

# Flora and Vegetation Assessment

## Lots 1, 3 and 128 South Western Highway

Byford



Lindsay Stephens Bsc (Geology), Msc (Botany) MELANZ  
Mem Aust Geomechanics Soc - Mem WA Environ Cons Assoc

25 Heather Road, Roleystone WA 6111  
Tel 9397 5145 Fax 9397 5350

**Contents**

1.0	Introduction	1
2.0	Methodology	1
2.1	Aims of the Survey	1
2.1	Methods of Survey	1
3.0	Physical Environment	2
3.1	Physical Description	2
3.2	Proposed Landuse	3
4.0	Vegetation Assessment	3
4.1	Community Types	3
4.2	Vegetation on Site	8
5.0	Significant Vegetation	11
5.1	Declared Rare, Priority or Significant Taxa	11
5.2	Threatened or Priority Ecological Communities	11
5.3	EPBC Legislation	12
6.0	Vegetation Condition	12
7.0	Representation of the Flora – Vegetation	13
7.1	Significant Flora	13
7.2	Vegetation Representation	13
7.3	Protection of Significant Vegetation	14
8.0	Clearing Assessment	18
9.0	Discussion	16
	References – Reading	
	Flora and Vegetation Notes	Attached

**Tables**

Table 1	Remnant Vegetation Summary	6
Table 2	Native species recorded during the site inspections	8
Table 3	Assessment of Clearing Principles	15

**Figures**

Figure 1	Byford DAP, Vegetation and Wetlands	4
Figure 2	Remnant Vegetation	
Figure 3	Vegetation Condition	
Figures 4 and 5	Site Photographs	
Figure 6	Concept Subdivision	

**Vegetation Assessment,  
Lots 1, 3 and 128 South Western Highway, Byford**

20 August 2011

**1.0 INTRODUCTION**

An assessment of the vegetation of Lots 1, 3 and 128 South Western Highway was conducted to provide comment on the type of vegetation present on site and its significance.

It is bounded to the south by Cardup Siding Road.

Brickwood Reserve, west of the rail reserve, is near the north western corner. This reserve is listed under Commonwealth EPBC legislation.

**2.0 METHODOLOGY****2.1 Aims of the Survey**

Landform Research conducted a vegetation assessment on 21 April 2010 to determine the quality of the vegetation and its significance.

The main aim was to determine which vegetation was the most significant with respect to preservation.

**2.2 Methods of Survey**

The vegetation assessment was conducted to the lowest level of assessment based on Environmental Protection Authority (2004) Guidance Statement, *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia*, No 51 June 2004.

The site was assessed by Lindsay Stephens of Landform Research who walked the site and all taxa observed were recorded. A total of 2.5 hours was spent on site.

However, bearing in mind the timing of the study, there will be a number of taxa that were not recorded, particularly those annual and smaller varieties which are only readily noticed when flowering.

The number and type of taxa present will however provide satisfactory information on the quality of the vegetation which in turn will provide information on the potential of finding additional taxa.

Searches of the Department of Environment and Conservation and WA Herbarium databases were made with respect to the species identified. The databases listed under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* were also searched.

Exotic species were considered but are so widespread and common that the main and dominant species only were recorded, and in general areas rather than in each specific area.

The DEC Rare and Priority Flora and Ecological Communities databases were searched. The Commonwealth EPBC databases were also searched.

Determinations and inferences on the Vegetation Complexes and Floristic Community Types were made in a number of ways, relating to comparisons to published floristics and geomorphic and regolith matching.

- The Commonwealth EPBC databases were searched.
- Comparisons were made to published boundaries of Vegetation Complexes in Heddle et al, 1980.
- Comparisons of species were made to the descriptions of Floristic Community Types in Gibson et al 1994, pages 29 to 45.
- Comparisons of species were made to the sorted table in Gibson et al 1994, Table 12, which shows the species frequency within each Floristic Community Type. Weston 2004 states that Neil Gibson noted that such comparisons are possible.
- Comparisons were made to the descriptions of the Floristic Community Types and maps in Appendix 1 of Gibson et al 2004.
- Comparisons to local studies completed by Keighery and Trudgen for Department of Conservation and Land Management, (*Remnant Vegetation on the Alluvial Soils of the Eastern Side of the Swan Coastal Plain*).
- Comparison to Wilde S A and G H Low, 1978, 1 : 250 000 Perth Geological Series, Geological Survey of Western Australia.
- Comparisons were made to published boundaries of Landforms and Soils in Churchward and McArthur, 1980.
- Soil and regolith mapping and assessment of the geomorphology by Lindsay Stephens at the time of the site inspections. Soil and regolith mapping has been found to be very closely aligned to species composition through extensive field mapping by Landform Research, with small changes to the clay or sesqui-oxide content being related to the introduction and deletion of particular indicators.

The original and existing plant communities, vegetation condition and plant species were considered.

### 3.0 PHYSICAL ENVIRONMENT

#### 3.1 Site Description

The study site lies on the eastern edge of the Swan Coastal Plain, just west of the Darling Fault.

Clays and sands shed from the Darling Scarp were washed onto the edge of the Swan Coastal Plain forming the sandy clays of the Guildford Formation that form the sediments of the eastern Swan Coastal Plain. Piled along the eastern edge of the Swan Coastal Plain are sands of the Yogannup Formation, which forms the Ridge Hill Shelf and represent a coastal edge of a marine transgression during the last million years.

During the Tertiary Period, and in more recent times, laterite developed across the landscape adding gravel to the soil profiles.

The soils of the study area are generally related to the Yogannup Formation.

