



# 2019

## McEwens Beach Local Coastal Plan



**Acknowledgements:** This project is supported by Reef Catchments through Mackay Regional Council's *Natural Environment Levy*. Local Coastal Plans are based on Mackay Regional Council's *Coastal Management Guidelines* (MRC 2012). Technical geomorphic assessment of the *McEwens Beach Local Coastal Plan* area was provided by Alluvium.

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# 1.2KM

OF COASTLINE  
IN THE COASTAL  
UNIT

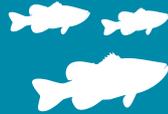


THE **CREEK ESTUARY** AND **MANGROVE COMMUNITIES** OF MCEWENS BEACH PROVIDE **IMPORTANT ENVIRONMENTAL SERVICES** INCLUDING **HABITAT FOR JUVENILE FISH, SEDIMENT TRAPPING AND CARBON SEQUESTRATION**

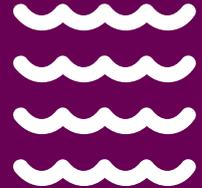


MCEWENS BEACH IS A POPULAR

# FISHING LOCATION



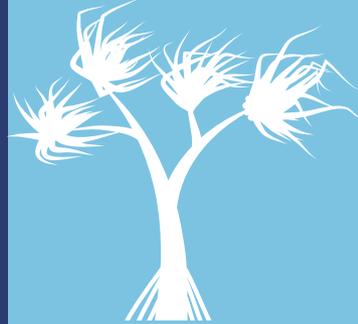
# THE SWIMMING ENCLOSURE



IS ONE OF ONLY  
THREE IN THE MACKAY REGION

MCEWENS BEACH SUPPORTS

**TWO REGIONALLY  
SIGNIFICANT  
SHOREBIRD  
ROOST SITES**



COASTAL DUNE SYSTEMS PLAY A **CRUCIAL ROLE** IN THE ECOSYSTEM. VEGETATION IS CRITICAL TO DUNE FORMATION AND STABILISATION.

**TRADITIONAL OWNERS** PREVIOUSLY OCCUPIED THE MCEWENS BEACH AREA. **ITEMS OF CULTURAL SIGNIFICANCE ARE KNOWN TO BE PRESENT IN THE AREA**



THE COASTAL UNIT CONTAINS **ESSENTIAL HABITAT FOR THE**

# COASTAL SHEATHTAIL BAT



THE COASTAL UNIT CONTAINS **ESSENTIAL HABITAT FOR THE MANGROVE MOUSE**



MCEWENS BEACH IS HIGHLY VALUED BY LOCALS AND VISITORS, WHO LIKE TO **ENJOY THE ENVIRONMENT** AND ITS **NATURAL ASSETS**



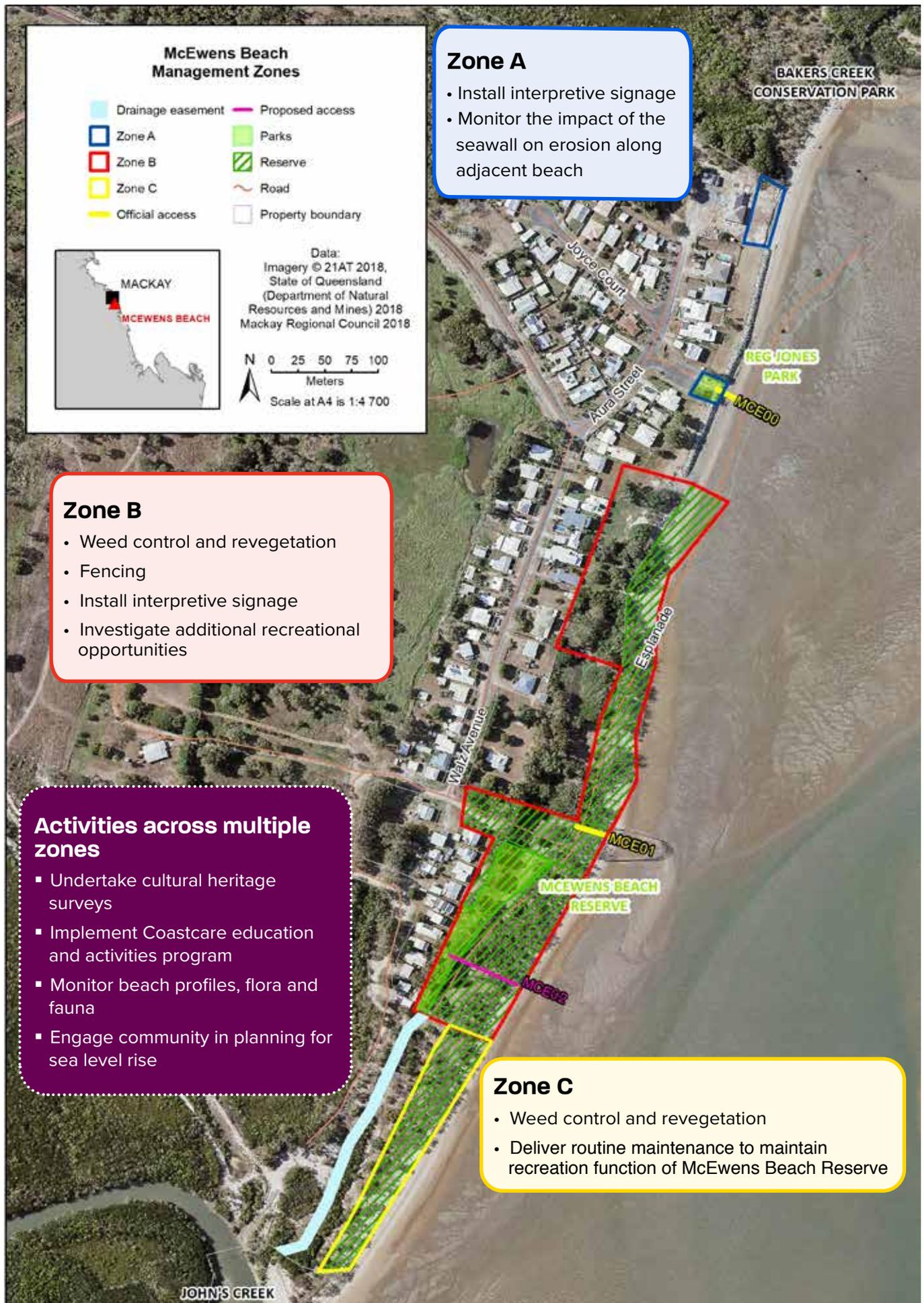


Figure 1: Visual summary of recommendations.



# 1 Executive Summary

McEwens Beach is a small coastal, residential area south of Mackay. Mackay Regional Council (MRC) (hereafter referred to as council) manages its coastal land at McEwens Beach through an integrated program of planning, on-ground works, monitoring and community engagement known as the *Coasts and Communities Program*. As part of this program, *Coastal Management Guidelines* (MRC 2012) have been developed to provide a framework for management decisions and activities for coastal land under council's jurisdiction. Individual Local Coastal Plans, such as this plan for McEwens Beach, provide site-specific recommendations for individual coastal units.

The *McEwens Beach Local Coastal Plan* describes the environmental and social values of the coastal unit, as well as the key threats and management issues. McEwens Beach has a small residential population of approximately 200 people (ABS 2018) living on the beachfront. The residential area that borders the beach is surrounded to the north, south and west by a range of remnant vegetation communities. Northward of the small town, the Bakers Creek Conservation Park extends until it meets Bakers Creek. Similarly, the southern end of the town abuts the Sandringham Bay Conservation Park and Johns Creek. West of the residential area, vegetated swamp and *Acacia* and *Corymbia* woodlands provide additional biodiversity benefits. This diverse composition of ecological communities provides essential habitat for rare and threatened species including the mangrove mouse (*Xeromys myoides*), coastal sheath-tail bat (*Taphozous australis*) and roosting shorebirds.

Key pressures within the coastal unit include climate change, sea level rise and associated erosion, loss of native vegetation, incursion of non-native vegetation and loss of the coastal strip which serves as a buffer between the residential area and the beach itself. Recommendations to manage these threats include weed control, revegetation, and ongoing engagement with the community to plan for the impacts of sea level rise associated with climate change within the McEwens Beach area. Social values are also described and opportunities to improve recreational facilities and values have been identified, including additional beach accesses, interpretive signage and park infrastructure. The recommended activities will be implemented on a prioritised basis as resources become available.

Community engagement is recognised as a critical part of the success of on-ground works and opportunities for the

community to learn about coastal ecosystems and get involved in management activities at McEwens Beach will be provided through the Coastcare program.

The activities recommended in this Local Coastal Plan (Table 2) will help protect and improve the condition of assets in the coastal unit, ensuring that best-practice management principles are implemented, and on-ground activities are prioritised and undertaken in a coordinated and strategic way. This plan will help attract additional funding to the region (including from State and Federal sources) to protect coastal resources and improve recreational opportunities for our community.

## Key recommendations include:

- Staged weed control across Zones B and C.
- Engaging with the community to explore the impacts of sea level rise at McEwens Beach and work together to determine potential mitigation actions.
- Monitoring the impacts of the seawall to the north and south of its extent, including terminal scour, and impacts of possible southern extension of seawall.
- Constructing a post and rail fence to formalise public beach access points in McEwens Beach Reserve at MCE01.
- Engaging and empowering local community members through community engagement events and working bees.
- Investigating possible locations and feasibility of additional recreational opportunities for the open area in McEwens Beach Reserve.
- Installing additional beach access point within McEwens Beach Reserve (MCE02).
- Ongoing maintenance on drainage easement in Zone C which flows into Johns Creek.
- Installing regulatory, cultural and interpretive signage where appropriate.



## 2 Introduction

Council has a major role to play in the management of public coastal lands. Council is responsible for the public land along the coast including Esplanade, Reserves and areas zoned as Open Space. The *Coastal Protection and Management Act 1995* and associated *Queensland Coastal Plan* (DEHP 2013a) underpin coastal management in Queensland and along with multiple other pieces of State and Federal legislation and council's own Local Laws and *Coastal Management Guidelines* (MRC 2012), direct the management of these public coastal areas.

The *Coastal Management Guidelines* recognise that the coast is characterised by a diverse range of natural features including: sandy beaches, rocky headlands, rainforest, woodland, grassland, extensive intertidal flats and substantial areas of coastal wetland. The Mackay coastline is a dynamic and forever changing landscape, shaped and formed by a range of factors including: wave action, changing tides, predominant winds and human influences. Mackay also has a large tidal range that exceeds six metres (EPA 2004).

The Mackay region is prone to severe storm events and tropical cyclones that impact coastal areas causing localised erosion. After a storm some areas recover quickly. However, if there is not enough time for adequate recovery before another storm event or if the coastline is a predominantly eroding coast, the impacts of erosion can accumulate altering the shape of the coastline over time.

Management options to improve the resilience of coastal areas to future storm events are available. Maintaining a sufficient buffer of vegetated dune or other coastal ecosystems such as mangrove acts to bind and retain sediment in coastal areas. The *Mackay Coast Study* describes the need to protect coastal areas not only for their importance as assets to tourism and recreation, but also as *the maintenance of wide sandy beaches and well vegetated dune systems as it provides a natural barrier to storm wave energy and protects inland areas*

*against extreme water levels* (EPA 2004 p.4). Effective coastal management can therefore be viewed as a risk mitigation strategy.

Within the region, development has occurred in some areas that are prone to erosion (EPA 2004). Some areas are already seeing changes in their local coastlines. With future predicted increases in sea level rise and more extreme weather events including cyclones, there is an increasing need to forecast the impact on coastal areas and plan effective, achievable action for protection of coastal values, including:

- The safety and longevity of communities - this includes property, infrastructure and services required for healthy communities.
- Meeting of recreational needs - many locals and visitors utilise coastal areas for activities that add to their health and fitness, provide relaxation and offer opportunities to enjoy nature.
- Continuity of economic services - fisheries and tourism rely heavily on healthy and attractive coastal areas.
- Environmental values – the provision of ecosystem services relies upon healthy coastal vegetation communities and natural environmental processes. Marine turtles and shorebirds require sandy beaches and healthy dune systems for nesting and feeding and many other native flora and fauna require coastal areas for habitat and food.

Adaptation options for coastal areas need to be well considered to ensure the region as a whole is best placed for the future. Maladaptation can occur when proper planning and best science are not incorporated into decision-making processes.



Council manages coastal areas through an integrated program of planning (i.e. Local Coastal Plans (formerly Beach Plans)), on-ground works, monitoring and community engagement known as the *Coasts and Communities Program* (Figure 2). The *Coasts and Communities Program* is a joint initiative of council and Reef Catchments. The aim of the *Coasts and Communities Program* is to protect coastal ecosystems in the Mackay region and, where opportunities exist, restore these areas to enhance their biodiversity values, whilst allowing for appropriate recreational access and use.

Visit [www.mackay.qld.gov.au/environment/natural\\_environment/coastal\\_management](http://www.mackay.qld.gov.au/environment/natural_environment/coastal_management) for more information on the program.

Historically, strong emphasis has been on the protection, conservation, rehabilitation and management of the coastal unit and its biological diversity. Actions implemented over past years include:

- Facilitation of the construction of a seawall.
- Ongoing maintenance of the swimming enclosure.
- Removal of hundreds of tyres from the foreshore.
- Installation of beach access stairs at Reg Jones Park.

The objectives of this Local Coastal Plan are to:

- Identify the values and pressures in the coastal unit.
- Develop strategies to guide the long-term protection of the natural coastal environment of McEwens Beach.
- Identify recreational opportunities within the coastal unit.

Council is committed to ensuring that communities are well informed throughout the process of Local Coastal Plan development.



## Mackay Coasts and Communities Program implementation model

**Figure 2** Mackay Coasts and Communities program Implementation Plan



## 2.1 STATUTORY OBLIGATIONS

There are a range of statutes at Regional, State and Federal level that are relevant to, and may guide the management of natural resources and recreation within the Mackay area. These are shown in Figure 3.



### FEDERAL GOVERNMENT

- *Biosecurity Act 2015* provides management principles for diseases and pests that may cause harm to human, animal or plant health or the environment, and for other related purposes.
- *Environmental Protection and Biodiversity Conservation Act 1999* provides a high level of protection for Matters of National Environmental Significance (MNES). In particular it provides protection for important populations of migratory species.
- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* provides for the preservation and protection of areas and objects in Australia and in Australian waters that are of particular significance to Aboriginals in accordance with Aboriginal tradition.



### INTERNATIONAL AGREEMENTS

- *China and Australia Migratory Bird Agreement (CAMBA)*, the *Japan and Australia Migratory Bird Agreement (JAMBA)*, and the *Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA)* provide for conservation of shorebirds (waders) across the migratory flyway for these species.



### STATE GOVERNMENT

- *Land Act 1994* provides for the designation of the reserves and assignment of Trustees for the protection of environmentally and culturally valuable and sensitive areas and features.
- *Recreation Areas Management Act 2006* provides for the establishment, maintenance and use of recreation areas; and aims to coordinate, integrate and improve recreational planning, recreational facilities and recreational management for recreation areas.
- *Vegetation Management Act 1999* provides management principles for vegetation within Queensland.
- *Coastal Protection and Management Act 1995 (Coastal Act)* provides a comprehensive framework for the coordinated management of the Queensland Coast, and establishes the Queensland Coastal Plan 2012 as the primary statutory instrument under the Coastal Act.
- *Nature Conservation Act 1992* provides management principles for wildlife within Queensland.
- *Native Title (Queensland) Act 1993* identifies the presence of Native Title over land.
- *Land Protection (Pest and Stock Route Management) Act 2002* provides the regulatory basis for control of pest species. In particular the Act classifies pest species and provides obligations for landholders.
- *Fisheries Act 1994* provides protection for marine plants including mangroves and saltmarshes, and provides the regulatory environment for control of recreational fishing activities.
- *Sustainable Planning Act 2009* provides the regulatory background for the development of planning schemes.
- *Environmental Protection Act 1994* regulates environmentally relevant activities, including release of emissions on land, air or water and noise.
- *Marine Parks Act 2004* regulates use of Marine Park to protect marine environment.
- *Waste Reduction and Recycling Act 2011* provides regulatory regime for management of litter and illegal dumping.
- *Queensland Coastal Plan 2012* provides policy guidance to coastal land managers including best practice coastal management principles which support the development of local management plans.



### LOCAL GOVERNMENT

- *Mackay Regional Council Local Law No. 4 (Local Government Controlled Areas, Facilities and Roads) 2011* provides for the management of council controlled lands by enabling the prohibition of vehicle access and protection of vegetation and infrastructure.
- *Mackay Regional Council Local Law No. 2 (Animal Management) 2011* provides for the management of animals in the natural environment, including ensuring that they are under effective control and requiring removal of faeces in a public place.
- *Coastal Management Guidelines 2012* provides a framework for management decisions and activities for land under Mackay Regional Council jurisdiction in the coastal zone.
- *Mackay Regional Council Planning Scheme Open Space Strategy No. 12* outlines Mackay Regional Council's commitment to provide a balanced mix of public open space that in turn will provide for a range of active and passive recreational opportunities for the community.
- *Reef Guardian Council program* recognises council's commitment to protect, conserve and enhance the values of the Great Barrier Reef for future generations through effective and responsible land-based management practices. The *Coasts and Communities Program* is a key initiative under this program.

Figure 3: Regulatory framework

# 3 Coastal Unit Description



McEwens Beach is a low lying, 1.2km long section of the coast located approximately 12km south of Mackay. The coastal unit covers one continuous stretch of coast in front of a small township bordered to the north, south and west by a range of vegetation communities. The beach is broad, sandy and low gradient, and is situated between the mouths of Bakers Creek in the north and Johns Creek in the south (Figure 4). The mouths of Bakers and Johns Creeks flow into Sandringham Bay, which is a Nationally Important Wetland and is characterised by extensive tidal flat communities (Appendix 7). Immediately south of the coastal unit, Sandy and Alligator Creek also flow into Sandringham Bay. A large intertidal zone characterises Sandringham Bay. At low tide, the eastern shore of the beach is up to 4km out from the mainland, exposing extensive tidal flats and channels.

There is a 6km long sealed road from the Bruce Highway to the beach, where McEwens Beach Reserve boasts a swimming enclosure and picnic facilities.

McEwens Beach can be described as a low-density residential township (Figure 5), with adjacent areas to the north and south managed by the State Government (Figure 6). To the immediate north of the coastal unit lies Bakers Creek Conservation Park, a part of Queensland's protected area estate, which is National Park tenure and zoned in the council's Planning Scheme for Conservation. On the southern bank of Johns Creek, south of the coastal unit, is additional State land. Much of the land within the McEwens Beach area is Freehold and zoned for Rural or Township land-use, but the coastal strip of vegetation leading from Johns Creek along the foreshore to the seawall, encompassing McEwens Beach Reserve and Reg Jones Park, is council-owned Reserve tenure land. Council is also the manager of Freehold land parcels to the immediate north and south of the seawall. This Reserve land, as well as the State land to the south of the coastal unit, is zoned as Open Space in the Planning Scheme.

The coastal unit is divided into three zones based on common management values and issues. Zone A is the northern end of the coastal unit, including north of the seawall to where council land meets national park, as well as Reg Jones Park.. Zone B is the middle management zone, stretching from the southern end of the seawall to the southern end of the residential area. Zone C is the remaining southern tip of the coastal unit and

extends from the southern end of the residential area to Johns Creek (Figure 7).

Common vegetation communities within the coastal unit include mangroves, tidal flats, estuarine wetlands and open forests, with woodlands occurring further inland. Extensive clearing has occurred in adjacent areas for residential and agricultural purposes. This clearing presents an ongoing threat to remnant vegetation communities by aiding decline in biodiversity and loss of ecosystem resilience and the introduction of invasive species, facilitating pollution, and subsequent ongoing degradation of natural values. Establishment of the McEwens Beach township and consequent removal and degradation of foreshore vegetation has restricted natural vegetation zonation processes. The impacts of this have been exacerbated by altered coastal sediment transport pathways and erosion.

Between 1947 and 2015 the northern half of the coastal unit experienced substantial sand loss and recession of the shoreline by up to 145m. In 2015 local property owners approached council with a proposal to construct a seawall. Council facilitated discussions with the State and assisted with allowing residents to fund the construction of the seawall extending approximately 230m in length in front of private properties. To facilitate construction of the seawall, council Freehold land was subdivided extending property boundaries to include the seawall for maintenance purposes. Extension of the seawall southwards (Stage 2) is in its preliminary phase of discussions with council.

Contrary to the erosion occurring in the northern section of the coastal unit, sand has accreted in the south and the foredune has extended in front of the coastal reserve, reflecting complex sand movement pathways throughout the coastal unit.

McEwens Beach is also valued for its rich cultural history, and social and recreational opportunities. The township is small and quiet, with no local shops, and a relaxed atmosphere. McEwens Beach is well-known for being family-friendly and safe. One of the major recreational attractions of the area is fishing. Bakers Creek and Sandringham Bay are popular fishing areas at high tide. Other recreational opportunities include swimming and visiting local parks/reserve areas.



Figure 4: Extent of McEwens Beach coastal unit.



Figure 5: Planning scheme zonation at McEwens Beach.

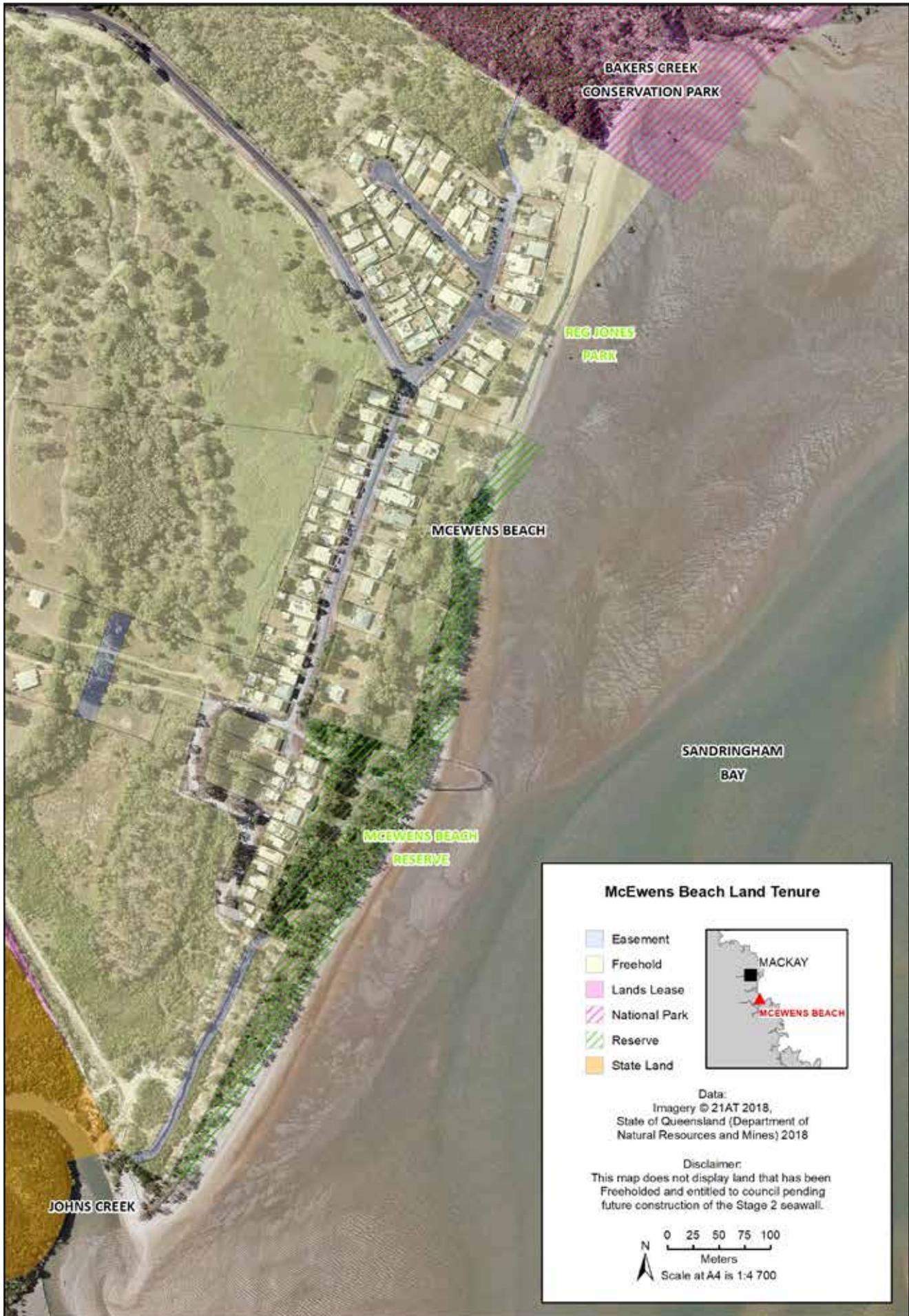


Figure 6: Land tenure at McEwens Beach. An easement has been created for landholders directly adjacent to the seawall to facilitate their responsibility for the support, repair and right of way of the seawall.

