

FINAL REPORT:

Integrated Vegetation Management Plan for the Bells Beach Recreation Reserve, Torquay, Victoria

ON BEHALF OF:

Surfcoast Shire

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Ecology Partners Pty Ltd

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1 INTRODUCTION

Bells Beach Recreation Reserve is approximately 50 hectares in size, located on Bells Beach Road on the south-western outskirts of the Torquay Township in southern Victoria. The reserve is Crown Land, reserved as Coastal Reserve under the Crown Land Reserve Act and is managed by the Surf Coast Shire. The reserve is situated adjacent to privately owned land, other foreshore reserves managed by the Surf Coast Shire, and the Great Otway National Park, managed by Parks Victoria. The beach and the ocean immediately to the south are part of the Point Addis Marine National Park, also managed by Parks Victoria.

The reserve has significant values which include;

- Biodiversity;
- Cultural heritage;
- Social value as an iconic surfing location; and,
- Scenic values providing views of the surrounding coastline.

Since European settlement, much of the adjacent indigenous vegetation has been cleared for agriculture, road constructions, and residential development. The reserve previously contained numerous tracks which subsequently led to the ongoing degradation of the vegetation and erosion of the reserve. Since the formalisation of the car parks, walking tracks and lookouts the remaining tracks have been fenced off and revegetated or brushed over. Revegetation has been taking place at the reserve for the last 20 years primarily by community groups in conjunction with the Surf Coast Shire and the Department of Sustainability and Environment, with a focus on replicating communities that would have occurred prior to European settlement.

Bells Beach attracts an influx of visitors to the site each year as a local and international surfing location and is host to the annual Bells Beach Rip Curl Pro. High regular visitation and poor drainage systems in the car park have resulted in erosion along the cliff tops and paths. The 'Bells Beach and Winkipop Masterplan' seeks to minimise further erosion, the associated hazards this presents for visitors and to ensure that the area can cope with high use during the Rip Curl Pro through stabilising the car park area and creating safe and easily accessible viewing platforms.

Several studies investigating ecological, cultural heritage and fire management issues within the reserve have been completed as stand alone documents. To address this Surf Coast Shire have commissioned Ecology Partners Pty. Ltd. to prepare an integrated vegetation management plan which aims to synthesise existing relevant documentation and provide a clear framework for future management planning and implementation (action plans). The management plan aims to provide a sufficient level of detail while still being flexible, clear, concise and user-friendly for those involved in ongoing management activities.

1.1 Vision

The vision for the Bells Beach Recreation Reserve as stated by the Surf Coast Shire is as follows:

"Bells Beach is unlike anywhere else in the world; it is a unique part of the Australian coastline and has a special place in surfing culture. The Surf Coast community acknowledges the importance of Bells Beach and seeks to protect and enhance the reserve's natural assets and those of the surrounding hinterland"

This vision is overarching and while relevant to the ongoing management of the area primarily for its nature conservation and educational values, the key vision of this management plan is ;

'to direct and facilitate the conservation and management of the ecological values within the Bells Beach Recreation Reserve'.

1.2 Aims and Objectives

The aim of the project is to provide an integrated vegetation management plan for the reserve for the next 10 years and beyond, balancing the high conservation and landscape values with the ongoing recreation and tourism use that occur at the site.

The key objectives of this management plan are to advise and direct on-ground actions to:

- Enhance, preserve and continue to rehabilitate the vegetation across the whole reserve;
- Reduce the impacts of erosion;
- Reduce unnecessary habitat disturbance;
- Enhance the habitat values of the reserve;
- Protect the cultural values of the site;
- Provide a safe environment for visitors to the reserve;
- Reduce the impacts of pest plants and animals;
- Identify priority sites for community groups undertaking re-vegetation works;
- Provide practical guidance for community groups when undertaking re-vegetation works;
- Integrate fire prevention and management into the ecological vegetation management practices;
- Provide strategic justification when seeking external funding; and,

- Provide a template to evaluate, review and track changes in vegetation management across the reserve.

1.3 Previous studies and plans

A series of documents relevant to the biodiversity values and management of the site have been recently compiled. This integrated vegetation management plan considers the recommendations from the following key reports as they relate to native vegetation:

- Landslide risk assessment, Bells Beach Reserve, Stage 1 and 2, Coffey (2006 and 2007);
- *Bells Beach Recreational Reserve Cultural Heritage Management Plan*, Department of Planning and community development, Aboriginal Affairs Victoria (2007);
- *Surf Coast Shire Bio-mapping. Flora and Fauna of nine priority reserves* (which includes the Bells Beach Recreational Reserve). A report for Surf Coast Shire, Arthur Rylah Institute for Environmental Research DSE (Macak *et. al.* 2007);
- *Surf Coast Shire Nature Reserves. Assignment and Mapping of Ecological Vegetation Classes*. Western Ecological Consultants (2007) – which includes the Bells Beach Recreational Reserve.
- Fire Management Plan for the Bells Beach Recreation Reserve (in preparation).
- Additional base information data was collated and utilised in the production of the integrated vegetation management plan including:
 - Pre 1750 Ecological Vegetation Class (EVC) mapping using DSE’s biodiversity interactive maps (www.dse.vic.gov.au);
 - *West Victoria Comprehensive Regional Assessment Report (1999, Volume 2)* Published by the joint Commonwealth and Victorian Regional Forest Agreement (RFA)
 - Mapping of historic clearing within the reserve; and
 - Mapping of past revegetation that has occurred within the reserve.

The above documents and data bases have been used as a technical and practical basis for the current management plan. Additional information has been sourced and included in this document through field visits and liaison with interested stakeholders (e.g. comments provided by SANE committee members).

1.4 Field work methodology

Field assessments were undertaken on 4, 5 and 11 June 2008 in order to determine and map ecological issues and threats. These threats have then been prioritised and incorporated into the integrated management plan. The entire site was visually assessed and the overall condition of vegetation noted, along with a record of the location and species of any environmental weed infestations.

2 ECOLOGICAL VALUES

2.1 Ecological Vegetation Classes

A report for the Surf Coast Shire by The Arthur Rylah Institute for Environmental Research (Macak *et al.* 2007) identified three Ecological Vegetation Classes (EVCs) from the Otway Plain Bioregion within the reserve (Table 1), (Figure 2).

Table 1. EVCs and their bioregional conservation status recorded within the study area (Macak *et al.* 2007).

EVC (number)	Conservation Status
Coastal Alkaline Scrub (858)	Endangered
Coastal Headland Scrub (161)	Vulnerable
Shrubby Dry Forest (21)	Least Concern

In addition, they noted areas of modified vegetation that included cleared and disturbed areas of vegetation dominated by introduced grasses, herbs and woody species present within the reserve.

2.2 Vegetation condition

The Bells Beach Recreation Reserve predominantly supports intact remnant vegetation of coastal heath and scrub and a large area of dry forest. Established revegetation areas and areas dominated by introduced species also occur amongst road and parking infrastructure. Areas of remnant vegetation are generally of good condition, varying throughout the site in structural and floristic composition.

Coastal Alkaline Scrub

Coastal Alkaline Scrub covers much of the reserve on the southern side of the road. This vegetation is dominated variously by Moonah *Melaleuca lanceolata* in sheltered situations with scattered Red Iron Bark *Eucalyptus tricarpa* and a complex of Coast Pomaderris *Pomaderris paniculosa* and Coast Beard-heath *Leucopogon parviflorus*. Additional indigenous shrub species include Thyme Rice-flower *Pimelea serpyllifolia* and Seaberry Saltbush *Rhagodia candolleana*. A diverse array of scattered indigenous groundcover species is also present.

Coastal Headland Scrub

Patches of Coastal Headland Scrub are interspersed within Coastal Alkaline Scrub to the east of the Winkipop car park. This vegetation is generally less than one metre in height forming a heathland community dominated by Silver Banksia *Banksia marginata*, Common Heath *Epacris impressa*, Slender velvet-bush *Lasiopetalum baueri*, Prickly tea-tree *Leptospermum continentale* and Thatch Saw-sedge *Gahnia radula*. Coastal Heathlands are recognised as being one of the most species rich plant associations in the world and now occur within a

fraction of their previous range. The protection and maintenance of this vegetation community is of utmost importance.

Shrubby Dry Forest

Shrubby Dry Forest vegetation covers the majority of the reserve on the northern side of Bells Beach Road and is generally of good condition. Dominant overstorey species include Red Ironbark to approximately eight metres in height with occasional *Eucalyptus obliqua* Messmate Stringybark. This community supports a variety of indigenous shrub species including Moonah, Coast Pomaderris, Coastal Beard Heath and Tree Everlasting *Ozothamnus ferrugineus*. A diverse array of scattered indigenous groundcover species is also present.

Revegetation Areas

Revegetation areas implemented by the community group SANE are present across the Reserve with substantial areas bordering the Bells Beach Road in the east of the Reserve, and to the east of the Southside car park. In addition, revegetation and laying of brush material, (the placing of cut branches of environmentally appropriate species in areas of disused paths and erosion areas to prevent human access, reduce erosion and promote regeneration of indigenous species), have been undertaken on disused paths. These areas of revegetation have been undertaken using appropriate, indigenous species of local provenance.

Modified Vegetation

Areas of slashed, modified vegetation are present on the northern side of Bells Beach Road in the east of the reserve and at the western end of the reserve. In both of these areas the understorey is dominated by introduced herbs and grasses such as Rye Grass *Lolium perenne*, Rat-tail Grass *Sporobolus africanus*, Couch *Cynodon dactylon*, Caterpillar Grass *Paspalum dilatatum*, Cocksfoot *Dactylis glomerata*, Onion Grass *Romulea rosea* and Cat's Ear *Hypochoeris radicata*. Furthermore, the western area also supports planted, mature native environmental weeds including Giant Honey-myrtle *Melaleuca armillaris*, Green Honey-myrtle *Melaleuca diosmifolia*, Showy Honey-myrtle *Melaleuca nesophila*, Sallow Wattle *Acacia longifolia* var. *longifolia*, Coast Wattle *Acacia longifolia* var. *sophorae* and Bushy Yate *Eucalyptus lehmannii*.

2.3 Significant species

2.3.1 Flora

Within the study area, one Nationally Significant flora species Glenelg Pomaderris *Pomaderris halmaturina* (listed as vulnerable) was noted within areas of Shrubby Dry Forest during surveys conducted by Macak *et al.* (2007). Two State Significant flora species have been previously noted within the reserve: Small Milkwort *Comesperma polygaloides* (status vulnerable) within areas of Coastal Headland Scrub, and Bellarine Yellow Gum *Eucalyptus leucoxylon* subsp. *bellarinensis* (status endangered [DSE 2005]) within areas of Coastal Alkaline Scrub (Stockton 2001).

Additional detailed floristic surveys may reveal additional significant species or species already occurring may receive a higher conservation status as further habitat depletion occurs throughout the adjoining landscape. Such additional species or updated levels of status can be added to this plan as required.

Fire can play a significant role in the management of significant flora species and determining appropriate management actions is often complex. Information related for fire and species management for the Small Milkwort and Bellarine Yellow Gum are provided below. There is a lack of information regarding the fire requirements of the Glenelg Pomaderris.

Small Milkwort Fire Ecology

Observations on the Western (Basalt) Plains indicate that Small Milkwort resprouts after fire. While some stands have been observed to persist where burning has taken place on a number of occasions over several years, not enough is known of the long-term persistence of the plant under different fire regimes. At sites where burning is carried out early in the season eg: to promote early flowering species, there is potential for Small Milkwort to become locally extinct. It is also possible that fire promotes Small Milkwort by decreasing competition from other species and that the long term absence of fire may therefore disadvantage Small Milkwort (DSE 2004).

Bellarine Yellow Gum Fire Ecology

Little is known about the requirements for recruitment of this subspecies. Although seeds germinate and establish successfully under controlled conditions little germination has been observed in the field. The role of fire is unknown although regeneration has occurred after fire events. Weed invasion and soil compaction may be contributing to limited recruitment. Seed predation by ants may also limit regeneration in the absence of fire. Following fire, seed falls may be heavier or seed predation reduced, allowing for more abundant seedling establishment. Further research is required to determine optimum conditions for recruitment (DSE 2003).

2.3.2 Fauna

Within the study area one State Significant fauna species the Rufous Bristlebird *Dasyornis broadbenti* (listed as vulnerable under the *Flora and Fauna Guarantee Act 1988*) was noted during the current and previous surveys (Stockton 2001, Moulton and Spittle 2007, Macak *et al.* 2007).

Further detailed fauna surveys may reveal additional significant species or species already occurring may receive a higher conservation status as further habitat depletion occurs throughout the adjoining landscape. Such additional species or updated levels of status can be added to this plan as required.

2.4 Adjacent Areas of Ecological Value

Significant remnant coastal vegetation contiguous with the eastern border of the reserve is part of a publicly owned coastal reserve managed by the Great Ocean Road Coast Committee (GORCC).

