

**Botanical Assessment of Lot 2 Nicholson Road  
FORRESTDALE**



**Prepared for:**  
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## SUMMARY

Bennett Environmental Consulting Pty Ltd was commissioned by Coterra Environmental Pty Ltd to undertake a vegetation and flora survey of Lot 2 Nicholson Road in the Shire of Armadale. The site had previously been used for grazing cattle and consisted of a lot of completely degraded areas. There were some sections of remnant vegetation left at the site.

The field work was undertaken on 4<sup>th</sup> October 2011 when temporary 10m x 10m quadrats were surveyed.

A total of 10 quadrats were surveyed and a listing of the weeds along the perimeter of the site with Nicholson Road was also recorded. There are two Bush Forever Sites located near to the site. These are:

- Bush Forever Site 344, Denis De Young Reserve and Gibbs Road Swamp Bushland, Banjup/Forrestdale which is located adjacent to the western boundary and
- Bush Forever Site 345 Forrestdale Lake and Adjacent Bushland, Forrestdale, which is located east of Nicholson Road.

During the survey a total of eight different vegetation units were identified. These are:

### UPLAND VEGETATION

- Low Woodland A of *Banksia attenuata*, *Banksia menziesii*, *Nuytsia floribunda* and *Eucalyptus todtiana* over Heath B dominated by *Acacia pulchella* var. *glaberrima* over Tall Grass dominated by *\*Ehrharta calycina* in grey sand.
- Low Forest A of *Banksia attenuata* and *Banksia ilicifolia* over Tall Grass dominated by *\*Ehrharta calycina* and *\*Ehrharta longiflora* in grey sand.
- Low Woodland A of *Eucalyptus todtiana* with occasional *Banksia ilicifolia* over Open Dense Tall Grass dominated by *\*Eragrostis curvula* over Herbs dominated by *\*Carpobrotus edulis*, *\*Erodium botrys*, *\*Lotus subbiflorus* and *\*Hypochoeris glabra* in pale grey sand.

### WETLAND VEGETATION

- Open Low Woodland B of *Melaleuca preissiana* over Dense Thicket of *Kunzea glabrescens* over Open Herbs dominated by *Patersonia occidentalis* and *Drosera glanduligera* in damp dark grey sand.
- Low Forest A of *Melaleuca raphiophylla* over Dense Herbs dominated by *\*Zantedeschia aethiopicum* and *\*Lotus subbiflorus* in very damp grey sand.
- Open Low Woodland A of *Eucalyptus todtiana* and *Melaleuca preissiana* over Low Scrub A or Scrub of *Kunzea glabrescens* and *Pultenaea reticulata* over Herbs dominated by *\*Carpobrotus edulis* and *\*Lotus subbiflorus* in grey sand.
- Low Forest A of *\*Eucalyptus* species (possibly *\*Eucalyptus robusta*), *Melaleuca preissiana* and *\*Populus nigra* over Dense Tall Grass dominated by *\*Eragrostis curvula* in grey sandy loam.
- Dense Tall Grass of *\*Eragrostis curvula*, *\*Paspalum urvillei*, and/or *\*Pennisetum clandestinum* or Tall Sedges of *Juncus pallidus* or Herbs dominated by *\*Lotus subbiflorus*, *\*Moraea flaccida* and *\*Euphorbia terracina* in damp grey sand.

No quadrats were placed in the completely degraded vegetation at the site which consisted of pasture grasses and often with clumps of *\*Paspalidium urvillei*.

The vegetation condition of the remnant vegetation at the site varied from good to degraded.

A total of 49 families, 108 genera and 148 taxa were recorded during the survey of which 66 species were weeds.

Two priority flora were located. These were:

- *Schoenus pennisetis*, a Priority 2 Flora is an annual sedge up to 15cm high; and
- *Jacksonia gracillima* a Priority 3 Flora is a shrub up to 1.5m tall.

## 1. INTRODUCTION

### 1.1 Background

Coterra Environment commissioned Bennett Environmental Consulting Pty Ltd to undertake a vegetation overview for Lot 2 Nicholson Road, Forrestdale, within the City of Armadale. It is approximately 22.16ha in area with 4.46ha mapped by the Department of Environment and Conservation as a Conservation Category Wetland. A wetland assessment was undertaken by Arthur Weston in December 2010 (Coterra Environment, 2011).



**Figure 1. Location of the site surveyed - outlined in red (extracted from Google Maps). The dotted blue line indicates the location of the gas pipeline.**

### 1.2 Scope of Works

The requirements for this project were to:

- i. Undertake a Level 2 vegetation survey (Environmental Protection Authority, 2004); and to
- ii. Search for and record all significant species at the site.

## 2. BACKGROUND INFORMATION

### 2.1 Geology and Landform

The area is included in the Bassendean Dunes which have off-white to pale grey sands at the surface and cream to yellow sands at depth. The Bassendean Dunes are again separated into three units based on the characteristics of their swamps. The study site occurs within the Southern River Complex, the sand appears to have been blown over the alluvial soils resulting in swamps with a clay base (Churchward and McArthur, 1980).

### 2.2 Vegetation

The Interim Biogeographical Regionalisation for Australia (IBRA) (Thackway and Cresswell, 1995) recognizes 85 bioregions. The IBRA is used as the common unit to compare biological and biophysical attributes. Bioregions represent a landscape-based approach to classifying the land surface and each region is defined by a set of major environmental influences, which shape the occurrence of flora and fauna and their interaction with the physical environment. Forrestdale occurs in the Swan Coastal Plain, which has been subdivided into the northern section and the southern section. The study area is located in the southern section, abbreviated SWA2 (Mitchell, Williams and Desmond, 2002).

The survey area is mapped by Beard (1981) as a Low Woodland of *Allocasuarina fraseriana*, *Banksia* species and *Eucalyptus marginata* (abbreviated e2,3Mi). Shepherd *et al.* (2002) have determined the pre-European and current extent of the vegetation associations described by Beard. In addition they have assessed the percentage of each vegetation association remaining, the amount in IUCN reserves and the percentage in other reserves. The pre-European area of e2,3Mi is estimated to be 79,001ha, the current extent is 18,398ha which represents 23.2% remaining vegetated of which 38% is included in conservation.

Heddle *et al.* (1980) described the vegetation complexes of the Darling System at a scale of 1:250 000. There was found to be a distinct pattern of plant distribution linked to landforms, soils and climate. The most obvious trend was associated with increasing aridity from west to east on the Darling Plateau. The vegetation changes observed were a decrease in height and percentage cover of the tallest stratum and a distinct change in floristics. Forrestdale occurs in the Southern River Complex which is described as an Open Woodland of *Corymbia calophylla* – *Eucalyptus marginata* subsp. *marginata* and *Banksia* species with fringing Woodland of *Eucalyptus rudis* subsp. *rudis* and *Melaleuca raphiophylla* along creek beds.

Bush Forever (Government of Western Australia, 2000) states that 17% of the original area of the Southern River Complex remains vegetated within the Swan Coastal Plain and that the area of that Complex proposed for protection is 10%.

### 2.3 Threatened Ecological Communities

An ecological community is a naturally occurring biological assemblage that occurs in a particular type of habitat. A Threatened Ecological Community is one which falls into one of the following categories, presumed totally destroyed, critically endangered, endangered or vulnerable (Department Environment and Conservation, 2011b).

A possible ecological community which does not meet the above is added to the Priority Ecological Community List. Priorities 1, 2, and 3 are adequately known but are not currently believed to be threatened. Those that have recently been removed from the threatened list are listed as Priority 4. Conservation dependent ecological communities are placed in Priority 5.

### 2.4 Significant Flora

Prior to undertaking the field work a search was undertaken of the Department of Conservation and Environment Rare Flora Database. The resulting data is provided in Table 3.

**Table 1. Code and description of Threatened and Priority Flora (Department Environment and Conservation, 2011a)**

Code	Declared Rare and Priority Flora Categories
T	T (Threatened Flora) -Extant Taxa. Taxa, which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection.
X	T (Threatened Flora) -Presumed Extinct Taxa. Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently.
1	Priority One -Poorly Known Taxa. Taxa, which are known from one or a few (generally <5) populations, which are under threat.
2	Priority Two -Poorly Known Taxa. Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat.
3	Priority Three -Poorly Known Taxa. Taxa, which are known from several populations, at least some of which are not believed to be under immediate threat.
4	Priority Four - Rare, Near Threatened and other species in need of monitoring. Taxa which are considered to have been adequately surveyed and which whilst being rare, are not currently threatened by any identifiable factors.
5	Priority Five - Conservation dependent species. Species that are not threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

Table 1 presents the definitions of Declared Rare and the four Priority Flora ratings under the Wildlife Conservation Act (1950) as extracted from Department of Environment and Conservation (2011a). Table 2 presents the definitions of the threatened species under the Environmental Protection and Biodiversity Conservation Act, 1999 (Department of Sustainability, Environment, Water, Populations and Communities, 2011).

