

**COTTESLOE NATURAL AREAS
MANAGEMENT PLAN – FINAL
22 SEPTEMBER 2008**

TOWN OF COTTESLOE

Prepared by:

Ecoscape (Australia) Pty Ltd

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Cottesloe Natural Areas Management Plan

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Acronyms

Cottesloe Natural Areas Management Plan

ARRPA	Agricultural and Related Resources Protection Act
AHD	Australian Height Datum
CALM	Department of Conservation and Land Management (now DEC)
CCA	Cottesloe Coastcare Association
DAFWA	Department of Agriculture and Food Western Australia
DEC	Department of Environment and Conservation
DIA	Department of Indigenous Affairs
DOW	Department of Water
DPI	Department for Planning and Infrastructure
ENA	Existing Natural Area
EPA	Environmental Protection Authority
EPBC	Environmental Protection and Biodiversity Conservation
EWSWA	Environmental Weed Strategy of Western Australia
FHPA	Fish Habitat Protection Area
MN	Management Node
MRS	Metropolitan Region Scheme
NAMP	Natural Area Management Plan
OPC	Opinion of Probable Cost
PNA	Potential Natural Area
TBA	To Be Assessed
TPS	Town Planning Scheme
WALGA	Western Australian Local Government Association
WAPC	Western Australian Planning Commission
WESROC	Western Suburbs Regional Organisation of Councils
WONS	Weeds Of National Significance

Executive Summary

Cottesloe Natural Areas Management Plan

Introduction

The Town of Cottesloe currently has 15.5 hectares of remnant natural areas which contain a number of land uses. This represents, less than 5% of the area of the municipality. Existing biodiversity is well below its original status, particularly with inland vegetation types. These remnant natural areas contain a number of important environmental values in terms of biodiversity and habitat, as well as social values such as sense of place, aesthetics, education and recreation.

In order to manage these important areas the Town has developed a Natural Area Management Plan (NAMP). This document sets out a management framework for each natural area through a 5 year program, which aims to provide a more united approach towards natural area management through an efficient allocation of resources. The management plan aims to act as an overarching policy to support current existing local planning and development policies.

The specific aims of the NAMP are to:

- identify the unique natural values within the Town, such as landscape character and biodiversity
- identify and describe the social and environmental characteristics of all existing areas of remnant vegetation within the Town
- identify and describe the social and environmental characteristics of open public spaces within the Town that may be enhanced or restored to a resemblance of the original vegetation
- outline a management framework that will prioritise all existing natural areas identified public open spaces and enhance the natural values of the Town
- prepare site-specific action and management guidelines for the conservation of local biodiversity, restoration of degraded areas, enhancement of visual amenity and reduction of Town water use in each identified natural area.

Key recommendations of this report are:

1. The Town of Cottesloe ensures the social, environmental and management values of the natural areas are recognised and addressed and implemented in the Town's policies, planning and work procedures.
2. The Town of Cottesloe enacts policies to protect the defined existing natural areas and ensure they are not developed or otherwise diminished.
3. The Town of Cottesloe adopts the Management Framework outlined in this report as aid prioritising and planning work and to assist in operational activities.
4. The Town of Cottesloe assigns highest priority to the following existing natural areas (ENAs):
 - a. Mudurup
 - b. Cottesloe Native Gardens
 - c. Vlamingh Parklands

-
- d. Grant Marine Park.
 5. The Town of Cottesloe assigns highest priority to develop the following potential natural areas (PNAs):
 - a. Land adjacent to the railway line
 - b. John Black Dune Park.
 6. The Town of Cottesloe recognises the opportunity to naturalise verges, median strips and other grassed areas.
 7. The Town of Cottesloe recognises that the protection and rehabilitation of ENAs is of higher importance than developing PNAs and that any work towards PNAs should only be conducted when it does not compromise efforts towards preserving ENAs.
 8. The Town of Cottesloe adopts the implementation of works outlined in the report in regards to weed management, revegetation erosion, pest management and infrastructure.
 9. The Town of Cottesloe investigates means to gain access to Bushcare experience, including the possibility of sharing the funding of a Bushcare Officer with other members of the Western Suburbs Regional Organisation of Councils (WESROC).

Social Environment

This study considered heritage, land use and development issues in relation to the natural areas within the Town of Cottesloe. Three registered Aboriginal heritage sites, including Mudurup Rocks, are located within the Town. European heritage sites that are located near natural areas include Cottesloe Beach Precinct (Napier to Jarrad Streets, The Old Cables Station (the McCall Centre), as well as existing Norfolk pines, Peppermint and Melaleuca trees.

The town also contains a number of greenways that are identified in The *Western Suburbs Greening Plan* (Ecoscape 2002). This plan is a joint venture between the six member Council of the Western Suburbs Regional Organisation of Council (WESROC) and the Town of Cambridge. There are three types of greenways within the Town that link existing natural areas, public open spaces and transport corridors such as major roads and the railway corridor. These are described in **section 2.1.2**.

Physical Environmental

Although no detailed records show the distribution and content of the original vegetation communities that existed within the Town of Cottesloe, five communities were extrapolated. This was done by examining the remaining natural areas and dividing the Town into regions according to landscape character and the physical environment factors of soil type, topography, and mapped vegetation complexes (Hedde *et al* 1980).

All natural areas were rapidly assessed for bushland condition according to the Keighery (1994) *Bushland Condition Scale*. None of the natural areas were observed to be in *Pristine* or *Excellent* Condition. Almost two thirds were in *Degraded* or *Completely Degraded* condition with the remaining third being *Good* to *Very Good*. A list of 48 weed species was collated from the literature and from observations during the site assessments in March 2008. Each weed species was ranked as either High, Medium and Low priority in order to determine suitable weed control strategies for each natural area.

Fauna was not a focus of this report, however records of native and pest fauna species and habitat are briefly discussed. None of the recorded fauna species were declared under state or federal legislation. Rabbits were considered to be the only significant threat with many sightings and warrens recorded along the coastal areas.

Management Framework

All natural areas within the Town were organised in a framework according to common social and environmental characteristics to prioritise and develop specific management strategies.

The Town was divided into two main landscape characters – Coastal and Undulating. The purpose of defining Landscape Character is to be able to place the natural and potential natural areas into a physical and social context to guide the management practices of these areas. The *Coastal* character is located along the foreshore strip and the predominant land use is recreational. This area is vested as Parks and Recreation under the *Metropolitan Region Scheme (MRS)* which allows some controlled development but the primary land use is for public access and recreation. The *Undulating* character is the remaining area within the Town occurring east of the coastal area. The majority of this character is zoned as urban under the MRS but contains a range of other land uses as well such as railways and commercial. The *undulating* character has fewer bushland areas compared to the *coastal* character but many potential natural areas have been identified that correlate with existing greenway corridors.

The two landscape characters were then divided into five *Precincts*, with each precinct requiring specific natural area management. Each precinct was further divided into 13 areas that currently contain remnant vegetation and termed *Existing Natural Areas (ENAs)*. In turn, each ENA was divided into 65 *Management Nodes (MNs)* according to site issues or land function. The division and naming of each ENA and MN follows the format adopted by Cottesloe Coastcare Association (CCA 2008).

This report recognised that the Town contained less than 5% of the original bushland and lacked much of the original biodiversity representation, particularly of vegetation communities within the Undulating Landscape. Various public open spaces were examined for use as *Potential Natural Areas (PNAs)* in enhancing biodiversity and increasing the amount of natural area.

Greenways identified in the *Western Suburbs Greening Plan* (Ecoscape, 2002) were examined for possible restoration with suitable native flora and enhancement of landscape amenity. Selected median strips, verges and the railway corridor were segregated by their land functions (e.g. median strip sump) and environmental character (e.g. vegetation community) into a total of 30 new MNs.

John Black Dune Park was also considered as a PNA as the site is currently in such a degraded condition that it requires management to re-establish native vegetation.

All of these areas were then categorised and titled according to their relevant Precinct and function (e.g. Mixed Use Verge), creating nine PNAs. Several illustrations of how these areas may be visually enhanced with local flora are provided in **Figures 11 to 15**.

Prioritising Natural Areas

As a result of finance and resource limitations, it is impractical to address every natural area at the same time over the next five years. The *Values* of the areas must be assessed in relation to level of importance, in order to rank their priority. Such values examined were:

- Social (heritage, visual amenity, public use)
- Business (commercial and development)
- Ecological Corridor (greenways)
- Biodiversity (vegetation and flora)
- Integrity (bushland condition, weeds, pests, erosion and recent restoration work).

The preservation of ENAs was recognised as a higher priority than the development of PNAs. The ENAs and PNAs were separately ranked according to the values and then classified as either *High*, *Moderate* or *Low* priority. ENAs ranked *High* priority were Cottesloe Native Gardens, Grant Marine Park, Mudurup and Vlamingh. The highest priority PNAs were determined to be Mixed Use Railway Line (the railway corridor) and John Black Dune Park. It should be noted that these priority ratings are only recommendations. The Town will make the final decisions on which natural areas are of greatest priority to manage.

Strategies for Existing Natural Areas

Details of the characters and management strategies of each identified ENA are presented in **Tables 23 to 36**. The first part of each table (*Natural Area Specifics*) summarises all the social and physical environment characteristics raised in **Sections 2 and 3** of this report that were relevant to each natural area. The summary of the relevant information allows site specific management strategies to be formulated and are presented in the second part the table (*Management Strategy*) with indicative *Opinion of Probable Costs* (OPCs) to achieve the strategy. The Management Strategy and OPCs are presented in three stages over a five year plan:

- Stage 1 (Preservation) – Year 1
- Stage 2 (Enhancement) - Years 2 to 3
- Stage 3 (Maintenance) – Years 4 to 5.

Guidelines for Potential Natural Areas

Detailed management strategies were not devised for the identified PNAs, as integration of natural restoration and visual amenity into the current and future land use and functions of each of the PNAs still need to be addressed by the Town. **Tables 37 to 42** instead summarise the characteristics of each PNA, and provide recommendations for the natural enhancement each MN.

Implementation of Works

The following methodologies and guidelines of the restoration, enhancement and maintenance works raised within the report are detailed and discussed:

- Weed management – site and species strategies
- Dune rehabilitation – landform, vegetation, sand trapping
- Revegetation – both for natural revegetation and landscaping works
- Erosion – use of matting, brush material, mulch and tritter
- Pest management details for rabbit control

- Infrastructure – fencing, access, drains, signage.

Weed management is recognised as the possibly the most critical threat to the existing natural areas. As such it requires an immediate separate strategy to target high priority weeds across the entire municipality, not just on a site priority basis, to help preserve the ENAs and to reduce costs and work over the longer term

In addition, a variety of funding sources are listed to assist in financing the proposed restoration work. The funding and responsibilities of a Bushcare Officer was proposed to be delegated across all members of the WESROC to oversee the application of the NAMP and fulfil the *Western Suburbs Greening Plan* (Ecoscape 2002) guidelines.

1.0 Introduction

Cottesloe Natural Areas Management Plan

1.1 Project Scope

The Town of Cottesloe has approximately 15.5 hectares of natural areas which contain a number of important environmental values in terms of biodiversity and habitat, as well as social values such as sense of place, aesthetics, education and recreation. These natural areas sit within a number of different adjoining land uses that have the potential to impact on their values and long-term sustainability.

The Town of Cottesloe has developed a Natural Area Management Plan (NAMP) for all natural areas within the Town's boundaries. This document sets out a management framework for each natural area through a 5 year program, which aims to provide a more united approach towards natural area management through an efficient allocation of resources. The management plan aims to act as an overarching policy to support current local planning and development policies.

1.2 Aims and Objectives

1.2.1 Project Aims

The overall guiding aim of the NAMP is to identify areas in the Town of Cottesloe that are to be managed as natural areas and to provide guidelines and priorities for their management with a view to protecting, preserving and enhancing local biodiversity. The specific aims of the project are to:

- identify the unique natural values within the Town, such as landscape character and biodiversity
- identify and describe the social and environmental characteristics of all existing natural areas within the Town
- identify and describe the social and environmental characteristics of public open spaces within the Town that may be enhanced or restored to a resemblance of the original vegetation
- outline a management framework that will prioritise all existing natural areas and identified public open spaces and enhance the natural values of the Town
- prepare site specific action and management guidelines for the conservation of local biodiversity, restoration of degraded areas, enhancement of visual amenity and reduction of Town water use.

1.2.2 Project Objectives

The NAMP has been commissioned by the Town of Cottesloe with the objectives of providing guiding information in the form of maps, priorities, strategies and management recommendations to enhance the natural areas within the Town's municipal boundaries, which are shown in **Figure 1**.

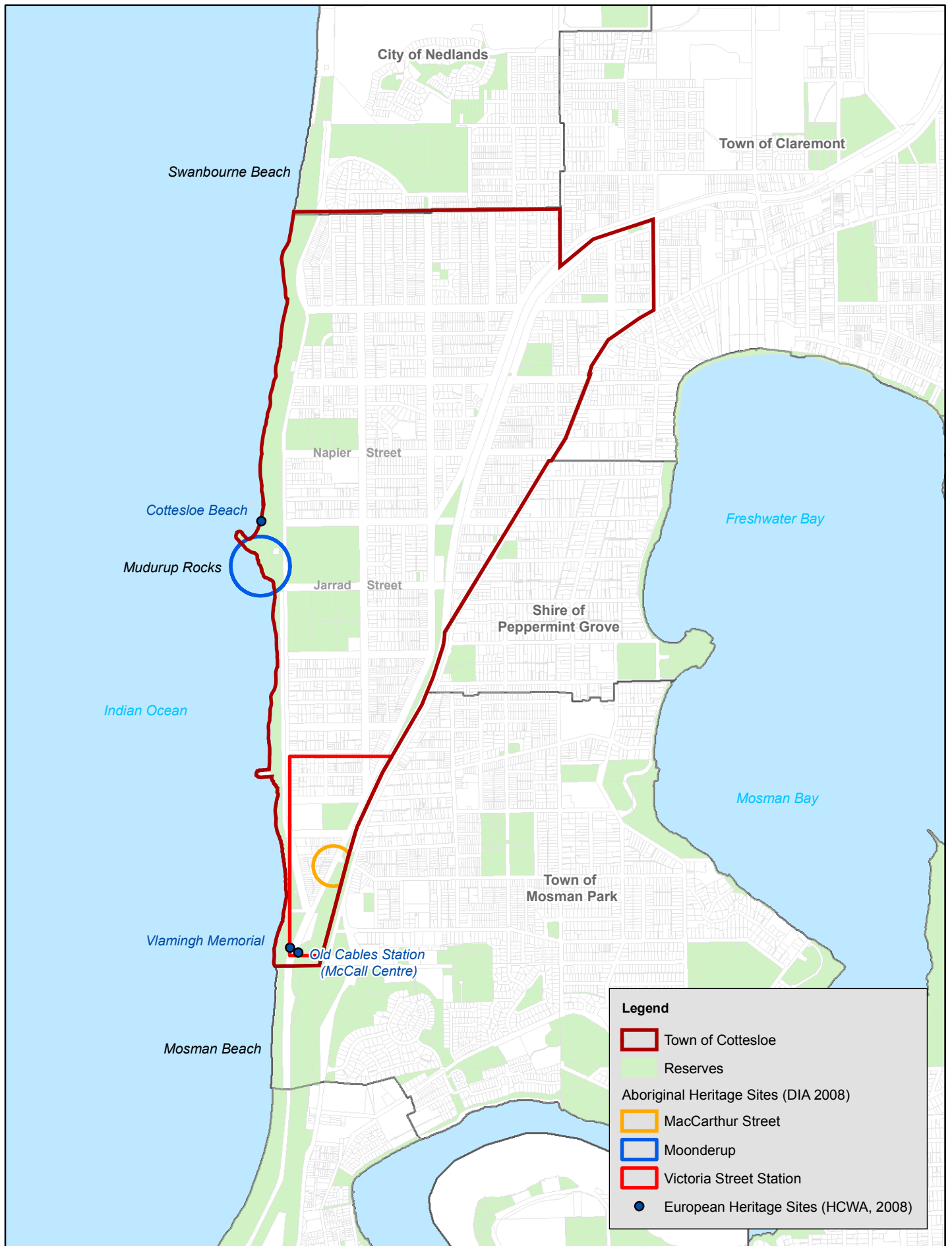


Figure 1 *Cottesloe Natural Areas Management Plan*
Study Area

Mar 2008

prepared for the TOWN OF COTTESLOE



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Project No. 1990-07

Delegating responsibilities to particular parties for implementation this plan was excluded on the basis that this was best determined by negotiation between stakeholders after endorsement by the Town of Cottesloe.

The objectives for the NAMP were to develop strategic recommendations, but did not include detailed implementation plans for works, nor was infrastructure (such as signs, paths and fences) a particular focus of the project.

1.3 Relevant Documents

To ensure this NAMP is consistent with other local, regional and national management initiatives, the following documents, guidelines and policies were reviewed and incorporated into the report where applicable:

- Department of Conservation and Land Management (CALM) (1986) *Draft Coastal Management Plan: Town of Cottesloe: Bulletin 258*
- Department of Planning and Infrastructure (DPI) (2007) *Town of Cottesloe Town Planning Scheme No. 2*
- Ecoscape (2002) *Western Suburbs Greening Plan*
- Ecoscape (2006) *North Cottesloe Foreshore Management Plan 2005-2010.*
- Environmental Protection Authority (2003) *Guidance Statement No. 10: Guidance Statement for the Level of Assessment for Proposals affecting natural areas within the System 6 Region and Swan Coastal Plain Portion of the System 1 Region*
- Government of Western Australia (2007) *Ecological Assessment and Management of Coastal Natural Areas in the Swan Region.*
- Green Skills (2002) *Greenhouse Action Plan*
- Luff and Luff (1999) *Report on recommended species for street tree*
- Quilty Environmental (1999) *South Cottesloe Foreshore Management Plan*
- Town of Cottesloe (2008) *Local Planning Strategy*
- Town of Cottesloe (1999) *Streetscape Policy and Manual*
- Town of Cottesloe (2004) *Town of Cottesloe Policy: Beach*
- Town of Cottesloe (2004) *Town of Cottesloe Policy: Residential Verges*
- Town of Cottesloe (2005) *Town of Cottesloe Policy: Street Trees*
- Town of Cottesloe (2005) *Town Centre Concept Plan*
- Town of Cottesloe (2005) *Town Centre Planning Report*
- Western Australian Planning Commission (1984) *Metropolitan Regional Scheme*
- Western Australian Planning Commission (2002) *Coastal Planning and Management Manual.*

2.0 Social Environment

Cottesloe Natural Areas Management Plan

2.1 Planning

2.1.1 The Metropolitan Region Scheme and Cottesloe Town Planning Scheme

The Metropolitan Region Scheme (MRS) is a Western Australia Planning Commission (WAPC 1984) document that identifies broad land use zones within the metropolitan area. It is amended regularly to allow for changing planning needs. This document provides a legal basis for planning in the metropolitan area. A *Town Planning Scheme* (TPS) is a more detailed planning document for Local Government areas which must be consistent with the MRS.

The Town currently has a wide range of social land uses. The MRS divides the Town into six broad planning zones. The TPS (DPI 2007) further subdivides these zones into more specific land uses that conform to the planning guidelines of the MRS zones. **Figure 2** shows the MRS and TPS zones within the Town of Cottesloe. Only TPS zones that are most relevant to the context of this study are shown. The full TPS document is available from the Town of Cottesloe and on their website. Under the MRS most of the Town is zoned as Urban land use, with the length of the foreshore reserve, about 40ha, vested for Parks and Recreation. This allows some controlled development along the reserve, but the primary purpose is for public access and recreation.

The distribution of land uses within the Town can be broadly divided into west and east sections. The Foreshore Centre, Parks and Recreation, Parks and Recreation (restricted), Hotel, Civic and Cultural, Special Development and Waterway land uses exist near the west coastal proportion of the town. The Primary Regional Roads, Town Centre, Railways and Public Purposes generally occur along within the east inland section.

2.1.2 Local Government

Draft Coastal Management Plan for the Town of Cottesloe: Bulletin 258 **Department of Environment and Conservation (DEC) (1986)**

In response to increased pressures on the local coastal environment, the Town of Cottesloe commissioned the DEC to prepare a management plan to address future development and management needs along the foreshore reserve. This document identified the following management issues:

- coastal erosion
- pedestrian access
- competing uses
- reticulation
- conservation

This management plan has been superseded by the South Cottesloe FMP and North Cottesloe FMP, described below.

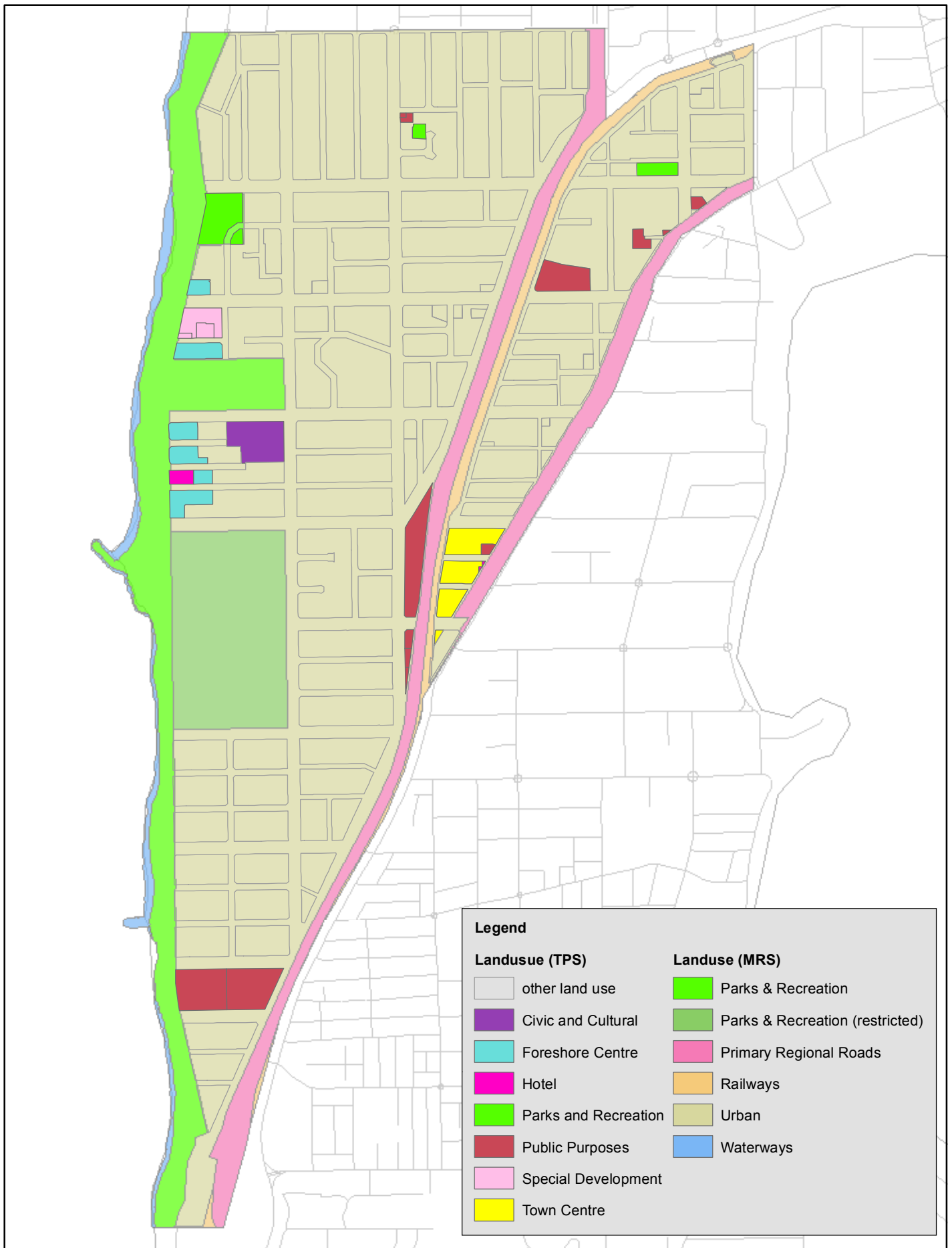


Figure 2 *Cottesloe Natural Areas Management Plan*
Landuse based on the MRS and TPS

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***South Cottesloe Foreshore Management Plan
Quilty Environmental (1999)***

This management plan was commissioned after the newly formed South Cottesloe Coastcare Association began its works program in 1995-96. The purpose of this report was to provide a comprehensive management and implementation program for the South Cottesloe Foreshore which would assist Coastcare in planning, budgeting and implementing their works. Its main focus was on dune rehabilitation with additional recommendations on access, infrastructure and weed control. The study area was the foreshore reserve from the Cottesloe main groyne in the north to the Vlamingh memorial in the south near the intersection of Marine Parade and Curtin Avenue. This area was divided into 17 management sectors with detailed recommendations on revegetation but limited information on weed control.

***North Cottesloe Foreshore Management Plan 2005-2010.
Ecoscape (2006)***

The North Cottesloe study area in this report was the foreshore reserve between North Street in the north and Forrest Street in the south. The focus of the study was a vegetation and weed survey to assess the bushland condition of the area. From this survey 24 recommendations were made to improve the condition of the bushland over the next five years.

***Western Suburbs Greening Plan
Ecoscape (2002)***

This document addresses integrating the natural environment into the urban landscape with the main objective to conserve and enhance green corridors (**Figure 3**). Green corridors vary from bushland to public open space and allow the movement of fauna between habitats. The Plan recommends that local governments aim to:

- establish regional green corridors, which provide linkage between significant remnant bushland areas, coastal habitats, riverine habitats and wetlands
- secure linkages between locally significant bushland and extending regionally significant bushland
- develop linkages between open space, parks and recreational areas to remnant bushland.

***Report on Recommended Species for Street Trees
Luff and Luff (2002)***

This report recommends planting a variety of tree species within six established horticultural zones of common local conditions. Species selection was based on purely streetscape aesthetics, subsequently many of the species recommended are exotics.

***Town of Cottesloe Policy: Street Trees
Town of Cottesloe (2005)***

This document discusses the integration of street trees to enhance the streetscape, suit the function and appearance of the adjacent land use, and promote indigenous vegetation for increasing fauna habitat in an urban environment.

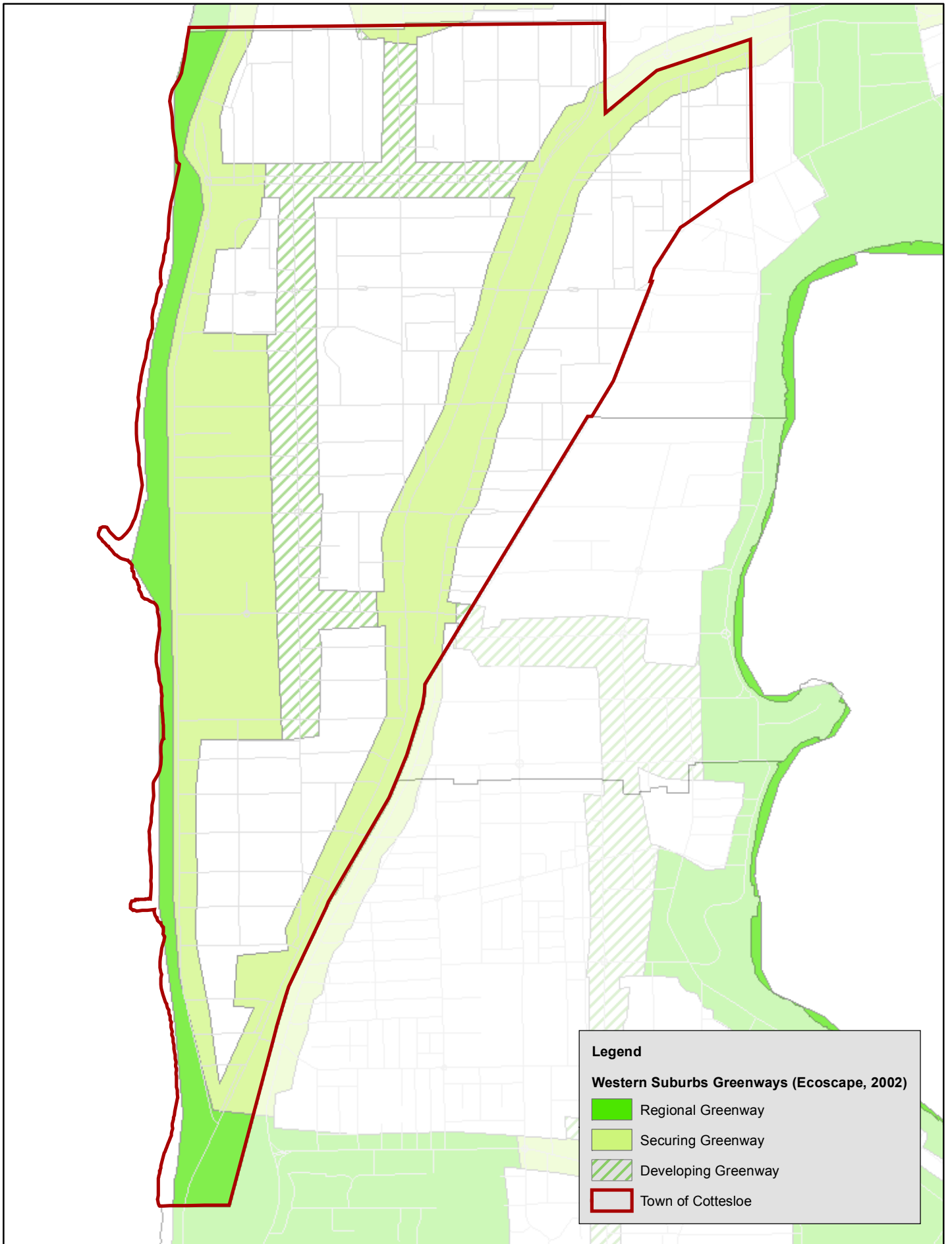


Figure 3

Cottesloe Natural Areas Management Plan
Western Suburbs Greenways

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Town of Cottesloe Policy: Residential Verges

Town of Cottesloe (2004)

This document discusses the integration of verges to enhance the streetscape, suit the function and appearance of the adjacent land use, and promote indigenous vegetation for increasing fauna habitat in an urban environment.

Town of Cottesloe Policy: Beach

Town of Cottesloe (2004)

This document discusses the management of beaches within the Town to both maintain their natural condition while facilitating a wide range of recreational opportunities for the local and broader Western Australian community.

Greenhouse Action Plan

Green Skills (2002)

The annual electricity cost of pumping water in local parks is recognised to be over \$18,000 and produces 125 tonnes of carbon dioxide. A water audit and management strategy have been proposed in the Green Skills (2002) *Greenhouse Action Plan* to decrease water use in local parks to reduce electricity costs and associated greenhouse emissions.

Town of Cottesloe Local Planning Scheme

Town of Cottesloe (2008)

The Town's Planning scheme outlines several relevant strategies in preserving and enhancing the Town values, as outlined below:

Heritage Strategy

- Foster cultural heritage conservation of places or areas of significance in Cottesloe in the context of the character of localities within the district and overall planning considerations.

Environmental Management Strategy

- Pursue the principles of sustainability through environmental protection, resource conservation, land use, development control, energy efficiency and open space management measures.
- Protect the environment and landscape values of the coastal foreshore and manage the area as a public resource in perpetuity.
- Maintain convenient and attractive physical and visual access to the beach, foreshore and coastal parks and recreation open space reserves.
- Articulate a foreshore vision as a broad guide to the managed use, development and care of the area.

Recreation & Open Space Strategy

- Maintain and enhance the accessibility, quality and amenity and landscape value of the local and regional open spaces with the district.
- See opportunities to augment local passive public open space within the developed suburban areas and larger development sites.
- Pursue an overall vision for the foreshore to guide long term land use, development and management.

Sustainability Development Plan**Care for Cottesloe (LA21) Committee (2003)**

The Plan has listed many actions to ensure the sustainability of the Town's village and coastal character, the relevant key actions to this report are listed below:

- Continue to develop means of protecting the Cottesloe marine environment.
- Regenerate sand dunes through the elimination of weeds on, and the improvement of sand dune biodiversity.
- Revegetate with water wise ground cover and trees to encourage local usage, quiet enjoyment and biodiversity.
- Maintain all current public open spaces along the beachfront and support and increase biodiversity by planting local natives on dunes and park surrounds on the Marine Parade Green Corridor.
- Bush Care Officer to devise draft plan for all public open spaces in conjunction with the plan for coastal dune systems paying particular attention to developing greenways as listed in "Western Suburbs Greening Plan" and Town's policy on Street trees.

2.1.3 State Government**Aboriginal Heritage Act****Department of Indigenous Affairs (1972)**

There are several registered Aboriginal Sites within the Town of Cottesloe which are listed in **Section 2.2.1** of this report. Aboriginal Sites, regardless of whether they are registered or not, are protected under the Aboriginal Heritage Act, 1972:

- Section 5 of the Act defines sites as places of importance where objects connected with traditional life have been left, stored or taken from; ceremonies have been conducted; some ethnographic interest
- Section 15 of the Act requires that findings be reported
- Section 17 of the Act makes it an offence to excavate, destroy, damage, conceal or in any way alter any Aboriginal site
- Section 18 of the Act establishes the conditions for certain uses of land affected by the Act.

Bush Forever**Government of Western Australia (2002)**

Bush Forever replaces the System 6 recommendations as a blueprint for conservation of bushland of regional significance in the Perth Metropolitan Region. Bush Forever was prepared by the Department of Environment Protection, Ministry for Planning, CALM and the Water and Rivers Commission and was endorsed by Cabinet and supported by the Environmental Protection Authority as the principle mechanism to identify and protect regionally significant bushland in the Perth Metropolitan Region. There are no Bush Forever sites within the Town of Cottesloe.

Coastal Planning and Management Manual**Western Australian Planning Commission (2002)**

This document is aimed at the community to assist in the conservation of coastal areas. It is a useful source of information for the community and covers the following topics:

- The coastal environment
- Coastal management planning
- Aboriginal consultation

- Project planning
- Coastal rehabilitation
- Useful contacts and references.