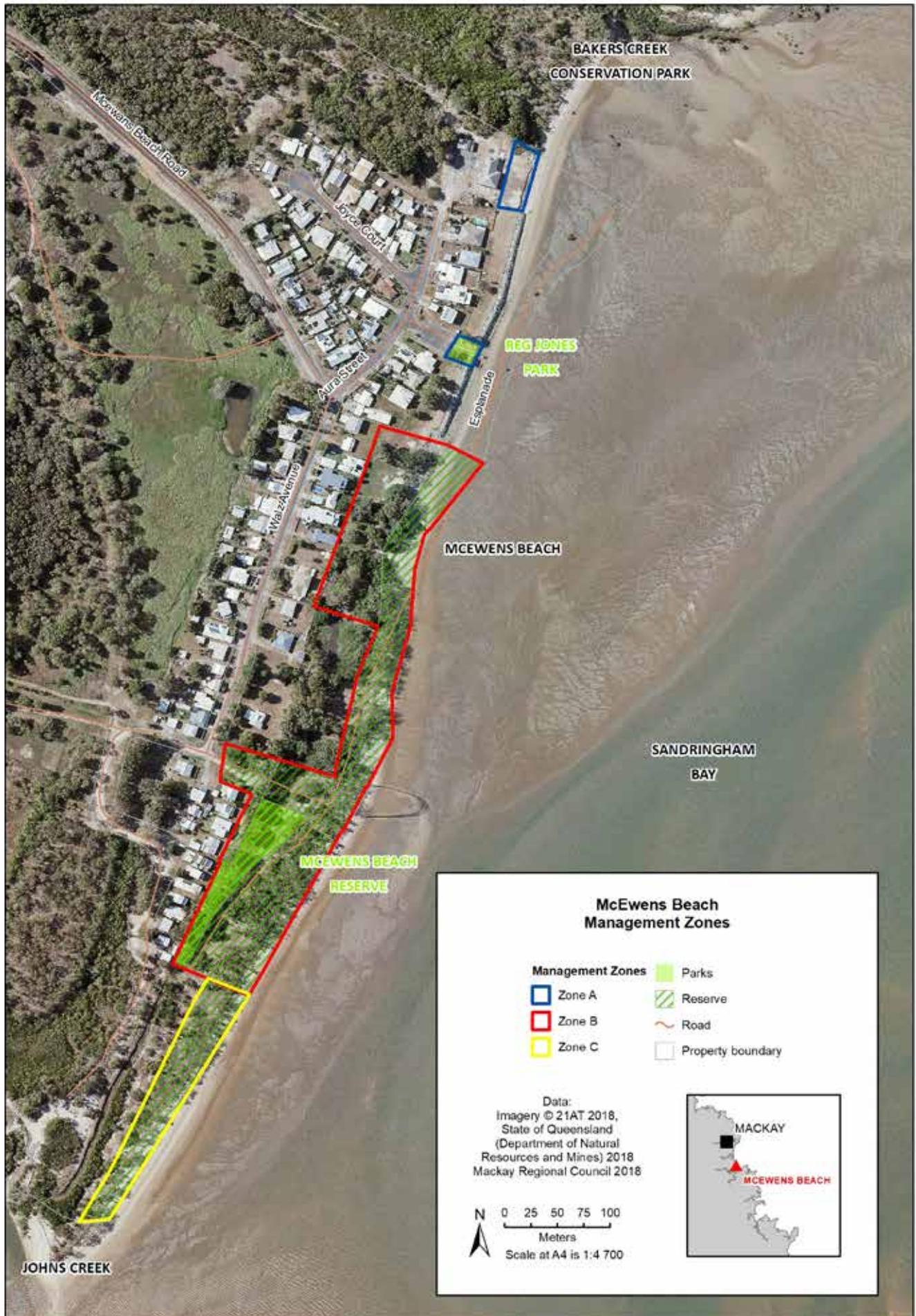


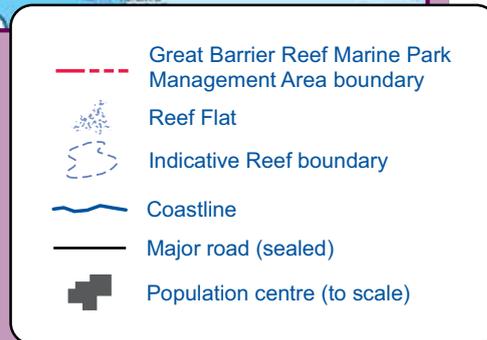
Figure 7: Coastal management zones at McEwens Beach.

The Mackay region is inshore from the Great Barrier Reef and activities must comply with the regulatory zoning conditions introduced by the Great Barrier Reef Marine Park Association (GBRMPA) in 2004. Marine Park zoning is an important component of managing marine areas (GBRMPA 2011). The area offshore known as Sandringham Bay is not considered part of the Marine Park. This area is located inside the red GBRMP border line on Figure 8. The bay is governed through local, state, national and international requirements for port activities such as dredging and dredge material disposal. The marine area directly to the east of the bay is within the GBRMP and zoned General Use (light blue) allowing both commercial and recreational activities to occur such as boating, crabbing, fishing, diving and traditional use of marine resources. Within this zone permits are required for certain commercial activities such as aquaculture.

GBRMP zones located directly to the north and south of Sandringham Bay are Habitat Protection (blue) Zones. These zones allow recreational activities as mentioned previously to occur but increases number of activities requiring permits and prohibits certain activities, such as trawling, in order to protect sensitive habitats in the Marine Park. For additional details regarding zoning restrictions, visit the GBRMPA website: [www.gbrmpa.gov.au](http://www.gbrmpa.gov.au)



**Figure 8:** GBRMPA Zoning – Excerpt from Zoning Map 12 (GBRMPA 2011) indicating the different zoning areas offshore from McEwens Beach. The red line indicates the border of the ports activity area, outside of which is the GBRMP. To the north and south of the ports activity area are Habitat Protection (blue) Zones. The remainder of the area is zoned for General Use (light blue).



# 4 Environmental Values and Management Issues

McEwens Beach coastal unit has undergone the loss of the coastal foredunes from erosion, residential development, parkland and construction of a seawall, therefore the natural dune system and its associated vegetation has been heavily impacted (Figure 9). However, the coastal strip is bordered on three sides by relatively intact remnant vegetation communities. To the north within Bakers Creek Conservation Park are mangrove ecosystems. Similarly, to the south of the coastal unit Johns Creek is bordered by mangroves. To the west of the coastal unit, on the western side of the small residential area, Freehold properties contain remnant swampland, woodland and open forest vegetation communities. The ecological communities surrounding McEwens Beach coastal unit sustain important wildlife populations of Regional, State and National Significance. Tracts of remnant vegetation provide important stepping stones to allow native species to cross the landscape. In addition, the ecosystems are important in maintaining natural processes and providing ecosystem services to the local community and region. Carbon storage, water filtration, climate regulation, stabilisation of the shoreline, nutrient cycling and scenic and recreational opportunities constitute just a few examples of the ecosystem services these areas provide to the local community.

This section outlines the distribution and significance of coastal vegetation and wildlife in the McEwens Beach area and its environmental values. The major threats and management issues relevant to the environmental values will be discussed, including dune systems and erosion processes.

## 4.1 VEGETATION

The vegetation component of this plan considers three important facets that define the integrity and condition of vegetation in the coastal unit.

**Remnant vegetation** is the historical vegetative cover of an area and is captured within official Regional Ecosystem mapping. It includes both woody and non-woody vegetation and is dominated by species characteristic of the vegetation's undisturbed canopy. Remnant vegetation is distinguished by the dominant canopy having greater than 70% of the height and greater than 50% of the cover relative to the undisturbed height and cover of that stratum (Queensland Government 2016).

**Vegetation zonation** is the sequence of different vegetation communities or zones that occur along a coastline. The zones reflect changes in the nutrient and moisture content of dune soils, which increase in a landward direction, and changes in the degree of exposure to strong winds, salt spray and sandblast, which decrease in a landward direction (DEHP 2015). When vegetation communities are heavily disturbed, for example by weed encroachment or mowing, vegetation zonation is inhibited.

**Non-native vegetation** is discussed in terms of the weed species that are present and may require management.

### 4.1.1 Remnant vegetation

Remnant vegetation is mapped at a scale of 1:100,000 by the Queensland Government for legislative and management purposes (Queensland Government 2016). Regional Ecosystems (RE) are vegetation communities in a bioregion that are consistently associated with a particular combination of geology, landform and soil. The Regional Ecosystem Description Database 2018 describes each RE and list both the biodiversity status and the Vegetation Management Class of each (Table 1). The biodiversity status is determined based on an assessment of the amount of a RE remaining (as a percentage of its historic range) and its condition and is used to determine the Vegetation Management Class, under the *Vegetation Management Act 1999* (DEHP 2013b). A regional ecosystem is listed as Endangered, Of concern or No concern at Present/Least concern based on these factors. It is important to note that RE mapping provides no indication of the current condition of this vegetation at the local scale.

The importance of coastal vegetation includes, but is not limited to:

- Native dunal vegetation can provide a significant refuge and source of food for local and migratory fauna species.
- Existing native dunal vegetation provides a seed bank for future generations of vegetation, thereby protecting the natural biodiversity of the area.
- Native dunal grasses and groundcover facilitate dune growth by colonising and trapping windblown sand and preventing its escape from the beach system.

In coastal areas, vegetation can be scorched by high temperatures and salt, as well as abraded by windblown sand. Species that can withstand these effects benefit from onshore winds by intercepting wind-borne nutrients from the sea. These nutrients are deposited on the leaves of coastal plants and washed into the sand by the first showers of rain, thereby introducing nutrients to the system and allowing less hardy species to colonise the coastal area (Gold Coast City Council 2007).

In Queensland, approximately 80% of people live on the coast (DEHP 2013a). As a result, remnant coastal vegetation is often fragmented and subject to high levels of disturbance (Caton and Harvey 2010). Coastal development characteristically results in a loss of coastal vegetation, as it often facilitates disturbance throughout the coastal zone through mowing and/or clearing areas of vegetation for recreation. Coastal vegetation remnants, however, remain a critical part of the landscape, providing important ecosystem services, habitat corridors, and recreational values.

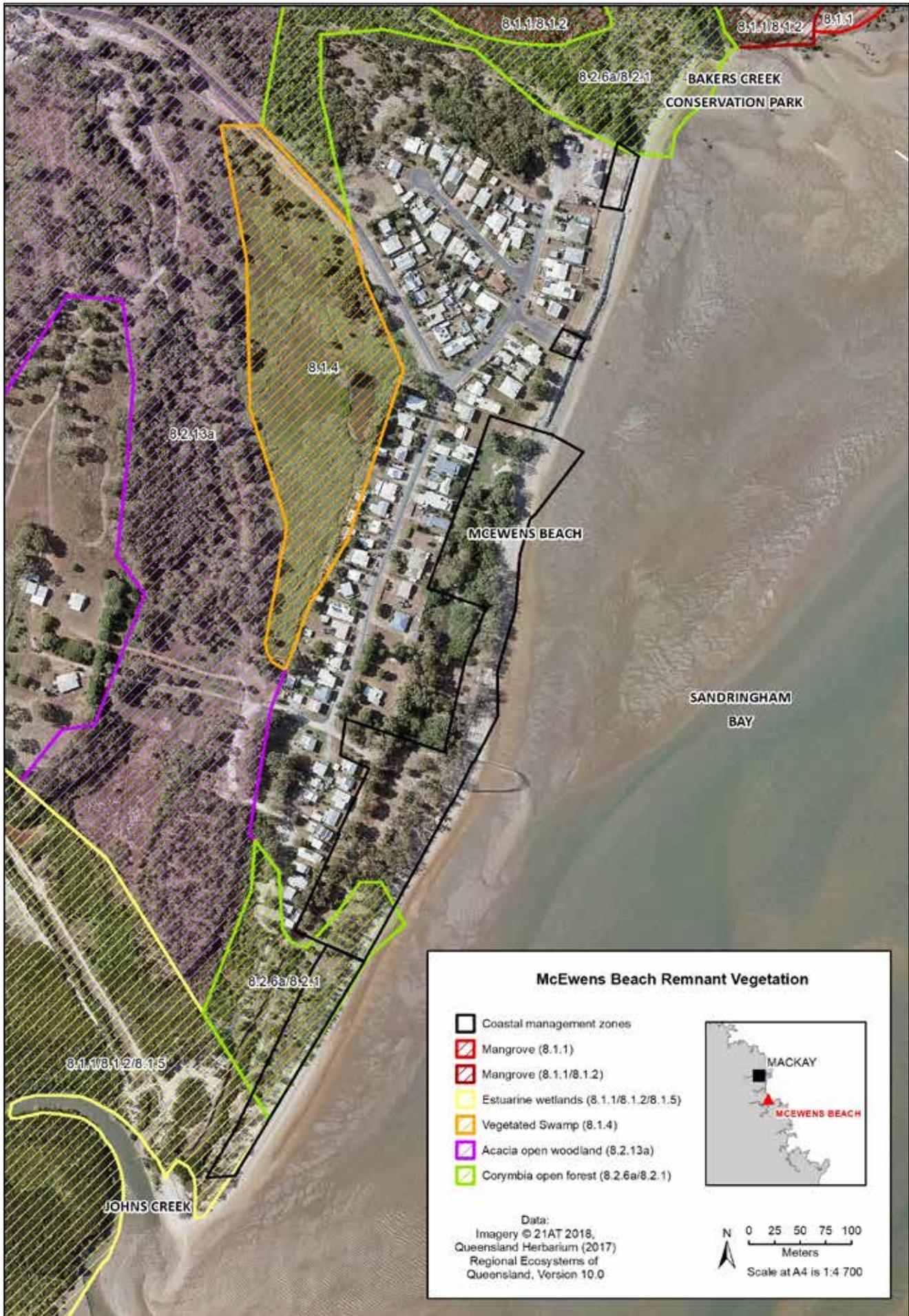


Figure 9: Remnant vegetation communities of the McEwens Beach coastal unit.

General principles for the conservation of remnant vegetation include:

- Controlling weeds to allow native species to regenerate.
- Discouraging the dumping of garden and general waste.
- Replanting areas adjoining remnant vegetation patches with native species, to build a buffer between the core vegetation and adjacent land uses.
- Controlling activities such as four-wheel driving, foot and vehicle traffic (Nordstrom *et al.* 2000).

Whilst the foredune along the length of McEwens Beach is mostly well vegetated, the vegetation is highly altered from its natural state. A large proportion of remaining vegetation is not considered remnant vegetation and is in moderate to poor condition due to vegetation clearing and weed invasion. Remnant vegetation outside of the management zone is within Freehold or National Park property and is therefore outside the scope of this Local Coastal Plan.

Within the coastal unit, there is 1.1ha of remnant vegetation on council-managed land (Figure 9). This patch of remnant vegetation is located in the southern section of Zone C, comprising 0.92ha of *Corymbia tessellaris* open forest to low woodland (RE 8.2.6) and *Casuarina equisetifolia* woodland to open scrub (RE 8.2.1), and 0.18ha of remnant wetland ecosystems.

RE 8.2.6 and 8.2.1 are naturally restricted communities and their biodiversity status is Of Concern. These coastal ecosystems are situated on parallel dunes covering the foredune and are vulnerable to erosion and weed invasion. Common threatening processes include clearing for residential and tourism development or for grazing and agricultural lands, as well as disturbance by recreational vehicles. The major threat to the open forest vegetation at McEwens Beach is fire. The risk of

fire is significant with a large amount of green waste present throughout the coastal unit, including palm fronds. Guinea grass (*Megathyrsus maximus*) and lantana (*Lantana camara*) have established in large patches through the southern section of the coastal vegetation further increasing the risk of high temperature fires. As per the *Clarke Connors Range Fire Management Guidelines* (Appendix 1), coastal forest communities are not well-adapted to fire. A wild-fire within RE 8.2.1 and 8.2.6a would likely result in the area being overrun by grassy and woody weeds.

The land around the mouth of Johns Creek contains remnant wetland ecosystems. The wetland is backed by elevated woodlands, surrounded by mangroves, and contains a diverse range of native vegetation. It is an important detention area and settling pond which helps improve water quality, nutrient and sediment loads entering the World Heritage Area, and provides good passage for fish migrations. Wetland communities such as mangrove forests (RE 8.1.1) and open samphire salt pans (RE 8.1.2) are very important habitats for breeding or roosting shorebirds as well as nurseries for reef fish species (Fukuda, Whitehead and Boggs 2007). There are also palustrine wetlands (RE 8.1.5) found bordering Johns Creek. Palustrine wetlands are different from RE 8.1.1 and 8.1.2 as they are affected by both fresh and saltwater. RE 8.1.5 is a vegetated freshwater swamp which is inundated by brackish (salty) waters at highest tides. Palustrine wetlands are listed as Endangered (Queensland Government 2016) and, as with RE 8.1.1 and 8.1.2, serve as important breeding areas for water birds. It is recommended that these wetland REs remain undisturbed to preserve important wildlife habitat and water filtration ecosystem services.

Native species identified within the McEwens Beach coastal strip outside of the remnant vegetation patches included coastal she-oak (*Casuarina equisetifolia*), native hibiscus (*Hibiscus tiliaceus*), Morton Bay ash (*Corymbia tessellaris*),



*Melaleuca* species, native cherry (*Exocarpos latifolius*), beach calophyllum (*Calophyllum inophyllum*), birds beak grass (*Thuarea involuta*), coastal love grass (*Eragrostis interrupta*) and coastal lollybush (*Clerodendrum inerme*).

Rehabilitation of remnant and non-remnant native vegetation patches should occur through prioritised weed management by targeting lantana and Guinea grass removal. Weed removal should be staged as not to expose large areas of open ground and should occur alongside planting native coastal species such as those listed in Appendix 4.

Regional Ecosystems found on council managed land are further described in Appendix 2.

Opportunities exist to protect and enhance the native vegetation throughout the coastal unit, mostly via weed control, revegetation and facilitation of natural regeneration. Vegetation rehabilitation will enhance the complexity of vegetation zonation, increase the environmental value of the area, improve dune stability, reduce impacts of artificial lighting on marine species and act as a buffer against wind, salt and extreme weather events. Additional native vegetation will also provide habitat for local fauna. In areas where the native vegetation remains largely intact, the approach to be taken will be one of assisted natural regeneration. By controlling weeds and limiting disturbance, natural recruitment of dunal species will occur. Supplementary planting may be undertaken in these areas to enhance vegetation complexity and to replace removed weed species. In areas where natural recruitment is not occurring or where vegetation has been cleared, revegetation should be used as a technique to restore and enhance native vegetation.

Succession planning of old trees will ensure that the natural and recreational values (shade etc.) of these trees are sustained. The local community is highly motivated to retain existing vegetation and facilitate the growth of native vegetation to protect dunes. Community education about

which species are most effective in preventing erosion, as well as native to the local Regional Ecosystems, would be beneficial and encourage positive stewardship. Promotion of council's Tree and/or Vegetation Vandalism Policy (MRC 2019) would also help raise awareness of the protected status of vegetation on public and council-managed land.

All revegetation activities should be guided by the coastal revegetation principles documented in Appendix 3 and consider appropriate species from the list provided in Appendix 4. The species selected for revegetation at any particular location will ultimately depend on current and pre-clearing regional ecosystem mapping and site specific conditions such as aspect, topography, existing vegetation, soil condition and the availability of appropriate plants. Local experts should be consulted for specific advice regarding unique vegetation communities, where appropriate.

## 4.1.2 Vegetation Zonation

A key feature of dune vegetation is the sequence of different vegetation communities that occur with increasing distance landward. Typically, this involves a gradual transition from bare sand, to ground cover, to open forests or woodlands (DEHP 2015). Zonation processes are those which facilitate this progression and are discussed in this Local Coastal Plan as recruitment and colonisation. Natural zonation refers to what is effectively a normally behaving ecosystem, where recruitment and colonisation can occur unhindered over natural gradients (Figure 10).

Zonation processes within Zone A have been interrupted due to the construction of the seawall which replaces the foredune and is unsuitable for vegetation recruitment. Sparse native ground cover is present in council's Freehold land to the north of the seawall, but Zone A and surrounding privately owned Freehold land is otherwise devoid of native vegetation, as shown in Figure 11.

**Table 1: Regional Ecosystem (RE) communities at McEwens Beach.**

Regional Ecosystem (RE)	Short description	Approximate area in hectares (ha) on Reserve and Esplanade tenure	Vegetation Management Act status	Biodiversity status
8.1.1	Mangrove closed forest of marine clay plains and estuaries	0.18ha	Least concern	No concern at present
8.1.2	Samphire open forbland on saltpans and plains adjacent to mangroves		Least concern	Of concern
8.1.5	<i>Melaleuca</i> spp. and/or <i>Eucalyptus tereticornis</i> and/or <i>Corymbia tessellaris</i> woodland with a ground stratum of salt tolerant grasses and sedges, usually in a narrow zone adjoining tidal ecosystems		Of concern	Endangered
8.2.1	<i>Casuarina equisetifolia</i> open forest to woodland with <i>Ipomoea pes-caprae</i> and <i>Spinifex sericeus</i> dominated ground layer on foredunes	0.92ha	Of concern	Of concern
8.2.6a	<i>Corymbia tessellaris</i> + <i>Acacia leptocarpa</i> + <i>Banksia integrifolia</i> + <i>Melaleuca dealbata</i> + beach scrub species open forest on coastal parallel dunes		Of concern	Of concern

In Zone B and C, much of the foredune maintains functioning dune zonation processes, with linear stands of coastal she-oaks and an understory of groundcovers on the foredune transitioning to denser stands of mid-story vegetation. However, zonation is impacted by erosion of the foredunes. Sand has been removed from the system, leaving the roots of the coastal she-oaks exposed along large stretches of Zone B and C (Figure 12). Vegetation immediately to the south of the seawall is at particular risk of erosion due to scouring processes as a result of the hard infrastructure. It is recommended that council densely revegetate this area to protect from erosion. Erosion has also had a significant impact on foredune vegetation in Zone C, as evidenced by the large number of fallen coastal she-oaks (Figure 13). This has eliminated the initial stages of zonation, where ground cover species extend past the front line of canopy vegetation, colonising the incipient foredune. There is evidence of ongoing recruitment through most of Zone B and C. Native canopy species including beach hibiscus, native cherry, coastal she-oaks and ground cover species including goats foot (*Ipomoea pes-caprae*) and birds beak grass are recruiting throughout the coastal unit.

Vegetation zonation processes are further impeded by invasive species as well as the intrusion of back yards and gardens into reserve land. Many fast-growing non-native species are present throughout McEwens Beach Reserve and foreshore, out-competing native species. Dense patches of pink and white periwinkle (*Catharanthus roseus*), cobbler's peg (*Bidens pilosa*) and snakeweed (*Stachytarpheta sp*) are present throughout the length of the foredune in Zone B and C, excluding native species where they are densely established (Figure 14).

McEwen's Beach Reserve is a hotspot for weed species given its high diversity and coverage of non natives. The vegetation is prone to weed invasion given the significant disturbances by mowing the large swale area and inappropriate access. Figure 15 shows the open, grassy area in the southern half of the coastal unit. This area contains mainly large, mature tree species and weeds. Mowing this open space interrupts natural vegetation zonation by impeding recruitment and growth of juvenile trees. Protection of recruits with tree guards, fencing off sections, infill planting of mid-story species and the removal of non natives would facilitate natural recruitment.

**Tertiary vegetation**

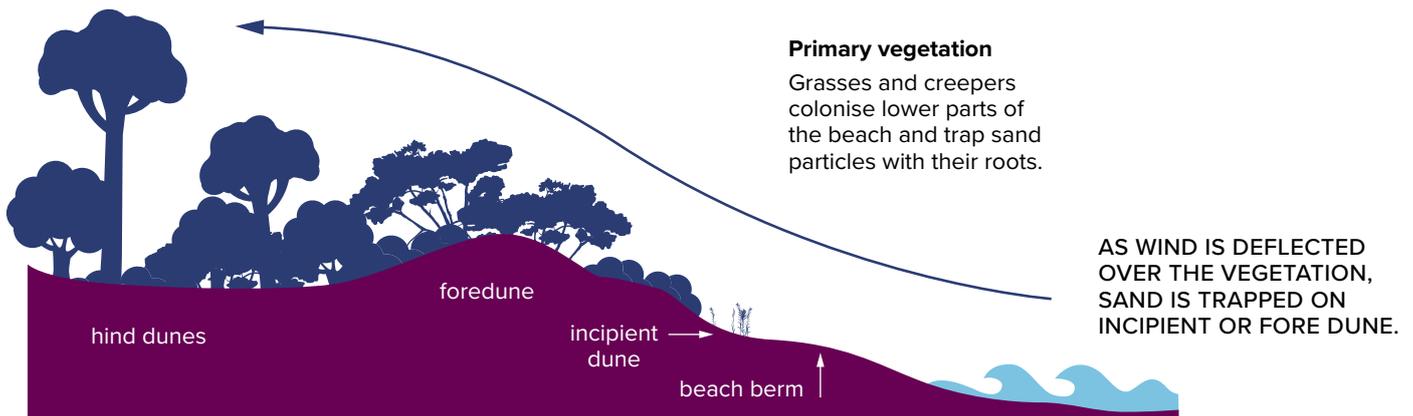
Taller shrubs and trees further elevate the wind and provide protection for inland plants, animals and property.

**Secondary vegetation**

Shrubs and small trees help to stabilise the foredune and deflect the wind up and over the foredune.

**Primary vegetation**

Grasses and creepers colonise lower parts of the beach and trap sand particles with their roots.



**Figure 10:** Role of dune vegetation.



**Figure 11:** Freehold land adjacent to Reg Jones Park is devoid of native vegetation, consisting of mown lawn from the private residences to the seawall.



**Figure 12:** Exposed roots of coastal she-oak (*Casuarina equisetifolia*) along large stretches of Zone B.



**Figure 13:** Large number of fallen coastal she-oaks (*Casuarina equisetifolia*) as a result of storm and cyclone activity.



**Figure 14:** Weeds including pink and white periwinkle (*Catharanthus roseus*), cobblers peg (*Bidens alba*), and snake weed (*Stachytarpheta cayennensis*) establishing on foredunes throughout McEwens Beach Reserve.



**Figure 15:** Mown open grassed area increasing risk to weed invasion.



**Figure 16:** Dense patches of Guinea grass (*Megathyrsus maximus*) outcompeting native vegetation and increasing fuel loads for fire risk within the McEwens Beach Reserve.

Guinea grass has established in dense patches in Zones B and C on the foredune and is out-competing many native species (Figure 16). Many weeds, especially woody and grassy species, have the ability to transform ecosystems into another state. Invasion of weed species can reduce native recruitment and result in competitive exclusion of native species. Increased coverage of weedy grasses increases the fuel load and fire risk. In some vegetation communities, such as RE 8.2.1 and 8.2.6a, even low intensity burns can negatively impact the dominant species. Because many grasses re-establish quickly and extensively after fire, weed grasses such as Guinea grass are capable of fundamentally transforming the composition of the vegetation present. Weed control promotes native recruitment, reduces competitive exclusion of natives and maintains specific vegetation community regimes.

Natural zonation processes could be improved throughout the coastal unit by revegetating the strip behind the crest of the foredune with natives. The absence of sand-trapping vegetation causes sand to be lost from the system and the natural, dynamic system of sand movement is therefore disrupted (Gold Coast City Council 2007). Increasing the area of natural coastal vegetation along the foreshore should be encouraged to allow for migration and increased dune stability. Over time fences could be located landward to allow natural regeneration and expansion of coastal vegetation into the mown area. Weed control and rehabilitation activities should be included to improve the dune structure and the condition along the length of the beach. Revegetating the dune system in this way will also enhance connectivity of vegetation, increase the aesthetic value of the area, provide shade and provide privacy for residences neighbouring publicly reserved areas. Weed control and infill planting would also assist vegetation establishment, and in doing so restore natural zonation, reduce wind speeds, increase natural shade and provide habitat for local fauna.

### 4.1.3 Non-native vegetation

The presence of non-native vegetation can be detrimental to the function of the dunal environment. Non-native vegetation can displace native dunal vegetation due to its ability to grow aggressively, smother native dunal species and compete for available nutrients. Transformative weeds such as Guinea grass and lantana can also increase fuel loading and fire intensity.

