

Biological Survey: Albany Ring Road



Report prepared for
Main Roads Western Australia
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1 SUMMARY

Main Roads Great Southern Region are proposing to construct stage two and three of the Albany Ring Road Project. Southern Ecology was engaged to assess a broad project envelope (247 ha) for potential environmental constraints.

FLORA

- A total of 337 plant taxa from 65 families were recorded within and adjacent to thirty-two floristic quadrats established in the Survey Area.
- Critical habitat or populations of five Priority-listed (Appendix A) flora were recorded: - *Prasophyllum paulinae* (P1), *Synaphea incurva* (P1), *Boronia crassipes* (P3), *Andersonia* sp. Jamesii (J. Liddelow 84) (P4) and *Thysanotus isantherus* (P4).
- Five Declared Pests or Weeds of National Significance (WONS) were recorded: - Blackberry (**Rubus* species complex), Bridal Creeper (**Asparagus asparagoides*), Gorse (**Ulex europaeus*), Arum Lily (**Zantedeschia aethiopica*) and Lantana (**Lantana camara*).
- Vegetation condition graded from Completely Degraded to Excellent; Large areas of vegetation associated with shire reserves and intact wetlands on private property were classified as Excellent.
- Thirteen vegetation associations were described: - four occur exclusively in wetland habitats (*Homalospermum firmum/Callistemon glaucus* Peat Thicket, *Evandra aristata* Sedgeland, *Taxandria juniperina* Closed Forest and *Melaleuca preissiana* Low Woodland), three are associated with granite outcrops (*Taxandria marginata*, *Gastrolobium bilobum* and *Leucopogon assimilis* Shrublands) and six generally occur on uplands (*Hakea* spp. Shrubland/Woodland Complex, Jarrah/Marri/Sheoak Laterite Forest, Jarrah/Sheoak/*E. staeri* Sandy Woodland, Marri/Jarrah Coastal Hills Forest, Marri/Jarrah Forest/Peppermint Woodland and Peppermint Low Forest).
- Two Threatened and four Priority Ecological Communities occur in the vicinity; no vegetation in the Survey Area meets the requisite criteria for these communities. Several vegetation associations can be consigned as being of conservation significance due to their association with wetlands, granite refugia, low reservation status or low overall extent.

FAUNA

- Five conservation significant fauna species were present within the Survey Area: - Carnaby's Cockatoo (*Calyptorhynchus latirostris*) (T-EN), Baudin's Cockatoo (*Calyptorhynchus baudinii*) (T-EN), Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) (T-VN), Western Ringtail Possum (*Pseudocheirus occidentalis*) (T-CR), and Southern Brown Bandicoot (*Isodon obesulus* subsp. *fusciventer*) (P4).
- Western Ringtail Possums scats were observed widely across the Survey Area, in multiple habitats of varying conditions. *Core* and *supporting habitats* and *potential habitat linkages* were identified, providing a preliminary guide to assessing impacts on the South Coast population.
- Foraging and potential breeding habitat for three Black Cockatoo species occurred throughout the Survey Area, in all the Eucalypt Woodland/Forest habitats. Large areas of potential roosting sites were identified in both native and introduced tree species.
- Potential breeding hollows for Black Cockatoo were observed in 117 trees, from a total of 664 habitat trees ($\geq 500\text{mm}$ DBH).

2 INTRODUCTION

Main Roads Great Southern Region are proposing to construct a heavy haulage route around the City of Albany for the transport of materials to the City's port, called the Albany Ring Road Project. Stage one was completed in 2007; stage two and three are proposed. Southern Ecology was engaged to assess the project envelope (Survey Area) for potential constraints related to vegetation, flora, fauna or other environmentally sensitive sites. The total Survey Area is 247 hectares.

The Survey Area intersects shire reserves, private property and road reserves to the west of Albany, centred on Link Rd, South Coast Highway, George St, Lower Denmark Rd and Albany Port Rd. The area is largely cleared for pasture or plantation and also includes several large areas of remnant vegetation and narrow, vegetated roadside corridors.

The Survey Area includes one large City of Albany reserve with remnant vegetation (Res 28465, 28466 & 28467; corner of South Coast Highway and George St) that is vested for gravel extraction and rubbish purposes. Several smaller reserves within the Survey Area are vested for railway, drainage, public utilities or other purposes. One gazetted conservation reserve (Gledhow Nature Reserve) and one Public Park (Mt Melville) occur within the vicinity of the Survey Area (Appendix B).

The hydrology of the Survey Area is largely altered by artificial channels draining east into Princess Royal Harbour. A natural broad drainage channel intersects the Survey Area north of South Coast Highway that flows west into Five Mile Creek and eventually into Lake Powell.

The Survey Area is located within the Jarrah Forest Interim Biogeographic Regionalisation of Australia (IBRA) Region (Department of the Environment [DotE] 2014a). Broad scale pre-European vegetation mapping (Shepherd *et al.* 2002) indicates the native vegetation is composed of three associations:

- Albany_3 - "*Forest. Mainly jarrah and marri Eucalyptus marginata, Corymbia calophylla.*"
- Albany_51 - "*Sedgeland. Cyperaceae, Restionaceae, Juncaceae.*"
- Albany_978 - "*Low forest, woodland or low woodland with scattered trees Eucalyptus marginata, Banksia spp., Allocasuarina spp.*"

The Survey Area occurs within the zone mapped during the Albany Regional Vegetation Survey (Sandiford and Barrett 2010), which provides context for assessing the regional conservation significance of vegetation associations. Several soil-landscapes (Department of Agriculture and Food Western Australia [DAFWA] 2017) are also mapped within the Survey Area as:

- Collis yellow duplex - "*Gravelly yellow duplex soils; Jarrah-Marri forest.*"
- Dempster crest - "*Sands and laterite on elongate crests; Jarrah-Albany Blackbutt-Marri forest.*"
- Dempster slope - "*Sands and gravels on smooth slopes; Albany blackbutt-sheoak low forest.*"
- Gardner granite - "*Granite outcrop.*"
- Mattaband yellow duplex - "*Gravelly yellow and yellow duplex soils; Jarrah-Marri-Yellow Tingle forest.*"
- Minor Valleys S7 slope - "*Broad valleys in sedimentary rocks; 30 m relief; smooth slopes. Deep sands and iron podzols on slopes; Albany Blackbutt-jarrah-sheoak woodland. Podzols and yellow duplex soils on floors; paperbark woodland, teatree heath.*"
- Owingup Subsystem - "*Plains with swamps, lunettes and dunes. Yellow solonchic soils, organic loams and diatomaceous earth. Wattle-Paperbark thickets, Teatree heath and reeds. Podzols on dunes; Banksia-Sheoak woodland.*"

3 METHODS

The assessment was conducted by Damien Rathbone (botanist) and Dr Sandra Gilfillan (zoologist), with field assistance by Dylan Lehmann, Kirsty Vogel and Fin Pope-Gilby. Field visits were conducted over several weeks from October 2017 to January 2018. Targeted flora surveys were conducted on the 24th October and 7th, 9th, 22nd, 23rd, 24th, 27th, 28th and 30th of November. Fauna habitat surveys and habitat tree measuring occurred on 24th, 25th, 26th 31st October; 7th, 9th, 13th, 15th, 21st, 23rd and 30th November; 7th, 11th, 13th, 14th December and 22nd January. Location information for all features were identified using a handheld GPS (Garmin 64).

3.1 Desktop Assessment

A desktop assessment of known or potential conservation significant vegetation, flora and fauna within a 10km radius of the Survey Area was undertaken using the following sources:

- NatureMap (Department of Parks and Wildlife [DPaW] 2017a).
- Protected Matters Search Tool (PMST) (Department of the Environment and Energy [DotEE] 2017a).
- Threatened and Priority flora and fauna records from the Department of Biodiversity, Conservation and Attractions [DBCA] and/or the Western Australian Herbarium as supplied by Main Roads.
- Priority Ecological Community (PEC) and Threatened Ecological Community (TEC) mapping from the Species and Communities Branch, DBCA, as supplied by Main Roads.

3.2 Vegetation Assessment

A vegetation assessment was conducted using floristic quadrats in accordance with technical guidance (EPA 2016) where the following attributes were recorded:

- Location and site description – GPS coordinate of NW corner, other corners measured using a vertex (Nikon 36) and compass. Quadrats dimensions are 10 m x 10 m unless stated. All four corners are marked with posts (temporarily) and UV stable flagging tape (3-5 years longevity).
- Species inventory – all vascular plant species present, including weed species. Species that were not confidently identified during the field survey were collected for identification in the Albany Regional Herbarium or Western Australian Herbarium.
- Foliar cover – the estimated percentage cover for each stratum.
- Vegetation condition – according to the current vegetation condition classification (Table 1).
- Photographs – four photographs overlooking the quadrat were combined into a panorama.

Quadrat information was used to define the vegetation association according to the National Vegetation Information System (Executive Steering Committee for Australian Vegetation Information [ESCAVI] 2003) and then aligned with units described in the Albany Regional Vegetation Survey (Sandiford and Barrett 2010). Floristic similarity was assessed using two-way tables and field observations. No cladistics analysis was conducted.

Table 1. Vegetation condition scale (EPA 2016).

Condition	Description
Pristine	Pristine or nearly so, no obvious signs of disturbance or damage caused by human activities since European settlement.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. Damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle tracks.
Very Good	Vegetation structure altered, obvious signs of disturbance. 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. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, 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. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds at high density, 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 areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees and shrubs.

3.3 Targeted Flora Search

A targeted search for potential Threatened and Priority flora identified from the desktop assessment was conducted across the Survey Area. The search was conducted in the appropriate season to detect most of the Threatened or Priority species considered possible or likely to occur. The assessment area was initially surveyed via a meandering traverse to identify vegetation types and condition. Where vegetation types were identified as potential habitat for Threatened or Priority flora, an intensive grid of suitably spaced transects was surveyed. Population census and site information of Threatened or Priority flora was recorded in accordance with the Threatened and Priority Flora Report Form Field Manual (Department of Environment and Conservation [DEC] 2010). Population size was determined by either direct counts, or by estimation of plant density using transects or suitably sized quadrats.

3.4 General Fauna Habitat Assessment

A fauna habitat assessment was undertaken for conservation significant fauna that could potentially occur in the Survey Area, determined from the desktop survey. The fauna habitat assessment primarily focused on the identification of fauna habitat based on vegetation type. Opportunistic recording of evidence (sightings, bird calls, tracks, scats, bones and feeding signs) of conservation significant fauna was undertaken within the Survey Area.

The likelihood of occurrence of conservation significant fauna was determined by an assessment of the availability of potentially suitable habitat; its current known distribution and on any actual opportunistic sightings or signs of a species,

3.5 Targeted Fauna Search

Identification and quantification of habitat for Western Ringtail Possum and three species of Black Cockatoo (Carnaby’s Cockatoo, Baudin’s Cockatoo and the Forest Red-tailed Black Cockatoo) was specifically undertaken within the Survey Area, in accordance with EPBC Act guidelines (DEWHA 2009; DSEWPaC 2012). Habitat quality was categorised to identify important areas for each species (Table 2) and is discussed below for each species.

Table 2: Habitat categories of target fauna species (adapted from DEWHA (2009) and DSEWPaC (2012)).

<p>Western Ringtail Possum</p>	<p>1. Core habitat (high number of scat observations; area sufficient to include multiple home ranges; habitat suitably high)</p> <p>2. Habitat linkage (scats observed but only comprising a narrow strip of vegetation).</p> <p> 2a. Likely habitat linkage (no scats observed and would not sustain individuals, but suitable habitat for movement through – continuous canopy or thick under or mid-storey).</p> <p>3. Supporting habitat (lower number of scat observations, OR no scats observed but habitat potentially suitable; area sufficient to include multiple home ranges; habitat suitability lower than core habitat).</p>
<p>Black Cockatoo species</p>	<p>High quality foraging habitat (high_feed): habitat patches consisting of a high coverage of feeding trees with a mature canopy. (NB: Pines not included in habitat assessment).</p> <p>High quality breeding habitat (high_breed): habitat patches consisting of a high number of potential breeding trees (≥500mm DBH)</p> <p>High quality roosting habitat (high_roost): habitat patches consisting of a high number of potential roosting trees.</p> <p>Low quality foraging habitat (low_feed): habitat patches consisting of a low coverage of feeding trees with a mature canopy.</p> <p>Low quality breeding habitat (low_breed): habitat patches consisting of a low number of potential breeding trees (≥500mm DBH).</p> <p>Low quality roosting habitat (low_roost): habitat patches consisting of a low number of potential roosting trees.</p>

Western Ringtail Possum (*Pseudocheirus occidentalis*) (T-CR)

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Significant Impact Guidelines for the Western Ringtail Possum pertain only to the population occurring on the southern Swan Coastal Plain (DEWHA 2009), and no guidelines have yet been developed for the South Coast population, which can be defined as a significant population under these guidelines (DEWHA, 2009). Comprehensive information is yet to be obtained for the South Coast population, including the extent of the population, abundance and density within different habitats types, diet and breeding ecology, core areas where breeding occurs and important corridors or linkages for maintaining population connectivity.

Preliminary data collected on the South Coast population indicates that this population is quite different to the Swan Coastal Plain population in terms of habitat use/preference and refuge types, and possibly other aspects of their ecology. For example, the presence of Peppermint (*Agonis flexuosa*) is not necessary for the presence the species and a percentage of individuals use refuges on the ground, for example in thick sedge ground layers (Van Helden *et al.* 2017; Gilfillan 2008 and S.Gilfillan pers. obs.). The EPBC Act Significant Impact Guidelines may therefore have limited application to the South Coast population.

The EPBC Act Significant Impact Guidelines identified three areas as important for the Western Ringtail Possums within the southern Swan Coastal Plain: *Core habitat*, *Primary corridors* and *Supporting habitat*. As the definitions in themselves are not Swan Coastal Plain specific they can be applied to some degree to the South Coast population. Using these habitat categories as a guide, and at a smaller scale than that applied to the Swan Coastal Plain area, three Western Ringtail Possum habitat types can be identified within the Survey Area: (NB: these categories are speculative and based on limited data).

Core habitat

Core habitat likely contains sites necessary for breeding and dispersal, and support recruitment and population maintenance. They are defined by the large size of the remnant occupied (able to support multiple home ranges); apparent high densities of individuals based on high numbers of individual scat observations.

Supporting habitat

Supporting habitat includes vegetation patches that buffer key local populations from threats, as well as providing foraging, breeding, and dispersal opportunities. These areas *likely* contain lower numbers of individuals and possibly survivorship. This habitat provides the opportunity for an immigration source and emigration destination to allow for natural fluctuations in the species' fecundity. Supporting habitat areas can have existing remnant vegetation that has a connective function, and/or areas that could enhance connectivity.

Habitat linkages

Habitat linkages are not large enough to support multiple home ranges but allow possums to move from one area of core or supporting habitat to another. In this survey they include any narrow linear patches of vegetation where Western Ringtail Possum scats or dreys were found. Habitat linkages don't necessarily need to form a continuous connection between core habitats, as Western Ringtail Possums will come to the ground to move through habitat if necessary. However, the presence of these linkages greatly enhances movement of individuals between core habitats.

Potential habitat linkages are areas potentially suitable for possums to travel through (continuous canopy or thick mid-storey vegetation), but where no scats were found. Scats may be absent as these are unlikely to be feeding areas. These can include planted trees.

Primary Corridors were not included here as they mostly occur at a larger scale than covered by the Survey Area.