Perth-Fremantle Transit Reserve Agreement

Public Transport Authority (2008)

The document is an agreement between the Public Transport Authority, Main Roads Western Australia and all local governments that share the Perth to Fremantle Transit Reserve (aka the railway corridor). All parties are committed to work together to enhance the appearance and community amenity of the reserve through revegetation, landscaping and other enhancements without significantly impacting essential transport requirements. All parties recognise the potential of this reserve of being an ecological corridor according to the Ecoscape (2002) *Western Suburbs Greening Plan*.

The Vlamingh Parklands

Western Australian Planning Commission (1998)

This document describes the vision for the Vlamingh Parklands in response to the proposed redeveloped of the Leighton area. The vision states to establish an integrated parkland between the river and the sea. The proposed parklands extend into the Town of Cottesloe along Marine Parade to include the Vlamingh Memorial area up to Warton Street and the area around the McCall centre. One concept plan aim is to *retain and enhance the natural environment of the site and rehabilitate disturbed areas with species local to the native area*.

The specific aims for the Vlamingh Memorial site include:

- funds allocation for the design and construction of a new memorial
- the replacement of introduced coastal tea tree with native Rottneest Island tea trees (*Melaleuca lanceolata*)
- existing grass areas to be retained or rehabilitated with low coastal species.

For the McCall centre the concept plan proposes:

- the conversion of the centre into a heritage centre featuring the Aboriginal and European heritage of the area
- the establishment of a café/restaurant
- additional parking area to the north of the centre which is currently bushland with mainly coastal tea tree.

The rehabilitation of the Vlamingh memorial is consistent with the goals of the Town of Cottesloe, any conversion to open space would not be consistent with the Town's goals for natural areas. The bushland behind the McCall centre is one of the few areas of remaining bushland within the town of Cottesloe that is not on the foreshore. The retention of this bushland would be a priority for the Town of Cottesloe and any development proposed for this area should consider this.

Licence to Take Water

Department of Water (DOW) (2007)

The Town obtained the latest *Licence to Take Water* in October 2007, with the end of the approval being 25 May 2010. The DOW has approved the Town to collect a maximum of 106,125 kl per year through approved bores and wells, 27% down from 146,00 kl that was allocated in 2007. The area to be watered is 14.15 ha in size. This area does not include

the Sea View Golf Club or the Cottesloe Tennis Club areas, which are responsible for their own Bore Licences.

Accordingly, a significant reduction is required in corporation and consumer water consumption to remain within the new restrictions. As a result, The Town seeks to identify which current management practices may be modified to reduce water consumption. Reticulation of lawn and other exotic plants that need a lot of water within public open spaces and natural areas is one such important practice to evaluate.

2.1.4 Additional Goals

In addition to the existing local and State government aims and objectives outlined above, more objectives should be added to encourage the preservation and enhancement of natural areas within the Town. These are outlined below.

Environment Objectives

- Raise further awareness of the value of natural areas and biodiversity to Town residents.
- Identify what unsecured natural areas are important enough to be secured.
- Ensure all different landforms are represented within Cottesloe.
- Use only local provenance plants.
- Protect and increase numbers of locally threatened species.
- Improve barriers to natural areas (e.g. fences and weed barriers).

Western Suburbs Greening Plan Objective

- Establish new green corridors inland from the coastal reserves.

Operations Objective

- Establish a Bushcare Officer to increase managerial and operational capacity to coordinate and execute the Natural Area Management Plan (NAMP).

Infrastructure Objective

- Increase access to ablution facilities near natural areas.
- Improve access points and pathways.
- Improve fencing and barriers.

2.2 Cultural Heritage

2.2.1 Aboriginal Heritage

The Department of Indigenous Affairs *Heritage Site database* (DIA 2008) has registered three aboriginal sites within the Town. Mudurup is a ceremonial site located at Mudurup rocks, south of the Cottesloe Surf Club, whereas sites at Victoria Street Station and Macarthur Street contain recorded artefacts. All three sites have open access and are not restricted (**Table 1**).

Table 1: Registered Aboriginal Sites within the Town of Cottesloe

Site ID	Site Name	Type	Status	Access	Restrictions	Site no.
435	Mudurup	Ceremonial, Mythological	Permanent Register	Open	None	S02940
3335	Macarthur Street	Artefacts / Scatter	Stored Data	Open	None	S00179
3336	Victoria Street Station	Artefacts / Scatter, Camp	Stored Data	Open	None	S00180

Source: DIA 2008

2.2.2 European Heritage

There are many heritage places, mainly buildings, listed on the Heritage Council of Western Australia's (2008) *Online Database*. Listed below are some of those sites that are located in or near natural areas:

- The Vlamingh Memorial, which is being proposed to be moved from its current location on the stable dunes to the main beach area.
- Cottesloe Beach Precinct (Napier to Jarrad Street). This area has cultural significance because it is a popular recreational and iconic beach that typifies the West Australian way of life and provides the community with a sense of place.
- The Old Cables Station, also known as the McCall Centre. The Cable Station was built in 1926 to link Western Australia with South Africa via submarine cables. The station closed in 1966 and was heritage listed in 1996 (WAPC 1998).
- The Norfolk pines, Peppermints and Melaleucas are tree species on the verges of Cottesloe that have been heritage listed.

The Vlamingh parkland and memorial is located at the southern extent of the foreshore reserve and was developed in 1998 to commemorate the 300th anniversary of Dutch Explorer William de Vlamingh landing on the mainland of Australia. Although the precise location of this landing site is not known, it is generally accepted that the landing party arrived in the general vicinity (WAPC 1998).

3.0 Physical Environment

Cottesloe Natural Areas Management Plan

3.1 Topography and Geology

3.1.1 Landform

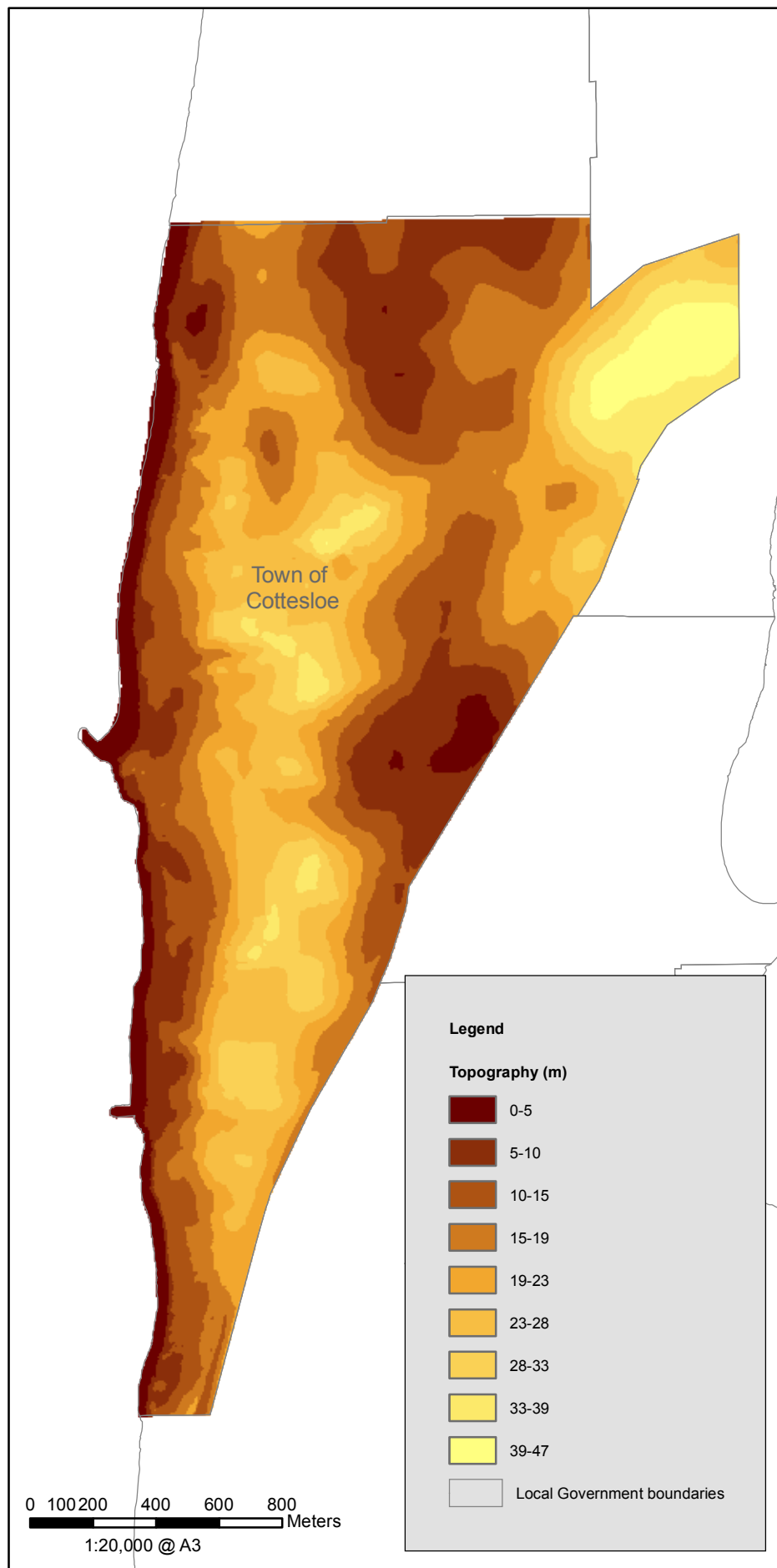
Landforms were mapped at a regional scale (1:250 000) by Heddle *et al.* (1980). The entire Town is identified as being within the Cottesloe landform unit of the Spearwood Dune System. This unit consists of shallow yellow brown sand and exposed limestone. However the study area (except Grant Marine Park, Cottesloe Native Gardens and John Black Dune Park) is immediately adjacent to the beach, and would more accurately be described as being part of the Quindalup Unit (within the Quindalup Dune System), which consists of calcareous sands and occurs as beach ridges and parabolic dunes along the Perth coastline.

Topography and soil type were observed to be closely aligned within the Town (**Figure 4**). The Department of Agriculture and Food *Soil Subsystems dataset* (DAFWA 2007) describes the Town as being composed of three soil units. The northern coastline of Cottesloe has *Quindalup Sand* - white, fine to medium-grained, sub-rounded quartz and shell debris, of Aeolian origin. The area with this soil type is mostly at sea level, and not exceeding 5m in elevation.

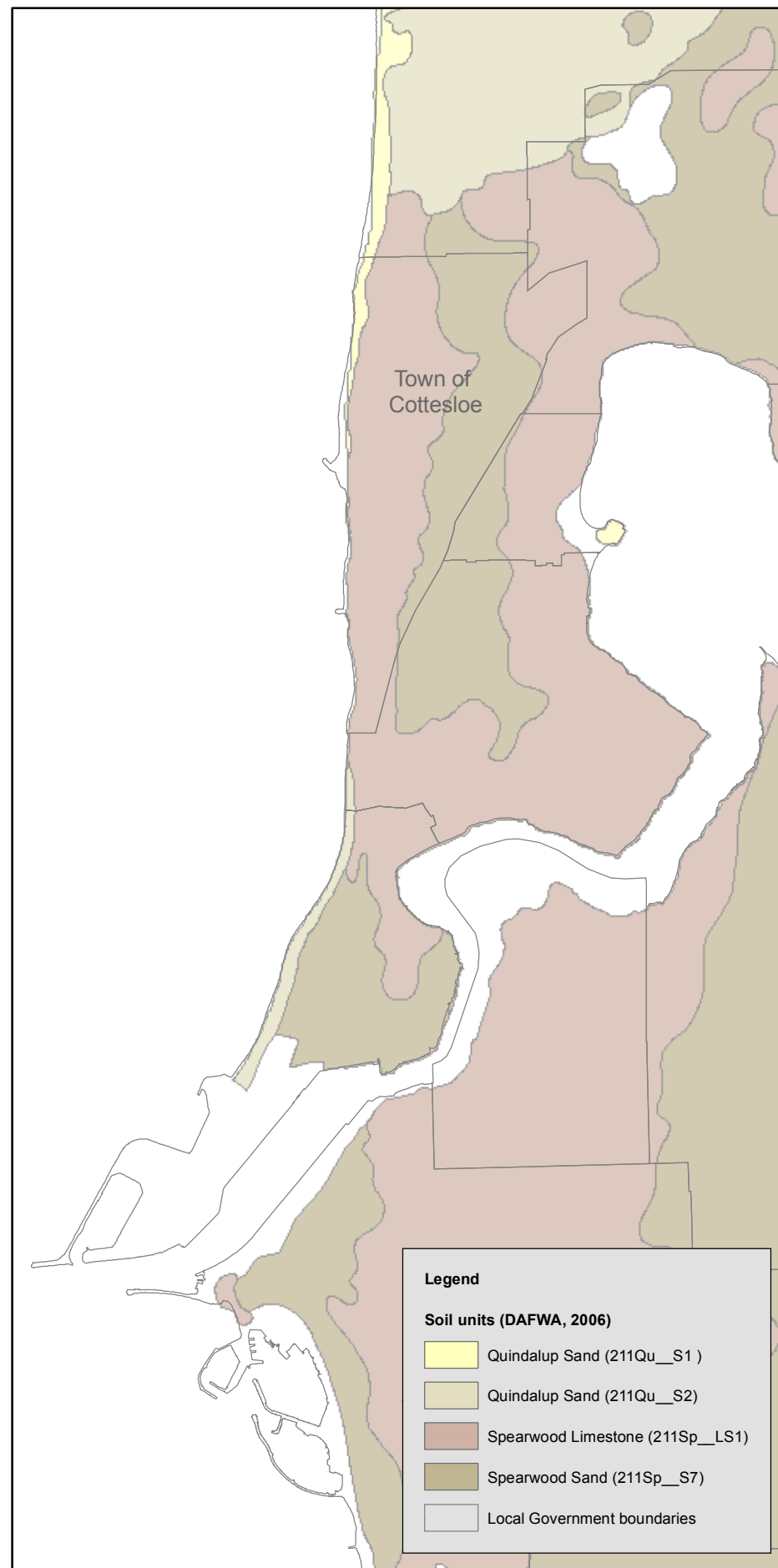
A majority of the western inland area of the town, as well as the north-east corner, is *Spearwood Limestone* - light, yellowish-brown, fine to coarse-grained, sub-angular to well rounded, quartz, trace of feldspar, shell debris, variably lithified, surface kankar, of Aeolian origin and minor heavy minerals. The area with this soil type is generally of greater variation in elevation than the surrounding area, ranging from 5m to over 40m. An example of Spearwood limestone heath is behind the McCall Centre on the limestone ridge.

The remaining areas in the eastern half of the Town is *Spearwood Sand* - pale and olive-yellow, medium to coarse-grained, sub-angular to sub-rounded quartz, trace of feldspar, moderately sorted, of residual origin. Elevation in this area is lower, ranging between 5m and 20m. Areas within the Spearwood Sands currently do not have any true natural area representation; with all greenways being parkland with exotic species.

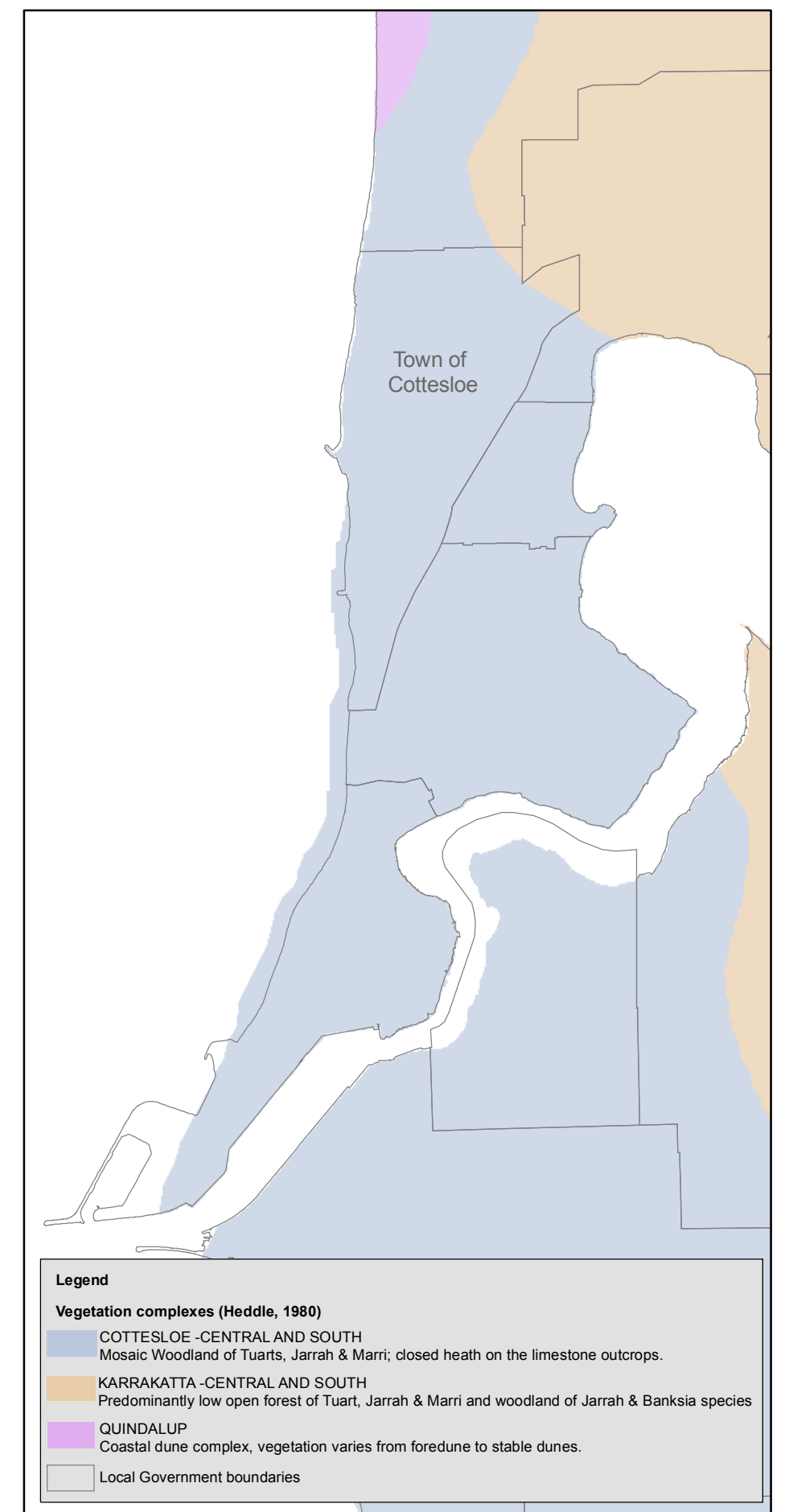
The elevation of the Town varies considerably from sea level to 47 metres in height. The highest elevations occur mainly from the middle to southern areas and also in the north-east corner. This is mostly in line with the *Spearwood Limestone* soil types.



TOPOGRAPHY



SOIL



VEGETATION

Figure 4 *Cottesloe Natural Areas Management Plan*
Existing Environment

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3.1.2 Sea Level

Possible future changes in global climate could lead to rising sea levels. Over time, the sea level elevation may encroach on and inundate adjacent coastal land, including the coastal natural areas. The Town has commissioned a report researching the possible impacts of climate change on the municipality, including change in sea levels.

As the timing and possible impacts of sea level rise is not yet known, it is recommended that this prospect should not affect any immediate plans for continuing restoration of the coastal natural areas.

3.2 Flora and Vegetation

3.2.1 Vegetation Complexes

Remnant bushland within the Town was divided into two Heddl vegetation complexes (Heddl *et al* 1980). *Cottesloe Central and South*, a mosaic Woodland of Tuarts, Jarrah & Marri and closed heath on the limestone outcrops. This complex nearly covers the entire Town, however only 15ha of this complex currently remain as remnant vegetation.

The northeast corner is mapped as a different Heddl complex, the *Karrakatta Central and South*, which is predominantly low open forest of Tuart, Jarrah & Marri and woodland of Jarrah & Banksia specie. However, none of the original vegetation remains, which is a significant loss in local biodiversity to the Town.

Details of the Heddl vegetation complexes are summarised in **Table 2** below.

Table 2: Vegetation Complexes in the Town of Cottesloe (Heddl *et al* 1980)

Vegetation Complex	Vegetation Description	Area remaining in Swan Coastal Plain	Area in Cottesloe
Cottesloe Central and South	Mosaic Woodland of Tuarts, Jarrah & Marri; closed heath on the limestone outcrops.	56,003 ha (41.0%)	15.5 ha
Karrakatta Central and South	Predominantly low open forest of Tuart, Jarrah & Marri and woodland of Jarrah & Banksia species	50,143 ha (29.5%)	0ha

The Environmental Protection Authority (EPA 2003) defines several levels to describe the status of a vegetation complex within the metropolitan region and southwest. These are:

- **Threshold level** – 30% of the pre-clearing extent is the level at which species loss appears to accelerate exponentially at an ecosystem level
- **Endangered level** – 10% of the original extent is regarded as being a level representing “endangered”.

The Cottesloe Central and South complex has over 41% remnant vegetation, thus is well above *Threshold* level. The Karrakatta Central and South complex has just less than 30%

remnant vegetation so is in the cusp of being in the *Threshold* level, making it an important complex.

3.2.2 Flora Communities

Although no detailed records exist of the distribution and composition of the original vegetation communities within the Town of Cottesloe, five communities may be extrapolated from examining the remaining natural areas and dividing the Town into areas according to landscape character and the physical environment factors described in the text above.

The *Coastal Community* can be defined as native flora that occurs in beach sands within approximately 100m of the shoreline. This community extends slightly more inland across the Quindalup soils in the most northern beaches at Grant Street. Elevation is near sea level so the vegetation is not sheltered and experiences harsh weather conditions. Plant species are highly tolerant of salt spray and wind pruning, ranging from hardy annuals growing on the foredunes to *Acacia* shrubs occurring further inland.

Trudgen (1991) stated that the composition of coastal flora is highly variable, depending on microhabitat, as:

- vegetation height is influenced by wind and salt-pruning
- the depth of soil and position can result in variations in density of small distances
- the vegetation is dynamic as a result of regeneration and successional processes.

As such, the Coastal flora Community in the Town can be further divided into *Foredune*, *Swale*, *Mobile Dunes*, *Stable Dune* and *Cliff* microhabitats.

Approximately 100m inland from the coast, the vegetation composition changes as the soil type becomes Spearwood Limestone and the Hedde vegetation complex is *Cottesloe Central and South*. Being further inland and ranging from 5 to 20metres above Australian Height Datum(AHD), the vegetation is slightly less exposed to the sea wind. The community has been named *Transition Shrubland*, as it occurs at the transition of coastal and inland species ranges.

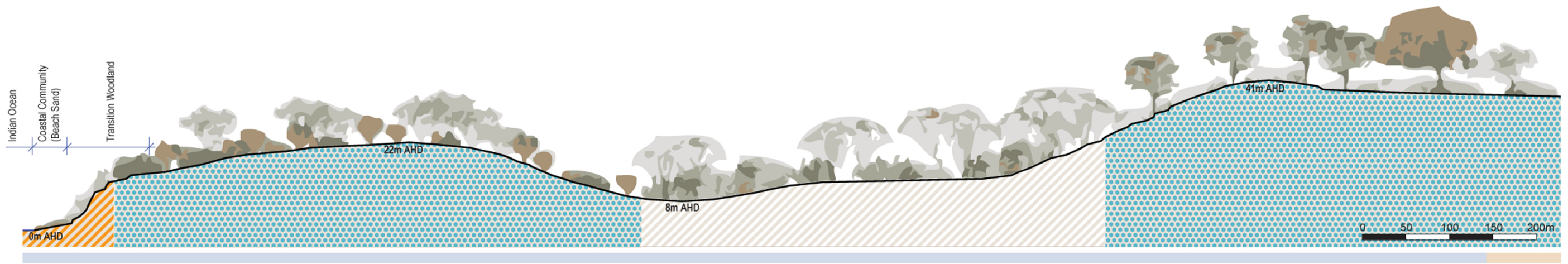
The vegetation composition changes again at about 300 to 400m from the coast as this area exceeds the coastal species' ranges. The soil type and Hedde vegetation complex is unchanged, however the elevation is higher, ranging from around 20 to 40m AHD. The area is somewhat exposed to sea winds. The community has been named *Cottesloe Shrubland*, as it is expected that shrub species occurring in the Cottesloe Central and South complex would dominate in the shallow soil and exposed conditions. An example of this community exists at Cottesloe Native Gardens.

The elevation is reduced further inland, dropping to 5m AHD, and the soil type is Spearwood Sands. This valley offers ideal sheltered conditions for flora such as trees. The Hedde vegetation complex is the same so it is expected that a *Cottesloe Woodland* community would have existed, promoting more trees species such as Banksias, Tuarts, Jarrah and Marri.







The north east corner of the Town boundary extends further inland than the rest of the municipality. The area varies from the rest of the Town in being designated by Hedde *et al* (1980) as a Karrakatta Central and South complex. The soil type is Spearwood Limestone

and the site elevation ranges from 20 to over 40m AHD. This community has been called *Karrakatta Forest* and is thought to have originally resembled an open forest of Tuarts, Jarrah, Marri and Banksia species.

These different vegetation communities, including the coastal microhabitats, are summarised in **Table 3** below. Indicative sections of the Town, demonstrating the division of these flora communities, is illustrated in **Figure 5**. Approximate distributions of these communities are in **Figure 6**. Species that are known, or thought, to occur in each of these communities are listed in **Appendix One**.



typical section

- legend**
-  Existing Soil - Quindalup Sand
 -  Existing Soil - Spearwood Limestone
 -  Existing Soil - Spearwood Sand
 -  Extent Vegetation - Complex (Cottesloe-Central and South)
 -  Extent Vegetation - Complex (Karrakatta-Central and South)
 -  Extent Vegetation - Community

rev A
 Figure 5
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Cottesloe Natural Areas Strategy Plan
Section of Town of Cottesloe

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Scale 1:5000 @ A3. (This Plan is Diagrammatic Only / Vertically Exaggerated)
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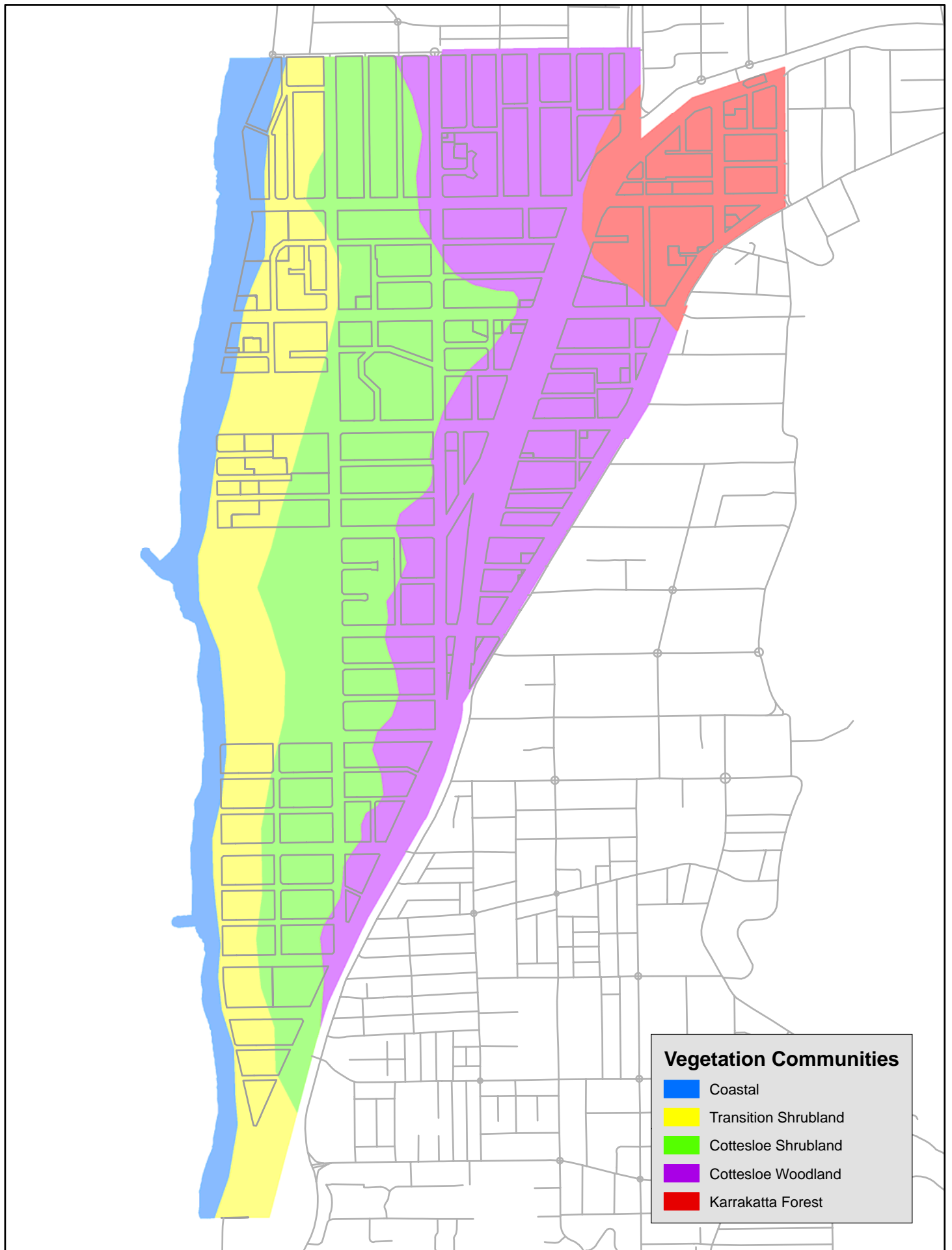


Figure 6 *Cottesloe Natural Areas Management Strategy*
Extrapolated Vegetation Communities in Town of Cottesloe

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Table 3: Flora Communities in Town of Cottesloe

Landscape Character	Distance from Shoreline	Heddle Vegetation Complex	Soil Type	Elevation (above sea level)	Vegetation Community
Coastal	0-150m	(none)	Beach sand/ Quindalup Sand	0-5m	Coastal
	100-400m	Cottesloe Central and South	Spearwood Limestone	5-20m	Transition Shrubland
Undulating	300-600m			20-40m	Cottesloe Shrubland
	400-1700m		Spearwood Sand	10-20m	Cottesloe Woodland
	1400m onward	Karrakatta Central and South	Spearwood Limestone	20m-40m	Karrakatta Forest

3.2.3 Bushland Condition

All natural areas were rapidly assessed for bushland condition according to the Keighery (1994) *Bushland Condition Scale*, detailed in **Table 4**. Each site was given an overall condition rating. General comments relating to variation within each site were taken where observed. The overall bushland conditions were then compared with ratings provided by CCA (2008) and found to be in general agreement.

Table 4: Summary of Bushland Condition (Keighery 1994)

Condition	Characteristics	Within Cottesloe	
		Area (ha)	% of area
Pristine	No obvious signs of disturbance	0	0
Excellent	Vegetation structure intact, disturbance only affecting individual species and weeds are non-aggressive species	0	0
Very Good	Vegetation structure altered, obvious signs of disturbance eg repeated fires, aggressive weeds, dieback, logging and grazing.	0.9	4.9
Good	Vegetation structure altered, obvious signs of disturbance. Retains basic vegetation structure or ability to regenerate it. The presence of very aggressive weeds at high density, partial clearing, dieback, logging and grazing.	5.9	33.3
Degraded	Basic vegetation structure severely impacted by disturbance. Requires intensive management. The presence of very aggressive weeds at high density, partial clearing, dieback, logging and grazing.	8.7	49.8
Completely Degraded	Vegetation structure is no longer intact and the area is completely or almost completely without native flora. 'Parkland Cleared'.	2.1	12.0

None of the natural areas in the Town were observed to be in *Pristine* or *Excellent* Condition. Almost two thirds were in *Degraded* or worse condition with the remaining third being *Good* to *Very Good*. A summary of bushland condition percentages within the Town are presented in **Table 4**.

The northern foreshore varied in general bushland condition (**Figure 7**). Small sections of beaches near North Street, Bryan Way, and at Cottesloe Beach were generally in *Good* condition, having some basic vegetation structure, whereas the rest of the foreshore was generally *Degraded* and were dominated by weeds. The Mudurup vegetation was overall in *Good* condition, however this site was highly variable. The entire southern foreshore was generally *Degraded*, with some dunes and cliffs entirely covered with weeds.

The inland natural areas also varied in overall condition status (**Figure 7**). Cottesloe Native Garden vegetation was generally in *Very Good* condition, having some site disturbance and aggressive weeds. Grant Marine Park was in overall in *Good* condition, with high quality revegetation on the sheltered, eastern half but poor plant growth on the exposed western half. John Black Dune Park was *Completely Degraded* as the majority of the site had virtually little native vegetation or structure remaining. Victoria Street had *Good* condition vegetation, having basic overstorey structure but almost little native understorey and high densities of aggressive weeds.

3.2.4 Priority Weeds

A list of 51 weed species was collated from the literature, discussion with CCA and from observations during the site assessments in March 2008. However, it must be noted that this list is not exhaustive and that additional weed species may be present at different times of the year.

The priority rating of each recorded weed species was determined after examining:

- the ratings under the *Environmental Weed Strategy of Western Australia* (EWSWA) (Department of Conservation and Land Management, 1999)
- the ratings under Dixon and Keighery (1995) *Recommended methods to control specific weed species*
- whether it was listed under the DAFWA *Agricultural and Related Resources Protection Act 1976* (ARRPA)
- whether it was listed as a *Weed of National Significance* (WONS) (Weeds Australia 2008)
- its local significance to the natural areas.

The role of EWSWA is to highlight which weed species pose significant environmental risk in Western Australia. The EWSWA rating provides a basis for determining which weeds are most critical to control. The three characteristics used for determining the EWSWA rating are:

- *invasiveness* – ability to invade bushland in good to excellent condition, and waterways
- *distribution* – wide current or potential distribution including consideration of known history of wide distribution elsewhere in the world
- *environment impacts* – ability to change the structure, composition and function of ecosystems, in particular to form a monoculture in a vegetation community.

