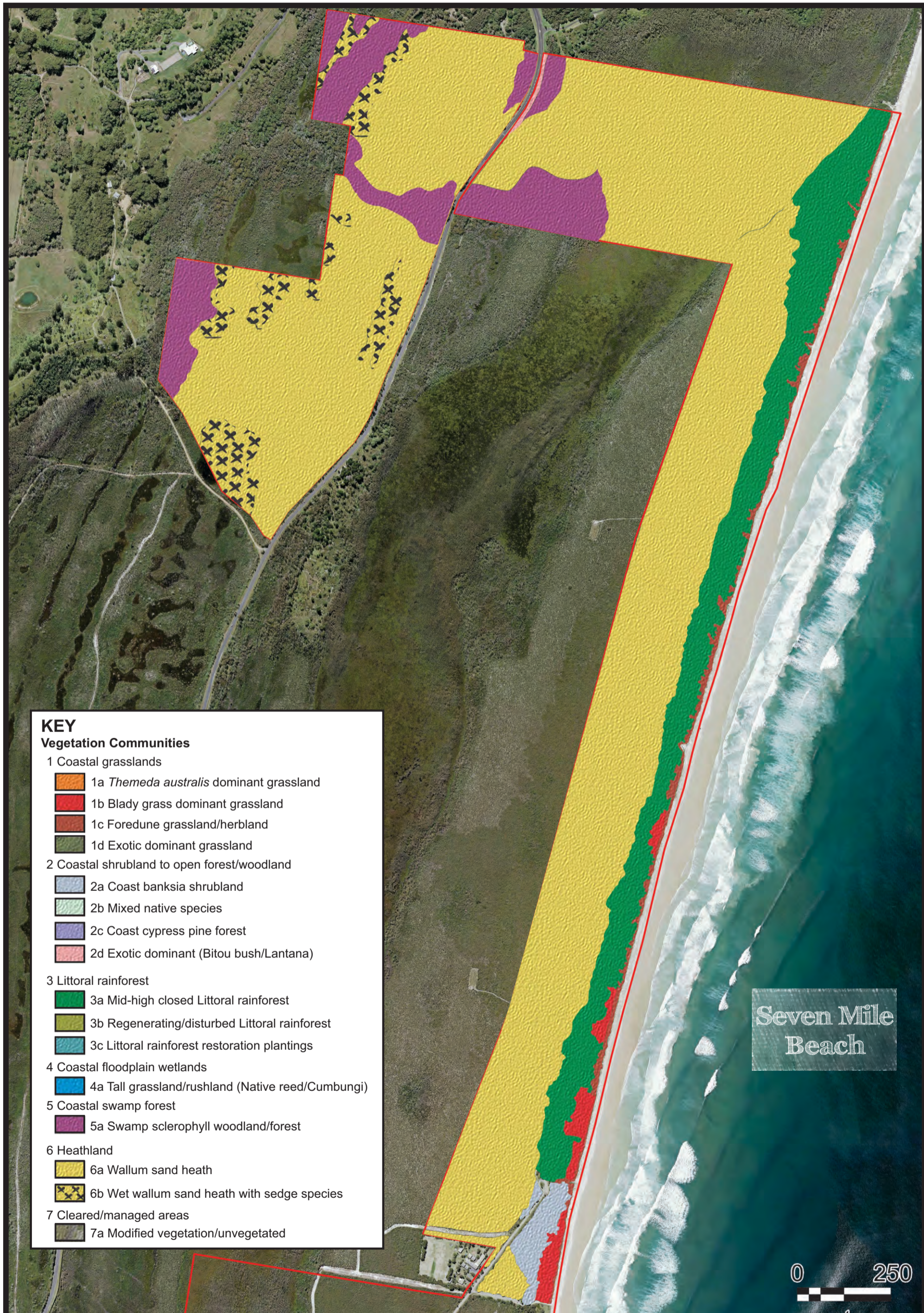














APPENDIX B

HISTORICAL PHOTOS



View of Lennox Point circa 1965



Edward Ford: album of sketches of NZ and NSW, ca. 1857, 1859 - 1862. NSW State Library.

View north toward Lennox headland circa 1857



APPENDIX C

BSC BUSHLAND AND BEACH ACCESS TRACK MAINTENANCE GUIDELINES

Ballina Shire Council

Bushland and Beach Access Track - Maintenance Guidelines

Purpose: To maintain safe access tracks for the public whilst protecting the local environment.

Environmental Constraints: Many tracks are located in high conservation value bushland areas containing vegetation communities that contain threatened species and/or endangered ecological communities listed under the NSW Threatened Species Conservation Act 1995. Maintenance of bushland and beach access tracks is predominantly consented to under the approved Vegetation Management Plan for each reserve area.

Public Constraints: The public will continue to want to use the tracks whilst maintenance may be occurring.

General Principles: These guidelines set out the maintenance requirements for the bushland and beach access tracks in Ballina Shire on public land that is under the ownership and/or management of Council.

Tracks to be maintained are those identified as numbered tracks on the maps. These tracks include a combination of hard surfaced, soft surfaced, fenced, unfenced, pedestrian, vehicle, vegetated and unvegetated tracks.

Tracks are to be maintained in the following ways that minimise environmental impact.

Tracks will vary in width and height depending on the surrounding environment and track infrastructure but should generally be maintained as per the requirements below.

Maintenance Requirements - The Aerial Corridor

- The track aerial corridor is that of which pedestrians walk, cyclists cycle and vehicles drive through the track and the respective vegetation clearances must be provided for each.
- For pedestrians on beach and bushland tracks the clearance height is 2.2m and clearance width is 1m or at a minimum to the edge of hardened surface or track fencing.
- For cyclists only on gazetted shared pathways or cycleways the clearance height is 2.2m and clearance width is 3m or at a minimum to the edge track fencing or 0.5m past any edge of hardened surface.
- For vehicles on vehicle access tracks the clearance height is 4m and clearance width is 4m or at a minimum to the edge track fencing or edge of hardened surface.
- The encroaching vegetation within the aerial corridor must be pruned and removed or relocated to allow safe pedestrian, cyclist or vehicle access.
- All branches are to be undercut then removed to avoid tearing of the bark- Use the “3 step cut method” (Figure 1).
- When pruning branches must be cut back to the next lateral growth point or branch collar (Figure 1).
- The branch collar will usually be located outside of the aerial corridor.
- Do not leave stubs or protruding limbs (coat hangers) on shrubs and trees pointing into the aerial corridor.
- All branch offcuts must be cut into smaller pieces, a maximum 1m length and carefully placed on the ground into the adjacent bushland a minimum 2-3m away from track and out of sight.
- Do not throw branch offcuts and do not place offcuts on native plants, native seedlings, shrubs signs or fencing.
- Do not pile branch offcuts up as they will otherwise become a weed trellis and suppress native growth.
- If the offending branch to be removed is the majority of or the whole shrub/tree then the whole shrub/tree may require pruning/removal. Is it obstructive to the aerial corridor causing unsafe conditions? If so, remove it.
- Some flexibility may be required to leave large limbs and/or trunks on the edges within the aerial corridor so as to minimise major localised environmental impact.
- Placement of branches across the contour may also be used in steep areas and/or where erosion is occurring from track or stormwater runoff.