The presence of Western Ringtail Possums within a habitat patch was assessed by the observation of dreys and scats. All dreys seen were recorded. Absence of dreys, however, does not indicate absence of Western Ringtail Possums (Gilfillan 2008). Scat searches were comprehensive, covering the entire remnant, therefore they provided an indication of distribution of the species.. The area of occupancy of Western Ringtail Possums was based on the presence of scats or dreys. Where either of these signs were observed it was assumed that Western Ringtail Possums would be using any continuous vegetation of similar habitat type extending from where the observations were made. Scat abundance is not an accurate measure of absolute abundance unless scat deposition and decay rates are known but can be used as an indication of relative abundance (Wayne *et al.* 2005), and in this survey the number of individual scat observations was used to aid the delineation of Western Ringtail Possum habitat into the categories above.

Black Cockatoos (Carnaby's Cockatoo (*Calyptorhynchus latirostris*) (T-EN); Baudin's Cockatoo (*Calyptorhynchus baudinii*) (T-EN); and Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii subsp. naso*) (T-VU)

Breeding, foraging and roosting habitat was assessed in accordance with the EPBC Act Referral guidelines for the three threatened Black Cockatoo species (Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC 2012). This included recording the species, location, number and behaviour of any observed Black Cockatoos; recording the number, location and species of breeding trees above or equal to a diameter at breast height (DBH) of 500mm and notes on whether trees contain hollows; the presence and extent of potential and known foraging habitat (identification of areas with known feeding species and observations of feeding evidence); and the presence and extent

of potential roosting habitat. For Tuart (*Eucalyptus gomphocephala*) many trees branched well below breast height. In these cases, the diameter was measured below the first branch. For Pine (*Pinus radiata*) only an estimate of whether the DBH was greater than or less than 500mm was taken, as the value of pines as a food source is not dependent on this threshold value. Pine saplings were recorded and specifically noted as such.

The survey timing potentially coincided with the use of hollows by nesting cockatoos, however the assessment was made only from ground level therefore limiting the detectability of active, or recently active hollows. Where a hollow was visible but an assessment of suitability or hollow entrance could not be made, the notation of 'possible' was made.

Recording of feeding evidence by Black Cockatoos was not exhaustive, but a sufficient sample of records were taken for each habitat patch, in order to assist in characterising that patch as current feeding habitat. However, any area within the range of the black cockatoos that contains known food or plant species is considered to be potential foraging habitat for the species (DSEWPac 2012).

3.6 Regional Significance of Fauna Habitat

A regional perspective on the significance of fauna habitat within the Survey Area was determined by comparing the extent of vegetation associations suitable for conservation significant species as a proportion of the total habitat within the Albany Regional Vegetation Survey Area (approximately 30 km radius) (Sandiford and Barrett 2010). Regional significance is also discussed with respect to the range of the conservation significant species.

3.7 Legislation and Conservation Significance

Flora, fauna and vegetation can be considered as conservation significant under Federal or State legislation or through listing by State Government Authorities. These are explained below with the definitions of conservation status relevant to the different Acts tabulated in Appendix A.

The EPBC Act is administered by the Federal Government and provides protection to Threatened flora, fauna or vegetation communities that are recognised as Matters of National Environmental Significance (MNES). Impacts to MNES require approval from the Federal Minister for the Environment.

State Government legislation includes the *Wildlife Conservation Act 1950* (WC Act), which recognises flora, fauna and vegetation that is Threatened (state level only) or in need of special protection within Western Australia. The recently proclaimed *Biodiversity Conservation Act 2016* (EPBC Act) will supersede the WC Act. The DBCA also maintains a list of Priority flora, fauna and ecological communities that warrant monitoring or protection.

The *Environmental Protection Act 1986* (EP Act) provides regulations for clearing of vegetation or habitats through ten clearing principles (Schedule Five of the EP Act) relevant to the biological and environmental aspects of native vegetation. The EP Act also recognises Environmentally Sensitive Areas (ESA) that have specific values such as threatened species, certain conservation estate and wetlands.

Other State level measures of conservation significance other than statutory listing include association with restricted habitats, range extensions, relictual characteristics, potentially novel taxa and naturally occurring hybrids. Conservation targets also exist for the protection of certain vegetation above thresholds of pre-European extent (EPA 2016).

4 FLORA RESULTS

4.1 Vegetation

Thirty-two floristic quadrats were established within the Survey Area (Appendix D). A total of 337 taxa from 65 families, including 60 weeds were recorded (including opportunistic observations; Appendix C). The plant families most represented were Myrtaceae (40 taxa), Fabaceae (37), Cyperaceae (27) and Proteaceae (25).

Thirteen vegetation formations were described, including three granite shrublands that were mapped in different combinations (mosaics) (Table 3). The vegetation was represented in condition scales grading from completely degraded (native understory very sparse or absent) to excellent (no obvious disturbance) or as a mosaic of multiple categories. The condition of the majority of the remnant vegetation was classified as a mosaic of Very Good to Excellent (EPA 2016). Vegetation descriptions and the area of extent for each condition scale is provided below; mapping is provided in Appendix B.

Table 3. Extent (ha) and condition (EPA 2016) of vegetation associations in the Survey Area.

Vegetation Association	Condition					Total:
	Completely Degraded	Degraded	Very Good	Very Good/ Excellent	Excellent	
Uplands						
<i>Hakea</i> spp. Shrubland/Woodland Complex		1.71	0.18	2.47		4.35
Jarrah/Marri/Sheoak Laterite Forest		6.81	0.11	22.21		29.13
Jarrah/Sheoak/ <i>E. staeri</i> Sandy Woodland		0.63		3.26		3.89
Marri/Jarrah Coastal Hills Forest				2.16		2.16
Marri/Jarrah Forest/Peppermint Woodland		2.01	1.73	4.20		7.94
Peppermint Low Forest	1.38					1.38
Granites						
Mosaic <i>Taxandria marginata</i> / <i>Gastrolobium bilobum</i> Granite Shrubland/Yate Woodland		1.61		1.39		3.00
Mosaic <i>Taxandria marginata</i> / <i>Leucopogon assimilis</i> Granite Shrubland				0.70		0.70
Wetlands						
<i>Evandra aristata</i> Sedgeland	0.53		0.59			1.12
<i>Homalosperrum firmum</i> / <i>Callistemon glaucus</i> Peat Thicket		1.95	1.34		5.12	8.42
<i>Melaleuca preissiana</i> Low Woodland	0.98					0.98
<i>Taxandria juniperina</i> Closed Forest	2.11	1.98	2.65			6.75
Total:	5.00	16.70	6.60	35.32	6.18	69.80

Hakea spp. Shrubland/Woodland Complex:

Soil: White sand with heavy laterite gravel and rocks (<30mm)

Landform: Hill crest

Represented in quadrat 1, 2 & 31

Total of 4.3 ha, Degraded to Excellent Condition

Concordant with Unit 31(Sandiford and Barrett 2010)



Lifeform	% Cover	Dominant taxa
Mallee <10m	10-30%	<i>Eucalyptus marginata</i> , <i>Eucalyptus staeri</i> , <i>Allocasuarina fraseriana</i>
Shrubs >2m	10-70%	<i>Hakea ferruginea</i> , <i>Hakea lasiantha</i> , <i>Hakea ceratophylla</i> , <i>Hakea trifurcata</i> , <i>Hakea lasiantha</i>
Shrubs 1-2m	10-30%	<i>Acacia browniana</i> var. <i>browniana</i> , <i>Acacia myrtifolia</i> , <i>Agonis theiformis</i> , <i>Allocasuarina humilis</i> , <i>Beaufortia decussata</i> , <i>Petrophile diversifolia</i> , <i>Leucopogon verticillatus</i> , <i>Leucopogon obovatus</i> subsp. <i>obovatus</i>
Shrubs <1m	10-30%	<i>Hibbertia microphylla</i> , <i>Hovea trisperma</i> , <i>Dasyopogon bromeliifolius</i> , <i>Synaphea gracillima</i> , <i>Xanthorrhoea platyphylla</i> , <i>Sphaerolobium grandiflorum</i> , <i>Sphenotoma capitata</i> , <i>Pultenaea verruculosa</i> , <i>Andersonia</i> sp. Jamesii (J. Liddelow 84)
Sedges	<10%	<i>Lepidosperma drummondii</i> , <i>Lepyrodia hermaphrodita</i> , <i>Anarthria gracilis</i> , <i>Anarthria prolifera</i> , <i>Mesomelaena tetragona</i> , <i>Tetraria octandra</i>

Jarrah/Marri/Sheoak Laterite Forest:

Soil: Grey sand with laterite gravel

Landform: Middle to upper hill-slopes

Represented in quadrat 4, 5, 6 & 7

Total of 29.13 ha, Very Good/Excellent condition

Concordant with Unit 12a (Sandiford and Barrett 2010)



Lifeform	% Cover	Dominant taxa
Tree >10m	30-70%	<i>Eucalyptus marginata</i> , <i>Corymbia calophylla</i> , <i>Allocasuarina fraseriana</i>
Shrubs >2m	10-30%	<i>Banksia grandis</i> , <i>Persoonia longifolia</i> (dieback free areas only), <i>Hakea amplexicaulis</i>
Shrubs 1-2m	10-30%	<i>Beaufortia decussata</i> , <i>Bossiaea linophylla</i> , <i>Agonis theiformis</i> , <i>Xanthorrhoea platyphylla</i> , <i>Leucopogon verticillatus</i>
Shrubs <1m	10-30%	<i>Acacia browniana</i> var. <i>browniana</i> , <i>Dasyopogon bromeliifolius</i> , <i>Hibbertia cunninghamii</i> , <i>Logania serpyllifolia</i> subsp. <i>serpyllifolia</i>
Sedges	30/70 %	<i>Patersonia umbrosa</i> var. <i>umbrosa</i> , <i>Desmocladus fasciculatus</i> , <i>Tetraria octandra</i> , <i>Lomandra pauciflora</i> , <i>Tetraria</i> sp. Jarrah Forest (R. Davis 7391)

17Jarrah/Sheoak/E. staeri Sandy Woodland:

Soil: Grey sand

Landform: Middle hill-slopes

Represented in quadrat 8, 21 & 25

Total 3.89 ha, Degraded to Excellent condition

Concordant with Unit 13 (Sandiford and Barrett 2010)



Lifeform	% Cover	Dominant taxa
Tree >10m	30-70%	<i>Eucalyptus marginata</i> , <i>Eucalyptus staeri</i> , <i>Allocasuarina fraseriana</i> , <i>Corymbia calophylla</i>
Shrubs >2m	10-30%	<i>Banksia grandis</i> (dieback free areas only)
Shrubs 1-2m	10-30%	<i>Bossiaea linophylla</i> , <i>Agonis theiformis</i> , <i>Xanthorrhoea platyphylla</i> , <i>Leucopogon verticillatus</i> , <i>Hakea ruscifolia</i> , <i>Leucopogon obovatus</i> subsp. <i>obovatus</i>
Shrubs <1m	10-30%	<i>Acacia browniana</i> var. <i>browniana</i> , <i>Dasyopogon bromeliifolius</i> , <i>Hibbertia cunninghamii</i> , <i>Xanthosia rotundifolia</i> , <i>Opercularia hispidula</i> , <i>Hibbertia cuneiformis</i>
Sedges	30/70 %	<i>Anarthria scabra</i> , <i>Patersonia umbrosa</i> var. <i>umbrosa</i> , <i>Tetraria octandra</i> , <i>Tetraria</i> sp. Jarrah Forest (R. Davis 7391), <i>Johnsonia lupulina</i>

Marri/Jarrah Coastal Hills Forest:

Soil: Brown loamy sand, granite boulders

Landform: Middle - upper hill-slopes

Represented in quadrat 11 & 12

Total 2.16 ha, Very Good/ Excellent condition

Concordant with Unit 17 (Sandiford and Barrett 2010)



Lifeform	% Cover	Dominant taxa
Tree >10m	30-70%	<i>Corymbia calophylla</i> , <i>Eucalyptus cornuta</i> , <i>Agonis flexuosa</i>
Shrubs >2m	<10%	<i>Bossiaea linophylla</i> , <i>Gastrolobium bilobum</i>
Shrubs 1-2m	10-30%	<i>Hovea elliptica</i> , <i>Leucopogon obovatus</i> subsp. <i>obovatus</i>
Shrubs <1m	10-30%	<i>Tremandra stelligera</i> , <i>Opercularia hispidula</i> , <i>Hibbertia cuneiformis</i> , <i>Hibbertia furfuracea</i> ,
Sedges/Grasses	10-30%	<i>Loxocarya cinerea</i> , <i>Microlaena stipoides</i> , <i>Poa porphyroclados</i> , <i>Stypantra glauca</i> , <i>Tetrarrhena laevis</i> , <i>Tetraria octandra</i> , <i>Lepidosperma tenue</i>

Marri/Jarrah Forest/Peppermint Woodland:

Soil: Brown or grey sand, sometimes granite boulders

Landform: Middle - lower hill-slopes

Represented in quadrat 9, 15 & 20

Total 7.94 ha, Very Good/ Excellent condition

Concordant with Unit 10 (Sandiford and Barrett 2010)



Lifeform	% Cover	Dominant taxa
Tree >10m	30-70%	<i>Corymbia calophylla</i> , <i>Eucalyptus marginata</i> , <i>Eucalyptus cornuta</i> , <i>Agonis flexuosa</i>
Shrubs >2m	<10%	<i>Bossiaea linophylla</i> , <i>Hovea elliptica</i> , <i>Agonis theiformis</i>
Shrubs 1-2m	10-30%	<i>Hovea elliptica</i> , <i>Leucopogon obovatus</i> subsp. <i>obovatus</i>
Shrubs <1m	10-30%	<i>Pteridium esculentum</i> , <i>Tremandra stelligera</i> , <i>Opercularia hispidula</i> , <i>Hibbertia furfuracea</i> , <i>Hibbertia cuneiformis</i> , <i>Xanthosia rotundifolia</i>
Sedges/Grasses	30-70%	<i>Loxocarya cinerea</i> , <i>Tetrarrhena laevis</i> , <i>Tetraria octandra</i>

Peppermint Low Forest:

Soil: White sand

Landform: Lower hill-slopes, dunes

Not represented in quadrats

Total 1.38 ha, Completely Degraded condition

Concordant with Unit 2 (Sandiford and Barrett 2010)



Lifeform	% Cover	Dominant taxa
Tree >10m	30-70%	<i>Agonis flexuosa</i>

***Taxandria marginata* Granite Shrubland:**

Soil: Shallow brown loam or sand
Landform: Granite outcrop
Represented in quadrat 10,
Total in mosaic 3.7 ha, Very Good condition
Concordant with Unit 24 (Sandiford and Barrett 2010)



Lifeform	% Cover	Dominant taxa
Shrubs >2m	10-30%	<i>Taxandria marginata</i> , <i>Anthocercis viscosa</i> , <i>Dodonaea ceratocarpa</i> , <i>Acacia crassiuscula</i>
Sedges/Grasses	10-30%	<i>Lepidosperma hopperi</i> , <i>Lepidosperma tenue</i> , <i>Patersonia limbata</i> , <i>Stypandra glauca</i>

***Gastrolobium bilobum* Granite Shrubland/Yate Woodland:**

Soil: Shallow brown loam or sand
Landform: Granite outcrop
Represented in quadrat 14,
Total in mosaic 3.7 ha, Very Good condition
Concordant with Unit 23 (Sandiford and Barrett 2010)