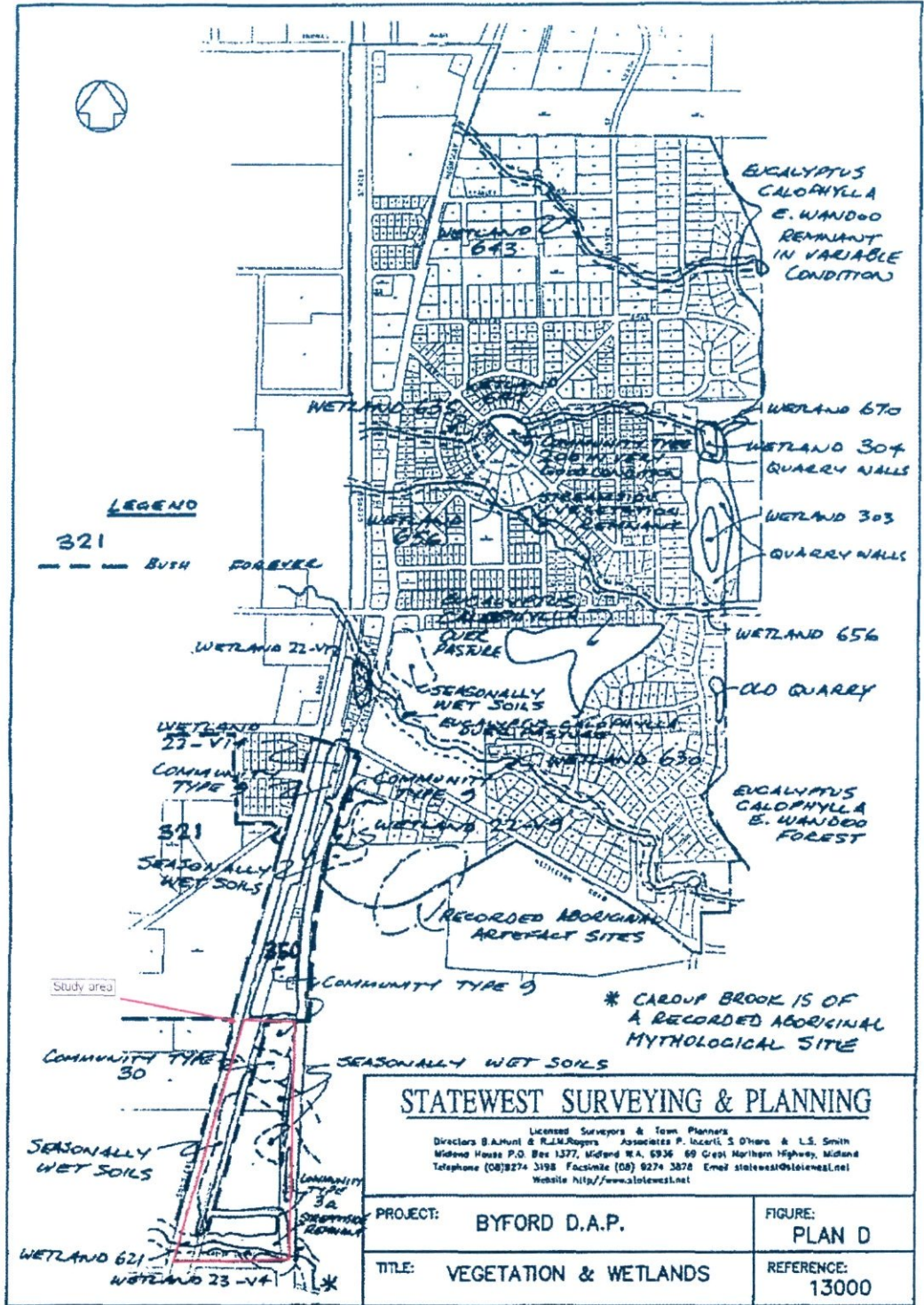


Figure 1



BRICKWOOD RESERVE

Study Boundary

NOT PRESENT

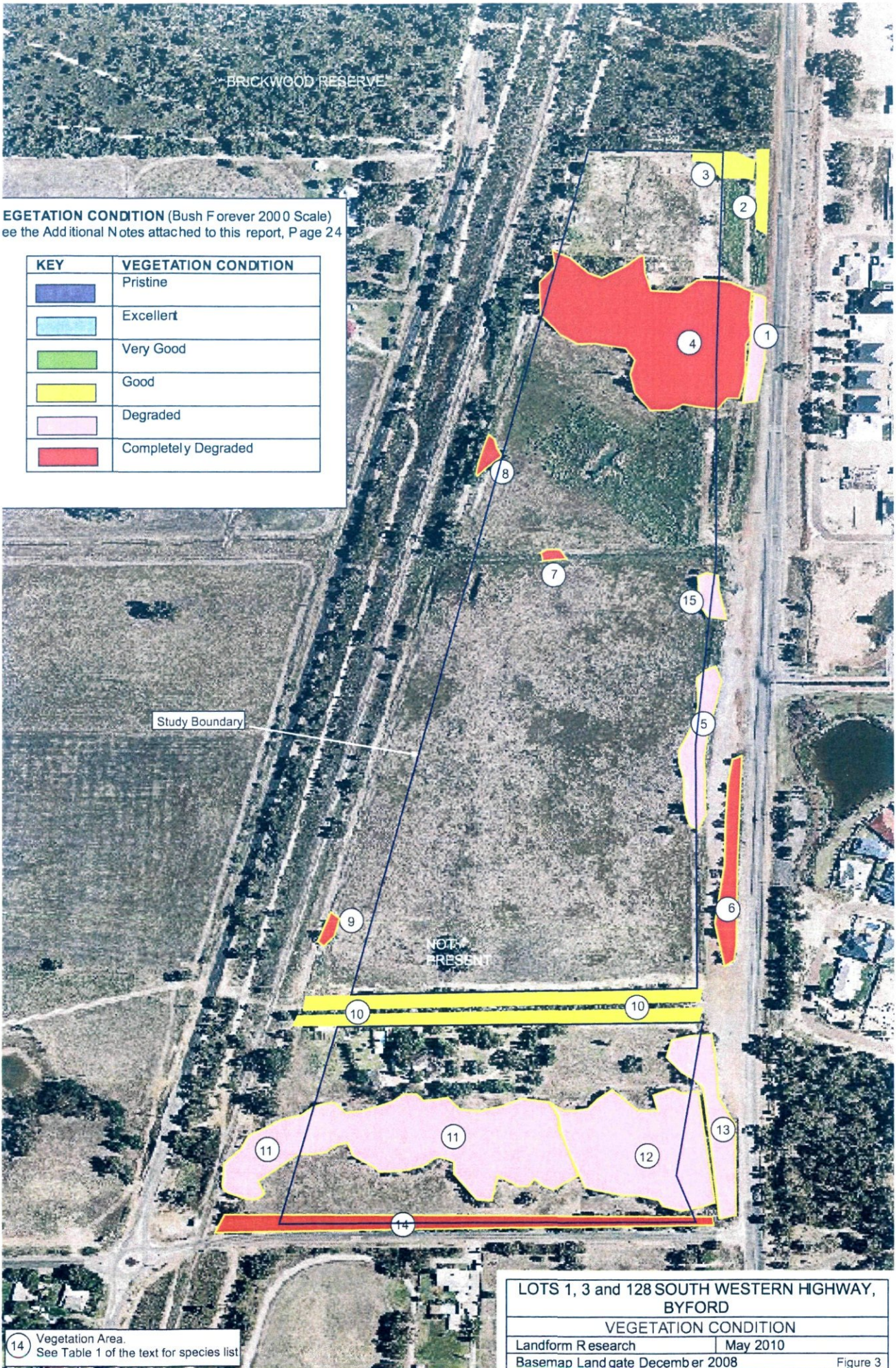
14 Vegetation Area.  
See Table 1 of the text for species list

LOTS 1, 3 and 128 SOUTH WESTERN HIGHWAY,  
BYFORD  
REMNANT VEGETATION

Landform Research May 2010

Basemap Land gate December 2008

Figure 2



VEGETATION CONDITION (Bush Forever 2000 Scale)  
 See the Additional Notes attached to this report, Page 24

KEY	VEGETATION CONDITION
	Pristine
	Excellent
	Very Good
	Good
	Degraded
	Completely Degraded

Study Boundary

NOT PRESENT

14 Vegetation Area.  
 See Table 1 of the text for species list

LOTS 1, 3 and 128 SOUTH WESTERN HIGHWAY, BYFORD	
VEGETATION CONDITION	
Landform Research	May 2010
Basemap Land gate December 2008	Figure 3

On Plan D from the Byford Townsite Detailed Area Plan, the site is shown as seasonally wet soils with an area of Community Type 9 and Community Type 3A in the north. The vegetation east of the site in the small traffic island is listed as Community Type 3A.

Cardup Brook is shown as Wetland 621 with the vegetation as 23-V4.

The vegetation in the north adjacent to Brickwood Reserve is described as below in the Byford Townsite Detailed Area Plan.

**“Adjacent to Brickwood Reserve.**

The vegetation adjacent to Brickwood Reserve is *Eucalyptus calophylla* woodland with some regrowth over an old gravel pit. Added in particular is *Melaleuca viminea*, which occurs in low areas and along the road reserve to the south. Wetland species increase to the west towards the rail reserve. The floristic community is 3a, *Eucalyptus calophylla* - *Kingia australis* woodlands on heavy soils. Community Type 3a is listed as Critically Endangered (WAPC 2000). Community Type 9 occurs on the wetter areas. Community Type 9 is the most northern representation of this vegetation and is therefore significant (WAPC 2000).

Whilst the taxa were not assessed, it was noted that they were similar to those of the Brickwood Reserve.” (*Byford Townsite Detailed Area Plan*)

The remnant vegetation is shown on the attached Figures 2 and 3.

The best nomination for the remnant vegetation on site is altered to significantly degraded Floristic Community 3a, *Eucalyptus calophylla* - *Kingia australis* woodlands on heavy soils.

There is a small area of remnant vegetation within the extreme north eastern corner where part of Area 3 lies on the subject land with the remainder being within the road reserve of South Western Highway. Only a small area occurs on site at that location (Area 3). See Figure 2. The vegetation is likely to be a small area originally of Community Type 3a but is small with an area of about 15 x 20 metres which adjoins remnant vegetation on the adjoining land to the north.

