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Environmental Surveys – Flora & Vegetation Assessment; Tree & Black Cockatoo Habitat Assessment

113 Kawina Road, Bickley

City of Kalamunda

Project Number: 170794

Assessment Date: 23 November 2017

Report Date:

5 June 2018

Report Details

Report Version	Submitted to	Submitted Date
v1.3	Landowner	
Plan Version	Amendment Record	Submitted Date

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Executive Summary

A Level 1 Flora and Vegetation Survey and Tree and Fauna Habitat Survey was carried out at 133 Kawina Road, Bickley, to assess environmental suitability for Development of the Subject Lot to a chalet/health spa tourist complex.

The flora survey identified no threatened or protected species or communities. The ST subcommunity of the Dwellingup 2 vegetation complex was the predominant vegetation complex found at the Lot, this is well reserved both generally and in the City of Kalamunda. One Weed of National Significance is present in the south east corner of the Lot, which is outside the area proposed for Development. The area selected for Tree and Habitat survey indicated that the Lot provides a high-quality foraging environment for Forest Red Tail Black Cockatoos, and may offer potential nesting sites. Fifty trees within the surveyed area exceeded 50cm diameter at breast height and as per EPBC Act (1999) referral guidelines (2012). These will not be impacted by the proposed Development.

A Building Envelope is delineated that would contain the buildings within the Development. The Building Envelope occupies a total area of 8980m² (0.898 hectares) with native vegetation that contains a total of 132 trees (81 Jarrah and 51 Marri). All these 132 trees are less than the 50cm diameter at breast height guidelines. Clearance of the Building Envelope for the Development proposed on the Subject Lot would therefore remove 0.898 hectares or 132 trees all less than 50cm diameter at breast height. The trees proposed for removal as part of development comprise approximately 18.5% of the total area of native trees on the Subject Lot, retaining 81.5% or 3.95 hectares of high quality foraging habitat for Black Cockatoos, with all large potential nesting trees remaining. Since the trees to be removed are all less than 50cm diameter at breast height and occupy an area of less than 1 hectare it is judged that the Development will not have a significant impact on Black Cockatoos, as defined by the EPBC Act (1999) Referral Guidelines. No trees are proposed for removal within areas that did not receive a detailed Tree survey on the Subject Lot, and the proposed Development will not have a significant impact on trees outside of the proposed Building Envelope.

The native understory vegetation was considered to range from degraded to excellent condition, having been impacted by previous understory disturbance to varying degrees. Approximately 13,560m² (1.36 hectares) containing native understory vegetation is proposed for removal / management to maintain the APZ to low threat state under relevant Bushfire legislation.

1 Introduction

1.1 Background

Bushfire Prone Planning were engaged to conduct a Level 1 Flora and Vegetation Survey and a Black Cockatoo and Fauna Habitat Assessment for Lot 602, 113 Kawina Road, Bickley (henceforward termed “the Lot”). The Landowners are considering a tourism-related development consisting of 6 chalets, a day spa, and a caretaker’s cottage (Figures 1 and 2). The Landowners have additionally requested that survey identifies locations where development will minimise environmental impacts.

1.2 Aims and Objectives

This report details the results of the following environmental surveys carried out at the Lot:

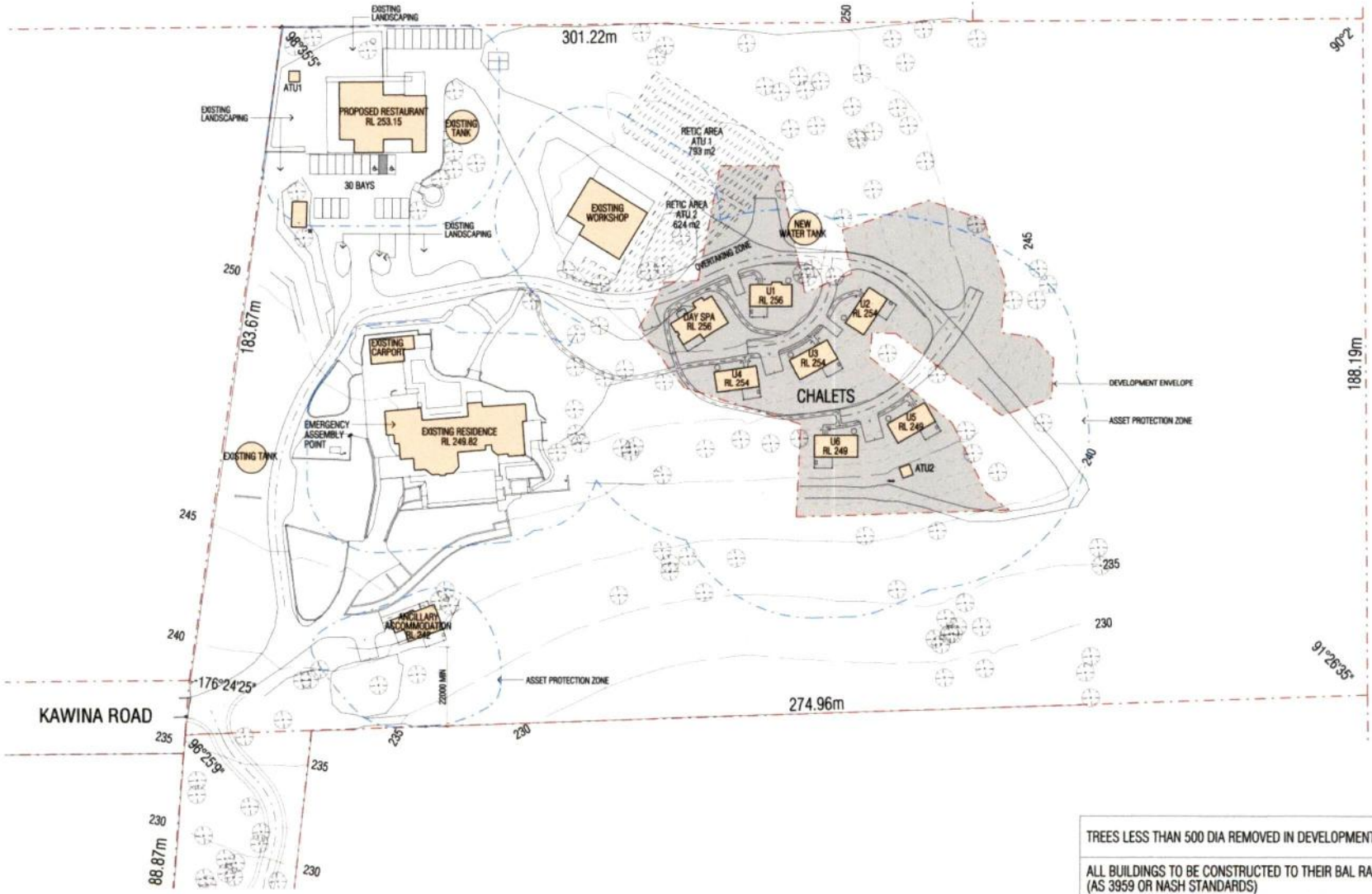
- A Level 1 Flora and Vegetation survey on the Lot, to identify flora species and communities present and ensure there are no impacts on threatened or protected species or communities. Further, the total area of native vegetation that would be removed was quantified.
- A Black Cockatoo Habitat and Tree Assessment at the Lot, to ensure that there is no impact on Black Cockatoo Habitat, and measure the overall number of trees to be removed as part of a proposed development.



rev	date	description	app	rev	date	description	app	project	issue	size	date	scale
A	20.06.18	FIRST ISSUE						BICKLEY HEALTH RETREAT LOT 602 (HN 80) LAWNBROOK ROAD EAST, BICKLEY	DEVELOPMENT APPROVAL			
B	11.07.18	ISSUE FOR DA							A3	MAY 2018	1:2000	
								drawing title	dwg no.			
								OVERALL PROPOSED SITE PLAN	SK-A02			B

Figure 1. Site Plan of Proposed Development.

Figure 2. Detail of Site Plan for Proposed Development



TREES LESS THAN 500 DIA REMOVED IN DEVELOPMENT ENVELOPE

ALL BUILDINGS TO BE CONSTRUCTED TO THEIR BAL RATINGS (AS 3959 OR NASH STANDARDS)

rev	date	description	app	rev	date	description	app	project	issue	size	date	scale
A	20.05.18	FIRST ISSUE						BICKLEY HEALTH RETREAT LOT 602 (HN 80) LAWNBROOK ROAD EAST, BICKLEY	DEVELOPMENT APPROVAL			
B	11.07.18	ISSUE FOR DA							A3	MAY 2018	1:1000	
								drawing title	dwg no.		rev	
								PROPOSED SITE PLAN	SK-A03		B	



2 Context of the Lot

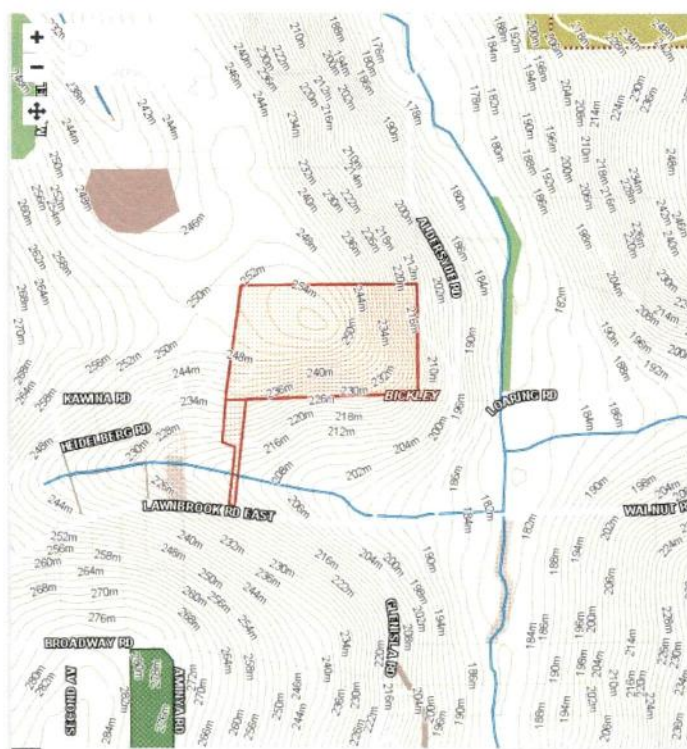
This section reports the results of desktop assessments of the Lot in context.

2.1 Physical Context of the Lot

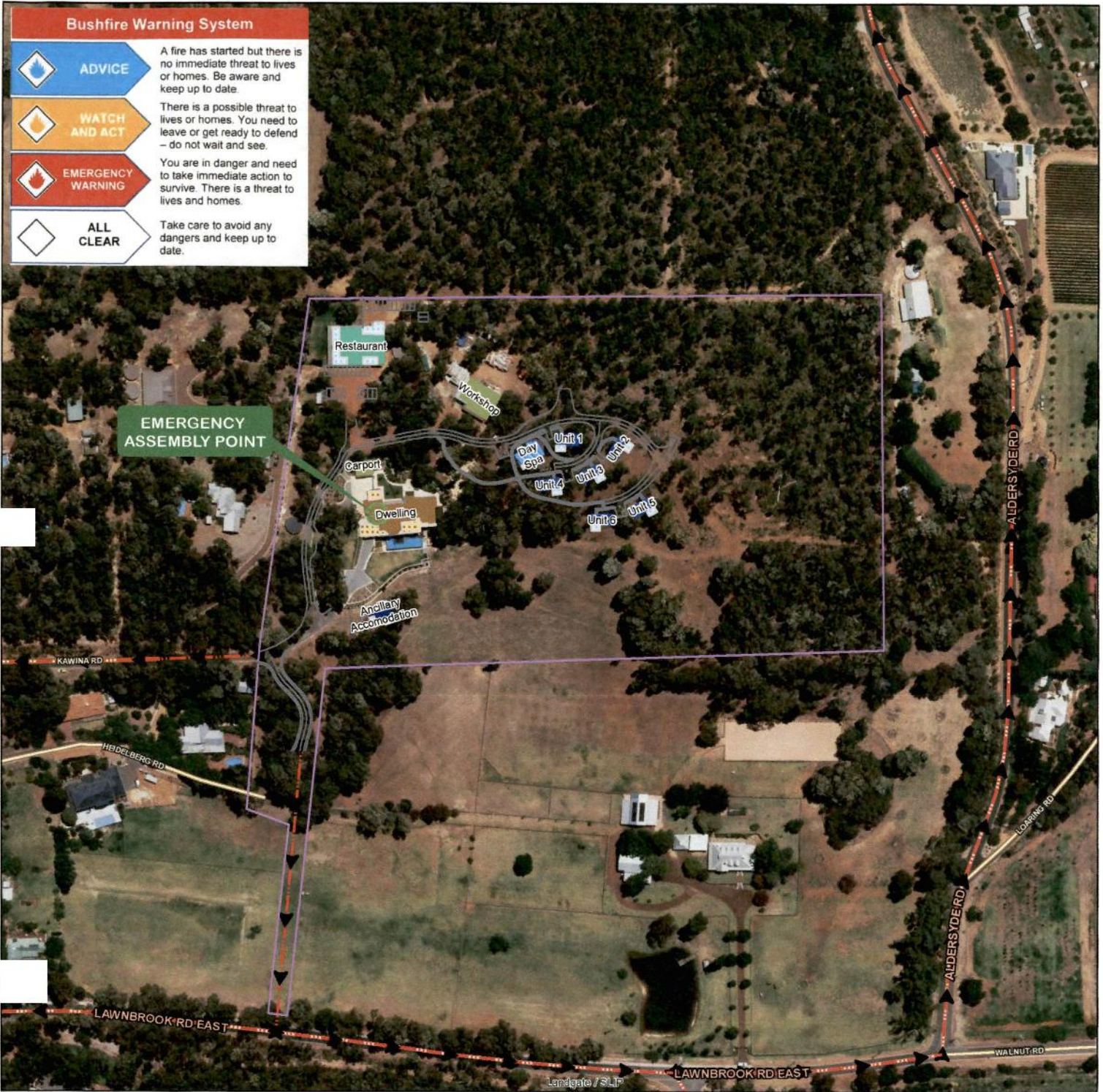
Lot 602 consists of 6.449 hectares (64488m²) at Bickley within the City of Kalamunda (Map 1), which is on the Darling Plateau uplands approximately 23km southwest of Perth. The Lot is topographically steep, ranging from 212m to 256m (Map 1). There is a local high point to the north-west corner of the Lot, a downslope to the south adjoins a tributary of Piesse Brook, and a steep downslope on the eastern side of the Lot adjoins Piesse Brook itself (Map 1). Piesse Brook is a tributary of the Helena River.