- Fast growing species such as Coastal Wattle, Bitou Bush and Lantana can be pruned another 0.5m to 1m beyond the aerial corridor.
- Wherever possible weed species should be removed rather than pruned repetitively.

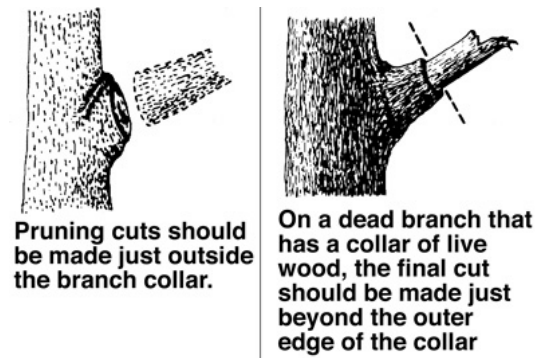


Figure 1. Branch pruning cut

Maintenance Requirements - The Ground

- Ground vegetation will need to be either cut, mowed, whipper snipped and/or sprayed (or combination of) so that a suitable ground surface within the width of the aerial corridor is visible and maintained.
- Trip hazards on the ground need to be identified and removed and/or mitigated.
- Trip hazards may include: Spinifex grass runners, exposed roots, sand accretion, rocks, fallen branches, worn steps, broken fencing and wire, broken glass and eroded areas.
- Holes may need to be filled in with blue metal/dust, woodchip or dirt/sand fill and bike jumps removed.
- Large erosion areas on tracks should be reported to Council's Natural Resource Officer for remediation action.
- Where vegetation groundcovers grow over hard surfaced tracks, they will need to be sprayed if the vegetation is a risk (trips or slippery).
- Spotters and signage should be utilised when maintaining tracks to warn the public.

Maintenance Requirements - Frequency

- Tracks require pruning frequently and more often during the summer growth period and are based on the type of vegetation growing, lighting levels and after storm and windy events.
- If the grass is long, snakes may hide and be trodden on.
- Tracks should be **pruned 3 three times/year**. Prune in November/December, then February/March and then July/August.
- Grass needs mowing or whipper snipping more frequently as required.



APPENDIX D

CHECKLIST FOR BUSH REGENERATION ACTIVITIES IN THE HABITAT OF THREATENED SPECIES, ENDANGERED POPULATIONS AND EECS/TECS



Northern Directorate

Checklist For Bush Regeneration Activities In The Habitat Of Threatened Species, Endangered Populations And Endangered Ecological Communities

Background

Threatened species, endangered populations and endangered ecological communities are protected in NSW under the *Threatened Species Conservation Act 1995* (TSC Act).

It is an offence to “harm” or “pick” threatened species, populations or ecological communities, or cause “damage” to critical habitat or the habitat of threatened species, populations or ecological communities¹.

“Harm” refers to native fauna, and is defined as to:

hunt, shoot, poison, net, snare, spear, pursue, capture, trap, injure, or kill.

“Pick” refers to native flora, and is defined as to:

gather, pluck, cut, pull up, destroy, poison, take, dig up, remove or injure the plant or any part of the plant.

“Damage” is not defined but the common dictionary definition would apply.

It is a defence to a prosecution if the action was:

- authorised in accordance with a Section 120 licence or a Section 132C licence under the *National Parks and Wildlife Act* or a licence granted under Section 91 of the TSC Act (flora and ecological communities);
- authorised in accordance with a development consent under the *Environmental Planning & Assessment Act 1979*; or
- authorised by or under the Rural Fires Act 1997, or the State Emergency and Rescue Management Act 1989.

Bush regeneration activities

Areas where bush regeneration is undertaken are often the habitat of threatened species or may be an endangered ecological community (e.g. Lowland

Rainforest on Floodplain). It is understood that the intention of bush regeneration activities is to have a positive impact, however, there is a chance that these activities may adversely impact on threatened species, populations or ecological communities. This may occur where:

- a species (flora or fauna) is not known to exist on the site (e.g. cryptic species such as orchids);
- a species may be accidentally harmed or picked (e.g. by spray drift or accidental cutting);
- a species may be misidentified and is thought to be either an exotic or common native species and therefore may be removed or damaged;
- the requirements of the species, including habitat structure and components, may be temporarily adversely impacted (e.g. maintaining microclimatic conditions, connecting or sheltering habitat for fauna);

Licensing

Those undertaking bush regeneration activities may consider applying for a Section 132C licence under the NPW Act.

A Section 132C licence is issued where the NPWS considers that the proposed work is for conservation purposes.

Licence Conditions

Generally, licences are issued on an annual basis; however, shorter or longer term licences are also issued where appropriate.

The NPWS may prohibit, condition, or limit bush regeneration works in some areas where it may affect research plots. Other licence conditions may be applied after consideration of population estimates, age structure, viability and health of the population or individuals.

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The Bush Regeneration Checklist

The intention of the checklist is to ensure that bush regeneration activities will **not** have a significant impact on threatened species, populations or ecological communities and their habitats. Applicants should consider attaching this standard checklist to any Section 132C licence application to assist the NPWS in assessing the significance of the proposed activity. The NPWS will assume the applicant is prepared to adhere to the guidelines in the checklist where they form part of the licence application. Detail of any proposed work additional or contrary to that described in the checklist must be provided. The NPWS then assesses the likely significance of the impact of the proposal² using the information provided in the licence application.

For the purposes of the checklist, bush regeneration is considered as all types of habitat restoration and may include such activities as manual weed removal, herbicide use, temporary damage to, or removal of native plants, planting, track work or maintenance and habitat removal or modification.

1. Threatened Species are listed under two schedules on the *Threatened Species Conservation Act*: Schedule 1 includes Endangered Species, Endangered Populations and Endangered Ecological Communities and Schedule 2 includes Vulnerable species. The *Threatened Species Conservation Act* Schedules are maintained by the NSW Scientific Committee. The most recent versions of these schedules may be obtained on the NPWS Web Site: www.nationalparks.nsw.gov.au.
2. A Species Impact Statement must be prepared where a proposed activity is assessed as likely to have a significant impact on threatened species, populations or ecological communities.
3. The Wildlife Atlas is the NPWS statewide flora and fauna database.

NPWS Checklist For Bush Regeneration Activities:

Please Note:

- 1) The checklist is provided to facilitate licence applications and to draw attention to NPWS issues of concern.
- 2) There is no requirement to use the checklist when applying for a licence. You may alternatively choose to provide details of your project and an explanation of how you will ensure there will not be a significant impact on threatened species, their habitat or on endangered ecological communities.
- 3) If you provide a negative answer using the checklist this does not necessarily mean your application will be unsuccessful. You will however need to provide a satisfactory explanation as to why you do not wish to comply with the guideline and how you will ensure there is unlikely to be a significant impact on threatened species, their habitat or on endangered ecological communities.
- 4) You may wish your licence application to cover the collection of Voucher Herbarium Specimens and Plant Material for Identification.

