BUSHLAND MANAGEMENT

PLAN

PENINSULAR RECREATION

PRECINCT (SOUTH OF UMINA

OVAL, AND FORESHORES) AT

UMINA BEACH

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1.0 INTRODUCTION

Gecko Environment Management has been engaged by Gosford City Council to provide a Bushland Management Plan for the natural areas within the Umina Peninsular Recreation Precinct. The resulting report attempts to analyse and discuss issues and problems faced in the management of the extant bushland upon site. A number of recommendations are made for the future bushland management of the site.

Gosford City Council received Federal Government funding under the Regional and Local Community Infrastructure program for the revitalisation of the Peninsular Recreation Precinct at Umina Beach. This project included provision for environmental restoration works within some of the bushland areas of the precinct. Consideration was to be given to the inclusion of these areas as a recreational resource without compromising the natural values of the bushland.

The bushland within this plan includes Umina Coastal Sandplain Woodland, listed as an Endangered Ecological Community under the Threatened Species Conservation Act 1995. The remnant upon this site represents one of the largest remaining remnants of this vegetation community and is of very high conservation significance. As such, a priority of this plan is to make recommendations to enhance and protect this extant vegetation community and appropriately provide for public awareness and education to help conserve this valuable area for future generations.

This Bushland Management plan (BMP) is limited in its scope to the extant bushland specified within the Umina Recreation Precinct. It includes only the following areas;

> "***Coastal Sand Foredune Scrub*** *(Regionally Significant within the Gosford LGA)*……... occupies a strip of land approximately 25-75 metres wide behind Umina Beach. The precinct area extends from Umina Surf Club in the north to the carpark adjacent to the caravan park in the south". And,
>
> "***Umina Sands Coastal Woodland*** *(listed as an Endangered Ecological Community under the NSW Threatened Species Conservation Act, 1995)*…. is located in the south-west section of the precinct. The community is bounded to the west by Ettalong Creek, to the north by Umina Oval, to the east by the Sydney Avenue road corridor and to the south by the caravan park"
>
> (Project Brief)

It should be noted that this plan is restricted to the specified site only. Gosford City Council is currently in the process of formulating a broad plan to cover all Umina Coastal Sandplain Woodland in the LGA.

It is intended that this BMP remains a dynamic document. Effective management of vibrant natural systems must allow for some revision as circumstances dictate. All management of these areas must, however, be in concurrence with the aims and objectives contained within this document and must comply with all relevant environmental legislation.

Gecko Environment Management consulted a number individuals and interest groups in formulating this plan and would like to thank the following parties for their suggestions and assistance, The Ettymalong Creek Landcare Group, Robert Payne, Peter Draper, Chris Coombes and Umina Beach Surf Life Saving Club.

2.0 AIMS AND OBJECTIVES

The aim of this bush regeneration plan is to provide analysis of site characteristics and management issues and determine recommended actions and works to restore and enhance the biodiversity within the extant native vegetation and open space within the Umina Peninsular Recreation Precinct

The objectives of the bushland management plan are:

- To improve and enhance the native vegetation communities on site
- To assist in management and control of noxious and environmental weeds on site
- To assist the natural regeneration and revegetation of the native flora of the site
- To appropriately provide for community awareness and education regarding the natural areas within the Umina Peninsular Recreation Precinct.

3.0 METHODOLOGY

The vegetation of the site was surveyed and recorded via random meander throughout the entire site and both indigenous and introduced plants have been recorded in species lists provided.

Vegetation communities on site were established both with the aid of

- literature review
- aerial photo interpretation to establish obvious zonation in vegetation cover on site and
- field application of the Specht Method of Vegetation Classification (Specht 1970)

The Specht method defines the structure of a plant community via determining both Foliage Projective Cover (FPC) and height as well as life form of the tallest strata.

Weed distribution throughout the site was surveyed and recorded via a modified version of the National Trust (NSW) method for weed infestation mapping. This method establishes relative level of weed distribution upon site.

Literature review has been relied upon to comment on soils, site history and fauna sightings, all outside the scope of field work for the purposes of this report.

4.0 SITE DESCRIPTION / EXISTING ENVIRONMENT

4.1 Location, Zoning and Regional Context

Figure 1: UBD locality map, the study area is shown shaded above.

Table 1.1 Site Details

Site Name:	Bushland within Umina Recreational Precinct	
Site Name:	As above	
Zoning code:	6(a) Open Space – Recreation	
DP No(s):	DP 106628	DP 166209
Lot No(s):	7175 and 7037	
Nearest adjoining public road(s)\ track(s)	Etta Road	

This BMP relates to the foreshore vegetation and the area of UCSW on the southern side of Umina Oval and does not include all UCSW in the precinct. Figure 2 below shows the extent of the Peninsula Recreation Precinct and associated natural areas.

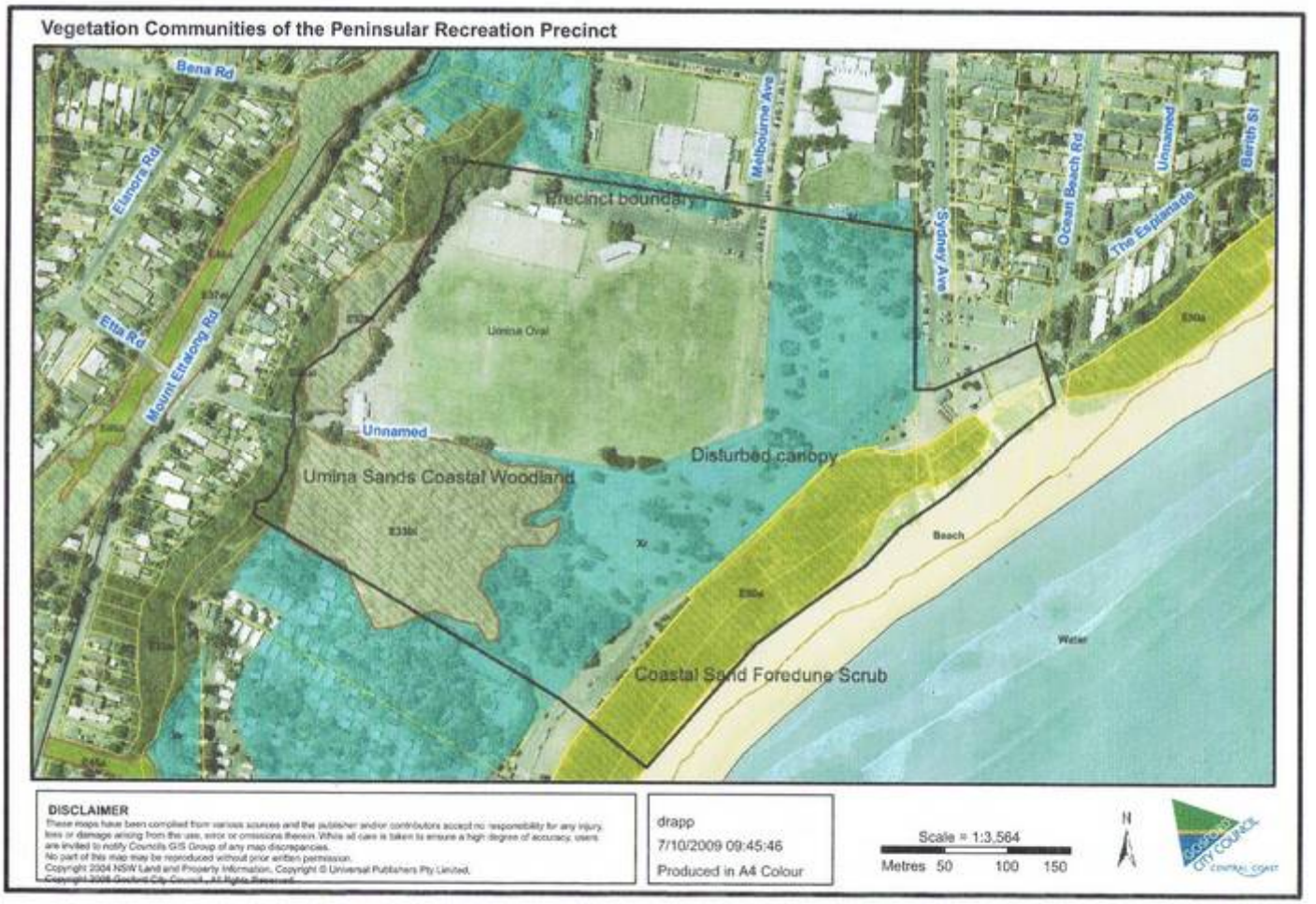

Figure 2; Peninsula Recreation Precinct

4.2 Legislative / Management Context

The Site is zoned **6(a) OPEN SPACE (RECREATION)** under the Gosford City Council's Local Environment Plan. Under this zoning, development that requires consent includes development for the purposes of camping grounds or caravan parks; community facilities; roads and utility installations. Development not requiring consent is limited to Development for the purpose of recreation areas. All other development is prohibited within this zone.

The EEC Umina Sandplain Coastal Woodland is not represented within conservation zoning within the Gosford LGA.

All facets of management of the site must be in compliance with relevant Council policies and applicable environmental legislation. Management decisions and actions regarding the site are instructed by Council's policies such as:

- Gosford City Council Biodiversity Policy
- Gosford City Council Erosion and Sediment Control Policy

A range of relevant State and Federal legislation must also be complied with, including;

- T*he Environmental Planning and Assessment Act (1979)*
- *Threatened Species Conservation Act (1995)*
- *Local Government Act (1993)*
- *Fisheries Management Act (1994)*
- *Noxious Weeds Act (1993)*
- *Catchment Management Authorities Act (2003)*
- *NSW Water Management Act (2000)*
- *National Parks and Wildlife Act (1974)*
- *Native Vegetation Act (2003)*
- *Occupational Health and Safety Act (2000)*
- *Pesticides Act (1999)*
- *Protection of the Environment Operations Act (1997)*
- *Commonwealth Environmental Protection and Biodiversity Conservation Act, (1999)*

Additionally, management decisions and recommendations made within this Bushland Management Plan are further instructed by relevant Management Plans such as;

- Broken Bay Beaches Coastal Management Plan (Patterson Britton and Partners, 1999)
- The Restoration and Rehabilitation Management Plan for Umina Coastal Sandplain Woodland' (Department of Environment and Climate Change (NSW), 2007)
- Bushland Plan of Management Mt Ettalong Floodway (KC6), Umina Beach (BARRC, 2005)

Whilst the site is included within the wider recreation precinct, these sensitive vegetation communities are unsuitable for active recreational pursuits. They do, however, provide passive recreational opportunities for activities such as environmental education and bird watching. These bushland remnants are highly valuable for aesthetic, environmental, scientific and educational purposes and far from representing a recreational constraint they should be viewed as providing the local context within which surrounding recreational opportunities should be sensitively designed.

The site contains Umina Coastal Sandplain Woodland which is listed as an Endangered Ecological Community under the *Threatened Species Conservation Act (1995).*

As such restoration work may require a licence from Department of Environment and Climate Change. Work requiring a licence might include:

- Seed collection
- Revegetation and or regeneration works within or in close proximity to the EEC

Questions related to licensing should be directed to the Wildlife Licensing Unit of DECC on (02) 9585 6540.

4.3 Landform, Geology and Soils

Umina Coastal Sandplain Woodland occurs on soils of the Woy Woy Soil Landscape (Chapman & Murphy 1989). The soils within the site are Iron Podsols.

4.4 Vegetation Communities

For the purposes of this plan the site comprises some of the extant bushland within the Umina Peninsula Recreation Precinct (PRP), the entire vegetation within the PRP is shown in Figure 1 below. The project brief provides that the Bushland Management Plan primarily covers the following two distinct vegetation communities.

> "***Coastal Sand Foredune Scrub*** *(Regionally Significant within the Gosford LGA)*……. occupies a strip of land approximately 25-75 metres wide behind Umina Beach. The precinct area extends from Umina Surf Club in the north to the carpark adjacent to the caravan park in the south". And,
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> "***Umina Sands Coastal Woodland*** *(listed as an Endangered Ecological Community under the NSW Threatened Species Conservation Act, 1995)*…. is located in the south-west section of the precinct. The community is bounded to the west by Ettalong Creek, to the north by Umina Oval, to the east by the Sydney Avenue road corridor and to the south by the caravan park"
>
> (Project Brief)

Bell 2004 classified and mapped the vegetation communities of the Gosford Local Government Area identifying the two communities Coastal Sand Foredune Scrub and Umina Sands Coastal Woodland (UCSW) within the subject site, these classifications have been relied upon with some ground truthing carried out to establish the current coverage of vegetation communities on site.

Stephen Bell includes UCSW as a mapunit in the Gosford City Council's mapping program. Figure 2 shows the vegetation Units within the PRP. These vegetation maps can now be downloaded from following the prompts on Councils website at the following web link: http://www.gosford.nsw.gov.au/gis

The coastal strip shows some narrow, though typical gradation between a number of vegetation communities common to the incipient dune, the dune crest and hind dune. These best correspond to Bells Coastal Sand Beach Spinifex (REMS Unit 53), Coastal Sand Foredune Scrub (REMS Unit 50) and Coastal Sand Banksia Scrub (REMS Unit E50b).

Divided by the Umina Beach and Caravan Park access road the site is divided into two sections, the UCSW to the south of Umina oval and the narrow coastal strip to the east.

The coastal Sand Banksia scrub is confined to the hind dune and is not represented in the curtilage of Umina Surf Club where the hind dune has long ago been developed as open space.

Local Botanist, Robert Payne has undertaken extensive mapping of the extent of UCSW, he states;

> "UCSW vegetation occurs on a series of parrallel strand lines made up of swales and dunes across the whole of the Umina Woy Woy Sandplain, interspersed with some aeolian areas. The vegetation on the dunes is somewhat differerent from what is found in the swales. The sandplain is over 4000 years old and was deposited when sea levels were higher."
>
> (Payne R, 2009. Personal Communication)

Throughout much of the UCSW within the study area the dominant tree species are *Eucalyptus botryoides* and *Angophora floribunda.* Common understorey species include *Banksia serrata, Banksia integrifolia, Glochidion ferinandii, Acacia suaveolans, Acacia longifolia, Breynia oblongifolia, Macrozamia communis, Lomandra longifolia* and *Entolasia stricta*.

Whilst some limited recruitment of younger *B. serrata* is evident, many specimens are old and senescent. These trees are obligate seeders releasing their load of seed after fire and a long term continued lack of fire may threaten their common presence in the community. The mesic native tree *Glochidion ferdinadii* appears to be increasing in population and cover abundance throughout and forming groves which could, in future, shade out understorey and alter the woodland microclimate. Its dominance would normally be truncated by fire events.

This UCSW remnant is of very high conservation significance. The small patch size suffers from a very poor edge effect with the ratio of the perimeter to the interior of the site extremely high. This results in constant exterior sources of weed invasion, altered wind speeds, light levels and subsequent temperatures to those the community would naturally endure (Lindenmayer and Burgman 2005 pp 268).

