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Flora and vegetation report

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Appendix K

Flora and vegetation report

South Metro Connect
11 May 2011

Roe Highway Extension Kwinana Freeway to Stock Road: Vegetation and Flora Assessment Phase 2

Roe Highway Extension Kwinana Freeway to Stock Road: Vegetation and Flora Assessment Phase 2

Prepared for

South Metro Connect

Prepared by

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Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
A	22-Dec-2010	Draft for Internal Review	Kellie Honczar Principal Ecologist	
0	07-Apr-2011	For Issue	Jamie Shaw South Metro Connect Environment Manager	
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Executive Summary

Main Roads is proposing to extend Roe Highway from its current terminus at Kwinana Freeway in Jandakot, to Stock Road in Coolbellup.

In August 2009, Main Roads Western Australia (MRWA) and AECOM formed the South Metro Connect Alliance. The team was created for the development phase of the Roe Highway Extension project. Its primary objective is to work collaboratively with specialist consultants, stakeholders and regulatory authorities to develop an environmentally, socially and economically acceptable project design, in order to obtain relevant statutory approvals.

In order to gain an understanding of potential environmental impacts, investigations including flora and vegetation assessments were undertaken. These studies commenced in 2009 and culminated into a two phase, detailed (Level 2) assessment, spanning the spring seasons of 2009 and 2010 and throughout the period of time in the interim. Studies and reporting have been conducted in accordance EPA Guidance Statement No. 51, *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA, 2004).

This report presents the findings of the various assessments carried out since July 2009, until spring 2010 and has been prepared with the purpose of being included as a technical appendix for the Public Environmental Review (PER) document for the proposal to extend Roe Highway, as described above.

The significant environmental values recorded within the project area with respect to flora and vegetation are:

- the occurrence of six Priority Flora species:
  - *Dampiera triloba* (P1);
  - *Tetraria* sp. Chandala (G.J. Keighery 17055) (P2);
  - *Cyathochaeta teretifolia* (P3);
  - *Jacksonia gracillima* (P3);
  - *Eryngium pinnatifidum* subsp. *palustre* (P3); and
  - *Dodonaea hackettiana* (P4).
- the occurrence of two regionally significant flora species:
  - *Ixiolaena viscosa*; and
  - *Gastrolobium ebracteolatum.*
- the occurrence of complex variants of flora species requiring further taxonomic review:
  - *Lepidosperma squamatum;*
  - *Lepidosperma pubisquameum;* and
  - *Caesia micrantha.*
- Six flora species significant for the PMR:
  - *Conostephium minus;*
  - *Cyathochaeta teretifolia;*
  - *Dodonaea hackettiana;*
  - *Eryngium pinnatifidum* subsp*. palustre* (ms);
  - *Hibbertia cuneiformis;* and
  - *Leschenaultia linarioides.*
- Three Declared Plant species:
  - **Zantedeschia aethiopica* (Arum Lily);
  - **Asparagus asparagoides* (Bridal Creeper); and
  - **Moraea flaccida* (One-leaf Cape Tulip).

- Eighteen vegetation communities that are considered locally significant populations of Priority Flora, regionally significant flora, significant flora of the PMR or species requiring taxonomic review ; and
- Eighteen communities that are considered regionally significant as they fall within the boundaries of an ESA (wetlands).

Following the 2009 spring surveys, the following additional work was recommended to be carried out to further define the flora and vegetation values of the site. These surveys have been completed during spring 2010 and are reported herein:

- phase two of a Level Two spring flora and vegetation survey in 2010;
- targeted regional surveys for recorded Priority flora species in suitable habitats; and
- follow up targeted *Caladenia huegelii* (DRF) survey in selected locations that were determined suitable habitat and were identified as “orchid hot-spots” in 2009.

The 2009 report made the following recommendation that is still pending and is recommended to be carried out as part on a continuation of this study:

- taxonomic work to continue to classify complex variants of Cyperaceae species that have been recorded during the 2009 and 2010 surveys.

1.0 Introduction

1.1 Background

More than 30 years ago, Roe Highway was identified as being an important link in Perth's Primary Regional Road network to create a high standard east-west connection; and to channel large volumes of traffic, particularly road freight, away from local roads and into Fremantle Port and other southern locations. Since this early planning and the inclusion of Roe Highway into the Metropolitan Region Scheme (MRS), seven sections of the highway have been completed, culminating in 2006 with connection to the Kwinana Freeway north of Berrigan Drive. The State Government has committed to completing a further section of the highway between Kwinana Freeway in Jandakot and Stock Road in Coolbellup, which remains in the MRS road reservation.

Main Roads is now proposing to extend Roe Highway from its current terminus at Kwinana Freeway in Jandakot, to Stock Road in Coolbellup. The project area is defined by the Main Roads Extent of Proposal, depicted in **Figure 1**. The footprint of the alignment will generally fall within the existing MRS, but may extend beyond the MRS boundary between Kwinana Freeway and North Lake Road into adjacent government owned land; should it be determined to be more environmentally and socially acceptable.

In order to gain an understanding of potential environmental impacts, significant environmental investigations were undertaken in spring 2009 encompassing flora surveys (including targeted Declared Rare Flora surveys) of the project area. This formed part of a phase 1, Level 2 assessment; and a second phase assessment was also required to be conducted to meet EPA Guidance.

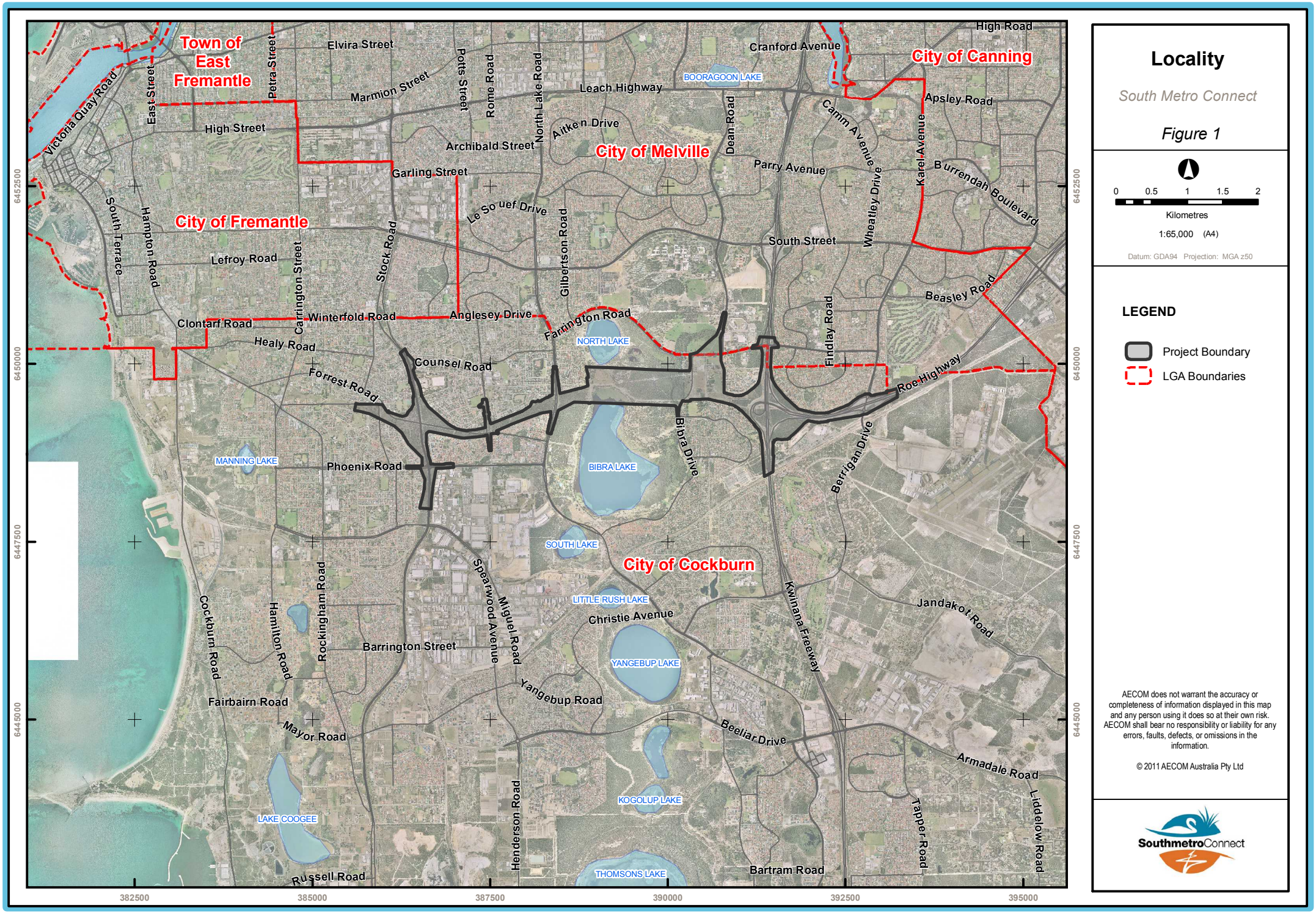
This report presents the findings of the second phase flora survey undertaken in spring 2010 for the project area, consolidated with the initial phase assessment results. Together these results meet the requirements for a 'Comprehensive Survey' as part of a Level 2 Flora and Vegetation Assessment, in accordance with EPA Guidance (2004).

1.2 Location

The project area is located within the City of Cockburn and the City of Melville, and includes the localities of Kardinya, Murdoch, Leeming, Coolbellup, North Lake, Jandakot and South Lake.

The project area runs in an east-west direction between North Lake and Bibra Lake. The MRS is situated entirely within the City of Cockburn Local Government Area; however, the proposed project extends slightly over the local government boundary into the City of Melville (**Figure 1**).

The area that was surveyed for relevant Declared Rare Flora (DRF) includes remnant native vegetation within both the Detailed Study Area (DSA) and the Local Study Area (LSA) (**Figure 2**).



Locality

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Figure 1

0 0.5 1 1.5 2

Kilometres

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Datum: GDA94 Projection: MGA z50

LEGEND

- Project Boundary
- LGA Boundaries

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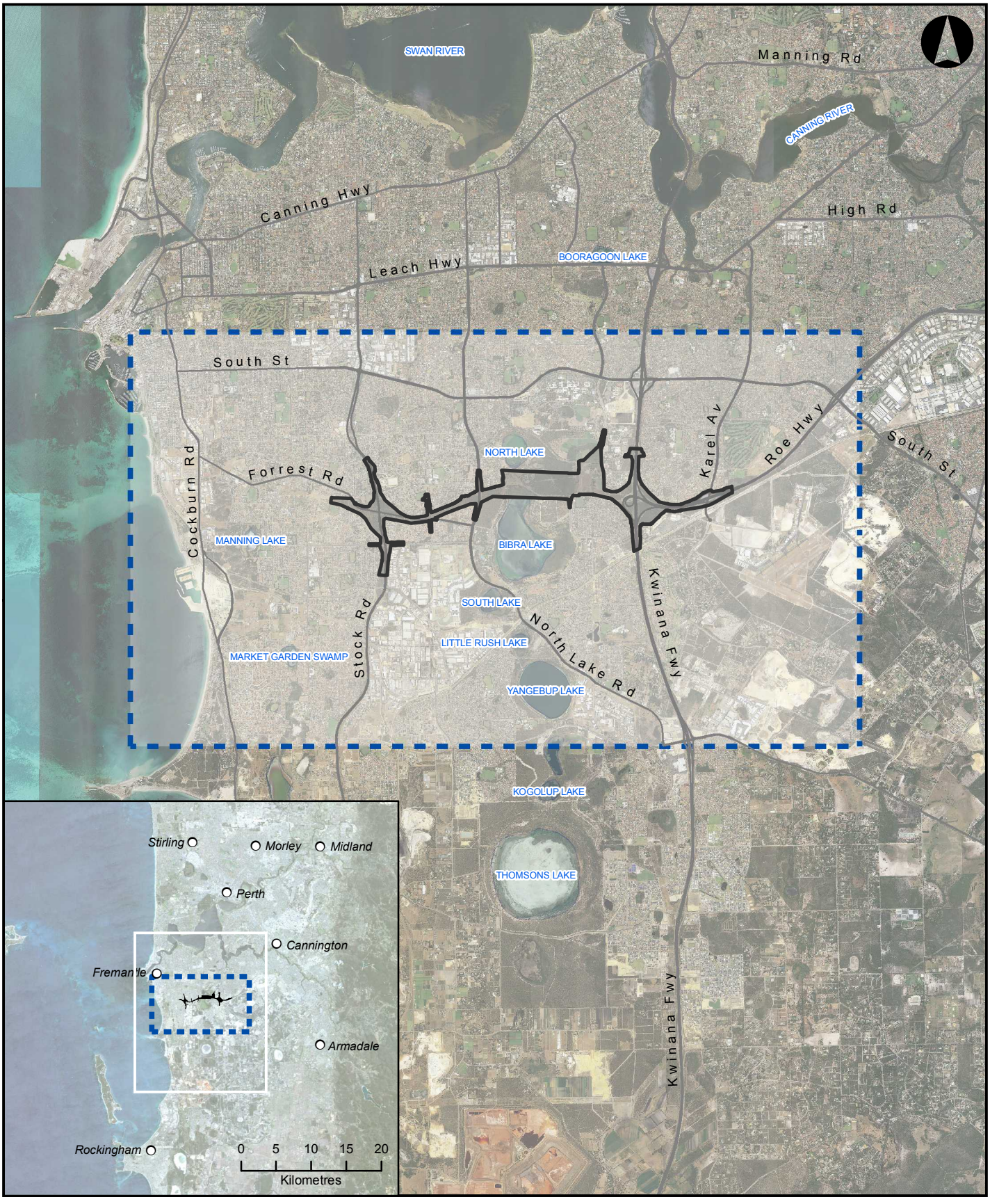

Regional Vegetation Study Area

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Figure 2

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Kilometres
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LEGEND

Local Study Area (LSA)

Detailed Study Area (DSA)

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1.3 Existing Environment

1.3.1 Climate

The project area is located within Perth Metropolitan Region which experiences a dry Mediterranean climate, with cool wet winters and warm dry hot summers. The nearest accessible climate data for the project area is available from the Jandakot Aero weather station, Site no. 009172. The average annual minimum temperature for the project area is 11.3°C and the average annual maximum temperature is 24.3°C. The average annual rainfall for the project area is 827.7mm. Perth receives more than 85% of its rain during May to October, with the remainder derived from thunderstorms and occasional cyclonic depressions during the warmer months (Bureau of Meteorology, 2011).

1.3.2 Landforms and Soils

The project area crosses two dune systems, with wetlands occurring in the depression at the dune interface. These dune systems are:

- Ed2 Degraded surface of Eolian origin, Spearwood Dunes;
- Lm1 Marsh in interbarrier depression, high level; and
- Ed3 Degraded surface of Eolian origin, Bassendean Dunes.

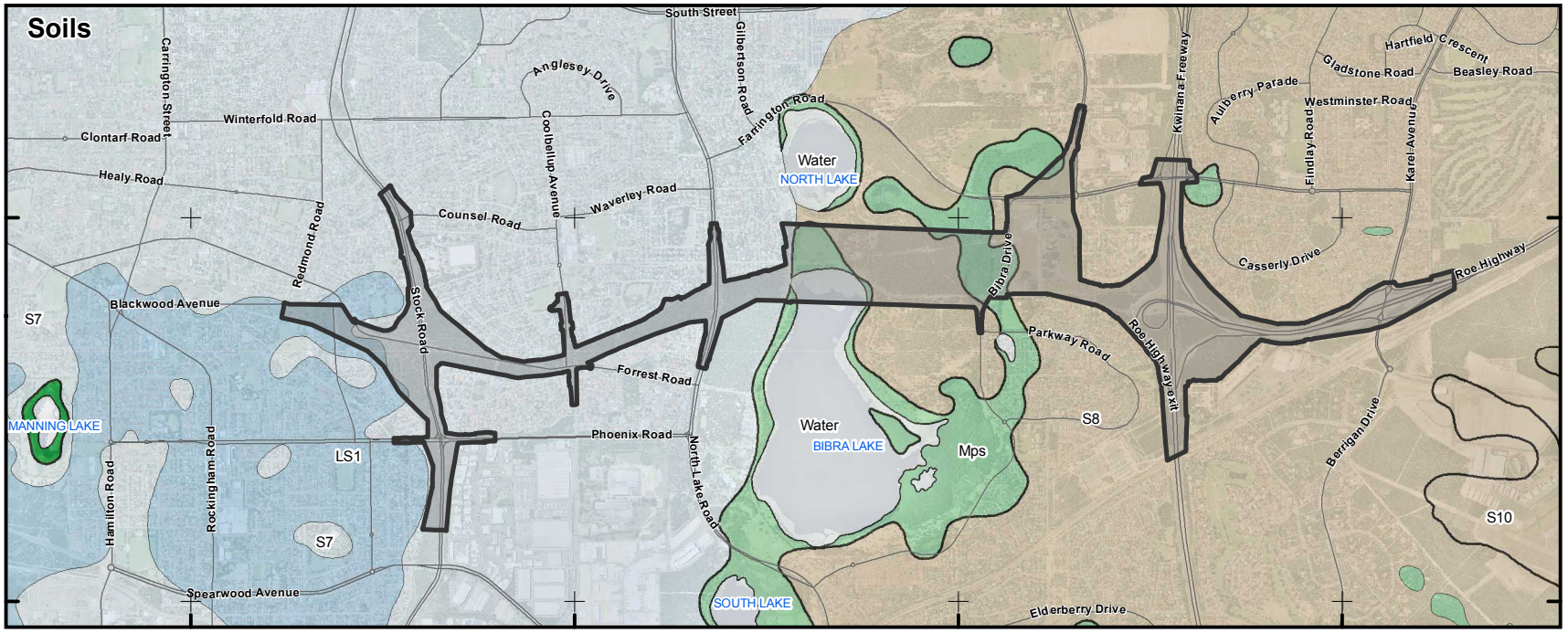
(Source: Geological Survey of Western Australia 1986)

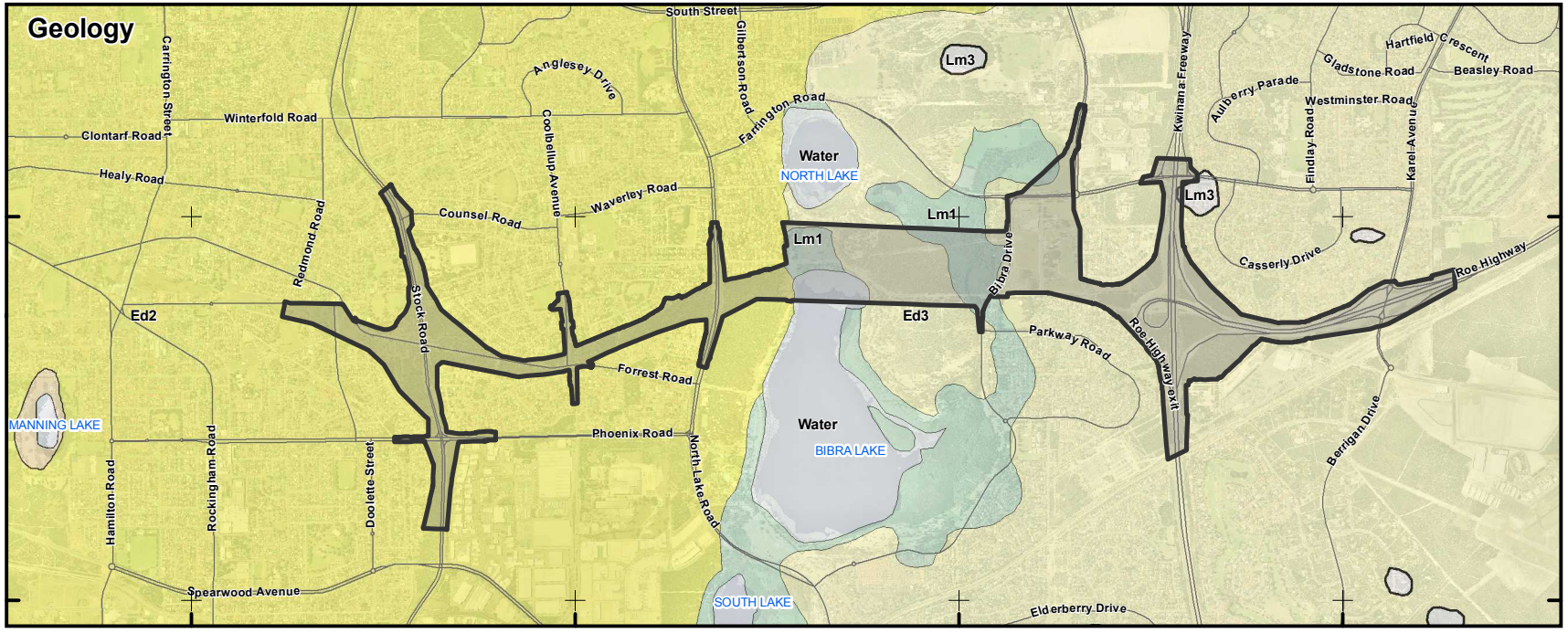
The spatial extent of the geology of the project area is summarised in **Figure 3**.

The project area traverses several soil types, generally related to distance from the coast. The eastern portion of the project area is on grey sands, with the sand become greater in limestone content further west towards the coast. The wetland areas occur on peaty silt at the interface of the two dune systems. Soil types are summarised in **Table 1** as they occur from east to west (**Figure 3**).

Table 1 Soil Types of the Project Area (Geological survey of Western Australia, 1986)

Code	Soil Type	Description
S8	Sand	Very light grey at surface, yellow at depth, fine to medium-grained, sub-rounded quartz, moderately well sorted, of eolian origin
Mps	Peaty Silt	Black, friable silt with abundant organic material, variable fine quartz sand content, soft, of lacustrine origin
S7	Sand	Pale yellowish brown, medium to coarse-grained sub-angular quartz, trace of feldspar, moderately sorted, of residual origin
LS1	Limestone	Pale yellowish brown, fine to coarse-grained, sub-angular to well rounded, quartz, trace of feldspar, shell debris, variably lithified, surface kankar, of eolian origin





Geology and Soils

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Figure 3

0 0.5 1 1.5

Kilometres

1:45,000 (A4)

Datum: GDA94 Projection: MGA z50

LEGEND

Soils	Geology
Mps	Ed2
Sm2	Ed3
S7	Lm1
LS1	Lm2
S8	Lm3
S10	Water
Water	

Geology of the 1:50 000 mapsheet FREMANTLE (20334) first edition

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1.4 Biological Context

1.4.1 IBRA Region

There are 85 recognised Interim Biogeographical Regionalisation of Australia (IBRA) regions across Australia that have been defined based on climate, geology, landforms and characteristic vegetation and fauna (Environment Australia, 2000). Western Australia supports 26 IBRA regions and 53 IBRA subregions. The project area lies within the Swan Coastal Plain IBRA region, and on a finer scale, within Perth sub-region.

The Swan Coastal Plain is a low lying coastal plain, covered mainly with woodlands dominated by *Banksia* or Tuart (*Eucalyptus gomphocephala*) on sandy soils (McKenzie *et al.,* 2002). It is composed of colluvial and aeolian sands, alluvial river flats, coastal limestone, heath and/or woodland of Tuart on limestone, *Banksia* and Jarrah (*Eucalyptus marginata*) - *Banksia* woodlands on Quarternary marine dunes of various ages, Marri (*Corymbia calophylla*) on colluvial and alluvials, and includes a complex series of seasonal wetlands (McKenzie *et al*., 2002).

1.4.2 Vegetation Complexes

Australia is divided into Botanical Provinces, Districts and Sub-Districts. The Perth Region lies within the Drummond Botanical Sub-District of the South-West Botanical Province which is typically characterised by low *Banksia* Woodlands with *Melaleuca* swamps and woodlands of Tuart (*Eucalyptus gomphocephala*), Jarrah (*Eucalyptus marginata*) and Marri (*Corymbia calophylla*) (Beard, 1990).

Four Broad vegetation complexes have been described by Beard (1990) for the project area region and are presented in **Table 2**. Beard vegetation mapping is spatially presented in **Figure 4b**.

Table 2 Beard's (1981) vegetation complexes that occur within the project area

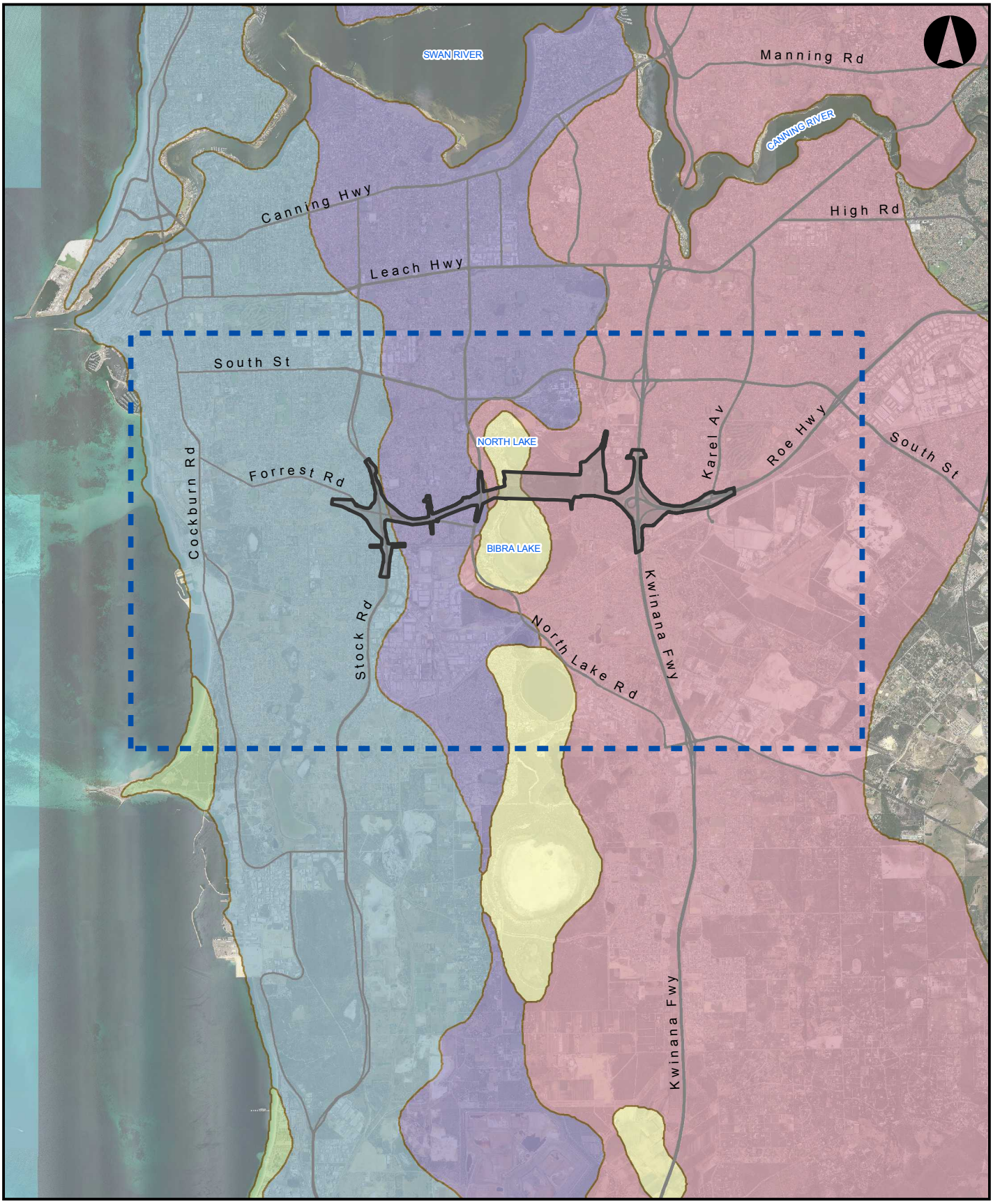
Beard Code	Description
e_2,4Mi	Medium woodland; Tuart and Jarrah
fl	Bare areas; freshwater lakes
e_4Mi	Medium woodland; Tuart
e_2Mb cbLi	Medium very sparse woodland: Jarrah with low woodland; *Banksia* and *Casuarina*

Mapping of vegetation in Western Australia was completed at a broad scale (1: 1000 000) by Beard (1981) according to rainfall variations and landform/soil properties. Beard's vegetation mapping is at a broad scale and requires amalgamation of minor vegetation associations. This may provide a bias towards large and commonly distributed units, as associations that are less common and/or isolated, therefore significant, are not included as individual vegetation communities. Additionally, due to limited sampling, Beard's vegetation units often contain inaccuracies.

Broad vegetation complexes as defined by Heddle *et al.,* (1980) based on vegetation in association with landforms and underlying geology that occur within the project area are summarised in **Table 3** and **Figure 4a**.

Table 3 Vegetation complexes (Heddle *et al*., 1980) that occur within the project area

Vegetation Complex	Description
Bassendean Complex Central and South	Woodland of *Eucalyptus marginata – Corymbia calophylla* with well defined second storey of *Calytrix fraseriana* and *Banksia grandis* on the deeper soils and a closed scrub on the moister sites. The understorey species reflect similarities with the adjacent vegetation complexes.
Herdsman Complex	Sedgelands and fringing woodland of *Eucalyptus rudis* and *Melaleuca* species.
Karrakatta Complex Central and South	Predominantly open forest of *Eucalyptus gomphocephala – Eucalyptus marginata – Corymbia calophylla* and woodland of *Eucalyptus marginata* and *Banksia* species.
Cottesloe Complex Central and South	Mosaic woodland of *Eucalyptus gomphocephala* and open forest of *Eucalyptus gomphocephala – Eucalyptus marginata* and *Corymbia calophylla*; closed heath on the limestone outcrops.



Source : Department of Conservation - System 6 Vegetation Complexes

Vegetation Complexes

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Figure 4A

0 1 2 3

Kilometres
1:100,000 (A4)
Datum: GDA94 Projection: MGA z50

Vegetation Complexes (System 6)

- Bassendean complex - Central and South
- Cottesloe complex - Central and South
- Herdsman Complex
- Karrakatta complex - Central and South
- Quindalup complex

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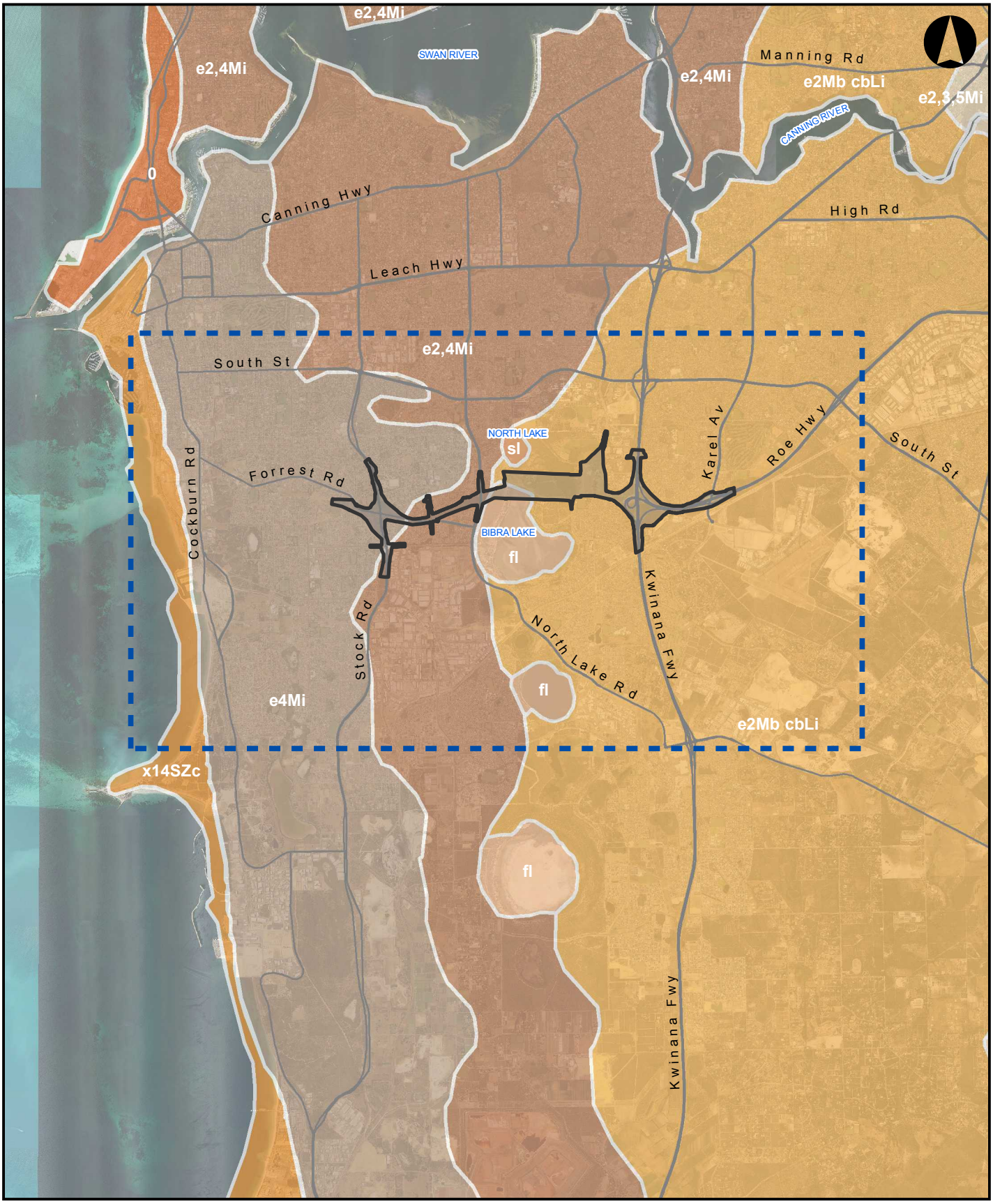

Beard's Vegetation Complexes

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Figure 4B

0 1 2 3

Kilometres
1:100,000 (A4)
Datum: GDA94 Projection: MGA z50

Beard's Vegetation Complexes

- 0
- e2,3,5Mi
- e2,4Mi
- e2Mb cbLi
- e4Mi
- e6Mi
- fl
- sl
- x14SZc

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1.4.4 Vegetation Clearing, Extent and Status

Where clearing of native vegetation is proposed to occur, purely from a biodiversity perspective and not taking into account any other land degradation issues present, there are now several key criteria being applied with regards to clearing licenses. The criteria, as outlined in the WA EPA Position Statement No. 2, *Environmental Protection of Native Vegetation in Western Australia: Clearing of native vegetation, with particular reference to the agricultural area* (EPA, 2000) are used in order to help reverse the long-term decline in the quality and extent of Australia's native vegetation cover. The criteria are as follows:

- The "threshold level" below which species loss appears to accelerate exponentially at an ecosystem level is regarded as being at a level of 30% of the pre-clearing extent of the vegetation type;
- A level of 10% of the original extent is regarded as being a level representing "endangered";
- Clearing which would put the threat level into the class below should be avoided; and
- From a biodiversity perspective, stream reserves should generally be in the order of at least 200m wide.

The status of remaining vegetation can be delineated into five different classes:

- *Presumed extinct*: probably no longer present in the bioregion;
- **Endangered*: <10% of pre-European extent remains;
- **Vulnerable*: 10-30% of pre-European extent exists;
- **Depleted*: >30% and up to 50% of pre-European extent exists; and
- *Least concern*: >50% pre-European extent exists and subject to little or no degradation over a majority of this area.

* Or a combination of depletion, loss of quality, current threats and rarity gives a comparable status.

1.4.5 Wetlands

Wetlands occur at the interface of two dune systems traversed by the project area. These wetlands influence the floristic characteristics of the site. Wetlands mapped in the *Swan Coastal Plains Geomorphic Wetlands* dataset and the Swan Coastal Plain (*Environmental Protection (Swan Coastal Plain Lakes) Policy 1992*) (*Lakes EPP*) as occurring within the project area, or in close proximity, are listed in **Table 4**. There are six wetlands that occur in the project area, and five more that are within close proximity. The areas associated with these wetlands are Environmentally Sensitive Areas (ESAs). Wetlands of the project area are shown in **Figure 5**.

Table 4 Geomorphic wetlands within and in the immediate vicinity of the project area

UFI	Wetland Name	Classification	Evaluation	Location
6595	Bibra Lake	Lake	Resource Enhancement Lakes EPP	Northern most portion of this wetland is within project area
6522	Bibra Lake	Lake	Resource Enhancement Lakes EPP	Approximately 1.5km south of project area
6601	Bibra Lake	Lake	Multiple Use	Within project area
6598	Bibra Lake	Lake	Multiple Use	Approximately 340m south of project area
13320	Bibra Lake	Lake	Multiple Use	Approximately 760m south of project area
6508	unknown	Sumpland	Multiple Use	Approximately 450m south of project area
6510	unknown	Sumpland	Multiple Use	Approximately 600m south of project area
6509	unknown	Sumpland	Resource Enhancement	Approximately 475m south of project area
6600	Horse Paddock Swamp	Lake	Conservation Lakes EPP	Within project area

UFI	Wetland Name	Classification	Evaluation	Location
15240	Roe Swamp and surrounding sumplands	Sumpland	Conservation	Within project area
14425	Roe Swamp and surrounding sumplands	Sumpland	Conservation	Within project area
14645	Lower Swamp and Melaleuca Swamp	Sumpland	Conservation Lakes EPP	Partially within project area
6599	North Lake	Lake	Conservation Lakes EPP	Approximately 80m north of project area

1.4.6 Bush Forever

The Bush Forever publication was prepared by the Ministry for Planning (now Department of Planning), Department of Environment, Department of Conservation and Land Management (both now the Department of Environment and Conservation) and Water and Rivers Commission (now Department of Water). Bush Forever is a revised update of the earlier System 6 study area and presents recommendations for bushland conservation within the Perth Metropolitan Region.

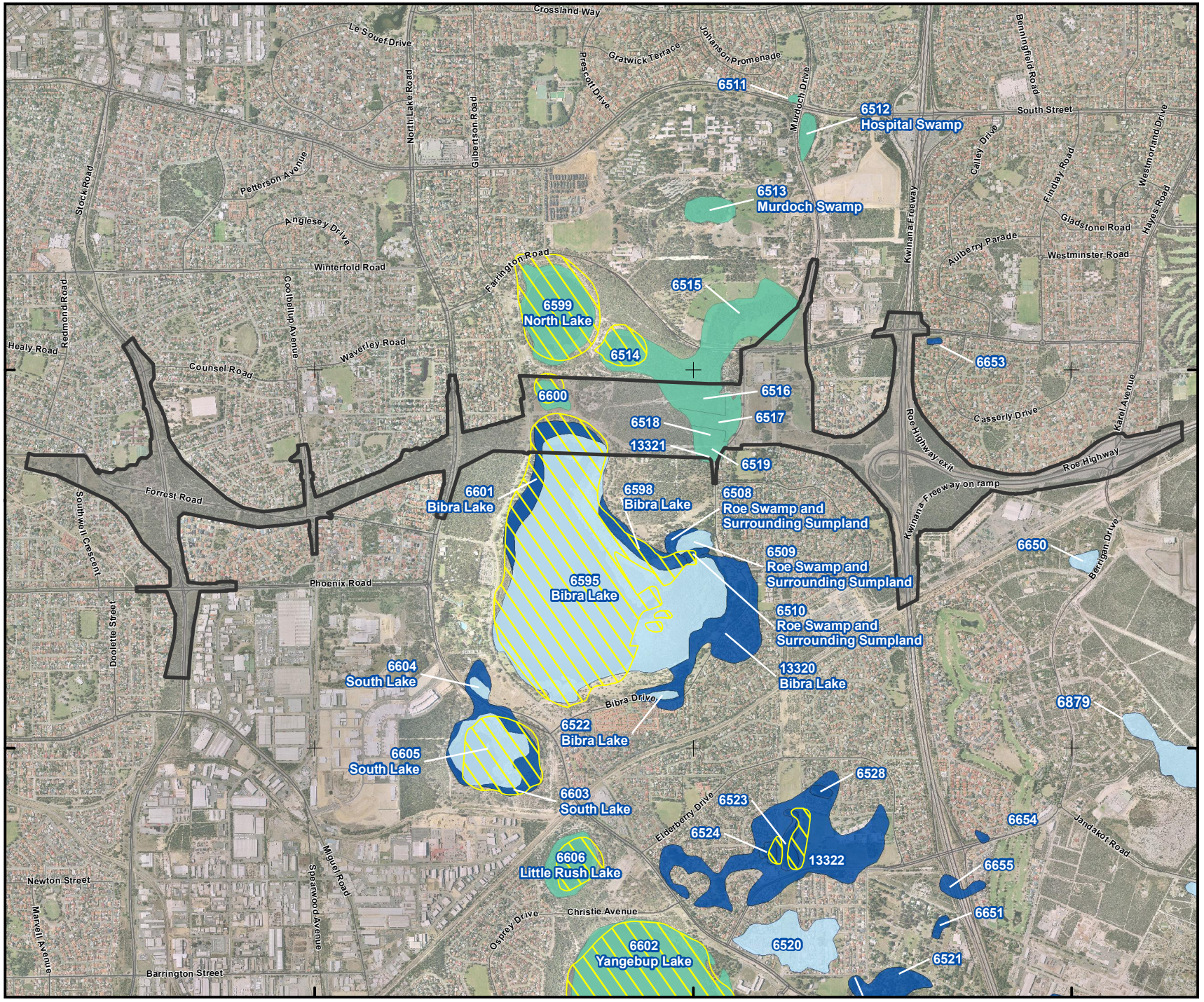
Bush Forever Site 244 (North Lake and Bibra Lake) occurs within the project area and its extent is shown in **Figure 6**.

The vegetation of North Lake is described as:

- *Eucalyptus marginata* open forest;
- *Banksia attenuata*, *Banksia menziesii* and *Allocasuarina fraseriana* low open forest, with emergent *Eucalyptus marginata;*
- *Eucalyptus rudis, Melaleuca preissiana, Melaleuca rhaphiophylla and Banksia ilicifolia* forest to woodland, with *Kunzea glabrescens, Acacia saligna* and *Agonis linearifolia;*
- *Melaleuca teretifolia* tall shrubland; and
- *Baumea articulata* and **Typha orientalis* sedgelands.

The vegetation of Bibra Lake is described as:

- *Banksia attenuata, Banksia menziesii* and *Allocasuarina fraseriana* low open forest, with *Eucalyptus marginata;*
- *Eucalyptus rudis, Melaleuca preissiana* and *Melaleuca rhaphiophylla* open forests;
- *Melaleuca teretifolia* low closed forest or closed tall scrub; and
- Closed sedgeland.



Wetlands

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Figure 5

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Kilometres

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Datum: GDA94 Projection: MGA z50

LEGEND

- EPP Lakes

Geomorphic Wetlands

- Resource Enhancement
- Conservation
- Multiple Use

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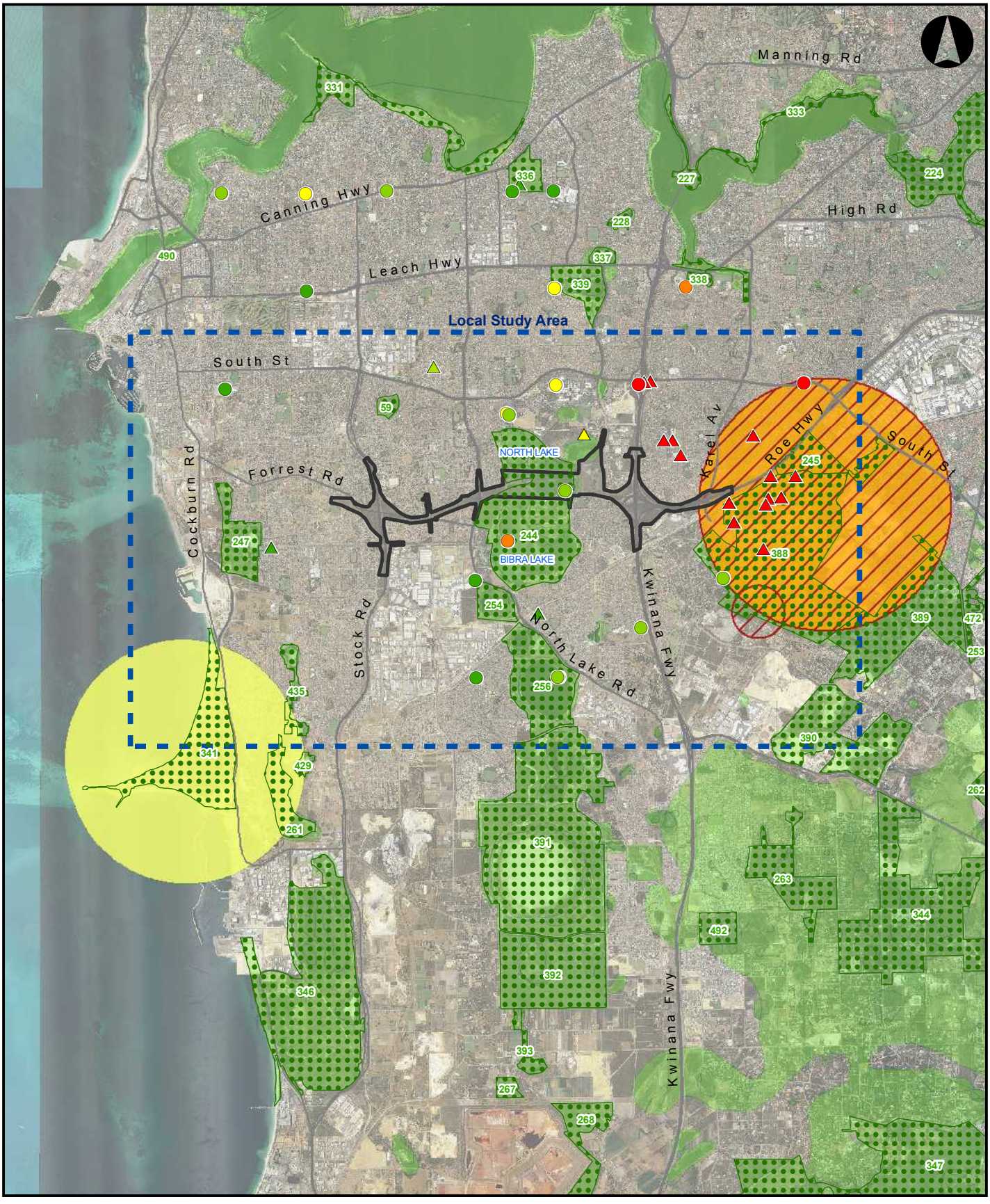

Environmental Constraints - Flora & Vegetation

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Figure 6

0 1 2 3

Kilometres
1:100,000 (A4)
Datum: GDA94 Projection: MGA z50

DEC Rare Flora
- Declared Rare Flora
- Priority P2
- Priority P3
- Priority P4

WA Herbarium
- Declared Rare Flora
- Priority P1
- Priority P2
- Priority P3
- Priority P4

- Bush Forever Site
- Environmentally Sensitive Area

TEC/PEC Buffer
- PEC - Priority 2
- PEC - Priority 3
- TEC - Vulnerable

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1.5 Biological Factors of Environmental Significance

1.5.1 Declared Rare, Priority and Threatened Flora Species

The Department of Environment and Conservation (DEC) assigns conservation status to endemic plant species that are geographically restricted to few known populations or threatened by local processes. Allocating conservation status to plant species assists in protecting populations and conserving species from potential threats (DEC, 2011a and 2011b).

Declared Rare Flora (DRF) species are gazetted under subsection 2 of section 23F of the *Wildlife Conservation Act, 1950*. It is an offence to "take" or damage Rare Flora without Ministerial approval. Section 23F of the *Wildlife Conservation Act, 1950* 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."

Species designated as Priority Flora are under consideration for declaration as 'Rare Flora' and are in urgent need of further survey (Priority One to Three) or require monitoring every 5-10 years (Priority Four). **Table 5** presents the definitions of Declared Rare and the four Priority ratings under the *Wildlife Conservation Act, 1950* as extracted from Department of Environment and Conservation (2011b).

Table 5 Definition of Rare and Priority Flora Species (Department of Environment and Conservation, 2011b)

Conservation Code	Category
DRF	**Declared Rare Flora – Extant Taxa** "Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection and have been gazetted as such."
P1	**Priority One – Poorly Known Taxa** "Taxa which are known from one or a few (generally <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."
P2	**Priority Two – Poorly Known Taxa** "Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but urgently need further survey."
P3	**Priority Three – Poorly Known Taxa** "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 >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."
P4	**Priority Four – Rare Taxa** "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."

Species at risk of extinction are recognised at a Commonwealth level and are categorised according to the *Environment Protection and Biodiversity Conservation (EPBC) Act*, *1999*, summarised in **Table 6**.

Table 6 Categories of Threatened Flora Species (*EPBC Act, 1999*)

Conservation Code	Category
Ex	**Extinct** Taxa which at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
ExW	**Extinct in the Wild** 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.
CE	**Critically Endangered** 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.
E	**Endangered** 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.
V	**Vulnerable** 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.
CD	**Conservation Dependent** Taxa which at a particular time if, at that time, the species is the focus of a specific conservation programme, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

Significance is not limited to species covered by State and Commonwealth legislation, and also includes species of local significance and species showing significant range extensions or at the edge of their known range.

1.5.2 Threatened and Priority Ecological Communities

Threatened Ecological Communities (TECs) are naturally occurring biological assemblages that occur in a particular type of habitat, which are subject to processes that threaten to destroy or significantly modify the assemblage across its range (DEC, 2001).

The primary tool for classification of TECs on the Swan Coastal Plain is by assigning a Floristic Community Type (FCT), as classified by Gibson *et al.,* (1994). The Floristic Survey of the Swan Coastal Plain (Gibson *et al.,* 1994) identifies suites of dominant and indicator flora species, in combination with the landform complex of the location, as characteristic of a specific FCT. Data collected in the field is compared to the Gibson *et al.,* (1994) dataset, and sites with similar species composition are confirmed for suitable distribution with regard to landform complexes to categorically determine FCTs.

Vegetation communities in Western Australia are described as TECs if they have been defined by DEC's Species and Communities Branch and found to be Presumed Destroyed (PD), Critically Endangered (CR), Endangered (EN) or Vulnerable (VU). For definitions of TEC categories and criteria refer to English and Blyth (1997). DEC maintains a database of state listed TECs which is available for online searches via their website (www.dec.wa.gov.au).

There is currently no legislation covering the conservation of TECs in Western Australia; however some are protected under the Commonwealth *EPBC Act, 1999.* The TECs on the Commonwealth register are also listed on the Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) website (www.environment.gov.au). For those State TECs not listed on the Commonwealth register, land clearing legislation under the *Environmental Protection Act, 1986* provides protection from clearing. The EPA's position is that proposals resulting in the direct loss of TECs are likely to be formally assessed.

In addition to TECs, potential TECs that do not meet survey criteria or that are not adequately defined, are rare but not threatened, have been recently removed from the TEC list or require regular monitoring are considered to be Priority Ecological Communities (PECs) (DEC, 2011b) and DEC require them to be taken into consideration during environmental impact assessments.

1.5.3 Local, Regional and National Significant Communities

Vegetation communities are referred to as locally significant where they:

- support populations of Priority Flora species;
- extend the geographic range of particular taxa from previously recorded locations;
- are restricted to only one or a few locations;
- occur as small isolated communities; or
- exhibit unusually high structural and species diversity (Dr. E. Mattiske, *pers. comm*.).

Vegetation communities are referred to as regionally significant where they:

- are limited to specific landform types;
- are uncommon or restricted plant community types within the regional context;
- support populations of Declared Rare Flora (Dr. E. Mattiske, *pers. comm*.); or
- support populations of TECs listed with state (DEC) significance.

Vegetation communities are referred to as nationally significant where they:

- support populations of Threatened (*EPBC* listed) species; or
- support populations of TECs listed with national (*EPBC*) significance.

Guidance Statement 51 (EPA, 2004) also states that *"vegetation may be significant for a range of reasons other than a statutory listing as a Threatened Ecological Community or because the extent is below threshold level".* According to Guidance Statement 51, other significant vegetation may include communities that are:

- scarce;
- a habitat for unusual species;
- a habitat for a novel combination of species;
- a refuge;
- a key habitat for threatened species or large populations representing a significant proportion of the local to regional total population of a species;
- 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 a range, recently discovered range extensions, or isolated outliers of the main range); or
- restricted in distribution.

1.5.4 Significant Flora Species

Guidance Statement 51 (EPA, 2004) states that *"species, subspecies, varieties, hybrids and ecotypes may be significant for a range of reasons, other than as Declared Rare Flora or Priority Flora"*. According to Guidance Statement 51 (EPA, 2004), other significant flora may include taxa that:

- have 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;
- have a relic status;
- have anomalous features that indicate a potential new discovery;
- are representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range);
- show the presence of restricted subspecies, varieties or naturally occurring hybrids;
- have local endemism / a restricted distribution; or
- are poorly reserved.

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2.0 Objectives

2.1 Vegetation and Flora

The objectives of the spring flora and vegetation assessments were to:

- accurately define the specific floristic site conditions and general conditions of the surrounding area;
- determine the presence or potential presence of any unknown floristic factors of environmental significance;
- confirm the extent of known floristic factors of environmental significance; and
- prepare a report that summarises the findings to contribute to the Public Environmental Review (PER) document for the Roe Highway Extension by South Metro Connect and Main Roads Western Australia.

2.2 Targeted DRF Survey

The objectives of the targeted DRF survey were to:

- identify and record locations of DRF species if present; and
- determine the size, extent and quality of any populations of DRF, if present.

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3.0 Methodology

3.1 Spring Vegetation and Flora Assessment

The flora and vegetation field assessment was conducted in accordance with a Level 2 assessment described by the EPA Guidance Statement No. 51, *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA, 2004). Specifically the assessment included:

- desktop studies;
- reconnaissance field survey, encompassing:
    - verification of desktop studies;
    - delineation and characterisation of flora and vegetation units;
    - identification of potential impacts; and
- a detailed flora and vegetation field survey.

3.1.1 Desktop Assessment

As part of the desktop assessment, a range of sources were consulted that included databases and information available in the literature.

A search of the DEC Declared Rare and Priority Flora database was undertaken to identify flora of conservation significance that have previously been recorded within the survey area and general surrounds. The database search was conducted between 32° 02' - 32° 07' S and 115° 46' - 115° 43' E and encompassed the survey area. The following databases were interrogated within this extent:

- DEC Threatened Flora Database;
- Western Australian Herbarium records;
- DEC Declared Rare Flora and Priority Flora List;
- DEC Threatened Ecological Communities (TEC) and Priority Ecological Community (PEC) databases; and
- The Commonwealth (*EPBC Act*) Protected Matters Search (for values of flora and vegetation of conservation significance).

3.1.2 Field Assessment

The initial (phase 1) Level 2 flora and vegetation surveys were conducted by Kellie Honczar and Gaby Martinez, experienced botanists;assisted by ecologists Eleanor Ridley and Alexandra Sleep of AECOM between 10 September and 24 November 2009. Additional survey areas were added to the original project area after the completion of the initial spring survey. Surveys in these additional areas were conducted during April 2010, with follow up spring 2010 surveys in these areas and the entire project extent.

The second phase of the Level 2 flora and vegetation assessment was conducted during spring 2010 in order to meet the requirements for a 'Comprehensive Survey', according to EPA Guidance (2004). This assessment was conducted by experienced botanists Gaby Martinez, Lisa Chappell and Vanessa Yeomans, assisted by ecologist Alexandra Sleep of AECOM between 9 – 15 November, 2010.