It is important to note that while not all weeds require immediate removal due to low impacts on native species, under the *Biosecurity Act 2014* (DAFF 2016), the council and the local community have a general biosecurity obligation to take reasonable and practicable steps to minimise the risks associated with invasive plants and animals under their control. This legislation was put into force on the 1st July 2016, and changes the classifications of weed species from what has been referred to in earlier Beach Plans. Subsequently, weeds will now be discussed in terms of:

- **Declared weeds** are described as species that have, or could have, serious economic, environmental or social impacts (DAFF 2013). Declared weeds recorded

at McEwens Beach such as lantana and prickly pear (*Opuntia stricta* and *O. monacantha*) require action for removal under the *Land Protection (Pest and Stock Route Management) Act 2002*.

- **Environmental weeds** are described as those that can cause major modifications to natural ecosystem function. These species are capable of outcompeting native vegetation and in some cases, have the potential to increase fuel loads in coastal ecosystems largely sensitive to fire (DAFF 2013). Guinea grass is the most significant environmental weed for removal at McEwens Beach.
- **Locally significant weeds** are those that impact natural processes at a local scale. The dominant locally significant weed within McEwens Beach is coconut palms (*Cocos nucifera*).
- **Non-transformative/nuisance weeds** are problematic on a local scale and should be managed on a case-by-case basis. A multitude of herbaceous non-transformative weeds and garden escapees result from the close proximity of coastal reserve areas to residential zones and include, cobbler's peg, pink periwinkle, rattlepod (*Crotalaria sp*), fleabane (*Conzoya sumatrensis*), Seaforth burr (*Cenchrus echinatus*), and red natal grass (*Melinis repens*).

Non-native vegetation is a serious threat to the remnant vegetation ecosystems at McEwens Beach. Weeds including lantana, Guinea grass, pink and white periwinkle, cobbler's peg and many others are well established throughout the area (Figures 14 and 16). Weed management should be prioritised spatially as well as by individual species. High priority species for removal throughout the coastal unit include prickly pear (Figure 18) and lantana. Prickly pear poses a particularly high threat for a number of reasons. It has long, sharp spikes which can cause significant damage to native wildlife and can grow vigorously in hot, dry weather, competitively excluding native species whilst they are stressed. Along with prickly pear, lantana is a *Weed of National Significance* (WONS) in Australia given its propensity to spread rapidly and form impenetrable thickets that take over native forests. As a woody weed, lantana is also a threat because it adds significantly to fuel loads. Both species require significant effort to control/remove, so early intervention is recommended.

Spatially, weed control should be prioritised for McEwens Beach Reserve. This area has dense patches of Guinea grass, lantana, prickly pear, periwinkle, cobbler's peg and other weed species, particularly around the beach access track (Figure 19). As highly trafficked areas, beach access tracks promote weed distribution across the coastal unit as seeds, such as those from cobbler's pegs, are easily picked up and transported throughout the coastal unit by pedestrians. Other weeds in the reserve are largely common garden escapees. Defining boundaries with fencing and educating the local community through the distribution of Mackay Whitsunday Regional Pest Management brochure '*Are Your Gardens Going Bush*' could prevent further spread of these weeds into natural ecosystems.

Council recognises that some community members may value coconuts (*Cocos nucifera*) for their aesthetic appeal. The removal of adult coconuts from recreational and parkland areas is beyond the scope of this plan. However, juvenile coconuts that occur within areas managed for environmental purposes will be removed in accordance with the coastal weed control principles (Appendix 5). Removal will be undertaken in a staged manner. Coconuts can be a significant risk to pedestrians, increase fire risk and intensity through the accumulation of vegetative waste and smother native vegetation preventing regeneration. It is a common misconception that coconut trees assist foredune stability, however their root system is very shallow and is easily undermined by high waves as shown in Figure 20.

At the southernmost end of the coastal unit, the foredune has been disturbed and likely opened up by storm and cyclone activity, as evidenced by a large number of fallen she-oaks on the foreshore in Zone C (Figure 13). Remnant vegetation communities have subsequently been exposed to weed invasion; there are juvenile coconut palms recruiting throughout the entire management zone (Figure 17), as well as other invasive species including lantana and prickly pear (Figures 18). As one of the only remaining pockets of remnant vegetation within the coastal unit, it is important to protect this vegetation. The palms should be removed while they are still juvenile, as per council guidelines. High priority invasive species, including lantana and prickly pear should also be removed in the early stages of management intervention. Staged removal of additional non-native species should follow. Revegetation of these foredunes, especially where non natives are removed, will act to stabilise dunes, reduce erosion, inhibit weed infestation and protect the remnant vegetation community.

It is recommended that weed management continues throughout the coastal unit and this, together with revegetation activities to replace removed weed species will prevent future weed re-occurrence and assist the re-establishment of native vegetation. Opportunities for local community members to get involved in coastal management activities will be provided through the Coastcare program. All revegetation activities should consider the guiding principles documented in Appendix 3.

The removal of non-native species from the coastal unit will improve the condition of native vegetation, enhancing habitat quality and its resilience to natural disturbance whilst also reducing the risk of fire. Using appropriate weed control techniques in a progressive manner as time and resources permit, as per Appendix 5 will assist the rehabilitation of coastal vegetation communities. A list of weed species common to the Mackay region can be found in Appendix 6.

## 4.2 WILDLIFE

All sandy beaches in the Mackay region provide potential habitat for marine turtle nesting and turtles are commonly sighted in the area. Significant challenges are present for turtle nesting along McEwens Beach including a receding shoreline, residential lights, noise pollution from the road and the presence of a seawall at the northern end of the beach.

Green turtles (*Chelonia mydas*) and flatback turtles (*Natator depressus*) are listed as vulnerable in State (*Nature Conservation Act 1992*) and Federal (*Environment Protection and Biodiversity Conservation Act 1999*) legislation. Given their status, a *Recovery Plan for Marine Turtles in Australia* has been in place since 2003 and provides an overview of threats and recovery actions required for these species. Key threats to turtles and their reproductive success are identified as the following:

- Light and noise pollution from nearby houses disorients hatchlings during their movement to the ocean.
- The presence of dogs and other domestic pets in the area, particularly those not on leashes, pose a number of threats including mortality of hatchlings from predation, exposure of clutches through digging and injury to turtles while laying eggs.
- Distribution and type of vegetation (i.e. root system), including excessive shading or lack thereof plays an influential role in determining the sex of the hatchling.
- Unofficial tracks through the dune system, where tracks appear brighter than surrounding areas due to light reflection and can disorientate both hatchlings and adults.
- Beach vehicle access, as turtles are not able to penetrate the compacted sand or navigate wheel ruts.

Essential Habitat mapping identifies sites and locations considered to contain important habitat for flora and fauna species of conservation significance. It is only mapped over either remnant or regrowth vegetation and is based on either confirmed sightings, records of breeding, known suitable habitat or resources occurring at a location, or habitat that forms part of a potentially important corridor (DEHP 2014).

Essential Habitat for the mangrove mouse (*Xeromys myoides*), which is listed as Vulnerable under the *Queensland Nature Conservation Act 1992*, includes the mangrove communities lining Johns Creek (Figure 21). Mature mammals appear to utilise taller communities dominated by yellow mangrove (*Ceriops tagal*) and orange mangrove (*Bruguiera subsp.*), however juveniles are sometimes located in low forests of yellow mangrove. The quantity and quality of storm water entering the catchment will be of relevance to the health of the mangrove mouse population. The mangroves themselves are also hugely valuable as a fish nursery for reef species (Fukuda, Whitehead and Boggs 2007).

The coastal unit also contains essential habitat for the coastal sheath-tail bat (*Taphozous australis*) (Hourigan 2011). These bats are known to live in highly specialised habitats such as beach scrub, mangroves, *Melaleuca* swamps and coastal heathlands.



**Figure 17:** Coconut palms (*Cocos nucifera*) have been planted throughout Zones B and C along the crest of the foredune.



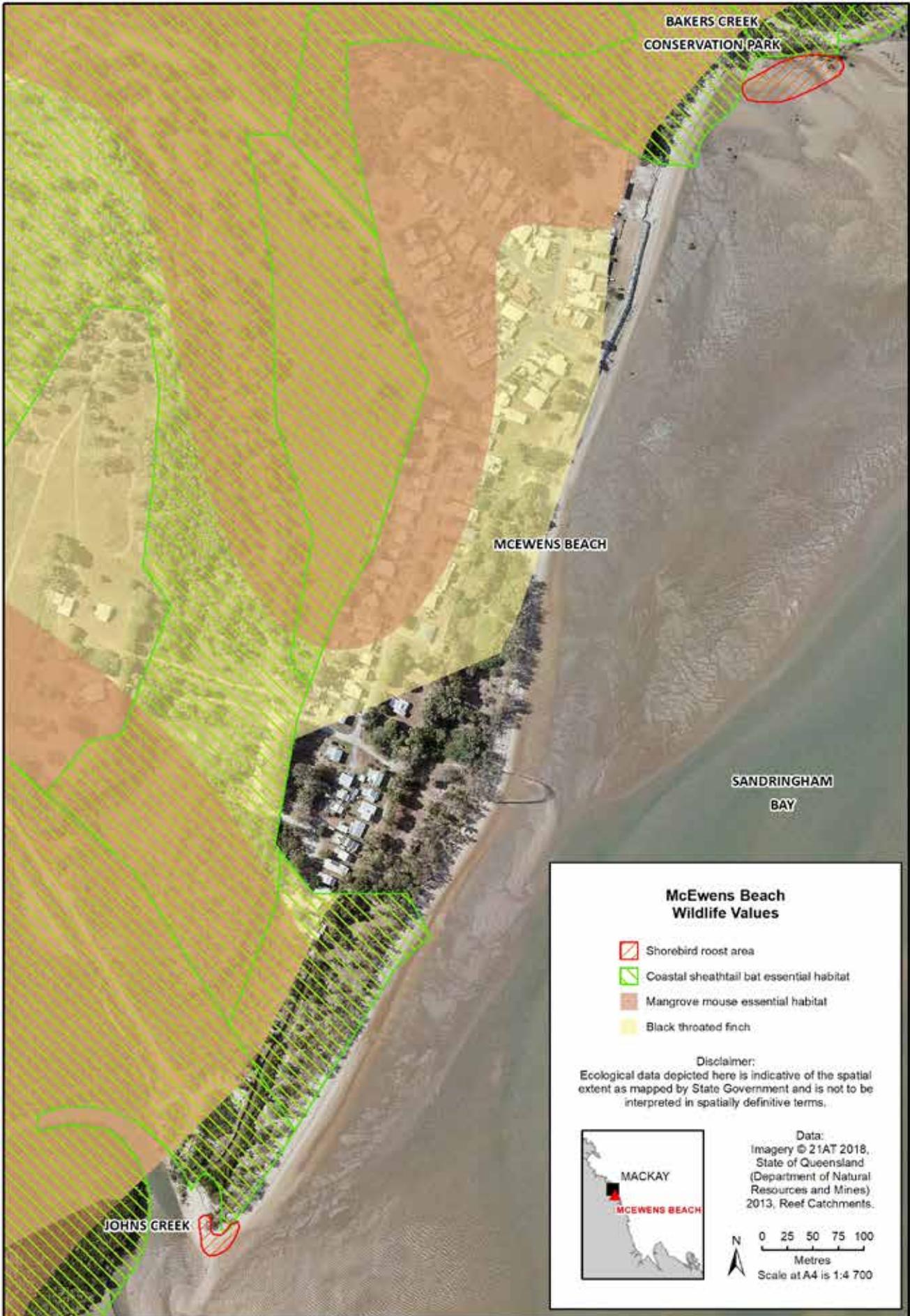
**Figure 18:** Prickly pear (*Opuntia* sp.) invading McEwens Beach Reserve.



**Figure 19:** A staged weed control program could begin within the recreational area of McEwens Beach Reserve. This area could be rehabilitated with coastal species to assist dune stabilisation.



**Figure 20:** Coconut palms (*Cocos nucifera*) at McEwens Beach doing little to stabilise dune sediment from erosion. It is evident from these pictures that the confined root-ball is stabilising only a very limited area of dune. More extensive and far-reaching root systems, such as those from coastal she-oaks, would stabilise a larger area of dune. .



**Figure 21:** Essential habitat mapping highlights ranges of the coastal sheath-tail bat (*Taphozous australis*), mangrove mouse (*Xeromys myoides*), and black-throated finch (*Poephila cincta*) along with known shorebird roosts.

Any threats to these vegetation communities constitutes a threat to the coastal bat which is classed as Vulnerable under the *Nature Conservation Act 1992*. Coastal sheath-tail bats are suspected to be easily disturbed when at roost and could be negatively impacted by noise. There is currently no widespread decline documented for the species, however disturbance due to high rates of human visitation at roost sites can have negative impacts on the species and may cause low breeding success or roosts to be abandoned. The loss of foraging habitat as consequence of coastal development, combined with roost disturbance (with increasing human access to the coast) may pose threat to this species.

The estuarine and palustrine wetland areas around Johns Creek contain permanent water and a wide range of habitats which provide important food sources and shelter for roosting and breeding waterbirds, such as sooty oystercatchers (*Haematopus fuliginosus*) and other shorebirds. Sandringham Bay and Bakers Creek are listed as an aggregated site on the Directory of Important Wetlands in Australia (DEE 2019). The complex includes a diverse array of habitats for wildlife including extensive expanses of intertidal and shallow water habitats and mangrove communities, rock platforms, a sandy beach and minor areas of saline clay pans (DEE 2019). The area is listed for four out of the six criteria of nationally important wetlands:

- Its representativeness as a good example of marine and estuarine wetlands of the Central Queensland Coast bioregion.
- It is a wetland which plays an important ecological or hydrological role in the natural functioning of a major wetland system/complex.
- It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail.
- The wetland supports native plant or animal taxa or communities which are considered endangered or vulnerable at the national level.

There are known shorebird roosts at either end of the coastal unit (Figure 21), and the beach is recognised as a regionally important area for shorebirds. Locals report seeing thousands of migratory shorebirds utilising these roosts. Migratory shorebirds are most abundant in the Mackay region over spring and summer months. They utilise intertidal and coastal zones for feeding to build up enough body weight to sustain themselves through migration. To protect shorebirds, the roosting and feeding areas should be disturbed as little as possible, especially through September to April. McEwens Beach is not an off-leash dog beach, but locals report seeing visitors walk their dogs without leashes most days. Installation of informative signs and restricting domestic animals on the foreshore at critical times of the year (i.e. nesting) would help to protect the ecological values of McEwens Beach, specifically shorebird populations. The Queensland Wader Study Group have found that the McEwens Beach sand spit, swamp, claypan and foreshore are all known shorebird roosting areas. In the *Mackay Shorebird Plan* (Harding and Milton 2003), two sites within the McEwens Beach area are

recorded as known high-tide roost sites with high counts of shorebirds. A high number of roosts are found in the southern section of the coastal unit every year. Many of these roosting sites are disturbed by recreational fishing activity, pedestrian traffic and pets being taken to the beach.

Seawalls, like that installed along the northern extent of the coastal unit, are likely to have an impact on multiple wildlife populations at McEwens Beach. Impacts include inhibition of natural coastal zonation and beach erosion/narrowing. This in turn leads to intertidal zone loss and the reduction of habitat available for macroinvertebrates and subsequently lowering their diversity and abundance. The loss of macroinvertebrates as a food source for shorebirds, coupled with the loss of habitat associated with beach shortening may negatively impact shorebird numbers (Dugan, Hubbard, Rodil, Revell and Schroeter 2008). There is a large area of tidal flat community west of the McEwens township which supports RE 8.1.4 (Figure 9). Tidal flat communities not only perform a number of important ecosystem services, such as conversion of plant wastes to biomass production, but also act to support coastal fisheries and biodiversity (Yoo *et al.* 2013).

Currently, the major threats to wildlife along the coastal unit include loss of habitat through development, erosion, weed incursion, infrastructure, feral and domestic animals and artificial lighting. Opportunities exist to install interpretive signage featuring key faunal species and ecosystems (such as migratory shorebirds) at high profile locations within the coastal unit, such as within Reg Jones Park. Signage informs the general public about what they can do to protect significant species and ecosystems. Holding community days to remove marine debris from the beach will further enhance the habitat values of the beach.

## 4.3 EROSION

### 4.3.1 Coastal processes and erosion

McEwens Beach foreshore and a large portion of the broader Mackay region's beaches maintain sand dunes in the coastal unit. Coastal dune systems play a crucial role in facilitating coastal ecosystem processes and in the protection of property in the coastal unit (DERM 2011a). As part of the broader sand movement process, healthy dune systems act to dissipate the kinetic energy of waves, which may otherwise propel into adjacent infrastructure and property. The sand and dunes create friction when waves pass over them, slowing the waves down and dissipating their energy. Healthy coastal dunes help protect coastal infrastructure during intense wind, storm and cyclone events (Figure 22). The dunes also act to replenish the foreshore with sand after major sand-loss events.

However, human induced changes have altered coastal areas and therefore dune formation. For example, the loss of coastal vegetation for Open Space and coastal development reduces the capacity of beaches to catch and trap wind-borne (aeolian) sand grains. Once the protective capacity of the dune system is weakened in this way, coastal erosion can take place, leading to significant damage to landforms and infrastructure via coastal recession.

Planners and coastal residents may have a negative association with erosion and coastal recession, though in many cases it is a natural phenomenon. There are constant interactions between coastal landforms and the ocean, and this creates a dynamic and ever-changing environment. Sandy coastlines migrate landward and seaward in response to natural phases of sand erosion (loss) and accretion (gain). Sand movements can form dunes onshore, sand bars offshore, or instigate beach erosion. All of these movements are governed by wind, waves and tidal activity over varying time scales.

Over short time scales there are natural beach fluctuations in response to intense weather activity. For example, during a storm, strong waves carve away sand from the beach and dunes, resulting in escarpments onshore and sand bars offshore. Gradually, sometimes over many years, the sand that was lost offshore is pushed back onshore by gentler high tides. This process is natural and, in many cases, cannot be stopped.

However, long-term erosion or accretion is driven by fundamental changes in the dynamics of sand deposition and removal from a beach system. This is an on-going problem and preventing beach recession would often require continual nourishing. This is illustrated in Figure 22, where too much sand from coastal dunes is lost seaward to allow the dune to be restored to its original state.

Challenges to dune health are often unavoidable in developed areas such as McEwens Beach. However, intervention and management can help to protect the coastal landforms.

Dunes should be protected where possible by maintaining and enhancing native vegetation. Ground cover, shrub and tree species stabilise dunes with their root systems and catch wind-borne sand sediments to replenish the dunes and foreshore. The loss of this vegetation can lead to accelerated rates of erosion of the dunes. The natural build-up of sand in frontal dunes needs to be encouraged as a reservoir for sand during periods of wind and wave erosion. Plant communities provide vegetative cover, which stabilises the dune and thus make the system resilient to pressures such as sea level rise, storms, and floods. Supporting vegetation as a surface cover increases dune stability but also biodiversity and ecological function of the dune system (DEHP 2013a). Coastal vegetation is also important in protecting infrastructure and houses, as it slows wind speeds and reduces the amount of salt and sand transported inland.

Damage to dunal vegetation in the Mackay region often occurs through pedestrian and vehicle traffic, and acts of vandalism. Intentional removal of coastal dune vegetation, as well as inappropriate pedestrian and vehicle access, displaces sand, and where it continuously occurs, can lead to localised eroded areas. Clearly established pathways to the foreshore can help to mitigate the threat of people and vehicles destroying dunal vegetation by funneling activity to a small number of well-maintained pathways. To prevent the degradation of dune systems and for public safety, it is important for users to stay on designated tracks. A range of consultation and education opportunities should be provided to the local community to mitigate damage to dunal vegetation.

Another major threat to the natural function of dunes is hard infrastructure (e.g. seawalls) (Figure 23). Often these structures are built in the attempt to protect property from shoreline recession. Seawalls and other hard structures reflect wave energy onto other areas, rather than gradually dissipate the energy like dunes do. This leads to scouring around the edges and in front of seawalls, and accelerates the loss of sand on the surrounding beach.

Ensuring that erosion prone areas (Figure 24) remain free of hard infrastructure and well covered by native vegetation allows natural processes to occur unhindered. This provides the best opportunity for managing shoreline erosion and retaining environmental values (EPA 2004). Where infrastructure is installed, such as seawalls, the amount of sand that is lost seaward is much greater than the natural amount, thereby accelerating erosion and beach recession.

Council's policy for managing coastal erosion is outlined in their *Coastal Erosion Protection Works – Contribution and Costs Recovery Policy* (MRC 2018). The purpose of this policy is to guide when it may be appropriate for council to deliver coastal erosion protection works, and how the costs will be shared in such situations.

The sandy beach of McEwens Beach foreshore has in the past shown a concerning degree of shoreline erosion. This section describes the geomorphology and processes shaping the McEwens Beach coastal area, the threats and management considerations.

### 4.3.2 Landscape context

McEwens is situated around 12km south of Mackay, within Sandringham Bay. Sandringham Bay is a dynamic zone characterised by extensive tidal flats (up to 4km wide), and influenced by inflows from the Sandy and Alligator Creek systems, as well as coastal processes (wind, wave and sediment dynamics). Dudgeon Point denotes the southern extent of the bay.

McEwens Beach extends across approximately 1.2km of relatively low-lying coastal land, on the westernside of the common mouth of Sandy and Alligator Creeks (Figure 25). The McEwens Beach coastline has developed as a sandy beach ridge system between two tidal creeks. Extensive mangrove ecosystems are present along the creek networks to the north and south of the beach. Most residential properties are situated along the northern and central parts of the beach. McEwens Beach Reserve extends from the central to southern parts of the beach, consisting of a well vegetated dune system. The natural form of the northern shoreline is now modified by the presence of a seawall, established in 2016 in response to decades of active long-term erosion (recession).

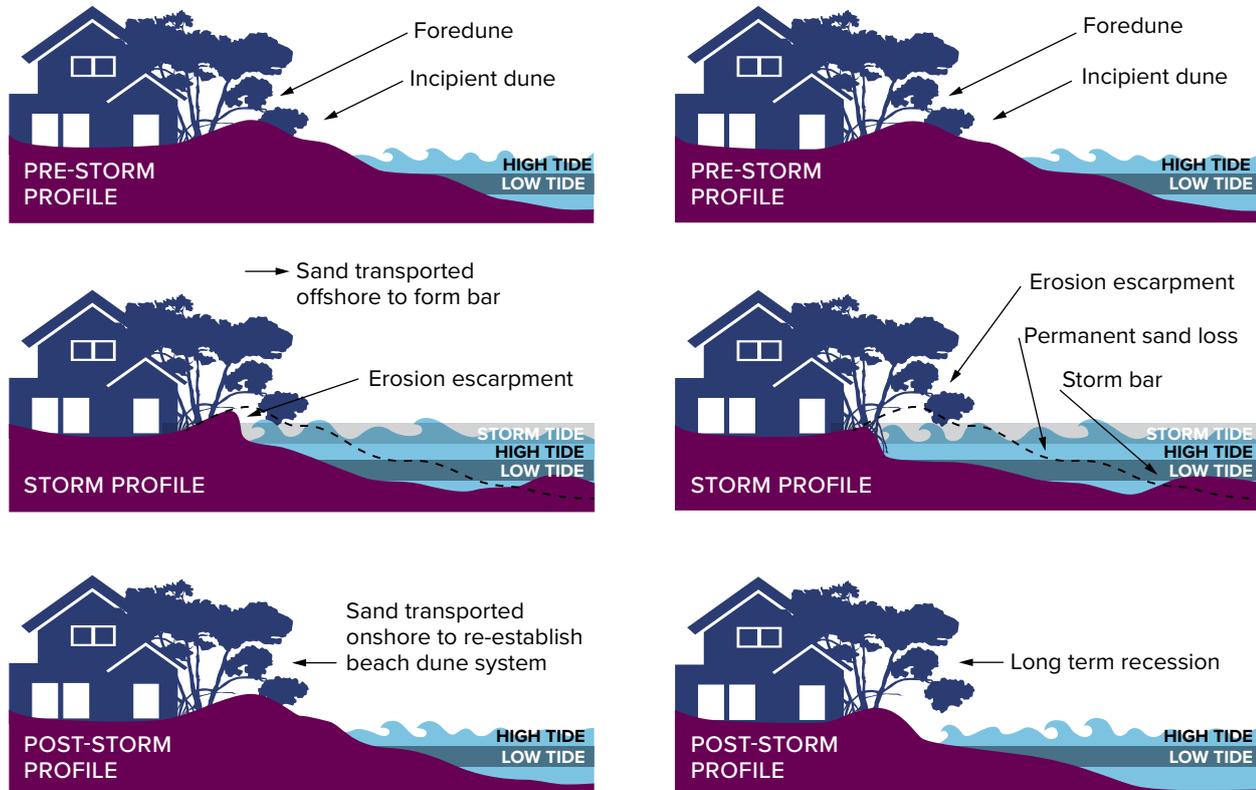
### 4.3.3 Sediment transport pathways

Regional off-shore sediment transport direction along the broader Mackay coastline is to the north, however turns to the south in the lee of the Dudgeon Point headland. The main sediment transport pathway along McEwens Beach is to the south (Figure 26), however complex interactions of creek inflows, waves and tides in this part of Sandringham

Bay will influence local variations in longitudinal and cross-shore sediment transport along McEwens Beach. The form of the beach is strongly influenced by the tides, with each flood and ebb tide driving observable changes in the shoreline morphology. The flood tide currents are typically stronger than the corresponding ebb tide currents, a factor influencing the southerly movement of sediment along McEwens Beach (EPA 2002).

#### 4.3.4 Sediment supply and trajectory

The main historical sediment sources to the McEwens Beach shoreline include supply from the local Sandy and Alligator Creek catchments, and the longshore sediment transport supply from sources south of Dudgeon Point. Sandy and Alligator Creeks now supply very little sand to the coast, and are inclined to act as sinks for sand supplied from



Beach erosion/accretion cycle showing no permanent sand loss or coastline retreat (Source: DERM).

Long term beach recession showing profile displaced landward due to permanent sand loss (Source: DERM).