**Table 2. Categories of Threatened Flora Species (Department of Sustainability, Environment, Water, Populations and Communities, 2011)**

Code	Declared Rare and Priority Flora Categories
Ex	<p style="text-align: center;">Extinct</p> <p>Taxa which at a particular time if, at that time, there is no reasonable doubt that the last member of this species has died.</p>
ExW	<p style="text-align: center;">Extinct in the Wild</p> <p>Taxa which is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.</p>
CE	<p style="text-align: center;">Critically Endangered</p> <p>Taxa which at any particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.</p>
E	<p style="text-align: center;">Endangered</p> <p>Taxa, which is not critically endangered, and it is facing a very high risk of extinction in the wild in the immediate or near future, as determined in accordance with the prescribed criteria.</p>
V	<p style="text-align: center;">Vulnerable</p> <p>Taxa which is not critically endangered or endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.</p>
CD	<p style="text-align: center;">Conservation Dependent</p> <p>Taxa which at a particular time if, at that time, the species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.</p>

**Table 3. Threatened and Priority Flora Species List as provided by the Department of Environment and Conservation**

Taxon	Code	Description
<i>Caladenia huegelii</i>	T	Tuberous, perennial, herb, 0.25-0.6 m high. Fl. green & cream & red, Sep to Oct. Grey or brown sand, clay loam.
<i>Diuris purdiei</i>	T	Tuberous, perennial, herb, 0.15-0.35 m high. Fl. yellow, Sep to Oct. Grey-black sand, moist. Winter-wet swamps.
<i>Drakaea elastica</i>	T	Tuberous, perennial, herb, 0.12-0.3 m high. Fl. red & green & yellow, Oct to Nov. White or grey sand. Low-lying situations adjoining winter-wet swamps.
<i>Drakaea micrantha</i>	T	Tuberous, perennial, herb, 0.15-0.3 m high. Fl. red & yellow, Sep to Oct. White-grey sand.
<i>Lepidosperma rostratum</i>	T	Rhizomatous, tufted perennial, grass-like or herb (sedge), 0.5 m high. Fl. brown. Peaty sand, clay.
<i>Eryngium pinnatifidum</i> subsp. <i>palustre</i>	3	Erect perennial, herb, 0.15-0.5 m high. Fl. white/blue, Oct to Nov. Clay, sandy clay. Claypans, seasonally wet flats.
<i>Jacksonia gracillima</i>	3	No description provided.
<i>Stylidium longitubum</i>	3	Erect annual (ephemeral), herb, 0.05-0.12 m high. Fl. pink, Oct to Dec. Sandy clay, clay. Seasonal wetlands.
<i>Drosera occidentalis</i> subsp. <i>occidentalis</i>	4	Fibrous-rooted, rosetted perennial, herb, to 0.01 m high. Fl. pink/white, Nov to Dec. Sandy & clayey soils. Swamps & wet depressions
<i>Grevillea thelemanniana</i> subsp. <i>thelmanniana</i>	4	No description provided.
<i>Jacksonia sericea</i>	4	Low spreading shrub, to 0.6 m high. Fl. orange, usually Dec or Jan to Feb. Calcareous & sandy soils.

Taxon	Code	Description
<i>Ornduffia submersa</i>	4	No description provided.
<i>Thysanotus glaucus</i>	4	Caespitose, glaucous perennial, herb, 0.1-0.2 m high. Fl. purple, Oct to Dec or Jan to Mar. White, grey or yellow sand, sandy gravel.
<i>Tripterococcus paniculatus</i>	4	Perennial, herb, to 1 m high. Fl. yellow-green, Oct to Nov. Grey, black or peaty sand. Winter-wet flats.
<i>Verticordia lindleyi</i> subsp. <i>lindleyi</i>	4	Erect shrub, 0.2-0.75 m high. Fl. pink, May or Nov to Dec or Jan. Sand, sandy clay. Winter-wet depressions.

## 2.5 Bush Forever Sites Close to Lot 2 Nicholson Road

There are 2 Bush Forever Sites near the site. These are Bush Forever Site 344, Denis De Young Reserve and Gibbs Road Swamp Bushland, Banjup/Forrestdale which is located adjacent to the western boundary and Bush Forever Site 345 Forrestdale Lake and Adjacent Bushland, Forrestdale, which is located east of Nicholson Road.

The vegetation of Bush Forever site 344 is described as (Government of Western Australia, 2000):

### Uplands:

*Banksia attenuata* and *Banksia menziesii* Low Woodland; and  
*Banksia attenuata* Low Woodland with scattered *Banksia menziesii*, *Banksia ilicifolia* and *Eucalyptus todtiana*.

### Wetlands:

*Melaleuca preissiana* Low Woodland to Forest sometimes over *Baumea juncea* Sedgeland;  
*Melaleuca raphiophylla* Low Open Forest;  
*Pericalymma ellipticum*. *Astartea* aff. *fascicularis*, *Aotus intermedia* and *Calothamnus lateralis* Closed Heath;  
*Pericalymma ellipticum* Closed Heath; and  
*Baumea juncea* and *Baumea articulata* Sedgelands.

The vegetation of Bush Forever site 345 is described as (Government of Western Australia, 2000):

### Uplands:

*Corymbia calophylla* Open Woodland;  
*Banksia attenuata* and *Banksia menziesii* Open Forest to Woodland with *Nuytsia floribunda*; and  
*Banksia ilicifolia* and *Banksia menziesii* Open Forest to Woodland with *Nuytsia floribunda*.

### Wetlands

*Eucalyptus rudis* Forest;  
*Melaleuca raphiophylla* and *Melaleuca preissiana* Low Open Forest with patches of *Eucalyptus rudis*;  
*Melaleuca preissiana* Open Woodland;  
*Melaleuca raphiophylla* Low Closed Forest;  
*Melaleuca uncinata*, *Melaleuca viminea* and *Melaleuca polygaloides* Closed Heath;  
*Regelia ciliata* Closed Heath;  
*Melaleuca teretifolia* and *Melaleuca viminea* Open Heath;  
Mixed Closed Herbland;  
*Hypolaena exsulca*, *Lyginia barbata* and *Schoenus curvifolius* Closed Sedgeland;  
*Leptocarpus canus* Sedgeland; and  
Closed Sedgeland dominated by *Baumea articulata*, \**Typha orientalis* and *Bolboschoenus caldwellii*.

## 3. METHODS

Transects were walked through the remnant bushland listing the vegetation units in the area and the dominant taxa. As this was being undertaken the bushland was searched for Declared Rare and Priority Flora. As a Level 2 vegetation survey was required temporary 10m x 10m



quadrats were recorded. The vegetation at the site is described using the vegetation classification of Muir (1977) as described in Table 4. Plants unknown in the field were collected, pressed and identified using the Reference Collection at the Western Australian Herbarium, which has limited collections and sometimes makes the positive identification difficult.

**Table 4 Vegetation Classification (from Muir, 1977)**

LIFE FORM / HEIGHT CLASS	Canopy Cover			
	DENSE 70% - 100%	MID DENSE 30% - 70%	SPARSE 10% - 30%	VERY SPARSE 2% - 10%
Trees > 30 m	Dense Tall Forest	Tall Forest	Tall Woodland	Open Tall Woodland
Trees 15 – 30 m	Dense Forest	Forest	Woodland	Open Woodland
Trees 5 – 15 m	Dense Low Forest A	Low Forest A	Low Woodland A	Open Low Woodland A
Trees < 5 m	Dense Low Forest B	Low Forest B	Low Woodland B	Open Low Woodland B
Mallee (tree form)	Dense Tree Mallee	Tree Mallee	Open Tree Mallee	Very Open Tree Mallee
Mallee (shrub form)	Dense Shrub Mallee	Shrub Mallee	Open Shrub Mallee	Very Open Shrub Mallee
Shrubs > 2 m	Dense Thicket	Thicket	Scrub	Open Scrub
Shrubs 1.5 – 2 m	Dense Heath A	Heath A	Low Scrub A	Open Low Scrub A
Shrubs 1 - 1.5 m	Dense Heath B	Heath B	Low Scrub B	Open Low Scrub B
Shrubs 0.5 – 1 m	Dense Low Heath C	Low Heath C	Dwarf Scrub C	Open Dwarf Scrub C
Shrubs 0 - 0.5 m	Dense Low Heath D	Low Heath D	Dwarf Scrub D	Open Dwarf Scrub D
Mat plants	Dense Mat Plants	Mat Plants	Open Mat Plants	Very Open Mat Plants
Hummock grass	Dense Hummock Grass	Mid-Dense Hummock Grass	Hummock Grass	Open Hummock Grass
Bunch grass > 0.5 m	Dense Tall Grass	Tall Grass	Open Tall Grass	Very Open Tall Grass
Bunch grass < 0.5 m	Dense Low Grass	Low Grass	Open Low Grass	Very Open Low Grass
Herbaceous spp.	Dense Herbs	Herbs	Open Herbs	Very Open Herbs
Sedges > 0.5 m	Dense Tall sedges	Tall Sedges	Open Tall Sedges	Very Open Tall Sedges
Sedges < 0.5 m	Dense Low Sedges	Low Sedges	Open Low Sedges	Very Open Low Sedges
Ferns	Dense Ferns	Ferns	Open Ferns	Very Open Ferns
Mosses, liverworts	Dense Mosses	Mosses	Open Mosses	Very Open Mosses

