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**FLORA AND VEGETATION OF  
AVIVA LEASE AREA**

Prepared for:

**URS Australia Pty Ltd**

on behalf of

**Aviva Corporation Ltd**

Prepared by:

**Mattiske Consulting Pty Ltd**

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**MATTISKE CONSULTING PTY LTD**

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## 1. SUMMARY

Mattiske Consulting Pty Ltd was commissioned by URS (Australia) Pty Ltd to conduct a flora and vegetation survey for a proposed Coolimba Power Station Project and Central West Coal Projects south of Eneabba, Western Australia. The objectives of the study were to investigate the potential flora and vegetation issues in the project area. Fieldwork was undertaken by Mattiske Consulting Pty Ltd in the spring months of 2005, 2006, 2007 and 2008 included a search for Declared Rare and Priority flora, defining and mapping the plant communities present, assessing the condition of the plant communities and reviewing the local and regional conservation values of the flora and vegetation. Detailed recordings were undertaken at representative plant communities.

A total of 512 taxa (including subspecies and varieties) from 182 genera and 64 families were recorded within the Aviva Project area. A total of 48 families, 123 genera and 261 taxa were found in the southern section of the Lake Logue Nature Reserve and near Lake Indoon. The dominant families in the Aviva Project area were Myrtaceae (106 taxa), Proteaceae (96 taxa), Papilionaceae (51 taxa) and Haemodoraceae (31 taxa). None of the 26 introduced species are listed by the Department of Agriculture and Food as Declared Plants pursuant to Section 37 of the *Agriculture and Related Resources Protection Act 1976* [WA].

Previous records from the Department of Environment and Conservation databases indicate that there are potentially twelve Rare, four Priority 1, sixteen Priority 2, thirty eight Priority 3 taxa and seventeen Priority 4 contained in the local area. Of these database records, seven are listed as Endangered and, four Vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* [cth]. Mattiske Consulting Pty Ltd fieldwork recorded, two Declared Rare, one Priority 1, ten Priority 2, 14 Priority 3 and seven Priority 4 of these taxa. Seven taxa, consisting of one Priority 1, five Priority 2 and one Priority 3 taxa were not previously recorded in the survey area. One Priority 1, two Priority 2, three Priority 3 and two Priority 4 taxa were found in Lake Logue reserve.

Potentially four declared rare, seven Priority 2, ten Priority 3, and seven Priority 4 taxa will be directly affected by either the Coolimba Power Project or the Central West Coal Project.

The Declared Rare taxa *Tetratheca nephelioides* (R) was recorded along the preferred infrastructure corridor, within community T1. The current proposal will directly impact 706 individuals, while another 860 will be left in South Eneabba Reserve. If the preferred route remains in the proposed position, then there will be a need to apply for State Ministerial approval to take this species. The option of avoiding the areas of native vegetation along the preferred infrastructure corridor has been reviewed and obviously from a conservation perspective it would be preferable to place the proposed infrastructure facilities in the already cleared paddocks to the south of the current alignment. The next option would be to locate the proposed infrastructure facilities south of the track and north of the fenceline to minimize the impact on the conservation areas. The latter will require State and Federal Ministerial approvals for taking of the rare and threatened flora species.

A few Declared Rare Eucalypts (*Eucalyptus crispata*, *Eucalyptus impensa* and *Eucalyptus johnsoniana*) have been recorded historically on and near the preferred infrastructure corridor. Some of these records are no longer present due to the clearing activities associated with the adjacent agricultural developments. State and Federal Ministerial Approval will be required for any taking of these species that are listed as Rare under the *Wildlife Conservation Act 1950* [WA] and as Endangered or Vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* [cth].

A number of Priority taxa will be directly impacted by both of the Central West Coal Project and the Coolimba Power Project. Of particular interest are those that are locally uncommon or are range extensions. Taxa that fall into this category include; *Acacia flabellifolia* (P3), *Calytrix purpurea* (P2), *Calytrix eneabbaensis* (P4), and *Verticordia aurea* (P4). All of these taxa have been found in locations that will be directly impacted by the Central West Coal Project.

A number of Priority taxa will be exposed to indirect impacts, with the main concerns being the increased exposure of surrounding Priority Flora to *Phytophthora* Dieback and unsustainable fire regimes (e.g. regular fires which may restrict regeneration through seeds or propagules).

A substantial proportion of the survey area has been burnt regularly in recent years and this may have influenced the coverage of flora. Some species may have been impacted negatively by the intensity of the fire, however many ephemeral species were covered in sampling after the fires. So on balance the coverage was considered to be comprehensive.

The vegetation on the southern part of the project area was mapped previously by Woodman Environmental Consulting Pty Ltd. This area was re-assessed and mapped by Mattiske Consulting Pty Ltd in November 2005 and updated in the spring months of 2008. Twenty-four plant communities were recorded in the Aviva survey area, comprising five heath communities, eight Proteaceae and Myrtaceae-dominated communities, eight Eucalypt communities and two chenopod communities (Figures 1 and 2). A large percentage of the Aviva survey area is also completely degraded farmland. The condition of the vegetation (based on the Bush Forever condition ratings) ranges from completely degraded in the pastures to excellent in the bushland areas.

The H1 heath community included pockets of lateritic rises, and therefore has some species in common with the only known Threatened Ecological Community in the Eneabba area, the Ferricrete Floristic Community - Rocky Springs type. Community 72 Ferricrete Floristic Community is listed as Vulnerable by the Department of Environment and Conservation (2006). This Threatened Ecological Community is not currently listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* [cth]. On the basis of database search and a comparison with regional datasets (Department of Environment and Conservation 2009a), the majority of the flora recorded on the Rocky Springs Ferricrete communities are represented either on the northern Swan Coastal Plain or in the adjacent regions. Twenty-nine of the sixty taxa recorded within the local TEC Ferricrete Community (Hamilton-Brown *et al.* 2004) were recorded within the survey area. The majority of these species occur more widely, and therefore the significance of the latter is difficult to assess in view of the lack of regional studies on the Rocky Springs TEC. The project as proposed does not impact directly on the Rocky Springs TEC.

A number of other communities were classed as regionally or locally significant. These include; T1, E1, E2, E4, E5, E6, H1, H2, H3, H5, T2, and, S1. These communities are represented in the Eridoon and Tathra vegetation systems. These vegetation systems are currently represented in conservation reserves (3.49 % (Tathra) and 14.94 % (Eridoon) of the pre – European extent of those vegetation systems). Both projects will only affect a maximum of 0.268 % of the Tathra system and 1.224 % of the Eridoon system. Assessment of whether the current conservation reserves are adequate will depend on an assessment of the impact of all current projects in the region.

In reviewing the lifeforms of the other plants within the communities on the Aviva project area, it is apparent that the majority of plants are dependent on soil moisture from rainfall events and that the majority of the plant species are herbs or small shrubs that will have shorter root systems. This relationship can then be expanded to their dominance within the respective plant communities. The heath and scrub (H2 and T1) communities that dominate the communities on the project area are largely dominated by shallow rooted species or shrubs that are primarily reliant on the soil moisture levels being maintained from rainfall events. These heath and scrub communities also dominate the south-eastern corner of Lake Logue Nature Reserve near Lake Indoon which may be impacted through the temporary lowering of groundwater levels. The *Eucalyptus camaldulensis* woodland around Lake Indoon has already been subjected to various periods of drought and despite some stress in the trees have survived these periods. Further, this woodland is further away from any potential groundwater drawdown areas.

A number of issues will require consideration if one or both projects are to go ahead. These include, but are not limited to the following;

- Risks posed to *Tetratheca nephelioides* as a species by the current infrastructure route associated with the Coolimba Power Station.
- Risks posed to community types, particularly T1, at a regional scale
- Risks posed to other Priority Flora, particularly *Calytrix purpurea* (P2), *Acacia flabellifolia* (P3), and *Calytrix eneabensis* (P4) in the Central West Coal Project as these taxa are locally uncommon or range extensions.

- Effect of indirect impacts such as emissions, weeds, too frequent fires and *Phytophthora Dieback* on surrounding vegetation, particularly Priority and Rare Flora.
- Potential indirect impacts from groundwater changes during the mining operations.

## 2. INTRODUCTION

Aviva Corporation Ltd proposes to establish a power facility (Coolimba Power Station Project – CPP) and coal mine (Central West Coal Project - CWC) to the west of the Brand Highway near Eneabba. The survey area consists of both native vegetation and previously cleared agricultural areas.

The survey area has been subject to numerous surveys including; in part by Woodman Environmental Consulting Pty Ltd (2001), and Matiske Consulting Pty Ltd in 2005, 2006, 2007, 2008. This report summarises the findings from these studies.

### 2.1 Location

The survey area is located approximately 10 km south west of Eneabba, and approximately 275 km Nor north west of Perth. The area is located in the Irwin Botanical District of the South-western Botanical Province as recognized by Diels (1906) and later developed by Gardner (1942) and Beard (1980, 1990) and the Geraldton Sandplain IBRA region (Thackway and Cresswell 1995, Department of Environment, Water, Heritage and the Arts 2004).

### 2.2 Climate

The climate associated with the project area is consider to be by Beard (1990) as Dry Warm Mediterranean, with historically, only 4 months receiving more rainfall than what is evaporated (Gentili 1972). Table 1 contains the rainfall (long term average, 2005, 2006, 2007 and 2008) and temperature (long term average) for the nearest weather station, Eneabba (Bureau of Meteorology 2009). Rainfall has been average for between 2005 and 2008 when compared against long term averages.

**Table 1: Temperature and Rainfall Data for Eneabba, Long term Averages and Survey Time (Mean rainfall 1964 – 2008, Mean Temperatures 1972 – 2008)**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean Rainfall (mm)	7.1	13.9	12.8	27.3	71.2	104.1	94.8	75.4	45.1	24.7	14.6	9.6	503.4
2005 Rainfall (mm)	0	1.7	16.6	15.9	71.9	127.1	28.9	88.1	76.6	33.7	2.3	1.9	464.7
2006 Rainfall (mm)	27.2	13.8	0	6.6	45.6	17.8	58.9	88	47.8	7.5	5.5	34	352.7
2007 Rainfall (mm)	5.9	0.8	0.6	12.4	28	75.7	114.1	67.9	38.8	26.7	1.3	25.8	398
2008 Rainfall (mm)	0	93.2	7.2	24.2	13.8	60.5	153.1	25	58.2	32.9	20	3.7	491.8
Mean Max Temp (°C)	35.9	36.1	33.4	29.1	24.2	20.8	19.6	20.5	22.9	26.2	29.7	33.2	27.6
Mean Min Temp (°C)	18.5	19.5	18.1	15.3	12.4	10.2	9.1	9	9.7	11.3	13.8	16.2	13.6

### 2.3 Landforms and Soils

The Eneabba Plain was formed during the high seas level epoch of the Pleistocene when mineral rich beach sands were deposited on the shoreline of the time (Beard 1990). The communities consequently are dominated by species that are able to tolerate the sandy soils. The flora in the area is dominated by taxa from the Proteaceae, Myrtaceae, Papilionaceae and Mimosaceae families.

### 2.4 Vegetation

Both of the proposed Aviva projects lie within the Irwin Botanical District of the South-western Botanical Province as recognized by Diels (1906) and later developed by Gardner (1942) and Beard (1980, 1990). More recently, the vegetation of Western Australia has been assigned to bioregions under the Interim Biogeographical Regionalisation for Australia (IBRA) (Thackway and Cresswell 1995 and Department of Environment, Water, Heritage and the Arts 2004). These subdivisions largely relied on the earlier physiographic work of Beard (1981).

Historically, the area has been mapped by Beard (1979) at a scale of 1:250 000. At this scale both vegetation systems and their underlying communities were defined. Beard (1979) defines a vegetation system as “consisting of a particular series of plant communities recurring in a catenary sequence or mosaic pattern linked to topographic, pedological and/or geological features”. The two vegetation systems that occur in the project areas are the Eridoon and Tathra vegetation systems.

The Eridoon system occupies “a flat coastal plain between coastal plain between the coastal limestone deposits and the Pleistocene shoreline”. It consists of yellow sand that has been blown into ridges, with lakes in swamps in the depressions. On the plains and slopes of dunes the vegetation consists of scattered *Eucalyptus tottiana* and other small trees, an open layer of tall shrubs and a closed heath layer of small shrubs, usually dominated by *Conospermum* spp... On the sandhills the tree layer disappears and *Banksia hookeriana* and *Xylomelum angustifolium* become dominant. In winter wet depressions the height of the heath reduces to 30 cm with scattered *Xanthorrhoea* spp. , while in wet areas *Melaleuca thyoides* and *Melaleuca lanceolata* to *Melaleuca raphiophylla* dominate. Occasionally these areas also have *Casuarina obesa* and *Eucalyptus camaldulensis* (Beard 1979).

The Tathra vegetation system occupies the Victoria and Dandaragan plateaux and their western slopes (Beard 1979). It is characterised by sandplain with Scrub heath assemblages. Due to the heterogeneous nature of the heath, Beard mostly limits his discussion of the sandplain to its physical structure. He describes it as consisting of dense layer of small shrubs (< 1 m), with emergent scattered shrubs of 1 –2 m. In some places along the catena trees also emerge from this heath. For example *Eucalyptus tottiana* and various *Banksia* spp. are confined to valleys with deeper sand. Along with the sandplain there are also areas of *Melaleuca* thicket, woodlands, and low heath assemblages on lateritic outcrops on ridges (Beard 1979).

At a finer scale than vegetation systems the following vegetation communities could possibly be directly or indirectly impacted by the proposed Coolimba Power Station and Central West Coal Mine. The type that covers the directly impacted area is Scrub heath of Shrubs associated with the Tathra vegetation system >1 m over mid dense mixed low shrubs. Surrounding areas include; mixed dwarf shrub heath on lateritic sandplains, mixed heath on deep sandy flats and in the Lake Logue and Lake Indoon area *Melaleuca thyoides* thicket with occasional *Casuarina obesa* (Beard 1979).

### 2.5 Declared Rare, Priority and Threatened Species

Species of flora and fauna are defined as Declared Rare or Priority conservation status where their populations are restricted geographically or threatened by local processes. The Department of Environment and Conservation recognises these threats of extinction and consequently applies regulations towards population and species protection.

Rare Flora species are gazetted under Subsection 2 of Section 23F of the *Wildlife Conservation Act (1950)* [WA] and therefore it is an offence to “take” or damage rare flora without Ministerial approval. Section 23F of the *Wildlife Conservation Act (1950-1980)* defines “to take” as “... to gather, pick, cut, pull up, destroy, dig up, remove or injure the flora or to cause or permit the same to be done by any means.”

Priority Flora are under consideration for declaration as ‘rare flora’, but are in need of further survey (Priority One to Three) or require monitoring every 5-10 years (Priority Four). Appendix A1 presents the definitions of Declared Rare and the four Priority ratings under the *Wildlife Conservation Act (1950)* as extracted from the Department of Environment and Conservation (2009a) and Western Australian Herbarium (2009).

Threats of extinction of species are also recognized at a Federal Government level and are categorized according to the *Environment Protection and Biodiversity Conservation Act 1999* [cth] (EPBC Act) (Department of Environment, Water, Heritage and the Arts, 2009a). Categories of threatened species are summarized in Appendix A2.

## 2.6 Threatened Ecological Communities (TEC’s)

Communities in Western Australia can be listed as ‘Threatened Ecological Communities’ (TEC’s) (Department of Environment and Conservation 2006) once they have been defined by the Western Australian Threatened Ecological Communities Scientific Advisory Committee. TEC’s are listed under four categories; Presumed Totally Destroyed (PD), Critically Endangered (CR), Endangered (EN) or Vulnerable (VU) (Department of Environment and Conservation 2009b). Appendix A3 presents a summary of the definitions of Threatened Ecological Communities as extracted from the Department of Environment and Conservation (2009b). Some Western Australian TEC’s are also listed under the EPBC Act (Department of the Environment, Water, Heritage and the Arts 2009b).

Possible Threatened Ecological Communities can be listed as Priority Ecological Communities (PEC’s) by the Department of Environment and Conservation (2009c). PEC’s are listed under five categories based on survey criteria and current knowledge, Priority 1, 2, 3, 4 and 5 Department of Environment and Conservation (2009b). Appendix A4 presents a summary of the definitions of Priority Ecological Communities as extracted from the Department of Environment and Conservation (2009b).

## 2.7 Local and Regional Significance

Flora or vegetation may be locally or regionally significant in addition to statutory listings by the State or Federal Government.

In regards to flora; species, subspecies, varieties, hybrids and ecotypes may be significant other than as Declared Rare Flora or Priority Flora, for a variety of reasons, including:

- “ a keystone role in a particular habitat for threatened species, or supporting large populations representing a significant proportion of the local regional population of a species;
- . Relic Status;
- . anomalous features that indicate a potential new discovery;
- . being representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range);
- . the presence of restricted subspecies, varieties, or naturally occurring hybrids;
- . local endemism/a restricted distribution;
- . being poorly reserved” (EPA 2004).



Vegetation may be significant because the extent is below a threshold level and a range of other reasons, including:

- “ . scarcity;
- . unusual species;
- . novel combinations of species;
- . a role as a refuge;
- . a role as a key habitat for threatened species or large populations representing a significant proportion of the local to regional total population of a species;
- . being representative of the range of a unit (particularly, a good local and/or regional example of a unit in “prime” habitat, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range);
- . a restricted distribution” (EPA 2004).

Vegetation communities are locally significant if they contain Priority Flora species or contain a range extension of a particular taxon outside of the normal distribution. They may also be locally significant if they are very restricted to one or two locations or occur as small isolated communities. In addition, vegetation communities that exhibit unusually high structural and species diversity are also locally significant.

Vegetation communities are regionally significant where they are limited to specific landform types, are uncommon or restricted plant community types within the regional context, or support populations of Declared Rare Flora.

Determining the significance of flora and vegetation may be applied at various scales, for example, a vegetation community may be nationally significant and governed by statutory protection as well as being locally and regionally significant.

### **3. OBJECTIVES**

The specific objectives of the flora and vegetation survey were to:

- identify all vascular plant species present within the survey area;
- review the conservation status of the vascular plant species by reference to current literature and current listings by the Department of Environment and Conservation (2009a) and Western Australian Herbarium (2009) and the Department of the Environment, Water, Heritage and the Arts web site under the EPBC Act (1999);
- assess the local and regional significance of the flora and vegetation; and
- produce a report summarizing the findings.

The survey area includes the proposed Central West Coal Project (CWC), the Coolimba Power Project (CPP) and some surrounding areas. Mattiske Consulting Pty Ltd (2009) examined the flora and vegetation values of Lake Logue Nature Reserve in the south-east section initially and around Lake Indoon. These results are summarized in this report.

### **4. METHODS**

The flora and vegetation of the Aviva Project Survey area was described and collected systematically recording sites, during 2005, 2006, and 2008. The dates of these surveys include; to November 2005, January 2006, – October 2006, to November 2007, – November 2007, April 2008, July 2008, – July 2008, to October 2008, and to October 2008. At each vegetation site the following floristic and environmental notes were made: topography, percentage litter cover, soil ratio, percentage of bare ground, outcropping rocks and their type, pebble type and size, and time since fire.

The condition of each plant community was rated according to the scale used for assessing Bush Forever sites (Government of Western Australia 2000). The scale is summarised in Table 2. For DRF searches of proposed infrastructure corridors, transects recording presence and absence of species were employed.

The vegetation and flora values of the Lake Indoon were established with a baseline flora and vegetation survey in the southern area of Lake Logue Reserve (Mattiske Consulting Pty Ltd 2009). This consisted of systematically recording sites in October 2008. At each vegetation site the following floristic and environmental notes were made: topography, percentage litter cover, soil ratio, percentage of bare ground, outcropping rocks and their type, pebble type and size, and time since fire. For each species recorded the average height and percent foliage cover for both alive and dead plants was noted.

All plant specimens collected during the field surveys were dried and fumigated in accordance with the requirements of the Western Australian Herbarium. The plant species were identified and then compared with pressed specimens housed at the Western Australian Herbarium. Where appropriate, plant taxonomists with specialist skills were consulted. Nomenclature of the species recorded follows the Department of Environment and Conservation (2009a) and Western Australian Herbarium (2009).

**Table 2: Condition rating scale from Bush Forever (Government of Western Australia 2000 based on 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. Disturbance to vegetation structure covers repeated fire, aggressive weeds, dieback, logging, grazing.
4	Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure covers frequent, aggressive wees at high density, partial clearing, dieback and grazing
5	Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure includes frequent fires, presence of very aggressive weeds, partial clearing, dieback and grazing.
6	Completely degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas often described as “parkland cleared” with the flora comprising weed or crop species with isolated native trees or shrubs.

A Department of Environment and Conservation DRF, Priority Flora and TEC/PEC search was conducted of the local area. The NW and SE corners of this search were MGA94 50J 320730 mE 6696510 mN and 50J 341800 mE 6675440 mN respectively.

