LOTS 2-4 ANKETELL ROAD, ANKETELL

FLORA AND VEGETATION SURVEY

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CONTENTS

Co	ntents		
List	t of At	tachr	nentsi
1	INTE	RODU	ICTION1
-	1.1	Purp	pose1
-	1.2	Scop	pe of Works1
2	EXIS	TING	ENVIRONMENT
2	2.1	Land	1 Use
	2.2	Тор	ography2
	2.3	Geo	logy and Soils
2	2.4	Hyd	rology2
3	FLO	RA AI	ND VEGETATION
3	3.1	Met	hodology
	3.2	Desl	xtop Searches
	3.3	Surv	ey Conditions
	3.4	Resu	ults
	3.4.	1	Flora
	3.4.	2	Vegetation
	3.4.	3	Vegetation Condition
	3.4.	4	Conservation Significance of Flora and Vegetation
4	SUN	1MAF	AND CONCLUSIONS
5	REFI	EREN	CES12

LIST OF ATTACHMENTS

Tables

Table 1:	List of Flora Species Identified from DPaW Database Searches within 5km of the site
Table 2:	Likelihood of Identified Significant Flora Species occurring on the Site
Table 3:	Statement of Botanical Survey Conditions
Table 4:	Vegetation Condition Rating Scale

Plates

Plate 1:	Dodonaea hackettiana P4 on Lot 4	•

Figures

Figure 1:	Site Location
Figure 2:	Vegetation Types
Figure 3:	Vegetation Condition

Appendices

Appendix 1:	DPaW Database Searches
Appendix 2:	Naturemap Report
Appendix 3:	Protected Matters Search Tool Report
Appendix 4:	Species List
Appendix 5:	Quadrat Data

1 INTRODUCTION

1.1 Purpose

Lots 2-4 Anketell Road, Anketell (the site) are located approximately 28km south of the Perth Central Business District (Figure 1) in the City of Kwinana. Currently the site is zoned 'Urban' under the Metropolitan Region Scheme (MRS) and 'Development' under the City of Kwinana Town Planning Scheme No. 2 with a small section in the northern part of the site zoned as 'Rural A' for the future widening of Anketell Road.

The lots have been developed for many years, however native vegetation remains on all three lots in varying amounts.

Terranovis Pty Ltd is examining the development potential of the lots and has commissioned PGV Environmental to undertake a Level 2 Spring Flora and Vegetation Survey of the lots to assist in their assessment.

1.2 Scope of Works

The Level 2 Spring Flora and Vegetation Survey was undertaken in accordance with Guidance Statement 51: *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA, 2004) and included the following:

- Desktop search and review of DPaW's Declared Rare and Priority Flora database and Threatened Ecological Communities database;
- Examination of recent aerial photography and contour maps to provisionally identify vegetation types and condition;
- Field survey in spring using quadrats to record native and introduced species as well as a thorough site walkover of any areas of native vegetation;
- Recording of any significant plant species using a hand-held GPS;
- Description and mapping of vegetation types and vegetation condition; and
- Compilation of a flora list.

2 EXISTING ENVIRONMENT

2.1 Land Use

Land use on the three lots comprising the site is quite different but are all consistent with rural and lifestyle pursuits. Lot 2 has an orchard as well as grazing land in the southern half, house and sheds in the northern portion and a small central area of remnant vegetation. Lot 3 is partially cleared and contains and house and other buildings and planted exotic trees. Lot 4 is mostly vegetated with a house in the north-west corner.

The present land use on the site and configuration of remnant native vegetation has remained in a similar state since the 1970s with only the addition of a new building on the southern part of Lot 3 since then.

2.2 Topography

The site is gently sloping form the south-east down to the west. The highest point in the south-east corner is at 39m Australian Height Datum (AHD) and the lowest point along the western boundary is around 26m AHD (DoW, 2015a).

2.3 Geology and Soils

The site is mapped as part of the Spearwood System, the second oldest of the three dune systems on the Swan Coastal Plain (Bolland, 1998). The Spearwood System contains sand dunes and plains and consists of aeolian sand and limestone over sedimentary rocks (DAFWA, 2015).