CSIRO soil data indicates the Lot lies at the junction of regions of tenosols, sandy loam and loam (Map 2). Bedrock geology is lateritic - massive and vuggy to cemented pisolites up to 4m thick associated with loose sandy pisolite gravels (Map 3), though the adjacent lots also are mapped as having gravels, sands and granite outcrops (Map 3). The land uses in the area are mapped as including minimal and dryland cropping across this and adjacent lots, with a range of intensive, extensive, conservation, minimal use and urban categories in surrounding areas (Map 4). The risk of Acid Sulphate soil formation is considered low (Map 5). Climate data shows that Bickley Station (within 4km of the Lot) has a cooler (mean maximum temperature is 2°C lower) and wetter (by 300mm per year) climate than at Perth Airport (Figure 2). Figure 3 shows an aerial image of the Lot.

Topography – from Intramaps, wwwmapping.kalamunda.wa.gov.au



Map 1 –Location of immediate location of Lot with topography – the Lot is bounded in red



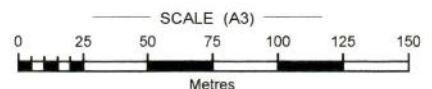
Appendix 6
 Site Response Map
 Lot 602 Kawina Road
 [House No. 113]
 BICKLEY

EVACUATION INFORMATION

LEGEND

- Subject Site
- Assembly / Muster Point
- Evacuation Route

CONTACT	PHONE
Emergency	000
DFES (Emergency Info)	13 DFES (13 3337)
DFES (Recorded Info)	1300 657 209



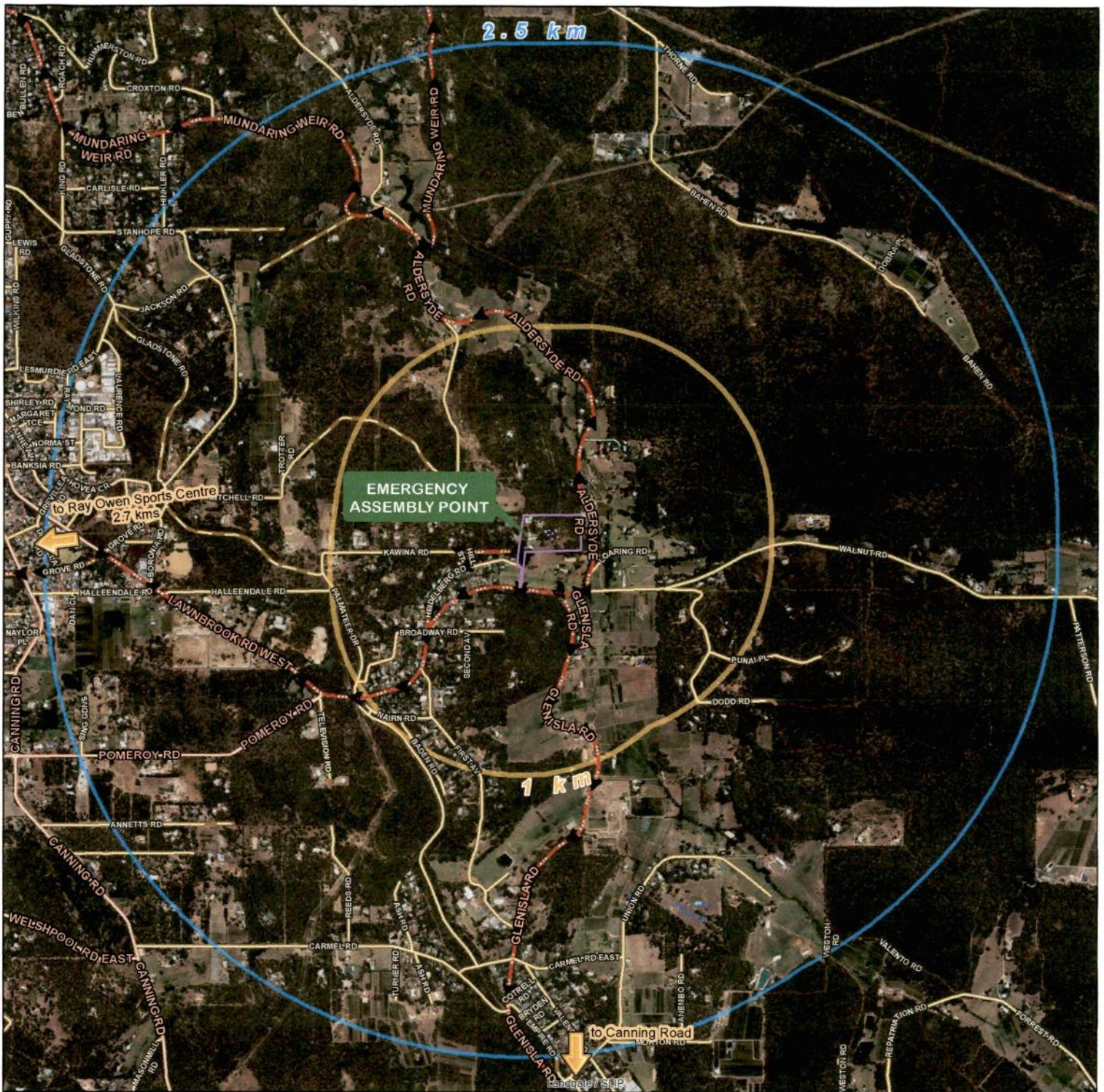
EVACUATION ROUTES
 Nominated Evacuation Location
RAY OWEN SPORTS CENTRE
 96 Gladys Road, Lesmurdies

WESTERN – (West) Kawina Rd, Left (south) on Hill St, Left (west) on Heidelberg St, **AND/OR** Right (west) on Lawnbrook Rd East, continue (northwest) on Lawnbrook Rd West, Left (west) on Grove Rd, Right (northwest) on Rooth Rd, Left (south) on Lesmurdie Rd, Right (west) on Grove Rd, Left (south) on Gladys Rd, left (east) to Ray Owens Sports Centre.

SOUTHERN – Left (east) on Lawnbrook Rd East, Right (south) on Glenisla Rd, then Left (east) or Right (west) on Canning Rd

NORTHERN – Left (east) on Lawnbrook Rd East, Left (north) on Aldersyde Rd, Left (west) or Right (east) on Mundaring Weir Rd dependent on location of bushfire.





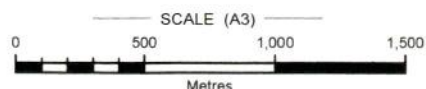
Appendix 7
Area Response Map
 Lot 602 Kawina Road
 [House No. 113]
 BICKLEY

EVACUATION INFORMATION

LEGEND

- Subject Site
- Evacuation Route
- Evacuation Readiness Zone
- Bushfire Awareness Zone

CONTACT	PHONE
Emergency	000
DFES (Emergency Info)	13 DFES (13 3337)
DFES (Recorded Info)	1300 657 209



EVACUATION ROUTES

Nominated Evacuation Location

RAY OWEN SPORTS CENTRE
 96 Gladys Road, Lesmurdies

WESTERN – (West) Kawina Rd, Left (south) on Hill St, Left (west) on Heidelberg St, **AND/OR** Right (west) on Lawnbrook Rd East, continue (northwest) on Lawnbrook Rd West, Left (west) on Grove Rd, Right (northwest) on Rooth Rd, Left (south) on Lesmurdie Rd, Right (west) on Grove Rd, Left (south) on Gladys Rd, left (east) to Ray Owens Sports Centre.

SOUTHERN – Left (east) on Lawnbrook Rd East, Right (south) on Glenisla Rd, then Left (east) or Right (west) on Canning Rd dependent on location of bushfire.

NORTHERN – Left (east) on Lawnbrook Rd East, Left (north) on Aldersyde Rd, Left (west) or Right (east) on Mundaring Weir Rd dependent on location of bushfire.

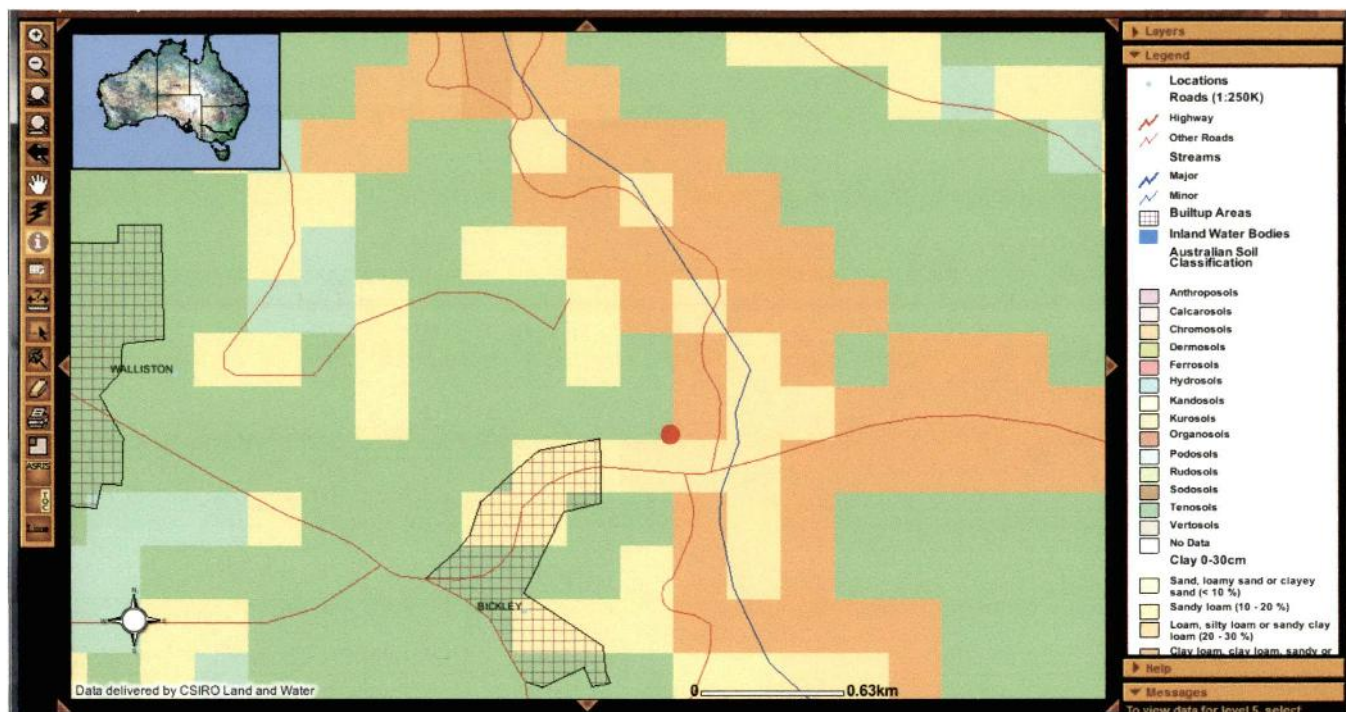
Date: 6/06/2018

Disclaimer and Limitation: This map has been prepared for bushfire management planning purposes only. All depicted areas, contours and any dimensions shown are subject to survey. Bushfire Prone Planning does not guarantee that this map is without error of any kind and disclaims all liability for any errors, loss or other consequence which may arise from relying on any information depicted.