Lifeform	% Cover	Dominant taxa
Tree >10m	<10%	<i>Eucalyptus cornuta</i>
Shrubs 1-2m	10-30%	<i>Gastrolobium bilobum</i> , <i>Dodonaea ceratocarpa</i> , <i>Hibbertia furfuracea</i> , <i>Leucopogon obovatus</i> subsp. <i>obovatus</i> , <i>Pimelea rosea</i> subsp. <i>rosea</i>
Sedges/Grasses	30-70%	<i>Lepidosperma hopperi</i> , <i>Lepidosperma tenue</i> , <i>Stypandra glauca</i> , <i>Loxocarya cinerea</i>

Leucopogon assimilis Granite Shrubland:

Soil: Shallow brown loam or sand
 Landform: Granite outcrop
 Represented in quadrat 13,
 Total in mosaic 3.7 ha, Excellent condition
 Concordant with Unit 25 (Sandiford and Barrett 2010)



Lifeform	% Cover	Dominant taxa
Tree >10m	<10%	<i>Eucalyptus comuta</i>
Shrubs >2m	30-70%	<i>Gastrolobium bilobum</i> , <i>Dodonaea ceratocarpa</i>
Shrubs <1m	10-30%	<i>Leucopogon assimilis</i> , <i>Leucopogon obovatus</i> subsp. <i>obovatus</i> , <i>Hibbertia diamesogenos</i> , <i>Leucopogon pendulus</i> , <i>Verticordia plumosa</i> , <i>Andersonia sprengelioides</i>
Sedges/Grasses/Herbs	30-70%	<i>Borya sphaerocephala</i> , <i>Stypandra glauca</i> , <i>Loxocarya cinerea</i> , <i>Microlaena stipoides</i> , <i>Neurachne alopecuroidea</i>

Evandra aristata Sedgeland:

Soil: Grey sand
 Landform: Wetland/valley floor
 Represented in quadrat 18
 Total in mosaic 1.2 ha, Completely Degraded to Very Good
 Concordant with Unit 46 (Sandiford and Barrett 2010)



Lifeform	% Cover	Dominant taxa
Tree <10m	<10%	<i>Nuytsia floribunda</i>
Shrubs 1-2m	10-30%	<i>Beaufortia sparsa</i> , <i>Adenanthos obovatus</i> , <i>Jacksonia horrida</i> , <i>Melaleuca thymoides</i> , <i>Taxandria parviceps</i>
Shrubs <1m	10-30%	<i>Hypocalymma strictum</i> , <i>Boronia crenulata</i> , <i>Boronia spathulata</i> , <i>Dampiera linearis</i> , <i>Dasypogon bromeliifolius</i>
Sedges/Grasses/Herbs	30-70%	<i>Evandra aristata</i> , <i>Gymnoschoenus anceps</i> , <i>Anarthria laevis</i> , <i>Anarthria prolifera</i> , <i>Anarthria scabra</i> , <i>Xyris lanata</i>

***Homalospermum firmum*/Callistemon glaucus Peat Thicket:**

Soil: Grey sand, with peat

Landform: Wetland/valley floor

Represented in quadrat 16, 22, 23, 24, 26, 27, 28, 29

Total 8.42 ha, Degraded to Excellent

Concordant with Unit 47 (Sandiford and Barrett 2010)



Lifeform	% Cover	Dominant taxa
Shrubs 1-2m	30-70%	<i>Callistemon glaucus</i> , <i>Homalospermum firmum</i> , <i>Taxandria linearifolia</i> , <i>Boronia crassipes</i> , <i>Hakea linearis</i> , <i>Sphaerolobium vimineum</i>
Sedges	>70%	<i>Empodisma gracillimum</i> , <i>Gymnoschoenus anceps</i> , <i>Leptocarpus tenax</i> , <i>Schoenus multiglumis</i> , <i>Xyris lanata</i>

***Melaleuca preissiana* Low Woodland:**

Soil: Sand

Landform: Wetland/valley floor

Not represented in quadrats

Total 0.98 ha, Completely Degraded

Concordant with Unit 49 (Sandiford and Barrett 2010)



Lifeform	% Cover	Dominant taxa
Shrubs >2m	30-70%	<i>Melaleuca preissiana</i> , <i>Melaleuca raphiophylla</i>
Grasses	>70%	<i>Pasture grasses and weeds</i>

***Taxandria juniperina* Closed Forest:**

Soil: Sand

Landform: Wetland/valley floor

Represented in quadrat 30 & 31

Total 0.98 ha, Completely Degraded to Very Good

Concordant with Unit 59 (Sandiford and Barrett 2010)



Lifeform	% Cover	Dominant taxa
Shrubs >2m	>70%	<i>Taxandria juniperina</i> , <i>Homalospermum firmum</i> , <i>Astartea species</i>
Grasses	>10%	<i>Leptocarpus scariosus</i> , <i>Baumea acuta</i> , <i>Lepidosperma striatum</i>

4.2 Conservation Significant Vegetation

Four vegetation types described from the Survey Area occur exclusively in wetland habitats and are consigned to legislation protecting those environments. Three vegetation types are associated with granite outcrops. These are generally considered to be of conservation significance due to their restricted distribution, high number of conservation significant taxa and their role as climatic refugia.

The current extent of Pre-European vegetation associations in the Survey Area are above 30% at state and local government jurisdictions (Table 4). When aligned with mapping unit in the Albany Regional Vegetation Survey (Sandiford and Barrett 2010), ten associations have low representation in reserves or very low extent (Table 5).

Table 4. Extent (ha) of Pre-European vegetation associations from the Survey Area (Government of Western Australia [GoWA] 2016).

Vegetation Association	Western Australia			City of Albany (LGA)		
	Pre-European Extent	Current Extent	% Remaining	Pre-European Extent	Current Extent	% Remaining
3 - Medium forest; jarrah-marri	2,661,405	1,810,489	68	50,509	16,305	32
51 - Sedgeland; reed swamps, occasionally with heath	59,085	33,001	56	17,586	5,851	33
978 - Low forest; jarrah, <i>Eucalyptus staeri</i> & <i>Allocasuarina fraseriana</i>	53,231	19,017	36	52,154	18,880	36

Table 5. Low reservation status or overall extent of ten vegetation associations aligned with the Albany Regional Vegetation Survey (Sandiford and Barrett 2010). Includes IUCN I-IV reserves with Albany Region (<35km radius).

Vegetation Type	Current Extent		Reserve IUCN I-IV	
	ha	%	ha	%
Jarrah/Marri/Sheoak Laterite Forest	13,144	29.8	1,273	9.8
Marri/Jarrah Forest/Peppermint Woodland	1,597	3.6	107	6.7
Peppermint Low Forest	1,232	2.8	281	22.8
<i>Gastrolobium bilobum</i> Granite Shrubland/Yate Woodland	163	0.4	2	1.3
<i>Leucopogon assimilis</i> Granite Shrubland	17	0.1	8	50
<i>Taxandria marginata</i> Granite Shrubland	109	0.2	21	19.1
<i>Homalospermum firmum/Callistemon glaucus</i> Peat Thicket	2,083.00	4.70	263	12.6
<i>Melaleuca preissiana</i> Low Woodland	679	1.5	53	7.7
<i>Evandra aristata</i> Sedgeland	1,747	4	219	12.5
<i>Taxandria juniperina</i> Closed Forest	779	1.8	77	9.9

Two TECs are known in the vicinity the Survey Area; no vegetation meets the requisite criteria for either community. Subtropical and Temperate Coastal Saltmarsh TEC (Vulnerable) occurs 140m from the Survey Area on the margin of Princess Royal Harbor and is confined to marine saline habitats (DotE 2013). The Survey Area falls outside (~6km) the South East Coastal Botanical Province, therefore the Proteaceae Dominated Kwongan Shrubland TEC (Endangered) is not applicable (DotE 2014b).

Four PECs occur directly adjacent to the Survey Area (DPaW 2017b, Appendix B). *Banksia coccinea* Thicket (P1), Coastal *Melaleuca incana/Taxandria juniperina* (P1) and *Banksia littoralis/Melaleuca incana* (P1) have distinctive dominant species that are absent from the Survey Area. *Astartea scoparia* Swamp Thicket (P1) may have previously occurred in the wetland areas on Lower Denmark Road that is now obscured by a high level of disturbance and altered drainage.

4.3 Conservation Significant Flora

The desktop assessment identified that 69 conservation significant plant taxa are known in the vicinity of the Survey Area (Appendix E). Of the species assessed, 37 are considered likely or possible to occur and were considered during the field assessments. Survey limitations (season/fire interval) were identified for five orchid taxa that may have prevented their detection during the field assessment. Critical habitat or populations of five conservation significant flora were recorded from the Survey Area (Appendix B) and are discussed below.



Plate 1. *Prasophyllum macrostachyum*, the common congener of *P. paulinae* (P1).



Plate 2. Potential critical habitat for *P. paulinae* (P1): regenerating swamp on private property where the first collection of the taxon was made in 1988.

Prasophyllum paulinae is a Priority 1 taxon from the Orchidaceae, known only from two wetland habitats in the vicinity of Albany. The first voucher and type specimen were collected in 1988 and 1993, respectively, from a regenerating swamp on private property (P222501) that occurs within the Survey Area. The taxon was named in dedication to the late Pauline Herberle (Jones and Clements 1996), the family of who still own the property. The precise location of the early collections is uncertain due to inaccurate geo-tags, but was noted to be locally frequent within a degraded swamp with black, peaty, alkaline soil on the Herberle's property, Frederick Street, Gledhow (Western Australian Herbarium Accession no. 04514238).

Extensive survey was undertaken of the Herberle's property (in the Survey Area) over several days in spring 2017. All suitable habitat was occupied by a common congener, *Prasophyllum macrostachyum* (Plate 1), and no individuals concordant with the description of *P. paulinae* were detected.

A large area of regenerating wetland vegetation and seasonally inundated firebreaks occur at the southern end of the Herberle's property, which is considered the most likely location of the early collections of *P. paulinae*. Currently the area is composed of a tall, long unburnt (>20 years) closed forest of *Taxandria juniperina* and *Homalospermum firmum* (Plate 2). This area has been defined as

critical habitat for *P. paulinae* (Appendix B). The failure to detect *P. paulinae* in a single survey season does not exclude its presence from the critical habitat or its potential to emerge in future years, particularly after fire.

Prasophyllum paulinae is also known from one other population at in a peat wetland at Two Peoples Bay, east of Albany. Population monitoring after a fire in 2010, indicates it co-occurred with other *Prasophyllum* species and that numbers peaked (over 100 individuals) two years after the fire, then declined thereafter. The last plants (23 individuals) were seen in 2015 (Anna de Haan pers. comm.).

Synaphea incurva is a Priority 1 taxon from the Proteaceae, known from a very narrow range between Redmond State Forest and Hassel National Park (Plate 3). It is commonly associated with heath or woodlands with laterite gravel and sand. Two populations, totalling eight individuals were recorded on road verges in the Survey Area.

Boronia crassipes is a Priority 3 taxon from the Rutaceae, known from wetlands between Albany and Walpole (Plate 4). It is commonly associated with *Homalospermum firmum* and *Empodisma gracillimum* on peat and sand. Several large populations are known within the vicinity of Albany. In the Survey Area, one population with 1018 individuals was recorded in the broad drainage channel on Link Rd.

Andersonia sp. *Jamesii* (J. Liddelow 84) is a Priority 4 taxon from the Ericaceae, known from a relatively narrow range around Albany (Plate 5). It is commonly associated with poorly drained lateritic areas, often on hill crests in *Eucalyptus marginata*/*E. staeri* woodlands. In the Survey Area, a population of 22 individuals was recorded in the large City of Albany Reserve on George St and one individual was recorded on Albany Highway.

Thysanotus isantherus is a Priority 4 taxon known from several coastal granite outcrops between Betty's Beach and Walpole and a disjunct occurrence near Cape Leeuwin (Plate 6). It is commonly associated with shallow soil herblands on the margin of granite sheets. It is inconspicuous due to its small size (<15 cm), its dull pink flowers and its leaves that wither to an underground tuber during dry periods. Two individuals were recorded on the western slopes of Mt Melville.



Plate 3. *Synaphea incurva* (P1).



Plate 5. *Andersonia* sp. *Jamesii* (J. Liddelow 84) (P4).



Plate 4. *Boronia crassipes* (P3).



Plate 6. *Thysanotus isantherus* (P4).

4.4 Weeds

A total of sixty weeds were recorded from areas of remnant vegetation. Weeds from cleared or agricultural areas were very numerous within the Survey Area, therefore were not recorded in the inventory unless considered significant (Declared pest (DPIRD 2018) or Weed of National Significance (DotEE 2017b)). Five significant weeds were recorded and mapped within the Survey Area (Appendix B). Blackberry (**Rubus* species complex) and Bridal Creeper (**Asparagus asparagoides*) were frequently observed in multiple habitats; Gorse (**Ulex europaeus*), Arum Lily (**Zantedeschia aethiopica*) and Lantana (**Lantana camara*) were recorded as isolated occurrences.

5 FAUNA RESULTS

The likelihood of occurrence assessment of conservation significant fauna identified as potentially occurring within the Survey Area is listed in Appendix E. Field assessments confirmed that habitats within the Survey Area are currently being utilised by five conservation significant fauna species; Carnaby's Cockatoo (*Calyptorhynchus latirostris*) (T-EN), Baudin's Cockatoo (*Calyptorhynchus baudinii*) (T-EN), Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) (T-VN), Western Ringtail Possum (*Pseudocheirus occidentalis*) (T-CR), and Southern Brown Bandicoot (*Isodon obesulus* subsp. *fusciventer*) (P4).

Five conservation significant fauna species were considered to *possibly* occur in the Survey Area: - South-western Brush-tailed Phascogale (*Phascogale tapoatafa wambenger*) (CD), Masked Owl (*Tyto novaehollandiae* subsp. *novaehollandiae*) (P3), Fork-tailed Swift (*Apus pacificus*) (IA), Short-nosed Snake (*Elapognathus minor*) (P2) and the Woollybush bee (*Hylaeus globuliferus*) (P3).

The known or potential vegetation associated with conservation significant fauna in the Survey Area is presented in Table 6. Some vegetation associations are mapped (Appendix B) that are not indicated as suitable habitat in Table 6. For example, *Evandra aristata* Sedgeland patches and *Hakea* spp. Shrubland/Woodland Complex patches are not considered suitable for Baudin's and Forest Red-tailed Black Cockatoos. However, in some instances have been mapped as habitat due to the presence of potentially suitable night roosting trees.

5.1 Targeted Conservation Significant Fauna

Western Ringtail Possum (*Pseudocheirus occidentalis*) (T-CR)

Preferred habitat for the Western Ringtail Possum on the south coast of Western Australia is not well understood. The species has been recorded in coastal heath, Jarrah/Marri woodland and forest, Jarrah/Sheoak woodland, peppermint woodlands, myrtaceous heaths and shrublands, Bullich (*Eucalyptus megacarpa*) dominated riparian zones and Karri forest (*Eucalyptus diversifolia*). In the vegetation associations mapped in the Albany Region (35km radius from Albany in Sandiford and Barrett (2010)), most ringtail records were from *Coastal limestone heath vegetation* unit 5b (DPaW 2014). Recent spotlight surveys have found high numbers in *Coastal Hills Forest, Jarrah Woodland and Marri/Jarrah Forest/Peppermint Woodland* on Mt Clarence/Adelaide and Mt Melville within the Albany town site (S. Gilfillan unpubl. data). Recent radio collaring of individuals determined home ranges of 0.88 ± 0.12 ha (mean \pm SE), and were commonly associated at night with Marri and Jarrah, suggesting a preference for these species as foraging trees. Daytime refuges included dreys, large trees, tree hollows (Marri only) and thick ground cover (Van Helden *et al.* 2017).

