

# Kendell Road

## Limestone Extraction Site

### Level 1 Flora and Vegetation

### Survey



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## **EXECUTIVE SUMMARY**

The Esperance Shire has requested various biological surveys as part of their compliance obligations for the purpose of clearing native vegetation to extract road material. The 2.4 hectare Kendell Road site is located 47 km north Esperance on the South Coast of Western Australia.

A level 1 flora survey was undertaken of both sites during early November 2012 in accordance with the Environmental Protection Authority (EPA) schedule 51, Guidance for the Assessment of Environmental Factors (the Environmental Protection Act 1986) Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia.

The site is part of a 170 ha vegetated mallee remnant which has traditionally been used as a limestone road base resource. The site comprises two plant communities being a:

- Low *Eucalyptus forrestiana* and *Eucalyptus uncinata* woodland Melaleuca mixed tall shrubland and
- Low *Eucalyptus halophila* and *Eucalyptus uncinata* open mallee Melaleuca shrubland.

The survey resulted in 26 species of flora being identified, all of which are considered common and showed evidence of being long unburnt (>20 years). The *Eucalyptus halophila* vegetation community and its proximity to an existing salt lake was a potential preferred habitat area for the DRF vulnerably listed *Eucalyptus merrickae*. No *Eucalyptus merrickae* plants were identified during the transect survey. No other DRF, PF, TEC's or their potential habitat were identified during the survey.

The area proposed for clearing is less than 0.03 per cent of its remaining vegetation type in the Catchment area. An existing historic fire break that dissects the site north to south has naturally regenerated with full recovery of vegetation structure and composition. The survey area is in excellent condition with no evidence of disturbance of vegetation structure and composition. The only immediate threat to vegetation condition is the proposed clearing for the purposes of limestone extraction.

### **Acknowledgements**

The Author would like to acknowledge the Esperance District DEC Flora Officer for the loan of DRF field reference guides, access to the District Herbarium and providing recommendations in setting DRF search buffer zones for survey sites.

Thank you to the Esperance Shire Council for providing access to GIS software and spatial datasets used within this report.

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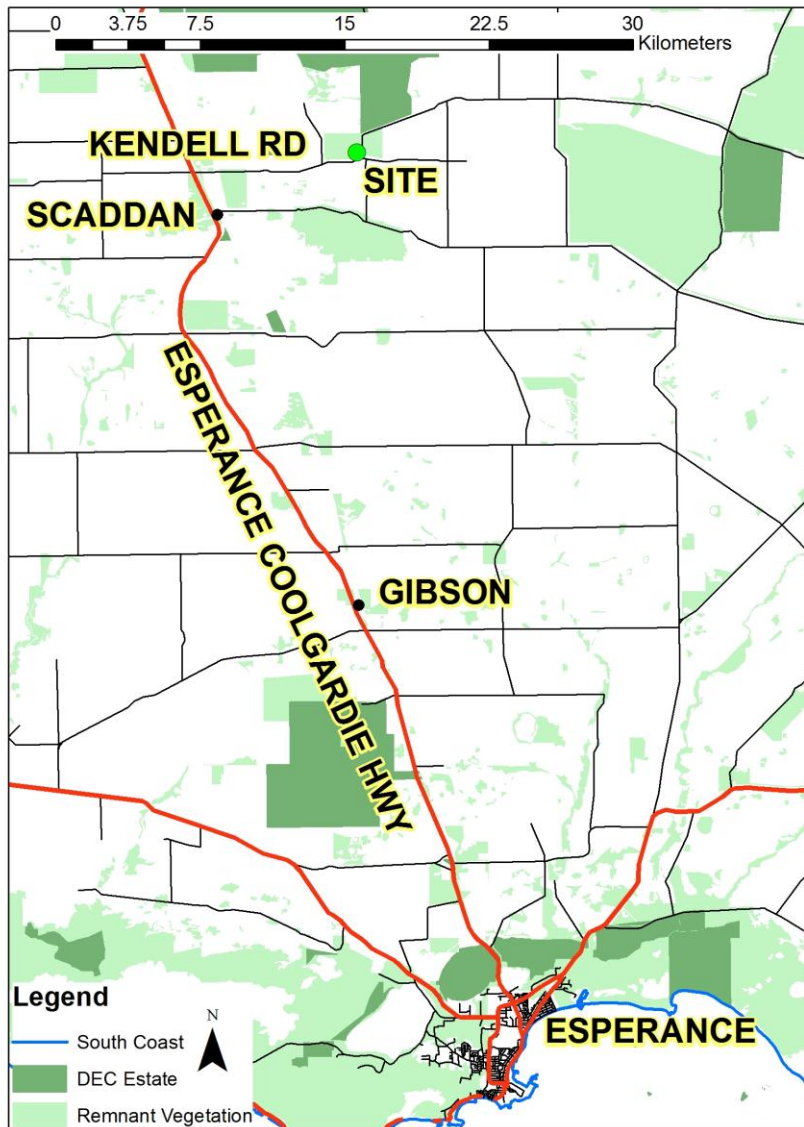
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## **INTRODUCTION**