Management Planning:	yes	no	more info attached
The proposed activities will be in accordance with a management plan or site plan (map). <i>Please attach the plan or relevant sections of the plan or strategy to the licence application.</i>			
The project has been discussed with the relevant Landcare coordinator. <i>If not, provide details of any other professional advice you have sought, e.g. from a qualified bush regenerator.</i>			
A NPWS Wildlife Atlas database search of a 5km radius of the site has been undertaken to identify threatened flora/fauna species known or likely to occur on the site. The Wildlife Atlas is accessible on the NPWS Web Site www.nationalparks.nsw.gov.au .			See Tables 1& 2
Prior to commencing any works on site, a permit or permission will be obtained from the relevant landowner(s) or land manager(s).			
Training and supervision:			
All workers carrying out bush regeneration and associated works will be supervised by a trained and experienced co-ordinator who has completed a recognised bush regeneration course (e.g. the Certificate of Bushland Regeneration) or a minimum of 2 years bush regeneration experience. <i>If 'yes', please provide below the name and qualifications of the co-ordinator.</i> Name: Qualifications/experience:.....			See attached s132c Licence application
Other members of the group that have bush regeneration training or experience. Name: Qualifications/experience: Name: Qualifications/experience:..... Name:		See	attached s132c Licence application

Qualifications/experience:..... Name:			
Qualifications/experience:..... Name:			
Qualifications/experience:..... Name:			
All activities by workers will be regularly checked and approved by the co-ordinator.			
All workers will be informed of any threatened species or endangered ecological communities in the area or which may occur in the area and the potential impacts of activities on these species/communities. <i>e.g. vines on the edge of a littoral rainforest remnant may protect the remnant from salt-bearing winds.</i>			
	yes	no	more info attached
All workers have adequate weed and native plant identification skills. <i>i.e. all workers can identify and differentiate between weeds and native plants that occur on the site.</i>			
Workers will be familiar with the identifying features of threatened flora that are known or likely to occur in the project area. Where threatened species known from the area are similar to weed species, the distinguishing features between these will be understood prior to commencing the work.			
Access to sites			
All vehicular access to sites will be restricted to formed roads.			
Unnecessary damage to sites will be avoided. <i>e.g. avoid working in wet weather to lessen soil compaction.</i>			
Impacts on flora:			
Prior to any works being undertaken, the presence or absence of threatened flora will be determined by a thorough walking search of the area.			
All threatened flora will be tagged with highly visible flagging tape before work commences. If a number of individuals occur in a clump, that area should be marked out with flagging tape.			
Cutting or damaging of threatened flora will be avoided.			
All plants will be positively identified before they are removed (pulled, cut, poisoned etc).			
Weed removal within 2m of a threatened species will be undertaken by hand.			
To reduce the possibility of introducing plant diseases and weeds the following measures will be applied: 1. Secateurs will be sharp and cleaned with methylated spirits. 2. Footwear will be cleaned of loose soil and preferably treated with bleach between sites.			

Impacts on fauna:			
All workers will be aware of any threatened fauna that are known or likely to occur on site, and the potential impacts of the proposed activities on those species.		See	attached lists for examples
The habitat and refuge potential of weeds and rubbish will be considered prior to removal. <i>e.g. Lantana can provide cover for threatened fauna such as the Bush-hen. Dead Lantana and poisoned Camphor Laurels should, where possible, be left in situ.</i>			
Weeds will be removed gradually in areas where an infestation is extensive. <i>Ideally, 50% of weeds that may provide habitat should be left until native plant species have re-established and provide alternative refuge.</i>			
Disturbance to, and removal of rocks, logs and other potential refuge sites will be avoided.			
A herbicide registered for use near waterways will be used within 5m of waterways.			
Herbicide spraying will be prohibited within 5 metres from watercourses where threatened frogs are known or likely to occur and within a 10m radius of records of threatened frogs.			
A buffer of 1m along other watercourses will be maintained in which no herbicide will be sprayed.			
Care will be taken to minimise disturbance to shy or cryptic species. <i>e.g. the Marbled Frogmouth roosts in vine 'curtains'.</i>			
Care will be taken to minimise disturbance to the leaf litter layer.			
Reconstruction through revegetation: <i>This section does not address propagation or planting of threatened species – this activity would need to be separately addressed.</i>			
Seed collection or cuttings will be from species, populations or ecological communities other than those listed as threatened (unless licensed by NPWS).			
Prior to collecting any seed or cuttings permission will be obtained from the relevant landholder or manager of the site. <i>e.g. a licence is required to collect native plants on National Parks estate.</i>			
	yes	no	more info attached
Seed collection from any one species will be limited to less than 10% of the available crop at that site.			
Seed collection from any individual plant will be limited to less than 10% of the available crop.			
If your seed source is used by other seed collectors, has consideration been			

given to minimising any cumulative impacts to the source plants? <i>Some individual plants are known as a reliable seed source and their seed is collected extensively. This may result in – (i) a reduction in genetic diversity); (ii) an impediment to the individual's natural ability to regenerate.</i>			
When collecting propagation material from a wild population, collection will be random from as many individuals as possible across the population to ensure a representative range of genetic material is collected. Collectors will avoid selection of propagation material on the basis of physical attributes. <i>e.g. tallest, most attractive, greatest amount of seed or flowers.</i>			
Plantings will be sourced from stock of local provenance.*			
Propagated plants will be used only at the subject site. <i>i.e. excess material will only be used at other sites if it meets the provenance criteria.</i>			
A buffer of 5 metres will be maintained around all threatened plant specimens. Planting will only be undertaken outside this buffer. <i>This requirement is intended to protect the roots of the threatened plant from damage, introduction of disease or impacts of herbicide.</i>			
Care will be taken to ensure that mulch does not introduce weeds or impede natural regeneration at the site.			
Care will be taken to ensure that weeds and/or phytophthora are not introduced to a site from any plantings.			
Consideration will be given to the possible impacts of plantings on the ecological requirements of threatened species at the site <i>e.g. reduced light, competition, etc.</i>			
Species will be planted within their natural habitat and range. Plantings will be guided by the plants' local habitat preferences. <i>e.g. the species used for plantings along watercourses should be those that naturally occur in that habitat in your local area.</i>			
Herbicide use: <i>A permit from the National Registration Authority for Agricultural and Veterinary Chemicals PO Box E240, Kingston ACT 2604 may be required for herbicide use that is not consistent with conditions specified on the label.</i>	Yes	No	
A buffer of 2m will be maintained around all threatened plant specimens. Herbicide use will only be undertaken outside this buffer.			
Herbicide use will cease where there are any signs of threatened species being affected by herbicide. <i>e.g. browning off, wilting, deformed growth.</i>			
All herbicide spray operators will be capable of undertaking precise and effective weed control.			
Spray will be directed away from threatened flora.			
Herbicide will only be sprayed in suitable weather conditions when the impact of spray drift (windy) or run-off (wet) on threatened flora is minimised.			
Marker dyes e.g. 'white field marker' will be mixed with herbicide before use. <i>Marker dye enables the worker to see where the spray is landing.</i>			

Reporting and data records:			
Any new records of threatened species will be provided within three months to NPWS. These records will be in a format appropriate for entry into the Wildlife Atlas, once identification of a threatened species is confirmed by a recognised authority. <i>Wildlife Atlas cards available on request.</i>			

*Local provenance species should be regarded as those species propagated from material that has been collected from a natural wild population as close as possible to a site. For example, within the local catchment – which may be based on a local creek.