## 5. RESULTS

### 5.1 Flora

A total of 512 taxa (including subspecies and varieties) from 182 genera and 64 families were recorded within the Aviva survey area. An additional 48 families, 123 genera and 261 taxa were found in the southern section of the Lake Logue Nature Reserve and near Lake Indoon, Appendix B. The dominant families in the Aviva Project area were Myrtaceae (106 taxa), Proteaceae (96 taxa), Papilionaceae (51 taxa) and Haemodoraceae (31 taxa). None of the 26 introduced species are listed by the Department of Agriculture and Food as Declared Plants pursuant to Section 37 of the *Agriculture and Related Resources Protection Act 1976* [WA].

### 5.2 Rare and Priority Flora

Previous records from the Department of Environment and Conservation databases indicate that there are potentially twelve Rare, four Priority 1, sixteen Priority 2, thirty eight Priority 3 taxa and seventeen Priority 4 contained in the local area (Appendix C). Of these database records, seven are listed as Endangered and, four Vulnerable under the EPBC Act. Mattiske Consulting Pty Ltd fieldwork recorded, two Declared Rare, one Priority 1, ten Priority 2, 14 Priority 3 and seven Priority 4 of these taxa. Seven taxa, consisting of one Priority 1, five Priority 2 and one Priority 3 taxa were not previously recorded in the local area. In addition to these records, one Priority 1, two Priority 2, three Priority 3 and two Priority 4 taxa were found in Lake Logue reserve.

#### 5.2.1 Rare Flora

Four Declared Rare species either will be or have potential to be, directly affected by the Central West Coal Project or Coolimba Power Station Project. These are listed and disused below.

- *Tetratheca nephelioides* **Declared Rare**  
This species is a caespitose, dwarf shrub which is found sandy and gravelly soils. There are eight records of this species in the Western Australian Herbarium (2009). This species is restricted to areas in around South Eneabba Reserve (Western Australian Herbarium 2009, Butcher 2007). Mattiske Consulting Pty Ltd found five populations of this taxon in and around the proposed infrastructure route from the Coolimba Power Project in community T1. Of these, two entire, and one half, populations will be directly impacted. In numerical terms, of the plants found during the Mattiske Consulting Pty Ltd survey, 706 plants will be and 860 plants not be directly impacted (Figure 3, Appendix D). West Australian Herbarium records place known numbers at a conservative estimate of 200 plants (Western Australian Herbarium 2009). The removal of the recorded populations at this stage of knowledge of the taxon may significantly affect its' overall population strength and genetic integrity.
- *Eucalyptus crispata* **Declared Rare, Vulnerable**  
The Yandanooka Mallee occurs between Yandanooka to Boothendarra on breakaways with sandy clay and lateritic soils (Brown *et al.* 1998). There are twenty-three records of this species in the Western Australian Herbarium (2009). This species has been historically recorded in the cleared agricultural areas to the south of the preferred infrastructure corridor and once in the corridor (Figures 1 and 2) within community T1. Although not located during field studies within the surveyed areas, if located in the future it should be avoided.
- *Eucalyptus impensa* **Declared Rare, Endangered**  
This low straggly mallee Eucalypt occurs near Eneabba on sandy and sandy -gravelly (lateritic soils). There are seven records of this species in the Western Australian Herbarium (2009) and six populations known (Stack and Broun 2004).

This species has been historically recorded on the preferred infrastructure corridor in one location, in the cleared agricultural areas to the south of the preferred infrastructure corridor and in the native vegetation areas north of the proposed infrastructure corridor (Figures 1 and 2). Although not located during field studies within the surveyed areas, if located in the future it should be avoided. This species is represented within the nearby reserve; although Ministerial approval would still be required to take the occurrences within the preferred corridor.

- *Eucalyptus johnsoniana* **Declared Rare, Vulnerable**

This mallee Eucalypt occurs between Eneabba and Badgingarra on undulating sandplains, lateritic mesas and uplands in white or grey sand over laterite (DEWHA 2008). There are forty-seven records of this species in the Western Australian Herbarium (2009) and 34 known populations (DEWHA 2008). This species has been located twice on the preferred infrastructure corridor, in the cleared agricultural areas to the south of the preferred infrastructure corridor and in the native vegetation areas north of the proposed infrastructure corridor by government agencies (Figures 1 and 2). Although not located during field studies within the surveyed areas, if located in the future it should be avoided. This species is represented within the nearby reserve; although Ministerial approval would still be required to take the occurrences within the preferred corridor.

The majority of the Rare flora species are also listed under the *EPBC Act 1999* as either Endangered or Vulnerable (see Appendix C). Therefore, there is a need to gain Federal Ministerial approval for any developments that may impact on listed threatened species.

## 5.2.2 Priority Flora

The Priority Flora that will be directly impacted by the Coolimba Power Project and the Central West Coal Project are described below:

- *Acacia lasiocarpa* var. *lasiocarpa* (Cockleshell Gully variant) (P2)  
This species is a shrub to 50cm in height, producing yellow flowers in August. It is usually found on grey-yellow sand with laterite, in open low heath. There are five records of this species in the Western Australian Herbarium (2009), with the first collection dating from 1973. This species was recorded by Matiske Consulting at four locations in the Central West Coal Project (within communities E4, E6, T1 and T2) and has been recorded at eight locations in South Eneabba Reserve (Figures 1 and 2). This species has also been recorded at Lake Logue Reserve, but should not be affected by any groundwater drawdown. This species is restricted to the Eneabba area (Western Australian Herbarium 2009).
- *Calytrix purpurea* (P2)  
This species is a spreading shrub and it is usually found on grey-yellow sands with laterite and sandplains, in open low heath. There are thirteen records of this species in the Western Australian Herbarium (2009). This species was recorded at three locations in the Central West Coal Project (within communities E1 and T1), and in one location in South Eneabba Reserve in H2. This species has not been recorded in the nearby Eneabba areas (Figures 1 and 2). This species extends from Yandanooka north to Kalbarri. This collection represents a range extension of 70 km south (Western Australian Herbarium 2009).
- *Comesperma griffinii* (P2)  
This species is an annual or perennial herb to 15cm in height, producing white flowers in October. It is usually found on yellow or grey sand. There are four records of this species in the Western Australian Herbarium (2009), collected since 1978. This species was recorded at one location in the Central West Coal Project (within community H5), and has been recorded at one location in the nearby Eneabba areas (Figures 1 and 2). This species extends from the Eneabba to Geraldton and to the Avon Wheatbelt (Western Australian Herbarium 2009).
- *Comesperma rhadinocarpum* (P2)  
This perennial herb is found on sandy soils, and produces blue flowers from October to November. There are eight records of this species in the Western Australian Herbarium (2009), with the first collection in 1976.

This species was recorded at one location in the Central West Coal Project (within community H3), and has been recorded at one location in the nearby Eneabba areas (Figures 1 and 2). This species extends from the Eneabba to Geraldton and to the Swan Coastal Plain and the Jarrah forest (Western Australian Herbarium 2009).

- *Daviesia debilior* subsp. *debilior* (P2)  
This species is an erect, spreading shrub to 0.3 to 0.6 m in height. It is found on upland plains in sand, often over lateritic gravel and clay (Crisp 1982, West Australian Herbarium 2009). There are 7 records of this species in the Western Australian Herbarium (2009). This species was recorded by DEC at one location in the in the Central West Coal Project within a cleared area (Figures 1 and 2). This is local to the Eneabba area (Western Australian Herbarium 2009) and known from 6 other locations in the area.
- *Thryptomene* sp. Eneabba (R.J.Cranfield 8433) (P2)  
This species forms an erect shrub to 150cm in height, and is found on white or yellow lateritic sand. It produces pink flowers in November. There are six records of this species in the Western Australian Herbarium (2009). This species was recorded at one location in Central West Coal Project (within community E2) and was recorded at four locations in nearby Eneabba areas (Figures 1 and 2). This species is restricted to the Eneabba area (Western Australian Herbarium 2009).
- *Verticordia argentea* (P2)  
This is an erect open shrub to 2m in height, producing pink or white flowers from November to April. It is found on white, grey or yellow sand on sandy ridges and undulating plains. There are 30 records of this species in the Western Australian Herbarium (2009). This species was recorded at one locations in the Central West Coal Project (within community T2), and has been recorded at once in community E4 and four other locations in South Eneabba Reserve by Matiske Consulting Pty Ltd. There are approximately twenty eight locations in the nearby Eneabba areas (Figures 1 and 2), including approximately 10 in South Eneabba Reserve. This species is restricted to the Eneabba area (Western Australian Herbarium 2009).
- *Acacia flabellifolia* (P3)  
This species is an erect, spreading shrub to 1m in height. It is found on rocky loam or lateritic gravelly soils on low hills and ridges. There are 24 records of this species in the Western Australian Herbarium (2009). This species was recorded at one location in the in the Central West Coal Project within the H1 community and in South Eneabba Reserve in community E2 by Matiske Consulting Pty Ltd, and is significant because it has not been recorded in nearby Eneabba areas (Figures 1 and 2). This species extends from Eneabba to the Avon Wheatbelt area (Western Australian Herbarium 2009).
- *Calytrix superba* (P3)  
This species is a shrub and it is usually found on grey-yellow sands with laterite, in open low heath. There are thirty-four records of this species in the Western Australian Herbarium (2009). This species was recorded at two locations in the Central West Coal Project (within communities H2 and T1), and two locations in Lake Logue Reserve. Also this species has been recorded at one location in T1 out of the project area, and thirteen in nearby Eneabba areas (Figures 1 and 2). This species is restricted to the Eneabba area (Western Australian Herbarium 2009).
- *Desmocladus elongatus* (P3)  
This species is a rhizomatous dioecious sedge-like perennial herb. It is found on gravelly white or grey sand over laterite. There are twenty-eight records of this species in the Western Australian Herbarium (2009). This species was recorded at two locations in the preferred corridor for the Coolimba Power Project and at a further seven populations in the adjacent South Eneabba Reserve on the fringes of the preferred corridor (Figure 2), and seven times in other vegetation. There are two government records from the local area. This species extends southwards from Eneabba to Badgingarra (Western Australian Herbarium 2009).

- *Grevillea biformis* subsp. *cymbiformis* (P3)  
This is an erect open shrub and is found on white, grey or yellow sand on sandy ridges and undulating plains. There are twenty-one records of this species in the Western Australian Herbarium (2009). This species was recorded at two locations within the Central West Coal Project (within communities E1 and T1), and has been recorded at twenty three locations in the nearby Eneabba areas (Figures 1 and 2). This species is restricted to the Eneabba area (Western Australian Herbarium 2009). This species may be susceptible to *Phytophthora* Dieback.
- *Haemodorum loratum* (P3)  
This species is a bulbaceous perennial herb growing to 120cm in height, but occasionally reaching 2m. It produces black, brown or green flowers in November. It is found on grey or yellow sand or gravel (Western Australian Herbarium 2009). There are sixteen records of this species in the Western Australian Herbarium. This species was recorded once in the Central West Coal Project by Mattiske Consulting Pty Ltd, which has since been vouchered at the State Herbarium (within community E4), and was recorded at four locations in the nearby Eneabba area and extends from the Eneabba to Perth.
- *Hemiandra* sp. Eneabba (H. Demarz 3687) (P3)  
Current voucher descriptions describe this species as being a straggly herb to 90 cm high (West Australian Herbarium 2009). One recording has been made by Government agencies in the H3 community in the Central West Coal Project. There are 15 records of this species in the Western Australian Herbarium (2009) and one in the area bounded by the database search. This species extends from 10 km south of Eneabba to Mt Adams, south east of Dongara (Western Australian Herbarium 2009). This recording may represent the most southern extent of the species.
- *Lepidobolus quadratus* (ms) (P3)  
This species is a rhizomatous, caespitose sedge-like perennial herb. It is found on sandy areas in dry kwongan areas. There are thirty-three records of this species in the Western Australian Herbarium (2009). This species was recorded at one location on the preferred corridor for the Coolimba Power Station Project (within community T1), and once adjacent to the infrastructure corridor, again in the T1 community. This species has been four times by other authorities in the local area (Figure 1). This species extends from the Cataby to Eneabba (Western Australian Herbarium 2009). These populations may represent the most northern extent of the species.
- *Mesomelaena stygia* subsp. *deflexa* (P3)  
This species is tufted sedge to 50 cm in height, producing brown or black inflorescences from March to October. It is found on white, grey or lateritic sand, gravel and clay. There are sixteen records of this species in the Western Australian Herbarium (2009). This species was recorded at two locations in the Central West Coal Project (within communities T1 and H5), eight times within South Eneabba Reserve and has been recorded at eleven locations in the nearby Eneabba areas (Figures 1 and 2). This species is restricted to the Eneabba area (Western Australian Herbarium 2009).
- *Schoenus griffinianus* (P3)  
This is a small tufted sedge to 10cm in height, found on white sand. Inflorescences are produced from September to October. There are twenty-four records of this species in the Western Australian Herbarium (2009). This species was recorded at one location in the Central West Coal Project (within community E4), and has been recorded at eleven locations in the nearby Eneabba areas (Figures 1 and 2). This species extends from the Eneabba area towards Perth (Western Australian Herbarium 2009). As the records around Eneabba represent the northern end of this species extent this species should be avoided if possible.
- *Verticordia fragrans* (P3)  
This openly-branched shrub grows to 3m in height and produces pink or white flowers from September to November. It is found on white, grey or yellow sand or clay loam, in low-lying areas and sandplains. There are twenty-three records of this species in the Western Australian Herbarium (2009).

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This species was recorded by Matiske Consulting Pty Ltd, once in the Central West Coal Project (within community H3), at two locations in South Eneabba Reserve and once in surrounding vegetation. It has also been recorded by government agencies in another thirteen locations in the nearby Eneabba areas (Figures 1 and 2). This species is restricted between Badgingarra and Geraldton (Western Australian Herbarium 2009).

- *Banksia chamaephyton* (P4)  
This species is also known as the fishbone Banksia and is a low, lignotuberous shrub that grows to 0.4 m high and 2 m wide. It flowers October to December and grows in grey or white sand over laterite (Western Australian Herbarium 2009). It was recorded by Matiske Consulting Pty Ltd in one location along the proposed infrastructure corridor for the Coolimba Power Station Project, as well as being recorded in two other locations in South Eneabba Reserve. It has been found in three locations by government agencies in the local area. This species ranges from Eneabba to Gingin (Western Australian Herbarium 2009), these populations may be a part of the northern most extent of this species.
- *Calytrix eneabensis* (P4)  
This species is a shrub and it is usually found on grey-yellow sands with laterite, in open low heath. There are twenty-three records of this species in the Western Australian Herbarium (2009). This species was recorded at one location in the Central West Coal Project (within community T1), and has been recorded at ten locations in the nearby Eneabba areas. This species is restricted to the Eneabba area (Western Australian Herbarium 2009).
- *Eucalyptus macrocarpa* subsp. *elachantha* (P4)  
The Small-leafed Mottlecah is a mallee that grows to 3m. It is found on upland areas, often over laterite (West Australian Herbarium 2009). There are 48 records of this species in the Western Australian Herbarium (2009). This species was recorded by DEC at one location in the in the Central West Coal Project within a cleared area (Figure 1) and seven other locations. This species extends from Reagans Ford to just south of Geraldton (Western Australian Herbarium 2009).
- *Georgeantha hexandra* (P4)  
This species is a rhizomatous herb to 80cm in height, found in seasonally moist areas of deep sand within tall shrubland or low heath. There are twenty-seven records of this species in the Western Australian Herbarium (2009). This species was recorded at five locations in the Central West Coal Project and three locations in the proposed infrastructure corridor for the Coolimba Power Station Project (within communities E1, H2, H3 and T1), as well as four locations in Lake Logue Reserve. It should not be affected by changes in groundwater depth. This species was also recorded in twenty-seven sites in the nearby Eneabba areas and seven times by government agencies. This species extends southwards from south of Arrowsmith River to Lancelin (Western Australian Herbarium 2009).
- *Grevillea rudis* (P4)  
This is a spreading shrub and is found on white, grey or yellow sand on sandy ridges and undulating plains. There are fifty-four records of this species in the Western Australian Herbarium (2009). This species was recorded by Matiske Consulting Pty Ltd twice within the proposed infrastructure corridor for the Coolimba Power Project (within community T1) and once by government agencies in cleared vegetation in the Central West Coal Project, five times by Matiske Consulting Pty Ltd in South Eneabba Reserve and five times in Lake Logue Nature Reserve (Figures 1 and 2). It has been recorded by government authorities in another five locations in the local area (Figure 1 and 2). This species extends from Eneabba to Badgingarra (Western Australian Herbarium 2009). These populations may represent the northern extent of this species.

- *Stylidium aeonioides* (P4)

This species is a rosette-forming perennial herb. It produces yellow, cream or white flowers from September to November. It is found on sand or loam over laterite on hillsides. There are twenty-six records of this species in the Western Australian Herbarium (2009).

This species was recorded at one location in the Central West Coal Project (within community H5), and has been recorded once in nearby Eneabba areas (Figures 1 and 2). This species extends from the Eneabba area south towards Cataby (Western Australian Herbarium 2009).

- *Verticordia aurea* (P4)

This is an erect open shrub to 2m in height, producing pink or white flowers from November to April. It is found on white, grey or yellow sand on sandy ridges and undulating plains. There are 20 records of this species in the Western Australian Herbarium (2009).

This species was recorded by Mattiske Consulting Pty Ltd at two locations in the Central West Coal Project (within communities E1 and H3), and has been recorded at a location inside Lake Logue Nature Reserve and one location out of it in surrounding areas. Another fifteen locations have been recorded in the nearby Eneabba areas (Figures 1 and 2). This species has a known distribution 15 km North of Eneabba to Lesueur National Park (Western Australian Herbarium 2009).

The list above describes the species that will be directly impacted by the Coolimba Power Project and Central West Coal Project (Appendix C). Other indirect impacts on the flora could be exposure *Phytophthora* Dieback, weeds, fire frequency, groundwater movement and emissions. Impacts such as weeds and emissions from the Coolimba Power Project should equally affect all flora, but the other two impacts, fire and *Phytophthora* Dieback are specific to plant species. The other Priority flora found to be occurring in the general area but are not directly impacted were examined for their susceptibility to other impacts. At this stage of research it appears that no species will be destroyed by a single fire but fire frequency will have to be monitored as some species maybe affected by inappropriate fire frequencies and regular intense fires. *Phytophthora* Dieback will affect some species and other species that make up habitats, so appropriate protocols will have to be in place.

### 5.3 Significant Flora

A number of range extensions were recorded. Most of these were additions to the known extent of a distribution and not a new disjunct population. Two prominent examples include - *Eremaea ebracteata* var. *ebracteata* and *Olearia revoluta*. *Eremaea ebracteata* var. *ebracteata* is usually found in the northern part of the Irwin district (Hnatuik 1993), so this recording is a 100 km range extension south, although possible as the southern extent of this species was not defined. Previously, *Olearia revoluta* (a daisy) had been recorded by the Western Australian Herbarium as occurring to the east of Geraldton. This collection represents a range extension of approximately 60 km to the south west. However, this species is expected to occur in these parts (Blackall and Grieve 1982).

### 5.4 Vegetation

A total of 24 plant communities were recorded in the Aviva survey area and in the mapped areas of Lake Logue Nature Reserve (Figures 1 and 2, Mattiske Consulting Pty Ltd 2006, Mattiske Consulting Pty Ltd 2009). The remaining areas consist mainly of cleared paddocks, with localised remnant trees. Listing of species in each community is in Appendix E.

**C1** - Low open Forest of *Casuarina obesa* over *Tecticornia indica* subsp. *bidens* and mixed invasive herbs on flats on white/grey sand.

**E1** - Low Woodland of *Eucalyptus todtiana* and *Nuytsia floribunda* over *Adenanthos cygnorum* subsp. *cygnorum*, *Eremaea beaufortoides* var. *lachmosanthe*, *Melaleuca leuropoma*, *Banksia sphaerocarpa* var. *sphaerocarpa* and *Hibbertia hypericoides* on sand.