Document Path: G:\BushfireProne\Mapping\MXD's\170794_Lot 602 (h113) Kawina Road, Bickley (BERP\ASP).mxd

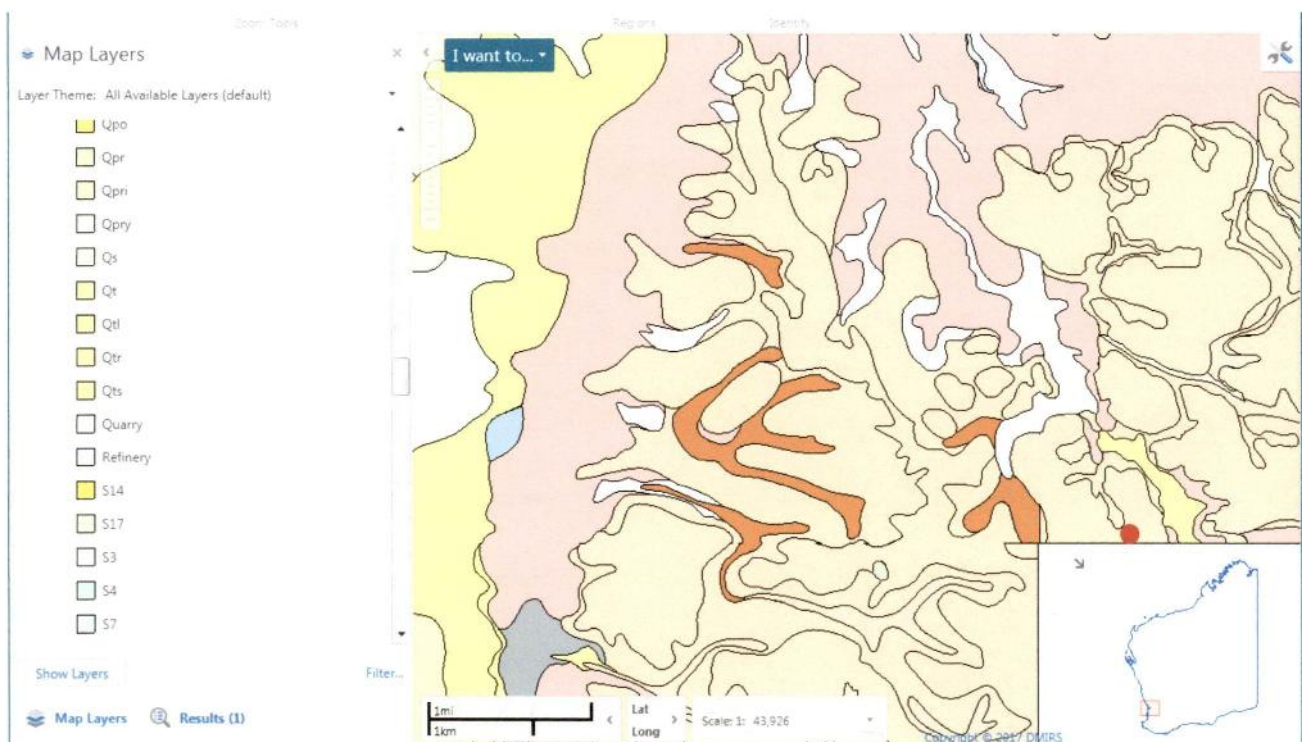


Soil types – from Australian Soil Resource Information System, www.asris.csiro.au



Map 2 – Soil types predicted study site - approximate location indicated by ●

Bedrock Geology – from GeoVIEW.WA, www.dmp.wa.gov.au/GeoView-WA-Interactive



Map 3 – Bedrock geology at the Lot - approximate location indicated by ●

The map shows laterite (pale orange) in a matrix of gravels (also pale orange), granitic outcrops (pink, blue), sands (orange, yellow), silts (pale green), silts over kaolinite (white), and sandstones (dark grey)

Legislation, Policy, Standards and Guidelines

The following legislation, policy, standards and guidelines were utilised as applicable in the development and implementation of these Environmental Assessments.

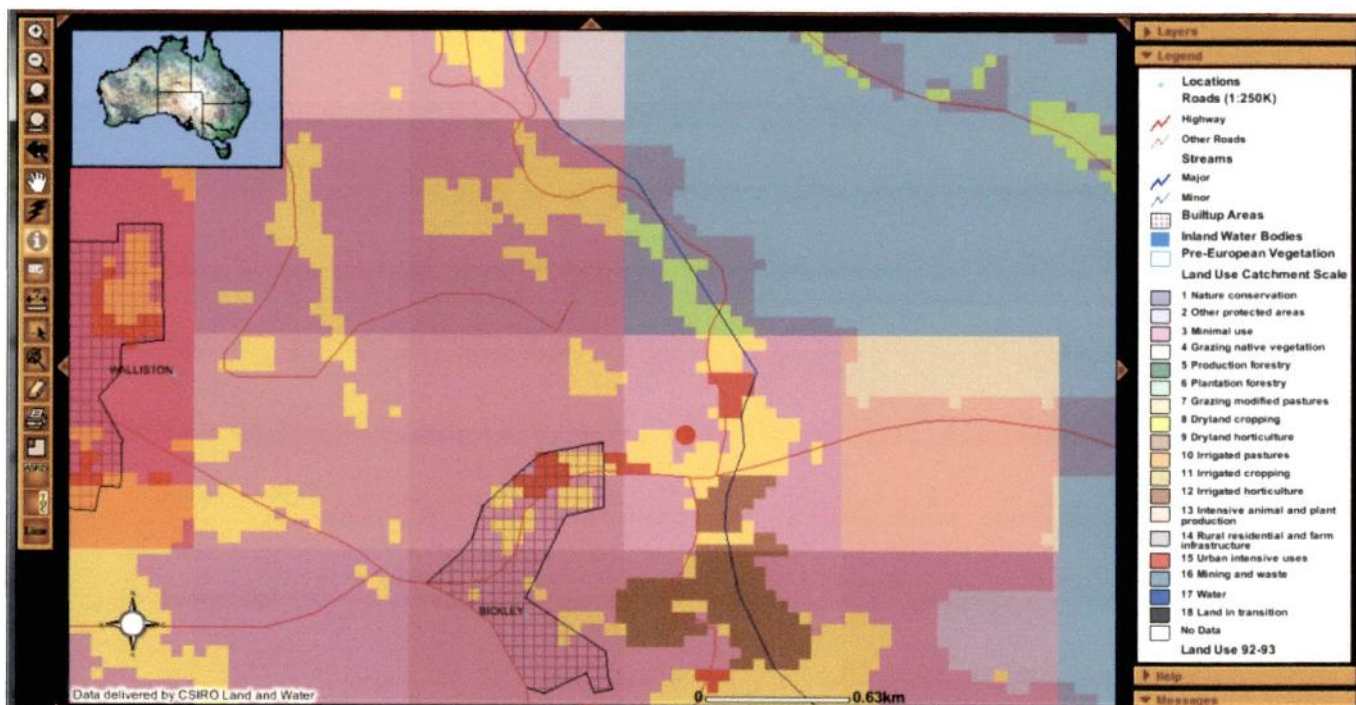
1.3 Legislation

- *Environmental Protection and Biodiversity Conservation (EPBC) Act 1999*
- *Environmental Protection Act 1986 (WA)*
- *Environmental Protection (Clearing of Native Vegetation) Regulations 2004 (WA)*
- *Australian Heritage Council Act 2003*
- *Water Act 2007*
- *Environmental Protection Regulations 1987 (WA)*
- *Contaminated Sites Act 2003 (WA)*
- *Contaminated Sites Regulations 2006 (WA)*

1.4 Policies and Guidelines

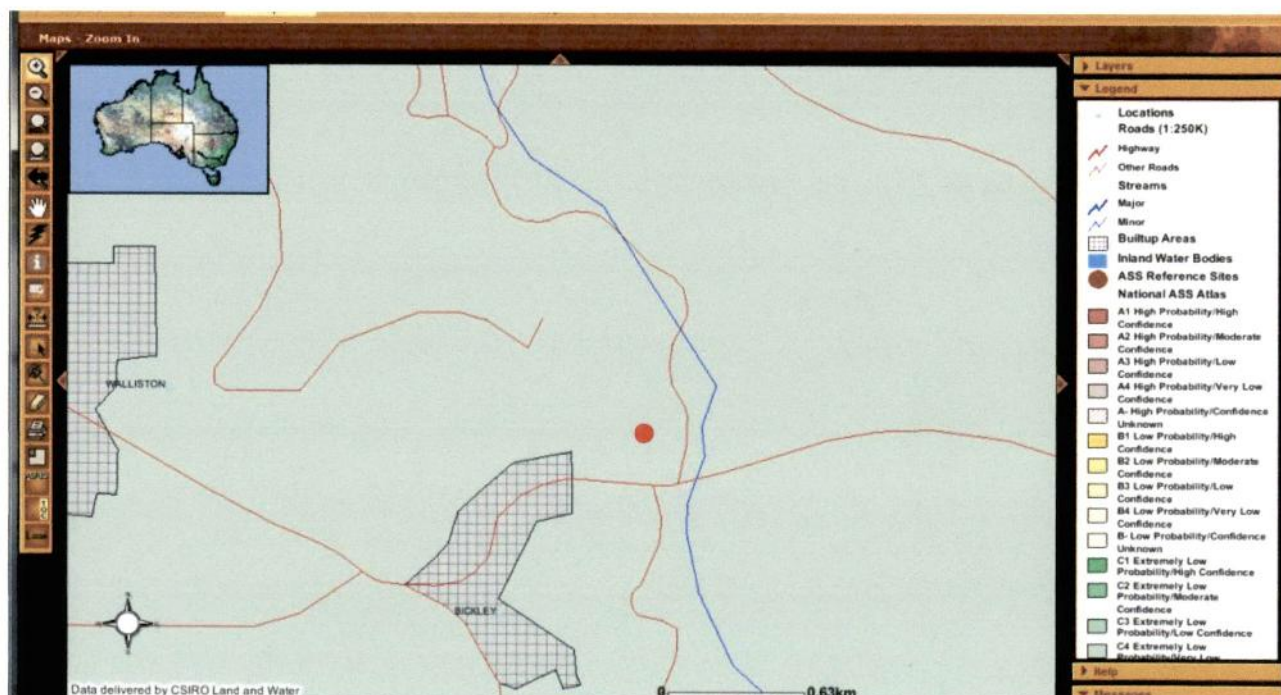
- Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016)
- EPBC Act referral guidelines for three threatened species of Black Cockatoos (Commonwealth of Australia 2012)
- A Guide to the Exemptions and Regulations for Clearing of Native Vegetation (Department of Environmental Regulation WA 2014)
- WA Environmental Offsets Policy (Government of Western Australia 2011)
- WA Environmental Offsets Guidelines (Government of Western Australia 2014)
- Environmental Protection (Swan Coastal Plain Lakes) Policy 1992
- Environmental Protection (Swan and Canning Rivers) Policy 1998
- Environmental Protection (South West Agricultural Zone Wetlands) Policy 1998
- Shire of Kalamunda Local Biodiversity Strategy 2008

Land use – from Australian Soil Resource Information System, www.asris.csiro.au



Map 4 – Land use categories around study site - approximate location indicated by ●

Acid Sulphate Soil formation risk – from Australian Soil Resource Information System, www.asris.csiro.au



Map 5 – Acid Sulphate Soil formation risk at study site - approximate location indicated by ●

Figure 3. Map and Vegetation Areas on the Lot.



2.2 Area Biological Context, Including Threatened and Protected Species and Communities Present, around 113 Kawina Road

2.2.1 Biological Context

Figure 3 shows that the Lot currently comprises a mix of forest vegetation surrounding residential housing with a paddock to the south. The City of Kalamunda Local Biodiversity Strategy vegetation communities map (2008: Figure 1) indicate that two native vegetation communities may be present on the Lot: Dwellingup 2 (summit of local hill and surrounds to north and west of the Lot) and Helena 2 (hillside on the eastern side of the Lot dropping down to include the Piesse Brook). The Murray 2 complex is expected to occur near the Lot (floors of major incised valleys and around banks of major streams) but is not expected to occur on the Lot as topography here represents local summit and slope (Shire of Kalamunda 2008).