## 4. RESULTS

Field work was undertaken on 4<sup>th</sup> October 2011. The gas pipeline traversed the site approximately NE to SW. In the following descriptions note that \* indicates the plant is a weed.

### 4.1 Vegetation

As with the vegetation description for the Bush Forever Sites it is possible to divide the vegetation at Lot 2 Nicholson Road into Uplands and Wetlands. Detailed species lists for each of the quadrats listed under the vegetation units is provided in Appendix B.

#### UPLAND VEGETATION

Low Woodland A of *Banksia attenuata*, *Banksia menziesii*, *Nuytsia floribunda* and *Eucalyptus todtiana* over Heath B dominated by *Acacia pulchella* var. *glaberrima* over Tall Grass dominated by \**Ehrharta calycina* in grey sand

This vegetation was recorded from the slopes and crest of the sand dune at the site. It was represented by quadrat CS05.

Low Forest A of *Banksia attenuata* and *Banksia ilicifolia* over Tall Grass dominated by \**Ehrharta calycina* and \**Ehrharta longiflora* in grey sand.

This vegetation was recorded from the northwest corner of the site. It was represented by quadrat CS02.

Low Woodland A of *Eucalyptus todtiana* with occasional *Banksia ilicifolia* over Open Dense Tall Grass dominated by \**Eragrostis curvula* over Herbs dominated by \**Carpobrotus edulis*, \**Erodium botrys*, \**Lotus subbiflorus* and \**Hypochaeris glabra* in pale grey sand.

This vegetation was a small area recorded from the south eastern side. It was represented by quadrat CS07.

#### WETLAND VEGETATION

Open Low Woodland B of *Melaleuca preissiana* over Dense Thicket of *Kunzea glabrescens* over Open Herbs dominated by *Patersonia occidentalis* and *Drosera gigantea* in damp dark grey sand.

This vegetation was recorded from the northwest corner of the site. It was represented by quadrat CS01.

Low Forest A of *Melaleuca raphiophylla* over Dense Herbs dominated by *\*Zantedeschia aethiopicum* and *\*Lotus subbiflorus* in very damp grey sand.

This vegetation occurred at the southeastern area of the site where there was lying water present. It was represented by quadrats CS03 and CS10.

Open Low Woodland A of *Eucalyptus tottiana* and *Melaleuca preissiana* over Low Scrub or Scrub of *Kunzea glabrescens* and *Pultenaea reticulata* over Herbs dominated by *\*Carpobrotus edulis* and *\*Lotus subbiflorus* in grey sand.

This vegetation occurred at the south eastern corner above the wetland represented by quadrat CS10. It was represented by quadrat CS06.

Low Forest A of *\*Eucalyptus* species (possibly *\*Eucalyptus robusta*), *Melaleuca preissiana* and *\*Populus nigra* over Dense Tall Grass dominated by *\*Eragrostis curvula* in grey sandy loam.

This occurred as a small area at the north east corner of the site. *\*Eucalyptus robusta* is spreading as there are several juvenile trees present. It is represented by quadrat CS08.

Dense Tall Grass of *\*Eragrostis curvula*, *\*Paspalum urvillei*, and/or *\*Pennisetum clandestinum* or Tall Sedges of *Juncus pallidus* or Herbs dominated by *\*Lotus subbiflorus*, *\*Moraea miniata* and *\*Euphorbia terracina* in damp grey sand.

This vegetation type occurred in small areas across the site. It was represented by quadrats CS04 and CD09.

Listing of weeds along Nicholson Road is site 11 and mapped as such in Appendix A.

## 4.2 Vegetation Condition

Bushland has been historically subject to ongoing degradation and is especially susceptible to disturbances arising as a result of indirect impacts from surrounding developments and human activity. Degradation is caused by a wide range of factors, including isolation, edge effects, weed invasion, plant diseases, changes in fire frequency, landscape fragmentation, increased predation on native fauna by feral animals, decrease in species richness and general modification of ecological function. Lot 2 has historically been used for stock grazing, phases of clearing and weed invasion. These issues affect the biodiversity rating and ecological viability of areas of remnant vegetation and should be assessed in line with conservation values.

Vegetation condition was rated according to the vegetation condition scale used in Keighery (1994). The vegetation condition at the survey site was mainly good to completely degraded with the higher ground vegetation in very good (condition 3) to good (condition 4) condition. There were groups of trees with good cover where the understorey had been completely replaced with weeds. These areas were degraded (condition 5). Where there were no trees and the weeds were dominant the vegetation condition was completely degraded (condition 6). Table 5 explains the vegetation condition rating scale and Table 5 gives the vegetation condition at the site. The vegetation condition of the site is mapped in Appendix C, Map 2.

**Table 5. Explanation of Vegetation Condition Rating (Keighery, 1994)**

Rating	Description	Explanation
1	Pristine	Pristine or nearly so, no obvious signs of disturbance.
2	Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
3	Very Good	Vegetation structure altered, obvious signs of disturbance.
4	Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it.
5	Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management.
6	Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species.

**Table 6. Vegetation Condition Recorded from the Site**

Vegetation Condition	Quadrat Number
Very good to good	CS05
Good	CS02, CS03
Good to degraded	CS01, CS10
Degraded	CS06, CS08
Degraded to completely degraded	CS04, CS07
Completely degraded	CS09, Area 11, Paddocks

### 4.3 Taxa

A total of 49 genera, 107 genera and 147 taxa during the survey of which 66 species were weeds. The dominant families were Asteraceae (Daisy family), Fabaceae (Pea and Wattle family) and Poaceae (Grass family).

### 4.4 Significant Taxa

During the current survey two priority flora were recorded. These were:

- *Schoenus pennisetis*, a Priority 2 Flora, is an annual sedge up to 15cm high with dark brown to black inflorescences. It occurs in grey or peaty sand or sandy clay in swamps or winter-wet areas. This is a new record for this area but will need to be confirmed once access into the other areas of the Western Australian Herbarium is permitted. The plants were not counted but were recorded from the vicinity of CS01; and



Photograph 1. Plants of *Schoenus pennisetis*

- *Jacksonia gracillima* a Priority Flora 3 flora was recorded from 2 sites.
  - i) 398647E; 6441321N (when walking traqnsects) where about 10 plants were recorded, and
  - ii) quadrat CS-06 where about 5 plants were recorded.



Photograph 2. *Jacksonia gracillima* photographed at a different site but it does illustrate the divided flattened “leaves” and the flower shape and colour.

#### 4.5 Weeds

A total of 66 weeds were recorded during the current survey. All have been determined as weeds by the Western Australian Herbarium (2011) and Department of Environment and Conservation (2011c). There are several ratings allocated to each weed in the Invasive Plant Prioritisation but only three have been selected to include in this report. These are ecological impacts, impact attributes and invasiveness which are shown in Table 7 for each of the non-endemic species recorded. Twenty nine of the weeds are listed as having a high ecological impact on the environment and 42 are listed having a rapid rate of dispersal.