**Figure 22:** Beach erosion processes.



**Figure 23:** Seawalls highly alter the natural functions of coastal dunes.

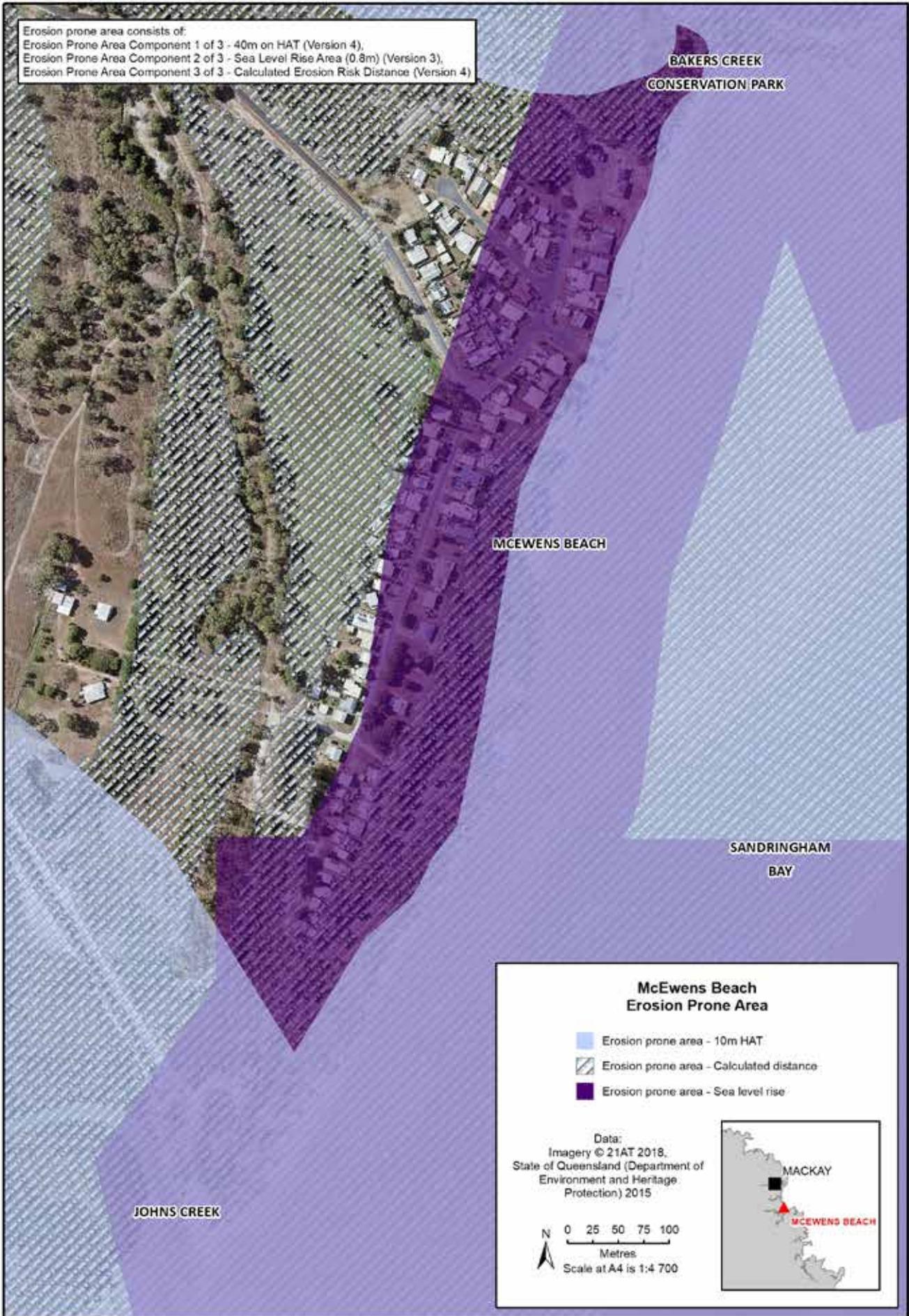


Figure 24: Erosion prone areas of McEwens Beach.

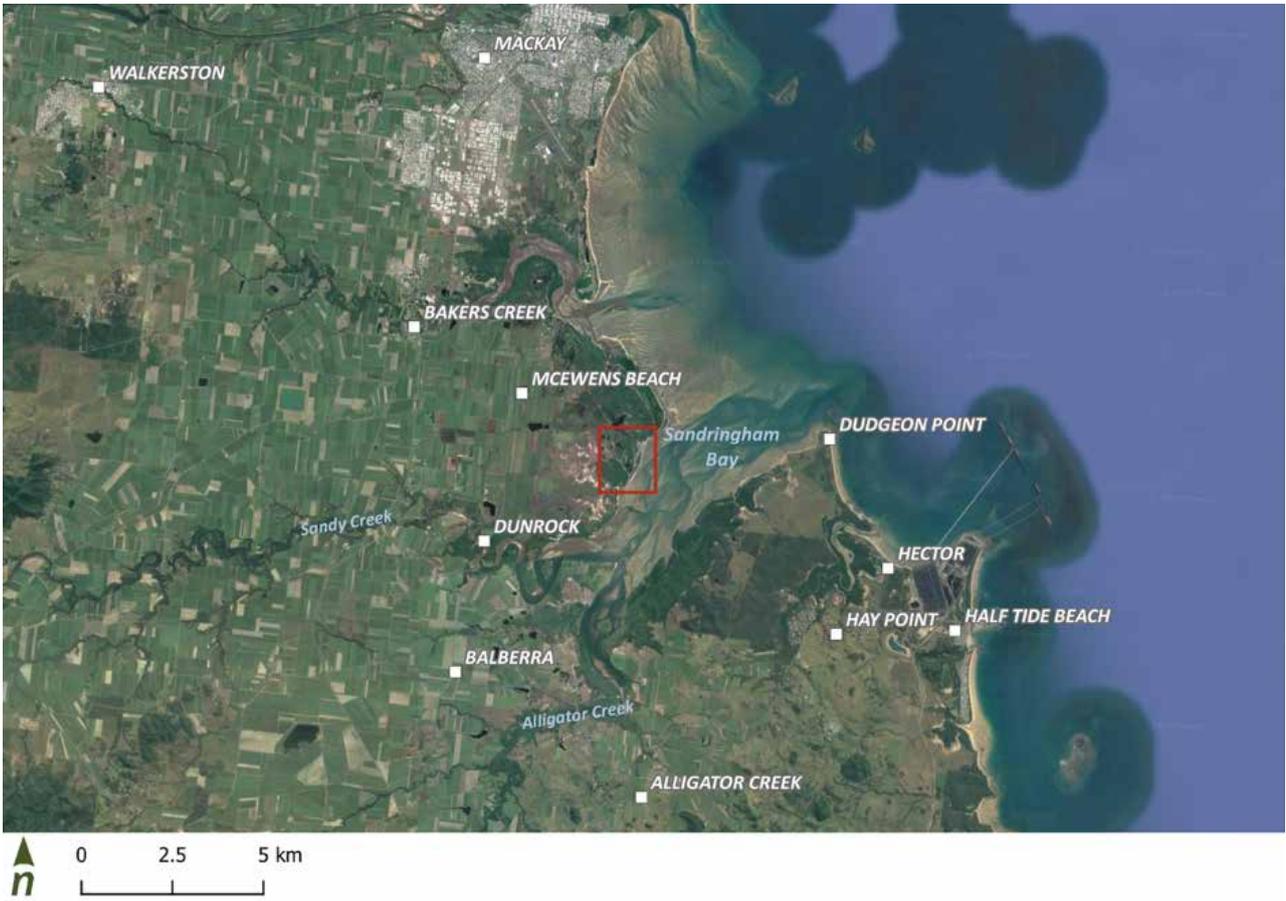


Figure 25: McEwens Beach location.

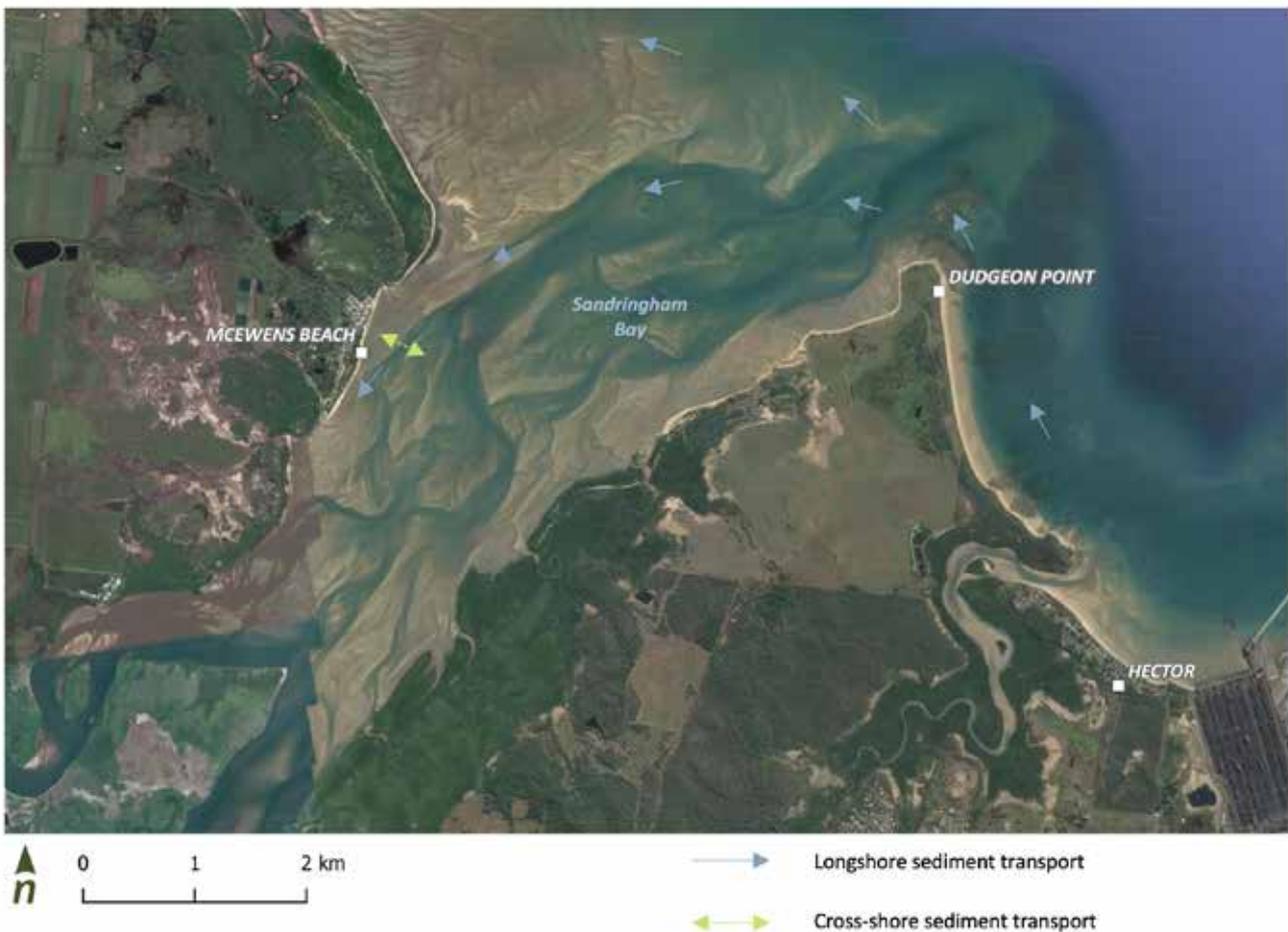


Figure 26: McEwens Beach indicative sediment transport and distribution pathways.

the nearshore tidal flats (EPA 2002). Sand shoals and the accumulation of sand in the form of a barrier spit system to the north of McEwens Beach may provide a future 'slug' of sand, however its progression to the south is likely to be relatively slow (many decades) (Figure 27).

### 4.3.5 Shoreline Changes

The McEwens Beach shoreline has changed considerably over recent decades. Comparative shoreline changes from 1947 to 2015 have included:

- Major recession (erosion) of the northern shoreline position – up to 145m.
- Pro-grading (accretion) of the mid-shoreline position, of up to 90m seaward by 2002, then retrograde (erosion) of up to 17m landward by 2015.
- Minor adjustments at the far southern end (EPA 2002 and Alluvium 2015, Figure 28).

Historical photos highlight the nature of the erosion experienced at the northern end of the shoreline, where a much wider grassed reserve areas was present several decades ago (Figure 29).

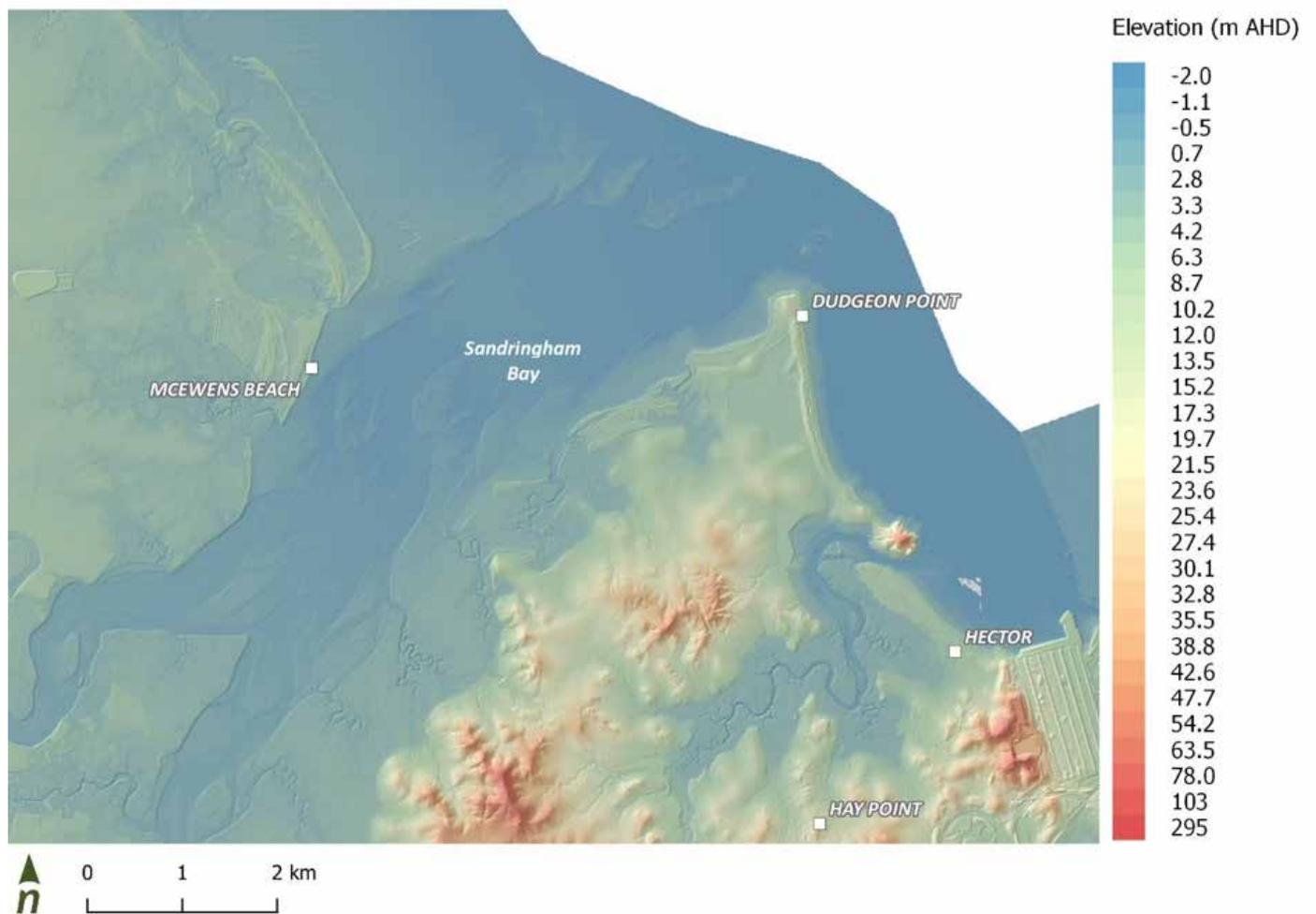
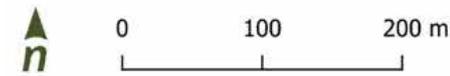
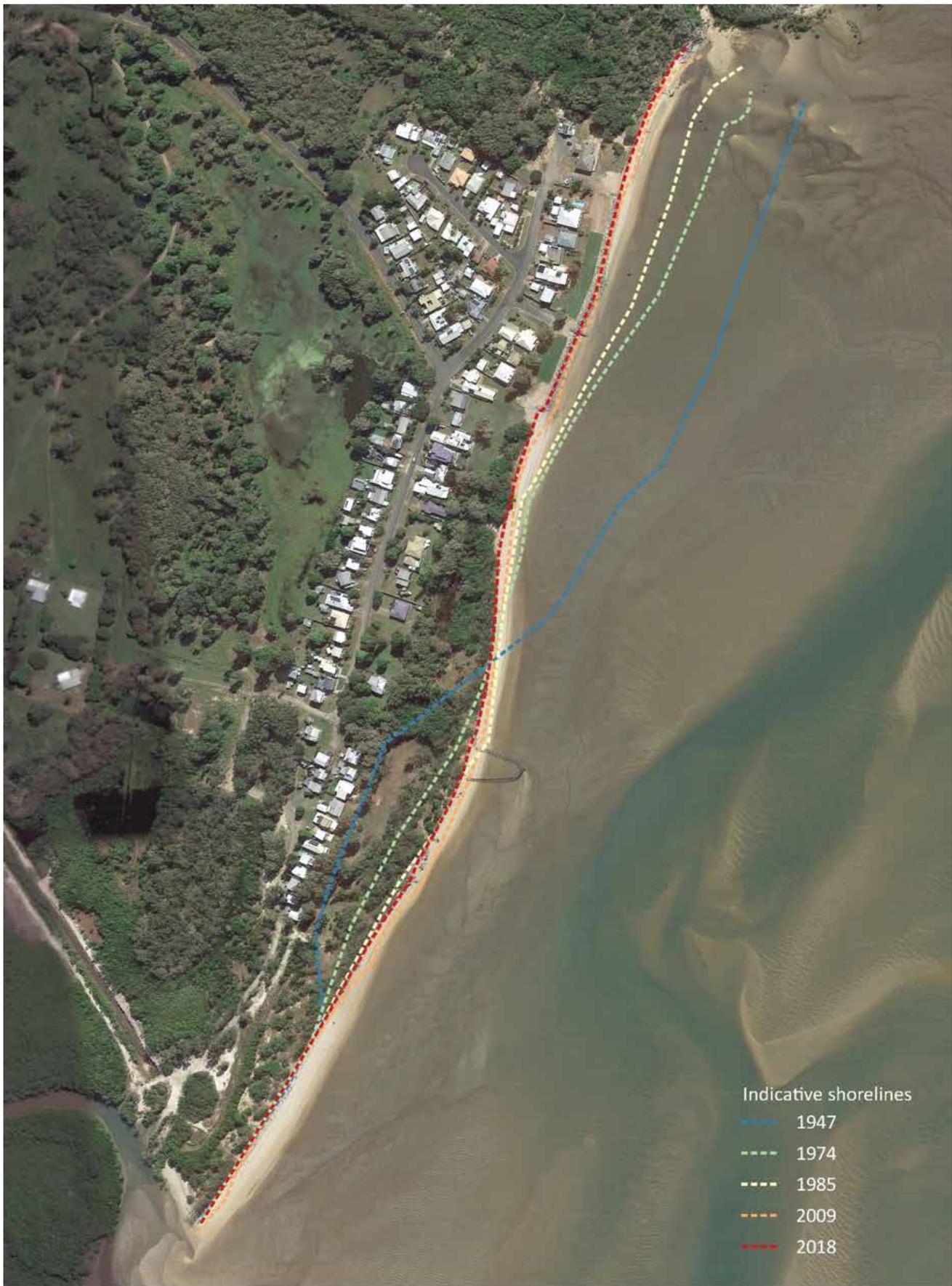


Figure 27: McEwens Beach and surrounds – elevation (LiDAR) data (m AHD).





**Figure 28:** Historical shoreline movement (1947 – 2015). 1947 to 1997 are indicative profiles replicated from the 2002 Erosion Study (EPA 2002). 2009 was produced by Alluvium (2015), and 2018 is the date of the aerial image as shown.

Construction of the 200m (approximately) long seawall at the northern end of McEwens Beach was completed in 2016 (Figure 30), funded by local landholders.

The wall, if maintained, will likely be effective in limiting shoreline recession at this location for the design life of the structure. However additional implications of the presence of the seawall include the following:

- In the absence of beach nourishment, the loss of a high tide sandy beach in front of the wall is likely. Sand will continue to be scoured away from the toe, and some maintenance / sand nourishment will likely be required to keep the toe buried (Figure 31).
- At the southern extent of the wall, localised terminal scour may be an ongoing issue. Terminal scour may impact on the width of the foreshore area immediately south of the wall including the low ridged dune near the netted swimming enclosure. Some localised terminal scour was observed in September 2018 (Figure 32).
- In halting the erosion at the northern extent of the beach, acceleration of erosion in the mid sections of McEwens Beach may occur over coming decades. This will also be influenced by increased coastal hazard exposure (erosion, storm tide and sea level rise) by 2100.

An extension of the seawall to the south was also proposed by the community as stage two of the development. Action to progress stage two may be taken by the community if erosion becomes a threat to private property adjoining Zone B. As part of an agreement with the McEwens Beach community, if stage two progresses, the council-owned Freehold land in Zone B will be transferred to adjoining residents to facilitate the extension of the seawall.

### 4.3.6 Coastal hazard area

Coastal hazards include erosion, storm tide inundation, and long-term (permanent) tidal inundation in low-lying areas due to sea level rise.

The State Government defines Erosion Prone Areas for the Queensland Coastline. The Erosion Prone Area represents coastal land that may be impacted between now and 2100 by open coast erosion, as well as permanent inundation due to sea level rise (0.8m by 2100). Areas prone to temporary impacts of storm tide inundation are also considered to be up to Highest Astronomical Tide (HAT) plus 2m.

A substantial extent of the McEwens Beach shoreline and settlement is situated within the Erosion Prone Area (Figure 34). This includes areas prone to open coast erosion as well as increased tidal area due to sea level rise (HAT + 40m horizontal, and HAT +0.8m vertical). The Erosion Prone Area does not represent a predicted loss of coastal land, however does indicate that these areas will be increasingly prone to erosion and inundation, and where planning will be required to mitigate coastal hazard impacts. This has implications for longer term strategic planning associated with coastal hazard adaptation. Any works completed to address erosion management over the next few decades should be in the context of longer-term coastal hazard adaptation and seek to achieve multiple strategic outcomes.

The majority of the McEwens Beach area is likely to be prone to storm tide inundation by 2100 (Figure 35). Storm tide inundation is the temporary inundation of land due to storm surge associated with extreme events (e.g. cyclones). Any future erosion protection works for the shoreline should consider ways to mitigate storm tide hazards as well (e.g. increasing dune height with beach nourishment).



**Figure 29:** Historical photos of the northern shoreline and erosion in 2001: left – view north along eroding shoreline, right – erosion scarp in the order of 2m high. Photos courtesy of local community member as provided to Reef Catchments.



**Figure 30:** Existing seawall along northern shoreline – view from McEwens Beach Carpark Road access stairs: left – view south, right – view north.



**Figure 31:** View north from southern end of the wall along wall base that will be prone to increased toe scour.



**Figure 32:** Terminal scour at southern end of the wall (7th September 2018). The seawall does not extend to the far northern extent of the shoreline. At the far north, there is approximately 50m of shoreline where active dune restoration works are being undertaken to limit disturbance (fencing) and encourage dune vegetation to establish, including some revegetation (Figure 33).



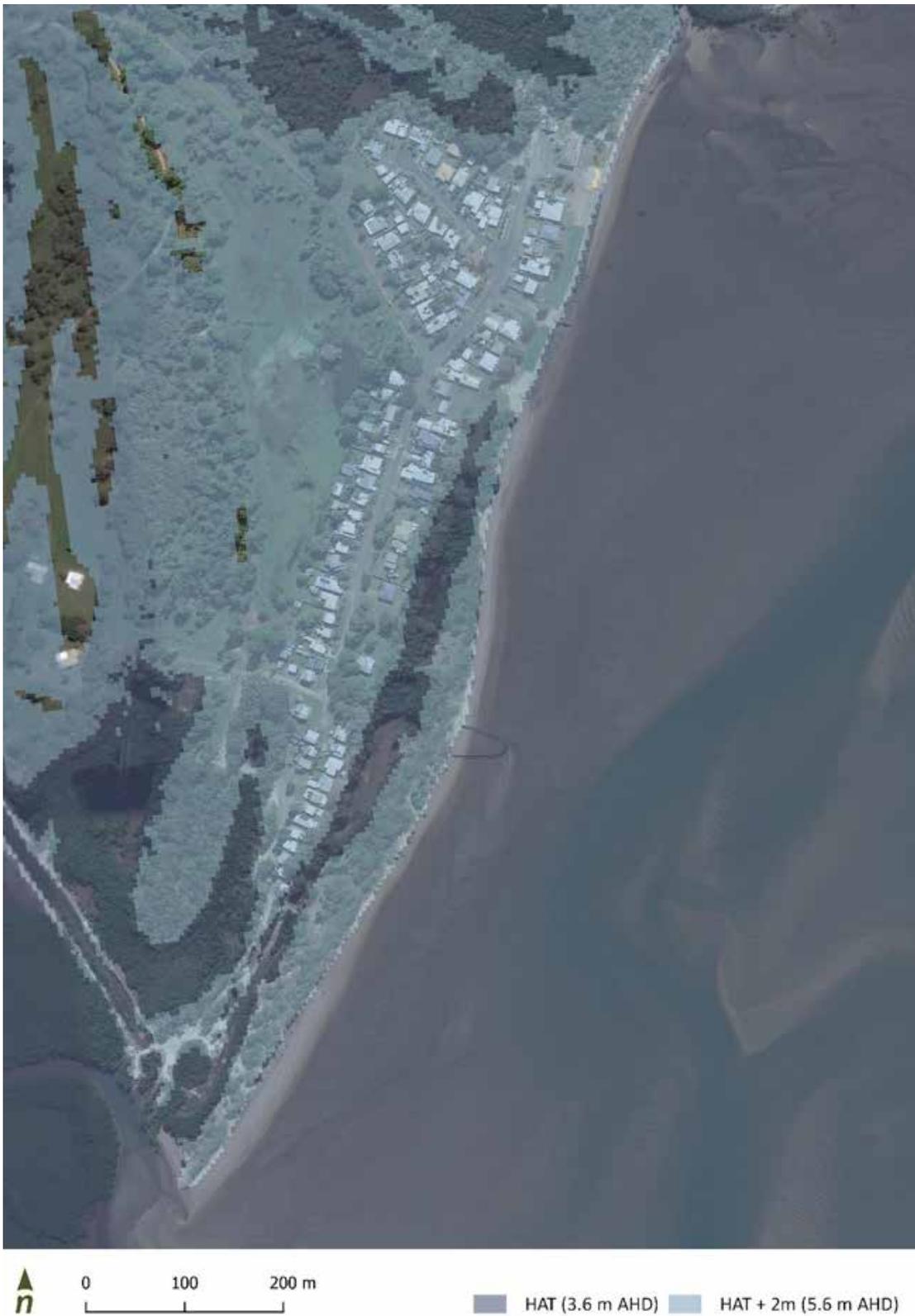
**Figure 33:** View north of the northern extent of the McEwens Beach shoreline: northern most section beyond the wall extent where active works are being undertaken to enhance dune recovery (fencing and revegetation).