The field assessment determined that the Western Ringtail Possum occupied a large percent of the Survey Area (Appendix B). A wide range of vegetation types in various levels of condition were utilised (Jarrah, Marri and Sheoak woodlands, Jarrah/Marri Forest, *Taxandria juniperina* Woodland) that varied in condition from intact to degraded.

Non-native vegetation was also utilised such as exotic Eucalypt species plantations, particularly where the weed species Sydney Golden Wattle (*Acacia longifolia*) and Victorian Tea Tree (*Leptospermum laevigatum*) provide patches of thick mid-storey (where a number of dreys were found). Ringtail Possum scats were also found at the base of many pine trees

Table 6: Conservation significant fauna and known (x) or potential (?) associated vegetation within the Survey Area compared to the larger Albany Regional Vegetation Survey Area (Sandiford and Barrett 2010). Insufficient information is available to determine the habitat of the Short-nosed Snake (P2) and Woollybush Bee (P3). * data obtained from DPaW (2013b). ^ calculation based on total area of remnant vegetation in the ARVS (Sandiford and Barrett 2010).

Vegetation Association (ARVS Unit no.)	Ha within Survey Area	Carnaby's Cockatoo (EN)	Baudin's Cockatoo (EN)	Forest Red-tailed Black-Cockatoo (VU)	Western Ringtail Possum (CR)	Quenda (P4)	Brush-tailed Phascogale	Masked Owl (P3)	Fork-tailed Swift (1A)
Uplands									
<i>Hakea</i> spp. Shrubland/Woodland Complex (31)	4.35	x			x				?
Jarrah/Marri/Sheoak Laterite Forest (12)	29.13	x	x	x	x	x	?	?*	?
Jarrah/Sheoak/ <i>Eucalyptus staeri</i> Sandy Woodland (13)	3.89	x	x	x	x	x	?*		?
Marri/Jarrah Coastal Hills Forest (17)	2.16	x	x	x	x	x	?	?*	?
Marri/Jarrah Forest/Peppermint Woodland (10)	7.94	x	x	x	x	x	?		?
Peppermint Low Forest (2)	1.38	x			x				?
Granites									
Mosaic <i>Taxandria marginata</i> / <i>Gastrolobium bilobum</i> Granite Shrubland/Yate Woodland (23/24)	3.00	x		x	x	x			?
Mosaic <i>Taxandria marginata</i> / <i>Leucopogon assimilis</i> Granite Shrubland (24/25)	0.70				x	x			?
Wetlands									
<i>Evandra aristata</i> Sedgeland (46)	1.12	x			x	x			?
<i>Homalospermum firmum</i> / <i>Callistemon glaucus</i> Peat Thicket (47)	8.42	x			x	x			?
<i>Melaleuca preissiana</i> Low Woodland (49)	0.98				x	x			?
<i>Taxandria juniperina</i> Closed Forest (59)	6.75	x			x	x			?
Non-native									
Planted <i>Eucalypts</i>		x	x	x		x			?
>75% Invasive Weeds						x			?
Total extent (ha) in Survey Area (including native vegetation only)		68.1	46.1	46.1	69.8	68.4	43.1	31.2	69.8
Extent in Survey Area as proportion (%) of the total potential habitat in the ARVS Survey Area (DPaW 2013b)		0.17	0.16	0.19	0.17	0.17	0.31	0.63	0.16^

Areas considered *Core habitat* occurred largely in the southern section of the Survey Area, in reserves, and in some remnants on private property (Appendix B). The area adjacent to Mt Melville Reserve is a large area of core habitat continuous with the Western Ringtail Possums occurring on Mt Melville, an established important area for this species within the Albany Region (Oyster Harbour Catchment Group, unpubl. data). The City of Albany Reserve on the corner of George St and South Coast Hwy is also a large area of core habitat for this species.

An important *Potential habitat linkage* occurs along the rail reserve, between Old Elleker Rd and the railway line, forming a partial link between the core habitats of the eastern edge of the Survey Area and the George St Reserve. *Potential habitat linkages* may provide additional areas for movement of individual Ringtail Possums between these core habitats, within the CSBP owned land and on private property, mostly in the form of planted tall trees with a continuous canopy. Small, narrow *Habitat linkages* also occur in patches of roadside vegetation, along Link Rd, south of Lancaster Rd and on George St.

Areas considered *Supporting habitat* include large areas in the east of the Survey Area within the CSBP owned land. These are in general planted tree assemblages with a varying density of largely non-native mid-storey species (from very spare to dense thickets of, particularly, Victorian Tea Tree and Sydney Golden Wattle). The two patches of *Homalospermum firmum/Callistemon glaucus* Peat Thicket (Albany Regional Vegetation Survey (ARVS) Unit No. 47) remnant on Link Rd are considered supporting habitat. Very limited scat searches were performed here due to the thick nature of the vegetation and no scats were observed. However, the presence of Western Ringtail Possums in the adjoining Eucalypt woodland to the north suggests this habitat is likely to be used, particularly due to the thick vegetation providing many opportunities for refuge.

Carnaby's Cockatoo (*Calyptorhynchus latirostris*) (T-EN)

Uncleared or remnant native Eucalypt woodlands or forests containing Marri, Jarrah or Karri and shrublands or Kwongan heathland dominated by *Hakea*, *Dryandra*, *Banksia* and *Grevillea* are considered habitat for this species (DSEWPaC 2012). On the south coast they feed on Jarrah and Marri seeds and a wide variety of mainly proteaceous species. Breeding hollows occur in Jarrah and Marri and generally have an entrance diameter >200mm and occur in trees that are 120–150 years old; trees approaching 680 mm DBH are close to developing suitable hollows (Pittman *et. al.* 2007, Whitford and William 2002, DPaW 2013a).

Communal night roosting occurs at different sites throughout the year. Groups of birds will roost in a suitable tree or group of tall trees, usually close to a water source (known to drink at dams and farm troughs) and within an area of quality foraging habitat. The cockatoos fly to feeding areas each day before returning to the night roost, however, use of a particular night roost site may vary from daily to weekly. Night roosts are generally located in the tallest trees in an area; on the south coast potential roost trees include Marri, Karri, Blackbutt, *Taxandria juniperina*, Tuart (planted), introduced Eucalypts (for example Blue Gum) and introduced pines (DSEWPaC 2012).

Species assessment:

The Survey Area occurs within the known distribution and predicted breeding range of Carnaby's Cockatoo. No individuals were directly observed during the field survey. There are no confirmed breeding sites within 10km of the Survey Area.

Breeding

There were 664 breeding trees \geq 500 mm DBH, and 243 trees \geq 680 mm DBH (Jarrah, Albany Blackbutt, Marri, Tuart or Dead (unknown sp)). Of these, 58 either contained or *possibly* contained hollows

potentially suitable for Carnaby's Cockatoo (entrance diameter of ≥ 200 mm). In addition, 6 trees with a DBH < 500 mm contained or *possibly* contained hollows. All these trees are considered potential breeding trees for this species.

Planted Tuart was also measured as this is a known breeding tree where this species occurs naturally. Based on anecdotal information it estimated that the planted Tuarts are at the most 70 years old, so, although some measured ≥ 500 mm DBH, none contained hollows at present. It is likely that they will form hollows in the next 100-200 years. These trees are considered potential future breeding trees.

High quality potential breeding habitat occurs in two large main areas of Eucalypt Woodland and Forest, on the eastern edge of the Survey Area and in the George St Reserve. Other smaller areas include the Eucalypt Woodland/ Forest just north of the railway line near Roundhay St and some areas of Marri and Jarrah on pasture lands with grazed understorey.

Lower quality breeding habitat occurs in areas of planted Tuart (due to the assumed time frame of hollow formation in these trees within the Survey Area and the unknown habit of this species outside of its natural range), which occur largely within CSBP owned land and to a small extent along the road reserve in the northern section of Link Rd.

Foraging

Evidence of feeding on Marri fruit by Carnaby's Cockatoo was observed during the field assessment within a number of native Eucalypt Woodland/Forest vegetation remnants (Appendix B). Pine trees likely formed a significant food source for this species with a large percentage of these trees showing feeding evidence. High quality foraging habitat occurred in all the large Eucalypt Woodland/Forest remnants.

Lower quality potential foraging habitat occurred in some of the narrow strips of roadside Eucalypt Woodland/Forest vegetation on Link Rd. and George St. The *Hakea* spp. *Shrubland/Woodland Complex* (ARVS Veg Unit No. 31) (George St Reserve) and *Homalospermum firmum/Callistemon glaucus* Peat Thicket (ARVS veg Unit no. 47) on Link Rd.) likely constitute lower quality foraging habitat for this species due to the sparseness of the *Hakea* spp. and the fact that Carnaby's Cockatoo only consume the nectar from the flowers of *Callistemon* spp. and this is not considered a major food source (Johnston 2013). Some roadside Eucalypt Woodland/Forest was considered low quality foraging habitat due to its degraded nature and presence of non-native Eucalypts (eg. *E. globulus*).

Roosting

Potential roosting habitat occurred throughout the Survey Area (Appendix B). As there were numerous water sources within the Survey Area (including dams, man-made pools and farm water troughs) all areas with tall trees suitable for roost sites are considered potential roosting areas. They include native Eucalypt Woodland/Forests, *Taxandria juniperina* woodlands, exotic Eucalypt plantations and introduced pine trees. Confirmed roost sites for Carnaby's Cockatoo occur in Marri Jarrah Forest/Peppermint Woodland on Mt Melville, only 350m from the eastern edge of the Survey Area and in tall *Taxandria juniperina* trees at Lake Seppings (4.8 km from the Survey Area).

Baudin's Cockatoo (*Calyptorhynchus baudinii*) (T-EN)

Baudin's Cockatoo occurs in high-rainfall areas, usually at sites that are heavily forested and dominated by Marri, Jarrah and Karri. It also occurs in woodlands of Wandoo (*E. wandoo*), Blackbutt (*E. patens*), Flooded Gum (*E. rudis*), and Yate (*E. cornuta*) (DSEWPac, 2012). Baudin's cockatoo feeds mainly on the seeds of Marri, but may also feed on the seed of *Banksia* spp., *Hakea* spp. and *Erodium botrys*. Additionally, Baudin's Cockatoo feeds on invertebrate larvae and on apple, pear and persimmon in domestic and commercial fruit orchards (Chapman 2008). There is very little breeding information and the breeding biology of this species remains poorly known (Johnstone and Kirkby 2008). Known

breeding trees include Karri, Marri, Wandoo and Tuart. Hollows suitable for Baudin's Cockatoo are likely to be in trees 500 mm or greater DBH and suitable hollows usually have a diameter of 300-400 mm (Johnstone & Storr 1998; Higgins 1999; Saunders 1974, 1979).

Species assessment:

The Survey Area occurs within the known distribution and known breeding range of Baudin's Cockatoo. No individuals were observed during the field survey. There are no confirmed breeding sites within 10 km of the Survey Area.

Breeding

There were 381 breeding trees \geq 500 mm DBH (Appendix B). Of these only four Marris either contained or *possibly* contained hollows potentially suitable for Baudin's Cockatoo (entrance diameter of \geq 300 mm) and are therefore considered potential breeding trees. Potential breeding habitat considered to be of high quality occurs in three main areas of Eucalypt Woodland/Forest, on the eastern edge of the Survey Area, north of the railway line near Roundhay St and in the George St Reserve. Lower quality potential breeding habitat occurs in some of the narrow strips of roadside Eucalypt Woodland/Forest vegetation on Link Rd, George St and in areas of Tuart.

Foraging

Evidence of feeding on Marri fruit by Baudin's Cockatoo was observed during the field assessment within a number of native Eucalypt Woodland/Forest vegetation types (Appendix B). All native Eucalypt Woodland/Forest containing Marri are considered foraging habitat for this species. High quality feeding habitat occurred in all the large Eucalypt Woodland/Forest remnants. Lower quality foraging habitat occurred in some of the narrow strips of roadside Eucalypt Woodland/Forest vegetation on Link Rd. and George St.

Roosting

There are no confirmed roosting sites within 10km of the Survey Area. However, some Black cockatoo flocks around Albany are mixed flocks comprising both Carnaby's and Baudin's Cockatoos and thus the confirmed roosting sites for Carnaby's Cockatoos may contain some Baudin's individuals (Sarah Comer, South Coast Regional Ecologist, DCBA, *pers.com.*)

Potential roosting habitat occurred throughout the Survey Area (Appendix B). As there were numerous water sources within the Survey Area (including dams, man-made pools and farm water troughs) all areas with tall trees suitable for roost sites are considered potential roosting areas. They include native Eucalypt Woodland/Forests, *Taxandria juniperina* woodlands, exotic Eucalypt plantations and introduced pine trees.

Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii subsp. naso*) (T-VN)

Forest Red-tailed Black Cockatoo commonly occur in Jarrah, Karri and Marri forests and also in a range of other forest and woodland types, including Blackbutt, Wandoo and Tuart (*E. gomphocephala*), Albany Blackbutt, Yate and Flooded Gum (DSEWPaC, 2012). Ninety percent of the Forest Red-tailed Black Cockatoo total diet consists of Marri and Jarrah seeds (Johnstone & Kirkby 1999), and it depends on both feed trees during breeding periods (Johnstone *et al.* 2013). Other feed trees include Blackbutt, Albany Blackbutt, Forest Sheoak (*Allocasuarina torulosa*), Snottygobble (*Persoonia* spp.) and Karri.

Breeding occurs almost exclusively in Marri. Johnson *et al.* (2013) found by measuring 128 breeding trees that mean DBH was 2790 mm, mean estimated age was 222 years, and mean hollow entrance area of hollows was 300 mm x 340 mm. However, Whitford *et al.* (2015) state a more realistic minimum age for trees bearing suitable hollows is approximately 120–150 years (tree diameters of 500–600 mm) and most nest hollows occurred in intermediate-sized trees.

Species assessment

The Survey Area occurs within the modelled distribution of the Forest Red-tailed Black Cockatoo. The breeding range has not been modelled although it is recognised that the species may breed anywhere within its range of occurrence (DSEWPaC 2012). No individuals were observed during the field survey. There are no confirmed breeding or roosting sites within 10 km of the Survey Area.

Breeding

There were 381 breeding trees with ≥ 500 mm DBH (Appendix B). Of these, 22 contained or *possibly* contained hollows potentially suitable for the Forest Red-tailed Black Cockatoo (entrance diameter of ≥ 200 mm, taken as an estimate of the lower end of a mean of 300 mm x 340 mm diameter measured by Johnson *et al.* 2013) and are therefore considered potential breeding trees. Potential breeding habitat considered to be of high quality occurs in three main areas of Eucalypt Woodland/Forest on the eastern edge of the Survey Area, just north of the railway line near Roundhay St and in the George St Reserve. Lower quality potential breeding habitat occurs in some of the narrow strips of roadside Eucalypt Woodland/Forest vegetation on Link Rd, George St and in areas of Tuart.

Foraging

Destructive foraging on Marri and Jarrah capsules diagnostic of Forest Red-tailed Black Cockatoo was also observed within the Survey Area (Appendix B). High quality feeding habitat occurred in all the large Eucalypt Woodland/Forest remnants. Lower quality potential breeding habitat occurs in some of the narrow strips of roadside Eucalypt Woodland/Forest vegetation on Link Rd. and George St.