To the west the vegetation is part of the Great Otway National Park, managed by Parks Victoria. This park is part of a larger contiguous area also connected to the Anglesea Heath, leased and managed by Alcoa.

In addition, the Point Addis Marine Reserve incorporates offshore waters adjacent to the Bells Beach Recreation Reserve covering an area of approximately 4,600 hectares.

3 OVERVIEW OF KEY MANAGEMENT ISSUES AND ECOLOGICAL THREATS

A number of threatening ecological processes and management issues exist across the study area and details on the nature and extent of these are outlined below. Specific management actions and an action plan format are provided in the following sections of the plan.

3.1 Environmental Weeds

The main weed issues within Bells Beach Recreation Reserve can be attributed to the group of weeds broadly referred to as ‘environmental weeds’. Environmental weeds are plants that invade native vegetation, usually adversely affecting regeneration and survival of the indigenous flora and fauna. An environmental weed in Victoria can be an exotic plant introduced from overseas, an Australian native species from outside Victoria, a Victorian species that has spread outside its pre-European distribution, or in some cases an indigenous plant that has become ‘out of balance’ and has invaded indigenous vegetation communities. The key environmental weeds within the Bells Beach Recreation Reserve are those listed as *Weeds of National Significance* (WONS), species listed as noxious weeds in Victoria under the *Catchment and Land Protection (CaLP) Act 1994* and the locally indigenous Coast Wattle that in this instance is beyond its typical distribution and causing adverse effects on remnant vegetation. The closely related Sallow Wattle from Gippsland and coastal New South Wales has also infested the reserve. Environmental weed infestations within the reserve are mapped in Figures 3a and 3b.

3.1.1 Weeds of National Significance (WONS)

The National Weeds Strategy Executive Committee was established in 1997, which concluded that the greatest impact from weed problems within Australia was related to the effect and spread of specific individual species. On this basis, they developed a list of weeds of national significance (WONS). The determination of twenty Weeds of National Significance is the first attempt to prioritise weeds over a range of land uses at the national level. WONS are those weeds, which have been identified as already causing significant environmental damage and must be eradicated.

3.1.2 Declared Noxious Weeds

Declared noxious weeds in Victoria are plants proclaimed under the *Catchment and Land Protection Act 1994* (CALP Act) as they cause environmental or economic harm, or have the potential to cause such harm. Declared weed species recorded from the reserve have been noted in Table 2. There are four categories of noxious weeds defined under the Act (two types that are located within the reserve are detailed below):

- State Prohibited (S).
- Regionally Prohibited (P).

- Regionally Controlled (C).
- Restricted (R).

Restricted Weeds (R)

This category includes plants that pose an unacceptable risk of spreading in Victoria or to other parts of Australia. Trade in these weeds and their propagules is prohibited.

Regionally Controlled Weeds (C)

These weeds are usually widespread and are considered critical in a particular region. Continuing control measures are required to prevent their spread. Land owners have the responsibility to take all reasonable steps to control and prevent the spread of these weeds on their land and the roadsides that adjoin their land.

Currently the Bells Beach Recreation Reserve supports three undesirable weed species listed as noxious on the CALP Act (Table 2), all of which are also considered WONS, and considered a priority for removal.

Significant environmental weeds present on the site are listed below (Table 2). The majority of significant environmental weeds within the Bells Beach Recreation Reserve are woody weeds. While there are introduced grasses and herbaceous species present within the reserve these are generally restricted to path edges or scattered in sparse concentrations in areas of intact remnant vegetation.

Table 2. Significant Environmental weeds requiring on-going control within the Bells Beach Recreation Reserve.

Common Name	Scientific Name
WOODY WEEDS	
Sallow Wattle	<i>Acacia longifolia</i> var. <i>longifolia</i>
Coast Wattle	<i>Acacia longifolia</i> var. <i>sophorae</i>
Boneseed (WONS)(CaLP – C)	<i>Chrysanthemoides monilifera</i> subsp. <i>monilifera</i>
Bushy Yate	<i>Eucalyptus lehmannii</i>
Sweet-scented Hakea	<i>Hakea drupacea</i>
Coast Tea-tree	<i>Leptospermum laevigatum</i>
Showy Honey-myrtle	<i>Melaleuca nesophila</i>
Green Honey-myrtle	<i>Melaleuca diosmifolia</i>
Giant Honey-myrtle	<i>Melaleuca armillaris</i>
Sweet Pittosporum	<i>Pittosporum undulatum</i>
HERBACEOUS AND GRASSY WEEDS	
Chilean Needle-grass (WONS) (CaLP – R)	<i>Nassella neesiana</i>
Serrated Tussock (WONS) (CaLP – C)	<i>Nassella trichotoma</i>
Ribwort	<i>Plantago lanceolata</i>

Common Name	Scientific Name
Cocksfoot	<i>Dactylis glomerata</i>
Toowoomba Canary-grass	<i>Phalaris aquatica</i>
Kikuyu	<i>Pennisetum clandestinum</i>
Cape Weed	<i>Arctotheca calendula</i>
Spear Thistle	<i>Cirsium vulgare</i>
Sweet Vernal Grass	<i>Anthoxanthum odoratum</i>
Galenia	<i>Galenia pubescens</i>
Cat's Ears/Flat Weeds	<i>Hypochoeris</i> spp.
Buck's-horn Plantago	<i>Plantago coronopus</i>
Sow Thistles	<i>Sonchus</i> spp.
Clovers	<i>Trifolium</i> spp.

Notes: WONS = Weed of National Significance, CaLP – C = Declared as a regionally controlled noxious weed of Victoria under the *Catchment and Land Protection Act 1994.*, CaLP – R = Declared as a restricted noxious weed of Victoria under the *Catchment and Land Protection Act 1994.*

3.1.3 Woody Weed Descriptions

Sallow Wattle *Acacia longifolia* var. *longifolia* and Coast Wattle *Acacia longifolia* var. *sophorae*

Sallow Wattle and Coast Wattle are the most prevalent woody weeds within the reserve and are present through out the study area. Scattered individuals are present on the cliff faces and southern side of the reserve to the east of the Winkipop car park. Vegetation dominated by these species occurs adjacent to the Bells and Winkipop car parks and there are also some infestations within the plantings at the western end of the reserve.

Sallow Wattle and Coast Wattle are closely related species with hybridisation a common occurrence in situations where populations mingle. Hybrid plants can be observed within the reserve with plants displaying a variety of intermediary characteristics.

Sallow Wattle has been widely planted outside its natural range and readily invades remnant vegetation in Victoria. Coast Wattle is found along coastal dune systems with shorter, wider and blunter phyllodes than Sallow Wattle and seed pods are usually coiled. Disturbance since European settlement has resulted in Coast Wattle spreading aggressively from dunes into adjacent heathlands, scrublands and woodlands. Both Sallow Wattle and Coast Wattle reach reproductive maturity within two to three years and can produce up to several thousand seeds per square metre of soil which can remain dormant for well over a decade. Disturbance around infestations usually stimulates mass seed germination. Additionally, Wattle species are capable of fixing nitrogen which increases soil fertility and affects the viability of some indigenous species. Dense stands shade out ground-storey species, crowd out other shrub species and impede overstorey regeneration (Muyt 2001). While fire destroys mature plants it also stimulates seed germination which with subsequent herbicide treatment can be a suitable

method for exhausting seed stores. Infestations should only be burnt if there are sufficient resources for follow up work.

Eliminating Sallow Wattle and Coast Wattle infestations can take several years due to the large number of long lived seeds in the soil. A long term perspective is critical, centred on strategies that exhaust the seed bank.

Boneseed *Chrysanthemoides monilifera subsp. monilifera*

Boneseed is present as minor infestations within some gully lines in vegetation to the north of the Bells Beach Road. In addition there are some scattered individuals throughout the remainder of the reserve, however these are in very low numbers and uncommon.

Boneseed is a WONS. The species was originally introduced for ornamental purposes and is now widespread throughout south eastern Australia. Boneseed is capable of completely dominating invaded habitats. Dense stands eliminate most indigenous ground flora and prevent overstorey regeneration. They are extremely tolerant species thriving in a variety of environments. Plants can produce 50,000 seeds annually with fruit readily dispersed by various native and exotic fauna. Seed numbers can reach 2500 per square metre under Boneseed infestations, with most seeds losing viability after four years but some remaining viable for up to ten years. Boneseed germinates in autumn with plants reaching reproductive maturity after 18 – 24 months. Mass seed germination is usually stimulated by disturbance around infestations.

Bushy Yate *Eucalyptus lehmanni*

Bushy Yate is present in plantings of mature trees at the western end of the reserve. It is growing here in patches with other introduced species. This species was also located around the Southside car park but these specimens have recently been removed.

Bushy Yate is a eucalyptus tree native to the southwest of Western Australia and capable of growing to over ten metres tall. It is widely planted as a windbreak and sand stabilizer, as well as an avenue and shade tree. As a large-growing, invasive tree it has the ability to disrupt ecological processes when planted in inappropriate locations altering the structure of vegetation and out competing locally indigenous species.

Sweet-scented Hakea *Hakea drupacea*

Sweet-scented Hakea is present as scattered individuals to the north of the Winkipop car park in association with other woody weeds species.

A native of the southwest corner of Western Australia, Sweet-scented Hakea is a rounded shrub that may reach a height of three metres by three metres across. The bright green leaves are lobed with sharp points. Plants may take up to six years to reach reproductive maturity. Hakea species tend to grow very quickly and invade rapidly, particularly in coastal situations. The fire sensitive shrubs sprout and regenerate prolifically after burning when small seedlings

will be found in very high numbers. Sweet-scented Hakea is capable of out competing locally indigenous species and altering the structure and ecological processes of indigenous vegetation. Seed is spread by wind and in dumped garden waste.

Coast Tea-tree *Leptospermum laevigatum*

Coast Tea-tree is present as scattered individuals in vegetation to the east of the Winkipop car park and to the north in association with other woody species.

A large shrub to four metres high, Coast Tea-tree flowers from August to November and is followed by the production of woody, cup-shaped capsules that release seeds when opened. Within the reserve it is also hybridizing with Silky Tea-tree *Leptospermum lanigerum* (G. Stockton pers. comm.). It is a versatile plant that can withstand strong winds, salt and sand spray, drought, frost and periodic inundation.

Coast Tea-tree is known to invade disturbed dunes and coastal areas, significantly altering the environment by forming dense thickets that shade out other indigenous plants, reducing biodiversity and adversely affecting the habitat of native fauna. It has invaded many coastal areas since the 1983 fires, forming thickets on dunes and heathlands, and smothering all indigenous vegetation. It is fire sensitive, but regenerates prolifically after burning from canopy stored seed. This species is of particularly high threat to the Coastal Heathland communities within the reserve.

Showy Honey-myrtle *Melaleuca nesophila*, Green Honey-myrtle *Melaleuca diosmifolia*, Giant Honey-myrtle *Melaleuca armillaris*

Weedy *Melaleuca* species are present across the reserve as seedlings and mature trees. Specimens are present in plantings of mature trees at the western end of the reserve and adjacent to the Winkipop car park, growing in association with other woody weeds. Regeneration and seedlings are also present to the east of the Winkipop car park within intact vegetation south of the Bells Beach Road and also on the north side where numerous mature specimens have recently been removed by SANE.

Weedy *Melaleuca* species within the reserve are large spreading shrubs or trees to five metres high. None are locally indigenous and are often used in roadside planting and as street trees.

Invasive *Melaleuca* species are serious environmental weeds as they are fast-growing and quick to invade coastal heathlands, reserves and roadsides. They can increase fuel loads, making areas more fire prone. Growth of seedlings is stimulated greatly by fire.

Sweet Pittosporum *Pittosporum undulatum*

Sweet Pittosporum is present as only a few scattered individuals in gully lines in vegetation to the north of the Bells Beach Road.

Sweet Pittosporum has been widely planted outside its natural range and has become a highly invasive species in a variety of habitats in Victoria. Plants reach reproductive maturity within five years and can produce thousands of seed annually. Fresh seeds have a viability of approximately 90% but declines significantly within two years. Sweet Pittosporum has very dense foliage which reduces light levels dramatically affecting the composition of ground flora, excluding shrubs and preventing any overstorey regeneration.

3.1.4 Herbaceous and Grassy Weed Descriptions and treatments

Chilean Needle Grass *Nassella neesiana* and Serrated Tussock *Nassella trichotoma*

The extent of Chilean Needle Grass and Serrated Tussock is restricted within the reserve. However both are *Weeds of National Significance* and are highly invasive plants and prompt treatment is critical. One patch of Chilean Needle Grass is located on the north of Bells Beach Road opposite the entry to the Winkipop car park and scattered specimens of Serrated Tussock are located on the south of the patch at the Wave car park.