Additional survey areas were again added to the project area after the completion of the phase 2 spring 2010 survey. These additional areas occur along the edge of the project boundary and encompass a larger area than previously assessed. Prior to the 2010 field assessments, vegetation communities in these areas were extrapolated by inferring vegetation communities from adjacent communities which were surveyed to Level 2 detail during favourable conditions within the project area. These additional areas were ground truthed during January 2011 to verify the vegetation communities, condition and floral composition of these locations.

The field assessments involved vegetation community and condition mapping combined with recording all observable flora within the project area. Non-permanent quadrats of 10m x 10m dimensions were used throughout site to characterise each vegetation community type. As part of the Level 2 Flora assessment, a total of 41 quadrats were surveyed during phase 1, and 36 quadrats were surveyed during phase 2, forming a collective total of 77 quadrats.

The project area was traversed on foot in order to search for DRF, which also enabled a detailed assessment for flora and vegetation values. The detailed assessment aimed to verify and further define vegetation communities within the project areas. Detailed information was recorded for each vegetation community where distinct changes in floristic composition and structure were noted.

The described method complies with the EPA's guidelines for flora surveys as outlined in EPA Guidance Statement No. 51 (EPA, 2004). Standardised data collection sheets were used to ensure consistent data records for the following features at each quadrat:

- GPS Location (WGS 84);
- species observed;
- height of all species recorded;
- percentage foliage cover (to determine dominance);
- soil type and colour;
- topography;
- degree and nature of disturbance;
- years since fire (if any); and
- vegetation condition.

Flora species that were unidentifiable in the field were systematically collected, pressed, dried and fumigated in accordance with the requirements of the West Australian Herbarium. These plant species were identified via comparison with pressed specimens housed at the herbarium, and using taxonomic keys and other references. The majority of flora identifications were carried out by experienced taxonomist Cate Tauss, with some additional flora identifications completed by experienced AECOM botanists Gaby Martinez, Lisa Chappell and Vanessa Yeomans. Specialist advice from specialist taxonomist Russell Barrett was sought for the identification of several Cyperaceae specimens. Nomenclature of the species recorded follows protocols of the West Australian Herbarium (DEC, 2011a).

Aerial imagery was used in the field to delineate vegetation community boundaries within the project area. A Panasonic Toughbook ® was utilised that, in conjunction with a GPS and the aerial imagery, provides mobile mapping capabilities. Coupled together, the aerial imagery and the Toughbook ® assisted with site navigation and tracking throughout the project areas to ensure that field assessments were accurately within the defined alignments, and that boundaries of varying vegetation communities and vegetation condition classifications was recorded accurately.

Vegetation condition is determined in relation to the (perceived) ability of the bushland to maintain itself (Keighery, 1994). This is commonly interpreted primarily on the ratio of visible introduced species to native species however disturbance (e.g. grazing, erosion), degree of alteration to community and habitat structure, site ecology and other factors are also considered.

In order to map vegetation condition of the project area, the condition was determined at a range of detailed recording sites and in between as necessary, where condition was perceived to change.

The categories of vegetation condition used were consistent with a combination of methods developed by Keighery (1994) and the Braun-Blanquet Scale (Mueller-Dombois and Ellenberg, 1974), as summarised in **Table** 7. Given that effective measures of bushland condition are a measure of both the amount of change in community structure and the proportion of weeds present, a quantitative measure is considered to add value to interpretations and results. Accordingly this method incorporates the Keighery (1994) (descriptive and qualitative) and the Braun-Blanquet Scale (Mueller-Dombois and Ellenberg, 1974) (quantitative) methods.

Table 7 Bushland Condition Ratings (adapted from Keighery, 1994 and the Braun-Blanquet Scale of Cover Abundance (from Mueller-Dombois and Ellenberg, 1974))

Descriptor	Explanation
Pristine	Pristine or nearly so, no obvious signs of disturbance. *0% weed cover*
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. *1 – 5% weed cover*
Very Good	Vegetation structure altered obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing. *5 – 25% weed cover*
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing. *25 – 50% weed cover*
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance of vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing. *50 – 75% weed cover*
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as "parkland cleared" with the flora comprising weed or crop species with isolated native trees or shrubs. *75 – 100% weed cover*

A search of the *Department of Agriculture and Food Western Australia* (DAFWA) website database for Declared Plants was conducted in order to determine if any of the recorded species are listed as Declared Plants (pest weeds) pursuant to the *Agriculture and Related Resources Protection Act, 1976* (DAFWA, 2011).

3.1.3 Dieback Assessment

A *Phytophthora cinnamomi* Dieback assessment of the remnant vegetation within the project area was conducted on 12 November 2009 and again on 8 January 2010 by Glevan Consulting. The mappable areas were traversed on a fifty metre grid using a GPS and suspicious areas were recorded and given a rating between one and five. The rating was used to determine the priority for further assessment, with one being unimportant and five being essential. Any sites rated as three or above during the initial stripping process were later sampled. Soil and tissue samples were then laboratory analysed for the presence of *Phytophthora cinnamomi.* Further details are available in Glevan (2010).

3.1.4 Targeted DRF Surveys

The desktop assessments determined the potential for four species of Declared Rare Flora (DRF) to occur within the project area and general surrounds (LSA). The likelihood of each species occurring was determined based on the habitat preferences, location and nature of existing records. From this it was determined that three species; *Caladenia huegelii, Drakaea elastica* and *Lepidosperma rostratum,* had the potential to occur within the project area.

Desktop assessments were carried out which involved spatial analysis of potentially occurring habitats within the LSA (regional scale) and DSA (project scale). DEC records and relevant literature of DRF in the region were examined and suitable potential habitat for each species was defined, based on geology, soil type, vegetation assemblage, as well as proximity to previous recordings of DRF.

Ground-truthing was carried out to characterise sites further as suitable for supporting DRF. This included broad foot traverses to investigate in detail the habitat suitability. If sites were observed to be suitable, detailed foot traverses were carried out.

Detailed field searches for DRF were carried out by experienced botanists, ecologists and environmental scientists, all familiar with the physical appearance of the target species. A minimum of three, and up to five professionals carried out the field searches in two phases to target the flowering and recognisable periods for each species. The initial survey was conducted from late July to early August 2009 as an appropriate time to record leaves of *Drakaea elastica* and then again from late September to October 2009 to enable recording of *Drakaea elastica, Caladenia huegelii* and *Lepidosperma rostratum* during peak flowering.

The dual assessment for *Drakaea elastica* is due to the fact that both the leaves and flowers can be confused with other species of *Drakaea,* and often at the time of flowering, leaves have begun to desiccate and accurate identification may no longer be possible.

Searches were undertaken with foot traverses using a gridding technique to examine all areas of native bushland determined to be suitable for the targeted searches. Field staff walked in rows, side by side, spaced between 3 to 12 metres apart. Grid sweeps varied between 3 to 12 metres apart depending on:

- The species being targeted (closer sweeps were used for *Drakaea elastica*, as it is smaller, and less easily observed than *Lepidosperma rostratum*);
- Visibility as a result of varying vegetation types; and
- Visibility as a result of varying vegetation condition (degradation) and density.

Where possible and for ease of navigation, grid sweeps were orientated north to south or east to west. Navigation of the sweeps was carried out using a combination of handheld GPS units, a GPS device coupled with a Panasonic Toughbook ® and magnetic compasses. Traversed ground was indicated by tying pieces of coloured paper streamers (biodegradable) to vegetation at eye height. This “trail” was then sighted on the returning subsequent sweeps to ensure that all areas were traversed and inspected.

During the phase two assessment, targeted searches for *Caladenia huegelii* were carried out within the project footprint, within areas of suitable habitat that were identified during the phase one assessment. The gridding technique described above was again used, focusing on areas where particularly suitable habitat had been identified previously and where populations of other species of *Caladenia* (Spider Orchids) had been recorded.

3.1.5 Targeted Priority Flora Surveys

Targeted priority flora surveys were carried out during spring 2010 (17 September and 4, 5 12, and 25 October 2010). Based on locations of occurrence and habitat information obtained from the records of the Western Australian Herbarium, detailed searches were carried out for species recorded to occur within the project area by AECOM during the 2009 spring surveys. Priority species recorded by AECOM during the combination of 2009 and 2010 surveys are as follows:

- *Dampiera triloba* (P1);
- *Cyathochaeta teretifolia* (P3);
- *Jacksonia gracillima* (P3);
- *Eryngium pinnatifidum* subsp. *palustre* (ms) (P3);
- *Dodonaea hackettiana* (P4); and
- *Aotus cordifolia* (no longer listed as a Priority species, was listed as P3 at the time of the initial survey.)

Searches were traversed on foot using the same method described for DRF searches, above.

Locations of individual plants were recorded using a handheld GPS. In some cases where the population was large and individual plants difficult to count due to their growth form (e.g. *Cyathochaeta teretifolia* and *Dampiera triloba*) the boundary of the population was mapped and the population size (number of plants) was estimated.

3.1.6 Targeted Cyperaceae Survey

Due to the fact that the project area supports a number of poorly understood Cyperaceae species, specialist advice from taxonomist Russell Barrett has been sought during the project regarding the taxonomy of he Cyperaceae flora of the project area. As a result, an additional targeted survey was conducted on the 8 June 2010 within vegetation community CcXpMrS to collect specimens and record populations of *Lepidosperma squamatum* (complex variant), a species previously recorded and identified for the project. The species is not of conservation significance, although is the subject of significant taxonomic review. The main purpose of the additional targeted survey was to collect specimens for identification by Russell Barrett in support of his ongoing revision of a number of the *Lepidosperma* and Cyperaceae groups, including the *Lepidosperma squamatum* group. This additional survey also served to accurately determine the species supported by the project area in this location. *Tetraria* sp. Chandala (G.J. Keighery 17055), a Priority Two species was also recorded during this additional targeted survey.

3.1.7 Monitoring Sites

Permanent 10m x 10m monitoring quadrats were installed during spring 2009 and assessed initially, then subsequently once each during summer, autumn and winter, for the purposes of seasonal flora and vegetation monitoring. Characteristics of trees within each 10m x 10m quadrat were recorded, including species, height, projected foliage cover and visible health. Within 1m x 1m quadrats at each corner of the 10m x 10m quadrats, the density and projected foliage cover of each species, both dead and alive was recorded. The results from these quadrats have been included in this report in order to provide additional breadth to the data, and account for seasonal variations with regards to flowering times and the emergence of annual or ephemeral species that may not necessarily peak during spring.

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4.0 Limitations

The majority of the two phases of Level 2 flora and vegetation assessment were conducted during spring 2009 and spring 2010. Spring, namely September to November, is typically the optimum time to conduct surveys within sites on the Swan Coastal Plain to capture the peak flowering period following winter rain. Officially, the winter of 2010 was Perth's second driest on record with only 256 millimetres recorded, almost 160 millimetres below average (Weatherzone, 2011). Due to the limited rainfall received during winter 2010, much of the flora and vegetation within the survey area was observed to be in poor condition. This may have led to collection of poor quality specimens less suitable for accurate identification and also may have resulted in some flora species being poorly recognisable or completely absent at the time of field assessments.

Some sections of the project area were surveyed out of season. However these portions of the study area comprised mainly of areas void of remnant vegetation and consisted of degraded parklands and rehabilitated roadside batters. It is considered that given the intensive assessment across the large and comprehensive project area directly adjacent to the added areas for study, that was initially assessed out during the appropriate survey season, optimum survey conditions, this does not represent a gap in the data, accuracy or validity of the assessment as a whole.

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5.0 Results

5.1 Flora

5.1.1 Desktop Assessment

A search of the DEC Threatened Flora database identified the previous occurrence of nineteen Declared Rare and Priority Flora species recorded within the vicinity of the study area. This included five DRF, three Priority 1, two Priority 2, four Priority 3 and five Priority 4 species. These results are presented in **Table 8**.

Table 8 Declared Rare and Priority Flora species previously recorded within or near the project area

Species	Commonwealth Conservation Code	State Conservation Code	Habitat	Flowering Period	Likelihood of Occurring in Project Area
Caladenia huegelii	Endangered	DRF	Grey or brown sand, clay loam	September - October	Likely
Darwinia foetida	Critically Endangered	DRF	Information not available		Unlikely
Drakaea elastica	Endangered	DRF	White or grey sand. Low-lying situations adjoining winter-wet swamps	October - November	Likely
Drakaea micrantha	Vulnerable	DRF	White-grey sand	September - October	Unlikely
Lepidosperma rostratum	Endangered	DRF	Peaty sand, clay		Possible
Acacia lasiocarpa var. *bracteolata* long peduncle variant (G.J.Keighery 5026)	None	Priority 1	Grey or black sand over clay. Swampy areas, winter wet lowlands	May - August	Possible
Dampiera triloba	None	Priority 1	Sandy rises, peaty sand over clay	August - December	Likely
Hydrocotyle striata	None	Priority 1	Clay, springs		Unlikely
Bossiaea modesta	None	Priority 2	Soils derived from granite. Damp areas close to stream	October - December	Unlikely
Byblis gigantea	None	Priority 2	Sandy-peat swamps. Seasonally wet areas	September - January	Possible
Angianthus micropodioides	None	Priority 3	Saline sandy soils. River edges, saline depressions, claypans	November - February	Unlikely
Jacksonia gracillima	None	Priority 3	Winter wet flats, grey sands.		Recorded
Phlebocarya pilosissima	None	Priority 3	White or grey sand, lateritic gravel	August - October	Unlikely
Stylidium longitubum	None	Priority 3	Sandy clay, clay. Seasonal wetlands	October - December	Possible
Dodonaea hackettiana	None	Priority 4	Sand. Outcropping limestone	July - October	Recorded
Microtis quadrata	None	Priority 4	Sandy clay swamps, black peaty soil		Possible
Anthotium junciforme	None	Priority 4	Sandy clay, clay. Winter-wet depressions, drainage lines	November - March	Unlikely
Hydrocotyle lemnoides	None	Priority 4	Swamps	August - October	Unlikely
Jacksonia sericea	None	Priority 4	Calcareous and sandy soils	December – February	Possible

5.1.2 Field Assessment

A total of 435 flora species from 244 genera and 80 families were recorded within the study area. The total includes 299 (69%) native species and 138 (31%) introduced (weed) or non-endemic species. The full list of vascular flora species recorded, and the representative communities in which they occur are presented in **Appendices A** and **B**.

Families with the highest representation are described in Table 9 below.Myrtaceae (55 taxa; 35 native, 20 introduced), Fabaceae (47 taxa; 35 native, 12 introduced), Poaceae (32 taxa; 10 native, 22 introduced) and Asteraceae (27 taxa, 14 natives, 13 introduced).

5.1.2.1 Flora of Conservation Significance

No species of DRF, listed by DEC under the *Wildlife Conservation Act, 1950* or as Threatened under the *EBPC Act, 1999* were recorded within the project area.

Eight species of Priority Flora were recorded within the project area:

- *Dampiera triloba* (P1);
- *Tetraria* sp. Chandala (G.J.Keighery 17055) (P2);
- *Cyathochaeta teretifolia* (P3);
- *Jacksonia gracillima* (P3);
- *Eryngium pinnatifidum* subsp. *palustre* (ms) (P3);
- *Dodonaea hackettiana* (P4);
- *Calothamnus rupestris* (P4); and
- *Eucalyptus caesia* (P4).

Dampiera triloba (P1) is endemic to the Swan Coastal Plain and Avon Wheatbelt regions. There are 14 populations of this species recorded within the study area in the vicinity of wetlands between Bibra and Progress Drives (see **Figures 7**). There are currently seven known population records of this species at the Western Australian Herbarium, providing a collective total of 21 known populations throughout the State. The WA Herbarium indicates that this species has been collected from Gnangara, Mount Barker, Cunderdin, Bayswater and also in the vicinity of the project area at North Lake.

A single specimen of *Tetraria* sp. Chandala (G.J. Keighery 17055) (P2) was collected opportunistically from vegetation community CcXpMrS (see **Table 13** for community description). There are three records of this taxon housed at the WA Herbarium from Gingin, Wanneroo and Muchea; in habitats ranging from *Melaleuca rhaphiophylla* forest over sedges to *Banksia littoralis* woodland. The closest known population occurs approximately 38 km north of the project area. This species has not previously been recorded from within the project area or in the near vicinity, as documented by the WA Herbarium.

Cyathochaeta teretifolia (P3) is endemic to the Swan Coastal Plain, Warren and Jarrah Forest regions. Five populations of this species have been recorded from within the study area from wetlands between Bibra and Progress Drives (**Figure 7)**. The populations recorded are significant in size, and this species constitutes the dominant understorey layer of the vegetation community within which it has been recorded. There are currently 51 known records of this species housed at the WA Herbarium, as far south as Millup and north to Muchea. This species has not previously been recorded from within the project area or in the near vicinity, as documented by the WA Herbarium.

Jacksonia gracillima (P3) is endemic to the Swan Coastal Plain and was collected from two sites (R10 and R25) during the 2009 field assessment and from one site as an opportunistic collection (P2R57) during the 2010 field assessment. Additionally, three populations were recorded during targeted surveys (**Figure 7**). There are currently 17 records of this species housed at the WA Herbarium from locations at Forrestdale and south to Capel and also in the vicinity of the project area in 1994, east of Roe Swamp.

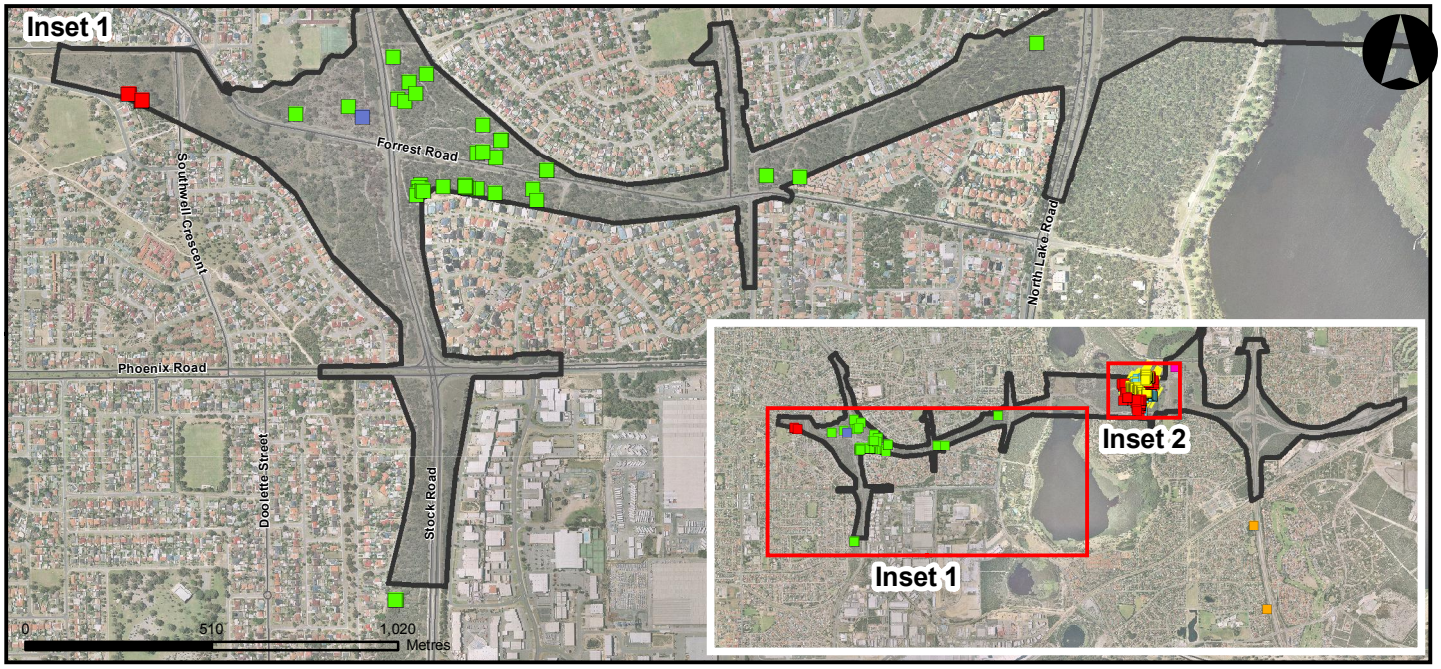
Eryngium pinnatifidum subsp. *palustre* (P3) is endemic to the Swan Coastal Plain and was recorded within the study area from four populations (**Figure 7**). There are currently eighteen records of this species housed at the WA Herbarium from locations as far north as Gingin and as far south as Pinjarra. This species has not previously been recorded from within the project area or in the near vicinity, as documented by the WA Herbarium.

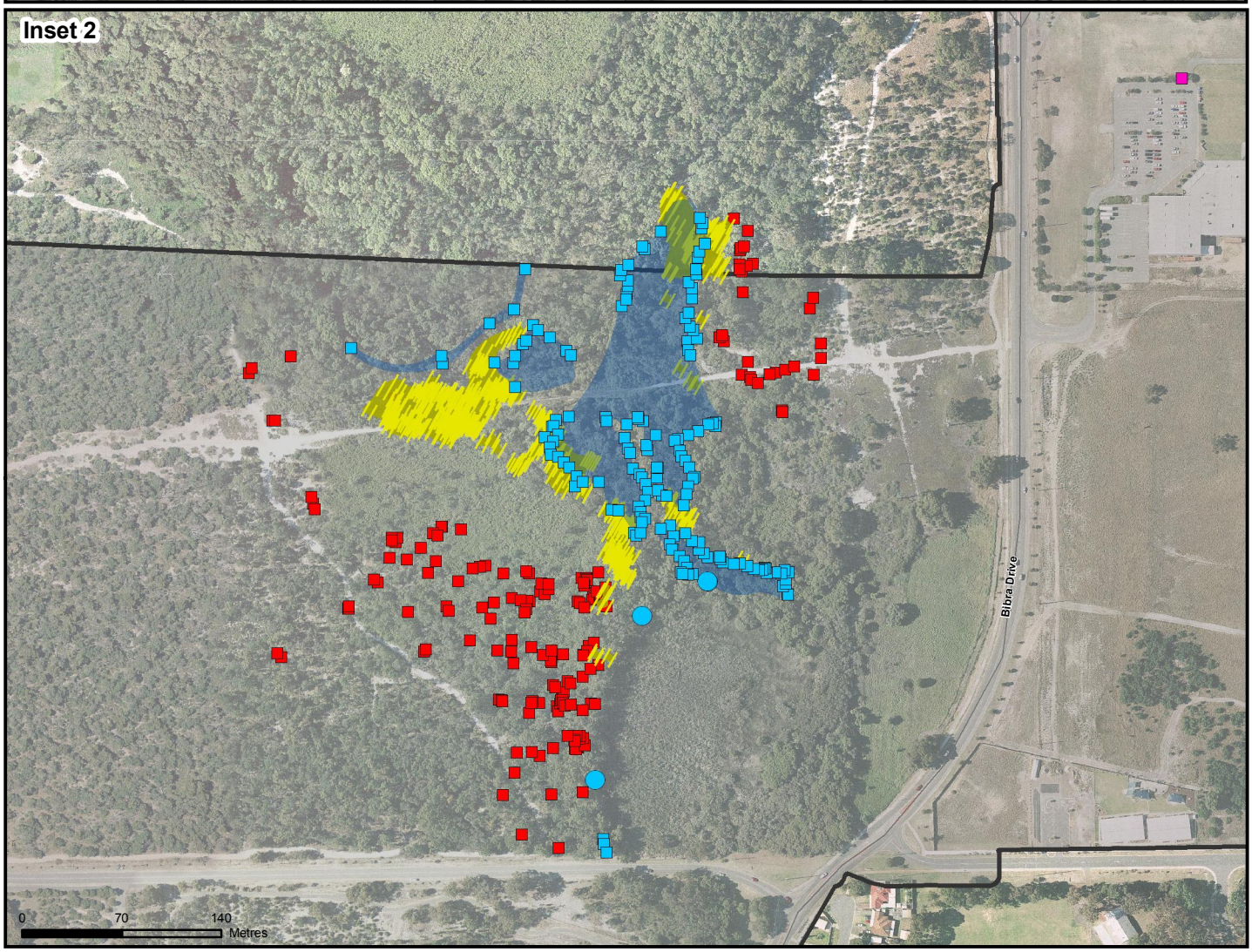
Dodonaea hackettiana (P4) is endemic to the Swan Coastal Plain and Esperance Plain regions, and was collected as an associated species (outside the study plot, but as part of the vegetation community) from one site (R18) during the 2009 field assessment. This area was thoroughly surveyed during the 2010 Phase 2 spring survey, however the species was not located within the project area. There are currently twenty nine records of this species housed at the WA Herbarium. It has been recorded from the vicinity of the project area, one kilometre south of Bibra Lake on the east side of Forrest Road.

Calothamnus rupestris (P4) is known from gravelly skeletal soils, granite outcrops, rocks and hillsides of the Swan Coastal Plain, Jarrah Forest and Avon Wheatbelt, primarily concentrated in the Jarrah Forest. There are sixty three records of this taxon at the Western Australian Herbarium from 46 populations, the majority of which were from lateritic soils. This species was recorded from two sites during the 2010 field assessment of extra areas (R35 and R36) and has been planted for roadside amenity purposes and does not occur naturally in the project area.

Eucalyptus caesia (P4) is an ornamental mallee cultivated extensively throughout the region and Australia (French, 1997). It is endemic to the Coolgardie, Avon Wheatbelt and Mallee regions of Western Australia, typically occurring in loam soil and on granite outcrops. *Eucalyptus caesia* was recorded from one site (R39) in 2010 it has been planted for roadside amenity purposes and does not occur naturally in the project area.

Based on the number of recorded and known individuals and populations of the Priority Flora that are of conservation significance for the project area, an impact assessment has been prepared and is presented in **Table 9**.





AECOM Priority Flora Locations

South Metro Connect

Figure 7

Datum: GDA94 Projection: MGA z50

AECOM Recorded Priority Flora

- *Dodonaea hackettiana*
- *Calothamnus rupestris*
- *Jacksonia gracillima*
- *Eryngium pinnatifidum ssp palustre*
- *Eucalyptus caesia*
- *Cyathochaeta teretifolia* Population Boundary
- *Cyathochaeta teretifolia* Individual Plant
- *Dampiera triloba*

AECOM Recorded Population Boundaries

- *Cyathochaeta teretifolia*
- *Dampiera triloba*

SouthmetroConnect

Date Modified: 28/02/2011

Author: CBB J:\Client_Data\Main_Roads\60100953_Roe_Extension\Workspaces\2011_02_04__Flora_Veg_Report_Maps_Updated\Fig7_Priority_Flora_Locations_2011_02_28.mxd

Table 9 Impact Assessment of Recorded Priority and Significant Flora

Species	Conservation Code	Total number of known populations	Number of known populations within the study area	Number of known populations within project footprint	Percentage of known populations within footprint	Total minimum number of known individuals	Number of known individuals within study area	Number of known individuals within project footprint	Percentage of known individuals to within footprint
Dampiera triloba	P1	21	14	4	19.05%	7,132	6,617	5,404	75.771%
Tetraria sp. Chandala (G.J. Keighery 17055)	P2	3	1	0	0%	3	1	0	0%
Cyathochaeta teretifolia	P3	56	5	3	5.36%	582	482+	38	6.529%
Jacksonia gracillima	P3	20	3	2	10.00%	200	173	15	7.500%
Eryngium pinnatifidum subsp. *palustre*	P3	20	4	4	20.00%	63	45	16	25.396%
Dodonaea hackettiana	P3	56	1	1	1.79%	205	1	1	0.487%
Calothamnus rupestris	P4	48	2	0	0%	8,394	2	0	0%
Eucalyptus caesia	P4	42	1	0	0%	741	1	0	0%

5.1.2.2 Other Flora of Interest

Some flora, although not necessarily of conservation significance, are of interest and can represent important floristic values including:

- new species;
- species occurring outside their previously recorded range;
- species or groups that require taxonomic review;
- regionally significant species that indicate areas of particular importance or values; and
- significant flora of the Perth Metropolitan Region.

5.1.2.2.1 Significant Flora of the Perth Metropolitan Region

One hundred and seventy eight vascular plant taxa (species, subspecies or varieties) of the Swan Coastal Plain are of particular interest as they are locally rare, poorly known, are restricted in distribution or have some other distinctive feature (Government of Western Australia, 2000b). A series of these taxa are protected under the *Wildlife Conservation Act 1950*.

Throughout 2009 and 2010, nine species of significant flora of the Perth Metropolitan Region (PMR) were recorded. The categories of significance considered relevant for each of the significant flora of the PMR recorded within the project area are listed in **Table 10**.

Table 10 Significant Flora of the Perth Metropolitan Region recorded within the Project Area

Species	Conservation Code	Significance Code*
Agonis flexuosa		r,s
Aotus cordifolia		p,s
Chamelaucium uncinatum		r,s
Conostephium minus		s,e
Cyathochaeta teretifolia	P3	p,s
Dodonaea hackettiana	P4	p,s,e
Eryngium pinnatifidum subsp. *palustre* (ms)	P3	p, s
Hibbertia cuneiformis		r,s
Leschenaultia linarioides		p
Melaleuca lanceolata		d,s

Source: Government of Western Australia 2000b.

*r = populations at the northern or southern limit of their known geographic range

s = significant populations (applies to all DRF and Priority taxa)

p = considered to be poorly reserved (applies to all DRF and Priority taxa)

e = taxa endemic to the Swan Coastal Plain

d = populations disjunct from their known geographic range

Although *Chamelaucium uncinatum* is listed as a species of significant flora of the PMR due to being at the limit of its population extent, it is not considered significant in the context of this project because it was recorded from roadside plantings and does not occur naturally in the area. *Melaleuca lanceolata* and *Agonis flexuosa* are also not considered significant for the same reason.

5.1.2.2.2 Species Requiring Taxonomic Review

Four specimens collected from the project area were determined to require further taxonomic assessment to classify them. These include:

- Two complex variants of *Lepidosperma squamatum* (*Lepidosperma squamatum* (complex variant) and *Lepidosperma squamatum* sens. lat.);
- *Lepidosperma pubisquameum* sens. lat.; and
- *Caesia micrantha* sens. lat.

Lepidosperma squamatum (complex variant) was recorded within community CcXpMrS. Identification of this species is continuing and is being carried out by specialist taxonomist, Russell Barrett, who is currently carrying out revision of many of the *Lepidosperma* and Cyperaceae groups, including the *Lepidosperma squamatum* group.

Lepidosperma pubisquameum sens. lat. was collected from communities CcXpDdS and EmXpS and appears to be an undescribed taxon which is currently included in the *Lepidosperma pubisquameum* group.

Lepidosperma squamatum sens. lat. was collected from communities AfBKgS, BXpW and EmXpS and also appears to be an undescribed taxon in the group currently known as *Lepidosperma squamatum*.

Caesia micrantha sens. lat. was collected from communities CcXpMrS and EmXpS and also appears to be an undescribed taxon in the group currently known as *Caesia micrantha*.

Further taxonomic works will be required to fully determine the taxonomic and conservation status of the four aforementioned species of interest.

5.1.2.2.3 Regionally Significant Species

Two species of regional significance were identified during the 2009 and 2010 spring surveys. These species are *Gastrolobium ebracteolatum* and *Ixiolaena viscosa*.

Gastrolobium ebracteolatum is significant because the particular type of damp habitat with which it is associated is rare on the Swan Coastal Plain. There are currently ninety six records of this species housed at the WA Herbarium. This species was collected from two sites (R24 and R29) and two monitoring sites (RW26 and RW28) during the 2009 field assessment and two sites (P2R52 and P2R54) during the 2010 field assessment.

Ixiolaena viscosa occurs in dampland sections of basin wetlands. The presence of *Ixiolaena viscosa* indicates that vegetation within the project area is more intact and in better condition than other wetlands on the Swan Coastal Plain (Bronwen Keighery August 2010 *pers.comm.*). There are currently seventy nine records of this species housed at the WA Herbarium. It was collected from one site (R22) during the 2009 field assessment and one site (P2R55) during the 2010 field assessment.

5.1.3 Introduced Species

Throughout Western Australia, over 1,200 introduced (weed) species have been recognised to date. Specifically within the Swan Coastal Plain Bioregion, a total of 801 weed species are known. Of these, 61% have been classified as Environmental Weeds (EPA, 2007). Environmental Weeds establish in natural ecosystems and adversely modify natural processes, resulting in the decline of the invaded community. Weeds effectively colonise areas where the soil has been disturbed and where there has been clearing and can then rapidly invade surrounding natural sites. Weeds threaten the survival of many flora species because of their rapid growth and ability to out-compete native plants for available nutrients, water, space and sunlight. Proliferation of weeds can also increase the risk of fire.

Under the *Agriculture and Related Resources Protection Act, 1976,* ninety six weed species occurring within WA are listed as Declared Plants (pest weeds). Pursuant to the Act, these species are subject to restrictions on movement or sale and landholders are obliged to carry out control measures to prevent their spread.

5.1.3.1 Desktop Assessment

A number of introduced flora (weed) species exist within the project area. A search of weed species for the Bibra Lake area (National Trust of Australia (WA), 2001) identified three Declared Plants that occur in the area. These species are:

- *Zantedeschia aethiopica* (Arum Lily);
- *Asparagus asparagoides* (Bridal Creeper); and
- *Moraea flaccida* (One-leaf Cape Tulip).

Strategen (2008) identified several major weeds in the Bibra Lake area and surrounds that have the potential to impact on the management of the area. These include:

- **Ficus carica* (Fig);
- **Ricinus communis* (Castor Oil);
- **Schinus terebinthifolius* (Japanese Pepper Tree);
- **Leptospermum laevigatum* (Victorian Tea Tree);
- Bamboo;
- **Typha orientalis* (Bulrush);
- **Eragrostis curvula* (African Love Grass);
- **Ehrharta calycina* (Perennial Veldt Grass);
- **Pennisetum clandestinum* (Kikuyu); and
- **Paspalum urvillei*.

5.1.3.2 Field Assessment

One hundred and thirty eight introduced, non-endemic or planted species were recorded during the field surveys in 2009 and 2010, three of which are listed as Declared Plants by the *Department of Agriculture and Food Western Australia* (DAFWA), pursuant to the *Agriculture and Related Resources Protection Act, 1976* (DAFWA, 2008). The required control measures for the recorded Declared Plants are available on the DAFWA website, www.agric.wa.gov.au and are included in **Appendix C.** The Declared Plants species recorded are as follows:

- **Zantedeschia aethiopica* (Arum Lily)
- **Asparagus asparagoides* (Bridal Creeper); and
- **Moraea flaccida* (One-leaf Cape Tulip).

5.2 Vegetation

5.2.1 Desktop Assessment

5.2.1.1 Threatened and Priority Ecological Communities

Prior to field assessments, a search of the DEC TEC/PEC database was conducted for the project area. This search did not identify the occurrence of any TECs within the project area or nearby, but did identify the occurrence of a Priority Three (P3) PEC (*Low lying Banksia attenuata woodland or shrubland*) which is equivalent to Floristic Community Type (FCT) 21c (Gibson *et al.*, 1994). Based on the DEC search results, the boundary of the P3 PEC intersects the project area. Additionally a Priority 2 (P2) PEC (*Banksia illicifolia woodlands*) was identified approximately 1.7km south-east of the project area (**Figure 6**).

5.2.2 Vegetation Associations and Representation

The project area traverses four vegetation complexes; Bassendean Complex Central and South, Herdsman Complex, Karrakatta Complex Central and South and Cottesloe Complex Central and South. These vegetation complexes are described in **Section 1.4.2** and the regional extent of these is summarised in **Table 11**.

Table 11 Extent of Vegetation Complexes of the Project Area (Government of Western Australia, 2000a)

Vegetation Complex	Pre-European Extent (Area) (ha)	Remaining Area (ha)	% Remaining	Existing Protection (ha)	Total Area within Project Area (ha)
Bassendean Complex Central and South	46,220	10,919	24	2818	199.36
Herdsman Complex	6,509	2,017	31	1,423	36.45
Karrakatta Complex Central and South	34,532	6,275	18	1,941	51.33
Cottesloe Complex Central and South	34,439	12,362	36	5,289	20.16

At another regional scale, four vegetation types have been described within the project area by the Department of Agriculture report, "*Land Use and Vegetation in Western Australia, Technical Report 250* (Beeston *et al.,* 2002). **Table 12**describes these vegetation types and summarises their regional extent.

Table 12 Extent of Regional Vegetation Associations of the Project Area (Beeston *et a*l., 2002)

Vegetation Association	Beard Code	Current Extent (ha)	Pre-European Extent (ha)	Remaining (%)	Description
6	e_2,4Mi	22,168	67,429	32.88	Medium woodland; tuart and jarrah
126	fl	204,323	220,518	92.66	Bare areas; freshwater lakes
998	e_4Mi	17,332	48,946	35.41	Medium woodland; tuart
1001	e_2Mb cbLi	16,758	64,799	25.86	Medium very sparse woodland: jarrah with low woodland; *Banksia* and *Casuarina*.

The vegetation types and extent in Technical Report 250 were identified and assessed using aerial photography and satellite imagery and therefore the figures above are indicative only (Beeston, *et al.*, 2002).

5.2.3 Field Assessment

Vegetation within the project area is predominantly *Banksia* woodland in upland areas, with varying levels of disturbance, and areas of wetland vegetation. A total of thirty eight vegetation communities were recorded during the spring surveys in 2009 and 2010, consisting of twenty four Woodlands, two Shrublands, two Herbland/Sedgelands and ten 'other' classifications of mapped areas (excluding open water, tracks and roads). These communities are presented in **Table 13**. The communities are described below and are spatially presented in **Figures 8.1 –8.12** (within Attachment 1). Qualitative data recorded from individual quadrats is presented in **Appendix D**.

Table 13 Vegetation Communities Recorded within the Project Area

Vegetation Community Code	Vegetation Community Description	Representative Sites/Quadrats
Woodlands		
AfBKgS	Low Woodland of *Allocasuarina fraseriana*, *Banksia menziesii*, *Banksia attenuata* and *Banksia ilicifolia* over a Low Open Shrubland of *Kunzea glabrescens* over an Open Herbland of *Phlebocarya ciliata*, *Dasypogon bromeliifolius* and *Loxocarya cinerea* on grey sand.	R11 RW15, RW16, R47
AfKgS	Open Forest of *Eucalyptus rudis* with occasional *Corymbia calophylla* over Tall Open Scrub of *Agonis flexuosa* with occasional *Kunzea glabrescens* and *Astartea scoparia* over Tall Shrubland of *Melaleuca preissiana* over introduced species.	R59, R72
BAhS	Low Open Woodland of *Banksia attenuata* and *Banksia menziesii* over a Tall Shrubland of *Regelia ciliata* over a Low Shrubland of *Allocasuarina humilis* and *Hibbertia hypericoides* over an Open Sedgeland of *Mesomelaena pseudostygia* on grey sand.	R20, R67
BaNfW	Low Woodland of *Banksia attenuata* and *Nuytsia floribunda* with occasional *Banksia ilicifolia* over a Low Open Shrubland of *Xanthorrhoea preissii* with emergent *Kunzea glabrescens* over an Open Herbland of **Zantedeschia aethiopica* on grey-brown sandy loam.	R15, R55
BaTs	Low Open Woodland of *Banksia attenuata* and *Banksia menziesii* with occasional *Eucalyptus marginata* over an Open -Heath of *Allocasuarina humilis*, *Conostephium minus* and *Eremaea pauciflora* over an Open Grassland/Sedgeland of *Amphipogon turbinatus* and *Mesomelaena pseudostygia* on grey sand.	R13, R69, RW01, RW04
BHhW	Low Open Woodland of *Banksia attenuata* and *Banksia menziesii* with occasional *Eucalyptus marginata* and *Nuytsia floribunda* over a	R05, R06, R07, R50, RW05

Vegetation Community Code	Vegetation Community Description	Representative Sites/Quadrats
	Shrubland of *Allocasuarina humilis and Hibbertia hypericoides* with occasional *Allocasuarina fraseriana* and *Jacksonia furcellata* over a Grassland of **Ehrharta calycina* and *Mesomelaena pseudostygia* on pale brown sand.	
BiSiH	Low Open Woodland of *Banksia ilicifolia* over a Tall Open Shrubland of *Kunzea glabrescens* over an Open Herbland of *Scholtzia involucrata* and **Carpobrotus edulis* on grey sand.	R14, RW20, RW21, RW30
BXpW	Low Open Woodland of *Banksia attenuata* and *Banksia menziesii* with occasional *Eucalyptus marginata* over an Open Heath of *Hibbertia hypericoides* and *Xanthorrhoea preissii* over an Open Sedgeland of *Mesomelaena pseudostygia* on grey sand.	R03, R45, R46, RW12, RW13, RW17
CcAf	Low Open Woodland of *Corymbia calophylla* over a tall shrubland of *Allocasuarina fraseriana* over a Very Open introduced Grassland of **Ehrharta calycina* and **Ehrharta longiflora* in brown sand.	
CcBKgS	Low Open Forest of *Corymbia calophylla*, *Banksia attenuata* and *Banksia ilicifolia* over a Tall Shrubland of *Kunzea glabrescens* over a Low Shrubland of *Xanthorrhoea preissii* with occasional *Macrozamia riedlei* over a Herbland of *Lomandra* sp. and *Dasypogon bromeliifolius* on grey sand.	R10, R25, R48 RW25, RW27, RW31
CcXpDdS	Open Woodland of *Eucalyptus marginata* and *Corymbia calophylla* over a Low Open Shrubland of *Xanthorrhoea preissii*, *Macrozamia riedlei*, *Daviesia divaricata* and *Hibbertia hypericoides* over an Open Grassland of **Ehrharta calycina* on grey sand over yellow sand.	R12, R49, RW06, RW07
CcXpMrS	Woodland to Open Woodland of *Eucalyptus marginata* and *Corymbia calophylla* over an Open to Low Shrubland of *Xanthorrhoea preissii*, *Macrozamia riedlei* and *Hibbertia hypericoides* over an Open Herbland of **Oxalis pes-caprae* and *Sowerbaea laxiflora* over an Open Grassland of **Briza maxima* and **Ehrharta calycina* on brown sandy loam.	R02, R04, R17, R62, R64, RW08, RW09
EgXpS	Open Woodland of *Eucalyptus gomphocephala* and *Eucalyptus marginata* over a Low Open Woodland of *Banksia attenuata* over a Tall Open Shrubland of *Xanthorrhoea preissii* over an Open Sedgeland of *Mesomelaena pseudostygia* on yellow sand.	R18, R60, RW10, RW11
EmApS	Open Woodland to Low Open Woodland of *Eucalyptus marginata* and *Banksia attenuata* over Low Shrubland of *Acacia pulchella*, *Hibbertia hypericoides*, *Macrozamia riedlei and Xanthorrhoea preissii* over **Briza maxima* on yellow sand.	R19, R61
EmBaS	Open Woodland of *Eucalyptus marginata* over a Low Open Woodland of *Banksia attenuata* and *Banksia menziesii* over a Low Open Heath of *Allocasuarina humilis*, *Xanthorrhoea preissii* and *Hibbertia hypericoides* over an Open Sedgeland of *Mesomelaena pseudostygia* in on grey-yellow sand.	R01, R68, RW02, RW03
EmKgS	Low Woodland of *Eucalyptus marginata* with occasional *Corymbia calophylla* and *Banksia menziesii* over a Tall Shrubland of *Kunzea glabrescens* with occasional *Allocasuarina fraseriana* over a Closed Herbland of **Carpobrotus edulis* on grey sand.	R26, R51
EmXpS	Low Open Woodland of *Eucalyptus marginata*, *Banksia attenuata* and *Banksia menziesii* over a Low Open Shrubland of *Xanthorrhoea preissii* with occasional *Banksia sessilis* in degraded areas, on brown-yellow sand.	R21, R63, R65 RW22, RW23
ErCtS	Low Woodland to Open Forest of *Eucalyptus rudis*, *Banksia attenuata* and *Melaleuca preissiana* over Low Open Shrubland of *Taxandria linearifolia*, *Gastrolobium ebracteolatum* and *Pteridium esculentum* over Closed Sedgeland of *Cyathochaeta teretifolia* (P3) on brown sandy loam.	R29, R71, RW26, RW29
ErMpAfS	Low Open Forest of *Eucalyptus rudis* and *Melaleuca preissiana* over a	R23, R54

Vegetation Community Code	Vegetation Community Description	Representative Sites/Quadrats
	Tall Open Shrubland of *Astartea fascicularis* and *Kunzea glabrescens* over an Open Shrubland of *Pteridium esculentum* over a Sedgeland of *Lepidosperma* sp. on brown clayey-loam flats.	RW24, RW28
ErMpGeS	Low Open Forest of *Eucalyptus rudis* and *Melaleuca preissiana* with occasional *Banksia attenuata* over a Tall Shrubland of *Gastrolobium ebracteolatum* and *Kunzea glabrescens* over a Low Open Shrubland of *Taxandria linearifolia* over a Sedgeland of *Baumea preissii* subsp. *laxa* on black clay flats.	R24, R52
ErMpH	Open Woodland to Low Open Woodland of *Eucalyptus rudis* and *Melaleuca preissiana* over Open Herbland of **Carpobrotus edulis*,**Zantedeschia aethiopica* and **Oxalis pes-caprae* on grey sand.	R09, R42, RW18
EtKgS	Low Open Woodland of *Eucalyptus todtiana* with occasional *Eucalyptus rudis* over a Tall Open Shrubland of *Kunzea glabrescens* over an Open Herbland of **Carpobrotus edulis* on grey sand.	R16, R43, RW19
MpBaS	Open Forest of *Corymbia calophylla*, *Eucalyptus rudis* and *Banksia littoralis* over a Tall Shrubland of *Melaleuca preissiana* and *Kunzea glabrescens* with occasional *Melaleuca rhaphiophylla* over a Closed Sedgeland of *Baumea articulata* fringing wetlands on brown sandy loam.	R28, R57
MpKgS	Low Open Woodland of *Melaleuca preissiana* and occasional *Eucalyptus rudis* over a Closed Tall Scrub of *Kunzea glabrescens* over occasional *Lepidosperma* sp. over an Open Herbland of **Zantedeschia aethiopica* over **Aira caryophyllea* and **Gallium murale* on brown sandy-loam flats.	R22, R53, RW14
BaBmBi	Low Woodland of *Banksia attenuata*, *Banksia menziesii* and *Banksia ilicifolia* with occasional *Nuytsia floribunda*, *Allocasuarina fraseriana*, *Melaleuca preissiana* and *Eucalyptus marginata* over a Shrubland dominated by *Xanthorrhoea preissii*, *Melaleuca thymoides* and *Acacia pulchella* over a Low Shrubland of *Patersonia occidentalis*, *Platysace compressa*, *Dasypogon bromeliifolius* and *Bossiaea eriocarpa* on grey sand.	R33, R70
Shrublands		
LlHpS	Low Shrubland of **Leptospermum laevigatum* and *Hakea prostrata* over a mixed Grassland/Herbland of introduced species in association with disturbed roadside areas.	R77
JfKgE	Tall Open Scrub of *Jacksonia furcellata* and *Kunzea glabrescens* over introduced grasses including **Ehrharta longiflora*, **Ehrharta calycina* and **Briza maxima* in disturbed roadside areas.	R30, R66
Herbland/Sedgeland		
TBS	Closed Sedgeland of **Typha orientalis*, *Baumea vaginalis* and *Baumea articulata* on brown sandy loam.	R27, R58
T1	Herbland of **Typha orientalis* with scattered *Juncus pallidus* surrounded by fringing wetland vegetation comprising of but not limited to *Melaleuca teretifolia*, *Eucalyptus camaldulensis*, *Melaleuca rhaphiophylla* and *Corymbia calophylla* on grey sand.	R38, R56
Other Areas		
R1	Tall Open Shrubland of *Regelia ciliata*, *Stirlingia latifolia*, *Allocasuarina humilis* and *Adenanthos cygnorum* over introduced grasses and weeds within on rehabilitated road batters.	R34, R73
R2	Planted Low Open Woodland of #*Eucalyptus conferruminata*, #*Eucalyptus erythrocorys* and #*Eucalyptus platypus* with scattered *Corymbia calophylla* and *Eucalyptus marginata* over a Tall Open Shrubland of #*Melaleuca nesophila*, **Acacia iteaphylla*, *Jacksonia furcellata* and #*Callistemon phoeniceus* with scattered **Callitris* sp. and occasional	R32

Vegetation Community Code	Vegetation Community Description	Representative Sites/Quadrats
	thickets of **Leptospermum laevigatum* over introduced grasses dominated by **Cynodon dactylon*, **Ehrharta calycina* and **Eragrostis curvula* on brown sand.	
R3	Planted Open Heath to Tall Open Shrubland dominated by *#Calothamnus rupestris* with changing dominance alternating between *Acacia cochlearis*, *Acacia saligna* (narrow form) and scattered **Corymbia maculata*; and *#Chamelaucium uncinatum* over introduced grasses dominated by **Ehrharta calycina* and **Eragrostis curvula* in association with rehabilitated road batters.	R35
R5	Rehabilitated area consisting of *#Adenanthos cuneatus*, *#Melaleuca nesophila, #Chamelaucium uncinatum* and *Melaleuca systena* in yellow sands.	
Pa1	Cleared parkland consisting mainly of **Araucaria heterophylla*, *Eucalyptus gomphocephala*, *Melaleuca viminea*, *Xanthorrhoea preissii*, *#Melaleuca nesophila* and *#Callistemon phoeniceus* over grasses dominated mainly by **Cynodon dactylon* and **Pennisetum clandestinum*.	R31
Pa2	Cleared parkland comprising of but not limited to *Melaleuca preissiana*, *#Eucalyptus camaldulensis*, *Corymbia calophylla* and *Xanthorrhoea preissii* over introduced grasses dominated by **Pennisetum clandestinum*, **Cynodon dactylon* and **Eragrostis curvula*.	R37
Pa3	Cleared areas comprising of but not limited to *Eucalyptus marginata*, *#Eucalyptus camaldulensis*, *#Eucalyptus macrocarpa* subsp. *macrocarpa*, *Corymbia calophylla*, *Acacia saligna* and *#Callistemon phoeniceus* over an Open Grassland dominated by **Eragrostis curvula* and **Ehrharta calycina* on grey sand.	R39
Pa4	Pasture community dominated by **Cynodon dactylon* and **Pennisetum clandestinum* with scattered *Melaleuca preissiana* and *Corymbia calophylla* on grey sand.	R40
Pa5	Cleared parkland of **Cynodon dactylon* and **Pennisetum clandestinum* with road edges comprising of but not limited to *Corymbia calophylla*, *#Eucalyptus conferruminata* and, *#Eucalyptus platypus* on grey sand.	R41, R74
Pa6	Cleared areas comprising of, but not limited to *Corymbia citriodora, Eucalyptus platypus, Eucalyptus erythrocorys, Agonis flexuosa, Callistemon phoeniceus, Melaleuca rhaphiophylla, Melaleuca preissiana, Corymbia calophylla, Corymbia ficifolia, Melaleuca nesophila, Callitris* sp. over an introduced grassland dominated by *Cynodon dactylon* and *Ehrharta calycina.*	R76
Pa7	Parkland of *Corymbia calophylla* and *Corymbia citriodora* over a lawn of introduced grasses.	R75

* denotes introduced (weed) species

# denotes non-locally native species, often planted

5.2.4 Vegetation Condition

The condition of the vegetation within the project area ranges from 'Very Good' to 'Completely Degraded'. The majority of the project area was recorded to be in 'Degraded to Completely Degraded' condition. The proportion of varying vegetation condition is presented in **Table 14**.

Table 14 Proportion of Varying Vegetation Condition

Condition Rating	Area (Ha)	% Total Area Surveyed
Very Good	3.5	1
Good to Very Good	20.25	8
Good	44.88	18
Degraded to Good	44.66	18
Degraded	23.93	10
Degraded to Completely Degraded	57.61	23
Completely Degraded	55.50	22
TOTAL	250.33	100

Vegetation condition of the project area has been mapped spatially and is presented in **Figures 8.1** to **8.12** (within **Attachment 1**).

5.3 Wetlands, Bush Forever Sites and Other Environmentally Sensitive Areas

Six wetlands and an associated ESA occur within the project area. The following vegetation communities have been mapped within the boundaries of these areas: AfBKgS, AfKgS, BHhW, BiSiH, CcBKgS, EmBaS, EmKgS, ErCtS, ErMpAfS, ErMpGeS, ErMpH and MpKgS.

Descriptions of these vegetation communities are included in **Table 13**. Further information on the wetlands that occur in the project area is included in **Section 1.4.4 Table 4** and **Figure 5**.

The condition of the vegetation within these wetland areas ranges from 'Completely Degraded' to 'Very Good'. The vegetation associated with Horse Paddock Swamp is in 'Completely Degraded' condition. The areas of 'Very Good' condition are within the area of Roe Swamp and associated wetlands. The fringing vegetation of Bibra Lake ranges in condition from 'Degraded to Good' to 'Completely Degraded'.

The majority of the project area between Progress and Bibra Drives lies within Bush Forever site 244 (*North Lake and Bibra Lake*). Bush Forever (2000) describes the condition of the vegetation associated with North Lake as being >60% Very Good to Excellent and >30% as Good to Degraded, with areas of severe localised disturbance.

The condition of the vegetation associated with Bibra Lake is described as >20% Good to Very Good and <80% Degraded, with areas of severe localised disturbance.

The condition of vegetation mapped within Bush Forever site 244 during the 2009 field survey ranges from 'Very Good' to 'Completely Degraded'. Areas mapped as 'Degraded to Completely Degraded' make up 20% of this area, followed by 'Completely Degraded' (18%) and 'Very Good to Good' (17%).

5.4 Dieback

Glevan Consulting carried out a detailed *Phytophthora* dieback assessment of the project area during spring 2009. A detailed field interpretation was carried out that assessed the visible evidence of dieback infestations, based primarily on vegetation health. Nine soil and tissue samples were taken from locations where dieback infection was suspected, within *Banksia* Woodland and from those species known to most reliably indicate the presence of the pathogen. These were then laboratory tested for the presence of *Phytophthora cinnamomi.* All of the samples returned a negative result for *Phytophthora cinnamomi* dieback and the results of the project area wide assessment are presented in **Table 15**. Of the total area surveyed, the majority was determined to be uninterpretable. Further details are available in Glevan (2010).

Table 15 Results of *P. cinnamomi* Assessment within Project Area

Dieback Category	Area (Ha)	% of Total Area Surveyed (Ha)
Infested (confirmed from analysed samples)	0	0
Uninterpretable	144.5	54.0
Uninfested (*P. cinnamomi* free)	42.5	15.9
Unmappable	80.5	30.1
Total Area	**267.5**	**100**

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6.0 Discussion

6.1 Flora

A total of 435 species from 244 genera and 80 families were recorded within the study area. Families with the highest representation are Myrtaceae, Fabaceae, Poaceae and Asteraceae, a floristic composition typical for the Swan Coastal Plain. A total of 108 sites were sampled during the 2009 and 2010 assessments. These sites included non-permanent quadrats used to characterise vegetation communities, permanent monitoring quadrats and opportunistic vegetation description sites.

The Level 2 floristic assessments were conducted between September and November of 2009 and 2010. The timing of the survey was in accordance with the optimal timing prescribed by EPA Guidance Statement No. 51, *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia*, which specifies that flora and vegetation surveys should be conducted in the main flowering season, following rain.

6.1.1 Declared Rare, Priority or Other Significant Flora

The search of DEC's Declared Rare and Priority Flora database identified the potential for five DRF and thirteen Priority Flora species to potentially occur within the project area (**Table 8**). Of these species, only *Jacksonia gracillima* (P3) and *Dodonaea hackettiana* (P4) were recorded during the field assessment.