- E2 -** Low Woodland of *Eucalyptus accedens* and *Eucalyptus eudesmioides* over *Hibbertia spicata* subsp. *spicata*, *Allocasuarina campestris* and *Melaleuca leuropoma* on sandy gravel.
- E3 -** Woodland and Open Woodland of *Eucalyptus camaldulensis* var. *obtusa* over *Melaleuca viminea* subsp. *viminea*, *Acacia saligna*, *Melaleuca lateriflora* subsp. *acutifolia* and *Macrozamia fraseri* on sandy loam.
- E4 -** Open Low Woodland of *Eucalyptus todtiana* and *Nuytsia floribunda* over *Banksia menziesii* and *Stirlingia latifolia* on sandy drainage lines.
- E5 -** Open Low Woodland of *Eucalyptus todtiana*, *Nuytsia floribunda* over *Banksia menziesii* and *Conospermum triplinervium* on sandy uplands.
- E6 -** Open Low Woodland of *Eucalyptus todtiana* and *Nuytsia floribunda* over mixed low shrubs and herbs on sandy lowlands.
- E7-** Low Woodland of *Eucalyptus camaldulensis* var. *obtusa* over *Melaleuca raphiophylla* and mixed herbs with occasional *Casuarina obesa* on flats on white/grey sand.
- E8-** Low Woodland of *Eucalyptus camaldulensis* var. *obtusa* and *Banksia prionotes* over mixed shrubs over \**Bromus* sp. and \**Ehrharta* sp. on lower and mid-slopes on white/grey sand.
- F1-** Tall Shrubland of *Melaleuca raphiophylla* over *Tecticornia indica* subsp. *bidens* and other shrubs and sedges on minor flowlines on grey/white sand.
- F2-** Low Open Shrubland of *Tecticornia indica* subsp. *bidens* with mixed herbs and grasses on flats on grey/white sand.
- H1 -** Mixed Heath of *Melaleuca leuropoma* with emergent *Banksia* species with occasional *Eucalyptus todtiana* and *Actinostrobos arenarius* on sand with exposed lateritic rises.
- H2 -** Heath or Low Shrubland of *Conospermum triplinervium*, *Verticordia nitens*, *Adenanthos cygnorum* subsp. *cygnorum*, *Stirlingia latifolia* and *Jacksonia floribunda* on sand.
- H3 -** Heath or Scrub of *Melaleuca leuropoma*, *Banksia sphaerocarpa* var. *sphaerocarpa*, *Dryandra nivea* subsp. *nivea*, *Eremaea beaufortioides* var. *lachnosanthe* and *Hibbertia subvaginata* on lateritic rises.
- H4 -** Mixed Heath of Proteaceae and Myrtaceae spp. with occasional *Eucalyptus todtiana* on sand.
- H5 -** Mixed Heath or Shrubland of *Xanthorrhoea drummondii*, *Allocasuarina humilis* and *Hibbertia* spp. and Proteaceae spp. on lateritic uplands.
- S1 -** Open Scrub of *Acacia blakelyi* and *Hakea psilorrhyncha* over *Gahnia trifida*, *Melaleuca leuropoma*, *Conostylis aculeata* subsp. *breviflora*, \**Ursinia anthemoides*, \**Trifolium campestre* and \**Vulpia bromoides* on rehabilitated land.
- S2 -** Open Scrub of *Acacia blakelyi* with occasional *Eucalyptus todtiana* over annual grasses and herbs.
- S3-** Tall Open Shrubland of *Banksia prionotes* over mixed shrubs and herbs; *Acacia blakeyi* in high numbers within fire disturbed areas on crests of dunes, mid- slopes and swales on white/grey sand.
- T1 -** Scrub or Thicket of *Banksia attenuata*, *Banksia menziesii* over *Banksia sphaerocarpa* var. *sphaerocarpa*, *Adenanthos cygnorum*, *Banksia hookeriana* and *Conospermum triplinervium* on sand.

- T1(d)**- Significantly Disturbed T1 community
- T2** - Thicket or Scrub of *Acacia blakelyi* over *Melaleuca leuropoma*, *Banksia sphaerocarpa* var. *sphaerocarpa*, *Verticordia densiflora* var. *densiflora* on sand.
- T3** - Thicket or Scrub of *Melaleuca hamulosa*, *Melaleuca concreta*, *Viminaria juncea* and *Kunzea recurva* on sand or loam flats.
- T4** - Thicket or Scrub of *Melaleuca rhapsiophylla* and *Melaleuca lanceolata* over sedges and rushes on low-lying sandy loams.
- T4(d)** - Significantly Disturbed T4 community
- T5** - Scrub or Thicket of *Banksia attenuata* and *Banksia menziesii* over *Eremaea beaufortioides*, *Hibbertia hypericoides*, *Melaleuca systema*, *Stirlingia latifolia* and herbs with occasional *Xylomelum angustifolium* on slopes and swales and flats on white/grey sand.

All of these communities extend outside the project area; however the extent of these communities in the region have been modified by agricultural activities and mining activities. The condition of the vegetation (based on the Bush Forever condition ratings) ranges from completely degraded in the pastures to excellent in the bushland areas.

## 5.5 Conservation Status of Vegetation

### 5.5.1 Threatened Ecological Community

The database query of DEC revealed one Threatened Ecological Community as occurring in the region. This TEC is the Ferricrete Floristic Community - Rocky Springs type. Community 72 Ferricrete Floristic Community is listed as Vulnerable by the Department of Environment and Conservation (2006), however is not listed under the *EPBC Act 1999*. Five examples of this TEC were listed and all occurring approximately 1.5 km from the CWC along Rocky Springs Road. Neither of the proposed Aviva projects directly impact of these TEC's however, there is debate as to whether groundwater drawdown will affect these communities.

The H1 heath community included pockets of lateritic rises, and therefore has some species in common with the only known Threatened Ecological Community in the Eneabba area, the Ferricrete Floristic Community - Rocky Springs type. Community 72 Ferricrete Floristic Community is listed as Vulnerable by the Department of Environment and Conservation (2006). This Threatened Ecological Community is not currently listed under the Commonwealth *EPBC Act 1999*. On the basis of database search and a comparison with regional datasets (Department of Environment and Conservation 2009a), the majority of the flora recorded on the Rocky Springs Ferricrete communities are represented either on the northern Swan Coastal Plain or in the adjacent regions.

Twenty-nine of the sixty taxa recorded within the local TEC Ferricrete Community (Hamilton-Brown *et al.* 2004) were recorded within the survey area (Appendix F). The majority of these species occur more widely, and therefore the significance of the latter is difficult to assess in view of the lack of regional studies on the Rocky Springs TEC. The project as proposed does not impact directly on the Rocky Springs TEC (Figure 1).

**Table 3: Threatened Ecological Communities found in the Eneabba area**

General Description	DEC (2006) Category	Status ( <i>EPBC Act 1999</i> Category)
72. Ferricrete Floristic Community	Vulnerable	-

As indicated by Blandford (pers. comm.), the ferricrete layer extends well beyond the designated Rocky Springs TEC location. The latter raises two critical issues, firstly it raises questions on how the TEC was defined and secondly what is the actual extent of the TEC as interpreted by the Department of Environment and Conservation (2009b). Currently the data available on the TEC is relatively restricted (Hamilton-Brown *et al.* 2004) and as there are four communities between the located TEC and the exposed ferricrete (located east of the designated TEC site there is confusion over the significance of the TEC).

### 5.5.2 Communities of Regional and Local Significance

Half of the communities described as occurring in the Coolimba Power Station Project and Central West Coal Project have either regional or local significance as they are known habitats for Rare and Priority Species (EPA 2004) or may reduce the local extent of these communities below 30 %. The direct impact on these communities and each community's significance is summarized below (Table 4). Both the Coal West Project and Coolimba Power Station Project will reduce communities E5, E6, H1, H5, S1, and T2 to 30 % or less of their immediate distribution.

**Table 4: Summary of Vegetation types to be directly impacted within the survey area by the proposals (CWC- Central West Coal, CPP – Coolimba Power Project)**

Type	Significance	Total area surveyed (ha)	Percent cleared		Percent outside of Direct Impact
			CPP	CWC	
C1		5.848	0	0	100
CL/D		1713.986	25.28	48.892	25.828
E1	Local	38.943	0	20.504	79.496
E2	Local	18.13	0	0	100
E3		5.414	0	0	100
E4	Local	89.328	9.883	32.907	57.21
E5	Local	18.426	0	77.24	22.76
E6	Local	47.868	0	72.691	27.309
E7		9.059	0	0	100
E8		9.209	0	0	100
F1		17.662	0	0	100
F2		5.769	0	0	100
H1	Local	52.855	0	93.278	6.722
H2	Local	163.261	0	41.431	58.569
H3	Local	625.22	0.963	67.872	31.165
H4		121.861	0	0.353	99.647
H5	Local	17.898	0	88.694	11.306
S1	Local	6.24	0	100	0
S2		18.928	0	52.007	47.993
S3		62.85	0	0	100
T1	Regional	720.431	4.384	23.555	72.061
T1(d)		9.318	0	0	100
T2	Local	32.538	0	79.635	20.365
T3		35.552	0	9.002	90.998
T4		70.915	0	6.675	93.325
T4(d)		23.534	0	0	100
T5		151.272	0	0	100
Total		2118.443	-	-	-

## 5.6 Groundwater Dependent Ecosystems

An assessment was undertaken on the potential Groundwater Dependent Ecosystems (GDE) in and near the project area. The heath and scrub communities (H2, H3 and T1) that dominate the vegetation of the survey area are largely characterised by shallow-rooted species or shrubs that are primarily reliant on the soil moisture levels being maintained by rainfall events. The two communities that may be susceptible to groundwater drawdown are summarized below:

- T4 - Thicket or Scrub of *Melaleuca raphiophylla* and *Melaleuca lanceolata* over sedges and rushes on low-lying sandy loams. This vegetation type was recorded in the northern part of the survey area (within the northern part of Project Area and within Lake Logue Nature Reserve). This community is dominated by *Melaleuca* spp. , which have both deep roots and shallower lateral roots, and so should be able to access soil moisture from the unsaturated above the groundwater table. This suggests that this community should display facultative dependence on groundwater.
- E3 - Woodland and Open Woodland of *Eucalyptus camaldulensis* var. *obtusata* over *Melaleuca viminea* subsp. *viminea*, *Acacia saligna*, *Melaleuca lateriflora* subsp. *acutifolia* and *Macrozamia fraseri* on sandy loam. This plant community was recorded in the southern part of the survey area and outside of the Project Area. It is considered that paperbark swamps (*Melaleuca* spp.) and River Red Gums (*Eucalyptus camaldulensis*) probably exhibit an facultative dependence on groundwater (Murray *et al.* 2003), which means that the presence or absence of groundwater is not critical to the presence of species within an ecosystem but that factors such as landscape position more strongly influence the sources of water used by the species.

The community types H4, T1 and T5 (Mattiske Consulting Pty Ltd 2009) dominate the south-eastern corner of the Lake Logue Nature Reserve. The *Eucalyptus camaldulensis* var. *obtusata* woodlands around Lake Indoon have already been subjected to various periods of varying drought.

The other key area appears to be the nearby Rocky Springs Ferricrete TEC. This TEC occurs outside the Project Area. On the basis of the high proportion of plant root systems in the upper 30 to 40cm of the surface and the absence of deep tap rooted species, it appears that the vast majority of the plant species within the different communities are reliant on soil moisture from rainfall events. This proposition was discussed with Doug Blandford and after reviewing the soil profiles in nearby areas it was decided that the plants would be largely reliant on the soil moisture in the sandy and sandy-clay environments and that therefore the risk to the flora and vegetation within the Rocky Springs Ferricrete TEC was very low.

To extend this interpretation to the flora and vegetation on the other sections of the survey area, the lifeforms of the respective plant species was extracted from Paczkowska and Chapman (2000) and the West Australian Herbarium (2009). This lifeform data is presented in Appendix B and as such reflects the high proportion of annual and perennial herbs and shrub species that are unlikely to be dependent on soil moisture from deeper sources and ground water.

## 6. DISCUSSION

The survey effort was undertaken in the spring months of 2005, 2006, 2007 and 2008 by experienced botanists familiar with the Kwongan flora near Eneabba. The specific work undertaken by Mattiske Consulting Pty Ltd in the spring months of 2005, 2006, 2007 and 2008 included a search for rare and priority flora, defining and mapping the plant communities present, assessing the condition of the plant communities and reviewing the local and regional conservation value of the flora and vegetation. Detailed recordings were undertaken at representative plant communities. The survey effort over multiple seasons and with average rainfall (Table 1) meets the standards for the EPA Guidance Statement 51.

## Flora

A total of 512 taxa (including subspecies and varieties) from 182 genera and 64 families were recorded within the Aviva Project area. An additional 48 families, 123 genera and 261 taxa were found in the southern section of the Lake Logue Nature Reserve and near Lake Indoon. The dominant families in the Aviva Project area were Myrtaceae (106 taxa), Proteaceae (96 taxa), Papilionaceae (51 taxa) and Haemodoraceae (31 taxa). The range of taxa recorded reflects the diversity of flora species in the Eneabba area.

None of the introduced taxa are listed by the Department of Agriculture and Food as Declared Pests pursuant to Section 37 of the *Agriculture and Related Resources Protection Act 1976* [WA].

Previous records from Department of Environment and Conservation databases indicate that there are potentially twelve Rare, four Priority 1, sixteen Priority 2, thirty eight Priority 3 taxa and seventeen Priority 4 contained in the local area. Of these database records, seven are listed as Endangered and, four Vulnerable under the *EPBC Act 1999*. Mattiske Consulting Pty Ltd fieldwork recorded, two Declared Rare, one Priority 1, ten Priority 2, 13 Priority 3 and seven Priority 4 of these taxa. Seven taxa, consisting of one Priority 1, five Priority 2 and one Priority 3 taxa were not previously recorded in the. In addition to these records, one Priority 1, two Priority 2, three Priority 3 and two Priority 4 taxa were found in Lake Logue reserve.

A total of one Declared Rare, seven Priority 2, ten Priority 3, and seven Priority 4 taxa will be directly impacted.

If proposed infrastructure corridor was to go ahead as is, *Tetratheca nephelioides*, will be significantly affected at a taxon level. It has been proposed that the corridor is moved to farmland south of the population, and from a species-conservation point of view, this should be the preferred option. The next option would be to locate the proposed infrastructure facilities south of the track and north of the fenceline to minimize the impact on the conservation areas. State Ministerial approval will be required to take this species if the current route is used.

The status and position of some of the Declared Rare Eucalypt species will have to be confirmed, and if necessary Federal Approval sought, and relevant protection from indirect impacts given. Many of the records summarized on the Figures rely on older records and therefore are less reliable in terms of location accuracy.

All Priority taxa have uncertain status in terms of plant numbers and therefore should be avoided if possible. However, the known locations and distribution of some taxa may be more affected than others may by both the proposed projects. These taxa fall into three categories; taxa that are at their northern extent, taxa that are at their southern extent, or taxa that are locally uncommon.

The taxa *Schoenus griffinianus* (P3), *Lepidobolus quadratus* ms (P3), *Banksia chamaephyton* (P4), *Grevillea rudis* (P4) are all at their northern extent in the Coolimba Power Station Project and the Central West Coal Project. Removal of these populations without some mitigation can reduce the genetic diversity and therefore the ability of the taxa as a whole to withstand disturbances. If these species can not be avoided, measures to protect the species genetic diversity will be required (either ensure seed/specimens of local provenance can be incorporated successfully into rehabilitation, or establishment of the status or these taxa, including conservation estate offset of found populations).

The taxa at their southern extent include *Calytrix purpurea* (P2), also a range extension of 70 km south, *Hemiandra* sp. Eneabba (H. Demarz 3687) (P3), and , *Stylidium aeonioides* (P4). The recording of *Calytrix purpurea* (P3), represents a population outlier of 70 km. These locations will have to be avoided until the status of the taxon in the local area can be confirmed. The other taxa at their southern extent will be exposed to the same risks as taxa at their northern extents and so will require mitigating measures of some kind.

The taxa that are locally uncommon include *Acacia flabellifolia* (P3), *Calytrix eneabbensis* (P4), and *Verticordia aurea* (P4). Some taxa are at more risk than others from the direct impact. Taxa such as *Comesperma rhadinocarpum* (P2) has a distribution stretching from Geraldton to Perth, therefore the effect of the population removal will not be as great as *Calytrix eneabbensis* (P4), and *Verticordia aurea* (P4). These taxa are only found in the local area and should be avoided or have appropriate mitigating measures put in place. The taxon *Acacia flabellifolia* (P3) has not been found in the Eneabba area before, although it has been found from Arrino, north of Three Springs to Watheroo. Therefore this taxon's location should be avoided.

The differences between the range of Priority flora on the nearby Eneabba Plains and the proposed mining operational area indicate that there is significant variation in these communities. This variation may in part reflect also the differences in sampling regimes between the different areas. The latter is not surprising in view of the different fire regimes and the high diversity of species in the Eneabba area.

Some range extensions did occur. These extensions again reflect the significant variation in flora in the Eneabba area. Other Rare and Priority flora species also occur outside the direct impact area. These species maybe exposed to impacts such as *Phytophthora* Dieback, weeds, inappropriate fire regimes, emissions and groundwater. For example, *Banksia elegans* (P4) are highly susceptible to *Phytophthora* Dieback and requires some time in between fires to resprout, as to not diminish the lignotuber (Patrick and Brown 2001). As long as areas outside of the footprint are given protection from indirect impacts such as *Phytophthora* Dieback, weeds, inappropriate fire regimes, emissions and groundwater drawdown, these species should be protected.

## Vegetation

Twenty four plant communities were recorded in the Aviva survey area, comprising five heath communities, eight Proteaceae and Myrtaceae-dominated communities, eight Eucalypt communities and two chenopod communities (Figures 1 and 2. Some communities such as T1 and T4 had higher species richness than other communities (Appendix E). This is due to a higher number of sampling points occurring in these communities due to their spatial extents (Table 4).

All of the defined communities are represented in either the Tathra or Eridoon vegetation systems (Beard 1979). Comparison of Pre – European vegetation extents of these vegetation systems with the direct impact of the projects and formal conservation reserves shows that the impact on the Eridoon vegetation system will be greater than the Tathra system (Table 5). This is expected as the extent of the Tathra vegetation system is greater (Table 5). Although Pre – European extents may not give an accurate indication of the complete impact of the Projects, it will accurately describe what percentage is currently in Conservation Estate and provides a conservative estimate of the impact of the proposals. Apart from the greater impact on the Eridoon systems, the amount that is in Conservation Estate is much greater than what will be affected. However, these figures should be compared with already approved projects to assess the impact at a regional level.

**Table 5: Summary of the direct impact of the proposals on Pre – European Extents of Vegetation Systems**

Vegetation system	Total Pre - European extents (ha)	Pre – European (% impacted)		Held in Conservation Estate (%)
		CWC	CPP	
TATHRA	396178	0.222	0.046	3.49
ERIDOOON	91283	0.896	0.328	14.94

The community type T1 is considered to be regionally significant as it contains two rare taxa, *Tetrateca nephelioides* and *Eucalyptus crispata*. Community types E1, E2, E4, E6, H1, H2, H3, H5, and T2 are considered to be locally significant as they contain Priority Flora (Environmental Protection Authority 2004), while communities E5 and S1 are locally significant as the proposals clear a significant amount of their known local area. The level of community reservation can be inferred from the regional vegetation system data.

## Potential TEC

The H1 heath community included pockets of lateritic rises, and therefore has some species in common with the only known Threatened Ecological Community in the Eneabba area, the Ferricrete Floristic Community - Rocky Springs type. Community 72 Ferricrete Floristic Community is listed as Vulnerable by the Department of Environment and Conservation (2006). This Threatened Ecological Community is not currently listed under the Commonwealth *EPBC Act* (1999). On the basis of database search and a comparison with regional datasets (Department of Environment and Conservation 2009a), the majority of the flora recorded on the Rocky Springs Ferricrete communities are represented either on the northern Swan Coastal Plain or in the adjacent regions. Twenty-nine of the sixty taxa recorded within the local TEC Ferricrete Community (Hamilton-Brown *et al.* 2004) were recorded within the survey area. The majority of these species occur more widely, and therefore the significance of the latter is difficult to assess in view of the lack of regional studies on the Rocky Springs TEC. The project as proposed does not impact directly on the Rocky Springs TEC.

As indicated earlier in this report there appears to be debate over the extent and definition of the Rocky Springs ferricrete TEC. The latter results from a lack of regional assessments and a clear understanding of the relationships between ferricrete layers and floristic data. The local findings indicate that the exposed ferricrete is not at the location as specified through the Department of Environment and Conservation (2006) database and that the ferricrete layer extends under large sections of the systems within the coastal plains. Therefore the whole question about the significance of the TEC remains open to debate until the TEC is better defined in composition and spatial extent. Meanwhile the data as collated on the flora and plant/soil relationships indicate that there are no species within the TEC that are restricted to the TEC and therefore the risk of any indirect impacts remains low. This low risk is further substantiated by the dominance of flora species in the range of communities within the Aviva project area that are reliant on rainfall rather than groundwater.

## Groundwater Dependent Communities

In reviewing the lifeforms of the other plants within the communities on the Aviva project area, it is apparent that the majority of plants are dependent on soil moisture from rainfall events and that the majority of the plant species are herbs or small shrubs that will have shorter root systems. This relationship can then be expanded to their dominance within the respective plant communities. The heath and scrub (H2 and T1) communities that dominate the communities on the project area are largely dominated by shallow rooted species or shrubs that are primarily reliant on the soil moisture levels being maintained from rainfall events. These heath and scrub communities also dominate the south-eastern corner of the Lake Indoon Nature Reserve which may be impacted through the temporary lowering of groundwater levels. The *Eucalyptus camaldulensis* var. *obtusa* woodlands around Lake Indoon have already been subjected to various periods of drought and despite some stress in the trees have survived these periods.

## Conclusions

A number of issues will require consideration if one or both projects are to go ahead. These include, but are not limited to the following;

- Risks posed to *Tetratheca nephelioides* as a species by the current infrastructure route associated with the Coolimba Power Station Project.
- Risks posed to community types, particularly T1, at a regional scale
- Risks posed to other Priority Flora, particularly *Calytrix purpurea* (P2), *Acacia flabellifolia* (P3), and *Calytrix eneabbaensis* (P4) in the Central West Coal Project as these taxa are locally uncommon or range extensions.
- Effect of indirect impacts such as emissions, weeds, too frequent fires and *Phytophthora Dieback* on surrounding vegetation, particularly Priority and Rare Flora.
- Potential indirect impacts from groundwater changes during the mining operations.

