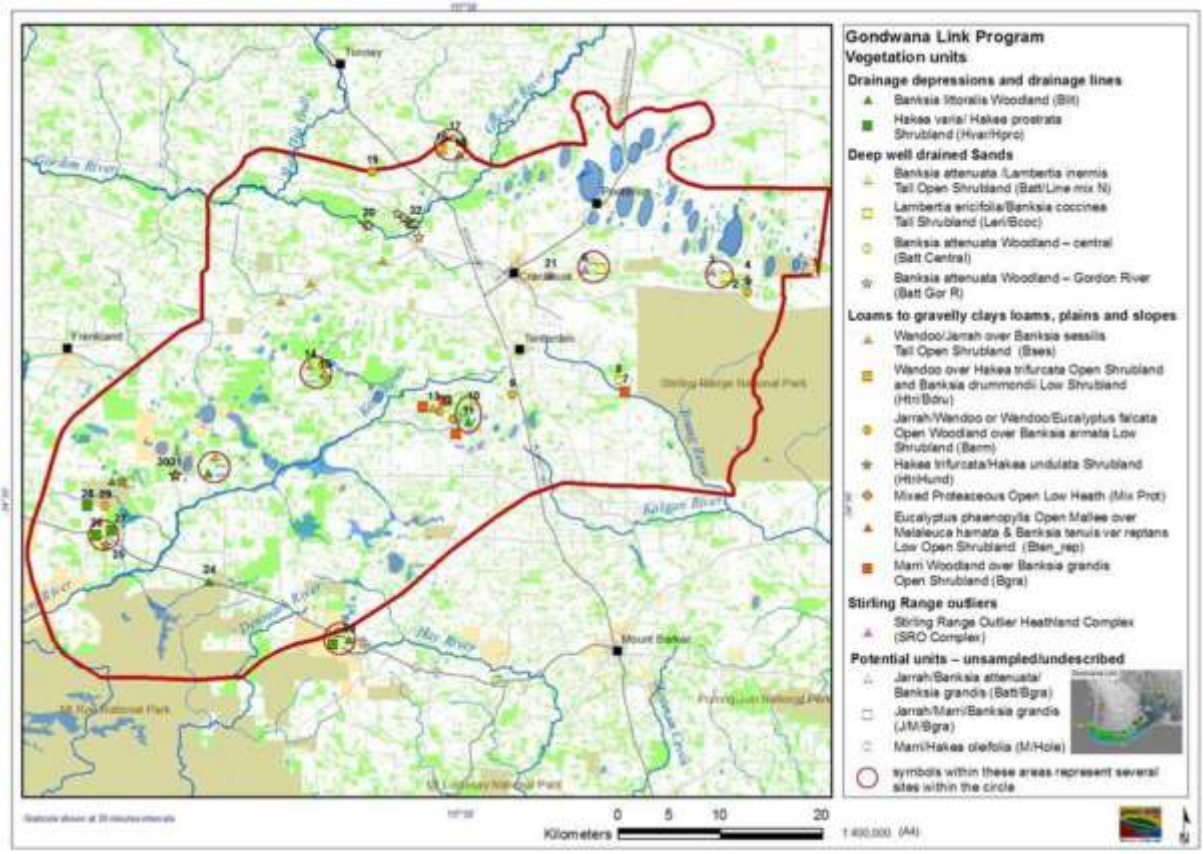
Proteaceous rich vegetation in the Forest to Stirlings section of Gondwana Link

Planning biodiversity conservation for the Wildlife Corridor Project
forming part of the Gondwana Link Forest to Stirlings
Conservation Action Planning Framework



E.M. (Libby) Sandiford

April 2012

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April 2012

CARING FOR OUR COUNTRY
SOUTHCOAST NATURAL RESOURCE MANAGEMENT
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1. Acknowledgements

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Disclaimer

2. Introduction

The 'Forest to Stirling' area forms an important part of the area encompassed by the "Gondwana Link" vision (Bradby 2008) which aims to "restore ecological connectivity across south-western Australia, from the woodlands of the drier interior to the tall wet forests in the far south-west corner"(Figure1, http://www.gondwanalink.org). In 2011 the Gillamii Centre and Green Skills with the assistance of Gondwana Link Ltd and other stakeholders, prepared a conservation plan for the Forest to Stirling section of Gondwana link which focuses on the area, (mostly cleared and agricultural), from the Walpole Wilderness Area to the Stirling Range National Park and encompasses the macro corridor identified by Wilkins et al (2006) and important wetlands identified by Hopkinson (2003), (2005) (Gondwana Link 2011)(Figure 2). Following the preparation of the conservation plan Green Skills and the Gillami Centre have commenced a two year Wildlife Corridor Project in line with the Australian Government's Green Corridor Plan in the South coast region of Western Australia and supported by the South Coast NRM through the Australian Government "Caring for our Country" program. This project uses the eight conservation targets identified in the conservation plan to help focus efforts in protecting and restoring biodiversity within the Forest to Stirling area (Gondwana Link 2011). One of the conservation targets is "Proteaceous rich Shrublands/Woodlands", with the objective "to improve the condition and conservation status of Proteaceous rich Shrublands/Woodlands in the Forest to Stirlings Functional Landscape by 2020".

Proteaceous rich Shrublands/Woodlands have been identified in the area as being at a high threat status due to fragmentation as a result of historical clearing and vulnerability to: drying climate, *Phytophthora* dieback and wildfire as well as grazing, weed and nutrients and weed seed drift. Proteaceous rich Shrublands/Woodlands are also likely to occur in most, if not all, of the other seven conservation targets including: the Upper Kent Wetland Suite, Wandoo associated vegetation communities, Jarrah/Marri associated vegetation communities, Carnaby's Black cockatoo, Stirling Range outliers, West Balicup Wetland suite and Black gloved Wallaby.

One of the difficulties in implementing programs to protect Proteaceous rich Shrublands/Woodlands is that they have not been clearly defined. Originally the concept of Proteaceous rich Shrublands as an important ecological asset on a broad scale was recognized within the Fitz-Stirling area of the Gondwana link where such vegetation was identified as

> "structurally important component of the vegetation mosaic across the Fitz-Stirling. Their nectar and pollen production is thought to provide an important food source throughout the year, particularly during summer and autumn. These communities were amongst the most easily cleared areas during agricultural development; consequently only small areas remain and many of those remnants are subject to on-going disturbances. They are mostly found on deep sand and gravelly sand and are particularly susceptible to *Phytophthora cinnamomi* and a range of other disturbance agents including fire, weeds and fertiliser drift". Deegan & Sanders 2008.

Within the Forest to Stirling link Proteacous rich Shrublands/Woodlands have been described as

- As providing "copious amounts of nectar and pollen, and important food source for native birds, mammals and insect species throughout the year, particularly during autumn and winter when other food sources are limited."
- Being "high value as habitat and a food rich resource, proteaceous rich shrublands/ woodlands are important for a range of species even if limited in area and are a priority for protection and restoration."

- Being “associated with a variety of soils e.g. rocky soils such as laterite and sandstone, as well as sand or gravel over clay, and deeper sands found in valley floors, often as low dunes and on slopes.”
- Areas that “may be small in size, and associated with other vegetation communities such as wandoo and mallee, however they have a very important ecological role.”
- Communities that were “historically small in extent and being easy to clear for agriculture in the past are now highly fragmented and reduced in size.”
- Having “high value as habitat and a food rich resource. Therefore important for a range of species even if limited in area and a priority for protection and restoration.” (Gondwana Link 2011)

Thus it appears Proteaceous woodlands have been broadly and vaguely defined on basis of perceived ecological importance (food and habitat), rarity (current or historical) and identified as vulnerable due to rarity and susceptibility to various factors including *Phytophthora* dieback, fire, grazing, clearing and weed invasion. In order to achieve the objective of “improving the condition and conservation status of Proteaceous rich Shrublands/Woodlands in the Forest to Stirling Functional landscape by 2020” through protection, rehabilitation and restoration, a more robust description of the vegetation in terms of floristic, structure and habitat is required.

Previous vegetation descriptions within the area are limited to broad scale mapping (Beard 1979), or very small scale property surveys and they indicate at least some vegetation types appear to fit the concept of Proteaceous rich Shrubland/Woodland in terms of high number of Proteaceous species present eg Mallee/Shrubland/Heaths on the Stirling Range outliers such as Geekabee, Sukey, Hamilla Hill (Beard 1979) Other vegetation described appears to fit the concept in terms providing an abundant food source by having a high density of at least one Proteaceous species e.g. *Banksia littoralis* Woodlands (Beard 1979).

This report describes some of the vegetation within the Forest to Stirling link that may fall within the floristic and ecological concepts of “Proteaceous rich” vegetation. It summarises the results of a brief vegetation survey undertaken in the spring and summer of 2011/12 which focussed on vegetation within the area that contained at least one layer dominated by at least one Proteaceous species.

Limitations

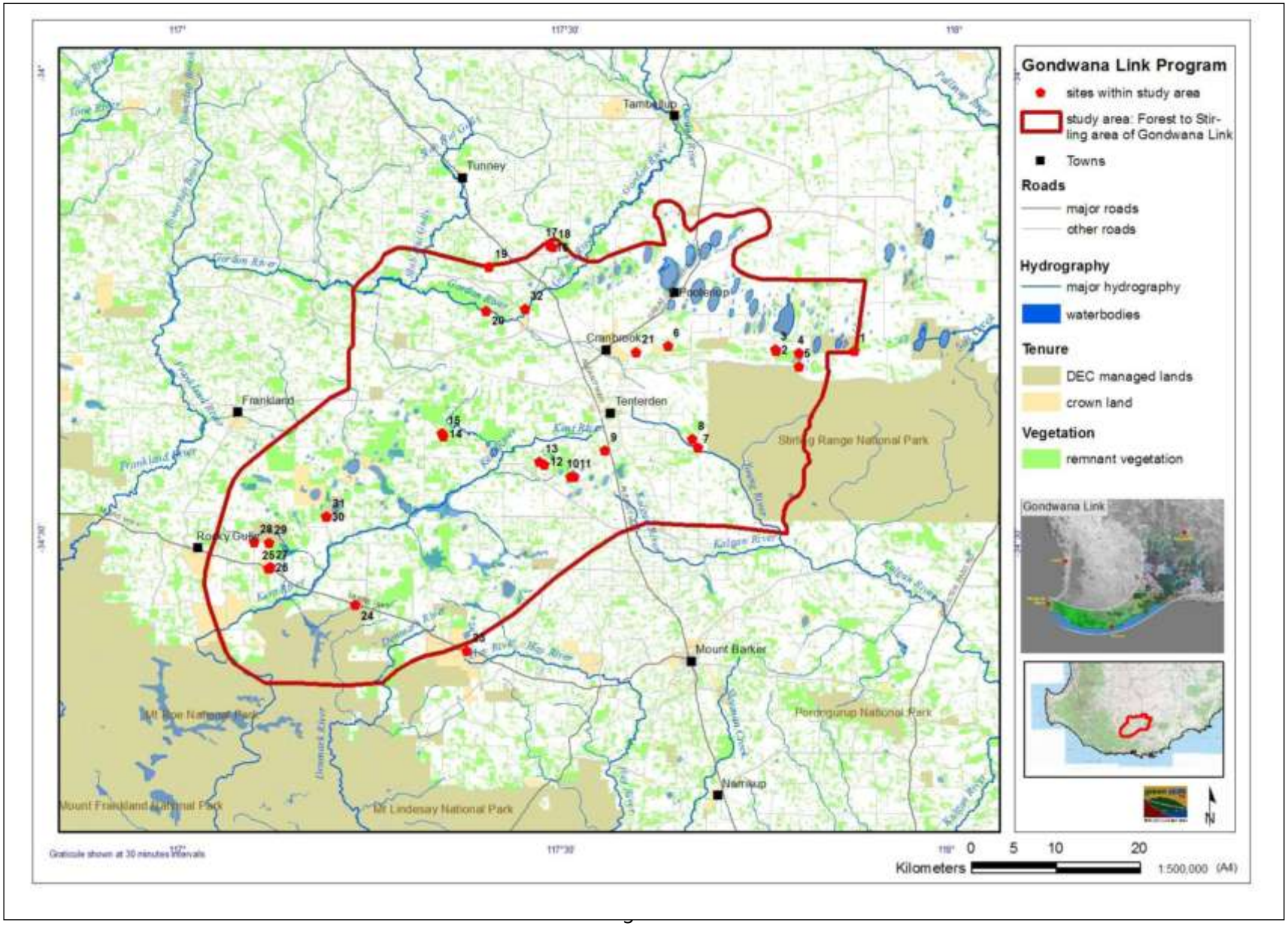
Limited time was available for survey work thus a comprehensive survey of all vegetation remnants within the area was not undertaken. It is likely some “Proteaceous rich” vegetation has been overlooked and differences between areas of “Proteaceous rich vegetation” and adjacent non “Proteaceous rich” vegetation and reasons for any differences have not been determined.

Full floristic plots were not surveyed and replication of plots within similar vegetation was low. Thus floristic and structural descriptions of vegetation units may not reflect the full diversity found within the Forest to Stirling Link and some units described may represent more than one unit.

Soil and hydrology data was only assessed briefly and subjectively, thus any conclusions regarding these attributes need to be treated with caution.

Not all species could be identified to species level due to lack of flowering/fruiting material or current taxonomic uncertainties (eg *Lepidosperma* sp.).

Figure 1 - Survey area and sites



3. Methods

Areas within the Forest to Stirling link known to have either a variety of Proteaceous species or be dominated by at least one Proteaceous species were visited on the 9, 10 & 14/11/2011 and on the 16/1/2012. These areas were initially identified by landholders, Wendy Bradshaw (SCNRM officer) or Basil Shur (Green Skills Inc.). Other sites were located opportunistically during the survey. Areas in the north, central and southern areas were targeted to cover the known variety in landforms, bio-geographical areas, broad vegetation types (Beard 1979) and rainfall within the target area.

Once vegetation was identified as having at least one tree or shrub layer dominated by a Proteaceous species a representative sample was recorded using the method adopted during the Albany Regional Vegetation Survey (Sandiford & Barrett 2010) and Ravensthorpe Mapping Project (Craig et al 2008). This method was adopted due to time constraints and provides detailed though not complete floristic data.

Each sample (relevé) consisted of an unmarked 10m x10m area, with GPS reading taken at the north west corner. (Site 26 was sampled over an area 20m x5m due to the narrowness of the vegetation.) The following data was recorded for each relevé:

Structure: Estimates of structure using standardised height and cover classes as per relevé reporting form (Appendix 1). Dominant or co-dominant species within each stratum were recorded, with structural and species data for the upper shrub and all tree strata recorded over a 20m x 20m area to enable more accurate description in areas of open to very open shrublands or woodlands.

Vascular plants: Species were recorded where a minimum of 3 plants occurred or where species cover was > 5% within the relevé or for upper shrub and tree species within a 20mx20m area. Species that could not be identified in the field were collected and identified later.

Site attributes: Visual assessment of soil colour and type, geology, percentage surface rock, landform, hydrology and drainage status were recorded, where known, as per relevé sheet (Appendix 1).

Condition was recorded using the condition categories of Keighery (1994) (Appendix 2a).

Additional notes were made where applicable and included health, age, other species of interest in general area e.g. conservation species, other Proteaceous species.

Whilst travelling from site to site brief notes of, and locations of, Proteaceous dominated vegetation were recorded. Plants that could not be identified in the field were identified using relevant taxonomic texts, the Albany Regional Herbarium and the author's personal herbarium. Nomenclature followed the current WA herbarium usage (DEC 2012) with the exception of many *Lepidsoperma* species which arecurrently undergoing revision and a few other species. Unidentified species were given unique identifiers when it was clear they were unique species eg *Lepdiosperma* "small fan" or *Schoenus* sp Site 3, or the identifier "sp unident" when it was not possible to determine if they were different from other recorded species e.g. *Austrostipa* sp. "unident".

Vegetation types are described structurally according to Keighery (1979), (Appendix 2b) and broadly equivalent to "associations" on the National Vegetation Inventory Scheme (ESCAVI 2003). Species data was sorted into a two way table: species versus site (relevé) to determine similarities and

differences between sites and vegetation units defined according to species composition, taking into account species dominance and site characteristics.

A brief summary of flowering times, food potential for Carnabys Black Cockatoos, susceptibility to Phytophthora dieback, and fire response is provided for each Proteaceous species recorded.

4. Results and Discussion

31 sites were surveyed within the Forest to Stirling area (Figure 1) with 341 species recorded within these sites. Not all species could be identified to species level (see Methods) and a few species were difficult to identify due to similarities between closely related species and variations in specimens collected. These species are noted in Appendix 3a. New and old names for some *Banksia* species previously known as *Dryandra* species are provided in Appendix 3b. A species list ordered by family is provided in Appendix 4, a two way table of site and species data is recorded in Appendix 5 and all site data in Appendix 6.

14 vegetation associations or complexes have been identified as having at least one strata dominated by at least one Proteaceous species and these were found on four broad landform/soil units.

Drainage depressions and drainage lines

1 *Hakea varia/ Hakea prostrata* Shrubland (Hvar)

Recorded on drainage flats and transitional zones between uplands and wetlands.

2 *Banksia littoralis* Woodland (Blit)

Recorded in drainage depressions.

Deep well drained sands

3 *Banksia attenuata /Lambertia inermis* Tall Open Shrubland (Batt/Line N)

Recorded on the north eastern plains

4 *Lambertia ericifolia/Banksia coccinea* Tall Shrubland (Leri/Bcoc)

Recorded on the mid to lower slopes of the Stirling Range outliers

5 *Banksia attenuata* Woodland – central (Batt C)

Recorded on deep sands in the central and eastern central areas.

6 *Banksia attenuata* Woodland – Gordon River (Batt Gor R)

Recorded on the lunettes adjacent the Gorden River.

Loams to gravelly clays loams, plains and slopes

7 Marri Woodland over *Banksia grandis* Open Shrubland (Bgra)

Recorded in the central east part of the survey area.

8 Wandoo/Jarrah over *Banksia sessilis* Tall Open Shrubland (Bses)

Recorded in central and northern areas of the survey area.

9 Wandoo over *Hakea trifurcata* Open Shrubland and *Banksia drummondii* Low Shrubland (Htri/Bdru)

Recorded in the north of the survey area, possibly a transitional unit.

10 Jarrah/Wandoo or Wandoo/*Eucalyptus falcata* Open Woodland over *Banksia armata* Low Shrubland (Barm)

Recorded throughout the survey areas

11 *Hakea trifurcata/Hakea undulata* Shrubland (Htri/Hund)

Recorded in south western areas of the survey aera on gravelly soils.

12 Mixed Proteaceous Open Low Heath (Mix)

Recorded in the north of the survey area on poorly drained clay sands.

13 *Eucalyptus phaenopylla* Open Mallee over *Melaleuca hamata* Tall Shruband and *Banksia tenuis* var *reptans* Low Open Shrubland (Bten_rep)

Recorded in the north on poorly drained clay soils.

Stirling Range Outliers

14 Stirling Range Outlier Heathland Complex (SRO Comp)

Recorded on the upper slopes and crests on hill to the N and NW of the Striling Range.

Detailed descriptions of these units are provided in Appendix 7 with photos of the Proteaceous species provided in Appendix 8. A floristic summary of these units is shown in Table 1. This table only shows species that were recorded as dominant in at least one site, nevertheless it shows there are clear floristic differences between the broad landforms and between many of the vegetation units. A change of species and species dominance across the vegetation units is evident as is the floristic differences and similarities within and between vegetation units.

Some units are clearly floristically distinct. For example *Eucalyptus phaenopylla* Open Mallee over *Melaleuca hamata* Tall /Shrublandand *Banksia tenuis* var *reptans* Low Open Shrubland (Bten_rep), *Lambertia ericifolia/Banksia coccinea* Tall Shrubland (Leri/Bcoc) and *Banksia attenuata* Woodland – Gordon River (Batt Gor R)) contain a high number of unique dominant species. Other units appear to form a continuum with species composition changing gradually, presumably reflecting small changes in environmental factors such as soil or hydrology. For example Wandoo/Jarrah over *Banksia sessilis* Tall Open Shrubland (Bses), Wandoo over *Hakea trifurcata* Open Shrubland and *Banksia drummondii* Low Shrubland (Htri/Bdru), Jarrah/Wandoo or Wandoo/*Eucalyptus falcata* Open Woodland over *Banksia armata* Low Shrublands (Barm) and *Hakea trifurcata/Hakea undulata* Shrubland (Htri/Hund) share many species but each unit has a few unique species and differences in dominance (Table 1 & Appendix 5). The Stirling Range Outlier Heathland Complex may contain several units as there is considerable floristic and structural variation between the sampled sites with further variations observed but not sampled in other areas. Additionally a very high number of unique species occur in Sites 3 and 21 indicating their floristic uniqueness (Appendix 5). Further surveys would be required to clearly delineate and describe these units.