The Esperance Shire has requested various biological surveys as part of their compliance obligations for the purpose of clearing native vegetation to extract road material. The 2.4 hectare Kendell Road site is located 47 km north of Esperance on the South Coast of Western Australia (Figure 1).

A level 1 flora survey has been undertaken of the site in accordance with the Environmental Protection Authority (EPA) schedule 51, Guidance for the Assessment of Environmental Factors (the Environmental Protection Act 1986) Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia.



**Figure 1 Location of Kendell Road survey site**

## **BACKGROUND**

The proposed limestone extraction site is an extension of existing limestone pits and has the potential to affect a number of possible environmental factors which have been outlined by DEC. These include;

- Declared Rare Flora (DRF) and Priority Flora (PF) within a ten kilometre radius.
- Compliance Level 1 vegetation and flora survey (Level 1 survey) and

The focus of this report will be on the DRF, PF and level 1 flora survey.

### **Scope**

As outlined in EPA schedule 51, the scope of the level 1 flora survey is in two parts being;

1. A desktop study for the purposes of gathering background information on the target area, and;
2. Reconnaissance survey to understand the likely presence of vegetation communities and flora species identified from the background study, define flora and vegetation units, their condition and potential impacts.

The survey involves low intensity sampling of flora to produce a species list, and maps of vegetation types and condition. The approximate survey area is 2.4 hectares.

### **Catchment landscape context**

The Grass Patch – Salmon Gums area covers 438,000 ha and begins about 50 km north of Esperance on the South Coast of Western Australia, and extends about 100 km north along the Coolgardie–Esperance Highway (DAFWA 2005). Only 16 per cent of the original vegetation has been retained and agricultural land retains only six per cent of its original vegetation (DAFWA 2005).

### **Climate**

The climate is Mediterranean with cool wet winters and dry warm summers. The site receives an average annual rainfall of about 480 mm (DAFWA 2005).

### **Geology**

The site has three distinct geologic units emplaced and deposited over three different geologic periods. The geology of the area is comprised of Precambrian crystalline basement rocks and Cenozoic sediments that have been emplaced and deposited over three geologic periods — Precambrian, Tertiary and Quaternary.

Precambrian basement rocks underlie the entire area. In the north-west they consist of Archaean granites of the Yilgarn Craton, and in the south-east they consist of Proterozoic granite, gneiss and migmatite from the Albany–Fraser Orogen (Morgan and Peers 1973).

Tertiary sediments from the Plantagenet Group of the Bremer Basin form a discontinuous cover over the basement rocks (Johnson & Baddock 1998). The sediments consist of two distinct formations — the Werillup Formation and the Pallinup Siltstone. The Werillup Formation consists of dark coloured siltstone, sandstone,

claystone and lignite, and is restricted to the depressions and valleys (palaeo-channels) in the basement rocks (Cockbain 1968). The Pallinup Siltstone is more widespread and consists of siltstone and spongolite overlying either the Werillup Formation sediments or weathered basement rock (Morgan and Peers 1973).

Quaternary sediments form the present day sandplain and occur as a thin (<10 m) surface veneer overlying the Tertiary sediments.