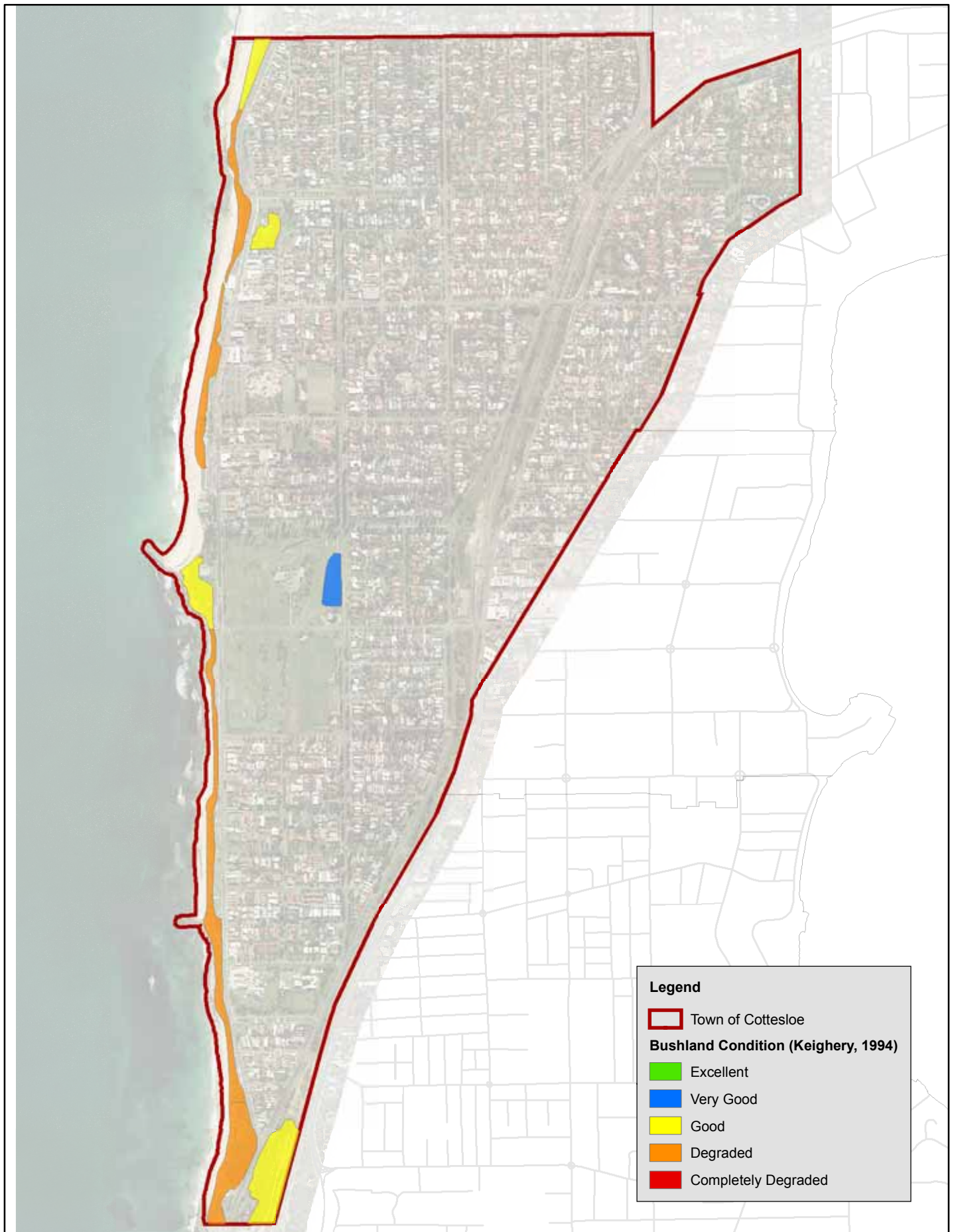


Figure 7 *Cottesloe Natural Areas Management Plan*
Bushland Condition of Existing Natural Areas

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EWSWA weed species were rated accordingly:

- *High* - have all three of the characteristics
- *Moderate* - have two of the characteristics
- *Mild* - have one of the characteristics
- *Low* - not deemed to have any of the characteristics.

The system used by Dixon and Keighery (1995) classified all weeds according to the threat they pose to bushland in the Perth Metropolitan region. The three classifications used were:

- *Priority 1* - major weeds, which are the most serious weeds within their ecosystem, often affecting many reserves or habitats in ways likely to permanently degrade them
- *Priority 2* - nuisance weeds, which are generally found only in a few locations or ecosystems, usually in disturbed areas
- *Priority 3* - minor weeds, which have little known effect and occur in smaller numbers or are less competitive than *Priority 2* weeds.

The type of control for ARRPA declared weed species are listed below:

- *P1* – Prohibits movement of plants or their seeds within the State. This prohibits the movement of contaminated machinery and produce including livestock and feed.
- *P2* – Eradicate infestation to destroy and prevent propagation each year until no plants remain. The infested area must be managed in such a way that prevents the spread of seed or plant parts on or in livestock, fodder, grain, vehicles and/or machinery.
- *P3* - Control infestation in such a way that prevents the spread of seed or plant parts within and form the property on or in livestock, fodder, grain, vehicles and/or machinery. Treat to destroy and prevent seed set all plants.
- *P4* – Prevent the spread of infestation from the property on or in livestock, fodder, grain, vehicles and/or machinery. Treat to destroy and prevent seed set on all plants.

WONS was jointly declared by the Minister for Forestry and Conservation, the Minister for Agriculture, Fisheries and Forestry and the Minister for The Environment in 1999 as part of the *National Weeds Strategy*. The four characteristics used for determining where the species was of national significance were:

- invasiveness
- impacts
- potential for spread
- socioeconomic and environmental values.

Ranking Priority Weeds

The above sources were used to rank the recorded weed species in order of priority for control. Both EWSWA and Dixon and Keighery (1995) were used because it allowed most weeds identified in the study area to be assigned a rating and thereby ranked. If only one source had been used, many weed species would have not been assigned a rating score.

For the purposes of this study, the Dixon and Keighery (1995) ratings of *Priority 1* and *Priority 2* were considered to be equivalent to the EWSWA ratings of *High* and *Moderate*, respectively. The Dixon and Keighery (1995) rating of *Priority 3* was considered to be equivalent to the EWSWA ratings of *Mild* and *Low*. Species which had only been rated under one system were assumed to have an equal rating in the other system. For example, a species that had a *High* rating in EWSWA but is not rated in Dixon and Keighery (1995) was assumed to have a *Priority 1* rating in Dixon and Keighery (1995).

The use of two rating systems does result in some conflict when assigning a ranking for a weed species. To overcome this issue, a scoring system was developed to enable the ranking of the weed species. The scoring system, is summarised in the **Table 5**, is as follows:

- EWSWA rates were scored as follows: High (3 points), Moderate (2 points) and Mild/Low (1 point). Mild and Low in EWSWA are considered to be equal.
- Dixon and Keighery rates were scored: Priority One (3 points), Priority Two (2 points) and Priority Three (1 point).
- If a weed was not rated by both EWSWA and Dixon and Keighery it was given a score of 1.

Table 5: Calculated rating of priority weeds

EWSWA Rating	Dixon & Keighery (1995) Rating	Score	Priority
High	Priority 1	6	High
High	TBA		
TBA	Priority 1		
High	Priority 2	5	High
Moderate	Priority 1		
High	Priority 3	4	Moderate
Moderate	Priority 2		
Moderate	TBA		
Mild/Low	Priority 1		
TBA	Priority 2		
Moderate	Priority 3	3	Moderate
Mild/Low	Priority 2		
Mild/Low	Priority 3		
Mild/Low	TBA	2	Low
TBA	Priority 3		
TBA	TBA		
TBA	TBA	1	Low

Note: TBA = To Be Assessed (weed species which have not been priority rated)

In addition, as weed species listed under either ARRPA or WONS are required by legislation to be controlled, any of these listed weed species recorded were automatically given a rating of 6 and were therefore given a *High* priority.

Through site assessments and discussions with CCA, the calculated ratings were adjusted according to whether the species were more or less of a threat or dominant in the local native areas. Species with low ratings that were posing a greater threat or were already highly dominant had the rating raised. In contrast, species with high ratings but were not considered to be a local threat had their rating lowered accordingly. The priority of each weed species was then classified by the final rating. Species given a rating of 5 or 6 were *High Priority Weeds*. Species with a final rating of 3 or 4 were *Moderate Priority Weeds*. Species with a rating of 1 or 2 were *Low Priority Weeds* (**Table 5**).

Significant Weed Species

State and National Significance

Athel Pine (*Tamarix aphylla*) and Bridal Creeper (*Asparagus asparagoides*) are both declared by ARRPA as P1. In addition, Bridal Creeper is also a Weed of National Significance (WONS). Both species need to be immediately targeted in weed control operations so were given ratings of 6, thus are *High Priority* weed species.

Locally Significance

Several weed species were initially ranked as either *Moderate* or *Low* priority weeds, however observed to be dominant or a serious invasive threat to one or more natural areas. Annual Veldt Grass (*Ehrharta longifolia*), Black Flag (*Ferraria crispera*), Brazilian Pepper Tree (*Schinus terebinthifolius*), Fountain Grass (*Pennisetum setaceum*), Gazania (*Gazania linearis*), Red Soldiers (*Lachenalia bulbifera*) Sea Spinach (*Tetragona decumbens*) and Yellow Soldiers (*Lachenalia reflexa*) are all considered to be highly dominant and/or invasive on the sites that they occur. The priority ratings of these 9 species were increased to 5, so were reclassified as *High Priority* weed species.

Geraldton Wax (*Chamaelium uncinatum*), Guildford Grass (*Romulea rosea*) and Sea Spurge (*Euphorbia paralias*) were less locally significant than the calculated ratings so were downgraded to rankings of 3 or 4. Onion Weed (*Trachyandra divaricata*), Sydney Golden Wattle (*Acacia longifolia*) and Veldt Daisy (*Dimorphotheca ecklonis*) were slightly more dominant to the natural areas than their calculated ratings so were raised to a priority ranking of 3 or 4. As the thistle species was not properly identified, it was given a rating of 3, as that was the most common rating of thistle species. These species were finally rated as *Moderate Priority* weed species.

Beach Evening Primrose (*Oenothera drummondii*), Flat Weed (*Hypochaeris glabra*), Hares Tail Grass (*Lagurus ovatus*), Pigface (*Carpobrotus edulis*) and Ursinia (*Ursinia anthemoides*) were deemed not a significant threat so were reduced to rankings of 2. Alyssum (*Lobularia maritima*) was regarded as slightly more dominant than its calculated rating of 1 so was raised to a priority rating of 2. All these weeds species were finally rated as having *Low Priority*.

Priority Ratings of Weed Species

The Priority ratings of weeds species recorded throughout the sites are listed in **Table 6**. A total of 22 weed species had a rating of 5 or above and were classified as *High Priority* weeds. Such species need to have immediate targeted strategies in place. A total of 13 weed species had a rating of 3 or 4 so are a *Moderate Priority* threats to the natural areas and should be targeted afterwards to enhance the site condition. The remaining 16 species had a rating of two or less, so are considered *Low Priority* threats. These species should be controlled as part of non-target or site-focused maintenance weed strategies if there are any resources available after controlling the high and moderate threat weeds.

A table indicating the calculation of priority weeds and methods of management is located in **Appendix Two**. Species not identifiable due to the season of survey are named to the most accurate level possible.

Table 6: Priority Ratings of weeds identified in natural areas in Town of Cottesloe

Scientific Name	Common Names	Final Rating
High Priority Weed Species – targeted control required for site preservation		
African Boxthorn	<i>Lycium ferocissimum</i>	6
Annual Veldt Grass	<i>Ehrharta longifolia</i>	5
Athel Tree	<i>Tamarix aphylla</i>	6
Bearded Oat	<i>Avena barbata</i>	5
Black Flag	<i>Ferraria crispa</i>	5
Brazilian Pepper Tree	<i>Schinus terebinthifolius</i>	5
Bridal Creeper	<i>Asparagus asparagoides</i>	6
Buffalo Grass	<i>Stenotaphrum secundatum</i>	5
Couch	<i>Cynodon dactylon</i>	6
Fountain Grass	<i>Pennisetum setaceum</i>	5
Freesia	<i>Freesia alba x leichtlinii</i>	6
Gazania	<i>Gazania linearis</i>	5
Geraldton Carnation Weed	<i>Euphorbia terracina</i>	6
Kikuyu Grass	<i>Pennisetum clandestinum</i>	5
Perennial Veldt Grass	<i>Ehrharta calycina</i>	6
Red Soldiers	<i>Lachenalia bulbifera</i>	5
Rose Pelargonium	<i>Pelargonium capitatum</i>	6
Sea Spinach	<i>Tetragonia decumbens</i>	5
Victorian Tea Tree	<i>Leptospermum laevigatum</i>	6
Western Blue Lupin	<i>Lupinus cosentinii</i>	6
Wild Gladiolus	<i>Gladiolus caryophyllaceus</i>	5
Yellow Soldiers	<i>Lachenalia reflexa</i>	5
Moderate Priority Weed Species – target once High Priority Weeds are controlled for site enhancement		
Cape Weed	<i>Arctotheca calendula</i>	3
Geraldton Wax	<i>Chamaelucium uncinatum</i>	3
Guildford Grass	<i>Romulea rosea</i>	3
Morning Glory	<i>Ipomoea sp.</i>	4
Onion Weed	<i>Trachyandra divaricata</i>	4
Sea Spurge	<i>Euphorbia paralias</i>	3
Soursob	<i>Oxalis pes-caprae</i>	3
Sydney Golden Wattle	<i>Acacia longifolia</i>	4
thistle	Asteraceae sp.	3
Veldt Daisy	<i>Dimorphotheca ecklonis</i>	3
Whiteflower Fumitory	<i>Fumaria capreolata</i>	3
Wild Onion	<i>Asphodelus fistulosus</i>	4
Low Priority Weed Species – control if resources allow during site maintenance		
Agave	<i>Agave americana</i>	2
Aloe	<i>Aloe sp.</i>	1
Alyssum, Sweet Alison	<i>Lobularia maritima</i>	2
Beach Evening Primrose	<i>Oenothera drummondii</i>	2
Flatweed	<i>Hypochaeris glabra</i>	2
Fleabane	<i>Conyza sp.</i>	2
fleshy bulbs	?Iridaceae sp.	1
Hares Tale Grass	<i>Lagurus ovatus</i>	2
Marguerite Daisy	<i>Argyranthemum frutescens</i>	2
Marram Grass	<i>Ammophila arenaria</i>	2
Mirror Plant, Looking Glass Bush	<i>Coprosma repens</i>	2
Pigface	<i>Carpobrotus edulis</i>	2
Stocks	<i>Matthiola sp.</i>	1
Summer Grass	<i>Digitaria sanguinalis</i>	1
Ursinia	<i>Ursinia anthemoides</i>	2
Wattle	<i>Acacia sp.</i>	1
White Arctotis	<i>Arctotis stoechadifolia</i>	2

3.3 Fauna

3.3.1 Native Fauna

A comprehensive fauna survey has not been conducted within the Town of Cottesloe, however some bird surveying and opportunistic records have been made.

WAPC (1998) mentions a variety of fauna at Vlamingh parklands, however no species lists were provided. The report states that 38 bird species, two gecko species, 12 skink species and at least one snake species were present. The Bobtail (*Tiliqua rugosa*) has also been observed across the northern coastal areas (Ecoscape 2005, CCA 2008).

A bird survey was conducted over 2003 and 2004 in the Cottesloe public open spaces, Mudurup and South Cottesloe foreshore (Gole 2003, 2004). A total of 33 species were recorded, which are listed in **Table 7** on the following page. None of the species were listed as protected by the DEWHA (1999) *EPBC Act* or the Government of Western Australia (1950) *Wildlife Protection Act*.

3.3.2 Fish Habitat Protection Area

The Cottesloe reef system is approximately 4.4 km long and stretches intermittently 330m south from the artificial surfing reef at Cable Station to North Street. This reef is readily accessible to the general public and is therefore vulnerable to human impacts. This reef was declared a Fish Habitat Protection Area (FHPA) under Section 115 of the Government of Western Australia (1994) *Fish Resources Management Act*.

3.3.3 Introduced Fauna

A total of 11 introduced fauna have been recorded occurring within the Town of Cottesloe, (**Table 8**). Over half of these species are bird species which have been introduced to the Perth region (Gole 2003, 2004). Introduced mammals such as mice, rats, cats, foxes and rabbits are also known to inhabit the coastal area (WAPC 1998). Of these, the rabbit is probably the most serious threat to the natural areas, with many sightings and warrens recorded along the dunes (CCA 2008).

Table 7: Native bird species recorded in the Town of Cottesloe

Common Name	Scientific Name
Australian Magpie	<i>Cracticus tibicen</i>
Australian Raven	<i>Corvus coronoides coronoides</i>
Australian Ringneck	<i>Platycercus zonarius</i>
Brown Honeyeater	<i>Lichmera indistincta</i>
Caspian Tern	<i>Sterna caspia</i>
Crested Tern	<i>Sterna bergii</i>
Eastern Reef Egret	<i>Ardea sacra</i>
Galah	<i>Cacatua roseicapilla roseicapilla</i>
Grey Butcherbird	<i>Cracticus torquatus</i>
Little Black Cormorant	<i>Phalacrocorax sulcirostris</i>
Little Pied Cormorant	<i>Phalacrocorax melanoleucos melaoleucos</i>
Little Wattlebird	<i>Anthochaera lunulata</i>
Magpie-lark	<i>Grallina cyanoleuca</i>
Nankeen Kestrel	<i>Falco cenchroides cenchroides</i>
New Holland Honeyeater	<i>Phylidonyris novaehollandiae</i>
Osprey	<i>Pandion haliaetus</i>
Pacific Gull	<i>Larus pacificus</i>
Pied Cormorant	<i>Hypoleucos varius</i>
Red Wattlebird	<i>Anthochaera carunculata</i>
Silver Gull	<i>Larus noveahollandiae</i>
Silveryeye	<i>Zosterops lateralis lateralis</i>
Singing Honeyeater	<i>Lichenostomus virescens virescens</i>
Tree Martin	<i>Hirundo nigricans</i>
Welcome Swallow	<i>Hirundo neoxena</i>
White-cheeked Honeyeater	<i>Phylidonyris nigra nigra</i>
White-faced Heron	<i>Ardea novaehollandiae novaehollandiae</i>
Willie Wagtail	<i>Rhipidura leucophrys leucophrys</i>

Source: Gole (2003, 2004)

Table 8: Introduced species recorded in the Town of Cottesloe

Common Name	Scientific Name
Laughing Kookaburra	<i>Dacelo novaeguineae</i>
Laughing Turtle-Dove	<i>Streptopelia senegalensis</i>
Long-billed Corella	<i>Cacatua tenuirostris tenuirostris</i>
Rainbow Lorikeet	<i>Trichoglossus haematodus</i>
Rock Dove	<i>Columba livia</i>
Spotted Turtle-Dove	<i>Streptopelia chinensis chinensis</i>
House Mouse	<i>Mus musculus</i>
Rat	<i>Rattus rattus</i>
Cat	<i>Feline catus</i>
Fox	<i>Vulpes vulpes</i>
Rabbit	<i>Oryctolagus cuniculus</i>

Source: Gole (2003, 2004)

4.0 Management Framework

Cottesloe Natural Areas Management Plan

4.1 Framework Structure

All natural areas within the Town were organised in a framework according common social and environmental characteristics. The areas were divided into the following format:

- Landscape Character
- Precinct
- Existing Natural Area
- Management Node.

By identifying and categorising the areas by these characteristics, prioritisation and specific management strategies can be devised.

4.2 Landscape Character

4.2.1 Defining Landscape Characters

The term Landscape is defined by the Department of Environment and Conservation (CALM,1994) as a combination of physical and cultural features. Landscape Character is where there is a common combination of these features such as topography, geology, vegetation and land use.

At a regional scale the Town of Cottesloe is part of the Swan Coastal Plain Landscape Character Type. This area extends from about the Moore River in the north to Busselton in the south and to the western edge of the Darling Plateau (CALM 1994).

For the purpose of this study Landscape Character has been defined at a local scale through a combination of desktop analysis and fieldwork. **Figure 4** illustrates the existing physical environment of the Town of Cottesloe which exhibits an undulating landscape with three broad soil types and one main vegetation complex. However local variation in vegetation is likely to occur where there are different combinations of soil and topography. Two Landscape Characters have been identified, from the social and physical characteristics of the Town:

1. Coastal
2. Undulating.

The coastal character is at a lower elevation than the rest of the study area and contains the most remnant bushland. The vegetation structure is a coastal community and the bushland condition is variable although generally degraded due to erosion from physical processes and human activity. The predominant land use is recreational and there are Aboriginal and European heritage sites along the Cottesloe coastline. These environmental and social values also contribute to a strong sense of place for the local and wider community.

The undulating character is the remaining area east of the coast and has variable topography with little remaining bushland. There are green corridors as identified in the

Western Suburbs Greening Plan (Ecoscape, 2002) and a range of land uses such as residential and commercial. Of the minimal area of bushland in this character there are a few important areas of bushland such as the Grant Street Marine Park, John Black Dune Park, Cottesloe Native Gardens and the Victoria street bushland which extends south behind the McCall Centre.

These two Landscape Characters have been further divided into five precincts which are based on local variation in environmental and social characteristics. The purpose of defining these precincts is to be able to place the natural and potential natural areas into a physical and social context to guide the management practices of these areas.

The Landscape Character units and Precincts are summarised in **Table 9** and are illustrated on **Figure 8**.

Table 9: Landscape Character Units for Town of Cottesloe

Landscape Character	Precincts	Social Environment	Physical Environment	Greenways
Coastal	1. Northern beaches 2. Central beaches 3. Southern beaches	- High recreation - Heritage	- continuous length of coastal bushland - erosion processes - Quindalup dunes and limestone cliffs	- Regional - Securing
Undulating	4. Residential zone 5. Mixed zone	Mixed land uses - residential - commercial - transport	- varied topography - little bushland - connecting corridors	- Securing - Developing

4.3 Precincts

The Landscape Characters defined above were divided into five *Precincts*, with each precinct requiring specific natural area management. The precincts are further divided into fourteen areas that currently contain remnant vegetation, termed *Existing Natural Areas* (ENAs). The naming and boundaries of each ENA follows the format adopted by CCA (2008), with the exception of Peters Pool and Bryan's Way, which were combined into one ENA. The division of each precinct into ENAs is outlined in **Figure 9**.

In turn, each ENA was divided into 65 *Management Nodes* (MNs) according to variation in site issues (e.g. impacts and condition) or land function (e.g. lawns versus dunes). The division of MNs allow a practical size for ground work, and follow clear boundaries, such as paths, wherever possible. The division and naming of each MN within each ENA follows the management zone format adopted by CCA (2008). Maps illustrating the boundaries of the ENAs and their MNs are presented with their corresponding Strategy Plans in **Section 6**.

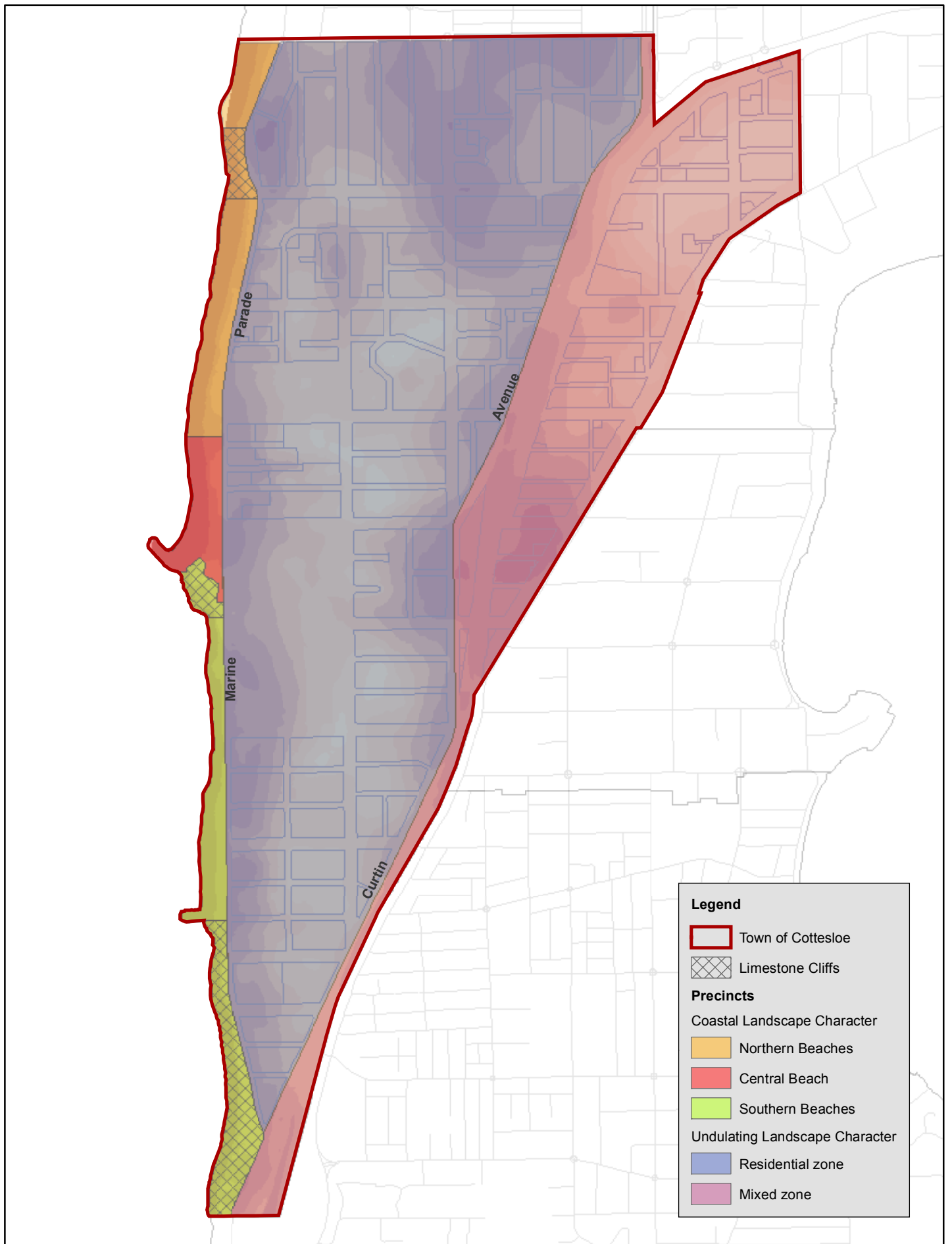


Figure 8 Cottesloe Natural Areas Management Plan
Landscape Character

Mar 2008

prepared for the TOWN OF COTTESLOE



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Meters

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Project No. 1990-07

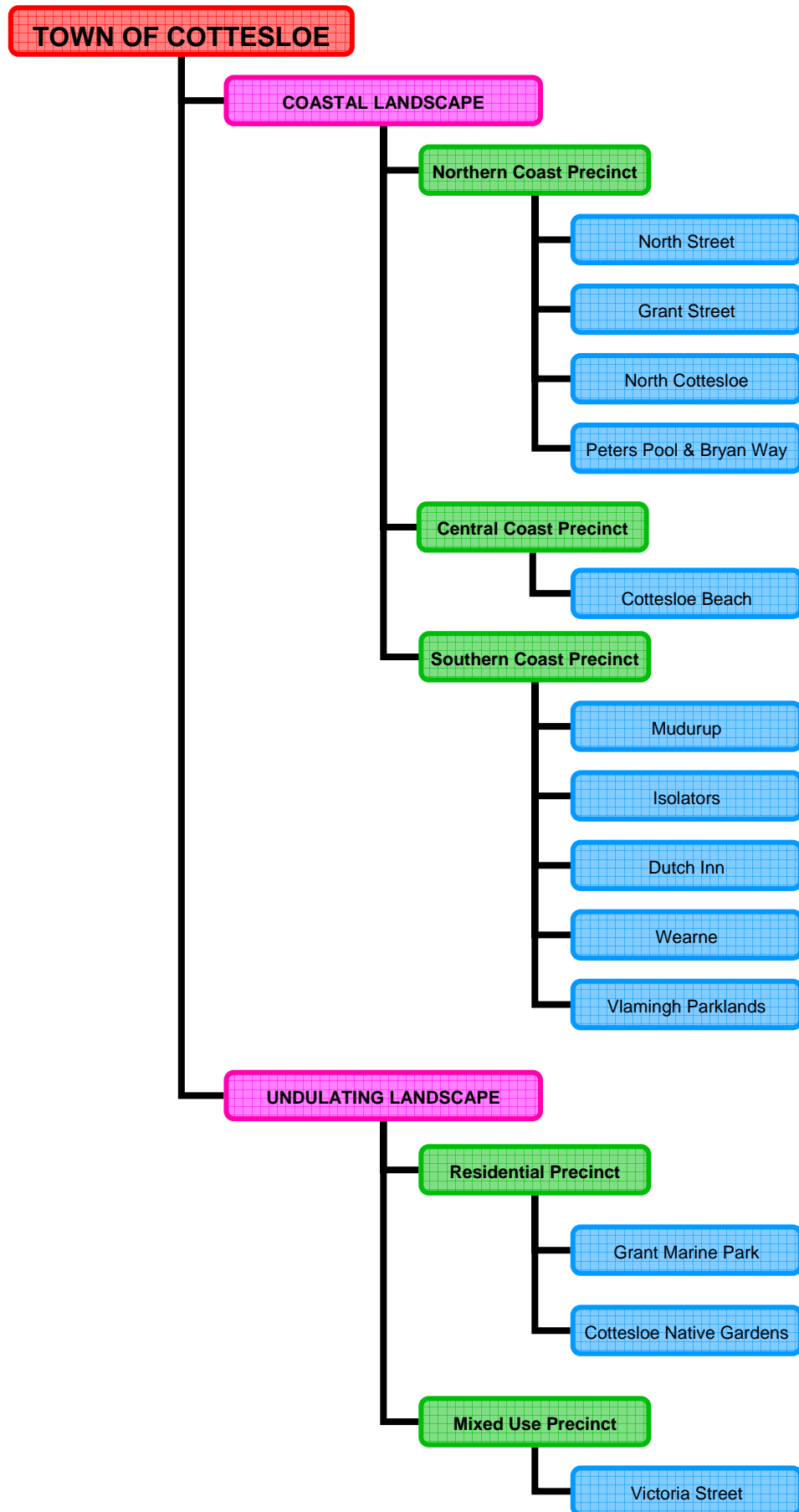


Figure 9. Existing Natural Areas in Town of Cottesloe Precincts

4.4 Coastal Landscape Precincts

The Coastal Landscape is separated into Northern, Central and Southern Coastal Precincts. The Coastal Vegetation community is the only community present in these three precincts.

4.4.1 Northern Coastal Precinct

The *Northern Coastal Precinct* comprises of the foreshores between Napier Street and North Street (**Table 10**). The majority of the area has wide beaches, with a small section of limestone cliffs north of Grant Street. This area experiences high use by the public, especially during summer. Common land uses are recreation (e.g. swimming and sunbathing) and commercial (e.g. cafes). Five ENAs and 10 MNs have been defined by CCA (2008) within this precinct. Details of these ENAs are given below.

Table 10: Management Issues of Northern Coast Precinct

Item	Precinct Specifics	
Social	Recreation	High use of Beaches
	Aesthetics	High importance
Natural	Landform	Wider sandy beaches, small areas of limestone cliffs.
	Soils	Quindalup
	Communities	Coastal
	Fauna	Fish Habitat Protection Area
	High Priority Weeds	Black Flag, Freesia, Gazania, Hares Tail Grass, Kikuyu Grass, Rose Pelargonium, Victorian Tea Tree.
	Pests	Rabbits
	Greenways	Regional
	Other	Erosion and collapsing cliff faces
Heritage	Adjacent to North Cottesloe Café	
Development	Cafes and Surf Clubs	
Infrastructure	Fencing	Condition varies from poor to good: needs to be a consistent style throughout the precinct
	Access	Dual access path popular for walking, cycling, rollerblading and skateboarding. 8 access paths to beach
	Other	Information signs, showers, dog bowl, benches, lookout, basketball ring, playground, bins, sculptures, stormwater drains
Other	<ul style="list-style-type: none"> • Risk of erosion/ cliff collapses threatening Marine Parade • Potential for restoration efforts to have landscaping focus for visual amenity • Informal paths causing trampling of vegetation and risking erosion • Over-spraying from reticulated verges encouraging couch invasion • Some stormwater pipes will be removed soon, however there is no plan for rehabilitation once the pipes are removed 	

North Street

North Street is the section of wide beaches and dunes from the Cottesloe/ Nedlands border (western end of North Street) to the timber bench access ramp at Vera View. Only one MN has been designated for this ENA (named NS1). The site is popular for fishing, dog walking and general beach use. Some non-local natives were planted in the dunes in the past, however these do not pose a serious threat to the site's biodiversity. Lawn grasses are invading the dunes from the adjacent grassed verges. Access paths, including timber ramp and boardwalk were built in 2006 from a joint Town of Cottesloe/ CCA project, which was partly funded by Coastwest.

Grant Street

Grant Street is the section of wide beaches, cliffs and dunes south of Vera View and north of the Grant Street access ramp. This area is also popular for fishing and general beach use. The ENA is divided into two MNs (named GS1 and GS2) by an access path west of Grant Street. Some remediation attempts have been made to combat erosion from two dune slips in GS1 that occurred in 2004, however this effort has been damaged by public use of the slope to access the beach. Much of the steep banks are dominated by Sea Spinach, which also contributes to the degraded nature of the site. There is also a potential blowout at the bottom right of the middle ramp in GS2.

North Cottesloe

North Cottesloe lies further south, between the access ramp and Bryan Way and contains the Blue Duck and Barchetta Cafés and the North Cottesloe Surf Club. Five MNs (named NC1 to NC5) have been designated in this ENA according to the layout of paths, including the lawn area north of the Lifesaving club building (NC2). The ENA is of high visual amenity value as it is heavily used by the public. An opportunity exists to revegetate the dunes surrounding the cafés and surf club with aesthetic coastal flora to improve the visual amenity of the area. Fencing is also required for some parts of the dunes that are being trampled by public use. The dunes adjacent to the sculpture in NC5 are bare and pose a potential erosion risk.