**Table 6. Ecological Impacts and Invasiveness of recorded weeds**

Species	Ecological Impacts		Invasiveness
	Ecological impact L – low impact species M – medium impact species H – high impact species U – unknown impact	Impact attributes 1, 2,3,4, 5, 6, 7, 8, 9, 10 See explanation below table	Rate of dispersal R=rapid, M=moderate, S=slow
* <i>Acacia longifolia</i>	H	1,2,4,6,7,8,9	M
* <i>Arctotheca calendula</i>	H	8,9	R
* <i>Asparagus asparagoides</i>	H	6,7,8,9	R
* <i>Avena barbata</i>	H		R
* <i>Azolla filiculoides</i>	L		M
* <i>Briza maxima</i>	U		R
* <i>Briza minor</i>	U		R
* <i>Bromus diandrus</i>	H		R
* <i>Carpobrotus edulis</i>	H	8,9	R
* <i>Cortaderia selloana</i>	H	1,6,7,8,9	R
* <i>Cotula coronopifolia</i>	U		R
* <i>Cotula turbinata</i>	L		M
* <i>Cynodon dactylon</i>	H	9	R
* <i>Cyperus congestus</i>	U		M
* <i>Cyperus tenellus</i>	L		U
* <i>Disa bracteata</i>	U		R

Species	Ecological Impacts		Invasiveness
	Ecological impact	Impact attributes	
* <i>Dittrichia graveolens</i>	M		R
* <i>Echium plantagineum</i>	H	increasing	R
* <i>Ehrharta calycina</i>	H	1,2,6,8,9	R
* <i>Ehrharta longiflora</i>	H	1,2,6,8,9	R
* <i>Eragrostis curvula</i>	H		R
* <i>Erodium botrys</i>	U		M
* <i>Eucalyptus robusta</i>	Not listed		
* <i>Euphorbia terracina</i>	H	8,9	R
* <i>Ficus carica</i>	H		M
* <i>Fumaria capreolata</i>	H	7,9	R
* <i>Gladiolus caryophyllaceus</i>	H		R
* <i>Gomphocarpus fruticosus</i>	H	9	R
* <i>Holcus lanatus</i>	H		U
* <i>Hypochaeris glabra</i>	H		R
* <i>Isolepis marginata</i>	U		U
* <i>Juncus acutus</i>	H	1,3,4,7,8,9	R
* <i>Juncus bufonius</i>	U		R
* <i>Juncus capitatus</i>	U		R
* <i>Lolium multiflorum</i>	Not listed		
* <i>Lotus subbiflorus</i>	U		R
* <i>Lupinus angustifolia</i>	H		M
* <i>Lupinus cosentinii</i>	H		M
* <i>Lythrum hyssopifolia</i>	M		R
* <i>Medicago polymorpha</i>	L		
* <i>Moraea flaccida</i>	H	8,9	R
* <i>Nerium oleander</i>	L		R
* <i>Oenothera stricta</i>	L		M
* <i>Ornithopus sativus</i>	M		R
* <i>Paspalum urvillei</i>	H		M
* <i>Pennisetum clandestinum</i>	H		S
* <i>Persicaria maculosa</i>	L		U
* <i>Populus nigra</i>	L		S
* <i>Ranunculus muricata</i>	L		U
* <i>Raphanus raphanistrum</i>	U		M
* <i>Ricinus communis</i>	M	2,8,9	R
* <i>Romulea rosea</i>	U		R
* <i>Rumex crispus</i>	U		R
* <i>Schinus terebinthifolia</i>	H	3,7,8,9	M
* <i>Solanum americanum</i>	U		R
* <i>Solanum nigrum</i>	M		R
* <i>Sonchus asper</i>	U		R
* <i>Sonchus oleraceus</i>	U	increasing	R
* <i>Trachyandra divaricata</i>	M	1,4,9	R
* <i>Trifolium campestre</i>	U		U
* <i>Trifolium hirtum</i>	U		U
* <i>Typha orientalis</i>	H	2, 3,5,6,7,9	R
* <i>Ursinia anthemoides</i>	U	increasing	R
* <i>Vulpia bromoides</i>	H		R
* <i>Wahlenbergia capensis</i>	U		R
* <i>Zantedeschia aethiopicum</i>	H	6,7,8,9,10	R

**Impact Attributes:** 1 - changed fire regime; 2 - changed nutrient conditions; 3 - changed hydrological patterns; 4 - changed soil erosion patterns; 5 - changed geomorphological processes; 6 - changed biomass distribution; 7 - changed light distribution; 8 - loss of biodiversity; 9 - substantially reduces regeneration opportunities of native plants; 10 - allelopathic effects. Increasing means that the weed is increasing its distribution from original known areas.

## 5. COMPARISON WITH WETLAND SURVEY

Dr A. Weston (Coterra Environment, 2011) surveyed Lot 2 to assess the quality, the taxa present and condition to determine the assessment of the wetland classification. He detailed each remnant section of vegetation and determined that the wetlands at the site should be downgraded after assessing the vegetation using Bulletin 686 (Coterra Environment, 2011). He photographed 13 different wetland areas, providing data on the dominant taxa. He also assessed the vegetation condition for each of the photo points. As a result of this survey he stated that the vegetation on site did not represent a conservation management category wetland as the vegetation was degraded, completely degraded or cleared.

Dr Weston did a detailed assessment of the area to the east of the high ground and did not cover the whole area as did the current survey.

## 6. DISCUSSION

As found by Dr Weston large areas of the site are degraded due to previous farming practices. It was mainly the lower ground where the development had occurred. The wetland remnants varied in their structure but *Melaleuca preissiana* and *Melaleuca raphiophylla* were the dominant trees with an understorey mainly replaced by weeds. In the centre of the site there was a sand ridge which had vegetation associated with the higher ground, *Banksia attenuata*, *Banksia menziesii* and *Eucalyptus todtiana* with an understorey of mixed shrub species.

At the north eastern end there were several Eastern Australian *Eucalyptus* trees growing. These have been tentatively identified as *\*Eucalyptus robusta* commonly called 'Swamp mahogany' a species which grows in wet soils. If it intended to rehabilitate this section of the wetland these plants should be removed and planted with the endemic *Eucalyptus rudis* subsp. *rudis*, a few trees of which are in the area. This remnant also included several plants of Poplar (*\*Populus nigra*) and Japanese pepper (*\*Schinus terebinthifolia*), all of which need to be removed. Poplars are inclined to sucker so may need to be removed for several years.

Two priority flora were recorded from the site. These were:

- *Jacksonia gracillima* a priority 3 flora was recorded from two locations. This is a low shrub up to about 1.5m tall with phyllodes (modified leaves) that appear to be divided into 3 at their ends; and
- *Schoenus pennisetis* a priority 2 flora was recorded from one area only. It is an annual sedge up to 15cm tall with dark brown to nearly black flowers. This species is readily overlooked once the damp areas in which it grows dries out.

Ten quadrats were established and a listing made of the species along the perimeter of the block with Nicholson Road and a listing of the weeds along Nicholson Road was also made. The vegetation condition varied from very good to completely degraded.

The client intends to retain and rehabilitate some areas. If it is possible the areas of quadrats CS01 and CS02 could be considered for retention and well as the drain represented by quadrat CS10. These three sections of the remnant bushland record the diversity of the wetland remnants. By putting any infrastructure on the higher ground, where the vegetation condition varied between good and degraded, it should overcome building problems, especially with the requirement of fill for lower areas. The higher ground recorded many *Banksia attenuata* and *Banksia menziesii* deaths, not just from the recent fire but as a result of the long hot summers and dry winters experienced over the previous two years.

If rehabilitation of the site is to occur it is recommended that seed of the endemic species be professionally collected prior to any clearing occurring. Seedlings could then be propagated on, or seed sown direct into, prepared soil. It is essential that weed control occur prior to any plantings.

Most of the site is degraded or completely degraded and includes some invasive weeds in particular, \**Zantedeschia aethiopica* (Arum lily), \**Euphorbia terracina* (Geraldton carnation weed) and several grasses including \**Ehrharta calycina* (Perennial veldt grass) and \**Bromus diandrus* (Great Brome). Control of these species should be undertaken immediately and if any other plants regrow they should be hand pulled immediately.