Both Dwellingup 2 and Helena 2 vegetation complexes are considered Jarrah Forest communities located on the Darling Plateau, with Dwellingup 2 being associated with valleys and Helena 2 the uplands (Shire of Kalamunda 2008). The Dwellingup 2 vegetation complex retains 84% of its Pre-European extent, of which 34% is currently protected in reserves, while the Helena 2 vegetation complex retains 85% of its Pre-European extent, of which 63% is currently protected in reserves (Shire of Kalamunda 2008).

Descriptions of the two vegetation communities that may be present at the Lot are:

Dwellingup 2 – open forest of *Eucalyptus marginata* ssp. *marginata* – *Corymbia calophylla* on lateritic uplands in subhumid and semiarid zones (Havel and Mattiske 2000); second storey of *Allocasuarina fraseriana*, *Banksia grandis* and *Personia elliptica*, shrub and herb storey consists of *Adenanthos barbiger*, *Lechnaultia biloba*, *Hibbertia hypericoides* and *Neurachne alopecuroidea* (Bennett 2006)

Helena 2 – Mosaic of open forest of *Eucalyptus marginata* ssp. *thalassica* – *Corymbia calophylla* and woodland of *Eucalyptus wandoo* with some *Eucalyptus accedens* and *Eucalyptus rudis* on the deeper soils ranging to closed heaths and lithic complex on shallow soils associated with granite on steep slopes of valleys in semiarid and arid zones (Havel and Mattiske 2000).

2.2.2 Threatened and Protected Species and Communities in the Area

A 10km buffer area around the site was set. The federal Protected Matters Search Tool (www.environment.gov.au/epbc/protected-matters-search-tool) and the state's Western Australian NatureMap (www.naturemap.dpaw.wa.gov.au) were used to search for protected species and communities.

A summary Table of Threatened and Priority species recorded within 10km of the site is given below, and these were utilised for reference in the site field study.

The following Threatened and Protected communities were identified as occurring within 10km of site using the two above search tools:

Banksia Woodlands of the Swan Coastal Plain – Endangered

***Corymbia calophylla* – *Kingia australis* woodlands on heavy soils of the Swan Coastal Plain– Endangered**

Shrublands and Woodlands of the Eastern Swan Coastal Plain– Endangered

It was noted that all the above threatened communities are from the Swan Coastal Plain rather than Darling Plateau, and are therefore unlikely to be present at the Lot. No threatened or priority ecological communities were identified as likely to occur on the Darling Plateau in the City of Kalamunda.

2.2.3 Protected Areas

The protected matters search tool (www.environment.gov.au/webgis-framework/apps/pmst/pmst.jsf) and Intramaps (www.mapping.kalamunda.wa.gov.au/intramaps) were used to identify protected areas near the study Lot and their approximate distances away:

Broadway Road Reserve – 282m

Hackett's Gulley State Forest Number 54 – 463m

First Avenue Reserve – 591m

Second Avenue Reserve – 741m

Lawnbrook Road Reserve – 781m

Old Railway Reserve – 1.1km

Korung National Park – 1.3km

Beelu National Park – 2.7km

Kalamunda National Park – 3.5km

It can be seen from the above list that a network of small local reserves lie close to the Lot, and the Lot is also embedded in a wider network of three larger national parks and a substantial area of State Forest, each of which are within 5km of the Lot. Therefore there is substantial connectedness from the Lot to surrounding areas of Jarrah forest.

2.2.4 Bush Forever

No Bush Forever reserves were identified within 10km of the Lot (www.bushlandperth.org.au).

2.2.5 Black Cockatoos

Range overlap for Black Cockatoos with respect to the Lot are as follows (Commonwealth of Australia 2012):

Baudin's (*Calyptorhynchus baudinii*) – the Lot is within the expected range and main foraging area

Carnaby's (*Calyptorhynchus latirostris*) – the Lot is within the expected breeding range

Forest Red Tail (*Calyptorhynchus banksii naso*) – the Lot is within the occurrence range

Recent data from the Great Cocky Count (BirdLife Australia 2017) show that night roost locations for Forest Red Tail Black Cockatoo are listed as occurring in the Piesse Brook area.

Table 1. Threatened and protected species identified as occurring within 10km of site as described in the text. Conservation codes: T – threatened; P2 – priority 2; P3 – priority 3; P4 – priority 4; S – special; IA – international agreement.

Species Name	Code
<i>Acacia oncinophylla</i>	Endemic
<i>Acroaspis olorina</i>	Endemic
<i>Antichiopus variabilis</i>	Endemic
<i>Aphyctoschaema vultuosum</i>	Endemic
<i>Ixodes hydromyidis</i>	Endemic
<i>Pimelea brevistyla</i>	Endemic
<i>Apus pacificus</i> (Fork-tailed Swift)	IA
<i>Merops ornatus</i> (Rainbow Bee-eater)	IA
<i>Boronia humifusa</i>	P1
<i>Hemigenia rigida</i>	P1
<i>Hydrocotyle striata</i>	P1
<i>Kawaniphila pachomai</i> (cricket)	P1
<i>Senecio gilbertii</i>	P1
<i>Thelymitra magnifica</i> (Crystal Brook Star Orchid)	P1
<i>Austromerope poultoni</i> (earwigfly)	P2
<i>Andersonia</i> sp. <i>Blepharifolia</i> (F. & J. Hort 1919)	P2
<i>Bossiaea modesta</i>	P2
<i>Grevillea manglesii</i> subsp. <i>ornithopoda</i>	P2
<i>Neelaps calonotos</i> (Black-striped Snake)	P3
<i>Acacia drummondii</i> subsp. <i>affinis</i>	P3
<i>Acacia horridula</i>	P3
<i>Acacia oncinophylla</i> subsp. <i>oncinophylla</i>	P3
<i>Acanthopis antarcticus</i> (Southern Death Adder)	P3
<i>Adenanthos cygnorum</i> subsp. <i>chamaephyton</i>	P3
<i>Allocauarina grevilleoides</i>	P3
<i>Amanita fibrillosipes</i>	P3
<i>Amanita kalamundae</i> (Kalamunda Lepidella)	P3
<i>Asteridea gracilis</i>	P3
<i>Banksia kippistiana</i> var. <i>paenepeccata</i>	P3
<i>Banksia pteridifolia</i> subsp. <i>vernalis</i>	P3
<i>Beaufortia purpurea</i> (Purple Beaufortia)	P3
<i>Byblis gigantea</i> (Rainbow Plant)	P3
<i>Grevillea manglesii</i> subsp. <i>dissectifolia</i>	P3
<i>Haemodorum loratum</i>	P3
<i>Halgania corymbosa</i>	P3
<i>Isopogon drummondii</i>	P3
<i>Lasiopetalum glutinosum</i> subsp. <i>glutinosum</i>	P3
<i>Pithocarpa corymbulosa</i> (Corymbose Pithocarpa)	P3
<i>Sporobolus blakei</i>	P3
<i>Stackhousia</i> sp. Red-blotched corolla (A. Markey 911)	P3
<i>Styphelia filifolia</i>	P3
<i>Synaphea diabolica</i>	P3
<i>Thysanotus anceps</i>	P3
<i>Verticordia serrata</i> var. <i>linearis</i>	P3
<i>Ctenotus delli</i> (Dell's skink)	P4
<i>Hydromys chrysogaster</i> (Water-rat)	P4
<i>Isodon obesulus</i> subsp. <i>fusciventer</i> (Quenda)	P4
<i>Acacia oncinophylla</i> subsp. <i>patulifolia</i>	P4
<i>Boronia tenuis</i> (Blue Boronia)	P4
<i>Calothamnus accedens</i>	P4
<i>Centrolepis caespitosa</i>	P4
<i>Cyanicula ixioides</i> subsp. <i>ixioides</i>	P4
<i>Drosera occidentalis</i> subsp. <i>occidentalis</i>	P4

Species Name	Code
<i>Grevillea pimeleoides</i>	P4
<i>Hibbertia montana</i>	P4
<i>Isoodon obesulus</i> (Southern Brown Bandicoot)	P4
<i>Lasiopetalum bracteatum</i> (Helena Velvet Bush)	P4
<i>Macropus eugenii</i> subsp. <i>derbianus</i> (Tamar Wallaby (WA subsp))	P4
<i>Macropus irma</i> (Western Brush Wallaby)	P4
<i>Ornduffia submersa</i>	P4
<i>Oxyura australis</i> (Blue-billed Duck)	P4
<i>Pimelea rara</i> (Summer Pimelea)	P4
<i>Senecio leucoglossus</i>	P4
<i>Stylidium striatum</i> (Fan-leaved Triggerplant)	P4
<i>Thysanotus glaucus</i>	P4
<i>Verticordia lindleyi</i> subsp. <i>lindleyi</i>	P4
<i>Falco peregrinus</i> (Peregrine Falcon)	S
<i>Calyptorhynchus baudinii</i> (Baudin's Cockatoo (long-billed black-cockatoo))	T
<i>Bettongia penicillata</i> subsp. <i>ogilbyi</i> (Woylie)	T
<i>Calyptorhynchus latirostris</i> (Carnaby's Cockatoo (short-billed black-cockatoo))	T
<i>Myrmecobius fasciatus</i> (Numbat)	T
<i>Phascogale tapoatafa</i> subsp. <i>wambenger</i> (South-western Brush-tailed Phascogale)	T
<i>Dasyurus geoffroii</i> (Chuditch)	T
<i>Acacia anomala</i> (Grass Wattle)	T
<i>Acacia aphylla</i> (Leafless Rock Wattle)	T
<i>Anthocercis gracilis</i> (Slender Tailflower)	T
<i>Banksia mimica</i> (Summer Honey-pot)	T
<i>Calectasia cyanea</i> (Blue Tinsel Lily)	T
<i>Calyptorhynchus banksii</i> subsp. <i>naso</i> (Forest Red-tailed Black-Cockatoo)	T
<i>Calyptorhynchus</i> sp. (white-tailed black cockatoo)	T
<i>Conospermum undulatum</i>	T
<i>Darwinia apiculata</i> (Scarp Darwinia)	T
<i>Diuris drummondii</i> (Tall Donkey Orchid)	T
<i>Diuris purdiei</i> (Purdie's Donkey Orchid)	T
<i>Goodenia arthrotricha</i>	T
<i>Setonix brachyurus</i> (Quokka)	T
<i>Thelymitra stellata</i> (Star Orchid)	T
<i>Westralunio carteri</i> (Carter's Freshwater Mussel)	T
<i>Scholtzia</i> sp. Bickley (W.H. Loaring s.n. PERTH 06165184)	Extinct

3 Field Assessment of Flora and Vegetation

3.1 Methods and Limitations

An on-site Level 1 flora and vegetation assessment was carried out on 16th November 2017 by Dr Ann Smithson. The Lot was walked in informal transects using a GPS unit approximately 10m apart starting from current tracks and firebreaks. Vegetation areas were defined and mapped by GPS during the transect assessment, with units defined by similarity in canopy, shrub and understory vegetation layers and also by geographic boundaries (eg. clearance). Vegetation condition in each vegetation area was classified according to the Keighery Vegetation Condition Scale (Keighery 1994), and flora species present were recorded. Vegetation areas were photographed. Subsequent to the site visit, species were further identified if required and presence/absence lists were compiled. Vegetation areas were then mapped using QGIS onto an aerial image of the site. During survey, lists of threatened and protected species and communities were available and referred to such that species and communities would be matched at site if these were present.

Most plant species surveyed during the site visit were flowering or fruiting so were identifiable, or in the case of Eucalypts were identifiable from bark and remaining fruits. The date of survey was at the end of the flowering season, but date of survey was not considered to have significantly limited the validity of the survey as the majority of species seen were able to be identified and only 3 species were not identifiable from photographs and specimens post-survey. The topography of the site, being particularly steep on the far eastern side and south-eastern corner of the Lot, limited access to some areas as slopes proved too steep to walk safely. In steep areas, survey effort was limited to access tracks and firebreaks for areas 4 and 5. Area 7 was not comprehensively surveyed due to steepness. It was noted that development is not proposed to occur within Area 7 of the Lot.

3.2 Results

A map of areas of vegetation assessed at the Lot is shown in Figure 2 above. Seven vegetation areas were mapped, and these are described below. A paddock in the south of the Lot was considered completely degraded and was not included further in the study. Areas around the two houses on the Lot were surrounded by planted maintained gardens, and these were also disregarded from the study.

3.2.1 Vegetation Area 1

Vegetation area 1 consists of three subplots on the south western boundaries of the Lot (Figure 2) near the entrance to the Lot from Kawina Road. Vegetation condition is degraded here due to multiple disturbances including partial clearance and weed invasion. A range of weed species were present in both shrub and understory, including some shrubs that had been planted (eg. Carob, Edible Fig). A canopy of Jarrah and Marri remains, including at least one significant habitat tree of substantial diameter, with a scattered range of remnant native shrubs and understory (Table 2).