## 7. LIST OF PARTICIPANTS

The following personnel of Mattiske Consulting Pty Ltd have been involved with this project:

Principal Ecologist:	Dr E. M. Mattiske
Experienced Botanists:	Dr C. Hancock Mrs L. Cobb Mrs. B. Koch
Botanists:	Mr D. Rathbone Ms B. Taylor Mr A. Ruschmann Mr. D. Marsh Mr. M. Boardman Ms S. Robinson Ms F. de Wit Ms. M. Van Wees Mr. R. Burrows Mr. A. Robinson Ms S. Thomson Ms F. Smith Mr S. Reiffer

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**APPENDIX A1: DEFINITION OF RARE AND PRIORITY FLORA SPECIES**  
**(Western Australian Herbarium 2009)**

Conservation Code	Category
R	<p><b>Declared Rare Flora – Extant Taxa</b></p> <p>“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.”</p>
P1	<p><b>Priority One – Poorly Known Taxa</b></p> <p>“Taxa which are known from one or a few (generally &lt;5) populations which are under threat, either due to small population size, or being on lands under immediate threat. Such taxa are under consideration for declaration as ‘rare flora’, but are in urgent need of further survey.”</p>
P2	<p><b>Priority Two – Poorly Known Taxa</b></p> <p>“Taxa which are known from one or a few (generally &lt;5) 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 urgently need further survey.”</p>
P3	<p><b>Priority Three – Poorly Known Taxa</b></p> <p>“Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally &gt;5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as ‘rare flora’ but need further survey.”</p>
P4	<p><b>Priority Four – Rare Taxa</b></p> <p>“Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years.”</p>

**APPENDIX A2: DEFINITION OF THREATENED FLORA SPECIES** (*Environment Protection and Biodiversity Conservation Act 1999* [Commonwealth])

Category Code	Category
<b>Ex</b>	<p><b>Extinct</b></p> <p>Taxa which at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.</p>
<b>ExW</b>	<p><b>Extinct in the Wild</b></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>
<b>CE</b>	<p><b>Critically Endangered</b></p> <p>Taxa which at a 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>
<b>E</b>	<p><b>Endangered</b></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>
<b>V</b>	<p><b>Vulnerable</b></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>
<b>CD</b>	<p><b>Conservation Dependent</b></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>

**APPENDIX A3 : DEFINITION OF THREATENED ECOLOGICAL COMMUNITIES (Department of Environment and Conservation 2009b)**

Category Code	Category
PTD	<p><b>Presumed Totally Destroyed</b></p> <p>An ecological community will be listed as Presumed Totally Destroyed if there are no recent records of the community being extant and either of the following applies:</p> <ul style="list-style-type: none"> <li>(i) records within the last 50 years have not been confirmed despite thorough searches or known likely habitats or;</li> <li>(ii) all occurrences recorded within the last 50 years have since been destroyed.</li> </ul>
CE	<p><b>Critically Endangered</b></p> <p>An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future, meeting any one of the following criteria:</p> <ul style="list-style-type: none"> <li>(i) The estimated geographic range and distribution has been reduced by at least 90% and is either continuing to decline with total destruction imminent, or is unlikely to be substantially rehabilitated in the immediate future due to modification;</li> <li>(ii) The current distribution is limited ie. highly restricted, having very few small or isolated occurrences, or covering a small area;</li> <li>(iii) The ecological community is highly modified with potential of being rehabilitated in the immediate future.</li> </ul>
E	<p><b>Endangered</b></p> <p>An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. The ecological community must meet any one of the following criteria:</p> <ul style="list-style-type: none"> <li>(i) The estimated geographic range and distribution has been reduced by at least 70% and is either continuing to decline with total destruction imminent in the short term future, or is unlikely to be substantially rehabilitated in the short term future due to modification;</li> <li>(ii) The current distribution is limited ie. highly restricted, having very few small or isolated occurrences, or covering a small area;</li> <li>(iii) The ecological community is highly modified with potential of being rehabilitated in the short term future.</li> </ul>
V	<p><b>Vulnerable</b></p> <p>An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing high risk of total destruction in the medium to long term future. The ecological community must meet any one of the following criteria:</p> <ul style="list-style-type: none"> <li>(i) The ecological community exists largely as modified occurrences that are likely to be able to be substantially restored or rehabilitated;</li> <li>(ii) The ecological community may already be modified and would be vulnerable to threatening process, and restricted in range or distribution;</li> <li>(iii) The ecological community may be widespread but has potential to move to a higher threat category due to existing or impending threatening processes.</li> </ul>

**APPENDIX A4: DEFINITION OF PRIORITY ECOLOGICAL COMMUNITIES (Department of Environment and Conservation 2009b)**

Category Code	Category
P1	<p><b>Poorly-known Ecological Communities</b></p> <p>Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist.</p>
P2	<p><b>Poorly-known Ecological Communities</b></p> <p>Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, un-allocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation.</p>
P3	<p><b>Poorly known Ecological Communities</b></p> <p>(i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or:</p> <p>(ii) Communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or;</p> <p>(iii) Communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing and inappropriate fire regimes.</p>
P4	<p><b>Ecological Communities</b></p> <p>Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring.</p>
P5	<p><b>Conservation Dependent Ecological Communities</b></p> <p>Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.</p>

**APPENDIX B: VASCULAR PLANT SPECIES RECORDED ON AVIVA SURVEY AREA, 2005,2006, 2007, 2008 AND LAKE LOGUE NATURE RESERVE**

Note: \* denotes introduced species; P1, P2, P3 and P4 denote - Priority Flora Species (DEC 2009a)

FAMILY	SPECIES	2005 & 2006	2007& 2008	Lake Logue	LIFEFORM
ZAMIACEAE	<i>Macrozamia fraseri</i>	x			Cycad
	<i>Macrozamia riedlei</i>			x	Cycad
CUPRESSACEAE	<i>Actinostrobus acuminatus</i>	x	x	x	Shrub
	<i>Actinostrobus arenarius</i>	x		x	Tree or shrub
	<i>Actinostrobus pyramidalis</i>		x	x	Tree or shrub
POACEAE	* <i>Aira caryophyllea</i>			x	Annual grass
	<i>Amphipogon caricinus</i>			x	Tufted perennial grass
	<i>Amphipogon debilis</i>	x			Tufted perennial grass
	<i>Amphipogon turbinatus</i>	x	x	x	Rhizomatous, tufted perennial grass
	<i>Austrostipa macalpinei</i>	x		x	Grass
	* <i>Avena</i> sp.		x		Annual and Perennial grasses
	* <i>Briza maxima</i>	x	x	x	Tufted, glabrous annual grass
	* <i>Briza minor</i>			x	Tufted annual grass
	* <i>Bromus diandrus</i>			x	Tufted annual grass
	* <i>Bromus madritensis</i>			x	Tufted annual grass
	* <i>Ehrharta calycina</i>			x	Perennial grass
	* <i>Hordeum</i> sp.			x	Annual grass
	<i>Neurachne alopecuroidea</i>	x			Rhizomatous, tufted perennial grass
	* <i>Pentaschistis airoides</i>			x	Delicate tufted annual grass
	* <i>Polypogon monspeliensis</i>			x	Annual grass
	* <i>Vulpia bromoides</i>	x			Loosely tufted annual grass
CYPERACEAE	<i>Caustis dioica</i>	x		x	Dioecious, rhizomatous, tangled, tussocky, pungent leaved perennial sedge
	<i>Gahnia trifida</i>			x	Rhizomatous, tufted perennial sedge
	<i>Lepidosperma costale</i>		x		Rhizomatous, tufted perennial sedge
	<i>Lepidosperma leptostachyum</i>	x			Rhizomatous, tufted perennial sedge
	<i>Lepidosperma pubisquamum</i>			x	Rhizomatous, tufted perennial sedge
	<i>Lepidosperma scabrum</i>			x	Rhizomatous, tufted perennial sedge
	<i>Lepidosperma squamatum</i>			x	Rhizomatous, tufted perennial sedge
	<i>Lepidosperma tenue</i>				Rhizomatous, tufted perennial sedge
	<i>Lepidosperma</i> sp.	x		x	Rhizomatous, tufted perennial sedge
	<i>Mesomelaena preissii</i>	x			Tufted perennial sedge
	<i>Mesomelaena pseudostygia</i>	x	x	x	Tufted perennial sedge
	<i>Mesomelaena stygia</i> subsp. <i>deflexa</i> (P3)	x	x		Tufted perennial sedge
	<i>Mesomelaena tetragona</i>	x			Tufted perennial sedge
	<i>Schoenus andrewsii</i>	x			Tufted perennial sedge
	<i>Schoenus brevisetis</i>	x			Tufted perennial sedge
	<i>Schoenus curvifolius</i>	x		x	Tufted perennial sedge with a bulb-like underground base



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FAMILY	SPECIES	2005 & 2006	2007& 2008	Lake Logue	LIFEFORM
CYPERACEAE (continued)	<i>Schoenus griffinianus</i> (P3)	x		x	Small, tufted perennial sedge
	<i>Schoenus latitans</i>		x		Small, tufted perennial sedge
	<i>Schoenus pedicellatus</i>			x	Tufted perennial sedge
	<i>Schoenus</i> aff. <i>pedicellatus</i>	x			Tufted perennial sedge
	<i>Schoenus pleiostemoneus</i>	x		x	Tufted perennial sedge
	<i>Schoenus rigens</i>	x		x	Tufted perennial sedge
	<i>Schoenus subfascicularis</i>	x		x	Tufted perennial sedge
	<i>Schoenus subflavus</i> subsp. <i>subflavus</i>	x			Rhizomatous, tufted perennial sedge
	<i>Schoenus variicellae</i>	x			Annual sedge
	<i>Schoenus</i> sp.			x	Tufted perennial sedge
	<i>Tetraria octandra</i>	x			Rhizomatous, tufted perennial sedge
RESTIONACEAE	<i>Alexgeorgea nitens</i>	x	x	x	Rhizomatous dioecious sedge-like perennial herb
	<i>Alexgeorgea subterranea</i>		x		Rhizomatous dioecious sedge-like perennial herb
	<i>Chaetanthus aristatus</i>			x	Tufted perennial rush-like herb
	<i>Chordifex sinuosus</i>	x	x	x	Rhizomatous, spreading perennial herb
	<i>Desmocladius asper</i>		x		Rhizomatous dioecious sedge-like perennial herb
	<i>Desmocladius elongatus</i> (P3)		x		Rhizomatous dioecious sedge-like perennial herb
	<i>Desmocladius flexuosus</i>		x	x	Rhizomatous dioecious sedge-like perennial herb
	<i>Harperia lateriflora</i>			x	Rhizomatous, perennial herb
	<i>Hypolaena exsulca</i>		x	x	Rhizomatous, perennial herb
	<i>Lepidobolus chaetocephalus</i>	x	x		Rhizomatous, caespitose sedge-like perennial herb
	<i>Lepidobolus densus</i> (ms) (P3)	x			Rhizomatous, caespitose sedge-like perennial herb
	<i>Lepidobolus preissianus</i>		x		Rhizomatous dioecious creeping sedge-like perennial herb
	<i>Lepidobolus preissianus</i> subsp. <i>preissianus</i>			x	Rhizomatous, perennial herb
	<i>Lepidobolus quadratus</i> (ms) (P3)		x		Rhizomatous, caespitose sedge-like perennial herb
	<i>Loxocarya cinerea</i>			x	Rhizomatous, perennial herb
	<i>Lyginia barbata</i>	x	x	x	Rhizomatous, creeping perennial herb
	<i>Lyginia imberbis</i>			x	Rhizomatous, caespitose perennial herb
	<i>Meeboldina coangustata</i>	x			Rhizomatous, perennial herb
	Restionaceae sp.			x	Perennial herb
ECDEIOCOLEACEAE	<i>Ecdeiocola monostachya</i>	x		x	Tufted perennial sedge-like herb
	<i>Georgeantha hexandra</i> (P4)	x	x		Rhizomatous, grass-like herb
CENTROLEPIDACEAE	<i>Centrolepis aristata</i>	x	x		Tufted annual herb
JUNCACEAE	<i>Juncus pallidus</i>		x		Rhizomatous, robust perennial herb

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FAMILY	SPECIES	2005 & 2006	2007& 2008	Lake Logue	LIFEFORM
DASYPOGONACEAE	<i>Acanthocarpus preissii</i>		x		Rhizomatous, tufted perennial herb
	<i>Calectasia narragara</i>		x	x	Rhizomatous, tufted herb
	<i>Dasyogon bromeliifolius</i>	x	x		Rhizomatous, tufted perennial herb
	<i>Dasyogon obliquifolius</i>		x	x	Dioecious rhizomatous, caespitose robust perennial herb
	<i>Kingia australis</i>		x		Perennial tree-like monocot
	<i>Lomandra caespitosa</i>		x		Dioecious rhizomatous, caespitose perennial herb
	<i>Lomandra hastilis</i>	x		x	Dioecious rhizomatous, caespitose robust perennial herb
	<i>Lomandra preissii</i>		x	x	Dioecious rhizomatous, caespitose perennial herb
	<i>Lomandra sericea</i>		x		Dioecious rhizomatous, caespitose perennial herb
	<i>Lomandra suaveolens</i>		x	x	Dioecious rhizomatous, caespitose perennial herb
XANTHORRHOACEAE	<i>Xanthorrhoea drummondii</i>		x	x	Grass tree
	<i>Xanthorrhoea preissii</i>	x	x	x	Grass tree
PHORMIACEAE	<i>Dianella revoluta</i>		x	x	Rhizomatous perennial herb
ANTHERICACEAE	<i>Arnocrinum preissii</i>	x		x	Rhizomatous, perennial herb
	<i>Corynotheca micrantha</i>		x	x	Rhizomatous, tufted, tangled perennial herb or shrub
	<i>Hensmania stoniella</i> (P3)	x			Tufted, stilt-rooted perennial herb
	<i>Johnsonia acaulis</i>	x		x	Rhizomatous, tufted perennial, grass-like herb
	<i>Johnsonia pubescens</i>		x		Rhizomatous, tufted perennial, grass-like herb
	<i>Johnsonia pubescens</i> subsp. <i>pubescens</i>		x		Rhizomatous, tufted perennial, grass-like herb
	<i>Laxmannia omnifertilis</i>	x	x		Slender or tufted stoloniferous perennial herb
	<i>Laxmannia sessiliflora</i>			x	Perennial herb
	<i>Laxmannia sessiliflora</i> subsp. <i>drummondii</i>			x	Tufted or spreading stilt-rooted perennial herb
	<i>Thysanotus manglesianus</i>			x	Perennial herb
	<i>Thysanotus rectantherus</i>	x		x	Perennial herb (with tuberous roots)
	<i>Thysanotus spiniger</i>	x	x	x	Rhizomatous, much branched perennial herb
	<i>Thysanotus teretifolius</i>			x	Caespitose perennial herb
	<i>Thysanotus thyrsoides</i>			x	Perennial herb (with tuberous roots)
	<i>Thysanotus triandrus</i>	x			Caespitose perennial herb
	<i>Tricoryne humilis</i>	x			Rhizomatous, perennial herb
<i>Tricoryne tenella</i>	x			Rhizomatous, perennial herb	
<i>Tricoryne</i> sp. <i>Eneabba</i> (E.A. Griffin 1200)	x			Rhizomatous, perennial herb	
COLCHICACEAE	<i>Burchardia congesta</i>	x		x	Cormous and tuberous, perennial herb
	<i>Wurmbea dioica</i>			x	Cormous, perennial herb
BORYACEAE	<i>Borya</i> sp.		x		Perennial herb

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FAMILY	SPECIES	2005 & 2006	2007& 2008	Lake Logue	LIFEFORM
HAEMODORACEAE	<i>Anigozanthos humilis</i>			x	Rhizomatous, perennial herb
	<i>Anigozanthos humilis</i> subsp. <i>humilis</i>	x	x		Rhizomatous, perennial herb
	<i>Anigozanthos manglesii</i>		x	x	Rhizomatous, perennial herb
	<i>Anigozanthos manglesii</i> subsp. <i>quadrans</i>	x			Rhizomatous, perennial herb
	<i>Anigozanthos pulcherrimus</i>	x	x		Rhizomatous, perennial herb
	<i>Blancoa canescens</i>	x	x		Rhizomatous, caespitose, clumped perennial herb
	<i>Conostylis aculeata</i>			x	Rhizomatous, perennial, grass-like herb
	<i>Conostylis aculeata</i> subsp. <i>breviflora</i>	x	x	x	Rhizomatous, proliferous, perennial, grass-like herb
	<i>Conostylis androstemma</i>		x		Rhizomatous, tufted perennial, grass-like herb
	<i>Conostylis aurea</i>	x	x	x	Rhizomatous, tufted perennial, grass-like herb
	<i>Conostylis candicans</i>			x	Rhizomatous, perennial, grass-like herb
	<i>Conostylis candicans</i> subsp. <i>candicans</i>			x	Rhizomatous, tufted perennial, grass-like herb
	<i>Conostylis canteriata</i>			x	Rhizomatous, tufted stilt-rooted perennial, grass-like herb
	<i>Conostylis crassinervia</i> subsp. <i>absens</i>			x	Rhizomatous, tufted perennial, grass-like herb
	<i>Conostylis hiemalis</i>	x			Rhizomatous, tufted perennial, grass-like herb
	<i>Conostylis neocymosa</i>	x	x		Rhizomatous, tufted perennial, grass-like herb
	<i>Conostylis prolifera</i>	x			Rhizomatous, tufted stoloniferous perennial, grass-like herb
	<i>Conostylis setigera</i>			x	Rhizomatous, tufted perennial, grass-like herb
	<i>Conostylis setigera</i> subsp. <i>setigera</i>			x	Rhizomatous, tufted perennial, grass-like herb
	<i>Conostylis teretifolia</i>			x	Rhizomatous, tufted perennial, grass-like herb
	<i>Conostylis teretifolia</i> subsp. <i>teretifolia</i>	x	x	x	Rhizomatous, tufted perennial, grass-like herb
	<i>Conostylis tomentosa</i>			x	Rhizomatous, tufted perennial, grass-like herb
	<i>Conostylis</i> sp.			x	Rhizomatous, tufted perennial, grass-like herb
	<i>Haemodorum loratum</i> (P3)	x			Bulbaceous, perennial herb
	<i>Haemodorum simplex</i>	x	x		Bulbaceous, perennial herb
	<i>Haemodorum simulans</i>	x	x		Bulbaceous, perennial herb
	<i>Haemodorum spicatum</i>	x		x	Bulbaceous, perennial herb
	<i>Haemodorum venosum</i>			x	Bulbaceous, perennial herb
	<i>Macropidia fuliginosa</i>			x	Rhizomatous, perennial herb
	<i>Tribonanthes australis</i>			x	Tuberous, perennial herb
Haemodoraceae sp.			x	Perennial herb	
IRIDACEAE	<i>Patersonia occidentalis</i>		x	x	Rhizomatous, tufted perennial herb
ORCHIDACEAE	<i>Caladenia</i> sp.		x		Tuberous, perennial herb
	<i>Diuris brumalis</i>		x		Tuberous, perennial herb
	<i>Diuris corymbosa</i>		x		Tuberous, perennial herb
	<i>Diuris</i> sp.		x		Tuberous, perennial herb
	<i>Prasophyllum</i> sp.			x	Tuberous, perennial herb
	<i>Pterostylis vittata</i>		x		Tuberous, perennial herb
	<i>Pterostylis</i> sp.		x		Tuberous, perennial herb
	Orchidaceae sp.			x	Perennial herb