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## **APPENDIX A**

**Species listed alphabetically under vascular plant families**

VASCULAR PLANT FAMILY	SPECIES
AIZOACEAE	* <i>Carpobrotus edulis</i>
ANACARDIACEAE	* <i>Schinus terebinthifolia</i>
APIACEAE	<i>Trachymene pilosa</i>
APOCYNACEAE	* <i>Nerium oleander</i>
ARACEAE	<i>Lemna disperma</i>
	* <i>Zantedeschia aethiopicum</i>
ASCLEPIDACEAE	* <i>Gomphocarpus fruticosus</i>
ASPARAGACEAE	* <i>Asparagus asparagoides</i>
	<i>Laxmannia grandiflora</i>
	<i>Thysanotus manglesianus</i>
	<i>Thysanotus patersonii</i>
	* <i>Trachyandra divaricata</i>
ASTERACEAE	* <i>Arctotheca calendula</i>
	* <i>Cotula coronopifolia</i>
	* <i>Cotula turbinata</i>
	* <i>Dittrichia graveolens</i>
	* <i>Hypochaeris glabra</i>
	<i>Podotheca angustifolia</i>
	<i>Podotheca chrysantha</i>
	<i>Podotheca gnaphalioides</i>
	<i>Quinetia urvillei</i>
	<i>Senecio pinnatifida</i> var. <i>latiloba</i>
	* <i>Sonchus asper</i>
	* <i>Sonchus oleraceus</i>
	* <i>Ursinia anthemoides</i>
BORAGINACEAE	* <i>Echium plantagineum</i>
BRASSICACEAE	* <i>Raphanus raphanistrum</i>
CAMPANULACEAE	* <i>Wahlenbergia capensis</i>
CASUARINACEAE	<i>Allocasuarina fraseriana</i>
CENTROLEPIDACEAE	<i>Centrolepis aristata</i>
COLCHICACEAE	<i>Burchardia umbellata</i>
COMMELINIACEAE	<i>Cartonema philydroides</i>
CRASSULACEAE	<i>Crassula colorata</i>
	<i>Crassula decumbens</i>
CYPERACEAE	* <i>Cyperus congestus</i>
	* <i>Cyperus tenellus</i>
	<i>Isolepis cernua</i>
	* <i>Isolepis marginata</i>
	<i>Isolepis oldfieldiana</i>
	<i>Isolepis stellata</i>
	<i>Lepidosperma longitudinale</i>
	<i>Lepidosperma pubisquameum</i>
	<i>Schoenus curvifolius</i>
	<i>Schoenus efoliatus</i>
	<i>Schoenus pennisetis</i>
	<i>Schoenus rigens</i>

VASCULAR PLANT FAMILY	SPECIES
DASYPOGONACEAE	<i>Dasypogon bromeliifolius</i>
DILLENACEAE	<i>Hibbertia racemosa</i>
DROSERACEAE	<i>Drosera erythrorhiza</i>
	<i>Drosera glanduligera</i>
EUPHORBIACEAE	* <i>Euphorbia terracina</i>
	* <i>Ricinus communis</i>
FABACEAE	<i>Acacia huegelii</i>
	* <i>Acacia longifolia</i>
	<i>Acacia pulchella</i> var. <i>glaberrima</i>
	<i>Acacia saligna</i>
	<i>Aotus procumbens</i>
	<i>Daviesia preissii</i>
	<i>Gompholobium tomentosum</i>
	<i>Jacksonia furcellata</i>
	<i>Jacksonia gracillima</i>
	<i>Jacksonia sternbergiana</i>
	<i>Kennedia prostrata</i>
	* <i>Lotus subbiflorus</i>
	* <i>Lupinus angustifolia</i>
	* <i>Lupinus cosentinii</i>
	* <i>Medicago polymorpha</i>
	* <i>Ornithopus sativus</i>
	<i>Pultenaea reticulata</i>
	* <i>Trifolium campestre</i>
	* <i>Trifolium hirtum</i>
FUMARIACEAE	* <i>Fumaria capreolata</i>
GERANIACEAE	* <i>Erodium botrys</i>
	<i>Geranium molle</i>
GOODENIACEAE	<i>Lechenaultia floribunda</i>
HAEMODORACEAE	<i>Anigozanthos humilis</i>
	<i>Anigozanthos manglesii</i>
	<i>Conostylis aculeata</i>
	<i>Conostylis juncea</i>
	<i>Haemodorum laxum</i>
	<i>Haemodorum spicatum</i>
HEMEROCALLIDACEAE	<i>Dianella divaricata</i>
IRIDACEAE	* <i>Gladiolus caryophyllaceus</i>
	* <i>Moraea flaccida</i>
	<i>Patersonia occidentalis</i>
	* <i>Romulea rosea</i>
JUNCACEAE	* <i>Juncus acutus</i>
	* <i>Juncus bufonius</i>
	* <i>Juncus capitatus</i>
	<i>Juncus pallidus</i>
LOBELIACEAE	<i>Lobelia alata</i>
LORANTHACEAE	<i>Nuytsia floribunda</i>

VASCULAR PLANT FAMILY	SPECIES
LYTHRACEAE	* <i>Lythrum hyssopifolia</i>
MOLLUGINACEAE	<i>Macarthuria apetala</i>
MORACEAE	* <i>Ficus carica</i>
MYRTACEAE	<i>Astartea scoparia</i>
	<i>Calytrix flavescens</i>
	* <i>Eucalyptus robusta</i>
	<i>Eucalyptus rudis</i> subsp. <i>rudis</i>
	<i>Eucalyptus todtiana</i>
	<i>Hypocalymma angustifolium</i>
	<i>Kunzea glabrescens</i>
	<i>Melaleuca preissiana</i>
	<i>Melaleuca raphiophylla</i>
	<i>Melaleuca teretifolia</i>
	<i>Melaleuca thymoides</i>
	<i>Melaleuca viminea</i>
	<i>Scholtzia involucrata</i>
ONAGRACEAE	* <i>Oenothera stricta</i>
ORCHIDACEAE	<i>Caladenia flava</i>
	<i>Caladenia paludosa</i>
	* <i>Disa bracteata</i>
	<i>Microtis media</i>
POACEAE	<i>Amphipogon turbinatus</i>
	<i>Austrostipa compressa</i>
	* <i>Avena barbata</i>
	* <i>Briza maxima</i>
	* <i>Briza minor</i>
	* <i>Bromus diandrus</i>
	* <i>Cortaderia selloana</i>
	* <i>Cynodon dactylon</i>
	* <i>Ehrharta calycina</i>
	* <i>Ehrharta longiflora</i>
	* <i>Eragrostis curvula</i>
	* <i>Holcus lanatus</i>
	* <i>Lolium multiflorum</i>
	<i>Microlaena stipoides</i>
	* <i>Paspalum urvillei</i>
	* <i>Pennisetum clandestinum</i>
	* <i>Vulpia bromoides</i>
POLYGALACEAE	* <i>Rumex crispus</i>
	* <i>Persicaria maculosa</i>
PORTULACACEAE	<i>Calandrinia liniflora</i>
PROTEACEAE	<i>Adenanthos cygnorum</i>
	<i>Banksia attenuata</i>
	<i>Banksia ilicifolia</i>
	<i>Banksia menziesii</i>
	<i>Stirlingia latifolia</i>

<b>VASCULAR PLANT FAMILY</b>	<b>SPECIES</b>
RANUNCULACEAE	* <i>Ranunculus muricata</i>
RESTIONACEAE	<i>Hypolaena exsulca</i>
	<i>Lyginia barbata</i>
SALICACEAE	* <i>Populus nigra</i>
SALVINIACEAE	* <i>Azolla filiculoides</i>
SOLANACEAE	* <i>Solanum americanum</i>
	* <i>Solanum nigrum</i>
TYPHACEAE	* <i>Typha orientalis</i>
XANTHORRHOEACEAE	<i>Xanthorrhoea brunonis</i>
ZAMIACEAE	<i>Macrozamia riedlei</i>

**APPENDIX B**  
**Quadrat Data**

## Quadrat CS01

**Location:** Southern edge of site

**GPS:** 397671E; 6441243N

**Soil Type:** Dark grey sand. Flat, damp land

**Vegetation Description:** Open Low Woodland B of *Melaleuca preissiana* over Dense Thicket of *Kunzea glabrescens* over Open Herbs dominated by *Patersonia occidentalis* and *Drosera glanduligera*

**Vegetation Condition:** Good with occasional areas degraded

**Notes:** Consists of occasional areas of good vegetation amongst open areas. Lot of rubbish dumped



SPECIES	HEIGHT (cm)	% COVER
* <i>Arctotheca calendula</i>	20	<1
* <i>Avena barbata</i>	60	<1
* <i>Briza maxima</i>	50	<1
<i>Caladenia flava</i>	40	<1
* <i>Carpobrotus edulis</i>	5	<1
<i>Crassula colorata</i>	15	5
* <i>Disa bracteata</i>	40	<1
<i>Drosera glanduligera</i>	10	15
* <i>Hypochaeris glabra</i>	15	2
<i>Kunzea glabrescens</i>	400	75
* <i>Lotus subbiflorus</i>	20	1
<i>Melaleuca preissiana</i>	300	3
<i>Microtis media</i>	50	<1
<i>Patersonia occidentalis</i>	70	3
<i>Podotheca chrysantha</i>	20	<1
<i>Quinetia urvillei</i>	10	<1