In addition to the vegetation units described in this report it is likely more Proteaceous dominated vegetation occurs within the survey area. Areas of Jarrah/Marri Open Forest/Woodland over *Banksia grandis* Tall Open Shrubland (J/M/Bgra, Map 2) were observed in the south and to the south west of the survey area. These appear to have a strong floristic affinity with the Jarrah/Marri/Sheoak Laterite Forest (ARVS unit 12) recorded in the Albany Regional Vegetation Survey (Sandiford & Barrett 2010) and are possibly confined to areas with laterite at or close to the surface. Areas of Jarrah Woodland over *Banksia attenuata/Banksia grandis* Tall Open Shrubland (Batt/Bgra, Map 2) were observed in central areas of the survey area. Based on the vegetation patterns observed in the Albany area this vegetation probably occurs on shallow sands in areas intermediate

Figure 2 - Forest to Stirling Link, Distributions vegetation units

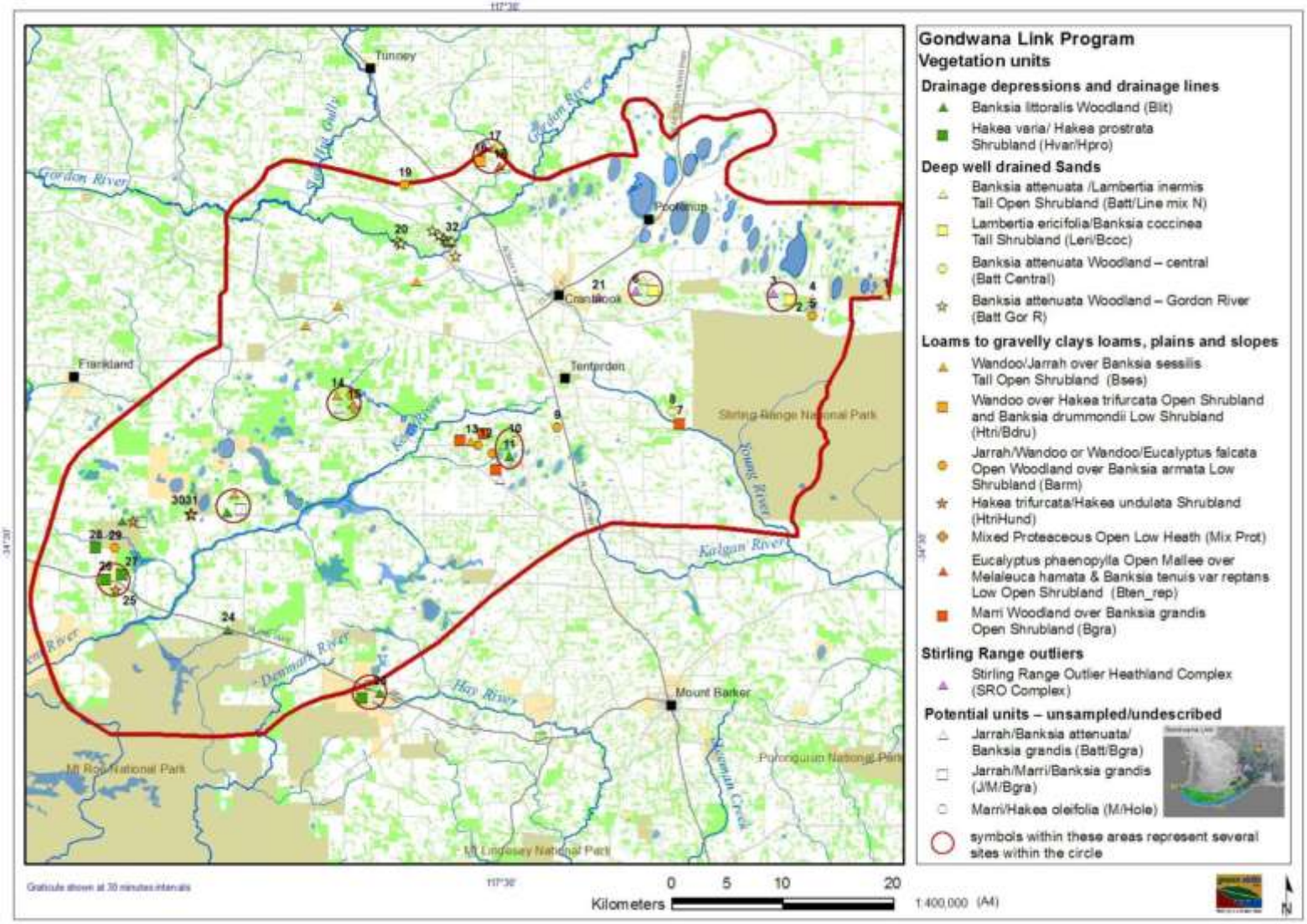
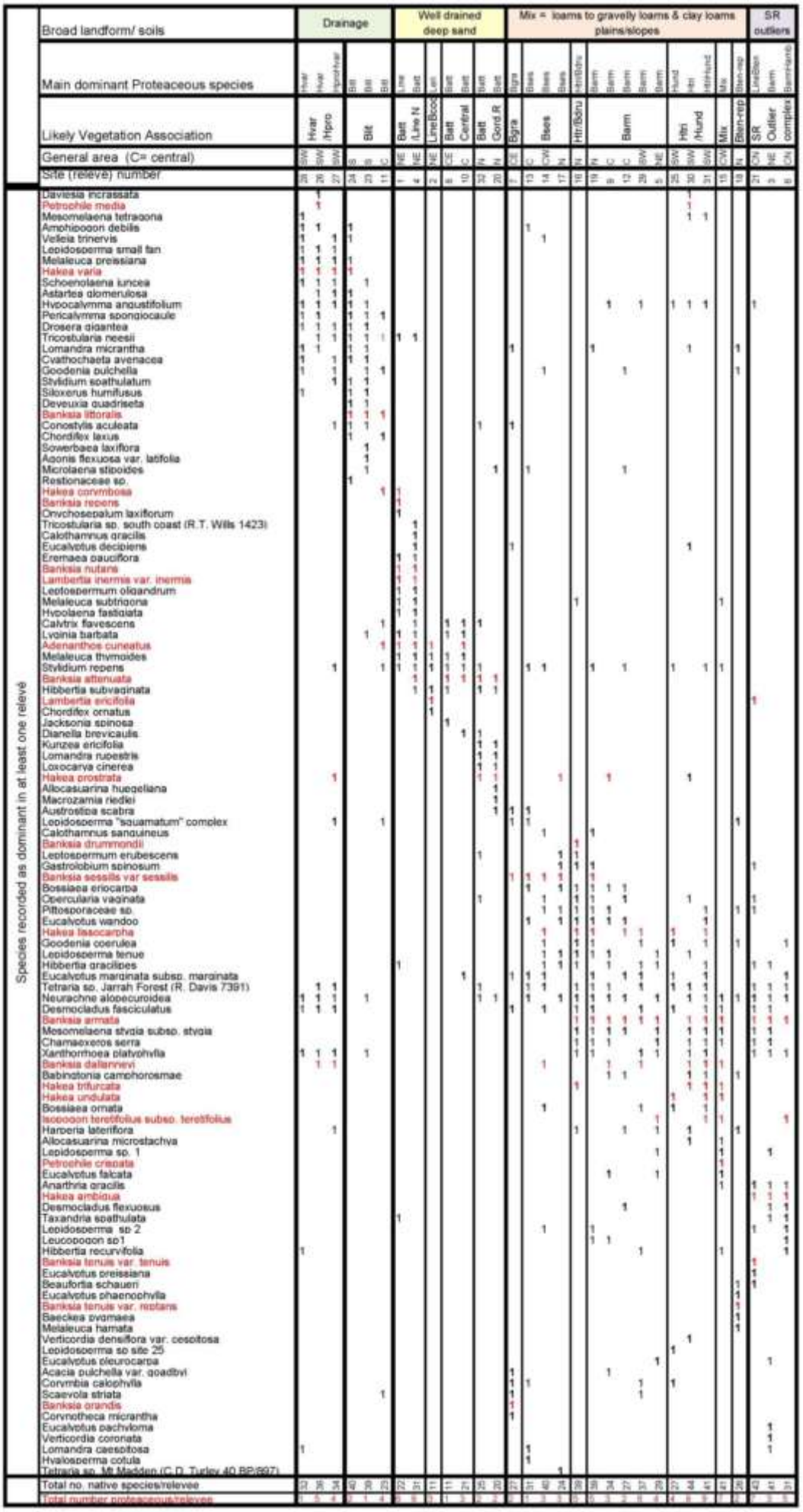


Table 1 - Simplified Site/Floristic data (Key: red = Proteacous species, bold **= dominant)**



between the Jarrah/Marri Open Forest /Woodland occurring over laterite and *Banksia attenuata* Woodland (e.g.*B. attenuata* central) occurring on deeper sands. Areas of Marri Open Forest over *Hakea oleifolia* Tall Shrubland were also observed just to the south west of the survey area and may occur in southern areas.

Identification of some vegetation associations was not clear cut due to several factors including, low sampling, vegetation forming a continuum with no distinct boundaries between units, changes in floristics occurring from south to north within and across vegetation units, variation in condition of sites sampled and possible differences in fire history. It is likely that further sampling would indicate some units represent more than one vegetation association. For example there appears to be floristic and habitat differences between the *Hakea prostrata* dominant Shrubland and *Hakea varia* dominated Shrubland with the former occurring higher in the landscape at the margins of uplands and wetlands and the latter occurring along drainage flats. A geographical floristic change from north to south was also noted in some units, e.g. in*Banksia littoralis* Woodland and *Banksia sessilis(*Barm) and *Banksia armata* (Barm) dominated units. Thus the Marri Jarrah Forest/Woodlands over *Banksia armata* Shrubland found in the south may be distinct from the *Eucalyptus falcata* &/or E. *pleurocarpa* Mallee dominated *Banksia armata* Shrubland of the north.

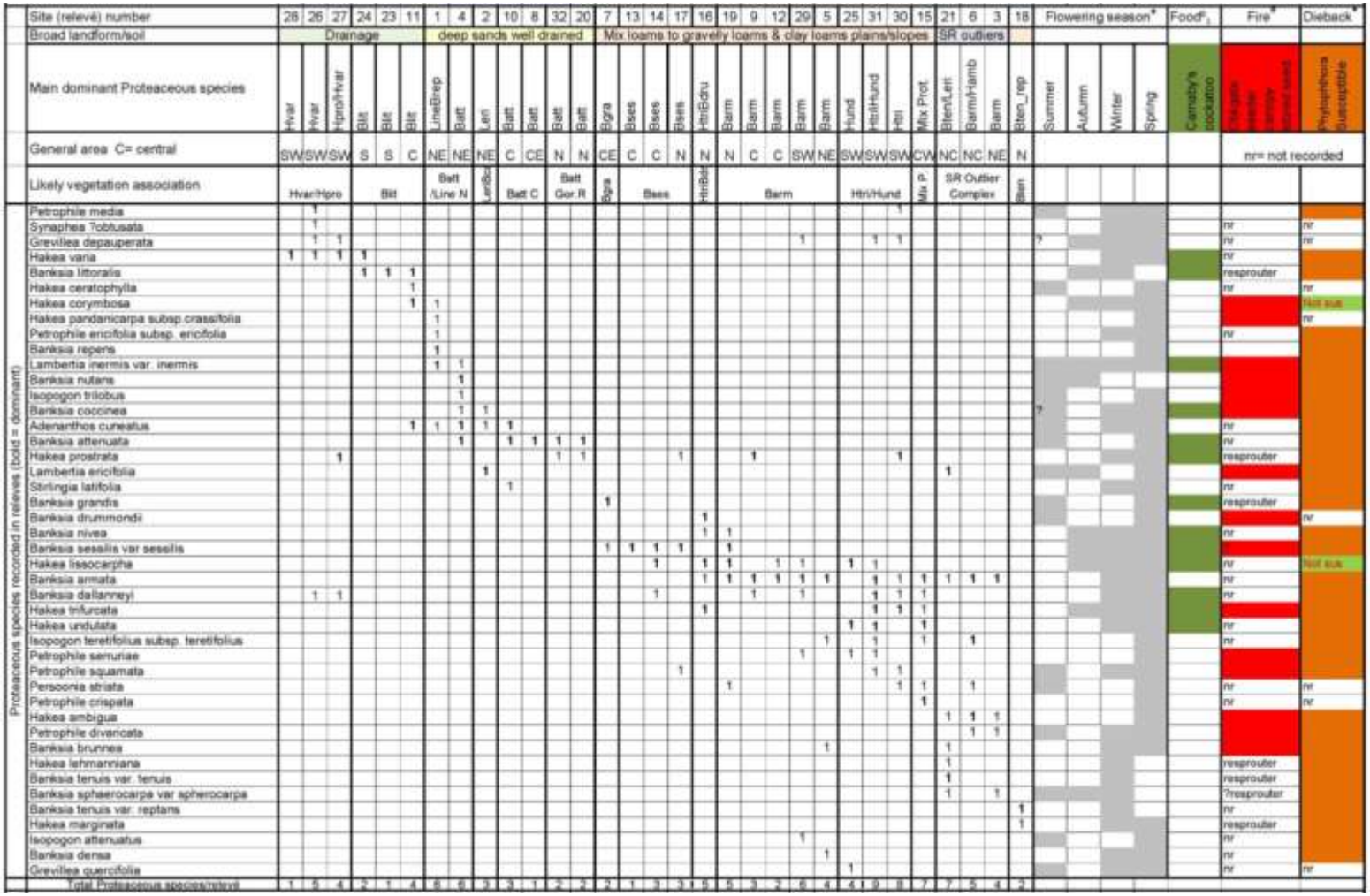
Many of the vegetation units were observed in very small patches. Sometimes this was governed by physical factors e.g *Banksia littoralis* Woodland is confined to small drainage depressions. However it is not clear why small patches *of Banksia sessilis* occurred in the Jarrah &/or Wandoo Woodland, surrounded by seemingly similar vegetation. As this adjacent vegetation was not surveyed it is not known if there are floristic differences between areas with or without *Banksia sessilis*. A similar scenario applies *to Banskia armata* dominated patches which appear to occur on slightly heavier soils than *B sessilis*.

The distribution of most units within the survey area has not been determined though some occurrences are indicated in Figure 2. Three units are likely to have a limited distribution, either in entirety or within the survey area. The Stirling Range Outlier Heathland Complex is likely to be restricted to the upper slopes and crests hills north and north west of the Stirling Range as well as on the western hills within the Stirling Range. Based on key species distribution *Banksia attenuata* Woodlands, Gordon River (Batt Gor R) appears to be restricted to the lunettes on and near the Gordon River (Appendix 6). Given that much of this vegetation appears to have been disturbed (grazing) and does not appear reserved in conservation reserves it may represent a threatened ecological community. Within the Forest to Stirling area *Eucalyptus phaenopylla* Open Mallee over *Melaleuca hamata* and *Banksia tenuis* var *reptans* Low Open Shrubland (Bten_rep) is likely to be restricted to the northern areas based on species distributions, however its distribution outside the survey area is not known.

No attempt has been made to map the vegetation across the survey area and experience in mapping vegetation around Albany indicates few vegetation units have distinctive aerial patterns and thus are not easily mapped without extensive ground truthing. Within the Forest to Stirling area the *Banksia attenuata* Woodland, Gordon River might be identifiable by the presence of lunettes, the Stirling Range Outlier Heathland Complex identifiable by contour and potential areas for units restricted to damplands and wetlands (*Banksia littoralis* Wooodland and *Hakea varia/Hakea prostrata* Shrubland) identifiable by occurrences of swamps and drainage lines though these areas will also contain other non-Proteaceous rich vegetation.

The number of Proteaceous species within each site varied from one in a *Banksia littoralis* Woodland (Site 23) and *Hakea varia* Shrubland (Site 28) to nine in a *Hakea trifurcata/Hakea undulata* Shrubland (Site 31) and within each unit from 1to 5 in *Hakea varia* Shrubland and from 2-6 in *Banksia armata* dominated vegetation, Table 2. These figures can be misleading however as a number of

Table 2 - Proteaceous species/site (*DEC 2012, [o]Groom 2011, [#]Barrett et al 2009, [•]www.dieback.net.au/www.dwg.org.au)



NB Flowering times in the survey area may not include all seasons indicated [1] Some of the Proteacous species not currently listed as food sources might be used by Carnaby's Cockatoo, but not yet recorded

proteaceous species were observed in some sites but not counted due to very low numbers (see methods).

Table 2 summarizes the distribution of Proteaceous species recorded in sites during this survey along with their known susceptibility to *Phytophthora* dieback, reproductive strategy and use as food for Carnaby's Coackatoos.

Only two of the 44 Proteaceous species recorded, *Hakea lissocarpha* and *Hakea corymbosa* are known to be resistant to *Phytophthora* dieback, with at least 77% (34 species) known to be susceptible to this disease. Thus all the vegetation units identified are potentially susceptible to *Phytophthora* dieback as they contain at least one dominant susceptible species.

Over a third of the Proteaceous species recorded are obligate re-seeders that retain a canopy stored seed (Table 2). These species usually regenerate naturally on mass post fire, given suitable conditions (Barrett et al 2009). The seeding regime of 43 % of the Proteaceous species recorded has not been document however it is likely many of them are also obligate re-seeders with canopy stored seed (serotinous). These serotinous obligate re-seeder species are particularly vulnerable to fire, with too frequent a fire resulting in the loss of species due to immaturity and lack of seed development and too infrequent a fire potentially has the same effect if the species has died due to old age and thus has no on site seed source. The disappearance of many *Banksia coccinea* plants in *Lamberita ericifolia/Banksia coccinea* Tall Shrubland in Site 2 appears to be the result of old age, and few unopened follicles (thus potential viable seed) were observed, suggesting any regeneration on this site will be limited without the additional input of *B coccinea* seed. Similar senescent patches of *Banskia sessilis* were observed during this survey. It is beyond the scope of this report to document impacts of fire on the different vegetation units however relevant ecological data and management issues on fire sensitive species and ecosystems within the South Coast National Resource Management area can be found in Barrett *et al* 2009.

Thirty per cent of the Proteaceous species recorded during this survey have been documented as food source for Carnaby's Coackatoo, and it is likely that other Proteaceous species recorded in the Forest to Stirling area of Gondwana link a food source for these birds (Table 2). Species recorded as food sources include many that often occur as lone Proteaceous species within their respective vegetation e.g. *Banksia littoralis*, *Banksia varia* and *Banksia grandis.*

A summary of known flowering times for the Proteaceous species recorded during this survey is provided in Table 2. This data is derived from DEC Florabase (DEC2012) based on state wide collections and the flowering times of the species within the Forest to Stirling area may vary slightly or not be as extensive as indicated. Nevertheless whilst it appears most species (86%) flower in in the prime season - spring, 38% flower in summer, 11% flower in Autumn and 66 % flower in winter including species which often occur as the lone proteaceous species within the vegetation e.g. Banksia *littoralis*. Collectively this group of flora appears to provide a year round nectar food source.

Within the vegetation surveyed there is a high diversity of species (>341) and a variety of vegetation types, some of which appear to be restricted in distribution either state wide or locally. Given that much of the survey area is cleared, it can be assumed that most of the vegetation types described currently represents a small proportion of their pre clearing extent and most of them are vulnerable to key degrading factors- *Phytophthora* dieback and inappropriate fire regimes. These facts along with occurrence of a wide variety of flowering times within the Proteaceous species present indicate

the vegetation units collectively fulfil the ecological role inferred in the original concept of "Proteacous rich" vegetation- i.e. providing habitat and food, and they appear under threat due to a number of factors including rarity and patchiness. Given the difficulties past conservation practitioners have had in defining "Proteaceous rich" vegetation, the term "Proteaceous dominant" may be a suitable replacement – more easily defined and more readily recognizable. Whilst it is not possible to determine how much biodiversity is confined to this vegetation within the Forest to Stirling area, conserving or restoring the vegetation described in this report would at least assist in protecting a very broad range of flora and any fauna dependent upon it.

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6. Appendices

Appendix 1 - Recording sheet

– Relevé Forest to Stirling "Proteaceous rich" Vegetation Survey		SITE_ID:
Date:	Wp:	mE
Recorder:	VegCode:	mN
Location and Site Notes:		

Condition: *Pristine Excellent Very Good Good Degraded --- RESIDUAL MODIFIED TRANFORMED*	
Aspect: *N NE E SE S SW W NW*	**Slope:** *Flat Gentle Mod Steep*
Geology: *Gnei Gran Lat Lime Silt*	**Rock:** *0 <2 2-10 10-20 20-50 >50*
Soil Colour: *Brown Grey Dark Brown Dark Grey Light Grey Light Brown Orange/Brown White Yellow Yellow/Grey*	**Soil Type:** *C CL CLS CS L LS S SCL SL SP ZCL ZL ZS P GL GS*
Hydrology: *Good drain Poor drain Perm wet Seasonal wet*	**Landform:** *Breakaway Cliff Consolidated Dune Drainage Depression Dune Gully Hill Crest Riparian Bank Rock Outcrop Slope Lower Slope Middle Slope Upper Swale Swamp Tidal Flat Tor Valley Flat Berm Flat Plain Ridge*

Growth form	Ht	Cvr	NVIS/dominant	Others
T_1	>30			
T_2	10-30			
T_3	<10			
M_1	>8			
M_2	<8			
S_1	>2			
S_2	1-2			
S_3	0.5-1			
S_4	<0.5			
V	NA			
H	NA			
G	NA			

Cover Codes: D >70% M 30-70% S 10-30% V 2-10% E <5% Emergent

Other Species:

Appendix 2a Condition & 2b Structural Classification

A Condition Scale (Keighery 1994)

1 Pristine

Pristine or nearly so, no obvious signs of disturbance

2 Excellent

Vegetation structure intact disturbance affecting individual species and weeds are non-aggressive species. For example damage to trees caused by fire, the presence of non-aggressive wees and occasional vehicle tracks.