The soil on the site has been mapped and described by the Department of Agriculture and Food Western Australia (DAFWA) as:

• Spearwood 2a Phase (211Sp_2a) which are on lower slopes (1-5%) of dune ridge with moderately deep to deep siliceous yellow-brown sands or pale sands with yellow-brown subsoils and minor limestone outcrops (DAFWA, 2015). The Spearwood soils are mapped on the western part of the site in the power line easement.

2.4 Hydrology

Groundwater is between approximately 18 and 20m AHD, which is 8-19m below the surface level, and generally flows to the north-west (DoW, 2015b).

There are no surface water features present on the site including no rivers, creek lines or wetlands.

3 FLORA AND VEGETATION

3.1 Methodology

A flora and vegetation survey of the site was conducted by Dr Paul van der Moezel on 10 and 22 September 2015. The survey included sampling from six non-permanent 10m x 10m quadrats as well as a thorough walk through the site. Site coverage was high due to the small size of the site and open understorey.

3.2 Desktop Searches

A search of the Department of Parks and Wildlife's (DPaW's) Threatened Flora Database, WA Herbarium database and Declared Rare and Priority Flora Species List (Parks and Wildlife, 2015) (Appendix 1), the Naturemap database (Appendix 2) and the Protected Matters Search Tool (Appendix 3) identified 17 Endangered, Threatened or Priority plant species that have been recorded within 5km of the site (Table 1).

Species	Common Name	Status under Wildlife Cons. Act	Status under EPBC Act
Andersonia gracilis	Slender Andersonia	Threatened	Endangered
Caladenia huegelii	Grand Spider Orchid	Threatened	Endangered
Centrolepis caespitosa		Priority 4	Endangered
Darwinia foetida	Muchea Bell	Threatened	Endangered
Diuris micrantha	Dwarf Bee Orchid	Threatened	Endangered
Diuris purdiei	Purdie's Donkey Orchid	Threatened	Endangered
Drakaea elastica	Glossy-leaved Hammer Orchid	Threatened	Endangered
Drakaea micrantha	Dwarf Hammer Orchid	Threatened	Vulnerable
Lepidosperma rostratum	Beaked Lepidosperma	Threatened	Endangered
Verticordia plumosa var. pleiobotrya	Narrow-petalled Feather- flower	Threatened	Endangered
Cyathochaeta teretifolia		Priority 3	
Jacksonia gracillima		Priority 3	
Pithocarpa corymbulosa	Corymbosa Pithocarpa	Priority 3	
Stylidium paludicola		Priority 3	
Aponogeton hexatepalus	Stalked Water Ribbons	Priority 4	
Dodonaea hackettiana	Hackett's Hopbush	Priority 4	
Stylidium ireneae	Irene's Triggerplant	Priority 4	

Table 1: List of Flora Species Identified from Database Searches within 5km of the
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Table 2 examines the preferred habitat of each species and the likelihood of them being present on the site.

Table 2: Likelihood of Identified Significant Flo	ora Species occurring on the Site
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Species	Preferred Habitat*	Likelihood to be present on the site	
Andersonia gracilis	White/grey sand, sandy clay, gravelly loam	No – the site is too dry for this species	
	near winter wet swamps	, ,	
Caladania huagalii	Sand or clay loam. Does not survive in	Possible in the Very Good quality	
Culuuelliu liuegelli	disturbed areas.	vegetation on Lot 4	
Centrolepis caespitosa	White sand, clay. Salt flats, wet areas	No – there are no salt flats on the site	