<b>SPECIES</b>	<b>HEIGHT (cm)</b>	<b>% COVER</b>
<i>Schoenus rigens</i>	70	5
* <i>Ursinia anthemoides</i>	25	<1
* <i>Vulpia bromoides</i>	20	1
<i>Astartea scoparia</i>	Opportunistic	
<i>Austrostipa compressa</i>	Opportunistic	
* <i>Azolla filiculoides</i>	Opportunistic	
<i>Banksia ilicifolia</i>	Opportunistic	
<i>Banksia menziesii</i>	Opportunistic	
* <i>Briza minor</i>	Opportunistic	
<i>Centrolepis aristata</i>	Opportunistic	
<i>Crassula decumbens</i>	Opportunistic	
* <i>Ehrharta longiflora</i>	Opportunistic	
* <i>Ehrharta calycina</i>	Opportunistic	
* <i>Eragrostis curvula</i>	Opportunistic	
* <i>Erodium botrys</i>	Opportunistic	
* <i>Gladiolus caryophyllaceus</i>	Opportunistic	
<i>Hypocalymma angustifolium</i>	Opportunistic	
<i>Jacksonia gracillima</i>	Opportunistic	
* <i>Juncus capitatus</i>	Opportunistic	
* <i>Juncus bufonius</i>	Opportunistic	
<i>Lemna disperma</i>	Opportunistic	
<i>Lepidosperma longitudinale</i>	Opportunistic	
<i>Lyginia barbata</i>	Opportunistic	
* <i>Medicago polymorpha</i>	Opportunistic	
<i>Microlaena stipoides</i>	Opportunistic	
<i>Schoenus efoliatus</i>	Opportunistic	
<i>Schoenus pennisetis</i>	Opportunistic	
* <i>Solanum americanum</i>	Opportunistic	
* <i>Solanum nigrum</i>	Opportunistic	
<i>Wahlenbergia capensis</i>	Opportunistic	
* <i>Zantedeschia aethiopicum</i>	Opportunistic	



### Quadrat CS02

**Location:** To the east of CS01

**GPS:** 397733E; 6441329N

**Soil Type:** Grey sand on a low slope

**Vegetation Description:** Low Forest A of *Banksia attenuata* and *Banksia ilicifolia* over Tall Grass dominated by \**Ehrharta calycina* and \**Ehrharta longiflora* in grey sand.

**Vegetation Condition:** Good

**Notes:** Lot of weeds especially \**Ehrharta calycina* and \**Zantedeschia aethiopica*. Many *Banksia* deaths



SPECIES	HEIGHT (cm)	% COVER
<i>Acacia pulchella</i> var. <i>glaberrima</i>	70	<1
* <i>Arctotheca calendula</i>	50	1
* <i>Avena barbata</i>	150	1
<i>Banksia attenuata</i>	600	35
<i>Banksia ilicifolia</i>	700	5-15
* <i>Briza maxima</i>	50	5
<i>Burchardia umbellata</i>	100	2
<i>Caladenia flava</i>	30	<1
<i>Caladenia paludosa</i>	70	<1
* <i>Carpobrotus edulis</i>	10	<1
<i>Crassula decumbens</i>	15	2
<i>Dasypogon bromeliifolius</i>	70	2

<b>SPECIES</b>	<b>HEIGHT (cm)</b>	<b>% COVER</b>
<i>Dianella divaricata</i>	70	1
<i>Drosera erythrorhiza</i>	5	<1
* <i>Ehrharta calycina</i>	100	60
* <i>Ehrharta longiflora</i>	50	15
<i>Geranium molle</i>	30	<1
<i>Haemodorum spicatum</i>	90	<1
<i>Hibbertia racemosa</i>	50	1
* <i>Hypochaeris glabra</i>	50	<1
<i>Hypolaena exsulca</i>	50	<1
<i>Isolepis cernua</i>	10	<1
<i>Lepidosperma pubisquameum</i>	60	2
<i>Lyginia barbata</i>	70	<1
<i>Melaleuca thymoides</i>	100	3
<i>Nuytsia floribunda</i>	200	1
<i>Patersonia occidentalis</i>	70	1
<i>Thysanotus manglesianus</i>	twiner	<1
<i>Xanthorrhoea brunonis</i>	100	2
* <i>Zantedeschia aethiopicum</i>	120	5
<i>Allocasuarina fraseriana</i>	Opportunistic	
* <i>Bromus diandrus</i>	Opportunistic	
<i>Eucalyptus todiana</i>	Opportunistic	
<i>Kennedia prostrata</i>	Opportunistic	
* <i>Ornithopus sativus</i>	Opportunistic	
* <i>Vulpia bromoides</i>	Opportunistic	

### Quadrat CS03

**Location:** Neat the southern end of site

**GPS:** 397870E; 6441234N

**Soil Type:** Grey sandy loam, damp

**Vegetation Description:** Low Forest A of *Melaleuca raphiophylla* over Dense Herbs dominated by *\*Zantedeschia aethiopicum* and *\*Lotus subbiflorus*

**Vegetation Condition:** Good

**Notes:** Area burnt recently. Old tracks through the community were water filled



SPECIES	HEIGHT (cm)	% COVER
<i>Acacia saligna</i>	200	<1
<i>*Bromus diandrus</i>	70	<1
<i>Caladenia paludosa</i>	40	5
<i>*Carpobrotus edulis</i>	30	2
<i>*Cotula coronopifolia</i>	25	3
<i>Crassula decumbens</i>	10	<1
<i>*Cynodon dactylon</i>	30	1
<i>*Cyperus tenellus</i>	15	3
<i>*Ehrharta longiflora</i>	50	3
<i>*Hypochaeris glabra</i>	90	<1
<i>*Isolepis marginata</i>	10	3
<i>Juncus pallidus</i>	90	1
<i>Lemna disperma</i>	2	3
<i>Lobelia alata</i>	20	<1

<b>SPECIES</b>	<b>HEIGHT (cm)</b>	<b>% COVER</b>
<i>*Lotus subbiflorus</i>	25	60
<i>Melaleuca raphiophylla</i>	600	40-60
<i>Melaleuca teretifolia</i>	100	<1
<i>Patersonia occidentalis</i>	50	<1
<i>*Pennisetum clandestinum</i>	25	2
<i>*Ranunculus muricata</i>	50	<1
<i>*Romulea rosea</i>	20	<1
<i>*Rumex crispus</i>	50	<1
<i>*Vulpia bromoides</i>	60	10
<i>*Zantedeschia aethiopicum</i>	100	35
<i>*Asparagus asparagoides</i>	Opportunistic	
<i>Astartea scoparia</i>	Opportunistic	
<i>Isolepis stellata</i>	Opportunistic	
<i>Jacksonia furcellata</i>	Opportunistic	
<i>Melaleuca preissiana</i>	Opportunistic	
<i>*Moraea flaccida</i>	Opportunistic	
<i>*Schinus terebinthifolia</i>	Opportunistic	

## Quadrat CS04

**Location:**

**GPS:** 397735E; 6441140N

**Soil Type:** Grey sandy loam

**Vegetation Description:** Dense Tall Grass of *Eragrostis curvula* or Tall Sedges of *Juncus pallidus* or Herbs dominated by *Moraea flaccida* and *Euphorbia terracina*

**Vegetation Condition:** Degraded to completely degraded

**Notes:** Open area surrounded to the south by good quality wetland. Many tracks through the area  
Rubbish dumped



SPECIES	HEIGHT (cm)	% COVER
<i>*Arctotheca calendula</i>	50	1
<i>Calandrinia liniflora</i>	20	2
<i>*Carpobrotus edulis</i>	15	25
<i>*Cyperus tenellus</i>	5	40
<i>*Dittrichia graveolens</i>	50	<1
<i>*Eragrostis curvula</i>	150	10-90
<i>*Isolepis marginata</i>	5	25
<i>Isolepis oldfieldiana</i>	20	15
<i>Isolepis stellata</i>	30	10
<i>*Juncus bufonius</i>	35	15
<i>Juncus pallidus</i>	120	5-50
<i>Lobelia alata</i>	20	5
<i>*Lolium multiflorum</i>	70	1
<i>*Lotus subbiflorus</i>	20	40
<i>*Moraea flaccida</i>	60	2-10