A small area of roadside vegetation occurs outside the site in the north east (Areas 1 and 2). This is likely to be a remnant of original Community Type 3a.

There is a stand of parkland *Eucalyptus calophylla* in the central north (Area 4) which is regrowth Marri forming parkland pasture. The trees are generally not very old and with almost no understorey do not represent significant vegetation, but rather self seeded regrowth of a generally young age of perhaps 20 – 30 years. This vegetation does not justify a classification other than parkland pasture.

Vegetation occurs outside the study area along the railway reserve to the west, and along the road reserve of Pinebrook Road in the south.

The vegetation along Pinebrook Road consists of mixed vegetation with *Eucalyptus calophylla* tree layer and including *Kingia australis* in the tall shrub layer. This is Area 10 and the vegetation is classified as originally being Community Type 3a.

There is minor native vegetation along the road reserve east of the site.

The vegetation along Cardup Brook is described as below, in the Byford Townsite Detailed Area Plan.



**“Cardup Brook**

The vegetation adjoining Cardup Brook is *Eucalyptus calophylla* woodland with understorey similar to parts of Brickwood Reserve and John Crescent and the water courses, but including *Kingia australis*, *Dryandra lindleyana* and *Nuytsia floribunda* of Community Type 3a.

The vegetation condition along Cardup Brook varies from fair, with a significant ground cover of pasture species in some areas, to good. More degraded areas could benefit from spray and replanting programs to crowd out undesirable species and provide better filtration effects and improvements as a vegetation corridor.” (*Byford Townsite Detailed Area Plan.*)

The assessment of the vegetation for the Byford Townsite Detailed Area Plan was general and broad scale. The on site vegetation was not all walked at the time, being on private land for which permission was not available. Edge assessment was used.

The current study of 21 April 2010 presents a much better analysis of the vegetation.

A brief description of the various remnants is listed below. The list of species from each remnant is shown in Table 2, and the vegetation condition and structure are also shown.

**Table 1 Remnant Vegetation Summary.**

Remnant	Description	Vegetation Condition (Bush Forever Scale 2000)		
		Overstorey > 4 metres	Shrub layer 0.5 – 2 metres	Ground Cover <0.5 metres
Area 1	Scattered <i>Eucalyptus calophylla</i> over isolated to occasional understorey species. Groundcover dominated by significant weed and exotic pasture species. Lies within the road reserve of South Western Highway.	Degraded	Absent	Pasture and exotics
Area 2	Occasional understorey species of <i>Hakea trifurcata</i> , <i>H. undulata</i> and <i>H. lissocarpha</i> with <i>Mesomelaena tetragona</i> . Groundcover dominated by significant weed and exotic pasture species. Lies within the road reserve of South Western Highway.	Absent	Degraded	Degraded
Area 3	Remnant of Floristic Community 3a with <i>Eucalyptus calophylla</i> over a range of understorey shrubs and groundcovers such as <i>Hakea trifurcata</i> , <i>H. undulata</i> and <i>H. lissocarpha</i> , <i>Kennedia prostrata</i> , <i>Daviesia incrassata</i> , <i>Lechenaultia biloba</i> with <i>Mesomelaena tetragona</i> . Much of the vegetation lies within the road reserve of South Western Highway.	Good	Good	Good - Degraded
Area 4	Monoculture of scattered <i>Eucalyptus calophylla</i> over pasture and exotic species. Complete absence of native understorey or groundcover. Too degraded to be classified as Floristic Community 3a.	Degraded	Absent	Pasture and exotics

Area 5	Scattered to occasional <i>Eucalyptus calophylla</i> over pasture and exotic species. Complete absence of native understorey or groundcover. Too degraded to be classified as Floristic Community 3a. Lies predominantly within the road reserve of South Western Highway.	Degraded	Absent	Pasture and exotics
Area 6	Planted <i>Eucalyptus calophylla</i> over planted non local native species such as <i>Callistemon</i> and <i>Grevillea</i> spp. Basically a native garden. Lies within the road reserve of South Western Highway.	Degraded	Exotic natives only	Absent
Area 7	Small clump of about 6 plants of <i>Astartea fascicularis</i> over pasture and exotic species.	Absent	Degraded	Pasture and exotics
Area 8	Occasional <i>Eucalyptus calophylla</i> over pasture and exotic species. Complete absence of native understorey or groundcover. Too degraded to be classified as Floristic Community 3a.	Degraded	Absent	Pasture and exotics
Area 9	Occasional <i>Eucalyptus calophylla</i> over pasture and exotic species. Complete absence of native understorey or groundcover. Too degraded to be classified as Floristic Community 3a.	Degraded	Absent	Pasture and exotics
Area 10	Remnant of Floristic Community 3a with <i>Eucalyptus calophylla</i> over a range of understorey shrubs and groundcovers such as <i>Hakea trifurcata</i> , <i>H. undulata</i> and <i>H. lissocarpha</i> , <i>Kennedia prostrata</i> , <i>Daviesia incrassata</i> , <i>Kingia australis</i> , <i>Hibbertia hypericoides</i> , <i>Lechenaultia biloba</i> with <i>Mesomelaena tetragona</i> . All the vegetation lies within the road reserve of Pinebrook Road.	Good	Good	Good - Degraded
Area 11	<i>Eucalyptus calophylla</i> and <i>E. rudis</i> over occasional <i>Darwinia citriodora</i> , and <i>Agonis linearifolia</i> with some exotic shrubs over pasture and exotic species. Lies within proposed Public Open Space.	Good	Degraded	Pasture and exotics
Area 12	<i>Eucalyptus rudis</i> and occasional <i>E. calophylla</i> associated with watercourse with <i>E. wandoo</i> on the bank and occasional <i>Dryandra armata</i> and some exotic shrubs over pasture and exotic species. Area of <i>Baumea vaginalis</i> in creek bed.	Good	Degraded	Pasture and exotics
Area 13	<i>Eucalyptus rudis</i> and occasional <i>E. calophylla</i> associated with watercourse with <i>E. wandoo</i> and occasional native understorey and significant exotic species. Much of Area 13 lies within the road reserve of South Western Highway.	Good	Degraded	Degraded
Area 14	Scattered <i>Eucalyptus calophylla</i> associated with <i>E. wandoo</i> over pasture in the road verge.	Degraded	Absent	Pasture and exotics
Area 15	Occasional <i>Eucalyptus calophylla</i> over isolated <i>Xanthorrhoea preissii</i> and <i>X. brunonis</i> .	Degraded	Degraded	Pasture and exotics

	About half the Area lies within the road reserve of South Western Highway.			
--	--	--	--	--

The vegetation along the rail reserve is in Good to Very Good condition and is a remnant of Floristic Communities 3a, *Eucalyptus calophylla* - *Kingia australis* woodlands on heavy soils and Community Type 9 *Dense shrublands on clay flats*.

### Wetlands

The vegetation along Cardup Brook is listed as Bush Forever Site 271. The riparian vegetation is classified as Wetlands 62 and 23-V1 associated with Cardup Brook. Whilst these vegetated sites are classified as Conservation Category wetlands, they are coincident with the remnant vegetation.

## 4.2 Vegetation on Site

### • Species List

Brickwood Reserve to the north west was assessed by Keighery and Keighery (undated). It was found to contain a total of 309 taxa of which ninety two taxa were considered to be of special significance and five were Priority taxa. Brickwood Reserve is listed on the register of National Estate and is subject to protection under the *Commonwealth Environment Protection and Biodiversity Act 1999*.

Cardup Remnant Vegetation ("Cardup Nature Reserve"), in a similar geomorphological position to the south west, was also assessed by Keighery and Keighery (undated). It contained 294 native taxa of which 58 were regarded as significant and included 4 Priority taxa. This is classified as Bush Forever Sites 271 and 352.

