

## FLORA AND VEGETATION ASSESSMENT M70/013 HOPKINS ROAD, NOWERGUP

Prepared for:

Limestone Building Block Co. Pty Ltd  
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18 March 2011

Limestone Building Block Co. Pty Ltd  
PO Box 60  
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**Attention: Max Barton**

Dear Max

**RE: Flora and Vegetation Assessment, M70/013 Hopkins Road, Nowergup**

Please find enclosed Coffey Environments' Report No. EP 2011/013, V2, *Flora and Vegetation Assessment, M70/013 Hopkins Road, Nowergup*. The Report has been amended to incorporate your comments on Version 1 of the report.

If you have any queries, please do not hesitate to contact either myself or Ms Martine Scheltema on 9355 7100.

For and on behalf of Coffey Environments Pty Ltd



**Beth Loudon**  
Senior Environmental Scientist - Botany

Attachment A: Coffey Environments Report No. EP 2011/013, V1

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## ABBREVIATIONS

<b>°C</b>	Degrees Celsius
<b>AHD</b>	Australian Height Datum
<b>CC</b>	Conservation
<b>Co</b>	Company
<b>DEC</b>	Department of Environment and Conservation
<b>DoE</b>	Department of Environment
<b>DRF</b>	Declared Rare Flora
<b>DSEWPC</b>	Department of Sustainability, Environment, Water, Population and Communities
<b>EPA</b>	Environmental Protection Authority
<b>EPBC</b>	Environment Protection and Biodiversity Conservation
<b>FCT</b>	Floristic Community Type
<b>Govt</b>	Government
<b>GPS</b>	Global Positioning System
<b>ha</b>	Hectares
<b>IBRA</b>	Interim Biogeographic Regionalisation for Australia
<b>km</b>	Kilometres
<b>Ltd</b>	Limited
<b>m</b>	Metres
<b>MGA</b>	Map Grid of Australia
<b>mm</b>	Millimetres
<b>PATN</b>	Pattern analysis
<b>PEC</b>	Priority Ecological Community
<b>PF</b>	Priority Flora
<b>PMR</b>	Perth Metropolitan Region
<b>Pty</b>	Proprietary
<b>R</b>	Rare
<b>RE</b>	Resource Enhancement
<b>SCP</b>	Swan Coastal Plain
<b>TEC</b>	Threatened Ecological Community
<b>WA</b>	Western Australia
<b>WAH</b>	Western Australian Herbarium
<b>WAPC</b>	Western Australian Planning Commission
<b>WGS84</b>	World Geodetic System 1984
<b>X</b>	Extinct

# EXECUTIVE SUMMARY

## Introduction/Background

Coffey Environments was commissioned by Limestone Building Block Co. Pty Ltd to undertake a flora and vegetation assessment of the un-mined, vegetated portion of Mineral Lease M70/013 on Hopkins Road, Nowergup. The assessment was undertaken to support an application for a native vegetation clearing permit.

The study area is located in the City of Wanneroo within the suburb of Nowergup, approximately 38 kilometres (km) north-northwest of the Perth Central Business District and 13km north of Joondalup. The study area covers approximately 14 hectares (ha), with the eastern third proposed for limestone extraction. The clearing of native vegetation will only apply to the area to be mined.

Ms Bethea Loudon, an experienced botanist from Coffey Environments, conducted a Level 2 flora and vegetation assessment of the study area in Spring (11 November 2010). The survey was undertaken in accordance with Environmental Protection Authority (EPA) guidance statement recommendations to enable the capture of ephemeral and late flowering species. The assessment was undertaken to provide a description of the dominant vegetation types, vegetation condition and flora species present, including any significant species. Floristic data collected were analysed and compared against Gibson *et al.*, (1994) to determine the Floristic Community Types on the subject land and whether any of these were a Threatened Ecological Community.

## Results

The vegetation occurring within the study area is mapped as consisting of the *Cottesloe – Central and South* and the *Karrakatta – Central and South* vegetation complexes of which 36% and 18% respectively, remains in the Perth Metropolitan Region of the Swan Coastal Plain. These complexes are well reserved as they are above the recommended minimum 10% retention threshold.

Two vegetation types were identified within the study area. In general the vegetation types represented *Eucalyptus marginata* (Jarrah) and *Banksia attenuata* (Candlestick Banksia) woodland on deep sand, and *Banksia sessilis* and *Xanthorrhoea preissii* Tall Open Scrub to Tall Shrubland on limestone substrate. The vegetation condition of the majority of the study area was Excellent, with the condition in the eastern third of the study area being Very Good-Excellent and an old disused limestone quarry in the north-east being Degraded-Completely Degraded.

Results of the floristic data analysis showed that the vegetation has some correlation to Floristic Community Types FCT 24 'Northern Spearwood shrublands and woodlands', a Priority 3 Priority Ecological Community and FCT 28 'Spearwood *Banksia attenuata* or *Banksia attenuata-Eucalyptus* woodlands', a common floristic community type considered to be well reserved and at low risk of extinction.

The PEC is not recognised under the Commonwealth's *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*.

Bush Forever Site 290 'Hopkins Road Bushland, Nowergup' covers the entire study area. Site 290 was selected for its representation of ecological communities and rarity. The Declared Rare Flora (DRF) taxon *Eucalyptus argutifolia* occurs elsewhere in Site 290 (but not within the study area) and is subject to protection under the *EPBC Act 1999*.

A total of 118 flora species were recorded from the study area. This included 100 native and 18 non-native, introduced (weed) species.

One Priority species (*Jacksonia sericea* – Priority 4) was recorded from the study area during the flora and vegetation assessment along with three other species that have been identified as significant flora



## EXECUTIVE SUMMARY

of the Spearwood dunes under Bush Forever (*Petrophile axillaris*, *Acacia alata* var. *tetrantha* and *Lechenaultia linearis*). All significant flora species identified in the DEC database searches would have been identifiable during the Spring survey if present. No DRF as defined by the *EPBC Act 1999* were recorded from the study area.

Discussions with the Department of Environment and Conservation and the Department of Planning are required in regards to potential impacts on the conservation significant flora and vegetation. It is unlikely that the Commonwealth *EPBC Act 1999* will have effect on the proposed development of the study area with regard to flora or vegetation, however the significance of any indirect impacts on *Eucalyptus argutifolia* (DRF) (relating to Bush Forever Site 290) needs to be determined.

Impacts on fauna species protected under the *EPBC Act 1999* have not been addressed in this report.

## 1 INTRODUCTION

### 1.1 Background

Coffey Environments was commissioned by Limestone Building Block Co. Pty Ltd to undertake a flora and vegetation assessment of the un-mined, vegetated portion of Mineral Lease M70/013 on Hopkins Road, Nowergup. The study area covers approximately 14 hectares (ha), with the eastern third proposed for limestone extraction. The clearing of native vegetation will only apply to the area to be mined.

The assessment was undertaken to support an application for a native vegetation clearing permit.

### 1.2 Scope of Works

The scope of works for the flora and vegetation assessment was as follows:

- Sample permanent 10m x 10m quadrats located within representative vegetation types in Spring (i.e. September - November) to record the species present;
- Map and describe the vegetation types based on Muir (1977) and Aplin's (1979) classification for structural units in Government of Western Australia (Govt of WA) (2000b), using a combination of recent aerial photography and field survey to ground-truth;
- Map vegetation condition using the Bush Forever condition rating;
- Provide a list of all native and non-native plant species recorded within the study area;
- Conduct a site walkover to search for conservation significant species and record any other species not found within quadrats;
- Review the Department of Environment and Conservations (DEC) threatened species (i.e. Declared Rare Flora (DRF) and Priority Flora (PF) and Threatened Ecological Communities (TEC) database, incorporating a list of significant species and communities recorded on the databases as occurring in the vicinity of the study area;
- Identify and record the location of any significant plant species or ecological communities recorded within the study area during the survey;
- Analysis of the floristic data recorded to determine the Floristic Community Types (FCT) and possible occurrence of any TECs or Priority Threatened Ecological Communities (PECs);
- Discuss the conservation significance of flora and vegetation identified within the study area in a local, regional context and national context; and
- Discuss the potential flora and vegetation constraints associated with the development of the site and implications of the Commonwealth's *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*.

## **2 EXISTING INFORMATION**

### **2.1 Location**

The study area is located in the City of Wanneroo within the suburb of Nowergup, approximately 38 kilometres (km) north-northwest of the Perth Central Business District (Figure 1) and 13km north of Joondalup. The study area occurs north of Wesco Road off Hopkins Road. It is bounded by Hopkins Road to the east, bushland to the north, south and west as well as an existing old quarry in the northeast. The study area is covered by mineral lease M70/013.

### **2.2 Existing Land Use**

The study area is currently vegetated crown land covered by an existing mineral lease (M70/013), abutting an old limestone quarry.

### **2.3 Geological and Physiographic Context of the Subject Land**

#### **2.3.1 Climate**

The study area is located on the Swan Coastal Plain (SCP) which experiences a Mediterranean climate with cool wet winters and warm dry summers.

The highest annual mean daily minimum and maximum temperatures for nearby Beenyup (approximately 16km from Nowergup) are 12.3°C and 24.1°C respectively.

The annual mean rainfall for Beenyup is approximately 760 millimetres (mm) per year with the majority of precipitation falling between April/May and September/October. Rainfall data for Beenyup was incomplete for 2010 however Tamala Park (Mindarie), situated approximately 8km from Nowergup, received approximately 500mm of rainfall during 2010 (Bureau of Meteorology, 2011).