Based on preferred habitat and soil types, along with previously recorded locations for the flora outlined in **Table 8**, the desktop study determined that there is the potential for an additional eight of these species to occur within the project area. These species not recorded in the 2009 or 2010 surveys, are as follows:

- *Caladenia huegelii* (DRF);
- *Drakaea elastica* (DRF);
- *Lepidosperma rostratum* (DRF);
- *Acacia lasiocarpa* var. *bracteolata* long peduncle variant (GJ Keighery 5026) (P1);
- *Byblis gigantea* (P2);
- *Stylidium longitubum* (P4);
- *Microtis quadrata* (P4); and
- *Jacksonia sericea* (P4).

Caladenia huegelii (DRF) is a tuberous perennial herb, with green, cream and red flowers that appear from September to October. Several populations of this species exist within the region, and suitable habitat of grey sands in *Banksia* woodland occurs within the project area. As such, the project area was extensively searched in 2009 (see **Section 3.1.4**) and 2010, during the peak flowering period when this species is at its most conspicuous. No *Caladenia huegelii* individuals or populations were recorded during spring 2009 or 2010, however six common *Caladenia* species were recorded, indicating that suitable *Caladenia* habitat occurs within the project area.

Drakaea elastica (DRF) is a tuberous, perennial herb, 0.12 – 0.3m high. The distinctive green glossy leaf emerges from May, and flowering occurs from October to November. *Drakaea elastica* grows in deep sandy soils in low-lying areas alongside winter wet swamps, typically in *Banksia* woodland or *Kunzea glabrescens* thicket vegetation (DEC, 2008). Within this habitat type it is restricted to areas that support a species of fungus, essential to the germination and survival of the orchid. These areas are typically open areas with bare sand within otherwise dense vegetation (DEC, 2008). The project area was extensively searched for this species (see **Section 2.4**) as suitable habitat does occur. No *Drakaea elastica* were recorded during spring 2009 or 2010. Although areas of suitable habitat are present, some of these areas are very disturbed. For example, bare sand lenses where *Drakaea elastica* is likely to occur are commonly covered with grassy weeds and there are also extensive diggings and disturbance caused by rabbits. throughout the site.

Lepidosperma rostratum (DRF) is a rhizomatous, tufted perennial, grass-like herb (sedge) to 0.5 metres tall. It is known from four populations in the east of the Perth Metropolitan Area (DEWHA, 2008). *Lepidosperma rostratum* is associated with *Banksia telmatiaea* and *Calothamnus hirsutus* and grows in sandy soil among low heath in winter-wet swamps (DEWHA, 2008). This species is small and inconspicuous and could possibly have been overlooked during the survey; however the majority of herbarium records indicate that this species prefers areas in the Guildford Association soil type, which does not occur in the project area. A site that supports a population of *Lepidosperma rostratum* at Brixton Street Wetlands was inspected by the project team and it was evident that the project area provides a significantly different habitat to this area. Additionally, the project area does not support the species it is often associated with.

Acacia lasiocarpa var. *bracteolata* long peduncle variant (P1) is a shrub 0.4 – 1.5 metres high. It occurs on grey or black sand over clay in swampy areas and winter wet lowlands. Being a shrub, this species if present in the project area, would have been easily observed and recognisable during the field assessment, although was not recorded during 2009 or 2010. *Byblis gigantea* (P3) is a small, branched, perennial herb to 0.45 metres high. It flowers from September to January and occurs in sandy, peat swamps and seasonally wet areas. With distinctive pink, purple or white flowers, this species, if present in the project area would have been easily observed and recognisable during the field assessment, although was not recorded during 2009 or 2010. *Stylidium longitubum* (P3) is an erect, annual herb from 0.05 – 0.12 metres high. It flowers from October to December and occurs in sandy clay, clay and seasonal wetland habitats. It was not recorded in the 2009 or 2010 surveys.

Microtis quadrata (P4) is a cream flowered herb to 0.4m high. This species may have been inconspicuous at the time of the survey and not observed. It was not recorded in the 2009 or 2010 surveys.

Jacksonia sericea (P4) is a low spreading shrub to 0.6 metres high. Flowers are orange and appear from December to February. This species generally occurs in calcareous and sandy soils. Due to the summer flowering period of this species, it may have been less easily recognisable at the time of the survey. Summer monitoring of quadrats did not record this species ,and surveys conducted during 2010 did not record this species.

Of the 435 species recorded during the field assessment, eight are listed as Priority Flora and are as follows:

- *Dampiera triloba* (P1);
- *Tetraria* sp. Chandala (G.J.Keighery 17055) (P2);
- *Cyathochaeta teretifolia* (P3);
- *Jacksonia gracillima* (P3);
- *Eryngium pinnatifidum* subsp. *palustre* (ms) (P3);
- *Dodonaea hackettiana* (P4);
- *Calothamnus rupestris* (P4); and
- *Eucalyptus caesia* (P4).

Excluding the planted priority species; *Calothamnus rupestris* (P4) and *Eucalyptus caesia* (P4), and excluding *Tetraria* sp. Chandala (G.J.Keighery 17055) (P2), it is anticipated that one population of each of the above listed Priority Flora species recorded within the project area occurs within the proposed footprint and therefore will be impacted as a direct result of the project (**Table 9**).

All of the Priority Flora species recorded within the project area have known occurrences outside of the project area. Large numbers of individual plants were identified for *Dampiera triloba, Cyathochaeta teretifolia* and *Jacksonia gracillima* within the study area. These high numbers have resulted from targeted surveys conducted at a fine scale. These results therefore indicate that a high proportion of the known individuals will be impacted. Although this is likely to be a product of varying levels of detail used for comparable studies that have recorded other known populations in the region.

Calothamnus rupestris (P4) is not considered to be of conservation significance in the context of this project as it was recorded from roadside plantings and does not occur naturally in the area. The lateritic soils that typically support this species do not occur in the project area.

Eucalyptus caesia (P4) is not considered to be of conservation significance in the context of this project as it does not occur naturally in the project area and has been planted for roadside amenity purposes.

In addition to the eight Priority Flora recorded during the field assessment, other flora of interest were also recorded. Nine species of Significant Flora of the PMR (**Section 4.1.2.2.1**) were recorded from the project area, some of which are also Priority Flora and are as follows:

- *Agonis flexuosa;*
- *Aotus cordifolia*
- *Chamelaucium uncinatum;*
- *Conostephium minus;*
- *Cyathochaeta teretifolia* (P3);
- *Dodonaea hackettiana* (P4);
- *Eryngium pinnatifidum* subsp. *palustre* ms(P3);
- *Hibbertia cuneiformis;*
- *Leschenaultia linarioides*; and
- *Melaleuca lanceolata*.

Although *Conostephium minus* has had its conservation status revised since the publication of Bush Forever (Government of Western Australia, 2000b), it is considered significant in the context of this project as it is located at the southern limit of its range within the project area and is endemic to the Swan Coastal Plain.

Aotus cordifolia was formerly listed as P3. It has recently had its conservation significance revised and was removed from the Priority Flora list during 2010. There are currently 47 records of this species at the WA Herbarium and this species is widely distributed within the study area, particularly adjacent to Roe Swamp. *Hibbertia cuneiformis* is considered significant in the context of this project as populations for this species are at the northern limit of their known geographic range.

Leschenaultia linarioides is considered significant in the context of this project as populations of this species are considered to be poorly reserved.

Agonis flexuosa, *Chamelaucium uncinatum* and *Melaleuca lanceolata* are not considered significant in the context of this project as they were recorded from roadside and amenity plantings.

Four specimens requiring further taxonomic work were recorded from the project area. They are as follows:

- *Lepidosperma squamatum* (complex variant);
- *Lepidosperma squamatum* sens. lat.;
- *Lepidosperma pubisquameum* sens. lat.; and
- *Caesia micrantha* sens. lat.

Further taxonomic work is required to determine the classification of these species, however they have been included here as their conservation status is unable to be determined at this stage.

Two regionally significant species were recorded from the project area:

- *Gastrolobium ebracteolatum*; and
- *Ixiolaena viscosa.*

These species are considered significant as their habitats are restricted and becoming rare in the region (**Section 4.1.2.2.3**).

6.1.2 Introduced Flora (Weeds)

One hundred and thirty eight weed or non-endemic species were recorded within the project area, of which, three are listed as Declared Plants by DAFWA. Landholders are obliged to carry out specific control measures to prevent the spread of these weeds (Declared Plants). The recommendations for each of these species recorded are provided on the DAFWA website and as **Appendix C**.

Weed invasion is relatively high throughout the project area due to the urban nature of the site, with several entry points which allow weeds to establish, such as walking trails, road reserves and drainage channels (Conservation

Commission, 2001). The past land use of the site and surrounds, which have included grazing and market gardens have also contributed to the presence of weeds at the site (Conservation Commission, 2001). Additionally, there are a number of non-endemic species, the presence of which is due to the area being highly developed, with a number of revegetated roadsides and recreational areas.

6.2 Vegetation

Vegetation within the project area is predominantly *Banksia* woodland and some areas of wetland vegetation. A total of thirty eight vegetation communities were recorded during the spring surveys in 2009 and 2010, consisting of twenty four Woodlands, two Shrublands, two Herbland/Sedgelands and ten 'other' classifications of mapped areas (excluding water, tracks and roads).

6.2.1 Threatened and Priority Ecological Communities

6.2.1.1 Known TECs and PECs

Prior to field assessments, a search of the DEC TEC/PEC database was conducted for the project area. This search did not identify the occurrence of any TECs within the project area or nearby, but did identify the nearby occurrence of a Priority 3 (P3) PEC, Low lying *Banksia attenuata* woodland or shrubland, which is equivalent to FCT21c (Gibson, *et. al.,* 1994). Based on the DEC search results, the boundary of the P3 PEC intersects the project area. Additionally a known occurrence of a P2 PEC, *Banksia ilicifolia* woodlands, is in close proximity to the project area (**Figure 6**).

The P3 PEC, Low lying *Banksia attenuata* woodland or shrubland, occurs sporadically between Gingin and Bunbury and is largely restricted to the Bassendean system. The type tends to occupy lower lying wetter sites and is variously dominated by Moonah (*Melaleuca preissiana*), Slender Banksia (*Banksia attenuata*), Firewood Banksia (*Banksia menziesii*), *Regelia ciliata*, Jarrah (*Eucalyptus marginata*) or Marri (*Corymbia calophylla*). Structurally, this community type may be either a woodland or occasionally a shrubland (DEC 2010).

The P2 PEC *Banksia ilicifolia* woodlands occur on the Bassendean and Spearwood systems in the central Swan Coastal Plain north of Rockingham. This community typically has a very open understorey and sites are likely to be seasonally waterlogged (DEC 2010).

The buffers of DEC's PEC point data are sized such that the radius extends to the furthest point of the community, to ensure that the buffer area encompasses at least the entire extent of the PEC. Therefore, occasionally buffers may extend across vegetation community boundaries into communities that do not represent PEC vegetation. Therefore, in terms of proposed impacts on areas of PEC vegetation, it is important to accurately ground truth the boundaries of vegetation classifications and relate these to PEC equivalence. Furthermore, protection buffers should also be delineated for the PEC boundary.

The detailed field assessments during spring 2009 and 2010 represent a detailed ground-truthing exercise and have characterised vegetation such that PEC equivalence can be determined. The primary tool for classification of TECs and PECs on the Swan Coastal Plain is by assigning a FCT as classified by Gibson *et. al.*,(1994). Gibson *et. al.,* (1994) is widely recognised in Western Australia as the benchmark study that has defined broad vegetation types (FCTs) across the Swan Coastal Plain. The data and information in the publication forms the basis of all vegetation assessments in the region. Although the publication is now seventeen years old, no other more recent comprehensive study exists and this publication therefore remains the primary reference. The methodology is considered to be rigorous and reproducible if used correctly and DEC continue to utilise it for determining floristic communities of the Swan Coastal Plain.

The species composition of the intact vegetation communities recorded within the project area were analysed and compared to the Gibson *et. al.*, (1994) dataset and from this, FCTs have been inferred. Vegetation communities AfKgS, JfKgE, LlHpS, TBS, R1, R2, R3, R4,T1, P1, P2, P3, P4 and P5 have not been included in this analysis as they were found to be too degraded, or lacked sufficient native species for statistical comparison.

FCTs supported by the project area are:

- 23a Central *Banksia attenuata – Banksia menziesii* woodlands;
- 21a Central *Banksia attenuata – Eucalyptus marginata* woodlands;
- 28 Spearwood *Banksia attenuata* or *Banksia attenuata – Eucalyptus* woodlands;
- 11 Wet forests and woodlands; and
- 4 *Melaleuca preissiana* damplands.

All of these FCTs are documented to be 'Well Reserved' and at 'Low Risk' of extinction. A summary of the FCTs inferred for vegetation communities recorded throughout the project area are presented below in **Table 16**. Results of the FCT analysis are presented in **Appendix E**.

Table 16 Inferred FCTs supported by the Project Area

Vegetation Community	Floristic Community Type (FCT)	Reservation Status	Conservation Status	TEC/PEC Status
AfBKgS	21a	Well Reserved	Low Risk	None
BaBmBi	23a	Well Reserved	Low Risk	None
BAhS	28	Well Reserved	Low Risk	None
BaNfW	21a	Well Reserved	Low Risk	None
BaTs	21a	Well Reserved	Low Risk	None
BHhW	28	Well Reserved	Low Risk	None
BiSiH	23a	Well Reserved	Low Risk	None
BXpW	28	Well Reserved	Low Risk	None
CcBKgS	23a	Well Reserved	Low Risk	None
CcXpDdS	28	Well Reserved	Low Risk	None
CcXpMrS	28	Well Reserved	Low Risk	None
EgXpS	28	Well Reserved	Low Risk	None
EmApS	28	Well Reserved	Low Risk	None
EmBaS	28	Well Reserved	Low Risk	None
EmKgS	28	Well Reserved	Low Risk	None
EmXpS	28	Well Reserved	Low Risk	None
ErCtS	11	Well Reserved	Low Risk	None
ErMpAfS	11	Well Reserved	Low Risk	None
ErMpGeS	11	Well Reserved	Low Risk	None
ErMpH	11	Well Reserved	Low Risk	None
EtKgS	23a	Well Reserved	Low Risk	None
MpBaS	11	Well Reserved	Low Risk	None
MpKgS	4	Well Reserved	Low Risk	None

Consultation with DEC in 2010 indicates that there are twenty one PECs on the Swan Coastal Plain. In order to determine which of the mapped and described communities within the project area may be characterised or considered equivalent to the P3 or P2 PECs, information including specific boundaries and distributional extent of PECs on the Swan Coastal Plain, as well as their species composition, soil types and position in the landscape were considered. Where appropriate, Senior Ecologist Jill Pryde from DEC was also consulted during this assessment. From this assessment , it was determined that none of the vegetation communities recorded within the project area is considered to be equivalent to any PECs under the DEC listings.

None of the vegetation communities recorded within the project area have been determined to be equivalent to State TECs under the DEC listings or Commonwealth TECs protected under the *EPBC Act*. Although determination of the FCT relevant to each vegetation community recorded (**Table 16**) did not determine that any PECs are supported by the project area, desktop results for PEC occurrences nearby prompted assessment with a higher degree of scrutiny.

6.2.2 Vegetation Condition

The project area has historically been cleared for urban based activities and market gardens, although there is remnant native vegetation within the project area, particularly in association with the local wetlands (Conservation Commission, 2001). The recreational aspect of the parklands and associated wetlands has contributed to disturbance of the project area and as a result, the majority of the project area has been found to be in 'Degraded to Completely Degraded' condition. However more than 20% of the vegetation has been recorded to be in 'Good' condition with almost 10% of the areas surveyed recorded in better ('Very Good' or 'Good to Very Good') condition.

6.2.3 Vegetation Representation

A range of factors including isolation, supporting significant flora or fauna and unusual landform types determine the significance of native vegetation communities. However, the most important factor in consideration of community significance (not including formal conservation significance) is the degree of representation in the local and regional area. That is, vegetation communities are considered significant if they are poorly represented elsewhere.

The EPA's Position Statement No. 2 lays out a series of constraints which relate to biodiversity. One of them is to protect at least 30% of the original extent of vegetation complexes in unconstrained areas and 10% in constrained areas such as urban zoned regions in accordance with the principles of Bush Forever (Government of Western Australia 2000a).

The project area is considered a constrained area due to its urban zoning and the minimum 10% retention target therefore applies. Vegetation types identified by Beeston *et al*., (2002) within the project area meet the 10% retention target (**Table 11**).

Determining vegetation representation on a local level was carried out for this project by assessing the proportionate extent of each recorded community within the surveyed area. Based on this assessment , it is considered that ten vegetation communities; AfBKgS, BAhS, BaBmBi, BaNfW, BiSiH, EmBaS, ErMpAfS, ErMpGeS, EtKgS and MpKgS may be considered significant due to limited representation (by area) within the local context. Representation of less than 1% of the total surveyed area has been considered to define limited representation within the local context.

Vegetation communities AfKgS, JfKgE, and TBS have not been included in this assessment as they represent degraded variants of their relative original intact native communities. Additionally, 'other' classifications of mapped areas, namely P1, P2, P3, P4, P5, P6, P7, R1, R2, R3, T1 and 'Water' have also not been included in this assessment as they are not intact native vegetation assemblages and consist of rehabilitation, cleared or degraded areas and open water bodies.

Table 17 Proportion of Vegetation Communities within the Project Area

Community	Hectares	% Total Survey Area
AfBKgS	1.02	0.41
AfKgS	0.65	0.26
BAhS	2.05	0.82
BHhW	15.12	6.04
BXpW	15.15	6.05
BaBmBi	1.93	0.77
BaNfW	0.36	0.15
BaTs	22.87	9.14
BiSiH	2.51	1
CcBKgS	4.45	1.78

Community	Hectares	% Total Survey Area
CcXpDdS	9.31	3.72
CcXpMrS	29.62	11.83
EgXpS	21.54	8.60
EmApS	7.89	3.15
EmBaS	1.76	0.70
EmKgS	3.18	1.27
EmXpS	6.87	2.74
ErCtS	2.53	1.01
ErMpAfS	2.45	0.98
ErMpGeS	0.76	0.30
ErMpH	12.77	5.10
EtKgS	0.81	0.32
JfKgE	2.41	0.96
LlHpS	2.81	1.12
MpBaS	4.98	1.99
MpKgS	1.53	0.61
Pa1	0.88	0.35
Pa2	3.21	1.28
Pa3	24.75	9.89
Pa4	0.43	0.17
Pa5	5.13	2.05
Pa6	0.14	0.06
Pa7	0.13	0.05
R1	23.65	9.45
R2	2.51	1
R3	1.24	0.49
T1	6.49	2.59
TBS	1.66	0.66
Water	2.77	1.11
Total	250.33	100

6.2.4 Vegetation Supporting Significant Flora

Eighteen communities mapped during the 2009 spring surveys are considered locally significant because they support populations of Priority flora, regionally significant species and significant flora of the PMR. These communities are AfBKgS, BaTs, BHhW, BiSiH, BXpW, CcBKgS, CcXpMrS, EgXpS, EmApS, EmKgS, EmXpS, ErCtS, ErMpAfS, ErMpGeS, ErMpH, EtKgS and MpKgS and the significant flora they support are listed in **Table 17**.

Vegetation Communities AfKgS and JfKgE have not been included in this assessment as they represent degraded variants of their relative original intact native communities. Additionally, communities Pa2, P5, R2, R3 and R4 have also not been included in this assessment as they are not intact native vegetation assemblages and comprise mainly rehabilitated and cleared degraded areas.

Table 18 Locally Significant Vegetation Communities within Project Area

Vegetation Community	Significant Flora Populations Supported	Significance
AfBKgS	*Conostephium minus* *Jacksonia gracillima* (P3)	Priority Flora under DEC Listings Significant flora for PMR
AfKgS^	*Agonis flexuosa*	Significant flora for PMR
BaTs	*Chamelaucium uncinatum* *Conostephium minus*	Significant flora for PMR
BHhW	*Chamelaucium uncinatum* *Conostephium minus*	Significant flora for PMR
BiSiH	*Jacksonia gracillima* (P3)	Priority Flora under DEC Listings
BXpW	*Jacksonia gracillima* (P3)	Priority Flora under DEC Listings
CcBKgS	*Jacksonia gracillima* (P3) *Conostephium minus* *Cyathochaeta teretifolia* (P3) *Dampiera triloba* (P1)	Priority Flora under DEC Listings Significant flora for PMR
CcXpMrS	*Tetraria* sp. Chandala (G.J.Keighery 17055) (P2) *Chamelaucium uncinatum* *Eryngium pinnatifidum* subsp. *palustre* ms (P3)	Priority Flora under DEC Listings Significant flora for PMR
EgXpS	*Eryngium pinnatifidum* subsp. *palustre* ms (P3) *Dodonaea hackettiana* (P4) *Jacksonia gracillima* (P3) *Leschenaultia linarioides*	Priority Flora under DEC Listings Significant flora for PMR
EmApS	*Eryngium pinnatifidum* subsp. *palustre* ms (P3)	Priority Flora under DEC Listing
EmKgS	*Hibbertia cuneiformis*	Significant flora for PMR
EmXpS	*Eryngium pinnatifidum* subsp. *palustre* (P3) *Chamelaucium uncinatum*	Priority Flora under DEC Listing Significant flora for PMR
ErCtS	*Dampiera triloba* (P1) *Cyathochaeta teretifolia* (P3) *Gastrolobium ebracteolatum* (regionally significant species) *Jacksonia gracillima* (P3)	Priority Flora under DEC Listings Regionally significant species
ErMpAfS	*Dampiera triloba* (P1) *Cyathochaeta teretifolia* (P3) *Gastrolobium ebracteolatum* (regionally significant species) *Jacksonia gracillima* (P3)	Priority Flora under DEC Listings Regionally significant species
ErMpGeS	*Cyathochaeta teretifolia* (P3) *Gastrolobium ebracteolatum* (regionally significant species) *Dampiera triloba* (P1) *Jacksonia gracillima* (P3)	Priority Flora under DEC Listings Regionally significant species
ErMpH	*Hibbertia cuneiformis*	Significant flora for PMR
EtKgS	*Hibbertia cuneiformis*	Significant flora for PMR
JfKgE^	*Agonis flexuosa* *Chamelaucium uncinatum*	Significant flora for PMR
MpBaS	*Cyathochaeta teretifolia* (P3) *Dampiera triloba* (P1) *Jacksonia gracillima* (P3)	Priority Flora under DEC Listings
MpKgS	*Ixiolaena viscosa* (regionally significant species) *Dampiera triloba* (P1)	Priority Flora under DEC Listings Regionally significant species
Pa2^	*Agonis flexuosa*	Significant flora for PMR
Pa5^	*Agonis flexuosa*	Significant flora for PMR
R2^	*Agonis flexuosa* *Melaleuca lanceolata*	Significant flora for PMR
R3^	*Chamelaucium uncinatum*	Significant flora for PMR
R5^	*Chamelaucium uncinatum*	Significant flora for PMR

^ Denotes vegetation communities that are not considered locally significant in the context of this project as they either represent degraded variants, or comprise mainly of rehabilitated and cleared areas.

6.3 Wetlands, Bush Forever Sites and Other Environmentally Significant Areas

Vegetation communities can be considered significant due to other factors that are not necessarily related to TEC or PEC status. Some of the vegetation within the project area, particularly that associated with Bibra Lake, Roe Swamp and surrounding sumplands (UFIs 14425 and 15240), Roe Swamp and Horse Paddock Swamp is located within an Environmentally Sensitive Area (ESA).

ESAs are areas that require special protection due to landscape, wildlife or historical value (Naturenet 2010). ESAs are based on the Western Australian Environmental Protection (Environmentally Sensitive Areas) Notice, 2005 which was gazetted on 8 April 2005. Exceptions offered for clearing under Regulation 5 of the Environmental Protection (Clearing of Native Vegetation) Regulations 2004 do not apply within ESAs.

ESAs are selected for their environmental values at State or National level and include:

- Declared World Heritage properties as defined in section 13 of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*;
- areas included on the Register of the National Estate;
- defined wetlands as per definition on the Western Australian Environmental Protection (Environmentally Sensitive Areas) Notice, 2005 and the area within 50m of the wetland (wetland buffer);
- vegetation within 50m of rare flora;
- Threatened Ecological Communities;
- Bush Forever sites;
- areas covered by:
    - the *Environmental Protection (Gnangara Mound Crown Land) Policy 1992*;
    - the *Environmental Protection (Western Swamp Tortoise) Policy 2002*;
- areas covered by the lakes to which the *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992* applies; and
- areas fringing native vegetation in the policy area as defined in the *Environmental Protection (Swan and Canning Rivers) Policy 1998*.

The conservation values of the project area have been recognised through its inclusion in Bush Forever Site 244 – *North Lake and Bibra Lake and Beeliar Regional Park*. Additionally, North and Bibra Lake are included in the National Trust's List of Classified Heritage places, and Beeliar Regional Park is included on the Interim List of the Register of the National Estate.

The Bush Forever Strategy is a ten year strategic plan which formally commenced in 2000 to protect around 51,200 ha of regionally significant bushland within around 290 Bush Forever Sites, representing, where achievable, a target of at least 10 per cent of each of the original 26 vegetation complexes of the Swan Coastal Plain portion of the Perth Metropolitan Region (Government of Western Australia, 2000a).

It is an EPA objective to ensure that regionally significant flora and vegetation communities within Bush Forever sites are adequately protected. However, the Bush Forever Site Implementation Guidelines and Practice Notes recognise that the primary purpose of road reserves identified in the MRS or local Town Planning Schemes is to accommodate vital transport infrastructure, and that the construction authority has the right to undertake the required works for transport and associated infrastructure. Approximately 30.41 hectares (7.56%) of the mapped extent of Bush Forever Site 244 lies inside the MRS road reserve.

Bush Forever Site 244 provides habitat for various birds, including migratory waterbirds and is part of a system of regional ecological linkages. The defined wetlands within the project area (i.e. Horse Paddock Swamp, Roe Swamp and surrounding sumpland and Bibra Lake), as well as sections of the project area between Progress Drive and Bibra Drive, are included within Bush Forever Site 244 and are therefore listed as an ESA.

There are 16 vegetation communities within the project area that are located entirely or almost entirely within ESAs, and have not been mapped outside this extent as part of the project. These communities are therefore considered significant in the local context and are as follows:

- AfBKgS;
- AfKgS;
- BaNfW;
- BiSiH;
- BXpW;
- CcBKgS;
- ErCtS;
- ErMpAfS;
- ErMpGeS;
- ErMpH;
- EtKgS;
- T1;
- MpKgS;
- Pa2;
- P4; and
- TBS.

The aforementioned communities and their inferred FCTs are not restricted to the project area and are all represented well elsewhere in the region (i.e. Thomson's Lake Nature Reserve and Adjacent Bushland in Beeliar as well as in Jandakot Airport), and are therefore not considered significant in the regional context.

6.4 Dieback

Dieback is a plant disease caused by soil borne fungus. In Western Australia the most common and destructive species is *Phytophthora cinnamomi*, also known as 'Jarrah Dieback' or 'Dieback'. The pathogen is a microscopic root-rot fungus, which lives in the soil and is easily carried by surface and soil water. In susceptible plant species, infection leads to decline of the canopy and eventually to death of the whole plant. The fungus is spread passively by spores carried in surface and ground water, but may also be spread over long distances through the movement of infected soil on vectors such as vehicles or by bushwalkers or animals.

Plants belonging to the *Proteaceae* and *Ericaceae* families are particularly vulnerable to the effects of Dieback. Impacts are not restricted to native plants, with many horticultural and crop species also affected. The disease occurs discontinuously throughout the south-west of Western Australia and DEC co-ordinates surveys and mapping of its occurrence and spread.

A *Phytophthora cinnamomi* Dieback assessment of the remnant vegetation within the project area was conducted on 12 November 2009 and again on 8 January 2010 by Glevan Consulting. Glevan (2010) identified no infestation of *Phytophthora cinnamomi* Dieback within the project area. The majority of the project has been determined to be either 'unmappable'; due to significant levels of disturbance and a lack of indicator species; or 'uninterpretable' because of the Spearwood Dune association west of Progress Drive. On the Spearwood Dune association, *Phytophthora cinnamomi* typically is not 'expressed' due to the alkaline soils. In simple terms, this means that the pathogen may actually be present within the soil, but it will subsist as an organism, rather than proliferate and manifest as visible disease symptoms (Glevan, 2010). Other areas were also 'uninterpretable' due to the presence of wetlands, where the associated vegetation is naturally void of reliable indicator species. Further details are available in Glevan (2010).

Although no infestations of *Phytophthora cinnamomi* were identified in the project area, other studies have recorded other *Phytophthora* species adjacent to the project area within wetland areas (i.e. inside water bodies) (Evan Brown, July 2010, *pers. comm*.).

7.0 Conclusions and Recommendations for Further Studies

The significant environmental values recorded within the project area with respect to flora and vegetation are:

- The occurrence of six Priority Flora species:
  - *Dampiera triloba* (P1);
  - *Tetraria* sp. Chandala (G.J. Keighery 17055) (P2);
  - *Cyathochaeta teretifolia* (P3);
  - *Jacksonia gracillima* (P3);
  - *Eryngium pinnatifidum* subsp. *palustre* (P3); and
  - *Dodonaea hackettiana* (P4).
- The occurrence of two regionally significant flora species:
  - *Ixiolaena viscosa*; and
  - *Gastrolobium ebracteolatum.*
- The occurrence of complex variants of flora species requiring further taxonomic review:
  - *Lepidosperma squamatum;*
  - *Lepidosperma pubisquameum;* and
  - *Caesia micrantha.*
- Six flora species significant for the PMR:
  - *Conostephium minus;*
  - *Cyathochaeta teretifolia;*
  - *Dodonaea hackettiana;*
  - *Eryngium pinnatifidum* subsp*. palustre* (ms);
  - *Hibbertia cuneiformis;* and
  - *Leschenaultia linarioides.*
- Three Declared Plant species:
  - **Zantedeschia aethiopica* (Arum Lily);
  - **Asparagus asparagoides* (Bridal Creeper); and
  - **Moraea flaccida* (One-leaf Cape Tulip).
- Eighteen vegetation communities that are considered locally significant due to supporting populations of Priority Flora, regionally significant flora, significant flora of the PMR or species requiring taxonomic review ; and
- Eighteen communities that are considered regionally significant as they fall within the boundaries of an ESA (wetlands).

Following the 2009 spring surveys, the following additional work was recommended to be carried out to further define the flora and vegetation values of the site. These surveys were completed during spring 2010 and are reported herein:

- phase two of a Level Two spring flora and vegetation survey in 2010;
- Targeted regional surveys for recorded Priority flora species in suitable habitats; and
- Follow up targeted *Caladenia huegelii* (DRF) survey in selected locations that were determined suitable habitat and were identified as “orchid hot-spots” in 2009.

The 2009 report also made the following recommendation that is still pending, and it is recommended that it be carried out as part of a continuation of this study:

- Taxonomic work to continue to classify complex variants of Cyperaceae species that have been recorded during the 2009 and 2010 surveys.

8.0 References

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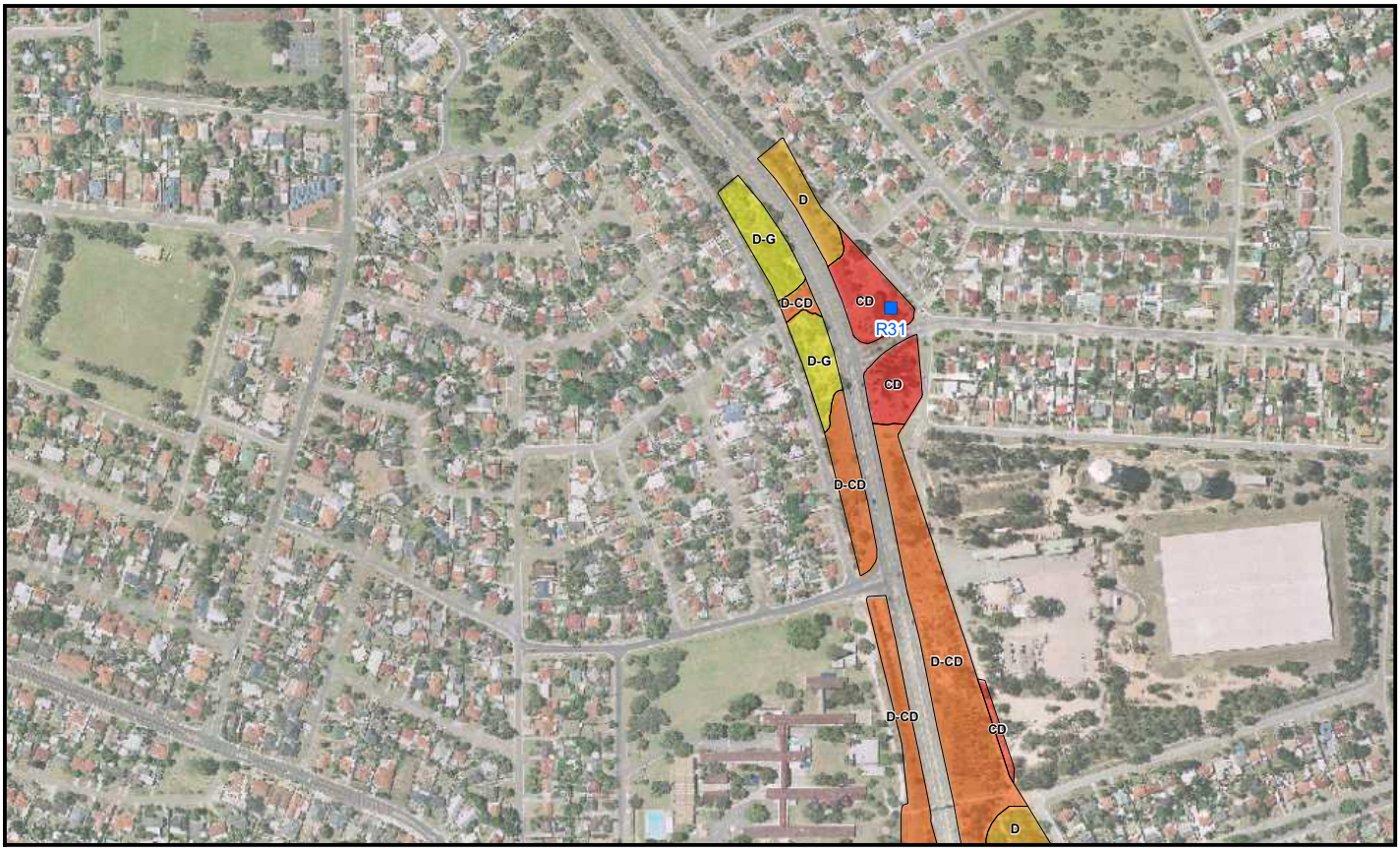


Vegetation Community & Condition

South Metro Connect

Figure 8.01

0 50 100 150 200 250

Metres

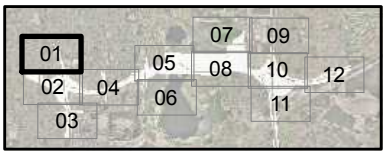
1:7,500 (A4)

Datum: GDA94 Projection: MGA z50

- Monitoring Quadrats
- 2009 Spring Survey Quadrats

Condition

- Very Good
- Good - Very Good
- Good
- Degraded - Good
- Degraded
- Degraded - Completely Degraded
- Completely Degraded



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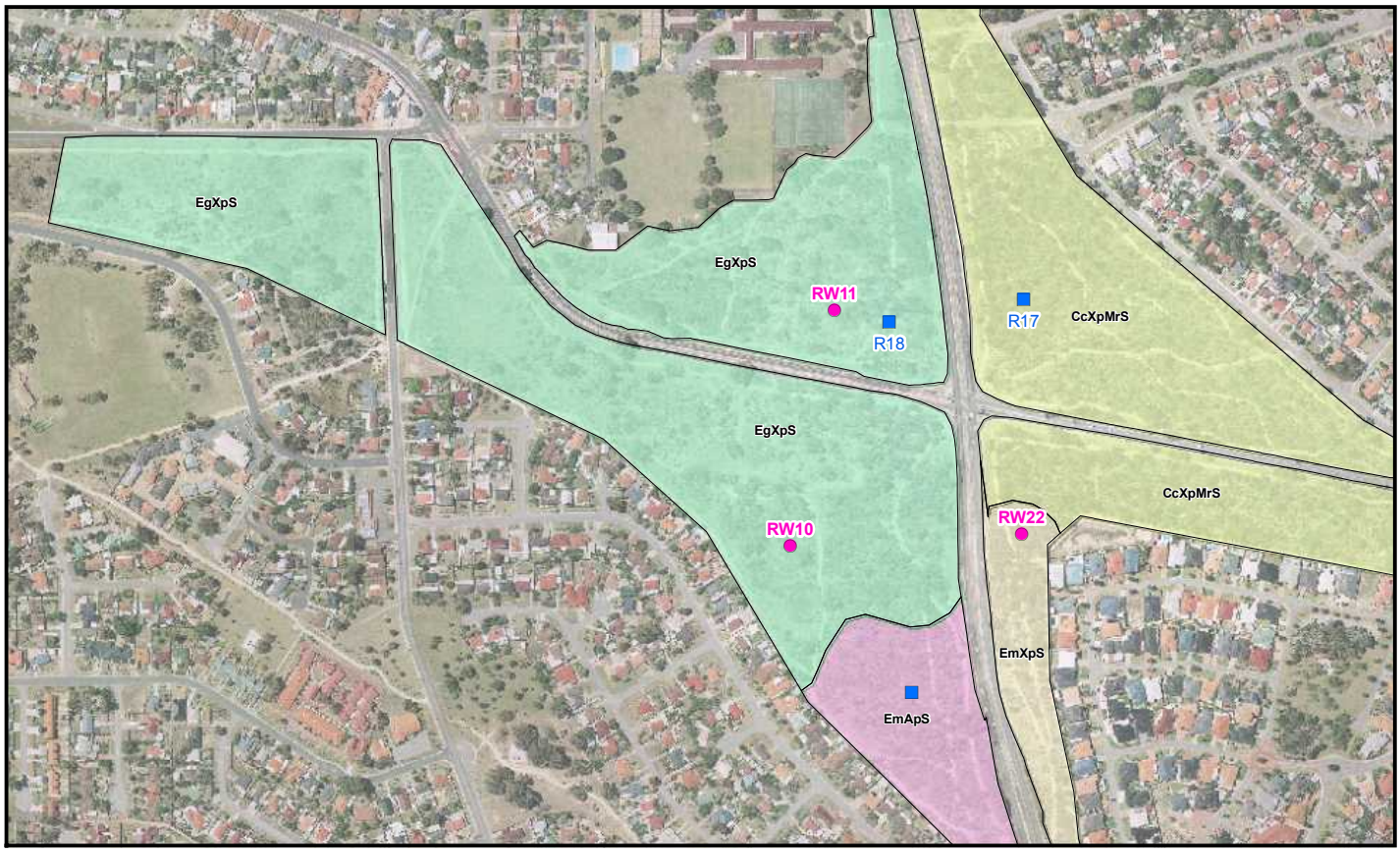
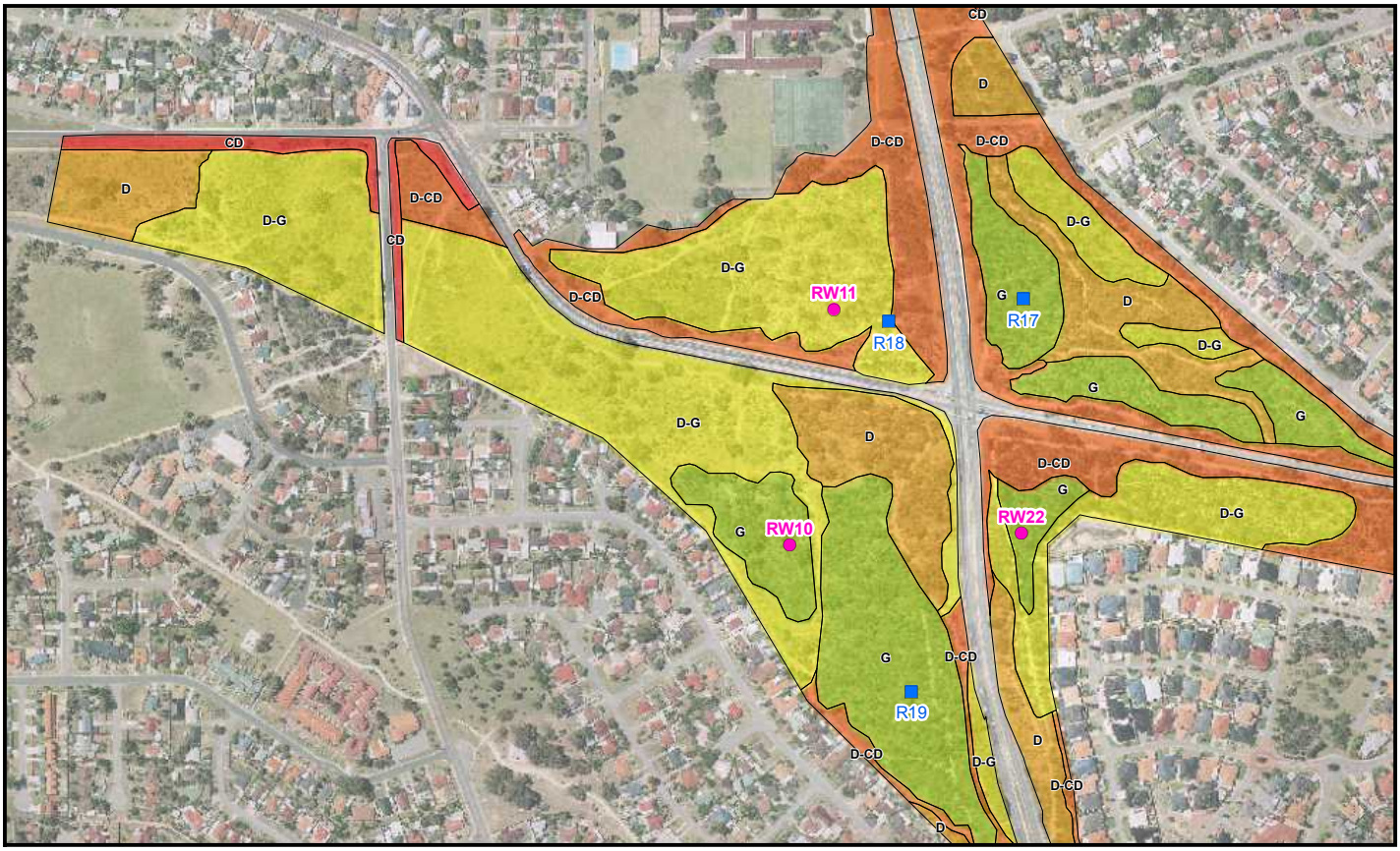




Vegetation Community & Condition

South Metro Connect

Figure 8.02

0 50 100 150 200 250

Metres

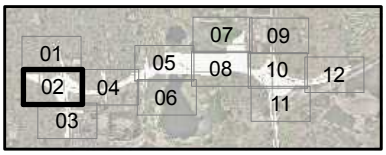
1:7,500 (A4)

Datum: GDA94 Projection: MGA z50

- Monitoring Quadrats
- 2009 Spring Survey Quadrats

Condition

- Very Good
- Good - Very Good
- Good
- Degraded - Good
- Degraded
- Degraded - Completely Degraded
- Completely Degraded



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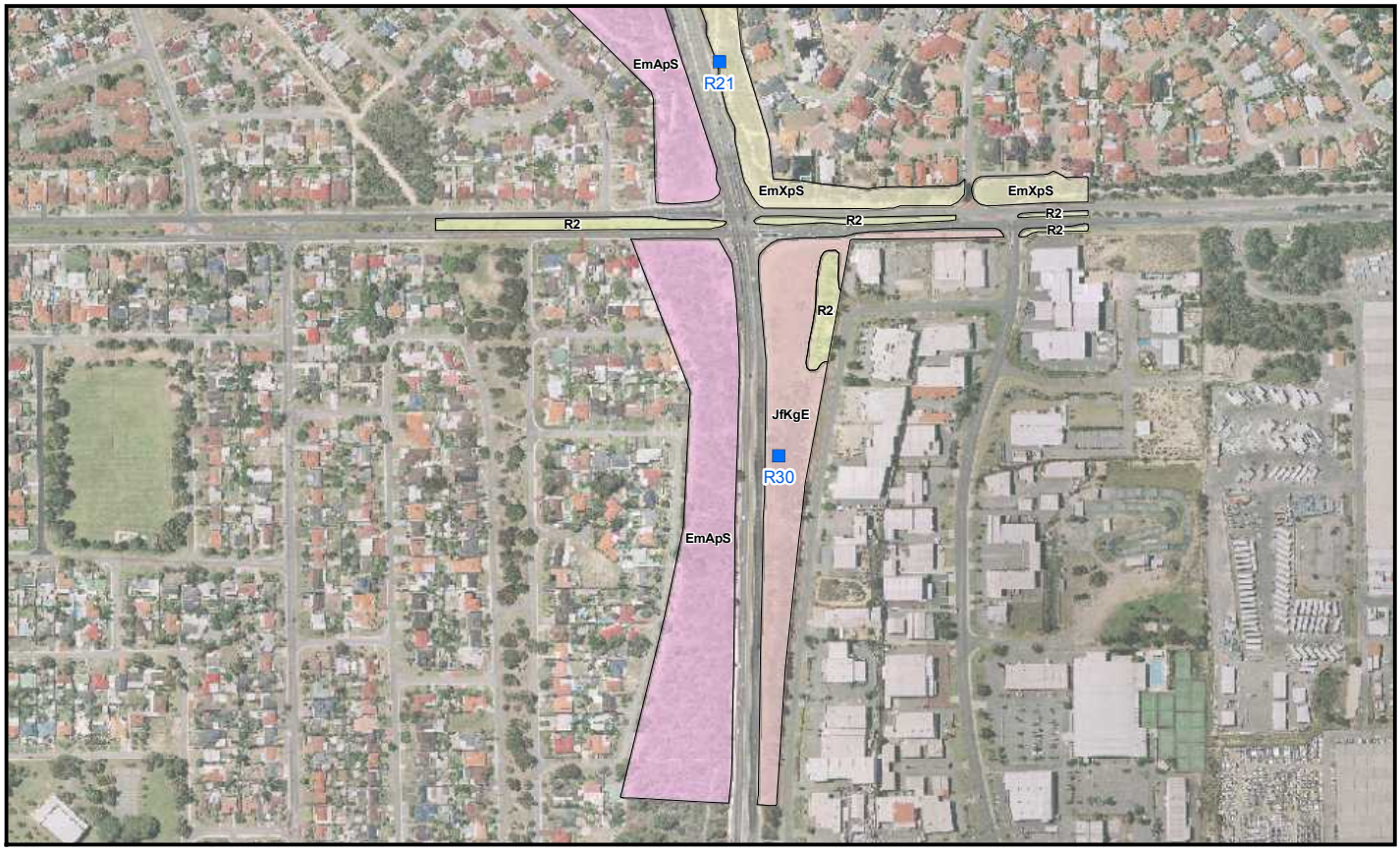
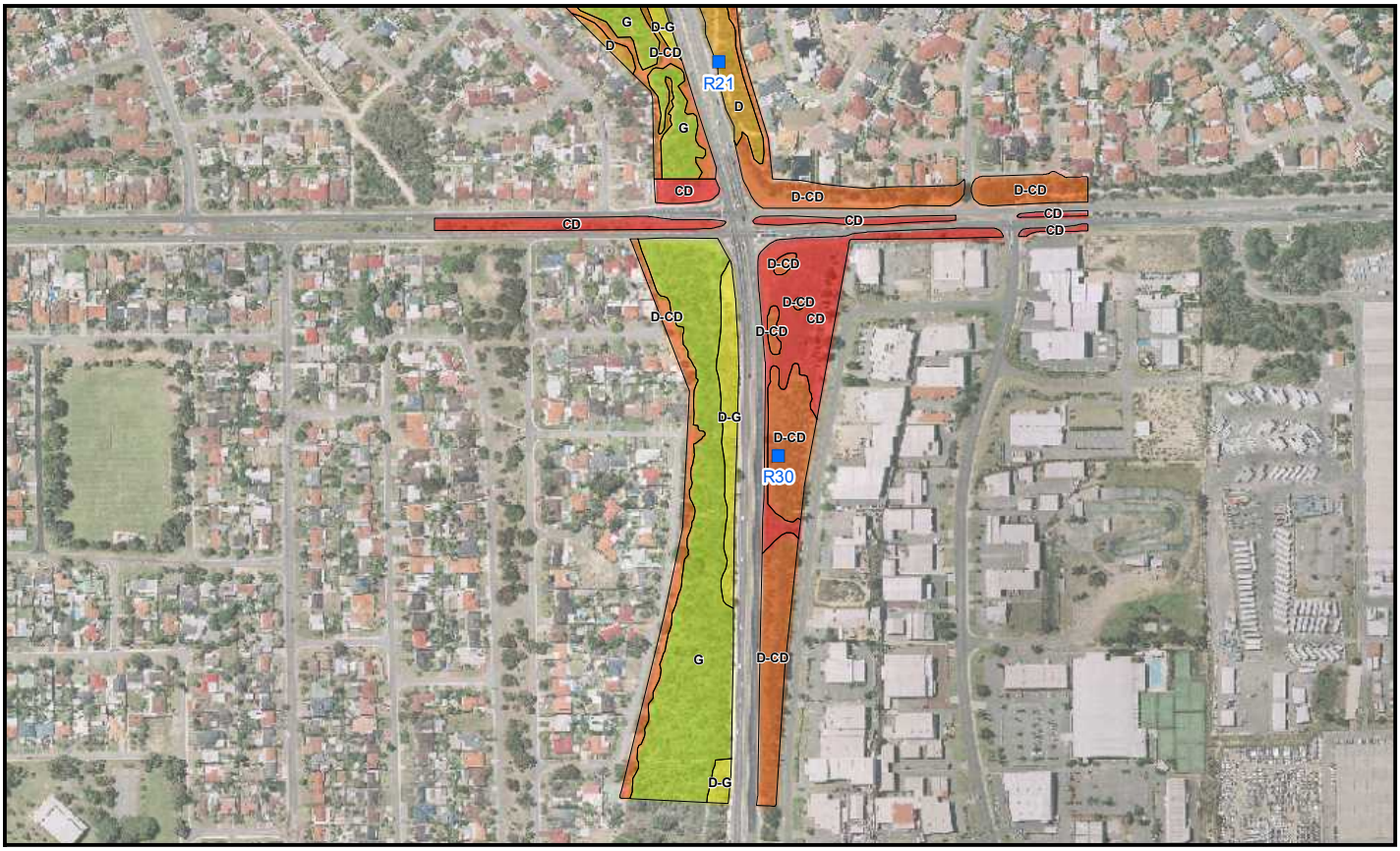




Vegetation Community & Condition

South Metro Connect

Figure 8.03

0 50 100 150 200 250

Metres

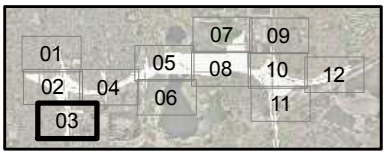
1:7,500 (A4)

Datum: GDA94 Projection: MGA z50

- Monitoring Quadrats
- 2009 Spring Survey Quadrats

Condition

- Very Good
- Good - Very Good
- Good
- Degraded - Good
- Degraded
- Degraded - Completely Degraded
- Completely Degraded



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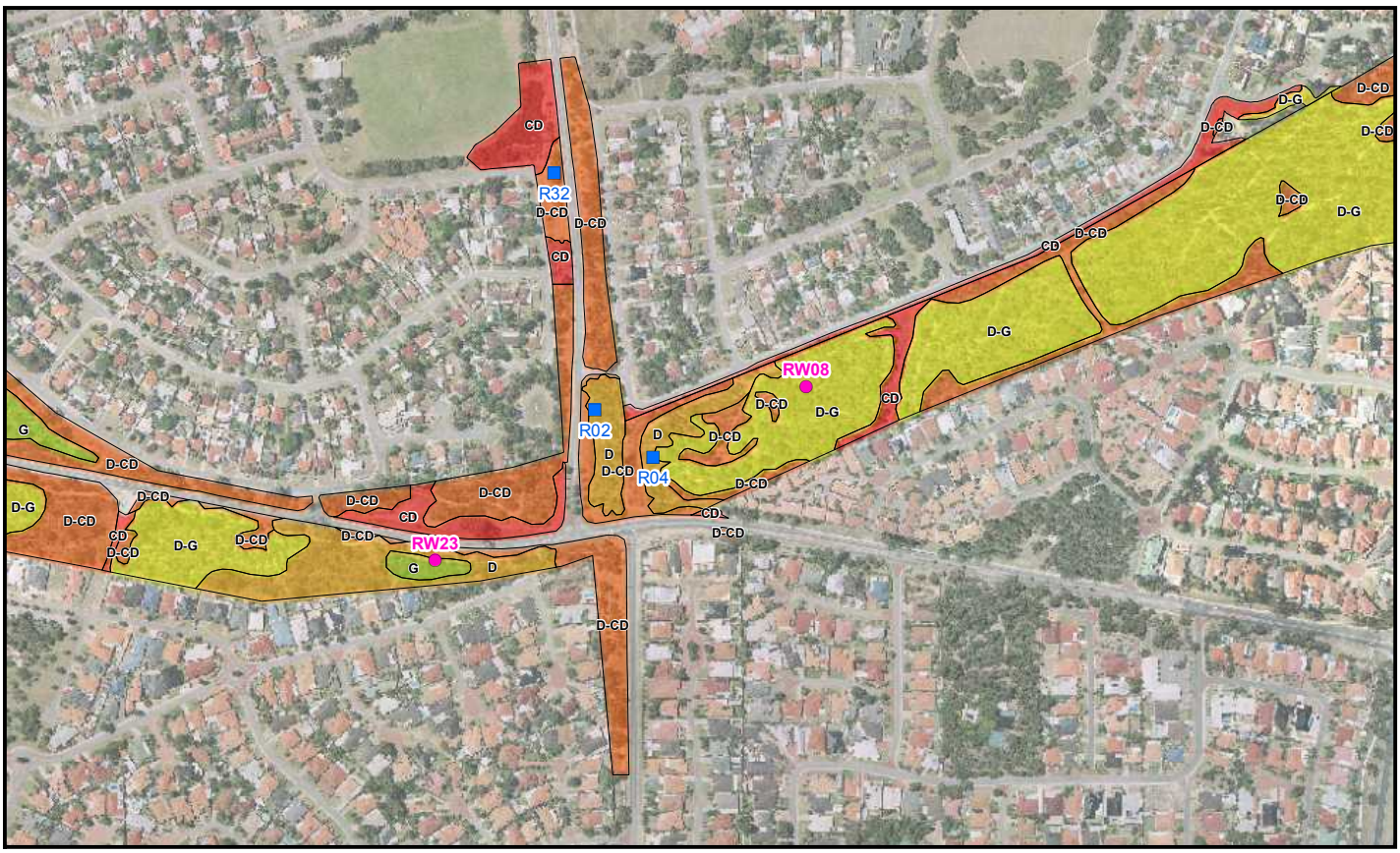

Vegetation Community & Condition

South Metro Connect

Figure 8.04

0 50 100 150 200 250

Metres

1:7,500 (A4)

Datum: GDA94 Projection: MGA z50

- Monitoring Quadrats
- 2009 Spring Survey Quadrats

Condition

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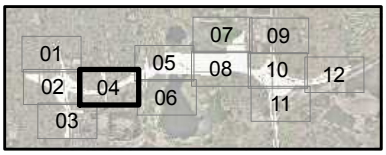
- Good - Very Good
- Good
- Degraded - Good
- Degraded
- Degraded - Completely Degraded
- Completely Degraded