**Table 2 Native species recorded during the site inspections**

- C Denotes common species.  
M Occasional plants of a particular species  
O Indicates uncommon plants  
U Indicates a single plant or 1 – 3 plants

# See Figure 1 for the location of each area

FAMILY	GENUS - SPECIES	1	2	3	4	5	6	7	8
Casuarinaceae	<i>Allocasuarina fraseriana</i>				m				
Cyperaceae	<i>Lepidosperma costale</i>			m					
	<i>Mesomelaena tetragona</i>		m	m					
Dasypogonaceae	<i>Kingia australis</i>								
Dilleniaceae	<i>Hibbertia commutata</i>								
	<i>Hibbertia hypericoides</i>								
Goodenaceae	<i>Lechenaultia biloba</i>		o	o					
	<i>Conostylis aculeata</i>		u						
Haemodoraceae	<i>Haemodorum paniculatum</i>								
	<i>Haemodorum spicatum</i>			o					
Cyperaceae	<i>Baumea vaginalis</i>								
	<i>Juncus pallidus</i>								
	<i>Schoenus sp</i>								
Laxmanniaceae	<i>Laxmannia squarrosa</i>								
Mimosaceae	<i>Acacia acuminata</i>								
	<i>Acacia lasiocarpa</i>			m					

	<i>Acacia pulchella</i>	o							
	<i>Acacia saligna</i>								
	<i>Acacia stenoptera</i>	u							
Myrtaceae	<i>Agonis linearifolia</i>								
	<i>Astartea affinis</i>							o	
	<i>Baeckea camphorosmae</i>								
	<i>Darwinia citriodora</i>								
	<i>Eucalyptus calophylla</i>	c		c	c	c	c		o
	<i>Eucalyptus marginata</i>								
	<i>Eucalyptus rudis</i>								
	<i>Eucalyptus wandoo</i>								
	<i>Melaleuca viminea</i>					u			
Papilionaceae	<i>Daviesia incrassata</i>			m					
	<i>Gompholobium marginatum</i>	o		m					
	<i>Hovea trisperma</i>			o					
	<i>Kennedia prostrata</i>	o							
	<i>Viminea juncea</i>					u			
Proteaceae	<i>Dryandra armata</i>								
	<i>Dryandra bipinnatifida</i>								
	<i>Dryandra lindleyaa</i>		u	m					
	<i>Hakea auriculata</i>								
	<i>Hakea lissocarpa</i>		o	m					
	<i>Hakea prostrata</i>					o			
	<i>Hakea ruscifolia</i>			u					
	<i>Hakea trifurcata</i>		o	m					
	<i>Hakea undulata</i>		u	m					
	<i>Hakea varia</i>					o			
	<i>Synaphea odocoileops</i>		u	o					
Restionaceae	<i>Desmodcladus fasciculatus</i>			m					
	<i>Hypolaena exsulca</i>			o					
	Sp	u							
Xanthorrhoeaceae	<i>Xanthorrhoea brunonis</i>		u						m
	<i>Xanthorrhoea gracilis</i>			u					
	<i>Xanthorrhoea preissii</i>		u						m
<b>TOTAL NATIVE SPECIES</b>		<b>48</b>							

# See Figure 1 for the location of each area

FAMILY	GENUS - SPECIES	9	10	11	12	13	14	15
Casuarinaceae	<i>Allocasuarina fraseriana</i>							
Cyperaceae	<i>Baumea vaginalis</i>				m			
	<i>Lepidosperma costale</i>		c			m		
	<i>Mesomelaena tetragona</i>		c					
	<i>Schoenus sp</i>		o					
Dasyopogonaceae	<i>Kingia australis</i>		u					
Dilleniaceae	<i>Hibbertia commutata</i>							
	<i>Hibbertia hypericoides</i>		c					
Goodenaceae	<i>Lechenaultia biloba</i>							
	<i>Conostylis aculeata</i>							
Haemodoraceae	<i>Haemodorum paniculatum</i>		u					
	<i>Haemodorum spicatum</i>							
Juncaeae	<i>Juncus pallidus</i>			o				
Laxmanniaceae	<i>Laxmannia squarrosa</i>							
Mimosaceae	<i>Acacia acuminata</i>							
	<i>Acacia lasiocarpa</i>							



## • Vegetation Structure

Photographs of the vegetation are attached, which provide information on the vegetation structure.

The structure of the vegetation has been partially to completely altered, although this is not readily apparent from aerial photography or a casual site inspection. The land has previously been subject to weather influences and drought.

A summary of the vegetation structure is presented in Table 1 above.

## 5.0 SIGNIFICANT VEGETATION

### 5.1 Declared Rare, Priority or Significant Taxa

A search of the CALM and WA Herbarium databases in 2004, as part of the Byford Townsite Detailed Area Plan, revealed that a total of 9 Priority species and 3 Declared Rare species' listed below, occur in the general area. Most of these species are associated with wetlands and are most likely to occur in, or adjacent, to Brickwood Reserve outside of the study area.

Listed Declared Rare and Priority Species:

-	<i>Drosera occidentalis</i> subsp <i>occidentalis</i>	P4
-	<i>Lambertia multiflora</i> var <i>darlingensis</i>	P3
-	<i>Schoenus pennisetis</i>	P1
-	<i>Thelymitra stellata</i>	R
-	<i>Trichocline</i> sp Treeton (BJ Keighery & N Gibson 564)	P2
-	<i>Acacia oncinophylla</i>	P2
-	<i>Aotus cordifolia</i>	P3
-	<i>Centrolepis caespitosa</i>	R
-	<i>Dryandra kippistiana</i>	P3
-	<i>Johnsonia pubescens</i> subsp <i>cygnorum</i>	P2
-	<i>Synaphea odocoileops</i>	P1
-	<i>Verticordia plumosa</i> var <i>pleiobotrya</i>	R

Of the above taxa, *Lambertia multiflora* var *darlingensis*, *Dryandra kippistiana*, *Verticordia plumosa* var *pleiobotrya* and *Acacia oncinophylla* are easily recognised and were not observed on site. It is just possible that any of the other taxa may occur, but only in areas where ground cover of native vegetation still remains. That is Areas 2, 3, 10 and 13. It is most unlikely that any other area will contain one of these taxa or any other significant taxa.

It is likely that the *Synaphea* recorded in the north east in Areas 2 and 3 is *Synaphea odocoileops* a Priority 1 taxa.

All the areas listed as containing Significant or Priority species are recommended to be retained and enhanced.

### 5.2 Threatened or Priority Ecological Communities

The only vegetation that can still be classified as a Floristic Community Type is the extreme north eastern corner (Area 3), the road reserves of Pinebrook Road, and the rail reserve to the west. Much of these lie within existing road reserves.

Some road reserves contain minor significantly altered remnants that also represent a defined Floristic Community Type.

Even Areas 11 and 12 are so significantly altered that ascribing a Floristic Community Type is probably invalid.

The best nomination for the remnant vegetation is altered to significantly degraded Floristic Community 3a, *Eucalyptus calophylla* - *Kingia australis* woodlands on heavy soils. The best representation of this is the small area in the extreme north eastern corner most of which does not lie on the subject land but rather on road reserve. The only other remnant of this community is scattered remnants along the road verges, outside the study site, and the vegetation along Pinebrook Road.

Floristic Community Type 3a is listed as a Threatened Ecological Community under State and Commonwealth Legislation.

There is also an *Interim Recovery Plan for Corymbia calophylla – Kingia Australis Woodlands on Heavy Soil (Swan Coastal Plain Community Type 3a – Gibson et al 1994) Commonwealth of Australia, 2003 – 2004.*

This plan lists ten occurrences of Community Type 3a but does not appear to list this site, presumably because the vegetation remnants are too small, the vegetation is too degraded, the remnants are located in situations where recovery is difficult such as road reserves or a combination of factors.

A number of recovery actions are proposed in the recovery plan, but none appear to be readily achievable on this site without allocating areas of protection that are larger than the remnants, and then a concerted replanting program.