Please sign below, keep a copy for your records and attach all original pages of checklist, and any additional information, to your application form.

I, the undersigned, agree that the proposed bush regeneration activities are in accordance with all items checked above, additional information attached and the licence application form.

Name (please print)

Signature

Date

Further reading:

Buchanan, R. (1989) *Bush Regeneration: Recovering Australian Landscapes*. TAFE Student Learning publication, Sydney.

Buchanan, R. (1992) "Site assessment – a vital part of bush regeneration" in *Urban Bushland in Western Sydney*. Seminar Proceedings, Nature Conservation Council of NSW, 1992.

FloraBank (1999) *Guidelines 5: Seed collection from woody plants for local revegetation*. FloraBank, ACT.

FloraBank (1999) *Guidelines 6: Native seed collection methods*. FloraBank, ACT.

FloraBank (2000) *Guideline 10: Seed Collection ranges for revegetation*. FloraBank, ACT

Greening Australia NSW (1999) *Management principles to guide the restoration and rehabilitation of indigenous vegetation*. Greening Australia NSW, Sydney.

Harden, G. (1990-1993; 2002) *Flora of NSW, Vols 1-4*. University of NSW Press, Kensington.

Joseph, R. (1999) An integrated, systematic approach to rainforest remnant restoration. In *Rainforest Remnants – A Decade of Growth*. Proceedings of a conference on rainforest regeneration., NSW National Parks and Wildlife Service, Alstonville.

McDonald, T. (1993) Strategic plans for bush regeneration. in *Bushland in Our Cities and Suburbs Part 1: Making Planning Work*. Seminar Proceedings, Nature Conservation Council of NSW, 1993.

McDonald, T. (1994) What are we doing with ecosystem resilience and the restoration of damaged plant communities. in *Bushland in Our Cities and Suburbs Part 2: Making Bush Regeneration Work*. Seminar Proceedings, Nature Conservation Council of NSW, 1994.

NSW National Parks and Wildlife Service. (2000) *Threatened species of the lower north coast of NSW*. NSW NPWS, Coffs Harbour

NSW National Parks and Wildlife Service. (2002) *Threatened species of the upper north coast of NSW*. Vol 1. Fauna. Vol 2. Flora. NSW NPWS, Coffs Harbour

NSW National Parks and Wildlife Service. (2003) *Threatened species of the New England Tablelands and North West Slopes of NSW*. NSW NPWS, Coffs Harbour

Acknowledgements

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APPENDIX E

BEST PRACTICE GUIDELINES FOR BUSH REGENERATION PERSONNEL

- The regenerators are to ensure all tools, equipment and vehicles are to be cleaned free of weed propagules and potential pathogens, such as Phytophthora and Myrtle rust.
- If a tree on the adjacent lands is damaged, immediately assess the situation and apply appropriate level of treatment to facilitate recovery.
- Weeds are to be controlled in accordance with the Weed Control Strategy (Appendix E) or using alternative proven best practice species-specific methods.
- Undertake native vine management where needed to reduce large impacts on seedlings and canopy ensuring habitat values are not compromised.
- Procedures are to be in place to minimise potential for spillage of chemicals and any spills are to be dealt with immediately. Each vehicle should have a spill response kit.
- All herbicides use should be undertaken in accordance with the manufacturer's specifications and should be undertaken by appropriately qualified personnel. Spraying of herbicides should not be undertaken within 6 hours of rainfall and where there is likelihood of rain within 24 hours.
- Any herbicides to be used near waterways should be registered for use in and around waterways, including Roundup Bioactive™ and Weedmaster 360™. These products have improved surfactants, making them safer to use near waterways.
- Personnel undertaking bush regeneration activities should have completed a minimum Certificate II Conservation and Land Management course and also hold a current ChemCert Accreditation card for the safe application of chemicals.
- The regulatory body for herbicide use is the Australian Pesticides and Veterinary Medicines Authority which administers the registration of Agricultural and Veterinary Chemicals (AGVET) in Australia. Workers should regularly consult the AGVET Permits to check on the latest updates.



APPENDIX F

BALLINA SHIRE COUNCIL DAILY RECORD SHEET

Bush Regeneration Record Sheet



Supervisor: _____

Zone/Location: _____ Date: _____

Volunteer Name(s)	Address	Start	Finish	Signature	Hours Worked
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
15.					
<i>(More space provided on back of form for additional volunteer names)</i>				Total hours worked	

Weather Conditions: (temp, wind,speed/direction,cloud cover etc) _____

Work Completed: (area, distance, number of plants, comments on prev or followup work, monitoring etc)

HERBICIDE APPLICATION Permit No. Used:

The Pesticides Amendment Regulation as part of the Pesticides Act, 1999 requires responsible personal to complete this form within 24 hours of herbicide application, and then lodged with Ballina Shire Council to be filed for 3 years.

Name of Chemical Certified Worker/s		Start	Finish	Signature	
1.					
2.					
3.					
Target weed species	Herbicide	Concentration Used	Volume used	Additional chemical agents	Method of application
Native/ Threatened Species Protected:			Precautions Taken:		

Bush Regeneration Site Map : Mark work area on map



Additional Volunteer Name(s)	Address	Start	Finish	Signature	Hours Worked
15.					
16.					
17.					
18.					
19.					
20.					
				Total hours worked	