3= 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 or grazing.

4 = 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 or grazing.

5= 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 to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing dieback or grazing

6 = Completely Degraded

The structure of the vegetation is no long intact and the area 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.

Appendix 2 **B** Structural Classification (Keighery 1994)

Life form/height class	Canopy cover			
	100-70%	70-30%	30-10%	10-2%
Trees over 30	Tall Closed Forest	Open Forest	Tall woodland	Tall Open Woodland
Trees 10-30m	Closed Forest	Open Forest	Woodland	Open Woodland
Trees under 10 m	Low |Closed Forest	Low Open forest	Low Woodland	Low Open Woodland
Tree Mallee	Closed Tree Mallee	Tree mallee	Open Tree Mallee	Very Open Tree Malle
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 under 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

Appendix 3 – Species Names

a Species difficult to identify

Pericalymma spongiocaule* vs *P ellipticum. These species are closely related and difficult to tell apart even with flowers (absent during this survey). Species were identified as *P spongiocaule* on the basis of slight thickening of the stems.

Xanthorrhoea platypylla* vs. *X preissii. Most specimens appeared to represent *X platyphylla* but a few had much finer leaves reminiscent of *X preissii* with some intermediate between the two. All plants have been record as *X platyphylla* in the two way tables.

Hibbertia amplexicaulis* vs *H cunninghammi These species are separated on leaf width though a whole range may be resent within one site and the species separation may not be a valid one (J Wheeler per.comm) These species were recorded as *H amlexicaulis.*

Tricostularia neesii vs ***T. compressa*** These species are very difficult to separate with differences dependent upon inflorescence length although there does not appear to be a clear separation in specimens observed in the great southern (author observations). Species have been recorded as *T neesii.*

b Old and New names for Dryandra

Banksia armata	*Dryandra armata*
Banksia brunnea	*Dryandra brownii*
Banksia densa	*Dryanda conferta*
Banksia drummondii	*Dryandra drummondii*
Banksia dallaneyi	*Dryandra lindleyana*
Banksia nivea	*Dryandra nivea*
Bansksia tenuis var. reptans	*Dryandra tenuifolia var. reptans*
Bansksia tenuis var. tenuis	*Dryandra tenuifolia var. tenuifolia*

Appendix 4 - Species list (from releves)

Amaranthaceae	**Campanulaceae**
Ptilotus declinatus	*Lobelia anceps*
Ptilotus manglesii	*Lobelia gibbosa*
Anarthriaceae	*Lobelia rhombifolia*
Anarthria gracilis	**Casuarinaceae**
Anarthria laevis	*Allocasuarina huegeliana*
Lyginia barbata	*Allocasuarina humilis*
Lyginia imberbis	*Allocasuarina microstachya*
Apiaceae	*Allocasuarina thuyoides*
Actinotus glomeratus	**Celastraceae**
Daucus glochidiatus	*Stackhousia monogyna*
Schoenolaena juncea	**Centrolepidaceae**
Xanthosia huegelii	*Centrolepis aristata*
Xanthosia singuliflora	*Centrolepis mutica*
Araliaceae	**Crassulaceae**
Trachymene pilosa	*Crassula colorata*
Asparagaceae	**Cyperaceae**
Asparagus asparagoides	*Caustis dioica*
Chamaescilla corymbosa	*Cyathochaeta avenacea*
Chamaescilla spiralis	*Cyperus tenellus*
Chamaexeros serra	*Isolepis cernua var. setiformis*
Laxmannia brachyphylla	*Isolepis cyperoides*
Laxmannia minor	*Lepidosperma sp. 1*
Laxmannia sessiliflora	*Lepidosperma sp. 2*
Lomandra caespitosa	*Lepidosperma "squamatum" complex*
Lomandra micrantha	*Lepidosperma sp 25*
Lomandra rupestris	*Lepidosperma sp 28*
Lomandra sericea	*Lepidosperma sp 30*
Lomandra suaveolens	*Lepidosperma sp 32*
Sowerbaea laxiflora	*Lepidosperma sp "small fan"*
Thysanotus brevifolius	*Lepidosperma striatum*
Thysanotus glaucus	*Lepidosperma tenue*
Thysanotus manglesianus	*Mesomelaena stygia subsp. stygia*
Thysanotus sparteus	*Mesomelaena tetragona*
Asteraceae	*Schoenus bifidus*
Asteridea nivea	*Schoenus ?brevisetis*
Craspedia variabilis	*Schoenus caespititius*
Helichrysum leucopsideum	*Schoenus curvifolius*
Hyalosperma cotula	*Schoenus laevigatus*
**Hypochaeris glabra*	*Schoenus obtusifolius*
**Hypochaeris radicata*	*Schoenus pleiostemoneus*
Lagenophora huegelii	*Schoenus subbarbatus*
Podolepis gracilis	*Schoenus sp. small hairy*
Podotheca angustifolia	*Schoenus sp. site 23*
Pterochaeta paniculata	*Schoenus sp. site 3*
Rhodanthe citrina	*Tetraria octandra*
Senecio glomeratus	*Tetraria sp. Jarrah Forest (R. Davis 7391)*
Siloxerus filifolius	*Tetraria sp. Mt Madden (C.D. Turley 40 BP/897)*
Siloxerus humifusus	*Tricostularia neesii*
Trichocline spathulata	*Tricostularia sp. south coast (R.T. Wills 1423)*
**Ursinia anthemoides*	
Boryaceae	
Borya scirpoidea	

Appendix 4 continued- Species list (from releves)

Dilleniaceae	**Fabaceae** cont.
Hibbertia acerosa	*Gompholobium marginatum*
Hibbertia amplexicaulis	*Gompholobium polymorphum*
Hibbertia commutata	*Gompholobium preissii*
Hibbertia gracilipes	*Gompholobium tomentosum*
Hibbertia microphylla	*Hovea chorizemifolia*
Hibbertia recurvifolia	*Isotropis cuneifolia*
Hibbertia stellaris	*Jacksonia alata*
Hibbertia subvaginata	*Jacksonia furcellata*
Droseraceae	*Jacksonia grevilleoides*
Drosera dichrosepala	*Jacksonia spinosa*
Drosera erythrorhiza	*Kennedia prostrata*
Drosera gigantea	**Lotus subbiflorus*
Drosera pulchella	*Pultenaea verruculosa*
Elaeocarpaceae	**Trifolium arvense*
Tetratheca affinis	**Gentianaceae**
Tetratheca virgata	**Centaurium erythraea*
Ericaceae	**Geraniaceae**
Andersonia simplex	*Pelargonium littorale*
Astroloma baxteri	**Goodeniaceae**
Astroloma compactum	*Anthotium humile*
Astroloma pallidum	*Dampiera alata*
Leucopogon gibbosus	*Dampiera juncea*
Leucopogon obovatus	*Dampiera lavandulacea*
Leucopogon pendulus	*Dampiera linearis*
Leucopogon aff elatior	*Goodenia coerulea*
Leucopogon sp. Great Southern (R.S. Cowan A 586)	*Goodenia pulchella*
Leucopogon sprengelioides	*Lechenaultia formosa*
Leucopogon sp 1	*Scaevola calliptera*
Lysinema ciliatum	*Scaevola striata*
Euphorbiaceae	*Velleia trinervis*
Stachystemon virgatus	**Haemodoraceae**
Fabaceae	*Anigozanthos flavidus*
Acacia browniana var. browniana	*Anigozanthos humilis*
Acacia browniana var. intermedia	*Conostylis aculeata*
Acacia lasiocarpa	*Conostylis pusilla*
Acacia nervosa	*Conostylis serrulata*
Acacia pulchella var. goadbyi	*Conostylis setigera subsp. setigera*
Acacia pulchella var. pulchella	*Conostylis villosa*
Acacia saligna	*Haemodorum laxum*
Acacia squamata	*Haemodorum sparsiflorum*
Acacia stenoptera	*Haemodorum spicatum*
Bossiaea eriocarpa	**Hemerocallidaceae**
Bossiaea ornata	*Caesia micrantha*
Bossiaea praetermissa	*Corynotheca micrantha*
Chorizema aciculare	*Dianella brevicaulis*
Chorizema rhombeum	*Dianella revoluta*
Daviesia flexuosa	*Stypandra glauca*
Daviesia incrassata	*Tricoryne elatior*
Daviesia preissii	*Tricoryne humilis*
Eutaxia parvifolia	**Iridaceae**
Gastrolobium praemorsum	*Patersonia babianoides*
Gastrolobium spinosum	*Patersonia limbata*
Gastrolobium velutinum	*Patersonia occidentalis*
Gompholobium knightianum	*Patersonia pygmaea*

Appendix 4 continued - Species list (from releves)

Lauraceae	**Myrtaceae** cont.
Cassytha micrantha	*Verticordia coronata*
Cassytha racemosa	*Verticordia densiflora var. cespitosa*
Loranthaceae	*Verticordia habrantha*
Nuytsia floribunda	**Orchidaceae**
Myrtaceae	*Diuris setacea*
Agonis flexuosa var. latifolia	*Leporella fimbriata*
Astartea glomerulosa	*Pyrorchis nigricans*
Babingtonia camphorosmae	*Thelymitra crinita*
Baeckea preissiana	*Orchid site 1*
Baeckea pygmaea	**Orobanchaceae**
Beaufortia anisandra	**Orobanche minor*
Beaufortia schaueri	**Parentucellia viscosa*
Calothamnus gracilis	**Phyllanthaceae**
Calothamnus microcarpus	*Poranthera microphylla*
Calothamnus planifolius	**Pittosporaceae**
Calothamnus quadrifidus	*Billardiera fusiformis*
Calothamnus sanguineus	*Marianthus sp.*
Calytrix flavescens	*Pittosporaceae sp.*
Calytrix leschenaultii	**Poaceae**
Corymbia calophylla	**Aira cupaniana*
Darwinia oederoides	**Aira praecox*
Darwinia vestita	*Amphipogon amphipogonoides*
Eremaea pauciflora	*Amphipogon debilis*
Eucalyptus decipiens	*Amphipogon laguroides*
Eucalyptus falcata	*Aristida contorta*
Eucalyptus incrassata	*Austrodanthonia setacea*
Eucalyptus lehmannii	*Austrostipa compressa*
Eucalyptus marginata subsp. marginata	*Austrostipa hemipogon*
Eucalyptus pachyloma	*Austrostipa scabra*
Eucalyptus phaenophylla	*Austrostipa semibarbata*
Eucalyptus pleurocarpa	**Briza maxima*
Eucalyptus preissiana	**Briza minor*
Eucalyptus rudis	*Deyeuxia quadriseta*
Eucalyptus wandoo	**Ehrharta longiflora*
Hypocalymma angustifolium	*Microlaena stipoides*
Kunzea ericifolia	*Neurachne alopecuroidea*
Kunzea micromera	*Poa drummondiana*
Kunzea recurva	**Vulpia bromoides*
Leptospermum erubescens	**Vulpia myuros*
Leptospermum oligandrum	**Polygalaceae**
Melaleuca hamata	*Comesperma polygaloides*
Melaleuca lateriflora	*Comesperma volubile*
Melaleuca pauciflora	**Primulaceae**
Melaleuca preissiana	**Lysimachia arvensis*
Melaleuca rhaphiophylla	**Proteaceacea**
Melaleuca spathulata	*Adenanthos cuneatus*
Melaleuca subtrigona	*Banksia armata*
Melaleuca thymoides	*Banksia attenuata*
Melaleuca sp hairy	*Banksia brunnea*
Pericalymma spongiocaule	*Banksia coccinea*
Regelia inops	*Banksia dallanneyi*
Rinzia fumana	*Banksia densa*
Taxandria parviceps	*Banksia drummondii*
Taxandria spathulata	*Banksia grandis*

Appendix 4 continued - Species list (from relevés)

Proteaceae cont.	**Rutaceae**
Banksia littoralis	*Boronia crenulata*
Banksia nivea	*Boronia ramosa*
Banksia nutans	*Boronia spathulata*
Banksia repens	*Boronia subsessilis*
Banksia sessilis	**Selaginellaceae**
Banksia sphaerocarpa	*Selaginella gracillima*
Banksia tenuis var. reptans	**Stylidiaceae**
Banksia tenuis var. tenuis	*Levenhookia pusilla*
Grevillea depauperata	*Levenhookia stipitata*
Grevillea quercifolia	*Stylidium caespitosum*
Hakea ambigua	*Stylidium calcaratum*
Hakea ceratophylla	*Stylidium eriopodum*
Hakea corymbosa	*Stylidium guttatum*
Hakea lehmanniana	*Stylidium hirsutum*
Hakea lissocarpha	*Stylidium piliferum*
Hakea marginata	*Stylidium repens*
Hakea pandanicarpa subsp. crassifolia	*Stylidium schoenoides*
Hakea prostrata	*Stylidium spathulatum*
Hakea trifurcata	*Stylidium tenue*
Hakea undulata	**Thymelaeaceae**
Hakea varia	*Pimelea angustifolia*
Isopogon attenuatus	**Xanthorrhoeaceae**
Isopogon teretifolius subsp. teretifolius	*Xanthorrhoea platyphylla*
Isopogon trilobus	**Zamiaceae**
Lambertia ericifolia	*Macrozamia riedlei*
Lambertia inermis var. inermis	
Persoonia striata	
Petrophile crispata	
Petrophile divaricata	
Petrophile ericifolia	
Petrophile media	
Petrophile serruriae	
Petrophile squamata	
Stirlingia latifolia	
Synaphea obtusata	
Restionaceae	
Chordifex laxus	
Chordifex ornatus	
Desmocladus fasciculatus	
Desmocladus flexuosus	
Harperia confertospicata	
Harperia lateriflora	
Hypolaena exsulca	
Hypolaena fastigiata	
Loxocarya cinerea	
Meeboldina kraussii ms	
Onychosepalum laxiflorum	
Rhamnaceae	
Stenanthemum emarginatum	
Trymalium ledifolium	
Rubiaceae	
Opercularia vaginata	

Appendix 5- . Two way table of site and species data. (red = Proteaceous species, Bold = dominant**)**

Broad landform/soil type	Drainage			Well drained deep sand							Mix=sandy loam to gravelly clay loams plains/slopes													SR Outlier			
Site (Relevé) No	28	26	27	24	23	11	1	4	2	8	10	32	20	7	13	14	17	16	19	12	29	9	5	25	31	30	15	21	3	6	18
Likely I Vegetation association	Hvar /Hpro			Blit			Blatt/ Line N		LeBc	Batt C		Batt Gor.R		Bgra	Bses			HtriBdru	Barm					Htri /Hund			Mix Prot	SR Outlier Complex			Bten_rep
General Location	SW	SW	SW	S	S	C	NE	NE	NE	CE	C	N	N	CE	C	CW	N	N	N	C	SW	C	NE	SW	SW	SW	CW	CN	NE	CN	N
Condition	E	VG	E	E	E	E	E	EVG	G	VG	E	VG	G	VG	VG	E	E	VG	VG	VG	E	E	E	VG	E	E	E	E	E	E	E
Soil type (broad)	CL	SL		S	S	S	S	S	S	S	S	S	S	GS		GL	GCS	GCS	GCL	SL	GL	LC	SL	GL	GSCL	SC	CS	CL	CS	LS	GCL
Stylidium calcaratum	1			1																											
Daviesia flexuosa	1																														
Darwinia oederoides	1																														
Isolepis cyperoides	1																														
Lepidosperma sp 28	1																														
Stylidium guttatum	1																														
Pimelea angustifolia		1																			1			1							
Astroloma compactum		1																						1							
Daviesia incrassata		1																								1					
Petrophile media		1																								1					
Thysanotus sparteus		1																								1					
Synaphea ?obtusata		1																													
Meeboldina krausii		1																													
Schoenus small		1																													
Ptilotus manglesii		1																													
Leucopogon pendulus			1																												
Mesomelaena tetragona	1																								1	1					
Grevillea depauperata		1	1																		1				1	1					
Conostylis pusilla		1	1																	1	1					1					
Schoenus bifidus	1	1																													
Kunzea micromera	1	1																								1		1			
Amphipogon debilis	1	1		1											1																
Velleia trinervis	1		1	1												1															
Lepidosperma "small fan"	1	1	1																				1								
Melaleuca preissiana	1	1	1	1																											
Hakea varia	1	1	1	1																											
Schoenolaena juncea	1	1	1		1																										
Borya scirpoidea	1	1	1		1																										
Astartea glomerulosa		1	1	1																											
Hypocalymma angustifolium	1	1	1	1	1																1	1		1	1	1		1			
Drosera gigantea	1	1	1	1	1																										
Pericalymma spongiocaule	1	1		1	1	1																									
Tricostularia neesii		1	1	1	1	1	1	1		1																					
Patersonia occidentalis	1	1	1	1	1	1						1		1																	
Lomandra micrantha	1	1		1	1									1					1							1				1
Cyathochaeta avenacea	1		1	1	1																										
Goodenia pulchella	1		1		1	1										1				1											1
Stylidium spathulatum			1	1	1																										
Selaginella gracillima			1	1	1																										
Deyeuxia quadriseta				1	1																										
Siloxerus humifusus	1			1	1																										
Hibbertia amplexicualis			1	1	1																1										
Banksia littoralis				1	1	1																									
Conostylis aculeata			1	1	1							1		1																	
Cassytha racemosa		1		1	1																							1			1
Anthotium humile			1	1																											
Chordifex laxus				1		1																									
Dampiera linearis				1	1						1						1		1												
Astroloma baxteri			1		1			1			1																				
Hypolaena exsulca			1		1			1			1			1																	
Bossiaea praetermissa						1					1																				
Drosera pulchella				1		1																									
Hakea corymbosa						1	1																								
Banksia repens							1																								
Onychosepalum laxiflorum							1																								
Eremaea pauciflora							1	1																							
Banksia nutans								1																							
Lambertia inermis var. inermis							1	1																							
Leptospermum oligandrum							1	1																							
Hypolaena fastigiata							1	1																							
Andersonia simplex							1	1																							
Melaleuca subtrigona							1	1										1									1				
Baeckea preissiana								1		1																					
Banksia coccinea								1	1																						
Lambertia ericifolia									1																			1			
Jacksonia grevilleoides									1																						
Schoenus curvifolius									1			1																			
Caustis dioica									1																						
Chordifex ornatus									1																						
Lyginia barbata					1		1	1		1	1																				
Adenanthos cuneatus						1	1	1	1		1																				
Melaleuca thymoides							1	1	1	1	1																				
Stylidium repens			1			1	1	1	1	1	1	1			1	1			1	1				1	1		1				
Banksia attenuata								1		1	1	1	1																		
Hibbertia subvaginata								1	1	1		1	1																		
Calytrix flavescens						1		1		1	1	1																			
Billardiera fusiformis								1				1	1								1										
Jacksonia furcellata						1					1	1		1																	
Dianella brevicaulis											1	1																			
Kunzea ericifolia												1	1																		
Lomandra rupestris												1	1																		
Loxocarya cinerea												1	1																		
Podotheca angustifolia												1	1																		
Dianella revoluta											1		1																		1
Austrostipa hemipogon											1		1									1									
Microlaena stipoides					1								1		1					1											
Hakea prostrata			1									1	1				1					1				1					
Trachymene pilosa											1	1	1	1	1		1	1		1					1						
Rhodanthe citrina											1		1	1	1	1		1													
Austrostipa scabra													1	1	1																

Appendix 5 cont. Two way table of site and species data. (red = Proteaceous species, **Bold = dominant**)