▲ n 0 50 100 m Erosion prone area (DES)

▲ n 0 50 100 m HAT + 0.8 m (vertical) Open coast erosion

**Figure 34:** Queensland State Government Erosion Prone Area – Department of Environment and Science – shaded areas indicate land that may be prone to coastal erosion process by 2100. Coastal erosion processes include open coast erosion, and increased tidal area (permanent inundation) due to 0.8m of sea level rise.



**Figure 35:** Areas prone to storm tide inundation by 2100, based on default HAT + 2m estimate.

**KEEP OFF THE ROCK WALL.**  
Please use beach access steps.  
At times of high tide these steps  
will not be able to be used.  
Please use beach access at  
the end of Walz Avenue.  
Stacey.com

**PLEASE KEEP  
ON LEASH  
ALL TIMES**  
Stacey.com



# 5 Social Values and Management Issues

This section provides an assessment of the social values, such as cultural values and recreational opportunities and facilities offered by the coastal unit. The focus lies on a sustainable approach to explore recreational opportunities while conserving the natural environmental values of the area. Provision of adequate facilities that cater for a range of interests and abilities is also an important consideration of this plan.

McEwens Beach is located approximately 12km south of Mackay and is easily accessible along a 6km sealed road off the Bruce Highway. Anecdotal evidence suggests that McEwens Beach is a popular recreation location. McEwens Beach boasts one of only three swimming enclosures in the Mackay region, and this infrastructure is a drawcard for the beach. Popular recreation activities include swimming in the designated enclosure and walking along the sand banks at low tide. Given the high quality wetland complex of Sandringham Bay, recreational fishing is also a popular activity. There are two council-owned parks within the coastal unit, Reg Jones Park and the McEwens Beach Reserve, which offer picnic tables and formal access points to the beach.

## 5.1 CULTURAL HERITAGE

The Traditional Owners of the Mackay region are the Yuwi custodians. The area between Bakers Creek and Johns Creek was a part of the first-ever Aboriginal Reserve in Queensland, established in 1871. As such, the land is extremely significant for the Yuwi custodians. It is possible that the area contains walking tracks and artefacts scattered throughout, as well as spiritual sites such as burial grounds. Sandy beaches and coastal areas in general were popular hunting and camping sites for Indigenous people of the land. Historically, the area of McEwens Beach was one of the most regularly used fishing and camping grounds of the Yuwi custodians, and a large fish trap once extended across the mouth of Alligator Creek (Tonga, G. 2018, pers. Comm.).

Council is committed to managing culturally significant places sensitively in partnership with the Yuwi people. Council acknowledges the importance of cultural heritage to the area and will work with Traditional Owners to recapture their connection to Country.

It is important to facilitate the exploration of this area by Traditional Owners in order to document and preserve whatever culturally significant locations and/or objects are still in the old reserve. Surveys of the area by Traditional Owners may reveal many sites or items of cultural significance. In order to do so, it is suggested that Traditional Owners are funded to document finds and outline clear management objectives for preserving the cultural heritage in the area.

The rich cultural significance of McEwens Beach could be shared with the broader community through design and installation of signage throughout the area. Sites for signs

could include McEwens Beach Road or McEwens Beach Reserve. This signage should be developed in consultation with Traditional Owners.

## 5.2 RECREATIONAL OPPORTUNITIES

Recreational sites are important as they provide a range of social benefits including opportunities for active and passive recreation, tourism, education and social activities. They also support community wellbeing and provide opportunities for improving general health through outdoor recreation. Additionally, through signage and interpretation, there is an opportunity to raise awareness of local wildlife and educate people about the natural coastal processes and vegetation that support these species. Council's *Mackay Region Planning Scheme* (MRC 2017) outlines council's vision to provide a balanced mix of public Open Space that in turn will provide for a range of active and passive recreational opportunities for the community. Open Space is set aside for recreational and non-recreational activities. Active and passive recreational opportunities are provided to meet the needs of the community, whereas non-recreational Open Space areas are provided for the protection of natural areas, (including environmentally significant vegetation, wildlife habitat areas, waterways, and wetlands) and for the use of land for utilities and storm water management (MRC 2018). In order to develop an integrated and comprehensive Local Coastal Plan, it is important to consider public use and future opportunities that balance the environmental conservation and recreational needs of this coastal unit.

The *Mackay Region Planning Scheme* (MRC 2017) was considered when assessing the coastal unit for possible recreational and conservation based recommendations, including the risks recreation may pose to local wildlife and native vegetation. Environmental sustainability is prioritised in line with the *Coastal Management Guidelines* (MRC 2012), with consideration for providing a range of recreational opportunities in order to meet needs of the broader McEwens Beach and Mackay community. Council's *Open Space Schedule* (MRC 2018) seeks to achieve recreational diversity and effective distribution of recreational areas, and to create an interactive interface between the environment and the community, and establish a network of Open Space areas accessible to everyone. This Local Coastal Plan seeks to align this policy, community needs and environmental conservation.

McEwens Beach is a popular recreation area for families and recreational fishers within the Mackay region. It is unique in boasting the only swimming enclosure south of Mackay where swimmers can swim safely at high tide (Figure 36). As a nationally important wetland, the Sandringham Bay and Bakers Creek Aggregate serves as a locally important recreational fishing and boating area. Therefore, the beach is visited throughout the year by recreational fishers, both Mackay residents and tourists alike.

The coastal unit boasts two main designated recreational zones, Reg Jones Park is situated at the end of McEwens Beach Carpark Road at the northern end of the coastal unit, and McEwens Beach Reserve is at the southern end off McEwens Beach Esplanade (Figures 37 and 38). Apart from formal beach access stairs off Aura Street and a picnic table, Reg Jones Park provides limited recreational opportunities to McEwens Beach residents. Reg Jones Park is classified as a Local Park. This park originally extended the length of the seawall, encompassing approximately 5400m<sup>2</sup>, but due to erosion and construction of the seawall, the size of this park has been reduced and its functionality limited. Most of the park has been re-zoned as Freehold land to facilitate construction and maintenance of the seawall by residents, and the park is now approximately 680m<sup>2</sup>. Due to its small size there are limited options for increasing the recreational value of this local park. However, installation of a water tap may make the area more functional, and interpretive signage regarding migratory shorebirds and the nearby (northern) shorebird roost may also add recreational value.

The overall reduction in recreational open space has negatively impacted the community's opportunities to participate in recreational activities. It is recommended that this loss of open space for recreational activity be addressed by increasing the recreational opportunities of McEwens Beach Reserve.

McEwens Beach Reserve is the main recreational area in the coastal unit, though it is classified as non-recreational open space. As per council's *Open Space Schedule*, the main purpose of non-recreational open space is for the protection of natural areas and other significant landscapes or to manage other infrastructure needs such as transport and drainage reserves as is the case within the McEwens Beach Reserve (MRC 2018). Given the significant reduction in space and subsequent lack of capacity for recreational development at Reg Jones Park, it is recommended that the council balance the recreational needs of the community with the goal to conserve natural areas. The reserve comprises a large, low-lying grassy area with scattered mature trees (Figure 39). The natural value of this land could be increased by facilitating regeneration of native vegetation by restricting mowing to certain areas and controlling non natives. Revegetation along the scarp, in select locations across the foredune and within the park would also assist vegetation establishment and foredune stabilisation. It will also facilitate dune growth, improve dune stability, encourage further plant recruitment, improve connectivity and provide habitat for native animals along the coastal corridor.

Regeneration of natives could be linked with and somewhat offset by recreational development within the reserve. Currently, facilities and infrastructure to encourage recreation are limited. The reserve has an official beach access point, MCE01 (Figure 40), leading from Walz Avenue, a tap near the entrance to the access point, and two picnic tables at the opposite end, near the beach (Figure 41). It is recommended that MCE01 be upgraded, with a clear path delineated and

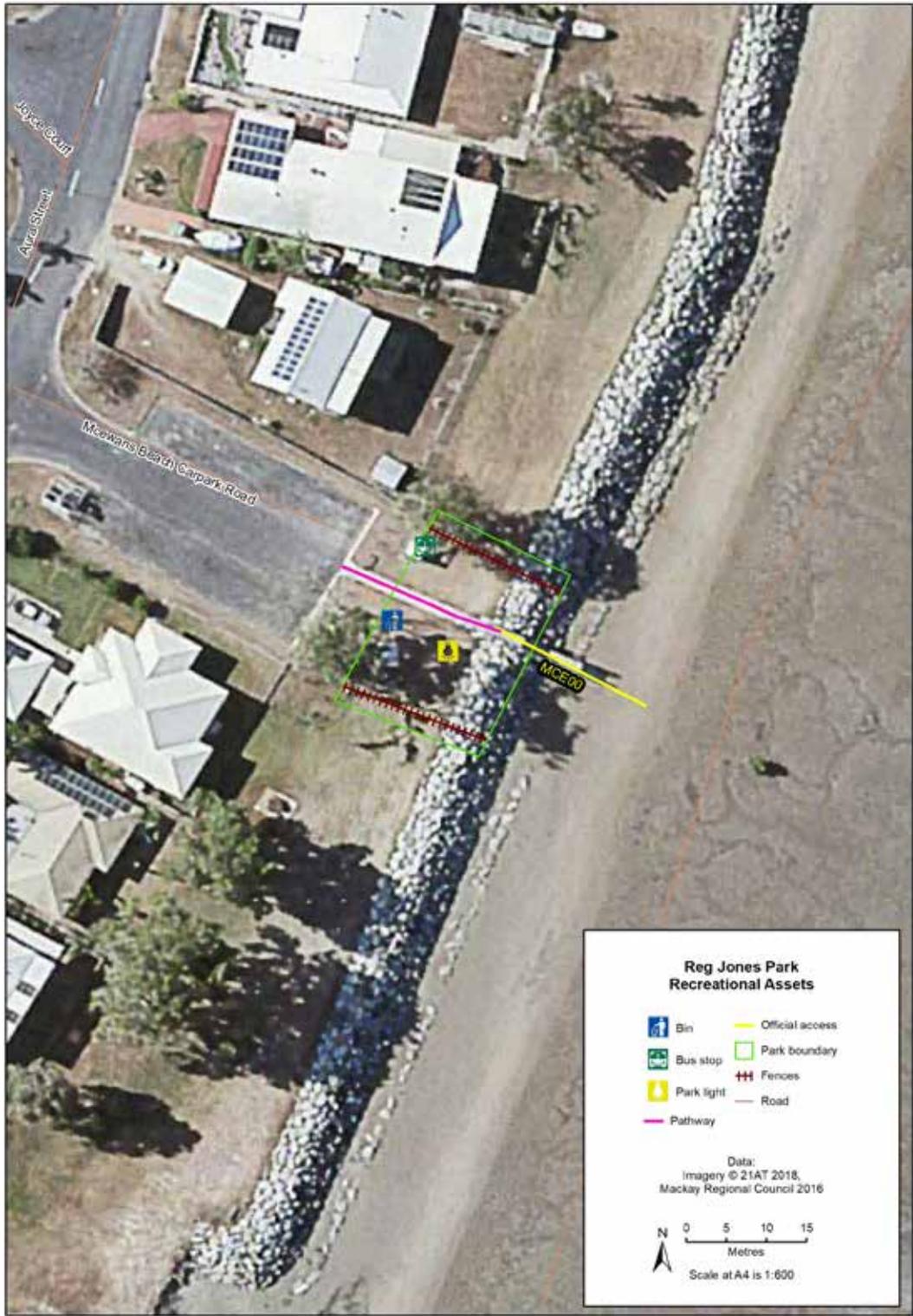
fenced from the carpark to the foreshore. This formal access path should be raised to avoid becoming waterlogged. Additionally, it is recommended that maintenance of the picnic tables continue to be delivered by council, as erosion has exposed the concrete slab and may be undermining the structure, which in turn may constitute a trip hazard. The main recreational facility is the swimming enclosure at the end of MCE01, which is one of only three in the Mackay region and the only enclosure south of Mackay city (Figure 36). This feature acts as one of the major drawcards for visitation at McEwens Beach, and its maintenance should be of high priority. There are a number of key factors which limit the recreational opportunities of McEwens Beach, namely a lack of parking at McEwens Beach Reserve, and the inundation and insufficient drainage of the low-lying area within the reserve. Partial infilling of the low-lying area would allow the construction of additional recreational infrastructure. However, council should first investigate the feasibility of developing assets in this area, as the foreshore is within the Erosion Prone Area (Figure 35) and infrastructure is likely to be impacted by sea level rise and erosion in the future. Additionally, McEwens Beach Reserve is classified as a non-recreational open space and therefore may not be suitable for development.

Currently, the low-lying area in McEwens Beach Reserve is seasonally inundated during high tides, with water flowing southward behind the dune system from a gully near Reg Jones Park. Local reports indicate that the same area can also become inundated during high tides, with water flowing northward through the channel from Johns Creek. Council has a drainage easement and tidal gate at the southern end of the coastal unit (Figure 42), which facilitates a one-way flow of water from the reserve out to Johns Creek. However, according to local reports, its functionality is limited. At high tides (above 6m) the tidal gate is outflanked, with water flowing northwards around the gate and raised ground. Water sits in the low-lying area for long periods of time, becoming stagnant and breeding mosquitoes. The reserve was graded in 2018 to better facilitate southward flow of water toward the drainage easement, but there are ongoing issues with the stagnant water impacting beach access and livability for nearby residents. It is recommended that council investigate this issue and deliver the required maintenance to the drainage easement and infrastructure, including possibly extending the length of the raised ground perpendicular to the tidal gate.

In 2015, the community approached council with a request to develop a boat ramp south of the swimming enclosure. In response, council investigated the feasibility of the proposal and determined that a boat ramp at McEwens Beach would be difficult to construct, given the limited area available for carparking and maintenance access, as required by the Department of Transport and Main Roads to service the boat ramp. It was determined that there is sufficient access to boat launching facilities in nearby Dunnrock to render construction of a boat ramp at McEwens Beach a low priority. This aligns with findings from the Department of Transport and Main Road's *Boating Facilities Demand Forecasting Study 2017* (GHD 2017).



**Figure 36:** Beach swimming enclosure provides recreational value as a safe swimming area at high tide.



**Figure 37:** Reg Jones Park recreational assets.



Figure 38: McEwens Beach Reserve recreational assets.



**Figure 39:** Large grassy reserve for recreational use.



**Figure 40:** Official access point MCE01 leads visitors to the swimming enclosure from Walz Avenue.



**Figure 41:** Picnic tables located on the foredune at MCE01 provide visitors with a shady place to enjoy the scenic views.



Figure 42: Map showing location of drainage easement through to Johns Creek.

## 5.3 PUBLIC ACCESS

To prevent the degradation of dune systems and for public safety, it is important for users to stay on designated access tracks. Pedestrian and vehicle traffic displaces sand, and where it continually occurs, can lead to localised erosion. Recreational activities/facilities (i.e. walking tracks, picnic facilities etc.) where possible, should only be located outside of the erosion prone area and inside the landward dunal areas (DERM 2011b).

There is a 6km long sealed road from the highway to McEwens Beach. Formal access to the beach is via two main access points in Reg Jones Park (Figure 43) and McEwens Beach Reserve. There is a formal beach access track located off Aura Street within Zone A at Reg Jones Park (Figure 44). There is a carpark on McEwens Beach Carpark Road, off Aura Street. This carpark can accommodate approximately 10-20 vehicles. Beach access consists of a concrete pathway leading to stairs over the seawall and onto the beach. At high tide the ocean abuts the wall, submerging the bottom of the stairs. The area also contains a picnic table and a bus stop and is fenced off on either side of the concrete pathway to prevent public access into private land.

In Zone B McEwens Beach can be accessed via an official access point in McEwens Beach Reserve off Walz Avenue, MCE01 (Figure 40). Informal car parking space accommodates approximately four to six vehicles and is bound by a post and rail fence, restricting access to council maintenance vehicles and pedestrians only. Aside from this fenceline, the boundary and access track within McEwens Beach Reserve remain unfenced (Figure 45). As one of only two public access tracks, this area is frequently accessed by beach goers who, through this action, unwittingly encourage colonisation of weeds and garden escapees. Formalising MCE01 with post and rail fencing extending onto the beach and running parallel to the dunes will encourage native plant recolonisation, provide for vegetation zonation and increase the buffer between the beach and houses. Any fence location should incorporate existing native mature trees and be offset from existing native vegetation to allow growth of juvenile recruits and natural regeneration.

Given the length of McEwens Beach Reserve, it is recommended that a second access point be installed at the southern end of the Reserve (MCE02). This access point will largely be utilised by property owners at the southern end of Walz Avenue, and may reduce unofficial access tracks through the Reserve to the foreshore, thereby reducing disturbance to native vegetation.

A number of unofficial access points exist (Figure 46), leading from private property, through dune vegetation and onto the beach. These paths facilitate the loss of native vegetation cover, encourage weed colonisation and enhance localised erosion processes via pedestrian traffic, and their effect is clearly visible from the foreshore. Their closure is encouraged in order to stabilise the area and restore environmental values in the area.

## 5.4 SIGNAGE

Signage provides educational and interpretive opportunities for visitors and increases the value that locals place on the natural environment. Signs can highlight areas of high value, provide information about current projects and advise of site-specific restrictions or hazards. Beach access signage is present at the landward and seaward end of the beach access points within the coastal unit. It is recommended that signage be regularly audited and updated where required to ensure consistency and accuracy.

At the access points to Reg Jones Park and McEwens Beach Reserve, interpretive signage featuring topics such as the history of McEwens Beach or the value of nearby shorebirds could be installed. Shorebird signage should detail when shorebirds are roosting, the impacts of disturbance to migration, and should encourage beach visitors to use a leash to walk their dogs at all times. Historical signage could explain how McEwens Beach was named. Such signage will contribute additional recreational value to the areas.

There is also scope to install signage in McEwens Beach Reserve reflecting the cultural history of the area. The McEwens Beach area was part of a large Aboriginal Reserve, and as such the area has a deep cultural significance to Traditional Owners. Interpretive signage, developed in consultation with Traditional Owners, could enhance visitor experience and ensure that the importance of cultural heritage is reflected and appreciated by locals and visitors.

Updating, repairing and installing new signs throughout the coastal unit, in particular, near beach access points or sheltered seating and picnic areas is recommended.

## 5.5 ECONOMIC VALUES

Beaches are important economic assets as well as natural resources, as they provide services to people and property that have an economic value, including reduced storm damage, together with recreational and tourism opportunities (Strong 2005).

The tourism industry is important for the Australian economy, comprising approximately three per cent of gross domestic product in 2014-15 (Productivity Commission 2015).

Australia's tourism industry is dominated by the natural environment, with national parks and protected areas forming the basis of nature-based tourism experiences (Weaver *et al.* 1999). Beaches are the most popular coastal attractions for visitors, providing opportunities for a range of activities including bushwalking, whale watching and fishing (Clarke and Johnston 2017).

Beach visitors generate income for the local economy through their expenditure. Spending by tourists is a component of the economic activity across a variety of sectors including accommodation, cafes and restaurants, transport and storage, retail trade, cultural and recreational services and education (Pambudi *et al.* 2009). Income generated by the coastal tourism sector is highly dependent on the quality and extent of beach systems (Jones and Phillips 2007).



Figure 43: McEwens Beach access points.



**Figure 44:** Access steps at Aura Street take visitors over the seawall onto the northern end of McEwens Beach.



**Figure 45:** Very little native recruitment occurs within the open reserve and adjacent foreshore due to mowing.



**Figure 46:** Unofficial access points in Zone B opening foredune to weed invasion and localised erosion.



Ecotourism is a significant and growing sector of the tourism industry, and provides a way to reconcile tourism and conservation (Weaver 2001). By marketing natural values, ecotourism can maintain the aesthetic appeal of coastal tourist areas while deriving economic value, and simultaneously produce environmental benefits (Clarke and Johnson 2017).

Beach and dune environments are among the most valuable natural habitats on the coast, providing environmental services, landscape values and habitat for marine and terrestrial plants and animals which can serve to attract tourists as well as provide amenity for local residents (James 2000). The costs associated with recreational and tourist usage of beaches includes the cost of infrastructure provision and maintenance.

Beaches provide goods and services to many stakeholders, with a range of market and non-market values which can be worth millions of dollars per year. The way people value the natural environment however can vary. Value can be associated with direct uses, such as fisheries or tourism, as well as indirect uses, such as mangroves providing nursery habitat for juvenile fish species. Indirect uses are usually found outside the market place and are effectively unpriced. Determining the full value of a natural asset is challenging and often overlooked, however if no monetary value is placed on environmental goods and services there is a risk that they will be perceived as having no value (zero worth) and may be vulnerable to exploitation (Kirkpatrick 2011).

Coastal resources in the Mackay region are highly sought after for competing uses including residential, commercial, tourism and recreation. Effective management is required to ensure that the natural values and attributes of the coast are preserved while economic development and population growth are accommodated (EPA 2004).

Climate change is likely to have a range of direct and indirect economic impacts on recreation and tourism in coastal areas. Local and state governments will need to invest in natural assets to ensure the continuation of a strong tourism culture and investigate opportunities to diversify the tourism image for beach-focused destinations while balancing the value of natural coastal assets against trade-offs for other uses such as industry and development (Kirkpatrick 2011).

McEwens Beach provides a range of direct and indirect economic values, though the exact monetary value of these services has not been quantified. The natural assets and built infrastructure of McEwens Beach, in particular the swimming enclosure, is a driver for tourism and visitation to the area. Visitation often results in direct local expenditure, such as purchase of food, petrol and nearby accommodation. Indirect economic values of McEwens Beach include the environmental value of Sandringham Bay wetland complex and mangrove ecosystems to fisheries, and the recreational value of the beach's natural and built assets to visitors and locals.

## 5.6 WASTE DUMPING AND LITTER

Green and general waste has aesthetic, social and conservation repercussions. Litter and green waste reduce the visual appeal of beaches, present health threats to visitors (e.g. toxic waste, glass and sharps etc.) and compromise vegetation condition. Green waste, such as palm fronds and lawn cuttings smother large sections of ground cover vegetation throughout the coastal unit. Plastics and other general waste often wash out to sea, presenting dangers for marine wildlife including birds, fish, sharks, turtles and marine mammals. Marine debris may lead to drowning, or cause injury or death through entanglement and internal injuries, or from starvation following ingestion.

Green waste, general waste and marine debris were found throughout the coastal unit. The planted coconut palms throughout Zones B and C are generating significant green waste, which not only detracts from the aesthetic value of the beach, increases the potential fire risk within the coastal unit (Figure 47), restricts vegetation recruitment, and smothers the development of ground cover which would otherwise act to bind sediment and protect from future erosion. The planting and widespread recruitment of new palms throughout the zones is likely to exacerbate this issue in the future. Accumulation of green waste within the coastal unit from coconut palms should be deterred.

Green waste from fallen or dead vegetation is accumulating through the southern end of the coastal unit. A large number of coastal she-oaks have fallen and appear as woody debris along the foreshore throughout Zone C (Figure 13). Native to the Australian coastline, coastal she-oaks have evolved to withstand environmental stressors prevalent along Australia's dynamic coastline (namely erodible shorelines and high intensity wind). She-oaks perform an ecological function specific to the coast/land interface: they preferentially establish stands (often seen as linear along coastlines), their lateral roots prevent erosion, their flexible branches and foliage dissipates wind power, and when fallen, their woody parts act to create a network of woody debris that assists in catching wind-borne sand and sediment, subsequently building the foredunes. The trees are contributing toward a natural process, and as part of a protected RE, their removal is prohibited. This southern end of the beach is largely unused for recreation, and therefore the fallen trees constitute little concern.

General waste, with tyres the most common form, is present throughout the coastal unit (Figure 48). Many are partially buried and may be difficult to remove. Removal of this waste will contribute to the intrinsic beauty of the beach, and its value as a clean, safe recreational area, however disturbance to dunes should be limited. Appropriate regulatory signage and a public education and awareness program on the values of coastal unit and impacts of waste dumping should complement other management actions.



**Figure 47:** Coconut palm fronds creating large amounts of green waste negatively affecting the aesthetic value of the beach, contributing to increased fire risk and smothering native ground covers.



**Figure 48 a and b:** Tyres littered along the foreshore reduce the aesthetic and environmental values of the beach.





# 6 Climate Change and Management Issues

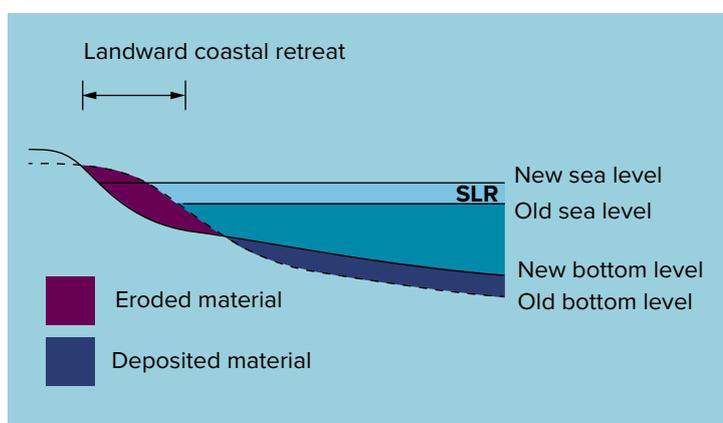
Climate change is the term used to describe long-term changes in global weather patterns, and the gradual increase in mean global temperature. There is strong evidence that suggests that the gradual warming trend over the last fifty years has been driven largely by human activity, for example, the burning of fossil fuels, deforestation and intensification of agriculture (The Royal Society 2010). Climate change is having, and will continue to have, significant impacts on lives and ecosystems on which we depend.

Council's *Climate Change Adaptation Policy (MRC 2018)* recognises that climate change has the potential to impact the Mackay region. The policy outlines the proactive approach employed by council to take leadership by adopting a strategic response to impacts and opportunities that may eventuate from climate change, as well as facilitating greater awareness of the causes and effects of climate change. Council's *Environmental Sustainability Strategy 2017-2022 (MRC 2017)* further reinforces the vision and commitments of the council to act as a leader in this space.

Coastal areas are highly exposed to climate change with sea level rise being one of the greatest threats. The best known model relating shoreline retreat due to an increase in local sea level is that proposed by Per Bruun (1962) (Figure 49).

Projected sea level rise (0.8 m by 2100) is expected to increase erosion and damage property and infrastructure (DERM 2011b). The response of Australian coastal ecosystems and landforms to climate change will vary, but most are expected to involve shoreline recession, vertical accretion of sand, increased saline inundation of wetlands, and the modification and southward shift of habitat (Australian Government 2013). Additionally, many intertidal ecosystems such as mangroves, seagrass and tidal flat communities will decline.

Key climate change messages for the wet tropics Natural



**Figure 49:** The Bruun Rule showing erosion of the upper beach and offshore deposition under sea level rise (SLR) sea level rise. Source; DERM.