<b>SPECIES</b>	<b>HEIGHT (cm)</b>	<b>% COVER</b>
<i>*Pennisetum clandestinum</i>	30	<1
<i>*Romulea rosea</i>	40	10
<i>*Vulpia bromoides</i>	30	25
<i>*Bromus diandrus</i>	Opportunistic	
<i>*Cortaderia selloana</i>	Opportunistic	
<i>*Echium plantagineum</i>	Opportunistic	
<i>*Gomphocarpus fruticosus</i>	Opportunistic	
<i>*Hypochaeris glabra</i>	Opportunistic	
<i>*Lythrum hyssopifolia</i>	Opportunistic	
<i>Melaleuca preissiana</i>	Opportunistic	
<i>Melaleuca teretifolia</i>	Opportunistic	
<i>Melaleuca viminea</i>	Opportunistic	
<i>*Paspalum urvillei</i>	Opportunistic	
<i>*Rumex crispus</i>	Opportunistic	
<i>*Sonchus asper</i>	Opportunistic	

## Quadrat CS05

**Location:** Central dune crest

**GPS:** 398069E; 6441322N

**Soil Type:** Pale grey sand. Crest of sand dune

**Vegetation Description:** Low Woodland A of *Banksia attenuata*, *Banksia menziesii*, *Nuytsia floribunda* and *Eucalyptus tottiana* over Heath B dominated by *Acacia pulchella* var. *glabrescens* over Tall Grass dominated by *\*Ehrharta calycina*

**Vegetation Condition:** Very good to good

**Notes:** Area burnt about 3 years. Numerous *Banksia* deaths. Becomes degraded above wetland to the east



SPECIES	HEIGHT (cm)	% COVER
<i>Acacia pulchella</i> var. <i>glaberrima</i>	150	60
<i>Anigozanthos humilis</i>	30	<1
<i>Anigozanthos manglesii</i>	70	<1
<i>Austrostipa compressa</i>	70	<1
<i>Banksia attenuata</i>	800	10
<i>Banksia menziesii</i>	500	5
<i>*Briza maxima</i>	70	<1
<i>Burchardia umbellata</i>	75	1
<i>Calytrix flavescens</i>	30	1
<i>*Carpobrotus edulis</i>	30	1
<i>Conostylis aculeata</i>	50	2
<i>Crassula decumbens</i>	15	3
<i>*Ehrharta calycina</i>	150	50
<i>*Ehrharta longiflora</i>	50	5

<b>SPECIES</b>	<b>HEIGHT (cm)</b>	<b>% COVER</b>
<i>Eucalyptus todtiana</i>	600	<1
* <i>Gladiolus caryophyllaceus</i>	70	1
<i>Hibbertia racemosa</i>	50	<1
* <i>Hypochaeris glabra</i>	30	1
<i>Macarthuria apetala</i>	20	<1
<i>Nuytsia floribunda</i>	600	2
* <i>Romulea rosea</i>	60	1
<i>Scholtzia involucrata</i>	70	<1
<i>Stirlingia latifolia</i>	90	2
<i>Thysanotus patersonii</i>	t	
* <i>Ursinia anthemoides</i>	70	2
* <i>Vulpia bromoides</i>	35	<1
<i>Acacia huegelii</i>	Opportunistic	
<i>Adenanthos cygnorum</i>	Opportunistic	
<i>Allocasuarina fraseriana</i>	Opportunistic	
<i>Amphipogon turbinatus</i>	Opportunistic	
* <i>Bromus diandrus</i>	Opportunistic	
<i>Caladenia flava</i>	Opportunistic	
<i>Cartonema philydroides</i>	Opportunistic	
<i>Drosera erythrorhiza</i>	Opportunistic	
* <i>Euphorbia terracina</i>	Opportunistic	
<i>Gompholobium tomentosum</i>	Opportunistic	
<i>Haemodorum laxum</i>	Opportunistic	
<i>Hypolaena exsulca</i>	Opportunistic	
<i>Jacksonia furcellata</i>	Opportunistic	
<i>Laxmannia grandiflora</i>	Opportunistic	
<i>Lechenaultia floribunda</i>	Opportunistic	
<i>Lyginia barbata</i>	Opportunistic	
<i>Macrozamia riedlei</i>	Opportunistic	
<i>Patersonia occidentalis</i>	Opportunistic	
<i>Podotheca angustifolia</i>	Opportunistic	
<i>Podotheca gnaphalioides</i>	Opportunistic	
<i>Schoenus curvifolius</i>	Opportunistic	
<i>Trachymene pilosa</i>	Opportunistic	



## Quadrat CS06

**Location:** In south eastern corner

**GPS:** Not recorded

**Soil Type:** Grey sand

**Vegetation Description:** Open Low Woodland A of *Eucalyptus tottiana* and *Melaleuca preissiana* over Low Scrub or Scrub of *Kunzea glabrescens* and *Pultenaea reticulata* over Herbs dominated by *\*Carpobrotus edulis* and *\*Lotus subbiflorus*

**Vegetation Condition:** Degraded

**Notes:** Continues to *Melaleuca raphiophylla* wetland to the north where there is open water



SPECIES	HEIGHT (cm)	% COVER
<i>Astartea scoparia</i>	90	<1
<i>*Avena barbata</i>	120	5
<i>*Carpobrotus edulis</i>	20	10
<i>*Ehrharta longiflora</i>	70	20
<i>*Eragrostis curvula</i>	120	2
<i>Eucalyptus tottiana</i>	1000	5
<i>*Hypochaeris glabra</i>	20	1
<i>Jacksonia gracillima</i>	90	<1
<i>Kunzea glabrescens</i>	250	5
<i>*Lotus subbiflorus</i>	10	15
<i>*Lupinus cosentinii</i>	60	2
<i>Melaleuca preissiana</i>	800	5
<i>Pultenaea reticulata</i>	175	5
<i>*Romulea rosea</i>	30	1

<b>SPECIES</b>	<b>HEIGHT (cm)</b>	<b>% COVER</b>
<i>*Ursinia anthemoides</i>	60	1
<i>*Vulpia bromoides</i>	25	10
<i>*Zantedeschia aethiopicum</i>	60	2
<i>Acacia pulchella</i> var. <i>glaberrima</i>	Opportunistic	
<i>Acacia saligna</i>	Opportunistic	
<i>*Cortaderia selloana</i>	Opportunistic	
<i>*Cotula turbinata</i>	Opportunistic	
<i>*Erodium botrys</i>	Opportunistic	
<i>Jacksonia furcellata</i>	Opportunistic	
<i>Juncus pallidus</i>	Opportunistic	
<i>Podotheca chrysantha</i>	Opportunistic	
<i>*Schinus terebinthifolia</i>	Opportunistic	

### Quadrat CS07

**Location:** South eastern side

**GPS:** 398202E; 6441083N

**Soil Type:** Pale grey sand

**Vegetation Description:** Low Woodland A of *Eucalyptus todtiana* with occasional *Banksia ilicifolia* over Open to Dense Tall Grass dominated by *\*Eragrostis curvula* over Herbs dominated by *\*Carpobrotus edulis*, *\*Erodium botrys*, *\*Lotus subbiflorus* and *\*Hypochaeris glabra*

**Vegetation Condition:** Degraded to completely degraded

**Notes:** Small area only



SPECIES	HEIGHT (cm)	% COVER
<i>Acacia pulchella</i> var. <i>glaberrima</i>	120	<1
<i>Aotus procumbens</i>	20	<1
<i>*Arctotheca calendula</i>	20	2
<i>*Carpobrotus edulis</i>	20	10
<i>Conostylis juncea</i>	50	<1
<i>Crassula decumbens</i>	5	1
<i>Daviesia preissii</i>	60	1
<i>Drosera glanduligera</i>	10	1
<i>*Ehrharta calycina</i>	120	5
<i>*Eragrostis curvula</i>	150	70
<i>*Erodium botrys</i>	15	5
<i>Eucalyptus todtiana</i>	1000	5-10
<i>*Hypochaeris glabra</i>	5	5
<i>Jacksonia sternbergiana</i>	175	<1
<i>Kunzea glabrescens</i>	170	1

<b>SPECIES</b>	<b>HEIGHT (cm)</b>	<b>% COVER</b>
<i>*Lotus subbiflorus</i>	10	5
<i>Patersonia occidentalis</i>	100	1
<i>*Romulea rosea</i>	30	1
<i>*Ursinia anthemoides</i>	70	2
<i>Allocasuarina fraseriana</i>	Opportunistic	
<i>Banksia ilicifolia</i>	Opportunistic	
<i>Dianella divaricata</i>	Opportunistic	

### Quadrat CS08

**Location:** On western side near Nicholson Road

**GPS:** 398239E; 6441348N

**Soil Type:** Grey sandy loam

**Vegetation Description:** Low Forest A of *Eucalyptus* species, possibly *Eucalyptus robusta*, *Melaleuca preissiana* and *Populus nigra* over Dense Tall Grass dominated by *Eragrostis curvula*