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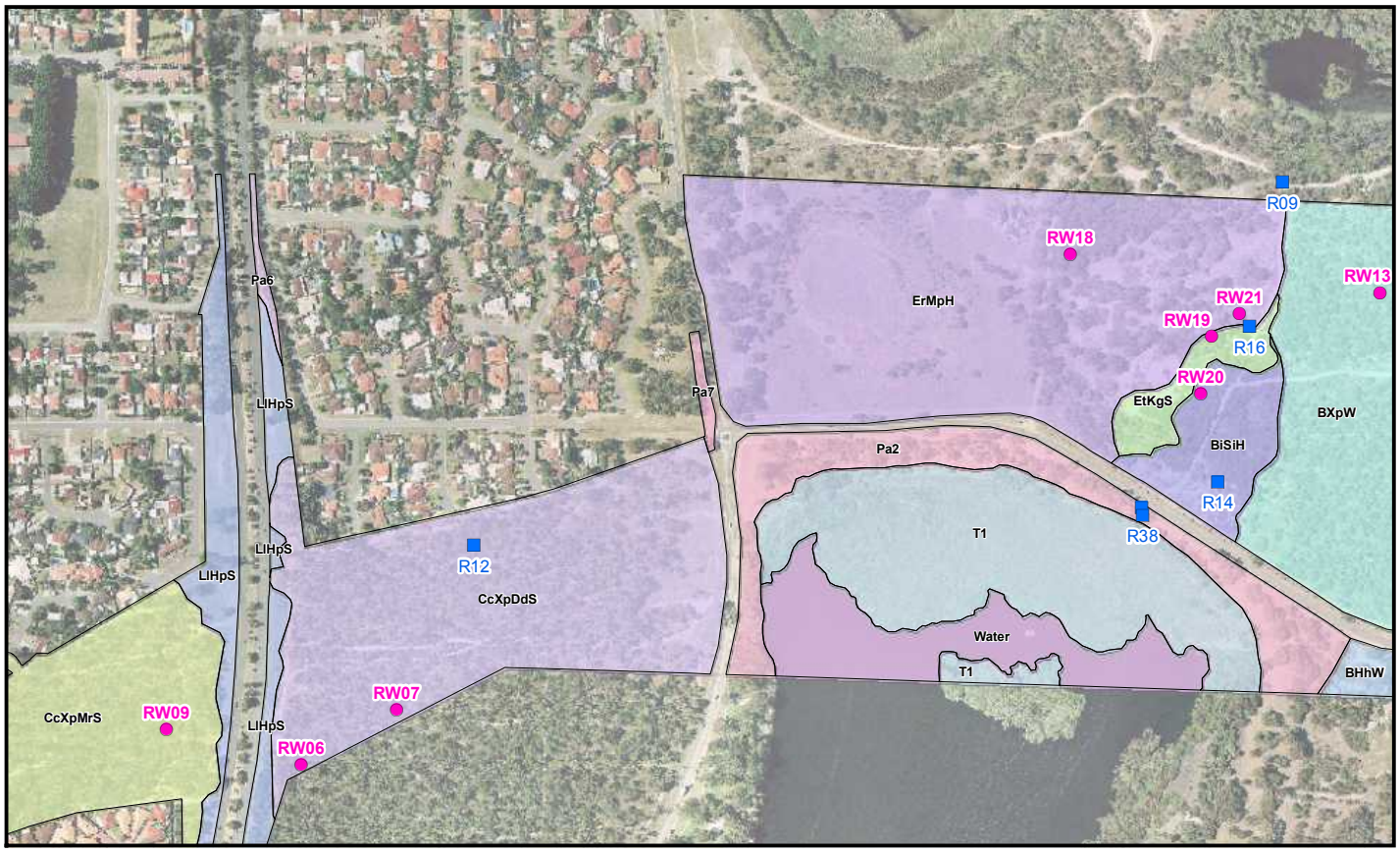

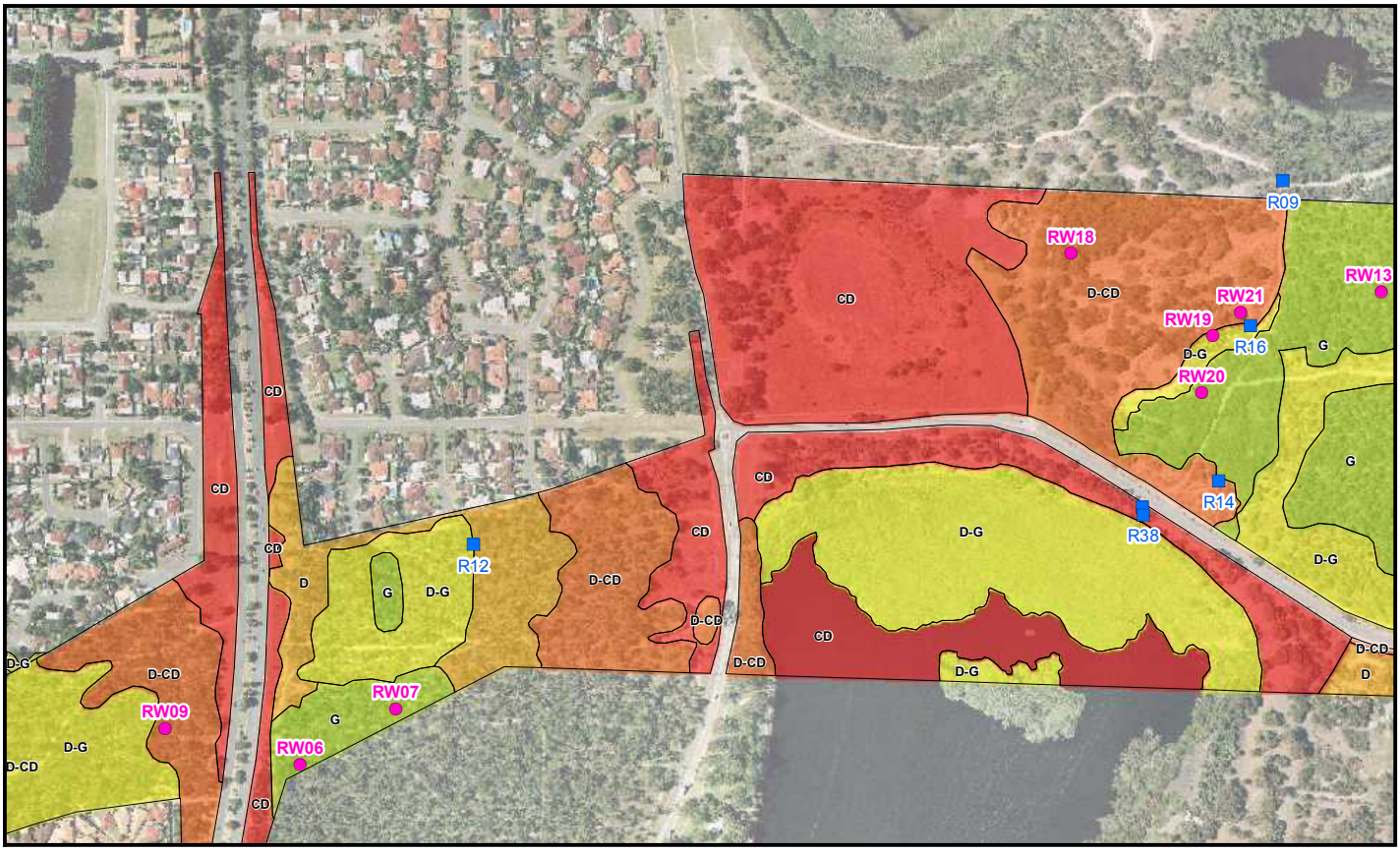

Vegetation Community & Condition

South Metro Connect

Figure 8.05

0 50 100 150 200 250

Metres

1:7,500 (A4)

Datum: GDA94 Projection: MGA z50

- Monitoring Quadrats
- 2009 Spring Survey Quadrats

Condition

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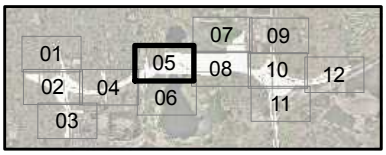
- Good
- Degraded - Good
- Degraded
- Degraded - Completely Degraded
- Completely Degraded



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Vegetation Community & Condition

South Metro Connect

Figure 8.06

0 50 100 150 200 250

Metres

1:7,500 (A4)

Datum: GDA94 Projection: MGA z50

- Monitoring Quadrats
- 2009 Spring Survey Quadrats

Condition

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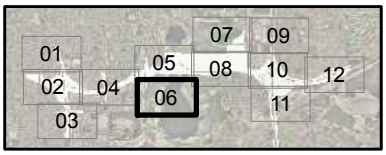
- Good - Very Good
- Good
- Degraded - Good
- Degraded
- Degraded - Completely Degraded
- Completely Degraded



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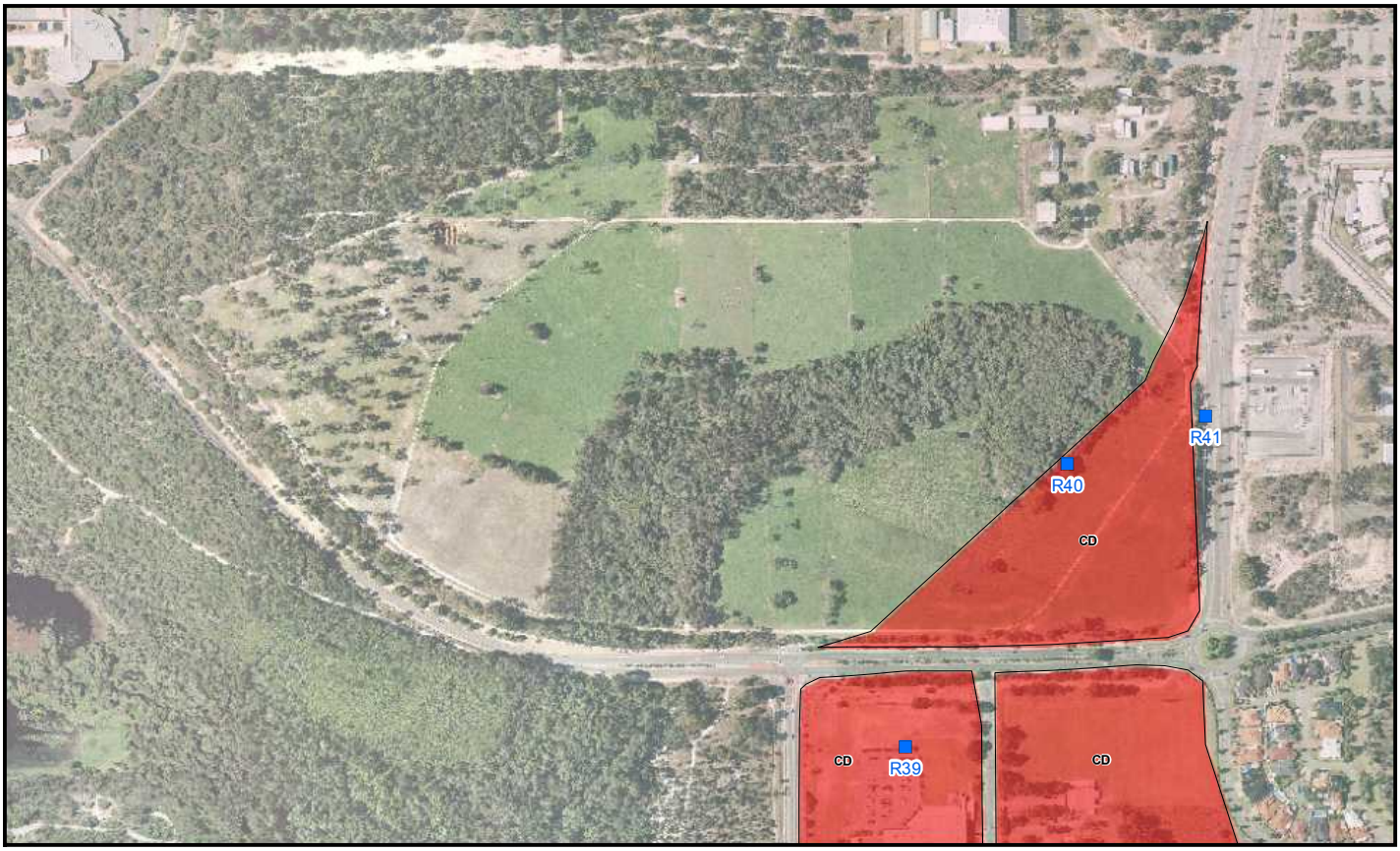

Vegetation Community & Condition

South Metro Connect

Figure 8.07

0 50 100 150 200 250

Metres

1:7,500 (A4)

Datum: GDA94 Projection: MGA z50

- Monitoring Quadrats
- 2009 Spring Survey Quadrats

Condition

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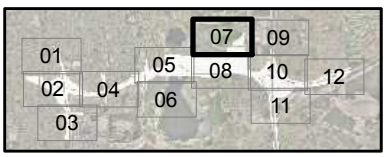
- Good
- Degraded - Good
- Degraded
- Degraded - Completely Degraded
- Completely Degraded



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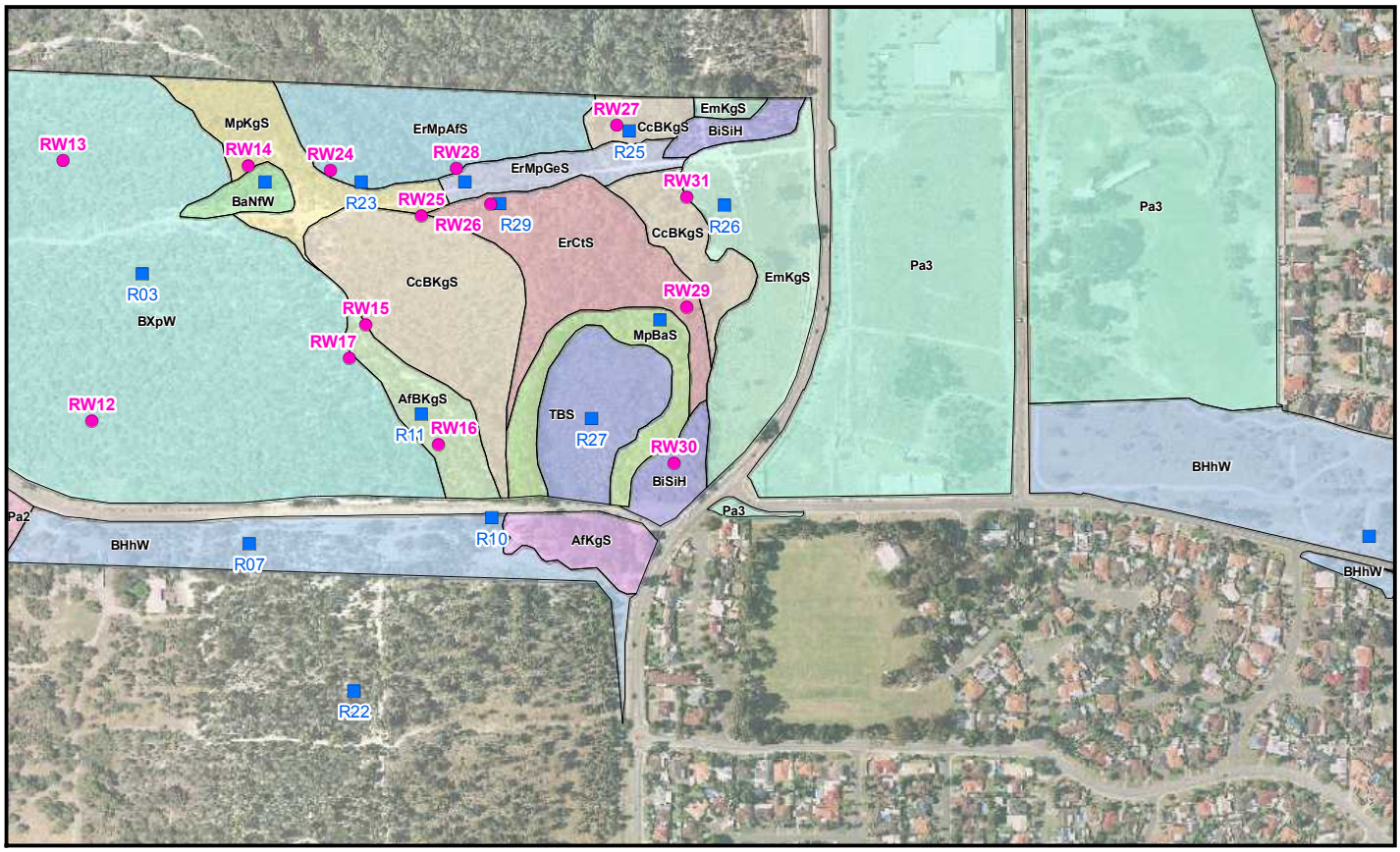

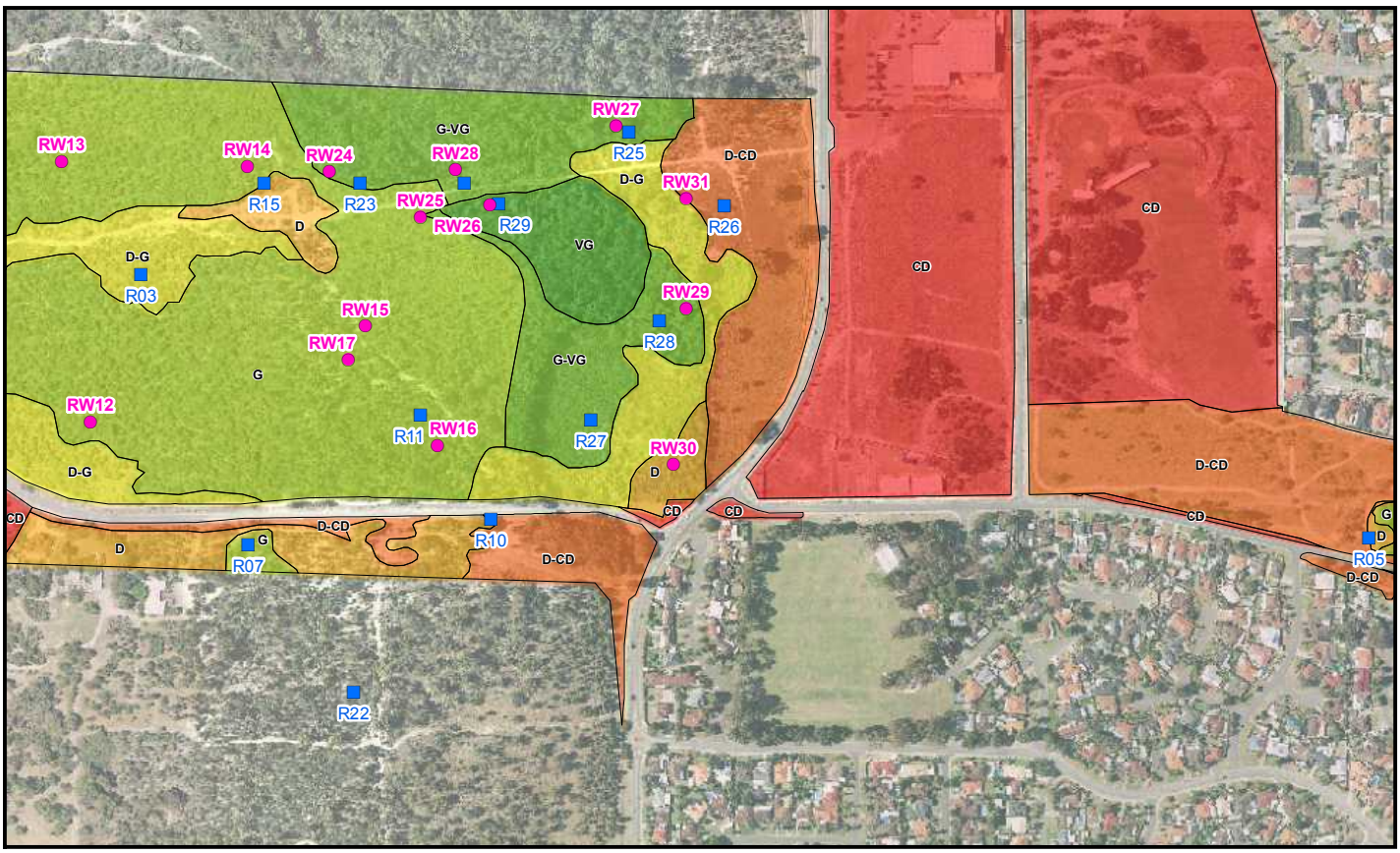

Vegetation Community & Condition

South Metro Connect

Figure 8.08

0 50 100 150 200 250

Metres

1:7,500 (A4)

Datum: GDA94 Projection: MGA z50

- Monitoring Quadrats
- 2009 Spring Survey Quadrats

Condition

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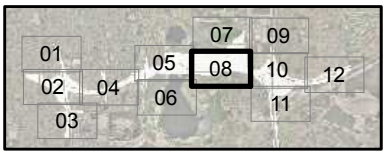
- Good
- Degraded - Good
- Degraded
- Degraded - Completely Degraded
- Completely Degraded



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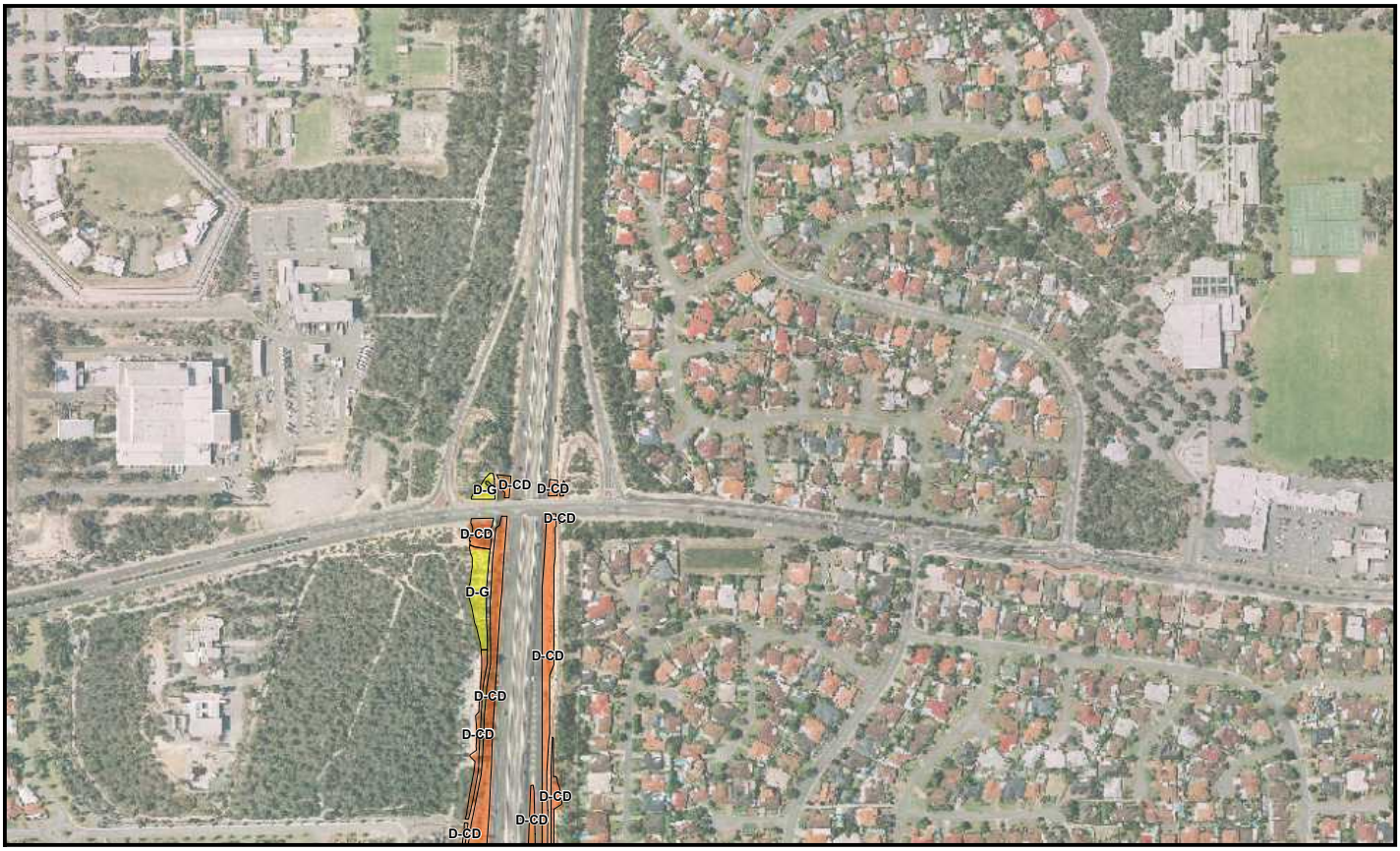

Vegetation Community & Condition

South Metro Connect

Figure 8.09

0 50 100 150 200 250

Metres

1:7,500 (A4)

Datum: GDA94 Projection: MGA z50

- Monitoring Quadrats
- 2009 Spring Survey Quadrats

Condition

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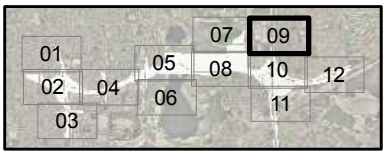
- Good
- Degraded - Good
- Degraded
- Degraded - Completely Degraded
- Completely Degraded



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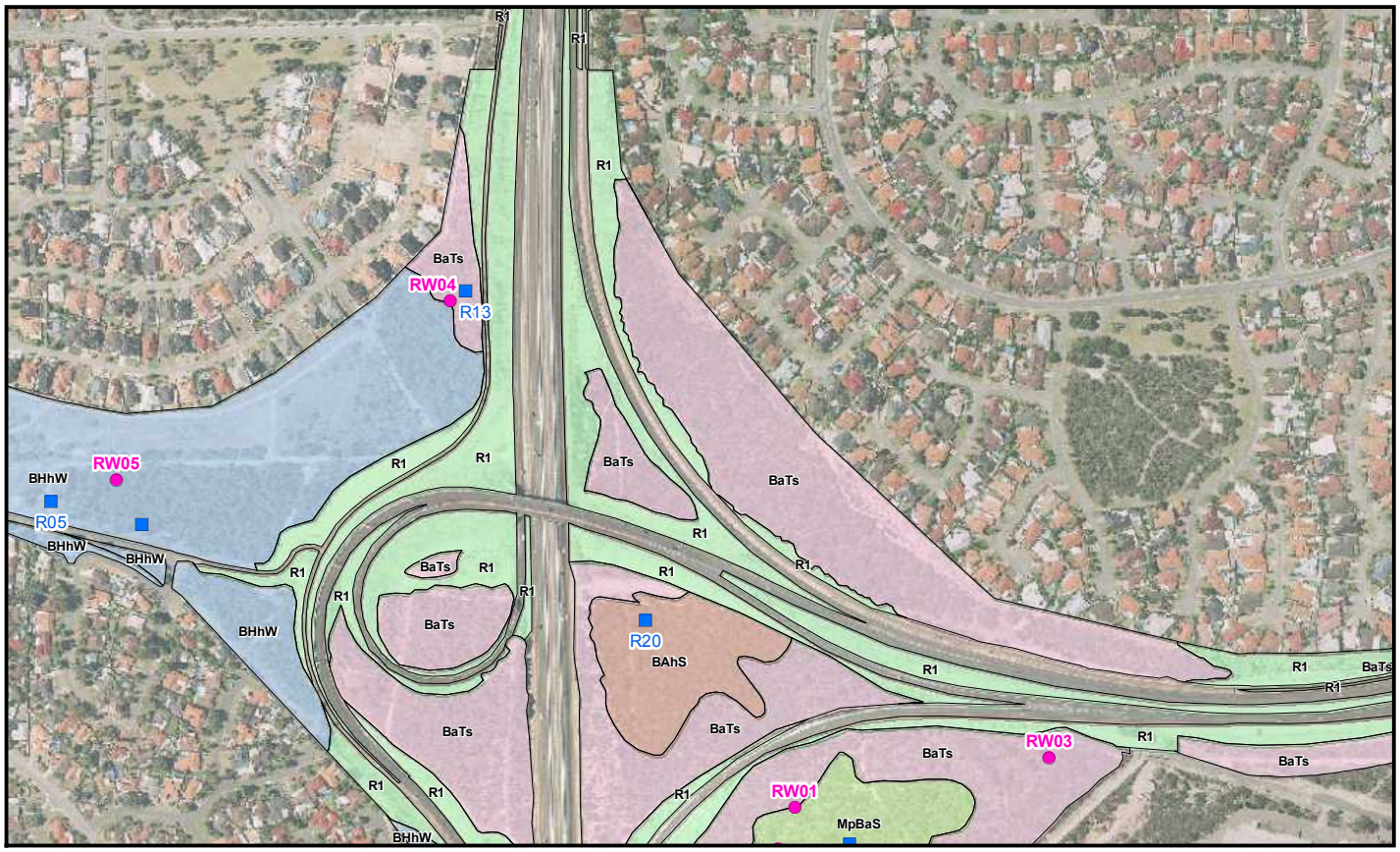
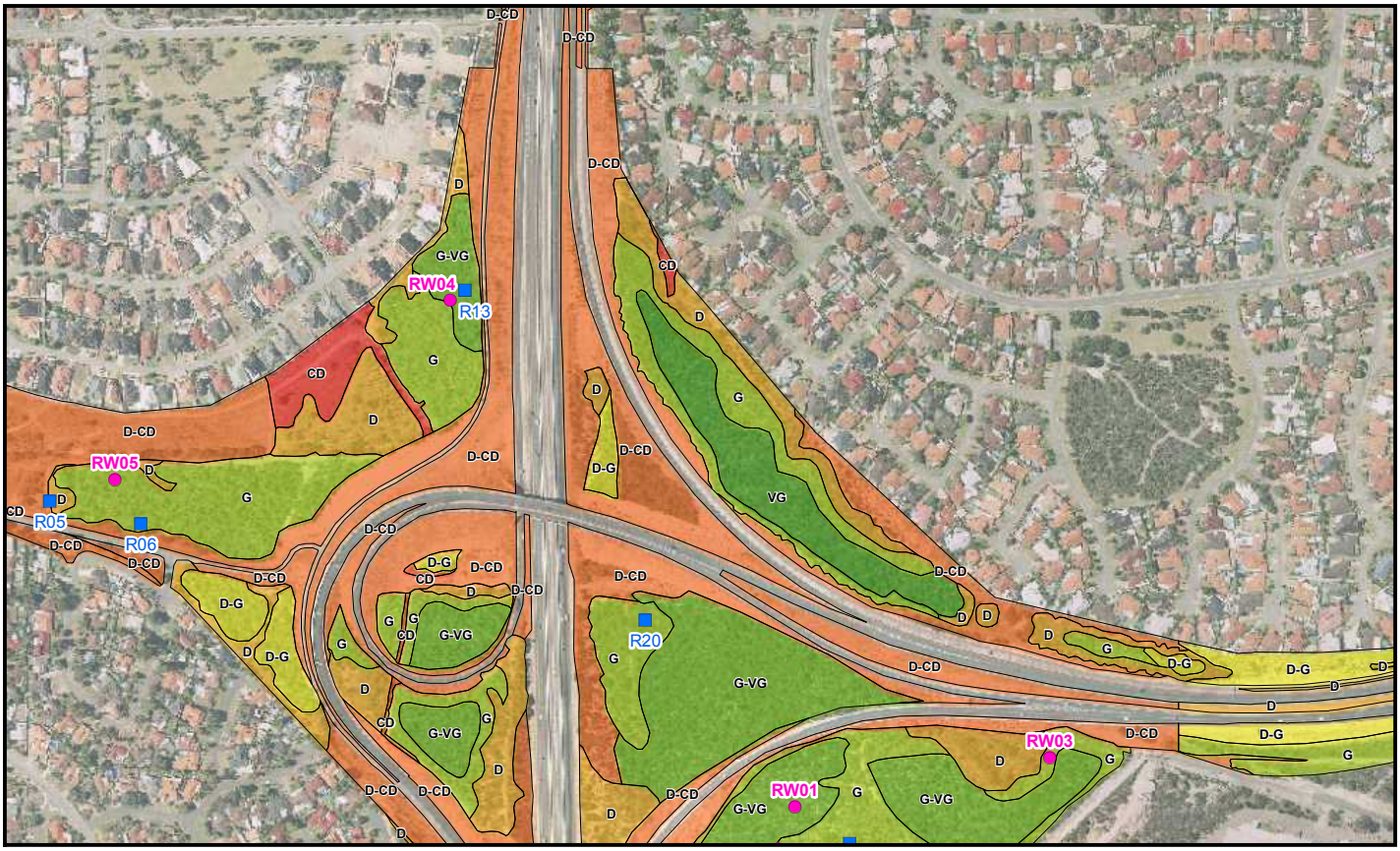




Vegetation Community & Condition

South Metro Connect

Figure 8.10

0 50 100 150 200 250

Metres

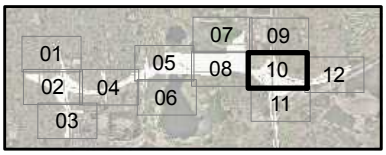
1:7,500 (A4)

Datum: GDA94 Projection: MGA z50

- Monitoring Quadrats
- 2009 Spring Survey Quadrats

Condition

- Very Good
- Good - Very Good
- Good
- Degraded - Good
- Degraded
- Degraded - Completely Degraded
- Completely Degraded



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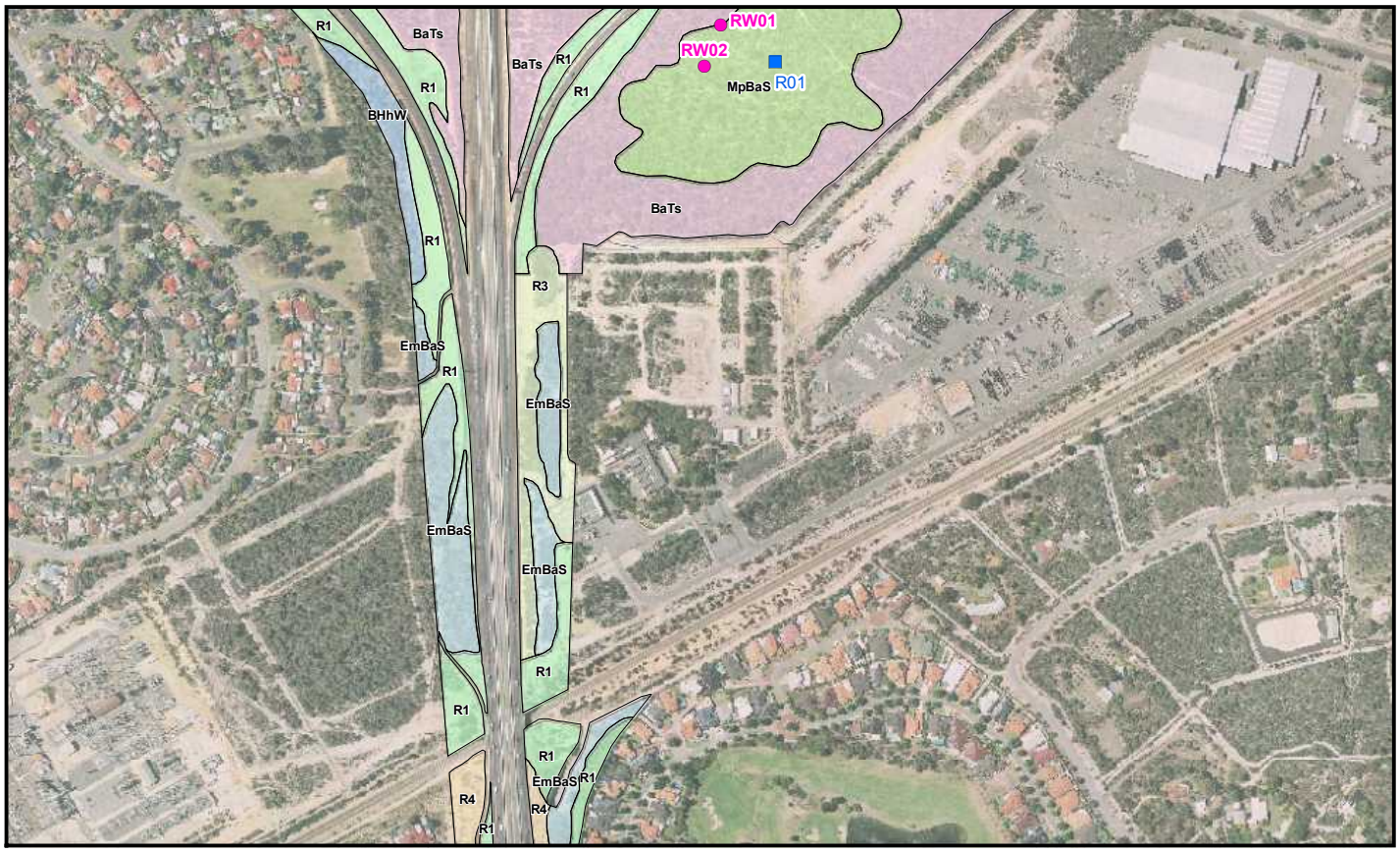
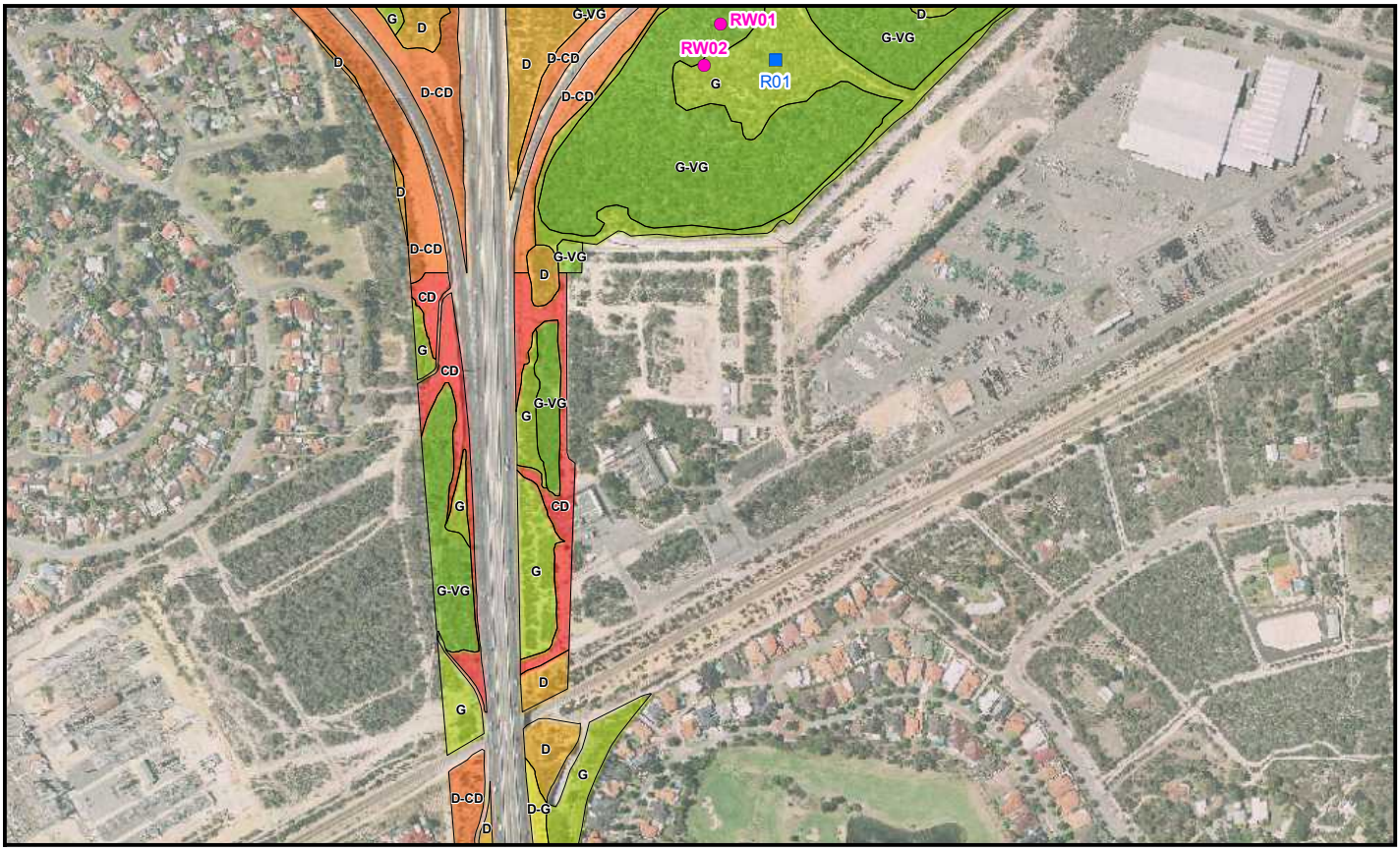




Vegetation Community & Condition

South Metro Connect

Figure 8.11

0 50 100 150 200 250

Metres

1:7,500 (A4)

Datum: GDA94 Projection: MGA z50

- Monitoring Quadrats
- 2009 Spring Survey Quadrats

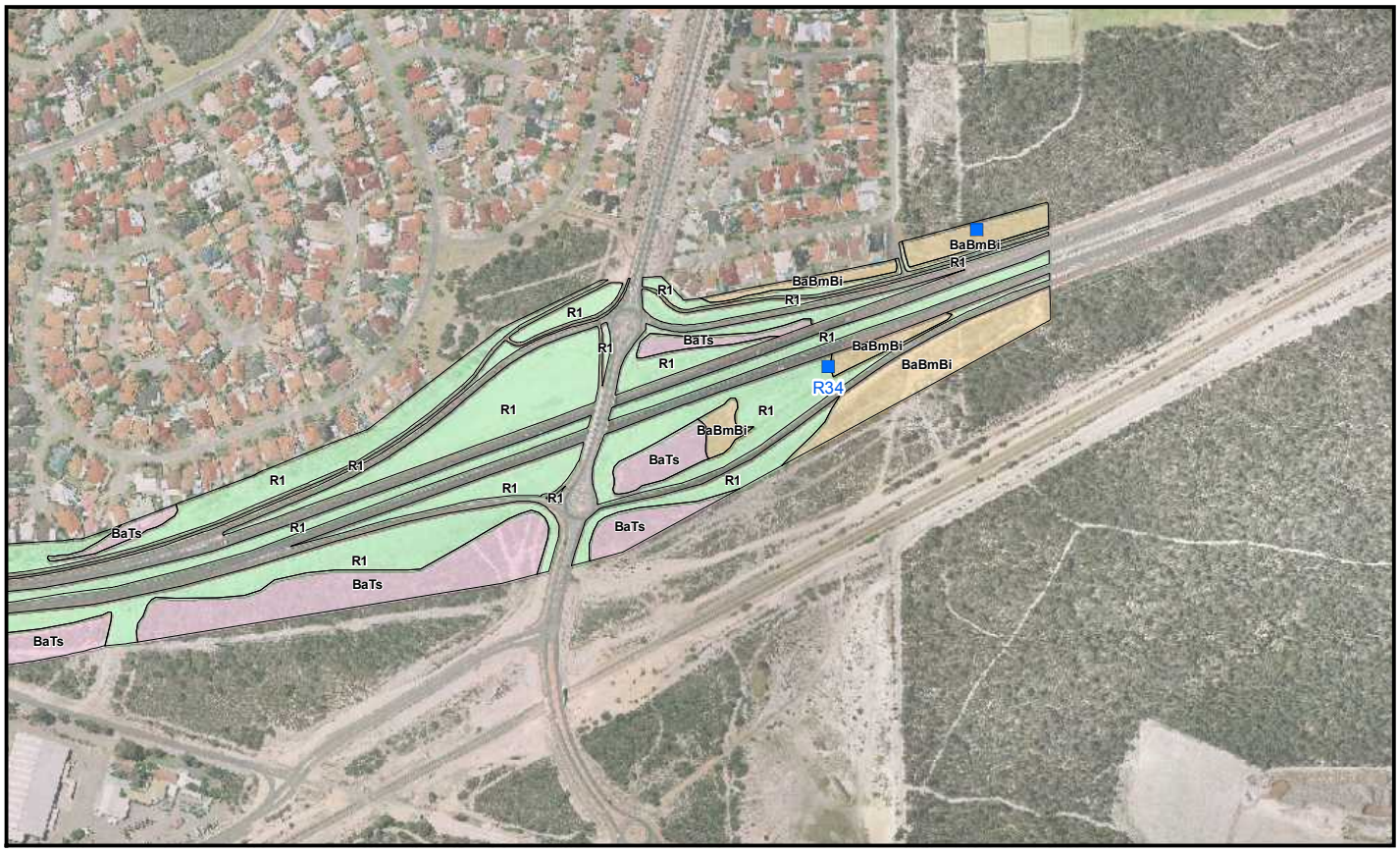
Condition

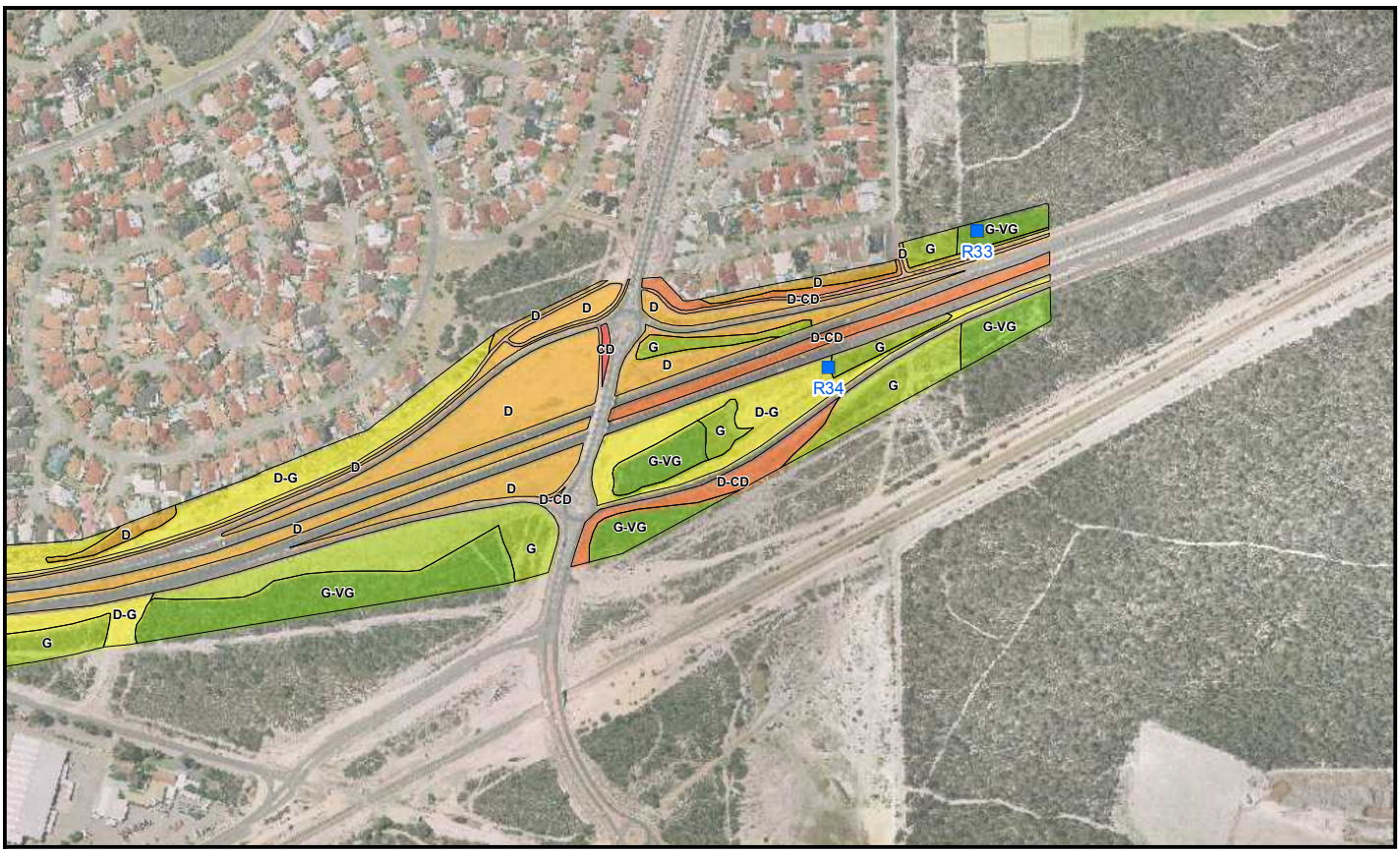
- Very Good
- Good - Very Good
- Good
- Degraded - Good
- Degraded
- Degraded - Completely Degraded
- Completely Degraded

SouthmetroConnect

Date Modified: 2/03/2011

Author: unknown J:\Client_Data\Main_Roads\60100953_Roe_Extension\Workspaces\2011_02_04__Flora_Veg_Report_Maps_Updated\Fig8_Condition_and_Community.mxd





Vegetation Community & Condition

South Metro Connect

Figure 8.12

0 50 100 150 200 250

Metres

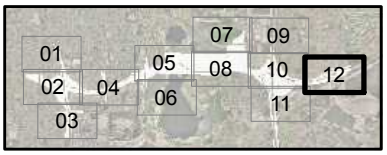
1:7,500 (A4)

Datum: GDA94 Projection: MGA z50

- Monitoring Quadrats
- 2009 Spring Survey Quadrats

Condition

- Very Good
- Good - Very Good
- Good
- Degraded - Good
- Degraded
- Degraded - Completely Degraded
- Completely Degraded



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Date Modified: 2/03/2011

Author: unknown J:\Client_Data\Main_Roads\60100953_Roe_Extension\Workspaces\2011_02_04__Flora_Veg_Report_Maps_Updated\Fig8_Condition_and_Community.mxd

Appendix A

Summary of Vascular Flora Species Recorded, Spring 2009 and 2010

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APPENDIX A: COMPLETE LIST OF VASCULAR FLORA SPECIES RECORDED TO OCCUR WITHIN THE ROE HIGHWAY VEGETATION ASSESSMENT AREA, SPRING 2009 and SPRING 2010

* Denotes introduced (weed) species

# Denotes non-endemic, planted species

DP Denotes Declared Plants

Family Code	Family Name	DP	I	Species
11C	Dennstaedtiaceae			*Pteridium esculentum*
16A	Zamiaceae			*Macrozamia riedlei*
17A	Pinaceae		*	*Pinus pinaster*
			*	*Pinus radiata*
18	Cupressaceae		*	*Callitris* sp.
20	Typhaceae		*	*Typha orientalis*
31	Poaceae		*	*Aira caryophyllea*
				Amphipogon turbinatus
				Aristida sp.
			*	*Arundo donax*
				Austrodanthonia occidentalis
				Austrostipa compressa
				Austrostipa elegantissima
				Austrostipa nitida
			*	*Avena barbata*
			*	*Avena fatua*
			*	*Briza maxima*
			*	*Briza minor*
				Bromus arenarius
			*	*Bromus diandrus*
			*	*Cortaderia selloana*
			*	*Cynodon dactylon*
			*	*Ehrharta calycina*
			*	*Ehrharta longiflora*
			*	*Eragrostis curvula*
			*	*Holcus lanatus*
				Lachnagrostis filiformis
			*	*Lagurus ovatus*
			*	*Lolium rigidum*
			*	*Lolium* sp.
				Neurachne alopecuroidea
			*	*Paspalum dilatatum*
			*	*Pennisetum clandestinum*
			*	*Pentaschistis airoides*
			*	*Poa annua*
				Poa drummondiana
			*	*Sorghum ?xdrummondii*
			*	*Stenotaphrum secundatum*
32	Cyperaceae			*Baumea articulata*
				Baumea preissii subsp. *laxa* (Nees) K.L.Wilson ms
				Baumea vaginalis
				Cyathochaeta teretifolia (P3)
			*	*Cyperus polystachyos*
				Ficinia nodosa
			*	*Isolepis marginata*
				Lepidosperma longitudinale
				Lepidosperma pubisquameum

APPENDIX A: COMPLETE LIST OF VASCULAR FLORA SPECIES RECORDED TO OCCUR WITHIN THE ROE HIGHWAY VEGETATION ASSESSMENT AREA, SPRING 2009 and SPRING 2010

* Denotes introduced (weed) species

# Denotes non-endemic, planted species

DP Denotes Declared Plants

Family Code	Family Name	DP	I	Species
32	Cyperaceae (cont.)			*Lepidosperma pubisquameum* sens. lat.
				Lepidosperma sp. Coastal Dunes (R.J.Cranfield 9963)
				Lepidosperma sp.
				Lepidosperma squamatum
				Lepidosperma squamatum (complex variant)
				Lepidosperma squamatum (narrow form)
				Lepidosperma squamatum sens. lat.
				Lepidosperma tenue
				Mesomelaena pseudostygia
				Mesomelaena stygia subsp. *stygia*
				Schoenus curvifolius
				Schoenus subfascicularis
				Tetraria capillaris
				Tetraria octandra
				Tetraria sp. Chandala (G.J.Keighery 17055) (P2)
35	Araceae	DP	*	*Zantedeschia aethiopica*
39	Restionaceae			*Chordifex sinuosus*
				Desmocladus fasciculatus
				Desmocladus flexuosus
				Hypolaena exsulca
				Loxocarya cinerea
				Lyginia barbata
				Lyginia imberbis
				Meeboldina scariosa
39A	Ecdeiocoleaceae			*Ecdeiocolea monostachya*
40	Centrolepidaceae			*Centrolepis drummondiana*
52	Juncaceae			*Juncus pallidus*
				Luzula meridionalis
54B	Asparagaceae			*Acanthocarpus preissii*
			*	*Agave americana*
		DP	*	*Asparagus asparagoides*
			*	*Asparagus officinalis*
				Chamaescilla corymbosa
				Laxmannia squarrosa
				Lomandra caespitosa
				Lomandra hermaphrodita
				Lomandra micrantha
				Lomandra nigricans
				Lomandra odora
				Lomandra sonderi
				Lomandra sp.
				Lomandra suaveolens
				Sowerbaea laxiflora
				Thysanotus arbuscula
				Thysanotus dichotomus
				Thysanotus manglesianus
				Thysanotus patersonii

APPENDIX A: COMPLETE LIST OF VASCULAR FLORA SPECIES RECORDED TO OCCUR WITHIN THE ROE HIGHWAY VEGETATION ASSESSMENT AREA, SPRING 2009 and SPRING 2010

* Denotes introduced (weed) species

# Denotes non-endemic, planted species

DP Denotes Declared Plants

Family Code	Family Name	DP	I	Species
54B	Asparagaceae (cont.)			*Thysanotus* sp.
				Thysanotus sparteus
54C	Dasypogonaceae			*Calectasia narragara*
				Dasypogon bromeliifolius
54D	Xanthorrhoeaceae			*Xanthorrhoea preissii*
54G	Asphodelaceae		*	*Asphodelus fistulosus*
			*	*Trachyandra divaricata*
54J	Colchicaceae			*Burchardia congesta*
54L	Boryaceae			*Borya sphaerocephala*
54P	Hemerocallidaceae			*Agrostocrinum* sp.
				Agrostocrinum hirsutum
				Caesia micrantha sens lat.
				Corynotheca micrantha
				Dianella revoluta var. *divaricata*
				Tricoryne elatior
55	Haemodoraceae			*Anigozanthos humilis* subsp. *humilis*
				Anigozanthos manglesii
				Conostylis aculeata
				Conostylis aculeata subsp. *aculeata*
				Conostylis candicans subsp. *candicans*
				Conostylis juncea
				Conostylis setigera subsp. *setigera*
				Conostylis setosa
				Haemodorum laxum
				Haemodorum sp.
				Phlebocarya ciliata
60	Iridaceae		*	*Babiana angustifolia*
			*	*Chasmanthe floribunda*
			*	*Ferraria crispa*
			*	*Freesia alba x leichtlinii*
			*	*Gladiolus caryophyllaceus*
			*	*Gladiolus* sp.
			*	*Ixia maculata*
		DP	*	*Moraea flaccida*
				Patersonia occidentalis
			*	*Romulea rosea*
			*	*Watsonia meriana*
66	Orchidaceae			*Caladenia arenicola*
				Caladenia discoidea
				Caladenia flava subsp. *flava*
				Caladenia georgei
				Caladenia latifolia
				Caladenia longicauda
				Caladenia longicauda subsp. *calcigena*
				Caladenia longicauda subsp. *longicauda*
				Caladenia sp.
			*	*Disa bracteata*

APPENDIX A: COMPLETE LIST OF VASCULAR FLORA SPECIES RECORDED TO OCCUR WITHIN THE ROE HIGHWAY VEGETATION ASSESSMENT AREA, SPRING 2009 and SPRING 2010

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# Denotes non-endemic, planted species

DP Denotes Declared Plants

Family Code	Family Name	DP	I	Species
66	Orchidaceae (cont.)			*Diuris longifolia*
				Diuris magnifica
				Eriochilus dilatatus
				Leporella fimbriata
				Microtis media
				Pheladenia deformis
				Pterostylis recurva
				Pterostylis sp.
				Pterostylis vittata
				Pyrorchis nigricans
				Thelymitra benthamiana
				Thelymitra crinita
				Thelymitra vulgaris
70	Casuarinaceae			*Allocasuarina fraseriana*
				Allocasuarina humilis
87	Moraceae		*	*Ficus carica*
89	Araucariaceae		*	*Araucaria heterophylla*
90	Proteaceae		#	*Adenanthos cuneatus*
				Adenanthos cygnorum subsp *cygnorum*
				Banksia attenuata
				Banksia dallanneyi
				Banksia grandis
				Banksia ilicifolia
				Banksia littoralis
				Banksia menziesii
				Banksia sessilis
				Banksia sp.
				Conospermum canaliculatum
			#	*Grevillea banksii* x *bipinnatifida*
				Grevillea bipinnatifida
				Grevillea crithmifolia
			#	*Hakea petiolaris*
				Hakea prostrata
				Hakea trifurcata
				Persoonia comata
				Petrophile linearis
				Petrophile macrostachya
				Stirlingia latifolia
				Synaphea spinulosa subsp. *spinulosa*
				Xylomelum occidentale
92	Santalaceae			*Leptomeria cunninghamii*
				Leptomeria pauciflora
97	Loranthaceae			*Nuytsia floribunda*
103	Polygonaceae		*	*Acetosella vulgaris*
				Muehlenbeckia adpressa
			*	*Rumex crispus*
105	Chenopodiaceae			*Chenopodiaceae* sp.