Area 1

Vegetation Community Classification: Formerly Jarrah/Marri Forest



Photo 1a



Photo 1b

Vegetation Condition – Degraded

3.2.2 Vegetation Area 2

A small patch of native vegetation at the highest point on the Lot, consisting of Jarrah / Marri canopy over predominantly *Bossiaea aquifolium* with an understory of mixed native species, including notably *Loxocarya cinerea*.

Area 2

Vegetation Community Classification: Jarrah/Marri Forest



Photo 2a



Photo 2b

Vegetation Condition – Good

3.2.3 Vegetation Area 3

An area surrounding the upper shed on the Lot, where building materials had been stockpiled by the owner at the time of survey. Native vegetation occurred in patches between stockpiles, and consisted of Jarrah / Marri canopy over *Bossiaea aquifolium* and a range of native understory species.

Vegetation condition was graded poor due to the extent of clearance in this area.

Area 3

Vegetation Community Classification: Jarrah / Marri Forest



Photo 3a



Photo 3b

Vegetation Condition – Poor

3.2.4 Vegetation Area 4

This area comprises the majority of native vegetation on the Lot, and occurred on the eastern half of the Lot as it slopes to the east towards Piesse Brook. Some physical disturbance was noted to the vegetation area on its western fringes, but generally vegetation condition was considered Very Good on the flatter areas to the west, and excellent on the eastern slopes where access was more challenging. A total of 67 species were recorded here, introduced species were generally rare and the majority were native species. The canopy comprised Jarrah / Marri over native shrubs including *Bossiaea aquifolium*, *Leucapogon verticiliatus*, *Banksia grandis* and occasional *Banksia sessilis*. The understory layer was diverse, notable species included *Adenanthos barbiger*, *Clematis pubescens* and *Patersonia umbrosa*. No threatened or protected species were identified here during survey.

Area 4

Vegetation Community Classification: Jarrah/Marri Forest



Photo 4a



Photo 4b

Vegetation Condition – Very Good (west), Excellent (east, slopes)

3.2.5 Vegetation Area 5

This vegetation area adjoined vegetation area 4, being separated only by a firebreak. It is predominantly south-facing, with less steep slopes than area 4. Since vegetation was considered to be both similar and relatively continuous with Area 5, species lists were combined as these did not differ significantly. However, there was a difference in vegetation condition, with area 5 notably accruing more physical disturbance and higher weed density than area 5, likely due to the shallower slope and location next to the main house.

Area 5

Vegetation Community Classification: Jarrah/Marri Forest



Photo 5a



Photo 5b

Vegetation Condition – good (western end near house) to very good

3.2.6 Vegetation Area 6

The area has been extensively cleared at some stage and retains only Jarrah and Marri canopy with relatively few native species in the understory and invasion by grasses from the adjoining paddock.

Area 6

Vegetation Community Classification: Jarrah / Marri Forest



Photo 6a – left of photo



Photo 6b – rear of photo

Vegetation Condition – Poor

3.2.7 Vegetation Area 7

The area was not extensively surveyed due to steep ground and lack of fire break access. Bordering vegetation area 6 a large and dense area of Blackberry (Weed of National Significance) further impeded access. As for other vegetation areas, the canopy was Jarrah / Marri, but with minimal shrub layer and an understory of *Xanthorrhoea priessii* and sedges. These species are indicative of moister conditions. At the border of an adjacent property an overgrown garden area was present with remains of seating.

Area 7 –

Vegetation Community Classification: Jarrah/Marri Forest



Photo 7a



Photo 7b

Vegetation Condition – Poor to Good

3.2.8 Summary of Flora and Vegetation Types

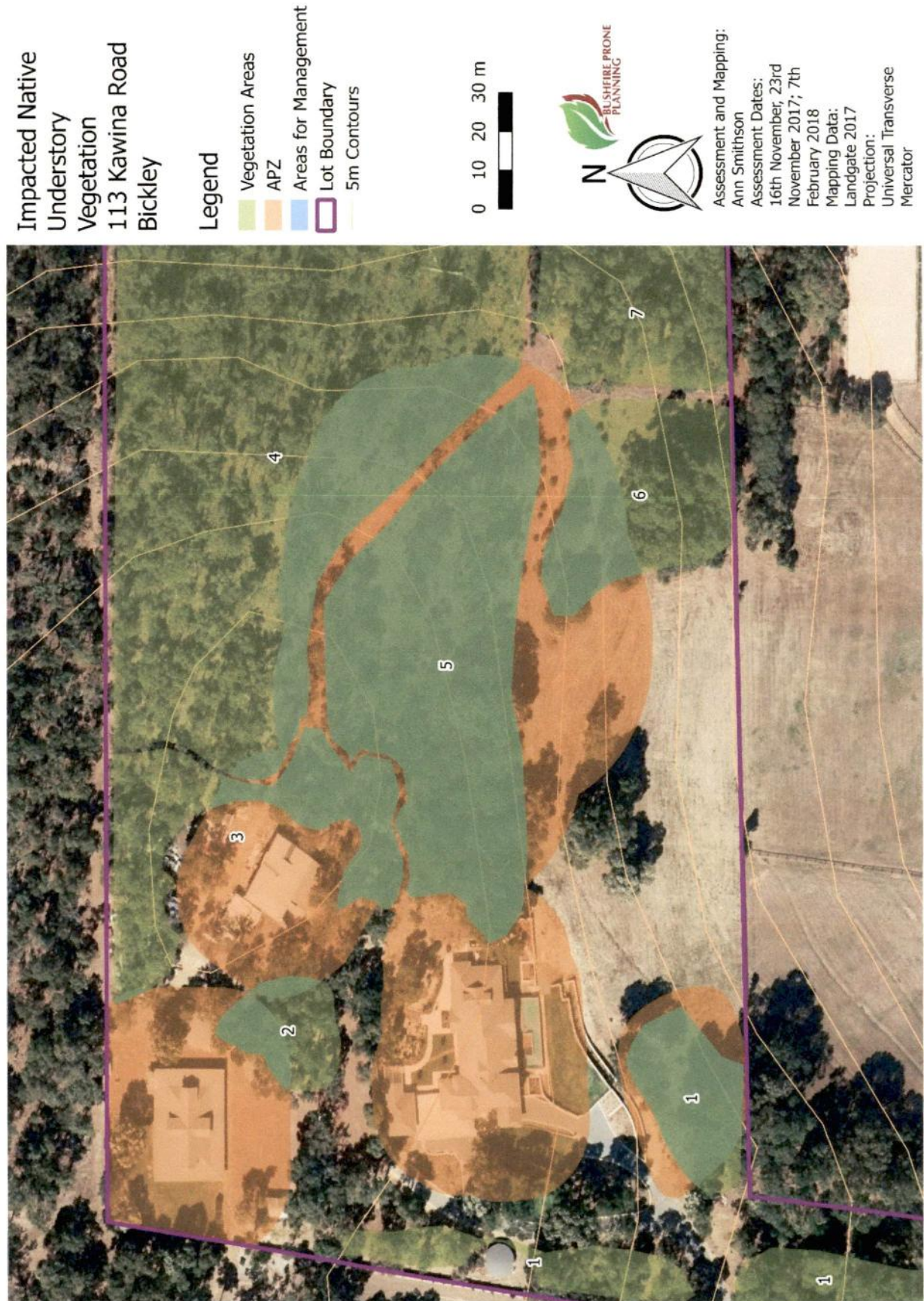
The flora survey identified 100 species, of which 31 were introduced and 69 native. Areas 4 and 5 comprised Jarrah / Marri forest with diverse understory match to the Dwellingup 2 vegetation complex as described above. The understory species present (*Pteridium esculentum*, *Clematis pubescens*, *Styphelia tenuiflora*, *Leucopogon verticillatus*, *Bossiaea aquifolium*) are characteristic of vegetation type ST within the wider Dwellingup 2 complex (Havel 1975). The community is well-represented in the extant Jarrah Forest, and is not listed as threatened or priority ecological community. The similarity in flora lists across each vegetation area suggests that all areas belong to the same community and vary only in disturbance received. Vegetation area 7 is exceptional, containing one weed of national significance (Blackberry) and was a moister vegetation type, so may match to Helena 2 vegetation complex. This community is also well-represented in the extant Jarrah Forest, and is not listed as threatened or priority ecological community. No rare or threatened species were recorded across the Subject Lot.

Table 2. Flora Species Lists for the Lot

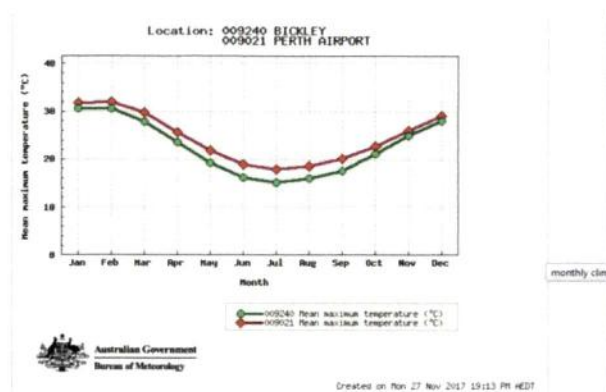
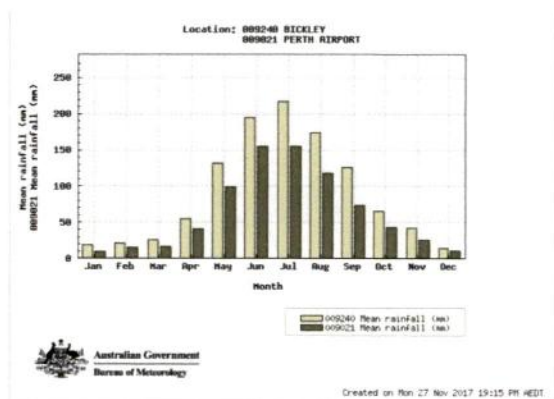
Species	Introduced	Vegetation Area				
		1	2	3	4 & 5	6
<i>Acacia baileyana</i>		1	0	0	0	0
<i>Acacia pulchella</i>		1	0	0	1	1
<i>Acacia pycnantha</i>		0	1	0	0	0
<i>Acacia saligna</i>		1	1	0	1	1
<i>Adenanthos barbiger</i>		1	0	0	1	0
<i>Adenanthos cygnorum</i>		0	0	0	1	0
<i>Alexgeorgea nitens</i>		0	0	1	0	0
<i>Astroloma pallidum</i>		0	0	0	1	0
<i>Austrostipa hemipogon</i>		0	0	0	1	0
<i>Avena fatua</i>	Yes	1	0	1	0	0
<i>Banksia grandis</i>		0	0	0	1	0
<i>Banksia nivea</i>		0	0	0	1	0
<i>Bossiaea aquifolium</i>		1	1	1	1	1
<i>Bossiaea eriocarpa</i>		1	0	0	0	0
<i>Bossiaea ornata</i>		1	1	0	1	0
<i>Briza maxima</i>	Yes	1	1	1	1	1
<i>Bromus diandrus</i>	Yes	0	1	1	0	0
<i>Burchardia congesta</i>		0	0	0	1	0
<i>Ceratonia siliqua</i>	Yes	1	0	0	0	0
<i>Chamaecytisus palmensis</i>	Yes	1	0	0	0	0
<i>Chamaescilla corymbosa</i>		0	0	0	1	0
<i>Citrullus lanatus</i>	Yes	1	0	0	0	0
<i>Clematis pubescens</i>		0	1	0	1	0
<i>Conostylis setosa</i>		0	0	0	1	0
<i>Conyza sp</i>	Yes	1	0	0	0	0
<i>Corymbia calophylla</i>		1	1	1	1	1
<i>Cotoneaster pannosus</i>	Yes	1	0	0	0	0
<i>Crepis sp</i>	Yes	1	1	1	1	0
<i>Cyathochaeta avenacea</i>		0	0	0	1	0
<i>Dampiera alata</i>		0	0	0	1	0
<i>Dampiera linearis</i>		1	0	0	1	0
<i>Daviesia angulata</i>		1	1	0	1	0
<i>Daviesia cordata</i>		0	0	0	1	1
<i>Daviesia decurrens</i>		0	1	0	0	0