**Vegetation Condition:** Degraded

**Notes:** Lot of rubbish dumped. Seedlings of *Eucalyptus robusta* were abundant. In some areas

*Avena barbata* has a cover up to 30% and *Bromus diandrus* a cover up to 20%



SPECIES	HEIGHT (cm)	% COVER
<i>*Acacia longifolia</i>	200	<1
<i>*Asparagus asparagoides</i>	twiner	1
<i>Astartea scoparia</i>	60	1
<i>*Carpobrotus edulis</i>	10	5
<i>*Cortaderia selloana</i>	200	1
<i>*Echium plantagineum</i>	50	<1
<i>*Eragrostis curvula</i>	150	80
<i>*Eucalyptus robusta</i>	1200	35
<i>*Ficus carica</i>	120	<1
<i>Juncus pallidus</i>	150	2
<i>Lepidosperma longitudinale</i>	120	2
<i>*Lotus subbiflorus</i>	15	5
<i>Melaleuca preissiana</i>	1000	5
<i>*Populus nigra</i>	1000	2
<i>*Schinus terebinthifolia</i>	400	2

<b>SPECIES</b>	<b>HEIGHT (cm)</b>	<b>% COVER</b>
<i>*Zantedeschia aethiopicum</i>	70	1-25
<i>*Arctotheca calendula</i>	Opportunistic	
<i>*Avena barbata</i>	Opportunistic	
<i>*Bromus diandrus</i>	Opportunistic	
<i>*Cynodon dactylon</i>	Opportunistic	
<i>Eucalyptus rudis</i> subsp. <i>rudis</i>	Opportunistic	
<i>*Fumaria capreolata</i>	Opportunistic	
<i>Juncus acutus</i>	Opportunistic	
<i>*Nerium oleander</i>	Opportunistic	
<i>*Paspalidium urvillei</i>	Opportunistic	
<i>*Romulea rosea</i>	Opportunistic	
<i>*Sonchus oleraceus</i>	Opportunistic	
<i>*Typha orientalis</i>	Opportunistic	

### Quadrat CS09

**Location:** Next to but not adjacent to Nicholson Road

**GPS:** 398300E; 6441295N

**Soil Type:** Sandy loam

**Vegetation Description:** Open Tall Grass of *Avena barbata* and *Eragrostis curvula* over Dense Herbs dominated by *Lotus subbiflorus*

**Vegetation Condition:** Completely degraded

**Notes:** Common degraded area



SPECIES	HEIGHT (cm)	% COVER
<i>Acacia saligna</i>	100	1
* <i>Arctotheca calendula</i>	25	5
* <i>Avena barbata</i>	100	10
* <i>Bromus diandrus</i>	90	10
* <i>Cortaderia selloana</i>	200	3
* <i>Eragrostis curvula</i>	100	15
<i>Juncus pallidus</i>	80	1
* <i>Lotus subbiflorus</i>	25	80
* <i>Lupinus angustifolia</i>	70	10
* <i>Moraea flaccida</i>	70	1
* <i>Populus nigra</i>	200	5
* <i>Zantedeschia aethiopicum</i>	60	5
* <i>Dittrichia graveolens</i>	Opportunistic	
<i>Eucalyptus rudis</i> subsp. <i>rudis</i>	Opportunistic	
<i>Melaleuca raphiophylla</i>	Opportunistic	
* <i>Paspalum urvillei</i>	Opportunistic	
* <i>Pennisetum clandestinum</i>	Opportunistic	
* <i>Rumex crispus</i>	Opportunistic	
* <i>Trifolium campestre</i>	Opportunistic	

### Quadrat CS10

**Location:** Near Nicholson Road

**GPS:** 398200E; 6441342N

**Soil Type:** Sandy loam

**Vegetation Description:** Open Low Woodland A of *Melaleuca raphiophylla* over Open Tall Grass of *Eragrostis curvula* over Open Low Grass of *Cynodon dactylon* over Open Herbs of *Lotus subbiflorus*

**Vegetation Condition:** Good to degraded

**Notes:** At time of survey water reasonably deep



SPECIES	HEIGHT (cm)	% COVER
<i>*Arctotheca calendula</i>	10	1
<i>Astartea scoparia</i>	80	1
<i>*Cynodon dactylon</i>	50	20
<i>*Cyperus congestus</i>	50	2
<i>*Eragrostis curvula</i>	120	30
<i>*Ehrharta calycina</i>	70	5
<i>*Holcus lanatus</i>	70	<1
<i>*Lotus subbiflorus</i>	50	20
<i>Melaleuca raphiophylla</i>	600	5
<i>*Rumex crispus</i>	60	1
<i>*Zantedeschia aethiopicum</i>	70	2
<i>*Avena barbata</i>	Opportunistic	
<i>*Lolium multiflorum</i>	Opportunistic	
<i>*Persicaria maculosa</i>	Opportunistic	



### CS11 – listing of weeds along Nicholson Road

**Location:** Adjacent to Nicholson Road  
**GPS:** 398244E; 6441095N  
**Soil Type:** Grey sand  
**Vegetation Description:** Grass and herbaceous weeds  
**Vegetation Condition:** Degraded  
**Notes:**



<b>WEEDS RECORDED</b>
<i>*Avena barbata</i>
<i>*Bromus diandrus</i>
<i>*Euphorbia terracina</i>
<i>*Lolium multiflorum</i>
<i>*Lupinus angustifolius</i>
<i>*Lupinus cosentinii</i>
<i>*Moraea flaccida</i>
<i>*Oenothera stricta</i>
<i>*Pennisetum clandestinum</i>
<i>*Raphanus raphanistrum</i>
<i>*Ricinus communis</i>
<i>*Trachyandra divaricata</i>
<i>*Trifolium campestre</i>
<i>*Trifolium hirtum</i>

## **APPENDIX C**

### **Maps**

- i Approximate location of quadrats and vegetation units
- ii Vegetation Condition



Map 1. Approximate location of quadrats (red dots with white number) and vegetation units (orange areas)

**Explanation of vegetation units abbreviation**

Map Abbreviation	Description
Ba	Low Woodland A of <i>Banksia attenuata</i> , <i>Banksia menziesii</i> , <i>Nuytsia floribunda</i> and <i>Eucalyptus todtiana</i> over Heath B dominated by <i>Acacia pulchella</i> var. <i>glaberrima</i> over Tall Grass dominated by <i>*Ehrharta calycina</i>
Bi	Low Forest A of <i>Banksia attenuata</i> and <i>Banksia ilicifolia</i> over Tall Grass dominated by <i>*Ehrharta calycina</i> and <i>*Ehrharta longiflora</i>
Et	Low Woodland A of <i>Eucalyptus todtiana</i> with occasional <i>Banksia ilicifolia</i> over Open to Dense Tall Grass dominated by <i>*Eragrostis curvula</i> over Herbs dominated by <i>*Carpobrotus edulis</i> , <i>*Erodium botrys</i> , <i>*Lotus subbiflorus</i> and <i>*Hypochaeris glabra</i>
Mp	Open Low Woodland B of <i>Melaleuca preissiana</i> over Dense Thicket of <i>Kunzea glabrescens</i> over Open Herbs dominated by <i>Patersonia occidentalis</i> and <i>Drosera glanduligera</i>
Mr	Low Forest A of <i>Melaleuca raphiophylla</i> over Dense Herbs dominated by <i>*Zantedeschia aethiopicum</i> and <i>*Lotus subbiflorus</i>
EM	Open Low Woodland A of <i>Eucalyptus todtiana</i> and <i>Melaleuca preissiana</i> over Low Scrub A or Scrub of <i>Kunzea glabrescens</i> and <i>Pultenaea reticulata</i> over Herbs dominated by <i>*Carpobrotus edulis</i> and <i>*Lotus subbiflorus</i>
Er	Low Forest A of <i>*Eucalyptus</i> species, possibly ( <i>*Eucalyptus robusta</i> ), <i>Melaleuca preissiana</i> and <i>*Populus nigra</i> over Dense Tall Grass dominated by <i>*Eragrostis curvula</i>
Ec	Dense Tall Grass of <i>*Eragrostis curvula</i> , <i>*Paspalum urvillei</i> and/or <i>*Pennisetum clandestinum</i> or Tall Sedges of <i>Juncus pallidus</i> or Herbs dominated by <i>*Lotus subbiflorus</i> , <i>*Moraea flaccida</i> and <i>*Euphorbia terracina</i>



Map 2. Vegetation condition (refer to Table 5 for interpretation of rating scale)