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FAMILY	SPECIES	2005 & 2006	2007& 2008	Lake Logue	LIFEFORM
CASUARINACEAE	<i>Allocasuarina campestris</i>	x			Dioecious or monoecious shrubs
	<i>Allocasuarina humilis</i>	x	x	x	Dioecious or monoecious, erect or spreading shrub
	<i>Allocasuarina microstachya</i>		x	x	Dioecious intricate shrub
	<i>Casuarina obesa</i>			x	Dioecious tree
	<i>Casuarina pauper</i>			x	Dioecious tree
PROTEACEAE	<i>Adenanthos cygnorum</i>			x	Non-lignotuberous shrub
	<i>Adenanthos cygnorum</i> subsp. <i>cygnorum</i>	x	x	x	Erect, diffuse, non-lignotuberous shrub
	<i>Adenanthos drummondii</i>		x		Diffuse, lignotuberous shrub
	<i>Banksia armata</i> var. <i>armata</i>		x		Much-branched sprawling or erect, prickly, lignotuberous shrub
	<i>Banksia attenuata</i>	x	x	x	Lignotuberous tree or shrub
	<i>Banksia bipinnatifida</i>		x		Prostrate, lignotuberous shrub
	<i>Banksia bipinnatifida</i> subsp. <i>multifida</i>	x	x		Prostrate, lignotuberous shrub
	<i>Banksia candolleana</i>		x	x	Lignotuberous shrub
	<i>Banksia carlinoides</i>	x	x	x	Rounded, compact, non-lignotuberous shrub
	<i>Banksia chamaephyton</i> (P4)		x		Lignotuberous, low shrub
	<i>Banksia dallanneyi</i>			x	Shrub
	<i>Banksia dallanneyi</i> subsp. <i>media</i>			x	Low, lignotuberous shrub
	<i>Banksia dallanneyi</i> var. <i>dallanneyi</i>			x	Prostrate, lignotuberous shrub
	<i>Banksia fraseri</i> var. <i>effusa</i> (P2)			x	Shrub
	<i>Banksia fraseri</i> var. <i>fraseri</i>	x	x		Shrub
	<i>Banksia glaucifolia</i>		x		Erect, prickly, non-lignotuberous shrub
	<i>Banksia grossa</i>			x	Lignotuberous, multi-stemmed shrub
	<i>Banksia hookeriana</i>	x	x		Much-branched, non-lignotuberous shrub
	<i>Banksia incana</i>			x	Lignotuberous shrub
	<i>Banksia kippistiana</i> var. <i>kippistiana</i>	x			Erect, prickly, non-lignotuberous shrub
	<i>Banksia lanata</i>		x		Non-lignotuberous shrub
	<i>Banksia menziesii</i>	x	x	x	Tree or shrub
	<i>Banksia ?micrantha</i>			x	Shrub
	<i>Banksia nana</i>			x	Dwarf, prostrate, lignotuberous shrub
	<i>Banksia nivea</i> subsp. <i>nivea</i>	x			Tufted, rounded to prostrate, non-lignotuberous shrub
	<i>Banksia platycarpa</i> (P4)			x	Erect, non-lignotuberous shrub
	<i>Banksia prionotes</i>			x	Non-lignotuberous tree or shrub
	<i>Banksia sessilis</i>			x	Prickly tree or shrub
	<i>Banksia sessilis</i> var. <i>cygnorum</i>			x	Non-lignotuberous shrub or tree
	<i>Banksia shuttleworthiana</i>	x	x	x	Low, spreading, lignotuberous shrub
	<i>Banksia sphaerocarpa</i>	x	x	x	Shrub
	<i>Banksia sphaerocarpa</i> var. <i>sphaerocarpa</i>	x			Lignotuberous shrub
<i>Banksia strictifolia</i>	x			Erect non-lignotuberous shrub	
<i>Banksia telmatiaea</i>			x	Non-lignotuberous shrub	
<i>Banksia tortifolia</i>	x	x		Prostrate, spreading, lignotuberous shrub	
<i>Banksia tridentata</i>			x	Low, open, lignotuberous shrub	

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FAMILY	SPECIES	2005 & 2006	2007& 2008	Lake Logue	LIFEFORM
PROTEACEAE	<i>Conospermum acerosum</i>			x	Spindly shrub
(continued)	<i>Conospermum crassinervium</i>	x	x	x	Tufted non-lignotuberous shrub
	<i>Conospermum glumaceum</i>	x			Erect non-lignotuberous shrub
	<i>Conospermum incurvum</i>		x		Erect, spindly, non-lignotuberous shrub
	<i>Conospermum nervosum</i>	x	x		Erect, much-branched shrub
	<i>Conospermum triplinervium</i>	x	x	x	Shrub or tree
	<i>Conospermum unilaterale</i>	x		x	Erect shrub
	<i>Conospermum wycherleyi</i>	x			Erect shrub
	<i>Grevillea althoferorum</i> subsp. <i>althoferorum</i> (R)		x		Lignotuberous shrub
	<i>Grevillea amplexans</i> subsp. <i>adpressa</i>		x		Spreading shrub
	<i>Grevillea bififormis</i> subsp. <i>bififormis</i>			x	Shrub
	<i>Grevillea bififormis</i> subsp. <i>cymbiformis</i> (P3)	x			Shrub
	<i>Grevillea eriostachya</i>	x		x	Small, lignotuberous shrub
	<i>Grevillea pinaster</i>	x		x	Erect, spreading shrub
	<i>Grevillea polybotrya</i>	x			Erect, bushy, non-lignotuberous shrub
	<i>Grevillea rudis</i> (P4)		x		Loose, spreading to erect shrub
	<i>Grevillea shuttleworthiana</i>		x		Shrub
	<i>Grevillea shuttleworthiana</i> subsp. <i>canarina</i>	x			Shrub
	<i>Grevillea synapheae</i>		x		Sprawling to prostrate, lignotuberous shrub
	<i>Grevillea vestita</i>		x		Erect, spreading, prickly shrub
	<i>Hakea adenia</i>		x		Erect shrub
	<i>Hakea auriculata</i>		x		Shrub
	<i>Hakea candolleana</i>	x	x	x	Spreading, lignotuberous shrub
	<i>Hakea conchifolia</i>		x		Shrub
	<i>Hakea costata</i>		x		Erect, non-lignotuberous shrub
	<i>Hakea eneabba</i>	x	x	x	Erect shrub
	<i>Hakea erinacea</i>		x		Prickly, non-lignotuberous shrub
	<i>Hakea flabellifolia</i>		x		Erect, lignotuberous shrub
	<i>Hakea gilbertii</i>	x		x	Erect, densely branched, non-lignotuberous shrub
	<i>Hakea incrassata</i>	x	x		Spreading, lignotuberous shrub
	<i>Hakea lissocarpa</i>	x	x		Erect to sprawling, pungent, ?lignotuberous shrub
	<i>Hakea obliqua</i>			x	Erect shrub
	<i>Hakea prostrata</i>		x	x	Erect to spreading or prostrate, non-lignotuberous shrub
	<i>Hakea psilorrhyncha</i>	x			Erect shrub
	<i>Hakea ruscifolia</i>		x		Lignotuberous shrub
	<i>Hakea stenocarpa</i>		x		Rounded, lignotuberous shrub
	<i>Hakea trifurcata</i>	x	x		Rounded or open, non-lignotuberous shrub
	<i>Isopogon adenanthoides</i>		x		Erect shrub
	<i>Isopogon dubius</i>	x	x		Compact, bushy shrub
	<i>Isopogon tridens</i>	x		x	Bushy shrub
	<i>Lambertia multiflora</i>		x	x	Many-stemmed, lignotuberous shrub
	<i>Lambertia multiflora</i> var. <i>multiflora</i>	x	x		Many-stemmed, lignotuberous shrub

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PROTEACEAE (continued)	<i>Persoonia acicularis</i>	x			Erect shrub
	<i>Persoonia comata</i>		x		Erect, sometimes spreading to decumbent, lignotuberous shrub
	<i>Petrophile brevifolia</i>	x	x	x	Erect, multi-stemmed, non-lignotuberous shrub
	<i>Petrophile drummondii</i>	x	x	x	Many-branched, prickly, non-lignotuberous shrub
	<i>Petrophile linearis</i>		x	x	Erect, lignotuberous shrub
	<i>Petrophile macrostachya</i>	x	x	x	Erect, compact or spreading, prickly shrub
	<i>Petrophile media</i>			x	Low, spreading, non-lignotuberous shrub
	<i>Petrophile megalostegia</i>		x		Erect shrub
	<i>Petrophile scabriuscula</i>			x	
	<i>Petrophile shuttleworthiana</i>		x		Upright, open shrub
	<i>Petrophile striata</i>		x		Erect rigid or sprawling shrub
	<i>Petrophile trifurcata</i>			x	Shrub
	<i>Stirlingia latifolia</i>	x	x	x	Erect, lignotuberous shrub
	<i>Stirlingia simplex</i>	x		x	Erect, woody perennial, suckering herb or shrub
	<i>Strangea cynanchicarpa</i>		x		Low, many-stemmed, spreading or lignotuberous shrub
	<i>Synaphea spinulosa</i>		x	x	Erect to spreading shrub
	<i>Synaphea spinulosa</i> subsp. <i>spinulosa</i>	x	x		Erect to spreading shrub
	<i>Xylomelum angustifolium</i>	x	x	x	Non-lignotuberous shrub or tree
SANTALACEAE	<i>Exocarpos sparteus</i>	x			Weeping shrub
	<i>Leptomeria empetriformis</i>		x	x	Shrub
	<i>Leptomeria preissiana</i>			x	Shrub
	<i>Leptomeria</i> sp.			x	
OLACACEAE	<i>Olex benthamiana</i>		x		Shrub
	<i>Olex scalariformis</i>		x	x	Shrub
LORANTHACEAE	<i>Nuytsia floribunda</i>	x	x	x	Tree or shrub
POLYGONACEAE	<i>Muehlenbeckia adpressa</i>	x	x	x	Decumbent or twining shrub or creeper
CHENOPODIACEAE	<i>Sarcocornia</i> sp.			x	Shrub
	<i>Tecticornia indica</i> subsp. <i>bidens</i>			x	Perennial Herb
AMARANTHACEAE	<i>Ptilotus ?drummondii</i>	x			Perennial herb
	<i>Ptilotus manglesii</i>	x			Prostrate to ascending perennial herb
	<i>Ptilotus polystachyus</i>	x		x	Erect or asecedning annual or prennial herb
GYROSTEMONACEAE	<i>Gyrostemon racemiger</i>	x	x		Shrub or tree
	<i>Tersonia cyathiflora</i>	x	x		Prostrate annual or biennial herb or shrub
AIZOACEAE	<i>Carpobrotus modestus</i>		x	x	Prostrate, succulent perennial herb

**APPENDIX B: VASCULAR PLANT SPECIES RECORDED ON AVIVA SURVEY AREA, 2005,2006, 2007, 2008 AND LAKE LOGUE NATURE RESERVE**

Note: \* denotes introduced species; P1, P2, P3 and P4 denote - Priority Flora Species (DEC 2009a)

FAMILY	SPECIES	2005 & 2006	2007& 2008	Lake Logue	LIFEFORM
MOLLUGINACEAE	<i>Macarthuria apetala</i>	x			Erect or ascending, spreading, wiry shrub
	<i>Macarthuria australis</i>	x			Erect or ascending, spreading, wiry shrub
CARYOPHYLLACEAE	* <i>Polycarpon tetraphyllum</i>	x			Erect, spreading or prostrate annual herb
	* <i>Silene gallica</i>	x			Erect or ascending, rather viscid annual herb
RANUNCULACEAE	<i>Clematis linearifolia</i>			x	Climber
LAURACEAE	<i>Cassytha aurea</i> var. <i>hirta</i>	x			Parasitic perennial herb and climber
	<i>Cassytha flava</i>	x			Parasitic perennial herb and climber
	<i>Cassytha glabella</i>		x		Parasitic perennial herb and climber
	<i>Cassytha</i> sp.			x	Parasitic perennial herb and climber
BRASSICACEAE	* <i>Brassica tournefortii</i>		x	x	Annual herb
DROSERACEAE	<i>Drosera allantostigma</i> (P1)	x			Fibrous-rooted, rosetted perennial herb
	<i>Drosera erythrorhiza</i> subsp. <i>magna</i>		x		Flat, rosetted tuberous perennial herb
	<i>Drosera gigantea</i> subsp. <i>gigantea</i>	x			Erect, robust, flexuous tuberous, perennial herb
	<i>Drosera humilis</i>		x		Tuberous, perennial herb
	<i>Drosera leucoblata</i>	x	x		Fibrous-rooted, rosetted perennial herb
	<i>Drosera menziesii</i>		x		Erect tuberous, perennial herb or climber
	<i>Drosera stolonifera</i>		x		Tuberous, perennial herb
	<i>Drosera</i> sp.			x	Perennial herb
CRASSULACEAE	<i>Crassula colorata</i>			x	Succulent annual herb
BYBLIDACEAE	<i>Byblis lamellata</i>	x			Small-branched shrub
SURIANACEAE	<i>Stylobasium australe</i>	x			Erect shrub
MIMOSACEAE	<i>Acacia ?aestivalis</i>		x		Erect, bushy shrub or tree
	<i>Acacia auronitens</i>	x	x		Spreading, procumbent to ascending, prickly shrub
	<i>Acacia blakelyi</i>	x	x	x	Dense or occasionally slender shrub or tree
	<i>Acacia cavealis</i>		x		Open, spreading shrub
	<i>Acacia drewiana</i> subsp. <i>drewiana</i>		x		Spreading shrub
	<i>Acacia flabellifolia</i> (P3)	x			Erect, spreading, pungent shrub
	<i>Acacia lasiocarpa</i> var. <i>lasiocarpa</i>	x	x	x	Dense compact or spreading & openly branched, often spinescent shrub
	<i>Acacia lasiocarpa</i> var. <i>lasiocarpa</i> Cockleshell Gully variant (E.A. Griffin 2039) (P2)	x	x		Shrub
	<i>Acacia lasiocarpa</i> var. <i>lasiocarpa</i> ?Cockleshell Gully variant (E.A. Griffin 2039) (P2)			x	Shrub
	<i>Acacia latipes</i> subsp. <i>latipes</i>	x	x		Diffuse to dense, prostrate or erect, pungent shrub
	<i>Acacia microbotrya</i>	x		x	Bushy shrub or tree
	<i>Acacia multispicata</i>	x	x		Low, multi-branched, spreading to erect, domes, densed to wispy shrub
	<i>Acacia pulchella</i>			x	Diffuse erect to low spreading, spinescent shrub
	<i>Acacia pulchella</i> var. <i>glaberrima</i>			x	Divaricately branched, erect to sprawling, spinescent shrub

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FAMILY	SPECIES	2005 & 2006	2007& 2008	Lake Logue	LIFEFORM
MIMOSACEAE	<i>Acacia rostellifera</i>			x	Dense shrub or tree
	<i>Acacia saligna</i>	x	x	x	Dense, often weeping shrub or tree
	<i>Acacia sessilis</i>	x	x		Diffuse, often straggling, pungent shrub
	<i>Acacia stenoptera</i>		x		Sprawling, scrambling or erect tangled, prickly shrub
CAESALPINIACEAE	<i>Labichea lanceolata</i> subsp. <i>lanceolata</i>	x	x		Erect, dense, intricately branched, prickly shrub
PAPILIONACEAE	<i>Bossiaea eriocarpa</i>			x	Erect and straggly to spreading shrub
	<i>Bossiaea</i> sp.			x	Shrub
	<i>Cristonia biloba</i>			x	Erect, spreading shrub
	<i>Daviesia angulata</i>			x	Erect, spreading, pungent shrub
	<i>Daviesia benthamii</i>			x	Erect, leafless spiny shrub
	<i>Daviesia chapmanii</i>			x	Erect, dense and compacy, pungent shrub
	<i>Daviesia daphnoides</i>			x	Erect, spreading shrub
	<i>Daviesia decurrens</i>			x	Erect shrub
	<i>Daviesia divaricata</i>			x	Erect, spreading shrub
	<i>Daviesia divaricata</i> ?subsp. <i>divaricata</i>	x			Erect, spreading shrub
	<i>Daviesia epiphyllum</i>			x	Erect, spreading shrub
	<i>Daviesia hakeoides</i> subsp. <i>hakeoides</i>			x	Shrub
	<i>Daviesia hakeoides</i> subsp. <i>subnuda</i>			x	Many-stemmed shrub
	<i>Daviesia incrassata</i>			x	Erect shrub
	<i>Daviesia incrassata</i> subsp. <i>incrassata</i>	x			Erect shrub
	<i>Daviesia incrassata</i> subsp. <i>teres</i>			x	Erect, spreading shrub
	<i>Daviesia nudiflora</i>			x	Shrub
	<i>Daviesia nudiflora</i> subsp. <i>nudiflora</i>	x			Bushy shrub
	<i>Daviesia podophylla</i>	x			Erect or spreading, divaricately branched shrub
	<i>Daviesia preissii</i>			x	Dense shrub
	<i>Daviesia</i> sp.			x	Shrub
	<i>Daviesia triflora</i>			x	Many-stemmed, leafless shrub
	<i>Gastrolobium capitatum</i>			x	Prostrate to low bushy shrub
	<i>Gastrolobium oxylobioides</i>	x			Spreading erect shrub
	<i>Gastrolobium plicatum</i>			x	Semi-prostrate to erect shrub
	<i>Gastrolobium polystachyum</i>	x			Upright, spreading shrub
	<i>Gastrolobium spinosum</i>	x			Shrub
	<i>Gompholobium confertum</i>	x			Erect shrub
	<i>Gompholobium glutinosum</i>			x	Erect, open shrub
	<i>Gompholobium knightianum</i>			x	Slender, erect shrub
	<i>Gompholobium shuttleworthii</i>	x			Erect shrub
	<i>Gompholobium tomentosum</i>	x			Erect shrub
	<i>Hovea stricta</i>			x	Erect shrub
<i>Isotropis cuneifolia</i> subsp. <i>cuneifolia</i>			x	Erect, spreading, soft-wooded shrub	
<i>Jacksonia angulata</i>			x	Erect or ascending shrub	
<i>Jacksonia calcicola</i>			x	Prostrate spreading or erect, prickly shrub	



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FAMILY	SPECIES	2005 & 2006	2007& 2008	Lake Logue	LIFEFORM
PAPILIONACEAE (continued)	<i>Jacksonia floribunda</i>	x	x	x	Prostrate, decumbent or erect shrub
	<i>Jacksonia furcellata</i>			x	Prostrate to decumbent, or weeping erect shrub
	<i>Jacksonia hakeoides</i>		x	x	Prostrate or erect, intricate, pungent shrub
	<i>Jacksonia nutans</i>	x	x	x	Erect, prickly shrub
	<i>Jacksonia ramulosa</i>	x	x	x	Erect, open to compact shrub
	<i>Jacksonia restioides</i>	x	x		Erect or straggling shrub
	<i>Kennedia prostrata</i>			x	Prostrate or twining shrub
	* <i>Lupinus angustifolius</i>			x	Erect, much-branched annual herb
	* <i>Lupinus cosentinii</i>			x	Robust, much-branched annual herb
	<i>Mirbelia spinosa</i>	x	x		Erect or ascending, spiney shrub
	<i>Mirbelia trichocalyx</i>			x	Erect, dense, spiny shrub
	<i>Sphaerolobium gracile</i>	x			Low straggling or prostrate shrub
	<i>Sphaerolobium pulchellum</i>			x	Low shrub
	* <i>Trifolium campestre</i>			x	Robust, erect or decumbent villous annual herb
	<i>Viminaria juncea</i>	x			Erect, often weeping shrub
RUTACEAE	<i>Boronia coerulescens</i>			x	Upright shrub
	<i>Boronia ericifolia</i> (P2)			x	Erect Shrub
	<i>Boronia ramosa</i>			x	Shrub
	<i>Boronia ramosa</i> subsp. <i>anethifolia</i>			x	Slender, erect or scrambling shrub
	<i>Boronia ramosa</i> subsp. <i>lesueurana</i> (P2)			x	Compact, woody perennial herb
	<i>Diplolaena ferruginea</i>	x			Spreading shrub
	<i>Philotheca spicata</i>			x	Slender, erect shrub
TREMADRACEAE	<i>Tetradlea confertifolia</i>			x	Erect or occasionally decumbent shrub
	<i>Tetradlea nephelioides</i> (R)			x	Caespitose, dwarf shrub
POLYGALACEAE	<i>Comesperma acerosum</i>	x	x		Erect perennial herb or shrub
	<i>Comesperma calymega</i>			x	Erect perennial herb
	<i>Comesperma griffinii</i> (P2)	x			Perennial herb
	<i>Comesperma integerrimum</i>			x	Twining shrub or climber
	<i>Comesperma rhadinocarpum</i> (P2)	x			Perennial herb
	<i>Comesperma scoparium</i>			x	Erect, spindly, broom-like shrub
EUPHORBIACEAE	<i>Monotaxis bracteata</i>	x			Glabrous, monoecious, or sometimes dioecious, compact perennial, herb
	<i>Poranthera microphylla</i>	x		x	Slender, procumbent to erect annual herb
	<i>Stachystemon axillaris</i>	x	x	x	Erect, slender shrub
STACKHOUSIACEAE	<i>Stackhousia monogyna</i>	x			Glabrous or pubescent perennial herb
	<i>Tripterococcus brunonis</i>	x	x		Perennial herb
SAPINDACEAE	<i>Dodonaea ericoides</i>			x	Erect shrub