Resource Management cluster, that encompasses the Mackay region, are displayed in Figure 50 (Abbs, D. *et al.* 2015). Current predictions suggest that much of the dune system will be inundated by 2100 (Queensland Government 2011). Maintaining and improving the condition of a buffer area of coastal vegetation, where possible, will provide the best opportunity to build resilience into these ecosystems to cope with changes into the future. *Mackay, Whitsunday and Isaac Climate Sustainability Plan 2016-2020* contains forecasts local to the Mackay region. Figure 50 also highlights other key changes associated with climate change, such as increased temperatures and more severe tropical storms.

McEwens Beach is vulnerable to erosion from storm tide inundation and permanent inundation as a result of expected sea level rise. Figure 24 uses the prescribed estimation (0.8 m by 2100) to model what the coastline will look like, and currently predicts that much of the dune system will be inundated by this time (DERM 2011b). Current king tides reach mid-way up the seawall in Zone A, infrequently breach the foredunes in Zones B and C and inundate the estuarine wetlands at the northern and southern end and the floodplains behind McEwens Beach. Maintaining and improving the condition of a buffer zone of coastal vegetation, where possible, will provide the best opportunity to build resilience into these ecosystems to cope with changes into the future. Revegetation of the McEwens Beach coastal strip with appropriate local native species will assist in limiting erosion as well as enhance the ability of flora and fauna to migrate southward by creating a habitat corridor, to facilitate movement of species.

Increased storm intensity predicted with climate change makes stabilising coastal strips in front of infrastructure important for risk mitigation. The use of vegetation is important to bind sediments together and reduce sediment loss. The degraded dune system along McEwens Beach currently has little capacity to be resilient to storm events and therefore requires revegetation and improved access points to keep pedestrians off fragile dune areas. The influx of water from the creeks and stormwater channels adds an additional consideration to the rising sea levels when determining options for protecting or retreating from rising waters.

Retreat is likely to be required in the longer term for McEwens Beach residents. The challenge for future planning will be to identify suitable ecological retreat zones for developed sections of coastlines, informed by geomorphic processes, to accommodate climate change processes and preserve unique habitat in specific geographic regions. For example, it may be important to limit development around estuary areas and coastal wetlands and waterways, in order to preserve a zone to accommodate ecological retreat. Adaptation planning is recommended to ensure that this is comprehensively



## KEY MESSAGES FOR THE WET TROPICS



Average temperature will continue to increase in all seasons.



More hot days and warm spells.



Changes to rainfall possible but unclear.



Increased intensity of extreme daily rainfall events.



Mean sea level will continue to rise. Height of extreme sea-level events will also increase.



Fewer but more intense tropical cyclones.



On annual and decadal basis, natural variability in the climate system can act to either mask or enhance any long-term human induced trend, particularly in the next 20 years and for rainfall.

considered to mitigate risk to social and environmental values in the area. Council's *Coastal Erosion Protection Works – Contribution and Costs Recovery Policy* establishes the circumstances under which the council may lead adaptation planning and other coastal protection works."

Rising sea levels will also see the loss of key habitats such as tidal flats sand dunes and coastal vegetation that is not provided space to retreat landward. Unvegetated coastal strips and mown open spaces will reduce the ability of communities to migrate through them. This will be the case for most of the coastal unit. The loss of coastal habitats may have impacts on local turtles, birds and other native flora and fauna. Sea level rise will likely have a large impact on the wetland ecosystems of McEwens Beach. Alterations to the 'halo-zone' (salt-affected area) is identified as one of the major disturbances to these ecosystems, driving changes in structure and floristics (Australian Government 2013). For example, longer periods of inundation by salt water will exclude particular species and change the soil chemistry.

Residents of the coast are already familiar with the risks of living close to the ocean, such as storm surges, cyclones and erosion. However, the intensity of these threats is expected to increase with a warming global climate, so it is important to understand and prepare for this. Elevated sea levels (during episodic storm events) are identified as the major cause of periods of high rates of erosion at McEwens Beach (EPA 2004).

As the incidence of storms is likely to increase, erosion processes will likely also accelerate. It is important to protect the foredunes for the coastal protection ecosystem services they provide. This can be achieved by minimizing hard infrastructure (such as seawalls), improving dunal vegetation condition and minimizing disturbance to the dunes (such as unofficial access points). Reducing environmental pressures will increase the resilience of coastal ecosystems, thereby increasing the likelihood of their persistence into the future.

**Figure 50:** Key climate change messages for the wet tropics Natural Resource Management (NRM) cluster (Source: Abbs, D. et al., 2015).



Figure 51: Tidal flat communities at McEwens Beach.

# 7 Recommended Activities

Recommended activities have been prioritised to assist council when planning works. Each activity has been ranked as High, Medium or Low priority relative to its contribution towards protecting, improving or enhancing environmental and/or recreational opportunities within the coastal unit:

1. **High priority** activities are critical to the protection of environmental or social values.
2. **Medium priority** activities are those which will significantly improve environmental or social values.
3. **Low priority** actions are those which will enhance environmental or social values.

**Table 2:** Recommended activities for the McEwens Beach Local Coastal Plan.

RECOMMENDED ACTIVITIES		PRIORITY
<b>Zone A   Council Freehold property north of seawall and Reg Jones Park (0.2ha)</b>		
1	<b>Recreational opportunities</b>	
1.1	Install interpretive and regulatory signage where appropriate to highlight topics such as the history of McEwens Beach or the value of nearby regionally significant shorebird roosting area and reinforce council's dog on leash requirements.	Low
1.2	Formalise access point MCE00 by installing signage.	Low
2	<b>Monitoring</b>	
2.1	Monitor effect of seawall on coastal unit, focusing on seawall ends and southern portion of beach.	Medium
2.2	Develop a case study to assist council with future coastal planning strategies.	Medium
<b>Zone B   Southern end of seawall to end of residential area (3.96ha)</b>		
3	<b>Vegetation management</b>	
3.1	Control major target weed species including prickly pear, lantana and Guinea grass.	High
3.2	Densely revegetate foreshore area immediately south of seawall to slow erosion.	Medium
3.3	Supplement removed weed species with native vegetation, particularly along the frontal dune.	Medium
3.4	Monitor and manage other problematic weed species including juvenile coconuts, cobbler's peg, periwinkle, rattlepod, fleabane, Seaforth burr, red natal and garden escapees.	Medium
3.5	Hold a community working bee to plan, develop and commence a program of staged vegetation rehabilitation activities to enhance the coastal buffer within Zone B and C.	Medium
3.6	Facilitate native vegetation regeneration throughout the zone through strategic weed management.	Medium
3.7	Control weeds on and around well used areas such as informal access tracks.	Medium
3.8	Work with Freehold property owners to facilitate protection and appropriate management of significant native vegetation on private land.	Low
4	<b>Recreational opportunities</b>	
4.1	Investigate drainage flow within McEwens Beach Reserve and amend where appropriate to improve park use and function.	High
4.2	Continue routine maintenance of swimming enclosure.	High
4.3	Investigate additional recreational opportunities for McEwens Beach Reserve.	Medium
4.4	Install interpretive and regulatory signage where appropriate to highlight nearby regionally significant shorebird roosting area and reinforce councils' dog on leash requirements.	Low
4.5	In consultation with Traditional Owners, develop and install interpretive signage to highlight Cultural Heritage values of McEwens Beach and its surrounds.	Low

**Table 2: Recommended activities for the McEwens Beach Local Coastal Plan**

<b>5</b>	<b>Access management</b>	
5.1	Delineate access point MCE01 by constructing post and rail fencing	<b>Medium</b>
5.2	Install post and rail fencing landward from coastal vegetation buffer to protect existing vegetation and encourage native recruitment.	<b>Medium</b>
5.3	Install additional beach access point within McEwens Beach Reserve (MCE02).	<b>Medium</b>
<b>6</b>	<b>Waste management</b>	
6.1	Work with the community to develop suitable solutions to manage palm frond waste.	<b>Low</b>
6.2	Work with the community to plan and develop a staged program to remove tyres and other foreshore waste, providing equipment where required.	<b>Low</b>
<b>7</b>	<b>Erosion management</b>	
7.1	Update the McEwens Beach Shoreline Erosion Management Plan.	<b>High</b>
7.2	While the maintenance of the seawall falls to the land owners; council will work with the community regarding the issues set out below: <ul style="list-style-type: none"> <li>• Beach nourishment in front of and at the southern end of the seawall.</li> <li>• Sand groynes to retain sediment.</li> <li>• Extension of the seawall (which may consider alternatives to rock, e.g. geotextile containers and a buried wall).</li> <li>• Installation of offshore structures to encourage localised sediment accumulation.</li> </ul>	<b>Medium</b>
7.3	Monitor changes to beach profile through periodic surveying.	<b>Medium</b>
7.4	Implement adaptive management techniques; use beach profile monitoring results to inform future coastal management works.	<b>Medium</b>
<b>Zone C   Southern tip of coastal unit (0.77ha)</b>		
<b>8</b>	<b>Vegetation management</b>	
8.1	Control major target weed species including prickly pear and lantana.	<b>High</b>
8.2	Monitor and manage other problematic weed species including juvenile coconuts and Guinea grass.	<b>Medium</b>
8.3	Supplement removed weed species with native vegetation, particularly along the frontal dune.	<b>Medium</b>
8.4	Work with Freehold property owners to facilitate protection and appropriate management of significant native vegetation on private land.	<b>Medium</b>
8.5	Retain fallen coastal she-oaks to re-shoot and/or trap windblown sand.	<b>Low</b>
<b>9</b>	<b>Improve drainage</b>	
9.1	Deliver routine maintenance to maintain recreational function of McEwens Beach Reserve.	<b>High</b>
<b>Other activities across multiple zones</b>		
<b>10</b>	<b>Cultural heritage</b>	
10.1	Engage Traditional Owners to undertake cultural heritage surveys of the area to outline clear management objectives for the preservation of cultural heritage within the coastal unit.	<b>Medium</b>
10.2	Work with Traditional Owners to reinstate connection to Country.	<b>Low</b>

**Table 2: Recommended activities for the McEwens Beach Local Coastal Plan**

<b>11</b>	<b>Signage</b>		
11.1	Audit all beach access signs across the coastal unit and update or install:		<b>Medium</b>
	<ul style="list-style-type: none"> <li>Signage at the landward end of each beach access point that clearly identifies the beach access number, restricted activities, hazards present and provides information on the appropriate first aid treatment for marine stingers.</li> <li>Beach access numbering signage at the seaward end of each beach access point.</li> </ul>		
11.2	Accompany rehabilitation areas with signage (both regulatory and informative).		<b>Low</b>
<b>12</b>	<b>Climate change</b>		
12.1	Consider how to manage future predicted reduction in coastal land to retain buffer above the high tide mark (e.g. rolling boundaries).		<b>Medium</b>
12.2	Plan for retreat as required.		<b>Medium</b>
12.3	Engage the community in an educational event or campaign to explain sea level rise and its likely extent and impact.		<b>Medium</b>
12.4	Review existing revegetation list to ensure that species reflect diversity of all Regional Ecosystems present in coastal unit and in preparation for future predicted climates.		<b>Low</b>
<b>13</b>	<b>Legislation and local laws</b>		
13.1	Use available legislation, i.e. vandalism policy, to protect existing native vegetation on Esplanade and Reserve tenure as required.		<b>Medium</b>
13.2	Protect regionally significant shorebird roost sites by using existing laws to undertake enforcements and compliance activities across the area, particularly relating to unrestrained dogs in park and beach areas.		<b>High</b>
13.3	Review and update this document in line with changing legislation.		<b>Low</b>
<b>14</b>	<b>Education</b>		
14.1	Partner with Coastcare and others to deliver education programs about:		<b>Low</b>
	<ul style="list-style-type: none"> <li>Local weed species and the use of local native species in residential gardens.</li> <li>Garden waste and general waste disposal.</li> <li>Responsible pet ownership and how to protect native wildlife.</li> </ul>		
<b>15</b>	<b>Vegetation maintenance</b>		
15.1	Continue to protect and enhance vegetated dune systems.		<b>Medium</b>
15.2	Work with Freehold property owners to facilitate protection and appropriate management of significant native vegetation on private land.		<b>Medium</b>

## 8 Implementation and review

The implementation of the *McEwens Beach Local Coastal Plan* will occur on a prioritised basis as resources become available. In addition to council's Natural Environment staff and Natural Environment Levy funding, multiple external sources for funding and resources to assist in the implementation of the Local Coastal Plan exist. These include:

- Federal Government grant opportunities.
- State Government grant opportunities.
- Corporate grant opportunities.
- Regional Natural Resource Management (NRM) group (Reef Catchments Mackay Whitsunday Isaac) partnerships.
- Specialist organisations with interest in the Reserve (such as the Mackay and District Turtle Watch Association, Birdlife Mackay, and Queensland Wader Study Group).
- Local community groups.
- Local community volunteers as part of the Coastcare program.

A formal review of the *McEwens Beach Local Coastal Plan* should take place every five years as feasible. However, council may seek to update the Plan at any stage based on the results of monitoring programs, and in line with further protecting the natural environment values of the area.





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# 10 Appendices

## APPENDIX 1: Clarke Connors Range Fire Management Guidelines

# The Clarke Connors Range b u s h f i r e c o n s o r t i u m

The Clarke Connors Range Bushfire Consortium is a Reef Catchments initiative with funding support from the Australian Governments Caring for Our Country and Queensland Governments Blueprint for the Bush.

# FIRE MANAGEMENT GUIDELINES



# Introduction

## Reef Catchments and the Clarke Connors Range Bushfire Consortium

Reef Catchments is a community based, not-for-profit organization that has a proven track record in advancing natural resource management in the Mackay-Whitsunday Region. Reef Catchments works seamlessly across the private and all levels of the public sectors to deliver the results where they matter. For more information and contact details visit the website [www.reefcatchments.com.au](http://www.reefcatchments.com.au)

The Bushfire Consortium was formed to begin reducing the threat of inappropriate fire on the outstanding natural and economic values of the Clarke-Connors Range on the Central Queensland coast. This area experiences an extremely variable climate and satellite imaging illustrates that numerous large and intense dry season wildfires have occurred over the last 10 years. The concern is that a drier and hotter climate may further increase the incidence of these fires with consequent environmental and economic impacts. Rural communities recognise the magnitude of these fires, and their effects on life, property, productivity, and the environment. However, the wider community has not had access to good information on appropriate fire management practices until now.

Reef Catchments, in partnership with Volunteer Rural Fire Brigades, Government and non-Government landholders, and the Queensland Fire and Rescue Service, has taken up the challenge of providing the best information available on fire management and planning in the region. These Fire Management Guidelines are the culmination of extensive discussions with experienced members of Volunteer Rural Fire Brigades and other respected fire managers and fire scientists.

The Clarke-Connors Range Bushfire Consortium is a Reef Catchments initiative with funding support from the Australian Governments Caring for Our Country and Queensland Governments Blueprint for the Bush.

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These Guidelines are one of the products of the Bushfire Consortium and are intended to be used by Volunteer Rural Fire Brigades and landholders who are on the front line in managing fire in rural communities. They are intended to be used to help land managers plan hazard reduction burning, and in undertaking planned burns for improved production and conservation outcomes.

### Using these guidelines

These Fire Management Guidelines have been developed for 12 landscape types in the Mackay Whitsunday region. These landscape types are composed of vegetation types that require similar fire prescriptions.

Four important factors to consider when planning for fire management are:

1. Fire Frequency - how often should an area be burnt;
2. Fire intensity - how hot does the fire need to be;
3. Season - what time of year will usually provide the desired conditions for a planned burn;
4. Burning mosaic - the percentage of ground cover remaining unburnt after a fire.

Other important factors to consider are fuel loads, wind speed, humidity, fuel curing, slope and aspect.

These guidelines are not intended to account for all circumstances. Seasonal, yearly and even daily conditions can vary dramatically. Plan ahead to carry out burns when conditions are suitable and always obtain and adhere to conditions of a permit from your fire warden.



**Green** - Under most circumstances the number of years between burns should fall within the GREEN range. This range is generally considered appropriate for fire hazard management, production and conservation outcomes.

**Orange** - Under some circumstances there may be a need for more or less frequent fire but this should fall within the ORANGE range. Generally, this would occur as a 'one off' e.g. two fires in 3 years to reduce a lantana infestation.

**Red** - Generally, it would be considered undesirable for fire frequency to fall within the RED range. For example these long periods of time between fires would result in undesired vegetation thickening and loss of pasture productivity.

**Note. Defining frequency by 'Years' can be misleading e.g. in times of drought or particularly high rainfall. Some fire managers prefer using 'average years.' (defined by having received +/- 20% of the local average annual rainfall by May).**

**Green** - Under most circumstances the desired conditions will be available within the GREEN range of months.

**Orange** - Desired fire conditions will sometimes fall within the ORANGE range of months and/or the specific requirements for a particular burn will differ in a particular circumstance e.g. Storm burning requires relatively high soil moisture.

**Red** - Under most circumstances, conditions within the RED range of months would result in damaging fire and/or fire that is difficult to control.

Patchy fuels produced by mosaic burns can be very effective in reducing the intensity and spread of wildfire without risking the complete loss of pasture grasses, loss of soil and nutrients, weed infestations or environmental damage that sometimes result from complete removal of the ground layer from large areas.

Different fire intensities perform different land management tasks as described within the guidelines.

**LOW** intensity fire is < 1m in height.

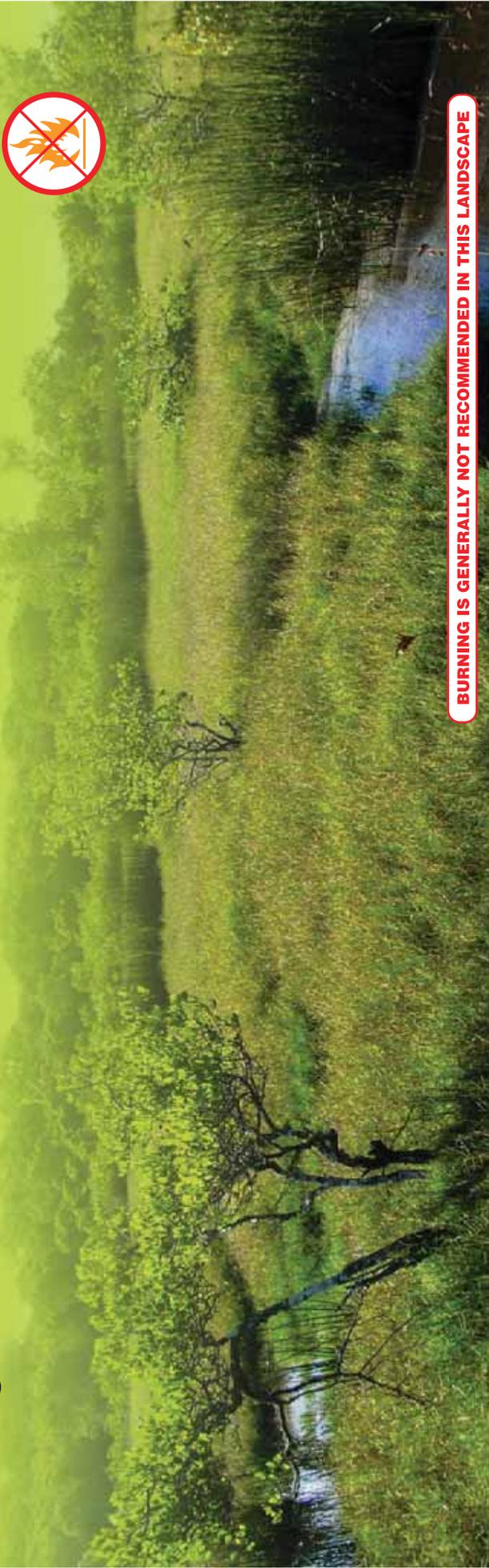
**MODERATE** intensity fire is < 2m in height.

**HIGH** intensity fire is > 2m in height.

# Mangroves and Estuarine Wetlands

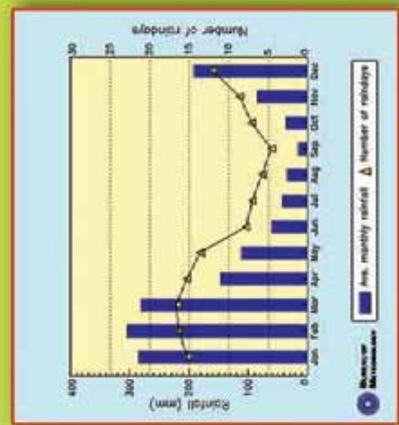
Fire Management Guidelines for Central Queensland Coast

## Landscape 1



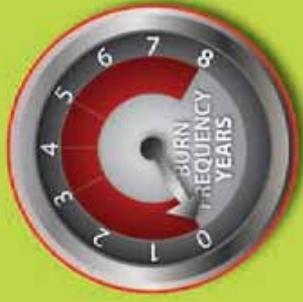
**BURNING IS GENERALLY NOT RECOMMENDED IN THIS LANDSCAPE**

Mangroves, saltmarsh, saltwater couch, areas of saltpan and fringing melaleuca forests and pandanus.



**BURNING MOSAIC - UNBURNT 100%**

**LOW MODERATE HIGH**  
FIRE INTENSITY - °C



The Clarke Connors Range  
b u s h f i r e c o n s o r t i u m

1

### Hazard Reduction

Saltmarsh and saltwater couch grasslands are regularly inundated by high tides which maintain high soil moisture and ensure continual green growth throughout the year. Because of this these areas rarely represent a fire hazard risk. Risk is further minimised by the fact that the grasslands rarely accumulate large amounts of fuels and tend to be broken up by patches of saline clay and sparse saltmarsh.

The native ground cover within fringing melaleuca woodland and forests is also saltwater couch and this does not represent a high fire hazard. However, in many areas Guinea grass and other exotic grasses have invaded and these can accumulate high fuel loads that pose a fire risk in the dry season. Guinea grass and many other exotic grasses tend to quickly increase their biomass after fire, often reaching a similar fuel load in as little as one season. The most effective long-term fire hazard reduction strategy is to remove these grasses using herbicide such as glyphosate.

### Production

Because of high salt levels in the soil, weed infestations are rarely a problem in saltwater couch grasslands and burning for weed control does not need to be undertaken. Saltwater couch is a perennial grass and pasture condition is strongly dependant on normal tidal cycles. Fire does

not improve productivity and indeed, fire can lead to loss of important nutrients. Saltmarsh and saltwater couch grasslands are an important food source, and refuge for juvenile fish. There is strong evidence that juvenile fish feed heavily in these areas on high tides. A decrease in biomass through removal by fire, or overgrazing, may have a significant impact on coastal fisheries production.

### Conservation

Apart from their values to coastal fisheries, mangroves, saltmarsh and saltwater couch grasslands provide essential habitat for a range of conservation dependant species. Minimising fire and other disturbance within these areas provides significant positive benefits for migratory and resident shorebirds, seabirds and the threatened mangrove mouse.



The Clarke Connors Range  
b u s h f i r e c o n s o r t i u m

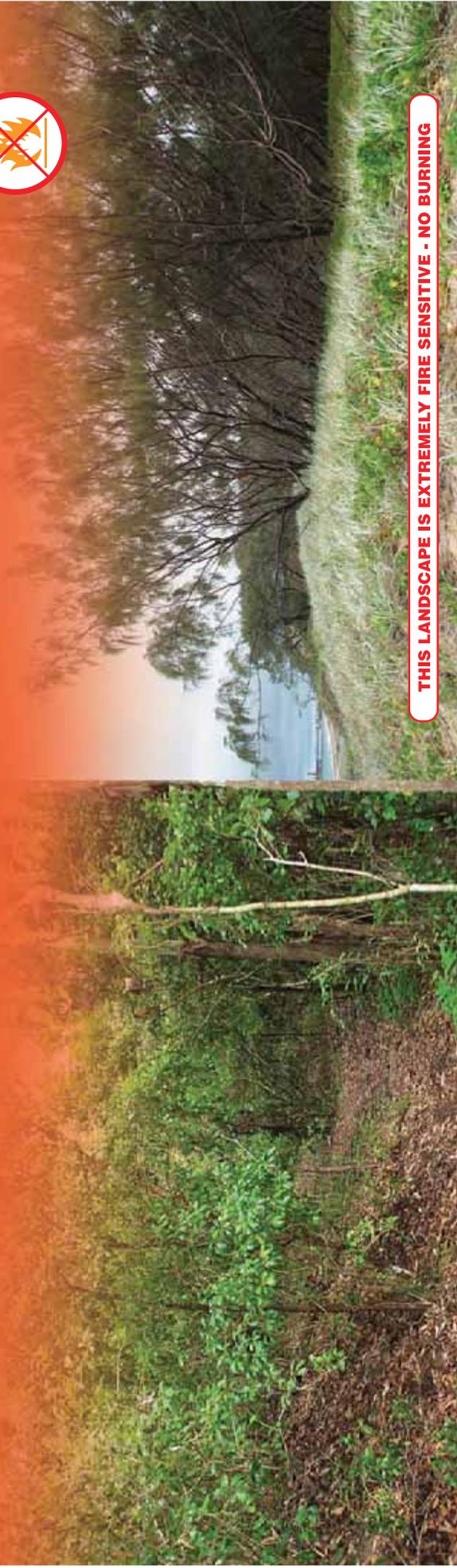
2

# Beaches and foreshores

Fire Management Guidelines for Central Queensland Coast

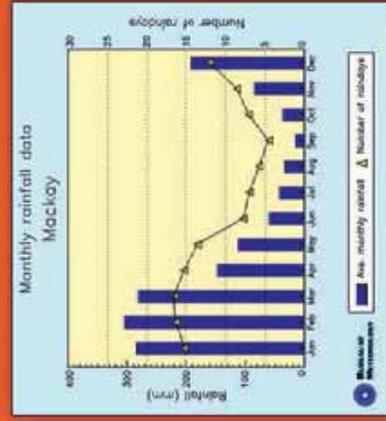
## Beaches and foreshores

### Landscape 2



**THIS LANDSCAPE IS EXTREMELY FIRE SENSITIVE - NO BURNING**

Coastal she-oak & beach scrub (rainforest) in protected areas.



The Clarke Connors Range  
bushfire consortium

3

### **Hazard Reduction**

Coast she-oak and beach scrub habitats are fire sensitive and will be killed or severely degraded by even low intensity fire.

The native ground cover within beach scrubs and coastal foreshores does not accumulate large amounts of fuel and does not represent a high fire hazard. However, infestations of exotic grasses and weeds can significantly increase hazardous fuels, especially along disturbed edges of this landscape.

Hazard reduction burning is generally not suitable in coastal areas as Guinea grass and other fire loving grasses quickly increase their biomass after fire, often reaching a similar fuel load in as little as one season.

An effective long-term strategy is the use of registered herbicide to reduce fuel hazards where required. Apply when grasses are actively growing, preferably prior to dry season. .