APPENDIX G

WEED CONTROL GUIDELINES



TABLE G1

CONTROL METHODS FOR WEED SPECIES RECORDED WITHIN THE VMP PROJECT AREA

Species	Control Methods
Aerial yam Air potato	Vines: scrape and paint (G 1:1.5), leaving stem intact; shoots: spray (G 1:200 + MM). Dig up tubers and remove from site (time-consuming but highly recommended).
African tulip tree	Saplings: cut, scrape and paint (G 1:1.5); trees: frill/inject (G 1:1.5); seedlings: spray (G 1:200).
Agapanthus	Hand-pull/dig.
Bitou bush	Larger Stems: cut, scrape & paint or Frill/Inject (G 1:1.5) Bushes: Overspray or cut down and spray regrowth during autumn (G 1:300) Seedlings: Hand-pull or spray
Brazilian cherry	Shrubs: Cut, scrape & paint (G 1:1.5) or Frill/Inject (G 1:1.5). Seedlings: Spray (G 1:50 + MM + surfactant)
Broad-leaved pepper tree	Saplings: Cut, scrape & paint (G 1:1.5) Trees: Frill/Inject (G 1:1.5) Seedlings: Hand-pull or spray (G 1:50 + MM + surfactant)
Cadaghi	Seedlings: hand-pull or spray (G 1:100 + penetrant); Small trees: Cut, scrape & paint (G 1:1.5) or Frill/Inject (G 1:1.5).
Camphor laurel	Seedlings: hand-pull or spray (G 1:75 + penetrant); Saplings: Cut, scrape and paint or basal bark (G 1:1.5); Trees: Drill (G 1:2.5)
Canna lily	Dig out entire plant or cut/slash and spray regrowth (G 1:200 + surfactant). Collect and bag seeds.
Cape ivy	Vines: hand-pull and remove from canopy; runners: roll up and hand to dry; stems: scrape and paint (G1:1.5 + MM); regrowth and seedlings: spray (G 1:200 or G 1:200 + MM + penetrant)
Castor oil plant	Shrubs: cut, scrape and paint or frill/inject (G 1:1.5); seedlings: hand-pull or spray (G 1:200)
Century plant <i>Agave</i> sp.	Dig out plant by hand or machine; cut and paint near ground (G 1:1.5) or spray (MM).
Climbing asparagus fern	Rhizomes: crown and hang to dry; stems: pull down and wind up and spray or cut and drip (G 1:1.5 + MM); spray regrowth (G 1:100 +MM)
Climbing nightshade	Seedlings: hand-pull; vines: cut, scrape and paint (G 1:1.5); regrowth and seedlings: spray (G 1:200 OR G 1:200 + MM).
Coastal morning glory	Hand-pull, roll up and hang to dry; Cut, scrape & paint (G 1:1.5) the larger stems, roots and nodes. Spray regrowth and ground layer (G 1:100 + MM)
Coastal tea tree	Trees: Frill/inject (G 1:1.5 + MM); Saplings: cut, scrape and paint (G 1:1.5 + MM); Seedlings: hand-pull or spray (G 1:100 + MM +



Species	Control Methods
	penetrant)
Cocos palm	Cut below lowest frond. Hand-pull seedlings.
Coral tree <i>Erythrina</i> spp.	Frill/inject (G 1:4 + MM) or cut and paint stumps (G 1:4 + MM); stack any fallen branches above the ground to dry and prevent re-sprouting. Follow up frill/inject sprouted branches (G 1:4 + MM) or spray regrowth (G 1:50 + MM). Trial drilling the base of large branches as well as the trunk and injecting (G 1:4 +MM) to kill branches before they fall to the ground and re-sprout.
Crofton weed	Hand-pull and hang to dry or spray G 1:50 + surfactant.
Duranta	Shrubs: cut, scrape and paint or frill/inject (G 1:1.5) or spray (G 1:100 glyphosate).
Fishbone fern Giant fishbone fern	Hand pull or crown. Spray glyphosate (G 1:100) + MM
Glory lily	Young shoots: spray (G 1:200 + MM). Best results in Oct-Nov and by using a penetrant and surfactant.
Golden rain tree	Stems: cut, scrape and paint (G 1:1.5 + MM) or spray (G 1:200 + MM); seeds: collect, bag and remove).
Ground asparagus fern	Crown or spray (G 1:75 + MM + penetrant OR MM + penetrant) Most effective if done between flowering and berries forming. Non chemical: mechanically crown out
Guava	Seedlings: Hand-pull. Trees: Stem inject (MM handmix)
Hairy commelina	Spray with (G 1:50 + MM + penetrant). 2-3 applications may be necessary. Rake and compost under black plastic.
Ivy	Stems: Cut, scrape and paint (G 1:1.5); spray (G 1:100 + MM)
Lantana	Stems: Cut, scrape & paint (G 1:1.5); bush-hook/slash and spray regrowth with glyphosate (G 1:100); over-spray (G 1:100 + penetrant) thoroughly soaking both foliage and stems or splatter gun (G 1:9 + penetrant)
Loquat	Saplings: cut, scrape and paint (G 1:1.5); trees: frill/inject (G 1:1.5); seedlings: hand-pull or spray (G 1:200 + MM OR MM only). Tends to be herbicide resistant.
Madeira vine	Ascending stems: scrape and paint (G 1:1.5 + MM); tubers gouge, scrape and paint; ground infestations: spray (G 1:50 + MM), hand-weed tubers and small vines; bag and compost or place in bin.
Mother-in-law's tongue	Hand-pull or dig. Spray (G 1:50 + MM). May require reapplication at 3 monthly intervals.
Mother-of-millions Resurrection plant	Hand-pull and compost or place in bin; plantlets: spray (G 1:50 + MM + penetrant OR MM + penetrant).
Mulberry	Trees: frill/inject (G 1:1.5). Stack cut branches above the ground to dry; saplings: cut, scrape and paint (G 1:1.5); seedlings: spray (G 1:200)
Murraya	Shrubs: cut, scrape and paint or frill/inject (G 1:1.5); seedlings: hand-pull or spray (G 1:100)



Species	Control Methods
Ochna	Stems: Cut, Scrape & Paint or Scrape & Paint or Frill/inject (G 1:1.5 + MM OR MM only handmix) Seedlings & regrowth: Spray (G 1:50 + MM + surfactant)
Paddy's lucerne	Hand-pull or spray (G 1:100 + penetrant) Stems: Cut, scrape and paint (G 1:1.5)
Passionfruit vines	Stems: Cut, scrape & paint (G 1:1.5); Regrowth: spray (G 1:75 + MM + penetrant).
Pennywort	Dab each leaf with a drop of hand mix (G 1:1.5 + MM) using a bottle applicator.
Philodendron	Soft-leaved varieties – cut stem high and low. Monitor and regularly remove newly formed adventitious roots. Fleshy-leaved varieties – trial scraping stems and painting with (G 1:1.5 + MM).
Pink polkadot plant	Hand-pull or crown; spray (G 1:50 + MM)
Prickly pear	Cut and paint or drill (G 1:1.5 + MM) or spray (G 1:50 + MM)
Rubber tree	Frill/inject (G 1:1.5) or cut and paint stumps (G 1:1.5). Stack cut branches above the ground to dry. Follow up frill/inject sprouted branches (G 1:1.5) or spray regrowth (G 1:200).
Senna (Cassia)	Seedlings: handpull or spot spray (G 1:100 +MM + surfactant) Shrubs: cut, scrape & paint stump, or stem inject (G 1:1.5 + MM)
Silver-leaf desmodium Green-leaved desmodium	Hand pull or crown. Spray (G 1:50) + surfactant. Cut, scrape & paint tuberous roots (G 1:1.5). Collect and bag seeds.
Singapore daisy	Spray MM (1.5g/10L). Repeated treatments required.
Siratro	Hand pull or crown. Spray (G 1:100 + MM)
Slash pine/Radiata pine/Norfolk pine	Seedlings: hand-pull; Saplings and trees: cut close to ground or trial Frill/Inject (G 1:1.5) ensuring thick bark is penetrated. Ringbark.
Soft herbs /grasses/annuals	Spray (G 1:100).
Tecoma, Yellow bells	Stems: cut, scrape and paint (G 1:1.5 + MM) or spray (G 1:200 + MM); seeds: collect, bag and remove).
Tobacco bush	Seedlings: hand-pull or spray (G 1:100 + MM + penetrant); Shrubs: Cut, scrape & paint (G 1:1.5 + MM) or Frill/Inject (G 1:1.5 + MM).
Turkey rhubarb	Dig up tubers and bag. Spray (G 1:50 + MM + penetrant).
Umbrella tree Dwarf umbrella tree	Seedlings: Hand-pull Trees: Scrape and paint or Frill/Inject (G 1:1.5 + MM). Locate any cut stems or seedlings off the ground and scrape and paint.
Yellow oleander	Stems: Cut scrape and paint (G 1:1.5 + MM) or frill/inject (G 1:1.5 + MM)



Species	Control Methods
Oleander Hibiscus Golden wreath wattle	Seedlings: Hand pull or spray (G 1:200 + MM + surfactant)

NOTES

- G Glyphosate
- MM Metsulfuron methyl
- (G 1:γ) Numbers in brackets are glyphosate dilution ratios
- MM ratios Spray application rate of 1.5g per 10L of water;
Hand mix application rate 1g/L with glyphosate or 2g/L without glyphosate
- penetrant Pulse is the recommended penetrant
- surfactant Brushwet is the recommended surfactant

Marker dye, such as Envirodye, should always be used when spraying.