### **Soils and Topography**

The site is located on the Halbert land system which includes a level plain with several small salt lakes. It makes up part of the Halbert (Ha1) subsystem and soils are dominated by alkaline grey shallow and deep sandy duplex soils, calcareous loamy earths, associated pale deep sands and salt lake soils (Overheu et al 1993). The site is dominated by alkaline grey shallow sandy duplex soils and is located between salt lakes (Figure 2).

### **Vegetation**

The site is located within the EPA schedule 51 bioregion Group one being the Mallee IBRA region. The site comprises the Esperance Mallee vegetation system, map code e27,32Si and is described by Beard as shrublands; mallee scrub, black marlock and Forrest's marlock (*Eucalyptus forrestiana*).

### **Land use**

The Site is located on Esperance location 2144 which is vested as a 170 ha Crown Reserve (2780). The surrounding area has traditionally been used by the Esperance Shire Council as a source of limestone road base and then revegetated.

## **METHODOLOGY**

### **Desktop study**

A desk top study of existing geospatial information was undertaken prior to the site visit as part of the level 1 survey. This included using a Geographical Information System (GIS) to review existing site digital orthophotos, geology, morphology, wetlands, native vegetation, IBRA classification, DRF, PF and TEC's.

State and Commonwealth database searches for potential DRF, PF, and Threatened Ecological Communities (TEC), within a ten kilometre buffer of the survey sites was undertaken as part of the desktop study. Additional liaison with the Esperance DEC District Flora officer was conducted to further refine conservation values of interest and to define the ten kilometre buffer due a lack of DRF and PF data across the District.

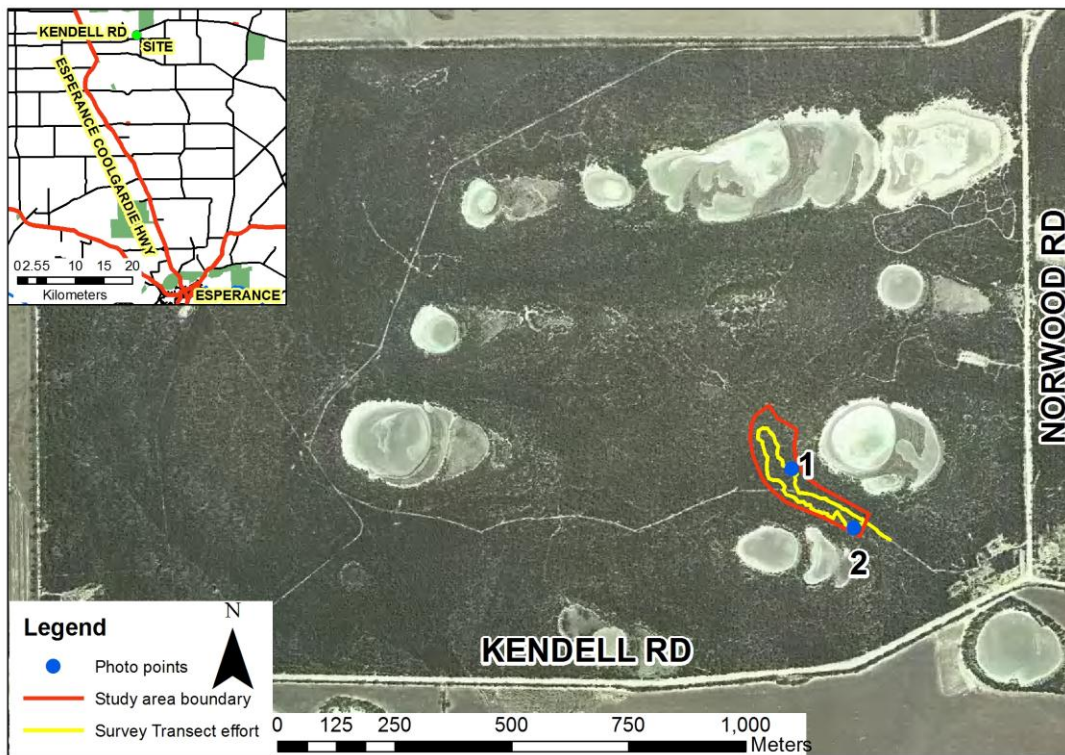
### **Field investigation**

The preliminary field survey was during late spring on the 5<sup>th</sup> of November 2012. The survey effort comprised of about 830 m of survey transect for the site (Figure 2 and 3) and covered an area of 2.4 ha. The transects were conducted to cover as much area as possible and representative habitats within each site. The length of transect was effected by access within the site pending density of shrublayer vegetation. The Esperance Shire provided coordinates for the site which were uploaded from GIS into a Garmin GPSmap 60CSX unit and a field aerial photo map was used to navigate to different habitat areas. A portable field herbarium was established and a preliminary species list developed.