Broad landform/soil type	Drainage						Well drained deep sand						Mix=sandy loam to gravelly clay loams plains/slopes																SR Outlier			
Site (Relevé) No.	28	26	27	24	23	11	1	4	2	8	10	32	20	7	13	14	17	16	19	12	29	9	5	25	31	30	15	21	3	6	18
Likely I Vegetation association	Hvar /-Hpro			Blit			Batt/ Line N		LeBc	Batt C		Batt Gor R		Bgra	Bses			HtriBdru	Barm					Htri /-Hund			Mix Prot	SR Outlier Complex			Blen_rep
General Location	SW	SW	SW	S	S	C	NE	NE	NE	CE	C	N	N	CE	C	CW	N	N	N	C	SW	C	NE	SW	SW	SW	CW	CN	NE	CN	N
Condition	E	VG	E	E	E	E	E	EVG	G	VG	E	VG	G	VG	VG	E	E	VG	VG	VG	E	E	E	VG	E	E	E	E	E	E	E
Soil type (broad)	CL	SL		S	S	S	S	S	S	S	S	S	S	GS		GL	GCS	GCS	GCL	SL	GL	LC	SL	GL	GSCL	SC	CS	CL	CS	LS	GCL
Lepidosperma "squamatum" complex			1			1								1	1																1
Austrodanthonia setacea									1					1	1	1							1								1
Anigozanthos humilis														1	1			1								1					
Lagenophora huegelii															1	1				1											
Acacia browniana var. intermedia															1	1		1													
Boronia ramosa															1				1												
Calothamnus sanguineus																1			1												
Banksia drummondii																		1													
Banksia nivea																		1	1												
Leptospermum erubescens												1					1	1													
Conostylis villosa																	1	1													
Tricoryne elatior													1				1	1						1							
Caesia micrantha																	1	1		1											
Gompholobium knightianum																1	1				1										
Stylidium piliferum												1				1	1		1											1	
Gastrolobium spinosum																	1	1	1									1			
Banksia sessilis var sessilis														1	1	1	1		1												
Bossiaea eriocarpa															1		1	1	1	1		1									
Eucalyptus wandoo															1		1	1	1	1		1			1						
Hakea lissocarpha																1		1	1	1	1			1	1						
Opercularia vaginata												1				1		1	1	1						1		1			
Pittosporaceae sp.																1	1	1	1			1			1			1			1
Chamaescilla corymbosa	1			1		1									1	1	1	1	1	1		1				1			1	1	
Hibbertia commutata														1		1				1	1	1		1	1						
Lepidosperma tenue																1	1	1	1			1	1			1					
Tetraria octandra														1		1		1	1	1	1	1		1	1			1		1	
Hibbertia gracilipes							1									1	1	1	1		1	1	1		1			1	1		
Eucalyptus marginata subsp. marginata											1			1	1	1			1	1	1			1	1					1	
Tetraria sp. Jarrah Forest (R. Davis 7391)		1	1									1			1	1		1	1		1	1	1	1	1		1	1	1		
Neurachne alopecuroidea	1	1	1		1							1	1		1		1	1	1	1		1	1		1	1	1	1	1	1	1	1
Desmocladus fasciculatus	1	1	1											1		1		1	1		1			1	1		1	1	1		
Banksia armata																		1	1	1	1	1	1		1	1	1	1	1	1	
Mesomelaena stygia subsp. stygia																		1	1	1		1	1		1	1	1	1	1		
Chamaexeros serra																		1	1			1	1		1	1	1	1	1		
Xanthorrhoea platyphylla	1	1	1		1													1	1		1		1		1	1	1		1	1	
Goodenia coerulea																1		1	1		1			1	1					1	1
Banksia dallanneyi		1	1													1					1	1			1	1	1				
Haemodorum laxum																						1	1	1		1	1		1		
Isopogon teretifolius subsp. teretifolius																							1		1		1			1	
Hakea undulata																								1	1		1				
Stylidium tenue																1					1			1	1				1	1	
Bossiaea ornata																1					1			1	1						
Petrophile serruriae																					1			1	1						
Babingtonia camphorosmae																				1		1			1	1					1
Petrophile squamata																	1								1	1					
Gompholobium marginatum																		1							1	1	1				
Hakea trifurcata																		1							1	1	1				
Persoonia striata																			1							1	1			1	
Daviesia preissii																1										1	1				
Allocasuarina microstachya																										1	1				
Stylidium eriopodum																							1			1	1		1		
Leverhookia pusilla											1				1		1					1	1			1					
Pterochaeta paniculata																		1				1	1			1					
Tetratheca virgata																					1	1			1		1				
Eucalyptus falcata																						1	1				1				
Leucopogon sp. Great Southern (R.S. Cowan A 586)																						1	1				1		1		
Conostylis setigera subsp. setigera							1									1						1	1		1					1	
Boronia subsessilis																						1					1		1		
Chamaescilla spiralis																							1				1				
Rinzia fumana																			1				1				1				
Dampiera alata		1														1					1			1			1	1			1
Harperia lateriflora			1															1		1			1			1					1
Lepidosperma sp. 1																											1		1		
Xanthosia singuliflora																	1	1									1		1		
Schoenus pleiostemoneus																		1								1	1	1			
Verticordia habrantha																			1			1					1	1	1		
Schoenus obtusifolius																			1				1				1	1	1		
Anarthria gracilis																											1	1	1	1	
Hakea ambigua																												1	1	1	
Leucopogon gibbosus																												1	1	1	
Desmocladus flexuosus																				1									1	1	
Gastrolobium velutinum																												1		1	
Lepidosperma sp 2																1			1									1		1	
Banksia sphaerocarpa var spherocarpa																												1	1		
Melaleuca sp hairy																												1	1		
Dampiera juncea																												1	1		
Darwinia vestita																					1						1		1	1	
Lysinema ciliatum																													1	1	
Calothamnus microcarpus																													1	1	
Allocasuarina humilis																										1			1	1	
Petrophile divaricata																													1	1	
Taxandria spathulata							1																						1	1	
Pyrorchis nigricans						1					1																			1	
Leucopogon sp1																			1			1								1	
Banksia brunnea																							1					1			

Appendix 5 cont. Two way table of site and species data. (red = Proteaceous species, **Bold = dominant**)

Broad landform/soil type	Drainage						Well drained deep sand					Mix=sandy loam to gravelly clay loams plains/slopes																		SR Outlier			
Site (Relevé) No.	28	26	27	24	23	11	1	4	2	8	10	32	20	7	13	14	17	16	19	12	29	9	5	25	31	30	15	21	3	6	18
Likely I Vegetation association	Hvar /Hpro			Blit			Batt/ Line N		LeBc	Batt C		Batt Gor R		Bgra	Bses			Htri/Bdru	Banm					Htri /Hund			Mix Prot	SR Outlier Complex			Bten_rep
General Location	SW	SW	SW	S	S	C	NE	NE	NE	CE	C	N	N	CE	C	CW	N	N	N	C	SW	C	NE	SW	SW	SW	CW	CN	NE	CN	N
Condition	E	VG	E	E	E	E	E	EVG	G	VG	E	VG	G	VG	VG	E	E	VG	VG	VG	E	E	E	VG	E	E	E	E	E	E	E
Soil type (broad)	CL	SL		S	S	S	S	S	S	S	S	S	S	GS	GL		GCS	GCS	GCL	SL	GL	LC	SL	GL	GSCL	SC	CS	CL	CS	LS	GCL
Beaufortia schaueri																												1			1
Eucalyptus phaenophylla																															1
Banksia tenuis var. reptans																															1
Baeckea pygmaea																															1
Melaleuca hamata																															1
Hakea marginata																															1
Melaleuca lateriflora																															1
Comesperma polygaloides					1																										1
Dampiera lavandulacea																															1
Boronia crenulata																									1						1
Eutaxia parvifolia																															1
Laxmannia minor																															1
Trichocline spathulata																															1
Acacia lasiocarpa																															1
Acacia pulchella var. goadbyi														1								1									
Corymbia calophylla	1													1	1						1			1							
Banksia grandis														1																	
Corynotheca micrantha														1																	
Scaevola striata						1						1		1							1				1						
Nuytsia floribunda														1																	
Pelargonium littorale				1										1																	
Kennedia prostrata														1																	
Austrostipa site 7														1																	
Poranthera microphylla														1																	
Allocasuarina huegeliana													1																		
Macrozamia riedlei													1																		
Aristida contorta													1																		
Stypandra glauca													1																		
Hakea pandanicarpa subsp crassifolia							1																								
Petrophile ericifolia subsp. ericifolia							1																								
Orchid sp. site 1							1																								
Conostylis serrulata							1																								
Tricostularia sp. south coast (R.T. Wills 1423)								1																							
Calothamnus gracilis								1																							
Eucalyptus decipiens								1						1																	
Isopogon trilobus								1																							
Harperia confertospicata								1																							
Hibbertia microphylla								1																							
Johnsonia teretifolia								1																							
Leucopogon sprengelioides								1																							
Schoenus caespititius								1																							
Actinotus glomeratus								1																							
Petrophile crispata																											1				
Chorizema rhombeum																											1				
Eucalyptus incrassata																											1				
Chorizema aciculare																											1				
Jacksonia alata																											1				
Ptilotus declinatus																											1				
Thelymitra crinita																											1				
Comesperma volubile																							1								
Eucalyptus preissiana																												1			
Stylidium hirsutum																											1	1			
Kunzea recurva																												1			
Leucopogon aff elatior																												1			
Patersonia limbata																												1			
Patersonia pygmaea		1																										1			
Regelia inops																												1			
Hakea lehmanniana																												1			
Melaleuca spathulata																												1			
Banksia tenuis var. tenuis																												1			
Beaufortia anisandra																												1			
Acacia squamata																												1			
Eucalyptus pachyloma																													1		
Verticordia coronata																													1		
Eucalyptus pleurocarpa																													1		
Leporella fimbriata																													1		
Lomandra sp."unident"																													1		
Lomandra caespitosa	1														1														1		
Stylidium schoenoides																													1		
Schoenus sp site 3																													1		
Thysanotus manglesianus																													1		
Thysanotus brevifolius																											1		1		
Hibbertia recurvifolia	1																				1						1			1	
Eucalyptus lehmannii																														1	
Laxmannia sp. "unident"																														1	
Calothamnus quadrifidus																														1	
Calytrix leschenaultii																		1													
Calothamnus planifolius																		1													
Schoenus subbarbatus							1								1			1													
Levenhookia stipitata				1											1			1								1					
Laxmannia sessiliflora															1																
Lechenaultia formosa															1																
Xanthosia huegelii															1											1					
Hyalosperma cotula															1																
Gompholobium tomentosum															1																
Isotropis cuneifolia					1										1																
Tetraria sp. Mt Madden (C.D. Turley 40 BP/897)																	1														
Podolepis gracilis																	1														

Appendix 5 cont. Two way table of site and species data. (red = Proteaceous species, **Bold = dominant**)

Broad landform/soil type	Drainage						Well drained deep sand							Mix=sandy loam to gravelly clay loams plains/slopes															SR Outlier			
Site (Relevé) No.	28	26	27	24	23	11	1	4	2	8	10	32	20	7	13	14	17	16	19	12	29	9	5	25	31	30	15	21	3	6	18
Likely I Vegetation association	Hvar /Hpro			Blit			Batt/ Line N		LeBc	Batt C		Batt Gor.R		Bgra	Bses			HtnBdru	Barm					Htti /Hund			Mix Prof	SR Outlier Complex			Blen_rep
General Location	SW	SW	SW	S	S	C	NE	NE	NE	CE	C	N	N	CE	C	CW	N	N	N	C	SW	C	NE	SW	SW	SW	CW	CN	NE	CN	N
Condition	E	VG	E	E	E	E	E	EVG	G	VG	E	VG	G	VG	VG	E	E	VG	VG	VG	E	E	E	VG	E	E	E	CN	NE	CN	N
Soil type (broad)	CL	SL		S	S	S	S	S	S	S	S	S	S	GS		GL	GCS	GCS	GCL	SL	GL	LC	SL	GL	GSCL	SC	CS	CL	CS	LS	GCL
Trymalium ledifolium																1						1			1						
Hibbertia acerosa																1															
Scaevola calliptera																1								1							
Thysanotus glaucus																1															
Tetratheca affinis																1															
Tricoryne humilis		1														1															
Boronia spathulata			1	1												1					1			1							
Asteridea nivea																1															
Astroloma pallidum																1					1										
Daucus glochidiatus																1															
Acacia stenoptera																			1							1					
Gompholobium polymorphum																			1												
Diuris setacea																			1												
Lomandra suaveolens	1																		1							1					
Amphipogon amphipogonoides																			1			1									
Pultenaea verruculosa																			1												
Eucalyptus pleurocarpa																							1						1		
Banksia dentata																							1								
Allocasuarina thuyoides																							1								
Lobelia rhombifolia																							1								
Stachystemon virgatus																							1								
Cassytha micrantha																						1						1			
Helichrysum leucopsideum																						1									
Stackhousia monogyna																						1									
Craspedia variabilis																				1											
Poa drummondiana																				1											
Schoenus small hairy																				1											
Drosera sp.																				1											
Jacksonia spinosa										1																					
Austrostipa sp. site 8										1																					
Crassula colorata										1																					
Leucopogon obovatus					1						1																				
Stirlingia latifolia											1																				
Amphipogon sp "unident"								1				1					1			1					1						
Lepidospermum ?striatum												1																			
Lepidosperma sp site 32												1																			
Austrostipa sp. "unident"												1		1																	
Hakea ceratophylla						1																									
Haemodorum spicatum						1																									
Drosera erythrorhiza						1																									
Siloxerus filifolius						1																									
Austrostipa compressa						1																									
Drosera dichrosepala						1									1																
Melaleuca rhaphiophylla					1																										
Taxandria parviceps					1																										
Agonis flexuosa var. latifolia					1																										
Acacia saligna					1																										
Sowerbaea laxiflora					1																										
Centrolepis aristata		1			1																										
Centrolepis mutica					1																										
Stylidium caespitosum					1																										
Haemodorum sparsiflorum			1		1																										
Amphipogon laguroides					1																										
Schoenus sp. site 23					1																										
Acacia pulchella var. pulchella				1																				1							
Melaleuca pauciflora				1																											
Hibbertia stellaris				1																											
Restionaceae sp."unident"				1																											
Anarthria laxa				1																											
Schoenus laevigatus				1																											
Isolepis cernua var. setiformis				1																											
Anigozanthus flavidus				1																											
Lobelia anceps				1																											
Senecio glomeratus				1																											
Austrostipa sp "unident"				1																											
Grevillea quercifolia																								1							
Lepidosperma sp. site 25																								1							
Grass sp "unident"																								1							
Gompholobium preissii																					1			1							
Acacia nervosa																					1										
Gastrolobium praemorsum																					1										
Hovea chorizemifolia																					1										
Patersonia babianoides																					1										
Isopogon attenuatus																					1										
Schoenus ? brevisetis																					1										
Lomandra sericea																					1				1						
Eucalyptus decipiens								1						1												1					
Verticordia densiflora var. cespitosa																										1					
Stenantheum emarginatum																										1					
Lepidosperma sp. site 30																										1					
Marianthus sp.																									1						
Austrodanthonia sp. "unident"																									1	1					
Acacia browniana var. browniana																									1						
Lobelia gibbosa																									1						
Total native species	32	36	34	40	39	23	22	32	11	11	21	26	20	29	31	40	24	39	39	27	37	34	29	27	41	44	41	43	42	31	26
Total Proteaceous species	1	5	4	2	1	4	6	6	3	1	3	2	2	2	1	3	3	5	5	2	6	3	4	4	9	8	7	7	3	5	2

Appendix 6 - Site data

SITE 1 WP 119 DATE 9/11/2011 RECORDERS E.M. Sandiford, W. Bradshaw

LAT/LONG -34.29564/ 117.87501 NORTHING/EASTING 6204716.57/580525.67

LOCATION East Boundary, Jebarijup Nature Reserve

VEGETATION TYPE *Banksia attenuata /Lambertia inermis* Tall Open Shrubland

LANDFORM Plain SLOPE Gentle ASPECT S

GEOLOGY %ROCK 0 SOIL TYPE Sand SOIL COLOUR :light grey/pink

HYDROLOGY Good drainage CONDITION Excellent

NOTES Other Proteaceous species in releve or vicinity but outside releve including *Banksia attenuata, B nutans, B nivea, Petrophile filifolia, Stirlingia latifolia, Franklandia fucifolia & Isopogon trilobus*

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Shrubs >2m	10-30	***Lambertia inermis* var. *inermis*** *Hakea pandanicarpa subsp crassifolia* *Hakea corymbosa* *Leptospermum oligandrum*
Shrubs 0.5-1m	30-70	***Eremaea pauciflora*** *Taxandria spathulata* *Melaleuca thymoides* *Adenanthos cuneatus* *Petrophile ericifolia subsp. ericifolia*
Shrubs <0.5	2-10	***Banksia repens*** *Melaleuca subtrigona* *Andersonia simplex* *Hibbertia gracilipes*
Sedges	2-10	***Lyginia barbata*** ***Tricostularia neesii*** *Onychosepalum laxiflorum* *Schoenus subbarbatus* *Hypolaena fastigiata*
Herbs	-	*Stylidium repens* *Conostylis setigera subsp. setigera* *Conostylis serrulata* *Orchid site 1*

SITE 2 WP 121 DATE 9/11/2011 RECORDERS E.M. Sandiford, W. Bradshaw

LAT/LONG -34.29615/ 117.77352 NORTHING/EASTING 6204736.37/ 571184.66

LOCATION Lot 4455, Balicup Rd/Hamilla Rd, Cranbrook

VEGETATION TYPE *Lambertia ericifolia/Banksia coccinea* Tall Shrubland

LANDFORM Middle slope SLOPE Gentle ASPECT SE

GEOLOGY %ROCK 0 SOIL TYPE Sand SOIL COLOUR light grey/pink

HYDROLOGY good drainage CONDITION Good

NOTES Area been grazed by sheep, bare understorey though very little weeds Previously had very dense *Banksia. coccinea*. Most dead or senescent, a few seedlings vulnerable to grazing.

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Shrubs >2m	10-30	***Lambertia ericifolia*** *Banksia coccinea*
Shrubs <0.5-1	-	*Melaleuca thymoides* *Jacksonia grevilleoides* *Adenanthos cuneatus*
Shrubs <0.5	<2	***Hibbertia subvaginata***
Sedges	2-10	***Chordifex ornatus P1*** *Schoenus curvifolius* *Caustis dioica*
Herbs	-	***Stylidium repens***
Grass		*Austrodanthonia acerosa*

SITE 3 WP 125 DATE 9/11/2011 RECORDERS E.M. Sandiford, W. Bradshaw

LAT/LONG -34.29478/117.77283 NORTHING/EASTING 6204888.54/571122.12

LOCATION Lot 4455, Balicup Rd/Hamilla Rd, Cranbrook

VEGETATION TYPE Stirling Range Outlier Complex

LANDFORM Middle slope SLOPE Gentle/moderate ASPECT SW

GEOLOGY Sandstone %ROCK >50 SOIL TYPE Clay Sand SOIL COLOUR Yellow brown

HYDROLOGY Good drainage CONDITION Excellent

NOTES Other Proteceous in relevee or vicinity *Hakea trifurcata* and *Persoonia striata*.