Both species are capable of producing large amounts of seed annually and are adapted to a large range of conditions, capable of forming dense swards and out competing indigenous groundcover species. It is imperative that these species are eradicated from the reserve while in such small concentrations. Autumn-winter is the optimum time for herbicide treatments with repeat applications commonly required for mature plants and seedlings

Remaining herbaceous and grassy weeds

The remaining herbaceous and grassy weeds are scattered throughout the reserve in sparse concentrations within areas of intact vegetation or forming small localised infestations particularly on path edges as detailed in Figure 3a and 3b. Scattered individuals within intact vegetation and revegetation areas can be treated with spot spray herbicide treatments or hand pulled if off-target herbicide damage is a concern.

3.2 Pest Animals

Pest animals that prey on, or compete with native wildlife for resources are known to use the site and their presence ultimately places pressure on local fauna populations. The more notable introduced animal species known to occur on the site and those considered most important to target for control include:

- Red Fox;
- Feral Cat;
- European Rabbit; and
- Uncontrolled domestic dogs.

All of these species are expected to have an impact on native wildlife and associated habitats on the site, and actions to control the more significant threats are provided.

3.2.1 European Rabbit

Rabbits appear to be a minor management problem and territorial diggings are scattered across the site, however populations may fluctuate and should be monitored. Rabbits can degrade native vegetation through soil disturbance, the further spread of weeds, burrowing, and grazing of palatable species. Rabbits place pressure on native wildlife by competing for resources, particularly under drought conditions, and prevent regeneration of native plant species by selecting the most nutritious parts of the plants.

It is not practicable to control rabbits with the intention of totally eradicating them from the site. Given the likelihood that the animals will re-invade from the surrounding agricultural and rural areas, a broad scale strategic approach to rabbit control is warranted. This approach may include a combination of harbour destruction, poisoning and shooting.

3.2.2 Red Fox

Foxes are considered a major vertebrate pest species threatening the long-term survival of numerous native fauna species inhabiting the site. The Red Fox has the ability to directly impact on native fauna populations through predation, and indirectly through competition for habitat resources such as food and shelter. Foxes can also facilitate the further spread of weeds. Fox control is best achieved through a combination of baiting and shooting.

3.2.3 Feral and domestic cats and dog

Similar to foxes, cats prey on a range of native birds, reptiles and frogs. While cat density across the site is likely to be low, any cats sighted in the study area should be considered as feral, and controlled accordingly.

Feral dogs are unlikely to be an issue within the reserve however domestic dogs brought to the reserve and roaming dogs from nearby properties may cause adverse effects to local fauna. Any dogs within the reserve must be kept under control at all times. In addition, dog excrement raises nutrient levels, which in turn increases the growth of exotic plant species over indigenous species.

3.3 Fire Management

The Bells Beach Recreation Reserve has not experienced a large scale planned or unplanned fire in the recent past. There have been small spot fires throughout the reserve but these have been quickly extinguished before developing into intense fires. Fire is an important process in ecological communities but planned burns must be balanced with other issues such as infrastructure management, tourism and budgetary constraints. Details of fire management practices within the reserve are provided in Moulton (2008).

Control of environmental weeds is vital after any planned or unplanned fires and resources should be allocated for this purpose in the case of any fire within the reserve.

3.4 Cultural Heritage

The Bells Beach Recreation Reserve lies within the traditional land of the Wada Warrung people. An archaeological survey conducted by Aboriginal Affairs Victoria (Tunn & Luke 2006) revealed nine Aboriginal heritage places in addition to four previously registered Aboriginal heritage places. As part of the study a plan was provided for the management of Aboriginal cultural heritage across the reserve. These recommendations have been incorporated into the management plan attached to this report.

3.5 Erosion

Erosion is an intrinsic natural process but in many places it is increased by human land use. Within the Bells Beach Recreation Reserve erosion was typically noted within areas of disturbance/vegetation clearance and disused walking paths that have been fenced off. Natural regeneration of these areas is slow as the topsoil has often been removed creating conditions unsuitable for germination. A combination of laying brush material (the placing of cut branches of appropriate species, either locally indigenous species or if non indigenous species are used they must be free of any propagules) hold soils and create a microclimate suitable for germination and revegetation is recommended. The laying of brush also encourages regeneration by acting as deterrent to human access and preventing trampling of seedlings.

Erosion was also noted at the base of the helipad at the eastern end of the Winkipop car park. This area is adjacent to Coastal Heathland and requires an assessment of its relevance and appropriate works to prevent continuing erosion processes.

3.6 Litter and Rubbish Dumping

Litter and dumping of rubbish was observed as a minor threat within the reserve at the time of survey. The reserve undergoes regular, high level visitation, particularly by large buses at the Winkipop and Bells Beach car parks. Rubbish bins have been installed to accommodate this, however, monitoring of litter levels and the adequacy of bins should be undertaken yearly and mitigative actions taken if required.

Within areas of vegetation low amounts of litter were noted with some litter observed along path edges and around car parks and no dumped rubbish was noted. One disused camp was observed with a small amount of litter which should be removed (Figure 3a and 3b).

3.7 Visitor Access and Infrastructure Management

The Bells Beach Recreation Reserve is a major tourist destination on the Great Ocean Road and human presence and vehicle traffic are high. Generally, fencing and strategically placed amenities such as toilet facilities and rubbish bins have reduced the impact to the ecological values of the reserve.

However, additional fencing and repairs to some fences may be appropriate in some instances to prevent human access. This is particularly evident around the Winkipop car park where trampling, litter and human excrement can be seen within the vegetated car park islands.

Interpretive signage may be effective to educate visitors about the ecological values of the reserve and discourage littering and inappropriate access.

3.8 The annual International Bells Beach Rip Curl Pro

The reserve is also used to host surfing competitions including local board rider club events and the annual International Bells Beach Rip Curl Pro, a major event attracting thousands of people each year. The Surf Coast Shire has developed the *Bells Beach Surfing Recreation Reserve Surfing Events Policy* to address potential environmental impacts associated with such a large event. In addition, community groups such as SANE work with event organisers to ensure that the event is run in a sustainable manner. These relationships should be encouraged to ensure that ecological issues are considered during event planning and methods to increase the sustainability of the event are continually improved.

Lopping of Moonah trees immediately to the south of the car parks to provide views for spectators at the annual event has become an issue in recent times. Moonah trunks tend to grow slowly and Macak *et al.* (2007) ascertain that it is likely that specimens with a trunk diameter of approximately 20 centimetres are likely to be in excess of 100 years old. This vegetation is part of the Coastal Alkaline EVC which is listed as endangered, provides habitat for the state significant Rufous Bristlebird and is within a reserve system which aims to conserve biodiversity values. It is likely that any lopping of vegetation will impose long lasting impacts. Vegetation clearance and lopping is not to be encouraged within the reserve unless undertaken for safety reasons.

3.9 Community Involvement

There is a strong relationship with the Bells Beach Recreation Reserve from local environmental and community groups including SANE, the Surfrider Foundation and the Jan Juc Coast Action Group. These groups offer a wealth of local knowledge, willing volunteers and the ability to increase community awareness of ecological issues within the reserve. Communication between these groups and the Surf Coast Shire should continue and be enhanced along with the continuation and encouragement of community events such as the Rip Curl Big Day Out (an event in which staff members from Rip Curl volunteer a day to plant out areas with indigenous plants).

3.10 Minimisation of Soil and Plant Pathogens

Cinnamon Fungus (*Phytophthora cinnamomi*) is a disease causing dieback in many Australian plants. It is a notable threat. The movement of water through soil and infected mud on shoes, car and bike tyres can spread the disease. Cinnamon Fungus does not appear to be an ongoing issue within the reserve but regular monitoring of vegetation health and sensible vehicle and

soil hygiene practices should be maintained by the Surf Coast Shire and its contractors and relevant community groups. Further, human access from paths into areas of remnant vegetation should be discouraged and fencing employed in strategic locations.

3.11 Summary of Management Issues, Threats and Priorities

Table 3, listed below is an overview of the major ecological management issues, threats and opportunities for the Bells Beach Recreation Reserve. Overall priority ratings have been allocated to each threat however each threat also has varying levels of priority within the reserve which are detailed in Figures 5a and 5b. Priorities of low, moderate and high have been established based on the following criteria:

- *Status* – threatened or rare species and communities before secure or common;
- *Condition* – areas of good condition treated before areas of poor condition;
- *Outlook* – deteriorating areas addressed before improving areas;
- *Ease* – threats that are easy to rectify before difficult ones; and
- *Threat* – high level threats before low level threats.

Management responses and timing for all of these issues are further developed in the following section of this plan, and are to be used in the development of annual action plans.

Table 3. Summary of management issues, threats, opportunities, priorities and responses within the Bells Beach Recreation Reserve.

Management issue	Comments, associated threats or opportunities	Mgt. priority	Management Response
Environmental Weeds	<ul style="list-style-type: none"> Adverse impacts on indigenous flora and fauna habitat 	High	Implement control program(s) and monitoring
Fire management	<ul style="list-style-type: none"> Any fire management actions must be undertaken while giving consideration to competing reserve uses including infrastructure management, tourism, ecological values and budgetary constraints. 	Moderate	See Moulton (2008a, 2008b) for details.
Cultural Heritage	<ul style="list-style-type: none"> Thirteen Aboriginal heritage places have been identified within the reserve 	Moderate	Protection of these sites to be increased and additional signage erected to highlight the cultural values within the reserve
Erosion	<ul style="list-style-type: none"> Moderate threat in disused paths and areas devoid of vegetation If left untended can result in the loss of top soil, impeding natural regeneration 	Moderate	Implement brushing and revegetation in affected areas
Visitor access and recreation	<ul style="list-style-type: none"> High level, regular visitation Reasonable recreation and visitor facilities are provided however these may be redesigned and expanded upon 	Moderate	Undertake regular consultation with locals, tourists, tourist operators and surfing competition organisers to ascertain visitor needs and potential threats to ecological values
Infrastructure management (fences, signage, tracks)	<ul style="list-style-type: none"> Fencing required in some locations Some sections of fencing in poor condition requiring maintenance to ensure prevent human access to vegetation 	Low	Implement fence maintenance and monitoring program Install additional signage to inform tourists of the ecological values of the reserve
Litter and rubbish dumping	<ul style="list-style-type: none"> Currently not a major issue 	Low	Regular litter checks and clean-ups Ongoing monitoring
Introduced pest animals (rabbits, foxes, cats, dogs)	<ul style="list-style-type: none"> Predation on and resource competition with native wildlife leading to local population declines Impacts on soil and vegetation health 	Low	Implement control program(s) and monitoring
Community involvement	<ul style="list-style-type: none"> Community groups can provide expertise and management assistance 	Low	Continue and strengthen community liaisons with groups such as SANE and Surfing Victoria.
Minimisation of soil and plant pathogens (e.g. Cinnamon Fungus)	<ul style="list-style-type: none"> Not obviously present within the study area 	Low	Maintain current access hygiene requirements for staff and contractors Respond and mitigate as required

4 MANAGEMENT ACTIONS

4.1 Objectives

The intention of the Integrated Management Plan is to provide management information and direction in an easily accessible format. An accompanying document, called an annual works plan or action plan, is also proposed to be created every year, in order to implement on-ground actions. This will be based on the priorities and strategies proposed in the management plan and annual resource allocations, and will include actions, quantifiable targets, timing and a responsible Surf Coast Shire staff member (see Section 4.7).

A number of management zones have been devised for the site where different management objectives are relevant and works can be undertaken and prioritised on a short-term (i.e. over the next three years), medium term, (i.e. four to six years) and longer term (i.e. seven to ten years plus) basis.

4.2 Timeframe, Priority Setting and Performance Criteria

The Surf Coast Shire and its contractors will be required to prioritise management activities depending upon available resources, with high priority management actions preferably to be undertaken in the immediate to short-term, while other low priority actions can be undertaken over the long-term or as required. Community groups should be consulted during the production of each annual plan to ensure that any proposed volunteer activities are undertaken in line with the priority actions and contribute to the vision of this document. The prioritised management activities will be scheduled every year in an annual action plan and have quantifiable targets to measure the success of works undertaken. Assessment of works is to lead to a review and revision process of the management regime.

4.3 Management Zones

Four separate management zones (one zone, Modified Vegetation and Revegetation, Zone 4, is split into two areas) are proposed for the reserve based on key site features, management requirements, vegetation condition and ecological attributes (Figure 4a and 4b). As previously documented, within these zones are management priority areas. The intention of the zones is to ensure that management actions undertaken by the Surf Coast Shire can be prioritised for each zone. The zones are discussed below and management objectives and prescriptions are provided in the following part of this section.

4.3.1 Intact Coastal Heathland Zone (ZONE 1)

This zone occupies vegetation to the east of the Winkipop car park south of the Bells Beach Road. This zone supports important high quality intact Coastal Heathland and Coastal Alkaline Scrub.