A list of DRF and PF within a ten kilometre radius of each site was used in the field along with a Threatened and Priority Flora field manual (Adams 2011) provided by the Esperance DEC District Flora Officer. A combination of local botanical knowledge, botanical field guides, the DEC Esperance District Herbarium and Florabase were used to prepare a plant species lists for each site (Appendix 1).

The transects were used to develop a botanical species list, descriptions of vegetation types, structure, condition, threats, soils and landforms. Vegetation type and soil descriptions of units identified across each site area were derived from applying the collated field data to the Australian Soil and Land Survey Field Handbook, CSIRO. The vegetation structure was determined by growth form, height class, dominant species, other common species, per cent cover, and health of each stratum. Vegetation condition ratings are derived from Keighery 1994, Appendix 2.

The vegetation was divided into three strata: upper, middle, and lower. Growth forms for each stratum were categorized based on those listed by McDonald *et al.* (1990). The upper stratum consists of tree, tree mallee, shrub, or mallee shrub. The middle stratum includes shrub, mallee shrub, or heath shrub. The lower stratum include Chenopod shrub, tussock grass, hummock grass, sod grass, sedge, rush, forb, fern, moss, or vine. Definitions for these growth forms can be found on page 65 of *Australian Soil and Land Survey* (McDonald *et al.*, 1990). The height classes for the dominant species were derived from McDonald *et al.* (pg. 67, 1990) and applied to each stratum based on the dominant vegetation.



**Figure 2 Kendell Rd site survey area and transect effort**

The site description consists of a location description, ecological impacts, vegetation structure, condition of vegetation, level of threat to vegetation, and surface and subsurface soil descriptions. The location description included aspects such as topographic position and drainage.

Ecological impacts are listed as being present or absent, and take into account both negative and positive impacts on the vegetation. They included clearing, artificial water way construction, fire, regeneration, waterlogging, senescence, weeds, erosion, sedimentation, rabbits, dieback, and illegal dumping of rubbish.

The condition of vegetation is a subjective assessment of how healthy the vegetation is at the time of the survey. This was based on the amount of dead or dying plants throughout the stratum compared to the amount of living plants and weed cover. This was categorized as “Excellent,” “Very Good,” “Good,” “Degraded,” or “Completely Degraded.” The categories are derived from Keighery 1994, and outlined in further detail in Appendix 2.

All field data collected relating to vegetation type, condition, transect coverage, and photo points have been collated into GIS shapefiles and used as part of the analysis. The survey transect coverage has attributed length to assist in defining survey effort undertaken. Mapping of site area vegetation type and condition were collated and recorded as polygon shapefiles and attributed with area and perimeter parameters.



The GIS vegetation type and condition database files were exported into Microsoft Excel, whereby pivot table functionality was used to summarise parameters and proportional statistics for further analysis.

## Analysis methodology

Findings from the desktop study and field survey were reviewed against whether the site would affect any of the following environmental values:

- The presence or absence of DRF, PF and TEC's and
- The area and condition of remnant vegetation.

## RESULTS

### Desktop study

The Declared and endangered flora list (DEFL) database search and liaison with the Esperance DEC District Flora Officer resulted in 46 known PF species and two known DRF Vulnerable species sites within a ten kilometre radius of the survey area (Table 1). Appendix 3 provides a description of each priority conservation status. The database search resulted in no known occurrences of TECs within the vicinity of the site.