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Mallee <8m	2-10	***Eucalyptus pachyloma***
		Eucalyptus pleurocarpa
Shrubs >1-2m	30-70	***Banksia armata***
		Taxandria spathulata
		Banksia sphaerocarpa var. spheerocarpa
		Hakea ambigua
		Petrophile divaricata
		Xanthorrhoea platyphylla
Shrubs <0.5	10-30	***Verticordia coronata***
		Calothamnus microcarpus
		Darwinia vestita
		Allocasuarina humilis
		Verticordia habrantha
		Boronia subsessilis
		Leucopogon gibbosus
		Dampiera juncea
		Lysinema ciliatum
		Leucopogon sp. Great Southern (R.S. Cowan A 586)
		Melaleuca sp hairy
		Hibbertia gracilipes
Sedges	2-10	***Lepidosperma sp. 1***
		Mesomelaena stygia subsp. stygia
		Desmocladus fasciculatus
		Anarthria gracilis
		Desmocladus flexuosus
		Tetraria sp. Jarrah Forest (R. Davis 7391
		Schoenus sp site 3
		Schoenus obtusifolius
Herbs	<2	***Chamaexeros serra***
		Haemodorum laxum — *Thysanotus manglesianus*
		Stylidium eriopodum — *Stylidium schoenoides*
		Stylidium tenue — *Chamaescilla corymbosa*
		Lomandra caespitosa — *Leporella fimbriata*
		Xanthosia singuliflora — *Lomandra* 3b
		Thysanotus brevifolius
Grass	<2	***Neurachne alopecuroidea***

SITE 4 WP 130 DATE 9/11/2011 RECORDERS E.M. Sandiford, W. Bradshaw

LAT/LONG 34.29830/ 117.80312 NORTHING/EASTING 6204476.71/573907.41

LOCATION NE corner Salt Lake Nature Reserve (Res 25812) near Balicup Rd/Salt River Rd

VEGETATION TYPE *Banksia attenuata /Lambertia inermis* Tall Open Shurbland

LANDFORM Plain (slight rise) SLOPE Flat ASPECT SW

GEOLOGY %ROCK SOIL TYPE Sand SOIL COLOUR :Light Grey

HYDROLOGY good drainage CONDITION Excellent/Very Good

NOTES

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Tree<10m	2-10	***Banksia attenuata***
Mallee <8m	<2 (e)	***Eucalyptus decipiens***
Shrubs >1-2m	10-30	***Leptospermum oligandrum*** *Banksia coccinea* *Lambertia inermis* var. *inermis*
Shrubs 1-2m	2-10	***Melaleuca thymoides***
Shrubs 0.5-1m	10-30	***Banksia nutans*** ***Adenanthos cuneatus*** ***Calothamnus gracilis*** *Eremaea pauciflora* *Isopogon trilobus*
Shrubs <0.5m	2-10	***Melaleuca subtrigona*** *Hibbertia subvaginata* *Calytrix flavescens* *Baeckea preissiana* *Andersonia simplex* *Astroloma baxteri* *Leucopogon sprengelioides* *Hibbertia microphylla*
Sedges	10-30	***Tricostularia* sp. south coast (R.T. Wills 1423)** ***Tricostularia neesii*** ***Hypolaena fastigiata*** *Lyginia barbata* *Harperia confertospicata* *Hypolaena exsulca* *Schoenus caespititius*
Herbs	-	*Stylidium repens* *Billardiera fusiformis* *Actinotus glomeratus* *Pyrorchis nigricans*
Grass	-	**Aira cupaniana* **Vulpia myuros* *Amphipogon sp*

SITE 5 WP 132 DATE 9/11/2011 RECORDERS E.M. Sandiford, W. Bradshaw

LAT/LONG -34.31243/117.80324 NORTHING/EASTING 6202909.21/573905.88

LOCATION NE corner Plantagenet Lot 4482 Salt River Road

VEGETATION TYPE Jarrah/Wandoo or Wandoo/*Eucalyptus falcata* Open Woodland over *Banksia armata* Low Shrubland

LANDFORM Plain SLOPE very gentle ASPECT E

GEOLOGY Laterite-sandstone %ROCK SOIL TYPE Sand loam SOIL COLOUR : not rec

HYDROLOGY CONDITION Excellent

NOTES Aslo present *Banksia sphaerocarpa*

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Mallee <8m	2-10	***Eucalyptus pleurocarpa***
		Eucalyptus falcata
Shrubs 0.5-1m	10-30	***Banksia armata***
		Banksia densa
		Allocasuarina thuyoides
Shrubs <0.5m	<2	*Banksia brunnea*
	Mix dom	*Leucopogon sp. Great Southern (R.S. Cowan A 586)*
		Xanthorrhoea platyphylla
		Hibbertia gracilipes
		Isopogon teretifolius subsp. teretifolius
		Stachystemon virgatus
		Rinzia fumana
Sedges	2-10	***Mesomelaena stygia subsp. stygia***
		Lepidosperma tenue
		Harperia lateriflora
		Lepidosperma sp.1
		Schoenus obtusifolius
Herbs	2-10	***Chamaexeros serra***
		Stylidium eriopodum
		Haemodorum laxum
		Comesperma volubile
		Chamaescilla spiralis
		Conostylis setigera subsp. setigera
		Pterochaeta paniculata
		Lobelia rhombifolia
		Cassytha racemosa
		Levenhookia pusilla
Grass	2-10	***Neurachne alopecuroidea***
		Austrodanthoia acerosa

SITE 6 WP 135 DATE 9/11/2011 RECORDERS E.M. Sandiford, W. Bradshaw

LAT/LONG -34.29150/117.63420 NORTHING/EASTING 6205340.85/558366.50

LOCATION Lot 6137 Barytes Rd, Cranbrook

VEGETATION TYPE Stirling Range Outlier Complex

LANDFORM Upper slope, ridge SLOPE Gentle ASPECT SW

GEOLOGY Sandstone %ROCK SOIL TYPE loamy sand SOIL COLOUR Pink/grey

HYDROLOGY Ggood drainage CONDITION Excellent

NOTES Also present *Banksia sphaerocarpa*

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Mallee <8m	2-10	*Eucalyptus marginata* subsp. *marginata* *Eucalyptus lehmannii*
Shrubs 1-2m	30-70	***Banksia armata*** ***Taxandria spathulata*** ***Hakea ambigua*** *Calothamnus quadrifidus*
Shrubs 0.5-1	-	***Isopogon teretifolius subsp. teretifolius.*** *Xanthorrhoea platyphylla* *Calothamnus microcarpus* *Gastrolobium velutinum*
Shrubs <0.5	10-30	***Hibbertia recurvifolia*** ***Leucopogon sp1*** *Allocasuarina humilis* *Persoonia striata* *Leucopogon gibbosus* *Petrophile divaricata* *Darwinia vestita* *Lysinema ciliatum*
Sedges	2-10	***Lepidosperma* sp 2** ***Desmocladus flexuosus*** *Tetraria octandra* *Anarthria gracilis* *Tetraria sp. Jarrah Forest (R. Davis 7391)*
Herbs	<2	*Stylidium tenue* *Conostylis setigera subsp. setigera* *Goodenia coerulea* *Chamaescilla corymbosa* *Stylidium piliferum* *Pyrorchis nigricans* *Laxmannia sp "unident"*
Grass	<2	***Neurachne alopecuroidea***

SITE 7 WP 142 DATE 10/11/2011 RECORDERS E.M. Sandiford, W. Bradshaw

LAT/LONG -34.40083/117.67324 NORTHING/EASTING 6193193.63/561878.82

LOCATION Lot 14 View Range Rd Kendenup

VEGETATION TYPE Marri Woodland over *Banksia grandis* Open Shrubland

LANDFORM Plain SLOPE Flat ASPECT

GEOLOGY %ROCK 0 SOIL TYPE Gravelly sand SOILL COLOUR :Grey

HYDROLOGY CONDITION Very Good

NOTES soil with quartz gravel. open understorey.

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Trees 10-30m	2-10	***Corymbia calophylla***
		Eucalyptus marginata subsp. marginata
Tree <10m	-	*Eucalyptus decipiens*
		Nuytsia floribunda
Shrubs 1-2m	2-10	***Banksia grandis***
		Banksia sessilis var. sessilis
		Jacksonia furcellata
Shrubs 0.5-1m	2-10	***Acacia pulchella var. goadbyi***
Shrubs <0.5	-	*Hibbertia commutata*
Sedges	<2	***Desmocladus fasciculatus***
		Tetraria octandra
		Hypolaena exsulca
		Lepidosperma "squamatum" complex
Herbs	10-30	***Corynotheca micrantha***
		Scaevola striata
		Conostylis aculeata
		Lomandra micrantha
		Kennedia prostrata
		Rhodanthe citrina
		Patersonia occidentalis
		Trachymene pilosa
		Poranthera microphylla
		Anigozanthos humilis
		Pelargonium littorale
		**Ursinia anthemoides*
Grass	<2	***Austrostipa scabra***
		Austrodanthonia acerosa
		Austrostipa sp "unident"
		**Briza maxima*

SITE 8 WP 143 10/11/2011 RECORDERS E.M. Sandiford, W. Bradshaw

LAT/LONG -34.39103/117.66667 NORTHING/EASTING 6194285.00/561282.95

LOCATION John Hitchins Reserve Lot 2429 Chinninup Rd, Tenterden

VEGETATION TYPE *Banksia attenuata* Woodland – central

LANDFORM Plain/slope SLOPE gentle ASPECT SE

GEOLOGY %ROCK 0 SOIL TYPE Sand SOIL COLOUR :Grey

HYDROLOGY good drainage CONDITION Very Good

NOTES Some quartz gravel. Burnt Tenterden fires 20??

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Tree <10m	10-30	***Banksia attenuata***
Shrubs >2m	30-70	***Jacksonia spinosa***
Shrubs 1-2m	2-10	***Melaleuca thymoides***
Shrubs <0.5m	2-10	***Calytrix flavescens*** *Hibbertia subvaginata* *Baeckea preissiana*
Sedges	-	*Tricostularia compressa/neesii* *Lyginia barbata*
Herbs	-	*Stylidium repens* *Crassula colorata* *******Hypochaeris glabra* **Trifolium arvense*
Grass	-	*Austrostipa sp site 8* **Aira cupaniana* **Vulpia myuros*

SITE 9 WP 145 DATE 9/11/2011 RECORDERS E.M. Sandiford, W. Bradshaw

LAT/LONG -34.40432/117.55352 NORTHING/EASTING 6192872.94/550873.00

LOCATION Approx 1km along Martegellup Tenterden Rd south of Albany Hwy

VEGETATION TYPE Jarrah/Wandoo or Wandoo/*Eucalyptus falcata* Open Woodland over *Banksia armata* Low Shrubland

LANDFORM Plain SLOPE Flat ASPECT -

GEOLOGY % ROCK SOIL TYPE Loam +/-clay/sand SOIL COLOUR : Brown

HYDROLOGY CONDITION Excellent

NOTES

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Tree <10m	2-10	***Eucalyptus occidentalis***
		Eucalyptus wandoo
Mallee >8m	2-10	***Eucalyptus falcata***
Shrubs >2m	<2 (e)	***Hakea prostrata***
Shrubs 0.5-1m	30-70	***Banksia armata***
		Hypocalymma angustifolium
		Tetratheca virgata
Shrubs <0.5m	-	*Trymalium ledifolium*
		Leucopogon sp. Great Southern (R.S. Cowan A 586)
		Boronia subsessilis
		Hibbertia gracilipes
		Acacia pulchella var. goadbyi
		Hibbertia commutata
		Verticordia habrantha
		Leucopogon sp 1
		Babingtonia camphorosmae
		Banksia dallanneyi
Sedges	2-10	***Mesomelaena stygia subsp. stygia***
		Lepidosperma tenue
		Tetraria octandra
		Tetraria sp. Jarrah Forest (R. Davis 7391)
Herbs	<2	***Pittosporaceae sp***
		Chamaexeros serra
		Stackhousia monogyna
		Haemodorum laxum
		Pterochaeta paniculata
		Chamaescilla corymbosa
		Conostylis setigera subsp. Setigera
		Cassytha micrantha
		Helichrysum leucopsideum *Levenhookia pusilla*
Grass	2-10	***Neurachne alopecuroidea***
		Austrostipa hemipogon
		Amphipogon amphipogonoides

SITE 10 WP 149 DATE 10/11/2011 RECORDERS E.M. Sandiford, W. Bradshaw

LAT/LONG -34.43259/117.50870 NORTHING/EASTING 6189760.28/546737.92

LOCATION NW corner Martegellup Nature Reserve (Res 16262), Kendenup

VEGETATION TYPE *Banksia attenuata* Woodland – central

LANDFORM Plain SLOPE Flat ASPECT -

GEOLOGY %ROCK 0 SOIL TYPE Sand SOIL COLOUR :brown/grey

HYDROLOGY good drainage CONDITION Excellent

NOTES

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Tree<10m	<2 (e)	***Eucalyptus marginata subsp. marginata***
Tree<10m	30-70	***Banksia attenuata***
Shrubs 0.5-1m	30-70	***Melaleuca thymoides*** ***Adenanthos cuneatus*** *Jacksonia furcellata*
Shrubs <0.5m	2-10	***Calytrix flavescens*** *Stirlingia latifolia* *Astroloma baxteri* *Dampiera linearis* *Bossiaea praetermissa* *Leucopogon obovatus*
Sedges	<2	***Lyginia barbata*** *Hypolaena exsulca*
Herbs	2-10	***Stylidium repens*** ***Dianella brevicaulis*** *Dianella revoluta* *Trachymene pilosa* *Rhodanthe citrina* *Levenhookia pusilla* *Pyrorchis nigricans* *******Hypochaeris radicata* *******Asparagus asparagoides*
Grass	-	*Austrostipa hemipogon* **Aira cupaniana*

SITE 11 WP 153 DATE 10/11/2011 RECORDERS E.M. Sandiford, W. Bradshaw

LAT/LONG -34.43278/117.51385 NORTHING/EASTING 6189737.07/547211.46

LOCATION N boundary Martegellup Nature Reserve (Res 16262), Kendenup

VEGETATION TYPE *Banksia littoralis* Low Woodland

LANDFORM Drainage depression SLOPE Flat ASPECT

GEOLOGY %ROCK 0 SOIL TYPE Sand SOIL COLOUR Grey

HYDROLOGY Poor drainage CONDITION Excellent

NOTES Also present *Hakea prostrata*

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Tree<10m	10-30	***Banksia littoralis***
Shrubs <1-2	2-10	***Hakea corymbosa*** ***Adenanthos cuneatus*** *Jacksonia furcellata*
Shrubs 0.5-1	10-30	***Pericalymma ellipticum*** *Hakea ceratophylla*
Shrubs < 0.5	-	*Calytrix flavescens* *Bossiaea praetermissa*
Sedges	>70	***Chordifex laxus*** *Tricostularia compressa/neesii* *Lepidosperma "squamatum" complex*
Herbs	<2	***Stylidium repens*** ***Goodenia pulchella*** *Haemodorum spicatum* *Drosera dichrosepala* *Drosera pulchella* *Chamaescilla corymbosa* *Pyrorchis nigricans* *Patersonia occidentalis* *Drosera erythrorhiza* *Siloxerus filifolius* *Scaevola striata*
Grass		*Austrostipa compressa*

SITE 12 WP 155 DATE 10/11/2011 RECORDERS E.M. Sandiford, W. Bradshaw

LAT/LONG -34.41946/117.47528 NORTHING/EASTING 6191231.37/543674.14

LOCATION W boundary Lot 791, Nunijup Rd, Tenterden

VEGETATION TYPE Jarrah/Wandoo or Wandoo/*Eucalyptus falcata* Open Woodland over *Banksia armata* Low Shrubland

LANDFORM Plain/upperslope SLOPE gentle ASPECT SE

GEOLOGY %ROCK SOIL TYPE Sandy loam SOIL COLOUR Brown

HYDROLOGY CONDITION Very Good

NOTES

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Tree <10m	10-30	***Eucalyptus wandoo***
		Eucalyptus marginata subsp. marginata
Shrubs <0.5m	10-30	***Banksia armata***
		Bossiaea eriocarpa
		Hakea lissocarpha
		Hibbertia commutata
		Hibbertia cunninghamii
		Babingtonia camphorosmae
Sedges	2-10	***Mesomelaena stygia subsp. stygia***
		Desmocladus flexuosus
		Tetraria octandra
		Harperia lateriflora
		Schoenus small hairy
Herbs	2-10 mix	*Opercularia vaginata*
		Chamaescilla corymbosa
		Stylidium repens
		Craspedia variabilis
		Conostylis pusilla
		Trachymene pilosa
		Lagenophora huegelii
		Caesia micrantha
		Goodenia pulchella
		Drosera sp.
Grass	10-30	***Neurachne alopecuroidea***
		Microlaena stipoides
		Poa drummondiana
		*Amphipogon sp "*unident"
		**Aira cupaniana*

SITE 13 WP 173 DATE 10/11/2011 RECORDERS E.M. Sandiford, W. Bradshaw

LAT/LONG -34.41660/117.46877 NORTHING/EASTING 6191550.6/543077.17

LOCATION W boundary Lot 791, Nunijup Rd, Tenterden

VEGETATION TYPE Wandoo/Jarrah over *Banksia sessilis* Tall Open Shrubland

LANDFORM Plain SLOPE Vey gentle ASPECT SE

GEOLOGY %ROCK SOIL TYPE not rec SOIL COLOUR not rec

HYDROLOGY CONDITION Very Good

NOTES Old Banksia sessilis, sparse understorey and very diverse herb layer

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Tree 10-30	2-10	***Eucalyptus wandoo***
		Eucalyptus marginata subsp. marginata
		Corymbia calophylla
Shrubs >2m	2-10	***Banksia sessilis var. sessilis***
Shrubs <0.5m	2-10	***Bossiaea eriocarpa***
		Boronia ramosa
		Gompholobium tomentosum
		Acacia browniana var. intermedia
		Lechenaultia formosa
Sedges	-	*Lepidosperma "squamatum" complex*
		Tetraria sp. Jarrah Forest (R. Davis 7391)
		Schoenus subbarbatus
Herbs	2-10	***Stylidium repens***
		Hyalosperma cotula
		Lomandra caespitosa
		Drosera dichrosepala
		Anigozanthos humilis
		Chamaescilla corymbosa
		Laxmannia sessiliflora
		Trachymene pilosa
		Lagenophora huegelii
		Rhodanthe citrina
		Isotropis cuneifolia
		Xanthosia huegelii
		Levenhookia stipitata
		Levenhookia pusilla
Grass	2-10	***Neurachne alopecuroidea***
		Austrostipa scabra
		Amphipogon debilis
		Microlaena stipoides
		Austrodanthonia setacea

SITE 14 WP 176 DATE 10/11/2011 RECORDERS E.M. Sandiford, W. Bradshaw

LAT/LONG -34.38958/117.34431 NORTHING/EASTING 6194592.68/531650.54

LOCATION Lot 2 Stockdale Rd, Tenterden

VEGETATION TYPE Wandoo/Jarrah over *Banksia sessilis* Tall Open Shrubland

LANDFORM Upper slope SLOPE Gentle ASPECT NE

GEOLOGY %ROCK 0 SOIL TYPE Gravelly loam SOIL COLOUR Brown

HYDROLOGY Good drainage CONDITION Excellent

NOTES soil = loam over yellow sand with large lat gravel

VEG LAYER	% COVER	SPECIES (Bold =dominant)	
Tree 10-30	10-30	***Eucalyptus marginata subsp. marginata***	
Shrubs >2m	2-10	***Banksia sessilis var. sessilis***	
Shrubs <0.5m	10-30	***Bossiaea ornata***	
		Calothamnus sanguineus	
		Gompholobium knightianum	
		Acacia browniana var. intermedia	
		Trymalium ledifolium	
		Banksia dallanneyi	
		Hibbertia gracilipes	
		Astroloma pallidum	
		Dampiera alata	
		Hakea lissocarpha	
		Hibbertia acerosa	
		Daviesia preissii	
		Hibbertia commutata	
		Tetratheca affinis	
		Scaevola calliptera	
		Goodenia coerulea	
		Boronia spathulata	
Sedges	10-30	***Desmocladus fasciculatus***	
		***Tetraria* sp. Jarrah Forest (R. Davis 7391)**	
		Tetraria octandra	
		Lepidosperma tenue	
		Lepidosperma sp 2	
Herbs	2-10-	*Stylidium repens*	
	Mix	*Asteridea nivea*	*Goodenia pulchella*
		Stylidium piliferum	*Stylidium tenue*
		Opercularia vaginata	*Rhodanthe citrina*
		Chamaescilla corymbosa	*Daucus glochidiatus*
		Velleia trinervis	*Tricoryne humilis*
		Conostylis setigera subsp. setigera	
		Lagenophora huegelii	
		Pittosporaceae sp.	
		Thysanotus glaucus	
Grass	-	*Austrodanthonia setacea*	

SITE 15 WP 178 DATE 10/11/2011 RECORDERS E.M. Sandiford, W. Bradshaw

LAT/LONG -34.38690/ 117.34261 NORTHING/EASTING 6194890.63/ 531495.23

LOCATION Lot 2 Stockdale Rd Tenterden

VEGETATION TYPE Mixed Proteaceous Open Low Heath

LANDFORM Plain SLOPE Flat to very gentle ASPECT

GEOLOGY %ROCK 0 SOIL TYPE Clay sand SOIL COLOUR Orange/brown

HYDROLOGY Poor drainage CONDITION Excellent

NOTES

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Mallee <8m	<2 (e)	***Eucalyptus falcata***
		Eucalyptus incrassata
Shrubs <1-2	2-10	***Hakea undulata***
		Hakea trifurcata
Shrubs <0.5-1m	30-70	***Banksia armata***
		Isopogon teretifolius subsp. teretifolius
		Petrophile crispata
		Leucopogon sp. Great Southern (R.S. Cowan A 586)
		Verticordia habrantha *Gompholobium marginatum*
		Daviesia preissii *Dampiera alata*
		Jacksonia alata *Allocasuarina microstachya*
		Banksia dallanneyi *Chorizema aciculare*
		Chorizema rhombeum *Hibbertia recurvifolia*
		Rinzia fumana *Boronia subsessilis*
		Melaleuca subtrigona *Darwinia vestita*
		Persoonia striata *Tetratheca virgata*
Sedges	2-10	***Mesomelaena stygia subsp. stygia)***
		Lepidosperma sp.1
		Anarthria gracilis
		Schoenus pleiostemoneus
		Desmocladus fasciculatus
		Schoenus obtusifolius
Herbs	<2	*Chamaexeros serra*
	mix	*Stylidium eriopodum*
		Haemodorum laxum
		Stylidium hirsutum
		Chamaescilla spiralis
		Stylidium repens
		Ptilotus declinatus
		Xanthosia singuliflora
		Thelymitra crinita
		Thysanotus brevifolius
Grass	2-10	***Neurachne alopecuroidea***

SITE 16 WP 261 DATE 10/11/2011 RECORDERS E.M. Sandiford, W. Bradshaw

LAT/LONG -34.18479/ 117.48122 NORTHING/EASTING 6217250.36/ 544343.50

LOCATION "Marawa Farm" Lot 7006 Peter Valley Rd, Cranbrook

VEGETATION TYPE Wandoo over *Hakea trifurcata* Open Shrubland and *Banksia drummondii* Low Shrubland
LANDFORM Plain undulating SLOPE Flat/very gentle ASPECT SE

GEOLOGY %ROCK 0 SOIL TYPE Gravelly clay sand SOIL COLOUR Yellow grey

HYDROLOGY Good drainage CONDITION Very Good

NOTES

VEG LAYER	% COVER	SPECIES (Bold =dominant)	
Tree<10m	2-10	***Eucalyptus wandoo***	
Shrubs >2	2-10	***Hakea trifurcata***	
Shrubs 1-2	2-10	***Gastrolobium spinosum***	
		Hakea lissocarpha	
		Calothalmus planifolius	
		Leptospermum erubescens	
Shrubs < 0.5	10-30	***Banksia drummondii***	
		Banksia armata	*Banksia nivea*
		Calytrix leschenaultia	*Melaleuca subtrigona*
		Hibbertia gracilipes	*Xanthorrhoea platyphylla*
		Gompholobium marginatum	
		Acacia browniana var. intermedia	
Sedges	2-10	***Mesomelaena stygia subsp. stygia***	
		Lepidosperma tenue	
		Desmocladus fasciculatus	
		Harperia lateriflora	
		Tetraria octandra	
		Schoenus subbarbatus	
		Schoenus pleiostemoneus	
		Tetraria sp. Jarrah Forest (R. Davis 7391)	
Herbs	2-10	***Opercularia vaginata***	
		Goodenia coerulea	
		Pittosporaceae sp	*Anigozanthos humilis*
		Levenhookia stipitata	*Xanthosia singuliflora*
		Chamaescilla corymbosa	*Trachymene pilosa*
		Conostylis villosa	*Pterochaeta paniculata*
		Chamaexeros serra	*Chamaexeros serra*
		Tricoryne elatior	*Rhodanthe citrina*
		Caesia micrantha	
Grass	*<2*	***Neurachne alopecuroidea***	
		** Aira cupaniana*	

SITE 17 WP 263 DATE 10/11/2011 RECORDERS E.M. Sandiford, W. Bradshaw

LAT/LONG -34.18490/ 117.48066 NORTHING/EASTING 6217237.52/ 544291.54

LOCATION "Marawa Farm" Lot 7006 Peter Valley Rd, Cranbrook

VEGETATION TYPE Wandoo/Jarrah over *Banksia sessilis* Tall Open Shrubland

LANDFORM Plain/upper slope SLOPE Flat very gentle ASPECT SSW

GEOLOGY %ROCK SOIL TYPE gravelly clay sand SOIL COLOUR :

HYDROLOGY Good drainage CONDITION Excellent

NOTES Other Proteacous in relevee or nearby = *Hakea undulata* & *H. trifurcata*

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Tree 10-30	2-10	***Eucalyptus wandoo***
Shrubs >2m	10-30	***Banksia sessilis var. sessilis***
Shrubs 1-2m	10-30	***Gastrolobium spinosum***
		Leptospermum erubescens
		Petrophile squmatum
		Hakea prostrata
Shrubs <0.5m	2-10	***Bossiaea eriocarpa***
		Hibbertia gracilipes
		Gompholobium knightianum
		Dampiera linearis
Sedges	2-10	***Lepidosperma tenue***
		***Tetraria* sp. Mt Madden (C.D. Turley 40 BP/897)**
Herbs	-	*Pittosporaceae sp*
		Conostylis villosa
		Stylidium piliferum
		Xanthosia singuliflora
		Chamaescilla corymbosa
		Caesia micrantha
		Trachymene pilosa
		Tricoline elatior
		Podolepis gracilis
		Levenhookia pusilla
Grass	2-10	***Neurachne alopecuroidea***
		******Aira cupaniana**
		Amphipogon sp.