Bryan Way and Peters Pool

The combined areas of *Bryan Way and Peters Pool* occur between Bryan Way and Overton Gardens. The smaller MN of Bryan Way (BW) exists immediately west of its namesake road and is separated from the larger node Peters Pool (PP) by an access path opposite to the adjacent car park. BW has been extensively restored by CCA since 2006 and is currently in a better condition than PP. Some reticulation over-spraying from the adjacent reticulated verges is encouraging lawn grass invasion into the dunes. The Town plans to remove a stormwater pipe from PP, however no rehabilitation plans have been made following the site disturbance. There is a potential blowout near the ramp at the middle of PP which needs to be addressed.

4.4.2 Central Coastal Precinct

The *Central Coastal Precinct* exists between Napier Street and Mudurup Rocks (**Table 11**). The precinct has been heavily modified, such as sheltered lawns, a groyne and the Cottesloe Surf Club. As such, it contains almost no remaining natural vegetation. The precinct is very popular for recreation (e.g. swimming and picnicking), and community activities (e.g. art displays). Currently only one ENA and one MN defined by CCA (2008) exists within this precinct. The beach precinct is heritage listed.

Table 11: Management Issues of Central Coast Precinct

Item	Precinct Specifics	
Social	Recreation	Extremely high use, particularly summer
	Aesthetics	Very high aesthetic importance
Natural	Landform	Highly modified
	Soils	Spearwood
	Communities	Coastal (almost none remaining)
	Greenway	Regional
	Priority Weeds	Athel Pine, Couch, Rose Pelargonium, Victorian Tea Tree
	Other	None
Heritage	Beach precinct	
Development	Cottesloe Surf Club, Indiana Tea House	
Infrastructure	Fencing	Along beach
	Access	Dual access path heavily used by pedestrians 7 access paths to beach (2 vehicle, 5 footpaths)
	Other	Lawn and picnic areas
Other	<ul style="list-style-type: none"> • Informal paths causing trampling of vegetation and risking erosion • Town has indicated it may move car park to John Black Dune Park 	

Cottesloe Beach

Cottesloe Beach exists as a small dune and beach system opposite a car park between Overton Gardens and Warnham Road. Only one MN has been attributed to this area (named CB). The beach is heavily used by the public, resulting in some trampling and degradation of the dune vegetation. This site has high visual amenity importance, providing an opportunity to revegetate the dunes with aesthetic coastal flora. This ENA is the only recorded site for ARRPA declared weed species Athel Pine (*Tamarisk aphylla*). The Town has indicated the possibility of moving the adjacent car park to John Black Dune Park.

4.4.3 Southern Coastal Precinct

The *Southern Coast Precinct* comprises of the foreshore between Mudurup and where Marine Parade terminates onto Curtin Avenue (**Table 12**). The foreshore varies from narrow beaches to limestone cliffs. The precinct experiences generally less use by the public than nearby areas, however has a far wider range of recreational activities including surfing, kite-surfing, snorkelling, kayaking and diving. Five ENAs and 50 MNs are defined by CCA (2008) within this precinct, which are discussed below.

Table 12: Management Issues of Southern Coast Precinct

Item	Precinct Specifics	
Social	Recreation	Moderate to High use in Summer Surfing, kite surfing, hang-gliding, diving Surf competitions have high impact on dunes
	Aesthetics	Seas views High aesthetic importance
Natural	Landform	Narrow beaches, larger lengths of limestone cliffs
	Soils	Spearwood limestone
	Communities	Coastal
	Fauna	Fish Habitat Protection Area
	Priority Weeds	African Box Thorn, Bearded Oat, Black Flag, Brazilian Pepper Tree, Buffalo Grass, Couch, Freesia, Gazania, Geraldton Carnation Weed, Gladiolus, Hares Tail Grass, Kikuyu Grass, Rose Pelargonium, Victorian Tea Tree
	Pests	Rabbits
	Greenway	Regional
	Other	Erosion, collapsing cliff faces
Heritage	Aboriginal Heritage Site (Mudurup) European Heritage Site (Vlamingh)	
Development	Leighton development adjacent to southern end of precinct	
Infrastructure	Fencing	Low pine logs, some wire fencing
	Access	<ul style="list-style-type: none"> 13 access paths to beach (2 unsafe) dual access path popular for walking, cycling, rollerblading and skateboarding
	Other	Sculptures, playgrounds, exercise areas, plaques, Bicentennial sundial, wind shelter, helicopter pad, limestone arch, signs, tap, picnic tables, car park, benches, drains,
Other	<ul style="list-style-type: none"> Informal paths causing trampling of vegetation and risking erosion Ablution access needed during surfing competitions Much invasion of lawn grass into dunes, requires weed barrier Opportunities to revegetate parts of verges using aesthetic flora to improve visual amenity Continuing recession south of the Dutch groyne Potential for cliff collapse 	

Mudurup

Mudurup is bounded between the limestone promontory in front of the Cottesloe Surf Club and the southern end of Cove beach just south of Forest Street. A total of seven MNs (named M1 to M7) are attributed to this ENA, including lawn verges. The northern section is an Aboriginal heritage site. The adjacent Cove Beach is a popular site for surfers. CCA has conducted restoration works on the limestone promontory (M1) between 2005 and 2006, greatly improving the state of the vegetation. Fencing around the limestone promontory has proven successful in keeping the public and pets out and retaining this condition. A sundial

and limestone wind shelter was built from a bicentennial grant in the early 1990s however this site has fallen into disrepair (M2). Various non-local native species were also planted in M2, though these are native bird attracting and are not a weed threat. The entire site is of high visual amenity importance so revegetation works should consider suitable aesthetic species.

Isolators

Isolators lies between Mudurup and a small car park west of Deane Street. A total of 9 MNs segment this ENA (numbered I1 to I9), including verges, lawn verges, steep slopes and swales. This site is generally neglected and experiences severe impacts during surfing competitions, particularly as a result of the lack of ablution blocks causing surfers to trample vegetation. Lawn grasses from adjacent verges are invading the dunal vegetation in MNs I1, I3, I4 and I6.

Dutch Inn

Dutch Inn is another long stretch of beach between Deane Street and a beach path just north of Gibney Street. The ENA has been divided into 11 MNs (numbered D1 to D11) of swales and grassed areas. This area is popular with families as well as kite and wind surfers. A groyne constructed near D10 and D11 has resulted in the foreshore immediately south to recede at a rate of 30cm a year. The mound at D10 was planted by CCA in 2001 but is not currently being maintained and is becoming degraded. There is also an erosion blowout in D1 that threatens the stability of the dunal systems and is currently being brushed and revegetated by CCA.

Wearne

The ENA of *Wearne* is between the Gibney Street and Sydney Street ramps and consists of 6 MNs (numbered W1 to W6) of steep slopes and narrow verge strips. There is little remnant native vegetation remaining as weeds dominate much of the site. The steep slopes in W1 and W5 are sparse. Washout caused by a broken pipe at W4 has been infilled but is still a high erosion risk and needs brushing. Some restoration was done by CCA in W3 in 2000.

Vlamingh

Vlamingh lies between the Sydney Street ramp and the car park north of where Marine Parade terminates on Curtin Avenue. CCA (2008) has divided this ENA into 16 MNs of verges, lawn areas, dunal systems and sections of the memorial parkland (numbered V1 to V16). A popular swimming hole and fishing spot lies opposite Sydney St (V1). Hang gliding is popular at V4 and V5, however the lack of a proper access path to the beach is resulting in significant erosion to the unstable slope in V4. The site may also be impacted by the Leightons parklands development occurring immediately south in the Town of Mosman Park. The only recorded population of the ARPPA and WONS declared weed Bridal Creeper is located in V8.

As well as the memorial site, *Vlamingh* serves as the southern entrance to Cottesloe. This high public profile gives the southern section a high importance in visual amenity. Restoration efforts should be focusing on using a suite of aesthetic local species. As there is

no residential housing adjacent to the area, the site may also be planted with large shrub and tree species.

4.5 Undulating Landscape Precincts

The Undulating Landscape Characters can be separated into Residential and Mixed Precincts, as described below.

4.5.1 Residential Precinct

The *Residential Precinct* is the greatest in size of the precincts (**Table 13**). Occurring inland from the coastal precincts, it is constrained along the eastern side by the railway corridor. The precinct contains a wide variety of vegetation:

- Transition Shrubland along the western portion
- Cottesloe Shrubland in the centre
- Cottesloe Woodland along the east proportion.

Table 13: Management Issues of Residential Precinct

Item	Precinct Specifics	
Social	Recreation	Parkland, bike riding, "bushwalk"
	Aesthetics	View points
Natural	Landform	Stable dune and rise
	Soils	Spearwood Limestone, Spearwood Sand
	Communities	Coastal Dunes (stable dunes), Transition Shrubland, Cottesloe Woodland
	High Priority Weeds	Bearded Oat, Black Flag, Brazilian Pepper Tree, Couch, Fountain Grass, Freesia, Geraldton Carnation Weed, Rose Pelargonium, Sea Spinach, Victorian Tea Tree, Western Blue Lupin, Yellow Soldiers.
	Pests	Rabbits
	Greenway	Securing and Developing
	Other	<ul style="list-style-type: none"> • Unique remaining intact inland bushland. • Important sources for biodiversity
Heritage	Aboriginal artefact scatters at Victoria Street	
Development	Much Residential and Business infrastructure	
Infrastructure	Fencing	Some limestone walls
	Access	Various sealed and informal paths
	Other	playground
Other	<ul style="list-style-type: none"> • Opportunities to reduce reticulation and revegetate unused lawn areas • Over-spraying of adjacent lawn sprinklers encouraging lawn grasses to invade natural areas • Neighbours resist any plantings that will restrict views 	

The area is predominantly residential however some businesses also occur, particularly along Marine Parade. The undulating landscape gives rise to views both inland and of the coast. The precinct contains wide, lawn verges with tree-lined mainly Norfolk Pines and a number of sumps. This precinct contains little remaining bushland, 2 ENAs and 2 MNs are defined by CCA (2008), they are the Grant Marine Park and Cottesloe Native Garden.

Maintaining and enhancing the biodiversity of these areas is important because the area of bushland inland from the coast is minimal.

Grant Marine Park

Grant Marine Park occurs at the southern side of where Grant Street terminates onto Marine Parade. It plays an important role to the local community – the playground and lawn area provides for physical recreation activities while the remnant stable dune offers a bench and platform for enjoying the sea view. The stable dune has been greatly restored by CCA since 2002, though the western side has been less successful from being exposed to harsh sea winds and salt spray.

There are opportunities to both reduce reticulation and lawn maintenance and increase the size of the natural vegetation. The southern verge area of the site is unused and can be revegetated with coastal flora. Also, a parcel of unused land occurs immediately southwest of the site along Hammersley Street/ Hawkstone Street which is maintained by the Town, this could be converted to a Transition Shrubland, promoting species that will not obstruct the view of the adjacent properties yet have aesthetic value to visually enhance the area.

Cottesloe Native Gardens

A small and unique remnant of inland vegetation occurs along the eastern side of the Cottesloe Golf Course, immediately north of the child care centre. The ENA has been given a single MN (titled CNG). This patch is the only remaining site in the Town for a wide diversity of local native species and contains a significant number of mature grasstrees (*Xanthorrhoea preissii*). The site also provides an important habitat for birds. A number of non-local native plants have been planted here, however these species also offer fauna habitat and are not regenerating, so do not offer a threat to the site.

Cottesloe Native Gardens is frequently used by locals as a “short bush walk”, resulting in the creation of an informal path, enclosed on both sides by shrubs, along the eastern section near Broome Street. A considerable proportion of the western and northern sections are dominated by Victorian Tea Trees and other weed species. There is an opportunity to expand the remnant vegetation size by replacing the weed trees with local native trees and shrubs.

4.5.2 Mixed Use Precinct

The *Mixed Use Precinct* occurs between the railway line and the eastern boundary of the Town (**Table 14**). Vegetation communities vary from Karrakatta Forest at the northern end to Cottesloe Woodland in the central and southern areas. The precinct contains a mixed use of residential, commercial and transport land uses, including the town centre. Curtin Avenue and the railway provide an important transport linkage as well as a Securing Greenway. The short section of Jarrad Street between the railway and the Town boundary is defined as a Developing Greenway, linking to the Shire of Peppermint Grove. There two wide median strips – Congdon Street and the eastern portion of Grant Street which are not currently designated as greenways and exist on high elevations, offering ideal viewpoints of the ocean. Only one ENA and one MN currently occur within this precinct.

Table 14: Management Issues of Mixed Use Precinct

Item	Precinct Specifics	
Social	Recreation	Playground and parkland
	Business	Town centre
	Aesthetics	Entry statements, high view points
Natural	Landform	Valley and high point
	Soils	Quindalup Sand and Spearwood Limestone
	Communities	Cottesloe Woodland and Karrakatta Forest
	High Priority Weeds	Bearded Oat, Couch, Victorian Tea Tree.
	Pests	Rabbits
	Greenway	Securing and Developing
	Other	None
Heritage	Aboriginal artefacts scatter site at Victoria Street.	
Development	Business, Railway, roadwork	
Infrastructure	Fencing	
	Access	
	Other	
Other	<ul style="list-style-type: none"> • Southern area is part of Leightons development, future land use uncertain • Potential for a viewpoint to be established as area has high elevation 	

Victoria Street

Victoria Street occurs at the southern tip of the Town boundary, east of the Vlamingh residential area, between Curtin Avenue and the Railway line and south of Victoria Street. Currently only one MN has been given to this ENA (called VIC). This remnant vegetation occurs on a sand and limestone ridge. Victorian Tea Trees dominates much of the overstorey, however many patches of good remnant shrubs such as Cockies Tongue (*Templetonia retusa*) and Red Eyed Wattle (*Acacia cyclops*) still exist, as well as a viable patch of Rottnest Island Pine (*Callitris preissii*).

The site has a steep elevation that leads to a high point behind the heritage listed McCall Centre which provides an overview across the entire Town of Cottesloe. This site provides an unique opportunity to the Town to create a lookout point.

4.6 Potential Natural Areas

4.6.1 Existing Representation and Biodiversity

Currently, only 15.5 ha of the Town (less than 5%) is recognised as containing natural areas. Existing biodiversity is well below its original status, as there is a lack of inland remnant vegetation areas or types. These remaining areas are mostly within the Coastal Landscape (10.8ha), however almost all of this vegetation is *Degraded* condition. Just under a third of the remnant vegetation is within the Undulating Landscape (4.7ha) however some of this is which is in a *Good to Very Good* condition (**Table 15**).

Table 15: Bushland Condition of remnant vegetation within Landscape Characters regions in the Town of Cottesloe

Landscape Character	Condition	Area (ha)
Coastal	Pristine	0
	Excellent	0
	Very Good	0
	Good	2
	Degraded	8.8
	Completely Degraded	0
	TOTAL	10.8
Undulating	Pristine	0
	Excellent	0
	Very Good	0.9
	Good	3.8
	Degraded	0
	Completely Degraded	0
	TOTAL	4.7

There is some representation of natural areas occurring on Quindalup and Spearwood Limestone, however none in Spearwood Sand, as the open areas are currently parklands containing exotic species. In terms of vegetation, there is no representation of the Hedde *et al* (1980) Karrakatta Central and South complex and poor representation of flora species within the Cottesloe Central and South vegetation complex, particularly tuarts (*Eucalyptus gomphocephala*). The poor bushland condition described in **Section 3.2.3** has resulted in some of the natural areas being sparse or even absent in remnant vegetation. The poor representation and status of the existing areas is indicated in **Figure 10**.

The lack of natural area representation and biodiversity needs to be addressed in order to meet the Town's environmental objectives. In order to achieve this, more suitable areas need to be identified and restored with appropriate native species.

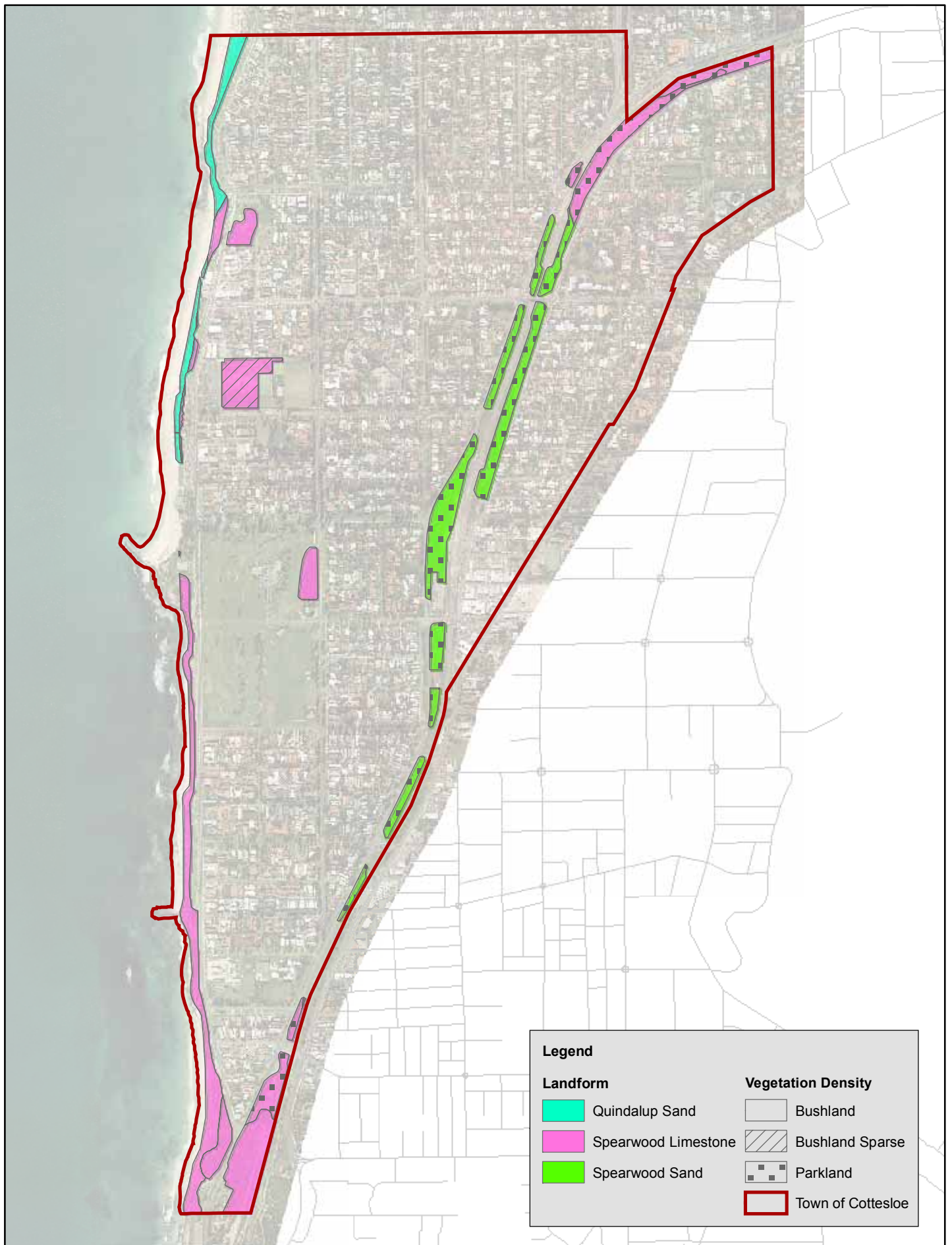


Figure 10

Cottesloe Natural Areas Management Plan
Landform Representation

Mar 2008

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4.6.2 Greenways

As discussed in **Section 2.1.2** and illustrated in **Figure 3**, the Ecoscape (2002) *Western Suburbs Greening Plan* highlights several greenways in the Town that should be conserved and enhanced. These greenways act as ecological corridors, linking the ENAs within the Town to those outside the municipal boundary. Major securing and developing greenways occur along Marine Parade, Grant Street, Broome Street and the Railway Corridor. With the exception of Marine Parade, the remaining corridors are currently not designated as *Parks and Recreation* under either the Town Planning Scheme or Metropolitan Regional Scheme (**Figure 2**).

These greenways may be categorised under their current land function:

- median strips
- verges
- railway corridor.

It must be recognised that these areas are already serving a current or future land use, so may not be fully returned to resembling the original natural area. Restoration efforts will then need to consider integrating the current or future land use with appropriate native vegetation. This may be conducted in terms of a *Landscaping* perspective to improve the visual amenity and function of the location with suitable local flora. Such restoration should also comply with relevant Town policies and documents, including:

- Town of Cottesloe (2004) *Policy: Residential Verges*
- Town of Cottesloe (2004) *Policy: Beach*
- Town of Cottesloe (2005) *Policy: Street Trees*
- Town of Cottesloe (2005) *Town Centre Planning Report*
- Town of Cottesloe (2005) *Town Centre Concept Plan*
- Public Transport Authority (2008) *Perth-Fremantle Transit Reserve Agreement*.

It should be noted that planting of local tree species may conflict with Luff and Luff (1999), which recommend many non-local and exotic species along these corridors for streetscape aesthetics. It is recommended that this report's recommendations be superseded along greenways as they do not support the Town's biodiversity values.

Incorporating aesthetics into these greenways may be achieved by selecting a subset of flora species within the corresponding vegetation community that are aesthetic and may serve a suitable function. The greenways function of enhancing fauna movement throughout the Town and across the municipality border can be promoted by planting flora species that provide habitat and food sources to native fauna.

4.6.3 Median Strips

The wide median strip in Grant Street offers a unique possibility of providing an ecological corridor from the coastline to the railway line and even further inland. It also connects to Congdon Street, which also has a wide median strip. The eastern section of the Grant Street median strip is currently covered by lawn which is reticulated and maintained by the Town. Parts of the strips contain a variety of specific functions, namely:

- view points

- sumps
- entry statements.

The median strips typically consist of mature non-native Norfolk Island Pines through the centre. The majority of the understorey is couch grass, although a number of small scattered native shrubs persist, as shown in **Figure 11a**. Most of the understorey within the median strips only comprise of couch grass and has a degraded appearance. A few local shrubs are present in small patches. The grassed areas may be replaced with low lying aesthetic local species to visually enhance the median strip which are also suitable for fauna feeding and habitat. This enhancement will reduce Town water consumption as the eastern section will no longer be reticulated. An illustration on how the median strips may appear with native understorey is presented in **Figure 11b**.

The Norfolk Island Trees are currently approaching their life expectancy. The current Town practice is to replace these trees with new Norfolk Island Pine saplings. It may be possible to alter this practice and replace the dying trees with local trees instead, such as Tuarts, Rottnest island pine (*Callitris preissii*) and Rottnest Tea Tree (*Melaleuca lanceolata*). An illustration of what the median strips may appear revegetated with native understorey and Tuart trees is presented in **Figure 11c**.

Variations in topography along Grant Street have resulted in a number of rises with clear ocean views at the intersections of Broome Street and Mann Street. These two *View Points* sites have a particularly high aesthetic landscape potential which is not being fulfilled from the lawn grasses. Replacing the median grass with highly visual local plant species that will not obscure the view will greatly enhance the view's visual amenity and reduce the requirement for irrigation.

The intersection of Curtin Avenue and Marine Parade serves as the southern gateway to the Town of Cottesloe. Also, the intersection of Curtin Avenue with Grant Street may also serve as a northern gateway. These *Entry Statements* have high aesthetic importance as they both serve as symbolic boundaries of the Town. The intersections may be restored with aesthetic coastal flora to promote the Town's natural beauty and heritage to incoming visitors. Illustrations of how the southern Entry Statement may appear are given in **Figure 12**.

Three *Sumps* currently exist on the Grant Street median strips. The western sump is located near the intersection of Marine Parade, however it has been planned to be in-filled by the Town in the near future. The middle sump lies immediately east of Marmion Avenue intersection and is of poor visual amenity and is dominated by weeds such as Victorian Tea Tree and lawn grasses. The eastern sump is part of the potential Northern Entry Statement near the intersection of Curtin Avenue and has been simply landscaped with several native shrubs. An opportunity exists to enhance the visual amenity of the middle and eastern sumps by replacing the weeds with suitable local, aesthetic flora.



(a) Current status of Grant Street median strip



(b) Possible restoration of Grant Street median strip (retaining Norfolk Island Pine trees)



(c) Possible restoration of Grant Street median strip (replacing Norfolk Island Pine trees with Tuarts)

Figure 11. Vision for restoring Grant Street Median Strip



(a) Current status of Southern Entry Statement



(b) Possible restoration of Southern Entry Statement (revegetation only)



(c) Possible restoration of Southern Entry Statement (revegetation and public art)

1.

Figure 12. Vision for restoring Southern Entry Statement

4.6.4 Verges

A majority of verges within the Town contain only lawn grasses, some of which are reticulated. Revegetating these verges with small aesthetic, water wise local flora can contribute to increasing the amount of natural areas while enhancing the visual appearance of the street and reduce Town water consumption. Sections of wide verges, such as those along Gibney Street, Warton Street, Eric Street and Marine Parade are most suitable for restoration. A demonstration planting may be established along a section of wide verge east of North Cottesloe Primary School, and serve to educate the local public and school children on the importance of local native flora and being water wise. Examples of the current status of the extensive lawn verges along Marmion Avenue may be revegetated are shown in **Figures 13 and 14**.

4.6.5 Railway Line

Similar to the median strips, the railway corridor adjacent to Curtin Avenue also provides an ecological corridor between the coastline at Vlamingh and the City of Nedlands. It also links with the developing greenways along Grant Street and Jarrad Street, increasing the value of the ecological corridors. The Railway line may be sectioned into four different land functions:

- railway stations
- entry statements
- sumps
- connecting corridors.

The Grant Street, Cottesloe and Mosman Park *Railway Stations* have high visual amenity importance as they are heavily used by the public. Some landscaping currently exists at these stations, however these are restricted to garden beds and do not necessarily comprise of local native species. It may be possible to enhance the visual appearance of the station garden beds using small local aesthetic butterfly flora species. Larger attractive bird attracting shrubs may also be planted adjacent to the station properties, increasing both the area of visual appeal and range of flora and fauna biodiversity.

Similarly, crossings and intersections at Claremont Crescent, Eric Street, Jarrad Street, Pearce Street and Salvado Road all special visual amenity importance as they all act as minor *Entry Statements* to the Town. Currently there is little current landscaping apart from some reticulated lawn at Eric Street. Again it is possible to enhance the visual amenity and biodiversity of these sites with suitable aesthetic, bird and butterfly attracting flora.

Four *Sumps* occurs along the Railway line. One sump is adjacent to the eastern end of Hawkstone Street, the second adjacent to Napier Street, the third north of the power sub-station at Jarrad Street near Finey Street and the third south-east of the Jarrad Road crossing near Keane Street. All three sites have a neglected appearance and have the weed Victorian Tea Tree as a screening plant. These sites may be visually enhanced using suitable dampland local flora.

The remaining majority of the land within the railway line are the Corridors. This expansive area offers an opportunity to re-establish many local tree species into the Town and resemble the original woodlands and forests described by Heddle et al (1980). An illustration how the railway corridor may be enhanced using local native flora is presented in Figure 15.



(a) Current status of verges along Marine Parade (view north to south)



(b) Possible restoration of verges along Marine Parade (view north to south)

Figure 13. Vision for restoring verges along Marine Parade (1)



(a) Current status of verges along Marine Parade (view south to north)



(b) Possible restoration of verges along Marine Parade (view south to north)

Figure 14. Vision for restoring Verges along Marine Parade (2)



(a) Current status of Railway Corridor



(b) Possible restoration of Railway Corridor

Figure 15. Vision for restoring Railway Corridors

4.6.6 John Black Dune Park

John Black Dune Park is a modified stable dune occurring between the car park and tennis club on the north side of Napier Street. The area was extensively cleared in the 1960s and retains only small sections of remnant vegetation at its north east and south east corners. The remainder of the open area is dominated by Victorian Tea Tree and understorey weeds. The Town has indicated the possibility of expanding the adjacent car park into the western section of this reserve. Currently John Black Dune Park does not experience any community ownership and is a source of antisocial behaviour and safety concerns.

The highly degraded state and lack of native vegetation makes this park to be more suitably classified as PNA rather than an ENA, as its management will require establishing native vegetation, rather than enhancing bushland condition. The unique position and large compact shape of this public open space provides much opportunity for public education, interpretation and demonstration, such as planting local species that are aesthetic and are bird and butterfly attracting.

4.6.7 Defining Potential Natural Areas and Management Nodes per Precinct

The greenways were divided in eight *Potential Natural Areas* (PNAs) by following the format of using landscape characters, precincts, vegetation complexes and communities to section the ENAs described in **Sections 4.2 and 4.3**. In turn, specific functions within the greenways were defined as 30 separate MNs. The naming of the new identified ENAs and MNs were as follows:

- PNAs were named by combining the Precinct name and Landuse (eg Mixed Use Median Strip).
- MNs within the PNAs were named after the sites specific location and function (eg Broome Street Intersection View Point).

John Black Dune Park has currently been given one MN (called JB1) by CCA.

The sectioning of the PNAs and their MNs per precinct and landscape character is shown in **Figure 16**. The division of all the ENAs and PNAs is shown in **Figure 17**. The locations of all the existing and natural areas are illustrated in **Figure 18**. Guidelines for restoring or enhancing the PNAs and their MNs are presented in **Section 7**.

It should be noted that this search for PNAs was not exhaustive and that more areas within the Town may yet be selected and enhanced. Any new identified site should be defined under this system of categorising natural area and MNs to assist with determining consistent and appropriate management guidelines.