#### **2.3.2 Topography**

The topography of the study area generally slopes from south to north over the western two-thirds from 68m AHD (Australian Height Datum) to 60m AHD. A north-south aligned ridge (limestone) runs along the eastern third of the site (64m AHD), sloping down to 54m AHD at the eastern boundary (Department of Environment (DoE), 2004; Landgate, 2011).

#### **2.3.3 Hydrology**

No surface water or natural drainage lines i.e. creeks or gullies with seasonal water flows, occur within the study area. The depth to groundwater (below ground level) ranges from 41m in the west of the study area to 30m in the east (DoE, 2004).

There are no wetlands within the study area. However, several wetlands occur in the vicinity of the study area:

- Camel Swamp, Resource Enhancement (RE) dampland – 830m southeast;
- Nowergup Lake, Conservation Category (CC) Lake – 2.3km west-southwest;
- Lake Pinjar, Multiple Use and CC sumpland – 2.5km east; and
- Carabooda Lake, RE sumpland – 3.3km west-northwest (Landgate, 2011).

### 2.3.4 Landform, Soils and Geology

#### 2.3.4.1 Landform and Soils

The majority of the study area consists of the *Cottesloe* landform and soil unit, comprised of a low hilly landscape with shallow brown sands over limestone with exposed limestone, with a very narrow strip of the *Karrakatta* landform and soil unit along the eastern side of the study area. The latter unit consists of an undulating landscape of deep yellow sands over limestone (Churchward and McArthur, 1980).

#### 2.3.4.2 Geology

The geology of the study area is mainly comprised of Limestone (*Ls* – light yellowish brown, fine to coarse-grained, sub-angular to well rounded quartz, a trace of feldspar, shell debris, variably lithified. Surface kankar of eolian origin), with a narrow section along the eastern and southern side of the study area consisting of Sand (*S<sub>7</sub>* – pale and olive yellow, medium to coarse-grained, sub-angular quartz and a trace of feldspar, moderately sorted, of residual origin) (Gozzard, 1982).

The study area is situated on the Spearwood Dunes geomorphological unit (Gozzard, 1982).

## 2.4 Biological Context of the Subject Land

### 2.4.1 Bioregional Data

The Australian environment has been categorised into biogeographic regions (based on geology, landform, vegetation, fauna and climate) known as IBRA (Interim Biogeographic Regionalisation for Australia) regions.

Based on IBRA mapping, the study area lies within the Perth Sub-region of the Swan Coastal Plain Bioregion. The Swan Coastal Plain Bioregion is comprised mainly of woodlands dominated by *Banksia* species or *Eucalyptus gomphocephala* (Tuart) on low-lying sandy soils, with *Casuarina obesa* (Swamp Sheoak) on outwash plains and *Melaleuca* species (Paperbarks) in swampy areas. The eastern side is dominated by *Eucalyptus marginata* (Jarrah) woodlands on higher elevations of duricrusted Mesozoic sediments, while three sets of dune formations line the coastal area (Thackway and Cresswell, 1995).

The Perth Sub-region is composed of heath and/or *Eucalyptus gomphocephala* (Tuart) woodlands on limestone or younger sands, *Banksia* and *Banksia-Eucalyptus marginata* (Jarrah) woodlands on older dune systems and *Corymbia calophylla* (Marri) on colluvial and alluvial soils. The Perth Sub-region includes a complex series of seasonal wetlands (DEC, 2002).

### 2.4.2 Beard's Vegetation Mapping

According to Beard (1990) the vegetation of the study area is located within the Drummond Botanical Sub-district of the Swan Coastal Plain Sub-region. The Drummond Botanical Sub-district is mainly comprised of *Banksia* low woodland on leached sands with *Melaleuca* swamps where ill-drained; woodland of *Eucalyptus gomphocephala* (Tuart), *Eucalyptus marginata* (Jarrah) and *Corymbia calophylla* (Marri) on less leached soils.

Beard (1981) maps the vegetation type of the study area as consisting of *Banksia (attenuata and menziesii)* Low Woodland on Limestone.

Beard's mapping of phytogeographic regions are based on natural delineations in vegetation and landscape, divisible in to regions and further broken down in to Botanical districts - the boundaries of Western Australia's IBRA regions are broadly compatible with those of Beard's phytogeographic regions (DEC, 2011).

### 2.4.3 Vegetation Complexes

According to mapping of the Swan Coastal Plain by Hedde *et al.* (1980), the majority of the study area falls within the *Cottesloe – Central and South* Vegetation Complex. The pre-European structure of this complex is described as consisting of a mosaic of *Eucalyptus gomphocephala* (Tuart) - *Eucalyptus marginata* (Jarrah) - *Corymbia calophylla* (Marri) woodland, with closed heath on limestone outcrops. A narrow strip of the *Karrakatta – Central and South* vegetation complex occurs along the eastern side of the study area. This complex is characterised by a predominantly open forest of *Eucalyptus gomphocephala* (Tuart) - *Eucalyptus marginata* (Jarrah) - *Corymbia calophylla* (Marri) and *Eucalyptus marginata* (Jarrah) – *Banksia* spp. woodland (Hedde *et al.*, 1980).

### 2.4.4 Bush Forever

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

The *Directory of Bush Forever Sites* (Bush Forever Volume 2, Government of Western Australia) indicates that part of Bush Forever Site 290 'Hopkins Road Bushland, Nowergup' covers the entire study area (Figure 3). Site 290 in its entirety covers 406.9ha of bushland, providing a linkage to bushland to the south (including Bush Forever Site 293) and to the west. It was selected for its representation of ecological communities and rarity (the DRF taxon *Eucalyptus argutifolia* occurs elsewhere in Site 290 which is subject to protection under the *EPBC Act 1999*). Bush Forever Site 290 contains vegetation representing the *Karrakatta – Central and South* and the *Cottesloe - Central and South* vegetation complexes. Quenda (*Isoodon obesulus fusciventer*), also known as the Southern Brown Bandicoot, is a significant mammal species listed as occurring in Site 290 (Govt of WA, 2000b). Quenda are listed under the DEC's Priority Fauna List as *Priority 5 – taxa in need of monitoring*.

The Department of Environmental Protection (1999 - edge inspection), Matiske Consulting Pty Ltd (1997) and Water Authority of Western Australian (1995) conducted limited flora and vegetation surveys for Bush Forever Site 290 (Govt of WA, 2000b). Structural units were described as:

- Sands derived from Tamala Limestone -
  - Woodlands dominated by *Eucalyptus marginata*, *Banksia attenuata* and *B. grandis*;
  - *Banksia* species Woodland with emergent *Eucalyptus gomphocephala*;
  - *Banksia* species Woodland with scattered *Eucalyptus todtiana* and *E. marginata*.
- Tamala Limestone –
  - Closed Heath dominated by *Xanthorrhoea preissii*, *Dryandra [Banksia] sessilis* var. *cygnorum*, *Melaleuca huegelii* and *M. systema*.

Vegetation condition was considered to be Excellent by Matiske Consulting Pty Ltd (1997). FCT 26b and FCT 28 were inferred as occurring within Bush Forever Site 290. No sampling was undertaken and the site was not assessed for the occurrence of TECs, however the site was listed as a Bush Forever site for its 'Representation of ecological communities, Rarity'. Significant flora included *Eucalyptus argutifolia*, a rare species, and typical Tamala Limestone taxa – *Melaleuca huegelii* (Govt of WA, 2000b).

### 3 FLORA AND VEGETATION SURVEY METHODOLOGY

#### 3.1 Survey Methodology

Ms Bethea Loudon, an experienced botanist from Coffey Environments, conducted a Level 2 flora and vegetation assessment of the study area in Spring (11 November 2010). The assessment was undertaken to provide a description of the dominant vegetation types, vegetation condition and flora species present, including any significant species. Floristic data collected were analysed and compared with Gibson *et al.* (1994) to determine the Floristic Community Types (FCTs) on the subject land and whether any of these were a Threatened Ecological Community (TEC).

The field assessment involved sampling from permanent quadrats of 10m x 10m dimension within representative vegetation types. A site walkover was also undertaken to record all plant species present at the time of the assessment (i.e. those species not recorded from within quadrats) and to search for significant flora (i.e. DRF and Priority taxa, significant flora of the Spearwood Dunes as identified in Bush Forever (Govt of WA, 2000b)). This method complies with Coffey Environments' interpretation of the Environmental Protection Authority (EPA) guidelines for flora surveys as outlined in Guidance Statement No. 51 - *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA, 2004) and *Terrestrial Biological Surveys as an Element of Biodiversity Protection Position Statement No. 3* (EPA, 2002). The timing of the survey was considered optimal for the region for the identification of annual and ephemeral species occurring within the study area.

The study area was accessed by vehicle along existing tracks and on foot. The major vegetation types and associated flora were surveyed and delineated using a combination of colour aerial photography and ground-truthing, with quadrats recorded in areas of representative vegetation types. Two quadrats were placed in each vegetation type that was intact, in good condition and covered a large area. Where these factors were less, only one quadrat was placed in that vegetation type.

Common species that were well known to the botanist were identified in the field. Specimens of all unknown species were collected, assigned a unique number to facilitate tracking and pressed that day. These specimens were then identified using various taxonomic identification resources on return from the field and by comparing against specimens held at the Western Australian Herbarium where required.