APPENDIX A: COMPLETE LIST OF VASCULAR FLORA SPECIES RECORDED TO OCCUR WITHIN THE ROE HIGHWAY VEGETATION ASSESSMENT AREA, SPRING 2009 and SPRING 2010

* Denotes introduced (weed) species

# Denotes non-endemic, planted species

DP Denotes Declared Plants

Family Code	Family Name	DP	I	Species
105	Chenopodiaceae (cont.)			*Rhagodia baccata*
106	Amaranthaceae			*Ptilotus polystachyus*
109	Phytolaccaceae		*	*Phytolacca octandra*
110	Aizoaceae		*	*Carpobrotus edulis*
110A	Molluginaceae			*Macarthuria australis*
111	Portulacaceae			*Calandrinia corrigioloides*
				Calandrinia granulifera
				Calandrinia sp.
113	Caryophyllaceae		*	*Petrorhagia dubia*
			*	*Silene gallica* var. *gallica*
131	Lauraceae			*Cassytha racemosa*
135	Papaveraceae		*	*Fumaria capreolata*
138	Brassicaceae		*	*Brassica tournefortii*
			*	*Heliophila pusilla*
			*	*Raphanus raphanistrum*
143	Droseraceae			*Drosera erythrorhiza*
				Drosera helodes
				Drosera macrantha subsp. *macrantha*
				Drosera menziesii
				Drosera menziesii subsp. *?penicillaris*
				Drosera menziesii subsp. *penicillaris*
				Drosera pallida
				Drosera stolonifera
149	Crassulaceae			*Crassula colorata*
				Crassula colorata var. *colorata*
			*	*Crassula glomerata*
161	Rosaceae		*	*Eriobotrya japonica*
162	Fabaceae			*Acacia alata*
				Acacia cochlearis
				Acacia cyclops
				Acacia huegelii
			#	*Acacia iteaphylla*
				Acacia lasiocarpa var. *lasiocarpa*
			*	*Acacia longifolia*
				Acacia pulchella
			*	*Acacia pycnantha*
				Acacia rostellifera
				Acacia saligna
				Acacia saligna (narrow form)
				Acacia saligna subsp. *saligna*
				Acacia stenoptera
				Acacia willdenowiana
				Aotus cordifolia
				Bossiaea eriocarpa
				Bossiaea ornata
			*	*Chamaecytisus palmensis*
				Daviesia divaricata subsp. *divaricata*

APPENDIX A: COMPLETE LIST OF VASCULAR FLORA SPECIES RECORDED TO OCCUR WITHIN THE ROE HIGHWAY VEGETATION ASSESSMENT AREA, SPRING 2009 and SPRING 2010

* Denotes introduced (weed) species

# Denotes non-endemic, planted species

DP Denotes Declared Plants

Family Code	Family Name	DP	I	Species
162	Fabaceae (cont.)			*Daviesia nudiflora* subsp. *nudiflora*
				Daviesia physodes
				Daviesia triflora
				Gastrolobium capitatum
				Gastrolobium ebracteolatum
				Gompholobium tomentosum
				Hardenbergia comptoniana
				Hovea pungens
				Hovea trisperma
				Isotropis cuneifolia
				Jacksonia furcellata
				Jacksonia gracillima (P3)
				Jacksonia sternbergiana
				Kennedia prostrata
			*	*Lotus subbiflorus*
			*	*Lupinus angustifolius*
			*	*Lupinus cosentinii*
			*	*Lupinus luteus*
				Mirbelia dilatata
			*	*Podalyria sericea*
				Pultenaea reticulata
				Sphaerolobium medium
				Sphaerolobium vimineum
			*	*Trifolium dubium*
			*	*Trifolium* sp.
			*	*Vicia sativa*
				Viminaria juncea
167	Geraniaceae		*	*Erodium botrys*
			*	*Erodium cicutarium*
				Erodium cygnorum
			*	*Geranium molle*
			*	*Geranium* sp.
			*	*Pelargonium capitatum*
168	Oxalidaceae		*	*Oxalis pes-caprae*
			*	*Oxalis purpurea*
169	Tropaeolaceae		*	*Tropaeolum majus*
173	Zygophyllaceae		*	*Tribulus terrestris*
175	Rutaceae			*Boronia crenulata*
				Philotheca spicata
183	Polygalaceae			*Comesperma calymega*
185	Euphorbiaceae		*	*Euphorbia peplus*
			*	*Euphorbia terracina*
			*	*Ricinus communis*
185A	Phyllanthaceae			*Phyllanthus calycinus*
194	Anacardiaceae		*	*Schinus terebinthifolius*
199	Celastraceae			*Stackhousia monogyna*
207	Sapindaceae			*Dodonaea hackettiana* (P4)

APPENDIX A: COMPLETE LIST OF VASCULAR FLORA SPECIES RECORDED TO OCCUR WITHIN THE ROE HIGHWAY VEGETATION ASSESSMENT AREA, SPRING 2009 and SPRING 2010

* Denotes introduced (weed) species

# Denotes non-endemic, planted species

DP Denotes Declared Plants

Family Code	Family Name	DP	I	Species
215	Rhamnaceae			*Spyridium globulosum*
				Trymalium odoratissimum subsp. *odoratissimum*
221	Malvaceae		*	*Malva parviflora*
226	Dilleniaceae			*Hibbertia cuneiformis*
				Hibbertia huegelii
				Hibbertia hypericoides
			#	*Hibbertia scandens*
				Hibbertia subvaginata
				Hibbertia vaginata
243	Violaceae			*Hybanthus calycinus*
				Hybanthus floribundus subsp. *floribundus*
248	Passifloraceae		*	*Passiflora filamentosa*
256	Cactaceae		*	*Opuntia stricta*
263	Thymelaeaceae			*Pimelea ciliata*
				Pimelea rosea subsp. *rosea*
				Pimelea sp.
				Pimelea sulphurea
273	Myrtaceae			*Agonis flexuosa*
				Astartea scoparia
				Babingtonia camphorosmae
				Beaufortia elegans
			#	*Callistemon phoeniceus*
				Calothamnus quadrifidus
			#	*Calothamnus rupestris* (P4)
				Calytrix flavescens
				Calytrix fraseri
				Calytrix sp.
			#	*Chamelaucium uncinatum*
				Corymbia calophylla
			#	*Corymbia citriodora*
			#	*Corymbia ficifolia*
			#	*Corymbia maculata*
				Eremaea asterocarpa subsp. *asterocarpa*
				Eremaea beaufortioides
				Eremaea pauciflora
				Eremaea pauciflora var. *pauciflora*
			#	*Eucalyptus caesia* (P4)
			#	*Eucalyptus camaldulensis*
			#	*Eucalyptus conferruminata*
			#	*Eucalyptus erythrocorys*
				Eucalyptus gomphocephala
			#	*Eucalyptus grandis*
			#	*Eucalyptus leucoxylon*
			#	*Eucalyptus macrocarpa* subsp. *macrocarpa*
				Eucalyptus marginata
			#	*Eucalyptus platypus*
				Eucalyptus rudis

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* Denotes introduced (weed) species

\# Denotes non-endemic, planted species

DP Denotes Declared Plants

Family Code	Family Name	DP	I	Species
273	Myrtaceae (cont.)		#	*Eucalyptus sideroxylon*
			#	*Eucalyptus* sp.
				Eucalyptus todtiana
			#	*Eucalyptus torquata*
				Hypocalymma angustifolium
				Hypocalymma robustum
				Kunzea glabrescens
			*	*Leptospermum laevigatum*
				Leptospermum spinescens
				Melaleuca ?seriata (sterile material)
				Melaleuca lanceolata
			#	*Melaleuca leucadendra*
			#	*Melaleuca nesophila*
				Melaleuca preissiana
				Melaleuca rhaphiophylla
				Melaleuca seriata
				Melaleuca systena
				Melaleuca teretifolia
				Melaleuca thymoides
				Melaleuca viminea
				Myrtaceae sp.
				Regelia ciliata
				Regelia inops
				Scholtzia involucrata
				Taxandria linearifolia
275	Onagraceae		*	*Oenothera drummondii*
276	Haloragaceae			*Gonocarpus pithyoides*
280	Araliaceae			*Trachymene pilosa*
281	Apiaceae			*Centella asiatica*
				Eryngium pinnatifidum
				Eryngium pinnatifidum subsp. *palustre* ms (P3)
			*	*Foeniculum vulgare*
				Platysace compressa
				Platysace tenuissima
287	Ericaceae			*Astroloma pallidum*
				Conostephium minus
				Conostephium pendulum
				Conostephium preissii
				Leucopogon ?oxycedrus
				Leucopogon capitellatus
				Leucopogon conostephioides
				Leucopogon nutans
				Leucopogon polymorphus
				Leucopogon propinquus
				Leucopogon sp. Murdoch (M. Hislop 1037)
				Leucopogon verticillatus
				Lysinema ciliatum

APPENDIX A: COMPLETE LIST OF VASCULAR FLORA SPECIES RECORDED TO OCCUR WITHIN THE ROE HIGHWAY VEGETATION ASSESSMENT AREA, SPRING 2009 and SPRING 2010

* Denotes introduced (weed) species

# Denotes non-endemic, planted species

DP Denotes Declared Plants

Family Code	Family Name	DP	I	Species
293	Primulaceae		*	*Lysimachia arvensis*
303	Gentianaceae		*	*Centaurium erythraea*
304	Apocynaceae		*	*Vinca major*
313	Lamiaceae			*Hemiandra pungens*
			*	*Lavandula dentata*
			*	*Rosmarinus officinalis*
315	Solanaceae		*	*Solanum nigrum*
320	Orobanchaceae		*	*Orobanche minor*
329	Plantaginaceae		*	*Plantago lanceolata*
331	Rubiaceae		*	*Galium murale*
				Opercularia echinocephala
				Opercularia vaginata
332	Caprifoliaceae		*	*Scabiosa atropurpurea*
339	Campanulaceae			*Lobelia anceps*
				Lobelia tenuior
			*	*Wahlenbergia capensis*
341	Goodeniaceae			*Brunonia australis*
				Dampiera lindleyi
				Dampiera linearis
				Dampiera triloba (P1)
				Lechenaultia floribunda
				Lechenaultia linarioides
				Scaevola canescens
				Scaevola crassifolia
				Scaevola repens
				Scaevola repens var. *repens*
343	Stylidiaceae			*Levenhookia pusilla*
				Stylidium amoenum
				Stylidium brunonianum
				Stylidium piliferum
				Stylidium repens
				Stylidium schoenoides
345	Asteraceae		*	*Arctotheca calendula*
			*	*Cirsium vulgare*
			*	*Conyza bonariensis*
			*	*Conyza sumatrensis*
			*	*Dimorphotheca ecklonis*
			*	*Dittrichia graveolens*
			*	*Gazania linearis*
			*	*Hedypnois rhagadioloides* subsp. *cretica*
			*	*Helminthotheca echioides*
				Hyalosperma cotula
			*	*Hypochaeris glabra*
				Ixiolaena viscosa
				Lagenophora huegelii
				Olearia axillaris
				Ozothamnus cordatus

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* Denotes introduced (weed) species

# Denotes non-endemic, planted species

DP Denotes Declared Plants

Family Code	Family Name	DP	I	Species
345	Asteraceae (cont.)			*Pithocarpa pulchella*
				Podolepis gracilis
				Podotheca gnaphalioides
				Podotheca sp.
				Quinetia urvillei
				Senecio condylus
				Senecio hispidulus
				Senecio pinnatifolius
				Siloxerus humifusus
			*	*Sonchus asper*
			*	*Sonchus oleraceus*
			*	*Ursinia anthemoides*

Appendix B

Summary of Vascular Flora Species Recorded in Each Community, Spring 2009 and 2010

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APPENDIX B: SUMMARY OF ALL VASCULAR FLORA SPECIES RECORDED TO OCCUR WITHIN EACH VEGETATION COMMUNITY WITHIN THE THE ROE HIGHWAY VEGETATION ASSESSMENT AREA, SPRING 2009 AND SPRING 2010

DP Denotes Declared Plants

* Denotes introduced (weed) species

# Denotes non-endemic, planted species

Family Code	Family Name	DP	I	Species	AfBKgS	AfKgS	BAhS	BaNfW	BaTS	BHhW	BiSiH	BXpW	CcBKgS	CcXpDdS	CcXpMrS	EgXpS	EmApS	EmBaS	EmKgS	EmXpS	ErCtS	ErMpAfS	ErMpCeS	ErMpH	EtKgS	MpBaS	MpKgS	BaBmBi	LHpS	JfKgE	TBS	T1	R1	R2	R3	P1	P2	P3	P4	P5	P6	P7
11C	Dennstaedtiaceae			*Pteridium esculentum*							+										+	+	+			+	+														
16A	Zamiaceae			*Macrozamia riedlei*	+			+	+	+		+	+	+	+	+	+	+		+				+			+			+				+							
17A	Pinaceae		*	*Pinus pinaster*																																		+				
			*	*Pinus radiata*										+																												
18	Cupressaceae		*	*Callitris* sp.																												+									+
20	Typhaceae		*	*Typha orientalis*		+																									+	+									
31	Poaceae		*	*Aira caryophyllea*	+			+	+	+	+	+	+	+	+	+		+						+			+														
				Amphipogon turbinatus			+		+	+					+	+	+	+		+								+														
				Aristida sp.															+																							
			*	*Arundo donax*		+										+																										
				Austrodanthonia occidentalis			+		+									+																								
				Austrostipa compressa					+			+				+				+				+																	
				Austrostipa elegantissima			+																				+														
				Austrostipa nitida					+																																	
			*	*Avena barbata*																																					
			*	*Avena fatua*	+	+		+		+	+	+	+	+	+	+	+	+	+					+		+		+	+	+			+		+			+			
			*	*Briza maxima*	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+			+		+						
			*	*Briza minor*	+	+				+	+	+	+	+	+	+			+		+	+		+		+	+	+					+								
				Bromus arenarius						+					+																											
			*	*Bromus diandrus*		+			+	+	+	+	+	+	+	+		+	+	+			+	+	+	+	+		+	+			+		+						
			*	*Cortaderia selloana*																		+																			
			*	*Cynodon dactylon*		+	+	+	+	+					+	+	+				+		+						+	+		+		+	+	+	+	+	+	+	+
			*	*Ehrharta calycina*	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+				+	+		+	+	+				+	+	+			+			+
			*	*Ehrharta longiflora*		+		+	+	+	+	+		+	+	+		+		+	+			+	+	+	+			+											
			*	*Eragrostis curvula*		+	+			+					+	+	+		+				+					+	+	+		+	+	+	+		+	+	+	+	
			*	*Holcus lanatus*		+																																			
				Lachnagrostis filiformis																			+			+															
			*	*Lagurus ovatus*						+	+	+		+	+	+	+	+	+	+				+				+	+					+	+						
			*	*Lolium rigidum*		+									+			+											+				+								
			*	*Lolium* sp.										+																											
				Neurachne alopecuroidea																	+																				
			*	*Paspalum dilatatum*																		+		+																	
			*	*Pennisetum clandestinum*		+										+										+			+				+				+	+		
			*	*Pentaschistis airoides*					+					+	+																										
			*	*Poa annua*	+							+	+									+				+														
				Poa drummondiana			+											+						+																	
			*	*Sorghum ?xdrummondii*												+																									
			*	*Stenotaphrum secundatum*		+									+																											
32	Cyperaceae			*Baumea articulata*																						+				+											
				Baumea preissii subsp. *laxa* (Nees) K.L.Wilson ms							+										+	+	+			+															
				Baumea vaginalis																						+				+											
				Cyathochaeta teretifolia (P3)									+								+	+	+			+															
			*	*Cyperus polystachyos*		+									+									+																	
				Ficinia nodosa																														+								
			*	*Isolepis marginata*								+	+			+			+				+																		
				Lepidosperma longitudinale																	+	+			+																
				Lepidosperma pubisquameum	+							+			+							+																			
				Lepidosperma pubisquameum sens. lat.										+						+																					
				Lepidosperma sp. Coastal Dunes (R.J.Cranfield 9963)											+																											
				Lepidosperma sp.																							+							+								
				Lepidosperma squamatum	+		+		+	+		+	+	+	+	+	+	+		+			+	+			+		+												
				Lepidosperma squamatum (complex variant)											+																											
				Lepidosperma squamatum (narrow form)								+	+		+																											
				Lepidosperma squamatum sens. lat.	+							+									+																				
				Lepidosperma tenue	+				+	+					+		+	+										+													
				Mesomelaena pseudostygia			+		+	+		+		+	+	+	+	+		+						+		+													
				Mesomelaena stygia subsp. *stygia*					+								+	+																+							
				Schoenus curvifolius					+			+																														
				Schoenus subfascicularis												+	+																									
				Tetraria capillaris	+				+					+				+		+	+	+	+			+	+														
				Tetraria octandra			+		+	+		+		+	+	+				+																					
				Tetraria sp. Chandala (G.J.Keighery 17055) (P2)											+																											
35	Araceae	DP	*	*Zantedeschia aethiopica*	+	+		+			+	+	+					+		+	+			+	+	+	+													
39A	Ecdeiocoleaceae			*Ecdeiocolea monostachya*											+																										

APPENDIX B: SUMMARY OF ALL VASCULAR FLORA SPECIES RECORDED TO OCCUR WITHIN EACH VEGETATION COMMUNITY WITHIN THE THE ROE HIGHWAY VEGETATION ASSESSMENT AREA, SPRING 2009 AND SPRING 2010

DP Denotes Declared Plants

* Denotes introduced (weed) species

# Denotes non-endemic, planted species

Family Code	Family Name	DP	I	Species	AfBKgS	AfKgS	BAhS	BaNfW	BaTS	BHhW	BiSiH	BXpW	CcBKgS	CcXpDdS	CcXpMrS	EgXpS	EmApS	EmBaS	EmKgS	EmXpS	ErCtS	ErMpAfS	ErMpCeS	ErMpH	EtKgS	MpBaS	MpKgS	BaBmBi	LHpS	JfKgE	TBS	T1	R1	R2	R3	P1	P2	P3	P4	P5	P6	P7
39	Restionaceae			*Chordifex sinuosus*					+																																
				Desmocladus fasciculatus								+		+	+	+		+		+								+													
				Desmocladus flexuosus	+		+					+	+	+	+	+				+																					
				Hypolaena exsulca	+																												+								
				Loxocarya cinerea	+		+		+	+		+	+	+	+		+	+		+						+		+					+								
				Lyginia barbata	+		+		+	+		+			+			+		+								+					+								
				Lyginia imberbis	+				+	+		+		+	+		+	+		+								+					+								
				Meeboldina scariosa					+	+								+			+	+	+					+					+								
40	Centrolepidaceae			*Centrolepis drummondiana*								+																													
52	Juncaceae			*Juncus pallidus*		+																									+										
				Luzula meridionalis										+	+																											
54B	Asparagaceae			*Acanthocarpus preissii*												+																									
			*	*Agave americana*										+		+																						+		+	
		DP	*	*Asparagus asparagoides*							+	+										+	+		+	+	+	+										+			
			*	*Asparagus officinalis*												+																									
				Chamaescilla corymbosa						+				+	+	+		+																							
				Laxmannia squarrosa			+		+	+		+			+		+	+		+								+												
				Lomandra caespitosa					+	+				+	+	+																								
				Lomandra hermaphrodita			+		+	+			+	+	+	+	+	+		+						+		+												
				Lomandra micrantha			+		+	+					+	+										+														
				Lomandra nigricans										+																											
				Lomandra odora											+																										
				Lomandra sonderi					+																																
				Lomandra sp.									+																												
				Lomandra suaveolens								+			+		+																								
				Sowerbaea laxiflora			+		+			+			+		+	+		+								+												
				Thysanotus arbuscula	+											+	+																								
				Thysanotus dichotomus						+								+																							
				Thysanotus manglesianus	+				+					+	+	+		+		+		+																		
				Thysanotus patersonii			+			+			+																												
				Thysanotus sp.												+																									
				Thysanotus sparteus								+			+			+																							
54C	Dasypogonaceae			*Calectasia narragara*					+	+					+			+																						
				Dasypogon bromeliifolius	+		+	+	+	+		+	+		+			+		+							+	+						+						
54D	Xanthorrhoeaceae			*Xanthorrhoea preissii*	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+				+		+	+	+		+			+	+	+		+	+	+			
			*	*Asphodelus fistulosus*												+																									
54G	Asphodelaceae		*	*Trachyandra divaricata*		+				+							+																+		+		+				
54J	Colchicaceae			*Burchardia congesta*			+		+	+		+		+	+	+	+	+		+						+		+					+							
54L	Boryaceae			*Borya sphaerocephala*												+	+											+					+							
54P	Hemerocallidaceae			*Agrostocrinum* sp.										+	+																									
				Agrostocrinum hirsutum										+																											
				Caesia micrantha sens lat.											+						+																			
				Corynotheca micrantha												+	+	+		+																				
				Dianella revoluta var. *divaricata*						+		+		+	+	+	+	+	+	+				+	+															
				Tricoryne elatior			+		+	+			+	+		+		+																						
55	Haemodoraceae			*Anigozanthos humilis* subsp. *humilis*			+		+						+	+	+	+		+								+												
				Anigozanthos manglesii			+			+				+						+													+							
				Conostylis aculeata	+		+		+	+	+	+		+	+	+	+	+		+													+							
				Conostylis aculeata subsp. *aculeata*			+		+	+			+													+														
				Conostylis candicans subsp. *candicans*										+	+	+																	+							
				Conostylis juncea									+					+															+							
				Conostylis setigera subsp. *setigera*			+		+	+								+															+							
				Conostylis setosa			+		+						+																									
				Haemodorum laxum					+																															
				Haemodorum sp.					+					+																									
				Phlebocarya ciliata	+		+		+	+	+	+	+	+	+			+																					
60	Iridaceae		*	*Babiana angustifolia*	+									+	+	+	+			+																			
			*	*Chasmanthe floribunda*		+								+	+																									
			*	*Ferraria crispa*												+														+										
			*	*Freesia alba x leichtlinii*	+				+	+		+		+	+	+				+																			
			*	*Gladiolus caryophyllaceus*	+	+	+		+	+		+	+	+	+	+	+	+	+	+					+				+										
			*	*Gladiolus* sp.					+			+																												
			*	*Ixia maculata*										+																										
		DP	*	*Moraea flaccida*				+				+		+	+									+																

APPENDIX B: SUMMARY OF ALL VASCULAR FLORA SPECIES RECORDED TO OCCUR WITHIN EACH VEGETATION COMMUNITY WITHIN THE THE ROE HIGHWAY VEGETATION ASSESSMENT AREA, SPRING 2009 AND SPRING 2010

DP Denotes Declared Plants

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Family Code	Family Name	DP	I	Species	AfBkgS	AfKgS	BAhS	BaNfW	BaTS	BHhW	BiSiH	BXpW	CcBKgS	CcXpDdS	CcXpMrS	EgXpS	EmApS	EmBaS	EmKgS	EmXpS	ErCtS	ErMpAfS	ErMpCeS	ErMpH	EtKgS	MpBaS	MpKgS	BaBmBi	LHpS	JfKgE	TBS	T1	R1	R2	R3	P1	P2	P3	P4	P5	P6	P7
60	Iridaceae (cont.)			*Patersonia occidentalis*	+		+	+	+	+	+	+	+					+		+	+	+	+			+	+						+					+					
			*	*Romulea rosea*	+	+				+		+		+	+	+	+			+							+											+					
			*	*Watsonia meriana*					+			+		+	+	+		+						+	+												+					
66	Orchidaceae			*Caladenia arenicola*	+				+			+		+	+	+		+																			+					
				Caladenia discoidea														+																									
				Caladenia flava subsp. *flava*			+		+	+		+		+	+	+		+																					+					
				Caladenia georgei			+			+		+			+	+		+																					+					
				Caladenia latifolia											+			+						+															+					
				Caladenia longicauda			+							+																													
				Caladenia longicauda subsp. *calcigena*											+																													
				Caladenia longicauda subsp. *longicauda*					+	+		+			+																													
				Caladenia sp.	+							+																															
			*	*Disa bracteata*								+																															
				Diuris longifolia										+																													
				Diuris magnifica					+			+	+		+			+																									
				Eriochilus dilatatus														+																									
				Leporella fimbriata								+																															
				Microtis media					+	+			+		+								+				+															
				Pheladenia deformis											+																												
				Pterostylis recurva					+									+																									
				Pterostylis sp.			+			+			+			+				+																						
				Pterostylis vittata														+																									
				Pyrorchis nigricans								+			+																												
				Thelymitra benthamiana					+									+																									
				Thelymitra crinita			+		+									+																									
				Thelymitra vulgaris											+			+																									
70	Casuarinaceae			*Allocasuarina fraseriana*	+		+			+	+	+	+		+	+	+	+	+	+				+				+						+		+		+	+	+			
				Allocasuarina humilis			+		+	+		+			+			+											+						+								
87	Moraceae		*	*Ficus carica*		+																+																			
89	Araucariaceae		*	*Araucaria heterophylla*																															+							
90	Proteaceae		#	*Adenanthos cuneatus*																															+							
				Adenanthos cygnorum subsp *cygnorum*			+			+																			+					+		+					+		
				Banksia attenuata	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+			+		+	+	+	+				+		+			+				
				Banksia dallanneyi			+		+	+		+			+	+	+	+		+						+												+				
				Banksia grandis										+	+	+	+																									
				Banksia ilicifolia	+		+	+	+	+	+	+	+												+	+		+	+					+								
				Banksia littoralis		+					+											+	+				+															
				Banksia menziesii	+		+	+	+	+	+	+	+	+	+	+	+	+		+				+		+	+	+					+		+			+				
				Banksia sessilis												+				+																						
				Banksia sp.	+											+																											
				Conospermum canaliculatum										+																												
			#	*Grevillea banksii* x *bipinnatifida*																																			+				
				Grevillea bipinnatifida			+																																				
				Grevillea crithmifolia																																	+						
			#	*Hakea petiolaris*																										+													
				Hakea prostrata										+	+	+				+									+						+	+	+						
				Hakea trifurcata						+																																	
				Persoonia comata			+		+	+		+		+	+		+	+		+								+													
				Petrophile linearis	+		+		+	+		+	+	+	+		+	+		+								+						+								
				Petrophile macrostachya					+	+				+	+																												
				Stirlingia latifolia			+	+	+	+		+	+		+		+	+										+						+								
				Synaphea spinulosa subsp. *spinulosa*			+		+						+			+		+														+								
				Xylomelum occidentale											+																												
92	Santalaceae			*Leptomeria cunninghamii*			+		+	+								+																									
				Leptomeria pauciflora	+																																						
97	Loranthaceae			*Nuytsia floribunda*	+	+	+	+	+	+	+	+	+			+				+				+			+	+														
103	Polygonaceae		*	*Acetosella vulgaris*																				+																		
				Muehlenbeckia adpressa																			+	+	+																		
			*	*Rumex crispus*																		+	+			+																
105	Chenopodiaceae			*Chenopodiaceae* sp.														+																								
				Rhagodia baccata													+																					+	+				
106	Amaranthaceae			*Ptilotus polystachyus*												+				+																						
109	Phytolaccaceae		*	*Phytolacca octandra*							+																															
110A	Molluginaceae			*Macarthuria australis*					+									+																								

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DP Denotes Declared Plants

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110	Aizoaceae		*	*Carpobrotus edulis*	+				+		+	+	+			+	+		+	+			+	+	+			+							+						
111	Portulacaceae			*Calandrinia corrigioloides*								+																													
				Calandrinia granulifera								+																													
				Calandrinia sp.			+					+																													
113	Caryophyllaceae		*	*Petrorhagia dubia*										+	+	+	+	+																						
			*	*Silene gallica* var. *gallica*					+			+		+	+	+										+														
131	Lauraceae			*Cassytha racemosa*					+							+	+	+			+	+	+			+														
135	Papaveraceae		*	*Fumaria capreolata*		+				+	+					+	+							+	+	+			+											
138	Brassicaceae		*	*Brassica tournefortii*						+						+	+																+		+			+			
			*	*Heliophila pusilla*						+																															
			*	*Raphanus raphanistrum*		+				+						+																					+		+		
143	Droseraceae			*Drosera erythrorhiza*								+		+				+																						
				Drosera helodes									+																												
				Drosera macrantha subsp. *macrantha*								+														+														
				Drosera menziesii			+		+																															
				Drosera menziesii subsp. *?penicillaris*										+																										
				Drosera menziesii subsp. *penicillaris*	+				+	+				+																										
				Drosera pallida								+																												
				Drosera stolonifera								+		+	+		+																						
149	Crassulaceae			*Crassula colorata*					+		+	+	+		+			+	+						+													
				Crassula colorata var. *colorata*							+	+				+				+					+	+								+						
			*	*Crassula glomerata*	+							+																												
161	Rosaceae		*	*Eriobotrya japonica*												+																							
162	Fabaceae			*Acacia alata*			+											+																					
				Acacia cochlearis										+																					+					
				Acacia cyclops												+																								
				Acacia huegelii											+																									
			#	*Acacia iteaphylla*										+	+	+			+					+										+	+	+		+		
				Acacia lasiocarpa var. *lasiocarpa*																														+		+				
			*	*Acacia longifolia*								+	+						+					+															
				Acacia pulchella	+		+		+	+		+		+	+	+	+	+		+							+	+	+			+		+	+	+				
			*	*Acacia pycnantha*											+	+																								
				Acacia rostellifera											+	+	+			+																+				
				Acacia saligna			+		+					+	+	+	+	+										+	+	+			+		+				
				Acacia saligna (narrow form)					+							+	+																	+	+				
				Acacia saligna subsp. *saligna*										+																										
				Acacia stenoptera					+	+				+	+			+											+					+						
				Acacia willdenowiana			+					+																	+											
				Aotus cordifolia																			+	+																
				Bossiaea eriocarpa	+		+		+	+		+	+	+	+	+	+	+		+								+					+						
				Bossiaea ornata					+																															
			*	*Chamaecytisus palmensis*										+	+																				+		+			
				Daviesia divaricata subsp. *divaricata*			+			+		+		+	+	+	+	+		+									+				+			+			
				Daviesia nudiflora subsp. *nudiflora*			+		+	+		+			+		+	+																+						
				Daviesia physodes								+																	+					+						
				Daviesia triflora			+		+			+			+			+	+										+	+									
				Gastrolobium capitatum			+		+	+									+																					
				Gastrolobium ebracteolatum																		+	+	+																
				Gompholobium tomentosum	+		+		+	+		+	+	+	+	+	+	+		+							+		+			+		+	+					
				Hardenbergia comptoniana	+				+	+		+		+	+	+	+	+		+				+			+									+				
				Hovea pungens	+				+				+					+									+													
				Hovea trisperma			+		+	+				+	+			+											+					+						
				Isotropis cuneifolia										+	+	+	+																							
				Jacksonia furcellata	+		+		+	+				+	+	+	+	+		+														+		+	+	+		
				Jacksonia gracillima (P3)	+						+	+	+			+					+	+	+			+														
				Jacksonia sternbergiana													+												+						+	+				
				Kennedia prostrata			+			+		+		+	+	+		+		+						+													
			*	*Lotus subbiflorus*																				+															
			*	*Lupinus angustifolius*											+																								
			*	*Lupinus cosentinii*					+	+				+	+	+	+			+										+	+				+					
			*	*Lupinus luteus*										+																										
				Mirbelia dilatata																																				
			*	*Podalyria sericea*											+																									
				Pultenaea reticulata									+																											

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DP Denotes Declared Plants

* Denotes introduced (weed) species

\# Denotes non-endemic, planted species

Family Code	Family Name	DP	I	Species	AfBKgS	AfKgS	BAhS	BaNfW	BaTS	BHhW	BiSiH	BXpW	CcBKgS	CcXpDdS	CcXpMrS	EgXpS	EmApS	EmBaS	EmKgS	EmXpS	ErCtS	ErMpAfS	ErMpCeS	ErMpH	EtKgS	MpBaS	MpKgS	BaBmBi	LHpS	JfKgE	TBS	T1	R1	R2	R3	P1	P2	P3	P4	P5	P6	P7
162	Fabaceae (cont.)			*Sphaerolobium medium*												+																										
				Sphaerolobium vimineum																		+																					
			*	*Trifolium dubium*						+		+		+	+	+	+	+		+								+														
			*	*Trifolium* sp.																	+											+	+									
			*	*Vicia sativa*		+									+	+				+					+							+										
				Viminaria juncea																														+									
167	Geraniaceae		*	*Erodium botrys*																					+																
			*	*Erodium cicutarium*												+																										
				Erodium cygnorum								+								+				+													+	+				
			*	*Geranium molle*								+												+	+																	
			*	*Geranium* sp.							+																															
			*	*Pelargonium capitatum*		+	+	+	+	+		+		+	+	+	+	+		+				+		+		+		+			+		+			+			
168	Oxalidaceae		*	*Oxalis pes-caprae*		+				+				+	+	+	+			+				+																
			*	*Oxalis purpurea*																																		+				
169	Tropaeolaceae		*	*Tropaeolum majus*											+																										
173	Zygophyllaceae		*	*Tribulus terrestris*												+	+																	+							
				Boronia crenulata																						+																
175	Rutaceae			*Philotheca spicata*	+		+		+	+		+	+	+	+			+										+													
				Comesperma calymega						+																																
185A	Phyllanthaceae			*Phyllanthus calycinus*											+	+		+																							
185	Euphorbiaceae		*	*Euphorbia peplus*									+		+	+			+	+				+	+												+	+				
			*	*Euphorbia terracina*		+	+		+	+		+	+	+	+	+	+		+	+				+					+	+								+			
			*	*Ricinus communis*					+							+				+																		+			
194	Anacardiaceae		*	*Schinus terebinthifolius*								+			+	+									+																
199	Celastraceae			*Stackhousia monogyna*	+					+			+		+																										
207	Sapindaceae			*Dodonaea hackettiana* (P4)												+																										
				Spyridium globulosum											+																											
215	Rhamnaceae			*Trymalium odoratissimum* subsp. *odoratissimum*					+																																
			*	*Malva parviflora*												+																										
226	Dilleniaceae			*Hibbertia cuneiformis*															+					+	+																
				Hibbertia huegelii			+		+	+		+			+			+		+																					
				Hibbertia hypericoides	+		+	+	+	+	+	+	+	+	+	+	+	+		+						+		+													
			#	*Hibbertia scandens*																																		+				
				Hibbertia subvaginata				+	+	+	+	+	+															+						+							
				Hibbertia vaginata			+							+				+										+													
243	Violaceae			*Hybanthus calycinus*			+		+	+								+																							
				Hybanthus floribundus subsp. *floribundus*					+						+																										
248	Passifloraceae		*	*Passiflora filamentosa*																	+																				
256	Cactaceae		*	*Opuntia stricta*																															+							
263	Thymelaeaceae			*Pimelea ciliata*										+			+																								
				Pimelea rosea subsp. *rosea*						+		+			+	+	+				+																					
				Pimelea sp.								+																															
				Pimelea sulphurea			+		+	+						+		+																								
273	Myrtaceae			*Agonis flexuosa*		+																								+				+			+			+	+	
				Astartea scoparia		+																+	+				+															
				Babingtonia camphorosmae										+	+			+																								
				Beaufortia elegans														+																								
			#	*Callistemon phoeniceus*			+																													+	+	+			+		
				Calothamnus quadrifidus												+																				+							
			#	*Calothamnus rupestris* (P4)																										+						+							
				Calytrix flavescens			+		+	+		+			+			+												+												
				Calytrix fraseri					+	+	+	+																+														
				Calytrix sp.																																							
			#	*Chamelaucium uncinatum*					+	+				+	+			+			+										+				+		+					
				Corymbia calophylla		+							+	+	+	+		+	+		+			+		+			+						+	+	+		+	+	+	+	+
			#	*Corymbia citriodora*																																					+	+
			#	*Corymbia ficifolia*																																					+	
			#	*Corymbia maculata*																																	+	+				+		
				Eremaea asterocarpa subsp. *asterocarpa*			+		+	+								+																								
				Eremaea beaufortioides														+										+													
				Eremaea pauciflora					+	+																																
				Eremaea pauciflora var. *pauciflora*			+		+																			+													
			#	*Eucalyptus caesia* (P4)																																				+		
			#	*Eucalyptus camaldulensis*																													+						+	+		+		

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273	Myrtaceae (cont.)		#	*Eucalyptus conferruminata*																														+								
			#	*Eucalyptus erythrocorys*																														+			+				+	
				Eucalyptus gomphocephala											+	+	+			+						+										+						
			#	*Eucalyptus grandis*																	+																					
			#	*Eucalyptus leucoxylon*																																		+					
			#	*Eucalyptus macrocarpa* subsp. *macrocarpa*																																			+				
				Eucalyptus marginata	+		+		+	+		+		+	+	+	+	+	+	+						+		+						+				+				
			#	*Eucalyptus platypus*												+																		+		+		+			+	
				Eucalyptus rudis		+							+									+	+	+	+	+	+	+					+				+					
			#	*Eucalyptus sideroxylon*											+																											
			#	*Eucalyptus* sp.																														+								
				Eucalyptus todtiana			+												+						+			+												+		
			#	*Eucalyptus torquata*																																		+				
				Hypocalymma angustifolium	+							+										+				+															
				Hypocalymma robustum			+		+	+		+	+	+	+			+	+		+		+				+														
				Kunzea glabrescens	+	+		+	+		+	+	+						+	+		+	+	+	+	+	+	+			+				+						
			*	*Leptospermum laevigatum*																										+	+			+								
				Leptospermum spinescens					+	+		+						+																								
				Melaleuca ?seriata (sterile material)	+																																					
				Melaleuca lanceolata																														+								
			#	*Melaleuca leucadendra*																																		+				
			#	*Melaleuca nesophila*																											+		+	+	+		+				+	
				Melaleuca preissiana		+					+											+	+	+	+	+	+											+		+	+	+
				Melaleuca rhaphiophylla														+				+				+					+	+						+		+	+	
				Melaleuca seriata				+			+	+																	+													
				Melaleuca systena														+											+					+		+						
				Melaleuca teretifolia		+																				+							+								
				Melaleuca thymoides	+		+	+	+				+															+													
				Melaleuca viminea																																	+					
				Myrtaceae sp.																		+																				
				Regelia ciliata			+		+	+			+					+							+		+	+						+							
				Regelia inops	+						+													+																	
				Scholtzia involucrata	+		+	+	+	+	+	+						+							+	+															
				Taxandria linearifolia		+															+	+	+			+	+				+										
275	Onagraceae		*	*Oenothera drummondii*					+							+	+												+				+		+						
276	Haloragaceae			*Gonocarpus pithyoides*	+													+																								
280	Araliaceae			*Trachymene pilosa*	+		+	+	+	+		+	+	+	+	+	+	+		+						+	+														
281	Apiaceae			*Centella asiatica*																	+		+									+									
				Eryngium pinnatifidum																					+																
				Eryngium pinnatifidum subsp. *palustre* ms (P3)											+	+	+			+																					
			*	*Foeniculum vulgare*												+				+															+						
				Platysace compressa																								+						+								
				Platysace tenuissima											+																											
287	Ericaceae			*Astroloma pallidum*			+		+	+		+			+			+		+												+								
				Conostephium minus	+				+	+			+															+													
				Conostephium pendulum			+		+	+				+	+		+	+		+								+													
				Conostephium preissii						+			+			+		+																							
				Leucopogon ?oxycedrus					+																																	
				Leucopogon capitellatus					+																																	
				Leucopogon conostephioides	+					+		+			+			+																							
				Leucopogon nutans	+		+			+		+			+												+														
				Leucopogon polymorphus								+																														
				Leucopogon propinquus					+					+	+		+	+		+	+	+	+			+	+														
				Leucopogon sp. Murdoch (M. Hislop 1037)						+																																
				Leucopogon verticillatus																		+																				
				Lysinema ciliatum						+								+										+													
293	Primulaceae		*	*Lysimachia arvensis*					+		+			+	+	+		+	+	+				+		+														
303	Gentianaceae		*	*Centaurium erythraea*																+																					
304	Apocynaceae		*	*Vinca major*										+																											
313	Lamiaceae			*Hemiandra pungens*			+		+	+				+				+																							
			*	*Lavandula dentata*																																	+					
			*	*Rosmarinus officinalis*																																		+		+		
315	Solanaceae		*	*Solanum nigrum*		+																									+									
320	Orobanchaceae		*	*Orobanche minor*								+		+		+							+	+																

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329	Plantaginaceae		*	*Plantago lanceolata*		+																																			
331	Rubiaceae		*	*Galium murale*					+									+						+			+														
				Opercularia echinocephala			+																																			
				Opercularia vaginata					+	+		+			+			+		+						+															
332	Caprifoliaceae		*	*Scabiosa atropurpurea*												+																									
339	Campanulaceae			*Lobelia anceps*						+				+				+																							
				Lobelia tenuior	+																	+				+															
			*	*Wahlenbergia capensis*		+									+																			+							
341	Goodeniaceae			*Brunonia australis*										+																											
				Dampiera lindleyi						+																		+														
				Dampiera linearis			+		+	+			+	+				+			+	+	+				+	+													
				Dampiera triloba (P1)									+								+	+	+			+	+														
				Lechenaultia floribunda	+		+		+																			+						+								
				Lechenaultia linarioides												+																										
				Scaevola canescens			+		+	+				+	+	+	+	+		+						+				+											
				Scaevola crassifolia																													+		+							
				Scaevola repens			+																																			
				Scaevola repens var. *repens*						+																																
343	Stylidiaceae			*Levenhookia pusilla*					+	+		+		+				+							+															
				Stylidium amoenum					+						+																										
				Stylidium brunonianum			+		+	+		+					+	+		+						+		+													
				Stylidium piliferum			+		+						+			+		+													+								
				Stylidium repens	+		+		+	+		+	+			+		+										+												
				Stylidium schoenoides					+	+					+		+	+																							
345	Asteraceae		*	*Arctotheca calendula*		+		+	+	+	+	+		+	+	+								+	+											+	+		+		
			*	*Cirsium vulgare*												+																										
			*	*Conyza bonariensis*																																		+			+		
			*	*Conyza sumatrensis*		+										+	+	+																+	+	+						
			*	*Dimorphotheca ecklonis*						+						+																										
			*	*Dittrichia graveolens*																														+								
			*	*Gazania linearis*		+				+					+	+	+														+				+						
			*	*Hedypnois rhagadioloides* subsp. *cretica*	+	+			+	+	+	+	+	+	+	+		+				+		+		+	+										+				
			*	*Helminthotheca echioides*					+																																
				Hyalosperma cotula																							+														
			*	*Hypochaeris glabra*	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+		+	+	+	+	+	+			+				+		+	+		+		
				Ixiolaena viscosa				+																			+														
				Lagenophora huegelii											+			+							+										+						
				Olearia axillaris																																	+					
				Ozothamnus cordatus													+																								
				Pithocarpa pulchella																								+													
				Podolepis gracilis										+	+	+	+			+																					
				Podotheca gnaphalioides																+																					
				Podotheca sp.					+									+																								
				Quinetia urvillei								+								+																					
				Senecio condylus																																		+	+			
				Senecio hispidulus				+															+																		
				Senecio pinnatifolius					+	+						+		+																							
				Siloxerus humifusus					+	+							+	+																							
			*	*Sonchus asper*		+				+	+	+		+		+						+	+				+	+										+			
			*	*Sonchus oleraceus*			+		+	+		+				+					+	+			+		+														
			*	*Ursinia anthemoides*	+		+	+	+	+		+		+	+	+	+	+		+					+	+	+		+	+	+			+					+		

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Appendix C

Recommended Department of Agriculture and Food Western Australia Control Measures for Declared Plants

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Department of Agriculture and Food
GOVERNMENT OF WESTERN AUSTRALIA

Declared plant in Western Australia

Bridal creeper (*Asparagus asparagoides*)

Printable version

See also: Control Method | Weed description | Declared plants list

(Locality Code: C= City; S=Shire; T=Town)

Category: P1
Location: for the whole of the State

Control Codes and Landholder Obligations

P1 REQUIREMENTS Prohibits movement	The movement of plants or their seeds is prohibited within the State. This prohibits the movement of contaminated machinery and produce including livestock and fodder.

Control Method

Recommended herbicides	:	• metsulfuron • glyphosate

Herbicide	:	Various trade names
Active ingredient and Group	:	600 g/kg metsulfuron methyl (Group B)
Rate of product per 10L	:	0.5 g Registered 0.02 g recommended for bushland treatment as this causes minimal damage to other vegetation.
Time of application	:	Mid – June to late August. Follow up treatment required for a couple of seasons.
Wetting Agent	:	Pulse at 2 mL/L
More information	:	The low rate can be applied by mister or by hand held spray equipment.
And other control measures	:	Biological control using the rust *Puccinia myrsiphylli* is very effective in the higher rainfall areas. A closely related species, bridal veil is not as susceptible to the herbicide or biological control and is taking the place of bridal creeper. The higher rate will control this species but will do considerable damage to other vegetation.

Herbicide	:	Various trade names
Active ingredient and	:	Glyphosate 360 g/L

Group		(Group M)
Rate of product	:	1:2 parts with water. Apply directly to plant using a sponge glove. While this is very selective method it is very slow to apply and is very slow to act in the plant. Retreatment will be necessary.

Weed Description

Family : Liliaceae
Form : Vine-herb
Status : Present in WA

Bridal Creeper is a serious, highly invasive environmental weed, destroying large areas of the native vegetation in southern Australia. Native to Ethiopia, Swaziland and the Cape Province, Natal, Orange Free State and Transvaal regions of South Africa. This plant, currently naturalised in Australia, was introduced into the country as a garden plant during the 1870s. It proved popular in floral arrangements, in particular bridal bouquets, giving rise to its common name, and also as a plant for hanging baskets. Bridal creeper is a Weed of National Significance.
Bridal Creeper grows in warm-temperate to tropical regions, preferring fertile, well-drained soils of light texture. It is often grown as an ornamental, and occurs as a weed along roadsides, in town allotments, orchards and citrus groves, waste places and disturbed scrubland close to habitation. Bridal Creeper invades dry coastal vegetation, heath land and healthy woodland, mallee shrubland, lowland grassland and grassy woodland, dry sclerophyll forest and woodland, damp sclerophyll forest, riparian vegetation, rock outcrop vegetation, and warm temperate rainforest. Bridal Creeper is frost tolerant and its perennial root system enables it to survive summer drought.

Stems : Bridal Creeper (*Asparagus asparagoides*) is a climbing herb or vine to 3 m, arising from a short rhizome attached to tuberous roots.

Leaves : The adult foliage of Bridal Creeper is not that of true leaves but flattened leaf-like appendages called cladodes or phylloclades that arise from the base of the true leaves, which are reduced to scales. The cladodes are stalkless, dull to glossy green, ovate to broadly lanceolate (shaped like the head of a lance), 10-70 mm long, 4-30 mm wide and have delicate parallel venation with no apparent midrib

Flowers : It has creamy white flowers with 6 petals, which are borne on stems in one's and two's along the climbing stems or branches.

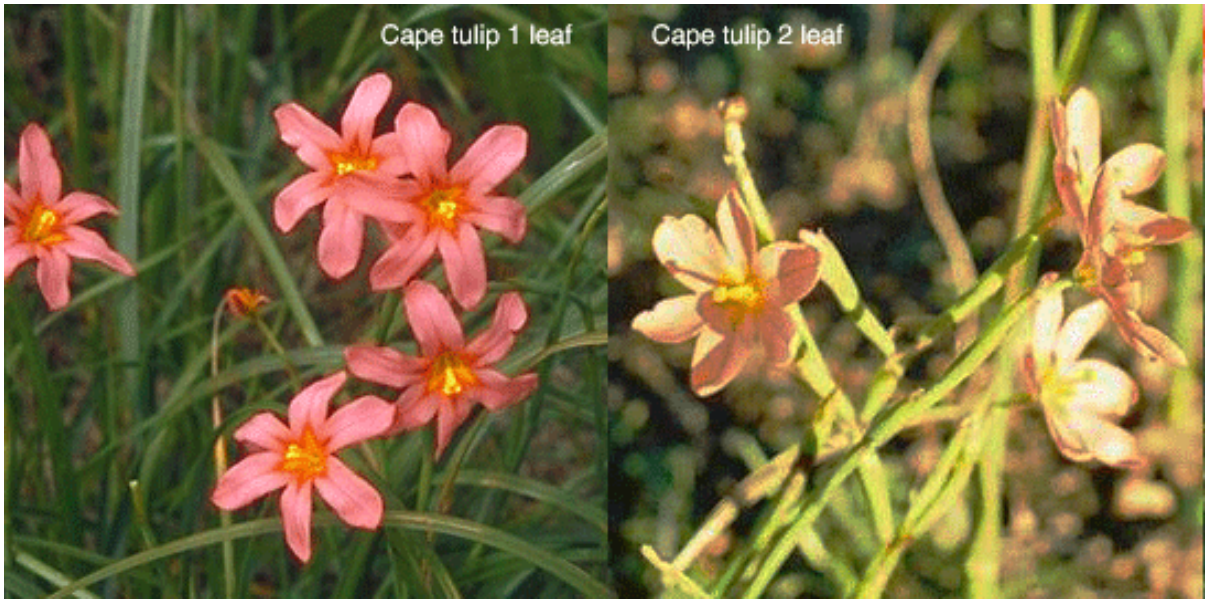
Fruit : Bright red fleshy berries

Seed : Each berry with 1-4 shiny black seeds, but occasionally with more.

Other relevant information related to this topic:

- Quarantine WA
- Permitted and quarantine species list
- Weed of National Significance
- Weeds CRC
- Bridal creeper (*Asparagus asparagoides*) (CSIRO)
- Permit for minor off-label-use of a registered agvet chemical product (Permit number – per9655)
- Off-label permit (olp) for use of a registered agvet chemical product (Permit number - per4590)

Cape Tulip, one-leaf (*Moraea flaccida)*; two-leaf Cape tulip *(Moraea miniata*)



Declaration

(Code: C= City; S=Shire; T=Town)

Category : P1
Location : for the whole of the State.

Category : P3
Location : For the municipal districts of Cranbrook (S), Denmark (S), Kent (S). except that area bordered by Albany Highway, Weir Road, Boyup-Cranbrook Road, Shamrock and Yeriminup Roads, and Frankland-Cranbrook Road.

Category : P4
Location : For the municipal districts of Albany (C), Augusta-Margaret River (S), Boddington (S), Boyup Brook (S), Bridgetown-Greenbushes (S), Brookton (S), Broomehill (S), Bunbury (C), Busselton (S), Capel (S), Collie (S), Corrigin (S), Cuballing (S), Dardanup (S), Donnybrook-Balingup (S), Dumbleyung (S), Esperance (S), Gnowangerup (S), Harvey (S), Jerramungup (S), Katanning (S), Kojonup (S), Mandurah (C), Manjimup (S), Murray (S), Nannup (S), Narrogin (S), Pingelly (S), Plantagenet (S), Ravensthorpe (S), Serpentine-Jarrahdale (S), Tambellup (S), Wagin (S), Wandering (S), Waroona (S), West Arthur (S), Wickepin (S), Williams (S), Woodanilling (S), Yilgarn (S). and that area of the Cranbrook Shire bordered by Albany Highway, Weir Rd, Boyup-Cranbrook Road, Shamrock & Yeriminup Roads & Frankland-Cranbrook Road

Cape tulip Control Codes	
P1 **REQUIREMENTS** Prohibits movement	The movement of plants or their seeds is prohibited within the State. This prohibits the movement of contaminated machinery and produce including livestock and fodder.

P3 REQUIREMENTS Aims to control infestation by reducing area and/or density of infestation	The infested area must be managed in such a way that prevents the spread of seed or plant parts within and from the property on or in livestock, fodder, grain, vehicles and/or machinery. Treat to destroy and prevent seed set all plants:- • within 50 metres inside of the boundaries of the infestation • within 50 metres of roads and highwater mark on waterways • within 50 metres of sheds, stock yards and houses Treatment must be done prior to seed set each year. Properties with less than 20 hectares of infestation must treat the entire infestation. Additional areas may be ordered to be treated.
P4 REQUIREMENTS Aims to prevent infestation spreading beyond existing boundaries of infestation.	The infested area must be managed in such a way that prevents the spread of seed or plant parts within and from the property on or in livestock, fodder, grain, vehicles and/or machinery. Treat to destroy and prevent seed set all plants:- • within 50 metres inside of the boundaries of the infested property for one-leaf and 20 metres for two-leaf • within 50 metres of roads and highwater mark on waterways • within 50 metres of sheds, stock yards and houses. Treatment must be done prior to seed set each year. Properties with less than 20 hectares of infestation must treat the entire infestation. Additional areas may be ordered to be treated.
Special considerations	In the case of P4 infestations where they continue across property boundaries there is no requirement to treat the relevant part of the property boundaries as long as the boundaries of the infestation as a whole are treated. There must be agreement between neighbours in relation to the treatment of these areas.