### **Production**

Many remaining areas of beach scrub are islands in a sea of cleared land, and much remaining foreshore vegetation is the only buffer between the land and the sea.

Undisturbed foreshores and beach scrubs are fairly resistant to weed invasions, however smaller patches and disturbed areas are more prone to weed invasions and associated fire risk.

Disturbance caused by stock trampling and the presence of feral pigs can encourage spread of lantana and other

weeds into otherwise intact areas. Management of stock access and provision of shade and watering points away from beach scrub and foreshores will reduce the impacts of disturbance in the long term.

Reducing weed impacts by means other than fire around buffers and in degraded areas will protect, and facilitate recovery of, these sensitive coastal areas.

### **Conservation**

Fire is a key threat to remaining areas of beach scrub (rainforest on sand dunes) - a critically endangered ecological community under the National Environment Protection and Biodiversity Conservation Act (1999). Beach scrubs and foreshores are key habitats for many rare and threatened plants and animals and migratory birds. Foreshores are breeding sites for marine turtles and shorebirds such as the beach stone-curlew (pictured above).

Disturbance of these habitats, commonly due to arson; clearing/mowing of undergrowth; stock trampling; 4WD and pedestrian tracks, leads to weed invasions and increased fire risk. Weed management, rather than fire management, should be used to protect and rehabilitate remaining areas.

Very careful use of fire in adjacent fire prone landscapes is required; check that there is little to no scorch into beach scrubs and foreshores as an indicator of successful fire management.



# Hind Dunes

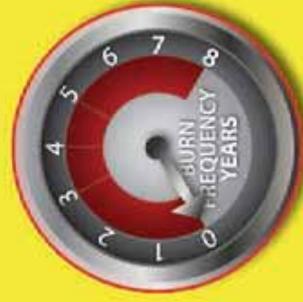
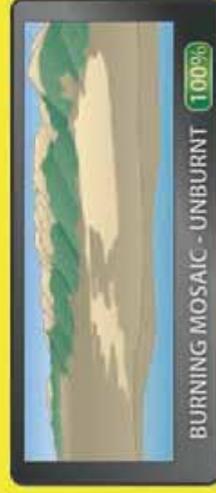
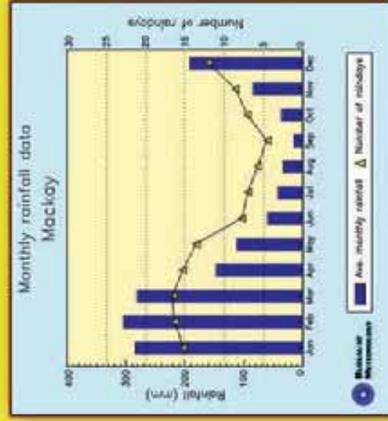
## Landscape 3

Fire Management Guidelines for Central Queensland Coast

## Landscape 3



**M**ixed vegetation on hind dunes (behind main beach and foreshore areas) including; Moreton Bay ash, acacia, coastal banksia, paperbarks, bloodwoods, bloodwoods, black she-oak, peppermint and stringy barks & grasslands on sand dunes



The Clarke Connors Range  
bushfire consortium

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### **Hazard Reduction**

Burning is not generally recommended in coastal dune systems and adjacent buffer zone unless for rehabilitation or protection purposes in special circumstances.

Exotic grass infestations such as Guinea grass are common along the edges of coastal dune vegetation. Many introduced grass are favoured by disturbance and rapidly re-grow after fire, often accumulating similar fuel loads in as little as one season.

Landowners in some built up areas may desire protection burning to reduce hazards. Fire should only be used to gain initial control of weedy areas as part of a long term weed management strategy. Burn with low intensity fire; ensure good soil moisture is present (e.g. after 50mm of rain) no more than once every 3-5 years. Avoid regular or repeated burning and do not burn in dry conditions when risk is high.

Management of exotic grasses and other weeds is best achieved by using a registered herbicide when the plant is actively growing. Guinea grass is easily killed after fire with minimal herbicide use.

### **Production**

Clearing and introduction of exotic pasture species coupled with impacts of stock can severely impact on fragile dune systems. Exotic species can out-compete natives in disturbed areas and alter natural fire regimes

Open dune grasslands supporting native grasses such as black spear grass would tolerate a low intensity fire every 3-7 years. Planned burns should only be conducted when rapid

regeneration of the grassy layer is expected; burn with good soil moisture and where there is a good chance of follow up rain. Avoid regular or repeated burning as loss of groundcover and soil nutrients will encourage weeds and less favourable grasses.

Disturbance of ground layer leads to weed invasions and loss of native grasses. Minimise disturbance from stock trampling and manage weeds using other methods than fire.

### **Conservation**

Lack of knowledge of this ecosystem and its need for fire is a major obstacle to effective fire management. In general, fire should only be applied for regeneration of native grasses and canopy trees and responses carefully monitored.

Fire management could be trialled in areas supporting a native grass ground layer. A low intensity fire no more than once every 3-7 years with good soil moisture is advised. Indicators of successful fire management include: germination of canopy tree species; maintaining native grass density; fauna abundance; and reducing exotic grass dominance.

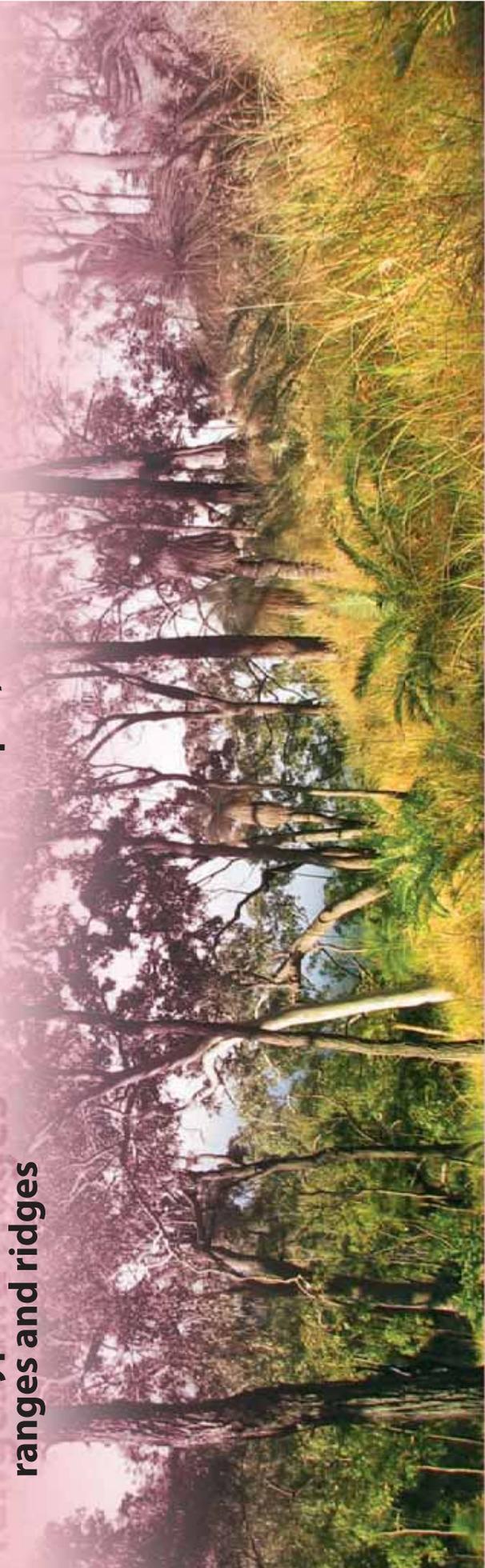
Many areas supporting beach scrub pioneer species in the understorey will naturally revert to beach scrub; actively exclude fire from these areas.

Coastal landscapes support a diverse range of plants and animals and their habitats are vulnerable to disturbance. Reducing disturbance and managing weeds rather than fire will protect coastal habitats and wildlife such as the orange footed scrub fowl (pictured above).

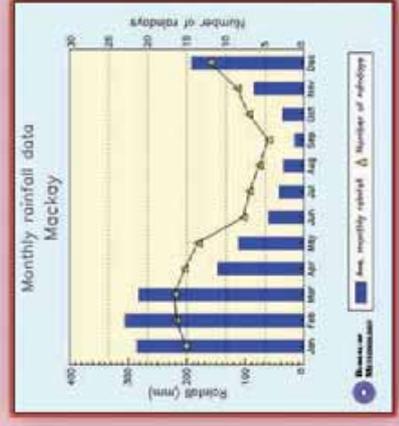


**Landscapes 9**

**Eucalypt forest and woodlands on hill slopes, ranges and ridges**



**V**ariable woodlands to open forests of ironbark, Moreton Bay ash, bloodwoods, poplar gum, blue gum, yellow stringybark, brushbox, white mahogany, lemon scented gum, depending on altitude and exposure.



The Clarke Connors Range  
b u s h f i r e c o n s o r t i u m

### Hazard Reduction

Fire intensity, and therefore risk, increases as the dry season progresses when fuel and soil moisture is low. Conversely, fires in the early dry and wet seasons are usually of lower intensity and more patchy.

Guinea grass and other fire-favoured introduced grasses rapidly colonise burned or otherwise disturbed areas, often reaching very high fuel loads in as little as one season. Because of its superior adaptation to fire, guinea grass will out-compete native and desirable species if burnt too regularly or in dry conditions, and spread into new sites.

To reduce the severity of wildfires and the threat they pose to life and property:

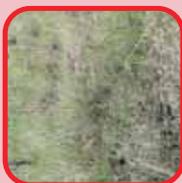
- Coordinate controlled burns with neighbours to manage fuel hazards and maintain a mosaic of different ages of vegetation in the landscape;
- Aim to burn 20-40% of a patch or property in a year. Remaining grassy patches can be re-lit or sprayed in protection zones post-fire;
- Vary the timing and frequency of burning & burn with good soil moisture. Burning is generally not advised between September & December unless after rain with a high chance of follow up rain;
- Observe response of vegetation and fuel load accumulation and adapt management if needed;
- Construct and maintain strategic fire breaks in populated areas or 'hot spots', potentially across several properties.



1000 kg / ha



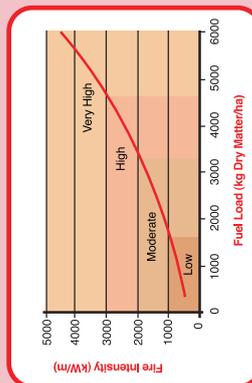
2000 kg / ha



3000 kg / ha



4000 kg / ha



Fuel Load  
(kg Dry Matter/ha)

thicker regrowth may increase with longer intervals.

For effective control of woody regrowth and dense shrub layer the undergrowth, fuel loads of at least 1,500 kg/ha are required. Tree and shrubs below approximately 2m high will be suppressed with a moderate intensity fire; however control of regrowth greater than 2m will be difficult as greater fuel loads are required and most eucalypts will re-sprout after fire.

Care must be taken to protect adjacent rainforest and creek edges from hot fires. Igniting along rainforest edges and allowing fire to burn downhill will reduce intensity and resulting damage to fire sensitive vegetation.

Country may need to be de-stocked prior to a burn to allow fuels to accumulate. Wet season spelling after fire will promote native grasses and diversity in ground cover.

### Conservation

Planned burning in this landscape should aim to promote patchy fires to ensure a mosaic of different vegetation types and time since fire across the landscape. Rangelands are prone to widespread intense fires in the dry season which is a key threat to biodiversity.

Fire too regularly leads to a loss of vegetation cover and directly threatens yellow-bellied glider, rufous owl and glossy back cockatoo habitat and the mature hollow bearing eucalypts they depend on. Rocky outcrops in the forest are essential habitat for the endangered northern quoll. Do not burn between mid-September and mid-December when juvenile quolls are most vulnerable to fire.

In potential or known quoll habitat, small scale patch burns of 17ha or less are best - burn with good soil moisture or just after the wet season when the ground, leaf litter & vegetation are still very wet. Burn around every 5-7 years and leave some areas unburnt for 7 years or longer, especially in years after a hot fire has occurred. Controlling weeds (especially lantana), woody regrowth and rainforest invasion is a major focus of planned burning in most areas. Dense areas of lantana may require well planned hotter fires to reduce infestations. Frost or herbicide spray before a burn can cure fuels and give better control.



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bushfire consultancy

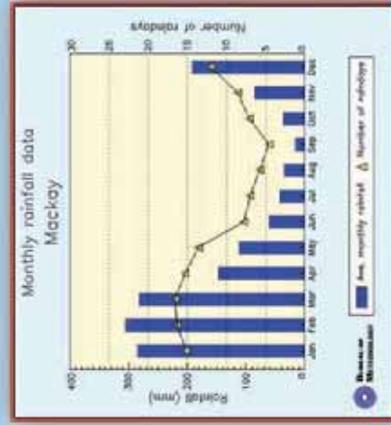
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## Landscape 12

# Island and rocky headland landscapes



**G**rassy headlands to acacia and brushbox and ironbark forest-shrubland, blue gum and poplar gum woodlands (including hybrids), Moreton Bay ash and blue gum woodland with a dense understorey of vine forest species.



The Clarke Connors Range  
b u s h f i r e c o n s o r t i u m

### Hazard Reduction

Island woodlands and coastal headlands can be infested with introduced grasses and lantana which promote hotter fire are rapidly regrow after fire. In general, it is the more disturbed areas impacted by weeds. Disturbance can be from repeated fires in the past.

Control of weeds and exotic grasses by means other than fire may be preferred in areas surrounding campgrounds, island leases and picnic areas.

Where hazard reduction burning is required, fuel loads of 1500kg/ha are adequate to ensure fire intensity is low to moderate. Greater fuel loads will increase fire intensity and the chance of fire spreading.

On the mainland, four wheel drive tracks and other areas of high visitation are a conduit for introducing weeds which can pose a fire risk to surrounding areas.

### Conservation

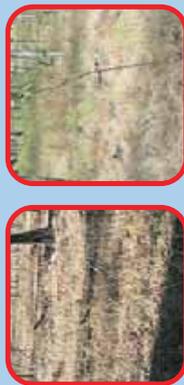
Some areas of open grassland are being invaded by woodland or vine forest pioneers whilst other areas remain as open grasslands. Research is needed to determine the role of fire in maintaining vegetation types to determine optimum fire regimes.

Dense thickets of swizzle bush (Timonius timon) are replacing grasslands in some areas. Swizzle bush flowers and fruits between July & November, and could be set back if burnt at during this time. Hotter fires may be needed to reduce woody vegetation and maintain an open canopy, requiring

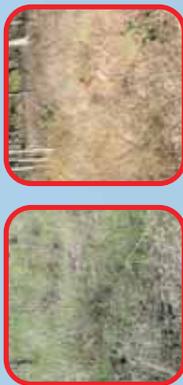
fuel loads of 2000-3000 kg/ha.

Maintain extent and area of grasslands, where they remain by trialling burning every 2-3 years with a low-moderate intensity fire; retain at least 50% unburnt. Monitor vegetation and adapt management depending on response to fire regime.

Lantana can be managed by fire in the same way as other woody vegetation. Suitable fuel loads must be available, between 2000-3000 kg/ha, to reduce infestations. Slow burning moderate intensity fire can suppress lantana as it damages the root and lower stem zone.



1000 kg / ha



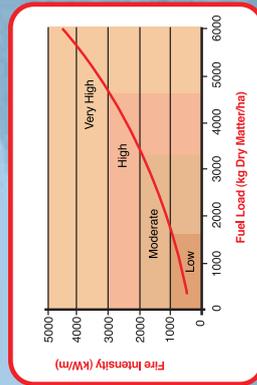
3000 kg / ha



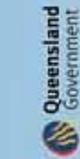
2000 kg / ha



4000 kg / ha



Fuel Load (kg Dry Matter/ha)



## APPENDIX 2: Regional Ecosystem (RE) descriptions as found on council managed land within the coastal unit

**RE 8.1.1** describes the mangrove communities that are established on the southern end of Walz Avenue and northern end of McEwens Beach. This ecosystem is clearly distinguished by its dominance of mangrove tree and shrub species (EPA 2004), which thrive in the muddy, saline, intertidal areas, common to the estuary and can form different compositional communities depending on their position in relation to tidal channels and frequency and abundance of freshwater flushes. This mangrove vegetation is exposed to marine debris, disturbance due to alteration of adjacent ecosystems (e.g. seawall) and stormwater runoff. Recreation activities such as fishing/crabbing also influence the health of this ecosystem. While offshore vegetation is not within council land tenure, it is important to consider the influence of onshore activities. Appropriate management of recreational access and improved stormwater management practices will assist in protecting these offshore ecosystems. Interpretive signage would assist in the prevention of illegal waste dumping experienced in adjacent vegetation. Generally, this ecosystem is resilient to weed invasion due to its saline growing conditions however lantana (*Lantana camara*) occasionally encroaches in less saline areas. Depending on their position in relation to tidal channels and the amount of freshwater received; the mangroves can form a variety of different compositional communities. At the seaward edge RE 8.1.1 *Rhizophora* species dominate, whereas white mangrove (*Avicennia marina*), blind your eye mangrove (*Excoecaria agallocha*), puzzle nut mangrove (*Xylocarpus moluccensis*), black mangrove (*Lumnitzera racemosa*), yellow mangrove (*Ceriops tagal*), myrtle mangrove (*Osbornia octodonta*) and other predominant species (*Bruguiera* and *Rhizophora* species) are more likely to occur on the landward side. Mangrove communities are vital breeding grounds for a diverse range of species including invertebrates, crocodiles and reef fish species and are therefore both culturally and biotically significant ecosystems. Mangroves are highly fire sensitive and therefore can be put at risk when flammable vegetation such as grassy weed infestations are present in adjacent areas. Fire Management Guidelines for Regional Ecosystems within the McEwens Beach coastal unit area can be found within the *Clarke Connors Ranges Fire Management Guidelines* (Reef Catchments 2009).

**RE 8.1.2** co-colonises the established mangrove systems associated with RE 8.1.1 in both the northern and southern estuarine wetlands. Individual pockets of this vegetation occur throughout the wetlands adjacent to mangroves with soils consisting of marine sediment. Forblands at McEwens Beach contain characteristic succulent saline-adapted herbaceous species. This vegetation can cope with salt accumulation at the soil surface from evaporation of sea water, which inundates these areas during the higher tides. With regards to fire management, RE 8.1.2 is typically inflammable but it often merges with the fire supporting saltwater couch grassland.

**RE 8.1.5** describes the low open woodland to open forest ecosystems associated with REs 8.1.1 and 8.1.2 in the southern estuarine wetlands at the mouth of Johns Creek at McEwens Beach. The canopy is usually dominated by *Melaleuca* spp. and/or *Eucalyptus tereticornis* and/or *Corymbia tessellaris* and *Acacia* spp. such as *A. leptocarpa* and *A. holosericea* may be present. Mangrove species may be interspersed in clumps,

and some sites have a sparse (to isolated plants) secondary tree or shrub layer consisting of one or several of *Pandanus* spp., *Myoporum acuminatum*, *Clerodendrum inerme*, *Gahnia sieberiana*, *Phragmites australis*, *Banksia* spp. The ground layer which is often interspersed with large bare areas of saline silts is often a narrow zone adjacent to tidal ecosystems and is most often dominated by salt tolerant grasses and sedges such as *Sporobolus virginicus*, *Baumea juncea* or *Acrostichum speciosum*. Other associated ground layer species include *Imperata cylindrica*, *Phragmites* spp., *Eriochloa procera*, *Gymnanthera oblonga*, *Juncus kraussii*, *Ceratopteris thalictroides* and *Cyperus javanicus*. This ecosystem occurs over broader low-lying, tidally influenced plains, and is important habitat for the threatened fauna species mangrove mouse (*Xeromys myoides*). Weed invasion is often a problem, especially lantana, leucaena (*Leucaena leucocephala*), Guinea grass (*Megathyrsus maximus*), *Dichanthium annulatum*, and hymenachne (*Hymenachne amplexicaulis*). Other common weeds include stinking passionflower (*Passiflora foetida*), corky passion vine (*Passiflora suberosa*), *P. pallida*, and sensitive weed (*Mimosa pudica*). This ecosystem is relatively fire tolerant and intense fire is unlikely with naturally restricted fuel accumulation; however, in areas containing weed infestation, particularly involving Guinea grass intense fires are possible and could cause damage to the habitat trees.

**RE 8.2.1** describes *Casuarina equisetifolia* woodland and/or sparse hermland to open scrub on foredunes and beaches and is easily recognisable along the foredunes in the north and south of McEwens Beach where it coexists with RE 8.2.6a. It is predominantly distributed along the foredunes and typically comprised of species such as coastal she-oak (*Casuarina equisetifolia* subsp. *incana*) and ground cover species such as beach spinifex (*Spinifex sericeus*), beach bean (*Canavalia rosea*), goats foot (*Ipomoea pes-caprae*) and birds beak grass (*Thuarea involuta*). Common species in the canopy or lower tree and shrub layers include: tulip tree (*Thespesia populnea*), silver bean (*Sophora tomentosa*), beach pandan (*Pandanus tectorius*), beach hibiscus (*Hibiscus* sp.), soapy ash (*Alphitonia excelsa*), flintwood (*Geijera salicifolia*) and gray nicker nut (*Caesalpinia bonduc*). Shrub layers often include: coastal vitex (*Vitex trifolia*), coastal lollybush (*Clerodendron inerme*), tuckeroo (*Cupaniopsis anacardioides*), forest indigo (*Indigofera pratensis*), beach berry bush (*Colubrina asiatica*), and octopus bush (*Argusia argentea*). Vegetation within this community is usually zoned according to tidal inundation/ exposure with the herbaceous communities closest to the sea and the open forest to woodland communities furthest landward. Disturbance can result in erosion and weed invasion, where problematic weeds include: Mossman River grass (*Cenchrus echinatus*), red natal grass (*Melinis repens*), lantana, tridax daisy (*Tridax procumbens*), prickly starwort (*Salsola australis*), Guinea grass, pink periwinkle (*Catharanthus roseus*) and prickly pear (*Opuntia stricta*). Species within this RE are fire sensitive and the removal of ground layer vegetation often results in infestation of pest species such as Guinea grass, red natal grass (*Melinis repens*) and other weed species, which intensify fire risk.

**8.2.6a** describes *Corymbia tessellaris* open forest to low woodland. RE 8.2.6a is recognisable as a very sparse to mid-

**APPENDIX 2:** Regional Ecosystem (RE) descriptions as found on council managed land within the coastal unit

dense sub-canopy tree layer, with species typically comprising of northern coast wattle (*Acacia leptocarpa*), coastal banksia (*Banksia integrifolia subsp. compar*), cocky apple (*Planchonia careya*) and screw pine (*Pandanus tectorius*). Processes such as clearing for coastal development and disturbance by recreational users have reduced the quality of this ecosystem. The fire management strategy discourages deliberate burning of beach ridge communities that have a component of littoral vine forest. Instead adjacent burns to fire adapted ecosystems under conditions where fire will not penetrate beach ridge communities is recommended. Infestations of exotic grass such as Guinea grass need to be addressed immediately as they increase fire risk. Weed control will reduce weed competition and reduce fuel loads in the area. Problematic weeds include lantana (*Lantana camara*), tridax daisy, Guinea grass, corky passionflower, Chinese burr (*Triumfetta rhomboidea*), blue couch (*Digitaria didactyla*) and stylo (*Stylosanthes humilis*).

### APPENDIX 3: Coastal revegetation principles

Encouraging the natural regeneration of native species is the best method for restoration of an area. For this to occur a viable seed bank must be present, and re-growth must include all native plant species from each stratum level. In areas where natural regeneration is to occur, the area should be clearly marked to exclude public access. In these areas, ongoing maintenance is required to minimise re-growth of weed species. However, the planting of local native vegetation (revegetation) is sometimes required due to insufficient cover or regrowth of native species.

#### Revegetation techniques

Revegetation in natural areas aims to reinstate Regional Ecosystems communities as described by Queensland Herbarium (Regional Ecosystem Description Database). In disturbed areas, pre-clearing mapping is available to inform what Regional Ecosystems were present prior to vegetation clearing.

Suggested techniques for coastal revegetation in the Mackay Regional Council area include:

- Local native species for planting should be sourced from within the Sarina Proserpine lowlands Subregion of the Central Queensland Coast Bioregion.
- Site preparation, such as weed control, should be carried out prior to planting.
- Depending on the site-specific circumstances coastal plantings may benefit from the use of mulch, weed mats, stakes, and/or tree guards.
- Tubestock planted in sandy soils will benefit from the addition of a wetting agent and fertiliser at the time of planting (eg. Terracottem).
- Ongoing maintenance of the site is required.

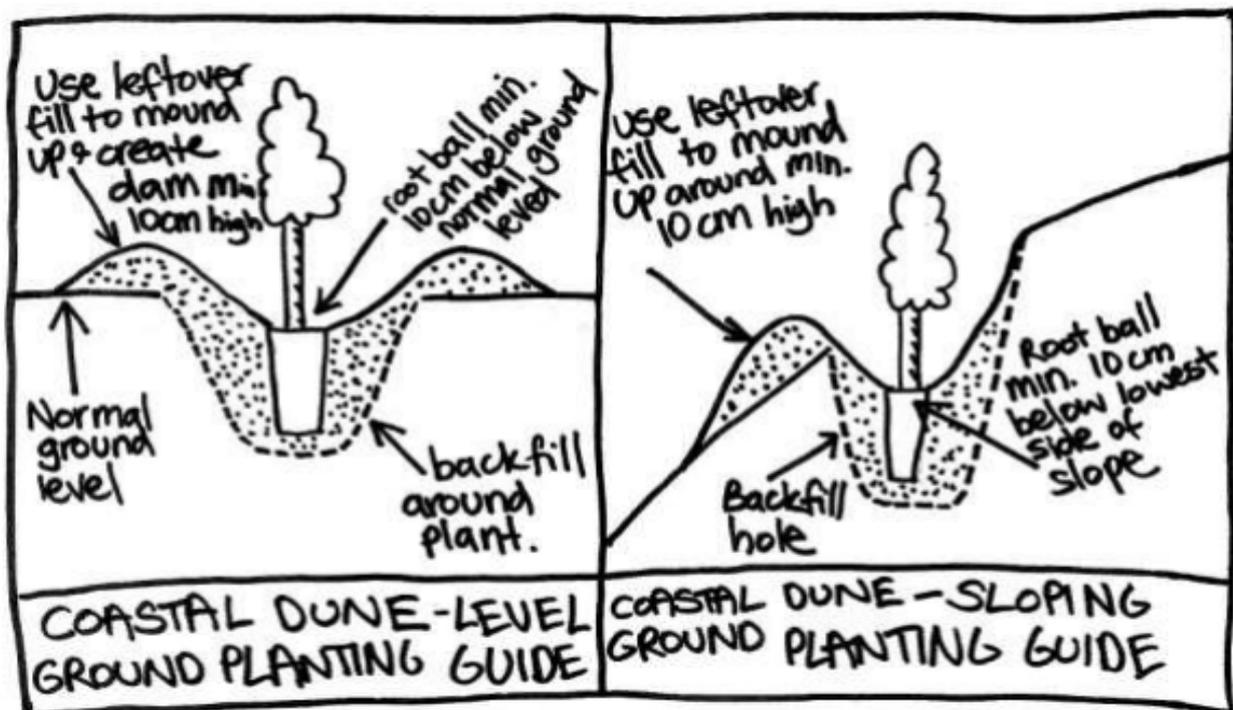


Figure 1: Coastal dune planting guide.