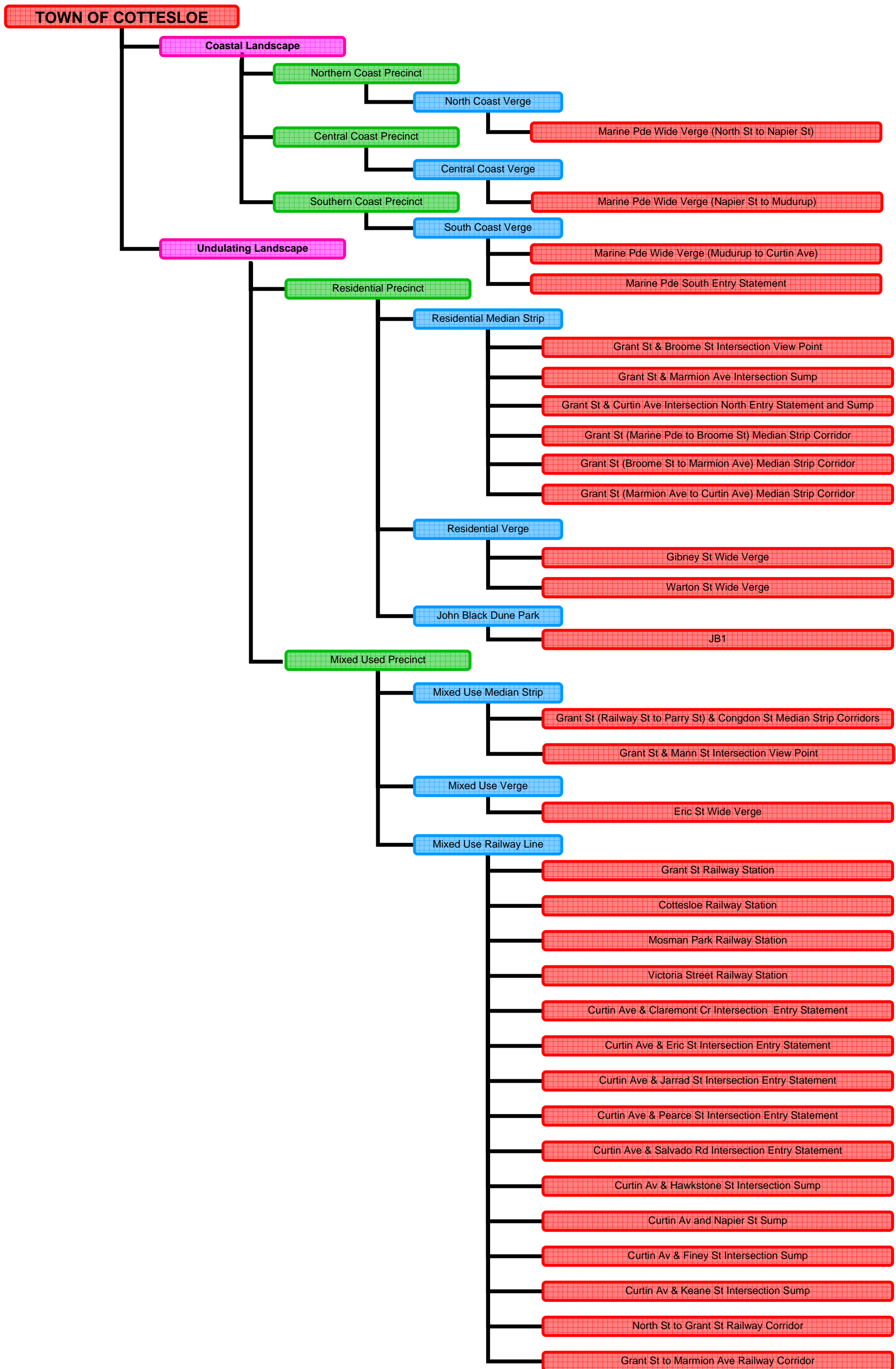
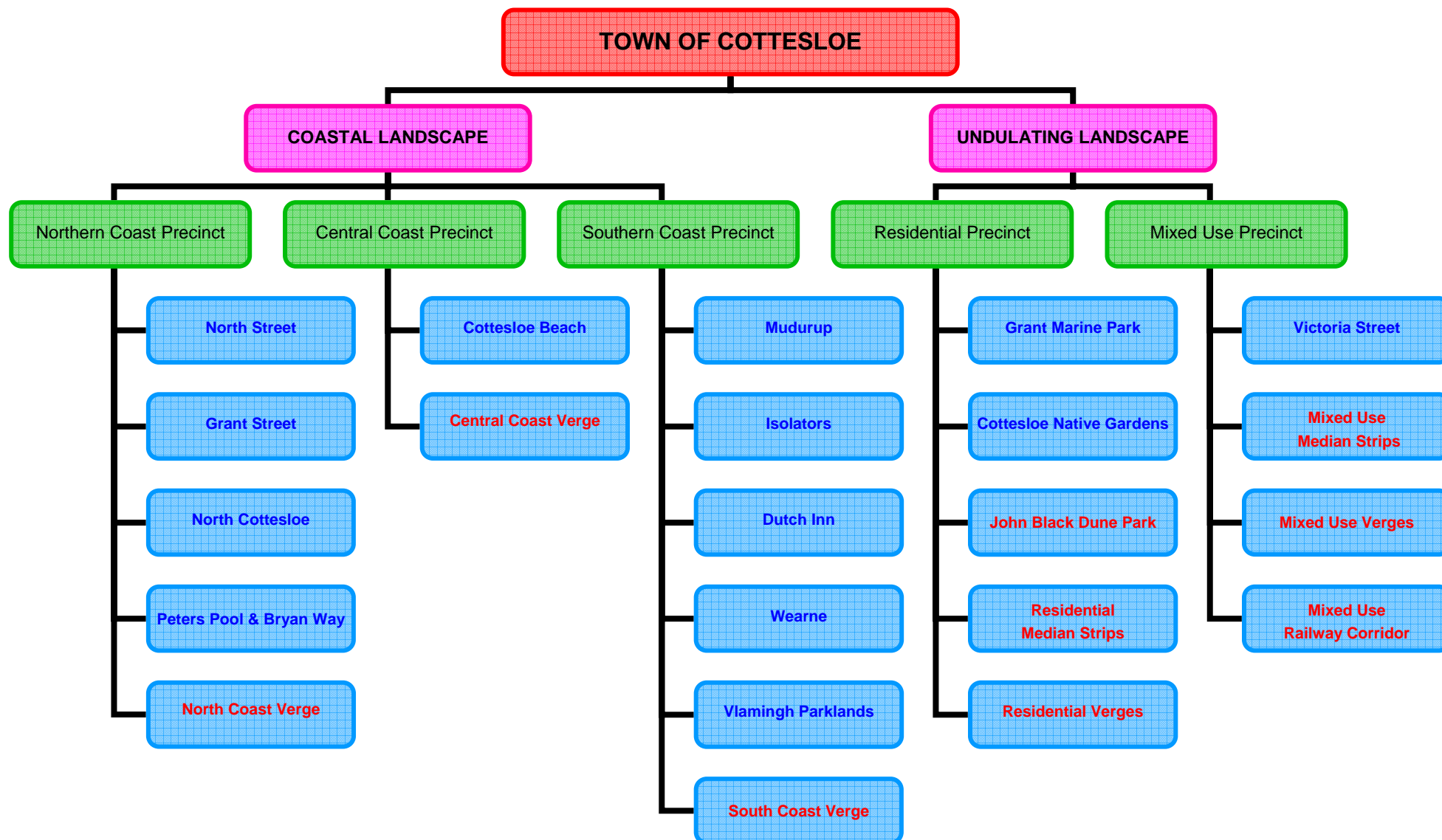


Figure 16. Potential Natural Areas and Management Nodes in the Town of Cottesloe



* Areas in red bold format are areas that are potentially able to be established into new natural areas

Figure 17. Management Framework for Natural Areas in the Town of Cottesloe

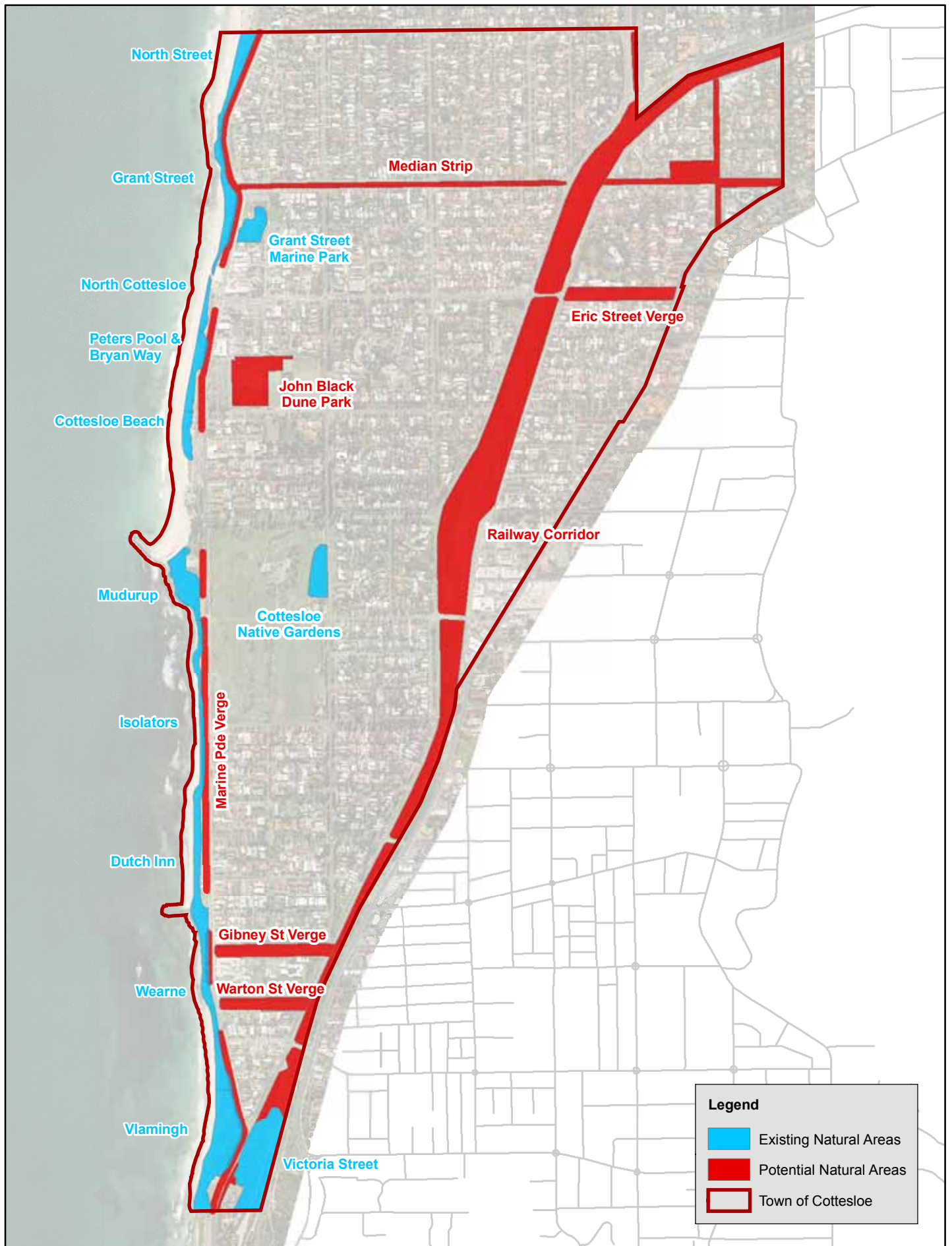


Figure 18

**Cottesloe Natural Areas Management Plan
Existing and Potential Natural Areas**

Mar 2008

prepared for the TOWN OF COTTESLOE



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Project No. 1990-07



5.0 | Prioritising Natural Areas

Cottesloe Natural Areas Management Plan

5.1 Values of Natural Areas

As a result of finance and of resource limitations, it is impractical to simultaneously address every natural area over the next five years. The *Values* of the areas must be assessed in level of importance in order to rank which natural areas are of greater priority to address over others. The social and environmental characteristics discussed throughout **Sections 2 to 4** may be used to determine the priority ranking of both ENAs and PNAs.

ENAs and PNAs were considered to have greater priority in *Social Values* if they had:

- Aboriginal or European heritage significance
- high visual amenity importance or potential
- a high degree of public and recreation use of each natural area.

Business Values examine the commercial or development interests within each ENA and PNA (discussed in **Section 4.2**). Areas with business values would be considered to have a greater present or future impact on the natural condition, and therefore be of higher priority than areas without business pressure.

ENAs were also given higher priority if they had *Ecological Corridor Value* (as discussed in **Section 4.6.2**). Areas recognised as part of any of the greenways are recommended to be preserved and enhanced under the Ecoscape (2002) *Western Suburbs Greening Plan*.

ENAs and PNAs had greater *Biodiversity Value* priority if they were designated with vegetation complexes or communities with little or no representation in the Town's boundaries (as discussed in **Sections 3.2.1 and 3.2.2**). For example, natural areas designated with Hedde et al (1980) *Karrakatta Central and South vegetation complex* and *Karrakatta forest* vegetation community were considered highly important as neither complex or community currently exists within the Town.

Similarly, ENAs were also given high biodiversity value if known to contain the only source of local provenance plants. Sites such as Cottesloe Native Gardens are vital in being the source of seeds and cuttings to revegetate other sites and preserve the local genetics. It is a priority that such sites do not degrade further in order to preserve this significant flora.

The *Integrity* of each ENAs was also examined to determine the threat of degradation. Following from discussions in **Sections 3.2.3, 3.2.4, 3.3.3, 4.4, 4.5 and 4.6**, the urgency of restoring and natural areas natural areas depends on:

- its bushland condition
- the threat of priority weeds
- the impact of pest fauna present
- the threat of erosion (including blowouts)
- where there had been any recent restoration efforts.

5.2 Calculating Priority Natural Area Values

5.2.1 ENA vs PNA

It should be acknowledged that, despite the advantages of increasing the amount of natural areas within the Town by revegetating PNAs, the preservation and restoration of ENAs is of far greater importance. Resources allocated to the NAMP should be immediately focused on protecting all ENAs. Any work on enhancing the PNAs should only be conducted without compromising efforts towards preserving ENAs.

Therefore, in terms of importance in preserving the natural area within the Town, All ENAs are given a higher priority than any PNA.

5.2.2 Scoring Natural Values

The value characteristic of each ENA was given a ranking score of 3 (Low), 2 (Medium) or 1 (High), depending on the significance of the characteristic within the site, as outlined in **Table 16** below. PNAs were not scored for bushland condition, source of local provenance, greenways, fauna, erosion, priority weeds or restoration efforts as these values were not applicable.

Table 16: Site Characteristics Considered in prioritising natural areas

Value	Characteristic	Ranking Score		
		3 (Low)	2 (Moderate)	1 (High)
Social	Heritage significance (Aboriginal and European)	None	-	Yes
	Visual Amenity Potential or Importance	Little or none	Some	High
	Public or Recreation Use	Little or none	Some	High
Business	Current or Future Commercial/ Development	Little or none	Some	High
Ecological Corridors	Part of Greenway	No	-	Yes
Biodiversity	Vegetation Complex representation	Some	-	None
	Vegetation Community representation	Much	Some	Little or None
	Source for local provenance seed/ plant stock	Little or none	Some	High
Integrity	Bushland Condition	Degraded to Completely Degraded	Good to Very Good	Excellent to Pristine
	Priority Weed Threat	Low	Moderate	High
	Pest Fauna Present	None	Some	Many
	Erosion	Little or none	Some	High
	Recent restoration works	None	Some	Much

5.2.3 Ranking total scores

In turn, the total of the ranking scores for each natural area was calculated. The ranking scores and totals of each ENA and PNA are respectively presented in **Tables 17 and 18**. The total scores of the ENAs and PNAs were then separately ranked in ascending order (i.e. areas with lower totals were ranked higher than those with larger totals). The two ranked lists were separately rated as *High, Moderate and Low Priority areas* in terms of their relevant total scores (**Table 19**). The distributions of the various priority areas are illustrated in **Figure 19**.

Table 17: Priority Ranking of Existing Natural Areas

Characteristic	North Street	Grant Street	North Cottesloe	Peters Pool & Bryan Way	Cottesloe Beach	Mudurup	Isolators	Dutch Inn	Wearne	Vlamingh	Grant Marine Park	Cottesloe Native Gardens	Victoria Street
Heritage significance	3	3	3	3	3	1	3	3	3	1	3	3	1
Visual Amenity	1	1	1	1	1	1	1	1	1	1	1	1	1
Public/ Recreation Use	1	1	1	1	1	1	2	2	2	2	1	2	3
Commercial/ Development	3	3	3	3	1	2	3	3	3	3	3	2	3
Part of Greenway	1	1	1	1	1	1	1	1	1	1	1	1	1
Vegetation Complex	1	1	1	1	1	1	1	1	1	1	1	1	1
Vegetation Community	3	3	3	3	3	3	3	3	3	3	2	1	2
Local seed/ stock source	3	3	3	3	3	2	3	3	3	2	1	1	1
Bushland Condition	2	3	3	2	2	2	3	3	3	2	2	2	2
Priority Weed Threat	2	2	2	2	2	1	1	1	1	1	1	1	1
Pest Fauna	3	3	2	3	3	2	2	3	3	1	2	2	2
Erosion	2	1	2	2	2	2	2	1	1	1	3	3	3
Restoration Works	2	2	3	2	3	1	2	2	2	2	1	1	3
TOTAL	27	27	28	27	24	20	27	27	27	22	22	21	24

Ranking Scores: High = 1; Moderate = 2; Low = 3

Table 18: Priority Ranking of Potential Natural Areas

Natural Area	North Coast Verge	Central Coast Verge	South Coast Verge	Residential Median Strip	Residential Verge	John Black Dune Park	Mixed Use Median Strip	Mixed Use Verge	Mixed Use Railway Line
Heritage significance	3	3	3	3	1	3	3	3	3
Visual Amenity	1	1	1	1	1	1	1	3	1
Public/ Recreation Use	1	1	1	2	3	1	2	2	1
Commercial/ Development	3	1	3	3	3	1	3	3	1
Part of Greenway	1	1	1	1	1	3	1	1	1
Vegetation Complex	3	3	3	3	3	1	1	3	1
Vegetation Community	3	3	3	1	1	1	1	1	1
TOTAL	15	13	15	14	13	11	12	16	9

Ranking Scores: High = 1; Moderate = 2; Low = 3

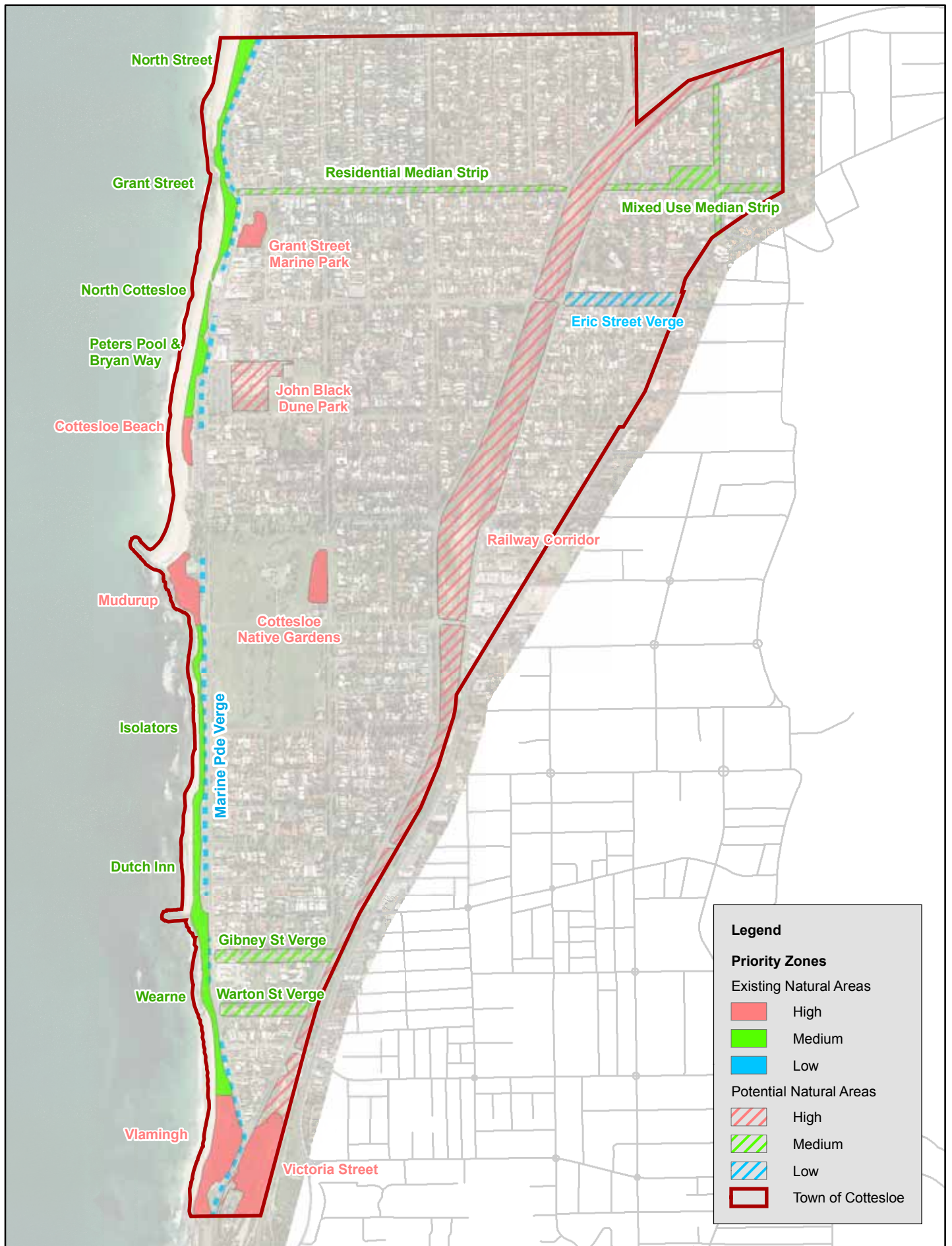


Figure 19

**Cottesloe Natural Areas Management Plan
Priority Zones**

Mar 2008

prepared for the TOWN OF COTTESLOE



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Project No. 1990-07



Table 19: Priority Rankings of Existing and Potential Natural Areas

Natural Area	TOTAL	Rank	Priority
Existing Natural Areas			
Mudurup	20	1	High
Cottesloe Native Gardens	21	2	
Vlamingh	21		
Grant Marine Park	22	3	Moderate
Victoria Street	24		
Cottesloe Beach	24		
Dutch Inn	27	4	Low
Grant Street	27		
Isolators	27		
North Street	27		
Peters Pool & Bryan Way	27		
Wearne	27		
North Cottesloe	28		
Potential Natural Areas			
Mixed Use Railway Line	9	1	High
John Black Dune Park	11		
Mixed Use Median Strip	12	2	Moderate
Central Coast Verge	13	3	
Residential Verge	13		
Residential Median Strip	14	4	
North Coast Verge	15	5	Low
South Coast Verge	15		
Mixed Use Verge	16	6	

It should be noted that these priority ratings are only recommendations and not final. The Town will finalise decisions on which natural areas are of greatest priority to manage.

5.3 Priority Natural Areas

5.3.1 Priority Existing Natural Areas

The total scores of the ENAs can be grouped into three levels. Cottesloe Native Gardens, Grant Marine Park, Mudurup, and Vlamingh all had total scores between 20 and 22 and were determined to be *High Priority*. Common values attributing to their high rankings were heritage listings, good bushland condition, recent restoration work and risk of erosion. These areas also play a particularly high visual amenity importance from the high public use or being a southern entry statement for the Town.

Cottesloe Beach and Victoria Street had scores of 24 and were given a *Moderate Priority*. Cottesloe Beach rated slightly lower as it was not a source of local seed/ stock, had no pest fauna to control and had no recent restoration works. Victoria Street ranked lower as it had less public/ recreation or commercial/ development use, low erosion and little recent restoration work.

All of the ENAs in the Northern Coast Precinct and a majority of ENAs the Southern Coast Precinct had total scores between 27 and 28, These coastal ENAs were all very comparable

in values such as visual amenity, bushland condition and public use and so require similar levels and strategies of management. These areas were given a *Low Priority* rating.

5.3.2 Priority Potential Natural Areas

The Mixed Use Railway Line had a total score of 9 as a result of its social values (high visual amenity importance, high public use), biodiversity values (being appropriate to return the Karrakatta forest community to the Town its vital ecological corridor value as a greenway). John Black Dune Park had a score of 11 as it held high importance in visual amenity, public/recreation and commercial/ development use, and was part of a poorly represented vegetation community and complex. These two open areas are of the greatest important to restore so were determined to be of *High Priority*.

The median strips and verges in the Residential and Mixed Use precincts had total scores between 12 and 14 and were ranked *Moderate Priority*. These areas were deemed more important as they represented vegetation communities that were under-represented or absent in the Town municipality.

The remaining verges in the Coastal precincts were given total scores between 15 and 16, so were *Low Priority*. Despite having high visual amenity and greenway importance, the coastal region already has much natural area representation with the coastal ENAs.

6.0 Strategies for Existing Natural Areas

Cottesloe Natural Areas Management Plan

6.1 Method for Determining Management Strategies of Existing Natural Areas

Details of the characters and management strategies of each identified ENA has been present in the form of the following **Tables 21 to 33**. Maps indicating the locations and distributions of MNs within each ENA are presented in **Figures 20 to 36**, following their relevant table. The first part of the table (*Natural Area Specifics*) summaries all the social and physical environmental features and issues raised in **Sections 2 and 3** that are relevant to each natural area. The summary of the relevant information then allows for site specific management strategies to be formulated and presented in the second part the table (*Management Strategy*) along with indicative *Opinion of Probable Costs* to achieve the strategy.

6.1.1 Natural Area Specifics

Items of public community importance mentioned under *Social Issues*:

- Recreation use
- Aesthetic value and features.

All environmental values presented under *Natural Issues*:

- General bushland condition
- What greenways may be present
- A concise description of the landform shape
- Names of MNs within the natural area
- Species lists of appropriate vegetation communities and any landscaping functions
- High, Medium and Low Priority Weeds present
- Listing of any native or pest fauna recorded in area
- Any other natural character feature.

Any relevant infrastructure present in each natural area was described under *Infrastructure*:

- Types of any fencing present
- Access (eg paths, ramps)
- Any other infrastructure (eg playground, interpretation signs).

Any *Heritage* and *Development Issues* items were discussed under their own headings. Any other important items not already discussed, including opportunities, were presented under *Other Issues*.

6.1.2 Management Strategy

After all the relevant issues were tabulated, each item was examined and their timing and importance priority determined. Methodologies of addressing each item were then categorised under three stages:

- *Stage 1 (Preservation)* - Actions that must be immediately conducted to conserve the natural area or prevent further degradation.

- *Stage 2 (Enhancement)* - Actions that may enhance the natural area which do not immediately need and/or require other issues to be resolved first.
- *Stage 3 (Maintenance)* - Actions that follow after all preservation and enhancement actions for the natural area have been successfully completed.

Recommendations of work plans for each Stage are as follows:

- *Weed Control*
 - what priority weed species should be targeted and in which area or MN
 - any other relevant weed control activities (eg weed barrier to be installed).
- *Pest Control* – where baiting stations may need to be installed or maintained for rabbits.
- *Revegetation* - which species should be used for each node
- *Landscape* - what landscape species lists should be applied to visually enhance particular areas within the natural area.
- *Infrastructure* – what infrastructure should be installed and maintained to protect the natural area.
- *Other* – any other action that should be taken.

Under a five year program, completion of each stage should ideally pursue the following time structure:

- Stage 1 (Preservation) – Year 1
- Stage 2 (Enhancement) – Years 2 to 3
- Stage 3 (Maintenance) – Years 4 to 5.

However, it should be noted that completion of each stage may take longer or less than expected, depending on the difficulty of completing the actions and availability of resources. Regardless of timing, work on an ENA should not start in a next stage if the actions of the previous stage have not been successfully completed.

6.1.3 Opinion of Probable Costs

Opinion of Probable Costs (OPCs) were formulated from indicative costs presented in **Table 20** below. Stage 1 costs are estimated for one years work whereas Stage 2 and 3 are for two years work.

It should be noted that the OPCs can only be used as a “ball park figure” indication of costs and not as an estimate. The OPCs were purely based on perceived contractor rates per unit measure. The actual costs will be highly variable depending upon the final form in which the recommendations are implemented (i.e. the degree to which volunteers undertake tasks and the style of fencing used) and amount of effort required to complete the task (i.e. controlling certain weed species may prove more expensive than other weed species). As a result, OPCs may also vary from those presented in the following tables.

Table 20: Pricing for Opinion of Probable Costs

Action		Cost	Unit
Stage 1			1 year
Targeted Weed control		\$0.90	square metre
Weed control barrier		\$12.00	linear metre
Bollards		\$50.00	
Revegetation (supply and installation of tubestock)	Excellent bush condition	\$7.00	square metre
	Very Good bush condition	\$14.00	
	Good bush condition	\$21.00	
	Degraded bush condition	\$28.00	
	Completely Degraded bush condition	\$35.00	
Landscape (supply and installation of tubestock)		\$35.00	
Fencing Installation		\$30.00	linear metre
Brushing Installation		\$25.00	square metre
Formal path Installation		\$15.00	
Rabbit baiting per 500 square metres		\$100.00	station
Miscellaneous Labour		\$30.00	hour
Stages 2 and 3			2 years
Targeted Weed control		\$0.90	square metre
Weed control maintenance		\$0.30	
Revegetation Maintenance	Excellent bush condition	\$1.40	
	Very Good bush condition	\$2.80	
	Good bush condition	\$4.20	
	Degraded bush condition	\$5.60	
	Completely Degraded bush condition	\$7.00	
Landscape Maintenance		\$7.00	
Fencing Maintenance		\$6.00	linear metre
Brushing Maintenance		\$5.00	square metre
Formal Path Maintenance		3.00	
Rabbit baiting per 500 square metres		\$200.00	station
Miscellaneous Labour		\$30.00	hour

6.2 Northern Coast Precinct

6.2.1 North Street

Table 21: Summary of Management Strategy for North Street

Item			Natural Area Characteristics		
Issues					
Social	Recreation		Fishing, dog beach, beach use		
	Aesthetics		Sea views for adjacent residence		
Natural	Condition		Mostly <i>Good</i>		
	Greenway		Regional		
	Landform		Low dunes to steep banks, narrow beaches		
	Management Nodes		NS1		
	Flora	Community		Coastal (foredune, swale, mobile dune)	
		Landscape		Verge	
	Priority Weeds	High		Couch Grass, Gazania, Kikuyu Grass, Rose Pelargonium, Sea Spinach , Victorian Tea Tree	
		Moderate		None recorded	
		Low		Marram Grass, Beach Evening Primrose	
	Fauna	Native		None recorded	
Pest			None recorded		
Other		Non-local natives have been planted and established along dunes Lawn grass invasion			
Infrastructure	Fencing		Along dual access path and access ramps		
	Access		4 beach access ramps, timber ramp, board walk, dual use path		
	Other		Fish Habitat Protection Area sign, shower, dog bowl		
Heritage		None			
Development		None			
Other		None			
Management Strategy					
Stage 1 Works	Strategy			OPC	
Weed Control	Target High Priority Weeds throughout NS1, focusing on lawn grasses invading from verge			\$396	
	Install barrier to stop further lawn grass invasion			\$2,640	
Pest Control	None			\$0	
Revegetation	Plant NS1 with species from Coastal (foredune, swale, mobile dune) species lists, focusing on exposed areas and where High Priority weeds have been successfully controlled			\$9,240	
Landscape	Plant verges with Coastal (mobile dune, stable dune) species that also occur on Verge species lists			\$1,540	
Infrastructure	None			\$0	
Other	None			\$0	
STAGE TOTAL				\$13,816	
Stage 2 Works	Strategy			OPC	
Weed Control	Maintenance spraying of High Priority weeds throughout NS1, focusing on any recent lawn grass invasion from verge			\$132	
	Target Moderate Priority weeds throughout NS1			\$396	
Pest Control	None			\$0	
Revegetation	Maintenance replanting where necessary, focusing on exposed areas and where High and Moderate Priority weeds have been successfully controlled			\$1,848	
Landscape	Maintenance landscape planting of verges			\$308	
Infrastructure	None			\$0	
Other	None			\$0	
STAGE TOTAL				\$2,684	
Stage 3 Works	Strategy			OPC	
Weed Control	Maintenance spraying of High and Moderate Priority weeds, focusing on any recent lawn grass invasion from verge			\$132	
	Target Low Priority weeds throughout NS1			\$396	
Pest Control	None			\$0	
Revegetation	Maintenance replanting where necessary, focusing on exposed areas and where all weeds have been successfully controlled			\$1,848	
Landscape	Maintenance landscape planting of verges			\$308	
Infrastructure	None			\$0	
Other	None			\$0	
STAGE TOTAL				\$2,684	
TOTAL OPC				\$19,184	



NS1

Figure 20: North Street
(Cottesloe Coastcare 2008)
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6.2.2 Grant Street

Table 22: Summary of Management Strategy for Grant Street

Item	Natural Area Characteristics		
Issues			
Social	Recreation	Popular for fishing, general beach use	
	Aesthetics	Sea views for adjacent residence	
Natural	Condition	Generally in <i>Degraded</i> condition	
	Greenway	Regional	
	Landform	Wide beach, Steep banks	
	Management Nodes	GS1-GS2	
	Flora	Community	Coastal (foredune, swale, mobile dune)
		Landscape	Verge
	Priority Weeds	High	Buffalo Grass, Couch, Rose Pelargonium, Sea Spinach, Victorian Tea Tree
		Moderate	Sea Spurge, Veldt Daisy
		Low	Marram Grass
	Fauna	Native	None recorded
Pest		None recorded	
Other	Two cliff face collapses, erosion high concern		
Infrastructure	Fencing	Along beach and along dual access path	
	Access	Dual access path, 4 beach access ramps	
	Other	benches, shower	
Heritage	None		
Development	None		
Other	Risk of erosion and cliff collapse during storms threatening Marine Parade.		
Management Strategy			
Stage 1 Works	Strategy	OPC	
Weed Control	Target Priority Weeds in GS1 – focus on top of dunes and around drains	\$504	
	Target Priority Weeds in GS2 – focus on southern section and bottom of ramp	\$540	
	Install barrier to stop further lawn grass invasion	\$5,400	
Pest Control	None	\$0	
Revegetation	Plant GS1 using Coastal (foredune, swale, mobile dune) species list, focusing on exposed areas and where High Priority weeds have been successfully controlled	\$15,680	
	Plant GS2 using Coastal (foredune, cliff) species list, focus on exposed areas, the potential blowout site at bottom right of ramp in GS2 and where High Priority weeds have been successfully controlled	\$16,800	
Landscape	Plant verges with Coastal (mobile dune, stable dune) species that also occur on Verge species lists	\$4,060	
Infrastructure	Improve fencing to deter people from accessing unstable slope	\$4,500	
Other	Restabilise eroding slope in GS1 with brushing	\$1,250	
STAGE TOTAL		\$48,734	
Stage 2 Works	Strategy	OPC	
Weed Control	Maintenance spraying of High Priority weeds throughout GS1 and GS2, focusing on any recent lawn grass invasion from verge	\$696	
	Target Moderate Priority weeds throughout GS1 and GS2	\$1044	
Pest Control	None	\$0	
Revegetation	Maintenance replanting where necessary, focusing on exposed areas and where High and Moderate Priority weeds have been successfully controlled	\$6,496	
Landscape	Maintenance landscape planting of verges	\$812	
Infrastructure	None	\$0	
Other	Continue restabilising eroding slope in GS1 with brushing	\$250	
STAGE TOTAL		\$9,298	
Stage 3 Works	Strategy	OPC	
Weed Control	Maintenance spraying of High and Moderate Priority weeds, focusing on any recent lawn grass invasion from verge	\$696	
	Target Low Priority weeds throughout GS1 and GS2	\$1044	
Pest Control	None	\$0	
Revegetation	Maintenance replanting where necessary, focusing on exposed areas and where all weeds have been successfully controlled	\$1,848	
Landscape	Maintenance landscape planting of verges	\$308	
Infrastructure	None	\$0	
Other	Continue restabilising eroding slope in GS1 with brushing	\$250	
STAGE TOTAL		\$4,146	
TOTAL OPC		\$62,178	



GS2

Figure 21: Grant Street
(Northern Section)
(Cottesloe Coastcare 2008)
1:1000



Figure 22: Grant Street
(Southern Section)
(Cottesloe Coastcare 2008)
1:1000

6.2.3 North Cottesloe

Table 23: Summary of Management Strategy for North Cottesloe

Item	Natural Area Characteristics		
Issues			
Social	Recreation	Heavily used coastal natural area.	
	Aesthetics	Sea views for adjacent residence, cafés and life saving club	
Natural	Condition	Mostly in <i>Degraded</i> Condition	
	Greenway	Regional	
	Landform	Coastal dunes, wide beaches	
	Management Nodes	NC1, NC3-NC5	
	Flora	Community	Coastal (foredune, swale, mobile dune)
		Landscape	Verge
	Priority Weeds	High	Couch, Rose Pelargonium, Sea Spinach, Victorian Tea Tree
		Moderate	Onion Weed , Whiteflower Fumitory
		Low	Marram Grass,
	Fauna	Native	None recorded
Pest		Rabbits	
Other		None	
Infrastructure	Fencing	Some, mostly in good condition	
	Access	Dual access path, 2 beach access paths, boat ramp	
	Other	Bins, metal sculpture, Ken Crew Memorial on top of dunes of NC1	
Heritage	None		
Development	Barchetta and Blue Duck cafés, North Cottesloe Life Saving Club, Lawn Area (NC2)		
Other	<ul style="list-style-type: none"> • Landscape areas around cafes and surf club with aesthetic native plants • More fencing required to reduce trampling in NC3 • Erosion potential at bottom of dune adjacent sculpture in NC5 		
Management Strategy			
Stage 1 Works	Strategy	OPC	
Weed Control	Target High Priority Weeds in NC1 – focus on front of boat shed	\$405	
	Target High Priority Weeds throughout NC3, NC4, NC5	\$540	
Pest Control	Set baiting stations for rabbits	\$100	
Revegetation	Plant NC1, NC5 with species from Coastal (foredune, swale, mobile dune, stable dune) species lists, focusing on exposed areas and where High Priority weeds have been successfully controlled	\$14,560	
Landscape	Plant lawn area of NC5 (around sculpture) and NC3 and southern end of NC1 (adjacent to cafés and surf club) using Coastal (mobile dune, stable dune) species that also occur on Verge species lists	\$6,650	
Infrastructure	Fence NC3 to prevent further trampling of vegetation and possible erosion	\$2,100	
Other	Add brushing to dune below sculpture in NC5 to prevent possible erosion	\$1,250	
STAGE TOTAL		\$25,605	
Stage 2 Works	Strategy	OPC	
Weed Control	Maintenance spraying of High Priority weeds in all MNs except NC2	\$225	
	Target Moderate Priority weeds in all MNs except NC2	\$675	
Pest Control	Continue setting baiting stations for rabbits	\$200	
Revegetation	Maintenance replanting where necessary, focusing on exposed areas and where High and Moderate Priority weeds have been successfully controlled	\$2,912	
Landscape	Maintain landscape planting in NC1, NC3, NC5	\$1,330	
Infrastructure	Maintain fencing	\$420	
Other	Maintain brushing to dune below sculpture in NC5 to prevent possible erosion	\$250	
STAGE TOTAL		\$6,012	
Stage 3 Works	Strategy	OPC	
Weed Control	Maintenance spraying of High and Moderate Priority weeds in all MNs except NC2	\$225	
	Target Low Priority weeds in all MNs except NC2	\$675	
Pest Control	Continue setting baiting stations for rabbits	\$200	
Revegetation	Maintenance replanting where necessary, focusing on exposed areas and where all weeds have been successfully controlled	\$2,912	
Landscape	Maintain landscape planting in NC1, NC3, NC5	\$1,330	
Infrastructure	Maintain fencing	\$420	
Other	Maintain brushing to dune below sculpture in NC5 to prevent possible erosion	\$250	
STAGE TOTAL		\$6,012	
TOTAL OPC		\$37,629	