Control Method

Recommended herbicides	**:**	• (1 leaf) August-September, (2 leaf) July-end August **2,4-D ester** (cereals and pasture) **2,4-D amine** (cereals and pasture) **2,4-DB** (cereals and pasture) **Gramoxone** (blanket wiper) • Full emergence to early August **2,2-DPA** • Wheat pre-sowing or post-emergence. Barley and oats post-emergence only **Chlorsulfuron** • Wheat - 10 days presowing. Barley post-emergence **Metsulfuron** • At point of corm exhaustion (pasture) **Spinnaker®** (for two leaf only)

Herbicide	**:**	**2,4-D ester** (various trade names)
Active ingredient	**:**	800 g/litre 2,4-D ester **(Group I)**
Rates of dilution for spot spraying	**:**	1:1500 to 1:1000
Amount of product per 10 litres water	**:**	7 - 10 mL
Rate of product per hectare	**:**	750 mL to 1 litre
Wetting agent dilution	**:**	1:600
Time of application	**:**	August-September (1 leaf) July-end August (2 leaf) A permit from APVMA is required after August 31.
Remarks	**:**	• Burn paddock in late summer early autumn to increase sprouting of corms cormils. Respraying at lower rates will be necessary for several years to exhaust dormant corms and cormils. Treatment will damage sub-clover. • Not favoured if near crops sensitive to 2,4-D eg. peas, canola, vines and lupins
More information and other control methods	**:**	• Cultivate after a good emergence. Repeat a few weeks later. • Repeat treatment for several years to exhaust dormant corms. Grub individual plants and burn but chemical control is preferrable. • Glyphosate or Gramoxone applied through a blanket wiper is effective on one-leaf. Less satisfactory results are achieved on two-leaf.

Herbicide	**:**	**2,4-D amine** (various trade names)
Active ingredient	**:**	500 g/litre 2,4-D amine **(Group I)**
Rates of dilution for spot spraying	**:**	1:1000 to 1:670
Amount of product per 10 litres water	**:**	10 - 15 mL
Rate of product per hectare	**:**	1 - 1.5 litres
Wetting agent dilution	**:**	1:600
Time of application	**:**	August-September (1 leaf) July-end August (2 leaf)
Remarks	**:**	Burn paddock in late summer early autumn to increase sprouting of cormils and corms. Respraying at lower rates will be necessary for several years to exhaust dormant corms and cormils. Treatment will damage clover.
More information and other control methods	**:**	• Cultivate after a good emergence. Repeat a few weeks later. • Repeat treatment for several years to exhaust dormant corms. • Grub individual plants and burn but chemical control is preferrable.

Herbicide	**:**	**2,4-DB**
Active Ingredient	**:**	400 g/litre 2,4-DB **(Group I)**
Rates of dilution for spot spraying	**:**	1:500 to 1:300
Amount of product per 10 litres water	**:**	20 - 30 mL
Rate of product per hectare	**:**	2 - 3 litres
Wetting agent dilution	**:**	1:600
Time of application	**:**	• August-September (1 leaf) • July-end August (2 leaf)
Remarks	**:**	Use where it is important to maintain clover content of pastures
More information and other control methods	**:**	• Cultivate after a good emergence. Repeat a few weeks later. • Repeat treatment for several years to exhaust dormant corms. • Grub individual plants and burn but chemical control is preferrable.

Herbicide	**:**	**2,2-DPA**
Active ingredient	**:**	740 g/kg 2,2-DPA **(Group J)**
Rates of dilution for spot spraying	**:**	55 g in 10 litres
Amount of product per 10 litres water	**:**	55 g
Rate of product per hectare	**:**	5.5 kg
Wetting agent dilution	**:**	1:600
Time of application	**:**	Full emergence to early August
Remarks	**:**	This treatment is recommended only for early control. More expensive than 2,4-D. Use in non-arable areas only. Useful for areas that become boggy later in winter. Can also be useful in bushland treatments.
More information and other control methods	**:**	• Cultivate after a good emergence. Repeat a few weeks later. • Repeat treatment for several years to exhaust dormant corms. Grub individual plants and burn but chemical control is preferrable. • Applied through a blanket wiper is effective on one-leaf. Less satisfactory results are achieved on two-leaf.

Herbicide	**:**	**Chlorsulfuron** (various trade names)
Active ingredient	**:**	750 g/kg chlorsulfuron **(Group B)**
Rates of dilution for spot spraying	**:**	2 g in 100 litres (**see remarks**)
Amount of product per 10 litres water	**:**	0.2 g
Rate of product per hectare	**:**	15 g

Wetting agent dilution	**:**	1:400
Time of application	**:**	Wheat pre-sowing or post-emergence. Barley and oats post-emergence only. Control can be achieved from early emergence to flowering of the Cape tulip. Less damage occurs to most non-legume components if applied late post-emergence
Remarks	**:**	• Recommended for control of tulip in cereal crops and non legume pastures, particularly if Paterson's curse, soursob or dock are also a problem. Dilution rate for spot spraying is based on 20 g/ha. • Before using chlorsulfuron or other sulfonyl ureas in cereals consider its implications for herbicide resistance strategies.
More information and other control methods	**:**	• Chlorsulfuron and metsulfuron have given promising results when used on pasture through a weed wiper at rates of 1 g/litre.

Herbicide	**:**	**Metsulfuron** (various trade names)
Active ingredient	**:**	600 g/kg Metsulfuron methyl **(Group B)**
Rates of dilution for spot spraying	**:**	1 g in 100 litres
Amount of product per 10 litres water	**:**	0.1 g
Rate of product per hectare	**:**	5 g
Wetting agent dilution	**:**	1:400 to 1:250
Time of application	**:**	• Wheat: 10 days presowing. • Wheat-barley: post-emergence
More information and other control methods	**:**	• Chlorsulfuron and metsulfuron have given promising results when used on pasture through a weed wiper at rates of 1 g/litre.

Herbicide	**:**	**Spinnaker®**
Active ingredient	**:**	700 g/kg imazethapyr **(Group B)**
Rate of product per hectare	**:**	35 - 50 g
Wetting agent dilution	**:**	BS-1000 1:500 or Pulse® at 200 mL/100 L or Hasten 500 mL/ 100 L
Time of application	**:**	At point of corm exhaustion
Remarks	**:**	Use Spinnaker only on two-leaf Cape tulip. Very safe on subterranean clover It may suppress some grases and erodium.
More information and other control methods	**:**	Chlorsulfuron and metsulfuron have given promising results when used on pasture through a weed wiper at rates of 1 g/litre. A mixture of 20-25 g Spinnaker with 100-150 mL glyphosate in pasture. Re-treatment the following years is essential.

Herbicide	**:**	**Gramoxone**
Active ingredient	**:**	250 g/L paraquat **(Group L)**
Rate of product per hectare	**:**	1 - 1.5 L
Wetting agent dilution	**:**	100 mL BS - 1000 per 100 L
Time of application	**:**	• Late August to September or at appearance of first flowers. • For 1 leaf cape tulip only
Remarks	**:**	• Recommended for trained or registered spraying contractor. • Can also be applied using a blanket wiper at 1 L / 10 L of mix
More information and other control methods	**:**	Can be used as a spray in conjunction with spray - topping to prevent grass seed production in pasture.

Weed Description

Family : Iridaceae
Form : Herbaceous – Perennial
Status : Present in WA

One-leaf Cape tulip (*Moraea flaccida,* previously *Homeria flaccida*) is a native of South Africa. Perennial herb to 70 cm high, distinguished by fibrous-sheathed corm at the base of the plant, orange to salmon pink flowers that are yellow in the centre; single leaves and presence of seeds in capsules. Corms 1–4 cm wide, developing new corms each year. Spread by seed and movement of corms. Often found in hay cut from infested paddocks.

Leaves : Leaf folded, ribbed, linear, to 1 m long, extended and drooping above the flowers.

Flowers: Borne on branched stems. Flowers with 6 petal-like perianth segments, each 2.6–4 cm long, not joined to each other; yellow forms have been found occasionally in WA. Flowers in spring when 2 or 3 years old.

Seeds : Angular red brown seeds, about 2 mm long, in narrow-cylindrical capsules 2.5–5 cm long, splitting from the apex into 3 parts.

Originally introduced as a garden plant in the 19th century. Seeds germinate in autumn and plants regrow from corms at the same time. Poisonous to stock but generally avoided by them. Young stock may be affected if there is no alternative grazing available. One-Leaf Cape Tulip is a serious pasture weed in WA, SA and Vic.

Two-leaf Cape tulip *(Moraea miniata* previously *Homeria miniata)* is a perennial herb to 60 cm high, native to South Africa. Confused with One-leaf Cape Tulip, *Moraea flaccida*, which produces seeds and has a single basal leaf. Distinguished by scaly covering around corm at the base of the plant, leaves 2 or 3;

Leaves : Folded, ribbed, linear, to 80 cm long.

Flowers: Pink–salmon coloured flowers with a green dotted yellow centre on branched stems. Flowers with 6 petal-like perianth segments, segments 1.3–2.5 cm long, not joined together. Flowers late winter and spring when 2 or 3 years old. Does not produce seeds, but does form a capsule to 1.5 cm long, which splits from the tips into 3 parts.

Corms : Corms 1–2.5 cm wide, developing new corms each year. Plants produce clusters of cormils in the swollen leaf axils and many small corms (cormils) around the parent corm. Grows from corms and cormils in autumn.

Spread by movement of corms and cormils caught in farm machinery and in agricultural produce. Poisonous to stock, but generally avoided by them. Cormil production may exceed many thousands per square metre, and may remain viable in the soil for many years. Less common than One-leaf Cape Tulip; the 2 species may grow together.

Other relevant information related to this topic:

- Quarantine WA
- Permitted and quarantine species list
- Cape tulips (Farmnote 100)
- Permit for minor off-label-use of a registered agvet chemical product (Permit number – per9655)
- Off-label permit (olp) for use of a registered agvet chemical product (Permit number - per4590)

Arum lily (*Zantedeschia aethiopica*)

Declaration

(Code: C= City; S=Shire; T=Town)

Category : P1, P4
Location : for the whole of the State.

Standard Control Codes (these may vary for individual plants)	
P1 REQUIREMENTS Prohibits movement	The movement of plants or their seeds is prohibited within the State. This prohibits the movement of contaminated machinery and produce including livestock and fodder.
P4 REQUIREMENTS Aims to prevent infestation spreading beyond existing boundaries of infestation	The infested area must be managed in such a way that prevents the spread of seed or plant parts within and from the property on or in livestock, fodder, grain, vehicles and/or machinery. Treat to destroy and prevent seed set all plants: • within 100 metres inside of the boundaries of the infested property • within 50 metres of roads and high-water mark on waterways • within 50 metres of sheds, stock yards and houses Treatment must be done prior to seed set each year. Properties with less than 2 hectares of infestation must treat the entire infestation. Additional areas may be ordered to be treated.
Special considerations	In the case of P4 infestations where they continue across property boundaries there is no requirement to treat the relevant part of the property boundaries as long as the boundaries of the infestation as a whole are treated. There must be agreement between neighbours in relation to the treatment of these areas .

Control Method

Recommended herbicides	**:**	June – October • **Chlorsulfuron** • **Metsulfuron** • **2,4-D amine** • **Paraquat**

Herbicide	**:**	**Chlorsulfuron** (various trade names - AVPMA site)
Active ingredient	**:**	750 g/kg or 790 g/kg chlorsulfuron **(Group B)**
Rates of dilution for spot spraying	**:**	1 g to 50 litres
Amount of product per 10 litres water	**:**	0.2 g
Rate of product per hectare	**:**	20 g
Wetting agent dilution	**:**	1:400
Time of application	**:**	June - October (best results when flowering)
Remarks	**:**	• Agitate well to ensure good mixing when using small quantities of chlorsulfuron - dissolve before adding to the tank. The spot spraying dilution is based on 20 g/ha. • To avoid the need to measure very small quantities of chemical add 1 g chlorsulfuron to 1 litre of water. Use 200 mL of this mix to 10 litres of water in a knapsack sprayer.
More information and other control methods	**:**	Glyphosate can be used at 1:100 but results are only fair.

Herbicide	**:**	**Metsulfuron** (various trade names - AVPMA site)
Active ingredient	**:**	600 g/kg chlorsulfuron **(Group B)**
Rates of dilution for spot spraying	**:**	0.75 g to 50 litres
Amount of product per 10 litres water	**:**	0.2 g
Rate of product per hectare	**:**	20 g
Wetting agent dilution	**:**	1:400
Time of application	**:**	June - October (best results when flowering)
Remarks	**:**	• Agitate well to ensure good mixing when using small quantities of metsulfuron - dissolve before adding to the tank. The spot spraying dilution is based on 20 g/ha. • For metsulfuron add 1 g to 1 litre of water and take 150 mL Add a wetting agent @ 10mL/10 L of water. Use 200 mL of this mix to 10 litres of water in a knapsack sprayer.
More information and other control methods	**:**	Glyphosate can be used at 1:100 but results are only fair.

Herbicide	**:**	**Paraquat** (various trade names - AVPMA site)
Active ingredient	**:**	200 or 250 g/L paraquat **(Group L)**
Amount of product per 10 litres water	**:**	20 mL
Rate of product per hectare	**:**	2 L
Wetting agent dilution	**:**	1:400 or 1 :1000 of BS - 1000
Time of application	**:**	End August - October before full flowering
Remarks	**:**	• Not recommended for application unless by registered spray contractor • This is a very effective treatment as it appears to reduce the underground rhizomes or tubers • Application through blanket wiper is also very effective for all the above chemicals.

Herbicide	**:**	**2,4-D amine** (various trade names - AVPMA site)
Active ingredient	**:**	a) 500 g/litre 2,4-D amine **(Group I)** b) 625 g/L
Rates of dilution for spot spraying	**:**	a) 1:200 b) 1:250
Amount of product per 10 litres water	**:**	a) 50 mL b) 40 mL
Rate of product per hectare	**:**	a) 5 L b) 4 L
Wetting agent dilution	**:**	1:1000
More information and other control methods	**:**	Busselton region recommended 1:80 2,4-D amine. Chemical is covered by the Restricted Spraying Regulations and can not be applied within 5 km of a commercial vineyard or tomato garden without a permit. Permits can be obtained from Department of Agriculture and Food Western Australia. In these situations paraquat, chlorsulfuron and metsulfuron are the preferred treatment.

Weed Description

Family : Araceae
Form : Herbaceous – Perennial
Status : Present in WA

Arum lily is a robust, dark green, succulent herb, also known as Calla or White arum lily. It was introduced to WA from South Africa as a garden plant and subsequently escaped to become established as a weed. It is found in creeks, irrigation ditches and areas of summer-moist land in the higher rainfall south west of Western Australia, often forming large dense clumps.

Arum lily competes with valuable perennial pasture plants on summer land. It has been claimed to cause eczema in humans. Stock deaths have occurred from grazing arum lily.

Arum lily has fleshy roots and forms extensive tubers which store food for future use. The roots when boiled provide a starchy food for some South African tribes, however, they are poisonous when eaten raw.

Arum lily spreads vegetatively by regeneration from tuber fragments and by seeds.

Leaves: The petioles (leaf stalks) are up to 0.4 m long and smooth; the leaf blades are thick and fleshy, pointed at the apex with blunt lobes at the base.

Flowers: White to greenish white and tubular flowers, becoming funnel shaped at the top with a slit down one side. Flowering takes place in spring.

Fruit: The berry is oval, yellowish, about 1 cm in diameter and contains several round seeds about 3 mm in diameter.

Other relevant information related to this topic:

- Quarantine WA
- Permitted and quarantine species list
- Weeds CRC
- Permit for minor off-label-use of a registered agvet chemical product (Permit number – per9655)
- Off-label permit (olp) for use of a registered agvet chemical product (Permit number - per4590)
- Off-label permit (olp) for use of a registered agvet chemical product (Permit number – per4594)

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Appendix D

Quadrat Data, Spring 2009 and 2010

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PHASE 1 - QUALITATIVE QUADRAT DATA FOR 2009

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R01

Described by KH **Date** 6/10/2009 **Type** Q 10 x 10

MGA Zone 50 391692**mE** 6449116**mN**

Soil Grey to yellow sand

Vegetation Open Woodland of *Eucalyptus marginata* over a Low Open Woodland of *Banksia attenuata* and *Banksia menziesii* over a Low Open Heath of *Allocasuarina humilis*, *Xanthorrhoea preissii* and *Hibbertia hypericoides* over an Open Sedgeland of *Mesomelaena pseudostygia* in grey-yellow sand.

Veg Condition Good

Name	Cover %	Height cm
**Briza maxima*	2	20
**Ehrharta calycina*	<1	70
**Hypochaeris glabra*	<1	5
**Lysimachia arvensis*	<1	5
**Petrorhagia dubia*	<1	10
**Ursinia anthemoides*	1	20
Acacia pulchella	1	80
Allocasuarina humilis	8	300
Banksia attenuata	5	600
Banksia menziesii	1	500
Burchardia congesta	<1	30
Conostylis aculeata	<1	30
Daviesia divaricata	1	50
Daviesia nudiflora subsp. *nudiflora*	<1	50

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
Hibbertia huegelii	15	80
Mesomelaena pseudostygia	2	80
Patersonia occidentalis	<1	30
Petrophile linearis	<1	50
Trachymene pilosa	<1	5
Xanthorrhoea preissii	8	200
**Ehrharta longiflora*	Opp	
**Gladiolus caryophyllaceus*	Opp	
**Lagurus ovatus*	Opp	
**Pelargonium capitatum*	Opp	
**Trifolium dubium*	Opp	
**Watsonia meriana*	Opp	
Acacia alata	Opp	
Acacia stenoptera	Opp	
Amphipogon turbinatus	Opp	
Anigozanthos humilis	Opp	
Anigozanthos manglesii	Opp	
Astroloma pallidum	Opp	
Babingtonia camphorosmae	Opp	
Banksia lindleyana	Opp	
Beaufortia elegans	Opp	
Bossiaea eriocarpa	Opp	
Caladenia arenicola	Opp	
Caladenia discoidea	Opp	
Caladenia flava subsp. *flava*	Opp	
Caladenia georgei	Opp	
Caladenia latifolia	Opp	
Calectasia narragara	Opp	
Calytrix flavescens	Opp	
Cassytha racemosa	Opp	
Chamaescilla corymbosa	Opp	
Chenopodiaceae sp.	Opp	
Conostephium pendulum	Opp	
Conostephium preissii	Opp	
Conostylis juncea	Opp	
Conostylis setigera	Opp	
Crassula colorata	Opp	
Dampiera linearis	Opp	
Dasypogon bromeliifolius	Opp	
Daviesia triflora	Opp	
Desmocladus fasciculatus	Opp	
Desmocladus flexuosus	Opp	
Dianella revoluta var. *divaricata*	Opp	
Diuris magnifica	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
Drosera erythrorhiza	Opp	
Eremaea asterocarpa	Opp	
Eremaea beaufortioides	Opp	
Eriochilus dilatatus	Opp	
Eucalyptus marginata	Opp	
Gastrolobium capitatum	Opp	
Gompholobium tomentosum	Opp	
Gonocarpus pithyoides	Opp	
Hedypnois rhagadioloides	Opp	
Hemiandra pungens	Opp	
Hibbertia vaginata	Opp	
Hovea pungens	Opp	
Hybanthus calycinus	Opp	
Hypocalymma robustum	Opp	
Jacksonia furcellata	Opp	
Lagenophora huegelii	Opp	
Laxmannia squarrosa	Opp	
Lepidosperma squamatum	Opp	
Lepidosperma tenue	Opp	
Leptomeria cunninghamii	Opp	
Leptospermum spinescens	Opp	
Leucopogon conostephioides	Opp	
Leucopogon propinquus	Opp	
Lobelia alata	Opp	
Lomandra hermaphrodita	Opp	
Loxocarya cinerea	Opp	
Lyginia imberbis	Opp	
Lysinema ciliatum	Opp	
Macarthuria australis	Opp	
Macrozamia riedlei	Opp	
Meeboldina scariosa	Opp	
Mesomelaena stygia subsp. *stygia*	Opp	
Opercularia vaginata	Opp	
Persoonia comata	Opp	
Phlebocarya ciliata	Opp	
Phyllanthus calycinus	Opp	
Pimelea sulphurea	Opp	
Poa drummondiana	Opp	
Pterostylis recurva	Opp	
Pterostylis vittata	Opp	
Regelia ciliata	Opp	
Scaevola canescens	Opp	
Scholtzia involucrata	Opp	
Senecio lautus	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
Sowerbaea laxiflora	Opp	
Stirlingia latifolia	Opp	
Stylidium brunonianum	Opp	
Stylidium piliferum	Opp	
Stylidium repens	Opp	
Stylidium schoenoides	Opp	
Thelymitra benthamiana	Opp	
Thelymitra crinita	Opp	
Thelymitra vulgaris	Opp	
Thysanotus dichotomus	Opp	
Thysanotus manglesianus	Opp	
Thysanotus sparteus	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R02

Described by KH **Date** 6/10/2009 **Type** Q 10 x 10

MGA Zone 50 387466**mE** 6449151**mN**

Soil Brown Sandy Loam

Vegetation Woodland to Open Woodland of *Eucalyptus marginata* and *Corymbia calophylla* over an Open to Low Shrubland of *Xanthorrhoea preissii*, *Macrozamia riedlei* and *Hibbertia hypericoides* over an Open Herbland of **Oxalis pes-caprae* and *Sowerbaea laxiflora* over an Open Grassland of **Briza maxima* and **Ehrharta calycina* on brown sandy loam.

Veg Condition Degraded

Name	Cover %	Height cm
**Briza maxima*	2	20
**Chamaecytisus palmensis*	1	150
**Oxalis pes-caprae*	3	30
**Vicia sativa*	<1	creeper
**Watsonia meriana*	1	150
Corymbia calophylla	20	1200
Eucalyptus marginata	1	1500
Hardenbergia comptoniana	<1	creeper
Macrozamia riedlei	2	200
Sowerbaea laxiflora	1	80
Tetraria octandra	1	50
Xanthorrhoea preissii	4	250

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
**Arctotheca calendula*	Opp	
**Brassica tournefortii*	Opp	
**Bromus diandrus*	Opp	
**Ehrharta calycina*	Opp	
**Ehrharta longiflora*	Opp	
**Eragrostis curvula*	Opp	
**Eucalyptus sideroxylon*	Opp	
**Euphorbia terracina*	Opp	
**Freesia alba x leichtlinii*	Opp	
**Gazania linearis*	Opp	
**Gladiolus caryophyllaceus*	Opp	
**Lagurus ovatus*	Opp	
**Lolium rigidum*	Opp	
**Lupinus cosentinii*	Opp	
**Pelargonium capitatum*	Opp	
**Schinus terebinthifolius*	Opp	
**Trifolium dubium*	Opp	
**Tropaeolum majus*	Opp	
Acacia saligna	Opp	
Banksia menziesii	Opp	
Ecdeiocolea monostachya	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R03

Described by KH **Date** 30/09/2009 **Type** Q 10 x 10

MGA Zone 50 389646**mE** 6449728**mN**
Soil Grey Sand
Vegetation Low Open Woodland of *Banksia attenuata* and *Banksia menziesii* with occasional *Eucalyptus marginata* over an Open Heath of *Hibbertia hypericoides and Xanthorrhoea preissii* over an Open Sedgeland of *Mesomelaena pseudostygia.*
Veg Condition Degraded to Good

Name	Cover %	Height cm
**Ehrharta calycina*	<1	30
**Ehrharta longiflora*	<1	30
**Hypochaeris glabra*	6	5
**Silene gallica* var. *gallica*	<1	10
Acacia pulchella	<1	30
Banksia attenuata	4	900
Banksia menziesii	4	700
Burchardia congesta	<1	30
Drosera stolonifera	<1	10
Eucalyptus marginata	1.5	1200
Hibbertia hypericoides	35	80
Hypocalymma robustum	<1	40
Lepidosperma squamatum	<1	30
Loxocarya cinerea	<1	10
Mesomelaena pseudostygia	0.5	70
Petrophile linearis	<1	30

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
Trachymene pilosa	<1	5
Xanthorrhoea preissii	2	120
**Arctotheca calendula*	Opp	
**Asparagus asparagoides*	Opp	
**Carpobrotus edulis*	Opp	
**Euphorbia terracina*	Opp	
**Gladiolus caryophyllaceus*	Opp	
**Isolepis marginata*	Opp	
**Moraea flaccida*	Opp	
**Sonchus oleraceus*	Opp	
**Zantedeschia aethiopica*	Opp	
Allocasuarina fraseriana	Opp	
Allocasuarina humilis	Opp	
Banksia ilicifolia	Opp	
Caladenia arenicola	Opp	
Caladenia flava subsp. *flava*	Opp	
Caladenia georgei	Opp	
Caladenia longicauda subsp. *longicauda*	Opp	
Calandrinia corrigioloides	Opp	
Calandrinia granulifera	Opp	
Calytrix flavescens	Opp	
Centrolepis drummondiana	Opp	
Conostylis aculeata	Opp	
Crassula colorata var. colorata	Opp	
Daviesia divaricata	Opp	
Dianella revoluta var. *divaricata*	Opp	
Diuris magnifica	Opp	
Drosera erythrorhiza	Opp	
Erodium cygnorum	Opp	
Hardenbergia comptoniana	Opp	
Hibbertia huegelii	Opp	
Kennedia prostrata	Opp	
Kunzea glabrescens	Opp	
Leporella fimbriata	Opp	
Leptospermum spinescens	Opp	
Leucopogon polymorphus	Opp	
Lyginia imberbis	Opp	
Macrozamia riedlei	Opp	
Nuytsia floribunda	Opp	
Patersonia occidentalis	Opp	
Persoonia comata	Opp	
Philotheca spicata	Opp	
Phlebocarya ciliata	Opp	
Pimelea rosea subsp. *rosea*	Opp	
Pyrorchis nigricans	Opp	
Quinetia urvillei	Opp	
Sowerbaea laxiflora	Opp	
Stirlingia latifolia	Opp	
Tetraria octandra	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R04

Described by KH **Date** 6/10/2009 **Type** Q 10 x 10

MGA Zone 50 387525**mE** 6449103**mN**

Soil Grey to Brown Sand

Vegetation Woodland to Open Woodland of *Eucalyptus marginata* and *Corymbia calophylla* over an Open to Low Shrubland of *Xanthorrhoea preissii*, *Macrozamia riedlei* and *Hibbertia hypericoides* over an Open Herbland of **Oxalis pes-caprae* and *Sowerbaea laxiflora* over an Open Grassland of **Briza maxima* and **Ehrharta calycina* on brown sandy loam.

Veg Condition Good

Name	Cover %	Height cm
**Ehrharta calycina*	1	90
**Ehrharta longiflora*	<1	100
**Freesia alba x leichtlinii*	<1	20
**Hypochaeris glabra*	<1	5
**Lupinus cosentinii*	<1	20
**Trifolium dubium*	<1	20
**Ursinia anthemoides*	<1	10
**Vicia sativa*	<1	creeper
Acacia rostellifera	<1	70
Bossiaea eriocarpa	<1	30
Burchardia congesta	<1	30
Conostylis aculeata	<1	20
Corymbia calophylla	4	1600
Desmocladus flexuosus	<1	20

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
Eucalyptus marginata	1.5	1600
Hakea prostrata	<1	250
Hibbertia hypericoides	5	80
Hovea trisperma	<1	50
Lomandra micrantha	<1	20
Macrozamia riedlei	<1	90
Mesomelaena pseudostygia	<1	50
Pimelea rosea subsp. *rosea*	<1	50
Platysace tenuissima	<1	80
Sowerbaea laxiflora	<1	30
Stackhousia monogyna	<1	20
Tetraria octandra	<1	30
Xanthorrhoea preissii	6	250
**Acacia pycnantha*	Opp	
**Aira caryophyllea*	Opp	
**Babiana angustifolia*	Opp	
**Cynodon dactylon*	Opp	
**Fumaria capreolata*	Opp	
**Lupinus angustifolius*	Opp	
**Lysimachia arvensis*	Opp	
**Moraea flaccida*	Opp	
**Petrorhagia dubia*	Opp	
Acacia huegelii	Opp	
Acacia pulchella	Opp	
Allocasuarina fraseriana	Opp	
Banksia dallanneyi	Opp	
Banksia grandis	Opp	
Caladenia flava subsp. *flava*	Opp	
Caladenia georgei	Opp	
Caladenia latifolia	Opp	
Caladenia longicauda subsp. *calcigena*	Opp	
Caladenia longicauda subsp. *longicauda*	Opp	
Calectasia narragara	Opp	
Chamaescilla corymbosa	Opp	
Chamelaucium uncinatum	Opp	
Conostephium pendulum	Opp	
Daviesia nudiflora subsp. *nudiflora*	Opp	
Daviesia triflora	Opp	
Dianella revoluta var. *divaricata*	Opp	
Diuris magnifica	Opp	
Eryngium pinnatifidum subsp. *palustre* (P3)	Opp	
Eucalyptus gomphocephala	Opp	
Gompholobium tomentosum	Opp	
Hybanthus floribundus	Opp	
Hypocalymma robustum	Opp	
Isotropis cuneifolia	Opp	
Jacksonia furcellata	Opp	
Lagenophora huegelii	Opp	
Laxmannia squarrosa	Opp	
Lepidosperma squamatum	Opp	
Lepidosperma squamatum (complex variant)	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
Leucopogon nutans	Opp	
Luzula meridionalis	Opp	
Lyginia imberbis	Opp	
Petrophile macrostachya	Opp	
Philotheca spicata	Opp	
Phyllanthus calycinus	Opp	
Podolepis gracilis	Opp	
Scaevola canescens	Opp	
Stylidium schoenoides	Opp	
Tetraria capillaris	Opp	
Thelymitra vulgaris	Opp	
Thysanotus sparteus	Opp	
Xylomelum occidentale	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R05

Described by KH **Date** 30/09/2009 **Type** Q 10 x 10

MGA Zone 50 390885**mE** 6449462**mN**

Soil Grey to Brown-Yellow Sand

Vegetation Low Open Woodland of *Banksia attenuata* and *Banksia menziesii* with occasional *Eucalyptus marginata* and *Nuytsia floribunda* over Shrubland of *Allocasuarina humilis* and *Hibbertia hypericoides* with occasional *Allocasuarina fraseriana* and *Jacksonia furcellata* over a Grassland of **Ehrharta calycina* and *Mesomelaena pseudostygia* on pale brown sand.

Veg Condition Degraded

Name	Cover %	Height cm
Allocasuarina humilis	3	150
Banksia attenuata	4	700
Banksia menziesii	2	600
Hibbertia huegelii	10	70
Mesomelaena pseudostygia	1	70
**Arctotheca calendula*	Opp	
**Brassica tournefortii*	Opp	
**Dimorphotheca ecklonis*	Opp	
**Ehrharta calycina*	Opp	
**Ehrharta longiflora*	Opp	
**Eragrostis curvula*	Opp	
**Euphorbia terracina*	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
**Freesia alba x leichtlinii*	Opp	
**Fumaria capreolata*	Opp	
**Gazania linearis*	Opp	
**Gladiolus caryophyllaceus*	Opp	
**Heliophila pusilla*	Opp	
**Hypochaeris glabra*	Opp	
**Lagurus ovatus*	Opp	
**Lupinus cosentinii*	Opp	
**Oxalis pes-caprae*	Opp	
**Pelargonium capitatum*	Opp	
**Raphanus raphanistrum*	Opp	
**Sonchus oleraceus*	Opp	
**Trachyandra divaricata*	Opp	
**Ursinia anthemoides*	Opp	
Acacia pulchella	Opp	
Acacia stenoptera	Opp	
Adenanthos cygnorum	Opp	
Allocasuarina fraseriana	Opp	
Amphipogon turbinatus	Opp	
Anigozanthos manglesii	Opp	
Banksia dallanneyi	Opp	
Bossiaea eriocarpa	Opp	
Bromus arenarius	Opp	
Burchardia congesta	Opp	
Caladenia flava subsp*. flava*	Opp	
Caladenia georgei	Opp	
Caladenia longicauda subsp. *longicauda*	Opp	
Calectasia narragara	Opp	
Calytrix flavescens	Opp	
Calytrix fraseri	Opp	
Chamelaucium uncinatum	Opp	
Conostephium minus	Opp	
Conostephium pendulum	Opp	
Conostylis aculeata subsp. *aculeata*	Opp	
Conostylis setigera	Opp	
Dampiera linearis	Opp	
Dasypogon bromeliifolius	Opp	
Daviesia divaricata	Opp	
Daviesia nudiflora subsp. *nudiflora*	Opp	
Drosera menziesii subsp. *penicillaris*	Opp	
Eremaea asterocarpa	Opp	
Eremaea pauciflora	Opp	
Eucalyptus marginata	Opp	
Gastrolobium capitatum	Opp	
Gompholobium tomentosum	Opp	
Hakea trifurcata	Opp	
Hardenbergia comptoniana	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
Hemiandra pungens	Opp	
Hibbertia subvaginata	Opp	
Hypocalymma robustum	Opp	
Jacksonia furcellata	Opp	
Kennedia prostrata	Opp	
Laxmannia squarrosa	Opp	
Lepidosperma squamatum	Opp	
Lepidosperma tenue	Opp	
Leptomeria cunninghamii	Opp	
Leptospermum spinescens	Opp	
Leucopogon conostephioides	Opp	
Leucopogon sp. Murdoch (M. Hislop 1037)	Opp	
Lobelia anceps	Opp	
Lomandra hermaphrodita	Opp	
Lomandra micrantha	Opp	
Lyginia imberbis	Opp	
Lysinema ciliatum	Opp	
Macrozamia riedlei	Opp	
Meeboldina scariosa	Opp	
Nuytsia floribunda	Opp	
Patersonia occidentalis	Opp	
Petrophile linearis	Opp	
Petrophile macrostachya	Opp	
Philotheca spicata	Opp	
Phlebocarya ciliata	Opp	
Pimelea rosea subsp. *rosea*	Opp	
Pimelea sulphurea	Opp	
Pterostylis sp.	Opp	
Regelia ciliata	Opp	
Scaevola canescens	Opp	
Scaevola repens var. *repens*	Opp	
Scholtzia involucrata	Opp	
Senecio pinnatifolius	Opp	
Siloxerus humifusus	Opp	
Stackhousia monogyna	Opp	
Stirlingia latifolia	Opp	
Stylidium brunonianum	Opp	
Stylidium repens	Opp	
Stylidium schoenoides	Opp	
Tetraria octandra	Opp	
Thysanotus dichotomus	Opp	
Thysanotus patersonii	Opp	
Trachymene pilosa	Opp	
Xanthorrhoea preissii	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R06

Described by KH **Date** 30/09/2009 **Type** Q10 x 10

MGA Zone 50 390977**mE** 6449439**mN**

Soil Pale Brown Sand

Vegetation Low Open Woodland of *Banksia attenuata* and *Banksia menziesii* with occasional *Eucalyptus marginata* and *Nuytsia floribunda* over Shrubland of *Allocasuarina humilis* and *Hibbertia hypericoides* with occasional *Allocasuarina fraseriana* and *Jacksonia furcellata* over a Grassland of **Ehrharta calycina* and *Mesomelaena pseudostygia* on pale brown sand.

Veg Condition Good

Name	Cover %	Height cm
Acacia pulchella	1	50
Allocasuarina humilis	16	150
Banksia attenuata	5	700
Banksia menziesii	1	400
Bossiaea eriocarpa	<1	30
**Briza maxima*	2	10
Burchardia congesta	<1	20
Caladenia flava subsp. *flava*	<1	20
Conostylis setigera	<1	20
Daviesia nudiflora subsp. *nudiflora*	<1	50
**Ehrharta calycina*	30	70
**Euphorbia terracina*	1	20
**Gladiolus caryophyllaceus*	<1	30
Gompholobium tomentosum	<1	40
Hibbertia hypericoides	2	70
Hypocalymma robustum	1	30
**Hypochaeris glabra*	<1	5
Jacksonia furcellata	1	190
Mesomelaena pseudostygia	2	70
Nuytsia floribunda	2	600
Petrophile linearis	<1	30
Stirlingia latifolia	<1	50
**Ursinia anthemoides*	<1	10

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R07

Described by KH **Date** 1/10/2009 **Type** Q 10 x 10

MGA Zone 50 389754**mE** 6449455**mN**

Soil Grey - Brown Sand

Vegetation Low Open Woodland of *Banksia attenuata* and *Banksia menziesii* with occasional *Eucalyptus marginata* and *Nuytsia floribunda* over Shrubland of *Allocasuarina humilis* and *Hibbertia hypericoides* with occasional *Allocasuarina fraseriana* and *Jacksonia furcellata* over a Grassland of **Ehrharta calycina* and *Mesomelaena pseudostygia* on pale brown sand.

Veg Condition Good

Name	Cover %	Height cm
Acacia pulchella	<1	80
Allocasuarina humilis	<1	250
Banksia attenuata	3	600
Banksia ilicifolia	<1	250
Banksia menziesii	2	600
Burchardia congesta	<1	40
Caladenia flava subsp. *flava*	<1	20
Caladenia longicauda subsp. *longicauda*	<1	30
Conostephium preissii	<1	100
Conostylis aculeata	<1	30
Dampiera lindleyi	<1	10
Daviesia divaricata	<1	40
Daviesia nudiflora subsp. *nudiflora*	<1	80
Dianella revoluta var. *divaricata*	<1	50

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
Eucalyptus marginata	3	900
**Gladiolus caryophyllaceus*	<1	80
Gompholobium tomentosum	<1	30
Hardenbergia comptoniana	<1	creeper
Hedypnois rhagadioloides	<1	10
Hibbertia hypericoides	<1	40
**Hypochaeris glabra*	<1	5
Jacksonia furcellata	4	300
Loxocarya cinerea	<1	20
Mesomelaena pseudostygia	<1	40
**Romulea rosea*	2	20
**Sonchus oleraceus*	<1	20
Tetraria octandra	<1	20
**Ursinia anthemoides*	<1	10
Xanthorrhoea preissii	5	300

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R09

Described by KH **Date** 1/10/2009 **Type** Q 10 x 10

MGA Zone 50 389467**mE** 6449954**mN**
Soil Grey Sand
Vegetation Open Woodland to Low Open Woodland of *Eucalyptus rudis* and *Melaleuca preissiana* over Open Herbland of **Carpobrotus edulis*,**Zantedeschia aethiopica* and **Oxalis pes-caprae* on grey sand.
Veg Condition Degraded to Completely Degraded

Name	Cover %	Height cm
*Lysimachia arvensis	<1	5
*Arctotheca calendula	<1	5
*Asparagus asparagoides	<1	creeper
*Carpobrotus edulis	10	20
Erodium cygnorum	<1	10
Eucalyptus rudis	3	1200
*Euphorbia terracina	<1	20
Hibbertia cuneiformis	<1	80
Melaleuca preissiana	4	800
Nuytsia floribunda	1	600
*Oxalis pes-caprae	20	10
Zantedeschia aethiopica	2	60
*Acacia iteaphylla	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	**Cover %**	**Height cm**
Allocasuarina fraseriana	Opp	
Caladenia latifolia	Opp	
Crassula colorata var. *colorata*	Opp	
Macrozamia riedlei	Opp	
**Moraea flaccida*	Opp	
Muehlenbeckia adpressa	Opp	
Scholtzia involucrata	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R10

Described by KH **Date** 30/09/2009 **Type** Q 10 x 10

MGA Zone 50 389999**mE** 6449481**mN**

Soil Pale Brown Sandy Loam

Vegetation Low Open Forest of *Corymbia calophylla, Banksia attenuata* and *Banksia illicifolia* over a Tall Shrubland of *Kunzea glabrescens* over a Low Shrubland of *Xanthorrhoea preissii* with occasional *Macrozamia riedlei* over a Herbland of *Lomandra* sp. and *Dasypogon bromeliifolius* on grey sand.

Veg Condition Good

Name	Cover %	Height cm
Allocasuarina fraseriana	<1	900
Banksia attenuata	4	700
Banksia menziesii	2	600
Bossiaea eriocarpa	<1	30
**Briza maxima*	<1	20
Conostephium minus	<1	40
Conostephium preissii	<1	50
Conostylis aculeata subsp. *aculeata*	0.1	30
Corymbia calophylla	0.5	1000
Dampiera linearis	<1	10
Dasypogon bromeliifolius	1	30
**Gladiolus caryophyllaceus*	<1	120

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
Gompholobium tomentosum	<1	40
**Hypochaeris glabra*	<1	5
Jacksonia gracillima (P3)	<1	50
Kunzea glabrescens	40	250
Lepidosperma squamatum	<1	70
Lomandra hermaphrodita	<1	10
Patersonia occidentalis	<1	50
Philotheca spicata	<1	20
Phlebocarya ciliata	4	40
Stackhousia monogyna	<1	30
Thysanotus patersonii	<1	creeper
Xanthorrhoea preissii	20	150
Diuris magnifica	Opp	
Hovea pungens	Opp	
Hypocalymma robustum	Opp	
Loxocarya cinerea	Opp	
Nuytsia floribunda	Opp	
Petrophile linearis	Opp	
Phlebocarya ciliata	Opp	
Stirlingia latifolia	Opp	
**Zantedeschia aethiopica*	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R11

Described by KH **Date** 30/09/2009 **Type** Q 10 x 10

MGA Zone 50 389928**mE** 6449586**mN**
Soil Grey Sand
Vegetation Low Woodland of *Allocasuarina fraseriana*, *Banksia menziesii, Banksia attenuata* and *Banksia illicifolia* over a Low Open Shrubland of *Kunzea glabrescens* over an Open Herbland of *Phlebocarya ciliata*, *Dasypogon bromeliifolius* and *Loxocarya cinerea*.
Veg Condition -Good

Name	Cover %	Height cm
Allocasuarina fraseriana	4	800
Banksia attenuata	3	600
Banksia ilicifolia	2	500
Banksia menziesii	3	600
Bossiaea eriocarpa	<1	50
**Briza maxima*	<1	10
Dasypogon bromeliifolius	1	50
**Ehrharta calycina*	<1	50
**Freesia alba x leichtlinii*	<1	20
Gompholobium tomentosum	<1	50
Hibbertia hypericoides	<1	60
**Hypochaeris glabra*	<1	5
Kunzea glabrescens	4	300

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
Lepidosperma squamatum	<1	50
Leptomeria pauciflora	<1	150
Leucopogon conostephioides	<1	40
Loxocarya cinerea	6	20
Lyginia imberbis	<1	60
Phlebocarya ciliata	<1	60
Scholtzia involucrata	<1	30
Stackhousia monogyna	<1	30
Trachymene pilosa	<1	5
Zantedeschia aethiopica	<1	80
Caladenia arenicola	Opp	
Conostephium minus	Opp	
Eucalyptus marginata	Opp	
**Gladiolus caryophyllaceus*	Opp	
Hardenbergia comptoniana	Opp	
Petrophile linearis	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R12

Described by KH **Date** 1/10/2009 **Type** Q 10 x 10

MGA Zone 50 388650**mE** 6449587**mN**

Soil Grey over Yellow Sand

Vegetation Open Woodland of *Eucalyptus marginata* and *Corymbia calophylla* over a Low Open Shrubland of *Xanthorrhoea preissii*, *Macrozamia riedlei*, *Daviesia divaricata* and *Hibbertia hypericoides* over an Open Grassland of **Ehrharta calycina* on grey sand over yellow sand.

Veg Condition Degraded

Name	Cover %	Height cm
Anigozanthos manglesii	<1	100
**Arctotheca calendula*	<1	10
**Briza maxima*	<1	10
Burchardia congesta	<1	30
Caladenia flava subsp. *flava*	<1	20
Corymbia calophylla	1.5	1900
Daviesia divaricata	2	100
Desmocladus flexuosus	<1	10
**Ehrharta calycina*	20	40
Eucalyptus marginata	3	1800
**Freesia alba x leichtlinii*	<1	10
**Gladiolus caryophyllaceus*	<1	50
Hibbertia hypericoides	2	40
Kennedia prostrata	<1	creeper

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
**Lupinus cosentinii*	<1	10
Macrozamia riedlei	3	200
Mesomelaena pseudostygia	1	50
**Oxalis pes-caprae*	<1	20
Tetraria octandra	<1	20
**Ursinia anthemoides*	<1	10
**Vinca major*	<1	creeper
Xanthorrhoea preissii	4	250
Acacia pulchella	Opp	
Acacia saligna subsp. *saligna*	Opp	
Acacia stenoptera	Opp	
Babingtonia camphorosmae	Opp	
Banksia attenuata	Opp	
Banksia grandis	Opp	
Bossiaea eriocarpa	Opp	
Brunonia australis	Opp	
Caladenia arenicola	Opp	
Caladenia longicauda	Opp	
**Chamaecytisus palmensis*	Opp	
Chamaescilla corymbosa	Opp	
**Chasmanthe floribunda*	Opp	
Conostephium pendulum	Opp	
Conostylis aculeata	Opp	
Conostylis candicans	Opp	
Dampiera linearis	Opp	
Dianella revoluta var. *divaricata*	Opp	
Diuris longifolia	Opp	
Drosera stolonifera	Opp	
Gompholobium tomentosum	Opp	
Haemodorum sp.	Opp	
Hakea prostrata	Opp	
Hardenbergia comptoniana	Opp	
Hemiandra pungens	Opp	
Hibbertia vaginata	Opp	
Isotropis cuneifolia	Opp	
**Ixia maculata*	Opp	
Jacksonia furcellata	Opp	
**Lagurus ovatus*	Opp	
Lepidosperma squamatum	Opp	
Leucopogon propinquus	Opp	
Lobelia anceps	Opp	
Lomandra caespitosa	Opp	
Lomandra hermaphrodita	Opp	
Loxocarya cinerea	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
**Lupinus luteus*	Opp	
Lyginia imberbis	Opp	
**Moraea flaccida*	Opp	
**Pelargonium capitatum*	Opp	
Persoonia comata	Opp	
Petrophile linearis	Opp	
Petrophile macrostachya	Opp	
Philotheca spicata	Opp	
Phlebocarya ciliata	Opp	
Pimelea ciliata	Opp	
Podolepis gracilis	Opp	
Scaevola canescens	Opp	
Tricoryne elatior	Opp	
**Trifolium dubium*	Opp	
**Watsonia meriana*	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R13

Described by KH **Date** 30/09/2009 **Type** Q 10 x 10

MGA Zone 50 391304**mE** 6449675**mN**

Soil Grey sand.

Vegetation Open Woodland of occasional *Eucalyptus marginata* over a Low Open Woodland of *Banksia attenuata* and *Banksia menziesii* with occasional *Eucalyptus marginata* over Open-heath of *Allocasuarina humilis*, *Conostephium minus* and *Eremaea pauciflora* over an Open Grassland/Sedgeland of *Amphipogon turbinatus* and *Mesomelaena pseudostygia* on grey sand.

Veg Condition Good to Very Good

Name	Cover %	Height cm
Acacia pulchella	<1	20
Allocasuarina humilis	30	250
Amphipogon turbinatus	20	30
Banksia attenuata	4	800
Banksia menziesii	2	600
Bossiaea eriocarpa	<1	30
**Briza maxima*	<1	10
Caladenia flava subsp. *flava*	<1	10
Caladenia longicauda subsp. *longicauda*	<1	15
Calectasia narragara	<1	30
Calytrix flavescens	1	60
Calytrix fraseri	1	60
Conostephium minus	10	80
Conostylis aculeata subsp. *aculeata*	<1	15
Conostylis setosa	<1	10
Dasypogon bromeliifolius	<1	20
Drosera menziesii subsp. *penicillaris*	<1	creeper
Eremaea pauciflora	5	60
Eucalyptus marginata	1	400
**Gladiolus caryophyllaceus*	<1	90
Hibbertia huegelii	<1	30
Hypocalymma robustum	<1	50
Leptomeria cunninghamii	<1	40
Lyginia imberbis	<1	80
Mesomelaena pseudostygia	1.5	30
Nuytsia floribunda	1	300
Patersonia occidentalis	<1	40
Petrophile linearis	<1	30
Philotheca spicata	<1	70
Pimelea sulphurea	<1	60
Scholtzia involucrata	<1	30
Senecio pinnatifolius	<1	10
Stirlingia latifolia	<1	120
Stylidium schoenoides	<1	20
Ursinia anthemoides	<1	10
Acacia stenoptera	Opp	
Amphipogon turbinatus	Opp	
Astroloma pallidum	Opp	
Austrodanthonia occidentalis	Opp	
Austrostipa nitida	Opp	
Banksia ilicifolia	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
Bossiaea ornata	Opp	
Caladenia arenicola	Opp	
Calectasia narragara	Opp	
**Carpobrotus edulis*	Opp	
Chamelaucium uncinatum	Opp	
Chordifex sinuosus	Opp	
Conostephium minus	Opp	
Conostylis setigera	Opp	
**Cynodon dactylon*	Opp	
Dampiera linearis	Opp	
Daviesia nudiflora subsp. *nudiflora*	Opp	
Daviesia triflora	Opp	
Diuris magnifica	Opp	
Drosera menziesii	Opp	
Eremaea pauciflora var. *pauciflora*	Opp	
Eucalyptus marginata	Opp	
**Euphorbia terracina*	Opp	
**Freesia alba x leichtlinii*	Opp	
Gastrolobium capitatum	Opp	
Haemodorum laxum	Opp	
Haemodorum sp.	Opp	
Hardenbergia comptoniana	Opp	
**Helminthotheca echioides*	Opp	
Hemiandra pungens	Opp	
Hibbertia huegelii	Opp	
Hibbertia subvaginata	Opp	
Hovea pungens	Opp	
Hovea trisperma	Opp	
Hybanthus calycinus	Opp	
Hybanthus floribundus	Opp	
**Hypochaeris glabra*	Opp	
Jacksonia furcellata	Opp	
Kunzea glabrescens	Opp	
Lechenaultia floribunda	Opp	
Lepidosperma tenue	Opp	
Leptomeria cunninghamii	Opp	
Leptospermum spinescens	Opp	
Leucopogon propinquus	Opp	
Lomandra hermaphrodita	Opp	
Lomandra sonderi	Opp	
Loxocarya cinerea	Opp	
**Lupinus cosentinii*	Opp	
Macarthuria australis	Opp	
Meeboldina scariosa	Opp	
Melaleuca thymoides	Opp	
Mesomelaena stygia subsp. *stygia*	Opp	
Microtis media	Opp	
Nuytsia floribunda	Opp	
Opercularia vaginata	Opp	
**Pelargonium capitatum*	Opp	
**Pentaschistis airoides*	Opp	
Persoonia comata	Opp	
Petrophile macrostachya	Opp	
Phlebocarya ciliata	Opp	
Pimelea sulphurea	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	**Cover %**	**Height cm**
Pterostylis recurva	Opp	
Scaevola canescens	Opp	
**Sonchus oleraceus*	Opp	
Sowerbaea laxiflora	Opp	
Stylidium amoenum	Opp	
Stylidium brunonianum	Opp	
Stylidium piliferum	Opp	
Stylidium repens	Opp	
Synaphea spinulosa subsp. *spinulosa*	Opp	
Tetraria capillaris	Opp	
Tetraria octandra	Opp	
Thelymitra benthamiana	Opp	
Thelymitra crinita	Opp	
Thysanotus manglesianus	Opp	
Trachymene pilosa	Opp	
Tricoryne elatior	Opp	
Trymalium odoratissimum subsp. *odoratissimum*	Opp	
**Watsonia meriana*	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R14

Described by KH **Date** 30/09/2009 **Type** Q 10 x 10
MGA Zone 50 389402**mE** 6449651**mN**

Soil Grey Sand
Vegetation BiSiH - Low Open Woodland of *Banksia illicifolia* over a Tall Open Shrubland of *Kunzea glabrescens* over an Open Herbland of *Scholtzia involucrata* and **Carpobrotus edulis* on grey sand.
Veg Condition Degraded to Good

Species	**Cover %**	**Height cm**
Banksia ilicifolia	1	700
**Briza maxima*	<1	5
**Carpobrotus edulis*	10	5
Crassula colorata var. *colorata*	<1	5
**Hypochaeris glabra*	<1	5
Kunzea glabrescens	3	250
Scholtzia involucrata	10	20
**Arctotheca calendula*	Opp	
**Ehrharta calycina*	Opp	
**Ehrharta longiflora*	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R15

Described by KH **Date** 1/10/2009 **Type** Q 10 x 10

MGA Zone 50 389770**mE** 6449820**mN**

Soil Grey - Brown Sandy Loam

Vegetation Low Woodland of *Banksia attenuata* and *Nuytsia floribunda* with occasional *Banksia illicifolia* over a Low Open Shrubland of *Xanthorrhoea preissii* with emergent *Kunzea glabrescens* over an Open Herbland of **Zantedeschia aethiopica* on grey-brown sandy loam.

Veg Condition Degraded

Name	Cover %	Height cm
**Arctotheca calendula*	<1	10
Banksia attenuata	5	800
Banksia ilicifolia	2	800
Banksia menziesii	0.5	500
**Briza maxima*	2	10
**Hypochaeris glabra*	<1	5
Kunzea glabrescens	1	300
Nuytsia floribunda	4	600
Trachymene pilosa	<1	5
Xanthorrhoea preissii	1	200
Zantedeschia aethiopica	10	100
**Ehrharta longiflora*	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
Hibbertia hypericoides	Opp	
Hibbertia subvaginata	Opp	
Macrozamia riedlei	Opp	
**Moraea flaccida*	Opp	
Scholtzia involucrata	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R16

Described by KH **Date** 1/10/2009 **Type** Q 10 x 10

MGA Zone 50 389434**mE** 6449808**mN**
Soil Grey Sand.
Vegetation Low Open Woodland of *Eucalyptus todtiana* with occasional *Eucalyptus rudis* over a Tall Open Shrubland of *Kunzea glabrescens* over an Open Herbland of **Carpobrotus edulis* on grey sand.
Veg Condition Degraded to Good

Name	Cover %	Height cm
Banksia ilicifolia	1	400
**Carpobrotus edulis*	20	20
Eucalyptus todtiana	3	500
Hibbertia cuneiformis	<1	100
Kunzea glabrescens	5	300
Zantedeschia aethiopica	2	50
**Arctotheca calendula*	Opp	
**Briza maxima*	Opp	
Crassula colorata var. *colorata*	Opp	
Eryngium pinnatifidum	Opp	
Eucalyptus rudis	Opp	
**Hypochaeris glabra*	Opp	
Regelia ciliata	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Scholtzia involucrata	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R17

Described by KH **Date** 14/09/2009 **Type** Q 10x10
MGA Zone 50 386577**mE** 6449271**mN**

Soil Brown sand

Vegetation Woodland to Open Woodland of *Eucalyptus marginata* and *Corymbia calophylla* over an Open to Low Shrubland of *Xanthorrhoea preissii*, *Macrozamia riedlei* and *Hibbertia hypericoides* over an Open Herbland of **Oxalis pes-caprae* and *Sowerbaea laxiflora* over an Open Grassland of **Briza maxima* and **Ehrharta calycina* on brown sandy loam.