This area is largely intact but requires ongoing management to ensure its biodiversity values and landscape character is maintained. Of particular importance is removing any potential weed infestations before they take hold.

4.3.2 Car Park and High Visitation Zone (ZONE 2)

This zone occurs adjacent to the Bells Beach and Winkipop car parks. This area supports relatively intact Coastal Alkaline Scrub with moderate to high levels of invasion by woody weed species. This area sustains some areas of dense woody weeds which may have been planted in the past. Ongoing management input is required within this zone to ensure vegetation diversity, health and character are maintained while allowing for visitor access and facilities and the continuation of a sustainable approach to the annual international Bells Beach Rip Curl Pro surfing competition.

4.3.3 Shrubby Dry Forest and Coastal Scrub Zone (ZONE 3)

This management zone encompasses the large areas of relatively intact vegetation to the north and west of the Bells Beach car park. This zone is to be maintained for conservation purposes, restricting disturbance by fencing areas to prevent access and to keep activity to well defined paths. Any potential weed infestations are to be removed before they take hold.

4.3.4 Modified Vegetation and Revegetation Zone (ZONE 4)

These zones are located in the west of the reserve and to the east of the Winkipop car park on the north of Bells Beach Road. They comprise areas of planted woody weeds amongst slashed, mostly introduced understorey species. Local environment group SANE has begun removing these introduced trees and shrubs and revegetating these areas with great success. This should be encouraged and continued as they create a buffer for the reserve and strengthen habitat links.

4.4 Overview of Management Requirements

The following recommendations provide specific management prescriptions to protect, maintain and enhance the site's ecological values in conjunction with providing for the protection of cultural sites and social requirements such as access and the running of the annual Rip Curl Pro surfing event, and they are ranked in order of priority. The prescriptions are based on the management issues and threats identified within the reserve and are intended to be undertaken within the proposed management zones. The details of activities to be undertaken, rather than how they should be performed, which allows flexibility for any land managers, are listed below.

4.4.1 Pest plant control

Ongoing weed control is one of the primary management requirements within the reserve. A list of priority weeds has been determined for the reserve based on recent field inspections. These are presented in Table 4, with recommended weed management techniques and timing.

It is recommended that at a minimum, the highest priority areas are continually targeted during all pest plant control activities.

Several management techniques are recommended to control weeds, including physical removal and herbicide application. In the majority of cases, it is recommended that ‘cut and paint’ methods be used on woody weeds and selective spot-spraying of herbicide applied to herbaceous and grassy weeds to prevent off-target issues. Weed treatment methods are listed in more detail below. Weed control should be given precedence based on priority mapping in Figures 4a and 4b.

With all weed control operations, it is important to establish a cover of native species as soon as practicable to occupy the newly vacated areas and prevent re-establishment of exotic species, particularly in areas of dense infestation. Therefore, management needs to be vigilant in ensuring the establishment of native species immediately after weed control to reduce the requirement for future weed control and the size of areas to be treated needs to be considered with regards to access to future management resources. Furthermore, the objectives of on-going weed control is to reduce weed populations to a manageable level, prior to them setting seed or spreading vegetatively, thus assisting native species to re-establish and flourish.

Identifying potential weed invasion points is also an important part of a weed management plan. In this case, encroaching woody weeds and garden escapees from private property to the north of the reserve along Bells Beach Road needs to be addressed and local residents need to be contacted to implement a coordinated approach.

It is important that Surf Coast Shire staff, weed spraying contractors and any community members involved in weed management can appropriately identify plant species, and they should be aware of correct weed control measures.

The following general guidelines should be taken as basic management principles in regards to weed control:

- Any weed control should be done in a manner that minimises soil disturbance.
- Pest plants that reproduce sexually (by seed) are best controlled before seed ripens.
- Weed control works should be monitored regularly to assess their effectiveness, perform follow up works and evaluate the feasibility of management objectives.
- Monitoring of weed infestations and general weed monitoring should be undertaken regularly but particularly during spring.

4.4.2 Woody Weed Control

Woody weed species can be treated with a number of techniques, however, the ‘cut and paint’ method is the most commonly used. The method involves applying a concentrated dose of herbicide to the target plants sapwood by cutting the plant as close to the base as possible and

applying concentrated herbicide to the exposed trunk. Mature specimens of Coast Wattle and Sallow Wattle, may not require the application of herbicide after cutting the plant at the base of the trunk. Treatment areas should always be monitored for any signs of reshooting.

It must be noted that removing large plants or infestations as part of ‘cut and paint’ treatments can damage adjacent remnant vegetation, disturb soils and disperse propagules. To minimise impacts on adjacent vegetation the following actions should be considered:

- Designating set routes for removing fallen material,
- Gathering propagules after plants have been cut down,
- Felling larger plants into poorer quality vegetation, ensuring areas are rehabilitated following clearing.

In addition, cutting should ideally be undertaken when plants are not fruiting. Any cut material with ripe or semi-ripe material should be disposed of safely

When woody weeds are at seedling stage they maybe sprayed with herbicides if indigenous species can be safely avoided. For small plants amongst indigenous species hand pulling is recommended ensuring that root systems are removed.

4.4.3 Herbaceous and Grassy Weed Control

Herbaceous and grassy weeds are continually establishing within the reserve brought in by vehicles, wind and animals. While infestations are currently typically minor and restricted to the edges of intact vegetation, management of these species needs to be continuous and regular monitoring required to prevent infestations and interruption of indigenous recruitment processes. Regular herbicide treatment of herbaceous and grassy species is typically the most effective treatment method.

Herbaceous and grassy weed control treatment methods include:

- Individual plants may be dug out. To prevent regrowth ensure entire plant is removed.
- Seed production of grasses can be minimised by mowing infestations around the time of peak flowering.
- Plants can be sprayed with non-selective or grass selective herbicides. Selective herbicides and those that kill plants quickly and are rapidly inactivated, leaving no residues (“knockdown” herbicides) are generally preferable to residual herbicides.
- To reduce the amounts of herbicide used, the target biomass should be reduced (e.g. slashed, pruned, etc.) before application so that the herbicide can also be absorbed by the actively regrowing plants. Herbicides are only effective when plants are actively growing.

Table 4. Summary of recommended significant weed management

Common Name	Scientific Name	Timing	Control Method	Location and comments
WOODY WEEDS				
Sallow Wattle	<i>Acacia longifolia</i> var. <i>longifolia</i>	All year. If undertaken during fruiting (winter/spring) ensure ripe material is disposed of	CP	Scattered throughout reserve particularly in the east with infestations adjacent to the Winkipop car park
Coast Wattle	<i>Acacia longifolia</i> var. <i>sophorae</i>	All year. If undertaken during fruiting (winter/spring) ensure ripe material is disposed of	CP	Scattered throughout reserve particularly in the east with infestations adjacent to the Winkipop car park
Boneseed (WONS)(CaLP – C)	<i>Chrysanthemoides monilifera</i> subsp. <i>monilifera</i>	All year. If undertaken during fruiting (winter/spring) ensure ripe material is disposed of	CP	Bone seed is present as minor infestation in some gully lines in vegetation to the north of the Bells Beach Road. In addition there are some scattered individuals throughout the remainder of the reserve however these are in very low numbers and uncommon
Bushy Yate	<i>Eucalyptus lehmannii</i>	All year	CP	Located at the western end of the reserve in association with clumps of other planted species
Sweet-scented Hakea	<i>Hakea drupacea</i>	All year	CP	Sweet scented Hakea is present as scattered individuals to the north of the Winkipop car park in association with other woody weeds species.
Coast Tea-tree	<i>Leptospermum laevigatum</i>	All year	CP	Coast Tea-tree is present as scattered individuals in vegetation to the east of the Winkipop car park and to the north in association with other woody species.
Showy Honey-myrtle	<i>Melaleuca nesophila</i>	All year	CP	Weedy Melaleuca are present across the reserve as seedlings and mature trees. Plants are scattered across the reserve as individuals and also in planted clumps in association with other woody weeds
Green Honey-myrtle	<i>Melaleuca diosmifolia</i>			
Giant Honey-myrtle	<i>Melaleuca armillaris</i>			
Sweet Pittosporum	<i>Pittosporum undulatum</i>	All year. If undertaken during fruiting ensure ripe material is disposed of	CP	Sweet Pittosporum is present as only a few scattered individuals in some gully lines in vegetation to the north of the Bells Beach Road.
HERBACEOUS AND GRASSY WEEDS				
Chilean Needle-grass (WONS) (CaLP – R)	<i>Nassella neesiana</i>	Autumn-Winter	DH	Small infestation opposite the entrance to the Winkipop car park
Serrated Tussock (WONS) (CaLP – C)	<i>Nassella trichotoma</i>	Autumn-Winter	SS & DH	Scattered individuals on the south side of the path at the Wave carpark
Ribwort	<i>Plantago lanceolata</i>	Spring	SS	Scattered along path edges

Common Name	Scientific Name	Timing	Control Method	Location and comments
				and some revegetation areas
Cocksfoot	<i>Dactylis glomerata</i>	Spring	SS	Scattered along path edges and some revegetation areas
Toowoomba Canary-grass	<i>Phalaris aquatica</i>	Spring	SS	Scattered along path edges and some revegetation areas. Two small infestations present, one at the Wave car park and one in a depression at the western end of the reserve.
Kikuyu	<i>Pennisetum clandestinum</i>	Spring	SS	Three small infestations at drainage points across Bells Beach Road and at the back of the Bells Beach car park
Cape Weed	<i>Arctotheca calendula</i>	Autumn-Winter	SS	Scattered along path edges and some revegetation areas
Spear Thistle	<i>Cirsium vulgare</i>	Early Spring	SS	Scattered along path edges and some revegetation areas
Sweet Vernal Grass	<i>Anthoxanthum odoratum</i>	All year	SS	Minor infestation along gully line north of Bells Beach Road
Galenia	<i>Galenia pubescens</i>	Early Spring	SS & DH	Small infestations on path edge at Wave car park and Winkipop car park
Cat's Ears/Flat Weeds	<i>Hypochoeris</i> spp.	Early Spring	SS	Scattered along path edges and some revegetation areas
Buck's-horn Plantago	<i>Plantago coronopus</i>	Early Spring	SS	Scattered along path edges and some revegetation areas
Sow Thistles	<i>Sonchus</i> spp.	Early Spring	SS & DH	Scattered along path edges and some revegetation areas
Clovers	<i>Trifolium</i> spp.	Winter-Early Spring	SS	Scattered along path edges and some revegetation areas

Notes: CP = Cut and Paint; SS = Spot-spray; and DH = Dig Out or Hand Pull.

4.4.4 Pest Animal Control

A combination of techniques is recommended to control pest animals, and control methods are likely to vary across the site and with the type of pest species concerned. Control measures used to control pest animal populations are provided below.

4.4.4.1 Rabbits

Currently rabbits are a minor management issue with diggings noted as minor and scattered across the site. As a first step it is important to determine overall rabbit densities on the site and undergo ongoing monitoring of populations to determine the effectiveness of control activities. Rabbit control is currently dependent on conventional control measures such as poisoning, fumigation, warren ripping and trapping, and these are briefly described below.

Poisoning

Two chemicals, sodium monofluoroacetate (1080) and Pindone, are used for rabbit control. Unlike Pindone, which can be used in urban areas, 1080 is not recommended in areas where domestic dogs or pets are likely to come in contact with the poison. Pindone is an anticoagulant, similar to rat poison, that is applied in carrot or oat bait. A number of feeds over several days are needed for a lethal dose, and it is relatively safe for cats and dogs, but possums can be susceptible to this poison.

Fumigation

Fumigation kills rabbits in burrows only, leaving surface living rabbits unaffected. Fumigation should be undertaken with extreme care as any native animals that are currently using the burrow as a harbour will be affected.

Generally, two tablets of aluminium phosphide are wrapped in absorbent paper, wet thoroughly and then placed as far down the burrow entrance as possible to fumigate rabbits. Entrances of burrows are then filled in and packed to prevent rabbits from escaping. Follow up fumigation is recommended one week after the initial treatment.

Trapping and shooting

Trapping and shooting can also be used to temporarily reduce rabbit populations on the site, though trapping generally takes more time and removes fewer animals than does shooting or poisoning. Trapping is generally a slow, long-term process with mixed results, as only a few rabbits are likely to be caught at any time.

Overall, an ongoing campaign of rabbit control should be considered using a combination of poisoning and shooting if rabbit populations are deemed high enough to warrant these treatments, as neither of these techniques on their own are considered to effectively control and eradicate rabbits. Due to the potential impacts on biodiversity values fumigation is not currently recommended.