**Table 1 Priority Flora sites within a 10 km radius of each survey area**

Taxon	Number PF Sites					Total
	DRF - Vuln	P 1	P 2	P 3	P 4	
<i>Beyeria physaphylla</i>		4				4
<i>Conostephium marchantiorum</i>				3		3
<i>Darwinia polycephala</i>					1	1
<i>Dillwynia acerosa</i>				1		1
<i>Eremophila chamaephila</i>			1			1
<i>Eucalyptus dolichorhyncha</i>					2	2
<i>Eucalyptus foliosa</i>				6		6
<i>Eucalyptus merrickiae</i>	2					2
<i>Eucalyptus misella</i>		1				1
<i>Goodenia laevis subsp. laevis</i>				1		1
<i>Goodenia sp. Scaddan (Turley 41VM/1099)</i>		1				1
<i>Grevillea baxteri</i>					6	6
<i>Hydrocotyle sp. Truslove (Burgman 4419)</i>		1				1
<i>Isopogon alpicornis</i>				2		2
<i>Kunzea salina</i>			2			2
<i>Leucopogon rotundifolius</i>				1		1
<i>Melaleuca dempta ms</i>				5		5
<i>Melaleuca fissurata</i>					4	4
<i>Persoonia cymbifolia</i>				2		2
<i>Pimelea pelinos</i>		1				1
<i>Trachymene anisocarpa var. trichocarpa</i>				1		1
<b>Grand Total</b>	<b>2</b>	<b>8</b>	<b>3</b>	<b>22</b>	<b>13</b>	<b>48</b>

## Field survey

The site had 26 species of flora identified during the flora survey (Appendix 1) and showed evidence of being long unburnt (>20 years). All species identified are considered to be common to the area with no evidence of weeds, DRF, TEC's and their associated habitat. The site comprised of two plant communities being a:

- Low (4-6 m) *Eucalyptus forrestiana* and *Eucalyptus uncinata* (20 per cent) woodland Melaleuca mixed tall shrubland (30 per cent) and
- Low (<4 m) *Eucalyptus halophila* and *Eucalyptus uncinata* open (2 per cent) mallee Melaleuca (open 50 per cent) shrubland (Figure 3).