Species	Preferred Habitat*	Likelihood to be present on the site	
Darwinia foetida	Grey-white sand on swampy, seasonally	No – not in the known range of this	
Durwiniu joetluu	wet sites near Muchea	species	
	Dark, grey to blackish, sandy clay-loam		
Diuris micrantha	substrates in winter wet depressions or	No – the site is too dry for this species	
	swamps		
Diuris nurdiei	Grey-black sand, moist. Winter-wet	No – the site is too dry for this species	
	swamps		
	Low-lying situations adjoining winter-wet		
Drakaea elastica	swamps. Does not survive in disturbed	No – the site is too dry for this species	
	areas		
	Usually found on cleared firebreaks or	No – the soils are generally too sandy	
Drakaea micrantha	open sandy patches that have been	and dry on the site	
	disturbed in wetter soils.		
Lepidosperma	Peaty and clay soils	No – the soils are too sandy on the site	
rostratum		for this species	
Verticordia plumosa	Clay, sandy loam. Seasonally inundated	ed No – No swampy areas on the site	
var. pleiobotrya	swamps, road verges.		
Cyathochaeta	Grey sand, sandy clay. Swamps, creek	No – the site is too dry for this species	
teretifolia	edges		
Jacksonia gracillima	Winter wet flats; brown clay, Flat of grey	No – The soils are sandy and not suitable	
	sand+	for this species	
Pithocarpa	Gravelly or sandy loam. Amongst granite	No – The soils are sandy and not suitable	
corymbulosa	outcrops	for this species	
Stylidium paludicola	Peaty sand over clay. Winter wet habitats	No – the site is too dry for this species	
Aponogeton	Freshwater: ponds, rivers, clavpans	No – No surface water features on the	
hexatepalus		site	
Dodonaea hackettiana	Sand. Outcropping limestone	Possible	
Stylidium ireneae	Sandy loam. Valleys near creek lines,	No – the site does not have the	
ory manufin in chicac	woodland, often with Agonis.	preferred habitat of this species	

* sourced from Florabase (DPaW, 2015), DoE SPRAT Database (DoE, 2015). + sourced from GBIF, 2015.

One of the Threatened species, the Grand Spider Orchid (*Caladenia huegelii*) has the potential to occur in the Very Good quality vegetation on Lot 4 due to the presence of a suitable soil type.

One Priority 3 species, *Dodonaea hackettiana*, may be present on the site.

A search of the DPaW Threatened and Priority Ecological Community database identified two Threatened and three Priority Ecological Communities that have been recorded within 5km of the site as follows:

- Vulnerable TEC Herb rich shrublands in clay pans (SCP 08)
- Endangered TEC Shrublands on clay flats (SCP 10a)
- The 'Priority 3' ecological community 'Low lying *Banksia attenuata* woodlands or shrublands (SCP21c)'
- The 'Priority 2' ecological community 'Banksia ilicifolia woodlands (SCP22)'
- The 'Priority 3' ecological community 'Northern Spearwood shrublands and woodlands (SCP24)'.

3.3 Survey Conditions

The conditions that the survey was undertaken in are presented in Table 3 in order to assess the adequacy of the survey. In summary, there were no constraints to the survey.

ISSUE	CONSTRAINTS (YES/NO); SIGNIFICANT, MODERATE OR NEGLIGIBLE	COMMENT
Competency/experience of the consultant conducting the survey	No constraints	Dr Paul van der Moezel has extensive survey experience on the Swan Coastal Plain.
Proportion of the flora identified	No constraints	The timing of the survey in early September should have identified most of the native species on the site.
Sources of information (historic/recent or new data)	No constraints	The flora of the Swan Coastal Plain is relatively well documented.
Proportion of the task achieved and further work that may need to be undertaken	No constraints	No follow-up survey required.
Timing/weather/season/cycle	No constraints	The September survey was optimal for identifying rare orchids and maximising flowering of most species. The 2015 orchid season was 2 weeks early as identified using reference sites of the DRF species <i>Caladenia</i> <i>huegelii</i> .
Intensity of survey (e.g. In retrospect was the intensity adequate)	No constraints	Approximately 4 hours spent on
Completeness (e.g. was relevant area fully surveyed)	No constraints	site coverage.
Resources (e.g. degree of expertise available for plant identification)	No constraints	Experienced botanist undertook plant identifications on site.
Remoteness and/or access problems	No constraints	Local site easily accessible on foot.
Availability of contextual (e.g. bioregional) information for the study area.	No constraints	Bush Forever and Gibson <i>et al.</i> (1994) used for regional context.

Table 3: Statement of Botanical Survey Conditions

Fungi and nonvascular flora (e.g. algae, mosses and liverworts) were not specifically surveyed for during the survey.

3.4 Results

3.4.1 Flora

A total of 110 plant species, comprising 95 native and 15 introduced species were recorded on the site (Appendix 4). Lot 4 contained the highest number of species, which is consistent with the larger area of remnant vegetation on the lot and the better condition than Lots 2 and 3.

- Lot 2 42 species (33 native, 9 introduced)
- Lot 3 41 species (35 native, 6 introduced)
- Lot 4 97 species (86 native, 11 introduced)

The families with the highest representation of species were the Fabaceae (Pea family – 14 species including one introduced), Asteraceae (Daisy family – 9 species, 2 introduced), Myrtaceae (Myrtle family – 7 species) and Proteaceae (Banksia family – 7 species).