4.4.4.2 Foxes

Fox control should be ongoing, with the intention to reduce local populations to a level that benefits native fauna populations on the site. Total eradication clearly cannot be realistically achieved given the probability of re-invasion from surrounding areas. A collaborative approach, however, which encompasses areas beyond the site such as incorporating the local Surf Coast and Inland Plain Network Landcare Group and encouraging adjoining landowner involvement, is recommended to maximise the overall effectiveness of control.

Therefore a regular fox control program using a combination of control techniques in collaboration with local landholders is required, which should have an objective to remove resident foxes and control foxes that subsequently move into the site. Fox control techniques

include, poisoning (Fox-off baits), shooting (see discussion below in cats), snaring (treadle snare) and fumigation.

4.4.4.3 Feral and domestic cats and dogs

Feral cat density on the site is likely to be low. However, any cats sighted should be considered as feral, and removed where possible. Cat control techniques include poisoning, shooting, and trapping. Feral dogs are also unlikely to be an issue within the reserve however domestic dogs brought to the reserve and roaming dogs from nearby properties may cause adverse effects to local fauna. Any dogs within the reserve must be kept under control at all times. In addition, dog excrement raises nutrient levels which in turn increases the growth of exotic species over indigenous. Plastic bags should be provided for the removal of dog excrement.

Similar to foxes, 1080 baits can be laid to poison cats, although shooting is one of the main methods currently used for feral cat control, and this should also be employed for any feral dogs. Shooting, however, is often labour intensive and is not considered an effective landscape control method, but it is recommended across the study area. If required, shooting should be undertaken at night with the aid of a spotlight. Night shooting is often assisted by the cat's distinctive, green eye shine.

Padded jaw leg-hold traps should only be used at sites where the animal can be destroyed by shooting whilst still held in the trap.

Trapping (cage traps) success is likely to vary, as feral cats are often trap-shy. Audible recorded lures for feral cats and other predators, or recordings, which mimic the distress call of a small animal, should be used to attract cats to bait or trap sites. The use of tuna fish oil or fried chicken as bait has also proven to be successful to attract cats.

4.4.5 Fire Management

Detailed fire management recommendations have been outlined in the *Bells Beach Fire Management Plan* (Moulton 2008a) and the *Fire Management Plans for Nature Reserves of the Surf Coast Shire – An Overview* (Moulton 2008b).

4.4.6 Cultural Heritage

As previously described, 13 Aboriginal heritage places have been recorded within the reserve. The most effective method of protecting these places is to adhere to recommendations improving fencing and impeding human access to areas of intact vegetation where many other sites are located. In addition, educational signage should be erected to improve public awareness of cultural heritage within the reserve and why it should be protected.

4.4.7 Erosion

To combat erosion, a combination of laying brush and revegetation is recommended. Laying of brush material (the placing of cut branches of appropriate species, either locally indigenous

species or if non indigenous species are used they must be free of any propagules) assists in retaining top soils and creates a microclimate suitable for plant germination. The laying of brush also encourages regeneration by acting as deterrent to human access and preventing trampling of seedlings.

Treatment of erosion areas should be detailed in annual works plans and prioritised according to priority ratings mapped in Figure 5a and 5b.

4.4.8 Protection of Significant Flora and Fauna

Flora

Within the study area, one nationally significant flora species Glenelg Pomaderris *Pomaderris halmaturina* (listed as vulnerable) was noted within areas of Shrubby Dry Forest during surveys conducted by Macak *et al.* (2007) the vegetation within this part of the reserve is relatively intact and safe from most ecological threats

The two state significant species: Small Milkwort *Comesperma polygaloides* (status vulnerable) within areas of Coastal Headland Scrub, and Bellarine Yellow Gum *Eucalyptus leucoxydon* subsp. *Bellarinensis* (status endangered) within areas of Coastal Alkaline Scrub (Stockton 2001) should be accurately mapped and monitored. Monitoring should assess health and recruitment success. It is imperative that weed control works are undertaken in this area to the east of the Winkipop car park to maintain the integrity of the habitat for these species.

Additional detailed floristic surveys may reveal additional significant species or species already occurring may receive a higher conservation status as further habitat depletion occurs throughout the adjoining landscape. Such additional species or updated levels of status can be added to this plan as required.

Fauna

Only one fauna species, the nationally significant Rufous Bristlebird (Garnett and Crowley 2000, Macak *et al.* 2007) has been recorded within the reserve. The Rufous Bristlebird is a poor flier and due to its ground dwelling behaviour it can fall prey to cats and foxes. The management of these pest species and environmental weeds to preserve the integrity of the Rufous Bristlebird habitat would be beneficial management actions for the protection of this significant population. Involving groups like the Geelong Field Naturalists Club or ecological consultancy firms to undertake regular monitoring surveys of this species and other fauna groups would also be beneficial in confirming the presence and continued persistence of fauna species at the site, and potentially provide information to guide future management actions at the site.

Any newly recorded fauna species of conservation significance on the site should be listed in this section of the management plan, and added to the site fauna list in Appendix 2 also in this management plan.

4.4.9 Visitor Access and Infrastructure Management

Whilst a conservation reserve, the Bells Beach Recreation Reserve is also a major tourist destination and conservation management needs to be balanced with management of infrastructure and the encouragement of tourism. Specific management actions for infrastructure are provided below:

- Fence condition should be checked annually and rectified when required;
- An assessment of the design and layout of the current road and car parking system to determine the efficacy of the current design is recommended.
- Informal access to areas of remnant vegetation should be discouraged and actions taken to impede human access such as fencing and the laying of brush should be applied in locations where informal access is occurring;
- Appropriate educational signage should be erected describing environmental and cultural values within the reserve to develop a public awareness and greater consideration for the environment.

4.4.10 Litter and Rubbish Management

Currently litter and rubbish is not a major threat. Regular monitoring of litter and assessment of the adequacy of rubbish collection bins within the reserve should be assessed annually.

4.4.11 Revegetation

Revegetation activities have been undertaken across the reserve and are an important component to the management of the reserve acting as weed suppressants in areas where weeds have been removed and also as buffers for the reserve. Revegetation days are also an important means of community involvement. Appropriate, planned revegetation should be continued and encouraged across the site. However, appropriate pre-planting weed treatments and also post planting weed suppression using mulch and follow up weed treatments are vital to revegetation success.

In addition to revegetation of disused paths, potential larger scale revegetation areas include the north side of the Bells Beach Road to the east of the Winkipop car park and opposite the Southside car park and adjacent to the Southside car park. These areas have been identified in Figure 5 with appropriate recommended ecological vegetation classes to be used for plantings. Appropriate ecological vegetation classes have been determined using pre-1750 DSE mapping (Figure 6) and on-ground assessments. Suggested species and planting ratios have been provided in Appendix 2.

Any areas of weed infestation that are cleared, particularly adjacent to the Winkipop car park should be revegetated appropriately to assist as a weed suppressant.

4.4.12 Managing Community Involvement

Surf Coast Shire should continue to develop relationships with established community groups and consider developing new relationships with additional groups such as local school groups

and the local Country Fire Authority. Opportunities for research by higher education and TAFE students also exist within the reserve and this should be encouraged. The Surf Coast Shire should develop liaisons with regional education institutions regarding student projects and research within the reserve to contribute to a better understanding of ecological processes and management. Numerous ecological and management research topics could be pursued on the site from disciplines such as conservation ecology, zoology, botany and natural resource management.

4.4.13 Minimisation of Soil and Plant Pathogens

This is generally a low risk issue and requires the ongoing vigilance of the Surf Coast Shire, its contractors and involved community groups such as SANE and Surfing Victoria. General monitoring of this issue should be undertaken as part of general pest, hydrological and ecological monitoring (see Section 4.5.2).

4.4.14 Overview of Key Management Actions on a Management Zone Basis

An overview of key management actions on a management zone basis for the first two years is provided below in Table 5. The majority of these key management actions, particularly the highest priority actions, should be considered in the first action plan.

Table 5. Management zone summary, objectives and actions.

Management zone	Management Objective(s)	Key Management Responses and Actions ranked in order of priority
1 Intact Coastal Heathland Zone	<ul style="list-style-type: none"> Maintain vegetation and habitat condition Limit the spread of introduced weeds and remove all mature woody weeds Limit pest animal impacts Maintain fencing Monitor overall vegetation health 	<ul style="list-style-type: none"> General pest plant and animal control program – remove all mature woody weeds Map and monitor state significant species Small Milkwort <i>Comesperma polygaloides</i> and Bellarine Yellow Gum <i>Eucalyptus leucoxylon</i> subsp. <i>bellarinensis</i> Conduct regular vegetation health assessment
2 Car Park and High Visitation Zone	<ul style="list-style-type: none"> Provide a space where high level visitation and ecological values can co-exist Improve vegetation and habitat condition within car park islands Improve fencing to protect vegetation and prevent human access Limit the spread of introduced weeds and control priority weeds Limit pest animal impacts Monitor overall vegetation health 	<ul style="list-style-type: none"> Erect signage detailing ecological and cultural values within the reserve General pest plant and animal control program Conduct regular vegetation health assessment Monitor and assess local, tourist and Surfing Victoria needs and mitigate as required Improve fencing Provide collection bags for dog excrement Regularly remove litter if required

Management zone	Management Objective(s)	Key Management Responses and Actions ranked in order of priority
3 Shrubby Dry Forest and Coastal Alkaline Scrub Zone	<ul style="list-style-type: none"> • Maintain vegetation and habitat condition • Limit the spread of introduced weeds and remove all mature woody weeds • Limit pest animal impacts • Maintain fencing along paths • Monitor overall vegetation health 	<ul style="list-style-type: none"> • General pest plant and animal control program • Map and monitor Nationally Significant flora species Glenelg Pomaderris <i>Pomaderris halmaturina</i> • Conduct regular vegetation health assessment • Improve fencing along paths
4 Modified Vegetation and Revegetation Zone	<ul style="list-style-type: none"> • Reduce weed seed entering adjacent areas of remnant indigenous vegetation 	<ul style="list-style-type: none"> • Removal of all woody weeds followed by appropriate revegetation • Monitor revegetation areas to prevent the regeneration of introduced species

4.5 Management Responsibility, Schedule and Monitoring

4.5.1 Plan Responsibility

It is envisaged that Surf Coast Shire will have primary responsibility for implementing this plan by developing annual on-ground action plans (see Section 4.7 for an example of an action plan), in consultation with relevant organisations such as DSE and other local interested parties such as SANE and Surfing Victoria. All technical on-ground works will require the services of a suitably qualified and experienced bushland management or revegetation contractor experienced in native vegetation management and restoration. Volunteer groups should be suitably monitored and limited to appropriate works.

4.5.2 Monitoring

Monitoring, in an ecological context, is aimed at documenting environmental changes as a critical step in developing management responses and setting quantifiable assessment targets for measuring success. Monitoring should fundamentally be motivated by the need to achieve set goals, measure success and understand change in order to quickly respond to adverse changes brought about by inappropriate management or other factors. Based on this, monitoring should keep any management plan ‘alive’ and help it adapt to different conditions, perceived values and evaluate management requirements.

For the Bells Beach Recreation Reserve, monitoring is required to assess the positive and negative impacts of management actions on the ecological values, and should be conducted by a qualified ecologist or revegetation contractor. Monitoring is considered essential for a number of key management threats, issues and activities identified and recommended in this plan, and these include, but are not limited to:

- Monitoring the effectiveness of addressing management threats;

- Monitoring the condition and status of vegetation health particularly the size of the Coastal Heathland communities and the diversity of stands of Coastal Alkaline Scrub as some shrub species may become over dominant;
- Monitoring the effectiveness of weed control, i.e. weed cover and type, new weed invasions areas or new weed species;
- Monitoring and documenting the extent of weed control works and/or shrub removal;
- Monitoring health and regeneration of significant species;
- Monitoring of pest animal populations;
- Monitoring of cultural heritage sites;
- Monitoring and mapping of erosion sites;
- Monitoring fire management actions.

The timing of monitoring will be dependent on the variables to be documented and a suitable monitoring framework should be adopted once management actions are agreed upon.

4.6 Management Plan Review Process

The lifespan of the management plan is perpetual as it is the intention to manage the site for its long-term conservation values. However, management requirements are likely to change and new priorities may become apparent in the future. For this reason it is important to provide a review cycle for any management plan.

It is proposed that an annual minor review of the management plan be undertaken to update management actions and monitoring outcomes, based on the action plan for that year, and that a full plan review is undertaken five years from the approval of this version.

4.7 Annual Action Plan for 08/09 (example)

As documented above an action plan is proposed to be created and implemented on an annual basis, in order to provide guidance and direction for any on-ground works that would be undertaken by a suitably qualified bush regenerator/practitioner. The action plan will include actions, targets, suggested timing (without impinging on the flexibility of the bush regenerator) quantifiable targets and a nominated responsible Surf Coast Shire staff member, and will be based upon issues, such as actions documented in the management plan, available resources, and any input from community groups, agencies, etc. An example is provided below in Table 6.