Species	Introduced	Vegetation Area					
		1	2	3	4 & 5	6	
<i>Dianella revoluta</i>		1	1	1	1	0	
<i>Disa bracteata</i>	Yes	1	0	0	0	1	
<i>Banksia sessilis</i>		0	0	0	1	0	
<i>Ehrharta calycina</i>	Yes	1	0	1	0	0	
<i>Eucalyptus grandis</i>	Yes	1	0	0	0	0	
<i>Eucalyptus marginata</i>		1	1	1	1	0	
<i>Euphorbia sp</i>	Yes	1	0	0	0	0	
<i>Ficus carica</i>	Yes	1	0	0	0	0	
<i>Fumaria sp</i>	Yes	1	0	0	0	0	
<i>Gompholobium marginatum</i>		0	0	0	0	0	
<i>Haemodorum laxum</i>		0	0	0	1	0	
<i>Hakea amplexicaulis</i>		1	0	0	1	0	
<i>Hakea prostrata</i>		1	1	0	1	0	
<i>Hakea ruscifolia</i>		0	0	0	1	0	
<i>Hakea varia</i>		0	0	1	1	0	
<i>Hibbertia hypericoides</i>		0	0	0	1	0	
<i>Hibbertia ovata</i>		1	0	0	1	0	
<i>Hovea elliptica</i>		0	1	0	1	0	
<i>Hyalosperma cotula</i>		1	0	0	1	0	
<i>Hypolaena exsulca</i>		1	0	1	1	0	
<i>Isopogon sphaerocephalus</i>		0	0	0	1	0	
<i>Isotoma hypocrateriformis</i>		0	0	0	1	0	
<i>Kennedia prostrata</i>		1	0	0	1	0	
<i>Lactuca sp</i>	Yes	1	0	1	0	0	
<i>Lantana camara</i>	Yes	1	0	0	0	0	
<i>Lechenaultia biloba</i>		0	0	0	1	0	
<i>Lepidosperma pubisquamum</i>		1	0	0	0	0	
<i>Leucopogon verticillatus</i>		1	0	0	1	0	
<i>Loxocarya cinerea</i>		0	1	0	0	0	
<i>Lupinus cosentinii</i>	Yes	1	0	0	0	0	
<i>Macrozamia riedlei</i>		1	1	1	1	0	
<i>Medicago sp</i>	Yes	1	0	0	0	0	
<i>Neurachne alopecuroidea</i>		0	1	0	0	0	
<i>Opercularia echinocephala</i>		0	1	0	1	0	
<i>Orobancha sp</i>	Yes	1	0	0	0	0	
<i>Oxalis pes-caprae</i>	Yes	1	0	0	1	0	
<i>Paterosonia occidentalis</i>		1	1	1	1	0	
<i>Paterosonia umbrosa</i>		0	0	0	1	0	
<i>Pennisetum clandestinum</i>	Yes	1	0	0	0	0	
<i>Pentapeltis peltigera</i>		0	0	0	1	0	
<i>Persoonia elliptica</i>		1	0	0	1	0	
<i>Phyllanthus calycinus</i>		1	0	0	1	0	
<i>Pimelea ciliata</i>		0	1	0	1	0	
<i>Pinus pinaster</i>	Yes	1	0	0	0	0	
<i>Plantago lanceolata</i>	Yes	1	0	0	1	0	
<i>Poa annua</i>	Yes	0	0	0	1	0	
<i>Pteridium esculentum</i>		1	0	0	1	0	
<i>Romulea rosea</i>	Yes	0	0	1	0	0	
<i>Rumex sp</i>	Yes	1	0	0	0	0	
<i>Scaevola calliptera</i>		1	1	1	1	0	
<i>Schoenus sp</i>		0	0	0	1	0	
<i>Sowerbaea laxiflora</i>		1	1	1	1	0	
<i>Sphaerolobium linophyllum</i>		0	0	0	1	0	
<i>Stylidium amoenum</i>		0	0	0	1	0	
<i>Stylidium diuroides</i>		0	0	0	1	0	
<i>Stylidium piliferum</i>		0	1	0	1	0	

Figure 4. Vegetation Areas that will be impacted by the development. The Figure shows the Asset Protection Zone defined by the Bushfire Management Plan, and the areas within this of native understory which will require a minimum of “parkland clearance” to attain low threat status under Bushfire regulations.



Climate – from the Bureau of Meteorology, www.bom.gov.au



Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Yr
Mean rainfall (mm) for years 1969 to 2017	18.5	20.8	26.3	55.6	131.5	194.7	217.2	173.5	125.9	65.0	42.4	13.9	1095.5	
Mean rainfall (mm) for years 1944 to 2017	10.0	15.3	16.4	40.5	90.9	155.9	155.7	116.2	73.2	43.3	26.2	11.2	768.3	

Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Years
Mean maximum temperature (°C) for years 1994 to 2017	30.6	30.6	27.9	23.6	19.3	16.2	15.1	16.0	17.5	21.2	23.0	22.6	24	
Mean maximum temperature (°C) for years 1944 to 2017	31.8	32.0	29.7	25.6	21.8	19.0	17.9	18.6	20.2	22.7	26.0	24.5	73	

12.5 = Not quality controlled

Rainfall – 1095.5mm per year compared to 768mm at Perth Airport

Mean Maximum Temperature – 22.6°C compared to 24.5°C at Perth Airport

Figure 2. Climate data at Bickley station, approximately 4km from the study site and 17.4km from Perth Airport

4 Black Cockatoo Habitat Assessment Including Tree Survey

4.1 Methods and Limitations

The site was assessed on 23rd November 2017, with supplementary data gathered on 7th February 2018. An area of the Lot was selected for detailed study as this was understood from plans to be targeted for the proposed development. This selected area was assessed for Black Cockatoo feeding activity by searching for species-specific beak marks on food fruits such as from Marri (*Corymbia calophylla*). Across the selected study area, all trees were measured at breast height (defined for this study as approximately 1.2m above ground) to determine diameter using tree callipers (Haglof, Sweden). Each tree measured was assessed for significant fauna habitat features, in particular the availability of nesting holes for Black Cockatoos, as well as feeding signs. Trees \geq 50cm diameter at breast height (DBH) were considered to exceed the EPBC Act Black Cockatoo referral guidelines size range. Incidental fauna signs and sightings were also recorded across the Lot during both site visits.

4.2 Results

The focal tree survey area is shown in Figure 5, alongside areas that were not surveyed on the Subject Lot.

In total 345 trees were measured in the surveyed area, 130 Marri (*C. calophylla*) and 215 Jarrah (*E. marginata*), of which 50 exceeded 50cm DBH Guidelines – all trees surveyed are mapped in Figure 5. Table 3 below lists all trees recorded along with diameter, location, and significant fauna habitat features recorded. Signs of black cockatoo foraging were recorded from 27 of the 98 Marris measured at the Lot, these were all Forest Red Tail Black Cockatoo beak marks. 7 trees had nestholes present, but none were observed to be used for nesting. 5 trees had hollows present at the base of the trunk, which provide excellent habitat for fauna. 4 dead trees were recorded at site, each of which had large trunk diameter and offered nesting opportunities.

During the survey multiple observations of foraging Forest Red Tail Black Cockatoos was made. Combined with survey data as described above, results indicate that the Lot provides a high quality foraging habitat for Forest Red Tail Black Cockatoos, and also provides potential nesting options.

From tree survey data, an area was mapped that contained no dead trees or trees exceeding 50cm DBH Guidelines. This area was defined as the area for a potential Building Envelope and is shown in Figure 7. The Building Envelope contained a total of 132 trees $<$ 50cm DBH, consisting of 81 Jarrah and 51 Marri, and occupies a total area of 8,980m² (0.898 hectares) (see Figure 7). Assuming that this Building Envelope is fully cleared during the Development, all surveyed trees exceeding 50cm DBH Guidelines at the Subject Lot would be retained (see Figure 8). Trees within the APZ (see Figure 4) would not be cleared. A total of 11,221m² (1.12 hectares) of the tree survey area remained outside the building area, and trees in this area would also be retained during development.

It was noted that unsurveyed areas on the Lot contained many trees that exceeded size thresholds as laid out in the EPBC Act Black Cockatoo referral guidelines. None are proposed for removal as part of the Development. The unsurveyed area covers a total of 28,315m² (2.832 hectares) of trees, and it is proposed that these will not be removed or impacted by the development. Therefore the total area of unimpacted trees sums to approximately 39,536m² (3.95 hectares) and the area of trees to be removed (8980m²) is approximately 18.5% of the total area of trees on the Subject Lot.

Species	Introduced	Vegetation Area				
		1	2	3	4 & 5	6
<i>Styphelia tenuiflora</i>		1	0	1	1	0
<i>Synaphea gracillima</i>		0	1	0	1	0
<i>Tetrarrhena laevis</i>		1	1	0	1	0
<i>Tricoryne elatior</i>		0	1	0	1	0
<i>Trifolium fragiferum</i>	Yes	0	0	0	1	0
<i>Trifolium pratense</i>	Yes	1	0	0	0	0
<i>Tripterococcus brunonis</i>		0	0	0	1	0
<i>Vicia sativa</i>	Yes	1	0	0	0	0
<i>Watsonia</i>	Yes	1	0	0	1	1
<i>Xanthorrhoea preissii</i>		1	1	1	1	0

Figure x plots the assessed Vegetation Areas 1-7 listed above which contain at least some native vegetation, alongside the Asset Protection Zone (APZ) defined by the Bushfire Management Plan. The APZ requires at least understory management or clearance to “parkland cleared” standards (ie to Low Threat Vegetation) to ensure compliance with relevant Bushfire legislation. The overlap in area between the APZ and assessed Vegetation Areas comprises approximately 13560m² (1.36 hectares), which will require removal and/or management to maintain the Bushfire Low Threat status of the APZ.

Figure 5. Area covered by the Tree and Fauna Habitat Survey at the Subject Lot, and areas of the Subject Lot where trees were not surveyed.





Surveyed Trees
113 Kawina
Road
Bickley

Legend

-  Lot Boundary
-  Unserved Area
-  Cadastral
-  5m Contours

Surveyed Trees

-  Dead
-  Jarrah
-  Jarrah \geq 50cm DBH
-  Marri
-  Marri \geq 50cm DBH

0 10 20 30 m



Assessment and Mapping:
Ann Smithson
Assessment Dates:
16th November, 23rd
November 2017; 7th
February 2018
Mapping Data:
Landgate 2017
Projection:
Universal Transverse
Mercator

Figure 6. Results of the Tree and Fauna Habitat Survey.

Figure 7. Building Envelope and trees therein, which are proposed for removal as part of this Development.

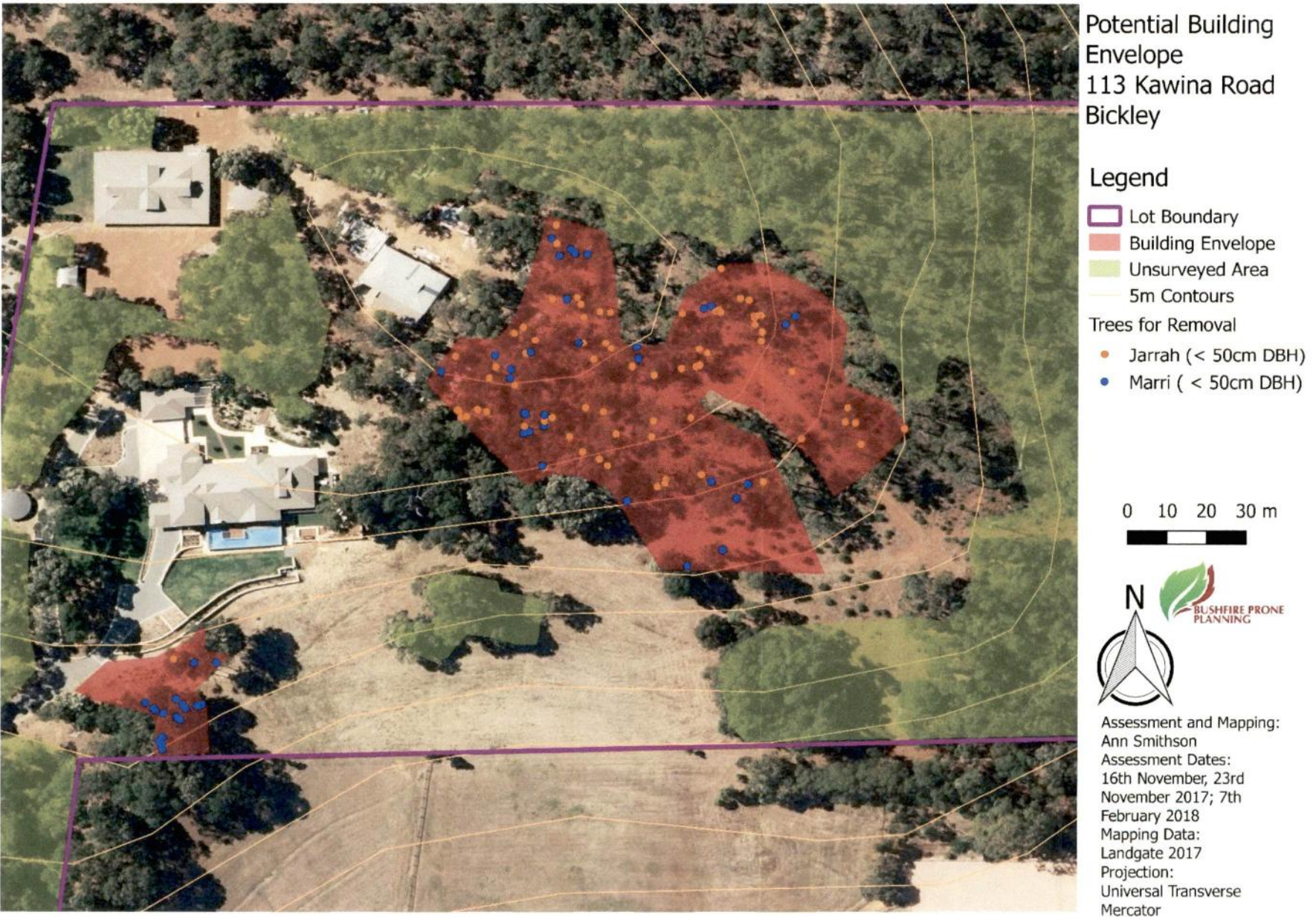


Figure 8. Building Envelope and trees surveyed but outside the envelope, which are proposed for retention as part of this Development. Note – all trees in the unsurveyed areas at the Subject Lot are proposed for retention.