The only area of potential is the road reserve of Pinebrook Road. The potential to protect the road reserve has been reviewed within the planning process and a number of road alignments considered but none have proved satisfactory and likely to protect the vegetation as there would be clearing to access the land between Pinebrook Road and Cardup Brook.

All other vegetation is so altered and consisting of regrowth that, whilst it might have originally been part of the same community Type, it can no longer be considered so.

### 5.3 EPBC Legislation

Databases held under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* were searched.

Floristic Community 3a is listed under Commonwealth legislation.

No unusual or unidentified species were recorded.

Brickwood Reserve is listed on the register of National Estate and is subject to protection under the *Commonwealth Environment Protection and Biodiversity Act 1999.*

### 6.0 VEGETATION CONDITION

The Vegetation Condition Score used in this study is that used in Bush Forever 2000.

A summary of the vegetation condition is shown in Table 1. The only area in better than Degraded condition is the extreme north eastern corner in Area 3 which is listed as being in Good Condition. All other areas are classed as Degraded or Completely Degraded, although Area 13 approaches Good.

Area 4 looks Good on an aerial photograph but is classified as Parkland Pasture which is Completely Degraded.

The majority of the site is pasture, with widespread pasture and other invasive species.

The open cleared areas are dominated by the invasive *Egrotis curvula* is widespread with *Digitaria sanguinalis*, *Lolium* spp, *Pennisetum clandestinum*, *Stenotaphrum secundatum*, *Erharta calicyna*, *Cyndodon dactylon*, *Avena* spp and *Briza maxima* among other pasture species. Other weed species include *Hypochaeris* spp, *Trifolium* spp, and *Echium plantagineum*.

## 7.0 REPRESENTATION OF THE FLORA - VEGETATION

### 7.1 Significant Flora

No Declared Rare, Priority Species or Significant flora was identified during the vegetation assessments.

Hedde et al 1980 show the site as being occupied originally by Guildford Complex.

The floristic community is 3a, *Eucalyptus calophylla* - *Kingia australis* woodlands on heavy soils. Community Type 3a is listed as Critically Endangered (WAPC 2000). The only remnants of this floristic Community are Areas 2 and 3 in the north eastern corner and Area 10, the reserve of Pinebrook Road, most of which lie on road reserves and not the subject land.

The vegetation along Cardup Brook is listed as Bush Forever Site 271. The riparian vegetation is classified as Wetlands 62 and 23-V1 associated with Cardup Brook. Whilst Degraded these vegetated sites are classified as Conservation Category wetlands, and are therefore listed as Significant.

Vegetation on site will be providing some habitats for birds and other small fauna, but with its sparseness on the low ridge the number of fauna species is likely to be significantly restricted.

### 7.2 Vegetation Representation

EPA Position Statement No 2, December 2000, *Environmental Protection of Native Vegetation in Western Australia*, specifically targets the retention of native vegetation in the Agricultural Areas in 4.1, *Clearing in the agricultural areas for agricultural purposes*. In 4.3, *Clearing in other areas of Western Australia*, it is unclear what "other areas" refers to, but may refer to retention of a 30% threshold in non agricultural areas.

Section 4.3 *Clearing in other areas of Western Australia*, (EPA Position Statement No 2, December 2000) expects that clearing will not take vegetation types below the 30% of the pre-clearing vegetation as recommended by ANZECC, 1999, *National Framework for the Management and Monitoring of Australia's Native Vegetation*. The National Objectives and Targets for Biodiversity Conservation 2001 - 2005 (Commonwealth of Australia 2001) also recognise 30% as the trigger value.

The cutoff for consideration of vegetation complexes when dealing with preservation in the Perth metropolitan Area is 10% as noted in Bush Forever and EPA Guidance Statement No 10.

The Guildford vegetation complex is listed as having 5% of the pre-European area still occurring, with 0.2% in secure tenure in 2003 (EPA Position Statement 2), well below the nominated 10% retention, hence the nomination of the Guildford Complex and Floristic Community Types as threatened.

### 7.3 Protection of Significant Vegetation



The site is zoned Industrial. Industrial zoned land does not require the allocation of Public Open Space.

However the alignment of Cardup Brook is listed as Bush Forever and represents a more significant community asset than the small discontinuous vegetation remnants of the regrowth Marri trees in the north.

Therefore in order to protect the community assets for biodiversity the landholders have elected to place Cardup Brook and its banks within Public Open Space. The vegetation within that suggested Public Open Space is degraded and could benefit from additional planting.

The landholders suggest that replanting and protection of the creekline has more chance of survival and forms better linkages.

They have tried a number of combinations and designs to try and save the vegetation along Pinebrook Road but in the end they deemed that the protection effort should be directed to protecting the larger remnant of Cardup Brook.

## 8.0 CLEARING ASSESSMENT

Clearing is controlled under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. These regulations provide for a number of principles against which clearing is assessed. (See attached notes for explanations).

	<b>CLEARING PRINCIPLE</b> <i>(Schedule 5 Environmental Protection Amendment Act, 1986)</i>
1a	<i>High Level of diversity</i>
1b	<i>Significant fauna habitat</i>
1c	<i>Necessary to existence of Rare flora</i>
1d	<i>Threatened Ecological Community</i>
1e	<i>Significant area of vegetation in an area that has been extensively cleared</i>
1f	<i>Wetland or watercourse</i>
1g	<i>Land degradation</i>
1h	<i>Impact on adjacent or nearby conservation areas</i>
1i	<i>Deterioration of underground water</i>
1j	<i>Increase flooding</i>

The *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* provide for planning and other policy issues to be taken into account when determining clearing applications.

Section 51O of the *Environmental Protection Act 1986* allows the CEO to take planning matters into account when making clearing decisions, such as a State Planning Policy. There is an agreement between DEC and DMP permitting DMP to issue Clearing Permits.

Table 3 Assessment against the Clearing Principles

	<b>CLEARING PRINCIPLE</b> <i>(Schedule 5 Environmental Protection Amendment Act, 1986).</i>	<b>COMMENT</b>
1a	High Level of diversity	<ul style="list-style-type: none"> <li>Only Areas 2 and 3 (north east corner) and 10 (Pinebrook Road) have sufficiently high levels of diversity to justify retention. Of these Area 2 and most of Area 3 lie outside the subject land.</li> <li>Some of scattered vegetation on the road verges such as Area 2 and 5 have minor value but may be better replaced by strategic revegetated corridors and linkages.</li> <li>The railway reserve outside the site has very high diversity and should be retained.</li> <li>Some areas have low diversity and could be replaced by strategic corridors and linkages which are planted to a high species richness. Areas of low value are Areas 4, 6, 7 and 9.</li> </ul>
1b	Significant fauna habitat	<ul style="list-style-type: none"> <li>All remnant vegetation has some habitat for fauna. Again Areas 2, 3 and 10 offer the most value.</li> <li>Also of high value and potential for enhancement is the linkage along Cardup Brook, Areas 11 to 13. This is earmarked for greater conservation effort as it is capable of providing for Public Open Space and linkages from east to west.</li> <li>If possible trees and vegetation could be protected within the road reserves and are recommended for retention and enhancement.</li> </ul>
1c	Necessary to existence of Rare flora	<ul style="list-style-type: none"> <li>No Declared Rare flora was found.</li> </ul>
1d	Threatened Ecological Community	<ul style="list-style-type: none"> <li>Threatened Ecological Community, Floristic Community 3a occurs on site in Areas 1 and 10 which are recommended for retention if possible.</li> <li>Community Type 3a is listed as a Threatened Ecological Community on both State and Commonwealth databases. This is listed as having very little of its original extant remaining.</li> <li>The vegetation complex, Guildford is listed as having 5% of the pre-European area still occurring, with 0.2% in secure tenure in 2003 (EPA Position Statement 2), well below the nominated 10% retention, hence the nomination of the Guildford Complex and Floristic Community Types as threatened.</li> </ul>
1e	Significant area of vegetation in an area that has been extensively cleared	<ul style="list-style-type: none"> <li>The remaining vegetation of Floristic Community 3a has very high conservation value because the vegetation community has largely been cleared.</li> <li>The Guildford Complex is listed as having 5% of the pre-European area still occurring, with 0.2% in secure tenure in 2003 (EPA Position Statement 2) well below the nominated 10%.</li> <li>Floristic Community 3a has an uncommon mixture of taxa. The same vegetation is present in the adjoining Brickwood reserve and Cardup Remnant Vegetation. The railway reserve also has Community 3a and 9.</li> <li>Other vegetation remnants could be cleared provided they were replaced by species rich linkages of local species.</li> <li>The best vegetation for retention is the Cardup Brook where the vegetation can be enhanced and will provide a linkage. It is proposed to be located within Public Open Space.</li> </ul>
1f	Wetland or watercourse	<ul style="list-style-type: none"> <li>The vegetation along Cardup Brook is listed as Bush Forever Site 271. The riparian vegetation is classified as Wetlands 62 and 23-V1 associated with Cardup Brook. Whilst Degraded these vegetated sites are classified as Conservation Category wetlands, and are therefore listed as Significant.</li> <li>It is recommended to be retained and enhanced. See above.</li> </ul>
1g	Land degradation	<ul style="list-style-type: none"> <li>The development of the site can be managed in a manner that does not lead to degradation of adjoining areas by the use of normal construction techniques and best practice environmental management.</li> </ul>