In general, and depending upon available resources, the annual action plan should always address the highest priority management actions (which are listed in Section 4.4 and summarised in Table 5), but also consider monitoring and review (inspection), in order to gauge the success of any management actions, and also consider lower priority actions, that can have an immediate impact on the site.

Table 6. Bells Beach Recreation Reserve Annual Management Zone Action Plan 2008/2009 (example).

Bells Beach Recreation Reserve Annual Action Plan- 2008/09						MANAGEMENT ZONE 1				
Performance against the action plan will be reviewed on an annual basis and communicated to the Surf Coast Shire Environment Unit and interested stakeholders and community groups										
						Quarterly Inspection				
						Date: / /				
Management Issue	Action and location	Timing	Control Method	Comments	Goal	Q1	Q2	Q3	Q4	Comments
Pest plants (noxious and environmental weeds)										
Coast Wattle and Sallow Wattle	Eliminate mature specimens in patches 5, 11, 14, 18 and 20. then ongoing monitoring and removal as part of quarterly inspections	All year	CP	Mostly scattered occurrences throughout the patches	All mature specimens (greater than 1.5 m tall) to be removed by June 2009					
Coast Tea-tree	Eliminate all specimens in patches 13, 15, 16 and 20 by June 2008 then ongoing monitoring and removal if required as part of quarterly inspections	All year	CP & HP	Scattered seedlings and some mature specimens but restricted in extent.	All specimens to be removed by June 2009. Ongoing monitoring of seedling recruitment required					
Bellarine Pea	Eliminate from management zone. Only recorded in patch 18.	All year	HP	Only located in one small patch in this management zone.	All mature specimens to be removed by June 2009. Ongoing monitoring of seedling recruitment required					
Herbaceous and Grassy Weeds	Herbicide spray patches 2, 7, 9, 10, 12 and 21. Ongoing treatment and removal as part of quarterly inspections	All year	SS	Occurring in varying degrees of infestation along path edges and within some revegetation areas Serrated Tussock recorded in patch 10.	Reduce infestation levels in each patch by one degree (I.e. >25% cover to 5 to 25% cover and 5 to 25 % cover to <5%). Serrated Tussock to be eliminated from the reserve and treatment site monitored for any regrowth.					
Adjacent Pest Plants	Liaise with adjacent landowners to the north and SCIPN Landcare for routine pest plant control measures and coordinated events	Annual			Contacts and liaisons developed					

Pest animals (rabbits, hares, foxes, cats, tree hollow & nest box competitors, overgrazing problem with kangaroos)										
Foxes, Cats, Rabbits	Ongoing monitoring & liaison with SCIPN Landcare and adjacent landowners for any response action required.	All year round	Baiting /trapping program developed if and when required and coordinated to coincide with action from other neighbouring properties and Landcare group action	Does not appear to be a significant problem at this stage.	Quarterly monitoring to ensure infestation does not occur.					
Fire Management										
To be determined	To be determined	To be determined	To be determined	To be determined						
Infrastructure Management (fencing, signage, tracks)										
Fence & signage	Monitor condition of fences and signage and repair as required Implement new fences as per high priority zones in figure 4a - Quarterly inspection.	All year round		Fencing is required in some areas around the Wave car park.	High priority fencing completed as per Figure 4a					
Litter & Rubbish	Remove any litter found onsite - Ongoing.	All year round								
Notes: CP = Cut and Paint;; SS = Spot-spray; and HP = Hand Pull										

FIGURES



Study area



0 500 1,000
Metres

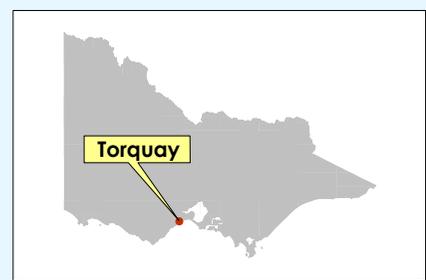
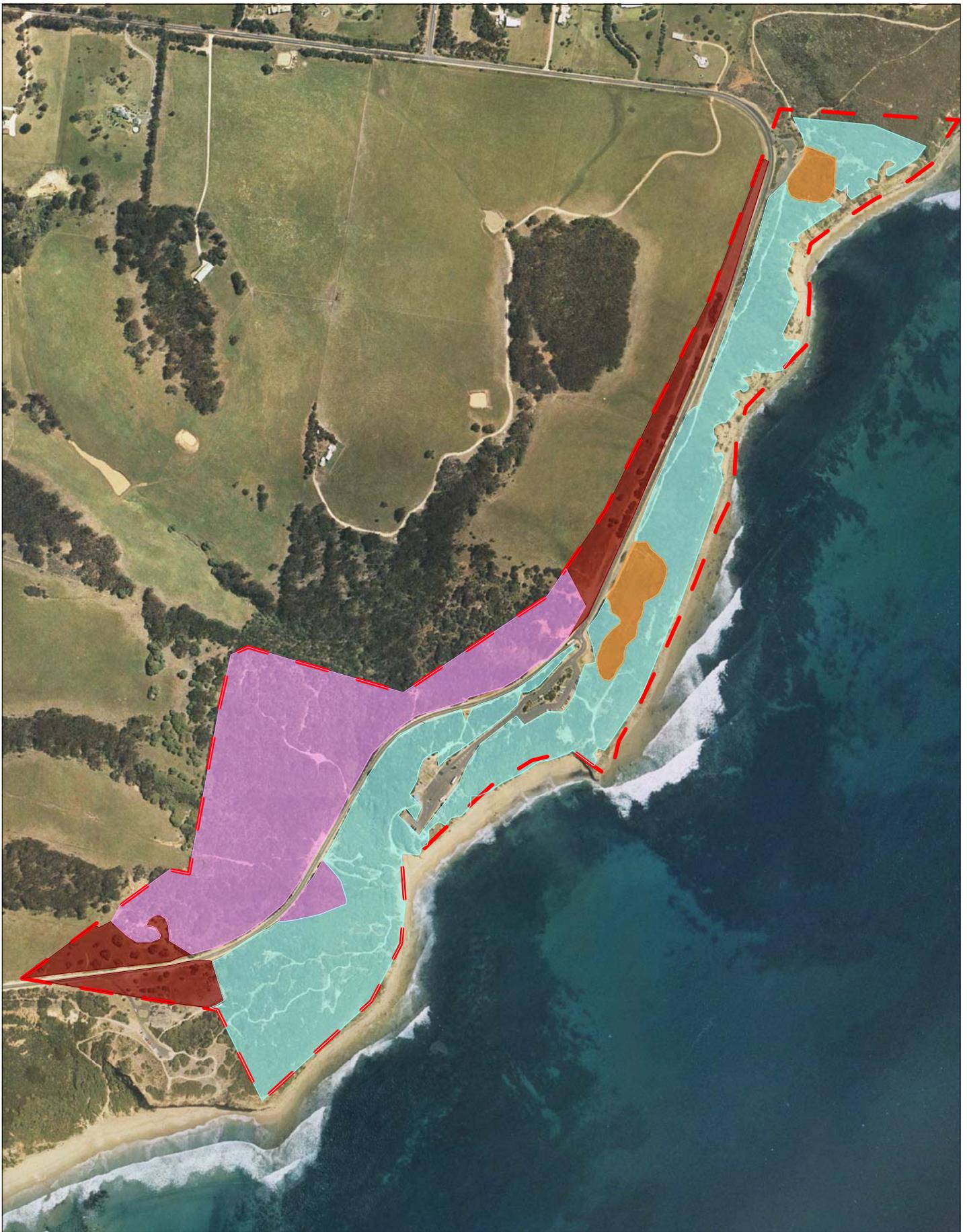


Figure 1
Location of study area,
Bells Beach Recreation
Reserve Vegetation Plan



EP Map Num: 937 Fig 1
Issue Date: 9/7/2008



Ecological Vegetation Classes

(Macak et al. 2007)

- Coastal Alkaline Scrub
- Coastal Headland Scrub
- Shrubby Dry Forest
- Modified
- Study area

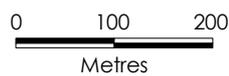


Figure 2
Ecological Vegetation Class
Mapping,
Bells Beach Recreation
Reserve Vegetation Plan





Level of weed infestation

- Scattered individuals <5% cover
- 5 - 25% cover
- >25% cover
- Erosion / disused walking path
- Planted environmental weeds

23 Label number (refer table)

Study area

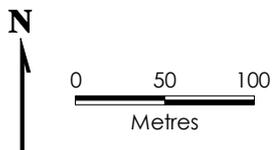


Figure 3a
Ecological threats,
Bells Beach Recreation
Reserve Vegetation Plan





Level of weed infestation

- Scattered individuals <5% cover
- 5 - 25% cover
- >25% cover
- Erosion / disused walking path
- Planted environmental weeds

23 Label number (refer table)

Study area

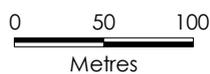


Figure 3b
Ecological threats,
Bells Beach Recreation
Reserve Vegetation Plan





Priority patches

- 1st priority
- 2nd priority
- 3rd priority

Fence priority

- 1st priority
- 2nd priority
- 3rd priority

Management Zones

Study area

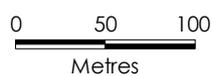


Figure 4a
Priority Management Areas,
Bells Beach Recreation
Reserve Vegetation Plan





Priority patches

- 1st priority
- 2nd priority
- 3rd priority

Fence priority

- 1st priority
- 2nd priority
- 3rd priority

Management Zones

Study area

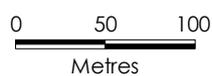


Figure 4b
Priority Management Areas,
Bells Beach Recreation
Reserve Vegetation Plan



Figure 4 Table 1 Management Zone 1 Threats and Priorities.

Label	Threat/ Level of weed infestation	Info	Area (m ²)
HIGH PRIORITY (Works to be undertaken immediately)			
2	>25% cover	Dense infestation of Toowoomba Canary-grass <i>Phalaris aquatica</i> and Cocksfoot <i>Dactylis glomerata</i>	92
5	Scattered individuals <5% cover	Scattered Coast Wattle <i>Acacia longifolia</i> var. <i>sophorae</i>	4,406
7	5 - 25% cover	Burnt Revegetation Area with moderate cover of weedy herbs including Bucks Horn Plantain <i>Plantago coronopus</i> , Prairie Grass <i>Bromus catharticus</i> , Rough Sow thistle <i>Sonchus asper</i> , Common Sow thistle <i>Sonchus oleraceus</i> , Cape Weed <i>Arctotheca calendula</i> and Ox tongue <i>Helminthotheca echioides</i>	355
9	Scattered individuals <5% cover	Scattered exotic herbs including Ribwort <i>Plantago lanceolata</i> , Ox-tongue <i>Helminthotheca echioides</i> and Cocksfoot <i>Dactylis glomerata</i>	1,228
10	5 - 25% cover	Herbaceous weeds on path edge Centaury Weed <i>Centaureum erythraea</i> , Mustard <i>Brassica</i> spp., Ribwort <i>Plantago lanceolata</i> , Serrated Tussock <i>Nassella trichotoma</i> , Mallow <i>Malva</i> spp. and Cocksfoot <i>Dactylis glomerata</i>	232
11	Scattered individuals <5% cover	Scattered Sallow Wattle <i>Acacia longifolia</i> var. <i>longifolia</i> and Coast Wattle <i>Acacia longifolia</i> var. <i>sophorae</i>	9,942
12	Scattered individuals <5% cover	Scattered exotic herbs including Ribwort <i>Plantago lanceolata</i> , Ox-tongue <i>Helminthotheca echioides</i> and Cocksfoot <i>Dactylis glomerata</i>	2,474
13	Scattered individuals <5% cover	Coast Tea-tree <i>Leptospermum laevigatum</i> seedlings	4,619
14	>25% cover	Coast Wattle <i>Acacia longifolia</i> var. <i>sophorae</i>	159
15	>25% cover	Coast Tea-tree <i>Leptospermum laevigatum</i> mature shrub	36
16	Scattered individuals <5% cover	Scattered Giant Honey-myrtle <i>Melaleuca armillaris</i> and Coast Tea-tree <i>Leptospermum laevigatum</i>	766
18	Scattered individuals <5% cover	Scattered Sallow Wattle <i>Acacia longifolia</i> var. <i>longifolia</i> , Coast Wattle <i>Acacia longifolia</i> var. <i>sophorae</i> and Bellarine Pea <i>Polygala myrtifolia</i>	868
20	Scattered individuals <5% cover	Scattered immature Coast Tea-tree <i>Leptospermum laevigatum</i> and Sallow Wattle <i>Acacia longifolia</i> var. <i>longifolia</i>	2,453
21	>25% cover	Scattered exotic species, Ribwort <i>Plantago coronopus</i> and Cocksfoot <i>Dactylis glomerata</i>	71
MODERATE PRIORITY (Works to be undertaken in the medium term)			
1	Scattered individuals <5% cover	Coast Tea-tree <i>Leptospermum laevigatum</i> scattered small individuals	696
6	Erosion / disused walking path	Old brush decomposing will need to be replaced	1,253
LOW PRIORITY (Works to be undertaken if resources available)			

Label	Threat/ Level of weed infestation	Info	Area (m ²)
3	Erosion / disused walking path	Some regeneration occurring at track	123
4	Erosion / disused walking path	Some regeneration occurring at track	105

Figure 4 Table 2 Management Zone 2 Threats and Priorities.