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FAMILY	SPECIES	2005 & 2006	2007& 2008	Lake Logue	LIFEFORM
RHAMNACEAE	<i>Cryptandra myriantha</i>	x	x		Slender, erect or straggling shrub
	<i>Cryptandra pungens</i>		x		Erect, slender, spinescent shrub
	<i>Polianthion wichurae</i>		x		Erect to low spreading shrub
	<i>Stenanthemum humile</i>		x		Upright perennial
	<i>Stenanthemum notiale</i> subsp. <i>notiale</i>		x		Erect or spreading, sometimes prostrate shrub
MALVACEAE	<i>Alyogyne hakeifolia</i>	x			Erect, slender or spreading shrub
	<i>Lawrenzia squamata</i>			x	Erect, spinescent shrub
	<i>Sida hookeriana</i>	x			Slender, erect annual herb
STERCULIACEAE	<i>Commersonia pulchella</i>		x		Erect, spreading shrub
	<i>Guichenotia alba</i> (P3)		x		Slender, lax, few-branched shrub
	<i>Guichenotia macrantha</i>		x		Erect Shrub
	<i>Guichenotia sarotes</i>	x	x		Shrub
	<i>Lasiopetalum drummondii</i>	x	x		Erect, slender shrub
	<i>Thomasia ?foliosa</i>		x		Multi-stemmed shrub
	<i>Thomasia grandiflora</i>		x		Multi-stemmed shrub
DILLENIACEAE	<i>Hibbertia acerosa</i>	x			Low, spreading, mat-forming or ascending shrub
	<i>Hibbertia crassifolia</i>		x		Erect, multi-stemmed shrub
	<i>Hibbertia huegelii</i>	x			Erect, open, spreading to prostrate shrub
	<i>Hibbertia hypericoides</i>	x	x	x	Erect, spreading, twiggy shrub
	<i>Hibbertia mylnei</i>		x		Erect Shrub
	<i>Hibbertia polystachya</i>		x		Erect or sprawling to straggling shrub
	<i>Hibbertia racemosa</i>		x		Erect or ascending, spreading shrub
	<i>Hibbertia spicata</i> subsp. <i>spicata</i>	x	x		Erect or spreading shrub
	<i>Hibbertia subvaginata</i>	x		x	Erect, occasionally prostrate, spreading or straggling shrub
	<i>Hibbertia</i> sp. Gngara (J.R. Wheeler 2329)	x	x		No description available
<i>Hibbertia</i> sp. Mt Lesueur (M. Hislop 174)		x	x	Description unavailable	
FRANKENIACEAE	<i>Frankenia pauciflora</i>			x	Prostrate to ascending shrub
VIOLACEAE	<i>Hybanthus floribundus</i> subsp. Hill River (E.M. Bennett 2252)		x		Shrub
THYMELAEACEAE	<i>Pimelea imbricata</i> var. <i>piligera</i>	x			Erect shrub
	<i>Pimelea microcephala</i>		x		Erect shrub
	<i>Pimelea suaveolens</i>		x		Erect, spindly shrub
	<i>Pimelea suaveolens</i> subsp. <i>suaveolens</i>		x		Erect, spindly shrub
	<i>Pimelea sulphurea</i>	x	x	x	Erect, spindly or open shrub

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FAMILY	SPECIES	2005 & 2006	2007& 2008	Lake Logue	LIFEFORM
MYRTACEAE	<i>Baeckea camphorosmae</i>	x	x		Prostrate to straggling or slender erect shrub
	<i>Baeckea crispiflora</i>			x	Shrub
	<i>Baeckea grandiflora</i>	x	x	x	Erect open or straggling shrub
	<i>Beaufortia bracteosa</i>			x	Shrub
	<i>Beaufortia elegans</i>	x	x	x	Erect shrub
	<i>Beaufortia squarrosa</i>			x	Shrub
	<i>Calothamnus hirsutus</i>	x	x	x	Often spreading shrub
	<i>Calothamnus quadrifidus</i>	x	x		Erect, compact or spreading shrub
	<i>Calothamnus sanguineus</i>			x	Erect to open spreading shrub
	<i>Calothamnus ?torulosus</i>			x	Erect or prostrate shrub
	<i>Calytrix angulata</i>			x	Shrub
	<i>Calytrix ?brevifolia</i>			x	Shrub
	<i>Calytrix depressa</i>	x		x	Shrub
	<i>Calytrix eneabbensis</i> (P4)	x			Shrub
	<i>Calytrix flavescens</i>	x	x	x	Shrub
	<i>Calytrix fraseri</i>			x	Shrub
	<i>Calytrix purpurea</i> (P2)	x			Spreading Shrub
	<i>Calytrix sapphirina</i>			x	Erect, multi-stemmed shrub
	<i>Calytrix superba</i> (P3)	x		x	Shrub
	<i>Calytrix variabilis</i>	x			Shrub
	<i>Chamelaucium uncinatum</i>			x	Erect shrub
	<i>Conothamnus trinervis</i>	x	x	x	Erect or straggling shrub
	<i>Corymbia calophylla</i>			x	Tree
	<i>Darwinia helichrysoides</i>			x	Erect, slender shrub
	<i>Darwinia neildiana</i>	x	x	x	Erect shrub
	<i>Darwinia sanguinea</i>	x	x		Low, sprawling, prostrate shrub
	<i>Darwinia speciosa</i>	x	x		Erect & sprawling or prostrate shrub
	<i>Eremaea asterocharpa</i>			x	Erect to spreading shrub
	<i>Eremaea beaufortioides</i>			x	Spreading shrub
	<i>Eremaea beaufortioides</i> var. <i>beaufortioides</i>			x	Spreading shrub
	<i>Eremaea beaufortioides</i> var. <i>lachnosanthe</i>	x	x		Erect to spreading shrub
	<i>Eremaea ebracteata</i>			x	Shrub
	<i>Eremaea ebracteata</i> var. <i>ebracteata</i>			x	Erect to spreading shrub
	<i>Eremaea ectadioclada</i>	x	x	x	Erect to spreading shrub
	<i>Eremaea pauciflora</i>			x	Erect to spreading shrub
	<i>Eremaea violacea</i>	x	x	x	Dense shrub
	<i>Eremaea violacea</i> var. <i>violacea</i>	x			Prostrate to decumbent shrub
	<i>Eremaea x phoenicea</i>			x	Erect Shrub
	<i>Eremaea</i> sp.			x	Shrub
	<i>Eucalyptus accedens</i>	x			Tree
	<i>Eucalyptus camaldulensis</i> var. <i>obtusa</i>	x	x	x	Tree
<i>Eucalyptus conveniens</i>	x			Mallee or shrub	

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MYRTACEAE	<i>Eucalyptus ebbanoensis</i>		x		Mallee
(continued)	<i>Eucalyptus eudesmioides</i>	x	x		Mallee or tree
	<i>Eucalyptus macrocarpa</i>		x		Spreading or sprawling mallee
	<i>Eucalyptus macrocarpa</i> subsp. <i>macrocarpa</i>		x		Spreading or sprawling mallee
	<i>Eucalyptus pleurocarpa</i>		x		Mallee
	<i>Eucalyptus todtiana</i>	x	x	x	Tree (mallee)
	<i>Kunzea recurva</i>	x			Erect shrub
	<i>Hypocalymma angustifolium</i>	x	x	x	Erect shrub
	<i>Hypocalymma hirsutum</i>		x		Erect or sprawling shrub
	<i>Hypocalymma xanthopetalum</i>	x	x	x	Erect to sprawling shrub
	<i>Hypocalymma</i> sp.			x	
	<i>Leptospermum erubescens</i>	x	x		Shrub
	<i>Leptospermum oligandrum</i>	x			Spreading shrub
	<i>Leptospermum spinescens</i>	x	x	x	Spinescent shrub
	<i>Melaleuca brevifolia</i>			x	Erect shrub or tree
	<i>Melaleuca ciliosa</i>		x	x	Erect, compact shrub
	<i>Melaleuca concreta</i>	x	x		Erect, bushy shrub
	<i>Melaleuca eleuterostachya</i>		x		Erect shrub or tree
	<i>Melaleuca hamulosa</i>	x			Shrub or tree
	<i>Melaleuca lanceolata</i>	x			Shrub or tree
	<i>Melaleuca lateriflora</i>			x	Shrub or tree
	<i>Melaleuca lateriflora</i> subsp. <i>acutifolia</i>	x			Shrub or tree
	<i>Melaleuca leuropoma</i>	x	x		Erect shrub
	<i>Melaleuca platycalyx</i>		x		Erect or spreading shrub
	<i>Melaleuca preissiana</i>		x		Shrub or tree
	<i>Melaleuca raphiophylla</i>	x		x	Tree or shrub
	<i>Melaleuca ryeae</i>			x	Erect open shrub
	<i>Melaleuca seriata</i>			x	Shrub
	<i>Melaleuca systema</i>	x	x	x	Erect to spreading shrub
	<i>Melaleuca trichophylla</i>	x	x		Straggly or rounded shrub
	<i>Melaleuca uncinata</i>	x			Shrub or tree
	<i>Melaleuca viminea</i>		x		Shrub or tree
	<i>Melaleuca viminea</i> subsp. <i>viminea</i>	x		x	Shrub or tree
	<i>Melaleuca zonalis</i>		x		Erect, several stemmed shrub
	<i>Melaleuca</i> sp.			x	Shrub or tree
	<i>Pileanthus filifolius</i>	x		x	Erect, slender shrub
	<i>Regelia ciliata</i>	x		x	Erect to ascending shrub
	<i>Scholtzia chapmanii</i> (ms)	x		x	Small, spreading shrub
	<i>Scholtzia laxiflora</i>	x	x	x	Erect, bushy shrub
	<i>Scholtzia</i> sp.			x	
	<i>Scholtzia</i> sp. 1	x			No description available
	<i>Scholtzia</i> sp. Eneabba (S. Maley 8)	x			Erect shrub
	<i>Scholtzia</i> sp. Wongonderrah (M.E. & M.R. Trudgen MET 12000)	x			No description available

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FAMILY	SPECIES	2005 & 2006	2007& 2008	Lake Logue	LIFEFORM
MYRTACEAE (continued)	<i>Thryptomene baeckeacea</i>			x	Spreading to prostrate shrub
	<i>Thryptomene mucronulata</i>	x		x	Erect shrub
	<i>Thryptomene</i> sp. Eneabba (R.J.Cranfield 8433) (P2)	x			Erect shrub
	<i>Verticordia argentea</i> (P2)	x			Erect, open shrub
	<i>Verticordia aurea</i> (P4)	x		x	Shrub
	<i>Verticordia blepharophylla</i>	x			Erect open shrub
	<i>Verticordia brachypoda</i>		x		Shrub
	<i>Verticordia chrysanthella</i>	x			Corymbose shrub
	<i>Verticordia densiflora</i>			x	Erect to spreading shrub
	<i>Verticordia densiflora</i> var. <i>densiflora</i>	x	x	x	Erect to spreading shrub
	<i>Verticordia drummondii</i>			x	Erect Shrub
	<i>Verticordia fragrans</i> (P3)	x	x		Openly branched shrub
	<i>Verticordia grandis</i>	x	x	x	Straggly, slender shrub
	<i>Verticordia monadelpha</i> var. <i>monadelpha</i>	x	x		Openly branched shrub
	<i>Verticordia nitens</i>	x			Erect shrub
	<i>Verticordia nobilis</i>			x	Spreading shrub
	<i>Verticordia ovalifolia</i>			x	Erect, spindly shrub
	<i>Verticordia pennigera</i>	x	x		Erect or prostrate shrub
	<i>Verticordia serrata</i>			x	Shrub
	<i>Verticordia serrata</i> var. <i>ciliata</i>			x	Shrub
<i>Verticordia</i> sp.			x	Shrub	
HALORAGACEAE	<i>Glischrocaryon aureum</i>	x	x		Tufted perennial herb
	<i>Gonocarpus pithyoides</i>	x	x		Erect perennial herb
APIACEAE	<i>Actinotus leucocephalus</i>	x			Erect annual herb
	<i>Daucus glochidiatus</i>		x		Slender, erect annual herb
	<i>Eryngium pinnatifidum</i> subsp. <i>pinnatifidum</i>	x			Erect perennial herb
	<i>Homalosciadium homalocarpum</i>	x			Erect or spreading annual herb
	<i>Platysace juncea</i>	x			Slender, rish-like rhizomatous, perennial herb
	<i>Platysace xerophila</i>		x		Prostrate, ascending or erect perennial herb
	<i>Trachymene coerulea</i> subsp. <i>leucopetala</i>	x			Erect annual or biennial herb
	<i>Trachymene pilosa</i>	x		x	Erect or ascending annual herb
	<i>Xanthosia huegelii</i>	x		x	Perennial herb
<i>Xanthosia tomentosa</i> (P4)	x			Herb	
EPACRIDACEAE	<i>Andersonia heterophylla</i>		x	x	Erect or ascending, slender shrub
	<i>Andersonia lehmanniana</i> subsp. <i>lehmanniana</i>		x		Erect, bushy, compact shrub
	<i>Astroloma glaucescens</i>	x	x		Erect, compact, pungent shrub
	<i>Astroloma microdonta</i>	x	x	x	Low spreading shrub
	<i>Astroloma pedicellatum</i> (ms)	x			Erect to spreading shrub
	<i>Astroloma serratifolium</i>			x	Low or erect spreading shrub

**APPENDIX B: VASCULAR PLANT SPECIES RECORDED ON AVIVA SURVEY AREA, 2005,2006, 2007, 2008 AND LAKE LOGUE NATURE RESERVE**

Note: \* denotes introduced species; P1, P2, P3 and P4 denote - Priority Flora Species (DEC 2009a)

FAMILY	SPECIES	2005 & 2006	2007& 2008	Lake Logue	LIFEFORM
EPACRIDACEAE (continued)	<i>Astroloma stomarrhena</i>		x		Erect, spreading or prostrate shrub
	<i>Astroloma xerophyllum</i>		x		Erect shrub
	<i>Conostephium minus</i>	x			Erect shrub
	<i>Conostephium pendulum</i>		x		Erect, open, multi-stemmed shrub
	<i>Conostephium preissii</i>		x		Erect, multi-stemmed shrub
	<i>Leucopogon conostephioides</i>	x	x	x	Erect spreading or straggling shrub
	<i>Leucopogon crassiflorus</i>		x		Erect, much-branched shrub
	<i>Leucopogon hispidus</i>	x			Erect compact or spreading shrub
	<i>Leucopogon oldfieldii</i>		x		Erect to spreading shrub
	<i>Leucopogon aff. oldfieldii</i>		x		Erect to spreading shrub
	<i>Leucopogon</i> sp. Lesueur (B. Evans 530)		x		Erect shrub
	<i>Leucopogon</i> sp. South Eneabba (E.A.Griffin 8027)	x		x	No description available
	<i>Leucopogon sprengelioides</i>		x	x	Erect shrub
	<i>Lysinema ciliatum</i>	x	x	x	Erect shrub
PRIMULACEAE	* <i>Anagallis arvensis</i>	x		x	Erect, spreading or sprawling annual herb
LOGANIACEAE	<i>Logania spermacoea</i>	x			Erect, caespitose perennial herb or shrub
LAMIACEAE	<i>Hemiandra pungens</i>		x		Prostrate to ascending shrub
	<i>Hemiandra rubriflora</i>	x	x		Prostrate to ascending shrub
	<i>Hemiandra</i> sp. Eneabba (H. Demarz 3687) (P3)	x		x	Erect or spreading shrub
	<i>Lachnostachys eriobotrya</i>	x			Erect shrub
	<i>Microcorys</i> sp. Coomallo (L. Haegi 2677)	x	x		Erect shrub
	<i>Pityrodia bartlingii</i>	x	x		Erect shrub
	<i>Pityrodia hemigenioides</i>	x	x		Erect compact or straggling shrub
	<i>Pityrodia verbascina</i>	x	x		Golden yellow woolly-tomentose shrub
SOLANACEAE	* <i>Solanum nigrum</i>		x		Erect perennial herb or short-lived shrub
SCROPHULARIACEAE	* <i>Dischisma ?capitatum</i>			x	Erect annual herb
RUBIACEAE	<i>Opercularia spermacoea</i>		x		Erect or spreading perennial herb or shrub
	<i>Opercularia vaginata</i>	x		x	Erect or spreading perennial herb or shrub
CUCURBITACEAE	* <i>Citrullus lanatus</i>		x		Trailing annual herb or climber
CAMPANULACEAE	* <i>Wahlenbergia capensis</i>	x		x	Erect or ascending annual herb
LOBELIACEAE	<i>Isotoma hypocrateriformis</i>	x			Erect annual herb
	<i>Lobelia heterophylla</i>	x		x	Erect annual herb
	<i>Lobelia rarifolia</i>	x			Erect annual herb
	* <i>Monopsis debilis</i>	x			Erect or sprawling annual herb

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FAMILY	SPECIES	2005 & 2006	2007& 2008	Lake Logue	LIFEFORM
GOODENIACEAE	<i>Dampiera carinata</i>			x	Erect perennial herb
	<i>Dampiera lavandulacea</i>		x	x	Erect perennial herb or shrub
	<i>Dampiera linearis</i>	x			Erect perennial herb
	<i>Dampiera oligophylla</i>	x	x		Erect perennial herb or shrub
	<i>Dampiera spicigera</i>	x	x	x	Erect shrub
	<i>Dampiera teres</i>			x	Erect, much-branched shrub
	<i>Goodenia coerulea</i>	x	x		Erect to ascending perennial shrub
	<i>Goodenia pulchella</i> subsp. Coastal Plain B (L.W. Sage 2336)	x			Decumbent to erect annual or perennial herb
	<i>Goodenia</i> sp.			x	Perennial herb
	<i>Lechenaultia biloba</i>	x			Small shrub
	<i>Lechenaultia hirsuta</i>	x	x		Stagging, procumbent shrub
	<i>Lechenaultia linarioides</i>			x	Tangled, erect or prostrate shrub
	<i>Lechenaultia stenosepala</i>	x	x		Diffuse, ascending perennial herb or shrub
	<i>Scaevola anchusifolia</i>	x	x		Erect or decumbent shrub
	<i>Scaevola canescens</i>			x	Prostrate to ascending shrub
	<i>Scaevola ?crassifolia</i>			x	Erect shrub
	<i>Scaevola eneabba</i> (P2)			x	Shrub
	<i>Scaevola glandulifera</i>	x			Erect shrub
	<i>Scaevola phlebopetala</i>	x		x	Prostrate perennial herb
	<i>Scaevola repens</i>			x	Prostrate perennial herb
<i>Velleia trinervis</i>	x			Perennial herb	
<i>Verreauxia reinwardtii</i>	x	x		Erect shrub	
STYLIDIACEAE	<i>Levenhookia stipitata</i>	x			Annual (ephemeral) herb
	<i>Stylidium aeonioides</i> (P4)	x			Rosetted perennial herb
	<i>Stylidium brunonianum</i>			x	
	<i>Stylidium crossocephalum</i>	x		x	Erect perennial shrub
	<i>Stylidium dichotomum</i>	x			Erect or creeping, stoloniferous perennial herb
	<i>Stylidium diuroides</i> subsp. <i>paucifoliatum</i>	x	x		Erect perennial shrub
	<i>Stylidium drummondianum</i> (P3)			x	Herb
	<i>Stylidium emarginatum</i>			x	Bulb-forming perennial herb
	<i>Stylidium emarginatum</i> subsp. <i>emarginatum</i>			x	Bulb-forming perennial herb
	<i>Stylidium maitlandianum</i>			x	Rosetted perennial herb
	<i>Stylidium purpureum</i> (ms)			x	Rosetted perennial herb
	<i>Stylidium repens</i>	x	x	x	Small, creeping perennial herb
<i>Stylidium rigidulum</i>			x	Rosetted perennial herb	

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FAMILY	SPECIES	2005 & 2006	2007& 2008	Lake Logue	LIFEFORM
ASTERACEAE	<i>Angianthus</i> sp.	x			Prostrate annual herb
	* <i>Arctotheca calendula</i>		x	x	Decumbent or ascending annual herb
	<i>Gnephosis tenuissima</i>	x			Annual herb
	* <i>Hypochaeris glabra</i>	x	x	x	Rosetted annual or perennial herb
	<i>Olearia revoluta</i>			x	Erect shrub
	<i>Pithocarpa pulchella</i> var. <i>pulchella</i>			x	Erect, slender, rigid perennial herb
	<i>Podolepis capillaris</i>	x		x	Annual or ?perennial herb
	<i>Podolepis gracilis</i>	x			Erect annual herb
	<i>Podotheca angustifolia</i>			x	Decumbent or ascending annual herb
	<i>Pterochaeta paniculata</i>			x	Erect, woolly annual herb
	<i>Siloxerus humifusus</i>	x		x	Decumbent to erect annual herb
	<i>Siloxerus</i> sp.			x	Herb
	* <i>Ursinia anthemoides</i>	x	x	x	Erect annual herb
	<i>Waitzia acuminata</i>	x			Erect or ascending annual herb
	<i>Waitzia acuminata</i> var. <i>albicans</i>	x			Erect or ascending annual herb
Asteraceae sp.				x	Herb