The following data were collected from permanent 10m x 10m quadrats:

**Location** – Map Grid of Australia (MGA) coordinates (equivalent of World Geodetic System (WGS) 84) were taken from the northwest corner of each quadrat using a hand-held Magellan Global Positioning System (GPS) to an accuracy of 5m;

**Vegetation Description** - Vegetation was described and mapped according to the structure and species composition of the dominant stratum using the system adapted from Muir (1977) and Aplin (1979) in Govt of WA (2000b);

**Disturbance Details** - Vegetation condition was assessed using the condition rating scale adapted from Bush Forever (Govt of WA, 2000b);

**Habitat** - Habitat was described based on landform, aspect and slope;

**Percentage Foliage Cover and Height** - Cover and height were estimated visually for each species recorded within a quadrat. Estimates were made to the nearest percentage and height where possible; and

**Soil** - Colour and soil texture within each quadrat was recorded.



### 3.1.1 Floristic Community Types

Floristic analysis (i.e. the analysis of variation in vegetation based on the species present, rather than a description of structural variation and dominance) is a significant component of the understanding of the variation present in the native vegetation of the Swan Coastal Plain (Gibson *et al.*, 1994).

The species composition of each quadrat sampled during the survey were compared against the data of Gibson *et al.*, (1994) (on a presence/absence basis) to determine FCTs occurring in a study area.

## 3.2 Database Searches

Prior to conducting the field survey, a desktop search for significant flora and vegetation communities was undertaken to identify significant flora or TEC that could potentially occur in the study area. This investigation encompassed a review of the following databases:

- The DEC 'Threatened Flora' database;
- The DEC 'Declared Rare and Priority Flora List' which contains species that are Declared Rare (Conservation code R or X for those presumed to be extinct), poorly known (Conservation codes 1, 2 or 3) or require monitoring (Conservation code 4);
- The Western Australian Herbarium (WAH) specimen database; and
- The DEC 'Threatened Ecological Community' database.

### 3.2.1 Vegetation

The results of the TEC database search are presented in Table 1 (DEC, 2010a). Occurrences of one TEC and one PEC are recorded as occurring in the vicinity of the study area (within 5km), however there are no known occurrences of TECs or PECs recorded within the study area.

TABLE 1

#### THREATENED & PRIORITY ECOLOGICAL COMMUNITIES RECORDED IN THE VICINITY OF THE STUDY AREA (DEC, 2010a)

Community Type	Description	DEC Conservation Category	Commonwealth Conservation Category*
SCP 24	Northern Spearwood shrublands and woodlands	PEC (Priority 3)	Not listed
SCP 26a	Limestone ridges: <i>Melaleuca huegelii</i> - <i>Melaleuca acerosa</i> (currently <i>M. systema</i> ) shrublands on limestone ridges	TEC (Endangered)	Not listed

\*Category under the Commonwealth EPBC Act 1999 (DSEWPC, 2011a)

Ecological communities are defined as 'naturally occurring biological assemblages that occur in a particular type of habitat' (English and Blythe, 1997). TECs are communities that have been assessed and assigned one of three categories under the EPBC Act 1999 - Critically Endangered, Endangered and Vulnerable (DSEWPC, 2011a), or a fourth category as classified by English and Blyth (1997) - Presumed Totally Destroyed. PECs are possible threatened ecological communities that have been assessed but do not meet survey criteria or are not adequately defined are listed as Priority 1, 2 or 3; communities that are adequately known, are rare but not threatened, meet criteria for Near Threatened, or have been removed from the threatened list are listed as Priority 4; and Conservation Dependent communities as Priority 5 (DEC, 2007). TECs may be recognised at both the State and Commonwealth level however PECs are only recognized at the State level.

Commonwealth legislation protects native vegetation communities classified as Threatened under Schedule 2 of the *EPBC Act 1999*, while TECs at the State level have no statutory protection under the *Environmental Protection Act 1986* or the *Wildlife Conservation Act 1950*.

### 3.2.2 Flora

The results of the flora database search of significant flora previously recorded in the vicinity of the study area are presented in Table 2 (DEC, 2010b). Based on the database results, no significant flora has been recorded from within the study area.

**TABLE 2**  
**DEC LISTED DECLARED RARE AND PRIORITY FLORA PREVIOUSLY RECORDED IN THE VICINITY OF THE STUDY AREA (DEC, 2010b)**

Species	DEC Status	EPBC Act Status*	Preferred Habitat	Flowering Period
<i>Acacia benthamii</i>	P2	Not Listed	Sand, typically on ironstone breakaways	Aug-Sep
<i>Buellia epigdea</i>	P2	Not Listed	(Information not available)	Fungi
<i>Conostylis bracteata</i>	P3	Not Listed	Sand, limestone, consolidated sand dunes	Jul-Aug
<i>Conostylis pauciflora</i> subsp. <i>euryrhipis</i>	P4	Not Listed	White, grey or yellow sand, consolidated dunes	Aug-Oct
<i>Eucalyptus argutifolia</i>	R - Vulnerable	Vulnerable	Shallow soils over limestone, slopes or gullies of limestone ridges, outcrops	Mar-Apr
<i>Grevillea evanescens</i>	P1	Not Listed	Brown sand, loam, clay, winter wet flats	Winter-Spring
<i>Jacksonia sericea</i>	P4	Not Listed	Calcareous and sandy soils	Dec-Feb
<i>Lasiopetalum membranaceum</i>	P3	Not Listed	Sand over limestone	Oct-Nov/Sep-Dec
<i>Lecania sylvestris</i>	P2	Not Listed	(Information not available)	Fungi
<i>Lecania turicensis</i> var. <i>turicensis</i>	P2	Not Listed	(Information not available)	Fungi
<i>Lepidium pseudotasmanicum</i>	P4	Not Listed	Loam, sand	Feb/Dec
<i>Leucopogon</i> sp. Perth coastal (AS George 17305)	P1	Not Listed	Grey, white, yellow sand, sand over limestone, coastal dunes	Mar-Aug/Nov
<i>Leucopogon</i> sp. Yanchep (M. Hislop 1986)	P3	Not Listed	Light grey-yellow sand, brown loam, limestone, laterite, granite, coastal plain, breakaways, valley slopes, low hills	Apr-Jun/Sep
<i>Melaleuca</i> sp. Wanneroo (G.J. Keighery 16705)	P1	Not Listed	Limestone ridges, Melaleuca thickets	Dec
<i>Placynthium nigrum</i>	P3	Not Listed	(Information not available)	Fungi



Species	DEC Status	EPBC Act Status*	Preferred Habitat	Flowering Period
<i>Rinodina bischoffii</i>	P2	Not Listed	(Information not available)	Fungi
<i>Sarcozona bicarinata</i>	P3	Not Listed	White sand	Aug
<i>Thomasia triloba</i>	P3	Not Listed	Sandy gravel over laterite, loamy soils, clay, limestone	Oct-Nov/Dec
<i>Stylidium maritimum</i>	P3	Not Listed	Sand over limestone, dune slopes and flats, coastal heath and shrubland, open Banksia woodland	Sep-Nov

\*Category under the Commonwealth EPBC Act 1999 (DSEWPC, 2011b)

Note: (Conservation codes as defined by the DEC)

R Declared Rare Flora - extant, 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, which are known from one or a few (<5) populations which are under threat. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need for further survey.

P2 Priority Two - Poorly known taxa, which are known from one or a few (<5) populations, at least some of which are not believed to be under immediate threat. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

P3 Priority Three - Poorly known taxa, which are known from several populations, at least some of which are not believed to be under immediate threat. Such taxa are under consideration for declaration as 'rare flora', but are in need of further survey.

P4 Priority Four - Rare 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.

### 3.3 Limitations

The potential limitations of the Spring 2010 flora and vegetation survey are presented in Table 3. Nonvascular flora (e.g. algae, mosses and liverworts) were not specifically surveyed for during the survey. No numerical analysis (i.e. PATN) of the floristic sample data was undertaken for this study.

**TABLE 3**  
**STATEMENT OF BOTANICAL SURVEY LIMITATIONS**

POTENTIAL LIMITATIONS	CONSTRAINTS (YES/NO); SIGNIFICANT, MODERATE OR NEGLIGIBLE	COMMENT
Competency/experience of the consultant conducting the survey	No constraints	Botanist with extensive survey experience and taxonomic skills.
Proportion of the flora identified	No constraints	One day was spent in study area.
Sources of information (historic/recent or new data)	No constraints	Relatively well documented.
Proportion of the task achieved and further work that may need to be undertaken	No constraints	All objectives of the task achieved.
Timing/weather/season/cycle	No constraint	The timing was considered optimal, with reasonable seasonal rainfall preceding the survey.
Intensity of survey (e.g. In retrospect was the intensity adequate)	No constraints	The vegetation of the entire study area was mapped and surveyed.
Completeness (e.g. was relevant area fully surveyed)	No constraints	
Resources (e.g. degree of expertise available for plant identification)	No constraints	An experienced botanist undertook plant identifications using relevant plant identification resources, including the WAH reference collection.
Remoteness and/or access problems	Moderate constraint	Site accessible by vehicle and on foot, although there were areas of dense vegetation which restricted the thoroughness of the site walkover in these areas.
Availability of contextual (e.g. bioregional) information for the survey area.	No constraints	Beard (1981, 1990), Churchward and McArthur (1980), DoE (2004), Gozzard (1982), Hedde <i>et al.</i> (1980).