In making its final determination of the area as an Endangered Ecological Community the NSW Scientific committee stated that;

> "Umina Coastal Sandplain Woodland is currently only known from three small areas at Umina; at Umina Oval, McEvoy Oval and Umina High School and at a tiny remnant at Little Patonga Beach. The total area still surviving in 2002 is estimated at less than 2 ha. Understorey has been removed for the occurrence at Pearl Beach."
>
> (NSW Scientific committee)

Subsequent mapping has identified;

> "12 patches of UCSW ranging in size from 0.03ha to 4.07ha, with a total community extent of only 13.36ha."
>
> (Payne, 2006)

The Umina Oval remnant represents the largest of these communities, for the purposes of this plan only the bushland to the south of Umina Oval is included for comment. This area constitutes the majority of the 4.07 ha of UCSW community within the wider Umina Oval community, with UCSW also fringing the Oval to the west.

To the south east of the UCSW the mid strata and understorey has been highly impacted with vegetation and topsoils removed by Council and used for their infrastructure works (Payne R,

2009. Personal communication). This area is highly degraded with heavy weed infestations and little evidence of natural regeneration, *Lantana camara* forms dense patches here. In parts *Banksia integrifolia* forms some connected area of canopy and to the extreme south east corner a patch of several *Eucalyptus botryoides* remain and appear to be in reasonable health. To the north of this area adjoining the concrete path and BMX track, Council has fenced and revegetated an area. This has vastly improved this section, the plantings were planted closely with the intention of being thinned in future. Numerous *Eucalyptus robusta* (not remnant within the woodland community) are included with little or no mid strata and understorey representation.

The bushland remnants on site have suffered from fragmentation, dumping and vandalism. Whilst much of the site suffers from infestation of environmental weeds the bushland is generally in good condition. Structural native vegetation layers of upper, middle and lower strata are present throughout most remnant bushland with a good diversity of native species represented in all strata.

A plan detailing the location of vegetation communities on site is included within Figure 2
A full list of native species recorded can be found within Appendix 1.
A summary of each vegetation community is provided below.

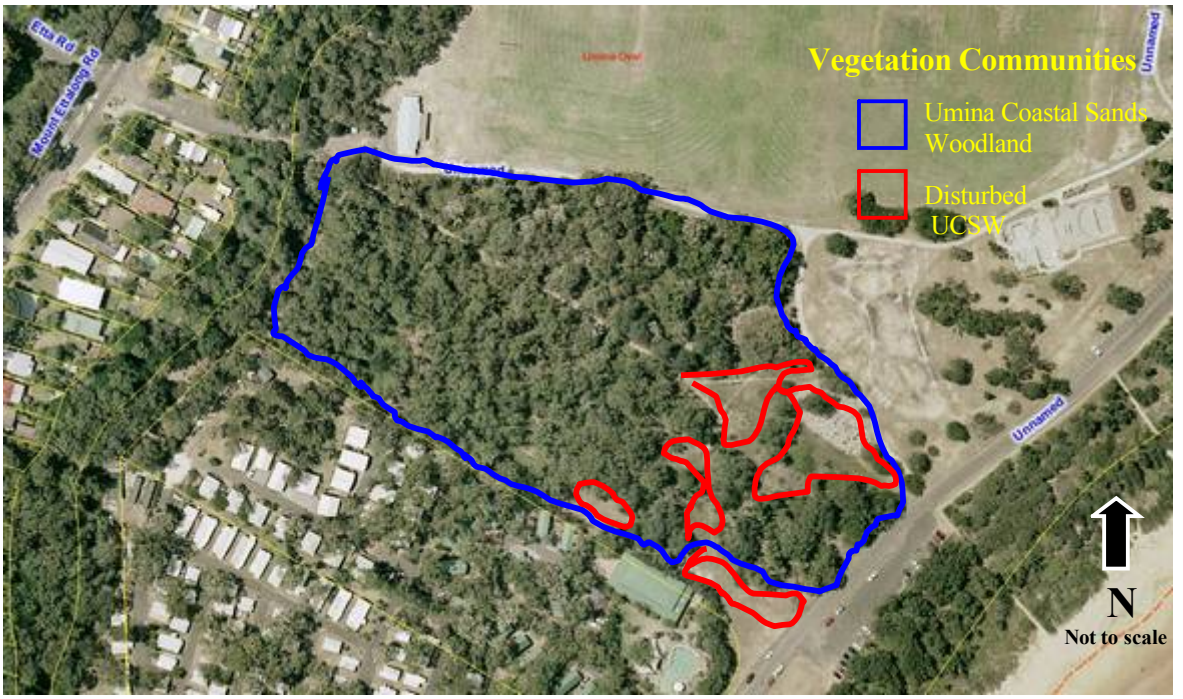
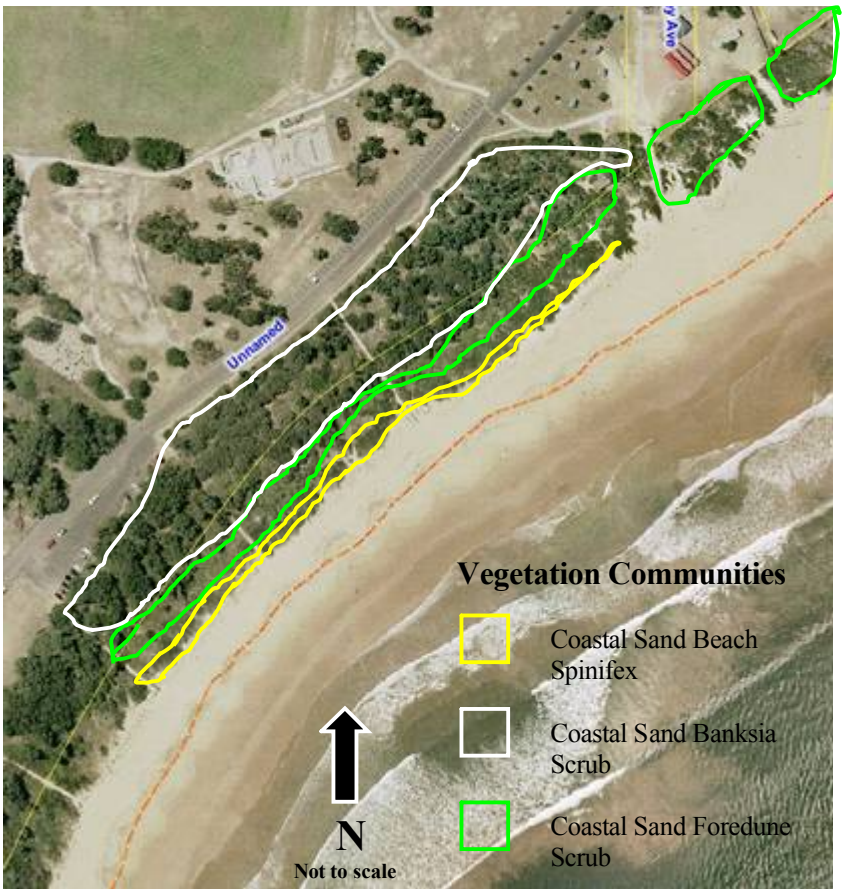


Figure 3; Vegetation Communities



Descriptions of extant vegetation communities

Coastal Sand Beach Spinifex (REMS Unit 53) National Parks and Wildlife Service (2000a)		
		
Key Species		
Family	**Species**	**Common Name**
Herbs and Ground covers		
	Scaveola calendulacea	Scaveola
	Carpobrotus glaucescens	Pig Face
Grasses		
Poaceae	*Spinifex sericeus*	Spinifex

Coastal Sand Foredune Scrub
(REMS Unit 50) National Parks and Wildlife Service (2000a)

Community Description: This community occupies the zone between the protected hind dune and the Coastal Sand Beach Spinifex on the incipient dune. It is a highly important zone as it traps vital reserves of sand able to meet erosion demand in storm conditions. (NSW Coastline Management Manual 1990). This community intergrades with the Coastal Sand Banksia Scrub within the hind dune, though *Acacia* is the dominant species with scattered emergents of species more common to the hind dune. It appears that at least in the north of this zone there is some successional change of this zone with Banksia recruitment in the foredune gradually broadening the Coastal Sand Banksia Scrub.

Key Species

Family	**Species**	**Common Name**
Trees and Shrubs		
	Acacia Sophorae	Coastal Wattle
	Acacia longifolia	Sydney Golden Wattle
	Monotoca elliptica	Tree Heath
	Banksia integrifolia	Coastal Banksia
Vines and Creepers		
Herbs and Ground covers		
	Scaveola calendulacea	Scented Fan Flower
	Carpobrotus glaucescens	Pig Face
	Crinum pedunculatum	Crinum Lilly
Grasses		
	Spinifex sericeus	Spinifex
Sedges and Rushes		
	Isolepis nodosa	Club Rush

Coastal Sand Banksia Scrub approx 1.8 ha
(REMS Unit E50b) National Parks and Wildlife Service (2000a)

Community Description: This community extends from the hind dune to the access road to the west. The dominant species in this zone is *Banksia integrifolia* and the zone maintains upper, middle and lower strata. Whilst the western boundary represents the cleared limit of this zone a few locations on the western edge of this zone contain *Eucalyptus botryoides* and species which would be expected in the ecotone between Coastal Sand Banksia Scrub and Umina Coastal Sands Woodland to the west. The mid layer of vegetation strata commonly contains *Monotoca elliptica, Breynia oblongifolia,* and *Leptospermum laevigatum. Lomandra longifolia,* is common in the understorey.

Key Species

Family	**Species**	**Common Name**
Trees and Shrubs		
	Banksia integrifolia	Coastal Banksia
	Banksia serrata	Old Man Banksia
	Eucalyptus botryoides	Bangalay
Vines and Creepers		
	Cassytha pubescens	Dodder
Herbs and Ground covers		
	Dianella caerulea	Dianella
	Lomandra longifolia	Matt Rush
Grasses		
	Entolasia stricta	
	Imperata cylindrica	Blady Grass
Sedges and Rushes		
	Isolepsis nodosa	Club Rush
	Juncus usitatus	

Umina Sands Coastal Woodland
(REMS Unit 33) National Parks and Wildlife Service (2000a)

Community Description:
This BMP includes only the portion of UCSW to the South of Umina Oval.Throughout much of the UCSW the dominant tree species are *Eucalyptus botryoides* and *Angophora floribunda.* Common understorey species include *Banksia serrata, Banksia integrifolia, Glochidion ferinandii, Acacia suaveolans, Acacia longifolia, Breynia oblongifolia, Macrozamia communis, Lomandra longifolia* and *Entolasia stricta.*

Key Species

Family	**Species**	**Common Name**
Trees and Shrubs		
	Eucalyptus botryoides	Bangalay
	Angophora floribunda	Rough Barked Apple
	Banksia integrifolia	Coastal Banksia
	Banksia serrata	Old Man Banksia
Vines and Creepers		
	Clematis glycinoides var glycinoides	Old Mans Beard
Herbs and Ground covers		
	Hydrocotyle peduncularis	Pennywort
	Commelina cyanea	Scurvy Weed
	Pomax umbellata	Pomax
Grasses		
	Microlaena stipoides var stipoides	Weeping Rice Grass
	Entolasia stricta	
Sedges and Rushes		
	Isolepis nodosa	Club Rush

4.5 Native Fauna

A fauna survey was beyond the scope of this Bushland Management Plan. The bushland on site forms a significant component of habitat linkage to the surrounding bushland remnants along Ettymalong creek, the nearby Brisbane Water National Park and the wider bioregion. Findings of a survey conducted by SWC Wetland and Management Consultancy in 1994 have been relied upon to complete the Fauna list contained within Appendix 2 of this report.

4.6 Threatened Species

No threatened fauna or flora species were located by GEM, however detailed flora and a fauna studies were beyond the scope of this study. It should be noted that the following species have been identified in other nearby areas of Ettymalong Creek. The site has been noted as potential habitat for the following species;

- Glossy Black Cockatoo
- Grey Headed Flying Fox
- Little Bittern
- Regent Honey eater
- Swift Parrot

SWC Wetland and Management Consultancy (1994)

A more detailed study of the current study area is required to determine the presence or absence of these and other threatened or vulnerable species in the current study area.

4.7 Weeds and Invasive Species

The following noxious weeds were identified on site;

Bitou Bush *Chrysanthemoides monilifera* subspecies *rotundata*	*Class 4*
Blackberry *Rubus fruticosus* aggregate species	*Class 4*
Bridal Creeper *Asparagus asparagoides*	*Class 4*
Crofton Weed *Ageratina adenophora*	*Class 4*
Lantana *Lantana camara*	*Class 5*
Mother of Millions *Bryophyllum delagoenese*	*Class 4*

A full list of current noxious weeds declarations within the Gosford LGA and their subsequent weed classes is available via the Department of Primary Industries website with the following link; www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/noxweed .

A host of other environmental weeds are present on site. .A plan detailing the weed distribution on site is included within Figure 3. Weed distribution throughout the site was surveyed and recorded via a modified version of the National Trust (NSW) method for weed infestation mapping. This method establishes relative level of weed distribution upon site as shown below;

Zone 1 – Red	70-100% Weed Density
Zone 2 – Orange	30-70% Weed Density
Zone 3 – Blue	10-30% Weed Density
Zone 4 – Green	1-10% Weed Density

The following observations have been made regarding the established zones of weed distribution;

Weed species are dispersed on site by a variety of means including wind blown dispersal, physical dispersal (via pedestrians, native and introduced fauna) and by the illegal dumping of garden waste. The fragmented and narrow shape of these bushland remnants combined with the dissection of vegetation communities by both formal and informal pedestrian access exposes extensive reserve edges to introduction of weed species.

Much of the weed distribution on site reflects the vulnerable shape of these remnants with grass weeds invading edges and creeping further into bushland interiors and the worst woody weed infestations evident around bushland edges.

4.7.1 Weed infestation within the Umina Sands Coastal Woodland

The northern boundary of this community adjoins Umina Oval for approximately 190 metres. There is currently no exclusion fence installed on boundaries to most of the UCSW. From the northern boundary the understorey of the UCSW is heavily impacted by an infestation of grass weeds stretching up to 70 metres into remnant bushland and infesting approximately 1.3 ha of the site. The lack of fencing adjoining Umina oval sees trampling of bushland edges from retrival of balls which fragments this edge vegetation and assists the spread of grass weeds in this area. This constitutes a serious threat to biodiversity in this EEC. Grass weeds are dominated by *Panicum maximum* though include *Ehrharta erecta* and *Paspalum dilatatum.*

Lantana camara forms dense infestations particularly in the far south west of the site and a patch mid way along the southern boundary where it forms over 70% weed density. Lantana currently infests approximately 0.42 ha. Bitou Bush *Chrysanthemoides monilifera* is mixed with these Lantana infestations though also occurs generally through the core of the remnant in a scattered, though not densely established, infestation covering approximately 0.5 ha. In the south of the zone scattered though dense patches of Asparagus Fern *Protoasparaugus aethiopicus* are establishing. Morning Glory *Ipomaea cairica*, a weed that can pose a significant environmental threat is present mostly in the south of the UCSW though appears to have not yet established extensively.