**APPENDIX C: POTENTIAL AND RECORDED RARE AND PRIORITY FLORA, 2005, 2006, 2007 AND 2008**

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FAMILY	SPECIES	SCC	FCC	Potential	Recorded		Lake Logue
					2005 & 2006	2007 & 2008	
CYPERACEAE	<i>Mesomelaena stygia</i> subsp. <i>deflexa</i>	P3		x	x	x	
	<i>Schoenus griffinianus</i>	P3		x	x		x
	<i>Schoenus</i> sp. <i>Eneabba</i> (F. Obbens & C.Godden 1154)	P2		x			
RESTIONACEAE	<i>Catacolea enodis</i>	P2		x			
	<i>Chordifex reseminans</i>	P1		x			
	<i>Desmocladius biformis</i>	P3		x			
	<i>Desmocladius elongatus</i>	P3		x		x	
	<i>Lepidobolus densus</i> (ms)	P3		x	x		
	<i>Lepidobolus quadratus</i>	P3		x		x	
	<i>Loxocarya gigas</i>	P2		x			
ECDEIOCOLEACEAE	<i>Georgeantha hexandra</i>	P4		x	x	x	
DASYPOGONACEAE	<i>Calectasia palustris</i>	P1		x			
ANTHERICACEAE	<i>Arnocrinum gracillimum</i>	P2		x			
	<i>Hensmania stoniella</i>	P3		x	x		
HAEMODORACEAE	<i>Haemodorum loratum</i>	P3		x	x		
	<i>Phlebocarya pilosissima</i> subsp. <i>pilosissima</i>	P3		x			
ORCHIDACEAE	<i>Paracaleana dixonii</i>	R	E	x			
	<i>Thelymitra stellata</i>	R	E	x			
CASUARINACEAE	<i>Allocasuarina ramosissima</i>	P3		x			
PROTEACEAE	<i>Banksia chamaephyton</i>	P4		x		x	
	<i>Banksia cypholoba</i>	P3		x			
	<i>Banksia elegans</i>	P4		x			
	<i>Banksia fraseri</i> var. <i>effusa</i>	P2				x	
	<i>Banksia kippistiana</i> var. <i>paenepeccata</i>	P3		x			
	<i>Conospermum scaposum</i>	P3		x			
	<i>Grevillea althoferorum</i> subsp. <i>althoferorum</i>	R	E	x		x	
	<i>Grevillea biformis</i> subsp. <i>cymbiformis</i>	P3		x	x		
	<i>Grevillea curviloba</i> subsp. <i>incurva</i>	R	E	x			
	<i>Grevillea rudis</i>	P4		x		x	
	<i>Grevillea uniformis</i>	P3		x			
	<i>Hakea megalosperma</i>	R	V	x			
	<i>Isopogon tridens</i>	P3		x	x		x
	<i>Persoonia filiformis</i>	P2		x			
	<i>Persoonia rudis</i>	P3		x			
<i>Synaphea aephynsa</i>	P3		x				
<i>Synaphea oulopha</i>	P1		x				
VISACEAE	<i>Korthalsella arthroclada</i>	P1		x			
DROSERACEAE	<i>Drosera allantostigma</i>	P1			x		
MIMOSACEAE	<i>Acacia flabellifolia</i>	P3			x		
	<i>Acacia lasiocarpa</i> var. <i>lasiocarpa</i> Cockleshell Gully variant (E.A. Griffin 2039)	P2			x	x	x
	<i>Acacia lasiocarpa</i> var. <i>lasiocarpa</i> ?Cockleshell Gully variant (E.A. Griffin 2039)	P2			x	x	x
	<i>Acacia retrorsa</i>	P2		x			
	<i>Acacia telmica</i>	P3		x			
	<i>Acacia vittata</i>	P2		x			

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FAMILY	SPECIES	SCC	FCC	Potential	Recorded		Lake Logue
					2005 & 2006	2007 & 2008	
PAPILIONACEAE	<i>Daviesia debilior</i> subsp. <i>debilior</i>	P2		x			
	<i>Daviesia pteroclada</i>	P3		x			
	<i>Jacksonia anthoclada</i>	P3		x			
RUTACEAE	<i>Boronia ericifolia</i>	P2				x	
	<i>Boronia ramosa</i> subsp. <i>lesueurana</i>	P2				x	
	<i>Geleznowia verrucosa</i> subsp. <i>formosa</i>	P3		x			
TREMANDRACEAE	<i>Tetradlea nephelioides</i>	R		x		x	
POLYGALACEAE	<i>Comesperma acerosum</i>	P3			x		x
	<i>Comesperma griffinii</i>	P2		x	x		
	<i>Comesperma rhadinocarpum</i>	P2		x	x		
EUPHORBIACEAE	<i>Beyeria gardneri</i>	P3		x			
	<i>Beyeria similis</i>	P3		x			
STERCULIACEAE	<i>Guichenotia alba</i>	P3		x		x	
MYRTACEAE	<i>Baeckea</i> sp. Bunney Road (S. Patrick 4059)	P2		x			
	<i>Beaufortia bicolor</i>	P3		x			
	<i>Calytrix chrysantha</i>	P3		x			
	<i>Calytrix eneabensis</i>	P4		x	x		
	<i>Calytrix purpurea</i>	P3		x	x		
	<i>Calytrix superba</i>	P3		x	x		x
	<i>Eucalyptus crispata</i>	R	V	x			
	<i>Eucalyptus diminuta</i>	P4		x			
	<i>Eucalyptus impensa</i>	R	E	x			
	<i>Eucalyptus johnsoniana</i>	R	V	x			
	<i>Eucalyptus loxophleba</i> x <i>wandoo</i>	P4		x			
	<i>Eucalyptus macrocarpa</i> subsp. <i>elachantha</i>	P4		x			
	<i>Eucalyptus pendens</i>	P4		x			
	<i>Eucalyptus suberea</i>	R	V	x			
	<i>Hypocalymma gardneri</i>	P3		x			
	<i>Thryptomene</i> sp. Eneabba (R.J.Cranfield 8433)	P2		x	x		
	<i>Verticordia albida</i>	R	En	x			
	<i>Verticordia amphigia</i>	P3		x			
	<i>Verticordia argentea</i>	P2		x	x		
	<i>Verticordia aurea</i>	P4		x	x		x
	<i>Verticordia fragrans</i>	P3		x	x		
<i>Verticordia muelleriana</i> subsp. <i>muelleriana</i>	P3		x				
APIACEAE	<i>Platysace ramosissima</i>	P3		x			
	<i>Xanthosia tomentosa</i>	P4		x	x		
EPACRIDACEAE	<i>Astroloma</i> sp. Cataby (E.A. Griffin 1022)	P4		x			
	<i>Conostephium magnum</i>	P4		x			
	<i>Leucopogon obtectus</i>	R	E	x			
MENYANTHACEAE	<i>Villarsia congestiflora</i>	P4		x			
LAMIACEAE	<i>Hemandra</i> sp. Eneabba (H.Demarz 3687)	P3		x	x		x
	<i>Pityrodia viscida</i>	P3		x			
MYOPORACEAE	<i>Eremophila microtheca</i>	P4	V	x			

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FAMILY	SPECIES	SCC	FCC	Potential	Recorded		Lake Logue
					2005 & 2006	2007 & 2008	
GOODENIACEAE	<i>Goodenia trichophylla</i>	P3		x			
	<i>Scaevola eneabba</i>	P3		x		x	
STYLIDIACEAE	<i>Stylidium aeonioides</i>	P4		x	x		
	<i>Stylidium drummonianum</i>	P3		x	x		
	<i>Stylidium inversiflorum</i>	P4		x			
	<i>Stylidium torticarpum</i>	P3		x			

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Species	Easting (Em) GDA94 (Zone 50)	Northing (Nm)	SCC	FCC	No. Plants
<i>Grevillea althoferorum</i> subsp. <i>althoferorum</i>	331763	6684989	R	En	
	331755	6684417	R	En	
	331757	6684021	R	En	
<i>Tetralochea nephelioides</i>	332362	6678325	R		
	332368	6678482	R		40
	332371	6678425	R		22
	332384	6678323	R		
	332386	6678363	R		2
	332386	6678440	R		8
	332388	6678388	R		12
	332389	6678502	R		27
	332391	6678482	R		32
	332393	6678406	R		19
	332398	6678467	R		10
	332399	6678531	R		4
	332401	6678510	R		7
	332401	6678323	R		
	332402	6678378	R		81
	332421	6678464	R		9
	332423	6678323	R		
	332434	6678472	R		14
	332437	6678488	R		19
	332440	6678372	R		22
	332446	6678324	R		
	332456	6678520	R		3
	332463	6678322	R		
	332482	6678319	R		12
	332483	6678316	R		
	332486	6678371	R		16
	332489	6678326	R		15
	332490	6678336	R		12
	332497	6678346	R		25
	332510	6678318	R		
	332513	6678337	R		14
	332515	6678354	R		5
	332526	6678337	R		12
	332537	6678315	R		
	332538	6678319	R		13
	332553	6678368	R		20
	332557	6678345	R		21
332563	6678310	R		3	
332570	6678314	R			
332597	6678314	R			
332598	6678358	R		6	
332603	6678315	R			
332625	6678314	R			
332657	6678313	R			
332680	6678313	R			
332704	6678311	R			
332717	6678312	R			
332737	6678317	R		2	
332739	6678357	R		9	
332760	6678312	R			
332777	6678312	R			
332807	6678313	R			
332822	6678406	R		22	

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Species	Easting (Em) GDA94 (Zone 50)	Northing (Nm)	SCC	FCC	No. Plants
<i>Tetradlea nephelioides</i> (Continued)	332826	6678312	R		
	332845	6678394	R		21
	332846	6678311	R		
	332864	6678309	R		
	332884	6678307	R		
	332898	6678304	R		
	332909	6678380	R		30
	332917	6678306	R		
	332934	6678303	R		
	332966	6678298	R		
	332985	6678297	R		
	333001	6678294	R		
	333026	6678292	R		
	333040	6678290	R		
	333066	6678287	R		
	333081	6678286	R		
	333097	6678283	R		
	333121	6678283	R		
	333144	6678287	R		6
	333145	6678277	R		
	333168	6678274	R		
	333190	6678274	R		
	333211	6678267	R		
	333237	6678263	R		
	333243	6678345	R		6
	333243	6678326	R		2
	333257	6678261	R		
	333259	6678381	R		56
	333279	6678259	R		
	333289	6678325	R		38
	333302	6678255	R		
	333315	6678369	R		64
	333320	6678254	R		
	333322	6678321	R		46
	333330	6678254	R		
	333343	6678318	R		15
	333344	6678384	R		25
	333348	6678286	R		2
	333351	6678259	R		
	333361	6678269	R		15
	333384	6678263	R		
	333391	6678341	R		5
	333404	6678327	R		10
	333404	6678379	R		37
	333410	6678272	R		14
	333419	6678372	R		41
	333438	6678272	R		12
333448	6678311	R		14	
333453	6678279	R		13	
333476	6678280	R			
333497	6678284	R			
333516	6678388	R		2	
333521	6678288	R			
333546	6678290	R			
333565	6678293	R			
333579	6678361	R		49	
333592	6678298	R			

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Species	Easting (Em) GDA94 (Zone 50)	Northing (Nm)	SCC	FCC	No. Plants	
<i>Tetradlea nephelioides</i> (Continued)	333601	6678368	R		5	
	333602	6678301	R			
	333611	6678308	R			
	333622	6678363	R		41	
	333633	6678250	R		4	
	333667	6678268	R		14	
	333676	6678313	R		11	
	333678	6678328	R		15	
	333681	6678298	R		4	
	333688	6678365	R		16	
	333693	6678287	R		19	
	333696	6678264	R		21	
	333711	6678339	R		13	
	333723	6678316	R		38	
	333725	6678277	R		37	
	333725	6678292	R		23	
	333731	6678254	R		33	
	333738	6678298	R		29	
	333749	6678357	R		42	
	333926	6678348	R		15	
	333972	6678268	R		3	
	333972	6678227	R		11	
	333992	6678308	R		24	
	333998	6678250	R		14	
	334004	6678225	R		12	
	334011	6678304	R		30	
	334028	6678212	R		3	
	334051	6678229	R		6	
	334056	6678264	R		8	
	334113	6678258	R		1	
	334317	6678216	R		4	
	<i>Drosera allantostigma</i>	331713	6684765	P1		
	<i>Acacia lasiocarpa</i> var. <i>lasiocarpa</i> Cockleshell Gully variant (E.A. Griffin 2039)	327325	6692634	P2		
327923		6692161	P2			
328601		6690274	P2			
328695		6682553	P2			
329153		6682288	P2			
329540		6684607	P2			
330721		6681901	P2			
330750		6682510	P2			
330750		6682366	P2			
330934		6681873	P2			
331147		6681824	P2			
331473		6681595	P2			
331554		6682182	P2			
331734		6683210	P2			
331782		6683061	P2			
331782		6682655	P2			
332960		6681390	P2			
333140		6681401	P2			
333944		6686582	P2			
334037		6684118	P2			
334200	6684120	P2				
<i>Acacia lasiocarpa</i> var. <i>lasiocarpa</i> ?Cockleshell Gully variant (E.A. Griffin 2039)	324202	6694198	P2			

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Species	Easting (Em) GDA94 (Zone 50)	Northing (Nm)	SCC	FCC	No. Plants
<i>Banksia fraseri</i> var. <i>effusa</i>	331431	6678819	P2		
	331455	6678825	P2		
	331498	6678837	P2		
	331528	6678851	P2		
	331568	6678862	P2		
	331617	6678880	P2		
	331655	6678897	P2		
<i>Boronia ericifolia</i>	331346	6682504	P2		
<i>Boronia ramosa</i> subsp. <i>lesueurana</i>	335608	6678139	P2		
	335627	6678127	P2		
	335655	6678116	P2		
	335670	6678103	P2		
<i>Calytrix purpurea</i>	327923	6692161	P2		
	328224	6689895	P2		
	328421	6692162	P2		
	328915	6692503	P2		
<i>Comesperma griffinii</i>	331450	6682559	P2		
<i>Comesperma rhadinocarpum</i>	329827	6685763	P2		
<i>Scaevola eneabba</i>	330750	6682510	P2		
<i>Acacia flabellifolia</i>	329194	6689088	P3		
	330291	6688757	P3		
<i>Grevillea biformis</i> subsp. <i>cymbiformis</i>	328421	6692162	P3		
	328915	6692503	P3		
<i>Hemiandra</i> sp. Eneabba (H. Demarz 3687)	324189	6694794	P3		
	330753	6685252	P3		
	331554	6682182	P3		
	331707	6687070	P3		
	331746	6685513	P3		
	331985	6686003	P3		
	332088	6687459	P3		
	332330	6686167	P3		
	332729	6686327	P3		
	332930	6686395	P3		
	332960	6681390	P3		
	333331	6686500	P3		
	333695	6681412	P3		
	333737	6686521	P3		
	333944	6686582	P3		
	334183	6686599	P3		
	334811	6681547	P3		
334922	6686613	P3			
335006	6681572	P3			
335213	6681582	P3			
336005	6681683	P3			
336592	6681724	P3			

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Species	Easting (Em) GDA94 (Zone 50)	Northing (Nm)	SCC	FCC	No. Plants
<i>Mesomelaena stygia</i> subsp. <i>deflexa</i>	328516	6688725	P3		
	330343	6679080	P3		
	330366	6678708	P3		
	330398	6679038	P3		
	330398	6678737	P3		
	330428	6689618	P3		
	330456	6678791	P3		
	330472	6678972	P3		
	330477	6678819	P3		
	330530	6678918	P3		
	330532	6678869	P3		
	330556	6678904	P3		
	330750	6682510	P3		
	330750	6682366	P3		
	330952	6682512	P3		
	331139	6682248	P3		
	331147	6681824	P3		
	331148	6682508	P3		
	331345	6682220	P3		
	331346	6682504	P3		
	331353	6681744	P3		
	331450	6682559	P3		
	331473	6681595	P3		
	331548	6682504	P3		
	331554	6682182	P3		
	331604	6681432	P3		
	331711	6686855	P3		
	331720	6681352	P3		
	331734	6683076	P3		
	331744	6682529	P3		
	331757	6684606	P3		
	331757	6684021	P3		
	331760	6684793	P3		
	331770	6683624	P3		
	331782	6683061	P3		
	331782	6682655	P3		
	331796	6682222	P3		
	331985	6686003	P3		
	332088	6687459	P3		
	332150	6686084	P3		
	332330	6686167	P3		
	332534	6686241	P3		
	332589	6681380	P3		
332729	6686327	P3			
332936	6686329	P3			
333123	6686500	P3			
333331	6686500	P3			
333737	6686521	P3			
334200	6684120	P3			
334735	6686611	P3			
334922	6686613	P3			
338166	6681730	P3			
<i>Schoenus griffinianus</i>	329932	6684767	P3		
	327000	6693588	P3		
<i>Thryptomene</i> sp. Eneabba (R.J.Cranfield 8433)	330291	6688757	P2		



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Species	Easting (Em) GDA94 (Zone 50)	Northing (Nm)	SCC	FCC	No. Plants
<i>Verticordia argentea</i>	329171	6689243	P2		
	331707	6687070	P2		
	331734	6683210	P2		
	331763	6684989	P2		
	331782	6683061	P2		
	331783	6683238	P2		
	331785	6683441	P2		
<i>Calytrix superba</i>	326200	6695000	P3		
	326400	6694000	P3		
	327923	6692161	P3		
	328413	6692845	P3		
	328936	6691961	P3		
<i>Desmocladius elongatus</i>	328695	6682553	P3		
	330205	6679289	P3		
	330231	6679247	P3		
	330257	6679201	P3		
	330284	6679152	P3		
	330314	6679110	P3		
	330366	6678708	P3		
	330377	6679055	P3		
	330385	6678671	P3		
	330407	6678615	P3		
	330423	6678566	P3		
	330425	6678763	P3		
	330439	6678996	P3		
	330439	6678543	P3		
	330456	6678512	P3		
	330497	6678840	P3		
	330506	6678939	P3		
	330556	6678904	P3		
	330750	6682510	P3		
	331148	6682508	P3		
	331473	6681595	P3		
	331744	6682529	P3		
	331812	6685933	P3		
	333627	6678307	P3		
	334399	6678175	P3		
	334431	6678167	P3		
	334467	6678162	P3		
	334501	6678158	P3		
	334530	6678154	P3		
	334575	6678153	P3		
	334621	6678154	P3		
	334649	6678148	P3		
	334676	6678148	P3		
334719	6678152	P3			
336111	6686667	P3			
336301	6686678	P3			
336930	6677952	P3			
338166	6681730	P3			
338762	6681732	P3			
<i>Guichenotia alba</i>	331431	6678818	P3		
	330493	6678505	P3		
	330776	6678593	P3		

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Species	Easting (Em) GDA94 (Zone 50)	Northing (Nm)	SCC	FCC	No. Plants
<i>Haemodorum loratum</i>	329993	6683726	P3		
<i>Hensmania stoniella</i>	330753	6685252	P3		
<i>Lepidobolus densus</i> (ms)	330428	6689618	P3		
<i>Lepidobolus quadratus</i> (ms)	333097	6678283	P3		
	333627	6678307	P3		
<i>Stylidium drummondianum</i>	331796	6682022	P3		
<i>Verticordia fragrans</i>	328413	6692845	P3		
	328915	6692503	P3		
	329148	6689727	P3		
	330428	6689618	P3		
<i>Banksia chamaephyton</i>	336930	6677952	P4		
	336690	6686701	P4		
	338365	6681738	P4		
<i>Calytrix eneabbensis</i>	328787	6691362	P4		
<i>Georgeantha hexandra</i>	328421	6692162	P4		
	328516	6688725	P4		
	328915	6692503	P4		
	328936	6691961	P4		
	329148	6689727	P4		
	330428	6689618	P4		
	330493	6678505	P4		
	330543	6678509	P4		
	330596	6678513	P4		
	330660	6678512	P4		
	330670	6678545	P4		
	330679	6678579	P4		
	330699	6678583	P4		
	330719	6678586	P4		
	330738	6678587	P4		
	330753	6678597	P4		
	330776	6678593	P4		
	330825	6678606	P4		
	330874	6678622	P4		
	331060	6678694	P4		
	331102	6678708	P4		
	331141	6678721	P4		
	331176	6678730	P4		
	331212	6678743	P4		
	331247	6678755	P4		
	331286	6678765	P4		
	331324	6678777	P4		
	331357	6678789	P4		
	331390	6678803	P4		
	331410	6678810	P4		
	332353	6679121	P4		
	332362	6678325	P4		
	332366	6678982	P4		
	332366	6678947	P4		
	332366	6678914	P4		

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Species	Easting (Em) GDA94 (Zone 50)	Northing (Nm)	SCC	FCC	No. Plants
<i>Georgeantha hexandra</i> (Continued)	332367	6679017	P4		
	332367	6678889	P4		
	332369	6678864	P4		
	332597	6678314	P4		
	332898	6678304	P4		
	333097	6678283	P4		
	333330	6678254	P4		
	336003	6678064	P4		
	336030	6678060	P4		
	336061	6678062	P4		
	336083	6678063	P4		
	336113	6678062	P4		
	336164	6678060	P4		
	336204	6678059	P4		
	336227	6678059	P4		
	336256	6678059	P4		
	336294	6678058	P4		
	336326	6678055	P4		
	336368	6678055	P4		
	336395	6678052	P4		
336429	6678047	P4			
336457	6678044	P4			
<i>Grevillea rudis</i>	330952	6682512	P4		
	331139	6682248	P4		
	331148	6682508	P4		
	331346	6682504	P4		
	331604	6681432	P4		
	331744	6682529	P4		
	331782	6682655	P4		
	331790	6682439	P4		
	332362	6678325	P4		
	332391	6678323	P4		
	332418	6678323	P4		
	332454	6678323	P4		
	332597	6678314	P4		
	333097	6678283	P4		
	334613	6681535	P4		
	334811	6681547	P4		
	336723	6678021	P4		
	336769	6678015	P4		
	336824	6678013	P4		
	336871	6678004	P4		
336898	6677999	P4			
<i>Stylidium aeonioides</i>	331734	6683076	P4		
<i>Verticordia aurea</i>	324200	6693200	P4		
	328421	6692162	P4		
	328915	6692503	P4		
	329148	6689727	P4		
<i>Xanthosia tomentosa</i>	333905	6681389	P4		





















**APPENDIX E: SUMMARY OF VASCULAR PLANT SPECIES RECORDED BY VEGETATION COMMUNITY WITHIN THE AVIVA SURVEY AREA**

Note: \* indicates introduced (weed) species; P1, P2, P3 and P4 denote - Priority Flora Species (DEC 2009)