Six 10m x 10m quadrats were sampled on the site (Appendix 5). The species richness in the quadrats ranged from 10 - 41. The vegetation in the best condition on Lot 4 had far higher species richness in the quadrats (average - 38.0) than the vegetation on the more degraded lots 2 and 3 (average - 18.8).

One Priority 4 species, Dodonaea hackettiana, was recorded on Lot 4 (see section 3.4.4).

3.4.2 Vegetation

Vegetation Complexes

The vegetation on the site is mapped as being part of the Bassendean – Central and South vegetation complex which is described as 'Vegetation ranging from woodland of *Eucalyptus marginata-Allocasuarina fraseriana-Banksia* species to low woodland of *Melaleuca* species and sedgelands on the moister sites. This area includes the transition of *E. marginata* to *E. todtiana* in the vicinity of Perth' (Heddle *et al., 1980*).

However, the Bassendean – Central and South vegetation complex occurs on Bassendean Sands which occur very close to the east of the site but. The soils on the site are mapped according to DAFWA as Spearwood Sands. The vegetation complex therefore is more likely to be part of the Karrakatta – Central and South vegetation complex which occurs on Spearwood soil types. Analysis of Floristic Community Type (see page 7) supports this conclusion.

Vegetation Types

Five vegetation types, based on the composition of the dominant plant strata, were described and mapped (Figure 2) on the site as follows:

BaBm Banksia attenuata/B. menziesii Low Open Woodland over Hibbertia hypericoides/Mesomelaena pseudostygia Low Open Heath

This vegetation type occurred on most of Lot 4. The *Banksia* trees are around 4m high and at medium density 10-30%. *Allocasuarina fraseriana* trees up to 5m high are also common in places and *Eucalyptus marginata* (Jarrah) to 8m high occurs sporadically. The understorey is low and open with common species *Hibbertia hypericoides, Mesomelaena pseudostygia, Xanthorrhoea preissii*,

Amphipogon turbinatus and Conostylis setigera. The soils are grey-brown deep sands. Quadrat AK1 is representative of this vegetation type.

BaBmAfAllocasuarina fraseriana/Banksia attenuata/B. menziesii/LowOpenWoodland over Hibbertia hypericoides/Mesomelaena pseudostygia LowOpen Heath

This vegetation type occurs on Lot 2 and 4 and is similar to the BaBm unit but with *Allocasuarina fraseriana* (Sheoak) more dominant and the tall shrubs *Adenanthos cygnorum* (Woolly Bush) and *Kunzea glabrescens* (Spearwood) fairly common. Common understorey species include *Hibbertia hypericoides, Mesomelaena pseudostygia, Amphipogon turbinatus, Gastrolobium capitatum* and *Lyginia barbata*. The soils are grey-brown sands. Quadrat AK2 is representative of this vegetation type in Excellent condition while A3 represents one in Degraded condition.

EmBaBm Eucalyptus marginata (Jarrah)/Banksia attenuata/B. menziesii Low Woodland over Hibbertia hypericoides/Mesomelaena pseudostygia Open Low Heath

This vegetation type occurs on Lot 2 and is different from the BaBm and BaBmAf units by the absence of Sheoak and more abundant Jarrah. The vegetation is quite degraded therefore the native understorey species are sparse and include *Hibbertia hypericoides* and *Mesomelaena pseudostygia* as the main species. The most common weed species is *Ehrharta calycina* (Annual Veldtgrass). The soil type is grey sand at the surface. Quadrat A5 is representative of this vegetation type in a degraded condition.

EmBaBmAf Eucalyptus marginata (Jarrah)/Banksia attenuata/B. menziesii/Allocasuarina fraseriana Low Woodland over Acacia pulchella/Mesomelaena pseudostygia Low Open Shrubland

This vegetation type occurs on Lot 3 and contain all four tree species, Jarrah, Sheoak, *Banksia attenuata* and *B. menziesii*, in similar density and 4-6m high. *Acacia pulchella* and *Mesomelaena pseudostygia* are common in a sparse native understorey that contains an abundance of Annual Veldtgrass. Quadrat A6 is representative of this vegetation type in a degraded condition.