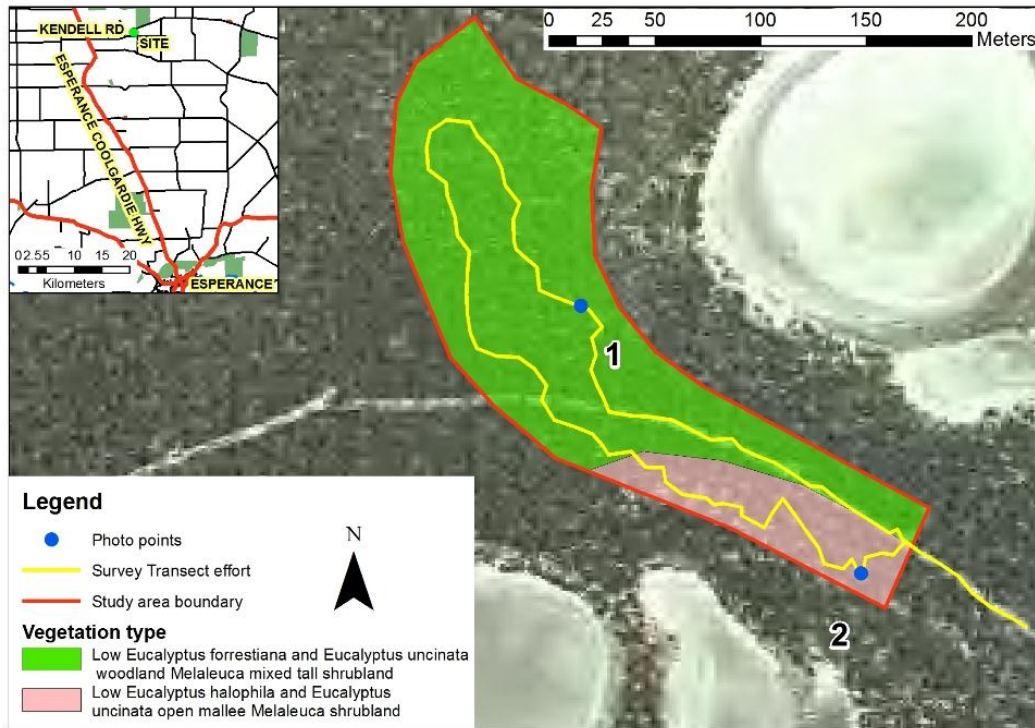


Figure 3 Kendell Rd survey site map

### ***Eucalyptus forrestiana*, *Eucalyptus uncinata* woodland Melaleuca tall shrubland**

The majority of the site comprises two hectares of Low (4-6 m) *Eucalyptus forrestiana* and *Eucalyptus uncinata* (20 per cent) woodland Melaleuca mixed tall shrubland (30 per cent) on a level plain with (<50cm) alkaline grey shallow sandy duplex soils (Plate 1). This vegetation type sits between two salt lakes on slightly higher flat ground with very little disturbance of vegetation structure resulting in a condition rating of excellent (Appendix 3). The canopy is dominated by very sparse (2-10 per cent cover) *Eucalyptus forrestiana* and *Eucalyptus uncinata* (<6 m), with a sparse (30 per cent) tall (>2 m) shrubland dominated by with a mix of Melaleucas such as *Melaleuca rigidifolia*, *Melaleuca blumea*, *Melaleuca coronicarpa* and *Melaleuca glaberrima*. Other shrub species include *Grevillea plurijuga subsp. superba*, *Leptomeria pachyclada*, *Daviesia benthamii subsp. benthamii*, *Baeckea latens* and *Dodonaea amblyophylla*. The ground cover was bare and open with very sparse *Gahnia ancistrophylla* (Plate 1).



**Plate 1 Photo point 1, West aspect**

***Eucalyptus halophila* and *Eucalyptus uncinata* mallee *Melaleuca* shrubland.**

The south west corner of the site is 0.4 ha of Low (<4 m) *Eucalyptus halophila* and *Eucalyptus uncinata* open (2 per cent) mallee *Melaleuca* open (50 per cent) shrubland on a flat plain at the eastern edge of a salt lake. The soils are moderately naturally saline and shallow (<10cm) alkaline grey sandy duplex. There is no evidence of disturbance from groundwater or surface water processes, grazing, weeds, dieback, fire, or senescence and vegetation structure is completely intact resulting in a condition rating of excellent (Appendix 2). The canopy is dominated by low (<4m) open *Eucalyptus halophila* and *Eucalyptus uncinata* mallee. A sparse shrubland mid layer is dominated by *Melaleuca thyoides*, *Melaleuca linguiformis*, and *Eucalyptus densa*. The ground cover was bare and open with very sparse *Gahnia ancistrophylla* (Plate 2).



**Plate 2. Photo point 2, North Aspect**

## Local scale of vegetation extent

At a regional context the Esperance mallee within the Esperance Shire has less than 20 per cent of its original native vegetation remaining. At a landscape catchment scale, only 13 per cent of shrublands; mallee scrub, black marlock and Forrest's marlock (*Eucalyptus forrestiana*) (This Beard vegetation type includes both plant communities identified across the site) vegetation remains in the Grass Patch – Salmon Gums catchment area (DAFWA 2002). Beards pre-clearing records show of the original 66,900 ha of this vegetation type in the catchment area, 8,700 ha remain. The 2.4 hectare area proposed for clearing is about 0.03 per cent of the remaining Beards vegetation type in the Catchment area.

## Vegetation condition rating

The site has no evidence of disturbance from hydrological processes (secondary salinity, waterlogging), weeds, senescence, fire, grazing, or dieback. The vegetation structure at the canopy, mid and ground level is fully intact with excellent plant health. A condition rating of excellent has been classified for the entire site (Appendix 2).

## Threats

The numerous salt lakes provide a natural barrier to the spread of wildfire and the main fire threat would require a direct lightning strike or accidental ignition from a nearby farm. The large intact vegetated area means that the groundwater hydrology is stable and there is no immediate or medium term threat from secondary salinity. The site is at immediate threat from proposed clearing for the purposes of accessing limestone.

## CONCLUSION

The site is part of a 170 ha vegetated mallee remnant which has traditionally been used as a limestone road base resource. The area proposed for clearing is less than 0.03 per cent of its remaining vegetation type in the Catchment area. An existing historic fire break that dissects the site north to south has naturally regenerated with full recovery of vegetation structure and composition. The survey area is in excellent condition with no evidence of disturbance on vegetation structure and composition. The only immediate threat to vegetation condition is the proposed clearing for the purposes of limestone extraction.