SPECIES	PLANT COMMUNITY																															
	C1	E1	E2	E3	E4	E5	E6	E7	E7/S3	F2	H1	H2	H3	H4	H4 (d)	H4/T1	H5	S1	S2	S3	T1	T1 (d)	T1/H4	T1/T4	T1/T4 (d)	T1/T5	T2	T3	T4	T4 (d)	T4/H4	T5
<i>Thysanotus rectantherus</i>													X								X								X		X	
<i>Thysanotus spiniger</i>		X			X							X	X									X							X		X	
<i>Thysanotus thyrsoideus</i>												X		X			X					X									X	
<i>Thysanotus triandrus</i>					X																											
<i>Trachymene coerulea</i> subsp. <i>leucopetala</i>							X						X																			
<i>Trachymene pilosa</i>				X										X	X							X									X	
<i>Tribonanthes australis</i>														X								X								X	X	
<i>Tricoryne humilis</i>		X																														
<i>Tricoryne tenella</i>							X																									
<i>Tricoryne</i> sp. Eneabba (E.A. Griffin 1200)							X																									
* <i>Trifolium campestre</i>																		X	X													
<i>Tripterococcus brunonis</i>														X			X															
* <i>Ursinia anthemoides</i>	X			X	X		X	X	X					X	X	X	X	X	X	X	X				X		X		X	X	X	
<i>Velleia trinervis</i>																													X			
<i>Verreauxia reinwardtii</i>																													X			
<i>Verticordia argentea</i> (P2)					X																						X					
<i>Verticordia aurea</i> (P4)		X										X										X										
<i>Verticordia blepharophylla</i>											X																					
<i>Verticordia chrysanthella</i>			X																													
<i>Verticordia densiflora</i>														X	X							X						X		X	X	
<i>Verticordia densiflora</i> var. <i>densiflora</i>											X		X	X		X				X	X		X		X	X	X	X	X	X	X	
<i>Verticordia drummondii</i>																						X									X	
<i>Verticordia fragrans</i> (P3)		X										X																				
<i>Verticordia grandis</i>							X					X	X	X							X	X	X		X		X		X		X	
<i>Verticordia monadelpha</i> var. <i>monadelpha</i>												X																				
<i>Verticordia nitens</i>												X	X									X										
<i>Verticordia nobilis</i>														X								X			X			X			X	
<i>Verticordia ovalifolia</i>																						X			X							
<i>Verticordia pennigera</i>																	X															
<i>Verticordia serrata</i>														X								X			X						X	
<i>Verticordia serrata</i> var. <i>ciliata</i>														X								X									X	
<i>Verticordia</i> sp.														X								X									X	
<i>Viminaria juncea</i>																						X						X	X	X		
* <i>Vulpia bromoides</i>				X			X											X	X								X					
* <i>Wahlenbergia capensis</i>					X		X						X														X				X	
<i>Waitzia acuminata</i> var. <i>albicans</i>					X																											
<i>Wurmbea dioica</i>														X								X									X	
<i>Xanthorrhoea drummondii</i>							X						X			X						X									X	
<i>Xanthorrhoea preissii</i>						X															X										X	
<i>Xanthosia huegelii</i>													X									X										
<i>Xylomelum angustifolium</i>		X										X	X	X								X	X		X		X		X		X	

**APPENDIX F: SPECIES LOCATED IN EACH OCCURANCE OF THE FERRICRETE FLORISTIC COMMUNITY (ROCKY SPRINGS TYPE)**

Occurrences extracted from data supplied by TEC team in DEC (2008a) and also from TEC RecoveryPlan (Hamilton-Brown *et al.* 2004)

SPECIES	SPECIES FLORABASE 20/06/08	Occurrence		Distribution		MCPL	COMMENTS	
		1	2	N SCP	Wider			
<i>Acacia blakelyi</i>	<i>Acacia blakelyi</i>	√	√		√	√	opportunistic colonizer	
<i>Acacia lasiocarpa</i>	<i>Acacia lasiocarpa</i>	√			√	√		
<i>Acacia saligna</i>	<i>Acacia saligna</i>	√			√	√		
<i>Allocasuarina campestris</i>	<i>Allocasuarina campestris</i>	√	√		√	√		
<i>Alyogyne hakeifolia</i>	<i>Alyogyne hakeifolia</i>	√	√		√	√		
<i>Amphipogon strictus</i>	<i>Amphipogon strictus</i>	√			√			
* <i>Anagallis arvensis</i>	* <i>Anagallis arvensis</i>	√			√			
<i>Banksia leptophylla</i> var. <i>melletica</i>	<i>Banksia leptophylla</i> var. <i>melletica</i>		√	√				white yellow sand over limestone and lateritic
<i>Brachyscome pusilla</i>	<i>Brachyscome pusilla</i>	√			√			
<i>Borya sphaerocephala</i>	<i>Borya sphaerocephala</i>	√	√		√	√		
<i>Calandrinia calyptata</i>	<i>Calandrinia calyptata</i>	√			√			
<i>Caladenia longicauda</i>	<i>Caladenia longicauda</i>	√			√			
<i>Calothamnus quadrifidus</i>	<i>Calothamnus quadrifidus</i>	√			√	√		
<i>Calytrix flavescens</i>	<i>Calytrix flavescens</i>	√			√	√		
<i>Calytrix gracilis</i>	<i>Calytrix gracilis</i>		√		√			
<i>Cassytha pomiformis</i>	<i>Cassytha pomiformis</i>	√			√			
* <i>Centaurea melitensis</i>	* <i>Centaurea melitensis</i>	√			√			
<i>Centrolepis drummondii</i> (now <i>drummondiana</i> )	<i>Centrolepis drummondiana</i>	√			√			
<i>Chamaescilla corymbosa</i>	<i>Chamaescilla corymbosa</i>	√			√			
<i>Crassula colorata</i>	<i>Crassula colorata</i>	√			√	√		
<i>Crassula peduncularis</i>	<i>Crassula peduncularis</i>	√			√			
<i>Dodonaea pinifolia</i>	<i>Dodonaea pinifolia</i>		√		√			
<i>Drosera erythrorhiza</i>	<i>Drosera erythrorhiza</i>	√			√	√		
<i>Drosera glanduligera</i>	<i>Drosera glanduligera</i>	√			√			
<i>Drosera macrantha</i>	<i>Drosera macrantha</i>	√			√			
<i>Drosera menziesii</i> subsp. <i>menziesii</i>	<i>Drosera menziesii</i> subsp. <i>menziesii</i>		√		√	√		
<i>Dryandra stricta</i> (P3)	<i>Banksia strictifolia</i>	√	√	√		√	white/grey/red sand lateritic soils and clay loams	
* <i>Galium murale</i>	* <i>Galium murale</i>	√			√			

**APPENDIX F: SPECIES LOCATED IN EACH OCCURANCE OF THE FERRICRETE FLORISTIC COMMUNITY (ROCKY SPRINGS TYPE)**

Occurrences extracted from data supplied by TEC team in DEC (2008a) and also from TEC Recovery Plan (Hamilton-Brown *et al.* 2004)

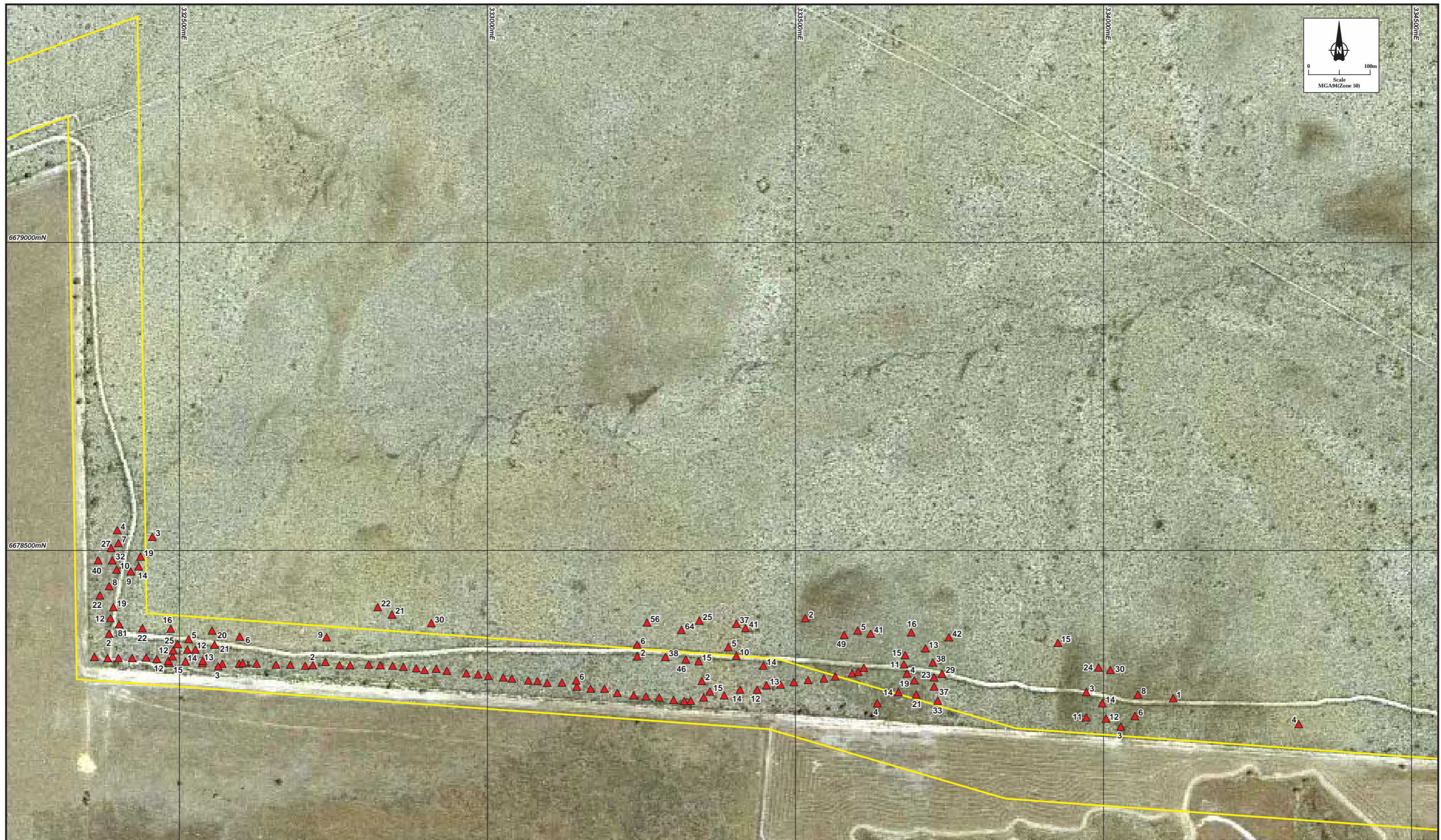
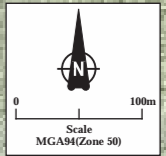
SPECIES	SPECIES FLORABASE 20/06/08	Occurrence		Distribution		MCPL	COMMENTS
		1	2	N SCP	Wider		
<i>Glischrocaryon aureum</i>	<i>Glischrocaryon aureum</i>	√			√	√	
<i>Gnaphalium sphaericum</i>	<i>Euchiton sphaericus</i>	√			√		
<i>Goodenia drummondii</i> subsp. <i>drummondii</i>	<i>Goodenia drummondii</i> subsp. <i>drummondii</i>	√			√		
<i>Grevillea petrophiloides</i>	<i>Grevillea petrophiloides</i>		√		√		
<i>Grevillea pinaster</i>	<i>Grevillea pinaster</i>	√	√		√	√	white/grey/yellow or red sand sandy clay loam and laterite
<i>Haemodorum simplex</i>	<i>Haemodorum simplex</i>	√			√		
<i>Hakea scoparia</i>	<i>Hakea scoparia</i>		√		√		
<i>Hibbertia huegelii</i>	<i>Hibbertia huegelii</i>		√		√	√	
<i>Homalocalyx chapmanii</i> (P1)	<i>Homalocalyx chapmanii</i> (P1)		√	√			yellow/grey/brown sand weathered granite
<i>Hibbertia rupicola</i>	<i>Hibbertia rupicola</i>		√		√		
<i>Hydrocotyle diantha</i>	<i>Hydrocotyle diantha</i>	√			√		
* <i>Hypochaeris glabra</i>	* <i>Hypochaeris glabra</i>	√			√	√	
<i>Isopogon divergens</i>	<i>Isopogon divergens</i>	√			√		
<i>Isopogon dubius</i>	<i>Isopogon dubius</i>	√			√	√	
<i>Isotoma hypocrateriformis</i>	<i>Isotoma hypocrateriformis</i>	√	√		√	√	
<i>Jacksonia hakeoides</i>	<i>Jacksonia hakeoides</i>	√		√		√	grey, white or yellow sand over gravelly laterite or limestone clays
<i>Jacksonia ulicina</i>	<i>Jacksonia hakeoides</i>	√		√		√	
<i>Labichea lanceolata</i> subsp. <i>lanceolata</i>	<i>Labichea lanceolata</i> subsp. <i>lanceolata</i>	√	√		√		
<i>Lepidosperma tenue</i>	<i>Lepidosperma tenue</i>	√			√	√	
<i>Leptosema aphyllum</i>	<i>Leptosema aphyllum</i>		√		√		
<i>Levenhookia dubia</i>	<i>Levenhookia dubia</i>	√			√		
<i>Lobelia heterophylla</i>	<i>Lobelia heterophylla</i>	√			√	√	
<i>Lobelia rhombifolia</i>	<i>Lobelia rhombifolia</i>	√			√		
<i>Lobelia winfridae</i>	<i>Lobelia winfridae</i>	√			√		
<i>Melaleuca conothamnoides</i>	<i>Melaleuca conothamnoides</i>		√		√		
<i>Melaleuca uncinata</i>	<i>Melaleuca uncinata</i>		√		√	√	

**APPENDIX F: SPECIES LOCATED IN EACH OCCURANCE OF THE FERRICRETE FLORISTIC COMMUNITY (ROCKY SPRINGS TYPE)**

Occurrences extracted from data supplied by TEC team in DEC (2008a) and also from TEC RecoveryPlan (Hamilton-Brown *et al.* 2004)

SPECIES	SPECIES FLORABASE 20/06/08	Occurrence		Distribution		MCPL	COMMENTS
		1	2	N SCP	Wider		
<i>Neurachne alopecuroidea</i>	<i>Neurachne alopecuroidea</i>	√			√	√	
<i>Opercularia spermacocea</i>	<i>Opercularia spermacocea</i>	√			√	√	
* <i>Pentaschistis airoides</i>	* <i>Pentaschistis airoides</i>	√			√	√	
<i>Petrophile brevifolia</i>	<i>Petrophile brevifolia</i>	√			√	√	
<i>Petrophile seminuda</i>	<i>Petrophile seminuda</i>	√	√		√		
<i>Podotheca gnaphalioides</i>	<i>Podotheca gnaphalioides</i>	√			√		
<i>Schoenus nanus</i>	<i>Schoenus nanus</i>	√			√		
<i>Scholtzia laxiflora</i>	<i>Scholtzia laxiflora</i>		√	√		√	sandy or clayey soils over laterite or limestone winter wet and hillslopes
<i>Selaginella gracillima</i>	<i>Selaginella gracillima</i>	√			√		
<i>Stylidium dichotomum</i>	<i>Stylidium dichotomum</i>	√	√		√	√	
<i>Stylobasium australe</i>	<i>Stylobasium australe</i>	√			√	√	
<i>Thelymitra villosa</i>	<i>Thelymitra villosa</i>	√			√		
<i>Thryptomene johnsonii</i> (P2)	<i>Thryptomene johnsonii</i> (P2)		√	√			north of Geraldton, grey sand sandstone slopes
<i>Thysanotus patersonii</i>	<i>Thysanotus patersonii</i>	√	√		√		
<i>Trachymene coerulea</i> subsp. <i>leucopetala</i>	<i>Trachymene coerulea</i> subsp. <i>leucopetala</i>	√		√		√	sand over limestone, loam over ironstone north and south of Geraldton
<i>Trachymene pilosa</i>	<i>Trachymene pilosa</i>	√			√	√	
<i>Triglochin centrocarpa</i>	<i>Triglochin centrocarpa</i>	√			√		
<i>Triglochin nana</i>	<i>Triglochin nana</i>		√		√		
<i>Verticordia amphigia</i> (P3)	<i>Verticordia amphigia</i> (P3)	√		√			restricted wet depressions, sandy loam clay and rock loam
<i>Verticordia densiflora</i>	<i>Verticordia densiflora</i>		√		√	√	
<i>Wahlenbergia gracilentata</i>	<i>Wahlenbergia gracilentata</i>	√			√		
<i>Waitzia paniculata</i>	<i>Pterochaeta paniculata</i>	√	√		√	√	



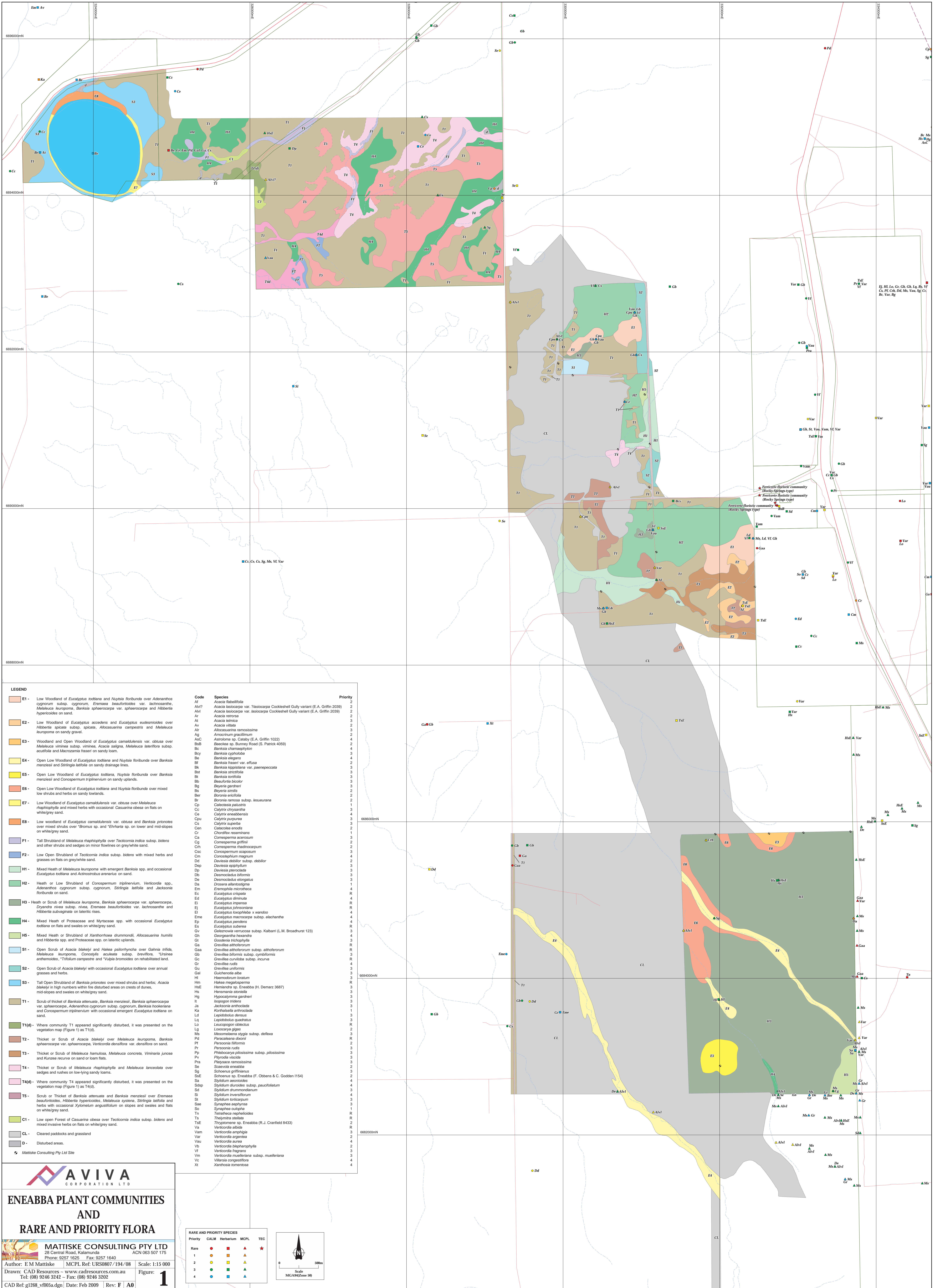


**Legend**  
▲ Tetradlea nepelioides (R)  
21 Number of plants  
— Infrastructure corridor



***Tetradlea nepelioides* (R)  
occurrences along the  
infrastructure corridor**

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**AVIVA CORPORATION LTD**

**ENEABBA PLANT COMMUNITIES AND RARE AND PRIORITY FLORA**

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CAD Ref: g1288\_vf05a.dgn | Date: Feb 2009 | Rev: F | A0

**RARE AND PRIORITY SPECIES**

Priority	CALM	Herbarium	MCPL	TEC
Rare	●	■	▲	★
1	●	■	▲	★
2	●	■	▲	★
3	●	■	▲	★
4	●	■	▲	★

Scale: 1:15 000  
 Scale: MGRS42Zone 56