Veg Condition Good

Name	Cover %	Height cm
Banksia attenuata	0.5	500
Bossiaea eriocarpa	<1	30
**Briza maxima*	<1	10
Burchardia congesta	<1	30
Caladenia flava subsp. *flava*	<1	10
Corymbia calophylla	2	1600
Daviesia triflora	<1	30
**Ehrharta calycina*	<1	50
Eucalyptus marginata	4	1600
**Freesia alba x leichtlinii*	<1	10
**Gladiolus caryophyllaceus*	<1	100

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
Gompholobium tomentosum	<1	30
Hardenbergia comptoniana	<1	creeper
Hibbertia hypericoides	7	50
Hypocalymma robustum	1	40
Macrozamia riedlei	3	200
Mesomelaena pseudostygia	1	30
**Oxalis pes-caprae*	<1	20
Phlebocarya ciliata	<1	30
Pimelea rosea subsp. *rosea*	1	50
Tetraria octandra	1	30
**Vicia sativa*	<1	creeper
Xanthorrhoea preissii	10	200
Acacia pulchella	Opp	
**Acacia pycnantha*	Opp	
Acacia rostellifera	Opp	
Acacia saligna	Opp	
Allocasuarina fraseriana	Opp	
Allocasuarina humilis	Opp	
Amphipogon turbinatus	Opp	
**Lysimachia arvensis*	Opp	
Anigozanthos humilis	Opp	
**Arctotheca calendula*	Opp	
Astroloma pallidum	Opp	
Banksia menziesii	Opp	
Bromus arenarius	Opp	
Caladenia arenicola	Opp	
Caladenia georgei	Opp	
Calectasia narragara	Opp	
Calytrix flavescens	Opp	
Chamelaucium uncinatum	Opp	
Conostephium pendulum	Opp	
Conostylis aculeata	Opp	
Crassula colorata	Opp	
**Cynodon dactylon*	Opp	
Daviesia divaricata	Opp	
Desmocladus flexuosus	Opp	
Drosera stolonifera	Opp	
**Ehrharta longiflora*	Opp	
**Eragrostis curvula*	Opp	
Eryngium pinnatifidum subsp. *palustre* (P3)	Opp	
Eucalyptus gomphocephala	Opp	
**Euphorbia terracina*	Opp	
Hakea prostrata	Opp	
Hibbertia huegelii	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
**Hypochaeris glabra*	Opp	
Jacksonia furcellata	Opp	
Kennedia prostrata	Opp	
Lagenophora huegelii	Opp	
**Lagurus ovatus*	Opp	
Laxmannia squarrosa	Opp	
Leucopogon propinquus	Opp	
**Lolium rigidum*	Opp	
Lomandra hermaphrodita	Opp	
Lomandra micrantha	Opp	
**Lupinus cosentinii*	Opp	
Lyginia imberbis	Opp	
Opercularia vaginata	Opp	
**Pentaschistis airoides*	Opp	
Persoonia comata	Opp	
Petrophile linearis	Opp	
Petrorhagia velutina	Opp	
Philotheca spicata	Opp	
Podolepis gracilis	Opp	
Pyrorchis nigricans	Opp	
**Romulea rosea*	Opp	
Scaevola canescens	Opp	
Sowerbaea laxiflora	Opp	
Stirlingia latifolia	Opp	
Stylidium amoenum	Opp	
Stylidium piliferum	Opp	
Synaphea spinulosa subsp. *spinulosa*	Opp	
Thysanotus manglesianus	Opp	
**Trifolium dubium*	Opp	
**Ursinia anthemoides*	Opp	
**Wahlenbergia capensis*	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R18

Described by KH **Date** 14/10/2009 **Type** Q 10 x 10

MGA Zone 50 386441**mE** 6449248**mN**

Soil Yellow Sand

Vegetation Open Woodland of *Eucalyptus gomphocephala* and *Eucalyptus marginata* over a Low Open Woodland of *Banksia attenuata* over a Tall Open Shrubland of *Xanthorrhoea preissii* over an Open Sedgeland of *Mesomelaena pseudostygia* on yellow sand.

Veg Condition Degraded

Name	Cover %	Height cm
Acacia pulchella	<1	20
**Lysimachia arvensis*	<1	5
Anigozanthos humilis	<1	30
**Arctotheca calendula*	<1	10
Austrostipa compressa	<1	30
Banksia attenuata	1	800
Banksia dallanneyi	<1	10
Bossiaea eriocarpa	<1	30
**Briza maxima*	<1	10
Burchardia congesta	<1	40
Caladenia arenicola	<1	20
Caladenia georgei	<1	20

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
Chamaescilla corymbosa	<1	5
Conostephium preissii	<1	30
Corynotheca micrantha	<1	10
Crassula colorata var. *colorata*	<1	10
**Ehrharta calycina*	<1	50
**Ehrharta longiflora*	<1	40
Eucalyptus gomphocephala	2	2200
Eucalyptus marginata	3	1700
**Ferraria crispa*	<1	10
**Freesia alba x leichtlinii*	2	10
**Fumaria capreolata*	<1	10
**Gladiolus caryophyllaceus*	<1	40
Hakea prostrata	<1	30
Hardenbergia comptoniana	<1	creeper
Hibbertia hypericoides	<1	50
**Hypochaeris glabra*	<1	10
Kennedia prostrata	<1	creeper
Lepidosperma squamatum	<1	20
Lomandra hermaphrodita	<1	20
Mesomelaena pseudostygia	2	70
**Petrorhagia dubia*	<1	30
Pimelea sulphurea	<1	5
Podolepis gracilis	<1	10
Pterostylis sp.	<1	10
Ptilotus polystachyus	<1	20
Senecio pinnatifolius	<1	10
**Sonchus oleraceus*	<1	10
Tetraria octandra	<1	30
Thysanotus manglesianus	<1	creeper
Trachymene pilosa	<1	5
**Trifolium dubium*	<1	10
**Ursinia anthemoides*	<1	10
Xanthorrhoea preissii	8	250
**Acacia pycnantha*	Opp	
Acacia rostellifera	Opp	
**Asparagus officinalis*	Opp	
Banksia grandis	Opp	
Banksia menziesii	Opp	
Banksia sessilis	Opp	
**Briza minor*	Opp	
Caladenia flava subsp. *flava*	Opp	
Conostylis aculeata	Opp	
Dianella revoluta var. *divaricata*	Opp	
Dodonaea hackettiana (P4)	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	**Cover %**	**Height cm**
Eryngium pinnatifidum subsp. *palustre* (P3)	Opp	
**Fumaria capreolata*	Opp	
Gompholobium tomentosum	Opp	
Jacksonia furcellata	Opp	
**Pelargonium capitatum*	Opp	
Pimelea rosea subsp. *rosea*	Opp	
Scaevola canescens	Opp	
**Trifolium dubium*	Opp	
**Watsonia meriana*	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R19

Described by KH **Date** 14/10/2009 **Type** Q 10 x 10
MGA Zone 50 386464**mE** 6448874**mN**

Soil Yellow Sand
Vegetation Open Woodland to Low Open Woodland of *Eucalyptus marginata* and *Banksia attenuata* over Low Shrubland of *Acacia pulchella*, *Hibbertia hypericoides*, *Macrozamia riedlei* and *Xanthorrhoea preissii* over **Briza maxima* on yellow sand.
Veg Condition Good

Name	Cover %	Height cm
Acacia pulchella	5	200
Allocasuarina fraseriana	<1	800
Amphipogon turbinatus	<1	5
Anigozanthos humilis	<1	20
Banksia attenuata	4	600
Banksia dallanneyi	<1	20
Banksia menziesii	<1	500
**Briza maxima*	1	10
Conostephium pendulum	<1	30
Conostylis aculeata	<1	20
Dianella revoluta var. *divaricata*	<1	50
Drosera stolonifera	<1	20
**Ehrharta calycina*	<1	40

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
Eucalyptus marginata	3	1200
**Gladiolus caryophyllaceus*	<1	30
Gompholobium tomentosum	<1	40
Hibbertia hypericoides	3	60
Hypocalymma robustum	<1	30
**Hypochaeris glabra*	<1	5
Isotropis cuneifolia	<1	10
Jacksonia furcellata	<1	150
Laxmannia squarrosa	<1	10
Lomandra hermaphrodita	<1	15
Lyginia imberbis	<1	50
Macrozamia riedlei	1	80
Mesomelaena pseudostygia	<1	40
Petrophile linearis	<1	5
Pimelea rosea subsp. *rosea*	<1	40
Podolepis gracilis	<1	20
Scaevola canescens	<1	20
Siloxerus humifusus	<1	2
Sowerbaea laxiflora	<1	30
Trachymene pilosa	<1	5
**Trifolium dubium*	<1	10
**Ursinia anthemoides*	<1	10
Xanthorrhoea preissii	6	250
Banksia grandis	Opp	
Eryngium pinnatifidum subsp. *palustre* (P3)	Opp	
Hardenbergia comptoniana	Opp	
Hovea trisperma	Opp	
**Pelargonium capitatum*	Opp	
**Petrorhagia dubia*	Opp	
Stylidium brunonianum	Opp	
Stylidium schoenoides	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R20

Described by KH **Date** 21/10/2009 **Type** Q 10 X 10
MGA Zone 50 391486**mE** 6449342**mN**

Soil Grey Sand
Vegetation Low Open Woodland of *Banksia attenuata* and *Banksia menziesii* over a Tall Shrubland of *Regelia ciliata* over a Low Shrubland of *Allocasuarina humilis* and *Hibbertia hypericoides* over an Open Sedgeland of *Mesomelaena pseudostygia* on grey sand.
Veg Condition Good to Very Good

Name	Cover %	Height cm
Acacia pulchella	<1	80
Allocasuarina humilis	1	150
Amphipogon turbinatus	<1	10
Astroloma pallidum	<1	30
Austrostipa elegantissima	<1	40
Banksia attenuata	5	600
Banksia menziesii	2	500
**Briza maxima*	<1	10
Burchardia congesta	<1	50
Dampiera linearis	<1	30
**Ehrharta calycina*	<1	40
Gastrolobium capitatum	<1	30
**Gladiolus caryophyllaceus*	<1	100
Gompholobium tomentosum	<1	60
Hemiandra pungens	1	20
Hibbertia hypericoides	2	70
Laxmannia squarrosa	<1	10
Lomandra hermaphrodita	<1	20
Lomandra micrantha	<1	10
Melaleuca thymoides	<1	80
Mesomelaena pseudostygia	1	70
Patersonia occidentalis	<1	70
Pimelea sulphurea	<1	10
Regelia ciliata	11	250
Scaevola canescens	<1	10
Stirlingia latifolia	<1	100
Thysanotus patersonii	<1	creeper
Trachymene pilosa	<1	5
**Ursinia anthemoides*	<1	20
Acacia alata	Opp	
Allocasuarina fraseriana	Opp	
Anigozanthos humilis	Opp	
Austrodanthonia occidentalis	Opp	
Banksia dallanneyi	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
Bossiaea eriocarpa	Opp	
Caladenia flava subsp. *flava*	Opp	
Caladenia georgei	Opp	
Caladenia longicauda	Opp	
Calandrinia sp.	Opp	
Calytrix flavescens	Opp	
Conostephium pendulum	Opp	
Conostylis aculeata subsp. *aculeata*	Opp	
Conostylis setigera	Opp	
Dasypogon bromeliifolius	Opp	
Daviesia divaricata	Opp	
Daviesia nudiflora subsp. *nudiflora*	Opp	
Daviesia triflora	Opp	
Desmocladus flexuosus	Opp	
Drosera menziesii	Opp	
Eremaea asterocarpa	Opp	
**Euphorbia terracina*	Opp	
Hibbertia huegelii	Opp	
Hibbertia vaginata	Opp	
Hybanthus calycinus	Opp	
Hypocalymma robustum	Opp	
**Hypochaeris glabra*	Opp	
Jacksonia furcellata	Opp	
Kennedia prostrata	Opp	
Lechenaultia biloba	Opp	
Leptomeria cunninghamii	Opp	
Loxocarya cinerea	Opp	
Nuytsia floribunda	Opp	
Opercularia echinocephala	Opp	
**Pelargonium capitatum*	Opp	
Persoonia comata	Opp	
Petrophile linearis	Opp	
Philotheca spicata	Opp	
Poa drummondiana	Opp	
Pterostylis sp.	Opp	
Scaevola repens	Opp	
Scholtzia involucrata	Opp	
**Sonchus oleraceus*	Opp	
Sowerbaea laxiflora	Opp	
Stirlingia latifolia	Opp	
Stylidium brunonianum	Opp	
Stylidium piliferum	Opp	
Stylidium repens	Opp	
Tetraria octandra	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
Thelymitra crinita	Opp	
Tricoryne elatior	Opp	
Xanthorrhoea preissii	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R21

Described by KH **Date** 22/10/2009 **Type** Q 10 x 10

MGA Zone 50 386610**mE** 6448714**mN**
Soil Brown - Yellow Sand
Vegetation Low Open Woodland of *Eucalyptus marginata*, *Banksia attenuata* and *Banksia menziesii* over a Low Open Shrubland of *Xanthorrhoea preissii* with occasional *Banksia sessilis* in degraded areas, on brown-yellow sand.
Veg Condition Degraded

Name	Cover %	Height cm
Allocasuarina fraseriana	<1	500
Banksia attenuata	5	500
Banksia menziesii	2	500
**Briza maxima*	2	20
Burchardia congesta	<1	20
**Carpobrotus edulis*	<1	10
Daviesia divaricata	<1	70
Dianella revoluta var. *divaricata*	<1	30
**Ehrharta calycina*	<1	50
**Ehrharta longiflora*	<1	30
Eucalyptus marginata	2	800
**Gladiolus caryophyllaceus*	<1	30
Gompholobium tomentosum	<1	30
Hardenbergia comptoniana	<1	creeper
Hibbertia hypericoides	<1	20
Hypocalymma robustum	<1	30
Jacksonia furcellata	3	300
**Lagurus ovatus*	<1	10
Leucopogon propinquus	<1	50
Macrozamia riedlei	<1	200
Mesomelaena pseudostygia	<1	50
Pimelea rosea subsp. *rosea*	1	50
**Ursinia anthemoides*	<1	20
Xanthorrhoea preissii	6	200
Acacia pulchella	Opp	
Acacia rostellifera	Opp	
Amphipogon turbinatus	Opp	
**Lysimachia arvensis*	Opp	
Anigozanthos humilis	Opp	
Anigozanthos manglesii	Opp	
**Babiana angustifolia*	Opp	
Banksia dallanneyi	Opp	
Banksia sessilis	Opp	
Chamelaucium uncinatum	Opp	
Conostephium pendulum	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
Conostylis aculeata	Opp	
Crassula colorata var. *colorata*	Opp	
Erodium cygnorum	Opp	
Eryngium pinnatifidum subsp. *palustre* (P3)	Opp	
Eucalyptus gomphocephala	Opp	
**Euphorbia terracina*	Opp	
**Freesia alba x leichtlinii*	Opp	
Gastrolobium capitatum	Opp	
Hakea prostrata	Opp	
Kennedia prostrata	Opp	
Laxmannia squarrosa	Opp	
Lepidosperma squamatum	Opp	
Lomandra hermaphrodita	Opp	
Loxocarya cinerea	Opp	
Lyginia imberbis	Opp	
Neurachne alopecuroidea	Opp	
**Oxalis pes-caprae*	Opp	
**Passiflora filamentosa*	Opp	
Patersonia occidentalis	Opp	
**Pelargonium capitatum*	Opp	
Persoonia comata	Opp	
Petrophile linearis	Opp	
Phlebocarya ciliata	Opp	
Podolepis gracilis	Opp	
Podotheca gnaphalioides	Opp	
Pterostylis sp.	Opp	
Ptilotus polystachyus	Opp	
Sowerbaea laxiflora	Opp	
Stylidium brunonianum	Opp	
Stylidium piliferum	Opp	
Tetraria capillaris	Opp	
Tetraria octandra	Opp	
**Trifolium dubium*	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R22

Described by GM **Date** 4/11/2009 **Type** Q 10 x 10

MGA Zone 50 389860**mE** 6449306**mN**

Soil Brown Sandy Loam

Vegetation Low Open Woodland of *Melaleuca preissiana* and occasional *Eucalyptus rudis* over a Closed Tall Scrub of *Kunzea glabrescens* over occasional *Lepidosperma angustifolium* over an Open Herbland of **Zantedeschia aethiopica* over **Aira caryophyllea* and **Gallium murale* on brown sandy-loam flats.

Veg Condition Good

Name	Cover %	Height cm
**Aira caryophyllea*	40	0.1
**Briza minor*	<1	0.1
**Galium murale*	40	0.1
**Hypochaeris glabra*	<1	prostrate
Ixiolaena viscosa	2	0.2
Kunzea glabrescens	80	2.5
Melaleuca preissiana	30	5
Zantedeschia aethiopica	25	0.2
Acacia pulchella	Opp	
**Asparagus asparagoides*	Opp	
Astartea scoparia	Opp	
Baumea preissii subsp. *laxa*	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	**Cover %**	**Height cm**
**Briza maxima*	Opp	
Dampiera linearis	Opp	
Hypocalymma robustum	Opp	
Lepidosperma sp.	Opp	
Microtis media	Opp	
Patersonia occidentalis	Opp	
Pteridium esculentum	Opp	
Taxandria linearifolia	Opp	
Tetraria capillaris	Opp	
Xanthorrhoea preissii	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R23

Described by GM **Date** 5/11/2009 **Type** Q 10 x 10

MGA Zone 50 389867**mE** 6449820**mN**

Soil Brown Clay-Loam

Vegetation Low Open Forest of *Eucalyptus rudis* and *Melaleuca preissiana* over a Tall Open Shrubland of *Astartea fascicularis* and *Kunzea glabrescens* over an Open Shrubland of **Pteridium esculentum* over a Sedgeland of *Lepidosperma angustifolium* on brown clayey-loam flats.

Veg Condition Good

Name	Cover %	Height cm
Aotus cordifolia (P3)	<1	30
Astartea scoparia	3	220
Baumea preissii subsp. *laxa*	60	120
Eucalyptus rudis	40	500
Hypocalymma angustifolium	<1	prostrate
Kunzea glabrescens	3	200
Melaleuca preissiana	5	40
Pteridium esculentum	4	150
Senecio hispidulus	<1	10
Thysanotus manglesianus	<1	creeper
**Zantedeschia aethiopica*	1	40
Banksia littoralis	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
**Cortaderia selloana*	Opp	
Hypocalymma robustum	Opp	
Meeboldina scariosa	Opp	
Melaleuca rhaphiophylla	Opp	
Tetraria capillaris	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R24

Described by GM **Date** 5/11/2009 **Type** Q 10 x 10

MGA Zone 50 389972**mE** 6449820**mN**
Soil Black Clay
Vegetation Low Open Forest of *Eucalyptus rudis* and *Melaleuca preissiana* with occasional *Banksia attenuata* over a Tall Shrubland of *Gastrolobium ebracteolatum* and *Kunzea glabrescens* over a Low Open Shrubland of *Taxandria linearifolia* over a Sedgeland of *Baumea preissii* subsp. *laxa* on black clay flats.
Veg Condition Good to Very Good

Name	Cover %	Height cm
Aotus cordifolia (P3)	<1	40
Astartea scoparia	3	20
Baumea preissii subsp. *laxa*	65	60
Cassytha racemosa	<1	creeper
Centella asiatica	1	10
Dampiera linearis	5	40
Eucalyptus rudis	10	600
Gastrolobium ebracteolatum	10	300
Hardenbergia comptoniana	<1	creeper
Kunzea glabrescens	2	230
Leucopogon propinquus	1	60
Melaleuca preissiana	15	500

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	**Cover %**	**Height cm**
Microtis media	<1	30
Patersonia occidentalis	1	50
Taxandria linearifolia	6	150
**Briza maxima*	Opp	
**Briza minor*	Opp	
**Carpobrotus edulis*	Opp	
Cyathochaeta teretifolia (P3)	Opp	
**Cynodon dactylon*	Opp	
**Cyperus polystachyos*	Opp	
**Eragrostis curvula*	Opp	
**Hypochaeris glabra*	Opp	
**Isolepis marginata*	Opp	
Lachnagrostis filiformis	Opp	
Lepidosperma squamatum	Opp	
**Lotus subbiflorus*	Opp	
Meeboldina scariosa	Opp	
Pteridium esculentum	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R25

Described by GM **Date** 8/11/2009 **Type** Q 10 x 10

MGA Zone 50 390138**mE** 6449872**mN**

Soil Grey sand

Vegetation Low Open Forest of *Corymbia calophylla*, *Banksia attenuata* and *Banksia illicifolia* over aTall Shrubland of *Kunzea glabrescens* over a Low Shrubland of *Xanthorrhoea preissii* with occasional *Macrozamia riedlei* over a Herbland of *Lomandra* sp. and *Dasypogon bromeliifolius* on grey sand.

Veg Condition Good to Very Good

Name	Cover %	Height cm
Banksia attenuata	15	600
Banksia ilicifolia	3	600
**Carpobrotus edulis*	1	10
Corymbia calophylla	30	900
Dasypogon bromeliifolius	12	50
Desmocladus flexuosus	3	40
Hypocalymma robustum	1	30
Jacksonia gracillima (P3)	2	30
Kunzea glabrescens	20	300
Lomandra sp.	6	40
Macrozamia riedlei	1	30
Microtis media	<1	30

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	**Cover %**	**Height cm**
Phlebocarya ciliata	1	40
Xanthorrhoea preissii	10	120
**Acacia longifolia*	Opp	
Bossiaea eriocarpa	Opp	
**Briza maxima*	Opp	
**Bromus diandrus*	Opp	
Conostylis juncea	Opp	
Crassula colorata	Opp	
Drosera helodes	Opp	
**Hypochaeris glabra*	Opp	
**Isolepis marginata*	Opp	
Tricoryne elatior	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R26

Described by GM **Date** 5/11/2009 **Type** Q 10 x 10

MGA Zone 50 390234**mE** 6449797**mN**

Soil Grey Sand

Vegetation Low Woodland of *Eucalyptus marginata* with occasional *Corymbia calophylla* and *Banksia menziesii* over a Tall Shrubland of *Kunzea glabrescens* with occasional *Allocasuarina fraseriana* over a Closed Herbland of **Carpobrotus edulis* on grey sand.

Veg Condition Degraded to Completely Degraded

Name	Cover %	Height cm
**Acacia longifolia*	1	120
**Lysimachia arvensis*	<1	10
**Bromus diandrus*	<1	10
**Carpobrotus edulis*	80	10
Eucalyptus marginata	20	600
**Euphorbia peplus*	2	20
**Gladiolus caryophyllaceus*	<1	40
Kunzea glabrescens	10	300
**Zantedeschia aethiopica*	5	30
**Acacia iteaphylla*	Opp	
**Avena fatua*	Opp	
**Briza maxima*	Opp	
**Ehrharta calycina*	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
**Eragrostis curvula*	Opp	
Eucalyptus todtiana	Opp	
Hibbertia cuneiformis	Opp	
**Lagurus ovatus*	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R27

Described by GM **Date** 12/11/2009 **Type** Q 10 x 10

MGA Zone 50 390100**mE** 6449581**mN**

Soil Brown Sandy Loam

Vegetation Closed sedgeland of **Typha orientalis*, *Baumea vaginalis* and *Baumea articulata* on brown sand loam.

Veg Condition Good to Very Good

Name	**Cover %**	**Height cm**
Baumea articulata	10	60
Baumea vaginalis	10	60
**Typha orientalis*	80	70
Melaleuca rhaphiophylla	Opp	
**Solanum nigrum*	Opp	
Taxandria linearifolia	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R28

Described by GM **Date** 12/11/2009 **Type** Q 10 x 10

MGA Zone 50 390169**mE** 6449681**mN**
Soil Brown Sandy Loam
Vegetation Open Forest of *Corymbia calophylla*, *Eucalyptus rudis* and *Banksia littoralis* over Tall Shrubland of *Melaleuca preissiana* and *Kunzea glabrescens* with occasional *Melaleuca rhaphiophylla* over a Closed Sedgeland of *Baumea articulata* fringing wetlands.
Veg Condition Good to Very Good

Name	Cover %	Height cm
Banksia littoralis	40	1200
Baumea articulata	30	130
Baumea vaginalis	<1	80
Lachnagrostis filiformis	1	60
Leucopogon propinquus	2	150
Melaleuca preissiana	10	1300
Melaleuca teretifolia	2	500
Patersonia occidentalis	<1	10
**Rumex crispus*	<1	20
Tetraria capillaris	30	50
**Zantedeschia aethiopica*	2	40
Acacia pulchella	Opp	
**Asparagus asparagoides*	Opp	
**Avena fatua*	Opp	
**Ehrharta longiflora*	Opp	
Eucalyptus rudis	Opp	
**Fumaria capreolata*	Opp	
Lobelia tenuior	Opp	
Melaleuca rhaphiophylla	Opp	
Patersonia occidentalis	Opp	
**Pelargonium capitatum*	Opp	
**Pennisetum clandestinum*	Opp	
Taxandria linearifolia	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R29

Described by GM **Date** 24/11/2009 **Type** Q 10 x 10

MGA Zone 50 390007**mE** 6449799**mN**

Soil Brown sandy loam

Vegetation Low Woodland to Open Forest of *Eucalyptus rudis*, *Banksia attenuata* and *Melaleuca preissiana* over Low Open Shrubland of *Taxandria linearifolia*, *Gastrolobium ebracteolatum* and **Pteridium esculentum* over Closed Sedgeland of *Cyathochaeta teretifolia* (P3) on brown sandy loam.

Veg Condition Very Good

Name	**Cover %**	**Height cm**
Banksia attenuata	5	900
Banksia littoralis	<1	20
Cassytha racemosa	<1	creeper
Cyathochaeta teretifolia (P3)	20	70
Dampiera triloba (P1)	30	50
Eucalyptus rudis	3	700
Gastrolobium ebracteolatum	5	140
Leucopogon propinquus	1	130
Melaleuca preissiana	35	1100
Pteridium esculentum	7	150
Taxandria linearifolia	5	400
Lobelia tenuior	Opp	
Patersonia occidentalis	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R30

Described by GM **Date** 1/04/2010 **Type** Q 10x10

MGA Zone 50 386670 **mE** 6448316 **mN**

Soil Pale grey-yellow Sand

Vegetation Closed scrub of *Jacksonia furcellata* over a tall shrubland of *Kunzea glabrescens* over a grassland dominated by **Ehrharta calycina*, **Ehrharta longiflora* and **Briza maxima* on pale grey-yellow sands, associated with disturbed roadside areas.

Veg Condition Degraded

Name	Cover %	Height cm
Acacia saligna	2	150
**Briza maxima*	10	30
**Ehrharta calycina*	5	100
**Ehrharta longiflora*	20	100
**Gladiolus caryophyllaceus*	<1	40
#*Hakea petiolaris*	2	200
Jacksonia furcellata	60	300
Kunzea glabrescens	10	250
**Lagurus ovatus*	2	15
Acacia pulchella	Opp	
Agonis flexuosa	Opp	
#*Chamelaucium uncinatum*	Opp	
**Cynodon dactylon*	Opp	
Daviesia divaricata	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
**Eragrostis curvula*	Opp	
**Gazania linearis*	Opp	
Gompholobium tomentosum	Opp	
**Lupinus cosentinii*	Opp	
Macrozamia riedlei	Opp	
#Melaleuca nesophila	Opp	
**Pelargonium capitatum*	Opp	
**Ursinia anthemoides*	Opp	
Xanthorrhoea preissii	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R31

Described by GM **Date** 12/04/2010 **Type** Vegetation Description

MGA Zone 50 386409 **mE** 6450038 **mN**

Habitat Parkland sloping down to detention basin and roadside vegetation.

Vegetation Cleared parkland consisting mainly of *#Araucaria heterophylla*, *Eucalyptus gomphocephala*, *Melaleuca viminea*, *Xanthorrhoea preissii*, *#Rosmarinus officinalis*, *#Melaleuca nesophila*, **Cynodon dactylon*, *#Callistemon phoeniceus*, **Pennisetum clandestinum*.

Veg Condition Completely Degraded

Name
Allocasuarina fraseriana
#Araucaria heterophylla
#Callistemon phoeniceus
**Cynodon dactylon*
Eucalyptus gomphocephala
#Eucalyptus platypus
Hakea prostrata
#Melaleuca nesophila
**Melaleuca viminea*
Olearia axillaris
**Pennisetum clandestinum*
Rhagodia baccata
#Rosmarinus officinalis
Xanthorrhoea preissii

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R32

Described by GM **Date** 12/04/2010 **Type** Q 10x10

MGA Zone 50 387425 **mE** 6449390 **mN**

Habitat Roadside vegetation on gently sloping earth batter

Soil brown sand

Vegetation Roadside vegetation consisting of a Tall Open Woodland of #*Eucalyptus conferruminata*, #*Eucalyptus erythrocorys*, #*Eucalyptus platypus* with scattered *Corymbia calophylla* and *Eucalyptus marginata*, over a Tall Open Shrubland of #*Melaleuca nesophila*, **Acacia iteaphylla*, *Jacksonia furcellata*, #*Callistemon phoeniceus* and #*Callitris sp.* over introduced grasses dominated by **Cynodon dactylon*, **Ehrharta calycina* and **Eragrostis curvula*.

Veg Condition Degraded to Completely Degraded

Name	Cover %	Height cm
**Acacia iteaphylla*	3	130
**Acacia longifolia*	<1	30
**Conyza sumatrensis*	<1	50
**Cynodon dactylon*	1	20
**Ehrharta calycina*	<1	50
#*Eucalyptus conferruminata*	60	800
#*Eucalyptus erythrocorys*	2	200
Jacksonia furcellata	1	180
Jacksonia sternbergiana	2	250
#*Melaleuca nesophila*	4	220
Acacia pulchella	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
Acacia saligna	Opp	
Agonis flexuosa	Opp	
Allocasuarina fraseriana	Opp	
#Callistemon phoeniceus	Opp	
#Callitris sp.	Opp	
Corymbia calophylla	Opp	
**Corymbia maculata*	Opp	
**Eragrostis curvula*	Opp	
Eucalyptus marginata	Opp	
#Eucalyptus platypus	Opp	
**Foeniculum vulgare*	Opp	
**Gazania linearis*	Opp	
Gompholobium tomentosum	Opp	
Hakea prostrata	Opp	
**Lagurus ovatus*	Opp	
**Leptospermum laevigatum*	Opp	
Macrozamia riedlei	Opp	
Melaleuca lanceolata	Opp	
Xanthorrhoea preissii	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R33

Described by GM **Date** 12/04/2010 **Type** Q 10x10

MGA Zone 50 393157 **mE** 6449627 **mN**

Vegetation Low Woodland of *Banksia attenuata*, *Banksia menziesii* and *Banksia illicifolia* with occasional *Nuytsia floribunda*, *Allocasuarina fraseriana*, *Melaleuca preissiana* and *Eucalyptus marginata* over a shrubland dominated by *Xanthorrhoea preissii*, *Melaleuca thymoides*, *Acacia pulchella* over a Low Shubland dominated by *Patersonia occidentalis*, *Platysace compressa*, *Dasypogon bromeliifolius* and *Bossiaea eriocarpa* on grey sand.

Veg Condition Good to Very Good

Name	Cover %	Height cm
Acacia pulchella	2	120
Astroloma pallidum	1	50
Banksia attenuata	8	700
Banksia ilicifolia	3	700
Banksia menziesii	3	500
Bossiaea eriocarpa	4	30
**Briza maxima*	<1	20
Conostephium pendulum	<1	60
Dasypogon bromeliifolius	6	30
**Gladiolus caryophyllaceus*	<1	40
Gompholobium tomentosum	1	50
Lepidosperma squamatum	1	20

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
Lomandra hermaphrodita	<1	30
Lyginia imberbis	3	70
Melaleuca seriata	2	100
Melaleuca thymoides	2	120
Patersonia occidentalis	2	70
Petrophile linearis	1	40
Philotheca spicata	1	100
Platysace compressa	5	60
Stylidium repens	<1	10
Xanthorrhoea preissii	15	110
**Acacia longifolia*	Opp	
Acacia stenoptera	Opp	
Acacia willdenowiana	Opp	
Adenanthos cygnorum	Opp	
Allocasuarina humilis	Opp	
Amphipogon turbinatus	Opp	
Anigozanthos humilis	Opp	
**Avena barbata*	Opp	
Borya sphaerocephala	Opp	
Burchardia congesta	Opp	
Calytrix sp.	Opp	
**Carpobrotus edulis*	Opp	
Dampiera linearis	Opp	
Daviesia physodes	Opp	
Daviesia triflora	Opp	
**Ehrharta calycina*	Opp	
**Eragrostis curvula*	Opp	
Eremaea beaufortioides	Opp	
Eremaea pauciflora	Opp	
Eucalyptus todtiana	Opp	
Hibbertia hypericoides	Opp	
Hibbertia subvaginata	Opp	
Hibbertia vaginata	Opp	
Hovea trisperma	Opp	
Jacksonia furcellata	Opp	
Lechenaultia floribunda	Opp	
Lepidosperma tenue	Opp	
Loxocarya cinerea	Opp	
Lysinema ciliatum	Opp	
Macrozamia riedlei	Opp	
Melaleuca preissiana	Opp	
Melaleuca systena	Opp	
Mesomelaena pseudostygia	Opp	
Nuytsia floribunda	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
Persoonia comata	Opp	
Phlebocarya ciliata	Opp	
Pithocarpa pulchella	Opp	
Regelia ciliata	Opp	
Scholtzia involucrata	Opp	
Stirlingia latifolia	Opp	
Stylidium brunonianum	Opp	
**Ursinia anthemoides*	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R34

Described by GM **Date** 13/04/2010 **Type** Q 10x10

MGA Zone 50 393007 **mE** 6449489 **mN**
Habitat Revegetated areas on roadside batters
Soil Pale grey sand
Vegetation Tall Open Shrubland of *Banksia menziesii* and *Banksia attenuata* with scattered *Eucalyptus marginata* and *Corymbia calophylla* over a Closed Tall Shrubland changing in dominance between *Regelia ciliata* and *Adenanthos cygnorum* with *Acacia pulchella* and *Allocasuarina humilis* in association with rehabilitated roadside batters.
Veg Condition Degraded to Good

Name	Cover %	Height cm
Acacia pulchella	1	50
Acacia stenoptera	<1	50
Allocasuarina humilis	<1	70
Banksia attenuata	2	210
Banksia menziesii	3	230
Bossiaea eriocarpa	<1	30
**Conyza sumatrensis*	<1	40
Daviesia divaricata	2	150
Daviesia physodes	<1	100
**Ehrharta calycina*	1	50
Gompholobium tomentosum	<1	60

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
Hibbertia subvaginata	2	20
Lechenaultia floribunda	<1	30
Regelia ciliata	75	200
#Adenanthos cygnorum	Opp	
Astroloma pallidum	Opp	
Banksia attenuata	Opp	
Banksia ilicifolia	Opp	
Borya sphaerocephala	Opp	
Bossiaea eriocarpa	Opp	
**Briza maxima*	Opp	
Conostylis aculeata	Opp	
Conostylis candicans subsp. *candicans*	Opp	
**Conyza sumatrensis*	Opp	
Corymbia calophylla	Opp	
Dasypogon bromeliifolius	Opp	
Daviesia divaricata	Opp	
Daviesia nudiflora	Opp	
**Dittrichia graveolens*	Opp	
**Eragrostis curvula*	Opp	
Eucalyptus marginata	Opp	
Ficinia nodosa	Opp	
**Gladiolus caryophyllaceus*	Opp	
Hovea trisperma	Opp	
**Hypochaeris glabra*	Opp	
Hypolaena exsulca	Opp	
Jacksonia furcellata	Opp	
Lyginia imberbis	Opp	
**Melaleuca nesophila*	Opp	
Mesomelaena pseudostygia	Opp	
**Oenothera drummondii*	Opp	
Patersonia occidentalis	Opp	
**Pelargonium capitatum*	Opp	
Petrophile linearis	Opp	
Platysace compressa	Opp	
Stirlingia latifolia	Opp	
Stylidium piliferum	Opp	
Synaphea spinulosa	Opp	
**Trachyandra divaricata*	Opp	
**Ursinia anthemoides*	Opp	
**Wahlenbergia capensis*	Opp	
Xanthorrhoea preissii	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R35

Described by GM **Date** 13/04/2010 **Type** Q 10x10

MGA Zone 50 391565 **mE** 6447095 **mN**

Habitat Re-vegetated roadside batter at Kwinana Freeway

Soil Grey Sand

Vegetation Open Heath to Tall Open Scrub dominated by #*Calothamnus rupestris* (P4), *Acacia cochlearis* and *Calothamnus quadrifidus* with occasional **Corymbia maculata* and #*Chamelaucium uncinatum* over introduced grasses dominated by **Ehrharta calycina*.

Veg Condition Degraded to Completely Degraded

Name	Cover %	Height cm
Acacia cochlearis	25	180
**Avena fatua*	4	50
#*Callistemon phoeniceus*	1	210
#*Calothamnus quadrifidus*	3	200
#*Calothamnus rupestris* (P4)	40	180
**Corymbia maculata*	1	400
**Ehrharta calycina*	2	50
Acacia cochlearis	Opp	
**Acacia iteaphylla*	Opp	
Acacia lasiocarpa var. *lasiocarpa*	Opp	
Acacia pulchella	Opp	
Acacia rostellifera	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
Acacia saligna	Opp	
#Adenanthos cuneatus	Opp	
Adenanthos cygnorum	Opp	
**Avena fatua*	Opp	
Banksia attenuata	Opp	
Banksia littoralis	Opp	
Banksia menziesii	Opp	
**Brassica tournefortii*	Opp	
**Briza maxima*	Opp	
**Bromus diandrus*	Opp	
**Carpobrotus edulis*	Opp	
**Chamaecytisus palmensis*	Opp	
#Chamelaucium uncinatum	Opp	
**Conyza sumatrensis*	Opp	
Corymbia calophylla	Opp	
**Cynodon dactylon*	Opp	
**Eragrostis curvula*	Opp	
#Grevillea crithmifolia	Opp	
Hakea prostrata	Opp	
Hardenbergia comptoniana	Opp	
**Hypochaeris glabra*	Opp	
Jacksonia furcellata	Opp	
Jacksonia sternbergiana	Opp	
Kunzea glabrescens	Opp	
**Lagenophora huegelii*	Opp	
**Lagurus ovatus*	Opp	
**Lavandula dentata*	Opp	
**Lupinus cosentinii*	Opp	
Melaleuca systena	Opp	
**Oenothera drummondii*	Opp	
**Opuntia stricta*	Opp	
**Pelargonium capitatum*	Opp	
Persoonia comata	Opp	
Rhagodia baccata	Opp	
**Ricinus communis*	Opp	
Scaevola crassifolia	Opp	
**Trachyandra divaricata*	Opp	
**Tribulus terrestris*	Opp	
Viminaria juncea	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R36

Described by GM **Date** 13/04/2010 **Type** Q 10x10

MGA Zone 50 391406 **mE** 6448114 **mN**
Soil yellow sand
Vegetation Low Open Woodland of *Corymbia calophylla* with scattered *Eucalyptus marginata* and *Banksia menziesii* over a Tall Shrubland of *Kunzea glabrescens* over introduced grasses.
Veg Condition Good

Name	Cover %	Height cm
Acacia pulchella	1	50
Allocasuarina humilis	1	180
**Avena fatua*	4	50
#*Calothamnus rupestris* (P4)	5	200
Corymbia calophylla	2	900
**Cynodon dactylon*	<1	20
Hibbertia hypericoides	1	50
Kunzea glabrescens	10	300
Acacia saligna	Opp	
Adenanthos cygnorum	Opp	
Banksia attenuata	Opp	
Banksia menziesii	Opp	
Calothamnus quadrifidus	Opp	
#*Chamelaucium uncinatum*	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
**Corymbia maculata*	Opp	
Daviesia nudiflora	Opp	
**Dittrichia graveolens*	Opp	
**Eragrostis curvula*	Opp	
Eucalyptus marginata	Opp	
Eucalyptus todtiana	Opp	
#Grevillea bipinnatifida	Opp	
Hardenbergia comptoniana	Opp	
Jacksonia sternbergiana	Opp	
#Melaleuca nesophila	Opp	
Mirbelia dilatata	Opp	
Muehlenbeckia adpressa	Opp	
**Pelargonium capitatum*	Opp	
Scholtzia involucrata	Opp	
**Trachyandra divaricata*	Opp	

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R37

Described by GM **Date** 03/08/10 **Type** Vegetation Description

MGA Zone 50 389325 **mE** 6449625 **mN**

Soil Grey Sand

Vegetation Cleared parkland comprising of but not limited to *Melaleuca preissiana*, *#Eucalyptus camaldulensis Corymbia calophylla* and *Xanthorrhoea preissii* over introduced grasses dominated by **Pennisetum clandestinum*, **Cynodon dactylon* and **Eragrostis curvula*.

Veg Condition Completely Degraded

Name
Agonis flexuosa
Allocasuarina fraseriana
**Arctotheca calendula*
**Conyza bonariensis*
**Cynodon dactylon*
Erodium cygnorum
#Eucalyptus camaldulensis
#Eucalyptus erythrocorys
#Eucalyptus leucoxylon
Eucalyptus rudis
#Eucalyptus torquata
**Euphorbia peplus*
**Hypochaeris glabra*
Melaleuca preissiana
Melaleuca rhaphiophylla
**Senecio condylus*

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name
**Trachyandra divaricata*
Xanthorrhoea preissii

Roe Hwy **Site** R38

Described by GM **Date** 03/08/10 **Type** Vegetation Description

MGA Zone 50 389326 **mE** 6449617 **mN**

Soil Grey Sand

Vegetation Herbland of **Typha orientalis* with scattered *Juncus pallidus* surrounded by fringing wetland vegetation comprising of but not limited to *Melaleuca teretifolia*, *Eucalyptus camaldulensis*, *Melaleuca rhaphiophylla* and *Corymbia calophylla* on grey sand.

Veg Condition Degraded to Good

Name
Centella asiatica
**Cynodon dactylon*
**Eragrostis curvula*
#Eucalyptus camaldulensis
Eucalyptus rudis
Juncus pallidus
#Melaleuca nesophila
Melaleuca rhaphiophylla
Melaleuca teretifolia
**Pennisetum clandestinum*
**Trifolium* sp.
**Typha orientalis*

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

**Vicia sativa*

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R39

Described by GM **Date** 03/08/10 **Type** Vegetation Description

MGA Zone 50 390447 **mE** 6450045 **mN**

Soil Grey Sand

Vegetation Cleared areas comprising of but not limited to *Eucalyptus marginata*, *#Eucalyptus camaldulensis*, *#Eucalyptus macrocarpa* subsp*. macrocarpa*, *Corymbia calophylla*, *Acacia saligna* and *#Callistemon phoeniceus* over an Open Grassland dominated by **Eragrostis curvula* and **Ehrharta calycina* on grey sand.

Veg Condition Completely Degraded

Name
**Acacia iteaphylla*
Acacia saligna
**Agave americana*
Allocasuarina fraseriana
**Arctotheca calendula*
**Asparagus asparagoides*
**Avena fatua*
Banksia attenuata
Banksia menziesii
**Brassica tournefortii*
**Chamaecytisus palmensis*
Corymbia calophylla
**Cynodon dactylon*
Daviesia divaricata

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name
**Ehrharta calycina*
**Eragrostis curvula*
Erodium cygnorum
#Eucalyptus camaldulensis
#Eucalyptus caesia
#Eucalyptus macrocarpa subsp. *macrocarpa*
Eucalyptus marginata
#Eucalyptus platypus
**Euphorbia peplus*
#Grevillea banksii x bipinnatifida
**Hedypnois rhagadioloides*
#Hibbertia scandens
**Hypochaeris glabra*
**Lupinus cosentinii*
**Oxalis purpurea*
**Pelargonium capitatum*
**Pinus pinaster*
**Raphanus raphanistrum*
**Ricinus communis*
**Romulea rosea*
**Rosmarinus officinalis*
**Senecio condylus*
**Sonchus asper*
**Ursinia anthemoides*
**Watsonia meriana*
Xanthorrhoea preissii

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R40

Described by GM **Date** 03/08/10 **Type** Vegetation Description

MGA Zone 50 390610**mE** 6450331 **mN**

Soil Grey Sand

Vegetation Pasture community dominated by **Cynodon dactylon* and **Pennisetum clandestinum* with scattered *Melaleuca preissiana* and *Corymbia calophylla* on grey sand.

Veg Condition Completely Degraded

Name
Corymbia calophylla
**Eragrostis curvula*
Melaleuca preissiana
**Pennisetum clandestinum*

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R41

Described by GM **Date** 03/08/10 **Type** Vegetation Description

MGA Zone 50 390750 **mE** 6450379 **mN**

Soil Grey Sand

Vegetation Cleared parkland of **Cynodon dactylon* and **Pennisetum clandestinum* with road edges comprising of but not limited to *Corymbia calophylla*, *#Eucalyptus conferruminata* and, *#Eucalyptus platypus* on grey sand.

Veg Condition Completely Degraded

Name
**Agave americana*
Agonis flexuosa
**Arctotheca calendula*
**Conyza bonariensis*
**Cynodon dactylon*
**Eragrostis curvula*
#Eucalyptus camaldulensis
#Eucalyptus conferruminata
**Euphorbia terracina*
**Hypochaeris glabra*
Melaleuca preissiana
**Pennisetum clandestinum*
**Raphanus raphanistrum*
**Ricinus communis*
**Vicia sativa*

* Denotes introduced (weed) species
# Denotes non-endemic, planted species

PHASE 2 - QUALITATIVE QUADRAT DATA FOR 2010

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** P2R42

Described by GM **Date** 9/11/2010 **Type** Q 10x10

MGA Zone 50 389241 **mE** 6449770 **mN**
Soil Grey Sand
Vegetation ErMpH - Woodland of *Eucalyptus rudis* over a Low Woodland of *Melaleuca preissiana* over a Tall Open Shrubland of *Kunzea glabrescens* over a Closed introduced Grassland of **Ehrharta calycina* over scattered *Dianella revoluta*, **Euphorbia terracina* and **Carpobrotus edulis* on grey sand.
Veg Condition Completely Degraded to Degraded

Name	Cover %	Height cm
**Arctotheca calendula*	<1	20
**Carpobrotus edulis*	1	10
Dianella revoluta	1	60
**Ehrharta calycina*	70	100
Eucalyptus rudis	10	1500
**Euphorbia terracina*	1	40
**Hedypnois rhagadioloides* subsp. *cretica*	<1	10
**Hypochaeris glabra*	<1	cr
Kunzea glabrescens	2	300
**Lagurus ovatus*	<1	20
Melaleuca preissiana	25	600

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	**Cover %**	**Height cm**
Muehlenbeckia adpressa	<1	40
**Zantedeschia aethiopica*	<1	50
**Avena fatua*	Opp	
Corymbia calophylla	Opp	
Hibbertia cuneiformis	Opp	
Macrozamia riedlei	Opp	
**Ursinia anthemoides*	Opp	
**Watsonia meriana*	Opp	
Xanthorrhoea preissii	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** P2R43

Described by GM **Date** 9/11/2010 **Type** Q 10x10

MGA Zone 50 389332 **mE** 6449699 **mN**

Soil Grey Sand

Vegetation EtKgS - Open Forest of *Eucalyptus rudis* over a Tall Shrubland of *Kunzea glabrescens* over scattered **Watsonia meriana* and **Zantedeschia aethiopica* over an exotic Herbland/Grassland of *Ehrharta calycina and ***Carpobrotus edulis* on grey sand.

Veg Condition Degraded

Name	Cover %	Height cm
**Briza minor*	5	15
**Bromus diandrus*	<1	10
**Carpobrotus edulis*	50	20
Dianella revoluta	1	60
**Ehrharta calycina*	10	20
**Ehrharta longiflora*	1	15
Eucalyptus rudis	30	2000
**Fumaria capreolata*	<1	3
Kunzea glabrescens	10	500
Muehlenbeckia adpressa	<1	30
**Ursinia anthemoides*	<1	10
**Watsonia meriana*	2	50
**Zantedeschia aethiopica*	2	30

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	**Cover %**	**Height cm**
**Briza maxima*	Opp	
Crassula colorata	Opp	
****Erodium botrys***	Opp	
Eucalyptus todtiana	Opp	
**Schinus terebinthifolius*	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** P2R44

Described by GM **Date** 9/11/2010 **Type** Q 10x10

MGA Zone 50 389450 **mE** 6449676 **mN**
Soil Grey-white Sand
Vegetation BiSiH – Open Forest of *Banksia attenuata* and *Banksia illicifolia* over a Low Woodland of *Melaleuca preissiana* over a Tall Shrubland of *Kunzea glabrescens* over an exotic Herbland of **Carpobrotus edulis* on grey-white sand.
Veg Condition Degraded to Good

Name	Cover %	Height cm
**Asparagus asparagoides*	<1	5
Banksia attenuata	30	1000
Banksia ilicifolia	20	1000
**Carpobrotus edulis*	50	15
**Ehrharta calycina*	1	40
**Ehrharta longiflora*	1	50
**Hedypnois rhagadioloides* subsp. *cretica*	<1	5
**Hypochaeris glabra*	<1	3
Kunzea glabrescens	20	500
**Lysimachia arvensis*	<1	5
Melaleuca preissiana	20	500
Scholtzia involucrata	<1	20
**Zantedeschia aethiopica*	1	80

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	**Cover %**	**Height cm**
Allocasuarina fraseriana	Opp	
Banksia menziesii	Opp	
**Briza maxima*	Opp	
**Briza minor*	Opp	
Calytrix fraseri	Opp	
Conostylis aculeata	Opp	
Crassula colorata	Opp	
Hibbertia hypericoides	Opp	
Hibbertia subvaginata	Opp	
Melaleuca seriata	Opp	
Nuytsia floribunda	Opp	
Patersonia occidentalis	Opp	
Phlebocarya ciliata	Opp	
Xanthorrhoea preissii	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** P2R45

Described by GM **Date** 9/11/2010 **Type** Q 10x10

MGA Zone 50 389499 **mE** 6449647 **mN**

Soil Grey Sand

Vegetation BXpW – Woodland of *Allocasuarina fraseriana* over a Low Open Forest of *Banksia attenuata*, and *Banksia menziesii* with occasional *Eucalyptus marginata* over an Open Shrubland of *Xanthorrhoea preissii* over a Low Shrubland of *Hibbertia hypericoides* over a mixed Herbland/Grassland dominated by exotic species; **Ehrharta calycina* and ***Carpobrotus edulis* in grey sand.

Veg Condition Good

Name	Cover %	Height cm
Allocasuarina fraseriana	10	1200
Banksia attenuata	15	800
Banksia menziesii	12	800
Calandrinia sp.	<1	5
**Carpobrotus edulis*	4	10
Dianella revoluta	1	30
**Ehrharta calycina*	5	60
**Ehrharta longiflora*	4	20
Eucalyptus marginata	5	800
**Gladiolus caryophyllaceus*	<1	30
**Hedypnois rhagadioloides* subsp. *cretica*	1	10

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	**Cover %**	**Height cm**
Hibbertia hypericoides	15	80
**Hypochaeris glabra*	<1	10
Patersonia occidentalis	1	60
Petrophile linearis	1	20
Phlebocarya ciliata	2	4
**Ursinia anthemoides*	<1	10
Xanthorrhoea preissii	2	150
**Zantedeschia aethiopica*	<1	30
**Acacia longifolia*	Opp	
Acacia pulchella	Opp	
**Arctotheca calendula*	Opp	
Astroloma pallidum	Opp	
**Avena fatua*	Opp	
Banksia ilicifolia	Opp	
**Briza maxima*	Opp	
**Briza minor*	Opp	
Calytrix fraseri	Opp	
Conostylis aculeata	Opp	
Dasypogon bromeliifolius	Opp	
Daviesia divaricata	Opp	
Daviesia nudiflora subsp. *nudiflora*	Opp	
Daviesia physodes	Opp	
**Ehrharta calycina*	Opp	
Eucalyptus marginata	Opp	
**Euphorbia terracina*	Opp	
Gompholobium tomentosum	Opp	
Hardenbergia comptoniana	Opp	
Kennedia prostrata	Opp	
Kunzea glabrescens	Opp	
**Lagurus ovatus*	Opp	
Laxmannia squarrosa	Opp	
Loxocarya cinerea	Opp	
Lyginia barbata	Opp	
Macrozamia riedlei	Opp	
Melaleuca seriata	Opp	
Mesomelaena pseudostygia	Opp	
Nuytsia floribunda	Opp	
**Pelargonium capitatum*	Opp	
**Schinus terebinthifolius*	Opp	
**Sonchus asper*	Opp	
Stirlingia latifolia	Opp	
**Ursinia anthemoides*	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	**Cover %**	**Height cm**
**Watsonia meriana*	Opp	
**Zantedeschia aethiopica*	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** P2R46

Described by GM **Date** 9/11/2010 **Type** Q 10x10

MGA Zone 50 389866 **mE** 6449546 **mN**

Soil Grey Sand

Vegetation BXpW – Open Forest of *Eucalyptus marginata, Banksia illicifolia* and *Banksia attenuata* over a Low Woodland of *Banksia menziesii* over a Low Shrubland of *Hibbertia hypericoides* over an Open introduced Grassland of **Ehrharta calycina* over a Sedgeland dominated by *Phlebocarya ciliata* and *Dasypogon bromeliifolius* on grey sand.

Veg Condition Good

Name	Cover %	Height cm
Acacia pulchella	<1	30
Acacia willdenowiana	<1	20
Allocasuarina fraseriana	1	200
Astroloma pallidum	<1	20
Banksia attenuata	15	1000
Banksia dallanneyi	<1	15
Banksia ilicifolia	15	1200
Banksia menziesii	20	800
Bossiaea eriocarpa	1	30
**Briza maxima*	2	15
**Briza minor*	3	15
Burchardia congesta	<1	20
Calytrix fraseri	2	150

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	**Cover %**	**Height cm**
Dasypogon bromeliifolius	15	40
Desmocladus fasciculatus	5	20
**Disa bracteata*	<1	30
**Ehrharta calycina*	10	60
Eucalyptus marginata	10	1500
**Freesia alba x leichtlinii*	<1	50
**Gladiolus caryophyllaceus*	<1	4
Gompholobium tomentosum	1	20
Hibbertia hypericoides	10	50
Hibbertia subvaginata	1	10
**Hypochaeris glabra*	<1	5
Lepidosperma pubisquameum	<1	40
Lepidosperma squamatum	3	50
Leucopogon nutans	<1	20
Leucopogon polymorphus	<1	20
Lomandra suaveolens	<1	15
Loxocarya cinerea	5	40
Lyginia barbata	3	60
**Orobanche minor*	<1	10
Patersonia occidentalis	2	60
Petrophile linearis	1	30
Philotheca spicata	<1	40
Phlebocarya ciliata	20	40
Pimelea sp.	<1	60
Schoenus curvifolius	<1	30
Scholtzia involucrata	<1	30
Sowerbaea laxiflora	<1	20
Stylidium brunonianum	<1	50
Stylidium repens	<1	10
Thysanotus sparteus	<1	60
**Zantedeschia aethiopica*	<1	15
**Avena fatua*	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** P2R47

Described by GM **Date** 9/11/2010 **Type** Q 10x10

MGA Zone 50 389933 **mE** 6449589 **mN**

Soil Grey Sand

Vegetation AfBKgS – Low Open Forest to Open Forest of *Allocasuarina fraseriana, Banksia attenuata, Banksia menziesii* and *Banksia illicifolia* over Tall Shrubland of *Kunzea glabrescens* over a Low Open Shrubland of *Hibbertia hypericoides* over a Sedgeland of *Loxocarya cinerea* and *Dasypogon bromeliifolius* with an Open Exotic Grassland dominated by **Briza maxima* on grey sand.