Sources

Big Scrub Rainforest Landcare Group (2000) Common Weeds of Northern NSW Rainforests. BSRLG.
 Ensbey (2011) NSW Department of Primary Industries, Noxious and Environmental Weed Control Handbook 5th Edition.

Details of weed control methods

(Adapted from www.mullum.com.au/wilsonscreeklandcare/weeds/weeds_techniques.html)

Cut, Scrape and Paint

This is suitable for coppicing and suckering weeds such as Camphor, Bitou bush and Privet, or any weeds which are too large for hand-pulling or have long taproots such as Ochna. This method provides for no soil disturbance and weed eradication is successful.

1. Cut the stem/s 1-2 cm above ground level using either secateurs, loppers, a pruning saw or a chainsaw, depending on the thickness and toughness of the stem.
2. Immediately apply glyphosate™ (generally 1:1 or 1:1.5 or 100%) to the cut surface of the stem or, with medium and large trees, to the outside edges of the cut surface. (Herbicides need to be applied immediately after the cut is made because the ability of the plant to transport fluids ceases as soon as the tissues are severed.)
3. Search through the leaf litter to locate any exposed stem or root surface. Scrape the exposed stem or root surface slightly with a knife until a light green coloured layer is exposed (Do not scrape too deeply.) Apply the herbicide to the scraped sections, either with a brush, injector or spray bottle.
4. Follow up as required.

Scrape and Paint

This is a variation of the cut, scrape and paint technique described above, the difference being the plant is not cut but left intact and scraped. This technique ensures the translocation of the herbicide throughout the entire plant.

1. Scrape several sections of the stem along one side only, in lengths of at least 30 cm. The stem needs to be scraped firmly, exposing the fibres and/or light green coloured layer. Be careful not to sever the stem completely.
2. Each scraped section is immediately painted, prior to scraping the next section, with the recommended diluted glyphosate for the particular weed.

Frill/Inject

Use a small axe to cut into the sapwood at a downward angle. Three rows of cuts are made in a brick pattern around all multi-branches, low to the ground. 1 to 3 cuts are made before immediately injecting the cuts with a glyphosate mix dependent on tree type. The cuts need to be filled slowly to avoid chemical spills. Frilling is easy to use in readily accessible spots. Drilling may be more suitable for hard to get at multi-stems.

Penetrant denotes use of penetrant such as Pulse®. Penetrant facilitates the transfer of the herbicide through the surface tissue and is often used for plants with waxy leaves. Manufacturer's instructions should be followed when using any penetrant.

APPENDIX H

General Guide to Planting

1. STOCK

Only use fully sun hardened plant stock, and not stock direct from a shade house. Tube stock is the best as it is a cost effective plant container size, light in weight and easy to handle. Choose plants that are not root bound, do not have yellowing or discoloured leaves and that have a strong stem. Seedlings should be about 30cm in height.

Seedlings should be ordered from a local nursery 6 months in advance and the need for local provenance emphasised.

The nursery should ensure no plants showing signs of Myrtle rust are delivered to the site.

2. SPACING

Random spacing is the usual planting pattern to obtain a natural effect, rather than lines or grids. Trees are typically planted at 1 to 2m spacings. The positioning of plantings should take into account any existing trees and any natural regeneration occurring in the planting area.

3. PREPARATION OF THE SITE

Remove any grasses and weeds completely at each specific planting location in a 1m diameter circle, either manually or chemically. When the weeds/grass cover have died (after about 3 weeks if spraying) at each location planting can begin. Dig a hole in the centre of the circle 20 cm deeper than the plant container and twice as wide. Tools usually used for digging holes are augers, shovels or mattocks. The soil at the base and sides of the hole should be rough and loose to allow root penetration. Water the plants well before planting to ensure a moist root ball.

4. PLANTING

Place a generous amount of water into the hole before planting (2-4 litres if the soil is dry), as losses are reduced by planting into and providing a moist root zone. Tap the plant out of its container and loosen any pot bound or circular roots. Prune the roots if they are very bound up. Put the plant in the hole with the water and fill in with loose crumbly soil. Firm the plant in well with the feet or hands. This is very important for settling the plant roots in, and to provide a stress free start for each plant.

5. FERTILISING

For specific plant species apply approximately one handful of low-phosphorus or “native” fertiliser, preferably in the form of slow-release pellets. Place the fertiliser on the soil surface following planting, but not too close to the stem. No fertiliser is to be used on Coast banksia.

6. WATER CRYSTALS

The use of water crystals should be employed when necessary, ie: on rocky sites, west facing dry slopes or during periods of drought. Soak water crystals and place a generous handful in the base of the hole prior to planting.

7. MULCH

Individual trees should be mulched. Mulch is basically any material that can cover the bare earth



and is essential for water retention and weed suppression. The usual method of mulching is to lay the mulch material in a 0.5m to 1.0m diameter area around the plant. Take care to mulch right up to the stem, but not too heavily. If a gap is left between the stem and the mulch weeds will grow from the gap in direct competition with the plant. Only weed and seed free mulch varieties that may include woodchip and hay bales are to be used.

8. TREE GUARDS/FENCING

Tree guards or in some cases fencing should be employed where browsing fauna are considered a problem.

9. WATERING

Plants should be watered every few days for at least a fortnight following planting if there is not sufficient rain. Extra watering may be necessary if dry conditions prevail after planting.

Adapted from Greening Australia (NSW) Inc. North Coast Regional Office. (Undated)
Reforestation: Why and How. <http://www.nor.com.au/environment/greenwork/refinfo.htm>.