A range of other significant environmental weeds are present throughout the UCSW in scattered distribution including Fleabane *Conyza sp*, Cobblers pegs *Bidens pilosa* and *Acetosa sagittata*

4.7.2 Weed Infestation within the Umina Beach Dune System

The coastal dune systems of the site discussed within this plan cover approximately 3 ha. Seven beach access tracks dissect the dune vegetation and one observation deck and associated track about 100 metres south of Umina Surf Club.

Dumping of a wide variety of rubbish, including green waste, into bushland along the beach access road and car parking areas appears to have been the source of a great deal of weed incursion into the coastal dune area. A number of small areas adjoining the road alignment appear to have had patches cleared or burnt. These open edges are infested with weeds such as Lantana, Asparagus Fern, African Veldt Grass *Ehrharta erecta*, Turkey Rhubarb *Acetosa sagitatta*, Mother of Millions, Kikuyu Grass and exotic Geranium sp. Whilst the northern end

of this zone suffers generally from lesser heavy woody weed infestation these roadside cleared patches are heavily weed infested, aesthetically very poor and present a sense of degradation to the area.

The serious environmental weeds Bitou Bush and Lantana are also evident throughout the dunes. The worst weed infestations appear to be in the southern half of the coastal strip with dense Lantana infestations forming low wind blown patches at the dune crest and within the immediate protection of the hind dune. Lantana and Bitou Bush form dense patches over approximately 0.8 ha.

A number of small Coral Trees are scattered through the south of the zone. Other environmental weeds scattered throughout include *Bidens pilosa*, Morning Glory, Gazania, African Daisy and Fire weed.

In front of Umina Surf Club Council has engaged professional bush regenerators. As such environmental weeds appear to be more under control in this zone, though the low growing Coastal Sand Foredune Scrub in this area suffers from intermittent clearing and pruning, presumably aimed at maintaining views. This should be heavily discouraged within a potentially mobile dune system and these cleared patches open the area to erosion, dumping, pedestrian access and further weed invasion.

4.7.3 Weed Infestation within Disturbed Zone

As would be expected the disturbed zone to the east of the UCSW suffers most heavily from dense Lantana infestation and a host of pasture grasses and annual weeds. Couch Grass has established in the under storey adjoining the couch lawn to the immediate north of the caravan park.

Endemic tree line and canopy cover is patchy throughout and care must be taken that weed removal does not merely open these areas as open space in close vicinity to a BMX track. Little resilience or regenerative capacity is evident through much of the zone. Particularly in the eastern half of the disturbed zone revegetation works would appear preferable to regeneration works. Fencing these areas prior to clearing of weed cover would seem imperative to the success of any revegetation efforts in this zone. The fenced revegetation area to the north of the zone has greatly improved the aesthetics on this edge and appears to be establishing with no disturbance.

The more serious weed infestation threats to vegetation communities on site are detailed below;

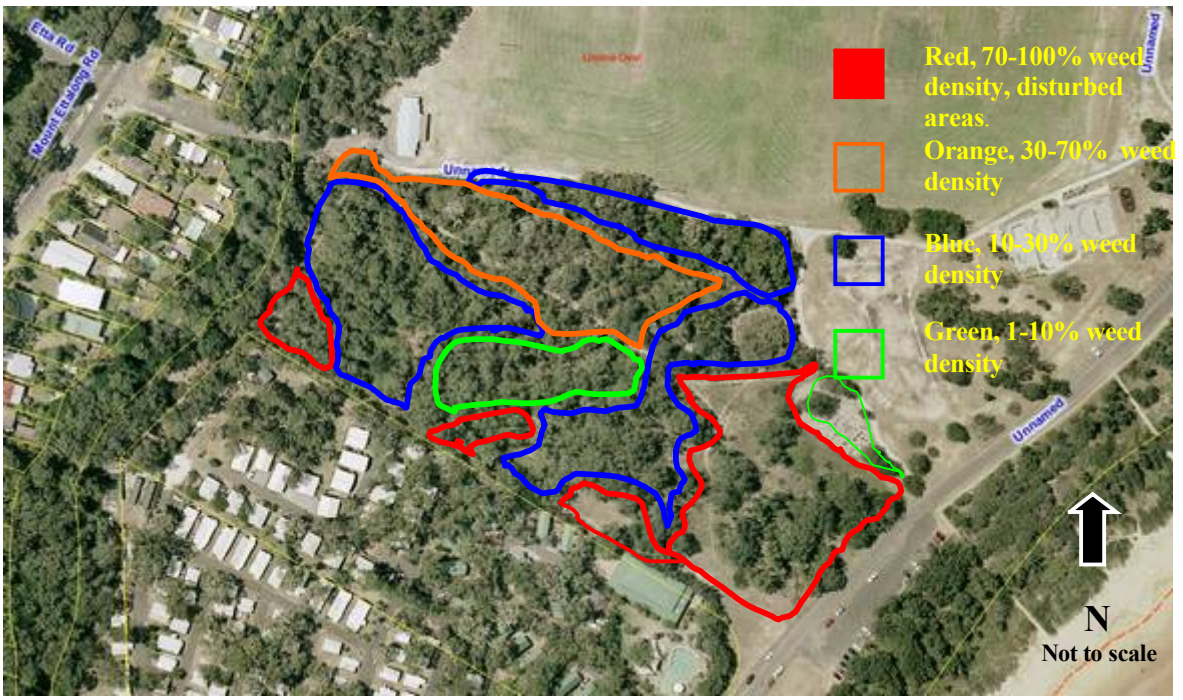
- Large areas of the Umina Coastal Sands Woodland (UCSW) have light to moderate Bitou Bush infestation, this weed of national significance is listed as a key threatening process under the Threatened Species Conservation Act. Bitou Bush establishes rapidly and has the potential to significantly alter the microclimate and natural ecological processes. Control of this woody weed is of high priority
- Heavy Lantana infestations are evident particularly in the south west and eastern edges of the UCSW as well as in pockets of the coastal dune system. This weed is also rated as of national significance and listed as a key threatening process under the Threatened Species Conservation Act. The potential of these heavy infestations to expand rapidly throughout the rest of the site makes control of this woody weed of high priority.

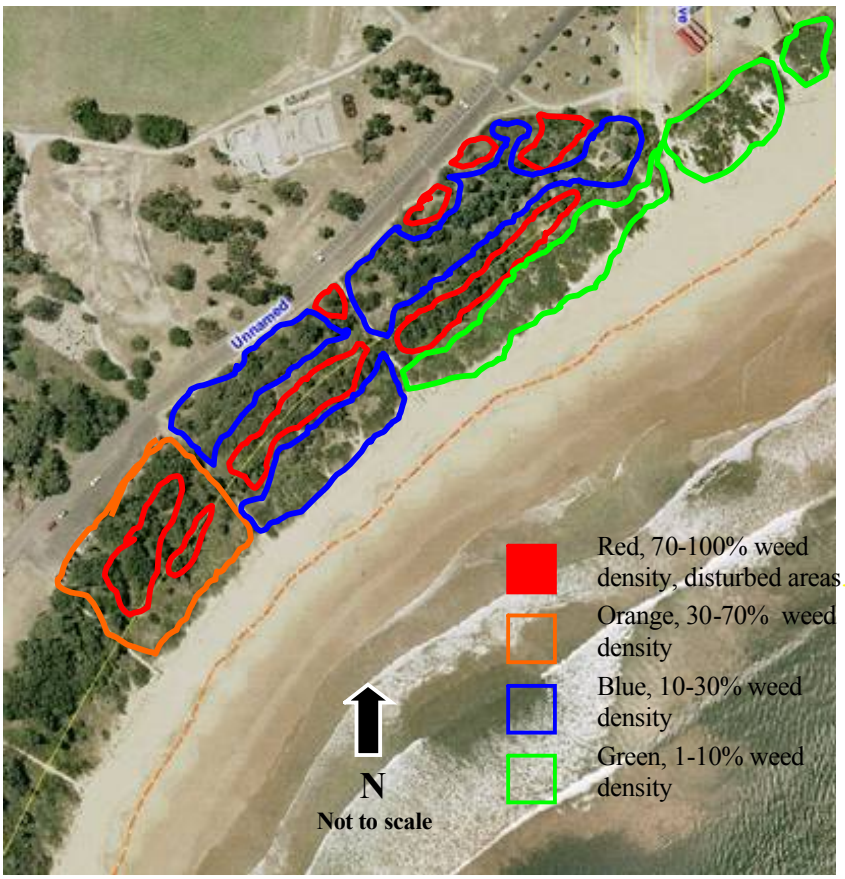
- The mixture of grass weeds including *Ehrharta erecta* and *Panicum maximum* have heavily infested the northern understorey of the UCSW adjoining Umina Oval. Control of these grass weeds is difficult to achieve. Much of this area does not include heavy infestation of the more obvious woody weeds, though these grasses appear to be having a significant impact on the endemic understorey and should be considered as a significant threat to ecosystem health.

Some comment on the distribution of major individual weed species has been included within the summary of individual management zones.

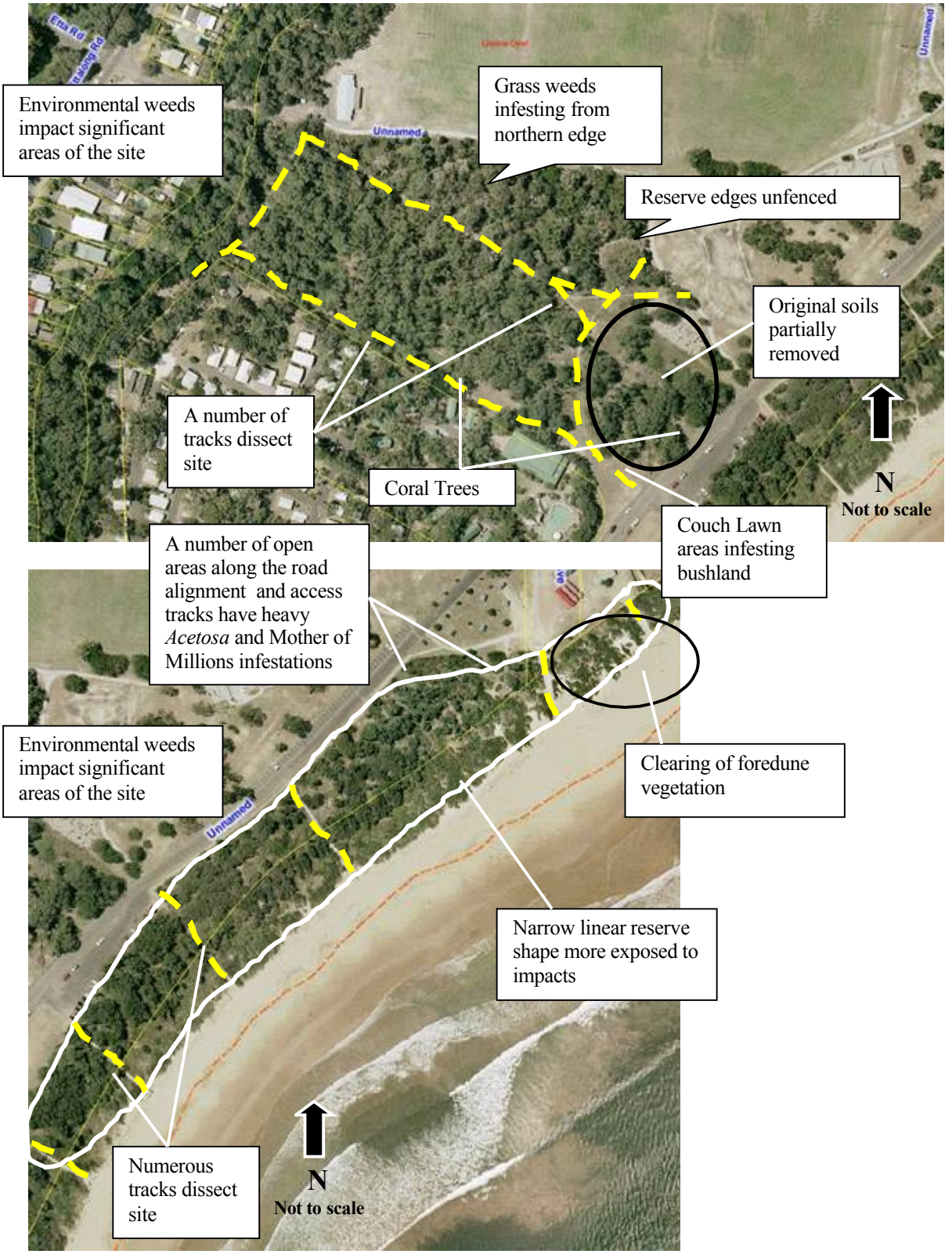
A full list of weed species recorded can be found within Appendix 3.

Figure 4; Weed Distribution




Unnamed
Red, 70-100% weed density, disturbed areas
Orange, 30-70% weed density
Blue, 10-30% weed density
Green, 1-10% weed density
N
Not to scale

5.0 ISSUES AND DISCUSSION



5.1 DECC RECOMMENDATIONS

The Department of Environment and Climate Change has established eleven priority actions in relation to the Umina Coastal Sands Woodland, these are listed below;

"

Description of priority action	Priority
Recovery strategy: <u>Assess threats and determine recovery strategies</u>	
Undertake conservation significance assessment for all remnants and prioritise sites for targeted funding and active management.	High
Recovery strategy: <u>Captive Husbandry or ex-situ collection/propagation</u>	
Collect seed for NSW Seedbank. Develop collection program in collaboration with BGT - all known provenances (conservation collection).	Medium
Investigate seed viability, germination, dormancy and longevity (in natural environment and in storage).	Medium
Recovery strategy: <u>Community and land-holder liaison/ awareness and/or education</u>	
Encourage community involvement in the implementation of on-ground actions to restore and protect sites (fencing, track rationalisation and bush regeneration).	Medium
Instigate program of interpretive walks within UCSW remnants to raise community awareness about its values.	Medium
Prepare resource kit on UCSW for schools in the Umina area.	Medium
Recovery strategy: <u>Conservation Status Review</u>	
Nominate UCSW as an EEC under the EPBC Act.	High
Recovery strategy: <u>Develop and implement protocols and guidelines</u>	
Department of Education and Training to prepare a management plan for remnants at Umina High School.	High
Gosford City Council to prepare and implement a Plan of Management for all remnants on community land such as Umina Recreation area, McEvoy Oval and Little Patonga Beach in accordance with Local Government Act.	High
Prepare best practice guidelines and educate Council staff working in or near remnants.	Medium
Recovery strategy: <u>Habitat management: Fire</u>	
Include or review the hazard reduction conditions on the Threatened Species Hazard Reduction List.	Low
Recovery strategy: <u>Habitat management: Ongoing EIA - Advice to consent and planning authorities</u>	
Prepare community profile and EIA guidelines to assist Council and other approval bodies in determining development applications.	High

Recovery strategy: <u>Habitat management: Site Protection (eg Fencing/Signage)</u>	
Control access to remnants by erecting fencing and gates and redirecting or closing tracks.	Medium
Recovery strategy: <u>Habitat Rehabilitation/Restoration and/or Regeneration</u>	
Undertake rehabilitation works at degraded sites using approved bush regeneration techniques.	Medium
Recovery strategy: <u>Research</u>	
Determine location, species composition and threats to remaining remnants to assist with prioritising restoration works.	Medium
Undertake management-focused research (including investigation of an appropriate fire regime and viability studies).	Medium
Recovery strategy: <u>Survey/Mapping and Habitat assessment</u>	
Accurately survey and map the extent and condition of all remnants."	High

(DECC website)
www.environment.nsw.gov.au/determinations/UminaCoastalSandplainWoodlandEndComListing.htm

Many of the recovery strategies have been implemented to differing degrees and most lie outside the scope of this plan or are the responsibility of other agencies. Where such strategies fall within scope of this Management Plan they have been relied upon to instruct management recommendations within this plan. An effort has been made to apply some of the wider priority actions at this site level though largely their application is for the entire extant UCSW.