Label	Threat/ Level of weed infestation	Info	Area (m ²)
HIGH PRIORITY (Works to be undertaken immediately)			
19	5 - 25% cover	Sallow Wattle <i>Acacia longifolia</i> var. <i>longifolia</i> and Coast Wattle <i>Acacia longifolia</i> var. <i>sophorae</i>	1,678
22	>25% cover	Herbaceous weeds <i>Galenia pubescens</i> , Panic Veldt-grass <i>Ehrharta erecta</i> , Ribwort <i>Plantago lanceolata</i> , Cocksfoot <i>Dactylis glomerata</i>	215
24	>25% cover	Single Coast Tea-tree <i>Leptospermum laevigatum</i>	70
25	Scattered individuals <5% cover	Scattered Coast Wattle <i>Acacia longifolia</i> var. <i>sophorae</i>	288
28	>25% cover	Herbaceous weeds <i>Galenia pubescens</i> , Panic Veldt-grass <i>Ehrharta erecta</i> , Ribwort <i>Plantago lanceolata</i> , Cocksfoot <i>Dactylis glomerata</i>	309
30	Scattered individuals <5% cover	Scattered Coast Wattle <i>Acacia longifolia</i> var. <i>sophorae</i> and Coast Tea-tree <i>Leptospermum laevigatum</i>	3,038
31	5 - 25% cover	Minor infestation of Panic Veldt Grass <i>Ehrharta erecta</i>	115
38	Scattered individuals <5% cover	Sallow Wattle <i>Acacia longifolia</i> var. <i>longifolia</i>	550
MODERATE PRIORITY (Works to be undertaken in the medium term)			
29	Erosion / disused walking path	Erosion Point. Old brush with some vegetation persisting. Requires re-brushing	626
32	Erosion / disused walking path	Brush required	24
33	Erosion / disused walking path	Brush required	79
LOW PRIORITY (Works to be undertaken if resources available)			
23	Erosion / disused walking path	No erosion but exposed soil	266
26	Scattered individuals <5% cover	Sallow Wattle <i>Acacia longifolia</i> var. <i>longifolia</i> and Coast Wattle <i>Acacia longifolia</i> var. <i>sophorae</i>	5,890
27	>25% cover	Sallow Wattle <i>Acacia longifolia</i> var. <i>longifolia</i> and Coast Wattle <i>Acacia longifolia</i> var. <i>sophorae</i>	916
34	>25% cover	Dominated by woody weeds including Coast Tea-tree <i>Leptospermum laevigatum</i> , Coast Wattle <i>Acacia longifolia</i> var. <i>sophorae</i> , Sallow Wattle <i>Acacia longifolia</i> var. <i>longifolia</i> and Green Honey-myrtle <i>Melaleuca diosmifolia</i>	542
35	Scattered individuals <5% cover	Scattered Coast Wattle <i>Acacia longifolia</i> var. <i>sophorae</i> , Sallow Wattle <i>Acacia longifolia</i> var. <i>longifolia</i> , Giant Honey-myrtle <i>Melaleuca armillaris</i> , <i>Melaleuca diosmifolia</i> and Coast Tea-tree <i>Leptospermum laevigatum</i>	1,929
36	Scattered individuals <5%	Scattered Coast Wattle <i>Acacia longifolia</i> var. <i>sophorae</i> , Sallow Wattle <i>Acacia longifolia</i> var. <i>longifolia</i> , Giant Honey-myrtle <i>Melaleuca armillaris</i> ,	1,087

Label	Threat/ Level of weed infestation	Info	Area (m ²)
	cover	Green Honey-myrtle <i>Melaleuca diosmifolia</i> and Coast Tea-tree <i>Leptospermum laevigatum</i>	
37	Scattered individuals <5% cover	Scattered Coast Wattle <i>Acacia longifolia</i> var. <i>sophorae</i> , Sallow Wattle <i>Acacia longifolia</i> var. <i>longifolia</i> , Giant Honey-myrtle <i>Melaleuca armillaris</i> , Green Honey-myrtle <i>Melaleuca diosmifolia</i> and Coast Tea-tree <i>Leptospermum laevigatum</i>	3,132

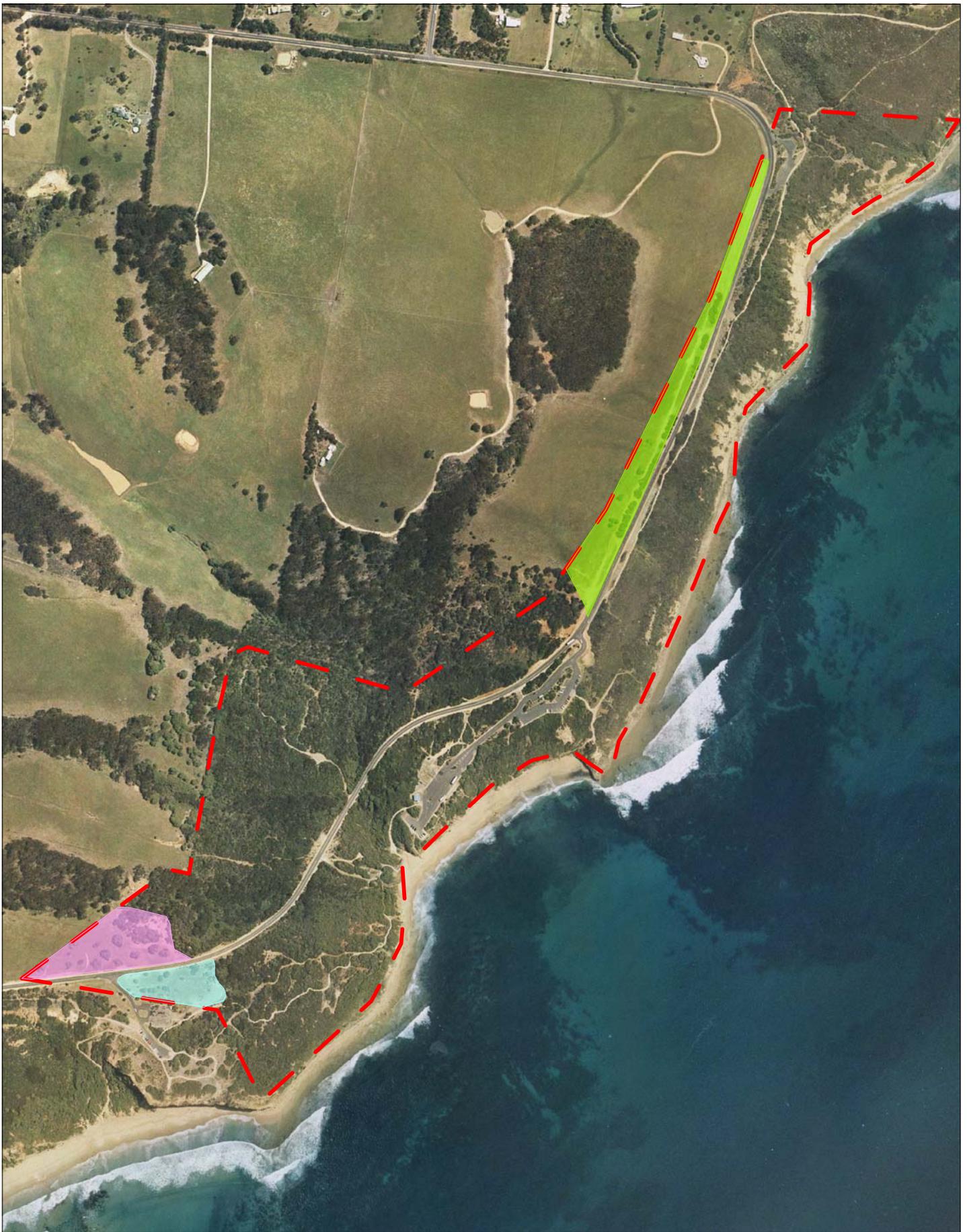
Figure 4 Table 3 Management Zone 3 Threats and Priorities.

Label	Threat/ Level of weed infestation	Info	Area (m ²)
HIGH PRIORITY (Works to be undertaken immediately)			
39	Scattered individuals <5% cover	Scattered Sallow Wattle <i>Acacia longifolia</i> var. <i>longifolia</i> and Boneseed <i>Chrysanthemoides monilifera</i> subsp. <i>monilifera</i>	392
40	Scattered individuals <5% cover	Scattered Sallow Wattle <i>Acacia longifolia</i> var. <i>longifolia</i> and Boneseed <i>Chrysanthemoides monilifera</i> subsp. <i>monilifera</i>	817
41	Scattered individuals <5% cover	Sallow Wattle <i>Acacia longifolia</i> var. <i>longifolia</i>	127
42	>25% cover	Kikuyu <i>Pennisetum clandestinum</i> infestation	60
49	Scattered individuals <5% cover	Toowoomba Canary-grass <i>Phalaris aquatica</i>	256
57	Scattered individuals <5% cover	Scattered Coast Tea-tree <i>Leptospermum laevigatum</i>	205
58	Scattered individuals <5% cover	Scattered Boneseed <i>Chrysanthemoides monilifera</i> subsp. <i>monilifera</i> , Sweet Pittosporum <i>Pittosporum undulatum</i> (x1), Sallow Wattle <i>Acacia longifolia</i> var. <i>longifolia</i> and localised patches of Sweet Vernal grass <i>Anthoxanthum odoratum</i>	5,339
65	Erosion / disused walking path	Old brushed path requiring brushing and replanting	279
MODERATE PRIORITY (Works to be undertaken in the medium term)			
43	Scattered individuals <5% cover	Kikuyu <i>Pennisetum clandestinum</i> and scattered Panic Veldt Grass <i>Ehrharta erecta</i> around drain	251
44	Erosion / disused walking path	Brushing and revegetation required to restrict access	75
45	Erosion / disused walking path	Brushing and revegetation required to restrict access	111
46	Scattered individuals <5% cover	Kikuyu <i>Pennisetum clandestinum</i> and scattered Panic Veldt Grass <i>Ehrharta erecta</i> around drain	231
47	>25% cover	Mature Coast Tea-tree <i>Leptospermum laevigatum</i> and Giant Honey-myrtle <i>Melaleuca armillaris</i>	287
52	Erosion / disused walking path	Needs re-brushing to prevent access	69
53	Erosion / disused walking path	Needs re-brushing to prevent access	260
55	Erosion / disused walking path	Old brushed path requiring re-brushing and replanting	137
60	>25% cover	Dominated by introduced woody weeds including Green Honey-myrtle	1,536

Label	Threat/ Level of weed infestation	Info	Area (m ²)
<i>Melaleuca diosmifolia</i> , Giant Honey-myrtle <i>Melaleuca armillaris</i> and Showy Honey-myrtle <i>Melaleuca nesophila</i>			
LOW PRIORITY (Works to be undertaken if resources available)			
48	Erosion / disused walking path	Scattered Sallow Wattle <i>Acacia longifolia</i> var. <i>longifolia</i> and Coast Wattle <i>Acacia longifolia</i> var. <i>sophorae</i>	362
50	Erosion / disused walking path	Already treated with brushing but requires re-brushing	143
51	Scattered individuals <5% cover	Scattered Panic Veldt Grass <i>Ehrharta erecta</i> in drainage line	539
54	Erosion / disused walking path	Needs re- brushing	137
56	Erosion / disused walking path	Requires brushing and replanting	348
59	>25% cover	Toowoomba Canary-grass <i>Phalaris aquatica</i> infestation	103

Figure 4 Table 4 Management Zone 4 Threats and Priorities.