		<ul style="list-style-type: none"> <li>The majority of the site is already cleared and under pasture which contains much weed and highly invasive species.</li> <li>The small watercourse that is directed into the site from the stormwater basin east of South Western Highway will require design as a constructed wetland or stormwater management system.</li> </ul>
1h	Impact on adjacent or nearby conservation areas	<ul style="list-style-type: none"> <li>The adjoining Brickwood Reserve has potential to be better linked to features such as Cardup Brook.</li> </ul>
1i	Deterioration of underground water	<ul style="list-style-type: none"> <li>Any impact on groundwater will depend on the land use and the design of stormwater management.</li> <li>The earthy clay soils of the Yogannup Formation are relatively good to good at dealing with pollution risk.</li> </ul>
1j	Increase flooding	<ul style="list-style-type: none"> <li>This will be considered in stormwater design and management and as the site is already predominantly cleared there will be little additional risk from clearing of some minor vegetation.</li> </ul>

## 9.0 DISCUSSION

No Declared Rare or Significant flora was identified. It is likely that the *Synaphea* recorded in the north east in Areas 2 and 3 is *Synaphea odocoileops* a Priority 1 taxa.

Some of the taxa listed on DEC databases as possibly occurring are either large and easily recognised, but were not observed, such as *Lambertia multiflora* var *darlingensis*, *Dryandra kippistiana*, *Verticordia plumosa* var *pleiobotrya*, *Acacia oncinophylla* or will only occur where a ground cover of native vegetation still remains. That is Areas 2, 3, 10 and 13.

All the areas listed as containing Significant or Priority species are recommended to be retained and enhanced.

The original vegetation complex is Guildford Formation of which only 5% remains.

The vegetation on site was originally Floristic community 3a, *Eucalyptus calophylla* - *Kingia australis* woodlands on heavy soils which is listed as Threatened on State and Commonwealth databases. However the majority of Community 3a is located within road reserve and not on site. It may be possible during the development of roads that some parts of the vegetation can be retained. A Recovery Plan is in place for Community Type 3a and is attached. This site is not listed as being part of the recovery plan and probably is too small to be sustainable.

Therefore any areas of Good vegetation will have high conservation value. The only areas on site in Good vegetation condition are the small portion of Area 3 in the north eastern corner that still remains as on the site and the road reserve of Pinebrook Road. To this should be added Area 2, also in the north eastern corner, because of the presence of *Synaphea odocoileops* but Area 2 lies within the road reserve of South Western Highway and is not therefore able to be managed by this subdivision.

The vegetation along Cardup Brook (Areas 11, 12 and 13) is listed as Bush Forever Site 271. The riparian vegetation associated with Cardup Brook is classified as Wetlands 62 and 23-V1. Whilst Degraded these vegetated sites are classified as Conservation Category wetlands, and are therefore listed as Significant. It is recommended they be retained and enhanced and included as Public Open Space.

All other areas of remnant vegetation are either too small and/or too degraded to have high significance for retention. They could be removed. An offset of vegetation planting that has a higher species richness could be used to replace or compensate for any loss of vegetation. This could be a linkage or corridor or might include infill planting and revegetation of the vegetation along Cardup Brook.

The adjoining Brickwood Reserve west of the rail reserve is near the north western corner. This reserve is listed under Commonwealth EPBC legislation.

Weed and dieback management is recommended to be incorporated into the guidelines for development of the site.