The management recommendations within this Bushland Management Plan have sought to ensure consistency in the application to this site of all DECC recommendations. Below are the relevant UCSW DECC priority actions within the scope of this plan and some reference to their implementation within this plan;

Relevent Priority Action	**Recommendations within BMP**
Community Awareness	Install Interpretive Signage Community planting days
Site Protection	Installation of fencing /bollards to exclude mowing, bicycles and pedestrians Track closure
Habitat Restoration	Implement 5 year bush regeneration /revegetation plan. Linkages of remnant vegetation recommended within study area
Research	Implement monitoring of all rehabilitation works and pre and post fire surveys
Mapping / Habitat Assessment	Initial weed density mapping and observations for site. Ongoing monitoring and updates of weed status

The Department of Environment and Climate Change has also published a 'Restoration and Rehabilitation Management Plan for Umina Coastal Sandplain Woodland', Department of Environment and Climate Change (NSW), 2007.

5.2 Bushland Regeneration / Weed control

The Australian Association of Bush Regenerators (AABR) provides the following definitions for bushland rehabilitation techniques:

> *"Revegetation* refers to planting, transplanting, seeding, brushmatting or other human introduction of plant propagules to establish native vegetation.
> *Regeneration* refers to allowing natural processes to establish native vegetation, with or without assistance, without introducing plant propagules.
> *Reconstruction* is where resilience has been depleted and conditions require major works before the ecosystem can function again.
> *Fabrication* is the construction of a vegetation community at a site where conditions are permanently changed and the original ecosystem lost."
>
> (AABR 2005)

Regeneration of native species and plant communities is largely dependant on the presence of a viable seed bank. Seed may be held within an ecosystem within the soil (many native seeds can remain viable in undisturbed soil horizons for decades). Seed may be stored by obligate seed plants and released after fire events (such as some Banksias, Hakeas and many more species) or held and released annually or intermittently as with many Eucalypt species. Seed and other propagules can be dispersed by local fauna, wind or water movement. Many species such as Eucalypts form underground lignotubers which re-sprout after fire or the cessation of disturbances such as mowing or grazing as well as sprouting from epicormic buds beneath their bark layer. Other species such as Grass Trees *Xanthorea* sp simply sprout back after fire.

Once it has been established that a site has a viable seed / propagule bank and no clear impediments to its regeneration it may be regarded as having a level of resilience in proportion to the available seed and vegetative resources present. It is always preferable to utilize regeneration as a priority wherever this form of rehabilitation is viable.

AABR policy states that

> "The benefits of protecting and rehabilitating existing native vegetation far outweigh those of establishing new vegetation in previously cleared areas…….. Regeneration may be assisted by human interventions such as weed removal. It is quicker and cheaper to protect healthy sites by regeneration than to revegetate degraded sites."
>
> (AABR 2005)

A major priority for allocation of resources for works addressed within this Bushland Management Plan should be upon bush regeneration activities within areas of adequate resilience. There are some key guiding weed control principles which can be relied upon for these works throughout the site.

1. Take advantage of optimum areas of resilience within the site
The resilience of the native species to regenerate in more open, severely degraded, weed infested areas of the site should be assessed as low in comparison with areas maintaining an intact native canopy and well represented native ground strata vegetation. As best results are likely to be achieved in areas already with healthy native vegetation, works within and extending out from these zones are the first priority for fast, inexpensive and effective regeneration results. Implementation of works within the areas of lower resilience should be recognised as often the most difficult and time consuming approach and in some cases may require a more 'landscape' approach including plantings to fabricate the adjoining native vegetation community.

2. Avoid over stretching resources
Some key considerations should be made in prioritising works. It is important not to undertake more works than can be maintained. Whether works are carried out by volunteer or contract labour it is important that a long term approach be taken and a serious emphasis be given to maintenance of all works commenced.

3. Monitor weeds on site, target problems as they arise
Whilst the bulk of works may be directed towards the areas of highest resilience, targeted works are also important throughout all zones. Noxious weeds such as Cobblers Pegs *Bidens pilosa* can be targeted to contain their spread. Removal of exotic vines strangling canopy natives, de-seeding of annual weeds and regular monitoring of weed status throughout can be easily carried out to ensure the weed problems are contained as much as possible.

4. Implement current best practice
It is always important to implement current best practice approaches and adhere to legislative changes to weed control techniques such as those contained within the pesticides legislation. Additionally, there are changes taking place continually in the search for more efficient and effective ways to control weeds and restore native vegetation.

5. Conducting rehabilitation works in an EEC
Whilst the intention of bush regeneration works within the EEC is clearly to improve and not harm the community, such works create the potential for accidental harm to occur. As such serious consideration must be given by those undertaking bush regeneration works as to applying for a section 132c License under the *National Parks and Wildlife Act 1975*. Parties undertaking works on site must ensure compliance with all relevant legislation and licencing obligations. All works should be carried out after first ensuring compliance with the issues raised within the *Checklist For Bush Regeneration Activities In The Habitat Of Threatened Species, Endangered Populations And Endangered Ecological Communities* available from the DECCW website. A copy has been attached within Appendix 5 of this plan.

5.3 Revegetation
Some disturbed areas upon site have very poor resilience or ability to regenerate, in these areas revegetation is the most appropriate method of bushland rehabilitation.

In re-vegetating cleared or degraded areas it is important to take all steps to maximise the endemic biodiversity of the site and no actions should be taken which drastically change the floristic and genetic integrity of the bushland.

Any revegetation works will require some timely planning with collection and propagation of native seed from within the catchment often necessary up to six months out from the projected time for revegetation on site. Most seed is available in reasonable quantities over the spring and summer months. All seed collection should be carried out in accordance with the Florabank guidelines set out within www.florabank.org.au.

The areas of site in which revegetation is most appropriate is within the disturbed UCSW zone to the east of the UCSW and within the open areas along the western boundary of the dune vegetation. The goal in these revegetation works should be to restore connectivity within the vegetation communities and thus improve the 'edge effect' for remnant vegetation. Such effort could improve the fauna habitat values, aesthetics and public perception of the area. Planning and timing of revegetation works is critical to their success, fencing will need to be installed /repaired and seed will need to be collected in advance by a suitably licensed collector. Resources should be adequately allocated for planting works and maintenance.

All strata of the surrounding vegetation communities should be well represented, ie dominant tree species, shrub and ground layer. Efforts must be made to ensure that weed propagules or pathogens are not introduced to site. See Phytophthora controls below.

Detailed records should be kept of planting supply, species, provenance and survival rates / success of revegetation works.

5.4 Phytophthora Hygeine protocols

Phytophthora cinnamomi causes a root rot disease, die back and eventual death of trees and other plants. Often death is also associated with other impacts upon tree health such as droughted or inundated conditions, insect attack, microclimatic changes from weed invasion and possibly the lack of fire. Spores are soil borne and therefore can easily be transported in soil material on boots, vehicles, tools and in nursery plant material.

Dieback caused by *Phytophthora* is listed as a 'Key Threatening Process' under the NSW *Threatened Species Conservation Act 1995* and the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999*

The Sydney Botanic Gardens Trust has developed Phytophthora protocols applicable for works in bush regeneration, these are provided below;

"

- Provide hygiene protocols and induction to all new workers, contractors and volunteers
- Assume the area you are entering in is free of *P. cinnamomi* unless otherwise tested and understand that your activities have the potential to introduce *P. cinnamomi*
- To avoid introducing infection, before entering uninfested sites remove excess soil and mud and then spray boots, tools, gloves and small equipment with recommended disinfectant until runoff is clear
- To avoid spreading *P. cinnamomi*, when leaving infested sites remove excess soil and mudand then spray boots, tools, gloves and small equipment with methylated spirits or disinfectant until runoff is clear
- Plan works so they begin in non- infested sites and then move on to infested areas

- Use coloured tape to label tools when working in infested sites. Remove tape once tools have been cleaned
- Do not work on a site if the soil is saturated and mud is likely to adhere to footwear and tools
- Avoid unnecessary soil disturbance
- Do not import plants unless they are from nurseries accredited with Nursery Industry Accreditation Scheme (NIASA)
- On infested revegetation sites, plant species known to be resistant to *P. cinnamomi*
- Use mulch sourced from disease free native trees and taken from at least one meter above ground level
- Never import soil or gravel unless it is certified to be free of *P. cinnamomi* by plant disease diagnostic laboratory
- All materials removed from a site must be bagged and taken to landfill
- Do not drive or park vehicles or trailers off established tracks
- Use vehicle wash down stations when available
- Ensure effluent from wash down stations does not drain into bushland
- Restrict access in high value areas, particularly if autonomous spread is unlikely to occur"

(Liew and Suddaby, 2008)

It is recommended to use non corrosive disinfectants such as Coolacide®, Phytoclean® or Biogram® for cleaning footwear, tools, tyres, and other items in contact with soil._ 70% Methylated spirits in spray bottle can be used for personal use. Whilst Sodium Hypochlorite 1% is very effective it can damage clothing and degrades rapidly in light. (Liew and Suddaby, 2008).

5.5 Determining Restoration Strategies

In determining the regeneration potential or 'resilience' of a site a number of factors can be analysed. These factors have been detailed below in relation to Management Zones identified on site within '6.3 Management Zones'.

Resilience factors for consideration, Umina

Landscape / Ecological Factor	Management Zone 1	Management Zone 2	Management Zone 3	Management Zone 4
Intact Canopy (ie; native species well represented)	Yes	Yes	Yes	Highly fragmented
Canopy species regenerating on site	Yes	Yes	Yes	Few
Intact Shrub layer (ie; native species well represented)	Yes	Yes	Yes	No
Shrub species regenerating on site	Yes	Yes	Some regen	No
Intact ground layer (ie; native species well represented)	Yes	Partially	Partially	Very limited
Ground layer species regenerating on site	Yes	Yes	Yes	Rare, restricted to boundary

				with UCSW
Regeneration observed after application of standard bush regeneration practices on site	No work conducted	Yes	N/A	No work conducted
Fill / imported soils	No	No	No	No
Original Soils	Yes	Yes	Yes	Some topsoil removed
Ongoing / current disturbance	Yes	In some locations	Yes	Yes
Weed infestation severely altering microclimate	No	No	No	No

Adapted from Department of Infrastructure, Planning and Natural Resources. (2003b)

The most efficient application of resources and most sound ecological approach seeks to assist the natural regeneration of the extant remnant vegetation and minimise interference in the natural processes of regeneration and vegetation succession. Burton, R (2005) concludes that;

"Revegetation measures should only be considered when:

- the regeneration potential of a site has been wholly or severely depleted
- attempts to trigger regeneration of soil-stored seed by a range of techniques have failed
- key missing species can not be naturally recruited to an area"

Burton, R (2005)

Zone 4 represents the least likely zone within the site to be capable of restoration without taking revegetation measures. Importantly, it should be noted that a range of approaches and results should be adapted to the differing zones on site. A variety of responses can be expected in the different zones. The management zones on site are arranged in order with the zone of highest resilience as Zone 1 to the zone of least resilience Zone 4.

5.6 Fire in the ecosystem

There is some faint evidence on site of blackening of trunks, which would appear to have been from fire many years previous, though there is little record of any fire in the reserve in recent times. The predominantly old senescent *Banksia serrata* and the common recruitment of mesic species such as *Glochidion ferdinandii* on site are also possible indicators that there has been a lengthy interval between fire events on site.

Records should continue to be kept of all fire events within the reserve, to be held by both the Department of Environment Climate Change and Water and Gosford City Council. Currently much of the evidence of current fire regimes is via anecdotal testimony such as the memory of local residents. The compilation of a clear picture of the regime would be invaluable in better understanding the extent to which fire should be controlled in better managing the UCSW.

Local Botanist, Robert Payne had the following observations regarding fire within this site;

- "Fire has not occurred in the vegetation under consideration for at least 35 years.
- On the sandplains we know that wildfire occurred in 1932, 1948, 1990, 1992 & 2006. The early fires burnt over the sandplains but the latter fires do not because of our fire fighting capabilities. A fire regime of about 13-15 years seems plausible.
- I believe the vegetation should now be burnt as it is long overdue otherwise we will run into this successional problem with not only the cheese trees……..but also with Clerodendrum tomentosum and poor recruitment of other species."

(Payne R, 2009. Personal Communication)

Determining a suitable fire regime in the UCSW is instructed to a point by the determinations on hazard reduction within this EEC in the 'Threatened Species Hazard Reduction List - Part 3 - Endangered Ecological Communities'

In accordance with the *"Rules and Notes for the implementation of the Threatened Species Hazard Reduction List for the Bush Fire Environmental Assessment Code";*

> *"* if using fire, at least 50% of the endangered ecological community within each local government area (LGA) must exist in a state that has been burnt less frequently than the minimum fire interval.*"*
>
> Rural Fire Service (2004)

The Threatened Species Hazard Reduction List declares that UCSW EEC should have; "No fire more than once every 10 years" and for mechanical hazard reduction "No slashing, trittering or tree removal"

Rural Fire Service (2004)

Gecko Environment Management would recommend a precautionary approach with any burns being conducted in a mosaic fashion in small patches over many years as the possibility of arson events shortening that fire interval is high.

Actual planning of the location of such fires would have to be carried out close to the time of implementation with due consideration given to;

- Flora to be targeted
- Post fire opening of edges to possible disturbance
- Resources for post fire maintenance

Any burns should be seen as a valuable scientific opportunity with pre and post fire detailed vegetation surveys recommended. Gosford Council should consult with the Rural Fire Service, The Department of Environment Climate Change and Water and the Royal Botanic Gardens Sydney in developing a fire plan.

It should be noted that a Species Impact Statement must be prepared where a proposed activity is assessed as likely to have a significant impact on threatened species, populations or an ecological community.

5.7 Illegal Dumping

The illegal dumping of both general and garden waste is evident on site in numerous areas. The car parks and beach access roads are predictably common dumping sites. Dumping introduces weeds and pollutants to site and negatively impacts the aesthetics and image of the area contributing to a sense of degradation. Efforts should be made to remove rubbish from site and prosecute offenders.

Photo Above: Taken at the beach car park adjoining the UCSW this photo shows car tyres, garden waste and building materials are amongst the rubbish illegally dumped on site.

5.8 Other disturbances/ impacts

A range of disturbance has impacted the site over many years.