## 4 FLORA AND VEGETATION RESULTS

### 4.1 Vegetation

#### 4.1.1 Vegetation Types

Vegetation types were described using the species composition, density and structure of the dominant stratum. The structure was classified according to the system based on Muir (1977) and Aplin (1979) (Table 4) in Govt of WA (2000b).

**TABLE 4**  
**VEGETATION STRUCTURAL CLASSES**

Life Form/Height Class	Canopy Cover			
	70-100%	30-70%	10-30%	2-10%
Trees over 30m	Tall Closed Forest	Tall Open Forest	Tall Woodland	Tall Open Woodland
Trees 10-30m	Closed Forest	Open Forest	Woodland	Open Woodland
Trees under 10m	Low Closed Forest	Low Open Forest	Low Woodland	Low Open Woodland
Tree Mallee	Closed Tree Mallee	Tree Mallee	Open Tree Mallee	Very Open Tree Mallee
Shrub Mallee	Closed Shrub Mallee	Shrub Mallee	Open Shrub Mallee	Very Open Shrub Mallee
Shrubs over 2m	Closed Tall Scrub	Tall Open Scrub	Tall Shrubland	Tall Open Shrubland
Shrubs 1-2m	Closed Heath	Open Heath	Shrubland	Open Shrubland
Shrubs < 1m	Closed Low Heath	Open Low Heath	Low Shrubland	Low Open Shrubland
Grasses	Closed Grassland	Grassland	Open Grassland	Very Open Grassland
Herbs	Closed Herbland	Herbland	Open Herbland	Very Open Herbland
Sedges	Closed Sedgeland	Sedgeland	Open Sedgeland	Very Open Sedgeland

Two vegetation types were identified within the study area during the 2010 survey. These vegetation types are described below and mapped in Figure 2:

**EmBa** - Open Woodland to Woodland of *Eucalyptus marginata* over Low Woodland of *Banksia attenuata* and Low Open Woodland to Low Woodland of *Allocasuarina fraseriana* over Open Shrubland to Shrubland of *Xanthorrhoea preissii* and *Macrozamia riedlei* over Low Shrubland to Open Low Heath of *Hibbertia hypericoides* over Very Open Sedgeland of *Mesomelaena pseudostygia* and Very Open Herbland of *Desmocladius flexuosus* with scattered trees or patches of *Banksia menziesii* and *B. grandis*.

This vegetation type occurred in yellow-brown sand in the western two-thirds of the study area and along the eastern boundary. Floristic data representative of this vegetation type was collected from Quadrat 1 and 2 (see Appendix A).

**BsXp** - Closed Tall Scrub of *Banksia sessilis* over Open Shrubland to Tall Shrubland of *Xanthorrhoea preissii* with Tall Open Shrubland to Tall Shrubland of *Acacia rostellifera* and scattered shrubs of *Melaleuca systema*, *Melaleuca huegelii* and *Hakea trifurcata* over Low Shrubland of *Jacksonia sericea* and *Hibbertia hypericoides* over Very Open Sedgeland of *Mesomelaena pseudostygia* and *Lepidosperma ?pubisquameum* over Very Open Herbland of *Conostylis candicans* and *Desmocladius flexuosus* with scattered tall trees of *Eucalyptus gomphocephala*.

This vegetation type occurred in yellow-brown loamy sand over limestone in the eastern third of the study area. Floristic data representative of this vegetation type was collected from Quadrat 3 and 4 (see Appendix A).

#### 4.1.2 Vegetation Condition

The condition of the vegetation was assessed using the vegetation condition rating scale of Keighery as published in Bush Forever (Govt of WA, 2000b) and is mapped in Figure 2. Keighery's condition rating scale ranges from Pristine (where the vegetation exhibits no visible signs of disturbance) to Completely Degraded (where the vegetation structure is no longer intact and without native plant species).

A full description of the vegetation condition ratings are outlined below in Table 5.

**TABLE 5**  
**VEGETATION CONDITION RATING SCALE**

<p><b>P = Pristine</b></p> <p>Pristine or nearly so, no obvious signs of disturbance</p>
<p><b>EX = Excellent</b></p> <p>Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species</p>
<p><b>VG = Very Good</b></p> <p>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</p>
<p><b>G = Good</b></p> <p>Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by frequent very fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing</p>
<p><b>Deg = Degraded</b></p> <p>Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing</p>
<p><b>CD = Completely Degraded</b></p> <p>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</p>

The vegetation condition of the western two-thirds of the study area was Excellent, with the condition in the eastern third of the study area being Very Good-Excellent. A small area in the north-east of the study area, corresponding with an old limestone extraction pit was in a Completely Degraded-Degraded condition as a result of past activity, loss of vegetation structure and a high weed presence.

Lower condition scores were a result of weed occurrences and the presence of rabbits. Weed presence was highest along the edge of the vehicle track passing through the eastern side of the study area and in the old pit.

#### 4.1.3 Floristic Community Types and Threatened Ecological Communities

Analysis of the quadrat data was undertaken to determine the presence of FCTs within the study area. Appendix B provides the results of the analysis.

The results of the data analysis identified that the vegetation shows some correlation to two FCTs, as follows:

- FCT 24 - 'Northern Spearwood shrublands and woodlands' with characteristic species including *Desmocladius flexuosus*, *Melaleuca systema*, *Xanthorrhoea preissii*, *Phyllanthus calycinus*, *Hardenbergia comptoniana*, *Conostylis aculeata*, *Lomandra maritima* and *Austrostipa flavescens*; and
- FCT 28 - 'Spearwood *Banksia attenuata* or *Banksia attenuata-Eucalyptus* woodlands' with characteristic species including *Banksia attenuata*, *Xanthorrhoea preissii*, *Hibbertia hypericoides*, *Mesomelaena pseudostygia*, *Burchardia congesta*, *Desmocladius flexuosus*, *Gompholobium tomentosum*, *Petrophile linearis*, *Acacia pulchella* and *Conostephium pendulum*.

Based on the analysis the areas represented by Quadrats 3 and 4 showed some correlation to FCT 24 (vegetation type BsXp). The vegetation of the remainder of the study area was more easily identified as FCT 28 (vegetation type EmBa), a common FCT (Quadrats 1 and 2) (see Figure 2).

FCT 24 is a recognised PEC (SCP 24, Priority 3) at the State level. It is not recognised at the Commonwealth level.

#### 4.1.4 Conservation Significance of Vegetation

##### *Vegetation Complex*

Bush Forever recommends a minimum retention and protection of at least 10% of the pre-European extent of vegetation complexes within the Perth Metropolitan Region (PMR) in at least five geographically separated areas and a minimum of 400ha. The percentage remaining of the *Cottesloe – Central and South* and the *Karrakatta – Central and South* vegetation complexes within the Perth Metropolitan Region portion of the Swan Coastal Plain is 36% and 18% respectively (Govt of WA, 2000a). The vegetation complexes in the study area are considered to be well represented within the PMR.

##### *Floristic Community Types*

The majority of the study area is represented by the well reserved FCT 28, which is considered to be at low risk of extinction (Gibson *et al.*, 1994). The low ridge running through the eastern portion of the study area potentially contains the Priority 3 PEC SCP 24 in association with a limestone substrate.

SCP 24 (FCT 24) is considered to be well reserved in the PMR of the SCP however it is susceptible to modification or destruction by human activities, or vulnerable to new threatening processes (Gibson *et al.*, 1994). Therefore those parts of the study area that show some correlation to SCP 24 are potentially of low to moderate conservation significance. Although the PEC is not protected by State legislation, any potential impacts of the proposed development on SCP 24 within the study area will require discussion with DEC. As the PEC is not listed by the Commonwealth the vegetation of the study area is not of national significance.

Any areas containing the Priority 3 PEC SCP 24 are at risk from potential development of the site for limestone extraction.

## 4.2 Flora

### 4.2.1 General

A total of 118 flora species were recorded from the study area during the Spring flora survey. This included 100 native species and 18 non-native (introduced) species. The dominant families represented were the Proteaceae (Banksia family - 15 native species), Fabaceae (Pea and Wattle family - 14 native species), Poaceae (Grass family - seven native and two introduced species) and Asparagaceae (Lily family - eight native species).

A complete list of the flora species recorded within the study area during the survey is provided in Appendix C.

### 4.2.2 Conservation Significance of Flora

No DRF was recorded during the survey.

One Priority flora species, *Jacksonia sericea* (Priority 4), was recorded from the study area during the Spring 2010 survey. The location of this species is shown in Figure 3.

Over 700 plants of *Jacksonia sericea* were observed scattered throughout the site, particularly in association with previously disturbed areas (along the tracks), with higher densities observed on the eastern side of the study area in both vegetation types (see Figures 2 and 3). This species appears to be a disturbance opportunist. *Jacksonia sericea* is also a significant species of the Spearwood dunes under the Bush Forever program, considered to be poorly reserved, a significant population and taxa endemic to the SCP in the PMR (Govt of WA, 2000b).

Three other species listed as Bush Forever significant flora species of the Spearwood Dunes, *Acacia alata* var. *tetrantha*, *Lechenaultia linearis* (both recorded opportunistically in very low numbers) and *Petrophile axillaris* (Quadrat 3) (Govt of WA, 2000b), were also recorded from the study area.

All significant flora species identified in the DEC database searches would have been identifiable during the survey if present. Table 6 provides a summary of the conservation significant flora recorded from the study area.