Cleared land, view north towards Area 4



Cleared land in the south



Area 4 showing complete absence of native understorey



Area 4 showing complete absence of native understorey



Road verge. View north towards areas 3 and 4



Area 2



Area 3 in the north eastern corner



Area 10. Road reserve of Pinebrook Road



Area 5, view north



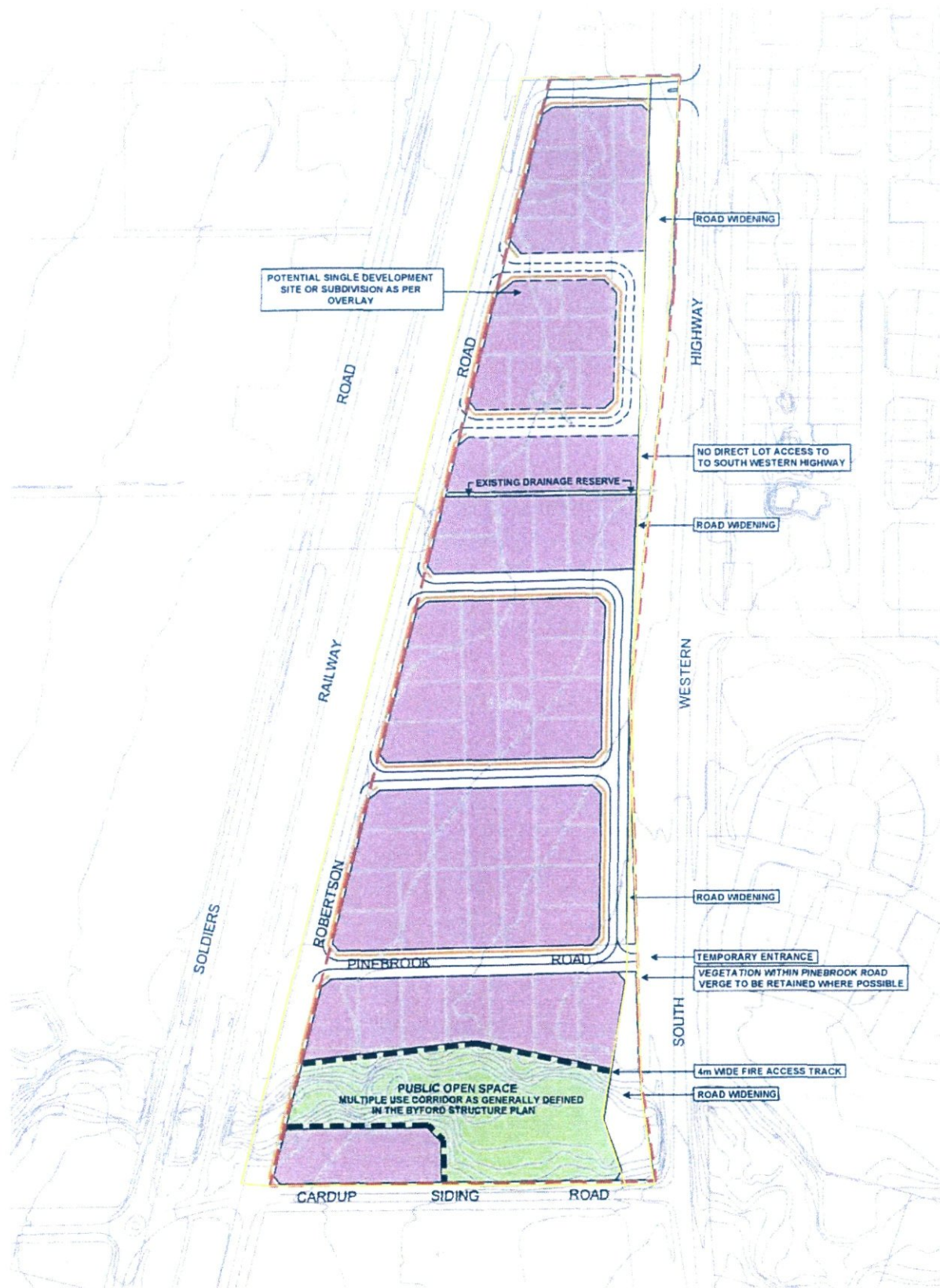
Area 5, view south



Area 12 in the south east on Cardup Brook



Area 11, Cardup Brook



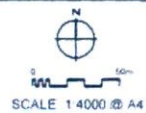
- LEGEND**  
**LOCAL SCHEME RESERVES**
- Local Roads
  - Public Open Space and Drainage ZONES
  - Mixed Use
  - OTHER
- Local Structure Plan Boundary  
 Footpath / Dual Use Path Network

**NOTE**  
 All proposed roads 20m wide  
 Distances and areas subject to survey  
 Road carriageways diagrammatic only  
 Minimum lot size 1000m

**LOCAL STRUCTURE PLAN**  
**LOTS 1, 3 & 128 SOUTH WESTERN HIGHWAY**  
**BYFORD**

17/05/2014

17/05/2014



**GRAY & LEWIS**  
 LAND USE PLANNERS

**FIGURE 1**  
 Suite 5, 2 Hancy Street  
 South Perth, WA 6151  
 T: (08) 9474 1720  
 F: (08) 9474 1772  
 perth@graylewis.com.au

Figure 6

**REFERENCES - READING**

- ANZECC, 1999, *National Framework for the Management and Monitoring of Australia's Native Vegetation*.
- Beard J S, 1979, *The Vegetation of the Perth Area, Western Australia, 1 : 250 000 Vegetation Series*, Vegmap Publications Perth.
- Cavanagh T and M Pieroni, 2006, *The Dryandras*, Australian Plants Society Victoria and Wildflower Society of Western Australia.
- Churchward H M and W M McArthur, 1980, *Landforms and Soils of the Darling System, Western Australia in Atlas of Natural Resources, Darling System, Western Australia*, Department of Conservation and Environment.
- Collins K, K Collins and A George, 2008, *Banksias*, Bloomings Books Pty Ltd Melbourne.
- Commonwealth Environment Protection and Biodiversity Conservation Act 1999*.
- Commonwealth of Australia 2001, *The National Objectives and Targets for Biodiversity Conservation 2001 – 2005*.
- Commonwealth of Australia, 2001, *National Objectives and Targets for Biodiversity Conservation 2001 – 2005*.
- Commonwealth of Australia, 2003 - 2004, *Interim Recovery Plan for Corymbia calophylla – Kingia australis Woodlands on Heavy Soil (Swan Coastal Plain Community Type 3a – Gibsoin et al 1994)*.
- Department of Environment and Conservation, 2006, *Declared Rare and Priority Flora List*.
- Environmental Protection Authority (2004) Guidance Statement, *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia*, No 5,1 June 2004.
- Environmental Protection Authority, Guidance 10, *Level of assessment for proposals affecting natural areas within the System 6 region and Swan Coastal Plain portion of the System 1 Region*.
- Environmental Protection Authority, Position Statement No 2, December 2000, *Environmental Protection of Native Vegetation in Western Australia*.
- Gibson et al, 1994, *A Floristic Survey of the Southern Swan Coastal Plain*, Unpublished Report for the Australian Heritage Commission, prepared by Department of Conservation and Land Management and the Conservation Council of Western Australia.
- Government of Western Australia, 2000, *Bush Forever*.
- Keighery G J and B J Keighery, undated, *Floristics of reserves and Bushland Areas of the Perth region (System 6) Parts V – IX*, Wildflower Society of Western Australia (Inc).
- Mattiske E M and J J Havel, 1998, *Vegetation Mapping in the South West of Western Australia, Perth Sheet*, CALM (DEC).
- Hedde et al, 1980, *Vegetation Complexes of the Darling System, Western Australia in Atlas of Natural Resources, Darling System, Western Australia*, Department of Conservation and Environment.



Kaesehagen, 1995, *Bushland Condition Mapping*, IN Invasive Weeds and Regenerating Ecosystems in Western Australia, Proceedings of Conference held at Murdoch University, July 1994, Institute for Science and Technology Policy, Murdoch University.

Wilde S A and G H Low, 1978, *1 : 250 Geological Series Perth Sheet*, Geological Survey of Western Australia.

## RARE AND SIGNIFICANT FLORA AND VEGETATION NOTES

### 1.0 RARE AND SIGNIFICANT FLORA AND VEGETATION

Flora can be significant on the basis of features of the taxa, its distribution and rarity. Flora as a vegetation community or complex can also be significant based on similar principles. The most commonly used determinants of significance are listed below.

A number of flora are regarded as significant even though they may not be listed as Declared Rare or Priority species. "Significant flora" and "Significant vegetation" are defined in Environmental Protection Authority (2004) Guidance Statement, Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia, No 51, June 2004.

Species, subspecies, varieties, hybrids and ecotypes may be significant for a range of reasons, other than as Declared Rare Flora or Priority flora, and may include the following:

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

### 1.1 DECLARED RARE FLORA

Species specially protected under the Wildlife Conservation Act 1950, as identified in the current listing. Normally listed within a Wildlife Conservation (Rare Flora) Notice; Schedule 1 Extant taxa.

#### **R: Declared Rare Flora – Extant Taxa**

*Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection and have been gazetted as such.*

#### **X: Declared Rare Flora – Presumed Extinct Taxa**

*Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such.*

### 1.2 PRIORITY FLORA

Lists of plant taxa, maintained by the Department of Conservation and Land Management that are either under consideration as threatened flora but are in need of further survey to adequately determine their status, or are adequately known but require monitoring to ensure their security does not decline.

#### **1: Priority One – Poorly known taxa**

*Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat, eg road verges, urban areas, farmland, active mineral leases, etc, or the plants are under threat, eg from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declarations as "rare flora", but are in urgent need of further survey.*

**2: Priority two – Poorly known taxa**

*Taxa which are known from one or a few (generally <5) populations, at which some at least are not believed to be under immediate threat (ie currently not endangered). Such taxa are under consideration for declarations as “rare flora”, but are in urgent need of further survey.*

**3: Priority Three – Poorly known taxa**

*Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (ie not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declarations as “rare flora”, but are in urgent need of further survey.*

**4: Priority Four – Poorly known taxa**

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

**Significant Vegetation**

*Vegetation may be significant for a range of reasons, other than a statutory listing as Threatened Ecological Communities or because the extent is below a threshold level, and may include the following reasons:*

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

**1.3 THREATENED ECOLOGICAL COMMUNITY**

*Ecological communities that have been assessed through a procedure (coordinated by CALM) and assigned to one of the following categories related to the status of the threat to the community. (EPA Guidance Statement No 51 2004).*

***Presumed Totally Destroyed******Critically Endangered***

*<10% of the pre-European extent remains in an intact condition in the bioregion.*

***Endangered***

*10 – 30% of pre-European extent remains*

***Vulnerable***

*Declining and/or has declined in distribution and/or condition, and whose ultimate security is not yet assured (it could move into a category of higher threat in the near future if threatening processes continue)*