SITE 18 WP 264 DATE 14/11/2011 RECORDERS E.M. Sandiford, W. Bradshaw

LAT/LONG -34.18613/ 117.48421 NORTHING/EASTING 6217099.76/ 544618.13

LOCATION "Marawa Farm" Lot 7006 Peter Valley Rd, Cranbrook

VEGETATION TYPE *Eucalyptus phaenopylla* Open Mallee over *Melaleuca hamata* Tall Shrubland and *Banksia tenuis* var *reptans* Low Open Shrubland

LANDFORM Plain/lower slope SLOPE Gentle ASPECT W

GEOLOGY %ROCK SOIL TYPE Gravelly clay loam SOIL COLOUR :Brown

HYDROLOGY Poor drainage CONDITION Excellent

NOTES

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Mallee <8m	10-30	***Eucalyptus phaenophylla***
Shrubs >2m	10-30	***Melaleuca hamata***
		Melaleuca lateriflora
Shrubs <0.5m	30-70	***Banksia tenuis var. reptans***
		Baeckea pygmaea
		Hakea marginata
		Dampiera alata
		Beaufortia schaueri
		Babingtonia camphorosmae
		Acacia lasiocarpa
		Dampiera lavandulacea
		Eutaxia parvifolia
		Boronia crenulata
Sedges	<2	***Lepidosperma "squamatum" complex***
		Harperia lateriflora
Herbs	2-10	***Lomandra micrantha***
		Laxmannia minor
		Goodenia pulchella
		Dianella revoluta
		Trichocline spathulata
		Comesperma polygaloides
		Goodenia coerulea
		Pittosporaceae sp
		Cassytha racemosa
		** Ursinia anthemoides*
Grass	-	*Neurachne alopecuroidea*
		Austrodanthonia acerosa
		**Aira cupaniana*

SITE 19 WP 265 DATE 14/11/2011 RECORDERS E.M. Sandiford, W. Bradshaw

LAT/LONG -34.20766/ 117.40227 NORTHING/EASTING 6214745.56/ 537058.55

LOCATION Lot 5604 Homestead Rd, Cranbrook

VEGETATION TYPE Jarrah/Wandoo or Wandoo/*Eucalyptus falcata* Open Woodland over *Banksia armata* Low Shrubland

LANDFORM Upper slope/broad crest SLOPE Flat very gentle ASPECT NE

GEOLOGY %ROCK 2-10 SOIL TYPE gravelly clay loam COLOUR yellow brown

HYDROLOGY Good drainage CONDITION Very Good

NOTES

VEG LAYER	% COVER	SPECIES (Bold =dominant)	
Tree 10-30	10-30	***Eucalyptus wandoo***	
		Eucalyptus marginata subsp. marginata	
Shrubs >2m	<2 (e)	***Banksia sessilis var. sessilis***	
Shrubs 1-2m	2-10	***Gastrolobium spinosum***	
Shrubs 0.5-1m	10-30	***Banksia armata***	
		Hakea lissocarpha	
Shrubs <0.5m	10-30	***Calothamnus sanguineus***	
		Pultenaea verruculosa	
		Rinzia fumana	
		Hibbertia gracilipes	
		Bossiaea eriocarpa	
		Xanthorrhoea platyphylla	
		Gompholobium polymorphum	
		Banksia nivea	
		Persoonia striata	*Dampiera linearis*
		Leucopogon sp1	*Boronia ramosa*
		Acacia stenoptera	*Verticordia habrantha*
Sedges	2-10	***Desmocladus fasciculatus***	
		Lepidosperma tenue	
		Lepidosperma sp2	
		Mesomelaena stygia subsp. stygia	
		Tetraria octandra	
		Schoenus obtusifolius	
		Tetraria sp. Jarrah Forest (R. Davis 7391)	
Herbs	2-10	***Lomandra micrantha***	
		Stylidium repens	
		Goodenia coerulea	*Pittosporacea sp.*
		Stylidium piliferum	*Chamaescilla corymbosa*
		Opercularia vaginata	*Lomandra suaveolens*
		Chamaexeros serra	*Diuris setacea*
Grass	<2	***Neurachne alopecuroidea***	
		Amphipogon sp.	

SITE 20 WP 268 DATE 14/11/2011 RECORDERS E.M. Sandiford, W. Bradshaw

LAT/LONG -34.25501/ 117.39856 NORTHING/EASTING 6209496.40/ 536695.53

LOCATION Lot 940 Addis Rd, Cranbrook

VEGETATION TYPE *Banksia attenuata* Woodland – Gordon River

LANDFORM Lunette(River) SLOPE Gentle ASPECT S

GEOLOGY %ROCK SOIL TYPE Sand SOIL COLOUR Light brown

HYDROLOGY Good drainage CONDITION Good

NOTES Area previously grazed

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Tree <10m	10-30	***Banksia attenuata***
		Allocasuarina huegeliana
Shrubs >2m	2-10	***Kunzea ericifolia***
		Hakea prostrata
Shrubs 0.5-1m	2-10	***Macrozamia riedlei***
Shrubs <0.5m	<2	***Hibbertia subvaginata***
Sedges	-	*Tetraria* sp. Mt Madden (C.D. Turley 40 BP/897)
		Loxocarya cinerea
Herbs	-	***Lomandra rupestris***
		****Ursinia anthemoides***
		Trachymene pilosa
		Tricoline elatior
		Dianella revoluta
		Podotheca angustifolia
		Stypandra glauca
		Rhodanthe citrina
		**Hypochaeris radicata*
Grass	-	***Austrostipa scabra***
		Microlaena stipoides
		Austrostipa hemipogon
		Neurachne alopecuroidea
		Aristida contorta
		**Ehrharta longiflora*

SITE 21 WP 278 DATE 14/11/2011 RECORDERS E.M. Sandiford, W. Bradshaw

LAT/LONG -34.29837/ 117.59309 NORTHING/EASTING 6204601.10/ 554578.30

LOCATION Sukey Hill Rd reserve, Cranbrook

VEGETATION TYPE Stirling Range Outlier Complex

LANDFORM Upper slope SLOPE Moderate ASPECT NW

GEOLOGY Sandstone %ROCK 20-50 SOIL TYPE Clay loam SOIL COLOUR Yellow brown

HYDROLOGY CONDITION Excellent

NOTES several Proteaceous in vicinity including *Isopogon baxteri and Petrophile divaricata, brunnea*

VEG LAYER	% COVER	SPECIES (Bold =dominant)	
Mallee <8m	<2 (e)	***Eucalyptus preissiana***	
Shrubs >2m	<2 (e)	***Lambertia ericifolia***	
		Hakea ambigua	
Shrubs 1-2m	-	*Regelia inops*	
Shrubs 0.5-1	2-10	*Kunzea recurva*	
	mix	*Gastrolobium spinosum*	
		Melaleuca spathulata	
		Xanthorrhoea platyphylla	
		Gastrolobium velutinum	
		Melaleuca sp hairy	
		Verticordia habrantha	
Shrubs <0.5	30-70	***Banksia tenuis var. tenuis***	
		Beaufortia schaueri	
		Banksia armata	
		Banksia sphaerocarpa	*Banksia brunnea*
		Hakea lehmanniana	*Hibbertia gracilipes*
		Beaufortia anisandra	*Leucopogon gibbosus*
		Leucopogon aff elatior	*Acacia squamata*
		Hypocalymma angustifolium	*Kunzea micromera*
		Dampiera alata	*Dampiera juncea*
Sedges	10-30	***Anarthria gracilis***	
		Schoenus pleiostemoneus	
		Tetraria sp. Jarrah Forest (R. Davis 7391)	
		Mesomelaena stygia subsp. stygia	
		Tetraria octandra	*Schoenus obtusifolius*
		Lepidosperma sp2	*Desmocladus fasciculatus*
Herbs	-	*Stylidium hirsutum*	*Cassytha micrantha*
		Opercularia vaginata	*Pittosporaceae sp.*
		Patersonia pygmaea	*Chamaexeros serra*
		Cassytha racemosa	
		Patersonia limbata	
Grass	<2	***Neurachne alopecuroidea***	

SITE 23 WP 325 DATE 16/1/2011 RECORDERS E.M. Sandiford, W. Bradshaw

LAT/LONG - -34.61978/117.37532 NORTHING/EASTING 6169056.4/534406.1

LOCATION 60m N of Muir Hwy, 3300 m west of Pardellup Rd, Forest Hill

VEGETATION TYPE *Banksia littoralis* Low Woodland

LANDFORM Drainage depression SLOPE Flat ASPECT

GEOLOGY %ROCK 0 SOIL TYPE Sand SOIL COLOUR Grey

HYDROLOGY Poor drainage CONDITION Excellent

NOTES

VEG LAYER	% COVER	SPECIES (Bold =dominant)	
Tree<10m	30-70	***Banksia littoralis***	
		Melaleuca rhaphiophylla	
Shrubs >2m	2-10	A***gonis flexuosa var latifolia***	
Shrubs 1-2m	-	*Taxandria parviceps*	
		Xanthorhoea ?preissii	
		Acacia saligna	
Shrubs 0.5-1	2-10	***Leucopogon obovatus***	
		Pericalymma? spongiocaule	
Shrubs < 0.5	2-10	***Hypocalymma angustifolia***	
		Hibbertia amplexicaulis	
		Comesperma polygaloides	
		Astroloma baxteri	
		Dampiera linearis	
Sedges	30-70	***Tricostularia neesii***	
		Hypolaena exsulca	
		Cyathochaeta avenacea	
		Lyginia barbata	*Schoenus sp 23 small*
Herbs	2-10	***Drosera gigantea***	
		Sowerbaea laxiflora	
		Stylidium spathulatum	
		Siloxerus humifusus	
		Centrolepis aristata	*Centrolepis mutica*
		Schoenolaena juncea	*Cassytha racemosa*
		Stylidium caespitosum	*Borya scirpoidea*
		Patersonia occidentalis	*Isotropis cuneifolia*
		Goodenia pulchella	*Selaginella gracillima*
		Lomandra micrantha	*Haemodorum sparsiflorum*
		Conostylis aculeata	**Hypochaeris radicata*
		**Centaurium erythraea*	
Grass		*Neurachne alopecuroidea*	
		Deyeuxia quadriseta	
		Amphipogon laguroides	
		Microlaena stipoides	
		** Aira cupaniana*	**Briza maxima **
		** Briza minor*	

SITE 24 WP 329 DATE 16/1/2011 RECORDERS E.M. Sandiford, W. Bradshaw

LAT/LONG --34.57061/117.23020 NORTHING/EASTING 6174548.8/521115.7

LOCATION S of Muir Hwy ????

VEGETATION TYPE *Banksia littoralis* Low Woodland

LANDFORM Drainage depression SLOPE Flat ASPECT

GEOLOGY %ROCK 0 SOIL TYPE Sand coarse SOIL COLOUR Grey

HYDROLOGY Poor drainage CONDITION Excellent

NOTES

VEG LAYER	% COVER	SPECIES (Bold =dominant)	
Tree<10m	10-30	***Banksia littoralis***	
		Melaleuca preissiana	
Shrubs >2m	10-30	***Hakea varia***	
Shrubs 0.5-1	3--70	***Hypocalymma angustifolia***	
		Pericalymma spongiocaule	
		Astartea glomerulosa	
		Acacia pulchella var. pulchella	
		Melaleuca pauciflora	
Shrubs < 0.5	-	*Hibbertia amplexicaulis*	
		Boronia spathulata	
		Hibbertia stellaris	
		Dampiera linearis	
Sedges	10-30	***Cyathochaeta avenacea***	
		Restionaceae sp site 24	
		Anarthria laevis	
		Isolepis cernua var. setiformis	*Chordifex laxus*
		Tricostularia neesii	*Schoenus laevigatus*
Herbs	2-10	*Stylidium spathulatum*	
		Siloxerus humifusus	
		Drosera gigantea	*Senecio glomeratus*
		Anthotium humile	*Drosera pulchella*
		Velleia trinervis	*Cassytha racemosa*
		Levenhookia stipitata	*Chamaescilla corymbosa*
		Patersonia occidentalis	*Lobelia anceps*
		Pelargonium littorale	*Selaginella gracillima*
		Lomandra micrantha	*Anigozanthos flavidus*
		Conostylis aculeata	** Lotus subbiflorus*
		** Lysimachia arvensis*	
Grass	<2	***Amphipogon debilis***	
		Deyeuxia quadriseta	
		Austrodanthonia sp unident	
		*Austrostipa sp "*unident*"*	
		** Aira cupaniana*	

SITE 25 WP 330 DATE 16/1/2012 RECORDERS E.M. Sandiford, W. Bradshaw

LAT/LONG --34.53176/117.11823 NORTHING/EASTING 6178875.0/510850.0

LOCATION Reserve 849, 20m S of Muir Hwy,3400m west of Papes Rd, Rocky Gully

VEGETATION TYPE *Hakea trifurcata*/*Hakea undulata* Shrubland

LANDFORM Plain SLOPE Gentle ASPECT N

GEOLOGY %ROCK 0 SOIL TYPE Gravelly loam SOIL COLOUR Yellow brown

HYDROLOGY Good drainage CONDITION Excellent

NOTES soil = loam over yellow sand with large lateritic gravel

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Tree 10-30	10-30	***Eucalyptus marginata subsp. marginata***
		Corymbia calophylla
Shrubs >2m	30-70	***Hakea undulata***
Shrubs 1-2m		*Petrophile serruriae*
Shrubs 0.5-1 m	30-70	***Bossiaea ornata***
		Hakea lissocarpha
		Hypocalymma angustifolium
		Acacia pulchella var. pulchella
Shrubs <0.5m		*Gompholobium preissii*
		Hibbertia commutata
		Hibbertia cunninghamii
		Pimelea angustifolia
		Dampiera alata
		Scaevola calliptera
		Boronia spathulata
		Grevillea quercifolia
		Astroloma compactum
		Goodenia coerulea
Sedges	10-30	***Tetraria* sp. Jarrah Forest (R. Davis 7391)**
		Desmocladus fasciculatus
		Lepidosperma sp terete fine long head
		Tetraria octandra
Herbs	2-10	***Stylidium repens***
		Stylidium tenue
		Tricoryne elatior
		Haemodorum laxum
Grass	-	*Grass sp "*unident*"*

SITE 26 WP 331 DATE 16/1/2011 RECORDERS E.M. Sandiford, W. Bradshaw

LAT/LONG --34.53053/117.12024 NORTHING/EASTING 6179010.4/511034.8

LOCATION Reserve 849, 120 m N of Muir Hwy,3250m west of Papes Rd, Rocky Gully

VEGETATION TYPE *Hakea varia +/-Hakea prostrata* Shrubland

LANDFORM Drainage depression SLOPE Flat ASPECT

GEOLOGY %ROCK 0 SOIL TYPE Sandy loam SOIL COLOUR Brown

HYDROLOGY Poor drainage CONDITION Very good

NOTES Some *Daviesia incrassata* plants dead.

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Tree<10m	2-10e	***Melaleuca preissiana***
Shrubs 1-2m	10-30	***Hakea varia***
Shrubs <0.5	30-70	***Hypocalymma angustifolia***
		Pericalymma? spongiocaule
		Daviesia incrassata
		Astartea glomerulosa
		Petrophile media
		Banksia dallaneyi
		Synaphea ?obtusata
		Grevillea depauperata
		Kunzea micromera
		Pimelea angustifolia
		Dampiera alata
		Astroloma compactum
		Xanthorrhoea platyphylla
Sedges	10-30	***Desmocladus fasciculatus***
		Tricostularia neesii
		Lepidosperma sp small fan
		Tetraria sp. Jarrah Forest (R. Davis 7391)
		Meeboldina kraussii ms
		Schoenus bifidus
		Schoenus sp 26
Herbs	2-10	*Conostylis pusilla*
	mix	*Schoenolaena juncea*
		Drosera gigantea
		Borya scirpoidea
		Thysanotus sparteus
		Centrolepis aristata
		Patersonia occidentalis
		Ptilotus manglesii
		Lomandra micrantha
		Tricoryne humilis
		Patersonia pygmaea
		Cassytha racemosa
Grass	<2	**Neurachne alopecuroidea**
		Amphipogon debilis

SITE 27 WP 331 DATE 16/1/2011 RECORDERS E.M. Sandiford, W. Bradshaw

LAT/LONG --34.53098/117.11980 NORTHING/EASTING 6178960.5/510994.4

LOCATION Reserve 849, 60m N of Muir Hwy 3250m west of Papes Rd

VEGETATION TYPE *Hakea varia +/-Hakea prostrata* Shrubland

LANDFORM Drainage depression SLOPE Flat ASPECT

GEOLOGY %ROCK 0 SOIL TYPE nr SOIL COLOUR nr

HYDROLOGY Poor drainage CONDITION Excellent

NOTES

VEG LAYER	% COVER	SPECIES (Bold =dominant)	
Tree<10m	2-10 e	***Melaleuca preissiana***	
Shrubs >2m	10-30	***Hakea prostrata***	
		Hakea varia	
Shrubs 0.5-1m	2-10	***Xanthorrhoea platyphylla***	
		Astartea glomerulosa	
Shrubs <0.5	30-70	***Hypocalymma angustifolia***	
		Banksia dallaneyi	
		Grevillea depauperata	
		Leucopogon pendulus	
		Boronia spathulata	
		Hibbertia amplexicaulis	
		Astroloma baxteri	
Sedges	10-30	***Desmocladus fasciculatus***	
		Lepidosperma "squamatum" complex	
		Tetraria sp. Jarrah Forest (R. Davis 7391)	
		Lepidosperma sp small fan	
		Tricostularia neesii	
		Cyathochaeta avenacea	
		Hypolaena exsulca	
		Harperia lateriflora	
Herbs	2-10	***Stylidium spathulatum***	
	mix	***Velleia trinervis***	
		Stylidium repens	
		Conostylis pusilla	*Schoenolaena juncea*
		Drosera gigantea	*Borya scirpoidea*
		Selaginella gracillima	*Conostylis aculeata*
		Patersonia occidentalis	*Goodenia pulchella*
		Haemodorum sparsiflorum	*Anthotium humile*
Grasses	-	*Neurachne alopecuroidea*	