TABLE 6

SIGNIFICANT FLORA RECORDED FROM THE STUDY AREA BY COFFEY ENVIRONMENTS

Species	DEC Status	EPBC Act Status	Bush Forever Status	Identification Confirmed / Determined By	Voucher Specimen	Places of Known Occurrence	Preferred Habitat
<i>Acacia alata</i> var. <i>tetrantha</i>	Not Listed	Not Listed	Significant population	B Loudon, Coffey Environments	-	Badgingarra Eneabba Jurien Bay Seabird Three Springs Two Rocks Wilbinga Yanchep	Sand & sandy clay, near watercourses, edges of swamps
<i>Lechenaultia linarioides</i>	Not Listed	Not Listed	Poorly reserved	B Loudon Coffey Environments	-	Ajana City Beach Geraldton Gingin Guilderton Kalbarri Jurien Bay Moora North Beach Northampton Shark Bay Two Rocks	Brown, grey, yellow or white sand, sometimes over limestone, red sandy clay, sandplains, low dunes, ridges, hillsides, winter-wet flats, roadverges
<i>Jacksonia sericea</i>	P4	Not Listed	Poorly reserved Significant population Endemic to SCP in PMR	B Loudon, Coffey Environments	Yes Coffey Environments	Gnangara Karnup Koondoola Landsdale Malaga Mandurah Mullaloo Neerabup Wanneroo	Calcareous and sandy soils
<i>Petrophile axillaris</i>	Not Listed	Not Listed	Poorly reserved Significant population At limit of known geographical range	B Loudon, Coffey Environments	-	Cervantes Coogee Gingin Jurien Bay Lancelin Mindarie Stake Hill Yalgorup Wanneroo	Red, yellow or grey sand over limestone, sandy loams and gravel, sandplains, gentle slopes, ridges



## 5 POTENTIAL IMPACTS

### 5.1 Vegetation

Although not protected by State legislation, any potential impact on the portion of the study area that is associated with a limestone substrate and contains vegetation potentially representing the Priority 3 PEC (SCP 24 'Northern Spearwood shrublands and woodlands'), requires discussion with DEC.

The vegetation of the study area is mapped as the *Cottesloe – Central and South* and the *Karrakatta – Central and South* vegetation complexes. The percentage remaining of these vegetation complexes respectively in the PMR of the SCP, is 36% and 18%. The vegetation complexes of the study area are considered well reserved. Therefore, any development of the study area will have minimal impact on the *Cottesloe – Central and South* and the *Karrakatta – Central and South* vegetation complexes as a whole.

### 5.2 Bush Forever

The entire study area is covered by Bush Forever Site 290 'Hopkins Road Bushland, Nowergup' and is regionally significant. *Bush Forever* is a statutory planning policy under the Western Australian Planning Commission's (WAPC) policy framework and is endorsed by the Western Australian Government, the WAPC, the EPA and other key environmental agencies. *State Planning Policy 2.8: Bushland Policy for the Perth Metropolitan Region* gives statutory effect to *Bush Forever*, to ensure bushland protection and appropriate address of bushland management in planning processes (WAPC 2010). The Policy states that further development or land use proposals should be consistent with the policy measures in Section 5.1 and 5.2 of the Policy to ensure all reasonable steps are taken to avoid, minimise or mitigate any likely adverse impacts (direct or indirect) on the regionally significant bushland. Policy measures apply to any proposal that is likely to have an adverse impact, direct or indirect, on a regionally significant bushland within a Bush Forever Protection Area (WAPC, 2010). If the study area comes under the *Bush Forever Protection Area* implementation category of *Urban, Industrial or Resource Development* (Section 5.1.2.2 of the Policy), a balance between conservation and development or resource extraction, having regard for the specific conservation values involved, will be sought and may involve a Negotiated Planning Solution with strategic outcomes that will facilitate bushland protection and development requirements (WAPC, 2010).

Any potential impacts on the Bush Forever site will require discussion with the Department of Planning, particularly as Site 290 is considered as a site with some existing protection under the proposed 'Gnangara Park' with the existing care, control and management of the Site endorsed (Govt of WA, 2000b).

### 5.3 Conservation Significant Flora

One Priority flora species, *Jacksonia sericea* (Priority 4), was recorded from the study area along with three Bush Forever significant species – *Acacia alata* var. *tetrantha*, *Lechenaultia linarioides* and *Petrophile axillaris*. Although these species are not protected by State or Commonwealth law with the latter three species being common, any potential impact on these species requires discussion with DEC.

### 5.4 EPBC Act 1999

As there is no Commonwealth listed conservation significant flora or ecological communities present within the study area, referral under the *EPBC Act 1999* in relation to direct impacts on the flora and vegetation of the study area is not required.



Govt of WA (2000b) states that Bush Forever Site 290 is subject to protection under the Commonwealth *EPBC Act 1999* due to the presence of the listed species *Eucalyptus argutifolia* (DRF). Although *Eucalyptus argutifolia* is not present within the study area, discussions with DEC are required to determine if the proposed development of the site is likely to have any indirect impacts on this species in the broader area of the Bush Forever site. Should the proposed development have a significant indirect impact on *Eucalyptus argutifolia*, the proposal will need to be referred under the *EPBC Act 1999*.

Impacts on fauna species protected under the *EPBC Act 1999* have not been addressed in this report.

## 6 CONCLUSIONS

Based on the results of the flora and vegetation assessment of the study area, the following conclusions have been made:

- The vegetation occurring within the study area is mapped as consisting of the *Cottesloe – Central and South* and the *Karrakatta – Central and South* vegetation complexes, of which 36% and 18% respectively, remains within the Perth Metropolitan Region of the Swan Coastal Plain (Govt of WA, 2000). These vegetation complexes are well reserved as they are above the minimum 10% retention threshold;
- Two vegetation types were identified within the study area. In general the vegetation types represented *Eucalyptus marginata* (Jarrah) and *Banksia attenuata* (Candlestick Banksia) woodland on deep sand, and *Banksia sessilis* and *Xanthorrhoea preissii* Tall Open Scrub to Tall Shrubland on limestone substrate;
- The results of the floristic data analysis showed that the vegetation has some correlation to two FCTs as follows:
  - FTC 24 - 'Northern Spearwood shrublands and woodlands'; and
  - FCT 28 - 'Spearwood *Banksia attenuata* or *Banksia attenuata-Eucalyptus* woodlands'
- Based on the analysis the areas represented by Quadrats 3 and 4 showed some correlation to SCP 24 (vegetation type BsXp);
- The vegetation of the remainder of the study area was more easily identified as FCT 28, a common FCT (vegetation type EmBa, Quadrats 1 and 2);
- The Priority 3 PEC, SCP 24 (FCT 24) 'Northern Spearwood shrublands and woodlands' is considered to be well reserved however it is susceptible to modification or destruction by human activities, or threatening processes (Gibson *et al.*, 1994);
- FCT 28 is not listed as a TEC or PEC by the DEC and is considered to be well reserved on the Swan Coastal Plain and at low conservation status risk (Gibson *et al.*, 1994);
- The vegetation condition of the majority of the study area was Excellent, with the condition in the eastern third of the study area being Very Good-Excellent and an old disused limestone quarry in the north-east being Degraded-Completely Degraded;
- A total of 118 flora species were recorded from the study area of which 18 were non-native, introduced (weed) species;
- The following conservation significant species were recorded from the study area:
  - *Jacksonia sericea* - Priority 4, Bush Forever significant flora;
  - *Petrophile axillaris* - Bush Forever significant flora;
  - *Acacia alata* var. *tetrantha* - Bush Forever significant flora; and
  - *Lechenaultia linearis* - Bush Forever significant flora.
- No Declared Rare Flora as defined by the *EPBC Act 1999* were recorded from the study area;
- Discussions are required with DEC regarding the potential presence of the PEC, the presence of conservation significant flora and any potential indirect impacts on *Eucalyptus argutifolia* (DRF); and
- Discussions are required with the Department of Planning regarding the inclusion of the study area within Bush Forever Site 290.