The *Eucalyptus halophila* vegetation community and its proximity to an existing salt lake is preferred habitat for the DRF vulnerably listed *Eucalyptus merrickae*. No *Eucalyptus merrickae* plants were identified during the transect survey. No other DRF, PF, TEC's or their potential habitat were identified during the survey.

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## **APPENDICES**

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## Appendix 1: Species list for surveyed study area

### Legend

- Status refers to conservation status
- \* refers an introduced weed species
- 1 refers to species presence, and blank is absent.

Family	Taxon	Status	Kendall
<b>Chenopodiaceae</b>	<i>Sclerolaena sp UNKOWN</i>		1
<b>Cyperaceae</b>	<i>Gahnia ancistrophylla Benth.</i>		1
<b>Ericaceae</b>	<i>Astroloma sp UNKNOWN</i>		1
<b>Fabaceae</b>	<i>Daviesia benthamii subsp acanthoclona</i>		1
	<i>Pultenaea elachista</i>		1
<b>Loranthaceae</b>	<i>Cassytha melantha</i>		1
<b>Mimosaceae</b>	<i>Acacia sp UNKNOWN</i>		1
<b>Myrtaceae</b>	<i>Baeckea latens</i>		1
	<i>Eucalyptus densa</i>		1
	<i>Eucalyptus forrestiana</i>		1
	<i>Eucalyptus halophila</i>		1
	<i>Eucalyptus uncinata</i>		1
	<i>Melaleuca coroncarpa</i>		1
	<i>Melaleuca glaberrima</i>		1
	<i>Melaleuca linguiformis</i>		1
	<i>Melaleuca plumea</i>		1
	<i>Melaleuca podiocarpa</i>		1
	<i>Melaleuca rigidifolia</i>		1
	<i>Melaleuca thyoides</i>		1
<b>Proteaceae</b>	<i>Banksia media</i>		1
	<i>Grevillia oligantha</i>		1
	<i>Grevillea plurijuga ssp superba</i>		1
	<i>Persoonia teretifolia</i>		1
<b>Rutaceae</b>	<i>Phebalium lepidotum</i>		1
<b>Santalaceae</b>	<i>Leptomeria pachyclada</i>		1
	<i>Dodonaea amblyophylla</i>		1

## Appendix 2: Bushland Condition Ratings<sup>1</sup>

Condition	Description
Excellent	Vegetation structure intact, with disturbance affecting individual species and weeds consist of non-aggressive species. 1 – 5% weed cover
Very Good	Vegetation structure altered, with obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and/or grazing. 5 – 25% weed cover
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and/or grazing. 25 – 50% weed cover
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance of vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and/or grazing. 50 – 75% weed cover
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely, or almost completely, without native species. These areas are often described as “parkland cleared” with the flora comprising weed or crop species with isolated native trees or shrubs. 75 – 100% weed cover

<sup>1</sup> Adapted from Keighery, 1994 and the Braun-Blanquet Scale of Cover Abundance [from Mueller-Dombois and Ellenberg, 1974]



## **Appendix 3 Conservation status descriptions**

Definitions of conservation codes given to declared rare and priority flora.  
KJ Atkins, 15 July 1998, Department of Conservation and Land Management

### **R: Declared Rare 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, and have been gazetted as such.

### **P1: Priority One – Poorly Known Taxa**

Taxa that are known from one or a few (generally less than five) populations, which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, or the plants are under threat, e.g. from disease, grazing by feral animals. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

### **P2: Priority Two – Poorly Known Taxa**

Taxa which are known from one or a few (generally less than five) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

### **P3 Priority Three – Poorly Known Taxa**

Taxa that are known from several populations, and the taxa are believed to be not under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally more than five), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora', but are in need of further survey.

### **P4 Priority Four – Rare Taxa**

Taxa which are considered to have been adequately surveyed and which, while being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years.

Note: The need for further survey of poorly known taxa is prioritised into the three categories depending on the perceived urgency for determining the conservation status of those taxa, as indicated by the apparent degree of threat to the taxa on the current information.