Figure 23: North Cottesloe
(Cottesloe Coastcare 2008)
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6.2.4 Peters Pool and Bryan Way

Table 24: Summary of Management Strategy for Peters Pool and Bryan Way

Item	Natural Area Characteristics		
Issues			
Social	Recreation	Beach used primarily for swimming and walking	
	Aesthetics	Sea views for adjacent residence and businesses	
Natural	Condition	Mostly <i>Good</i> , some <i>Degraded</i>	
	Greenway	Regional	
	Landform	Narrow beach, wide flat dunes	
	Management Nodes	BW, PP	
	Flora	Community	Coastal (foredune, swale, mobile dune, stable dune)
		Landscape	Verge
	Priority Weeds	High	Black Flag, Couch, Rose Pelargonium, Sea Spinach, Victorian Tea Tree
		Moderate	Onion Weed
		Low	None recorded
	Fauna	Native	None recorded
Pest		None recorded	
Other	None		
Infrastructure	Fencing	Pine logs along dual access path	
	Access	ramp, 4 beach access paths	
	Other	Exercise area, Small Coastcare signs, Reef Habitat Protection Area sign, stormwater drain	
Heritage	None		
Development	None		
Other	<ul style="list-style-type: none"> • Much recent revegetation work done on Bryan Way by CCA • Some reticulation over-spraying from reticulated verges encouraging couch invasion • a potential blowout near the ramp at the middle of PP • Regular trampling and informal tracks occurring • stormwater pipes will be removed soon, however there is no plan for rehabilitation once the pipes are removed. 		
Management Strategy			
Stage 1 Works	Strategy	OPC	
Weed Control	Target Priority Weeds throughout BW and PP	\$720	
	Install barrier to stop further lawn grass invasion from verge	\$3,300	
Pest Control	None	\$0	
Revegetation	Plant BW and PP with species from Coastal (foredune, swale, mobile dune, stable dune) species lists, focusing on exposed areas, including around storm water drain at southern end of PP and where High Priority weeds have been successfully controlled	\$21,000	
Landscape	None	\$0	
Infrastructure	Fence BW to reduce trampling	\$1,350	
Other	Cease reticulation of verge	\$0	
	Apply brushing to blowout in PP	\$750	
STAGE TOTAL		\$27,120	
Stage 2 Works	Strategy	OPC	
Weed Control	Maintenance spraying of High Priority weeds throughout BW and PP, focusing on any recent lawn grass invasion from verge	\$240	
	Target Moderate Priority weeds throughout BW and PP	\$720	
Pest Control	None	\$0	
Revegetation	Maintenance replanting where necessary, focusing on exposed areas and where Moderate and High Priority weeds have been successfully controlled	\$4,200	
Landscape	None	\$0	
Infrastructure	Maintain fencing at BW	\$270	
Other	Maintain brushing at blowout in PP	\$150	
STAGE TOTAL		\$5,580	
Stage 3 Works	Strategy	OPC	
Weed Control	Maintenance spraying of High and Moderate Priority weeds throughout BW and PP, focusing on any recent lawn grass invasion from verge	\$240	
	Target Low Priority weeds throughout BW and PP	\$720	
Pest Control	None	\$0	
Revegetation	Maintenance replanting where necessary, focusing on exposed areas and where all weeds have been successfully controlled	\$4,200	
Landscape	None	\$0	
Infrastructure	Maintain fencing at BW	\$270	
Other	Maintain brushing at blowout in PP	\$150	
STAGE TOTAL		\$5,580	
TOTAL OPC		\$38,280	



Figure 24: Peters Pool and Bryan Way
(Cottesloe Coastcare 2008)
1:1000

6.3 Central Coast Precinct

6.3.1 Cottesloe Beach

Table 25: Summary of Management Strategy for Cottesloe Beach

Item	Natural Area Characteristics		
Issues			
Social	Recreation	Beach use	
	Aesthetics	Very high visual amenity importance, Sea views for adjacent residence and businesses	
Natural	Condition	Most of area is <i>Good</i> , some patches <i>Degraded</i>	
	Greenway	Regional	
	Landform	Wide beach, wide dunes, swale	
	Management Nodes	CB	
	Flora	Community	Coastal (foredune, swale, mobile dune, stable dune)
		Landscape	Verge
	Priority Weeds	High	Athel Pine, Couch, Rose Pelargonium, Sea Spinach, Victorian Tea Tree
		Moderate	None recorded
		Low	None recorded
	Fauna	Native	None recorded
Pest		None recorded	
Other	None		
Infrastructure	Fencing	Limited fencing	
	Access	Dual access path, 2 beach access paths	
	Other	None	
Heritage	Part of Heritage listed Cottesloe Beach Precinct		
Development	Adjacent car park		
Other	<ul style="list-style-type: none"> Town has indicated it may move car park to John Black Dune Park Need more fencing to reduce trampling of vegetation 		
Management Strategy			
Stage 1 Works	Strategy	OPC	
Weed Control	Remove Athel Pine, target priority weeds	\$180	
Pest Control	None	\$0	
Revegetation	Plant CB with species from Coastal (foredune, swale, mobile dune, stable dune) species lists, focusing on exposed areas and where High Priority weeds have been successfully controlled	\$5,040	
Landscape	Plant section of dunes closest to dual access path using Coastal (mobile dune, stable dune) species that also occur on Verge species lists	\$700	
Infrastructure	Fence CB to prevent future trampling of vegetation during revegetation work	\$5,400	
Other	None	\$0	
STAGE TOTAL		\$11,320	
Stage 2 Works	Strategy	OPC	
Weed Control	Maintenance spraying of High Priority weeds	\$60	
	Target Moderate Priority weeds	\$180	
Pest Control	None	\$0	
Revegetation	Maintenance replanting where necessary, focusing on exposed areas and where High and Moderate Priority weeds have been successfully controlled	\$1,008	
Landscape	Maintain landscape planting in area close to Dual access path	\$140	
Infrastructure	Maintain fencing	\$1,080	
Other	None	\$0	
STAGE TOTAL		\$2,468	
Stage 3 Works	Strategy	OPC	
Weed Control	Maintenance spraying of High and Moderate Priority weeds	\$60	
	Target Low Priority weeds	\$180	
Pest Control	None	\$0	
Revegetation	Maintenance replanting where necessary, focusing on exposed areas and where all weeds have been successfully controlled	\$1,008	
Landscape	Maintain landscape planting in	\$140	
Infrastructure	Maintain fencing	\$1,080	
Other	None	\$0	
STAGE TOTAL		\$2,468	
TOTAL OPC		\$16,256	



Figure 25: Cottesloe Beach
(Cottesloe Coastcare 2008)
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6.4 Southern Coast Precinct

6.4.1 Mudurup

Table 26: Summary of Management Strategy for Mudurup

Item	Natural Area Characteristics		
Issues			
Social	Recreation	Heavily used beach use, Body surfers off rocks, Divers explore near shore reef	
	Aesthetics	High visual amenity, sea views	
Natural	Condition	Mixed, most of areas is <i>Good</i> , however some areas, such as near sundial is <i>Degraded</i>	
	Greenway	Regional	
	Landform	limestone promontory, steep slope, narrow beach	
	Management Nodes	M1-M7	
	Flora	Community	Coastal (mobile dune, stable dune, cliff)
		Landscape	Verge, Bird Attracting, Butterfly Attracting, Tree, Shrub
	Priority Weeds	High	Black Flag, Buffalo Grass, Couch, Rose Pelargonium, Sea Spinach, Victorian Tea Tree
		Moderate	Onion Weed
		Low	Beach Evening Primrose, Hares Tail Grass, Pigface, Stocks
	Fauna	Native	Much bird life
Pest		Rabbits in zones M1 to M4	
Other	Some erosion near sundial		
Infrastructure	Fencing	Fencing around entire native vegetation, in good condition	
	Access	sealed paths, dual access path	
	Other	Bicentennial sundial, wind shelter, helicopter pad, limestone arch, bronze interpretive signage	
Heritage	Aboriginal Heritage Site - Ceremonial - Aboriginal meaning of Mudurup is place of spirit release. It is a Noongar ceremony area where the salt water people sent spirits out to the sea.		
Development	Surf Club immediately adjacent to MS1, MS3, MS5 planning to be rebuilt, potential impact on paths and natural areas not yet known		
Other	<ul style="list-style-type: none"> Many non-local Australian flora planted near sundial, are bird attracting and are not a weed threat Broken reticulation in M2 Trampling of vegetation in M5 Unsafe access to beach along steps southwest of M6 		
Management Strategy			
Stage 1 Works	Strategy	OPC	
Weed Control	Target Priority Weeds in M1 (particularly black flag), M2, M3, M4 and M6	\$693	
Pest Control	Set baiting stations for rabbits in M1 to M4	\$200	
Revegetation	Plant M1, M6, M7 with species from Coastal (cliff, mobile dune, stable dune) species lists, focusing on exposed areas and where Priority weeds have been successfully controlled	\$13,230	
Landscape	Plant M2, M3, and western portion of M5 using Coastal (cliff, mobile dune, stable dune) species lists that also occur on Bird Attracting, Butterfly Attracting, Tree and Shrub lists	\$12,600	
	Plant M4 and eastern portion of M5 using Coastal (cliff, mobile dune, stable dune) species lists that also occur on Verge lists	\$4,900	
Infrastructure	Remove helicopter pad	\$960	
	Add handrail to unsafe concrete steps southwest of M6	\$2,000	
	Remove broken reticulation in M2	\$480	
	Fence M5 to prevent future trampling	\$2,700	
Other	None	\$0	
STAGE TOTAL		\$37,763	
Stage 2 Works	Strategy	OPC	
Weed Control	Maintenance spraying of High Priority weeds in M1, M2, M3, M4 and M6	\$297	
	Target Moderate Priority weeds in M7 (Sea Spinach)	\$198	
Pest Control	Continue setting baiting stations for rabbits in M1 to M4	\$400	
Revegetation	Maintenance replanting where necessary, focusing on exposed areas and where High and Moderate Priority weeds have been successfully controlled, especially in M7	\$2,646	
Landscape	Maintain landscape plantings in M2, M3, M4 and M5	\$3,500	
Infrastructure	Maintain fencing in M5	\$540	
Other	None	\$0	
STAGE TOTAL		\$7,581	
Stage 3 Works	Strategy	OPC	
Weed Control	Maintenance spraying of High and Moderate Priority weeds in all MNs	\$462	
	Target Low Priority weeds in all MNs	\$1,386	
Pest Control	Continue setting baiting stations for rabbits in M1 to M4	\$400	
Revegetation	Maintenance replanting where necessary, focusing on exposed areas and where all weeds have been successfully controlled	\$2,646	
Landscape	Maintain landscape plantings in M2, M3, M4 and M5	\$3,500	
Infrastructure	Maintain fencing in M5	\$540	
Other	None	\$0	
STAGE TOTAL		\$8,934	
TOTAL OPC		\$54,278	



Figure 26: Mudurup
(Cottesloe Coastcare 2008)
1:1000

6.4.2 Isolators

Table 27: Summary of Management Strategy for Isolators

Item	Natural Area Characteristics		
Issues			
Social	Recreation	Area heavily used by surfers, especially I3 and I4 during surfing competitions Popular swimming hole opposite Deane St (I8)	
	Aesthetics	Ocean views	
Natural	Condition	Mostly <i>Degraded</i> , some small areas in I1 and I8 <i>Good</i>	
	Greenway	Regional	
	Landform	Narrow beaches, small dunes, limestone	
	Management Nodes	I1-I9	
	Flora	Community	Coastal flora (foredune, swale, mobile dune, stable dune, cliff)
		Landscape	Verge, Butterfly Attracting
	Priority Weeds	High	Black Flag, Couch Grass, Gazania, Geraldton Carnation Weed, Kikuyu Grass, Rose Pelargonium, Sea Spinach
		Moderate	Cape Weed, Onion Weed, Veldt Daisy
		Low	Marguerite Daisy, Marram Grass, Mirror Plant, Pigface, Stocks, White Arctotis
	Fauna	Native	None recorded
Pest		Rabbits recorded in I1 and I8	
Other	<ul style="list-style-type: none"> Some erosion in I1, I3 and I4. Much neglected lawn space 		
Infrastructure	Fencing	Low lying pine logs, some fencing along access ramps,	
	Access	Dual access path, 4 access tracks to beach, access ramps	
	Other	Sculpture, brass plaque, picnic table	
Heritage	None		
Development	None		
Other	<ul style="list-style-type: none"> Some previous revegetation work done in I1 Ablution access needed to prevent surfers trampling vegetation during competitions Need to retain lawn spaces in I2 and I3 for use during surfing competitions 		
Management Strategy			
Stage 1 Works	Strategy	OPC	
Weed Control	Target High Priority Weeds in I1, I6, I7, I8, focus on lawn weed invasion from verge	\$378	
	Install weed barrier in I1, I3, I4, I6, to prevent lawn weed invasion	\$3,120	
Pest Control	Set baiting stations for rabbits in I1 and I8	\$100	
Revegetation	Plant I1, I5, I7, I8 using species from Coastal (mobile dune, stable dune, cliff), focusing on areas where High Priority weeds have been successfully controlled	\$11,700	
Landscape	Plant I4 and I9 using species from Coastal (mobile dune, stable dune) lists that also occur on Verge lists	\$1,330	
Infrastructure	None	\$0	
Access	None	\$0	
Other	Install temporary ablution blocks near I3 and I4 during surfing competitions	\$1,000	
STAGE TOTAL		\$17,628	
Stage 2 Works	Strategy	OPC	
Weed Control	Maintenance spraying of High Priority weeds and lawn grass invasion	\$126	
	Target Moderate Priority weeds in I1, I5, I6, I7, I8	\$423	
Pest Control	Continue setting baiting stations for rabbits in I1 and I8	\$200	
Revegetation	Maintenance replanting where necessary, focusing on areas where High and Moderate Priority weeds have been successfully controlled	\$2,352	
Landscape	Maintain landscape planting in I4 and I9	\$266	
Infrastructure	None	\$0	
Access	None	\$0	
Other	Continue installing temporary ablution blocks near I3 and I4 during surfing competitions	\$2,000	
STAGE TOTAL		\$5,347	
Stage 3 Works	Strategy	OPC	
Weed Control	Maintenance spraying of Moderate and High Priority weeds and lawn grass invasion	\$141	
	Target Low Priority weeds in I1, I5, I6, I7, I8	\$423	
Pest Control	Continue setting baiting stations for rabbits in I1 and I8	\$200	
Revegetation	Maintenance replanting where necessary, focusing on areas where all weeds have been successfully controlled	\$2,352	
Landscape	Maintain landscape planting in I4, I8 and I9	\$266	
Infrastructure	None	\$0	
Access	None	\$0	
Other	Continue installing temporary ablution blocks near I3 and I4 during surfing competitions	\$2,000	
STAGE TOTAL		\$5,392	
TOTAL OPC		\$27,927	



I1

I2

I3

I4

I5

I6

I7

Figure 27: Isolators
(Northern Section)
(Cottesloe Coastcare 2008)
1:1000



I7

I8

I9

D1

D2

D3

Figure 28: Isolators
(Southern Section)
(Cottesloe Coastcare 2008)
1:1000

6.4.3 Dutch Inn

Table 28: Summary of Management Strategy for Dutch Inn

Item		Natural Area Characteristics		
Issues				
Social	Recreation	<ul style="list-style-type: none"> D8 used for playground, exercise area and kite surfers to assemble gear Divers and surfers use shore south of groyne (D11) Groyne and beach south of groyne popular fishing spots (D10 and 11) Entire beach popular for dog walking 		
	Aesthetics	Ocean views for adjacent residence, pedestrians and bike users		
Natural	Condition	Most of area is <i>Degraded</i> some places <i>Good</i>		
	Greenway	Regional		
	Landform	Cliffs, narrow to wide beaches, long gentle rising dunes		
	Management Nodes	D1, D5, D6, D7, D9, D10, D11 dunal systems, D2, D3, D4, D8 grassed areas		
	Flora	Community	Coastal (foredune, swale, mobile dune, stable dune, cliff)	
		Landscape	Verge	
	Priority Weeds	High	Couch Grass, Gazania, Geraldton Carnation Weed, Kikuyu Grass, Rose Pelargonium, Sea Spinach, Victorian Tea Tree	
		Moderate	Onion Weed	
		Low	Aloe, Marram Grass	
	Fauna	Native	None recorded	
Pest		None recorded		
Other	<ul style="list-style-type: none"> Blowout and potential erosion problem in D1 erosion problems after storm events foreshore south of groyne receding at 30cm a year 			
Infrastructure	Fencing	Pine log fencing, needs repair in D5		
	Access	4 beach access paths, poor access to the south of the groyne at Beach Street causing trampling of dune vegetation		
	Other	Car park, exercise equipment, playground, information signs, shaded bench, information signs Bitumen road launch site for small boats		
Heritage	None			
Development	None			
Other	<ul style="list-style-type: none"> Much invasion of lawn grass into dunes, requires weed barrier 			
Management Strategy				
Stage 1 Works	Strategy	OPC		
Weed Control	Target Priority Weeds in D1, D5, D6, D7, D9, D10, D11, focusing on eastern borders to control lawn grasses invasion	\$1,044		
	Construct weed barrier along western border of D2, D3, D4, D8 to prevent lawn grass invasion	\$2,160		
Pest Control	None	\$0		
Revegetation	Plant D1, D5, D6, D7, D9, D10 using Coastal (foredune, swale, mobile dune, stable dune) focusing on exposed areas and where High Priority weeds have been successfully controlled	\$28,700		
	Plant D11 using species from Coastal (mobile dune, stable dune, cliff) lists focusing on areas where High Priority weeds have been successfully controlled	\$3,780		
Landscape	Plant D2, D3 using species from Coastal (foredune, swale, mobile dune, stable dune) that lists that also occur on Verge and Butterfly Attracting lists	\$2,100		
Infrastructure	None	\$0		
Other	Apply brushing to bare areas in D11 to reduce erosion	\$1,250		
STAGE TOTAL		\$39,034		
Stage 2 Works	Strategy	OPC		
Weed Control	Maintenance spraying of High Priority weeds in D1, D5, D6, D7, D9, D10, D11	\$348		
	Target Moderate Priority weeds in D1, D5, D6, D7, D9, D10, D11	\$1,044		
Pest Control	None	\$0		
Revegetation	Maintenance replanting in D1, D5, D6, D7, D9, D10, D11 where necessary, focusing on exposed areas and where High and Moderate Priority weeds have been successfully controlled	\$6,496		
Landscape	Maintain landscape planting in D2, D3	\$420		
Infrastructure	None	\$0		
Other	Continue applying brushing to bare areas in D11 to reduce erosion	\$250		
STAGE TOTAL		\$8,558		
Stage 3 Works	Strategy	OPC		
Weed Control	Maintenance spraying of Moderate and High Priority weeds in D1, D5, D6, D7, D9, D10, D11	\$348		
	Target Low Priority weeds in D1, D5, D6, D7, D9, D10, D11	\$1,044		
Pest Control	None	\$0		
Revegetation	Maintenance replanting in D1, D5, D6, D7, D9, D10, D11 where necessary, focusing on exposed areas and where all weeds have been successfully controlled	\$6,496		
Landscape	Maintain landscape planting in D2, D3 bare areas in D11 to reduce erosion	\$420		
Infrastructure	None	\$0		
Other	Continue applying brushing to bare areas in D11 to reduce erosion	\$250		
STAGE TOTAL		\$8,558		
TOTAL OPC		\$56,150		



D3

D5

D4

D6

D7

D8

Figure 29: Dutch Inn
(Northern Section)
(Cottesloe Coastcare 2008)
1:1000



Figure 30: Dutch Inn
(Southern Section)
(Cottesloe Coastcare 2008)
1:1000

6.4.4 Wearne

Table 29: Summary of Management Strategy for Wearne

Item	Natural Area Characteristics		
Issues			
Social	Recreation	Beach popular for fishing and dog walking	
	Aesthetics	Ocean views for adjacent residence and users of dual access path.	
Natural	Condition	Most of area is <i>Degraded</i>	
	Greenway	Regional	
	Landform	Narrow beach, steep sloping banks, narrow strips between slopes and dual access path.	
	Management Nodes	W1, W3, W4, W5 dunal systems, W2, W6 verges	
	Flora	Community	Coastal (foredune, swale, mobile dune)
		Landscape	Verge
	Priority Weeds	High	Black Flag, Gazania, Victorian Tea Tree
		Moderate	Cape Weed, Veldt Daisy
		Low	None recorded
	Fauna	Native	None recorded
Pest		None recorded	
Other			
Infrastructure	Fencing	Pine logs along dual access path	
	Access	Dual access path, 2 paths to beach	
	Other	Information signs, Elizabeth shipwreck plaque, inactive drain, photo observation point	
Heritage	Aboriginal artefacts scatter site adjacent in MacArthur Street		
Development	None		
Other	<ul style="list-style-type: none"> Lawn areas in W2 and W6 can be landscaped with coastal/ verge species Infill at W4 is still a high erosion risk and needs brushing. 		
Management Strategy			
Stage 1 Works	Strategy	OPC	
Weed Control	Target Priority Weeds in W1, W3, W4, W5	\$738	
Pest Control	None	\$0	
Revegetation	Plant W1, W3, W4, W5 with species from Coastal (foredune, swale, mobile dune) lists, focusing on exposed areas and where High Priority weeds have been successfully controlled	\$22,960	
Landscape	Plant W2, W6 using species from Coastal (foredune, swale, mobile dune, stable dune) that lists that also occur on Verge and Butterfly Attracting lists	\$5,950	
Infrastructure	None	\$0	
Other	Apply brushing to infill at W4 to reduce risk of erosion	\$500	
STAGE TOTAL		\$30,148	
Stage 2 Works	Strategy	OPC	
Weed Control	Maintenance spraying of High Priority weeds in W1, W3, W4, W5	\$246	
	Target Moderate Priority weeds in W1, W3, W4, W5	\$738	
Pest Control	None	\$0	
Revegetation	Maintenance replanting where necessary, focusing on exposed areas and where High and Moderate Priority weeds have been successfully controlled	\$4,592	
Landscape	Maintain landscape planting in W2, W6	\$1,190	
Infrastructure	None	\$0	
Other	Maintain brushing to infill at W4 to reduce risk of erosion	\$100	
STAGE TOTAL		\$6,866	
Stage 3 Works	Strategy	OPC	
Weed Control	Maintenance spraying of Moderate and High Priority weeds in W1, W3, W4, W5	\$246	
	Target Low Priority weeds in W1, W3, W4, W5	\$738	
Pest Control	None	\$0	
Revegetation	Maintenance replanting where necessary, focusing on exposed areas and where all weeds have been successfully controlled	\$4,592	
Landscape	Maintain landscape planting in W2, W6	\$1,190	
Infrastructure	None	\$0	
Other	Maintain brushing to infill at W4 to reduce risk of erosion	\$100	
STAGE TOTAL		\$6,866	
TOTAL OPC		\$43,880	



W2

W3

W4

W5

W6

Figure 31: Wearne
(Cottesloe Coastcare 2008)
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6.4.5 Vlamingh

Table 30: Summary of Management Strategy for Vlamingh

Item	Natural Area Characteristics		
Issues			
Social	Recreation	Hang gliding is popular in V4-5 Popular swimming hole and fishing spot opposite Sydney St (V1)	
	Aesthetics	High visual amenity potential Curtin Ave and Marine Pde intersection an southern entry statement into Cottesloe (V11, V14, V16)	
Natural	Condition	Mostly <i>Degraded, some sections in Good condition</i>	
	Greenway	Regional	
	Landform	Narrow to wide beaches, large dunes, slope and swales	
	Management Nodes	V1, V2, V4, V6, V7, V9, V10, V12, V15, V16 dunal systems	
	Flora	Community	Coastal (foredune, swale, mobile dune, stable dune)
		Landscape	Verge, Large Shrub, Bird Attracting, Butterfly Attracting
	Priority Weeds	High	African Box Thorn, Athel Pine, Black Flag, Bridal Creeper, Buffalo Grass, Couch Grass, Freesia, Gazania, Geraldton Carnation Weed, Rose Pelargonium, Sea Spinach, Victorian Tea Tree, Wild Gladiolus
		Moderate	thistle, Onion Weed, Veldt Daisy
		Low	Agave, Beach Evening Primrose, fleshy bulbs, Flea Bane, Sweet Alyssum
	Fauna	Native	2 gecko species, 12 skink species, 1 snake species and 38 bird species known to inhabit area
Pest		Rabbits, particularly in V8 and V12	
Other		<ul style="list-style-type: none"> Erosion occurring in V4 and V7 Blowout in V16 	
Infrastructure	Fencing	Some fencing along dunes, in poor condition	
	Access	Access ramps, fenced pathways, 5 beach access paths, informal walk trails	
	Other	Memorial with plaques, information signs, 2 drains	
Heritage		<ul style="list-style-type: none"> European Heritage – official landing site of Dutch explorer William de Vlamingh Tourists visit the memorial, highly important to maintain the area 	
Development		Part of Leighton development, future in unclear.	
Other		<ul style="list-style-type: none"> Unused grassy lawn area in V3 has potential for coastal/ verge revegetation Extensive erosion in V4 from a broken drain and trampling of vegetation and slope by hang gliders Only site to have infestation of Bridal Creeper May be affected by adjacent Leightons development 	
Management Strategy			
Stage 1 Works	Strategy	OPC	
Weed Control	Target Priority Weeds in V1-2, V4, V6-10, V12-13, V15-16, focusing on Bridal Creeper in V8 to prevent it spreading further	\$549	
Pest Control	Set baiting stations for rabbits in V8 and V12	\$200	
Revegetation	Plant V1, V2, V4, V6, V7, V9, V10, V12, V15 using species from Coastal (foredune, swale, mobile dune, stable dune) lists, focusing on exposed areas and where High Priority weeds have been successfully controlled	\$55,300	
Landscape	Plant V3, V11, V13, V14 using species from Coastal (foredune, swale, mobile dune, stable dune) lists that also occur on Verge and Butterfly Attracting lists	\$10,325	
	Plant V8, V10, V16 using species from Coastal (foredune, swale, mobile dune, stable dune) lists that also occur on Butterfly Attracting, Bird Attracting, Tree and Shrub lists	\$39,200	
Infrastructure	Install wooden platform near V4 for hang gliders to use, preventing further trampling/ erosion	\$5,000	
	Improve fencing along V1, V2, V4, V6, V7, V9 to prevent further trampling and erosion issues	\$13,650	
Other	Extensive brushing throughout foredunes/ beach areas of V4, V6 and V7 to reduce further erosion	\$2,125	
STAGE TOTAL		\$126,349	
Stage 2 Works	Strategy	OPC	
Weed Control	Maintenance spraying of High Priority weeds in V1-2, V4, V6-10, V12-13, V15-16 focusing on Bridal Creeper in V8	\$183	
	Target Moderate Priority weeds in V1-2, V4, V6-10, V12-13, V15-16	\$549	
Pest Control	Continue setting baiting stations for rabbits in V8 and V12	\$400	
Revegetation	Maintenance replanting in V1, V2, V4, V6, V7, V9, V10, V12, V15 where necessary, focusing on exposed areas and where High and Moderate Priority weeds have been successfully controlled	\$11,060	
Landscape	Maintain landscape plantings of V3, V8, V10, V11, V13, V14, V16	\$9,905	
Infrastructure	Maintain fencing throughout site	\$2,730	
Other	Maintain brushing in V4, V6 and V7	\$425	
STAGE TOTAL		\$25,252	
Stage 3 Works	Strategy	OPC	
Weed Control	Maintenance spraying of Moderate and High Priority weeds in V1-2, V4, V6-10, V12-13, V15-16 focusing on Bridal Creeper in V8	\$183	
	Target Low Priority weeds in V1-2, V4, V6-10, V12-13, V15-16	\$549	
Pest Control	Continue setting baiting stations for rabbits in V8 and V12	\$400	
Revegetation	Maintenance replanting in V1, V2, V4, V6, V7, V9, V10, V12, V15, V16 where necessary, focusing on exposed areas and where all weeds have been successfully controlled	\$11,060	
Landscape	Maintain landscape plantings of V3, V8, V10, V11, V13, V14, V16	\$9,905	
Infrastructure	Maintain fencing throughout site	\$2,730	
Other	Maintain brushing in V4, V6 and V7	\$425	
STAGE TOTAL		\$25,252	
TOTAL OPC		\$176,583	



Figure 32: Vlamingh
(Northern Section)
(Cottesloe Coastcare 2008)
1:1000



Figure 33: Vlamingh
(Southern Section)
(Cottesloe Coastcare 2008)
1:1000

6.5 Residential Precinct

6.5.1 Grant Marine Park

Table 31: Summary of Management Strategy for Grant Marine Park

Item		Natural Area Characteristics		
Issues				
Social	Recreation	Popular parkland, much lawn space		
	Aesthetics	Ocean views, high visual amenity		
Natural	Condition	Mostly <i>Good</i> , west side <i>Degraded</i>		
	Greenway	Securing		
	Landform	Stable dune		
	Management Nodes	GMP		
	Flora	Community	Coastal Dunes (stable dunes), Transition Shrubland	
		Landscape	Verge, Butterfly Attracting	
	Priority Weeds	High	Black Flag, Couch, Rose Pelargonium, Sea Spinach, Victorian Tea Tree	
		Moderate	Onion Weed	
		Low	None recorded	
	Fauna	Native	Insects, birds and reptiles (included bob tail lizard) recorded	
Pest		Rabbits		
Other	None			
Infrastructure	Fencing	Some small limestone walls		
	Access	Sealed limestone and slab pathways		
	Other	Lookout, playground, basketball ring,		
Heritage	NA			
Development	NA			
Other	<ul style="list-style-type: none"> • Much unused reticulated lawn area, especially adjacent area south east of site, can be revegetated • Neighbours resist any plantings that will restrict views • Over-spraying of lawn sprinklers 			
Management Strategy				
Stage 1 Works	Strategy		OPC	
Weed Control	Target Priority Weeds throughout site		\$720	
	Spray unused lawn areas – western verge along southern end of site and adjacent southeast land		\$100	
	Install barrier to prevent lawn grass invade stable dunes		\$960	
Pest Control	Maintain baiting stations for rabbits		\$200	
Revegetation	Plant stable dune using species from Coastal (stable dune) list, where necessary, focusing on western side and where High Priority weeds have been successfully controlled		\$16,800	
Landscape	None		\$0	
Infrastructure	Stop and remove reticulation use in areas where lawn grass has been sprayed		\$0	
Other	Reduce amount of reticulation watering of remaining grassed areas		\$0	
STAGE TOTAL			\$19,500	
Stage 2 Works	Strategy		OPC	
Weed Control	Maintenance spraying of High Priority weeds		\$240	
	Target Moderate Priority weeds		\$720	
Pest Control	Continue setting baiting stations for rabbits		\$400	
Revegetation	Maintenance replanting of stable dune where necessary, focusing on exposed areas and where High and Moderate Priority weeds have been successfully controlled		\$3,360	
	Plant small verge area where lawn is removed with species from Coastal (stable dune) and Transition Shrubland lists that also occur on Verge list		\$1,575	
Landscape	Plant adjacent southwest area where lawns has been controlled with species from Transition Shrubland list, promoting species that also occur in Bird Attracting and Butterfly Attracting and Verge lists		\$15,000	
Infrastructure	None		\$0	
Other	None		\$0	
STAGE TOTAL			\$21,295	
Stage 3 Works	Strategy		OPC	
Weed Control	Maintenance spraying of Moderate and High Priority weeds		\$240	
	Target Low Priority weeds		\$720	
Pest Control	Continue setting baiting stations for rabbits		\$400	
Revegetation	Maintenance replanting where necessary, focusing on exposed areas and where all weeds have been successfully controlled		\$1,890	
Landscape	Maintain landscape planting in adjacent southwest site		\$3,000	
Infrastructure	None		\$0	
Other	None		\$0	
STAGE TOTAL			\$6,250	
TOTAL OPC			\$47,045	



Figure 34: Grant Marine Park
(Cottesloe Coastcare 2008)
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6.5.2 Cottesloe Native Gardens