Em Eucalyptus marginata (Jarrah) Open Woodland over weeds

A small stand of Jarrah over mostly weed species occurs in the south-west corner of Lot 2. The Jarrah trees are up to 7m high and moderately dense at 30%. Annual Veldtgrass dominates the understorey with very few native, none of which are abundant. The soil type is grey sand at the surface. Quadrat A4 is representative of this vegetation type in a degraded condition.

Floristic Community Types

Floristic Community Types (FCT) are based on the whole floristic composition of the vegetation rather than being determined by soil type and geomorphology (Vegetation Complex) or the nature of the dominant species (Vegetation Types). The FCT level of vegetation is required to identify whether any of the vegetation on the site is a Threatened or Priority Ecological Community.

The condition of the vegetation on lots 2 and 3 is too degraded to assign a FCT. The FCT of the two quadrats in the best condition on Lot 4 was determined using the spreadsheet method corresponding to Table 12 in Gibson *et al.* (1994). Both quadrats had very close similarities to FCT 28 and lesser

correlation to several other FCTs. FCT 28 is described as 'Spearwood *Banksia attenuata* or *B. attenuata* – *Eucalyptus* woodlands' (Gibson *et al.* 1994). FCT 28 occurs on Spearwood sands only, which supports the case for the vegetation complex being Karrakatta – Central and South rather than Bassendean – Central and South. The FCT has been recorded from Thompson's Lake near Jandakot north to Seabird.

3.4.3 Vegetation Condition

The vegetation condition over the site was assessed using the condition scale adopted in Bush Forever (Table 4). The condition of the native vegetation ranged from Degraded and Completely Degraded on Lots 2 and 3 up to Very Good and Excellent for the vegetation on Lot 4 (Figure 4).

Several dead Banksia trees occur on Lot 4 suggestive of Dieback disease (*Phytophthora cinnamomi*), however there are also patches of cut trees possibly for firewood that may have contributed to the standing dead trees.

Condition	Description
Pristine	Pristine or nearly so, no obvious signs of disturbance.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very Good	Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
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 and grazing.
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

Table 4: Vegetation Condition Rating Scale

Source: Government of Western Australia, 2000.

3.4.4 Conservation Significance of Flora and Vegetation

Flora

No Threatened (Declared Rare) Flora species were recorded on the site. The timing of the survey was considered suitable to identify any potential Threatened or Priority species. The Threatened orchid species *Caladenia huegelii* (Grand Spider Orchid) was observed to be flowering at a reference site on Armadale Road prior to the survey on the site.

Nineteen plants of the Priority 4 species *Dodonaea hackettiana* (Hackett's Hopbush) were recorded in the south-west corner of Lot 4 (Figure 3). *Dodonaea hackettiana* (Plate 1) is a shrub or tree up to 1-5m that occurs on sand and outcropping limestone in the southern Perth metropolitan region close to the coast as well as in the Shire of Gingin near Lancelin. The plants on Lot 4 were all located in close proximity to each other within a radius of around 10m.



Plate 1 Dodonaea hackettiana P4 on Lot 4.

Priority 4 plant species are those that are not currently considered threatened but could be if present circumstances change. Priority 4 species are not protected under the State *Wildlife Conservation Act 1950* or Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. However, wherever possible Priority plant species should be protected from clearing.

Vegetation

The vegetation on the site was considered to be representative of FCT 28 which is not a Threatened or Priority Ecological Community. According to Gibson *et al.* (1994) FCT 28 is Well Reserved and has a Low Risk conservation status.

The condition of the vegetation on Lots 2 and 3 is too degraded to be considered suitable for retention as an example of remnant vegetation in the Anketell area. The vegetation on Lot 4 is mostly excellent and is of suitable condition to be considered for retention in Public Open Space in any future development of the area. However, the size of the vegetated portion on Lot 4, around 2.3ha is below the 4ha minimum considered in Perth's *Urban Bushland Strategy* as being viable in the long term (Government of Western Australia, 1995). If the vegetation on Lot 4 were to be retained it would require management by the local authority to maintain the vegetation in its current condition.

The trees on Lots 2 and 3 would provide some habitat for avifauna and the understorey vegetation on Lot 4 would provide some additional habitat for ground-dwelling fauna such as small reptiles.

The vegetation on the site does not form a part of any continuous ecological corridor in the Anketell area and therefore its use as an ecological corridor would be limited to avifauna (birds and bats).