**APPENDIX 4\*:** Generic list of recommended species for coastal revegetation in the Mackay Region

\* Local experts will be consulted for specific advice regarding unique vegetation communities, where appropriate.

Species name	Common name	Habit	Regional Ecosystem
<i>Acacia leptocarpa</i>	north coast wattle, slender fruited wattle	Tree	8.2.6
<i>Acacia oraria</i>	coast wattle	Tree	8.2.2; 8.2.6
<i>Acronychia laevis</i>	hard aspen, glossy acronychia, yellow wood	Tree	8.2.2
<i>Alphitonia excelsa</i>	red ash, soapy ash	Tree	8.2.1; 8.2.6
<i>Argusia argentea</i>	octopus bush	Tree	8.2.1
<i>Banksia integrifolia</i> subsp. <i>compar</i>	coastal banksia	Tree	8.2.6
<i>Calophyllum inophyllum</i>	beauty leaf, beach calophyllum, ball nut	Tree	8.2.1
<i>Canavalia rosea</i>	beach bean	Groundcover	8.2.1
<i>Capparis lucida</i>	coastal caper	Tree	8.2.1; 8.2.2
<i>Casuarina equisetifolia</i>	coastal she-oak	Tree	8.2.1
<i>Chionanthus ramiflorus</i>	native olive	Tree	8.2.2; 8.2.6
<i>Clerodendrum floribundum</i>	lolly bush	Tree	8.2.2; 8.2.6
<i>Clerodendrum inerme</i>	coastal lollybush	Shrub	8.2.1
<i>Corymbia tessellaris</i>	Morton Bay ash	Tree	8.2.6
<i>Crinum pedunculatum</i>	river lily, swamp lily	Herb	8.2.1
<i>Crotalaria mitchellii</i>	sand rattlepod	Herb	8.2.9
<i>Cupaniopsis anacardioides</i>	tuckeroo	Tree	8.2.1; 8.2.2; 8.2.6
<i>Cymbopogon refractus</i>	barbed wire grass	Grass	8.2.9
<i>Cyperus pedunculatus</i>	pineapple sedge	Sedge	8.2.1; 8.2.9
<i>Dianella caerulea</i>	blue flax lily	Herb	8.2.6; 8.2.9
<i>Dianella longifolia</i>	smooth flax lily	Herb	8.2.6a; 8.2.9
<i>Diospyros geminata</i>	scaly ebony	Tree	8.2.2; 8.2.6
<i>Dodonaea viscosa</i> subsp. <i>viscosa</i>	sticky hop bush	Shrub	8.2.1
<i>Drypetes deplanchei</i>	yellow tulip	Tree	8.2.2
<i>Eragrostis interrupta</i>	coastal love grass	Grass	8.2.6; 8.2.9
<i>Eriachne triodioides</i>	wanderrie grass	Grass	8.2.6; 8.2.9
<i>Eugenia reinwardtiana</i>	beach cherry	Shrub	8.2.2
<i>Euroschinus falcatus</i>	ribbonwood	Tree	8.2.2; 8.2.6
<i>Eustrephus latifolius</i>	wombat berry	Climber	8.2.2; 8.2.6
<i>Ganophyllum falcatum</i>	scaly ash	Tree	8.2.2; 8.2.6
<i>Geitonoplesium cymosum</i>	scrambling lily	Climber	8.2.2; 8.2.6
<i>Heteropogon triticeus</i>	giant spear grass	Grass	8.2.2; 8.2.9
<i>Hibbertia scandens</i>	golden Guinea flower, snake vine	Climber/groundcover	8.2.1
<i>Hibiscus heterophyllus</i>	native hibiscus	Shrub	8.2.6
<i>Imperata cylindrica</i>	blady grass	Grass	8.2.6; 8.2.9
<i>Ipomoea pes-caprae</i>	goats foot convolvulus	Groundcover	8.2.1
<i>Jagera pseudorhus</i>	foam bark	Tree	8.2.6
<i>Jasminum didymium</i>	native jasmine	Climber/Shrub	8.2.2; 8.2.6
<i>Lomandra longifolia</i>	spiny-headed mat-rush	Herb	8.2.6
<i>Macaranga tanarius</i>	macaranga	Tree	8.2.2; 8.2.6
<i>Mallotus philippensis</i>	red kamala	Tree	8.2.2; 8.2.6
<i>Melia azedarach</i>	white cedar	Tree	8.2.6
<i>Mimusops elengi</i>	red coodoo	Tree	8.2.2

**APPENDIX 4:** Generic list of recommended species for coastal revegetation in the Mackay Region

Species name	Common name	Habit	Regional Ecosystem
<i>Morinda citrifolia</i>	giant morinda, cheese fruit, smelly cheese tree	Tree	8.2.1
<i>Pandanus tectorius</i>	beach pandan, coastal screw, pine pandanus	Tree	8.2.1; 8.2.6
<i>Pittosporum ferrugineum</i>	rusty pittosporum	Tree	8.2.1; 8.2.6
<i>Planchonia careya</i>	cocky apple	Tree	8.2.6
<i>Pleiogynium timorense</i>	Burdekin plum	Tree	8.2.2; 8.2.6
<i>Scaevola taccada</i>	sea lettuce	Shrub	8.2.1
<i>Sophora tomentosa</i>	silver bean	Shrub	8.2.1
<i>Spinifex sericeus</i>	beach spinifex	Grass	8.2.1
<i>Sporobolus virginicus</i>	marine couch	Groundcover	8.2.1
<i>Stephania japonica</i>	tape vine	Climber/groundcover	8.2.1; 8.2.2; 8.2.6
<i>Sterculia quadrifida</i>	peanut tree	Tree	8.2.2; 8.2.6
<i>Terminalia muelleri</i>	coast damson	Tree	8.2.1; 8.2.2; 8.2.6
<i>Themeda triandra</i>	kangaroo grass	Grass	8.2.6; 8.2.9
<i>Thespesia populnea</i>	tulip tree	Tree	8.2.1
<i>Thuarea involuta</i>	birds beak grass	Grass	8.2.1
<i>Vigna marina</i>	vigna	Groundcover	8.2.1
<i>Vitex rotundifolia</i>	creeping vitex, beach vitex	Groundcover	8.2.1
<i>Vitex trifolia</i>	coastal vitex, common blue vitex	Shrub	8.2.1
<i>Xerochrysum bracteatum</i>	golden everlasting daisy	Herb	8.2.9

**View sensitive native plant list**

Species name	Common name	Habit	Regional Ecosystem
<i>Acacia simsii</i>	Sim's wattle	Shrub	8.2.6
<i>Caesalpinia bonduc</i>	nicker nut	Climber	8.2.1
<i>Canavalia rosea</i>	beach bean	Groundcover	8.2.1
<i>Clerodendrum inerme</i>	coastal lollybush	Shrub	8.2.1
<i>Crinum pedunculatum</i>	river lily, swamp lily	Tufty	8.2.1
<i>Crotalaria mitchellii</i>	sand rattlepod	Herb	8.2.9
<i>Cymbopogon refractus</i>	barbed wire grass	Grass	8.2.9
<i>Cyperus pedunculatus</i>	pineapple sedge	Sedge	8.2.1; 8.2.9
<i>Dianella caerulea</i>	blue flax lily	Herb	8.2.6; 8.2.9
<i>Dianella longifolia</i>	smooth flax lily	Herb	8.2.6a; 8.2.9
<i>Dodonaea viscosa subsp. viscosa</i>	sticky hop bush	Shrub	8.2.1
<i>Eragrostis interrupta</i>	coastal love grass	Grass	8.2.6; 8.2.9
<i>Eriachne triodioides</i>	wanderrie grass	Grass	8.2.6; 8.2.9
<i>Eustrephus latifolius</i>	wombat berry	Climber	8.2.2; 8.2.6
<i>Geitonoplesium cymosum</i>	scrambling lily	Climber	8.2.2; 8.2.6
<i>Heteropogon triticeus</i>	giant spear grass	Grass	8.2.6; 8.2.9
<i>Hibbertia scandens</i>	golden Guinea flower, snake vine	Climber/groundcover	8.2.1
<i>Imperata cylindrica</i>	blady grass	Grass	8.2.6; 8.2.9
<i>Ipomoea pes-caprae</i>	goats foot convolvulus	Groundcover	8.2.1

**APPENDIX 4:** Generic list of recommended species for coastal revegetation in the Mackay Region

<i>Jasminum didymium</i>	native jasmine	Climber/shrub	8.2.2; 8.2.6
<i>Lomandra longifolia</i>	spiny-headed mat-rush	Herb	8.2.6
<i>Scaevola taccada</i>	sea lettuce	Shrub	8.2.1
<i>Sophora tomentosa</i>	silver bean	Shrub	8.2.1
<i>Spinifex sericeus</i>	beach spinifex	Grass	8.2.1
<i>Sporobolus virginicus</i>	marine couch	Groundcover	8.2.1
<i>Stephania japonica</i>	tape vine	Climber/groundcover	8.2.1; 8.2.2; 8.2.6
<i>Themeda triandra</i>	kangaroo grass	Grass	8.2.6; 8.2.9
<i>Thuarea involuta</i>	birds beak grass	Grass	8.2.1
<i>Vigna marina</i>	vigna	Groundcover	8.2.1
<i>Vitex rotundifolia</i>	creeping vitex, beach vitex	Groundcover	8.2.1
<i>Vitex trifolia</i>	coastal vitex, common blue vitex	Shrub	8.2.1
<i>Xerochrysum bracteatum</i>	golden everlasting daisy	Herb	8.2.9

**APPENDIX 5:** Weed control principles

Principles	Comments
Staged weed removal	<ul style="list-style-type: none"> <li>• Weed removal should be carried out in a staged approach.</li> <li>• Work outwards from intact remnants of coastal vegetation as a priority.</li> <li>• Particularly important in removal of non-native vegetation along the dune scarp.</li> <li>• Large woody weeds should be removed slowly to ensure the replaced native vegetation provides sufficient habitat value and protection against erosion before more removal of woody species.</li> </ul>
Physical weed removal	<ul style="list-style-type: none"> <li>• Physical weed removal, including hand pulling, chipping or cutting weeds is effective in small infestations in environmentally sensitive areas.</li> </ul>
Mechanical weed removal	<ul style="list-style-type: none"> <li>• Mowing or brush cutting will suppress weed growth, discourage seeding and spread.</li> <li>• This method should be used particularly in areas bordering large infestations.</li> <li>• Care should be taken to reduce potential disturbance as excessive mowing and brush cutting can facilitate further weed growth and reduce regeneration of native vegetation.</li> </ul>
Herbicide weed removal	<ul style="list-style-type: none"> <li>• The application of herbicides includes foliage or basal spraying, cut/ paste and stem injection where applicable.</li> <li>• Spraying may be carried out on large or robust weed infestation, particularly to gain initial control of an infestation. However the majority of spraying is likely to be small scale 'spot spray' applications to minimise non-target impacts.</li> <li>• Roundup Bi-active ® is recommended due to its low toxicity to wildlife and humans.</li> </ul>
Timing	<ul style="list-style-type: none"> <li>• Weed control on foredunes to occur between April and October only, to avoid turtle nesting season (November to March).</li> <li>• Weed control on hind dunes can occur at any time of the year depending on local weather conditions. Herbicide application is ineffective if carried out during rain periods, or once the plants have entered their non-active period during extended dry periods.</li> </ul>
Consideration of fire risk	<ul style="list-style-type: none"> <li>• Once treated, remaining dead woody weeds (such as Lantana) should be pulled away from native trees to reduce the fire risk to fire-sensitive coastal vegetation should 'accidental' fires occur. This woody, dry biomass serves as fuel for fires and by pulling it away from native trees it reduces the chances of fire reaching the canopy.</li> <li>• Mulching down of large, dense areas of dead woody weeds using brush cutters or hand tools, would similarly reduce fire risk and allow native plants a better chance at regeneration.</li> </ul>
Preventing re-infestations	<ul style="list-style-type: none"> <li>• Keep maintenance vehicles on the existing tracks where possible to reduce disturbance.</li> <li>• Clean maintenance vehicles before and after access to the site to prevent weed spread or introduction.</li> <li>• Monitor the success of weed control techniques and native regeneration following several wet seasons to assess whether revegetation might be needed in large areas of infestation.</li> </ul>

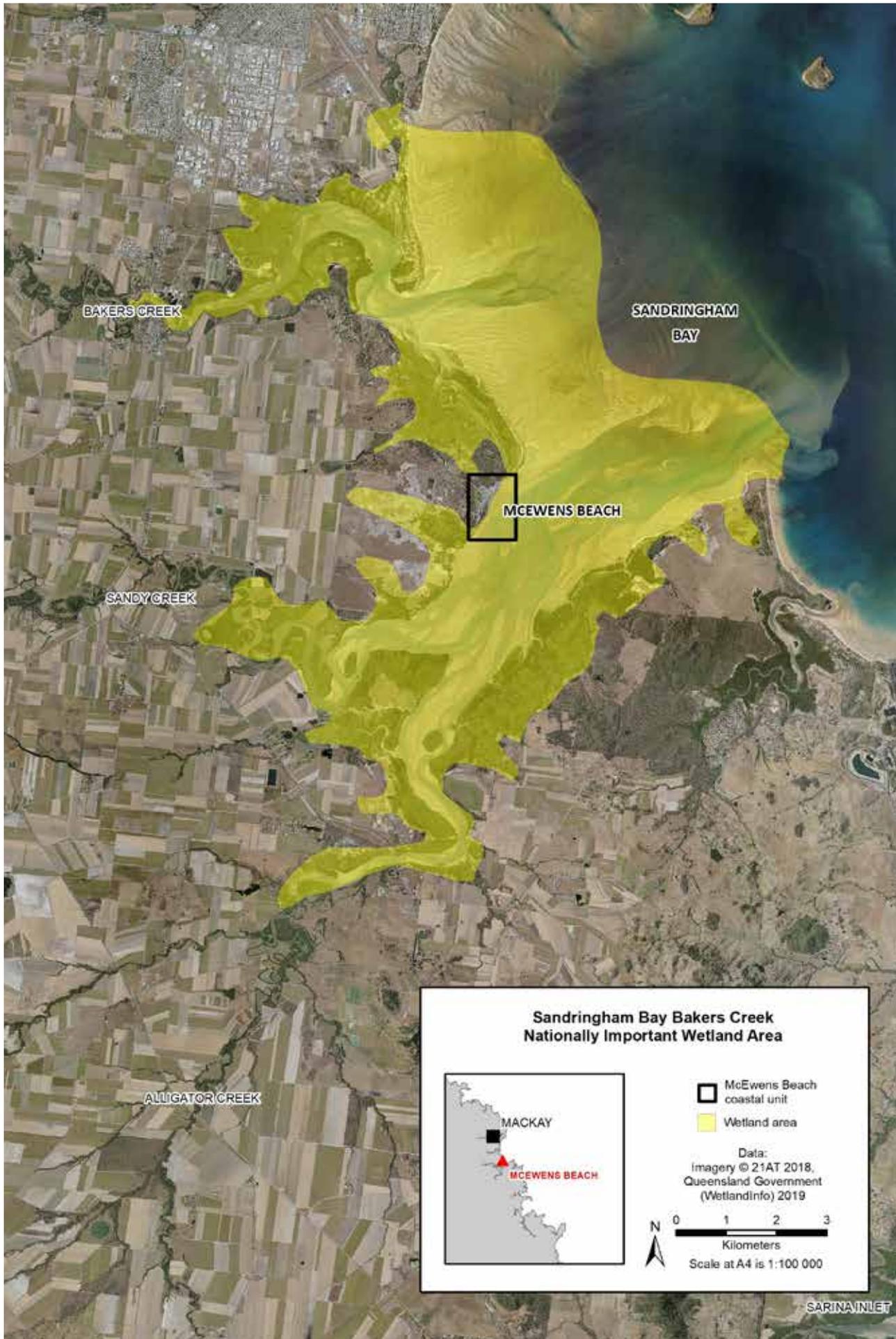
**APPENDIX 6: Main weed species found in coastal areas in the Mackay region**

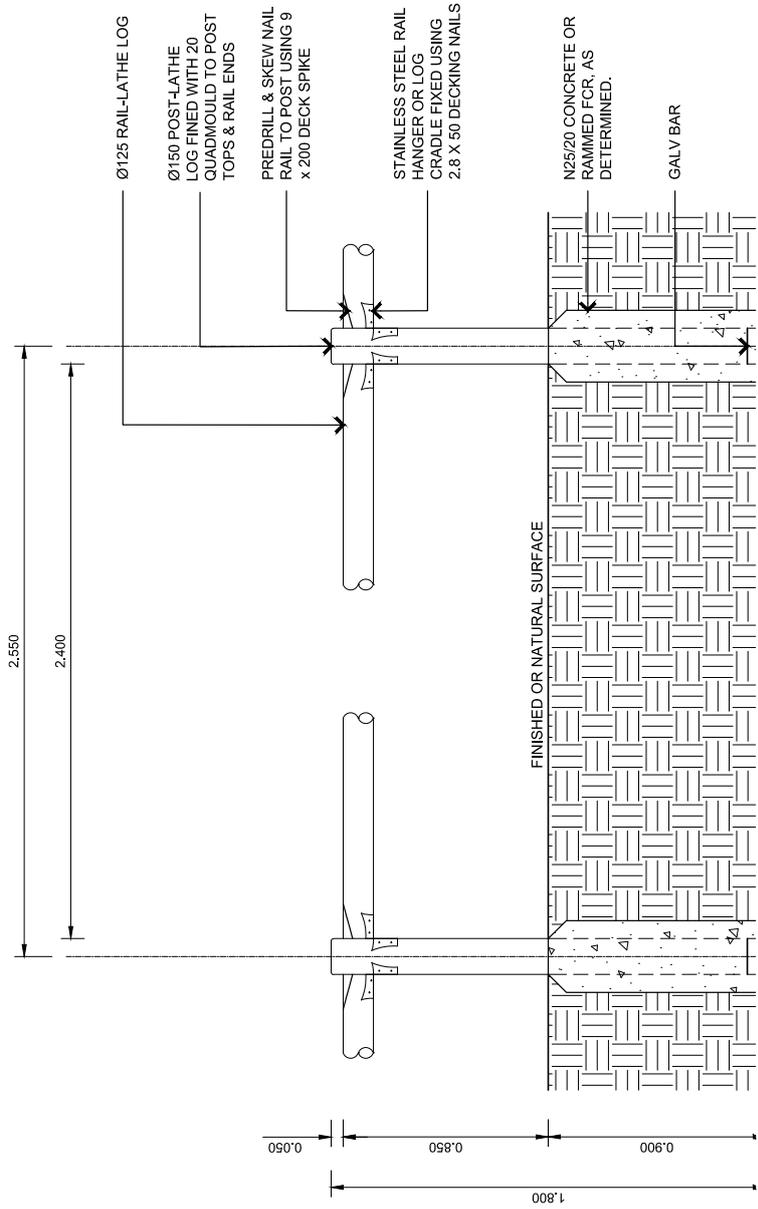
<b>Species Name</b>	<b>Common Name</b>	<b>Form</b>
<i>Agave sp.</i>	sisal hemp	Succulent
<i>Ageratum conyzoides subsp. conyzoides</i>	billy goat weed	Herb
<i>Alternanthera brasiliana</i>	red-leaved alternanthera	Herb
<i>Antigonon leptopus</i>	coral vine	Climber
<i>Aster subulatus</i>	wild aster, bushy starwort	Herb
<i>Bidens alba var. radiata</i>	cobbler's peg	Herb
<i>Bougainvillea sp.</i>	bougainvillea	Vine
<i>Bryophyllum sp.</i>	mother-of-millions	Shrub
<i>Bryophyllum delagonenses</i>	mother-of-millions hybrid	Shrub
<i>Callisia fragrans</i>	callisia	Herb
<i>Catharanthus roseus</i>	pink periwinkle	Herb
<i>Cenchrus echinatus</i>	Seaforth burr	Grass
<i>Cocus nucifera</i>	coconut palm	Tree
<i>Conyza canadensis var. pusilla</i>	fleabane	Herb
<i>Corymbia torelliana</i>	cadaji	Ree
<i>Crotalaria pallida</i>	rattlepod	Herb
<i>Dactyloctenium sp.</i>	button grass	Grass
<i>Delonix regia</i>	poinciana	Tree
<i>Dichantium annulatum</i>	sheda grass	Grass
<i>Digitaria didactyla</i>	blue couch	Grass
<i>Duranta erecta</i>	duranta	Shrub
<i>Eleusine indica</i>	crowsfoot grass	Grass
<i>Emilia sonchifolia</i>	emelia	Herb
<i>Euphorbia cyathophora</i>	painted spurge	Herb
<i>Hyparrhenia rufa</i>	thatch grass	Grass
<i>Ipomoea indica</i>	coastal morning glory	Herb
<i>Lantana camara</i>	lantana	Shrub or branched climber
<i>Leucaena leucocephala</i>	leucaena	Small tree
<i>Macroptilium atropurpureum</i>	siratro	Vine
<i>Megathyrsus maximus</i>	Guinea grass	Grass
<i>Melinis repens</i>	red natal grass	Grass
<i>Melinis minutiflora</i>	molasses grass	Grass
<i>Mimosa pudica</i>	sensitive weed	Herb
<i>Momordica charantia</i>	balsam pear	Vine
<i>Oenothera drummondii subsp. drummondii</i>	beach evening primrose	Herb
<i>Opuntia stricta</i>	common prickly pear	Succulent
<i>Opuntia monacantha</i>	drooping prickly pear	Succulent
<i>Passiflora foetida</i>	stinking passionfruit	Climber
<i>Passiflora suberosa</i>	corky passionfruit	Climber
<i>Persicaria perfoliata</i>	mile-a-minute	Vine
<i>Psidium guajava</i>	guava	Small tree
<i>Portulaca pilosa</i>	hairy pigweed	Succulent
<i>Ricinus communis</i>	castor oil plant	Sub-shrub
<i>Richardia brasiliensis</i>	Mexican clover	Herb

**APPENDIX 6:** Main weed species found in coastal areas in the Mackay region

<i>Species Name</i>	<b>Common Name</b>	<b>Form</b>
<i>Salsola australis</i>	prickly starwort	Succulent shrub
<i>Sansevieria trifasciata</i>	mother-in-laws toungue	Herb
<i>Senna pendula var. glabrata</i>	Easter cassia	Shrub or branched climber
<i>Sida cordifolia</i>	sida	Sub-shrub
<i>Solanum capsicoides</i>	devil's apple	Sub-shrub
<i>Solanum chrysotrichum</i>	devil's fig	Sub-shrub
<i>Solanum nigrum</i>	black nightshade	Sub-shrub
<i>Solanum seaforthianum</i>	Brazilian nightshade	Sub-shrub
<i>Sphagneticola trilobata</i>	Singapore daisy	Groundcover
<i>Stachytarpheta jamaicensis</i>	snake weed	Herb or sub-shrub
<i>Stylosanthes humilis</i>	stylo	Herb
<i>Themeda quadrivalvis</i>	grader grass	Grass
<i>Tradescantia spathacea</i>	Moses-in-a-cradle	Herb
<i>Tridax procumbens</i>	tridax daisy	Herb
<i>Triumfetta rhomboidea</i>	Chinese burr	Sub-shrub
<i>Urochloa decumbens</i>	signal grass	Grass
<i>Yucca aloifolia</i>	yucca	Succulent

**APPENDIX 7: Sandringham Bay Bakers Creek Nationally Important Wetland Area**





POST & RAIL DETAIL FOR THE BEACH ENVIRONMENT  
1:20

NOTES:

1. ALL DIMENSIONS IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. CONCRETE STRENGTH: N25/10.
3. ALL TIMBER SHALL BE H4 'TANALITH E' TREATED PINE LATHE LOGS IN ACCORDANCE WITH AS/NZ 1604.1:2000, OR APPROVED SIMILAR.
4. ALL STEEL COMPONENTS & FASTENERS TO BE HOT DIPPED GALVANISED MIN. COATING THICKNESS AS PER AS/NZ1214 AND AS/NZ 4680 UNLESS NOTED OTHERWISE.
5. FOR POST AND RAIL INSTALLATION WITHIN A BEACH ENVIRONMENT, THE MASS CONCRETE FOOTING IS TO BE DELETED AND THE POST EXTENDED INTO THE GROUND A MIN.900mm DEEP. BACKFILL AND COMPACT GRADUALLY WITH EXCAVATED SOIL.
6. ALL FOOTINGS BE TO INSTALLED CLEAR OF ANY W&S ASSETS.

SHEET 1 OF 1		WORKS JOB No.	
DRAWING No.		AMEND.	
A3-00160		B	
<b>STANDARD</b>			
<b>POST &amp; RAIL DETAIL</b>			
<b>BEACH ENVIRONMENT</b>			
		DIRECTOR PLANNING AND COMMERCIAL INFRASTRUCTURE	
DATE		DATE	
13.11.06		13.11.06	
DRAWN D ANDREWS		DRAWN D ANDREWS	
CHECKED J CLARK		CHECKED J CLARK	
EXECUTIVE MANAGER STUART HOLLEY		ORIGINAL SIGNED BY S.M. HOLLEY STUART HOLLEY	
DATE		DATE	
13.11.06		13.11.06	
SURVEY		SURVEY	
D A GIBSON		D A GIBSON	
SURVEY FILE No		SURVEY FILE No	
13.11.06		13.11.06	
LEVEL DATUM		LEVEL DATUM	
MERIDIAN		MERIDIAN	
APPROVED		APPROVED	
AMENDMENTS AND REVISIONS		AMENDMENTS AND REVISIONS	
STANDARD DRAWING/PARKS & GARDENS		STANDARD DRAWING/PARKS & GARDENS	



# Local Coastal Plan

## McEwens Beach 2019

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**PO Box 41**  
**Mackay QLD 4740**

Fax **(07) 4944 2400**

### Client Service Centres

#### Mackay

Sir Albert Abbott Administration Building  
73 Gordon Street, Mackay

Mon-Fri  
8:30am - 4:30pm

#### Mirani

20 Victoria Street, Mirani

Mon-Fri  
8:30am - 4:30pm

#### Sarina

65 Broad Street, Sarina

Mon-Fri  
8:30am - 4:30pm