- Development of adjoining caravan parks, oval and roads has seen the local bushland significantly fragmented.
- The disturbed zone to the south west of the UCSW has suffered from topsoil removal (Payne.R. 2009 pers comm).
- Mowing of bushland edges appears to have gradually extended couch lawn areas into the fragmented remnant vegetation at the south east of the site
- Dune vegetation in front of the Umina Surf Club has been impacted upon by pedestrian trampling within the fenced area, unauthorised clearing and pruning (presumably for views) rubbish dumping and occasional fire lighting. These activites threaten sensitive dune vegetation and could cause serious beach erosion issues.
- Signage and much of the infrastructure installed in the area has regularly been targeted with vandalism and graffiti.

5.9 Tracks and Fencing

Dune fencing has been installed around the inland side and access tracks within the coastal dune vegetation communities. Fencing in a number of locations and particularly within the curtilage of Umina Surf Club is in disrepair and possibly due for replacement. It is a recommendation of the *Broken Bay Beaches Coastal Management Study and*

Coastal Management Plan (Patterson Britton and Partners, 1999), that apart from in front of Umina and Ocean Beach Surf Clubs, dune fencing not be replaced along the ocean side of the dunal system.

Apart from a small fenced area at the Etta Road entrance and fencing installed around recent plantings adjoining the BMX track, no fencing has been installed to restrict pedestrian access and other impacts to the perimeters or tracks of the UCSW EEC.

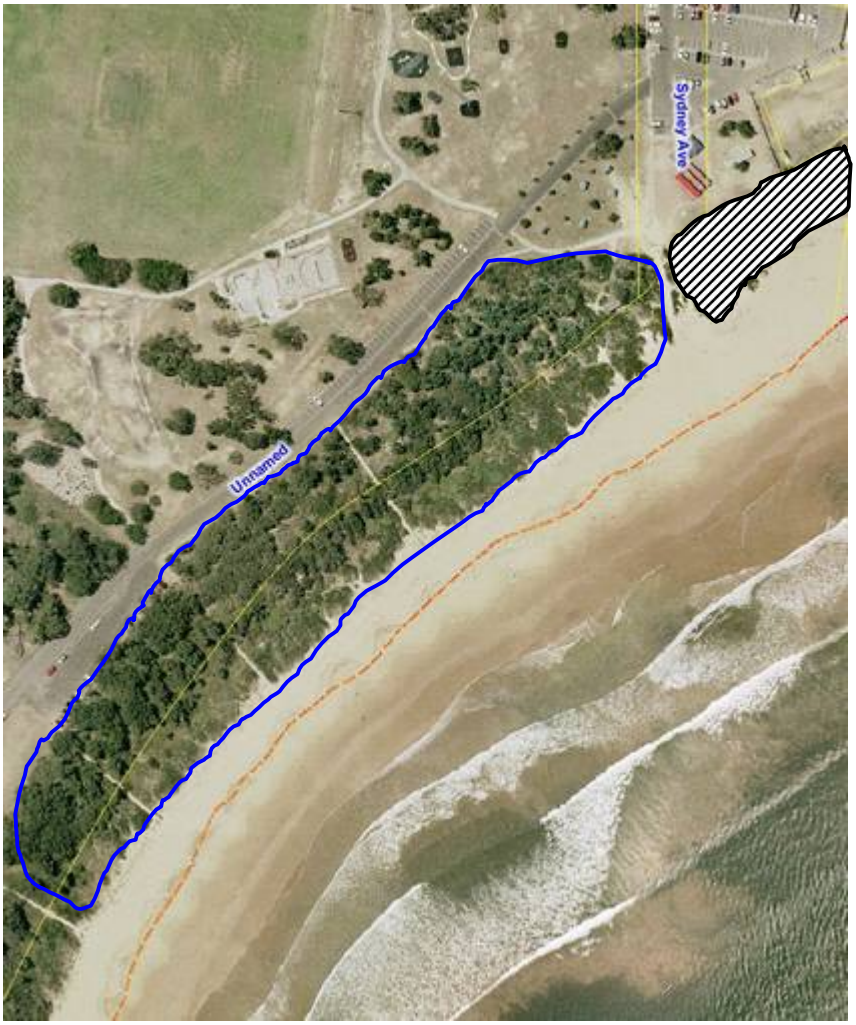
Any revegetation efforts in the open disturbed area to the east of the remnant UCSW would require the protection of fencing prior to commencing revegetation works.

5.10 Natural areas/ recreational facilities interface

All development of areas within the recreational precinct should give due consideration to possible impacts on the adjoining UCSW EEC. Some opportunities exist in landscape design for such works to utilise local native species to enhance the edge effect impacting upon remnants throughout the study area and install landscaping in context with the local environment.

6.0 Management Zones

Figure 5; Management Zones



Management Zones

6.1 Management Zone 1 UCSW

Northern UCSW Management Zone 1	
Priority Ranking	1

Management Zone Description; This zone encompasses the entire area of intact Umina Coastal Sands Woodland within the scope of this plan. The zone is bound by Umina Oval to the north, the caravan park to the south, Ettymalong Creek to the west and Disturbed ground and the caravan park access road to the east.

This area suffers heavily from weed infestation, the poor edge effects encountered are compounded by two pedestrian tracks penetrating the site.

Vegetation Communities (Corresponding to Bell)	**EEC**
Umina Coastal Sands Woodland	Yes

Major Weed Species Present

Species	**Comments / Distribution**	**GCC Noxious rating**	**Key Threatening Process**	**Priority**
Erythrina X Sykesii	A few specimens, one large tree along southern fence line and another about 20m to the NE of fence line tree			M
Lantana camara	Scattered throughout the UCSW though the heaviest infestation is in the south west of the zone where it comprises approximately 70% of the heavy weed infestation	Yes	Yes	H
Chrysanthemoides monilifera	Scattered throughout often with Lantana though not in extreme infestations, a moderate infestation of Bitou Bush extends throughout the core of this zone	Yes	Yes	H
Senna pendula	Isolated occurrences with a small grove about half way along the southern boundary			H
Senecio madagascariensis	Uncommon, though more prevalent on the outer edges of the zone			L
Bidens pilosa	Mostly restricted to disturbed edges			L
Asparagus aethiopicus	Isolated patches throughout with the greater density being along the southern boundary			M
Ochna serrulata	Uncommon isolated plants throughout			H
Ehrharta erecta	Patches throughout			L

Ehrharta longifolia	Uncommon, mostly present on southern boundary			L
Panicum maximum	A serious weed throughout much of the zone, creeping in from the north with its worst infestation between the track and oval and beyond the track in the north west			H
Eragrostis curvula	Amongst the *Panicum* infestation and in open ground and edges to zone			M
Other issues				
The mesic native tree *Glochidion ferdinadii* appears to be increasing in population and cover abundance throughout and forming groves which would in future shade out understorey and alter the Woodland microclimate. Whilst simultaneously there appears to be poor recruitment of *Banksias serrata* with most specimens very large and a number becoming senescent. These are possible indicators for a currently low and possibly detrimental fire frequency on site.				

6.2 Management Zone 2

Coastal dune system management Zone 2	
Priority Ranking	1

Management Zone Description; This management zone encompasses the successional coastal dune systems and the three extant vegetation communities. This area suffers heavily from a history of dumping, historical clearing of its surrounding broader vegetation associations and the resulting narrow linear shape of this remnant. Whilst weed infestation is significant throughout this zone the native vegetation community maintains good regeneration resilience with the general integrity of vegetation structure maintained throughout much of the zone. There are a few heavily weed infested open cleared areas adjoining the beach access road.

Vegetation Communities (Corresponding to Bell)	**EEC**
Coastal Sand Banksia Scrub (REMS Unit E50b)	-----
Coastal Sand Foredune Scrub (REMS Unit 50)	-----
Coastal Sand Beach Spinifex (REMS Unit 53)	-----

Major Weed Species Present

Species	**Comments**	**GCC Noxious rating**	**Key Threatening Process**	**Priority**
Lantana camara	Scattered throughout the dune system though the heaviest infestation is in the south of the zone. Lantana has established low windblown though dense patches within the foredune and taller patches within the more protected Banksia Scrub	Yes	Yes	H
Chrysanthemoides monilifera	Scattered throughout often with Lantana	Yes	Yes	H
Bidens pilosa	Scattered throughout			L
Asparagus aethiopicus	Isolated though dense patches throughout, more extensive in the south of the zone			M
Ehrharta erecta	Patches throughout			L
Erythrina X Sykesii	A few small trees to southern half of zone along beach access tracks			M
Acetosa sagittata	Patches throughout			L
Bryophyllum delagoenese	Mother of Millions forms significant patches from dumping in cleared pockets along the beach access road	Yes		H
Other issues				
Rubbish dumping represent a constant incursion of possible hew weeds to this site. All rubbish should be removed from site for council pick up and disposal in an approved landfill				

6.3 Management Zone 3

Umina Dunes Management Zone 3 – Surf Club Precinct	
Priority Ranking	1
Management Zone Description This zone comprises the incipient and fore dune area within the vicinity of the Umina Surf Club. This area is a highly utilized area by the public and Surf Life Saving Club. This area suffers from clearing, small fires and rubbish dumping. This zone has received periodic bush regeneration works.	

Vegetation Communities (Corresponding to Bell)	**EEC**
Coastal Sand Foredune Scrub (REMS Unit 50)	------
Coastal Sand Beach Spinifex (REMS Unit 53)	------

Major Weed Species Present

Species	**Comments**	**GCC Noxious rating**	**Key Threatening Process**	**Priority**
Chrysanthemoides monilifera	Much of this weed has been controlled though a few patches remain in this zone	Yes	Yes	H
Lantana camara	Much of this weed has been controlled though a few patches remain in this zone	Yes	Yes	H
Asparagus aethiopicus				H
Ehrharta erecta				M
Acetosa sagittata				M

Other issues	
The surf club has expressed a desire for environmental weeds to be removed from this zone, and a concern as to safety issues regarding visibility of the water from the club. This area contains Coastal Sand Foredune Scrub and this low growing community should be conserved.	

6.4 Management Zone 4

Disturbed UCSW area adjoining UCSW. Management Zone 4				
Priority Ranking	2			
Management Zone Description This zone comprises the area adjoining the eastern boundary of Zone 1 to its west and the beach / caravan park access road to the east.				
Vegetation Communities (Corresponding to Bell 2004)	**EEC**			
Disturbed area with fragmented representation of both UCSW and Coastal Sand Banksia Scrub communities	-------			
Weed Species Present				
Species	**Comments**	**GCC Noxious rating**	**Key Threatening Process**	**Priority**
Erythrina X Sykesii	A few specimens, one large tree along the road edge to the east of zone			M
Lantana camara	Very heavy infestations throughout this zone	Yes	Yes	M
Chrysanthemoides monilifera	Scattered throughout amongst Lantana.	Yes	Yes	M
Senna pendula	Isolated occurrences with a small grove about half way along the southern boundary			M
Senecio madagascariensis	Infestation patches throughout this zone			L
Bidens pilosa	Infestation patches throughout this zone			H
Asparagus aethiopicus	Some patches amongst Lantana			H
Ochna serrulata	Uncommon isolated plants throughout			H
Ehrharta erecta	Infestation patches throughout this zone			L
Ehrharta longifolia	Infestation patches throughout this zone			L
Panicum maximum	Infestation patches throughout this zone			M
Cynodon dactylon	Lawn areas spreading and heavily infesting this zone, primarily from the Southern corner			M
Other issues				
This zone is dissected by a number of tracks and cleared pockets, it is open to push bikes and pedestrians in many areas and caution must be taken as wholesale weed removal would expose a large open area. As such some large woody weeds are given a lower priority unitl fencing can be installed. This zone also represents a disturbed and fragmented area disrupting a vegetative link between the UCSW and the coastal dune system.				

7.0 MANAGEMENT RECOMMENDATIONS

7.1 Parties undertaking works

It is envisaged that works recommended within this plan may be implemented by a range of organizations under the management of Gosford City Council including local bushcare groups such as the Ettymalong Creek Landcare Group, Council Staff, Greencorps teams and professional bush regenerators. It is important that all works are closely supervised and all parties have an understanding of the aims, objectives, recommendations and obligations detailed within the Bushland Management plan.

7.2 Limitations of this Bushland Management Plan

This Bushland Management plan is limited in its scope to the extant bushland specified within the Umina recreation precinct. No design input has been included into adjoining recreation works underway or the broader management of UCSW within the Gosford LGA. It is recommended, however, that all works in adjoining areas should incorporate a design emphasis upon enhancing the conservation and recovery of the UCSW EEC.

In concurrence with recommendations made by the NSW Scientific Committee in making the Final Determination of UCSW as an EEC and with recommendation made within the 'Restoration and Rehabilitation Management Plan for Umina Coastal Sandplain Woodland' (DECC, 2007), this plan recommends Gosford Council prepare a BMP addressing all UCSW within the Gosford LGA. This would enable development of a cohesive plan and identify opportunites to best conserve this valuable endangered ecological community.

7.3 Minimum Qualifications for Bush Regeneration Contractors

Bush regeneration and revegetation work must be carried out competently by experienced and qualified bush regenerators. Contractors and Council must ensure responsible parties for these works and associated seed collection and propagation are suitably licensed and qualified.

Chosen bush regeneration contractors should be eligible for membership of the Australian Association of Bush Regenerators (AABR). Team members should meet the following criteria:

- Field Supervisor – minimum Bush Regeneration TAFE Certificate II plus Certificate IV or equivalent, and 2 years or greater than 200 hours of bush regeneration experience in similar vegetation communities.

- Bush Regenerator – with a minimum of a Bush Regenerator TAFE Certificate II and 2 years or greater than 200 hours of bush regeneration experience in similar vegetation communities.

- Trainee Bush regenerator – Substantial completion of the majority of the Bush Regenerator TAFE Certificate II

Works should be completed in accordance with standard TAFE NSW Bush Regeneration practices, with consideration given to *The Checklist For Bush Regeneration Activities In The Habitat Of Threatened Species, Endangered Populations And Endangered Ecological Communities (DECCW).* Contractors should follow best practice at the time of implementation of works. At the time of report preparation, *Bringing the Bush Back to*

Western Sydney, Best Practice Guidelines for Bush Regeneration on the Cumberland Plains (DIPNR 2003) should be instructive as a relevant guideline.

7.4 Recommended Sequence of Works

This management plan has been formulated with a view to works requiring implementation over at least a five year period. In the first year of implementation approximately $70000.00 in grant funding has been allocated to bushland rehabilitation works within the study area and a further $6000.00 for interpretive signage in bushland on site.

Priority has been given to effective suppression of the most threatening weed infestations on site and on revegetating links in the disturbed open areas at the East of the UCSW and within the coastal dune areas. The proposed sequence of works seeks to address the key issues on site and ensure the maintenance of all areas worked. Resources are unfortunately characteristically limited in natural resource management and the plan seeks to achieve realistic goals whilst necessarily recognizing that without significant increases in available funding some issues must remain as future priorities. Management of this area into the future should sustainably allocate resources by ensuring the successful control of weeds or establishment of revegetation areas already undertaken.