#### 1.4 PRIORITY ECOLOGICAL COMMUNITY

*Ecological communities that have been assessed through the procedures for Threatened Ecological Communities, but do not meet the criteria although still potentially at risk are assigned to one of the following categories related to the status of the threat to the community. (Definitions and Criteria for Priority Ecological Communities, DEC and CALM Policy Statement No 9).*

##### **Priority One**

*Poorly known ecological communities that are very restricted and not actively managed for conservation.*

##### **Priority Two**

*Poorly known ecological communities that are restricted and mostly actively managed for conservation*

##### **Priority Three**

*Poorly known ecological communities that are of more widespread occurrence, which may not be well reserved or subject to disturbance pressures or significant communities that are not under threat.*

##### **Priority Four**

*Communities that are adequately known, but rare and not threatened, or are near the status of Threatened. They are divided into Rare, Near Threatened or communities removed from the Threatened List.*

##### **Priority Five**

*Communities that are not threatened, but are dependant on conservation for their survival.*

#### 1.5 COMMONWEALTH LEGISLATION

*Some vegetation communities or plant taxa that are very rare or of National importance are listed under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.*

*Databases held under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 can be searched.*

#### 1.6 REPRESENTATION OF VEGETATION COMMUNITIES

*The significance of the flora depends on a number of issues.*

- *Rare, Priority or Significant species may be present.*
- *A Threatened Ecological Community may be present.*
- *The development may take the area of the particularly vegetation community or complex below desirable levels or guidelines.*
- *There may be an aspect of the flora that may be listed under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.*

*EPA Position Statement No 2, December 2000, Environmental Protection of Native Vegetation in Western Australia, specifically targets the retention of native vegetation in the Agricultural Areas in 4.1, Clearing in the agricultural areas for agricultural purposes. In 4.3, Clearing in other areas of Western Australia, it is unclear what "other areas" refers to, but may refer to retention of a 30% threshold in non agricultural areas.*

*Section 4.3 Clearing in other areas of Western Australia, (EPA Position Statement No 2, December 2000) expects that clearing will not take vegetation types below the 30% of the pre-clearing vegetation as recommended by ANZECC, 1999, National Framework for the Management and Monitoring of Australia's*

*Native Vegetation. The National Objectives and Targets for Biodiversity Conservation 2001 - 2005 (Commonwealth of Australia 2001) also recognise 30% as the trigger value.*

*For the Perth Metropolitan Area and the Greater Bunbury Area the minimum retention figure is 10%.*

#### VEGETATION CONDITION NOTES

*The vegetation condition mapping used is that used by the Department of Environment and Conservation and is taken from Bush Forever 2000.*

#### *Vegetation Condition Scale reproduced from page 48 (Bush Forever 2000).*

<b>Condition Score</b>	<b>Vegetation Condition</b>	<b>Vegetation Descriptors</b>
<b>1</b>	<b>Pristine</b>	<i>Pristine or nearly so, no obvious signs of disturbance 0% weed cover</i>
<b>2</b>	<b>Excellent</b>	<i>Vegetation structure intact, disturbance affecting individual species, and weeds are non aggressive species. 1 – 5% weed cover</i>
<b>3</b>	<b>Very Good</b>	<i>Vegetation structure altered, obvious signs of disturbance. For example disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing. 5 – 25% weed cover</i>
<b>4</b>	<b>Good</b>	<i>Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing. 25 – 50% weed cover</i>
<b>5</b>	<b>Degraded</b>	<i>Basic structure of the vegetation severely impacted on by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing. 50 – 75% weed cover</i>
<b>6</b>	<b>Completely Degraded</b>	<i>The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as "parkland cleared" with the flora comprising weed or crop species with isolated native trees or shrubs. 75 – 100% weed cover</i>

This condition scale uses a scale that can distort the public perception of middle vegetation condition when compared to previous vegetation studies. In previous studies the word "Good" would have been a lower classification such as "Poor" as shown in Bush Forever 2000, page 48. The scale Good also does not seem to match the vegetation description provided on page 48. The Bush Forever 2000 Condition Score is possibly better related to the potential for regeneration of remnant vegetation rather than being a descriptor of its current condition. See Attachment 2.

The weed data has been added from the DEC Guideline for collecting the Graceful Sun-Moth.

Another approach is to use the number of remaining species as an indicator of vegetation condition. This provides for a less subjective assessment of the vegetation condition.

Kaesehagen, 1995, Bushland Condition Mapping, IN Invasive Weeds and Regenerating Ecosystems in Western Australia, Proceedings of Conference held at Murdoch University, July 1994, Institute for Science and Technology Policy, Murdoch University, 1995, A copy of the Kaesehagen 1995 vegetation condition table is shown below.

<b>Descriptor</b>	<b>Percentage of species remaining</b>	<b>Comments</b>
<b>Very Good - Excellent</b>	<b>80 – 100%</b>	<ul style="list-style-type: none"> <li>• Vegetation structure intact or nearly so.</li> <li>• Cover / abundance of weeds less than 5%.</li> <li>• No or minimal signs of disturbance.</li> </ul>
<b>Fair - Good</b>	<b>50 – 80%</b>	<ul style="list-style-type: none"> <li>• Vegetation structure modified.</li> <li>• Cover / abundance of weed 5 – 20%, any number of individuals.</li> <li>• Minor signs of disturbance</li> </ul>
<b>Poor</b>	<b>20 – 50%</b>	<ul style="list-style-type: none"> <li>• Vegetation structure completely modified.</li> <li>• Cover / abundance of weeds 20 – 60% any number of individuals.</li> <li>• Disturbance incidence high</li> </ul>
<b>Very Poor</b>	<b>0 – 20%</b>	<ul style="list-style-type: none"> <li>• Vegetation structure disappeared.</li> <li>• Cover / abundance of weeds 60 – 100% cover, any number of individuals.</li> <li>• Disturbance incidence very high.</li> </ul>

## CLEARING PRINCIPLES

Clearing is controlled under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. These regulations provide for a number of principles against which clearing is assessed.

	<b>CLEARING PRINCIPLE</b> <i>(Schedule 5 Environmental Protection Amendment Act, 1986)</i>
1a	<i>High Level of diversity</i>
1b	<i>Significant fauna habitat</i>
1c	<i>Necessary to existence of Rare flora</i>
1d	<i>Threatened Ecological Community</i>
1e	<i>Significant area of vegetation in an area that has been extensively cleared</i>
1f	<i>Wetland or watercourse</i>
1g	<i>Land degradation</i>
1h	<i>Impact on adjacent or nearby conservation areas</i>
1i	<i>Deterioration of underground water</i>
1j	<i>Increase flooding</i>

The *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* also provide for planning and other policies and issues to be taken into account when determining clearing applications.

Section 51O of the *Environmental Protection Act 1986* allows the CEO to take planning matters into account when making clearing decisions, such as a State Planning Policy. There is an agreement between DEC and DMP permitting DMP to issue Clearing Permits.

As well as considering Biodiversity and other conservation issues the Clearing Principles that have to be satisfied are apparently designed for rural regions and do not adequately address the issues of resource needs. Therefore some additional principles need to be added when considering the need for essential Raw Materials. In an attempt to provide a better balance to the clearing principles those principles have been expanded as listed in the tables below.

<b>ADDITIONAL CLEARING PRINCIPLES – EXTRACTIVE INDUSTRIES</b>	
<b>Environmental Protection Act 1984 Section 51O</b>	
<b>Planning Matters</b>	
1	<i>Planning Matters</i>
<b>Environmental Protection Act 1984 Section 51O</b>	
<b>Relevant Matters</b>	
2a	<i>Need for the resource</i>
2b	<i>Classification of the resource and existing approvals</i>
2c	<i>Availability of alternative resources and the impact of their use</i>
2d	<i>Proposed final land use</i>
2e	<i>Offsite Environmental impacts if the resource is not used</i>
2f	<i>Sound environmental management and rehabilitation</i>