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## **8       DISCLAIMER**

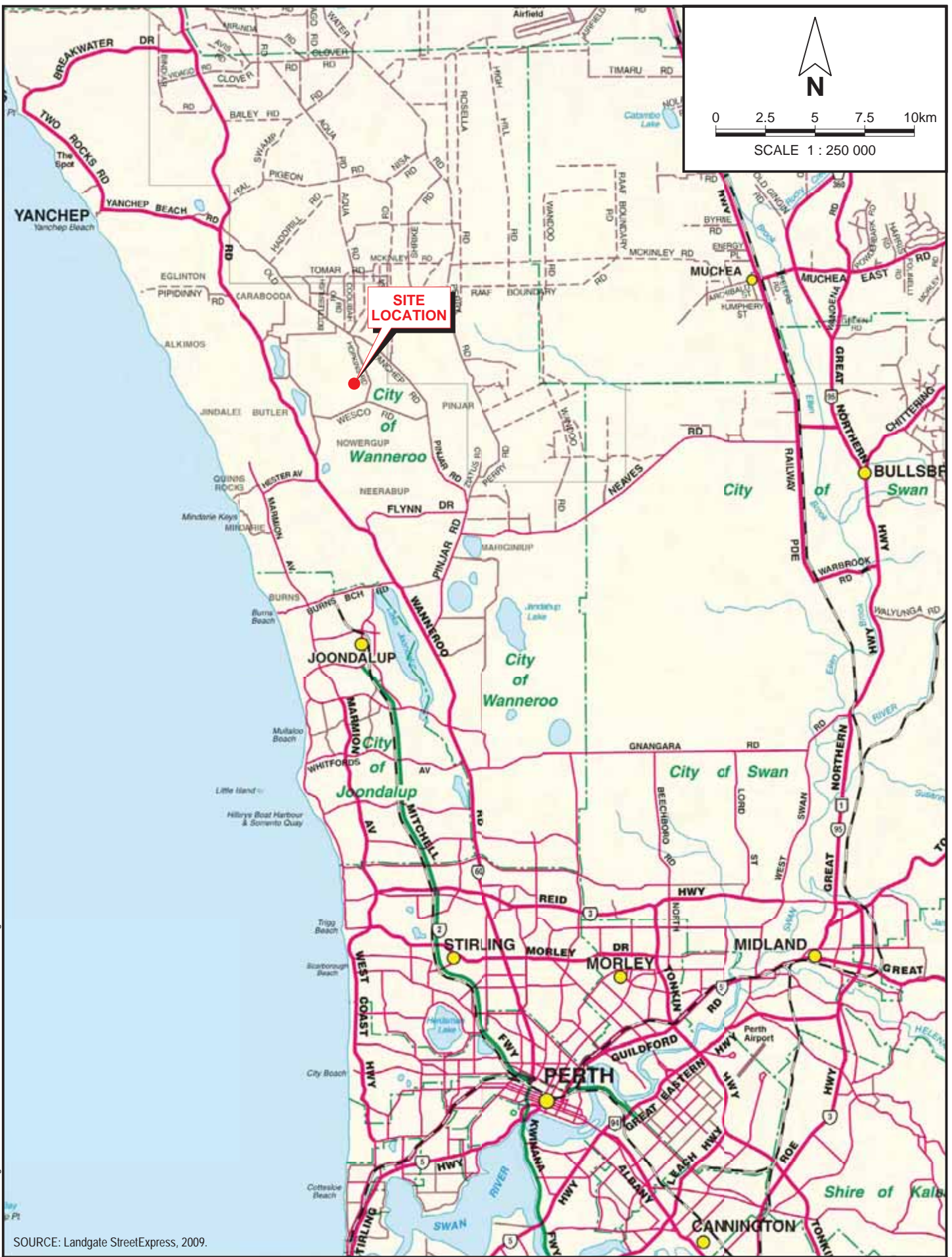
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# Figures

**Flora and Vegetation Assessment  
M70/013 Hopkins Road, Nowergup**





SOURCE: Landgate StreetExpress, 2009.

Drawn:	C. Reeves
Checked:	B. Loudon
Date:	14 Feb 2011
Projection:	MGA zn50
Scale:	1 : 250 000 at A4

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**REGIONAL LOCATION**

**Figure 1**





AERIAL PHOTOGRAPH SOURCE: NearMap, flown October 2010.  
 TENEMENTS SOURCE: Department of Mines and Petroleum, July 2010.

LEGEND	
	Site Boundary
	Mining Tenement Boundary
	Vegetation Type Boundary
	Vegetation Type
	Vegetation Condition Boundary
	Vegetation Condition
	Quadrat Location
Vegetation Types	
<b>EmBa</b>	Open Woodland to Woodland of <i>Eucalyptus marginata</i> over Low Woodland of <i>Banksia attenuata</i> and Low Open Woodland to Low Woodland of <i>Allocasuarina fraseriana</i> over Open Shrubland to Shrubland of <i>Xanthorrhoea preissii</i> and <i>Macrozamia riedlei</i> over Low Shrubland to Open Low Heath of <i>Hibbertia hypericoides</i> over Very Open Sedgeland of <i>Mesomelaena pseudostygia</i> and Very Open Herbland of <i>Desmocladius flexuosus</i> with scattered trees or patches of <i>Banksia menziesii</i> and <i>B. grandis</i>
<b>BsXp</b>	Closed Tall Scrub of <i>Banksia sessilis</i> over Open Shrubland to Tall Shrubland of <i>Xanthorrhoea preissii</i> with Tall Open Shrubland to Tall Shrubland of <i>Acacia rostellifera</i> and scattered shrubs of <i>Melaleuca systema</i> , <i>Melaleuca huegellii</i> and <i>Hakea trifurcata</i> over Low Shrubland of <i>Jacksonia sericea</i> and <i>Hibbertia hypericoides</i> over Very Open Sedgeland of <i>Mesomelaena pseudostygia</i> and <i>Lepidosperma ?pubisquamum</i> over Very Open Herbland of <i>Conostylis candicans</i> and <i>Desmocladius flexuosus</i> with scattered tall trees of <i>Eucalyptus gomphocephala</i> .
Vegetation Condition	
<b>P - Pristine</b>	Pristine or nearly so, no obvious signs of disturbance
<b>E - Excellent</b>	Vegetation structure intact, disturbance affecting individual species and weeds are non aggressive
<b>VG - Very Good</b>	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.
<b>G - Good</b>	Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate. 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.
<b>Deg - Degraded</b>	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
<b>CD - Completely Degraded</b>	The structure of the vegetation is no longer intact and the areas is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora composing weed or crop species with isolated native trees or shrubs.
<b>C - Cleared</b>	No native vegetation remaining.



Drawn:	C. Reeves		Limestone Building Block Co. Pty Ltd FLORA AND VEGETATION ASSESSMENT M70/013 HOPKINS ROAD, NOWERGUP
Checked:	B. Loudon		
Date:	14 Feb 2011	SPECIALISTS IN ENVIRONMENTAL, SOCIAL AND SAFETY PERFORMANCE	<b>VEGETATION TYPES AND CONDITION</b>
Projection:	MGA zn50		
Scale:	1 : 2 000 at A3		
			<b>Figure 2</b>

G:\work\ENM\UPE\RT0235AA\Flora and Vegetation Assessment\EP2011-013\EP2011-013\F02.dgn



**LEGEND**

- Site Boundary
- Mining Tenement Boundary
- Bush Forever Site
- ▲ Location of *Jacksonia sericea* (P4)
- 3 Number of Plants



G:\work\EMALUP\ERT0235AA\Flora and Vegetation Assessment\EP2011-013\EP2011-013\F03.dgn

AERIAL PHOTOGRAPH SOURCE: NearMap, flown October 2010.  
 TENEMENTS SOURCE: Department of Mines and Petroleum, July 2010.

Drawn:	C. Reeves
Checked:	B. Loudon
Date:	22 Feb 2011
Projection:	MGA zn50
Scale:	1 : 2 000 at A3

**coffey**  
**environments**  
 SPECIALISTS IN ENVIRONMENTAL,  
 SOCIAL AND SAFETY PERFORMANCE

Limestone Building Block Co. Pty Ltd FLORA AND VEGETATION ASSESSMENT M70/013 HOPKINS ROAD, NOWERGUP	
<b>LOCATION OF CONSERVATION        SIGNIFICANT FLORA</b>	<b>Figure 3</b>



# Appendix A

## Quadrat Data

**Flora and Vegetation Assessment  
M70/013 Hopkins Road, Nowergup**

Quadrat 1

**Described:** BL

**Date:** 11/11/2010

**Type:** Quadrat (10m x 10m)

**Location:** South-west section of site

**MGA Zone:** 50 382328mE, 6500269mN

**Habitat:** Gentle slope to north-west

**Soil:** Yellow-brown sand

**Vegetation:** Open Woodland of *Eucalyptus marginata* to 10m over Low Woodland of *Banksia attenuata* to 8.5m over Low Open Woodland to Low Woodland of *Allocasuarina fraseriana* to 8m over Shrubland of *Xanthorrhoea preissii* and *Macrozamia riedlei* to 1.9m over Open Low Heath of *Hibbertia hypericoides* to 0.6m over Very Open Sedgeland of *Mesomelaena pseudostygia* to 0.6m and Very Open Herbland of *Desmocladius flexuosus* to 0.2m, with scattered *Banksia menziesii* and *B. grandis* to 9m

**Condition:** Excellent

**Fire Age:** >5yrs



**Species List:**

Name	Cover (%)	Height (m)	Notes
<i>Acacia pulchella</i>	1	1.3	
<i>Alexgeorgea nitens</i>	<1	0.12	
<i>Allocasuarina fraseriana</i>	1-10	8	
<i>Banksia attenuata</i>	15	8.5	
<i>Banksia menziesii</i>	1	2.5	
<i>Bossiaea eriocarpa</i>	<1	0.35	
<i>Burchardia congesta</i>	<1	0.4	
<i>Calothamnus sanguineus</i>	1	1	
<i>Conostephium pendulum</i>	1	0.8	
<i>Conostylis aculeata</i>	<1	0.15	
<i>Conostylis setigera</i>	1	0.1	
<i>Desmocladius flexuosus</i>	2	0.2	
<i>Eucalyptus marginata</i>	3-10	10	
* <i>Gladiolus caryophyllaceus</i>	<1	0.4	
<i>Gompholobium tomentosum</i>	<1	0.3	
<i>Haemodorum paniculatum</i>	<1	0.25	
<i>Hakea lissocarpa</i>	<1	1.1	
<i>Hardenbergia comptoniana</i>	<1	Climber	
<i>Hibbertia hypericoides</i>	40	0.6	