Future available resources are unknown throughout the life of this plan and priorities established have been formulated with a view to consolidating works implemented within the first year and preventing further deterioration of these priority issues.

7.5 Bushland Management Work Plan

Zone	Issue	Year/Time Frame#	Recommended Action	Priority	Responsibility
Zone 1 UCSW	Bitou and Lantana infestations predominantly on edges	1	Remove via cut and paint from inner areas of higher resilience to outer edge infestations	H	Bush regeneration contractor
			For dense patches some Glyphosate 'Biactive' herbicide spraying of Bitou could be used in winter at low rates of 1:200, or Low Volume application as per label	H	
	Asparagus Fern infestations	1	Crown /dig out and remove propagules	H	
		1-5	Maintenance of all previous works	H	
	Grass weeds infestation into bushland from northern edge	1	Bush regeneration works from southern edge of infestation working in northern direction, removing weeds from areas of higher resilience first	H	Bush regeneration contractor
	Senescent Banksias/ Lack of fire	As applicable	Plan for >10 year fire regime. Incorporate *B.serratta* into any revegetation works in adjoining other zones.	M	Council to investigate together with other public authorities
	Impact from pedestrian tracks	1-2	Investigate future funding options	H	Council
			Close southern fence line track	H	Council
			Formalise northern track, install dune fencing in open areas and bollards at both entrances to exclude bike traffic	H	Council / Fencing Contractor
	Oval edge boundary would benefit from fencing	1-2	Install dune fencing	L	Fencing Contractor
	Community education / awareness	1	Install interpretive signage	M	Council/contractor
			Conduct guided walks, involve local schools		Council/contractor

Zone	Issue	Year/Time Frame#	Recommended Action	Priority	Responsibility
Zone 2 Dunal system	Bitou and Lantana infestations	1	Target removal *Lantana, Bitou and* Asparagus Fern throughout working from North to South., where any significant open areas created replant with *Acacia sophorae ,* Carpobrotus, Scaveola, Correa alba, Isolepsis nodosa or other 'Coastal Sand Foredune Scrub' species	H H	Bush regeneration contractor
		1-5	Maintenance of all previous works	H	
	Heavily weed infested open areas adjoining beach access road, carpark and access tracks Approx 400 m^2	1	Targeted weed removal of all environmental weeds in these areas	H	Bush regeneration contractor
		1	Seed Collection and propagation	H	Licensed contractor /grower
		1	Planting to open patches to 'in fill' gaps in canopy, improve aesthetics. Tree species 1x tubestock/10m^2, *Acacia sophorae* 1x tubestock/10m^2, mixed shrub/understorey 2x tubestock/m^2 , Carpobrotus transplants from Council approved donor site. replant with *Acacia sophorae , Carpobrotus, Scaveola, Correa alba, Isolepsis nodosa* or other 'Coastal Sand Foredune Scrub' species	H	As Above
		1-5	Maintenance of all previous works	H	As Above
	Target removal of other environmental weeds throughout zone	1-5	If resources remain after completion of high priority works then commence. otherwise seek funding ie; target removal as funding permits	M	Bush regeneration contractor
	Fencing in disrepair	1	Carry out repairs / maintenance	L	Council/ contractor

Zone 3 Dune area in front of surf club					
	Fencing in disrepair	1-2	Carry out repairs / maintenance/ replacement	M	Council/ contractor
	Bitou and Lantana infestations	1 1-5	Target removal *Lantana, Bitou and* Asparagus Fern throughout Maintenance of all previous works	H H	Bush regeneration contractor
	Bare sand cleared areas	1-5	Replant with *Acacia sophorae ,* Carpobrotus, Scaveola, Correa alba, Isolepsis nodosa (all low growing 'Coastal Sand Foredune Scrub' species)	H	
Zone 4 Heavily Disturbed zone to east of UCSW	Heavy Lantana infestations	1-5	Target removal via cut and paint only when resources available for fencing and revegetation works including maintenance.	H	Bush regeneration contractor
	Other environmental weeds in open grassy sections		De-seed and target any highly invasive annual weed outbreaks with an emphasis upon reducing seeding and propagule spread along tracks into better condition UCSW remnant. NB; Only treat weeds in these open areas comprehensively when resources for proper planting preparation including fencing, mulching, planting and maintenance are available.	M	Bush regeneration contractor
Zone	**Issue**	**Year/Time Frame#**	**Recommended Action**	**Priority**	**Responsibility**
Zone 4 cont'	Coral Trees to east of zone	1	To be cut out and removed	M	Council/ Tree removal contractor
	Open nature/lack of	1-5	Install dune fencing to perimeters of zone,	M	Council /

	fencing/dissected by a number of tracks		allowance for fenced track access from east of UCSW to concrete path adjacent to BMX track. Fencing should be prioritised at areas where informal tracks dissect the bushland or around areas identified for replanting.		Fencing contractor
		1	Bollards installed at entrances to formalized track to exclude bike traffic into UCSW.	H	Council / Fencing contractor
	Poor resilience	1	Seed collection and propagation	H	Licenced collector / grower
		1-5	Most of area suitable for staged revegetation. See priority planting areas below. Aim of works to attempt to replicate key woodland species in all strata of UCSW, provide vegetation link, improved edge effect and improved aesthetics. Tree species 1x tubestock/10m^2, *Eucalyptus botryoides* and *Angophora floribunda*, Mid Strata trees 1x tubestock/ 5m^2 Mixed shrub species 1x tubestock/m^2 , Understory plants 3x tubestock/m^2 See Appendix 4 'suitable species for revegetation'	M	Bush Regeneration contractor and/or community planting days
		1	**1st priority planting area** *E.robusta* within plantings should be thinned out and mid strata and understorey species should be installed to the existing fenced tree planting to the North East corner of the zone.	H	
		2-5	**2nd priority planting area** The link between the existing planting area and the UCSW to the immediate west	M	As above
	Couch grass infesting understorey from southern mown lawn areas	1-5	Install low post and rail barrier to 1 metre outside vegetation/tree line to exclude mowing. Pre-spray weed around native plants. Herbicide spray Couch	M	Council and /or Bush regeneration

			grass and establish and maintain sprayed edge to restrict lawn spread into remnant areas.		contractor
		1-5	Investigate funding for future works to control Couch infestation as part of staged regeneration/revegetation efforts in this area. Potentially this area could be fenced and revegetated if future funds available.	M	As above
	Southern mown lawn area acts as entrance to southern informal pedestrian access track	1	Close track initially with low post and timber rails and signage at both east and western ends.	M	Council and /or Bush regeneration contractor
		1-5	Exclude mowing with low post and rail barrier installed to vegetation edge as above, could be moved progressively south with staged strips of revegetation with a view to fencing off area and aid in closing southern boundary track., improving edge effect	L	As above

Where only a 1 appears this action is prioritized to the first year of implementation of this plan. Most other actions will be acted upon as feasible with relevant available funding opportunities. Maintenance of all works implemented should be of very high priority throughout the 5 year coverage of this plan and beyond.

Note: Rubbish removal where necessary in each zone should be coordinated with Gosford City Council as incidents occur.

7.6 Fencing

Fencing installed will need to be robust and durable in beach side conditions, have low wind resistance to avoid trapping wind blown sand. Fencing should also be in context with the surroundings, existing fencing and have low installation, repair and replacement cost.

Simple dune fencing currently installed on site should continue to be used. Current fencing installed consists of three or four stranded galvanized wire fencing with CCA treated pine posts at 3 metre spacings.

Aesthetically these fences have low visibility which helps preserve bushland and ocean views.

Photo; Heavy duty dune fencing installed at the Etta Road entrance

We estimate simple dune fencing as installed by Council costs approximately $45/Lm, with more substantial fencing with 200mm posts and rails at straining points. (Like that recently installed near the Umina Oval amenities block), costing about $60/Lm.

The Broken Bay Beaches Coastal Management Plan stipulates that no dune fencing is to be installed to the seaward side of the dunes within this study area except in front of Umina Surf Club where existing fencing on the seaward side should be retained (Patterson Britton and Partners 1999)

The installation and maintenance of fencing can come at a significant cost. Less expensive alternatives such as bollards, signs, rocks, vegetation barriers or even logs placed on track edges should be used where possible in low impact areas.

Fencing may be prioritised at areas where informal tracks dissect the bushland or around areas identified for replanting.


Photos Above: Fencing in disrepair at Umina Surf Club


Photo Above Left; The Couch Lawn area to the South East of the disturbed UCSW area showing encroachment by mowing and invasive lawn infesting remnant understorey. **Above Right;** Simple, low, post and rail barriers installed along the northern side of the UCSW could also be installed to the couch lawn edge and infestation controlled within the remnant area.

7.7 Community Education / Signage

At the Etta Road entrance to Umina Oval the Ettymalong Creek Landcare group has some time ago installed a billboard information shelter shown below. The intention of these systems is to be able to regularly replace signs and information to notify of activities, or when signs become outdated or faded. Unfortunately this sign has been regularly vandalized and remains in a state of disrepair.

Photo Above Left: The Signage shelter at the Etta Road entrance, this sign has been regularly vandalized and no longer serves as an interpretive display. **Above Right;** Simple bollards which could be installed to restrict push bike access to the northern UCSW track.

Whilst vandalism is a major deterrent to proceeding with interpretive signage there are signs available which are designed to withstand very heavy treatment. Etched anodized aluminium signs are available which are very durable, have tamper proof fittings and have the images etched into the metal sign making them relatively vandal proof. At slightly less cost polycured and full colour digital printed signs are also options.

The final location of signage will need further consultation with Council, though some appropriate locations would include;

- At the proposed planting zone and eastern track entrance to the UCSW
- At the beachfront viewing platform to the south of the Umina Surf Club


Photo Above Left; The viewing platform a possible site for installation of an interpretive sign. **Above Right;** signs which could be utilized to inform of works underway.

Actual content of the signs would also require further planning though themes which should be considered include;

- The UCSW EEC, including local fauna
- Coastal dune vegetation and beach ecology
- Local history

Public education should be considered to encourage some community ownership of this area and support the local land care groups. Provision should be made for some suitable interpretive signage to be strategically installed to educate and inform the public of the history and natural resource value of the site and surrounds. A sum of $6000.00 has been initially allocated for the installation of interpretive signage.

Signage can serve a number of purposes such as to inform and educate, to attempt to control undesirable behavior or to provide orientation. Some simple and cheap "Bushland Regeneration in Progress" signs (as utilized on many sites already by Gosford Council) could be useful on dune fencing and near heavy traffic areas such as in front of the Surf Club or at track entrances.

Interpretive signage could be effectively used to:

- Explain the conservation significance and some features of the UCSW and direct local residents to the local bushcare program.

- Educate visitors to Umina Beach about the importance of the local dune vegetation and direct local residents to the local bushcare program.

Signage may be located at a significant track head, lookout or placed strategically along track sides. A host of design options abound for the installation of effective signage. Any signage would need to be very robust, suitably informative and attractive. Gosford Council has corporate signage protocols which may need to be addressed.

Signage costs vary considerably depending on construction materials, art work requirements and the number of signs ordered. As an indication the $6000.00 budget allocated would be adequate for development and installation of four (4) 600mm X 400mm interpretive signs installed on pedestal posts similar to that shown below. Such signs could also be bolted directly to the beachfront viewing platform.

Photo; A typical pedestal post interpretive sign, similar signage could be placed at track entrances or along the track alignment within the UCSW.

7.8 Monitoring

Effective monitoring of progress of works and resultant site conditions is important for many reasons. Progress of rehabilitation works can be slow, staff within council and contractors can change and memories of initial site conditions may be inaccurate. Monitoring can also assist in;

- determining the effectiveness of chosen techniques,
- responding to unforeseen impacts or issues on site
- assisting in attracting future funding
- contributing to the scientific understanding of environmental management

The following monitoring techniques are recommended for works within this site;

- Before and after photos. These should be established at the commencement of works with progress photos taken six monthly and at major milestones such as when conducting significant primary weed removal, plantings or hazard reduction burns. Locations should be recorded preferably with a grid reference and marked in the field (such as with a capped and tagged star picket)
- Daily site records, to record works carried out, seed collection, planting species, numbers, locations, hours worked etc
- Records of all significant flora and fauna sightings. Threatened species should be notified to Gosford Council and records lodged with the NSW Wildlife Atlas.

7.9 Revegetation works

The recommendations allow for planting in the following locations;

- Zone 4, forming a vegetation link in the northern open grassy edge between recent planting area and UCSW. This is a considerable undertaking and should be started when adequate funding is available. A reasonable planting throughout the currently unfenced area in zone 4 would require approximately 14000 tubestock as well as associated fencing and maintenance costs. Funding should be sought specifically for this zone. These works could be staged over a number of years

- Zone 4, underplanting within the existing fenced planting zone., this area is already fenced and will require some thinning of existing planted trees. Planting would require approximately 2000 tubestock.

- Zone 2 and 3, plantings to stabilize dunes and create canopy links in open disturbed areas along the road alignment and beach access tracks. Also plantings and possible transplants of carpobrotus as a precautionary approach to assist revegetation in areas cleared of dense Lantana during primary works. Plantings would require a minimum of 2600 tubestock

All strata of the surrounding vegetation communities should be well represented, ie dominant tree species, shrub and ground layer. Appendix 4 details recommended species from which to choose for revegetation works in all zones. Recommended planting densities for each zone are contained within the recommendations for each management zone above.

Any revegetation works will require some timely planning with collection and propagation of native seed from within the catchment often necessary up to six months out from the projected time for revegetation on site. Most seed is available in reasonable quantities over the spring and summer months. All seed collection should be carried out in accordance with the Florabank guidelines set out within www.florabank.org.au.

It is advisable for all revegetation works to be planned for Autumn.

The open grassy area in zone 4 should not be planted until adequate protection in the form of dune fencing or low barriers is installed. Prior to planting, major weeds should be controlled in the planting zone. The open area could be mulched to a depth of 75-100 mm with Eucalypt leaf mulch preferably from a local source. The Mulch must be free of weed seeds and not containing Camphor Laurel, Cotoneaster, Coral Tree or any other invasive species.

Mulch is not to be used in the zone 2 and 3 dunal areas as mulch can inhibit plant establishment and provides a nutrient source for the growth of weeds in dune ecosystems. Carpobrotus transplants can form a natural living mulch along the roadside and beach access plantings. Bushland regeneration Contractors must meet on site with council to approve process, donor sites and amount of Carpobrotus from each site. Carpobrotus transplants are very quick and normally very successful, though care must be taken to not adverserly damage any donor location.

Tubestock should be well soaked prior to planting and thoroughly watered after planting. If possible council should make available recycled water to bushland contractors and plants should be watered within 2 days and then again within 1 week of planting.

7.10 Preferred Works Program

Resources in natural resource management are characteristically limited and often sporadic in their availability. Vast resources would be required to fully address all issues upon site and as funding has limitations, priorites have been chosen to attempt to most effectively allocate these precious funds. A major priority for Council should be the attempt to secure future funding and resources, the greater the continuity of funding and associated works the more effectively recommendations within this report may achieve their objectives.