APPENDIX I
SITE PHOTOS



Disturbed area around stormwater inspection point within Zone 2



Prickly pear and Bitou bush in Zone 10



Garden offcuts in Zone 10



Beehives in clearing within Zone 10



Bitou bush at foot of dune along Seven Mile Beach (Zone 10)



APPENDIX J

NATIVE SPECIES LIST

Scientific name	Common Name	Boulder Beach (North) incl. wetland	Lower Point	Upper Point incl Pat Morton lookout	Seven Mile Dunes	Lake Ainsworth East of Camp Drewe Rd	Ross Lane Reserve incl. northern heathland	Skennars Head Sharpes Ck to Iron Peg	Bora Ring	Boulder Beach (South) incl. SEPP Littoral Rainforest	Notes
Trees & Shrubs:											
Acacia disparrima	Brush ironbark wattle									✓	
Acacia longifolia								✓			
Acacia melanoxylon	Blackwood	✓				✓	✓			✓	
Acacia sophorae	Coastal Wattle	✓	✓	✓	✓	✓	✓	✓		✓	
Acacia suaveolens					✓	✓	✓				
Acacia ulcifolia	Prickly Moses				✓	✓	✓				
Acmena hemiilampra	Broad-leaved Lillipilli	✓	✓							✓	
Acmena smithii	Lillipilli		✓		✓	✓	✓	✓		✓	
Acronychia imperforata	Beach Acronychia		✓		✓	✓	✓	✓		✓	
Acronychia wilcoxiana	Silver Aspen									✓	
Acronychia littoralis	Scented Acronychia		✓				✓				TSC-E EPBC-E
Alectryon coriaceus	Beach Birdseye	✓	✓	✓	✓	✓		✓	✓	✓	
*Casuarina equisetifolia	Coastal She-Oak		✓		✓			✓	✓		
Alpinia caerulea	Native Ginger		✓	✓						✓	
Alyxia ruscifolia	Prickly Alyxia		✓							✓	
Aphananthe philippinensis	Rough Leaved Elm			✓							
Archidendron hendersonii	White lace flower									✓	TSC-V
Archontophoenix cunninghamia	Bangalow Palm	✓	✓			✓	✓	✓		✓	
Arytera distylis	Twin-leaf Coogera			✓							
Arytera divaricata	Coogera									✓	
*Araucaria bidwillii	Bunya Pine			✓							
Araucaria cunninghamii	Hoop Pine		✓	✓			✓		✓		
Austromyrtus dulcis	Midgenberry	✓	✓		✓	✓	✓	✓	✓	✓	
Baeckia stenophylla	Weeping Baeckea						✓				
Baloghia inophylla	Brush bloodwood									✓	
Banksia aemula	Wallum Banksia					✓	✓				
Banksia ericifolia	Heath Banksia					✓	✓				
Banksia integrifolia	Coastal Banksia	✓	✓		✓	✓	✓	✓	✓	✓	
Banksia oblongifolia							✓				
Banksia serrata	Saw Banksia						✓		✓		
Brachychiton acerifolius	Kurrajong		✓								
Breynia oblongifolia	Breynia	✓			✓	✓	✓	✓		✓	
Callicoma serratifolia	Black Wattle							✓			
Callistemon salignus	Willow bottlebrush		✓								
Callitris columellaris	White (Coastal) Cypress	✓				✓	✓				
Cyclophyllum longipetalum	Coast Canthium			✓						✓	
Capparis arborea	Brush Caper Berry			✓							
Elaeodendron australe	Red Olive Plum	✓	✓	✓				✓		✓	
Casuarina glauca	Swamp She-Oak	✓	✓		✓	✓	✓	✓			
Allocastrum littoralis	Black She-Oak	✓	✓		✓	✓	✓				
Commersonia bartramia	Brown Kurrajong	✓			✓	✓	✓	✓		✓	

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Cordyline congesta	Toothed Palm-Lily					✓		✓		✓	ROTAP
Cordyline petiolaris	Broad-leaved Palm lily										
Cordyline rubra	Red-Fruited Palm Lily		✓	✓						✓	
Cordyline stricta	Narrow-leaved Palm lily						✓			✓	
Corymbia intermedia	Pink Bloodwood		✓	✓	✓	✓	✓		✓		
Crinum pedunculatum	Swamp Lily				✓			✓			
Crotolaria dissitifolia	Grey Rattle Pod	✓									
Cryptocarya laevigata	Red Fruited Laurel		✓	✓							
Cryptocarya triplinervis	Three Vein Laurel	✓	✓	✓	✓	✓		✓	✓	✓	
Cupaniopsis anacardioides	Tuckeroo	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Dicksonia youngiae	Bristly tree Fern							✓		✓	
Diospyros fasciculosa	Grey Ebony									✓	
Diplocyclos palmatus	Native Bryony						✓				
Dodonea triquetra	Hop Bush		✓			✓	✓				
Drypetes australasica	Yellow Tulip			✓							
Duboisia myoporoides	Soft Corkwood		✓	✓	✓	✓	✓			✓	
Dysoxylum mollissimum	Red Bean									✓	
Eclipta prostrata	White eclipta	✓									
Elaeocarpus obovatus	Hard Quandong									✓	
Elaeocarpus reticulatus	Blueberry Ash		✓		✓	✓	✓			✓	
Endiandra discolor	Rose Walnut									✓	
Eucalyptus robusta	Swamp Mahogany			✓		✓	✓				
Eucalyptus signata	Scribbly Gum						✓				
Eupomatia laurina	Bolwarra			✓						✓	
Euroschinus falcata	Ribbon Wood									✓	
Exocarpos latifolius	Broad-leaved ballart									✓	
Ficus coronata	a sandpaper fig	✓									
Ficus fraseri	Sandpaper Fig					✓					
Ficus macrophylla	Moreton Bay Fig		✓	✓		✓					
Ficus obliqua	Small-leaved Fig									✓	
Ficus superba	Deciduous Fig									✓	
Ficus watkinsiana	Strangler Fig				✓		✓			✓	
Flindersia bennettiana	Bennets Ash									✓	
Flindersia schottiana	Cudgerie	✓								✓	
Fontainea oraria	Coast Fontainea		✓	✓				✓			TSC-CE EPBC-E
Glochidion fernandi	Cheese Tree						✓			✓	
Glochidion sumatranum	Umbrella Cheese Tree	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Goodenia paniculata	Branched Goodenia									✓	
Guoia semiglauca	Guoia	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Hedraianthera porphyropetala	Hedraianthera			✓						✓	
Hibiscus tiliaceus	Cottonwood		✓	✓	✓	✓		✓	✓		
Hibiscus diversifolia	Swamp Hibiscus					✓	✓				
Homoranthus sp.						✓	✓				