Table 32: Summary of Management Strategy for Cottesloe Native Gardens

Item	Natural Area Characteristics		
Issues			
Social	Recreation	"Bushwalk" path frequently used by locals	
	Aesthetics	High view point	
Natural	Condition	Mostly <i>Very Good</i> , northern end <i>Degraded</i>	
	Greenway	Developing	
	Landform	Rise with view over golf course	
	Management Nodes	CNG	
	Flora	Community	Cottesloe Woodland
		Landscape	Bird Attracting, Butterfly Attracting, Tree, Large Shrub
	Priority Weeds	High	Bearded Oat, Black Flag, Brazilian Pepper Tree, Couch, Fountain Grass, Freesia, Geraldton Carnation Weed, Rose Pelargonium, Victorian Tea Tree, Western Blue Lupin, Yellow Soldiers
		Moderate	Cape Weed, Geraldton Wax, Guildford Grass, Onion Weed, Soursob, Sydney Golden Wattle
		Low	Flatweed, Fleabane, Hares Tail Grass, Summer Grass, Ursinia, Wattle
	Fauna	Native	Many bird species, much fauna habitat
Pest		Rabbits	
Other	<ul style="list-style-type: none"> Unique remaining intact inland bushland. Important site for biodiversity 		
Infrastructure	Fencing	None	
	Access	Informal track regularly used, many small informal paths also created form trampling	
	Other	Several pine long posts, tap (working)	
Heritage	None		
Development	Native remnant/ screen for golf course		
Other	None		
Management Strategy			
Stage 1 Works	Strategy	OPC	
Weed Control	Target Priority Weeds throughout CNG	\$720	
Pest Control	Set baiting stations for rabbits in CNG	\$200	
Revegetation	Plant CNG using species from Cottesloe Woodland species list, promoting species that also occur in Bird Attracting, Butterfly Attracting, Tree and Large Shrub lists, focusing on exposed areas and where High Priority weeds have been successfully controlled	\$14,000	
Landscape	None	\$0	
Infrastructure	Establish formal path over informal pathway	\$3,000	
	Establish of bollards and weed barrier to prevent lawn grass invasion	\$3,000	
Other	Prune vegetation along formal pathway to allow wider access	\$240	
STAGE TOTAL		\$21,160	
Stage 2 Works	Strategy	OPC	
Weed Control	Maintenance spraying of High Priority weeds	\$240	
	Target Moderate Priority weeds	\$720	
Pest Control	Continue setting baiting stations for rabbits	\$400	
Revegetation	Maintenance replanting where necessary, focusing on exposed areas and where High and Moderate Priority weeds have been successfully controlled	\$2,800	
Landscape	None	\$0	
Infrastructure	None	\$0	
Other	Maintain pruning of vegetation along formal pathway	\$240	
STAGE TOTAL		\$4,400	
Stage 3 Works	Strategy	OPC	
Weed Control	Maintenance spraying of Moderate and High Priority weeds	\$240	
	Target Low Priority weeds	\$720	
Pest Control	Continue setting baiting stations for rabbits	\$400	
Revegetation	Maintenance replanting where necessary, focusing on exposed areas and where all weeds have been successfully controlled	\$2,800	
Landscape	None	\$0	
Infrastructure	None	\$0	
Other	Maintain pruning of vegetation along formal pathway	\$240	
STAGE TOTAL		\$4,400	
TOTAL OPC		\$29,960	



CNG

Figure 35: Cottesloe Native Gardens
(Cottesloe Coastcare 2008)
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6.6 Mixed Precinct

6.6.1 Victoria Street

Table 33: Summary of Management Strategy for Victoria Street

Item	Natural Area Characteristics		
Issues			
Social	Recreation	None	
	Aesthetics	High visual amenity potential. Excellent potential viewpoints.	
Natural	Condition	Majority of site is <i>Good</i> , northern section is <i>Degraded</i>	
	Greenway	Regional	
	Landform	Steep limestone rise	
	Management Nodes	VIC	
	Flora	Community	Transition Shrubland
		Landscape	Bird Attracting, Butterfly Attracting, Tree, Large Shrub
	Priority Weeds	High	Bearded Oat, Couch, Victorian Tea Tree
		Moderate	None recorded
		Low	None recorded
	Fauna	Native	Potential for fauna habitat
Pest		Rabbits	
Other	None		
Infrastructure	Fencing	None	
	Access	None	
	Other	None	
Heritage	Aboriginal artefacts scatter site, adjacent to heritage listed McCall Centre		
Development	Area is part of Leightons development, future land use uncertain		
Other	Potential for viewpoint behind McCall Centre, as elevation allows view over all of Town of Cottesloe		
Management Strategy			
Stage 1 Works	Strategy	OPC	
Weed Control	Target Priority Weeds throughout VIC	\$2,808	
Pest Control	Set baiting stations for rabbits	\$600	
Revegetation	Plant VIC with species in Transition Shrubland list, focusing on exposed areas and where High Priority weeds have been successfully controlled	\$62,520	
Landscape	None	\$0	
Infrastructure	None	\$0	
Other	None	\$0	
STAGE TOTAL		\$65,928	
Stage 2 Works	Strategy	OPC	
Weed Control	Maintenance spraying of High Priority weeds throughout VIC	\$936	
	Target Moderate Priority weeds throughout VIC	\$2,808	
Pest Control	Continue setting baiting stations for rabbits	\$1,200	
Revegetation	Maintenance replanting where necessary, focusing on exposed areas and where High and Moderate Priority weeds have been successfully controlled	\$13,104	
Landscape	None	\$0	
Infrastructure	None	\$0	
Other	None	\$0	
STAGE TOTAL		\$18,048	
Stage 3 Works	Strategy	OPC	
Weed Control	Maintenance spraying of Moderate and High Priority weeds throughout VIC	\$936	
	Target Low Priority weeds throughout VIC	\$2,808	
Pest Control	Continue setting baiting stations for rabbits	\$1,200	
Revegetation	Maintenance replanting where necessary, focusing on exposed areas and where all weeds have been successfully controlled	\$13,104	
Landscape	None	\$0	
Infrastructure	None	\$0	
Other	None	\$0	
STAGE TOTAL		\$18,048	
TOTAL OPC		\$102,024	



Figure 36: Victoria Street
(Cottesloe Coastcare 2008)
1:2000

7.0 Guidelines for Potential Natural Areas

Cottesloe Natural Areas Management Plan

7.1 Method for Determining Guidelines for Enhancing Potential Natural Area

Detailed management strategies were not devised for the identified PNAs, as integration of natural restoration into the current and future land use and function of each of the areas still need to be addressed. Also, the PNAs have not yet been properly researched for many issues (eg presence of weed and pest species). The following **Tables 34 to 40** instead summarise the limited natural area characteristics known of each PNA then provide recommendations for the enhancement of each MN.

7.1.1 Natural Area Characteristics

Similar to ENA management tables, the following guideline table summaries the local natural area characteristics of each PNA table, which include:

- if the PNA is designated as part of a greenway
- the current land use of the area
- the inferred flora of the site including
 - The Hedde vegetation complex
 - Which vegetation community species lists to revegetate the area
 - What landscape species lists may be used to improve the visual amenity of the area
- the current infrastructure, present (eg fencing and access)
- the current and possible land functions within the area (eg sumps, ecological corridor)
- any other issue specific to the area.

7.1.2 Management Node Guidelines

Guidelines were recommended for each identified management nod. Items discussed include:

- which specific land function the node served
- which revegetation species should be used to restore the area to its original natural condition
- which landscape species lists should be applied to compliment the site function.

In cases where two or more MNs within a PNA shared the same guidelines, these MNs were grouped together to prevent repetition within the table (eg Cottesloe, Mosman Park and Victoria St Railway Stations MNs in the Mixed Use Railway Line PNA).

7.2 Northern, Central and Coastal Precincts

7.2.1 North, Central and South Coast Verges

Table 34: Summary of Guidelines for enhancing North, Central and South Coast Verges

Item	Natural Area Characteristics		
Issues			
Natural	Greenway	Securing	
	Land use	Lawn areas	
	Flora	Complex	Cottesloe Central and South
		Community	Coast (mobile dune, stable dune)
		Landscape	Verge
Other	None		
Infrastructure	Fencing	Pine log, wire	
	Access	Entries to beach access paths, dual access path	
	Other	car parks, playgrounds, exercise areas	
Functions	Verges, Southern Entry Statement		
Other	None		
Management Node Guidelines			
Marmion Ave Wide Verge (North St to Napier St)			
Marmion Ave Wide Verge (Napier St to Mudurup)			
Marmion Ave Wide Verge (Mudurup to Curtin Ave)			
Revegetation	Coast (mobile dune, stable dune)		
Landscape	Verge		
Infrastructure	None		
Marine Parade South Entry Statement			
Revegetation	Coast (mobile dune, stable dune)		
Landscape	Verge		
Infrastructure	Potential for public art to be displayed		

7.3 Residential Precinct

7.3.1 Residential Median Strips

Table 35: Summary of Guidelines for enhancing Residential Median Strips

Item	Natural Area Characteristics		
Issues			
Natural	Greenway	Securing and Developing	
	Land use	Median Strips	
	Flora	Complex	Cottesloe Central and South
		Community	Transition Shrubland, Cottesloe Shrubland, Cottesloe Woodland
		Landscape	Verge, Bird Attracting, Butterfly Attracting, Dampland, Tree
Other	None		
Infrastructure	Fencing	Wire fencing around sumps, some pine logs	
	Access	NA	
	Other	Formal and informal car parks	
Functions	View Points, Sumps, Northern Entry Statement, Ecological corridor		
Other	None		
Management Node Guidelines			
Grant St & Broome St Intersection View Point			
Revegetation	Cottesloe Shrubland		
Landscape	Verge, Tree		
Infrastructure	None		
Grant St & Marmion St Intersection Sump			
Revegetation	Cottesloe Woodland		
Landscape	Dampland		
Infrastructure	Wire Fencing		
Grant St & Curtin Ave Entry Statement & Intersection Sump			
Revegetation	Cottesloe Woodland		
Landscape	Dampland		
Infrastructure	None		
Grant St (Marine Pde to Broome St) Median Strip Corridor			
Revegetation	Transition Shrubland		
Landscape	Bird Attracting, Butterfly Attracting, Tree		
Infrastructure	None		
Grant St (Broome St to Marmion St) Median Strip Corridor			
Revegetation	Cottesloe Shrubland		
Landscape	Bird Attracting, Butterfly Attracting, Tree		
Infrastructure	None		
Grant St (Marmion St to Curtin Ave) Median Strip Corridor			
Revegetation	Cottesloe Woodland		
Landscape	Bird Attracting, Butterfly Attracting, Tree		
Infrastructure	None		

7.3.2 Residential Verges

Table 36: Summary of Guidelines for enhancing Residential Verges

Item	Natural Area Characteristics		
Issues			
Natural	Greenway	Securing	
	Land use	Wide verge	
	Flora	Complex	Cottesloe Woodland
		Community	Transition Shrubland, Cottesloe Woodland
		Landscape	Verge
Other	None		
Infrastructure	Fencing	None	
	Access	NA	
	Other	None	
Functions	Verge		
Other	None		
Management Node Guidelines			
Gibney St Wide Verge			
Warton St Wide Verge			
Revegetation	Transition Shrubland, Cottesloe Woodland		
Landscape	Verge		
Infrastructure	None		

Table 37: Summary of Management Strategy for John Black Dune Park

Item	Natural Area Characteristics		
Issues			
	Greenway	Securing	
	Landform	modified stable dune	
	Flora	Complex	Cottesloe Central and South
		Community	Transition Shrubland
		Landscape	Bird Attracting, Butterfly Attracting, Large Shrubs
Other	<ul style="list-style-type: none"> High Priority weeds Black Flag, Couch, Rose Pelargonium, Victorian Tea Tree 3 Butterfly species breed on existing plant species 		
Infrastructure	Fencing	None present	
	Access	No formal access paths present	
	Other	None	
Other	<ul style="list-style-type: none"> Antisocial behaviour and safety concerns no community ownership, no formal paths, not attractive to walk through Western side of park may be used for car park expansion possible long term plan – develop area for demonstration / interpretation / education 		
Management Node Guidelines			
JB1			
Revegetation	Transition Shrubland		
Landscape	Verge, Large Shrub, Tree, Butterfly Attracting, Bird Attracting		
Infrastructure	<ul style="list-style-type: none"> Install a formal sealed path to connect northern and Southern sides so to prevent informal pathways Install education/ demonstration signage 		

7.4 Mixed Precinct

7.4.1 Mixed Use Median Strip

Table 38: Summary of Guidelines for enhancing Mixed Use Median Strips

Item	Natural Area Characteristics		
Issues			
Natural	Greenway	Developing	
	Land use	Median Strip	
	Flora	Complex	Karrakatta Central and South
		Community	Karrakatta Forest
		Landscape	Bird Attracting, Butterfly Attracting, Tree
Other	None		
Infrastructure	Fencing	None	
	Access	NA	
	Other	None	
Function	Median Strip, View Point		
Other	None		
Management Node Guidelines			
Grant St (Railway St to Parry St) and Congdon St Median Strip			
Revegetation	Karrakatta Forest		
Landscape	Bird Attracting, Butterfly Attracting, Tree		
Infrastructure	None		
Grant St & Mann St Intersection View Point			
Revegetation	Karrakatta Forest		
Landscape	Verge, Tree		
Infrastructure	None		

7.4.2 Mixed Use Verges

Table 39: Summary of Guidelines for enhancing Mixed Use Verges

Item	Natural Area Characteristics		
Issues			
Natural	Greenway	None	
	Landform	Wide Verge	
	Flora	Complex	Cottesloe Central and South
		Community	Cottesloe Woodland
		Landscape	Verge
Other	None		
Infrastructure	Fencing	None	
	Access	NA	
	Other	None	
Functions	Wide Verge		
Other	Potential for demonstration verge planting for public education		
Management Node Guidelines			
Eric St Wide Verge			
Revegetation	Cottesloe Woodland		
Landscape	Verge		
Infrastructure	None		

7.4.3 Mixed Use Railway Line

Table 40: Summary of Guidelines for enhancing Mixed Use Railway Line

Item	Natural Area Characteristics		
Issues			
Natural	Greenway	Securing	
	Land use	Railway Corridor	
	Flora	Complex	Karrakatta Central and South, Cottesloe Central and South
		Community	Cottesloe Woodland, Karrakatta Forest
		Landscape	Bird Attracting, Butterfly Attracting, Large Shrub, Tree, Dampland
Other	None		
Infrastructure	Fencing	Ringlock Fencing	
	Access	NA	
	Other	Crossings, railway stations, railway line	
Functions	Railway Stations, Entry Statements, Sumps, Ecological corridor		
Other	None		
Management Node Guidelines			
Grant St Railway Station			
Revegetation	Cottesloe Woodland/ Karrakatta Forest		
Landscape	Bird Attracting, Butterfly Attracting, Shrub, Tree		
Infrastructure	Railway station		
Cottesloe Railway Station			
Mosman Park Railway Station			
Victoria St Railway Station			
Revegetation	Cottesloe Woodland		
Landscape	Bird Attracting, Butterfly Attracting, Shrub, Tree		
Infrastructure	Railway station		
Curtin Ave & Claremont Cr Intersection Entry Statement			
Revegetation	Karrakatta Forest		
Landscape	Bird Attracting, Butterfly Attracting, Shrub		
Infrastructure	Railway station		
Curtin Ave & Claremont Cr Intersection Entry Statement			
Curtin Ave & Eric St Intersection Entry Statement			
Curtin Ave & Jarrad St Intersection Entry Statement			
Curtin Ave & Pearce St Intersection Entry Statement			
Curtin Ave & Salvado Rd Intersection Entry Statement			
Revegetation	Cottesloe Woodland		
Landscape	Bird Attracting, Butterfly Attracting, Shrub		
Infrastructure	None		
Curtin Ave & Hawkstone St Intersection Sump			
Curtin Ave and Napier St Intersection Sump			
Curtin Ave & Finey St Intersection Sump			
Curtin Ave & Keane St Intersection Sump			
Revegetation	Cottesloe Woodland		
Landscape	Bird Attracting, Butterfly Attracting, Shrub, Dampland		
Infrastructure	Ringlock fencing		
North to Grant St Railway Corridor			
Revegetation	Karrakatta Forest		
Landscape	Bird Attracting, Butterfly Attracting, Large Shrub, Tree		
Infrastructure	None		
Grant St to Marine Pde Railway Corridor			
Revegetation	Cottesloe Woodland		
Landscape	Bird Attracting, Butterfly Attracting, Large Shrub, Tree		
Infrastructure	None		

8.0 Implementation of Works

Cottesloe Natural Areas Management Plan

8.1 Implementation of Works

8.1.1 Weed Management

Weeds are considered to be the biggest threat to preserving the ENAs. Two separate approaches are required to minimise the weed threat:

- Site Approach
- Species Approach.

Site Approach

Weed control should be an integral part of the management strategy for an ENA when it is being restored. The priority status of present weed species should be used to decide when to target those species within the three stage approach outlined in **Section 6.1.2**.

- Any *High Priority* weed infestations should be targeted as part of *Stage 1 (Preservation)* prior to planting native tubestock.
- Any *Moderate Priority* weeds infestations should be targeted during *Stage 2 (Enhancement)* to encourage further native flora dominance and improve visual amenity.
- Any *Low Priority* weed infestations should be controlled during *Stage 3 (Maintenance)* to further improve the condition of the native area.

In addition to minimising existing weed infestations, other weed control activities may be considered to reduce further invasion of weeds, such as weed barriers. Such works should be conducted during Stage 1 to immediately prevent any further invasion and minimise costs and works.

Species Approach

It is not expected that restoration work will fully commence on all ENAs simultaneously, rather the areas will be worked on over time, according to priority status and funding options. This means that, while several high priority ENAs may be restored over the short term, infestations of high priority weeds may increase within lower priority ENAs, threatening their natural value and increasing the amount restoration work required. Populations of high priority weeds, such as Black Flag and Bridal Creeper, are also highly likely to occur elsewhere within the City (eg public open space) which may spread into the ENAs. An early intervention strategy will therefore be required to target all high priority weed species populations within in the Town to minimise costs and work involved in the longer term.

Site assessments should be first conducted to determine the presence/ absence and location/ distributions of all high priority weeds within the Town's municipality. A weed control program can then be formulated to target all high priority weed infestations during their optional time frames. Ongoing monitoring and follow up controls will need to be maintained after the initial targeted works.

Sea Spinach (*Tetragona decumbens*), despite being rated as a high priority weed species, should not be targeted as part of this strategy, as it is recognised that it serves some role in minimising erosion on coastal dunes. This species should only be targeted in a particular coastal natural area during restoration works (ie prior to planting of native seedlings).

A list of the current known occurrences of the high priority weeds is summarised in **Table 41** on the following page. It should be noted that this list is not exhaustive and does not indicate locations of any high priority weed populations occurring elsewhere in the Town's boundaries. A range of control methods and timings is suggested in **Appendix 2**.

8.1.2 Revegetation

Native Rehabilitation

It should be noted that, due to the small size and degraded state of the Cottesloe natural areas, not all the indigenous species that would have naturally occurred onsite have been retained. Therefore species used for the revegetation within the study area should be based on what species would naturally occur onsite rather than only be restricted to those species presently recorded onsite during this project.

A list of species suitable for each vegetation unit is included in **Appendix One**. This list of 173 species was developed on the basis of what species occurred in the Town of Cottesloe, with additional species incorporated on the basis of a specific literature on appropriate species for the study area (Smith 1973, Grasby 1983, Cresswell & Bridgewater 1985, CALM 1986, Oma *et al* 1992, Rippey & Rowland 1995, Quilty 1999, Powell and Emberson 2001, Ecoscape 2002, CCA 2008). Species lists have been prepared according to their relevant landform and environment, as discussed in **Section 3.2**.

It should be noted that the 67 species highlighted in red are those recommended by CCA (2008) for revegetating ENAs. The remaining 108 species should only be considered as additional species when revegetating or landscaping PNAs.

Species selections lists were prepared for various sections of coastal natural areas:

- fore dunes
- swale
- mobile dune
- stable dune
- cliff.

Species selection lists were also prepared for the vegetation communities of inland areas:

- Transition Shrublands
- Cottesloe Shrubland
- Cottesloe Woodland
- Karrakatta Forest.

All plant stock used for revegetation ENAs should be sourced from local plants to ensure preservation of provenance. Plants used for restoring PNAs should be sourced from local provenance when possible.

Table 41. Known infestations of High Priority Weeds in ENAs

WEED SPECIES		EXISTING NATURAL AREAS												
Common Name	Scientific Name	North Street	Grant Street	North Cottesloe	Peters Pool and Bryan Way	Cottesloe Beach	Mudurup	Isolators	Dutch Inn	Wearne	Vlamingh	Grant Marine Park	Cottesloe Native Gardens	Victoria Street
African Boxthorn	<i>Lycium ferocissimum</i>										*			
Annual Veldt Grass	<i>Ehrharta longifolia</i>										*		*	
Athel Tree	<i>Tamarix aphylla</i>					*					*			
Bearded Oat	<i>Avena barbata</i>												*	*
Black Flag	<i>Ferraria crispa</i>		*		*		*	*		*	*	*	*	
Brazilian Pepper Tree	<i>Schinus terebinthifolius</i>												*	
Bridal Creeper	<i>Asparagus asparagoides</i>										*			
Buffalo Grass	<i>Stenotaphrum secundatum</i>		*				*				*			
Couch	<i>Cynodon dactylon</i>	*	*	*	*	*	*	*	*		*	*	*	*
Fountain Grass	<i>Pennisetum setaceum</i>												*	
Freesia	<i>Freesia alba x leichtlinii</i>										*	*	*	
Gazania	<i>Gazania linearis</i>	*						*	*	*	*	*	*	
Geraldton Carnation Weed	<i>Euphorbia terracina</i>							*	*		*		*	
Kikuyu	<i>Pennisetum clandestinum</i>	*						*	*			*		
Perennial Veldt Grass	<i>Ehrharta calycina</i>												*	
Red Soldiers	<i>Lachenalia bulbifera</i>		*									*		
Rose Pelargonium	<i>Pelargonium capitatum</i>	*	*	*	*	*	*	*	*		*	*	*	
Victorian Tea Tree	<i>Leptospermum laevigatum</i>	*	*	*	*	*	*		*	*	*	*	*	*
Western Blue Lupin	<i>Lupinus cosentinii</i>											*	*	
Wild Gladiolus	<i>Gladiolus caryophyllaceus</i>										*			
Yellow Soldiers	<i>Lachenalia reflexa</i>												*	

Landscaping

In addition to restoring the natural vegetation to natural areas, native planting can also be used to upgrade the visual amenity and function of the natural areas. Species from **Appendix One** would be strongly encouraged for use in amenity and landscape plantings by the Town of Cottesloe in both ENAs and PNAs. This would also provide a more uniform character to the North Cottesloe landscape, reduce weed introduction and reduce water use to the open public spaces.

Landscaping species lists were prepared from the recommended local revegetation list as follows:

- *Verge* – are less than 1m in height and do not obscure views
- *Large Shrubs* – provide screening
- *Trees* – provide overstorey and shade
- *Dampland* – may grow in moist or seasonally inundated environments (eg sumps)
- *Bird Attracting* – provide either habitat or food source for local native birdlife
- *Butterfly Attracting* – provide either habitat or food source for local native butterflies.

Landscape species for each natural area should be selected by determining which species indicated in the designated landscape functions also match those in the local vegetation community list. This will result in sub-lists of flora species which will fulfil the landscape functions which will still resemble the native vegetation communities.

8.1.3 Dune Rehabilitation

All dunes within the foreshore natural areas need to be reconstructed when there is a need to establish a stable landform that can support sand trapping, stabilise vegetation and act as a barrier to wind and wave erosion. The common sequence of work in rehabilitating degraded or eroding coastal foreshores is as follows:

1. Reconstruct damaged dunes to a stable confirmation, where necessary.
2. Applying stable stabilisers to hold exposed sand until vegetation is established.
3. Planting and/ or seeding to establish permanent vegetative cover.
4. Installing protective measures and improvements to control access though dunes between the beach and inland (eg fencing, pathways).
5. Follow up maintenance to ensure results of initial rehabilitation are sustained over the long-term.

(Quilty Environmental, 1999).

8.1.4 Erosion

Erosion is not extensive in the Town and is only noted to occur within the coastal precincts. Areas that do become eroded can be covered to facilitate the revegetation of the area and minimise pedestrian traffic through the area. Covering protects the young plants and bare surfaces from erosive wind, sand blasting, sand creep and helps to conserve soil moisture, while creating a suitable environment for seed germination and establishment of young plants. Stabilising should incorporate strategic wind fencing, covering materials and intensive planting of dune stabilising species such as those indicated in **Appendix One**.

Suitable covering materials include:

- matting
- brush material
- mulch
- tritter.

Matting is used in areas with highly unstable dunes where new vegetation may not be able to establish unless the potential for soil movement is mitigated through stabilisation with matting or netting of some type.

Brushing has the added advantage of acting as a reservoir for wind blown sand and is a deterrent to pedestrians (Oma *et al* 1992). The presence of brush controls sand movement by impeding the surface wind flow, trapping sand and sheltering plants. *Melaleuca* and pine prunings are ideal brush materials as they retain leaves for long periods, increasing their ability to trap sand and protect the surface (Oma *et al* 1992). Brushing material should not to be utilised where there is a risk of erosion onto the strand due to issues of public risk and liability through injury to beach users. Brushing should be limited to less than 150mm deep, openly spaced, not to contain leaf material (fire risk), free of seed material to prevent weed introduction and to be less than 2cm in diameter to enable more rapid decomposition and aid soil making.

Mulching with locally available materials, which could include seaweed, will also stabilise sandy surfaces. No wood chips should be used due to lack of ability to decompose in the nitrogen depleted dune sands. Mulch has a much lower capacity than brush to trap sand, and will not protect seedlings from sand blasting or wind once pore spaces have been filled (Oma *et al* 1992). This technique is best used where sand drift and sand blasting are not an issue, in sheltered sites and dune swales. Thick layers of mulch can help retain soil moisture for seedlings whilst denying weed seeds access to light and thereby restricting their growth. Following the application of manual and herbicide weed control, weed-free mulch can be spread around seedlings in bare areas to help reduce weed growth. A light cover of mulch (1-2 cm deep) is recommended over the direct seeded areas. If there are large quantities of mulch available, then 5-10 cm is optimum for areas planted with seedlings. Care must be taken in sourcing mulch to ensure that it is not contaminated with weed seeds or disease.

Tritter is an alternative method which could be explored if the results of mulching are unsatisfactory. Tritter is part way between mulching and brushing and consists of guillotined brush material. This which means that brush can lie flatter and interlock more, without as much pore space. However, it must be noted that trittering would be more costly than mulching.

8.1.5 Pest Management

Evidence of rabbits was observed in the study area but rabbit numbers are low and in insufficient numbers to have a significant impact on the vegetation. This in part could be attributed to the narrowness of the study area, however suitable habitat areas occur in Grant Marine Park, Vlamingh and Victoria Street. A baiting program has recently been implemented south of the study area, which has targeted major breeding areas and is expected to affect the entire area in the long term.

The additional options for rabbit control include warren fumigation and destruction, fencing, tree guards and biological control. However, these other methods have been found difficult to implement in coastal areas, are not as cost effective or as easy to maintain as the current baiting program. The considerations in choosing rabbit control methods are listed in **Table 42** below.

Table 42: Issues concerning rabbit control methods

Control Method	Considerations
Baiting	Pindone® baiting can only be used in areas where no native fauna will be at risk (eg bandicoots and kangaroos).
	Baiting may affect other mammal species known or may occur in the area.
	There is little risk of poisoning of domestic dogs as oats are used in the baiting and any poisoned rabbits eaten would be not toxic enough to affect the dogs health. Bait stations are used to further reduce the risk and vitamin K can be used as an antidote for Pindone®
	There is little risk of poisoning birdlife as Pindone® is coloured to detract birds from eating the bait.
	The impact of baiting on reptiles is not well understood. It is possible that reptiles may eat the bait.
Fencing	Consideration needs to be given to the aesthetics, costs and possible effects on native animal species. Wire netting should have holes too small for rabbits to pass through.
Warren Fumigation and Destruction	In coastal dunes rabbits usually reside amongst dense vegetation rather than establish extensive warrens and therefore warren fumigation may not be required. Any warren fumigation practices would be site specific.
Tree guards	Tree guards can be effective in protecting seedlings in revegetation projects.
Biological Control	Biological control includes release of Myxomatosis and Rabbit Haemorrhagic Disease (RHD). Whilst useful in controlling overall rabbit numbers, their impacts are variable and none of these diseases will result in the elimination of rabbits, therefore not relied upon alone for the sustained long-term effectiveness of rabbit control programs in Australia (DAFWA 2008)

The rabbit control options should be chosen, depending on the numbers of the rabbits present, the amount of warrens versus vegetative cover, access to the areas to be treated, and risks of each method in that location. Options selected should allow for a minimum average of 70% control of rabbits across all areas treated (Swan Catchment Council/ Coastcare Program 2008).

Any rabbit control should be carried out by the Animal Pest Management Services, who are qualified and licensed in feral animal control.

8.1.6 Infrastructure

Infrastructure such as signs, paths and fences were not a focus of the project, but some pertinent observations were made during the preparation of the management plan and these are discussed below. Any infrastructure installed in natural areas should comply with Town of Cottesloe (2002) *Streetscape Policy and Manual*

Fencing

Fencing may be required in certain situations to discourage the public accessing dunes and trampling vegetation. The choice of fencing style should be practical, visually unobtrusive and attempt to be consistent throughout all the natural areas. Wire fencing may be concealed in some locations by planting local shrub species adjacent to the fencing. As the shrubs mature, branches should grow out between the wires and the foliage should then hide the wires.

Access

There is currently adequate access through a majority of the coastal dunes to the beach. This can be further controlled through fencing of bushland areas, and the provision of formal paths.

Uncontrolled access can contribute to the degradation of coastal areas. Areas at greatest risk from pedestrian traffic are generally narrow areas without large undulations, without dense vegetation and adjacent to focal points for people such as car parks and popular beaches. The area of greatest risk in the Town is in Vlamingh (MNs V4 to V6) where hang gilders cross the unstable steep slope to access to the beach.

Drains

Several drains were observed along the coastal areas. These drains have a direct detrimental impact on the native vegetation by encouraging the proliferation of weeds, particularly exotic grasses. The Town plans to remove the drains in the near future and divert the water into recharging the local aquifer.

Signage

There is already considerable signage in the study area at present, most of a regulatory nature. Additional signage could be considered to educate the public about the values and fragility of the natural areas, and discourage the traffic of pedestrians and any domestic dogs through established bushland and revegetation works. The number, functions and locations of the signage will need to be determined by the Town.

8.2 Operational and Funding Options

8.2.1 Works Funding

The Town has a range of budget allocations which may be fully or partly utilised to fund the restoration and enhancement of the natural areas. A new annual budget of \$50,000 is being proposed to be spent on preserving natural areas. In addition, parts of the maintenance budget, especially lawn maintenance, may be redirected into improving the ENAs and enhancing PNAs.

A variety of other funding sources are available which may be approached to further finance the work scheme. These funding bodies include:

- Coastwest (WAPC)
- Caring for our Country (DEWHA)
- Swan Alcoa Landcare grants
- Green Corps and other training programs.

Potential developers may also be viewed as a funding and operation possibility. Conditions for their development application to be approved may involve commitments to enhance the natural environment within their development properties.

It should be recognised that the CCA, working with the Town, has attracted over \$200,000 in funds for coastal preservation from community funding bodies. The volunteers within the Association have also donated much of their own time towards preserving the ENAs and have thus saved, and continue to save, the Town a considerable amount of funds through their ongoing labours.

8.2.2 Bushcare Officer

Care for Cottesloe (LA21) Committee (2003) *Sustainability Development Plan* recommended the employment of a Bushcare Officer to devise a draft plan for all public open spaces in conjunction with:

- coastal dune systems management plans
- developing greenways as listed in the *Western Suburbs Greening Plan* (Ecoscape, 2002)
- Town of Cottesloe (2004) *Policy: Street Trees*.

This recommendation is consistent with the outcomes of this document. A Bushcare Officer may be responsible for managing the NAMP, namely:

- developing a timetable for implementing work on natural areas according to priorities and availability of financial, equipment and labour resources
- strategically directing work teams and volunteer groups
- implementing the recommended management strategies for ENAs
- following guidelines for enhancing PNAs
- providing information and training
- educating the public about the social and environmental importance of remnant natural areas
- applying for financial support from funding sources such as those mentioned above.

The preservation and enhancement of the Town's natural areas may be applicable to the neighbouring local governments which are part of the *Western Suburbs Greening Plan*. The proposed Bushcare Officer position could be employed under all the associated local governments to improve all natural areas within the WESROC and City of Nedlands jurisdictions. The salary of the Bushcare Officer may then be shared between these local governments as applicable to the amount of work and time directed to each Local government municipality.

The advantage of the Bushcare Officer being jointly employed under all the local governments are:

- greater commitment towards meeting the Greening Plan objectives
- greater strategic and cooperative long-term development between the local governments in preserving and enhancing natural areas
- presenting a stronger case to funding bodies to obtain financial aid
- greater coordination of resources and work across all municipalities
- maintaining knowledge and records of natural area management work undertaken.

It is therefore highly recommended that a Bushcare Officer position be created to implement the NAMP with the Town of Cottesloe. It is also highly recommended that the Bushcare Officer be jointly employed by the WESROC and City of Nedlands to fulfil the *Western Suburbs Greening Plan* objectives.

References

Cottesloe Natural Areas Management Plan

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Appendix One: Native Flora List

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Table 43: Native species for Revegetation and Landscaping in Town of Cottesloe (173 spp.)