* <i>Hypochaeris glabra</i>	<1	0.15	
<i>Lomandra caespitosa</i>	<1	0.2	
<i>Lomandra hermaphrodita</i>	<1	0.15	
<i>Lomandra sericea</i>	<1	0.35	
<i>Macrozamia riedlei</i>	3	1.9	
<i>Mesomelaena pseudostygia</i>	3	0.6	
<i>Patersonia occidentalis</i>	<1	0.4	
<i>Petrophile linearis</i>	<1	0.2	
<i>Schoenus curvifolius</i>	<1	0.3	
? <i>Schoenus clandestinus</i>	<1	0.1	
<i>Stylidium brunonianum</i>	<1	0.02	
<i>Stylidium repens</i>	<1	0.05	
<i>Tetralix octandra</i>	<1	0.25	
* <i>Ursinia anthemoides</i>	<1	0.2	Dead
<i>Xanthorrhoea preissii</i>	10	1.5	

Quadrat 2

**Described:** BL

**Date:** 11/11/2010

**Type:** Quadrat (10m x 10m)

**Location:** Northern banksia area

**MGA Zone:** 50 382446mE, 6500349mN

**Habitat:** Gentle slope to south/south-east

**Soil:** Yellow-brown sand

**Vegetation:** Low Woodland of *Banksia attenuata* and *Allocasuarina fraseriana* to 7m over Tall Open Shrubland of *Macrozamia riedlei* to 2.2m over Open Shrubland of *Xanthorrhoea preissii* to 2m over Low Shrubland of *Hibbertia hypericoides* and *Conostephium pendulum* to 0.8m over Very Open Sedgeland of *Mesomelaena pseudostygia* to 0.6m and Very Open Herbland of *Desmocladius flexuosus* to 0.3m with patches of Low Woodland of *Banksia menziesii* and *B. grandis* to 7m and Woodland of *Eucalyptus marginata* to 12m

**Condition:** Excellent

**Fire Age:** >5yrs

**Notes:** Random Banksia deaths (mainly old deaths) and some Jarrah - Dieback?; Rabbit faecal mounds present



**Species List:**

Name	Cover (%)	Height (m)	Notes
<i>Acacia huegelii</i>	<1	0.15	
<i>Acacia pulchella</i>	1	1.2	
<i>Allocasuarina fraseriana</i>	4	7	
<i>Anigozanthos ?humilis</i>	<1	0.15	
<i>Austrodanthonia occidentalis</i>	<1	0.5	
<i>Banksia attenuata</i>	15	6	
<i>Bossiaea eriocarpa</i>	<1	0.5	
<i>Burchardia congesta</i>	<1	0.4	
<i>Calytrix</i> sp.	<1	0.3	
<i>Conostephium pendulum</i>	2	0.4	
<i>Conostylis aculeata</i>	<1	0.2	
<i>Conostylis setigera</i>	<1	0.1	
<i>Desmocladius flexuosus</i>	2	0.3	
<i>Dianella revoluta</i>	<1	0.7	
* <i>Gladiolus caryophyllaceus</i>	<1	1.2	
<i>Gompholobium tomentosum</i>	<1	0.2	

<i>Haemodorum</i> sp.	<1	0.2	
<i>Hardenbergia comptoniana</i>	<1	Climber	
<i>Hibbertia hypericoides</i>	20	0.8	
? <i>Hybanthus calycinus</i>	<1	0.05	
* <i>Hypochoeris glabra</i>	<1	0.15	
<i>Jacksonia sternbergiana</i>	1	1.4	
<i>Lomandra hermaphrodita</i>	<1	0.3	
<i>Lyginia imberbis</i>	<1	0.25	
<i>Macrozamia riedlei</i>	3	2.2	
<i>Mesomelaena pseudostygia</i>	5	0.6	
<i>Petrophile linearis</i>	<1	0.3	
<i>Petrophile macrostachya</i>	1	1	
<i>Phyllanthus calycinus</i>	<1	0.9	
? <i>Schoenus clandestinus</i>	<1	0.04	
<i>Sowerbaea laxiflora</i>	<1	0.3	
<i>Stylidium ?piliferum</i>	<1	0.01	
<i>Tetraria octandra</i>	<1	0.4	
<i>Thysanotus patersonii/manglesianus</i>	<1	Climber	Dead
* <i>Urospermum picroides</i>	<1	0.25	
* <i>Ursinia anthemoides</i>	<1	0.3	Dead
<i>Xanthorrhoea preissii</i>	10	2	



Quadrat 3

**Described:** BL

**Date:** 11/11/2010

**Type:** Quadrat (10m x 10m)

**Location:** South of main track on ridge

**MGA Zone:** 50 382679mE, 6500155mN

**Habitat:** Gentle slope, slight ridge

**Soil:** Yellow-brown loamy sand

**Rock Type:** Limestone boulders

**Vegetation:** Tall Open Shrubland of *Acacia rostellifera* to 3m over Closed Tall Scrub of *Banksia sessilis* to 2.4m over Open Shrubland of *Xanthorrhoea preissii*, *Melaleuca systema* and *Hakea trifurcata* to 2m over Low Shrubland of *Jacksonia sericea* and *Hibbertia hypericoides* to 0.5m over Very Open Sedgeland of *Mesomelaena pseudostygia* to 0.5m over Very Open Herbland of *Conostylis candicans* and *Desmocladius flexuosus* to 0.3m with occasional patches of Low Open Woodland of *Allocasuarina fraseriana* and *Banksia attenuata* to 6m and trees (Woodland) of *Eucalyptus gomphocephala* to 15m

**Condition:** Very Good-Excellent

**Fire Age:** >5yrs

**Notes:** Rabbit faecal mounds present, warren immediately south of the quadrat



**Species List:**

Name	Cover (%)	Height (m)	Notes
<i>Acacia rostellifera</i>	1-2	3	
<i>Acanthocarpus preissii</i>	<1	0.5	
<i>Banksia nivea</i> subsp. <i>nivea</i>	<1	0.3	
<i>Banksia sessilis</i>	95	2.4	
<i>Bossiaea eriocarpa</i>	<1	0.4	
* <i>Brachypodium distachyon</i>	<1	0.4	
* <i>Briza maxima</i>	<1	0.2	
<i>Caesia micrantha</i>	<1	0.4	
<i>Conostylis candicans</i>	2	0.3	
<i>Desmocladius flexuosus</i>	5	0.2	
* <i>Gladiolus caryophyllaceus</i>	<1	0.4	
<i>Hakea lissocarpa</i>	1	1.4	
<i>Hakea trifurcata</i>	2	1.8	
<i>Hibbertia hypericoides</i>	5	0.6	
<i>Hibbertia racemosa</i>	<1	0.2	

<i>Hybanthus calycinus</i>	<1	0.2
* <i>Hypochaeris glabra</i>	<1	0.02
<i>Jacksonia sericea</i>	10	0.5
<i>Lepidosperma ?pubisquamum</i>	<1	0.5
<i>Lepidosperma scabrum</i>	<1	0.3
<i>Lobelia tenuior</i>	<1	0.15
<i>Lomandra maritima</i>	1	0.4
* <i>Lysimachia arvensis</i>	<1	0.1
<i>Melaleuca systema</i>	2	1.5
<i>Mesomelaena pseudostygia</i>	2	0.5
<i>Petrophile axillaris</i>	<1	1
<i>Tetralix octandra</i>	<1	0.3
<i>Trachymene pilosa</i>	1	0.1
<i>Tricoryne elatior</i>	<1	0.3
* <i>Urospermum picroides</i>	<1	0.3
<i>Xanthorrhoea preissii</i>	6	2

**Priority 4 - 24 plants**





<i>Melaleuca huegelii</i>	2	1.6
<i>Mesomelaena pseudostygia</i>	1	0.5
<i>Patersonia occidentalis</i>	1	0.8
<i>Ptilotus drummondii</i>	<1	0.4
<i>Rhagodia baccata</i>	<1	1
<i>Tetragia octandra</i>	1	0.5
<i>Trachymene pilosa</i>	<1	0.1
* <i>Urospermum picroides</i>	<1	0.15
<i>Xanthorrhoea preissii</i>	15	4

Opportunistic Records

Described: BL

Date: 11/11/2010

Type: Opportunistic

**Species List:**

**Name**

*Acacia alata* var. *tetrantha*  
*Acacia lasiocalyx*  
*Allocasuarina humilis*  
*Andersonia ?lehmanniana*  
*Anigozanthos humilis*  
*Austrostipa flavescens*  
\**Avena* sp.  
*Brachyloma preissii*  
\**Bromus diandrus*  
*Calectasia narragara*  
*Calytrix* sp.  
\**Carduus pycnocephalus*  
*Cassutha racemosa*  
*Comesperma confertum*  
*Corynotheca micrantha*  
*Daviesia decurrens*  
*Daviesia divaricata*  
\**Ehrharta calycina*  
\**Euphorbia peplus*  
\**Euphorbia terracina*  
\**Foeniculum vulgare*  
*Gastrolobium capitatum*  
*Gompholobium confertum*  
*Grevillea preissii*  
*Hakea prostrata*  
*Hakea ruscifolia*  
*Hibbertia huegelii*  
\**Hyparrhenia hirta*  
*Hypolaena exsulca*  
*Kunzea glabrescens*  
*Lechenaultia linarioides*  
*Lepidosperma leptostachyum*  
\**?Leptochloa fusca* subsp. *fusca*  
*Leucopogon ?squarrosus*  
*Nuytsia floribunda*  
*Olearia axillaris*  
\**Pelargonium capitatum*  
*Petrophile brevifolia*  
*Podolepis gracilis*  
*Scaevola canescens*  
*Stirlingia latifolia*  
*Synaphea petiolaris*  
*Thysanotus scaber*  
*Waitzia suaveolens* var. *suaveolens*