Funding currently allocated for bushland rehabilitation works and signage in the first year of implementation of this plan has been relied upon as the basis on which works can commence. Works prioritized for year should be able to be implemented with this allocated funding. If further funding becomes available, timing of works could obviously be accelerated.

8.0 CONCLUSION

Gecko Environment Management was engaged by Gosford City Council to provide a Bushland Management Plan for natural areas within the Peninsular Recreation Precinct. A number of recommendations have been made for the future bushland management of this area.

This area preserves vegetation communities of high conservation significance, fauna habitat and public open space. The site has suffered heavily from disturbance and neglect. This report makes recommendations to assist in overcoming the issues faced in the management of the extant bushland on site. With funds allocated effectively and a long term commitment to conservation of these valuable areas there is real potential to greatly improve and enhance the bushland and public amenity of the site.

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10.0 APPENDICES

APPENDIX 1: NATIVE FLORA LIST

Trees and Shrubs

FAMILY	Species	Common name
Apiaceae	*Platysace lanceolata*	
Casuarinaceae	*Allocasuarina littoralis*	Swamp She Oak
Euphorbiaceae	*Glochidion ferdinandi*	Cheese Tree
Euphorbiaceae	*Omalanthus populifolius*	Bleeding Heart
Epacridaceae	*Monotoca elliptica*	
Meliaceae	*Melia azederach var. australasica*	White Cedar
Mimosaceae	*Acacia Longifolia var. longifolia*	Golden Wattle
Mimosaceae	*Acacia suaveolans*	
Mimosaceae	*Acacia ulicifolia*	
Myrtaceae	*Angophora floribunda*	
Myrtaceae	*Eucalyptus botryoides*	
Myoporaceae	*Myoporum acuminatum*	Coastal Boobialla
Oleaceae	*Notolea longifolia*	
Pittosporaceae	*Pittosporum revolutum*	
Pittosporaceae	*Pittosporum undulatum*	Sweet Daphne
Proteaceae	*Banksia integrifolia*	Coastal Banksia
Proteaceae	*Banksia serrata*	Old Man Banksia
Santalaceae	*Exocarpus cupressiformis*	
Sapinadceae	*Dodonea triquetra*	Hop Bush
Verbanaceae	*Clerodenron tomentosum*	

Vines and Creepers

FAMILY	Species	Common name
Asclepiadaceae	*Parsonsia straminea var. straminea*	Silk Pod
Bignoneaceae	*Pandorea pandorana*	
Dioscoreaceae	*Dioscorea transversa*	Native Yam
Dilleniaceae	*Hibbertia scandens*	
Fabaceae	*Desmodium brachypodum*	
Fabaceae	*Hardenbergia violacea*	
Fabaceae	*Glycine clandestina*	
Fabaceae	*Glycine microphylla*	
Fabaceae	*Kennedia rubicunda*	
Haloragaceae	*Gonocarpus tetragynus*	
Haloragaceae	*Gonocarpus teucrioides*	
Lauraceae	*Cassytha spp*	
Menispermaceae	*Stephania japonica*	Snake Vine
Philesiaceae	*Eustrephus latifolius*	

Philesiaceae	*Geitnoplesium cymosum*	
Pittosporaceae	*Billardiera scandens*	Apple Berry
Ranunculaceae	*Clematis glycinoides*	
Rubiaceae	*Morinda jasminoides*	
Violaceae	*Violaceae hederacea*	
Vitaceae	*Cayratia clematidea*	
Vitaceae	*Cissus hypoglauca*	

Ferns

FAMILY	Species	Common name
Adiantaceae	*Cheilanthes spp*	

Herbs and Ground Covers

FAMILY	Species	Common name
Aizoaceae	*Tetragonia tetraganoides*	New Zealand Spinach
Amaryllidaceae	*Crinum pedunculatum*	Crinum Lily
Apiaceae	*Centella asiatica*	Pennywort
Apiaceae	*Hydrocotyle sp*	
Asteraceae	*Sigesbeckia orientalis*	
Commelinaceae	*Commelina cyanea*	
Convolvulaceae	*Dichondra repens*	
Zamiaceae	*Macrozamia communis*	
Geraniaceae	*Geranium homeanum*	
Liliaceae	*Dianella caerulea*	
Lomandraceae	*Lomandra longifolia*	Matt Rush
Oxalidaceae	*Oxalis spp*	
Rubiaceae	*Pomax umbellata*	

Grasses

FAMILY	Species	Common name
Poaceae	*Entolasia marginata*	
Poaceae	*Entolasia stricta*	
Poaceae	*Imperata cylindrical var. major*	
Poaceae	*Microlaena stipoides*	
Poaceae	*Oplismenus aemulus*	
Poaceae	*Themeda australis*	

Sedges and Rushes

FAMILY	Species	Common name
Cyperaceae	*Isolepis nodosa*	
Juncaceae	*Juncus usitatus*	

APPENDIX 2: NATIVE FAUNA LIST

Birds	Common name
Yellow Thornbill	*Acanthiza nanna*
White Browed Scrub wren	*Sericornis frontalis*
Collared Sparrowhawk	*Accipiter cirrhocephalus*
Marsh Harrier	*Circus aeruginosus*
Whistling Kite	*Haliastersphenurus*
Brown Falcon	*Falco berigora*
Black Duck	*Anuas superciliosa*
Domestic Goose	*Anser anser**
Maned Duck	*Chenonetta jubata **
Pekin Duck	*Anus spp. **
White Faced Heron	*Ardea novaehollandiae*
Great Egret	*Egretta alba*
Dusky Woodswallow	*Artamus cyanopterus*
Brush Turkey	*Alectura lathami*
Azure Kingfisher	*Ceyx azurea*
Laughing Kookaburra	*Dacelo novaeguineae*
Sacred Kingfisher	*Halcyon sancta*
Sulphur Crested Cockatoo	*Cacatua galerita*
Galah	*Cacatua rosicapilla*
Long Billed Corella	*Cacatua tenuirostris*
Rainbow Lorikeet	*Trichoglossus haematodus*
Scaly-breasted Lorikeet	*Trichoglossus chlorolepidoyus*
King Parrot	*Alisterus scapularis*
Eastern Rosella	*Platycercus eximius*
Crimson Rosella	*Platycercus elegans*
Black Faced Cuckoo Shrike	*Coracina novaehollandiae*
Masked Lapwing	*Vanellus miles*
Crested Pigeon	*Ocyphaps lophotes*
White Headed Pigeon	*Columba leucomela*
Feral Pigeon	*Columba livia **
Peaceful Dove	*Geophelia placida*
Wonga Pigeon	*Leucosarcia melanoleuca*
Spotted Turtle Dove	*Streptopelia chinensis **
Boobook Owl	*Ninox novaeseelandiae*
Tawny Frogmouth	*Podargus strigoides*
Grey Butcherbird	*Cracticus torquatus*
Pied Butcherbird	*Cracticus negrogularis*
Pied Currawong	*Strepera graculina*
Red Wattlebird	*Anthochaera carunculata*
Common Myna	*Acridothees tristis **
Dollar Bird	*Eurostomus orientalis*
Australian Raven	*Corvus coronoides*
Australian Magpie	*Gymnorhina tibicen*
Pheasant Coucal	*Centropus phasianinus*
Common Koel	*Eudynamys scolopacea*

Pallid Cuckoo	*Cuculus pallidus*
Channel Billed Cuckoo	*Scythrops novahollandiae*
Australian Magpie Lark	*Grallina cyanoleuca*
Welcome Swallow	*Hirundo neoxena*
Silver Gull	*Larus novahollandiae*
Superb Fairywren	*Malurus cyaneus*
Eastern Spinebill	*Acanthorhynchus tenuirostris*
Brush Wattlebird	*Anthochaera chrysoptera*
Little Wattlebird	*Anthochaera lunulate*
Eastern Whipbird	*Psophodes Olivaceus*
Noisy Miner	*Manorina melanochphala*
Lewins' Honeyeater	*Meliphaga lewinii*
Noisy Friarbird	*Philemon corniculatus*
Richards Pipit	*Anthus novaseelandiae*
Grey Shrike Thrush	*Colluricincla harmonica*
Eastern Yellow Robin	*Eopsaltria australis*
Jacky Winter	*Microeca leucophaea*
Golden Whistler	*Pachycephala pectoralis*
Flame Robin	*Petroica Phoenicia*
Grey Fantail	*Rhiphidura fuliginosa*
Willie Wagtail	*Rhiphidura leucophrys*
Rufous Fantail	*Rhiphidura rufifrons*
Whites Thrush	*Zoothera lunulate*
Green Catbird	*Aliuroedus crassirostris*
Satin Bowerbird	*Ptilonofhynchus violaceus*
Spotted Pardalote	*Pardalotus punctatus*
House Sparrow	*Passer domesticus* *
Great cormorant	*Phalacrocorax carba*
Little Black Cormorant	*Phalacrocorax sulcirostris*
Royal Spoonbill	*Platalea regia*
Sacred Ibis	*Threskiothornis aethiopica*
Straw Necked Ibis	*Threskiornis spinicollis*
Red Browed Firetail	*Embelema temporalis*
Red Whiskered Bulbul	*Pyconotus jocosus* *
Dusk Moorhen	*Gallinula tenebrosa*
Purple Swamphen	*Prophyrio porphyrio*
Buff Banded Rail	*Rallus phillippensis*
Silvereye	*Zosterops lateralis*
Buff-banded Rail	*Gallirallus phillipensis*
Mammals	***Common name***
Long Nosed Bandicoot	*Parameles nastua*
Brush-tailed Possum	*Trichosurus vulpeculata*
Ring-tailed Possum	*Pseudocherius peregrinus*
Sugar Glider	*Petaurus breviceps*
Grey Headed Flying Fox	
Reptiles	***Common name***
Eastern Snake Necked Turtle	*Chelodina longicollis*
Blue Tongue Lizard	*Tiliqua scincoids*

Eastern Water Skink	*Eluamprus guoyii*
Pale Garden Skink	*Lampropholis guichenoti*
Weasel Skink	*Samprocinus mustelinus*
Coppertail Skink	*Cenotus taeniolatus*
Marsh (Grass) Snake	*Hemiaspis signata*
Red Bellied Black Snake	*Pseudechis porphyriacus*
Amphibians	***Common name***
Brown Stiped Frog	*Limnodynastes peronii*
Eastern Dwarf Tree Frog	*Litoria fallax*
Leaf Green Tree Frog	*Litoria phyllochroa*
Common Eastern Froglett	*Crinia signifera*
Fish	***Common name***
Glassfish	*Ambassia jacksoniensis*
Short Finned Eel	*Anguillia australis*
Long Finned Eel	*Anguillia reinhardtii*
Striped Gudgeon	*Gobiomorphis australis*
Sea Mullet	*Mugil cephalis*
Australian Bass	*Macquaria novaemaculata*
Mosquito Fish	*Gambusia affinis* *

* Denotes introduced species

APPENDIX 3: WEED SPECIES LIST

Trees and Shrubs

FAMILY	Species	Common name
Asteraceae	*Chrysanthemoides monilifera*	Bitou Bush
Caesalpiniaceae	*Senna pendula*	Senna
Fabaceae	*Erythrina X Sykesii*	Coral Tree
Ochnaceae	*Ochna serrulata*	Mickey Mouse Plant
Verbaneceae	*Lantana camara*	Lantana
	Pavonia hastata	

Vines and Creepers

FAMILY	Species	Common name
Convolvulaceae	*Ipomoea indica*	Morning Glory
Polygonaceae	*Acetosa sagittata*	Turkey Rhubarb

Herbs and Ground Covers

FAMILY	Species	Common name
Apiaceae	*Hydrocotyle bonariensis*	Pennywort
Asclepiadaceae	*Gomphocarpus fruticosus*	Cotton Bush
Asparagaceae	*Protoasparagus aethiopicus*	Asparagus Fern
Asteraceae	*Aster subulatus*	Aster
Asteraceae	*Bidens pilosa*	Cobblers Pegs
Asteraceae	*Conyza sp*	Fleabane
Asteraceae	*Coreopsis lanceolata*	Coreopsis
Asteraceae	*Crassocephalum crepidoides*	Thickhead
Asteraceae	*Gazania linearis*	Gazania

Asteraceae	*Hypochaeris radicata*	Cats ear
Asteraceae	*Osteospermum fruticosum*	African Daisy
Asteraceae	*Taraxacum officinale*	Dandelion
Brassicaceae	*Brassica sp*	Brassica
Caryophyllaceae	*Petrorhagia sp*	
Chenopodiaceae	*Chenopodium album*	FatHen
Commelinaceae	*Tradescantia fluminensis*	Trad
Crassulaceae	*Bryophyllum delagoense*	Mother of Millions
Geraniaceae	*Geranium sp*	Geranium
Iridaceae	*Crocosmia x crocosmiiflora*	Montbretia
Malvaceae	*Sida rhombifolia*	Paddy's Lucerne
Plantaginaceae	*Plantago lanceolata*	Lambs Tongue
Solanaceae	*Solanun nigrum*	Blackberry Nightshade
Verbenacae	*Verbena bonariensis*	Purple Top

Grasses

FAMILY	Species	Common name
Poaceae	*Briza maxima*	Quaking Grass
Poaceae	*Bromus catharticus*	Prarie Grass
	Cynodon dactylon	Couch grass
	Ehrharta erecta	African Veld Grass
	Ehrharta longifolia	Annual Veld grass
	Eragrostis curvula	African Love Grass
	Lolium perenne	Perennial Ryegrass
	Paspalum dilatatum	Paspalum
	Panicum maximum	

APPENDIX 4: SPECIES SUITABLE FOR REVEGETATION UCSW

Trees and Shrubs

FAMILY	Species	Common name
Apiaceae	*Platysace lanceolata*	
Casuarinaceae	*Allocasuarina littoralis*	Swamp She Oak
Euphorbiaceae	*Glochidion ferdinandi*	Cheese Tree
Euphorbiaceae	*Omalanthus populifolius*	Bleeding Heart
Meliaceae	*Melia azederach var. australasica*	White Cedar
Mimosaceae	*Acacia Longifolia var. longifolia*	Golden Wattle
Mimosaceae	*Acacia suaveolans*	
Mimosaceae	*Acacia ulicifolia*	
Myrtaceae	*Angophora floribunda*	
Myrtaceae	*Eucalyptus botryoides*	
Oleaceae	*Notolea longifolia*	

Pittosporaceae	*Pittosporum revolutum*	
Proteaceae	*Banksia integrifolia*	Coastal Banksia
Proteaceae	*Banksia serrata*	Old Man Banksia
Sapinadceae	*Dodonea triquetra*	Hop Bush
Verbanaceae	*Clerodenron tomentosum*	

Vines and Creepers

FAMILY	Species	Common name
Bignoneaceae	*Pandorea pandorana*	
Dilleniaceae	*Hibbertia scandens*	
Fabaceae	*Hardenbergia violacea*	
Fabaceae	*Kennedia rubicunda*	
Lauraceae	*Cassytha spp*	
Menispermaceae	*Stephania japonica*	Snake Vine
Philesiaceae	*Eustrephus latifolius*	
Ranunculaceae	*Clematis glycinoides*	