Roosting

Potential roosting habitat occurred throughout the Survey Area (Appendix B). As there were numerous water sources within the Survey Area (including dams, man-made pools and farm water troughs) all areas with tall trees suitable for roost sites are considered potential roosting areas. They include native Eucalypt Woodland/Forests, *Taxandria juniperina* woodlands, exotic Eucalypt plantations and introduced pine trees.

5.2 Other Conservation Significant Fauna

Quenda (*Isoodon obesulus* subsp. *fusciventer*) (P4)

The Quenda occurs in wet or dry sclerophyll forest through to open woodland and scrubby, dense vegetation on sandy soils. The species often feeds in adjacent forest and woodland that is burnt on a regular basis and in areas of pasture and cropland lying close to dense cover (Paull 2008).

Characteristic diggings of this species were observed throughout the Survey Area in all vegetation types but one, from degraded to very good/excellent condition. Diggings were also observed in some plantation areas and areas with $>75\%$ weeds (Table 6, Appendix B). One roadkill was observed on the Old Denmark Rd, near the corner of George St and a skull and lower jaw bones were found in the small roadside remnants east of Albany Hwy.

South-western Brush-tailed Phascogale, Wambenger (*Phascogale tapoatafa wambenger*) (CD)

The Brush-tailed Phascogale in south-west WA inhabits Eucalypt woodland and open forests, and is found less commonly in wetter forests. The species has an arboreal foraging habit and a preference for mature trees for nesting hollows, although sometimes smaller trees have the potential to provide these (Abbott and Whitford 2002). Rees *et al.* (2006) found that suitable hollows for this species in Victoria ranged in diameter at breast height (DBH) from 25 to 171 cm, with a mean DBH for the trees used by each individual phascogale of >80 cm. Hollow entrance sizes for Brush-tailed Phascogales are small, > 5 cm diameter, with large hollow chamber size. This species was not directly observed during the survey.

A confirmed record of the South-western Brush-tailed Phascogale in Mira Mar (an Albany suburb approximately 4km from the Survey Area) in March 2017 indicates they possibly occur within the Albany area. This species was targeted in a community fauna survey of Mt. Melville Reserve (bounding the eastern edge of the Survey Area) in 2014/15 by the installation of nest boxes. After one year no Brush-tailed Phascogales were found to be using the nest boxes. Spotlighting was also carried out during the survey and no Brush-tailed Phascogale were observed (Gilfillan and Maciejewski 2015). However, targeted trapping for this species was not carried out. Potentially suitable habitat exists in the Marri and Jarrah woodland and forest vegetation types within the Survey Area (Table 6).

Masked Owl (*southern subsp*) (*Tyto novaehollandiae subsp. novaehollandiae*) (P3)

The Masked Owl inhabits forests, woodlands, timbered waterways and open country on the fringe of these areas and require tall Eucalypts with suitable hollows for nesting and roosting and adjacent areas for foraging that support an abundance of principally terrestrial mammals, although arboreal mammals can also be taken. They may also use caves for nesting. Masked Owls are territorial, and pairs remain in or near the territory all year round (Garnett 2000).

This species was not observed during the survey. It possibly occurs as hollows suitable for nesting are present within the Eucalypt woodland/forest vegetation types and prey in the form of terrestrial mammals (Quenda, rabbits) are also present within the Survey Area.

Spotlighting during a fauna survey of Mt. Melville Reserve (bounding the eastern edge of the Survey Area) in 2014/15 (Gilfillan and Maciejewski 2015) did not observe and Masked Owls and none were heard, however no targeted playback for the species was carried out.

Fork-tailed Swift, Pacific Swift (*Apus pacificus*) (1A)

The Fork-tailed Swift is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground. It does not breed in Australia, and therefore breeding habitat is not required. This species was not observed during the survey. Habitats that provide a source of insects would most likely comprise all the vegetation types present within the Survey Area.

Short-nosed Snake (*Elapognathus minor*) (P2)

There are only a few records for this species on the South Coast and therefore its habitat is not well known. This species was not observed during the survey. As the habitat is not well known, it is possible that suitable habitat may exist within the Survey Area, however the vegetation types cannot be confirmed.

Woollybush Bee (*Hylaeus globuliferus*) (P3)

Hylaeus are typically small to medium-sized bees with black, relatively hairless bodies and most species have characteristic white, cream or yellow marks on the face and thorax. Vacated borer holes in tree trunks and dead branches, hollow pithy stems and the vacated burrows of other bees or wasps are commonly used (WAM 2018).

This species was not observed during the survey. Only the type specimen (1929) is known from the Albany area. Its habitat within the South Coast is not known, therefore the species may possibly occur. However, the vegetation types cannot be identified at this point in time.

5.3 Regional Significance of Fauna Habitat within the Survey Area

Habitat for all conservation significant fauna species known or potentially occurring within the Survey Area (for which data is available) is well represented outside of the Survey Area, with percentages of habitat within the Survey Area being less than 1% (Table 6).

All of the fauna species for which ranges are well known are wide ranging, and thus the Survey Area represents only a small area of their total range. It should be noted, though, for Western Ringtail Possums the South Coast population may be an isolated sub-population and is considered a separate management unit (DPaW 2013). Thus, when considering range for this species, the South Coast range is the most appropriate scale.

Ranges of the Short-nosed snake and Woollybush Bee are not well known, therefore the regional context of their ranges cannot be discussed. In addition, the Survey Area is situated at the eastern edge of the range of the Brush-tailed Phascogale and Baudin's Cockatoo's predicted breeding range, and possibly the Short-nosed Snake (from current known records).

In terms of regional connectivity, the southern section of the Survey Area (in the area of the Hanrahan Rd and Frenchman's Bay Rd. intersection) currently provides an already tenuous link between the central Albany area of Ringtail Possum core habitat and that to the south west (Robinson, Big Grove and the Torndirrup Peninsula) and further fragmentation may detrimentally reduce this link.

6 SURVEY LIMITATIONS

6.1 Flora

Seasonal conditions preceding the field assessment has the potential to affect the emergence of annual species and the flowering of perennial species. The Survey Area occurs within a high rainfall zone and the assessment was conducted after close to average rainfall (Figure 1). Consequently, soil moisture conditions were not considered a major limitation for the emergence and flowering of Threatened or Priority flora species.

The information provided within this report is accurate and correct to the best of the author's knowledge. However, no liability is accepted for loss, damage or injury arising from its use. Plant populations can fluctuate over time, particularly after disturbance events such as fire and drought. Consequently, all mapping, vegetation descriptions and population estimates within this report should not be considered accurate indefinitely.

6.2 Fauna

There were few limitations on the identification of currently used habitat (or feeding habitat in the case of the Cockatoos) for the four targeted fauna species in this survey. Western Ringtail Possum scats and Cockatoo feeding signs were easily detected and remain present over a number of seasons.

A substantial limitation to the identification of potential breeding habitat of Cockatoo species was the difficulty of assessing the suitability of hollows from the ground. Thus, the DBH of potential breeding trees is a preferable assessment of potential breeding habitat. Identification of potential roosting habitat for Cockatoos was based largely on whether trees were tallest within the immediate area. There was an assumption that the many watering points were in close enough proximity to these to render these tall trees potential roosting trees.

For non-targeted fauna species only opportunistic sampling was undertaken, thus this was biased toward species that can easily be detected by sightings or by prominent signs such as scats or diggings. For example, Quenda diggings are easily detected and therefore the distribution of Quenda determined by the survey is likely to be a close approximation of its true distribution. Nocturnal, cryptic, less common species or seasonal visitors were not likely to have been identified during the survey. For example the Brush-tailed Phascogale is a nocturnal species and is very difficult to detect by signs and requires trapping to determine presence. For these reasons the focus in this survey was on identifying potential suitable habitat rather than presence of these species.

A large limitation to the identification of potential habitat of some non-target species included lack of knowledge of known/ preferred habitat (Short-nosed Snake, Woollybush Bee).

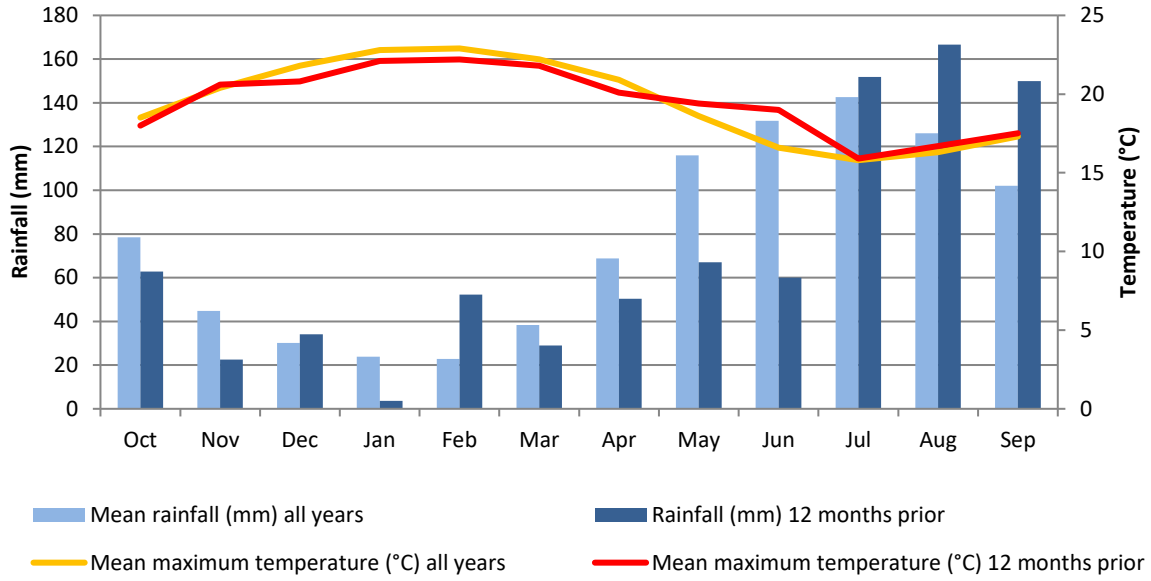


Figure 1. Rainfall and temperature statistics for 12 months prior to the assessment compared with historical averages (all years available) from the nearest weather station (Albany 9500) (BOM 2017). Total rainfall for 12-month period prior to the survey was 850 mm compared to the historic average of 925 mm.

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8 APPENDIX A - Conservation Status Definitions

Table A1. Acts used in environmental impact assessment.

<i>Environment Protection and Biodiversity Conservation [EPBC] Act 1999</i>	https://www.legislation.gov.au/Details/C2016C00777
<i>Wildlife Conservation [WC] Act 1950</i>	https://www.slp.wa.gov.au/legislation/statutes.nsf/law_a908.html
<i>Environmental Protection [EP] Act 1986</i>	https://www.slp.wa.gov.au/legislation/statutes.nsf/law_a252.html
<i>Biodiversity Conservation [BC] Act 2016</i>	https://www.slp.wa.gov.au/legislation/statutes.nsf/law_a147120.html

Table A2. The categories for flora and fauna listed as Threatened or specially protected. Taxa can be recognised as Threatened (T) or Conservation Dependent under Federal (EPBC Act) and / or State (WC / BC) Acts.

Threat category	Definition
Threatened - Critically Endangered (T-CR)	Considered to be facing an extremely high risk of extinction in the wild
Threatened – Endangered (T-EN)	Considered to be facing a very high risk of extinction in the wild
Threatened – Vulnerable (T-VN)	Considered to be facing a high risk of extinction in the wild
Threatened - Presumed extinct (T-EX)	Species which have been adequately searched for and there is no reasonable doubt that the last individual has died.
Conservation dependant (CD)	Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened
Migratory birds protected under international agreement (IA)	Birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and the Bonn Convention, relating to the protection of migratory birds
Other specially protected fauna (OS)	Fauna otherwise in need of special protection to ensure their conservation

Table A3. Flora or fauna that are potentially threatened but do not meet the survey criteria or are otherwise data deficient are listed under Priority categories.

Category	Description
Priority One (P1)	Known from few locations (generally <5), small populations and/or occurring on land with insecure tenure
Priority Two (P2)	Known from few locations (generally <5), small populations with some occurring on land with secure tenure
Priority Three (P3)	Known from several locations with habitat not under imminent threat
Priority Four (P4)	(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for Vulnerable, but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy

Table A4. Categories for ecological communities listed as Threatened (TEC). Communities can be recognised as Threatened under Federal (EPBC) and / or State (WC / BC) Acts.

Category	Description
Presumed totally destroyed (PU)	Adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future.
Critically Endangered (CR)	Adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future.
Endangered (EN)	Adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future.
Vulnerable (VU)	Adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium (within approximately 50 years) to long-term future.

Table A5. The categories for ecological communities listed as Priority (PEC).

Category	Brief description
Priority One (P1)	Known from very few occurrences with a very restricted distribution (generally ≤ 5 occurrences or a total area of ≤ 100 ha) and are currently under threat
Priority Two (P2)	Known from few occurrences with a restricted distribution (generally ≤ 10 occurrences or a total area of ≤ 200 ha). At least some occurrences are not believed to be under immediate threat (within approximately 10 years)
Priority Three (P3)	Known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: (ii) known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat (within approximately 10 years), or; (iii) made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, inappropriate fire regimes, clearing, hydrological change etc
Priority Four (P4)	Adequately known, rare but not threatened or meet criteria for Near Threatened or that have been recently removed from the threatened list. These communities require regular monitoring
Priority Five (P5)	Conservation dependant ecological communities. Not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years

9 APPENDIX B - Maps

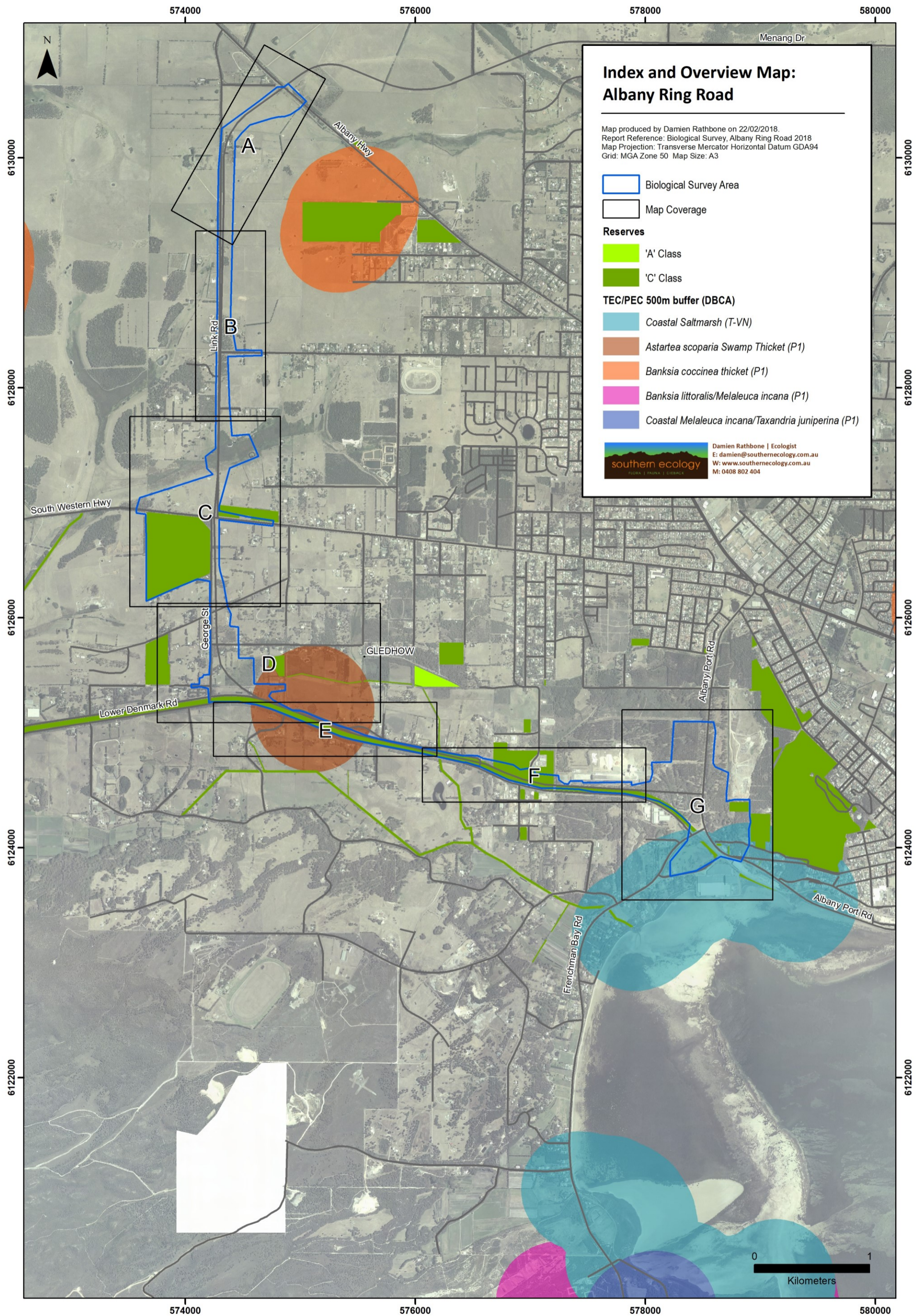
CONTENTS:

Index and Overview Map

Map 1A-G - Vegetation Association, Condition and Conservation Significant Flora

Map 2A-G - Western Ringtail Possum Habitat, Fauna Observations and Weeds

Map 3A-G - Cockatoo Habitat and Significant Fauna Habitat Trees



Index and Overview Map: Albany Ring Road

Map produced by Damien Rathbone on 22/02/2018.
 Report Reference: Biological Survey, Albany Ring Road 2018
 Map Projection: Transverse Mercator Horizontal Datum GDA94
 Grid: MGA Zone 50 Map Size: A3

- Biological Survey Area
- Map Coverage
- Reserves**
- 'A' Class
- 'C' Class
- TEC/PEC 500m buffer (DBCA)**
- Coastal Saltmarsh (T-VN)
- Astartea scoparia* Swamp Thicket (P1)
- Banksia coccinea* thicket (P1)
- Banksia littoralis*/*Melaleuca incana* (P1)
- Coastal *Melaleuca incana*/*Taxandria juniperina* (P1)

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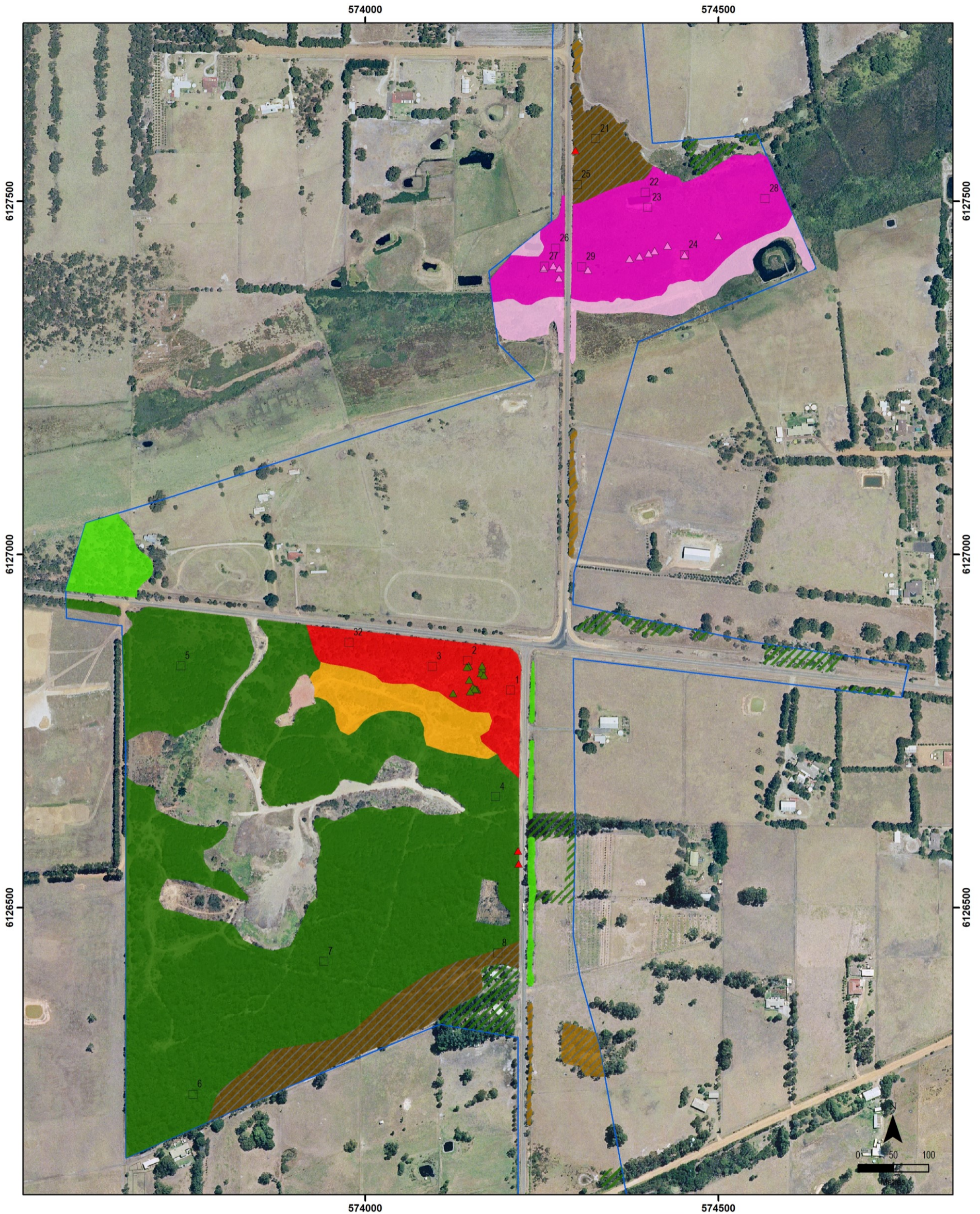


Map 1A&B: Vegetation Association, Condition and Conservation Significant Flora

Map produced by Damien Rathbone on 22/02/2018.
 Report Reference: Biological Survey, Albany Ring Road 2018
 Map Projection: Transverse Mercator Horizontal Datum GDA 1994
 Grid: MGA Zone 50 Map Size: A3 Scale 1:5000

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- Vegetation Association, Condition**
- Hakea spp Shrubland/Woodland Complex, Very Good/Excellent
 - Hakea spp Shrubland/Woodland Complex, Degraded
 - Jarrah/Marri/Sheoak Laterite Forest, Very Good/Excellent
 - Jarrah/Marri/Sheoak Laterite Forest, Degraded
 - Jarrah/Sheoak/E.staeri Sandy Woodland, Very Good/Excellent
 - Jarrah/Sheoak/E.staeri Sandy Woodland, Degraded
 - Marri/Jarrah Coastal Hills Forest, Very Good/Excellent
 - Marri/Jarrah Forest/Peppermint Woodland, Very Good/Excellent
 - Marri/Jarrah Forest/Peppermint Woodland, Degraded
 - Peppermint Low Forest, Completely Degraded
 - Evandra aristata Sedgeland, Very Good
 - Evandra aristata Sedgeland, Completely Degraded
 - Homalospermum firmum/Callistemon glaucus Peat Thicket, Very Good/Excellent
 - Homalospermum firmum/Callistemon glaucus Peat Thicket, Degraded
 - Melaleuca preissiana Low Woodland, Completely Degraded
 - Taxandria juniperina Closed Forest, Very Good
 - Taxandria juniperina Closed Forest, Degraded/Completely Degraded
 - Mosaic T. marginata/G. bilobum Shrubland/Yate Woodland, Very Good/Excellent
 - Mosaic T. marginata/G. bilobum Shrubland/Yate Woodland, Degraded
 - Mosaic T. marginata/Leucopogon assimilis Granite Shrubland, Very Good/Excellent
 - Revegetation or Plantation, NA
 - >75% Invasive Weeds, NA
- Conservation Significant Flora**
- ▲ *Synaphea incurva* (P1)
 - ▲ *Andersonia* sp. Jamesii (J. Liddelow 84) (P4)
 - ▲ *Boronia crassipes* (P3)
 - ▲ *Thysanotus isantherus* (P4)
 - Quadrat Location (No.)
- 0 50 100
Metres



Map 1C: Vegetation Association, Condition and Conservation Significant Flora

Map produced by Damien Rathbone on 22/02/2018.
 Report Reference: Biological Survey, Albany Ring Road 2018
 Map Projection: Transverse Mercator Horizontal Datum GDA 1994
 Grid: MGA Zone 50 Map Size: A3 Scale 1:5000



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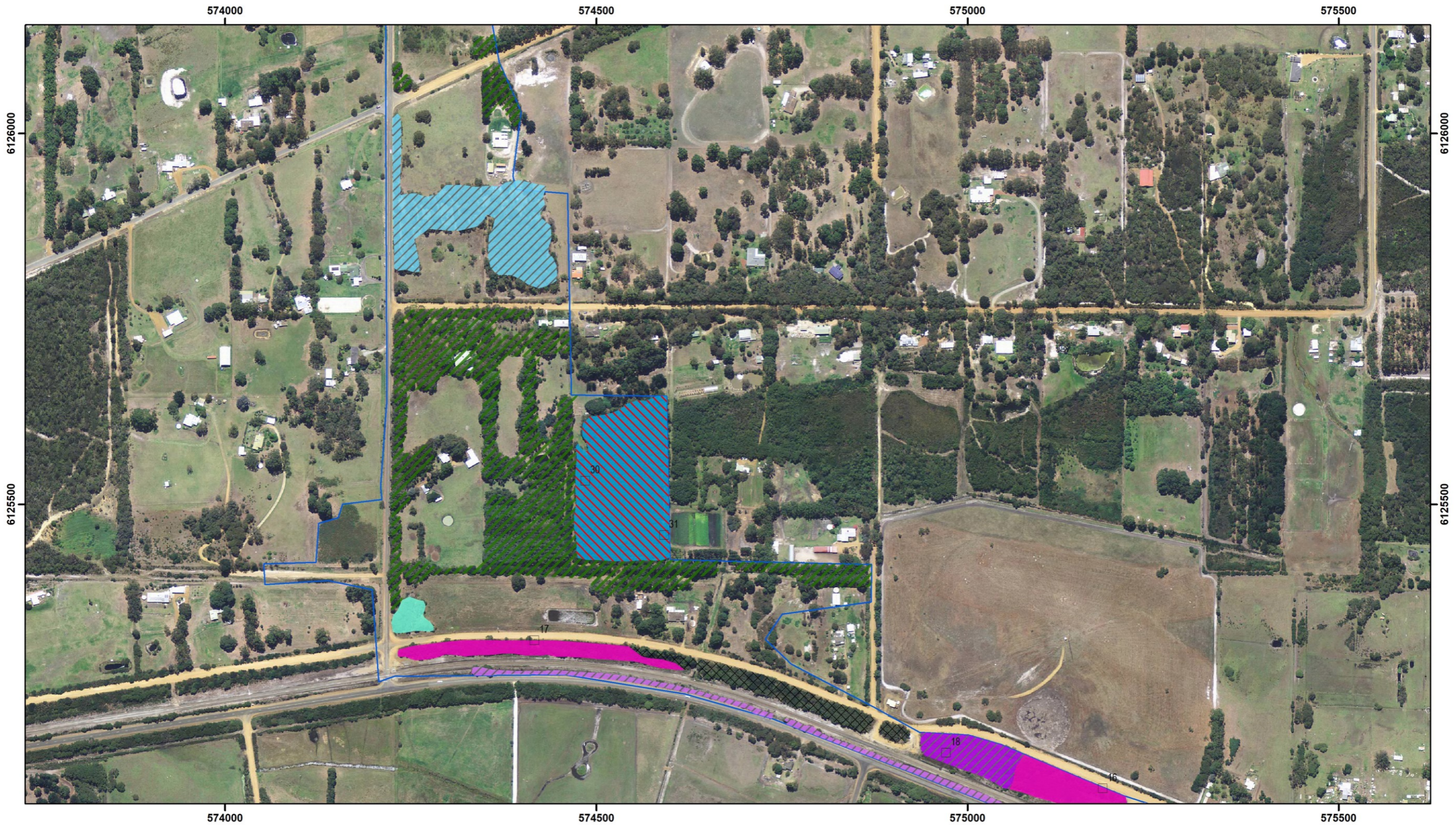
Vegetation Association, Condition

- Hakea spp Shrubland/Woodland Complex, Very Good/Excellent
- Hakea spp Shrubland/Woodland Complex, Degraded
- Jarrah/Marri/Sheoak Laterite Forest, Very Good/Excellent
- Jarrah/Marri/Sheoak Laterite Forest, Degraded
- Jarrah/Sheoak/E.staeri Sandy Woodland, Very Good/Excellent
- Jarrah/Sheoak/E.staeri Sandy Woodland, Degraded
- Marri/Jarrah Coastal Hills Forest, Very Good/Excellent
- Marri/Jarrah Forest/Peppermint Woodland, Very Good/Excellent
- Marri/Jarrah Forest/Peppermint Woodland, Degraded
- Peppermint Low Forest, Completely Degraded

Conservation Significant Flora

- ▲ *Synaphea incurva* (P1)
- ▲ *Andersonia* sp. Jamesii (J. Liddelow 84) (P4)
- Quadrat Location (No.)
- ▲ *Boronia crassipes* (P3)
- ▲ *Thysanotus isantherus* (P4)

- *Evandra aristata* Sedgeland, Very Good
- *Evandra aristata* Sedgeland, Completely Degraded
- *Homalospermum firmum/Callistemon glaucus* Peat Thicket, Very Good/Excellent
- *Homalospermum firmum/Callistemon glaucus* Peat Thicket, Degraded
- *Melaleuca preissiana* Low Woodland, Completely Degraded
- *Taxandria juniperina* Closed Forest, Very Good
- *Taxandria juniperina* Closed Forest, Degraded/Completely Degraded
- Mosaic *T. marginata/G. bilobum* Shrubland/Yate Woodland, Very Good/Excellent
- Mosaic *T. marginata/G. bilobum* Shrubland/Yate Woodland, Degraded
- Mosaic *T. marginata/Leucopogon assimilis* Granite Shrubland, Very Good/Excellent
- Revegetation or Plantation, NA
- >75% Invasive Weeds, NA



Map 1D: Vegetation Association, Condition and Conservation Significant Flora

Map produced by Damien Rathbone on 22/02/2018.
 Report Reference: Biological Survey, Albany Ring Road 2018
 Map Projection: Transverse Mercator Horizontal Datum GDA 1994
 Grid: MGA Zone 50 Map Size: A3 Scale 1:5000