# Appendix B

## Floristic Data Analysis

**Flora and Vegetation Assessment  
M70/013 Hopkins Road, Nowergup**

































































Full name	Data	FCT	2	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	22	24	25	27	28	10a	10b	1a	20a	20b	20c	21a	21b	21c	23a	23b	26a	26b	29a	29b	30a	30b	30c	3a	3b	3c							
Acacia aff. alata scps (alata var. tetrantha Ms)			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Acacia alata			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Acacia aurantifolia			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Acacia barbinervis subsp. barbinervis scps			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Acacia barbinervis subsp. borealis scps			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Acacia browniana			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Acacia cochlearis			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Acacia cyclops			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Acacia dentifera			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Acacia divergens			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia drewiana			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia ericifolia			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia extensa			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia flagelliformis			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia huegelii			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia incurva			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia lasiocarpa			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia lasiocarpa var. bracteolata			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia latericola			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia littorea			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia mooreana			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia myrtifolia			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia nervosa			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia pulchella			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia pulchella			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia pycnantha			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia rostellifera			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia saligna			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia semitullata			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia sessilis			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia stenoptera			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia teretifolia			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia tetragonocarpa			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia truncata			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia varia var. varia			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia willdenowiana			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia xanthina			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acanthocarpus canaliculatus	</																																																			



















# Appendix C

## Flora Species List

**Flora and Vegetation Assessment  
M70/013 Hopkins Road, Nowergup**

## Flora Species List

	# Records
<b>016A   Zamiaceae</b>	
<i>Macrozamia riedlei</i>	2
<b>031     Poaceae</b>	
<i>Austrodanthonia occidentalis</i>	1
<i>Austrostipa flavescens</i>	1
* <i>Avena</i> sp.	1
* <i>Brachypodium distachyon</i>	2
* <i>Briza maxima</i>	1
* <i>Bromus diandrus</i>	1
* <i>Ehrharta calycina</i>	1
* <i>Hyparrhenia hirta</i>	1
* ? <i>Leptochloa fusca</i> subsp. <i>fusca</i>	1
<b>032     Cyperaceae</b>	
<i>Lepidosperma leptostachyum</i>	1
<i>Lepidosperma ?pubisquameum</i>	2
<i>Lepidosperma scabrum</i>	1
<i>Mesomelaena pseudostygia</i>	4
<i>Schoenus curvifolius</i>	1
? <i>Schoenus clandestinus</i>	2
<i>Tetraria octandra</i>	4
<b>039     Restionaceae</b>	
<i>Alexgeorgea nitens</i>	1
<i>Desmocladius flexuosus</i>	4
<i>Hypolaena exsulca</i>	1
<i>Lyginia imberbis</i>	1
<b>054B    Asparagaceae</b>	
<i>Acanthocarpus preissii</i>	1
<i>Lomandra caespitosa</i>	1
<i>Lomandra hermaphrodita</i>	3
<i>Lomandra maritima</i>	1
<i>Lomandra sericea</i>	1
<i>Sowerbaea laxiflora</i>	1
<i>Thysanotus patersonii/manglesianus</i>	1
<i>Thysanotus scaber</i>	1
<b>054C    Dasypogonaceae</b>	
<i>Calectasia narragara</i>	1
<b>054D    Xanthorrhoeaceae</b>	
<i>Xanthorrhoea preissii</i>	4
<b>054J    Colchicaceae</b>	
<i>Burchardia congesta</i>	2
<b>054P    Hemerocallidaceae</b>	
<i>Caesia micrantha</i>	1
<i>Corynotheca micrantha</i>	1
<i>Dianella revoluta</i>	1
<i>Tricoryne elatior</i>	1
<b>055     Haemodoraceae</b>	
<i>Anigozanthos ?humilis</i>	1
<i>Anigozanthos humilis</i>	1
<i>Conostylis aculeata</i>	3
<i>Conostylis candicans</i>	2
<i>Conostylis setigera</i>	2
<i>Haemodorum paniculatum</i>	1
<i>Haemodorum</i> sp.	1

<b>060</b>	<b>Iridaceae</b>		
*	<i>Gladiolus caryophyllaceus</i>		3
	<i>Patersonia occidentalis</i>		2
<b>070</b>	<b>Casuarinaceae</b>		
	<i>Allocasuarina fraseriana</i>		3
	<i>Allocasuarina humilis</i>		1
<b>090</b>	<b>Proteaceae</b>		
	<i>Banksia attenuata</i>		2
	<i>Banksia menziesii</i>		1
	<i>Banksia nivea</i> subsp. <i>nivea</i>		1
	<i>Grevillea preissii</i>		1
	<i>Grevillea vestita</i>		1
	<i>Hakea lissocarpa</i>		2
	<i>Hakea prostrata</i>		2
	<i>Hakea ruscifolia</i>		1
	<i>Hakea trifurcata</i>		1
	<i>Petrophile axillaris</i>	<b>Bush Forever species</b>	1
	<i>Petrophile brevifolia</i>		1
	<i>Petrophile linearis</i>		2
	<i>Petrophile macrostachya</i>		1
	<i>Stirlingia latifolia</i>		1
	<i>Synaphea petiolaris</i>		1
<b>097</b>	<b>Loranthaceae</b>		
	<i>Nuytsia floribunda</i>		1
<b>105</b>	<b>Chenopodiaceae</b>		
	<i>Rhagodia baccata</i>		1
<b>106</b>	<b>Amaranthaceae</b>		
	<i>Ptilotus drummondii</i>		1
<b>110</b>	<b>Aizoaceae</b>		
*	<i>Carpobrotus edulis</i>		1
<b>131</b>	<b>Lauraceae</b>		
	<i>Cassytha racemosa</i>		1
<b>167</b>	<b>Fabaceae</b>		
	<i>Acacia alata</i> var. <i>tetrantha</i>	<b>Bush Forever species</b>	1
	<i>Acacia huegelii</i>		1
	<i>Acacia lasiocalyx</i>		1
	<i>Acacia pulchella</i>		2
	<i>Acacia rostelifera</i>		1
	<i>Bossiaea eriocarpa</i>		3
	<i>Daviesia decurrens</i>		1
	<i>Daviesia divaricata</i>		1
	<i>Gastrolobium capitatum</i>		1
	<i>Gompholobium confertum</i>		1
	<i>Gompholobium tomentosum</i>		2
	<i>Hardenbergia comptoniana</i>		3
	<i>Jacksonia sericea</i>	<b>Priority 4</b>	2
	<i>Jacksonia sternbergiana</i>		1
<b>167</b>	<b>Geraniaceae</b>		
*	<i>Pelargonium capitatum</i>		1
<b>183</b>	<b>Polygalaceae</b>		
	<i>Comesperma confertum</i>		1
	<i>Comesperma volubile</i>		1
<b>185</b>	<b>Euphorbiaceae</b>		
*	<i>Euphorbia pepus</i>		1
*	<i>Euphorbia terracina</i>		1

<b>185A</b>	<b>Phyllanthaceae</b>		
	<i>Phyllanthus calycinus</i>		1
<b>226</b>	<b>Dilleniaceae</b>		
	<i>Hibbertia huegelii</i>		1
	<i>Hibbertia hypericoides</i>		3
	<i>Hibbertia racemosa</i>		1
<b>243</b>	<b>Violaceae</b>		
	<i>Hybanthus calycinus</i>		2
	? <i>Hybanthus calycinus</i>		1
<b>273</b>	<b>Myrtaceae</b>		
	<i>Calothamnus sanguineus</i>		1
	<i>Calytrix</i> sp.		2
	<i>Eucalyptus marginata</i>		1
	<i>Kunzea glabrescens</i>		1
	<i>Melaleuca huegelii</i>		1
	<i>Melaleuca systema</i>		1
<b>280</b>	<b>Araliaceae</b>		
	<i>Trachymene pilosa</i>		2
<b>281</b>	<b>Apiaceae</b>		
*	<i>Foeniculum vulgare</i>		1
<b>287</b>	<b>Ericaceae</b>		
	<i>Andersonia ?lehmanniana</i>		1
	<i>Brachyloma preissii</i>		1
	<i>Conostephium pendulum</i>		2
	<i>Leucopogon ?squarrosus</i>		1
<b>293</b>	<b>Primulaceae</b>		
*	<i>Lysimachia arvensis</i>		2
<b>340</b>	<b>Lobeliaceae</b>		
	<i>Lobelia tenuior</i>		2
<b>341</b>	<b>Goodeniaceae</b>		
	<i>Lechenaultia linarioides</i>	<b>Bush Forever species</b>	1
	<i>Scaevola canescens</i>		1
<b>343</b>	<b>Stylidiaceae</b>		
	<i>Stylidium brunonianum</i>		1
	<i>Stylidium ?piliferum</i>		1
	<i>Stylidium repens</i>		1
<b>345</b>	<b>Asteraceae</b>		
*	<i>Carduus pycnocephalus</i>		1
*	<i>Hypochaeris glabra</i>		3
	<i>Olearia axillaris</i>		1
	<i>Podolepis gracilis</i>		1
*	<i>Urospermum picroides</i>		3
*	<i>Ursinia anthemoides</i>		2
	<i>Waitzia suaveolens</i> var. <i>suaveolens</i>		1
Native Species			100
Introduced Species			18
<b>TOTAL SPECIES</b>			<b>118</b>

\* Denotes introduced (weed) species