SITE 28 WP 334 DATE 16/1/2011 RECORDERS E.M. Sandiford, W. Bradshaw

LAT/LONG --34.50374/117.09956 NORTHING/EASTING 6181983.1/509140.0

LOCATION SW boundary Tootanellup Nature Reserve, Quindabellup Rd, Res No. 22442

VEGETATION TYPE *Hakea varia +/-Hakea prostrata* Shrubland

LANDFORM Drainage flat SLOPE flat ASPECT

GEOLOGY %ROCK 0 SOIL TYPE Clay loam SOIL COLOUR Brown

HYDROLOGY Poor drainage CONDITION Excellent

NOTES

VEG LAYER	% COVER	SPECIES (Bold =dominant)	
Tree<10m	2-10 e	*Melaleuca preissiana*	
		Corymbia calophylla	
Shrubs >2m	10-30	***Hakea varia***	
Shrubs 1-2m	10-30	***Xanthorrhoea ?preissii***	
Shrubs 0.5-1m	2-10	***Hypocalymma angustifolia***	
		Pericalymma? spongiocaule	
		Daviesia flexuosa	
Shrubs <0.5m	-	*Astartea glomerulosa*	
		Kunzea micromera	
		Darwinia oederoides	
Sedges	10-30	***Mesomelaena tetragona***	
		Cyathochaeta avenacea	
		Lepidosperma sp small fan	
		Isolepis cyperoides	
		Desmocladus fasciculatus	
		Schoenus bifidus	
		Lepidosperma sp tall dense head	
		**Cyperus tenellus*	
Herbs	2-10	***Lomandra micrantha***	
		Schoenolaena juncea	
		Goodenia pulchella	
		Velleia trinervis	
		Siloxerus humifusus	
		Drosera gigantea	*Borya scirpoidea*
		Chamaescilla corymbosa	*Lomandra suaveolens*
		Patersonia occidentalis	*Stylidium guttatum*
		Stylidium calcaratum	*Lomandra caespitosa*
		**Hypochaeris radicata*	**Orobanche minor*
		** Lotus subbiflorus*	**Centaurium erythraea*
Grass	<2	***Neurachne alopecuroidea***	
		Amphipogon debilis	
		******* *Briza maxima*	**Briza minor*
		**Aira cupaniana*	** Vulpia bromoides*

SITE 29 WP 336 DATE 16/1/2012 RECORDERS E.M. Sandiford, W. Bradshaw

LAT/LONG --34.50423/117.11837 NORTHING/EASTING 6181927.7/510866.4

LOCATION SW boundary Tootanellup Nature Reserve, Quindabellup Rd, Res No. 22442

VEGETATION TYPE Jarrah/Wandoo or Wandoo/*Eucalyptus falcata* Open Woodland over *Banksia armata* Low Shrubland

LANDFORM Middle slope SLOPE Gentle gentle ASPECT NE

GEOLOGY %ROCK SOIL TYPE gravelly loam COLOUR Light brown

HYDROLOGY CONDITION Excellent

NOTES Adjacent old gravel pit

VEG LAYER	% COVER	SPECIES (Bold =dominant)	
Tree 10-30	10-30	***Eucalyptus marginata subsp. marginata***	
		Corymbia calophylla	
Shrubs 1-2m	2-10	***Xanthorrhoea ?platyphylla***	
		Petrophile serruriae	
Shrubs <0.5-1m	30-70	***Banksia armata***	
		Bossiaea ornata	
		Hakea lissocarpha	*Pimelea angustifolia*
		Gastrolobium praemorsum	*Hovea chorizemifolia*
		Grevillea depauperata	*Hibbertia amplexicaulis*
		Gompholobium preissii	*Gompholobium kninghtianum*
		Darwinia vestita	*Boronia spathulata*
		Banksia dallaneyi	*Isopogon attenuatus*
		Hibbertia recurva	*Hibbertia gracilipes*
		Hypocalymma angustifolia	*Damperia alata*
		Astroloma pallidum	*Hibbertia commutata*
		Tetratheca virgata	*Scaevola striata*
		Acacia nervosa	*Goodenia coerulea*
Sedges	2-10	***Desmocladus fasciculatus***	
		***Tetraria* sp. Jarrah Forest (R. Davis 7391**)	
		Tetraria octandra	
		Schoenus ?brevisetis	
Herbs	<2	*Lomandra sericea*	
		Stylidium tenue	
		Conostylis pusilla	
		Billardiera fusiformis	
		Patersonia babianoides	

SITE 30 WP 346 DATE 6/1/2012 RECORDERS E.M. Sandiford, W. Bradshaw

LAT/LONG --34.47640/117.19281 NORTHING/EASTING 6185002.7/517706.0

LOCATION S boundary Res 28586 Nature Reserve, Randell Rd, Perillup

VEGETATION TYPE *Hakea trifurcata*/*Hakea undulata* Shrubland

LANDFORM Lower slope SLOPE gentle ASPECT NW

GEOLOGY % ROCK SOIL TYPE Sandy clay SOIL COLOUR : Yellow Brown

HYDROLOGY CONDITION Excellent

NOTES

VEG LAYER	% COVER	SPECIES (Bold =dominant)	
Mallee >8m	2-10 e	***Eucalyptus decipiens***	
Shrubs >2m	<2 (e)	***Hakea prostrata***	
Shrubs 1-2m	30-70	***Hakea trifurcata***	
		Allocasuarina humilis	
Shrubs 0.5-1m		*Xanthorrhoea ?platyphylla*	
		Petrophile squamatum	
Shrubs <0.5m	30-70	***Verticordia densiflora var. cespitosa***	
		Babingtonia camphorosmae	
		Allocasuarina microstachya	
		Banksia armata	*Banksia dallanneyi*
		Petrophile media	*Persoonia striata*
		Grevillea depauperata	*Hypocalymma angustifolium*
		Stenantheum emarginatum	*Acacia stenoptera*
		Daviesia preissii	*Daviesia incrassata*
		Gompholobium marginatum	*Kunzea micromera*
Sedges	2-10	***Mesomelaena stygia subsp. stygia)***	
		Harperia lateriflora	
		Lepidosperma tenue	
		Mesomelaena tetragona	
		Schoenus pleiostemoneus	
		Lepidosperma sp fan wide, dense head	
		Tetraria sp. Jarrah Forest (R. Davis 7391)	
Herbs	<2	*Chamaexeros serra*	
		Opercularia vaginata	
		Haemodorum laxum	*Levenhookia stipitata*
		Pterochaeta paniculata	*Conostylis pusilla*
		Chamaescilla corymbosa	*Xanthosia huegelii*
		Lomandra micrantha	*Lomandra suaveolens*
		Anigozanthos humilis	*Thysanotus sparteus*
		Stylidium eriopodum	*Levenhookia pusilla*
Grass	2-10	***Neurachne alopecuroidea***	
		Austrodanthonia sp. unident	
		**Vulpia bomoides*	

SITE 31 WP 350 DATE 6/1/2012 RECORDERS E.M. Sandiford, W. Bradshaw

LAT/LONG --34.47631/117.19369 NORTHING/EASTING 6185012.6/517786.3

LOCATION S boundary Res 28586 Nature Reserve, Randell Rd, Perillup

VEGETATION TYPE *Hakea trifurcata*/*Hakea undulata* Shrubland

LANDFORM Middle slope SLOPE gentle ASPECT SW

GEOLOGY % ROCK 0 SOIL TYPE Gravelly sand clay loam SOIL COLOUR : Yellow Brown

HYDROLOGY CONDITION Excellent

NOTES

VEG LAYER	% COVER	SPECIES (Bold =dominant)	
Tree 10-30m	10-30	***Eucalyptus wandoo***	
		Eucalyptus marginata subsp. marginata	
Shrubs 1-2m	10-30	***Hakea trifurcata***	
		Hakea undulata	
		Xanthorrhoea ?platyphylla	
Shrubs <0.5-1mm	10-30	***Banksia armata***	
		Petrophile squamata	
		Babingtonia camphorosmae	
		Isopogon teretifolius subsp teritifolius	
		Grevillea depauperata	
		Hakea lissocarpha	
		Banksia dallaneyi	
		Petrophile serruriae	*Hibbertia commutata*
		Trymalium ledifolium	*Tetratheca virgata*
		Gompholobium marginatum	*Goodenia coerulea*
		Hypocalymma angustifolium	*Hibbertia gracilipes*
		Acacia browniana var. browniana	*Bossiea ornata*
		Boronia crenulata	*Scaevola striata*
Sedges	2-10	***Mesomelaena stygia subsp. stygia)***	
		***Tetraria* sp. Jarrah Forest (R. Davis 7391)**	
		Desmocladus fasciculatus	
		Mesomelaena tetragona	
		Tetraria octandra	
Herbs	2-10	*Chamaexeros serra*	
	mix	*Lomandra sericea*	
		Conostylis setigera subsp setigera	
		Stylidium tenue	*Stylidium repens*
		Trachymene pilosa	*Lobelia gibbosa*
		Marianthus sp	*Pittosporaceae sp.*
Grass	<2	*Neurachne alopecuroidea*	
		Austrodanthonia sp. unident	
		Amphipogon sp. unident	

SITE 32 WP 268 DATE 16/1/2012 RECORDERS E.M. Sandiford, W. Bradshaw

LAT/LONG --34.25309/117.44892 NORTHING/EASTING 6209690.0/541333.3

LOCATION Gordon River crossing, Boyup Brook- Cranbrook Rd

VEGETATION TYPE *Banksia attenuata* Woodland – Gordon River

LANDFORM Lunette(River) SLOPE Gentle ASPECT N

GEOLOGY %ROCK SOIL TYPE Sand SOIL COLOUR Light brown

HYDROLOGY Good drainage CONDITION Very Good

NOTES

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Tree <10m	30-70	***Banksia attenuata***
Shrubs >2m	2-10	***Kunzea ericifolia***
		Hakea prostrata
		Jacksonia furcellata
Shrubs 1-2m	2-10	***Leptospermum erubescens***
Shrubs <0.5m	2-10	***Hibbertia subvaginata***
		Calytrix flavescens
		Scaevola striata
Sedges	10-30	***Loxocarya cinerea***
		Tetraria sp. Jarrah Forest (R. Davis 739)1
		Lepidosperma ?striatum
		Lepidosperma Site 32
		Schoenus curvifolius
Herbs	2-10	***Lomandra rupestris***
		Patersonia occidentalis
		Trachymene pilosa
		Dianella brevicaulis
		Podotheca angustifolia
		Stylidium repens
		Stylidium piliferum
		Conostylis aculeata
		Billardieria fusiformis
		**Ursinia anthemoides*
Grass	-	***Neurachne alopecuroidea***
		**Aira cupaniana*
		**Aira praecox*
		Amphipogon sp
		Austrostipa sp. unident

Appendix 7 - Vegetation Descriptions

1 Hvar/Hpro: *Hakea varia +/-Hakea prostrata* Shrubland (Sites 26, 27 & 28)

Hakea varia +/-H prostrata Shrubland was found on along drainage flats or the margins of drainage lines in the south western parts of the survey area, occurring on sandy loams or clay loams with impeded drainage. These shrublands were typically quite open with the upper shrub strata dominated by a *Hakea varia* and/or *Hakea prostrata* Shrubland over *Hypocalymma angusifolium* Open Low Heath, Mixed Open Sedgeland, Mixed Very Open Herbland and *Neurachne alopecuroidea /Amphipogon deblis* Very Open Grassland. A *Xanthorrhoea platyphylla* Shrubland and an emergent canopy of *Melaleuca preissiana* were often present. The lower shrub strata varied in density from a shrubland to open low heath and low open shrubland with common species including *Xanthorrhea platyphylla, Hypocalymma angustifolia, Pericalymma spongiocaule, Kunzea micromera, Astartea glomerulosa, Daviesia incrassata* and two Proteaceous species, *Banksia dallanyei* and *Grevillea depauperata*. Another Proteaceous species *Petrophile media* was dominant in Site 26 with *Synaphea obtusata* also present. The sedge layer is relatively open with dominant species including *Desmocladus fasciculatus, Tetraria* sp Jarrah Forest, C*yathochaeta avenacea Lepidosperma* "small fan", *Schoenus bifidus, Tricostularia neesii, Mesomelaena tetragona*. Common herbs included *Drosera gigantea, Schoelaena juncea, Patersonia occidentalis, Conostylis pusilla, Lomandra micatntha, Velleaia trinervis* and *Goodenia pulchella*.

Several small patches of *Hakea prostrata* Shrubland were observed during this survey occurring at the transition zone between well drained Jarrah/Marri +/-Wandoo Woodland/Forest and drainage lines. Further survey may indicate the *Hakea varia* and *Hakea prostrata* Shrubland are distinct in both floristic composition and habitat with *Hakea varia* Shrubland occurring lower in the landscape on flats and *Hakea prostrata* Shrubland occurring slightly higher in the landscape.

It is not clear if this vegetation association is restricted to southern areas of the survey area as most common species are found throughout the Forest Stirling link. Beard mentions *Eucalyptus decipiens* occurring in sandy swampy places with X*anthorrhoea* and *Hakea varia*, in the southern parts of the survey area.

The *Hakea varia* Shrubland appear similar to a *Eucalyptus decipiens* unit recorded in Noobijup NR to the south west(Gibson and Keighery 2000). This unit was recorded on clay soils, with understorey dominants including *Kunzea micranthera, Hakea varia, Daviesia incrassata* and *Calothamnus lateralis*. Other known vegetation with a *Hakea varia* dominated shrubland occurs around Albany but has significantly different shrub and sedge compositions (Sandiford and Barrett et al 2010).

Hakea prostrata Heaths have been recorded further to the south west in Galamup, Pinticup and Lake Muir NR (Gibson and Keighery (2000) and around Perilup (Sandiford 2004) though the floristic similarities between these areas and those within the survey area are unclear.

Hakea varia &/orHakea prostrata Shrubland

Site 26

Site 28

Site 27

2 B lit: *Banksia littoralis* Low Woodland (Sites 11, 23 & 24

Banksia littoralis Low Woodland was observed and sampled in the central and southern areas of the Forest-Stirling link though this unit may not be restricted to these areas. The understorey shrub strata was relative open, typically occurring over a dense sedge strata and a diverse though very open herbland. Notable differences in florisitcs and dominance were observed between all sites with each site having a relatively high number of unique species, most of which were herbs or sedges.

In the central site the upper shrub strata was dominated by two proteaceous species *Adenanthos cuneatus* and *Hakea corymbosa* , occurring over a *Pericalymma spongiocaule* Low Shrubland and *Chordifex laxus* Closed Sedgeland. Other common plants included *Tricostulaira neesii, Patersonia occidentalis*, *Hakea ceratophylla, Calytrix flavescens, Stylidium repens* and *Goodenia pulchella*.

In the southern sites common shrub species included *Pericalymma spongiocaule and Hypocalymma angustifolium, Dampiera linearis* and *Hibbertia amplexicaulis* with the Proteaceous species *Hakea varia* dominant in one site. Common sedges and herbs included *Cyathochaeta avenacea, Tricostularia neesii, Lomandra micrantha*, *Drosera gigantea, Patersonia occidentalis, Stylidium spathulatum, Conostylis aculeata, Selaginella gracillima* and *Siloxerus humifusis.*

Other Proteaceus species observed within this unit were *Hakea prostrata* and *Petrophile filifolia.*

Banksia littoralis swamps have been recorded across a wide area of southern WA and they appear to vary in floristic composition. Those previously record in or near the Forest to Stirling link include:

- In swamps the" Kwornicup system" which covers the central and southern areas of the Forest to Stirling lin (Beard 1979)
- In a number of the swamps associated with Lake Muir and adjacent lake systems south west of the Forest to Stirling link where it is recorded as a co-dominant with *Melaueca preissiana* or *Melaleuca rhaphiophylla* (Gibson & Keighery 2000)
- Across the South Stirling plains and north east of the Stirling Range where they occur in small drainage depressions, often in association with the sedge *Anarthria laxus* (Newbey 1979 and author observations)
- Around Albany where three different *Banksia littoralis* Woodland units were recorded (Sandiford and Barrett 2010).

Banksia littoralis is susceptible to Phytophthora dieback, increasing salinity and lowering of water and deaths resulting from these factors have been observed within the Great Southern Region.

Banksia littoralis Low Woodland

Site 11

Site 23

Site 24

3 Batt/Line N: *Banksia attenuata /Lambertia inermis* Tall Open Shrubland- north (Sites 1 & 4).

This vegetation was recorded north of the Stirling Range, occurring on deep well drained sands though it is unclear (due to low sampling) if the sites represent one or more vegetation types. These sites had a high number of Proteaceous species with 6 species recorded in each site: Site 1: *Lambertia inermis, Hakea pandanicarpa* var *crassifolia*, *Hakea corymbosa*, *Adenanthos cuneatus*, *Petrophile ericifolia* subsp *ericifolia*, *Banksia repens* and Site 4: *Banksia attenuata*, *Lambertia inermis, Banksia nutans, Adenathos cuneatus*, *Banksia coccinea* and I*sopogon trilobus*. A further 6 proteaceous species noted in or similar vegetation close by in Site 1 (but not recorded in site data due to low numbers): *Isopogon trilobus, Banksia nutans*, *Banksia attenuata, Petrophile filifolia*, *Strilingia latifolia* and *Banksia nivea* and 2 in Site 2: *Franklandia fucifolia* and *Petrophile filifolia*. The non-recording of these latter species highlights the limitations of both the low sampling and scoring methods.

Within the sites sampled the structure and dominance varied with 3-5 shrub layers recorded over a very open or open sedgeland. An emergent *Eucalyptus decipiens* Mallee strata was present in Site 4. Dominant shrub species included *Banksia attenuata, Lambertia inermis, Leptospermum oligandrum, Banksa nutans, Adenanthos cuneatus, Melaleuca thymoides, Eremaea pauciflora, Banksia repens* and *Melalueca subtrigona*. Dominant sedges include *Lyginia barbata, Tricostularia* sp Sth Coast, *Tricostularia neesii* and *Hypolaena fastigiata*. The commonest herb was *Stylidium repens*.

This vegetation is distinguished from other *Banksia attenuata* dominated vegetation by the presence of a number of species typical of inland and/or eastern sandplain areas including *Eremaea pauciflora, Lambertia inermis, Melaueca subtrigona, Hakea corymbosa, Isopogon trilobus,* and *Hypolaena fastigiata.*

Similar vegetation has been describe as occurring on deep sands in the Stirling Ranges, on the plains north and south and extending across to the Fitzgerald River National Park,(Beard 1979, Newbey 1979.

Banksia attenuata /Lambertia inermis Tall Open Shrubland

Site 1

Site 4

4 Leri/Bcoc: *Lambertia ericifolia/Banksia coccinea* Tall Shrubland (Site 2)

This vegetation was only sampled once on sands on the mid slopes of the northern Stirling Range outliers. The area sampled has not been burnt for a long time and the vegetation appears to be senescing and to have been grazed.

Currently the area sampled is dominated by *Lambertia ericifolia* Tall Shrubland over a *Hibbertia subvaginata* Very Open Shrubland and *Chordifex ornatus* P2 Open Sedgeland. The paucity of understorey shrubs and sedges (*Jacksonisa grevilleoides, Adenanthos cuneatus, Melaleuca thymoides, Schoenus curvifolius* and *Caustis dioca)* appears related to grazing.

Most *Banksia coccinea* present are dead or dying, apparently from old age. Some seedlings were observed. In the past the area had a dense thicket of *Banksia coccinea* (L Fiegert via W Bradshaw Pers. Comm). Maintenance of such thickets would require adopting appropriate fire regimes, though in the area of Site 2 it may require the addition of external *Banksia coccinea* seed as relatively few unopened cones remain and grazing would need to be excluded to protect seedlings.

Similar vegetation was observed but not sampled on an outlier 12km to the west, where *Lambertia ericifolia* dominated and occurred with *Banksia attenuata, Adenanthos cuneatus Agoins theifomis* and *Jacksonia calycina* P3. Further survey is required to adequately define this vegetation unit and determine the floristic and site differences between it and other tall shrublands occurring on deep sands in the general area e.g. *Banksia attenuata /Lambertia inermis* Tall Open Shurbland (Unit 3).

The dominant sedge *Chordifex ornatus* is a Priority 2 species and relatively large numbers were observed in this and adjacent upslope vegetation. *Isopogon longifolia* P3 (Proteaceae) and *Jacksonia calycina* P3 were also observed nearby.