SPECIES		REVEGETATION								LANDSCAPE					
		Coastal Microhabitats					Communities			Butterfly Attracting	Bird Attracting	Verge	Trees	Large Shrubs	Dampland
Scientific Name	Common Name	Fordunes	Swale	Mobile Dune	Stable Dune	Cliff	Transition Woodland	Cottesloe Shrubland	Cottesloe Woodland						
<i>Acacia alata</i>	Winged Wattle								*	*	*				
<i>Acacia applanata</i>							*	*	*	*	*		*		
<i>Acacia barbinervis</i>									*	*	*			*	
<i>Acacia cochlearis</i>	Rigid Wattle			*	*										
<i>Acacia cyclops</i>	Red-Eyed Wattle, Galyang			*	*		*	*	*	*	*				
<i>Acacia huegelii</i>					*	*	*	*							
<i>Acacia lasiocarpa</i>	Dune Moses, Panjang			*	*		*	*				*			
<i>Acacia pulchella</i>	Prickly Moses			*	*		*	*				*			*
<i>Acacia rostellifera</i>	Summer-Scented Wattle				*						*				
<i>Acacia saligna</i>	Orange Wattle				*			*	*	*	*				*
<i>Acacia stenoptera</i>	Narrow Winged Wattle														
<i>Acacia truncata</i>					*	*	*				*				
<i>Acacia willdenowiana</i>									*						
<i>Acanthocarpus preissii</i>	Prickle Lily			*	*		*				*				
<i>Acrotriche cordata</i>	Coast Ground Berry		*	*		*									
<i>Adriana quadripartita</i>	Bitter Bush			*	*										
<i>Agonis flexuosa</i>	Peppermint Tree, Wonnill				*		*			*					
<i>Allocasuarina fraseriana</i>	Western Forest Sheoak						*		*	*			*		
<i>Allocasuarina lehmanniana</i>	Dune Sheoak						*	*						*	*
<i>Allocasuarina humilis</i>	Dwarf Sheoak													*	
<i>Alyogyne huegelii</i>							*	*						*	
<i>Alyxia buxifolia</i>	Dysentery Bush			*	*										
<i>Andersonia lehmanniana</i>									*	*					
<i>Anigozanthos humilis</i>	Cats Paw														
<i>Anigozanthos manglesii</i>	Mangles Kangaroo Paw														
<i>Anthocercis littorea</i>	Yellow Tail-Flower				*										
<i>Aotus gracillima</i>									*						*
<i>Astroloma glaucescens</i>									*	*					
<i>Astroloma pallidum</i>	Kick Bush								*						*
<i>Atriplex cinerea</i>	Grey Saltbush	*	*		*	*									
<i>Atriplex isatidea</i>	Coast Saltbush	*	*		*										
<i>Austrostipa elegantissima</i>	Spear-Grass			*	*						*				
<i>Austrostipa flavescens</i>	Tall Spear-Grass				*			*	*		*				
<i>Banksia attenuata</i>	Slender Banksia								*	*		*			
<i>Banksia dallanneyi</i>	Couch Honeypot						*	*				*	*		
<i>Banksia grandis</i>	Bull Banksia								*	*		*			
<i>Banksia menziesii</i>	Firewood Banksia, Biara						*	*	*	*		*			
<i>Banksia sessilis</i>	Parrot Bush, Boojak						*	*		*				*	
<i>Boronia alata</i>	Winged Boronia				*	*	*								
<i>Bossiaea eriocarpa</i>	Common Brown Pea						*	*	*	*	*				
<i>Burchardia congesta</i>	Milkmaids						*	*	*						
<i>Callitris preissii</i>	Rottneest Island Pine				*		*	*					*		
<i>Calothamnus quadrifidus</i>	Common Net Bush						*	*	*	*		*		*	*
<i>Calothamnus sanguineus</i>							*	*	*	*		*		*	*
<i>Calytrix flavescens</i>	Summer Starflower							*	*						*
<i>Carex preissii</i>			*	*	*	*						*			
<i>Carpobrotus virescens</i>	Pigface	*	*	*	*		*					*			
<i>Cassytha flava</i>	Dodder Laurel								*						*
<i>Cassytha racemosa</i>	Dodder Laurel			*	*										
<i>Clematis linearifolia</i>				*	*		*								
<i>Comesperma confertum</i>					*		*								
<i>Conospermum stoechadis</i>	Common Smokebush							*	*	*					
<i>Conospermum triplinervium</i>	Tree Smokebush							*	*	*					*
<i>Conostephium pendulum</i>	Pearl-Flower						*	*	*	*					
<i>Conostephium preissii</i>								*	*	*					*
<i>Conostylis aculeata</i>	Spiny Cottonhead						*	*	*	*		*	*		
<i>Conostylis candicans</i>	Grey Cottonhead				*		*	*	*	*		*	*		
<i>Corymbia calophylla</i>	Marri, Red Gum								*	*		*			
<i>Corynotheca micrantha</i>	Sand Lily				*										
<i>Crassula sp.</i>			*	*											
<i>Cryptandra arbutiflora</i>	Waxy Cryptandra								*	*					*
<i>Cryptandra mutila</i>							*								
<i>Cryptandra pungens</i>							*			*					
<i>Daviesia decurrens</i>	Winged Bitter-Pea								*						
<i>Daviesia divaricata</i>	Marno								*					*	
<i>Daviesia nudiflora</i>									*						
<i>Daviesia triflora</i>									*	*		*			
<i>Desmocladius flexuosus</i>							*	*		*					

SPECIES		REVEGETATION										LANDSCAPE					
		Coastal Microhabitats					Communities					Butterfly Attracting	Bird Attracting	Verge	Trees	Large Shrubs	Dampland
		Fordunes	Swale	Mobile Dune	Stable Dune	Cliff	Transition Woodland	Cottesloe Shrubland	Cottesloe Woodland	Karrakatta Forest							
Scientific Name	Common Name																
<i>Dianella revoluta</i>	Flax-Lily						*			*							*
<i>Dichondra repens</i>	Kidney Weed									*		*					
<i>Dichopogon capillipes</i>										*		*					
<i>Diplolaena angustifolia</i>	Yanchep Flower				*		*										
<i>Diplopeltis huegelii</i>										*		*					
<i>Dodonaea aptera</i>	Coast Hop-Bush						*	*								*	
<i>Enchylaena tomentosa</i>	Ruby Saltbush	*		*	*		*						*				
<i>Eremaea asterocarpa</i>	Star-Fruited Eremaea							*	*	*							
<i>Eremaea pauciflora</i>	Sand Plain Eremaea						*		*								
<i>Eremophila glabra</i>	Tar Bush	*		*	*								*	*			
<i>Eucalyptus decipiens</i>	Limestone Marlock								*	*					*		*
<i>Eucalyptus gomphocephala</i>	Tuart								*	*					*		*
<i>Eucalyptus marginata</i>	Jarrah								*	*	*				*		
<i>Eucalyptus oraria</i>	Fremantle Mallee								*	*	*				*		
<i>Exocarpos sparteus</i>	Broom Ballart			*	*							*					
<i>Ficinia nodosa</i>	Knotted Club-Rush	*	*	*			*							*			
<i>Frankenia pauciflora</i>	Sea-Heath	*	*			*								*			
<i>Gastrolobium nervosum</i>				*	*		*		*					*			
<i>Geranium solanderi</i>	Native Geranium			*	*			*	*	*							
<i>Gompholobium tomentosum</i>	Hairy Yellow Pea			*	*				*	*							
<i>Grevillea crithmifolia</i>				*	*		*	*				*		*			
<i>Grevillea preissii</i>	Spider-net Grevillea						*	*		*			*	*			*
<i>Grevillea vestita</i>									*	*							
<i>Gyrostemon ramulosus</i>	Corkybark			*	*		*		*					*			
<i>Hakea costata</i>	Ribbed Hakea						*	*	*	*							
<i>Hakea lissocarpa</i>	Honeybush						*	*	*	*			*				
<i>Hakea prostrata</i>	Harsh Hakea						*	*	*	*							
<i>Hakea ruscifolia</i>	Candle Hakea							*	*	*							
<i>Hakea trifurcata</i>	Two-Leaf Hakea							*	*	*							
<i>Hardenbergia comptoniana</i>	Native Wisteria			*	*		*	*	*	*	*	*	*	*	*		*
<i>Hemiandra pungens</i>	Snakebush			*	*		*	*	*	*			*	*			
<i>Hibbertia crassifolia</i>									*	*							
<i>Hibbertia hypericoides</i>	Common Buttercups			*	*		*	*	*	*							*
<i>Hibbertia racemosa</i>	Stalked Guinea Flower			*	*		*	*	*								
<i>Hibbertia subvaginata</i>				*	*		*	*	*								*
<i>Hovea pungens</i>	Devil's Pins								*	*	*	*					
<i>Hovea trisperma</i>	Common Hovea						*	*	*	*	*	*					*
<i>Hybanthus calycinus</i>	Wild Violet								*	*							
<i>Hypocalymma robustum</i>	Pink Myrtle								*	*							
<i>Isotropis cuneifolia</i>	Common Lamb-Poison								*	*							*
<i>Jacksonia fasciculata</i>									*	*							
<i>Jacksonia furcellata</i>	Grey Stinkwood			*	*		*	*	*	*	*	*					
<i>Jacksonia sericea</i>	Waldjumi						*	*	*	*	*	*					
<i>Jacksonia sternbergiana</i>	Green Stinkwood							*	*	*	*	*					
<i>Kennedia prostrata</i>	Running Postman			*	*		*	*	*	*	*	*	*	*	*		
<i>Lepidosperma angustatum</i>				*	*	*	*	*	*	*	*	*	*	*	*		
<i>Lepidosperma gladiatum</i>	Coast Sword Sedge, Kerbein			*	*	*	*	*	*	*	*	*	*	*	*		
<i>Lepidium rotundum</i>	Veined Peppergrass				*		*	*	*	*	*	*	*	*	*		
<i>Leschenaultia linarioides</i>	Yellow Leschenaultia				*		*	*	*	*	*	*	*	*	*		
<i>Leucophyta brownii</i>	Cushion Bush	*	*	*	*		*	*	*	*	*	*	*	*	*		
<i>Leucopogon parviflorus</i>	Coast Beard-Heath			*	*		*	*	*	*	*	*	*	*	*		
<i>Leucopogon propinquus</i>				*	*		*	*	*	*	*	*	*	*	*		
<i>Logania vaginalis</i>	White Spray							*	*	*	*	*	*	*	*		*
<i>Lomandra caespitosa</i>	Tufted Mat-Rush								*	*	*	*	*	*	*		
<i>Lomandra maritima</i>	Maritime Mat-Rush			*	*		*	*	*	*	*	*	*	*	*		
<i>Lomandra suaveolens</i>									*	*	*	*	*	*	*		
<i>Macrozamia fraseri</i>	Sandplain zamia (Djiriji)						*	*	*	*	*	*	*	*	*		*
<i>Melaleuca huegelii</i>	Chenille Honey-myrtle			*	*		*	*	*	*	*	*	*	*	*		*
<i>Melaleuca lanceolata</i>	Rottneest Tea-Tree, Moonah			*	*		*	*	*	*	*	*	*	*	*		*
<i>Melaleuca systema</i>	Coast Honey-Myrtle			*	*		*	*	*	*	*	*	*	*	*		*
<i>Mesomelaena pseudostygia</i>	Semaphore Sedge			*	*		*	*	*	*	*	*	*	*	*		
<i>Mesomelaena stygia</i>	Common Rush								*	*	*	*	*	*	*		
<i>Microlaena stipoides</i>	Weeping Grass								*	*	*	*	*	*	*		
<i>Muehlenbeckia adpressa</i>	Climbing Lignum								*	*	*	*	*	*	*		
<i>Myoporum caprarioides</i>	Slender Myoporum							*	*	*	*	*	*	*	*		*
<i>Myoporum insulare</i>	Boobiala			*	*		*	*	*	*	*	*	*	*	*		*
<i>Nitraria billardieri</i>	Nitre Bush			*	*		*	*	*	*	*	*	*	*	*		*
<i>Olearia axillaris</i>	Coast Daisybush			*	*		*	*	*	*	*	*	*	*	*		*
<i>Olearia dampieri</i>				*	*		*	*	*	*	*	*	*	*	*		*
<i>Ozothamnus cordatus</i>	Tangle Daisy			*	*		*	*	*	*	*	*	*	*	*		*
<i>Parietaria cardiostegia</i>				*	*		*	*	*	*	*	*	*	*	*		*
<i>Parietaria debilis</i>	Native Pellitory			*	*		*	*	*	*	*	*	*	*	*		*
<i>Phyllanthus calycinus</i>	False Boronia								*	*	*	*	*	*	*		*
<i>Pimelea ferruginea</i>	Coast Banjine			*	*		*	*	*	*	*	*	*	*	*		*
<i>Pimelea lanata</i>									*	*	*	*	*	*	*		*
<i>Pimelea rosea</i>	Rose Banjine			*	*		*	*	*	*	*	*	*	*	*		*
<i>Pittosporum phylliraeoides</i>	Weeping Pittosporum								*	*	*	*	*	*	*		*
<i>Poa porphyroclados</i>		*	*										*	*	*		*

SPECIES		REVEGETATION								LANDSCAPE						
		Coastal Microhabitats					Communities			Butterfly Attracting	Bird Attracting	Verge	Trees	Large Shrubs	Dampland	
Scientific Name	Common Name	Fordunes	Swale	Mobile Dune	Stable Dune	Cliff	Transition Woodland	Cottesloe Shrubland	Cottesloe Woodland							Karrakatta Forest
<i>Rhagodia baccata</i>	Berry Saltbush				*	*	*									
<i>Salsola australis</i>	Prickly Saltwart	*	*													
<i>Santalum acuminatum</i>	Sweet Quandong				*		*	*		*		*				
<i>Scaevola anchusifolia</i>	Silky Scaevola				*		*									
<i>Scaevola crassifolia</i>	Thick-Leaved Fan-Flower		*	*	*			*								
<i>Scaevola nitida</i>	Shining Fan-flower				*	*	*	*								
<i>Schoenus clandestinus</i>									*	*			*			
<i>Schoenus grandiflorus</i>	Large-Flowered Bog-Rush			*	*		*									
<i>Senecio pinnatifolius</i>	Coastal Groundsel				*	*	*									
<i>Senecio ramosissimus</i>	Auricled Groundsel															
<i>Solanum simile</i>	Oondoroo							*	*	*					*	
<i>Sowerbaea laxiflora</i>	Purple Tassels				*		*		*							
<i>Spinifex hirsutus</i>	Satin-Leaved Spinifex	*	*	*												
<i>Spinifex longifolius</i>	Long-Leaved Spinifex	*	*	*	*		*									
<i>Sporobolus virginicus</i>	Marine Couch			*	*	*										
<i>Spyridium globulosum</i>	Basket Bush				*		*	*							*	
<i>Templetonia retusa</i>	Cockies' Tongues				*		*	*				*			*	
<i>Tersonia cyathiflora</i>	Button Runner				*		*	*	*	*			*			
<i>Threlkeldia diffusa</i>	Wallaby Saltbush			*	*	*	*									
<i>Thysanotus arenarius</i>	Sand-Dune Fringed Lily				*		*									
<i>Thysanotus manglesianus</i>	Fringed Lily								*	*			*			
<i>Thysanotus patersonii</i>	Twining Fringed Lily								*	*			*			
<i>Trachymene coerulea</i>	Rottnest Island Daisy						*					*				
<i>Tricoryne elatior</i>	Yellow Lily				*				*							
<i>Trymalium ledifolium</i>					*		*									
<i>Westringia dampieri</i>							*	*	*	*		*				
<i>Xanthorrhoea preissii</i>	Grasstree, Balga						*	*	*	*	*	*	*	*	*	*
Total No. (for PNAs)		11	14	38	77	20	79	44	89	74	32	18	35	12	13	24
Total No. (for ENAs)		9	9	24	48	12	48	16	13	12	13	15	18	5	4	6

Species highlighted in red are for revegetating in ENAs

Appendix Two: Weed Prioritisation and Management

Cottesloe Natural Areas Management Plan

Table 44: Prioritisation of Weeds recorded in Town of Cottesloe

WEED SPECIES		PRIORITISATION							
Common Names	Scientific Name	EWSWA Rating	Dixon & Keighery Rating	Calculated Rating	WONS	ARRPA Declared Plant	Locally significant	Final Rating	Priority
African Boxthorn	Lycium ferocissimum	High		6				6	High
Annual Veldt Grass	Ehrharta longifolia	Moderate	3	3			y	5	High
Athel Tree	Tamarix aphylla	Moderate		4		P1		6	High
Bearded Oat	Avena barbata	Moderate	1	5				5	High
Black Flag	Ferraria crispa	Unrated	2	4			y	5	High
Brazilian Pepper Tree	Schinus terebinthifolius	Unrated		1			y	5	High
Bridal Creeper	Asparagus asparagoides	High	1	6	*	P1		6	High
Buffalo Grass	Stenotaphrum secundatum	Moderate	1	5				5	High
Couch	Cynodon dactylon	Moderate	1	5				6	High
Fountain Grass	Pennisetum setaceum	Mild	3	2			Y	5	High
Freesia	Freesia alba x leichtlinii	High		6				6	High
Gazania	Gazania linearis	Low	3	2			y	5	High
Geraldton Carnation Weed	Euphorbia terracina	High	1	6				6	High
Kikuyu	Pennisetum clandestinum	Moderate	1	5				5	High
Perennial Veldt Grass	Ehrharta calycina	High	1	6				6	High
Red Soldiers	Lachenalia bulbifera	Low		1			y	5	High
Rose Pelargonium	Pelargonium capitatum	High	1	6				6	High
Sea Spinach	Tetragonia decumbens	Moderate	3	3			y	5	High
Victorian Tea Tree	Leptospermum laevigatum	High	1	6				6	High
Western Blue Lupin	Lupinus cosentinii	High	1	6				6	High
Wild Gladiolus	Gladiolus caryophyllaceus	Moderate	1	5				5	High
Yellow Soldiers	Lachenalia reflexa	High	3	4			y	5	High
Cape Weed	Arctotheca calendula	Moderate	3	3				3	Mod
Geraldton Wax	Chamelaucium uncinatum	Moderate	2	4			n	3	Mod
Guildford Grass, Onion Grass	Romulea rosea	High	1	6			N	3	Mod
Morning Glory	Ipomoea sp.	Moderate		4				4	Mod
Onion Weed	Trachyandra divaricata	Mild	3	2			Y	4	Mod
Sea Spurge	Euphorbia paralias	Moderate		4			N	3	Mod
Soursob	Oxalis pes-caprae	Mild	2	3				3	Mod
Sydney Golden Wattle	Acacia longifolia	Moderate	3	3			y	4	Mod
thistle	Asteraceae sp.	Moderate	3	3				3	Mod
Veldt Daisy	Dimorphotheca ecklonis	Low		1			y	3	Mod
Whiteflower Fumitory	Fumaria capreolata	Mild	2	3				3	Mod
Wild Onion	Asphodelus fistulosus	Mild	1	4				4	Mod
Agave	Agave americana	Low	3	2				2	Low
Aloe	Aloe sp.	Unrated		1				1	Low
Alyssum, Sweet Alison	Lobularia maritima	Low		1			y	2	Low
Beach Evening Primrose	Oenothera drummondii	Moderate	3	3			n	2	Low
Flat Weed	Hypochaeris glabra	Moderate	3	3			n	2	Low
Fleabane	Conyza sp.	Low	3	2				2	Low
fleshy bulbs	?Iridaceae sp.	Unrated		1				1	Low
Hares Tail Grass	Lagurus ovatus	High	2	5			n	2	Low
Marguerite Daisy	Argyranthemum frutescens	Low	3	2				2	Low
Marram Grass	Ammophila arenaria	Low	3	2				2	Low

WEED SPECIES		PRIORITISATION							
Common Names	Scientific Name	EWSWA Rating	Dixon & Keighery Rating	Calculated Rating	WONS	ARRPA Declared Plant	Locally significant	Final Rating	Priority
Mirror Plant, Looking Glass Bush	<i>Coprosma repens</i>	Low	3	2				2	Low
Pigface	<i>Carpobrotus edulis</i>	Moderate	2	4			n	2	Low
Stocks	<i>Matthiola sp.</i>	Unrated		1				1	Low
Summer Grass	<i>Digitaria sanguinalis</i>	Low		1				1	Low
Ursinia	<i>Ursinia anthemoides</i>	Moderate	3	3			n	2	Low
Wattle	<i>Acacia species</i>	Low		1				1	Low
White Arctotis	<i>Arctotis stoechadifolia</i>	Low	3	2				2	Low

Table 45: Summary of Weed Management Methods

WEED SPECIES		CONTROL RECOMMENDATIONS			
Common Names	Scientific Name	Manual Control	Wicker Wipe/ Cut Stump	Spot Spray @ 10L water plus 25 mL Pulse®	Spray Timing
African Boxthorn	<i>Lycium ferocissimum</i>	Manually remove seedlings.	Cut plant to ground and treat stump with straight Roundup.	100mL Roundup®	All year round
Agave	<i>Agave americana</i>	Generally best to pull out eg chain and tractor, or dig out.	Spearing centre of plant with crowbar and pouring in straight Roundup®. Or inject base leaves with 1:5 Tordon® to diesel		
Aloe	<i>Aloe sp.</i>	Manual remove small populations by digging up entire plant, taking care to also remove roots.	1:3 Roundup® to water for wicker wiping	100mL Roundup®	All year round
Alyssum, Sweet Alison	<i>Lobularia maritima</i>	Manual remove small populations	1:3 Roundup® to water for wicker wiping	100mL Roundup®	All year round
Annual Veldt Grass	<i>Ehrharta longifolia</i>	Manual remove small populations	1:2 Fusilade®, Sertin®, Targa® or Roundup® to water for wicker wiping	Selective control - 20 mL Targa®, Sertin®, Fusilade® or 10 mL Verdict® Non-selective control - 40 mL Roundup®	Jul-Sep
Athel Tree	<i>Tamarix aphylla</i>	Manually remove any seedlings	cut trees stump to ground level and treat with straight Roundup® or paint 1:3 Garlon® to water on basal bark	100mL Roundup®	Sep-Jan
Beach Evening Primrose	<i>Oenothera drummondii</i>	It is difficult to remove by hand because it tends to break off and regrow from the rootstock. If removing manually, use a weed fork and ensure that all the fleshy rootstock is collected and burnt or buried more than 1 m deep.	Roundup® is usually ineffective. Try 10g Logran® per 1 L water for wicker wiping	1g Logran®	All year round
Bearded Oat	<i>Avena barbata</i>	Manual remove small populations	1:2 Fusilade®, Sertin®, Targa® or Roundup® to water for wicker wiping	Selective control - 5 mL Targa®, Sertin®, Fusilade® or 2 mL Verdict® Non-selective control - 100 mL Roundup®	May-Aug
Black Flag	<i>Ferraria crispa</i>	manually remove individual plants by extracting all soil within 20 of plant to ensure no corms are left in the soil.	1:2 Roundup® for wicker wiping	100mL Roundup®	Jul-Sep
Brazilian Pepper Tree	<i>Schinus terebinthifolius</i>				All year round
Bridal Creeper	<i>Asparagus asparagoides</i>	As plants are usually under trees and shrubs they are difficult to dig out. However, young plants are easily removed by hand. Mats of bridal creeper can be rolled up and destroyed.	1:2 Roundup® for wicker wiping	100mL Roundup® or 0.04g Brushoff®	Jul-Sep
Buffalo Grass	<i>Stenotaphrum secundatum</i>	Rake the grass out of the rushes and roll back out of the rushes with a small amount of digging. Remove as much of the buffalo grass thatch as possible. Cover the remaining buffalo grass in June/July with black plastic held down with rocks.		Selective control - 5 mL Targa®, Sertin®, Fusilade® or 2 mL Verdict® Non-selective control - 100 mL Roundup®	All year round
Cape Weed	<i>Arctotheca calendula</i>	Manually remove small populations		Selective control - 5 mL Lontrel® Non-selective control - 100 mL Roundup®	Jun-Sep
Couch	<i>Cynodon dactylon</i>			Selective control - 5 mL Targa®, Sertin®, Fusilade® or 2 mL Verdict® Non-selective control - 100 mL Roundup®	All year round
Flat Weed	<i>Hypochaeris glabra</i>	Use a weed fork to extract the taproot if hand pulling.	1:2 Roundup® for wicker wiping	100mL Roundup or 50 mL Tordon®75-D	
Fleabane	<i>Conyza sp.</i>	Manually remove small populations after stem elongation is effective on loose soils, but on heavier soils a weed fork is required to prevent the plant breaking and regrowing from the base. Mowing is not effective.	A mixture of 1:2 L Roundup® to water can be used to wipe the stems of plants.	5 mL Lontrel® or 50 mL Tordon®75-D	Oct-Feb
fleshy bulbs	?Iridaceae sp.	Manually remove by removing all soil within 20 of plant to ensure removal of any corms.	1:2 Roundup® for wicker wiping	100mL Roundup® or 0.2g Brushoff®	Aug-Nov
Fountain Grass	<i>Pennisetum setaceum</i>	Manual remove small populations	1:2 Fusilade®, Sertin®, Targa or Roundup® to water for wicker wiping	Selective control - 5 mL Targa®, Sertin®, Fusilade® or 2 mL Verdict® Non-selective control - 100 mL Roundup®	Jun-Aug
Freesia	<i>Freesia alba x leichtlinii</i>	These plants are very difficult to control by hand weeding because they produce seed, corms and cormels. Loosen the soil before removal to corm breaking off. Grazing and mowing provide control, however don't mow or slash after seed or cormel formation as this may increase spread.	1:2 Roundup® for wicker wiping	100mL Roundup® or 0.2g Brushoff®	Jun-Oct
Gazania	<i>Gazania linearis</i>	Manual remove small populations.	1:2 Roundup® for wicker wiping	100mL Roundup®	Jun-Aug
Geraldton Carnation Weed	<i>Euphorbia terracina</i>	Manually remove small populations	1:2 Roundup® for wicker wiping	15mL Spray-seed®	May-Jun
Geraldton Wax	<i>Chamelaucium uncinatum</i>	Manually remove seedlings	Cut trees to ground level and treat stumps with straight Roundup®	100 mL Roundup®	Sep-Nov
Guildford Grass	<i>Romulea rosea</i>			40 mL Roundup®, Ally®, Brushoff® or Glean® or Raptor®	Aug-Oct
Hares Tail Grass	<i>Lagurus ovatus</i>	Prevent seed set for 2-3 years by mowing, grazing or cultivation.	1:2 Fusilade®, Sertin®, Targa® or Roundup® to water for wicker wiping	Selective control - 5 mL Targa®, Sertin®, Fusilade® or 2 mL Verdict® Non-selective control - 100 mL Roundup®.	Jun-Sep
Kikuyu	<i>Pennisetum clandestinum</i>	Rake the kikuyu out of the rushes and roll kikuyu back out of the rushes with a small amount of digging. Remove as much of the kikuyu thatch as possible. Cover the remaining kikuyu in June/July with black plastic held down with rocks.		Selective control - 5 mL Targa®, Sertin®, Fusilade® or 2 mL Verdict® Non-selective control - 100 mL Roundup®	All year round
Marguerite Daisy	<i>Argyranthemum</i>	Manually remove small infestations	1:2 Roundup® for wicker wiping	100 mL Roundup®	May-Jul

WEED SPECIES		CONTROL RECOMMENDATIONS			
Common Names	Scientific Name	Manual Control	Wicker Wipe/ Cut Stump	Spot Spray @ 10L water plus 25 mL Pulse®	Spray Timing
	<i>frutescens</i>				
Marram Grass	<i>Ammophila arenaria</i>	Manually remove small populations		Selective control - 5 mL Targa®, Sertin®, Fusilade® or 2 mL Verdict® Non-selective control - 100 mL Roundup®	Jun-Aug
Mirror Plant	<i>Coprosma repens</i>	Manually remove seedlings. Roots need to be dug up and removed on larger plants to prevent regrowth.	Cut stem to ground level and treat with straight Roundup®	100mL Roundup®	Jul-Aug
Morning Glory	<i>Ipomoea sp.</i>		Scrape and paint stems with 20-50% Roundup®	200mL Roundup®	
Onion Weed	<i>Trachyandra divaricata</i>	Manually remove isolated patches before flowering	1g Ally®, Brushhoff® or Glean® to 1L water for wicker wiping	0.5g Ally®, Brushhoff® or Glean® or 100 mL Roundup®	Aug-Sep
Perennial Veldt Grass	<i>Ehrharta calycina</i>	Manual remove small populations	1:2 Fusilade®, Sertin®, Targa® or Roundup® to water for wicker wiping	Selective control - 10 mL Targa®, Sertin®, Fusilade® or 4 mL Verdict® Non-selective control - 60 mL Roundup®	Jul-Sep
Pigface	<i>Carpobrotus edulis</i>	Manually remove and destroy all plant parts			Jul-Nov
Red Soldier	<i>Lachenalia bulbifera</i>	In sandy soils use a knife or trowel to cut the roots and pull out when flowering.	1:2 Roundup® for wicker wiping	100mL Roundup® or 0.2g of Brushhoff®	Apr-Jun
Rose Pelargonium	<i>Pelargonium capitatum</i>	Pull plants of small populations in autumn/winter when soil is damp. Plant will reshoot if stem is broken at or below ground level.	1:2 Roundup® to water for wicker wiping	Selective control - 100 mL of Tordon®75-0 or 20 mL Access Non-selective control - 100 mL Roundup®	All year round
Sea Spinach	<i>Tetragonia decumbens</i>	Manually remove small populations		Selective control - 100 mL of Tordon®75-D or 20 mL Access® Non-selective control - 200 mL Roundup®	Aug-Nov
Sea Spurge	<i>Euphorbia paralias</i>			15mL Spray-seed®	May-Jun
Soursob	<i>Oxalis pes-caprae</i>		1:2 Roundup® to water for wicker wiping	100 mL Roundup®, Ally®, Brushhoff® or Glean® or Raptor®	Jul-Sep
Stocks	<i>Matthiola sp.</i>	Manually remove small populations	1:2 Roundup® for wicker wiping	100mL Roundup®	All year round
Summer Grass	<i>Digitaria sanguinalis</i>			Selective control - 5 mL Targa®, Sertin®, Fusilade® or 20 mL Verdict® Non-selective control - 100 mL Roundup®	All year round
Sydney Golden Wattle	<i>Acacia longifolia</i>	Manually remove seedlings	Cut trees to ground level and treat stumps with straight Roundup®	100 mL Roundup®, Garlon®600, Lontrel® or Starane®	Sep-Nov
Thistle	<i>Asteraceae sp.</i>	Manually remove small populations before seeding	1:2 Roundup® to water for wicker wiping	100mL Roundup®, 0.5 g Ally® or Brushhoff®	Jun-Sep
Ursinia	<i>Ursinia anthemoides</i>	Manually remove small populations before they spread.		100mL Roundup®	Jul-Sep
Veldt Daisy	<i>Dimorphotheca ecklonis</i>	Manually remove seedlings		100mL Roundup®	Apr-Jun
Victorian Tea Tree	<i>Leptospermum laevigatum</i>	Seedlings can be manually removed in the first year or two. Older seedlings tend to break off and regrow. Small bushes tend to regrow when cut but older bushes tend to die.	Cut stump to ground level and treat with straight Roundup®. Ensure removal of all cut foliage to prevent any seed set.	Spray seedlings with 100mL Roundup®, Garlon®, Grazon® or Velpar® Spray mature trees with 200 mL of Access® in 10 L of diesel to the lower 50 cm of each trunk.	Feb-Jun
Wattle	<i>Acacia species</i>	Manually remove seedlings		100 mL Roundup®, Garlon®, Lontrel® or Starane®	Sep-Nov
Western Blue Lupin	<i>Lupinus cosentinii</i>	Prevent seed set for 2-3 years by mowing or hand pulling before flowering.	1:2 Roundup® for wicker wiping	200mL Roundup®, 100mL Lontrel®, 1 g Logran® or 20 mL of Tordon®75-D	May-Aug
White Arctotis	<i>Arctotis stoechadifolia</i>		1: 2 Roundup® per water for wicker wiping	100mL Roundup®	Jun-Aug
Whiteflower Fumitory	<i>Fumaria capreolata</i>	Small populations can be pulled by hand, best when the plants are large but before seeding.	1:2 Roundup® for wicker wiping	100mL Roundup®	May-Sep
Wild Gladiolus	<i>Gladiolus caryophyllaceus</i>	Remove old flower heads to prevent seeding. In some sandy soils can pull straight out of the ground (Aug - Sept). In heavy soils use a long narrow trowel or knife close to the stem which cuts the roots then pull out.	Wicker wipe one leaf with 1:2 Roundup®	100mL Roundup®	Aug-Nov
Wild Onion	<i>Asphodelus fistulosus</i>	Manually remove isolated patches before flowering. Cultivate in summer to kill old plants and repeat in the following summer to control seedlings that have established.	1:2 Roundup® for wicker wiping	100mL Roundup® or 0.1g of Brushhoff®	Jun-Nov
Yellow Soldiers	<i>Lachenalia reflexa</i>	In sandy soils use a knife or trowel to cut the roots and pull out when flowering.	1:2 Roundup® for wicker wiping	100mL Roundup® or 0.2g of Brushhoff®	Apr-Jun

Weed management recommendations are based on information from Moore and Moore (2008) *Herbicide*, Brown and Brooks (2002) *Bushland Weeds*, and Dixon and Keighery (1994) *Recommended methods to control specific weed species*.

Table 46: Herbicide Information

Herbicide Brand	Active ingredients	Type
Access®	50% 2,4-D amine w/w	I
Ally®	50% 2,4-D amine w/w	B
Brushoff®	60% metsulfuron methyl w/w	B
Fusilade®	21.2% fluazifop-p butyl ester w/v	A
Garlon®	71.7% triclopyr butoxyethyl ester, 20% diethyl glycol monoethyl ester w/v	I
Glean®	75% chlorosulfuron w/w	B
Grazon®	39.6% 2,4-D triclopyr, 10.2% picloram	I
Logran®	75% triasulfuron w/v	B
Lontrel®	59.1% clopyralid w/w	I
Raptor®	70% imazamox w/v	B
Roundup®	36% glyphosate w/v	M
Sertin®	18.6% sethoxydim w/v	A
Spray-Seed®	13.5% paraquat dichloride, 11.5 % diquat dibromide w/v	L
Starane®	30.3% fluroxypyr methylheptyl ester w/v	I
Targa®	10.3% quizalofop-p-ethyl w/v	A
Tordon® 75-D	47.2% 2,4-D TIPA, 7.5% picloram TIPA w/v	I
Velpar®	75% hexazinone w/v	C
Verdict®	48% haloxyfop r-methyl ester, 43.4% diethylene glycol monoethyl ether w/v	A