Herbs and Ground Covers

FAMILY	Species	Common name
Aizoaceae	*Tetragonia tetraganoides*	New Zealand Spinach
Amaryllidaceae	*Crinum pedunculatum*	Crinum Lily
Zamiaceae	*Macrozamia communis*	
Liliaceae	*Dianella caerulea*	
Lomandraceae	*Lomandra longifolia*	Matt Rush

Grasses

FAMILY	Species	Common name
Poaceae	*Entolasia marginata*	
Poaceae	*Entolasia stricta*	
Poaceae	*Imperata cylindrical var. major*	
Poaceae	*Microlaena stipoides*	
Poaceae	*Themeda australis*	

Sedges and Rushes

FAMILY	Species	Common name
Cyperaceae	*Isolepis nodosa*	
Juncaceae	*Juncus usitatus*	

APPENDIX 4: SPECIES SUITABLE FOR REVEGETATION IN DUNAL AREA

Trees and Shrubs

FAMILY	Species	Common name
Casuarinaceae	*Allocasuarina littoralis*	Swamp She Oak
Epacridaceae	*Monotoca elliptica*	
Euphorbiaceae	*Glochidion ferdinandi*	Cheese Tree
Mimosaceae	*Acacia sophorae*	
Mimosaceae	*Acacia suaveolans*	
Myrtaceae	*Leptospermum laevigatum*	Coastal Tea Tree
Proteaceae	*Banksia integrifolia*	Coastal Banksia
Proteaceae	*Banksia serrata*	Old Man Banksia
Sapinadceae	*Dodonea triquetra*	Hop Bush

Vines and Creepers

FAMILY	Species	Common name
Bignoneaceae	*Pandorea pandorana*	
Dilleniaceae	*Hibbertia scandens*	
Fabaceae	*Hardenbergia violacea*	

Herbs and Ground Covers

FAMILY	Species	Common name
Aizoaceae	*Tetragonia tetraganoides*	New Zealand Spinach
Aizoaceae	*Carpobrotus glaucescens*	
Amaryllidaceae	*Crinum pedunculatum*	Crinum Lily
Zamiaceae	*Macrozamia communis*	
Geraniaceae	*Geranium homeanum*	
Goodeniaceae	*Scaveola calendulacea*	
Liliaceae	*Dianella caerulea*	
Lomandraceae	*Lomandra longifolia*	Matt Rush

Grasses

FAMILY	Species	Common name
Poaceae	*Imperata cylindrical var. major*	

Sedges and Rushes

FAMILY	Species	Common name
Cyperaceae	*Isolepis nodosa*	

APPENDIX 5 – WEED REMOVAL TECHNIQUES

General Bush Regeneration techniques

Use of Herbicide
All staff using herbicide should read the MSDS and label for the herbicide prior to use. Herbicide applicators should hold a Chemcert Certification or equivalent and ensure compliance with the *Occupational Health and Safety Act 2000, Pesticides Act 1999, Protection of the Environment Operations Act 1997* and other relevant legislation.

Bringing the Bush Back to Western Sydney, Best Practice Guidelines for Bush Regeneration on the Cumberland Plains. Provides the following guidance on the use of herbicides

> "While herbicides are valuable aids in weed management, they will destroy native vegetation if used indiscriminately. To avoid outcomes counter-productive for regeneration:
> • only choose a herbicide on the basis of a clear understanding of:
> ◦ the purpose behind the use of the herbicide.
> ◦ the effectiveness of the herbicide on the targeted species.
> ◦ the correct concentration of herbicide identified for the weed species.
> ◦ the possible deleterious effect on any off target native species, including fauna, amphibians, insects etc.
> • use herbicides strictly in accordance with the manufacturers' labelling and ensure that any permits, orders or other 'off-label' use requirements are obtained and complied with.
> • where direct injection, or cut/scrape and paint methods using concentrated solutions of non-selective herbicides is being carried out in herbaceous native areas, exercise great care so that applicators or other equipment do not inadvertently drip onto or touch native plants.
> • limit the use of non-selective herbicides in grassy/woodland situations. Control by herbicide should follow prior assessment to ensure no endangered or vulnerable species are on site. Work should be limited to cautious, targeted spot spraying only, carried out by experienced operators with a good knowledge of native ground storey flora (i.e. no broad-scale spraying of these herbicides).
> • only use selective herbicides where spraying in grassy woodland situations is needed to control woody or other weed infestations, or where the level/extent of weed occurrence requires a more extensive approach.
> • avoid spraying to such an extent that it leaves the naturally dispersive soils bare and easily susceptible to erosion, and/or open to hardening or 'baking' which will make natural regeneration difficult.
> • time the application of herbicides so that maximum effectiveness is achieved. Application should be in accordance with:
> ◦ the identified peak period of susceptibility for the weed concerned.
> ◦ the limitations posed by climatic conditions, eg hot, dry weather, slows herbicide translocation; wet weather may wash it off or render it ineffective.
> ◦ the seeding times of native grasses as an additional precaution to minimise the potential for loss of native species (in cases where there is no suitable selective herbicide)."
>
> (DIPNR 2003)

Weed Control Methods

Herbicide spraying
Care must be taken that herbicide spraying activities are only undertaken in a manner in which no harm is done to native species within the site. Gecko Environment Management only recommends herbicide spraying within this site in areas of heavy weed cover where native species are over 2 metres from the target weed. Marker dyes must be used in all spraying. The only herbicide recommended for use on site is Glyphosate 360g/l in low surfactant formulation such as Roundup 'biactive'.

Cut and paint method
A number of woody weeds including Bitou Bush and Lantana can be easily controlled via;

- Horizontally cutting stems of actively growing plants at ground level with loppers, saw or secateurs
- Applying herbicide to cut stump within 15 seconds. Marker dyes must be used in herbicide to mark treated stumps

Scrape and Paint method
Some woody weeds such as Mickey Mouse Plant, *Ochna serrulata* and Camphor Laurel *Cinnamomum camphora* will readily sucker if treated via the cut and paint method. These plants can be treated in the following manner;

- The stem of the plant is scraped from the base for around 20cm to expose the cambium
- Applying herbicide to stem within 15 seconds. Marker dyes must be used in herbicide
- Some larger stems may require two scrapes.

Stem injection
Established weed trees can be controlled with the following method;

- At the base of actively growing tree, holes 5cm apart are drilled into sap wood at a 45 degree angle
- Each hole is immediately filled with herbicide

Hand Pull
Small woody weeds, vines and annual weeds which can be easily pulled out without snapping can be controlled with the following method;

- Remove viable seeds, bag and remove
- Use correct manual handling techniques and test the load etc
- Carefully pull out plant and shake to dislodge soil from roots
- Pile plants or hang in vegetation off ground to dessicate

Below are some of the more significat weeds upon site and common environmental weeds and some effective methods of removal. This list is by no means comprehensive. Further information on many of these significant weeds and their control should be sought from thw weeds Australia website, www.weeds.org.au .

Bitou Bush
This weed of national significance is listed as a Key Threatening Process under the Threatened Species Conservation Act 1995. Bitou Bush can be easily hand pulled as a seedling, though larger plants should be cut and painted. Dense infestations can be sprayed with low concentrations of herbicide in winter months, Glyphosate 360g/l at 1:200 is effective on large plants.

Lantana – Lantana camara
This weed of national significance is listed as a Key Threatening Process under the Threatened Species Conservation Act 1995. Lantana is very shallow rooted and generally very easy to pull out . Large plants can be cut and painted. When not in the presence of vulnerable native plants , spraying (particularly in Summer) with 1:100 concentration of Glyphosate is effective.

Mickey Mouse Plant- *Ochna serrulata*
This weed is best dealt with by scraping and painting the stem with Glyphosate. It is a heavy suckerer if snapped and its deep root system is rarely able to be hand pulled without snapping.

Large Leaf Privet –*Ligustrum lucidum* and Small Leaf Privet, *Ligustrum sinense*
Privet will always re-shoot from cut stems or roots left in the soil, therefore any hand pulling of Privet must be methodical to ensure that no roots remain. Large Leaf Privet with a stem diameter up to 3cm is often still easy to physically remove, though Small Leaf Privet has a far more tenacious root system and a similar size sapling may snap and eventually sucker further advancing the problem. For larger saplings cutting and painting at the base with 100% Glyphosate or Roundup 'Biactive' is recommended.
Large trees can be drilled of 'frilled with a chisel at the base and be injected with Glyphosate. Ringbarking of trees will only result in many more suckers. Only people properly trained in the handilng of pesticides should be responsible for using Glyphosate.

Camphor Laurel – *Cinnamomum camphora.*
Small seedlings can be hand pulled, Saplings are best scraped and painted with Glyphosate. Camphor Laurel has a very extensive root system and it is essential to translocate poison throughout the entire plant.
Large trees can be drilled of 'frilled with a chisel at the base and be injected with Glyphosate. Ringbarking of trees will only result in many more suckers. Camphor Laurel is notorious for shooting back after poisoning and may require repeat application.Only people properly trained in the handilng of pesticides should be responsible for using Glyphosate.

Blackberry- *Rubus fruiticosus aggregate spp*
Large roots of this plant can be either dug out or poisoned. Spraying with either Roundup, Garlon or Brush off can all be effective, again only people properly trained in the handilng of pesticides should be responsible for using such chemicals. For best results spraying should be between flowering and fruiting in late summer but may take several years of repeat application to achieve complete control.

Wandering Jew – *Tradescantia fluminensis*
Can be easily hand removed and often may be composted on site. It effective eradication can take numerous years of diligent maintenance. This plant can be easily confused with the native *Commelina cyanea*, the flowers of Commelina are bright blue as opposed to the white flowers of Wandering Jew, the latter also having more fleshy foliage.

The weed vines – Madiera Vine, *Anredera cordifolia* Morning Glory, Moth Plant, *Araujia hortorum* and Acetosa sagitatta.
Different vines can be dealt with differently depending on growth habit, Honeysuckle and Morning Glory root at the nodes. They can ussuall be hand pulled with care not to snap of the nodes with roots in the soil as these will re-establish- the main root system can be dug out or if very extensive scraped and painted with Glyphosate. Vines on ground level may be treated with foliar spray, those in the canopy can be cut off to dessicate above and be treated below. Vines with underground tubers such as Acetosa sagittata and Anredera cordifolia are less responsive to spraying as the poison rarely reaches all the tubers, in some situations repeat application may be effective. Alternatively roots and tubers should be dug up. Madira vine carries many stem tubers which will grow if knocked from the vine. Large infestations especially in the canopy are best dealt with through scraping large stems with 100% Glyphosate.

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APPENDIX 6: NPWS Checklist for Bush Regeneration Activities:

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

Management Planning:	**yes**	**no**	**more info attached**
The proposed activities will be in accordance with a management plan or site plan (map). *Please attach the plan or relevant sections of the plan or strategy to the licence application.*			
The project has been discussed with the relevant Landcare coordinator. *If not, provide details of any other professional advice you have sought, e.g. from a qualified bush regenerator.*			
A NPWS Wildlife Atlas database search of a 5km radius of the site has been undertaken to identify threatened flora/fauna species known or likely to occur on the site. *The Wildlife Atlas is accessible on the NPWS Web Site www.nationalparks.nsw.gov.au.*			
Prior to commencing any works on site, a permit or permission will be obtained from the relevant landowner(s) or land manager(s).			
Training and supervision:			
All workers carrying out bush regeneration and associated works will be supervised by a trained and experienced co-ordinator who has completed a recognised bush regeneration course (e.g. the Certificate of Bushland Regeneration) or a minimum of 2 years bush regeneration experience. *If 'yes', please provide below the name and qualifications of the co-ordinator.* Name: …… Qualifications/experience:……..			
Other members of the group that have bush regeneration training or experience. Name: …… Qualifications/experience: …… Name: …… Qualifications/experience:…….. Name: …… Qualifications/experience:…….. Name: …… Qualifications/experience:…….. Name: …… Qualifications/experience:……..			
All activities by workers will be regularly checked and approved by the co-ordinator.			
All workers will be informed of any threatened species or endangered ecological communities known from the area or which may occur in the area and the potential impacts of activities on these species/communities. *e.g. vines on the edge of a littoral rainforest remnant may protect the remnant from salt-bearing winds.*			
All workers have adequate weed and native plant identification skills. *i.e. all workers can identify and differentiate between weeds and native plants that occur on the site.*			

	yes	no	more info attached
Workers will be familiar with the identifying features of threatened flora that are known or likely to occur in the project area. Where threatened species known from the area are similar to weed species, the distinguishing features between these will be understood prior to commencing the work.			
Access to sites			
All vehicular access to sites will be restricted to formed roads.			
Unnecessary damage to sites will be avoided. *e.g. avoid working in wet weather to lessen soil compaction.*			
To reduce the possibility of introducing plant diseases and weeds the following measures will be applied: 1. Secateurs will be sharp and cleaned with methylated spirits. 2. Footwear will be cleaned of loose soil and preferably treated with bleach between sites.			
Impacts on flora:			
Prior to any works being undertaken, the presence or absence of threatened flora will be determined by a thorough walking search of the area.			
All threatened flora will be tagged with highly visible flagging tape before work commences. If a number of individuals occur in a clump, the area should be marked out with flagging tape.			
Cutting or damaging of threatened flora will be avoided.			
All plants will be positively identified before they are removed (pulled, cut, poisoned etc).			
Weed removal within 2m of a threatened species will be undertaken by hand.			
Impacts on fauna:			
All workers will be aware of any threatened fauna that are known or likely to occur on site, and the potential impacts of the proposed activities on those species.			
The habitat and refuge potential of weeds and rubbish will be considered prior to removal. *e.g. Lantana can provide cover for threatened fauna such as the Bush-hen. Dead Lantana and poisoned Camphor Laurels should, where possible, be left in situ.*			
Weeds will be removed gradually in areas where an infestation is extensive. *Ideally, 50% of weeds that may provide habitat should be left until native plant species have re-established and provide alternative refuge.*			
Disturbance to, and removal of rocks, logs and other potential refuge sites will be avoided.			
A herbicide registered for use near waterways will be used within 5m of waterways.			
Herbicide spraying will be restricted to a distance greater than 5 metres from watercourses where threatened frogs are known or likely to occur and within a 10m radius of records of threatened frogs.			
A buffer of 1m along other watercourses will be maintained in which no herbicide will be sprayed.			
Care will be taken to minimise disturbance to shy or cryptic species. *e.g. the Marbled Frogmouth roosts in vine 'curtains'.*			
Care will be taken to minimise disturbance to the leaf litter layer.			
Reconstruction through revegetation: *This section does **not** address propagation or planting of threatened species – this activity would need to be separately addressed.*			
Seed collection or cuttings will be from species, populations or ecological communities other than those listed as threatened (unless licensed by NPWS).			
Prior to collecting any seed or cuttings permission will be obtained from the relevant landholder or manager of the site. *eg a licence is required to collect native plants on National Parks estate.*			
Seed collection from any one species will be limited to less than 10% of the available crop at that site.			
Seed collection from any individual plant will be limited to less than 10% of the available crop.			

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

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