Veg Condition Good

Name	Cover %	Height cm
Allocasuarina fraseriana	15	800
**Avena fatua*	8	30
**Babiana angustifolia*	<1	10
Banksia attenuata	15	1000
Banksia ilicifolia	10	600
Banksia menziesii	15	800
Bossiaea eriocarpa	<1	15
**Briza maxima*	15	20
**Briza minor*	10	20
Dasypogon bromeliifolius	15	40
**Ehrharta calycina*	3	40
Gonocarpus pithyoides	1	15

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	**Cover %**	**Height cm**
**Hedypnois rhagadioloides* subsp. *cretica*	<1	10
Hibbertia hypericoides	6	50
Hovea pungens	<1	40
Hypocalymma angustifolium	<1	10
**Hypochaeris glabra*	<1	5
Kunzea glabrescens	30	200
Lechenaultia floribunda	<1	30
Lepidosperma pubisquameum	3	70
Lepidosperma tenue	<1	50
Leucopogon conostephioides	1	60
Leucopogon nutans	<1	30
Loxocarya cinerea	40	40
Macrozamia riedlei	3	70
Melaleuca thymoides	2	30
Nuytsia floribunda	3	300
Patersonia occidentalis	1	60
Petrophile linearis	2	30
Philotheca spicata	<1	30
Phlebocarya ciliata	5	10
Stylidium repens	<1	10
Thysanotus arbuscula	<1	50
Thysanotus manglesianus	<1	20
Trachymene pilosa	<1	5
**Ursinia anthemoides*	<1	10
**Zantedeschia aethiopica*	<1	10
Acacia pulchella	Opp	
**Carpobrotus edulis*	Opp	
**Gladiolus caryophyllaceus*	Opp	
Lechenaultia floribunda	Opp	
Leucopogon nutans	Opp	
Lobelia tenuior	Opp	
Lyginia barbata	Opp	
Scholtzia involucrata	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** P2R48

Described by GM **Date** 9/11/2010 **Type** Q 10x10

MGA Zone 50 389857 **mE** 6449717 **mN**
Soil Grey Sand
Vegetation CcBKgS – Low Open Forest of *Banksia attenuata* and *Nuytsia floribunda* with occasional *Banksia illicifolia over a* Tall Shrubland of *Kunzea glabrescens* over a Low Open Shrubland of *Hibbertia hypericoides* over a Sedgeland of *Dasypogon Bromeliifolius* over a Open exotic grassland of **Ehrharta calycina* on grey sand.
Veg Condition Degraded

Name	Cover %	Height cm
**Aira caryophyllea*	<1	5
**Avena fatua*	2	40
Banksia attenuata	40	900
Banksia ilicifolia	1	200
**Briza minor*	1	15
Crassula colorata	<1	5
Dasypogon bromeliifolius	30	30
**Ehrharta calycina*	10	20
**Hedypnois rhagadioloides* subsp. *cretica*	<1	10
Hibbertia hypericoides	10	50
Hibbertia subvaginata	1	10
**Hypochaeris glabra*	1	5
Kunzea glabrescens	30	500

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	**Cover %**	**Height cm**
Melaleuca thymoides	1	80
Nuytsia floribunda	20	800
Patersonia occidentalis	1	60
Trachymene pilosa	<1	5
Xanthorrhoea preissii	4	200
**Zantedeschia aethiopica*	1	60
Banksia menziesii	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** P2R49

Described by GM **Date** 9/11/2010 **Type** Q 10x10

MGA Zone 50 388768 **mE** 6449511 **mN**

Soil Grey Sand

Vegetation Open Forest of *Corymbia calophylla* and *Eucalyptus marginata* over *Banksia attenuata* over a Shrubland of *Macrozamia riedlei* over an introduced Grassland of **Ehrharta calycina* over a mixed sedgeland/introduced grassland of *Phlebocarya ciliata* over **Briza maxima* and **Briza minor* on grey sand.

Veg Condition Completely Degraded to Degraded

Name	Cover %	Height cm
Acacia saligna	<1	40
Banksia attenuata	8	1000
Bossiaea eriocarpa	<1	20
**Briza maxima*	10	20
**Briza minor*	10	20
Burchardia congesta	<1	20
Conostylis aculeata	3	20
Conostylis candicans subsp. *candicans*	<1	30
Corymbia calophylla	20	1500
Desmocladus fasciculatus	1	20
Dianella revoluta	1	60
**Ehrharta calycina*	50	100
Eucalyptus marginata	15	1200

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
**Euphorbia terracina*	<1	20
**Gladiolus caryophyllaceus*	2	30
Gompholobium tomentosum	<1	20
Hardenbergia comptoniana	<1	30
Hibbertia hypericoides	<1	20
Kennedia prostrata	<1	10
Loxocarya cinerea	1	20
**Lysimachia arvensis*	<1	10
Macrozamia riedlei	10	150
Mesomelaena pseudostygia	<1	20
Phlebocarya ciliata	10	40
Tetraria octandra	1	50
#Acacia iteaphylla	Opp	
**Acacia longifolia*	Opp	
**Agave americana*	Opp	
**Arctotheca calendula*	Opp	
**Avena fatua*	Opp	
**Babiana angustifolia*	Opp	
Banksia grandis	Opp	
Bossiaea eriocarpa	Opp	
**Bromus diandrus*	Opp	
#Chamelaucium uncinatum	Opp	
Hakea prostrata	Opp	
Hibbertia hypericoides	Opp	
Hovea trisperma	Opp	
Jacksonia furcellata	Opp	
**Lagurus ovatus*	Opp	
Leucopogon propinquus	Opp	
Loxocarya cinerea	Opp	
**Orobanche minor*	Opp	
**Pelargonium capitatum*	Opp	
Pimelea ciliata	Opp	
Pinus radiata	Opp	
**Sonchus asper*	Opp	
**Ursinia anthemoides*	Opp	
**Watsonia meriana*	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** P2R50

Described by GM **Date** 9/11/2010 **Type** Q 10x10

MGA Zone 50 391057 **mE** 6449438 **mN**

Soil Grey Sand

Vegetation BHhW – Low Open Forest of *Allocasuarina fraseriana, Banksia attenuata* and *Banksia menziesii* over a Shrubland of *Macrozamia riedlei, Allocasuarina humilis* and *Xanthorrhoea preissii* over a Low Shrubland of *Hibbertia hypericoides* over a Sedgeland of *Mesomelaena pseudostygia* and *Mesomelaena stygia* subsp. *stygia* on grey sand.

Veg Condition Good

Name	Cover %	Height cm
#Acacia iteaphylla	<1	30
Acacia pulchella	15	70
Allocasuarina fraseriana	15	800
Allocasuarina humilis	10	120
Astroloma pallidum	5	40
**Avena fatua*	15	30
Banksia attenuata	10	700
Banksia dallanneyi	1	20
Banksia menziesii	10	700
**Briza maxima*	5	20
**Briza minor*	2	20
Burchardia congesta	<1	30

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	**Cover %**	**Height cm**
Conostylis aculeata	<1	20
Dasypogon bromeliifolius	3	40
Daviesia divaricata	3	70
Daviesia nudiflora subsp. *nudiflora*	<1	40
Eremaea pauciflora	<1	50
**Gladiolus caryophyllaceus*	5	50
Gompholobium tomentosum	<1	20
Hardenbergia comptoniana	<1	20
Hibbertia huegelii	<1	40
Hibbertia hypericoides	20	50
Hypocalymma robustum	2	40
Jacksonia furcellata	<1	40
Kennedia prostrata	<1	20
Laxmannia squarrosa	<1	15
Lepidosperma squamatum	1	40
Leptomeria cunninghamii	<1	30
Leucopogon nutans	3	40
Lomandra caespitosa	2	30
Lyginia barbata	3	30
Lyginia imberbis	2	30
Macrozamia riedlei	3	150
Mesomelaena pseudostygia	25	40
Mesomelaena stygia subsp. *stygia*	10	50
Opercularia vaginata	<1	20
Patersonia occidentalis	<1	40
Petrophile linearis	8	40
Philotheca spicata	<1	50
Scaevola canescens	<1	40
Stirlingia latifolia	1	50
**Ursinia anthemoides*	1	20
Xanthorrhoea preissii	5	110
Angianthus humifusus	Opp	
**Avena fatua*	Opp	
**Brassica tournefortii*	Opp	
**Bromus diandrus*	Opp	
Comesperma calymega	Opp	
**Cynodon dactylon*	Opp	
Dampiera linearis	Opp	
**Gazania linearis*	Opp	
**Lagurus ovatus*	Opp	
Lomandra caespitosa	Opp	
**Lupinus cosentinii*	Opp	
Melaleuca seriata	Opp	
Regelia ciliata	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
**Sonchus oleraceus*	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** P2R51

Described by GM **Date** 9/11/2010 **Type** Q 10x10

MGA Zone 50 390255 **mE** 6697521 **mN**
Soil Grey Sand
Vegetation EmKgS – Closed forest of *Corymbia calophylla* over a Tall Shrubland of **Acacia longifolia* and *Kunzea glabrescens* over an exotic Herbland/grassland of **Zantedeschia aethiopica* and **Ehrharta calycina* over **Carpobrotus edulis* on grey sand.
Veg Condition Completely Degraded to Degraded

Name	Cover %	Height cm
**Acacia longifolia*	10	300
**Carpobrotus edulis*	25	15
Corymbia calophylla	100	2000
**Ehrharta calycina*	30	
Kunzea glabrescens	10	200
**Zantedeschia aethiopica*	10	40
Allocasuarina fraseriana	Opp	
Aristida sp.	Opp	
Crassula colorata	Opp	
Dianella revoluta	Opp	
Eucalyptus marginata	Opp	
**Euphorbia terracina*	Opp	
Hibbertia cuneiformis	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

**Isolepis marginata*	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** P2R52

Described by GM **Date** 9/11/2010 **Type** Q 10x10

MGA Zone 50 390061 **mE** 6449835 **mN**
Soil Grey Sand
Vegetation ErMpGeS – Low Woodland of *Eucalyptus rudis* and *Melaleuca preissiana* over a Tall Open Scrub of *Taxandria linearifolia* and *Astartea scoparia* over a Sedgeland of *Cyathochaeta teretifolia* (P3) with *Baumea preissii* subsp. *laxa* and an Open Herbland of *Pteridium esculentum* on grey sand.
Veg Condition Very Good to Good

Name	Cover %	Height cm
Astartea scoparia	5	200
Baumea preissii subsp. *laxa*	10	70
Cassytha racemosa	<1	creeper
Cyathochaeta teretifolia (P3)	20	200
Eucalyptus rudis	10	500
**Hypochaeris glabra*	<1	prostrate
**Isolepis marginata*	<1	10
Leucopogon propinquus	2	70
Melaleuca preissiana	10	500
Muehlenbeckia adpressa	<1	20
**Paspalum dilatatum*	<1	80

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	**Cover %**	**Height cm**
Patersonia occidentalis	1	40
Poa drummondiana	<1	20
Pteridium esculentum	15	250
Taxandria linearifolia	30	500
Tetraria capillaris	2	60
**Acacia longifolia*	Opp	
Aotus cordifolia	Opp	
**Briza minor*	Opp	
**Cynodon dactylon*	Opp	
**Eragrostis curvula*	Opp	
Gastrolobium ebracteolatum	Opp	
**Lotus subbiflorus*	Opp	
**Orobanche minor*	Opp	
Patersonia occidentalis	Opp	
**Rumex crispus*	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** P2R53

Described by GM **Date** 9/11/2010 **Type** Q 10x10

MGA Zone 50 389881 **mE** 6449805 **mN**

Soil Grey Sand

Vegetation MpKgS – Low Woodland of *Eucalyptus rudis* and *Melaleuca preissiana* over a Tall Open Scrub of *Kunzea glabrescens* and *Astartea scoparia* with occasional *Taxandria linearifolia* over an Open Herbland of *Pteridium esculentum* over a Sedgeland of *Baumea preissii* subsp. *laxa* over an Open exotic Herbland of **Aira caryophyllea* on grey sand.

Veg Condition Degraded to Good

Name	Cover %	Height cm
**Aira caryophyllea*	10	20
Astartea scoparia	20	300
Austrostipa elegantissima	<1	30
Baumea preissii subsp. *laxa*	30	80
Cassytha racemosa	1	creeper
Dampiera triloba (P1)	1	30
Eucalyptus rudis	15	500
**Hedypnois rhagadioloides* subsp. *cretica*	<1	20
**Hypochaeris glabra*	<1	20
Kunzea glabrescens	40	450
Leucopogon propinquus	<1	50
Melaleuca preissiana	10	400

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	**Cover %**	**Height cm**
Pteridium esculentum	10	110
Regelia ciliata	<1	150
Taxandria linearifolia	1	300
Xanthorrhoea preissii	<1	50
**Zantedeschia aethiopica*	1	30
**Sonchus asper*	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** P2R54

Described by GM **Date** 9/11/2010 **Type** Q 10x10

MGA Zone 50 389865 **mE** 6449842 **mN**

Soil Brown Loam clay

Vegetation ErMpAfS – Open Forest of *Melaleuca preissiana* and *Eucalyptus rudis* over occasional *Banksia littoralis* over a Closed Herbland of *Pteridium esculentum* over **Zantedeschia aethiopica* over a Sedgeland of *Lepidosperma pubisquameum* and *Lepidosperma* sp. on brown loamy clay.

Veg Condition Degraded

Name	Cover %	Height cm
**Asparagus asparagoides*	<1	20
Banksia littoralis	1	400
**Briza maxima*	2	20
Eucalyptus rudis	20	2500
Gastrolobium ebracteolatum	2	400
Lepidosperma pubisquameum	20	50
Lepidosperma sp.	20	60
Melaleuca preissiana	40	2500
**Orobanche minor*	<1	15
Pteridium esculentum	50	200
Senecio hispidulus	<1	30
**Sonchus asper*	<1	20
**Zantedeschia aethiopica*	50	80

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Astartea scoparia	Opp	
**Ficus carica*	Opp	
Lepidosperma longitudinale	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** P2R55

Described by GM **Date** 9/11/2010 **Type** Q 10x10

MGA Zone 50 389741 **mE** 6449823 **mN**
Soil Grey Sand
Vegetation BaNfW – Low Open Forest of *Banksia illicifolia*, *Nuytsia floribunda* and *Banksia attenuata* over an Open Shrubland of *Melaleuca thymoides* over an Exotic Herbland of **Zantedeschia aethiopica* with a Low Shrubland of *Hibbertia hypericoides* and *Stirlingia latifolia* over an Exotic Open Grassland of **Ehrharta calycina* on grey sand.
Veg Condition Degraded

Name	Cover %	Height cm
**Aira caryophyllea*	<1	30
**Avena fatua*	<1	20
Banksia attenuata	15	600
Banksia ilicifolia	15	900
**Ehrharta calycina*	10	30
Hibbertia hypericoides	15	50
***Hypochaeris glabra*	<1	15
Ixiolaena viscosa	<1	15
Melaleuca thymoides	3	120
Nuytsia floribunda	15	600
Senecio hispidulus	<1	30
Stirlingia latifolia	5	80

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	**Cover %**	**Height cm**
**Zantedeschia aethiopica*	30	80
**Cynodon dactylon*	Opp	
Dasypogon bromeliifolius	Opp	
Macrozamia riedlei	Opp	
Melaleuca seriata	Opp	
Patersonia occidentalis	Opp	
**Pelargonium capitatum*	Opp	
**Ursinia anthemoides*	Opp	
Xanthorrhoea preissii	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** P2R56

Described by GM **Date** 9/11/2010 **Type** O

MGA Zone 50 388953 **mE** 6449633 **mN**
Soil Grey Sand
Vegetation H1
Veg Condition Degraded to Completely Degraded

Name
**Arctotheca calendula*
**Avena fatua*
Banksia littoralis
**Ehrharta longiflora*
**Euphorbia terracina*
**Lagurus ovatus*
**Lolium rigidum*
**Sonchus asper*
**Vicia sativa*

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** P2R57

Described by GM **Date** 10/11/2010 **Type** Q 10x10

MGA Zone 50 390025 **mE** 6449534 **mN**
Soil Grey Sand
Vegetation MpBaS – Open Forest of *Corymbia calophylla* over a Low Woodland of *Eucalyptus marginata* with *Melaleuca preissiana* over a Tall Open Scrub of *Kunzea glabrescens* with occasional *Taxandria linearifolia* over scattered *Xanthorrhoea preissii* over a Very Open Sedgeland of *Baumea articulata* over **Pennisetum clandestinum* on Grey Sand.
Veg Condition Good to Very Good

Name	Cover %	Height cm
**Asparagus asparagoides*	1	10
Baumea articulata	5	70
Corymbia calophylla	60	2000
Eucalyptus marginata	20	800
Hardenbergia comptoniana	<1	creeper
Kunzea glabrescens	30	300
Lepidosperma longitudinale	20	70
Melaleuca preissiana	2	400
Patersonia occidentalis	<1	60
**Pennisetum clandestinum*	5	30
Taxandria linearifolia	1	300
Xanthorrhoea preissii	1.5	150

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	**Cover %**	**Height cm**
**Zantedeschia aethiopica*	<1	10
**Avena fatua*	Opp	
Boronia crenulata	Opp	
**Briza maxima*	Opp	
Cyathochaeta teretifolia (P3)	Opp	
Hibbertia hypericoides	Opp	
Hypocalymma angustifolium	Opp	
**Hypochaeris glabra*	Opp	
Jacksonia gracillima (P3)	Opp	
Leucopogon nutans	Opp	
**Lysimachia arvensis*	Opp	
Opercularia vaginata	Opp	
Pteridium esculentum	Opp	
**Sonchus asper*	Opp	
**Vicia sativa*	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** P2R58

Described by LC **Date** 10/11/2010 **Type** Q 10x10

MGA Zone 50 390036 **mE** 6449594 **mN**

Vegetation TBS – Exotic Closed Sedgeland of **Typha orientalis* with fringing sedges of *Baumea articulata* and *Baumea vaginalis*.

Veg Condition Degraded

Name	Cover %	Height cm
Baumea articulata	10	100
Baumea vaginalis	10	100
**Typha orientalis*	80	300

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** P2R59

Described by LC **Date** 10/11/2010 **Type** Q 10x10

MGA Zone 50 390102 **mE** 6449468 **mN**

Soil Grey Sand

Vegetation AfKgS – Closed Forest of *Eucalyptus rudis* over a Low Open Forest of *Agonis flexuosa* and *Melaleuca preissiana* over an Open Shrubland of *Astartea scoparia* and *Taxandria linearifolia* over Very Open Grassland of **Stenotaphrum secundatum* on grey sand.

Veg Condition Degraded to Completely Degraded

Name	Cover %	Height cm
Agonis flexuosa	50	600
Astartea scoparia	1	150
**Bromus diandrus*	<1	20
Eucalyptus rudis	80	2500
**Fumaria capreolata*	<1	20
Melaleuca preissiana	2	300
**Stenotaphrum secundatum*	5	30
Taxandria linearifolia	<1	100
**Vicia sativa*	<1	20
**Zantedeschia aethiopica*	1	40
**Arundo donax*	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	**Cover %**	**Height cm**
**Avena fatua*	Opp	
Banksia littoralis	Opp	
**Chasmanthe floribunda*	Opp	
Corymbia calophylla	Opp	
**Cynodon dactylon*	Opp	
**Cyperus polystachyos*	Opp	
**Ehrharta longiflora*	Opp	
**Eragrostis curvula*	Opp	
***Euphorbia terracina**	Opp	
**Ficus carica*	Opp	
**Hedypnois rhagadioloides* subsp. *cretica*	Opp	
**Hypochaeris glabra*	Opp	
Nuytsia floribunda	Opp	
**Pelargonium capitatum*	Opp	
**Solanum nigrum*	Opp	
**Sonchus asper*	Opp	
**Typha orientalis*	Opp	
Xanthorrhoea preissii	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** P2R60

Described by LC **Date** 10/11/2010 **Type** Q 10x10

MGA Zone 50 386241 **mE** 6449163 **mN**
Soil Brown Sand
Vegetation EgXpS – Open Forest of *Eucalyptus gomphocephala* over a Low Woodland of *Banksia attenuata* over a Tall Open Shrubland to Open Shrubland of *Jacksonia furcellata*, *Hakea prostrata*, *Xanthorrhoea preissii* and *Macrozamia riedlei* over Closed Exotic Grassland of **Ehrharta calycina* on brown sand.
Veg Condition Degraded to Good

Name	Cover %	Height cm
Acacia cyclops	<1	60
**Avena fatua*	<1	50
**Babiana angustifolia*	<1	20
Banksia attenuata	30	600
**Briza minor*	<1	20
Conostylis aculeata	<1	30
**Ehrharta calycina*	40	80
Eucalyptus gomphocephala	50	2000
**Euphorbia terracina*	<1	30
Gompholobium tomentosum	4	30
Hakea prostrata	1	150

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	**Cover %**	**Height cm**
Hardenbergia comptoniana	1	creeper
Jacksonia furcellata	1	250
**Lagurus ovatus*	<1	20
**Lupinus cosentinii*	<1	30
Macrozamia riedlei	1	100
**Pelargonium capitatum*	2	30
Thysanotus arbuscula	<1	30
Tricoryne elatior	4	30
**Trifolium dubium*	<1	20
**Ursinia anthemoides*	<1	10
Xanthorrhoea preissii	1	100
#*Acacia iteaphylla*	Opp	
Acacia rostellifera	Opp	
**Agave americana*	Opp	
Allocasuarina fraseriana	Opp	
**Arundo donax*	Opp	
Banksia dallanneyi	Opp	
**Brassica tournefortii*	Opp	
**Bromus diandrus*	Opp	
**Cynodon dactylon*	Opp	
Dianella revoluta	Opp	
Dryandra sessilis	Opp	
Eucalyptus marginata	Opp	
**Euphorbia terracina*	Opp	
**Foeniculum vulgare*	Opp	
Lomandra hermaphrodita	Opp	
**Malva parviflora*	Opp	
**Raphanus raphanistrum*	Opp	
**Ricinus communis*	Opp	
**Sonchus asper*	Opp	
**Sorghum ?xdrummondii*	Opp	
**Trifolium dubium*	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** P2R61

Described by LC **Date** 10/11/2010 **Type** Q 10x10

MGA Zone 50 386563 **mE** 6448515 **mN**

Soil Grey Sand

Vegetation EmApS – Low Woodland of *Allocasuarina fraseriana*, *Banksia menziesii* and *Banksia attenuata* over a Tall Shrubland of *Jacksonia furcellata* over a Shrubland of *Xanthorrhoea preissii* over scattered *Macrozamia riedlei* over an Exotic Grassland of **Ehrharta calycina* and **Briza maxima* with Low Shrubland of *Gompholobium tomentosum* and **Pelargonium capitatum* on grey sand.

Veg Condition Good

Name	Cover %	Height cm
Allocasuarina fraseriana	10	500
**Avena fatua*	5	30
Banksia attenuata	3	400
Banksia dallanneyi	1	10
Banksia menziesii	5	500
**Briza maxima*	20	20
**Briza minor*	<1	20
Burchardia congesta	<1	20
Cassytha racemosa	<1	creeper
**Ehrharta calycina*	20	80
**Euphorbia terracina*	<1	20
**Gazania linearis*	<1	10

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	**Cover %**	**Height cm**
**Gladiolus caryophyllaceus*	<1	20
Gompholobium tomentosum	5	70
Hardenbergia comptoniana	<1	20
Isotropis cuneifolia	<1	20
Jacksonia furcellata	10	500
**Lagurus ovatus*	<1	20
Laxmannia squarrosa	1	5
Lepidosperma tenue	1	30
Lomandra suaveolens	<1	30
**Lupinus cosentinii*	<1	15
Macrozamia riedlei	2	70
Mesomelaena pseudostygia	2	20
**Pelargonium capitatum*	5	50
Petrophile linearis	<1	30
Pimelea rosea subsp. *rosea*	1	50
**Romulea rosea*	<1	20
Scaevola canescens	<1	20
Sowerbaea laxiflora	<1	20
**Trifolium dubium*	<1	10
**Ursinia anthemoides*	<1	20
Xanthorrhoea preissii	20	150
Anigozanthos humilis	Opp	
**Babiana angustifolia*	Opp	
Bossiaea eriocarpa	Opp	
Daviesia divaricata	Opp	
Dianella revoluta	Opp	
Eucalyptus marginata	Opp	
Isotropis cuneifolia	Opp	
Lepidosperma squamatum	Opp	
Leucopogon propinquus	Opp	
Mesomelaena stygia	Opp	
Thysanotus arbuscula	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** P2R62

Described by VY **Date** 10/11/2010 **Type** Q 10x10

MGA Zone 50 386699 **mE** 6449085 **mN**
Soil Grey Sand
Vegetation CcXpMrS – Low Woodland of *Eucalyptus marginata*, *Banksia attenuata*, *Banksia menziesii* and *Allocasuarina fraseriana* over Open Shrubland of *Xanthorrhoea preissii* over a Closed Exotic Grassland of **Ehrharta calycina* with Low Open Shrubland of *Gompholobium tomentosum* on grey sand.
Veg Condition Degraded to Good

Name	Cover %	Height cm
Allocasuarina fraseriana	2	400
Anigozanthos humilis	<1	20
**Babiana angustifolia*	1	20
Banksia attenuata	20	600
Banksia menziesii	2	400
**Briza maxima*	5	20
Burchardia congesta	<1	30
Conostylis aculeata	<1	30
Dianella revoluta	<1	80
**Ehrharta calycina*	75	100
Eucalyptus marginata	5	800
**Gladiolus caryophyllaceus*	<1	80
Gompholobium tomentosum	5	80

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	**Cover %**	**Height cm**
Hardenbergia comptoniana	<1	creeper
**Lagurus ovatus*	<1	20
Laxmannia squarrosa	1	20
Lepidosperma pubisquameum	2	60
Lepidosperma tenue	<1	60
Leucopogon conostephioides	<1	20
Leucopogon propinquus	2	80
Lomandra hermaphrodita	<1	30
Lomandra suaveolens	<1	30
Macrozamia riedlei	<1	150
Mesomelaena pseudostygia	<1	80
Opercularia vaginata	<1	20
**Pelargonium capitatum*	<1	60
Pimelea rosea	<1	60
Tetraria octandra	1	60
**Trifolium dubium*	1	10
**Ursinia anthemoides*	2	30
Xanthorrhoea preissii	5	150
Banksia dallanneyi	Opp	
**Briza minor*	Opp	
Conostylis setigera	Opp	
Dasypogon bromeliifolius	Opp	
Daviesia divaricata	Opp	
Eucalyptus gomphocephala	Opp	
Loxocarya cinerea	Opp	
Lyginia barbata	Opp	
Petrophile linearis	Opp	
Spyridium globulosum	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** P2R63

Described by VY **Date** 10/11/2010 **Type** Q 10x10

MGA Zone 50 386575 **mE** 6448929 **mN**

Soil Grey Sand

Vegetation EmXpS – Low Open Forest of *Eucalyptus marginata*, *Banksia attenuata*, *Allocasuarina fraseriana* and *Banksia menziesii* over an Open Shrubland of *Xanthorrhoea preissii* over mixed Open Grassland of **Ehrharta calycina* with emergent *Gompholobium tomentosum* over *Briza maxima and **Ursinia anthemoides* on grey sand.

Veg Condition Degraded

Name	Cover %	Height cm
Acacia pulchella	2	100
Allocasuarina fraseriana	5	600
Anigozanthos humilis	<1	20
**Babiana angustifolia*	1	20
Banksia attenuata	25	600
Banksia dallanneyi	1	60
Banksia menziesii	2	400
Bossiaea eriocarpa	<1	60
**Briza maxima*	5	20
Burchardia congesta	<1	30
Desmocladus fasciculatus	<1	20
**Ehrharta calycina*	20	80

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	**Cover %**	**Height cm**
Eucalyptus marginata	10	800
**Gladiolus caryophyllaceus*	<1	80
Gompholobium tomentosum	5	80
Hibbertia hypericoides	1	80
Kennedia prostrata	<1	creeper
Laxmannia squarrosa	<1	20
Leucopogon propinquus	<1	80
Lomandra hermaphrodita	<1	30
Macrozamia riedlei	1	150
Mesomelaena pseudostygia	1	80
Opercularia vaginata	<1	30
Scaevola canescens	<1	20
Synaphea spinulosa	<1	20
**Ursinia anthemoides*	5	20
Xanthorrhoea preissii	5	150
Astroloma pallidum	Opp	
**Bromus diandrus*	Opp	
**Foeniculum vulgare*	Opp	
Hibbertia huegelii	Opp	
Jacksonia furcellata	Opp	
**Ricinus communis*	Opp	
**Trifolium dubium*	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** P2R64

Described by VY **Date** 10/11/2010 **Type** Q 10x10

MGA Zone 50 387930 **mE** 6449275 **mN**
Soil Grey Sand
Vegetation CcXpMrS – Open Woodland of *Corymbia calophylla* and *Eucalyptus marginata* over Low Woodland of *Banksia attenuata* over a Shrubland of *Acacia pulchella* and *Xanthorrhoea preissii* over a Low Shrubland of *Hibbertia hypericoides* and *Gompholobium tomentosum* over an Open Grassland of **Ehrharta calycina* on grey sand.
Veg Condition Degraded to Good

Name	Cover %	Height cm
Acacia pulchella	10	150
Acacia stenoptera	<1	30
**Babiana angustifolia*	<1	20
Babingtonia camphorosmae	<1	80
Banksia attenuata	10	800
Banksia menziesii	<1	600
Bossiaea eriocarpa	1	60
**Briza maxima*	1	20
Burchardia congesta	<1	30
Calectasia narragara	<1	30
Conostylis aculeata	<1	30
Conostylis setigera	<1	20
Corymbia calophylla	10	1200

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
**Cyperus polystachyos*	<1	30
**Ehrharta calycina*	10	80
Eucalyptus marginata	5	1200
Gompholobium tomentosum	5	80
Hardenbergia comptoniana	<1	creeper
Hibbertia huegelii	<1	30
Hibbertia hypericoides	10	80
Lepidosperma squamatum	<1	60
Lepidosperma tenue	<1	80
Lomandra hermaphrodita	<1	30
**Lupinus cosentinii*	<1	30
Macrozamia riedlei	1	150
Mesomelaena pseudostygia	2	80
Patersonia occidentalis	<1	80
**Trifolium dubium*	<1	20
**Ursinia anthemoides*	1	30
Xanthorrhoea preissii	5	150
#Acacia iteaphylla	Opp	
Astroloma pallidum	Opp	
**Avena fatua*	Opp	
**Bromus diandrus*	Opp	
**Chasmanthe floribunda*	Opp	
**Cynodon dactylon*	Opp	
Daviesia divaricata	Opp	
Desmocladus fasciculatus	Opp	
**Euphorbia terracina*	Opp	
Hardenbergia comptoniana	Opp	
Isotropis cuneifolia	Opp	
**Lagurus ovatus*	Opp	
Lomandra suaveolens	Opp	
**Lysimachia arvensis*	Opp	
**Stenotaphrum secundatum*	Opp	
Tetraria octandra	Opp	
Trachymene pilosa	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** P2R65

Described by LC **Date** 15/11/2010 **Type** Q 10x10

MGA Zone 50 385354 **mE** 6449314 **mN**
Soil Brown Sand
Vegetation EgXpS – Tall Woodland of *Eucalyptus gomphocephala* over a Tall Open Scrub of *Acacia rostellifera* with occasional *Banksia sessilis* over an exotic Grassland of **Ehrharta calycina* with **Avena fatua* on brown sand.
Veg Condition Degraded

Name	Cover %	Height cm
Acacia rostellifera	30	200
**Avena fatua*	20	40
Banksia sessilis	1	220
**Brassica tournefortii*	<1	50
**Briza maxima*	2	15
**Bromus diandrus*	<1	30
Dianella revoluta	1	50
**Ehrharta calycina*	40	70
Eucalyptus gomphocephala	95	3000
**Euphorbia terracina*	<1	20
Hardenbergia comptoniana	<1	30
**Hypochaeris glabra*	<1	30
**Lagurus ovatus*	<1	30

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	**Cover %**	**Height cm**
Lechenaultia linarioides	1	60
**Lupinus cosentinii*	<1	30
Macrozamia riedlei	1	80
**Pelargonium capitatum*	3	80
**Sonchus asper*	<1	20
Tricoryne elatior	<1	20
Xanthorrhoea preissii	5	240
Acacia pulchella	Opp	
Acacia saligna	Opp	
**Asphodelus fistulosus*	Opp	
Banksia attenuata	Opp	
Cassytha racemosa	Opp	
Desmocladus fasciculatus	Opp	
Eucalyptus marginata	Opp	
**Gazania linearis*	Opp	
Hakea prostrata	Opp	
Jacksonia furcellata	Opp	
Kennedia prostrata	Opp	
**Oenothera drummondii*	Opp	
Phyllanthus calycinus	Opp	
Ptilotus polystachyus	Opp	
**Ricinus communis*	Opp	
Stylidium repens	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** P2R66

Described by LC **Date** 15/11/2010 **Type** Q 10x10

MGA Zone 50 386672 **mE** 6448386 **mN**
Soil Grey Sand
Vegetation JfKgE – Tall Shrubland of *Jacksonia furcellata* over an exotic Closed Grassland of **Ehrharta calycina* and **Avena fatua* over an Open Herbland of **Ursinia anthemoides* on grey sand.
Veg Condition Degraded

Name	Cover %	Height cm
**Avena fatua*	50	50
**Cynodon dactylon*	5	10
**Ehrharta calycina*	30	80
**Euphorbia terracina*	<1	20
**Gazania linearis*	<1	20
**Hypochaeris glabra*	<1	20
Jacksonia furcellata	20	400
**Lupinus cosentinii*	<1	10
**Pelargonium capitatum*	1	30
**Ursinia anthemoides*	15	10
Acacia pulchella	Opp	
Acacia saligna	Opp	
Agonis flexuosa	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	**Cover %**	**Height cm**
**Briza maxima*	Opp	
**Bromus diandrus*	Opp	
Daviesia divaricata	Opp	
**Gladiolus caryophyllaceus*	Opp	
Hakea petiolaris	Opp	
Kunzea glabrescens	Opp	
**Lagurus ovatus*	Opp	
**Leptospermum laevigatum*	Opp	
**Lolium rigidum*	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** P2R67

Described by LC **Date** 15/11/2010 **Type** Q 10x10

MGA Zone 50 391448 **mE** 6449288 **mN**

Soil Grey Sand

Vegetation BaHs – Low Open Forest of *Allocasuarina fraseriana* and *Banksia attenuata* over Shrubland of *Xanthorrhoea preissii* and *Allocasuarina humilis* over Low Shrubland dominated by *Hibbertia hypericoides* over an Open Sedgeland of *Mesomelaena pseudostygia* on grey sand.

Veg Condition Good to Very Good

Name	Cover %	Height cm
Acacia pulchella	3	50
Acacia willdenowiana	<1	40
Allocasuarina fraseriana	10	600
Allocasuarina humilis	4	100
Amphipogon turbinatus	3	20
Banksia attenuata	40	500
Banksia dallanneyi	1	20
**Briza maxima*	2	20
Burchardia congesta	<1	60
Dampiera linearis	<1	30
Daviesia divaricata	5	80
**Ehrharta calycina*	5	30

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	**Cover %**	**Height cm**
Eremaea pauciflora var. *pauciflora*	2	30
**Gladiolus caryophyllaceus*	<1	60
Hibbertia hypericoides	15	80
Hovea trisperma	2	60
Leucopogon nutans	2	30
Lomandra hermaphrodita	<1	20
Loxocarya cinerea	2	30
Lyginia barbata	1	40
Mesomelaena pseudostygia	20	60
Opercularia echinocephala	<1	10
Patersonia occidentalis	<1	60
Petrophile linearis	1	70
Regelia ciliata	3	50
Stirlingia latifolia	4	81
Stylidium repens	<1	5
Synaphea spinulosa	2	80
Tricoryne elatior	<1	20
**Ursinia anthemoides*	1	30
Xanthorrhoea preissii	20	150
Acacia saligna	Opp	
Adenanthos cygnorum	Opp	
Anigozanthos manglesii	Opp	
Astroloma pallidum	Opp	
Banksia ilicifolia	Opp	
Banksia menziesii	Opp	
#*Callistemon phoeniceus*	Opp	
Conostylis aculeata	Opp	
Conostylis setosa	Opp	
**Cynodon dactylon*	Opp	
Daviesia nudiflora subsp. *nudiflora*	Opp	
**Eragrostis curvula*	Opp	
Eucalyptus marginata	Opp	
Eucalyptus todtiana	Opp	
Gompholobium tomentosum	Opp	
Grevillea bipinnatifida	Opp	
Hemiandra pungens	Opp	
Jacksonia furcellata	Opp	
Kennedia prostrata	Opp	
Laxmannia squarrosa	Opp	
Lepidosperma squamatum	Opp	
Phlebocarya ciliata	Opp	
Scaevola canescens	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** P2R68

Described by LC **Date** 15/11/2010 **Type** Q 10x10

MGA Zone 50 391509 **mE** 6447993 **mN**
Soil Yellow Sand
Vegetation EmBaS – Open Forest of *Corymbia calophylla* over a Low Woodland of *Allocasuarina fraseriana* over a Tall Shrubland of *Kunzea glabrescens* and *Acacia saligna* with occasional *#Chamelaucium uncinatum* over a mixed Low Shrubland dominated by *Regelia ciliata* over a Very Open Exotic Grassland of **Ehrharta calycina* on yellow sand.
Veg Condition Degraded

Name	Cover %	Height cm
Acacia saligna	10	400
Allocasuarina fraseriana	15	800
**Avena fatua*	2	60
**Briza maxima*	1	30
**Bromus diandrus*	<1	20
Conostylis aculeata	1	30
Corymbia calophylla	60	1000
**Ehrharta calycina*	5	40
Hardenbergia comptoniana	<1	creeper
**Hedypnois rhagadioloides* subsp. *cretica*	<1	10
Kunzea glabrescens	4	300
**Lagurus ovatus*	<1	30

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	**Cover %**	**Height cm**
**Lolium rigidum*	<1	1
Melaleuca rhaphiophylla	2	150
Melaleuca systena	2	100
**Pelargonium capitatum*	2	30
Regelia ciliata	3	60
#Chamelaucium uncinatum	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** P2R69

Described by LC **Date** 15/11/2010 **Type** Q 10x10

MGA Zone 50 392325 **mE** 6449239 **mN**
Soil White Sand
Vegetation BaTS – Low Woodland of *Banksia attenuata* over a Shrubland of *Xanthorrhoea preissii*, *Regelia ciliata* and *Allocasuarina humilis* over a Very Open Sedgeland of *Lepidosperma squamatum* over a Low Open Shrubland of *Gastrolobium capitatum* over an Open Grassland of *Amphipogon turbinatus* on white sand.
Veg Condition Good to Very Good

Name	Cover %	Height cm
Acacia pulchella	<1	30
Allocasuarina humilis	10	110
Amphipogon turbinatus	10	10
Banksia attenuata	15	800
Bossiaea eriocarpa	<1	20
Burchardia congesta	<1	30
Calytrix fraseri	<1	20
Cassytha racemosa	<1	creeper
Conostephium minus	1	10
Conostylis aculeata	1	30
Dasypogon bromeliifolius	3	40
Daviesia triflora	1	60
**Ehrharta calycina*	2	70

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	**Cover %**	**Height cm**
Eremaea asterocarpa subsp. *asterocarpa*	1	70
Eremaea pauciflora	2	70
Gastrolobium capitatum	5	30
Gompholobium tomentosum	<1	30
Hibbertia huegelii	2	60
Laxmannia squarrosa	<1	10
Lepidosperma squamatum	5	60
Lepidosperma tenue	2	70
Loxocarya cinerea	3	20
Lyginia barbata	1	30
Patersonia occidentalis	2	60
Petrophile linearis	<1	30
Regelia ciliata	10	120
Stirlingia latifolia	15	90
Tricoryne elatior	1	40
Xanthorrhoea preissii	2	130
Acacia saligna	Opp	
**Arctotheca calendula*	Opp	
Banksia ilicifolia	Opp	
Banksia menziesii	Opp	
Eucalyptus marginata	Opp	
**Euphorbia terracina*	Opp	
**Gladiolus caryophyllaceus*	Opp	
Gompholobium tomentosum	Opp	
Hibbertia hypericoides	Opp	
Jacksonia furcellata	Opp	
Laxmannia squarrosa	Opp	
Lechenaultia floribunda	Opp	
Lomandra hermaphrodita	Opp	
Lyginia barbata	Opp	
Macrozamia riedlei	Opp	
***Oenothera drummondii*	Opp	
Petrophile linearis	Opp	
Stylidium repens	Opp	
Synaphea spinulosa	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** P2R70

Described by LC **Date** 15/11/2010 **Type** Q 10x10

MGA Zone 50 393180 **mE** 6449638 **mN**

Soil white sand

Vegetation BaBmBi – Low Open Woodland of *Banksia attenuata* and *Banksia menziesii* over a Shrubland of *Xanthorrhoea preissii* and *Macrozamia riedlei* over a mixed Low Shrubland and Sedgeland dominated by *Acacia pulchella*, *Conostephium minus* and *Lyginia barbata* on white sand.

Veg Condition Good to Very Good

Name	Cover %	Height cm
Acacia pulchella	6	70
Allocasuarina humilis	1	30
Astroloma pallidum	2	30
Banksia attenuata	30	800
Banksia menziesii	20	600
Bossiaea eriocarpa	4	50
**Briza maxima*	<1	30
Burchardia congesta	4	30
Calytrix fraseri	1	40
Conostephium minus	20	50
Dampiera linearis	<1	20
Dasypogon bromeliifolius	<1	30
Desmocladus fasciculatus	1	10

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	Cover %	Height cm
**Ehrharta calycina*	<1	70
**Gladiolus caryophyllaceus*	<1	60
Gompholobium tomentosum	1	40
Hibbertia subvaginata	1	30
Lomandra hermaphrodita	<1	20
Lyginia barbata	8	30
Macrozamia riedlei	5	110
Melaleuca systena	3	40
Melaleuca thymoides	1	30
Patersonia occidentalis	3	80
Platysace compressa	<1	20
Sowerbaea laxiflora	<1	20
Stylidium brunonianum	<1	30
Stylidium repens	<1	15
**Ursinia anthemoides*	<1	20
Xanthorrhoea preissii	10	150
Acacia saligna	Opp	
**Avena fatua*	Opp	
**Briza minor*	Opp	
Dampiera linearis	Opp	
Dasypogon bromeliifolius	Opp	
Daviesia divaricata	Opp	
Eucalyptus marginata	Opp	
Laxmannia squarrosa	Opp	
Lechenaultia floribunda	Opp	
Loxocarya cinerea	Opp	
Nuytsia floribunda	Opp	
**Pelargonium capitatum*	Opp	
Petrophile linearis	Opp	
Regelia ciliata	Opp	
**Trifolium dubium*	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** P2R71

Described by LC **Date** 15/11/2010 **Type** Q 10x10

MGA Zone 50 390052 **mE** 6449794 **mN**

Soil Brown Loam Clay

Vegetation ErCtS – Closed Forest of *Melaleuca preissiana* with occasional *Banksia littoralis* and *Eucalyptus rudis* over Tall Shrubland of *Taxandria linearifolia* over a Herbland of *Pteridium esculentum* over a Closed Sedgeland of *Cyathochaeta teretifolia* (P3), *Lepidosperma longitudinale*, *Meeboldina scariosa* and *Tetraria capillaris* over introduced species **Cynodon dactylon* and **Zantedeschia aethiopica* on brown loamy clay.

Veg Condition Good to Very Good

Name	Cover %	Height cm
**Asparagus asparagoides*	<1	creeper
Centella asiatica	1	30
Cyathochaeta teretifolia (P3)	20	120
**Cynodon dactylon*	20	60
Dampiera linearis	2	30
**Gladiolus caryophyllaceus*	<1	60
Lepidosperma longitudinale	30	80
Leucopogon propinquus	1	70
Meeboldina scariosa	10	60
Melaleuca preissiana	80	2000
Pteridium esculentum	30	150
**Sonchus asper*	<1	30

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	**Cover %**	**Height cm**
Taxandria linearifolia	25	400
Tetraria capillaris	25	50
**Zantedeschia aethiopica*	8	60
Banksia littoralis	Opp	
Eucalyptus rudis	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** P2R72

Described by LC **Date** 29/11/2010 **Type** Q 10x10

MGA Zone 50 390106 **mE** 6449481 **mN**

Soil Grey Sand

Vegetation AfKgS – Open Forest of *Eucalyptus rudis* with occasional *Corymbia calophylla* over *Allocasuarina fraseriana* and *Melaleuca preissiana* over a scattered Tall Shrubland of *Kunzea glabrescens* and *Astartea scoparia* over introduced species.

Veg Condition

Name	**Cover %**	**Height cm**
Agonis flexuosa	40	1200
Bromus diandra	2	40
Eucalyptus rudis	60	1500
**Fumaria capreolata*	<1	30
Melaleuca preissiana	50	1000
**Pennisetum clandestinum*	8	30
**Solanum nigrum*	<1	40
**Zantedeschia aethiopica*	<1	30
**Arctotheca calendula*	Opp	
**Arundo donax*	Opp	
Astartea scoparia	Opp	
**Avena fatua*	Opp	
Banksia attenuata	Opp	
**Briza maxima*	Opp	
**Conyza sumatrensis*	Opp	
Corymbia calophylla	Opp	
**Cynodon dactylon*	Opp	
Cyperus polystachyus	Opp	
**Ehrharta calycina*	Opp	
**Eragrostis curvula*	Opp	
**Euphorbia terracina*	Opp	
**Ficus carica*	Opp	
Gladiolus caryophyllea	Opp	
**Holcus lanatus*	Opp	
**Hypochaeris glabra*	Opp	
Juncus pallidus	Opp	
Kunzea glabrescens	Opp	
**Lolium rigidum*	Opp	
Melaleuca teretifolia	Opp	
Plantago lanceolatum	Opp	
**Sonchus asper*	Opp	
Taxandria linearifolia	Opp	
**Vicia sativa*	Opp	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R73

Described by LC **Date** 18/01/2011 **Type** V

Location Road verge along Kwinana Freeway, near Farrington Road overpass.

MGA Zone 50 391423 **mE** 6450237 **mN**
Soil White Sand
Vegetation R1 - Rehabilitated road verge, Shrubland to one metre.
Veg Condition Degraded to Completely Degraded
Notes Disturbance = High

Name	Cover
Acacia lasiocarpa var. *lasiocarpa*	
Acacia pulchella	Dominant
Acacia saligna	
Adenanthos cygnorum	
Allocasuarina humilis	
Anigozanthos manglesii	
**Avena fatua*	
Banksia attenuata	
Banksia menziesii	
**Bromus diandrus*	
#*Chamelaucium uncinatum*	
Conostylis juncea	
**Conyza sumatrensis*	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Name	**Cover**
**Eragrostis curvula*	
#Eucalyptus sp.	
Hypolaena exsulca	
Jacksonia furcellata	
Lyginia barbata	
Melaleuca systena	
Mesomelaena stygia	
**Pelargonium capitatum*	
Regelia ciliata	Dominant
Scaevola crassifolia	Dominant
Stirlingia latifolia	

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R74

Described by LC **Date** 18/01/2011 **Type** V

Location Murdoch Drive, Southern end

MGA Zone 50 390748 **mE** 6450431 **mN**
Soil White Sand
Vegetation R5 - Road Verges
Veg Condition Degraded to Completely Degraded

Name
Adenanthos cygnorum
Corymbia calophylla
#Corymbia maculata
**Cynodon dactylon*
**Eragrostis curvula*
Eucalyptus todtiana
**Euphorbia terracina*
Melaleuca rhaphiophylla
**Pelargonium capitatum*
**Pennisetum clandestinum*

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R75

Described by LC **Date** 18/01/2011 **Type** V

Location West side of Hope Road.

MGA Zone50 388879 **mE** 6449788 **mN**
Vegetation #*Corymbia citriodora* and *Corymbia calophylla* over grasses.
Veg Condition Degraded to Completely Degraded

Name
Corymbia calophylla
#Corymbia citriodora

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R76

Described by LC **Date** 18/01/2011 **Type** V

MGA Zone50 388432 **mE** 6449960 **mN**

Vegetation P6 - Cleared areas comprising of introduced and planted species of but not limited to *Agonis flexuosa, #Callistemon phoeniceus, Corymbia calophylla* and *#Corymbia citriodora*.

Veg Condition Completely Degraded

Name
Agonis flexuosa
#Callistemon phoeniceus
**Callitris sp.*
Corymbia calophylla
#Corymbia citriodora
#Corymbia ficifolia
**Cynodon dactylon*
**Ehrharta calycina*
#Eucalyptus erythrocorys
#Eucalyptus platypus
Melaleuca nesophila
Melaleuca preissiana
Melaleuca rhaphiophylla

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

Roe Hwy **Site** R77

Described by GM **Date** 18/01/2011 **Type** V

MGA Zone 50 388352 **mE** 6449167 **mN**

Soil Yellow Sand

Vegetation LIHpS - Low Shrubland of **Leptospermum laevigatum* and *Hakea prostrata* over a mixed Grassland/Herbland of introduced species in association with disturbed roadsides

Veg Condition Completely Degraded

Name	Cover
Acacia saligna	Dominant
Banksia attenuata	Scattered
**Briza maxima*	
#Calothamnus rupestris	Scattered
Calytrix flavescens	
Corymbia calophylla	Scattered
Daviesia triflora	
**Ehrharta calycina*	
**Eragrostis curvula*	
**Euphorbia terracina*	
Hakea prostrata	Dominant
Jacksonia sternbergiana	
**Lagurus ovatus*	
**Leptospermum laevigatum*	Dominant

Appendix D: Quadrat Data Recorded from Vegetation Communities within the Roe Highway Project Area.

**Oenothera drummondii*	
Scaevola canescens	
**Ursinia anthemoides*	

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Appendix E

Floristic Community Type Analysis

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APPENDIX E: SUMMARY OF FLORISTIC COMMUNITY TYPE (FCT) ANALYSIS FOR THE ROE HIGHWAY VEGETATION ASSESSMENT AREA, SPRING 2009 AND SPRING 2010

Vegetation Community		Floristic Community Types (FCTs)																																										Determined FCT
		1a	1b	2	3a	3b	3c	4	5	6	7	8	9	10	10a	10b	11	12	13	14	15	16	17	18	19	20a	20b	20c	21a	21b	21c	22	23a	23b	24	25	26a	26b	27	28	29a	29b	30a	30b	30c	
AfBKgS	FCT Scores	30	32	15	23	32	22	30	26	20	12	15	11	7	12	19	18	7	8	4	0	1	3	5	4	31	26	29	44	35	43	28	46	35	33	26	17	26	14	39	11	10	5	10	11	21a
BAhS		45	42	21	41	45	34	40	31	31	12	20	13	12	11	25	25	5	8	8	1	2	4	7	6	56	57	53	74	52	58	38	68	59	55	42	23	49	21	77	13	19	4	10	10	28
BaNfW		14	15	7	15	15	11	18	16	17	8	10	5	7	6	10	11	3	6	1	2	3	3	5	2	13	14	16	23	17	21	14	23	18	18	18	7	14	4	21	7	5	4	7	9	21a
BaTS		57	57	25	56	53	44	54	48	39	23	30	21	16	19	35	34	12	15	8	1	5	7	11	9	63	66	57	92	63	73	44	83	72	66	50	31	63	21	96	23	24	10	18	13	21a
BHhW		50	51	23	51	52	40	49	46	37	23	28	19	17	21	35	39	12	14	8	2	4	7	12	13	63	59	57	86	59	67	45	77	67	72	52	30	58	23	95	23	27	13	20	16	28
BiSiH		11	16	8	12	14	12	19	15	15	10	10	9	6	7	10	16	4	9	5	0	4	4	6	6	13	13	15	25	17	23	16	25	17	24	19	8	13	4	23	12	8	7	12	6	23a
BXpW		47	49	18	47	57	52	50	43	41	29	35	21	15	20	34	33	11	15	7	1	6	7	13	12	52	49	51	87	59	68	43	72	60	74	54	32	58	23	90	27	24	12	20	19	28
CcBKgS		29	32	16	22	28	19	33	27	22	11	17	12	6	13	23	22	7	9	4	0	3	4	8	4	29	28	29	43	34	42	27	43	33	35	29	15	27	15	40	14	8	6	13	9	23a
CcXpDdS		43	43	14	42	49	42	38	35	33	25	29	19	18	19	22	35	8	12	11	2	3	8	10	13	42	44	41	71	43	48	27	52	40	63	56	30	56	23	77	26	29	12	19	17	28
CcXpMrS		49	53	18	49	60	48	50	44	40	29	38	22	22	24	27	41	8	13	13	4	6	12	11	13	54	57	54	92	59	62	37	68	54	83	69	33	68	25	101	30	32	20	28	20	28
EgXpS		34	37	11	37	42	37	38	31	34	25	28	21	26	17	21	34	9	14	10	2	6	15	12	14	35	36	39	67	37	47	23	49	36	70	57	34	63	20	80	36	34	22	28	22	28
EmApS		29	31	10	27	31	28	27	25	22	19	18	11	15	15	12	26	6	8	8	1	3	8	8	7	35	34	34	57	32	42	23	45	36	53	44	22	50	13	61	19	19	10	15	15	28
EmBaS		56	53	26	54	58	48	53	45	40	25	36	20	17	22	33	42	13	14	13	3	5	11	11	12	62	69	54	95	61	72	46	85	67	75	58	36	65	28	103	28	29	13	25	17	28
EmKgS		4	5	2	6	6	7	6	4	9	6	6	5	5	2	2	10	1	2	2	0	3	4	3	3	4	7	5	11	5	11	4	11	5	16	13	6	9	1	15	10	6	5	9	4	28
EmXpS		33	37	12	32	42	35	30	26	29	20	27	12	19	13	22	29	6	9	8	0	6	8	9	12	37	40	42	64	39	49	23	49	40	61	49	25	55	17	72	24	25	15	19	17	28
ErCtS		6	11	6	8	7	8	8	12	7	7	11	8	1	2	5	16	4	10	3	1	4	6	4	4	5	6	6	13	5	11	5	10	6	9	11	5	7	2	11	4	4	4	8	2	11
ErMpAfS		10	13	9	9	11	9	12	15	8	11	12	11	2	8	9	19	8	14	6	1	3	6	7	5	6	5	5	15	7	10	6	10	6	12	12	4	8	3	13	6	4	2	7	3	11
ErMpGeS		8	10	7	8	9	10	11	14	7	10	13	12	3	9	9	16	9	16	4	3	1	8	5	3	6	5	7	16	7	11	6	10	6	11	10	7	9	4	13	9	6	1	8	4	11
ErMpH		9	13	6	12	13	15	16	17	22	11	15	7	10	4	10	18	3	8	5	1	5	8	7	8	9	14	13	25	14	24	11	23	15	28	24	12	18	4	30	17	11	13	16	11	11
EtKgS		3	7	3	9	10	10	12	11	12	9	10	4	8	4	7	10	4	6	6	0	3	4	5	3	4	8	6	16	9	15	6	14	8	16	15	6	10	2	17	9	6	7	10	6	23a
MpBaS		20	27	13	24	27	27	24	25	25	15	22	15	9	9	17	30	9	17	10	4	6	13	8	13	18	20	23	40	18	32	17	33	20	37	34	18	32	13	39	17	16	10	17	12	11
MpKgS		13	18	11	17	15	13	21	20	17	11	16	12	4	11	15	21	7	10	6	0	2	4	6	3	13	14	15	24	15	22	13	21	16	21	17	9	13	4	24	8	6	6	11	5	4
BaBmBi		35	38	17	30	35	26	36	29	24	10	16	13	9	12	18	21	3	6	7	0	0	2	5	3	41	44	37	57	46	51	38	60	47	43	27	12	34	15	55	7	7	2	5	7	23a