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Hibbertia dentata	Trailing Guinea Flower					✓				✓	
Hibbertia scandens	Twining Guinea Flower	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Hoya australis	Native Hoya									✓	
Ipomoea brasiliensis	Goats Foot	✓			✓			✓			
Kennedia rubicunda	Dusky Coral Pea	✓			✓	✓	✓			✓	
Maclura cochinchinensis	Cockspur	✓			✓	✓	✓	✓	✓		
Marsdenia rostrata	Common Milk Vine	✓			✓	✓	✓			✓	
Millettia megasperma	Native Wisteria			✓						✓	
Pandorea pandorana	Wonga Vine				✓	✓	✓				
Parsonsia lanceolata	Rough silkpod									✓	
Parsonsia rostrata	Veinless Silkpod									✓	
Parsonsia straminea	Common Silkpod	✓		✓	✓	✓	✓		✓	✓	
Ripogonum elseyanum	Hairy Supplejack									✓	
Rubus sp. hillii?	Native Raspberry						✓				
Sarcopetalum harveyanum	Pearl vine				✓					✓	
Secamone elliptica	Corky Milk Vine									✓	
Smilax australis	Australian Sarsparilla	✓		✓	✓	✓	✓	✓	✓	✓	
Smilax glycyphylla	Sweet Sarsparilla						✓				
Stephania aculeata	Prickly Snake Vine						✓				
Stephania japonica var. discolor	Snake Vine	✓	✓		✓	✓	✓	✓	✓	✓	
Tetrastigma nitens	Three-leaf Water Vine									✓	
Vigna marina	Yellow Beach Bean			✓				✓	✓		
Grasses/Orchids /Groundcover / Ferns/ Herbs											
Actites megalocarpus	Coastal sowthistle				✓						
Adiantum hispidulum	Rough Maidenhair					✓	✓				
Aeschynomene brevifolia	False sensitive Plant							✓	✓		
Alocasia brisbanensis	Cunjevoi			✓							
Artenama fimbriatum	Koala Bells						✓				
Arthraxon hispidus	Hairy-joint Grass		✓								TSC-V EPBC-V
Asplenium australasicum	Birds Nest Fern	✓	✓			✓	✓			✓	
atriplex cinerea	Coastal Salt Bush		✓								
Blechnum indicum	Swamp Fern	✓				✓	✓			✓	
Bossiaea ensata							✓				
Botrychium australe	Parsley Fern	✓									
Carex appressa	Tall sedge	✓									
Carex pumila	Dune Sedge	✓			✓					✓	
Carpobrotus glaucesens	Coastal Pigface	✓	✓	✓	✓			✓	✓	✓	
Caustis recurvata					✓		✓				
Centella asiatica				✓	✓	✓	✓				
Chamaecrista maritima								✓			
Commelina cyanaea	Blue Commelina	✓			✓	✓	✓			✓	
Cryptostylis erecta	Bonnet Orchid	✓					✓			✓	

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Culcita dubia	False Bracken						✓				
Cyperus enervis	a Sedge	✓			✓	✓	✓			✓	
Cyperus exaltus		✓									
Cyperus gracilis	Slender Flat-sedge	✓									
Cyperus haspan		✓									
#Cyperus odoratus	Rusty Flatsedge / Fragrant	✓									
Cyperus polystachyos	Bunchy sedge	✓									
Cyperus stradbokensis		✓									
Cyperus trinervis										✓	
Cymbopogon refractus	Barbed Wire Grass							✓	✓		
Desmodium nemorosum										✓	
Dianella caerulea	Blue Flax Lily	✓			✓	✓	✓	✓	✓	✓	
Dianella congesta	Coastal Flax Lily		✓					✓	✓		
Dianella crinoides					✓					✓	
Dichelachne crinata	Long hair plume grass							✓			
Dichondra repens	Kidney weed									✓	
Dichopogon fimbriatus	Nodding Chocolate Lily						✓				
Doodia australis	Common Rasp Fern		✓								
Drosera sp.	Sundew					✓	✓				
Echinopogon caespitosus var. caespit	Tufted hedgehog grass							✓			
Einadia hastata	Berry Saltbush	✓									
Eragrostis brownii	Browns love Grass	✓									
Eragrostis interrupta	Blue/Coastal Love Grass	✓			✓	✓	✓	✓	✓	✓	
Gahnia aspera	Saw Sedge		✓	✓		✓	✓				
Gahnia clarkei	Swordgrass						✓				
Gahnia sieberana	Red-Fruited Saw Sedge					✓	✓				
Helichrysum sp.	Everlasting Daisy							✓	✓		
Histopteris incisa	Water Fern	✓									
Hydrocotyle laxiflora	Stinking pennywort							✓			
Hypolepis muelleri	Harsh Ground Fern	✓					✓				
Imperata cylindrica	Blady Grass		✓	✓	✓	✓	✓	✓	✓		
Ischaemum triticeum	Ischaemum	✓						✓	✓	✓	
Isolepis nodosa	Knobby Club Rush	✓	✓		✓	✓	✓	✓	✓	✓	
Lachnagrostis filiformis	Blown grass							✓			
Leperonia articulata						✓	✓				
Lobelia alata	Angled Lobelia	✓									
*Lomandra hystrix			✓								
Lomandra longifolia	Spiny Headed Mat Rush	✓	✓		✓	✓	✓	✓	✓	✓	
Lygodium microphyllum	Climbing Maidenhair	✓					✓			✓	
Oplismenus aemulus	Creeping Beard Grass				✓	✓	✓				
Oplismenus imbecilis	Basket Grass			✓				✓	✓		
Oplismenus undulatifolius	Wavy Basket Grass	✓									
Ottochloa gracillima										✓	
Oxalis rubens	Yellow Wood Sorrel							✓			

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Panicum obseptum	White Water Panic	✓									
Paspalum distichum	Water Couch	✓									
Persicaria decipiens	Slender Knotweed	✓									
Platycerium bifurcatum	Elkhorn	✓	✓				✓			✓	
Platycerium superbum	Staghorn Fern	✓	✓			✓	✓			✓	
Plectanthus cremnus	Fuzzy Spur Flower		✓	✓				✓	✓		ROTAP
Pomax umbellata	Pomax						✓				
Pratia purpurascens	Forest Lobelia				✓	✓	✓				
Pteridium esculentum	Common Bracken fern			✓	✓	✓	✓		✓		
Pseuderanthemum variabile						✓	✓				
Pyrosia rupestris	Rock felt fern									✓	
Restio tatrephyllus	Feather Plant					✓	✓				
Rostellularia adscendens								✓			
Schizaea bifida	Forked Comb Fern						✓				
Senecio pinnatifolius	Variable groundsel				✓						
Senecio sp.	Native Fireweed							✓	✓		
Sesuvium portulacastrum	Sea Purslane	✓						✓	✓	✓	
Sowerbaea juncea	Vanilla Plant						✓				
Spinifex sericeus	Hairy Spinifex	✓			✓			✓	✓	✓	
Sporobolus virginicus	Saltwater Couch	✓	✓								
Tetragona tetragonoides	Warrigal Spinach	✓			✓			✓	✓	✓	
Themadra australis	Kangaroo Grass	✓	✓	✓	✓	✓	✓	✓	✓		
Viola hederacae	Native violet							✓	✓		
Wahlenbergia gracilis	Australian bluebells									✓	
Wahlenbergia stricta								✓			
Xerochrysum bracteatum	Golden Everlasting							✓			
Zoysia macrantha	Prickly Couch	✓						✓	✓	✓	
Aquatic:											
Azolla sp.	Azolla					✓					
Baumea articulata	Jointed-twig Rush					✓					
Baumea sp.			✓								
Bolboschoenus fluviatilis	Marsh Clubrush	✓									
Carex fasciculais	Tassel sedge	✓				✓					
Cyanobacteria	Blue-green Algae					✓					
Eleocharis sp.	Spike Rush					✓					
Hydroctyle verticillata	Shield pennywort					✓					
Juncus sp.	Rush					✓					
Juncus kraussii	Salt rush							✓			
Juncus usitatus	Common rush	✓									
Leersia hexandra	Swamp Rice Grass	✓									
Lemna sp.	Duckweed					✓					
Lepironia articulata						✓					