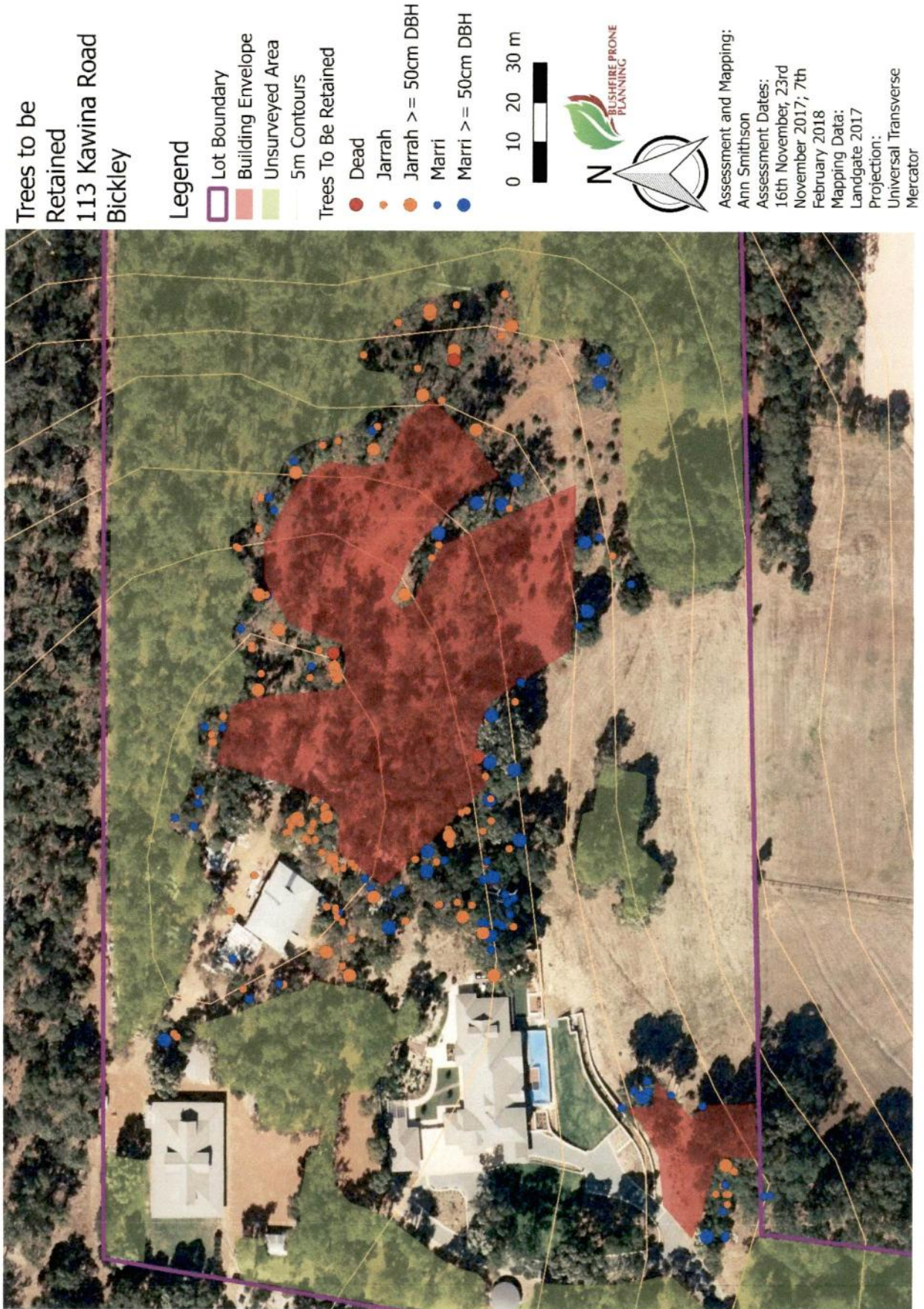


Table 3. Results of the Tree Survey

Species	DBH (cm)	Nestholes	Cockatoo Chewed Nuts	Hollow trunk	Dead	Latitude	Longitude
Jarrah	82					-31.99898304	116.0966188
Marri	26					-31.99897521	116.0966888
Marri	53					-31.99897278	116.0967254
Jarrah	59					-31.99895392	116.0967329
Marri	17					-31.99895911	116.096759
Marri	34					-31.99894927	116.0967607
Jarrah	7					-31.99899411	116.0967575
Marri	42					-31.99899122	116.0967602
Marri	15					-31.99900408	116.0967514
Jarrah	8					-31.99903447	116.09675
Marri	12					-31.99902516	116.0967829
Marri	22					-31.99903505	116.0968259
Marri	13					-31.99901816	116.0968139
Marri	14					-31.99901129	116.0968361
Marri	86	Yes			Yes	-31.99897772	116.0968794
Marri	62					-31.99898007	116.0968823
Marri	26					-31.99896008	116.0968767
Marri	41					-31.99895459	116.0968781
Marri	14					-31.99895459	116.0968781
Marri	9					-31.99895354	116.0968762
Jarrah	16					-31.99892387	116.0968075
Jarrah	123			Yes		-31.9988991	116.096776
Jarrah	22					-31.9988846	116.0968145
Marri	15					-31.99883997	116.0968079
Jarrah	33					-31.99883276	116.0968074
Jarrah	21					-31.99883737	116.0968093
Marri	24		Yes			-31.99873301	116.0968498
Marri	26		Yes			-31.99871939	116.0968388
Marri	56					-31.99880233	116.0968978
Marri	50					-31.99880443	116.0969509
Jarrah	40					-31.99895253	116.0970065
Jarrah	36					-31.99895937	116.0969186
Marri	39					-31.9989628	116.0969246
Jarrah	39					-31.99902231	116.096959
Marri	75					-31.99905043	116.096982
Jarrah	23					-31.99897403	116.0970335
Marri	61					-31.99896997	116.0970895
Jarrah	30					-31.9989732	116.097093
Marri	69		Yes			-31.99903505	116.097171
Marri	54		Yes			-31.9989698	116.097191
Jarrah	29					-31.99895882	116.0971533
Jarrah	69	Yes			Yes	-31.99893883	116.0972056
Jarrah	20					-31.99891461	116.0971787
Marri	46		Yes			-31.99890962	116.0971745
Jarrah	46					-31.99891046	116.0970611
Jarrah	32					-31.99889441	116.0970554
Jarrah	8					-31.99885962	116.0970098
Jarrah	9					-31.99886134	116.0970045
Jarrah	51					-31.99886214	116.096993
Jarrah	16					-31.99886532	116.0969707
Marri	26		Yes			-31.99884864	116.0969261
Jarrah	5					-31.99882798	116.0969231
Jarrah	15					-31.99882798	116.0969231
Jarrah	5					-31.99877161	116.09693

Species	DBH (cm)	Nestholes	Cockatoo Chewed Nuts	Hollow trunk	Dead	Latitude	Longitude
Jarrah	5					-31.99875933	116.0969442
Jarrah	5					-31.99876264	116.0969493
Jarrah	13					-31.99877987	116.0969539
Jarrah	8					-31.99877672	116.0969695
Jarrah	18					-31.998759	116.0969986
Jarrah	41					-31.99876449	116.0970238
Jarrah	7					-31.9986748	116.0970305
Jarrah	18					-31.99864592	116.0970484
Marri	41					-31.99865188	116.0970885
Marri	49					-31.99867509	116.0970858
Jarrah	25					-31.99869328	116.0970982
Marri	23					-31.99876796	116.0971247
Marri	17					-31.99877044	116.097129
Marri	20					-31.99877044	116.097129
Marri	18					-31.99881712	116.0971379
Marri	43					-31.99882144	116.097123
Jarrah	5					-31.99880271	116.0971253
Marri	21					-31.99880204	116.0971783
Jarrah	16					-31.9987893	116.0971792
Marri	36					-31.99877278	116.0971791
Jarrah	27					-31.99878012	116.0972005
Jarrah	31					-31.99882957	116.097247
Jarrah	21					-31.99887127	116.0972817
Jarrah	35					-31.99889055	116.0973281
Jarrah	33					-31.99896486	116.0973049
Marri	81		Yes			-31.99897429	116.0973154
Jarrah	16					-31.99903707	116.0973537
Marri	29		Yes			-31.99905136	116.0974071
Marri	45		Yes			-31.99900312	116.0974031
Jarrah	35					-31.99890857	116.0973503
Jarrah	22					-31.99875296	116.0972906
Jarrah	32					-31.99876419	116.0973383
Jarrah	49			Yes		-31.99882324	116.0973731
Jarrah	49	Yes				-31.99878875	116.0974738
Jarrah	22					-31.99883003	116.0974699
Jarrah	37					-31.99894621	116.0975072
Jarrah	23					-31.99896515	116.0974847
Jarrah	22					-31.99895605	116.0975058
Jarrah	40					-31.99893351	116.0976046
Jarrah	43					-31.99895119	116.0976329
Marri	43					-31.99895119	116.0976329
Marri	42					-31.99899591	116.0977014
Marri	47					-31.99895807	116.0977314
Jarrah	31					-31.99895174	116.0977733
Marri	57					-31.99893401	116.0978898
Marri	56					-31.99900081	116.0978858
Jarrah	14					-31.99902005	116.0978753
Marri	51					-31.9990387	116.097951
Jarrah	29					-31.99883506	116.0978755
Marri	63	Yes				-31.99883137	116.0978082
Jarrah	25					-31.99883209	116.0977765
Jarrah	28					-31.99881386	116.0977414
Jarrah	60					-31.99874185	116.0976418
Jarrah	47					-31.99878008	116.0975758
Jarrah	25					-31.99864429	116.0975893
Jarrah	19					-31.99860883	116.0976211
Jarrah	23					-31.99860883	116.0976211

Species	DBH (cm)	Nestholes	Cockatoo Chewed Nuts	Hollow trunk	Dead	Latitude	Longitude
Jarrah	26					-31.99859727	116.0975978
Jarrah	49					-31.99864069	116.0975993
Jarrah	25					-31.99864986	116.0975495
Jarrah	22					-31.99866688	116.0974759
Jarrah	29					-31.998644	116.097417
Marri	32					-31.99862447	116.0974331
Marri	24					-31.99859199	116.0974286
Marri	69	Yes			Yes	-31.99855083	116.097484
Jarrah	50					-31.99855339	116.097446
Jarrah	54			Yes		-31.99856118	116.0974194
Jarrah	42					-31.99854928	116.0974277
Jarrah	29					-31.99859655	116.0973599
Jarrah	33					-31.99862526	116.0973125
Jarrah	47			Yes		-31.99857975	116.0973444
Jarrah	43					-31.99857987	116.0972831
Marri	33					-31.99857925	116.0972719
Jarrah	22					-31.99846102	116.0971998
Marri	43					-31.99846085	116.0972392
Jarrah	29					-31.99845607	116.0972674
Jarrah	28					-31.99847435	116.0972775
Jarrah	41					-31.99850963	116.0972856
Jarrah	37					-31.99849501	116.0973292
Jarrah	37					-31.99849685	116.0973569
Jarrah	25					-31.99848772	116.0974171
Marri	16					-31.99849132	116.0974475
Jarrah	29					-31.99851194	116.0974916
Jarrah	22					-31.99849899	116.0975515
Jarrah	32					-31.99848533	116.0976107
Marri	29					-31.99848533	116.0976107
Marri	34					-31.99847979	116.0976321
Jarrah	18					-31.99849287	116.0976439
Jarrah	29					-31.99848985	116.0976517
Jarrah	26					-31.9984953	116.0976577
Jarrah	14					-31.99845909	116.0977105
Jarrah	23					-31.99846332	116.0977335
Jarrah	20					-31.99850368	116.0977657
Jarrah	33					-31.99852958	116.0977495
Jarrah	22					-31.99850477	116.0977467
Jarrah	33					-31.9985484	116.097769
Jarrah	5					-31.99857309	116.0977664
Jarrah	17					-31.99851144	116.0977485
Jarrah	25					-31.9985049	116.0977557
Marri	49					-31.99852862	116.0978321
Jarrah	14					-31.99850599	116.0978593
Jarrah	35					-31.99865711	116.0978498
Jarrah	33					-31.99879039	116.0979931
Jarrah	13					-31.99875288	116.098
Jarrah	23					-31.99875288	116.098
Jarrah	39					-31.99879303	116.0980203
Jarrah	37					-31.9988509	116.0980356
Jarrah	56					-31.99893166	116.0980857
Jarrah	32					-31.99899717	116.0983372
Jarrah	56					-31.99902479	116.0983635
Jarrah	17					-31.99900693	116.0984493
Jarrah	31					-31.99887718	116.0984204
Jarrah	86	Yes				-31.99880644	116.0983955
Jarrah	52					-31.99880669	116.0984051