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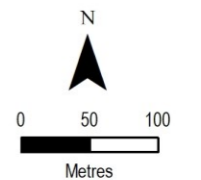
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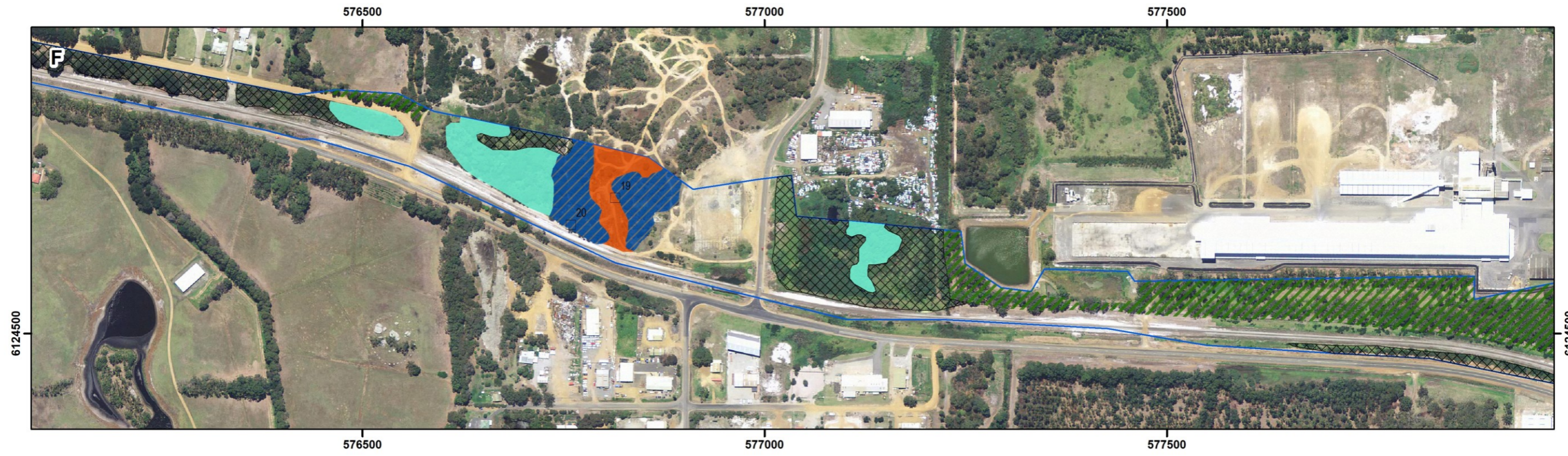
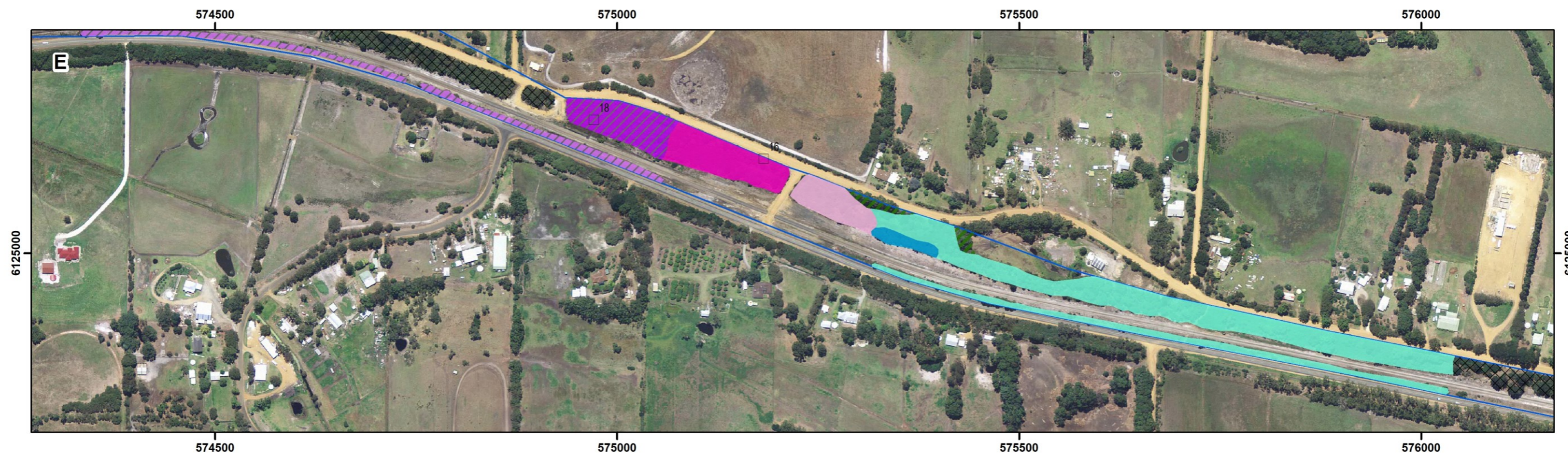
Vegetation Association, Condition

- Hakea spp Shrubland/Woodland Complex, Very Good/Excellent
- Hakea spp Shrubland/Woodland Complex, Degraded
- Jarrah/Marri/Sheoak Laterite Forest, Very Good/Excellent
- Jarrah/Marri/Sheoak Laterite Forest, Degraded
- Jarrah/Sheoak/E.staeri Sandy Woodland, Very Good/Excellent
- Jarrah/Sheoak/E.staeri Sandy Woodland, Degraded
- Marri/Jarrah Coastal Hills Forest, Very Good/Excellent
- Marri/Jarrah Forest/Peppermint Woodland, Very Good/Excellent
- Marri/Jarrah Forest/Peppermint Woodland, Degraded
- Peppermint Low Forest, Completely Degraded
- Evandra aristata Sedgeland, Very Good
- Evandra aristata Sedgeland, Completely Degraded
- Homalospermum firmum/Callistemon glaucus Peat Thicket, Very Good/Excellent
- Homalospermum firmum/Callistemon glaucus Peat Thicket, Degraded
- Melaleuca preissiana Low Woodland, Completely Degraded
- Taxandria juniperina Closed Forest, Very Good
- Taxandria juniperina Closed Forest, Degraded/Completely Degraded
- Mosaic T. marginata/G. bilobum Shrubland/Yate Woodland, Very Good/Excellent
- Mosaic T. marginata/G. bilobum Shrubland/Yate Woodland, Degraded
- Mosaic T. marginata/Leucopogon assimilis Granite Shrubland, Very Good/Excellent
- Revegetation or Plantation, NA
- >75% Invasive Weeds, NA

Conservation Significant Flora

- Synaphea incurva* (P1)
- Boronia crassipes* (P3)
- Andersonia* sp. Jamesii (J. Liddelw 84) (P4)
- Thysanotus isantherus* (P4)
- Prasophyllum paulinae* (P1) Critical Habitat
- Quadrat Location (No.)





Map 1E&F: Vegetation Association, Condition and Conservation Significant Flora

Map produced by Damien Rathbone on 22/02/2018.
 Report Reference: Biological Survey, Albany Ring Road 2018
 Map Projection: Transverse Mercator Horizontal Datum GDA 1994
 Grid: MGA Zone 50 Map Size: A3 Scale 1:5000



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Vegetation Association, Condition

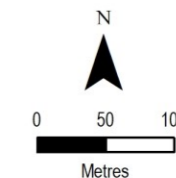
- Hakea spp Shrubland/Woodland Complex, Very Good/Excellent
- Hakea spp Shrubland/Woodland Complex, Degraded
- Jarrah/Marri/Sheoak Laterite Forest, Very Good/Excellent
- Jarrah/Marri/Sheoak Laterite Forest, Degraded
- Jarrah/Sheoak/E.staeri Sandy Woodland, Very Good/Excellent
- Jarrah/Sheoak/E.staeri Sandy Woodland, Degraded
- Marri/Jarrah Coastal Hills Forest, Very Good/Excellent
- Marri/Jarrah Forest/Peppermint Woodland, Very Good/Excellent
- Marri/Jarrah Forest/Peppermint Woodland, Degraded
- Peppermint Low Forest, Completely Degraded

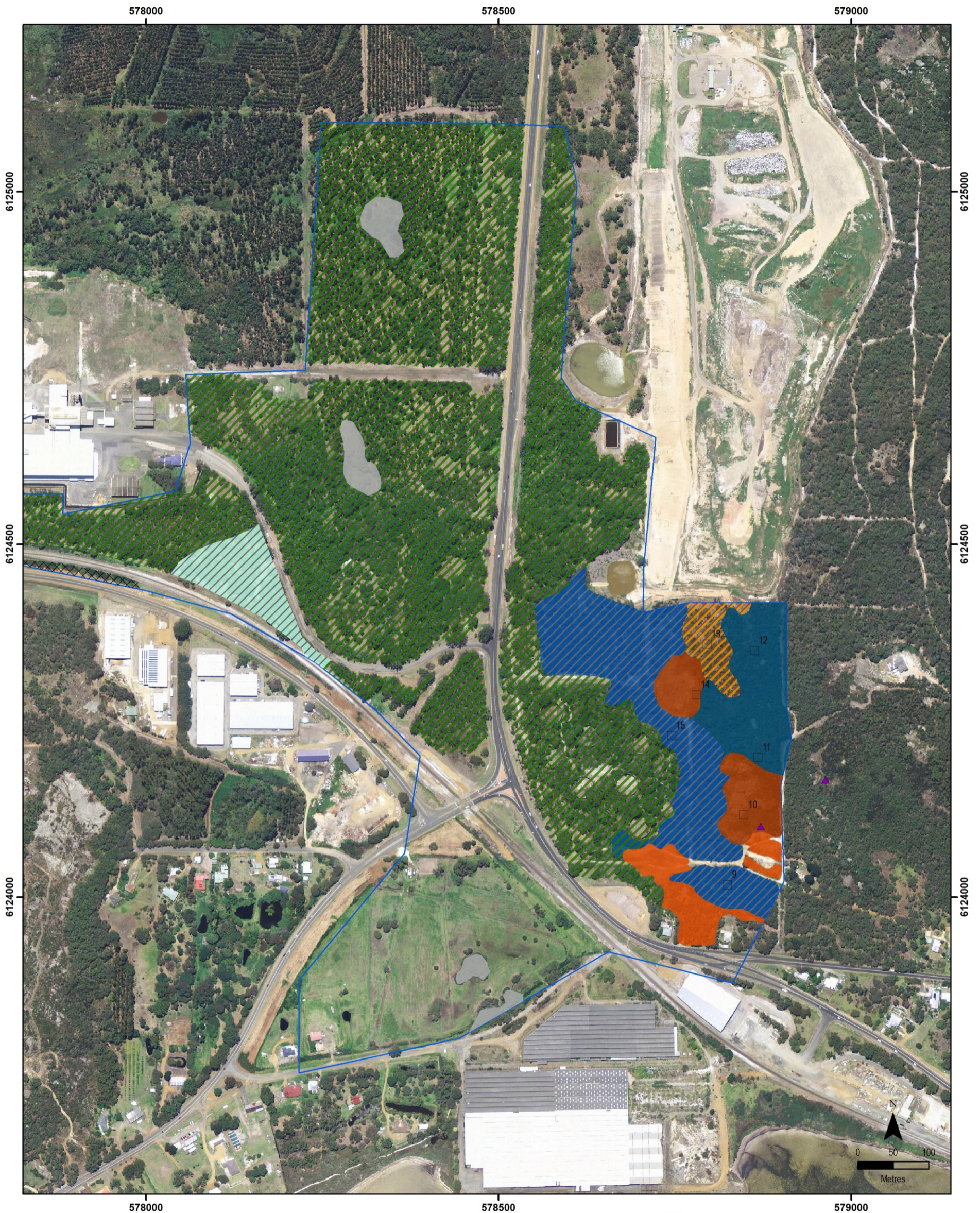
Vegetation Association, Condition

- Evandra aristata Sedgeland, Very Good
- Evandra aristata Sedgeland, Completely Degraded
- Homalospermum firmum/Callistemon glaucus Peat Thicket, Very Good/Excellent
- Homalospermum firmum/Callistemon glaucus Peat Thicket, Degraded
- Melaleuca preissiana Low Woodland, Completely Degraded
- Taxandria juniperina Closed Forest, Very Good
- Taxandria juniperina Closed Forest, Degraded/Completely Degraded
- Mosaic T. marginata/G. bilobum Shrubland/Yate Woodland, Very Good/Excellent
- Mosaic T. marginata/G. bilobum Shrubland/Yate Woodland, Degraded
- Mosaic T. marginata/Leucopogon assimilis Granite Shrubland, Very Good/Excellent
- Revegetation or Plantation, NA
- >75% Invasive Weeds, NA

Conservation Significant Flora

- ▲ *Synaphea incurva* (P1)
- ▲ *Boronia crassipes* (P3)
- ▲ *Andersonia* sp. Jamesii (J. Liddelow 84) (P4)
- ▲ *Thysanotus isantherus* (P4)
- Quadrat Location (No.)





Map 1G: Vegetation Association, Condition and Conservation Significant Flora

Map produced by Damien Rathbone on 22/02/2018.
 Report Reference: Biological Survey, Albany Ring Road 2018
 Map Projection: Transverse Mercator Horizontal Datum GDA 1994
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Vegetation Association, Condition

- | | | | |
|--|--|--|---|
| | Hakea spp Shrubland/Woodland Complex, Very Good/Excellent | | Evandra aristata Sedgeland, Very Good |
| | Hakea spp Shrubland/Woodland Complex, Degraded | | Evandra aristata Sedgeland, Completely Degraded |
| | Jarrah/Marri/Sheoak Laterite Forest, Very Good/Excellent | | Homalospermum firmum/Callistemon glaucus Peat Thicket, Very Good/Excellent |
| | Jarrah/Marri/Sheoak Laterite Forest, Degraded | | Homalospermum firmum/Callistemon glaucus Peat Thicket, Degraded |
| | Jarrah/Sheoak/E.staeri Sandy Woodland, Very Good/Excellent | | Melaleuca preissiana Low Woodland, Completely Degraded |
| | Jarrah/Sheoak/E.staeri Sandy Woodland, Degraded | | Taxandria juniperina Closed Forest, Very Good |
| | Marri/Jarrah Coastal Hills Forest, Very Good/Excellent | | Taxandria juniperina Closed Forest, Degraded/Completely Degraded |
| | Marri/Jarrah Forest/Peppermint Woodland, Very Good/Excellent | | Mosaic T. marginata/G. bilobum Shrubland/Yate Woodland, Very Good/Excellent |
| | Marri/Jarrah Forest/Peppermint Woodland, Degraded | | Mosaic T. marginata/G. bilobum Shrubland/Yate Woodland, Degraded |
| | Peppermint Low Forest, Completely Degraded | | Mosaic T. marginata/Leucopogon assimilis Granite Shrubland, Very Good/Excellent |
| | | | Revegetation or Plantation, NA |
| | | | >75% Invasive Weeds, NA |

Conservation Significant Flora

- | | | | | | |
|--|-------------------------------|--|--|--|------------------------|
| | <i>Synaphea incurva</i> (P1) | | <i>Andersonia</i> sp. Jamesii (J. Liddelw 84) (P4) | | Quadrat Location (No.) |
| | <i>Boronia crassipes</i> (P3) | | <i>Thysanotus isantherus</i> (P4) | | |



Map 2A&B: Western Ringtail Possum Habitat, Fauna Observations and Weeds

Map produced by Damien Rathbone on 22/02/2018.
 Report Reference: Biological Survey, Albany Ring Road 2018
 Map Projection: Transverse Mercator Horizontal Datum GDA 1994
 Grid: MGA Zone 50 Map Size: A3 Scale 1:5000