Lambertia ericifolia/Banksia coccinea Tall Shrubland (Site 4)

Seedling *Banksia coccinea*

5 Batt C: *Banksia attenuata* Woodland – central (Sites 8 & 10)

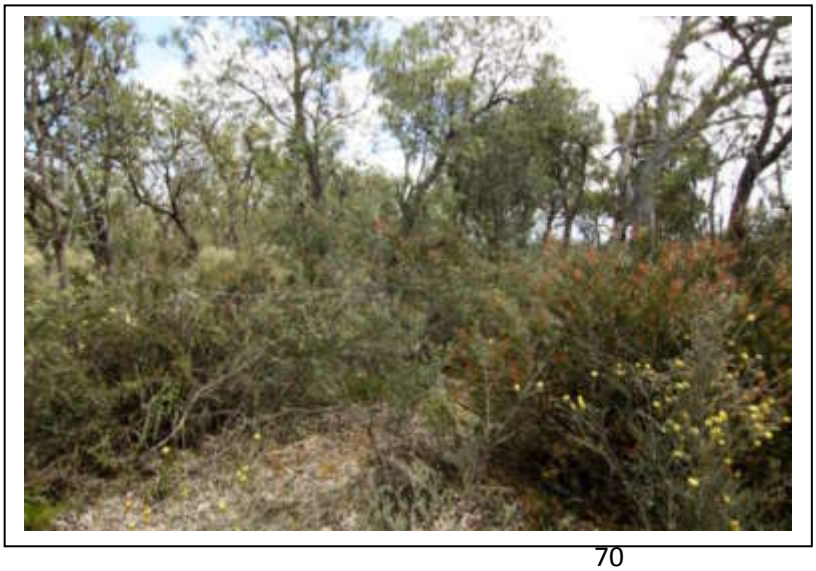
This vegetation unit was found in the central areas of the Forest to Stirling link. It has affinities with both northern *Banksia attenuata* associations (*Hibbertia subvaginata* and *Baeckea preissiana*) and southern associations recorded in the Albany Regional vegetation Survey (*Jacksonia spinosa*)(Sandiford and Barrett 2010).The upperstorey varies from a *Banksia attenuata* Low Open Forest to Low Woodland with emergent Jarrah recorded in one site (10). The understorey was dominated with by either *Jacksonia spinosa* Open Heath or *Melaluca thymoides/Adenanthos cuneatus* Open heath over *Calytrix flavescens* LowOpen Shrubland. Other common plants included *Lyginia barbata* and *Stylidium repens.*

Proteaceous species included *Banksia attenuata, Adenathos cuneatus* and *Stirlingia latifolia* (10). The area around Site 8 was burnt in the Tenterden fires (2003) and many young plants of *Banksia attenuata* were observed during this survey.

Banksia attenuata Woodland – central

Site 8

Banksia attenuata regeneration after Tenterden 2003 fire, vicinity Site 8



Site 10

6 Batt Gor R.: *Banksia attenuata* Woodland – Gordon River (Sites 20 & 32)

This vegetation appears restricted to the deep light brown sands on lunettes near and abutting the Gordon River area. It is very distinctive in terms of dominant species composition. The upperstorey varies from a *Banksia attenuata* Low Open Forest to Low Woodland with *Allocasuarina huegelliana* co-dominant in some areas. The understorey is relatively open and typically a *Kunzea ericiflia/Hakea prostrata* Tall Open Shrubland over *Leptospermum erubescens* Open Shrubland, *Hibbertia subvaginata/Calytrix flavescens* Low Open Shrubland, *Loxocarya cinerea* Open Sedgeland and *Lomandra ruprestris* Open Herbland. Other common shrubs included *Jacksonia furcellata* with *Macrozamia riedlei* (zamia/cycad) dominant in some areas. Unlike other *Banksia attenuata* vegetation units, this unit appears to have a relatively high number of native grasses, though it is unclear if this is associated with past and current grazing practices. Native grasses recorded include *Austrostipa scabra, Austrostipa hemipogon, Miclroleana stipioies* and *Atristida contorta.*

Many areas observed have been grazed in the past.

Many dominant and common species within this unit occur at or near their range limit. *Kunzea ericifolia, Loxocarya cinerea* and *Macorzamia riedlei* occur at or near their northerly range limits whilst *Allocasuarina huegelliana, Lomandra rupestris, Hibbertia subvaginata, Aristida contorta* and *Austrostipa scabra* occur on or near their southerly boundaries. These species distributions suggest this vegetation may naturally have had a very limited distribution and it is recommended that further survey be undertaken to determine current distribution as this vegetation may be a possible threated ecological community.

Banksia attenuata Woodland – Gordon River

Site 20

Site 32

7 **Bgra**: **Marri Woodland over *Banksia grandis* Open Shrubland** (Site 7)

This vegetation was only recorded in the central area and may have been disturbed in the past. Structurally and floristically it is a Marri Woodland over *Banksia grandis* Open Shrubland, *Acacia pulchella* var *goadbyi* Low Open Shrubland, *Desmocladus fasciculatus* Very Open Sedgeland, Mixed Open Herbland over *Austrostipa scabra* Very Open Grassland. Other trees and shrubs present were Jarrah*, Eucalyptus decipiens, Nuytsia floribunda, Banksia sessilis, Jacksonia furcellata* and *Hibbertia commutata*.

This vegetation differs floristically from other vegetation occurring in the southern areas of the Forest Stirling link that also contained a *Banksia grandis* dominated Tall Shrubland. This Latter vegetation (not sampled due to time constraints) occurred in Marri Open Forest over *Banksia grandis* Tall Open Shrubland with associated species including *Bossiaea linophylla, Hakea amplexicaulis, Persoonia longifolia, Agonis theiformis, Taxandria parviceps, Leucopogon obovatus, Hibbertia amplexicaulis, Tetraria sp* jarrah forest*, Desmocladus fasciculatus and Tetraria octandra.* This latter vegetation is likely to be very common in the southern area and has very strong floristic affinities with the Jarrah/Marri/ Sheaok Laterite Forest (ARVS unit 12) recorded in the Albany Regional Vegetation Survey (Sandiford & Barrett 2010).

Marri Woodland over *Banksia grandis* Open Shrubland (Site 7)

8 Bses: Wandoo/Jarrah over *Banksia sessilis* Tall Open Shrubland (Sites 13, 14 & 17).

Pockets of vegetation with a shrub strata dominated by *Banksia sessilis* were observed throughout the survey area excluding the north east corner and southern areas. They occurred in either Wandoo (*Eucalyptus wandoo*) and/or Jarrah (*Eucalyptus marginata*) Woodland to Low Open Woodland, occurring on a variety of gravelly soils from clay sands to loams. This vegetation is very open, typically containing a *Banksia sessils* Tall Open Shrubland over *Bossiaea* spp (*B eriocarpa* or *B ornata*) Low Shrubland, over Mixed Very Open Sedgeland, Mixed Herbland and *Neuarachne alopecuroidea* Very Open Grassland. Other common shrubs included *Hakea lissocarpha, Hibbertia commutata, Acacia browniana var. intermedia, Gompholobium knightianum* and *Hibbertia gracilipes.* Sedge dominance varied between the sampled sites with common dominant species including *Tetraria* sp Jarrah Forest and *Lepidosperma tenue*. A high diversity of herb was recorded with *Stylidium repens, Trachmene pilosa, Rhodantha citrina, Lagenphora huegelii, Chaemescilla corymbosa* and *Stylidium piliferum* common. *Austrodanthonia setacea* was the only other native grass beside *Neurachne alopecuroidea* to be recorded in more than one site.

This vegetation shares many species with the other Jarrah/ Wandoo dominated vegetation: units 9, 10 and 11. These units appear to form a continuum across the landscape with slight differences in soil and hydrology the likely factors determining distribution. Wandoo Jarrah over *Banksia sessilis* Tall Open Shrubland differs floristically from these other units by the dominance and presence of *Dryandra sessilis* and absence of dominant and/or common species *i*ncluding *Banksia armata, Chamaexeros serra, Xanthorrhoea platyphylla, Mesomelaena stygia, Hakea undulata, Hakea trifurcata, Babingtonia camphrosomae, Petrophile squamata* and *Petrophile serruiae.* The delineation of these similar vegetation groups is further complicated by apparent floristic changes occurring across the groups in a north south direction. For example *Gastrolobium spinosum* was only recorded in the northern sites of units 8 and10 as well as in the northerly site of unit 9. Similarly *Leptospermum erubescens* was only recorded in the north (Site 17, unit 8 and in Unit 9.

Patches of *Banksia sessilis* were often very small and it is not clear why some area of Wandoo/Jarrah Woodland have *Banksia sessilis* and others do not, or why some apparently similar areas are dominated by *Banksia armata* or *Hakea trifurcata* or *Hakea undulata*.

Banksia sessilis plants were often recorded in old gravel pits, possibly planted. Their abundance in these areas suggests this species is well suited for revegetation programs.

Wandoo/Jarrah over *Banksia sessilis* Tall Open Shrubland

Site 17

Site 14

Site 13- senescent

9 Htri/Bdru: Wandoo over *Hakea trifurcata* Open Shrubland and *Banksia drummondii* Low Shrubland (Site 16)

This vegetation was only recorded on the northern boundary of the Forest Stirling link. Floristically it appears transitional between Jarrah Wandoo Woodland over *Banksia sessilis* Tall Open Shrubland (8) Jarrah/Wandoo/*E. falcata* Open Woodland over *Banksia armata* Low Shrublands (10) and *Hakea trifurcata/Hakea undulata* Shrubland (11). It may represent a northern version of *Hakea trifurcata* Shrubland and further survey would be required to determine if it is distinct. It is distinguished by the *Banksia drumondii* Low Shrubland with other unique species appearing to be *Calothamnus planifolius* and *Calytrix leschenaultia.* The presence of *Leptospermum erubescens* and *Conostylis villosa* is indicative of the northern location.

Wandoo over *Hakea trifurcata* Open Shrubland and *Banksia drummondii* Low Shrubland

Site 16

10 Barm: Jarrah/Wandoo or Wandoo/*Eucalyptus falcata* Open Woodland over *Banksia armata* Low Shrubland (Sites 5,9,12,19,& 29)

This vegetation was found throughout the survey area and is characterized by the dominance of *Banksia armata* Low Open Heath or Low Shrbuland in the understorey, usually occurring over a *Mesomelaena stygia* Very Open Sedgeland and *Neurachne alopecuroidea* Very Open Grassland. However there was considerable floristic variation between sites sampled, especially at the range ends in the NE, NW and south. Jarrah and Wandoo are the typical canopy species in the overstorey however four other tree and mallee species were recorded with *Eucalyptus pleurocarpa* dominant in the NE, Marri (*Corymbia calophylla*) dominant in the south, and *Eucalyptus falcata* absent from the south. *Eucalyptus occidentalis* was recorded in a central site along with Wandoo and *E. falcata*. Such variation in overstorey and understorey composition suggests there may be more than one association within this group.

Other common species include *Hakea lissocarpha* (Proteaceae), *Bossiaea eriocarpa, Hibbertia commutata, Hibbertia gracilipes, Tetratria octandra, Tetraria* sp Jarrah Forest, *Xanthorrhoea platypylla*, and *Chamaexeros serra*. The presence of species such as *Mesomelaena stygia, Chamexeros serra* as well as *Goodenia coreulea, Babintonia camphorsomae, Tetratheca virgata* and *Rinzia fumana* are indicative of heavier soils.

This vegetation is closely related to all the Jarrah/Wandoo/*E falcata* dominated units recorded on the lower slopes and plains (8, 9, 11 & 12) which appear to form a continuum with differences in soil and hydrology likely factors in determining distribution and species composition.

Jarrah/Wandoo or Wandoo/*Eucalyptus falcata* Open Woodland over *Banksia armata* Low Shrubland

Site 5

Site 12

Site 19

Site 29

Site 9

11 Htri/Hund: *Hakea trifurcata/Hakea undulata* Shrubland (Sites 25,30,31)

Patches of dense *Hakea undulata* and/or *Hakea trifurcata* were observed frequently, especially in southern areas though they were difficult to sample due to small size of patches or occurrences associated with past disturbance such as road edges or gravel pits. Most patches observed appeared to be dominated by either *Hakea undulata* or *Hakea trifurcata* with *H. trirurcata* absent in the *H. undulata* dominated patches. It is not clear if there are distinct floristic and habitat differences between areas dominated by either species.

Higher in the landscape this vegetation had an overstorey of Jarrah/Marri Woodland whilst areas adjacent drainage lines appeared to lack an overstorey (Site 30).

Structurally this vegetation varied from a tall open scrub to open heath and scrubland with a secondary open low heath present over an open or very open sedgeland, very open herbland and *Neurachne alopecuoirdea* Very Open Grassland. Dominant lower shrubs included the Proteaceous species *Banksia armata* and *Hakea lissocarpha* as well as *Bossiaea ornata, Verticordia densiflora* var *cesptisoa, Hypocalymma angustifolia*, *Babingtonia camphrosomae* and *Allocasuarina microstachya*. Other common shrubs included the Proteacous species *Petrophile squamata* and *Petrophile serruriae* as well as *Hibbertia commutata, Xanthorhoea platyphylla, Goodenia coerulea* and *Gompholobium marginatum.* Common sedges included *Tetraria* sp Jarrah Forest, *Tetraria octandra,* and *Desmocladus fasciculatus.* Common herbs included *Chamaexeros serra, Haemodorum laxum* and *Stylidium tenue.*

Hakea trifurcata/Hakea undulata Shrubland has close floristic and ecological affinities with units 8, 9 10 and 12, all of which appear to form a continuum on soils ranging from loams to gravelly loams and clays and occurring on gentle slopes and plains.

Hakea trifurcata/Hakea undulata Shrubland

Site 25

Site 31

Site 30

12 Mix Prot: Mixed Proteaceous Open Low Heath (Site 15)

This vegetation was only recorded in a very small flat area surrounded by Jarrah/Wandoo Woodland which appears to occur where the drainage is impeded. It has a very diverse shrub strata dominated by *Petrophile crispata, Isopogon teretifolius, Banskia armata* and *Allocasuarina humils* with an emergent mallee canopy *of Eucalyptus falcata* and *E incrassata. Hakea varia* and *Hakea trifurcata* were present as an Open Shrubland above the open low heath, though these species appeared more common on the edges of this vegetation. Many of the species present are indicative of heavier soils and poor drainage inluding *Rinzia fumana, Boronia subsessilis, Jacksonia alata, Damperia alata, Xanthosia singuliflora, Chamaexeros serra*, and the sedges *Mesomelaena stygia, Anarthria gracilis* and *Schoenus obtusifolia*.

This vegetation is has close floristic affinities with units 11 and to lesser extent unit 10, possibly occurring where soils are heavier and less well drained.

This unit has some affinities with *Eucalyptus falcata* Very Open Mallee over Mixed Low Heaths recorded in similar habitats east of Porongorup Range, but differs in low shrub composition (Sandiford 2006).

Three additional P proteaceous species were observed in this vegetation but outside Site 15: *Hakea lehmanniana, Banksia porrecta* P4.and *Petrophile ?filifolia*.

Site 15

13 Bten_rep: ***Eucalyptus phaenopylla* Open Mallee over *Melaleuca hamata* Tall Shrubland and *Banksia tenuis* var *reptans* Low Open Shrubland** (Site 18)

This vegetation was only recorded on the northern boundary of the Forest to Stirling link occurring on gravelly clay loam or clays and surrounded by Wandoo Woodland. Over half the species were only recorded this unit including all dominant trees and shrubs, highlighting the distinctiveness of this unit. The vegetation is sparse with an open mallee canopy above *Melaleuca hamata* Tall Shrubland, *Banksia tenuis* var. *reptans* Low Shrubland and Mixed Very Open Sedgeland. The presence of such species as *Banksia tenuis* var. *reptans, Damperia alata*, *Harperia lateriflora and Goodenia coerulea* are indicative of heavy poorly drained soils.

Many species in this unit occur at their southerly or south westerly limit near the boundary of the Forest to Stirling link, including *Eucalyptus phaenophylla, Melaleuca lateriflora, Melalauca hamata, Hakea marginata, Beaufortia schaueri* and *Dampiera lavandulacea,* suggesting that this vegetation is unlikely to be widespread in the survey area.

Two Proteaceous species were recorded in this vegetation *Banksia tenuis* var. *reptans* and *Hakea marginata*. A new population of the Priority 3 species *Stylidium pseudohirsutm* was located in this vegetation.

Eucalyptus phaenopylla Open Mallee over *Melaleuca hamata* and *Banksia tenuis* var *reptans* Low Open Shrubland

Site 18

14 (SRO) Stirling Range Outlier Heathland Complex (Site 3. 6 & 21)

Three Stirling Range outliers were visited and sampled once and although all three sites shared a number of species including the dominant Proteaceous species *Banksia armata* and *Hakea ambigua* along with *Leucopgpogon gibbous*, *Xanthorrhoea platyphylla* and the sedges *Tetraria* sp Jarrah Forest and *Anarthria gracilis*, they differed markedly in floristics and structure. This variation along with the presence of other (not sampled) vegetation on these outliers e.g. *Eucalyptus pleurocarpa* Open Mallee over *Banksia armata/Banksia aculeata*/ Open Heath and *Eucalyptus pleurocarpa/E.?phaenophylla* Very Open Mallee over *Hakea pandanicarpa/Banksia aculeata* Tall Shrubland and *Banksia tenuis/Beaufortia schaueri* Low Heath suggests there is range of Mallee/Shrubland/Heathlands on these outliers. Thus this group is broadly described as a "complex" and further survey is required to determine the vegetation associations.

The presence and dominance in some sites within this complex of *Banksia armata, Tetraria* sp jarrah Forest, *Mesomelaena stygia* and *Chamaexero serra* indicate this unit has some floristic affinities with unit 10 (Barm). However the overstorey species differed markedly with a range of Mallees including *Eucalyptus pleurocarpa, Eucalyptus pachyloma, Eucalyptus preissiana* and *Eucalyptus lehmanii* present and a large number of understorey species were restricted to this complex including *Hakea ambigua, Gastrolobium velutinum, Banksia sphaerocarpa, Melaleuca sp Hairy, Calothamnus microcarpus* and *Petrophile divaricata* (Table1).

A high number of Proteaceous species were recorded in this complex with 9 recorded within the relevés including*: Lambertia ericifolia, Banksia armata, Banksia brunnea, Banksia tenuis var tenuis, Isopogon teretifolius subsp teretifolius, Persoonia striata, Banksia sphaerocarpa, Hakea lehmanniana* and *Petrophile divaricata.* An additional 7 species observed on these outliers included: *Banksia aculeata, Hakea pandanicarpa, Hakea baxteri, Hakea trifurcata, Lambertia inermis, Banksia senecifolia* and *Isopogon baxteri. Banksia hirta*, a species that is very similar to B. armata may also be present.

A high number of conservation species was also noted within in the sites or on the outliers, including *Banksia acuelata P2, Calothamnus micorcarpus P2, Verticordia coronata P2, Banksia senecifolia P3* with *Chordifex ornatus P2 Petrophile longifolia P3,* and *Jacksonia calycina P3* recorded on sandier soils slightly lower on these outliers. The presence of these conservation species was notable given the brevity of survey and small area visited.

Given the variety of vegetation observed and high number of conservation species present and it is recommended further surveys be undertaken on these outliers to assist in documentation and management.

Stirling Range Outlier Heathland Complex

Site 3

Site 6

Site 21

Appendix 8 – Photos of Proteaceous species recorded within sites
(Photos from author (LS), Basil Shur (BS) or DEC Florabase with permission from WA herbarium)

Adenanthos cuneatus (LS)

Banksia armata (LS)

Banksia armata (DEC Florabase)

Banksia attenuata (BS)

Banksia brunnei (LS)

Banksia coccinea (LS)

Banksia dallaneyi (LS)

Banksia densa (DEC Florabase)

Banksia drummondii (BS)

Banksia grandis (LS)

Banksia littoralis (LS)

Banksia nivea (DEC Florabase)

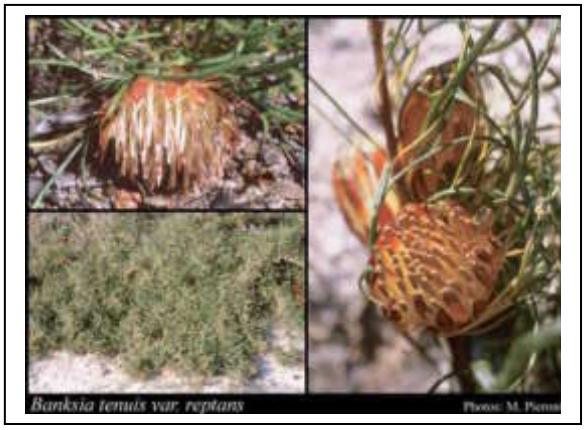
Banksia nutans ((DEC Florabase)

Banksia porrecta (DEC Florabase)

Banksia repens (DEC Florabase)

Banksia sessilis (LS)

Banksia sphaerocarpa (LS)



Banksia tenuis var reptans (DEC Florabase)

Banksia tenuis var tenuis (DEC Florabase)

Franklandia fucifolia (LS)

Grevillea quercifolia (LS)

Hakea ambigua (LS)

Hakea ceratophylla (DEC Florabase)

Hakea lissocarpha (DEC Florabase)

Hakea lehmanniana (LS)

Hakea corymbosa (LS)

Hakea prostrata (LS)

Hakea marginata (LS)

Hakea pandanicarpa subsp *crassifolia* (DEC Florabase)

Hakea trifurcata (LS)

Hakea undulate (LS)

Hakea varia (LS)

Isopogon teretifolius (DEC Florabase)

Isopogon trilobus (DEC Florabase)

Lambertia ericifolia (BS)

Lambertia inermis (DEC Florabase)

Petrophile crispate (LS)

Petrophile divaricata ((DEC florabase)

Petrophile ericifolia (DEC florabase)

Petrophile filifolia (BS)

Petrophile longifolia (LS)

Petrophile media (BS)

Petrophile serruriae (LS)

Petrophile squamata (DEC Florabase)

Stirlingia latifolia (DEC Florabase)

Synaphea obtusata (DEC Florabase)