Species	DBH (cm)	Nestholes	Cockatoo Chewed Nuts	Hollow trunk	Dead	Latitude	Longitude
Jarrah	9					-31.99872279	116.0983719
Jarrah	34					-31.99863117	116.0982844
Jarrah	27					-31.99877429	116.0982485
Jarrah	56					-31.99887182	116.0982982
Marri	64	Yes			Yes	-31.99887207	116.0982725
Jarrah	28					-31.99883846	116.0981639
Jarrah	32					-31.99880832	116.0981516
Jarrah	71					-31.99878842	116.0981778
Jarrah	46					-31.99866872	116.0980932
Marri	7					-31.99865376	116.0980821
Jarrah	54					-31.99865871	116.0980321
Jarrah	29					-31.99856169	116.0980546
Jarrah	26					-31.99852061	116.0980427
Marri	31					-31.99844229	116.0979988
Jarrah	53					-31.99844727	116.0979692
Marri	46					-31.99850549	116.0978583
Marri	21					-31.99838889	116.0978673
Marri	27					-31.9983759	116.0979023
Jarrah	21					-31.99835289	116.0979012
Jarrah	26					-31.9983477	116.0978179
Jarrah	26					-31.99828839	116.0977694
Jarrah	39					-31.99829451	116.0977657
Jarrah	25					-31.9983772	116.0976578
Marri	6					-31.99837368	116.0976367
Jarrah	23					-31.9983692	116.097639
Jarrah	58					-31.99834908	116.0976399
Jarrah	74			Yes		-31.99840268	116.0975465
Marri	33		Yes			-31.9983008	116.0975482
Jarrah	16					-31.99832921	116.0975048
Jarrah	16					-31.99833026	116.0974952
Jarrah	21					-31.99835574	116.0974275
Jarrah	73					-31.99834715	116.0973835
Marri	49		Yes			-31.99833831	116.097295
Marri	25		Yes			-31.99833655	116.0972616
Marri	16		Yes			-31.99832511	116.0972502
Marri	16					-31.99834359	116.0972197
Jarrah	47					-31.99831006	116.0972121
Marri	45					-31.99829564	116.0971977
Jarrah	36					-31.99826019	116.0972104
Marri	30		Yes			-31.99825197	116.0972823
Jarrah	18					-31.99825348	116.097312
Marri	38		Yes			-31.99820382	116.0972833
Jarrah	18					-31.99822243	116.0972629
Jarrah	24					-31.99822268	116.0972418
Jarrah	31					-31.99822792	116.0972422
Marri	33		Yes			-31.99818978	116.09711
Marri	21					-31.99818668	116.0970786
Marri	17					-31.99812675	116.0970386
Marri	35					-31.99817532	116.0970161
Jarrah	24					-31.99833873	116.096885
Jarrah	27					-31.99843256	116.0970302
Jarrah	16					-31.99845377	116.0970412
Jarrah	16					-31.99845113	116.0970321
Jarrah	10					-31.99844384	116.0970404
Jarrah	5					-31.99845565	116.0970319
Jarrah	31					-31.99842443	116.0970005
Jarrah	29					-31.99842443	116.0970005

Species	DBH (cm)	Nestholes	Cockatoo Chewed Nuts	Hollow trunk	Dead	Latitude	Longitude
Jarrah	13					-31.99843369	116.0970027
Jarrah	19					-31.99843369	116.0970027
Jarrah	12					-31.99845381	116.0970268
Jarrah	5					-31.99845658	116.0970352
Jarrah	8					-31.99844568	116.0970286
Jarrah	15					-31.99843776	116.0970189
Jarrah	50					-31.99845473	116.0970385
Jarrah	16					-31.99846395	116.0970253
Jarrah	19					-31.99850217	116.0970876
Jarrah	12					-31.99853721	116.0971222
Jarrah	20					-31.99853721	116.0971222
Jarrah	5					-31.99855293	116.0970976
Jarrah	6					-31.99855293	116.0970976
Jarrah	8					-31.99853084	116.0970699
Jarrah	20					-31.9985264	116.0970646
Jarrah	31					-31.9985264	116.0970646
Jarrah	51					-31.99853373	116.097044
Jarrah	16					-31.99849689	116.0970222
Jarrah	13					-31.99849815	116.0970262
Jarrah	9					-31.99849119	116.0970051
Jarrah	17					-31.99848361	116.0969781
Jarrah	9					-31.99848038	116.0969829
Jarrah	6					-31.99847472	116.096985
Jarrah	27					-31.99850373	116.096981
Jarrah	11					-31.99852129	116.0969472
Jarrah	7					-31.99852129	116.0969472
Jarrah	54					-31.99854941	116.0969293
Jarrah	11					-31.99855708	116.0969126
Jarrah	18					-31.99855993	116.0969015
Jarrah	28					-31.99858155	116.096905
Jarrah	21					-31.99861202	116.0969088
Jarrah	12					-31.9986036	116.0969193
Jarrah	24					-31.99861885	116.0969387
Marri	45					-31.9986155	116.0970456
Jarrah	12					-31.99861072	116.097129
Marri	27					-31.99860741	116.0971412
Jarrah	27					-31.99857107	116.0971539
Marri	35					-31.9986388	116.0968766
Marri	28					-31.99865799	116.0968998
Marri	34					-31.99865443	116.0968508
Jarrah	55					-31.99866273	116.0968283
Jarrah	32					-31.99874705	116.0967647
Marri	58		Yes			-31.99870288	116.0967463
Jarrah	23					-31.99860494	116.0967156
Jarrah	18					-31.99856977	116.0967863
Jarrah	19					-31.99856977	116.0967863
Marri	38		Yes			-31.99856977	116.0967863
Jarrah	12					-31.99855909	116.0967898
Jarrah	13					-31.99856294	116.0967737
Jarrah	36					-31.99857916	116.0967614
Jarrah	24					-31.99855833	116.096799
Jarrah	27					-31.99853377	116.0968016
Jarrah	50					-31.99853361	116.0966803
Jarrah	25					-31.99857904	116.0966424
Jarrah	69					-31.99859919	116.0966181
Jarrah	28					-31.99841915	116.0965925
Marri	41					-31.99840654	116.0965942

Species	DBH (cm)	Nestholes	Cockatoo Chewed Nuts	Hollow trunk	Dead	Latitude	Longitude
Marri	25					-31.99832716	116.0965539
Jarrah	3					-31.99830968	116.0965799
Marri	39		Yes			-31.99828173	116.0966612
Jarrah	26					-31.99827515	116.0967892
Marri	39		Yes			-31.99810005	116.0964419
Marri	74		Yes			-31.99810005	116.0964419
Jarrah	26					-31.99812482	116.0964591
Jarrah	21					-31.99813224	116.0964509
Marri	26		Yes			-31.99832532	116.0965531
Marri	63		Yes			-31.99925772	116.0982143
Marri	62		Yes			-31.99926924	116.0982732
Marri	23		Yes			-31.99927184	116.0982676
Marri	51					-31.99922143	116.097785
Marri	30		Yes			-31.99925881	116.0977973
Jarrah	23					-31.99929493	116.0977493
Marri	39					-31.99934443	116.0976716
Marri	55		Yes			-31.99922759	116.0975989
Marri	40					-31.99920617	116.0975589
Marri	32					-31.99917629	116.0975668
Marri	43					-31.999134	116.0976643
Marri	45					-31.999323	116.096265
Marri	33					-31.999356	116.096311
Marri	42					-31.999391	116.096337
Marri	33					-31.999391	116.096337
Marri	50					-31.99938	116.096294
Marri	26					-31.999389	116.096308
Marri	26					-31.999395	116.09631
Marri	29					-31.999454	116.096299
Marri	33					-31.999436	116.096297
Marri	40					-31.999436	116.096237
Marri	7					-31.999538	116.096269
Marri	44					-31.999547	116.096257
Marri	31					-31.99955	116.096245
Marri	43					-31.999532	116.096188
Jarrah	13					-31.999426	116.096182
Marri	15					-31.999547	116.096206
Marri	20					-31.999556	116.096214
Marri	23					-31.99958	116.09619
Marri	19					-31.999587	116.0962
Marri	37					-31.999634	116.096153
Jarrah	58					-31.9996	116.096112
Marri	20					-31.99957	116.096155
Marri	38					-31.999562	116.096133
Marri	20					-31.999559	116.09613
Marri	10					-31.999558	116.096128
Marri	23					-31.999543	116.096106
Jarrah	6					-31.999574	116.096035
Jarrah	7					-31.999593	116.096057
Marri	32					-31.999599	116.096059
Jarrah	10					-31.999602	116.096034
Jarrah	8					-31.999605	116.096007
Marri	31					-31.999593	116.095989
Jarrah	9					-31.999608	116.096034
Jarrah	11					-31.999623	116.096096
Marri	36					-31.999636	116.096151
Marri	5					-31.999666	116.096152
Marri	35					-31.999654	116.096151

Species	DBH (cm)	Nestholes	Cockatoo Chewed Nuts	Hollow trunk	Dead	Latitude	Longitude
Marri	38					-31.999645	116.096144
Marri	23					-31.999717	116.096031
Marri	30					-31.999702	116.096029
Marri	26					-31.999599	116.095917
Marri	40					-31.9996	116.095925
Marri	51					-31.999551	116.09592

5 Summary and Recommendations

The flora survey found no threatened or protected species or communities at the Subject Lot. The vegetation community present over the majority of the Lot best matched to the ST subcommunity of the Dwellingup 2 vegetation complex, which is well reserved both generally and in the City of Kalamunda.

The area of understory native vegetation impacted by development is defined by the Asset Protection Zone (APZ) required under the Bushfire Management Plan, as the APZ requires clearance of the understory to low threat state ("parkland clearance"). The total area of APZ that is proposed for clearance / management is 13,560m² (1.36 hectares), which lies within surveyed vegetation areas 1-6. These vegetation areas were assessed as having a condition ranging from degraded (Area 1) through to Very Good / Excellent (Area 4), having been previously impacted predominantly by previous understory disturbance to varying degrees. One Weed of National Significance (Blackberry) was present in vegetation area 7, while outside the area impacted by development it is recommended that control of Blackberry in this area be considered to prevent further spread.

The Tree and Habitat survey indicates that the Lot provides a high-quality foraging environment for Forest Red Tail Black Cockatoos, and habitat trees of significant size with nestholes may also offer them potential nesting sites. A Building Envelope was proposed that contains no trees exceeding 50cm DBH size guidelines (Figure 7). If this Building Envelope were cleared for the proposed Development, a total of 132 trees < 50cm DBH would be impacted, consisting of 81 Jarrah and 51 Marri. The Building Envelope occupies a total area of 8980m² (0.898 hectares), which is less than 1 hectare. No trees are proposed for removal within unsurveyed areas on the Subject Lot, and the proposed Development will not have a significant impact on trees outside of the proposed Building Envelope. It is therefore concluded that clearing of trees for Development only within the Building Envelope will result in the removal of 18.5% of trees within the Subject Lot with 81.5% or 3.95 hectares of high quality foraging habitat for Black Cockatoos remaining, and all large potential nesting trees retained. The Development is thus not judged to have a significant impact on Black Cockatoos, with significant impact as defined by the EPBC Act (1999) Referral Guidelines.

Prior to any approved clearing of native vegetation at site, it is recommended that an environmental officer visit site and, using information from this report, clearly mark trees that may be removed and those outside the Building Envelope that exceed size guidelines and may not be removed. This will ensure that contractors responsible for clearance protect appropriate areas, and ensure compliance.