Label	Threat/ Level of weed infestation	Info	Area (m ²)
HIGH PRIORITY (Works to be undertaken immediately)			
17	Scattered individuals <5% cover	Scattered Chilean Needle Grass <i>Nassella neesiana</i>	3,509
62	Planted environmental weeds	Woody weed plantings including Giant Honey-myrtle <i>Melaleuca armillaris</i> , Showy Honey-myrtle <i>Melaleuca nesophila</i> , Green Honey-myrtle <i>Melaleuca diosmifolia</i> , Bushy Yate <i>Eucalyptus lehmanni</i> , Sweet Scented Hakea <i>Hakea drupacea</i> , Sallow Wattle <i>Acacia longifolia</i> var. <i>longifolia</i> and Coast Wattle <i>Acacia longifolia</i> var. <i>sophorae</i>	4,702
63	5 - 25% cover	Scattered herbaceous weeds including Ribwort <i>Plantago lanceolata</i> , Cape Weed <i>Arctotheca calendula</i> , Pimpernel <i>Anagallis arvensis</i> , Toowoomba Canary-grass <i>Phalaris aquatica</i> , <i>Sonchus oleraceus</i> and Common Sow thistle <i>Sonchus asper</i>	3,441
64	5 - 25% cover	Dominated by introduced woody weeds including Green Honey-myrtle <i>Melaleuca diosmifolia</i> , Giant Honey-myrtle <i>Melaleuca armillaris</i> and Showy Honey-myrtle <i>Melaleuca nesophila</i>	720
8	Scattered individuals <5% cover	Scattered Coast Tea-tree <i>Leptospermum laevigatum</i> and Giant Honey-myrtle <i>Melaleuca armillaris</i>	1,605
MODERATE PRIORITY (Works to be undertaken in the medium term)			
61	5 - 25% cover	Scattered woody weeds including Sallow Wattle <i>Acacia longifolia</i> var. <i>longifolia</i> and Giant Honey-myrtle <i>Melaleuca armillaris</i>	751



- Coastal Alkaline Scrub (EVC858)
- Grassy Woodland (EVC175)
- Shrubby Dry Forest (EVC21)
- Study area

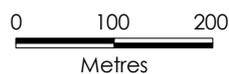
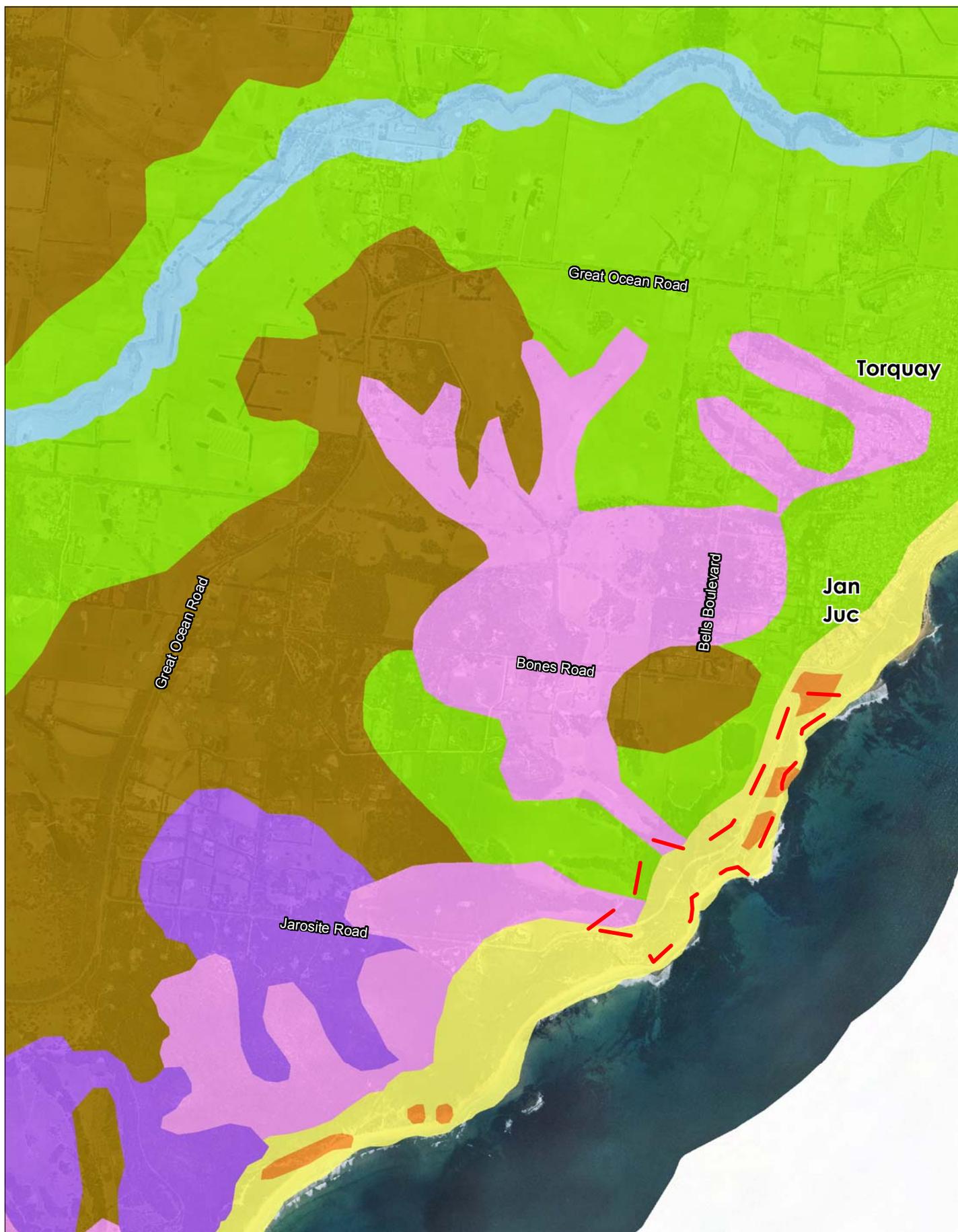


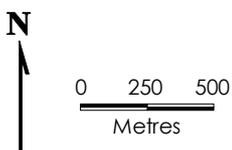
Figure 5
Recommended Revegetation Zones
and suggested Ecological Vegetation Classes,
Bells Beach Recreation Reserve
Vegetation Plan





Pre 1750 DSE Mapping of Ecological Vegetation Classes

- Coastal Headland Scrub
- Coastal Tussock Grassland
- Grassy Woodland
- Healthy Woodland
- Lowland Forest
- Shrubby Dry Forest
- Swampy Riparian Woodland



┌ └ Study area

Figure 6
Pre 1750 DSE Mapping of Ecological Vegetation Classes, Bells Beach Recreation Reserve Vegetation Plan



APPENDICES

A1 Defining Vegetation Condition

Table A1 Defining Vegetation Condition.

Criteria for defining Vegetation Condition
Good condition - Vegetation dominated by a diversity of indigenous species, with defined structures (where appropriate), such as canopy layer, shrub layer, and ground cover, with little or few introduced species present.
Moderate condition - Vegetation dominated by a diversity of indigenous species, but is lacking some structures, such as canopy layer, shrub layer or ground cover, and/or there is a greater level of introduced flora species present.
Poor condition - Vegetation dominated by introduced species, but supports low levels of indigenous species present, in the canopy, shrub layer or ground cover.

A2 Suggested Revegetation Species and Ratios

Table A2.1 Suggested species mixes for **Shrubby Dry Forest** EVC revegetation within the Bells Beach Recreation Reserve. **Note:** Approximate planting densities are to be used as a guide. To recreate a 'natural' structure, and promote survivorship life form plantings should be clustered together in groups.

Life-form to be planted	DSE Recommended Number of plants required per hectare	Number of plants required per hectare (allowing for plant mortality)	Approximate planting density	Species
Overstorey trees	100	125	1 plant per 80 square metres	<i>Eucalyptus tricarpa</i> Red Ironbark
				<i>Eucalyptus obliqua</i> Messmate Stringybark
Understorey trees or large shrubs	50	63	1 plant per 180 square metres	<i>Melaleuca lanceolata</i> Moonah
Medium shrubs (1-5 m tall)	1000	1250	1 plant per 8 square metres	<i>Pimelea serpyllifolia</i> Thyme Rice-flower
				<i>Pomaderris paniculosa</i> ssp. <i>paralia</i> Coast Pomaderris
				<i>Rhagodia candolleana</i> Seaberry Saltbush
				<i>Pultenaea daphnoides</i> Large-leaf Bush-pea
				<i>Spyridium vexilliferum</i> Propeller Plant
				<i>Goodenia ovata</i> Hop Goodenia
Small shrub (< 1 m tall)	500	625	1 plant per 16 square metres	<i>Hibbertia sericea</i> Silky Guinea-flower
				<i>Lasiopetalum baueri</i> Slender Velvet Bush
				<i>Leucopogon parviflorus</i> Coast Beard Heath
				<i>Platylobium obtusangulum</i> Common Flat-pea
				<i>Hibbertia stricta</i> Upright Guinea Flower
Large Tufted Graminoids (grasses and grass like tussocks)	1000	1250	1 plant per 8 square metres	<i>Lomandra longifolia</i> Spiny-headed Mat-rush
				<i>Gahnia radula</i> Thatch Saw-sedge
				<i>Joycea pallida</i> Silvertop Wallaby-grass
				<i>Austrodanthonia geniculata</i> Kneed Wallaby-grass
				<i>Microlaena stipoides</i> var. <i>stipoides</i> Weeping Grass

Table A2.2 Suggested species mixes for **Coastal Alkaline Scrub** EVC revegetation within the Bells Beach Recreation Reserve. **Note:** Approximate planting densities are to be used as a guide. To recreate a 'natural' structure, and promote survivorship life form plantings should be clustered together in groups.

Life-form to be planted	DSE Recommended Number of plants required per hectare	Number of plants required per hectare (allowing for plant mortality)	Approximate planting density	Species
Trees and shrubs	900	1125	1 plant per 8 square metres	<i>Melaleuca lanceolata</i> Moonah
				<i>Allocasuarina verticillata</i> Drooping Sheoak
				<i>Bursaria spinosa</i> spp. <i>spinosa</i> Sweet Bursaria
				<i>Leucopogon parviflorus</i> Coast Beard-heath
				<i>Pomaderris paniculosa</i> ssp. <i>paralia</i> Coast Pomaderris
				<i>Rhagodia candolleana</i> Seaberry Saltbush
				<i>Pimelea serpyllifolia</i> Thyme Rice-flower
				<i>Correa reflexa</i> Common Correa
				<i>Acacia verticillata</i> var <i>ovoidea</i> Coast Prickly Moses
				<i>Allocasuarina misera</i> Small Sheoak
				<i>Acacia pycnantha</i> Golden Wattle
				<i>Acacia paradoxa</i> Hedge Wattle
<i>Ozothamnus ferrugineus</i> Tree Everlasting				
Small shrub (< 1 m tall)	500	625	1 plant per 16 square metres	<i>Hibbertia sericea</i> Silky Guinea-flower
				<i>Lasiopetalum baueri</i> Slender Velvet Bush
Large Tufted Graminoids (grasses and grass like tussocks)	500	625	1 plant per 16 square metres	<i>Lomandra longifolia</i> Spiny-headed Mat-rush
				<i>Dianella revoluta</i> s.l. Black-anther Flax-lily
				<i>Poa sieberiana</i> Tussock Grass

Table A2.3 Suggested species mixes for **Grassy Woodland** EVC revegetation within the Bells Beach Recreation Reserve. **Note:** Approximate planting densities are to be used as a guide. To recreate a 'natural' structure, and promote survivorship life form plantings should be clustered together in groups.

Life-form to be planted	DSE Recommended Number of plants required per hectare	Number of plants required per hectare (allowing for plant mortality)	Approximate planting density	Species
Overstorey trees	100	125	1 plant per 80 square metres	<i>Eucalyptus radiata</i> s.l. Narrow-leaf Peppermint
				<i>Eucalyptus leucoxylon</i> spp. <i>bellarinensis</i> Bellarine Yellow-gum
				<i>Allocasuarina verticillata</i> Drooping Sheoak
Understorey trees or large shrubs (> 5 m tall)	50	63	1 plant per 180 square metres	<i>Acacia mearnsii</i> Black Wattle
				<i>Allocasuarina littoralis</i> Black Sheoak
Medium shrubs (1-5 m tall)	1000	1125	1 plant per 10 square metres	<i>Leptospermum continentale</i> Prickly Tea-tree
				<i>Epacris impressa</i> Common Heath
				<i>Cassinia aculeata</i> Common Cassinia
Small shrub (< 1 m tall)	500	625	1 plant per 16 square metres	<i>Pimelea humilis</i> Common Rice-flower
				<i>Lasiopetalum baueri</i> Slender Velvet Bush
				<i>Leucopogon parviflorus</i> Coast Beard Heath
				<i>Hibbertia riparia</i> Erect Guinea-flower
Tufted Graminoids (grasses and grass like tussocks)	1000	1125	1 plant per 10 square metres	<i>Xanthorrhoea minor</i> spp. <i>lutea</i> Small Grass-tree
				<i>Gahnia radula</i> Thatch Saw-sedge
				<i>Themeda triandra</i> Kangaroo Grass
				<i>Poa sieberiana</i> Grey Tussock-grass
				<i>Microlaena stipoides</i> var. <i>stipoides</i> Weeping Grass
<i>Lepidosperma laterale</i> Variable Sword-sedge				

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