The Jarrah, Sheoak and Banksia trees would provide foraging habitat potentially for Carnaby's and Baudin's Black Cockatoo and to a limited degree Forest Red-tailed Black Cockatoos. All three species are listed species under the Commonwealth EPBC Act. In addition, 9 Jarrah trees with a diameter

greater than 500mm at breast height were observed on the site. The Jarrah trees did not contain any hollows therefore would not provide any current breeding habitat for Black Cockatoos. Under the definition of breeding habitat released by the Department of the Environment in 2012 the trees could be considered potential breeding habitat in the future.

According to the Black Cockatoo Referral Guidelines (DSEWPaC, 2012) clearing more than 1ha of Black Cockatoo foraging habitat and one breeding tree has the high likelihood of having a significant impact. Referral under the EPBC Act is therefore recommended in such instances. However, in PGV Environmental's experience since the release of the Guidelines the clearing of around 2.3ha of habitat on Lot 4 and an additional 1ha of Jarrah trees on Lots 2 and 3 would highly unlikely be considered significant if a proposal to refer the clearing were referred. A decision of Not a Controlled Action would likely be the result of an EPBC Act Referral.

Four Bush Forever sites containing similar upland vegetation types and habitat for Black Cockatoos occur within 2km of the site as follows:

- Site 347 Wandi Nature Reserve and Anketell Road Bushland, Wandi/Oakford
- Site 270 Sandy Lake and Adjacent Bushland, Anketell
- Site 269 The Spectacles
- Site 268 Mandogalup Road Bushland, Mandogalup

The presence of these Bush Forever sites in close proximity to the site greatly reduces the impact of potentially clearing all the vegetation on fauna and vegetation values.

4 SUMMARY AND CONCLUSIONS

The Level 2 Flora and Vegetation Survey of Lots 2-4 Anketell Road, Anketell resulted in the following findings:

- Native vegetation occurs on all three lots in varying condition;
- A total of 110 plant species, comprising 95 native and 15 introduced species were recorded on the site. Lot 4 contained the highest number of species, which is consistent with the larger area of remnant vegetation on the lot and the better condition than Lots 2 and 3;
- No Threatened (Declared Rare) Flora species were recorded on the site. Nineteen plants of the Priority 4 species *Dodonaea hackettiana* (Hackett's Hopbush) were recorded in the southwest corner of Lot 4. While Priority species are not protected by State or Federal legislation wherever possible Priority plant species should be protected from clearing;
- The vegetation is mapped as being part of the Bassendean Central and South vegetation complex, however based on the underlying Spearwood soil type the vegetation is most likely more accurately described as part of the Karrakatta Central and South vegetation complex;
- Five vegetation types were described and mapped on the site. All five types are upland vegetation types occurring on dry sandy soils. The dominant tree species include Jarrah, *Allocasuarina fraseriana, Banksia attenuata* and *Banksia menziesii*;
- The vegetation on lots 2 and 3 was too degraded to assign a Floristic Community Type. The better vegetation on Lot 4 was assessed as being FCT 28 'Spearwood Banksia attenuata or B. attenuata Eucalyptus woodlands' which is considered Well Reserved and has a Low Risk conservation status;
- The vegetation condition on Lots 2 and 3 is too degraded to consider retention in any future development. The vegetation on Lot 4 is in good condition for retention however the size, around 2.3ha, is below the 4ha minimum recommended under the *Urban Bushland Strategy* as being viable in the long term and would require considerable management by the local authority if it were to be retained;
- The trees on the site have some habitat value for avifauna and the understorey on Lot 4 would provide some additional habitat for ground-dwelling reptiles. The ecological corridor value of the vegetation is low;
- Upland native vegetation of similar vegetation type occurs in four Bush Forever sites within 2km of the site; and
- According to the Black Cockatoo Referral Guidelines (DSEWPaC, 2012) clearing more than 1ha of Black Cockatoo foraging habitat and one breeding tree has the high likelihood of having a significant impact. Referral under the EPBC Act is therefore recommended in such instances. However, based on evidence of similar proposals referred under the EPBC Act in recent years the proposal to clear the site would highly unlikely be considered significant. A decision of Not a Controlled Action would likely be the result of an EPBC Act Referral.

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FIGURES