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Western Ringtail Possum (T) Habitat

- Core Habitat
- Supporting Habitat
- Habitat Linkage
- Likely Habitat Linkage

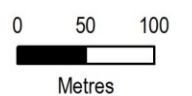
Fauna Observations

- Western Ringtail Possum (T) drey
- Western Ringtail Possum (T) scats
- Quenda (P4) diggings or skull

Significant Weeds

- Asparagus asparagoides*
- Lantana camara*
- Rubus fruticosus aggregate*
- Ulex europaeus*
- Zantedeschia aethiopica*

Survey Area





Map 2C: Western Ringtail Possum Habitat, Fauna Observations and Weeds

Map produced by Damien Rathbone on 22/02/2018.
 Report Reference: Biological Survey, Albany Ring Road 2018
 Map Projection: Transverse Mercator Horizontal Datum GDA 1994
 Grid: MGA Zone 50 Map Size: A3 Scale 1:5000



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Western Ringtail Possum (T) Habitat

- Core Habitat
- Supporting Habitat
- Habitat Linkage
- Likely Habitat Linkage

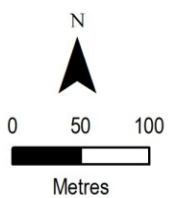
Fauna Observations

- ▲ Western Ringtail Possum (T) drey
- ▲ Western Ringtail Possum (T) scats
- ▲ Quenda (P4) diggings or skull

Significant Weeds

- *Asparagus asparagoides*
- *Lantana camara*
- *Rubus fruticosus aggregate*
- *Ulex europaeus*
- *Zantedeschia aethiopica*

- Survey Area





Map 2D: Western Ringtail Possum Habitat, Fauna Observations and Weeds

Map produced by Damien Rathbone on 22/02/2018.
 Report Reference: Biological Survey, Albany Ring Road 2018
 Map Projection: Transverse Mercator Horizontal Datum GDA 1994
 Grid: MGA Zone 50 Map Size: A3 Scale 1:5000

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Western Ringtail Possum (T) Habitat

- Core Habitat
- Supporting Habitat
- Habitat Linkage
- Likely Habitat Linkage

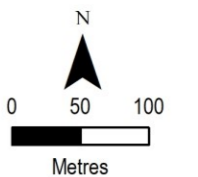
Fauna Observations

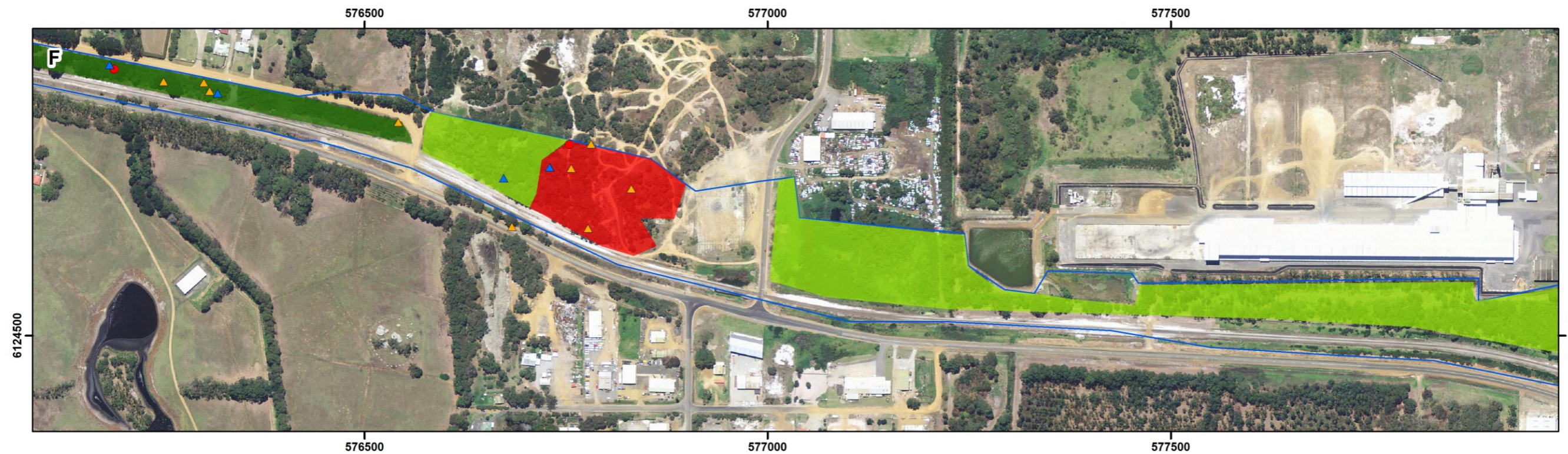
- Western Ringtail Possum (T) drey
- Western Ringtail Possum (T) scats
- Quenda (P4) diggings or skull

Significant Weeds

- Asparagus asparagoides*
- Lantana camara*
- Rubus fruticosus aggregate*
- Ulex europaeus*
- Zantedeschia aethiopica*

Survey Area





Map 2E&F: Western Ringtail Possum Habitat, Fauna Observations and Weeds

Map produced by Damien Rathbone on 22/02/2018.
 Report Reference: Biological Survey, Albany Ring Road 2018
 Map Projection: Transverse Mercator Horizontal Datum GDA 1994
 Grid: MGA Zone 50 Map Size: A3 Scale 1:5000



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Western Ringtail Possum (T) Habitat

- Core Habitat
- Supporting Habitat
- Habitat Linkage
- Likely Habitat Linkage

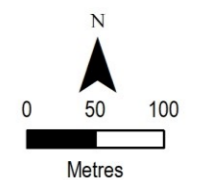
Fauna Observations

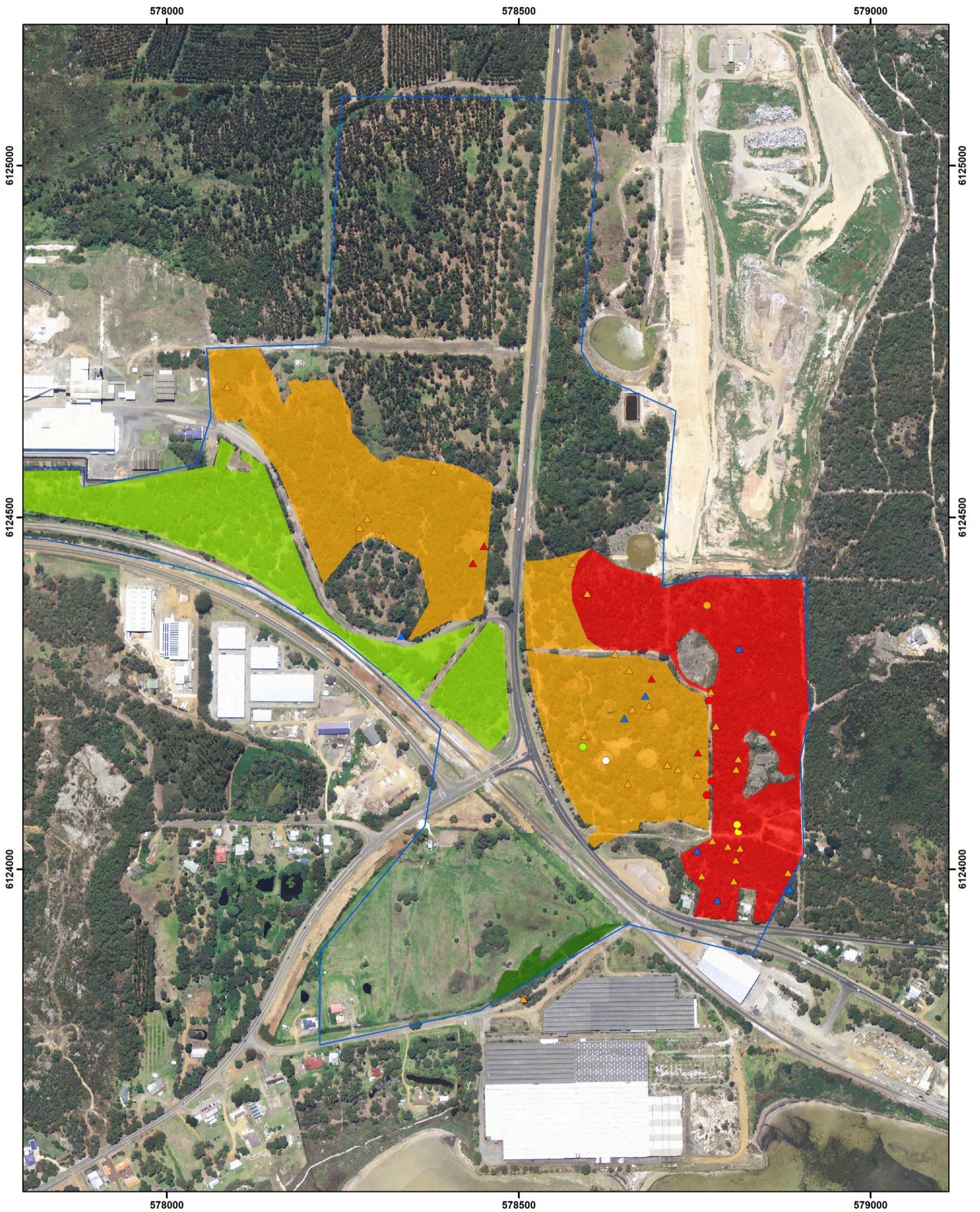
- Western Ringtail Possum (T) drey
- Western Ringtail Possum (T) scats
- Quenda (P4) diggings or skull

Significant Weeds

- Asparagus asparagoides*
- Lantana camara*
- Rubus fruticosus aggregate*
- Ulex europaeus*
- Zantedeschia aethiopica*

Survey Area





Map 2G: Western Ringtail Possum Habitat, Fauna Observations and Weeds

Map produced by Damien Rathbone on 22/02/2018.
 Report Reference: Biological Survey, Albany Ring Road 2018
 Map Projection: Transverse Mercator Horizontal Datum GDA 1994
 Grid: MGA Zone 50 Map Size: A3 Scale 1:5000



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Western Ringtail Possum (T) Habitat

- Core Habitat
- Supporting Habitat
- Habitat Linkage
- Likely Habitat Linkage

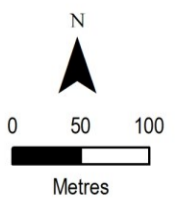
Fauna Observations

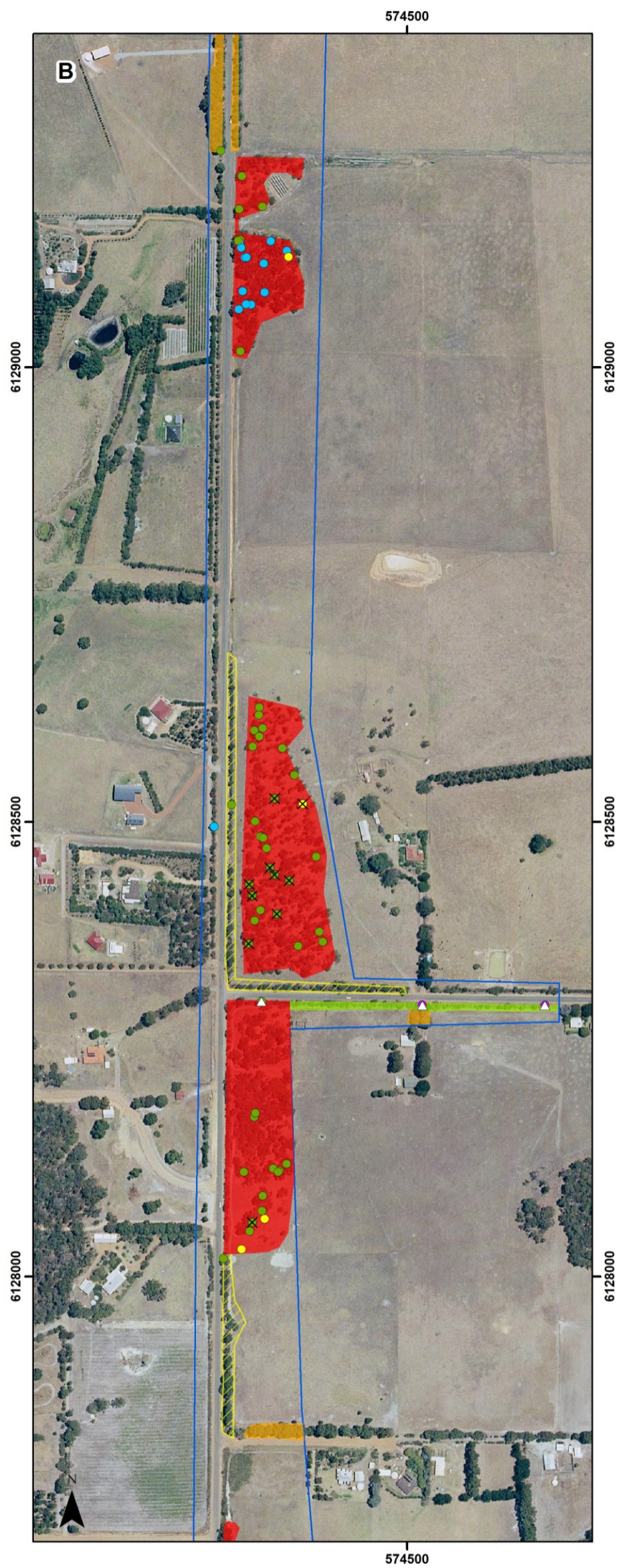
- ▲ Western Ringtail Possum (T) drey
- ▲ Western Ringtail Possum (T) scats
- ▲ Quenda (P4) diggings or skull

Significant Weeds

- *Asparagus asparagoides*
- *Lantana camara*
- *Rubus fruticosus aggregate*
- *Ulex europaeus*
- *Zantedeschia aethiopica*

- Survey Area





Map 3A&B: Cockatoo Habitat and Significant Fauna Habitat Trees

Map produced by Damien Rathbone on 22/02/2018.
 Report Reference: Biological Survey, Albany Ring Road 2018
 Map Projection: Transverse Mercator Horizontal Datum GDA 1994
 Grid: MGA Zone 50 Map Size: A3 Scale 1:5000



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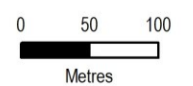
Cockatoo Habitat and Observations

(suitable for three Cockatoo species, unless stated)

- High quality feeding, roosting and potential breeding
- High quality roosting
- Low quality feeding, roosting or potential breeding
- Low quality feeding (Camaby/FRTB)
- Low quality feeding (Camaby)
- Baudin's Cockatoo (T) feeding evidence
- Carnaby's Cockatoo (T) feeding evidence
- Red-tailed Black Cockatoo (T) feeding evidence

Significant Fauna Habitat Trees

- Eucalyptus marginata*
- Eucalyptus staeri*
- Eucalyptus gomphocephala*
- Corymbia calophylla*
- Dead *Eucalyptus*/*Corymbia* sp.
- Pinus radiata*
- X Hollows present (>200mm)





Map 3C: Cockatoo Habitat and Significant Fauna Habitat Trees

Map produced by Damien Rathbone on 22/02/2018.
 Report Reference: Biological Survey, Albany Ring Road 2018
 Map Projection: Transverse Mercator Horizontal Datum GDA 1994
 Grid: MGA Zone 50 Map Size: A3 Scale 1:5000



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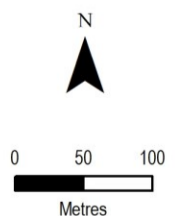
Cockatoo Habitat and Observations

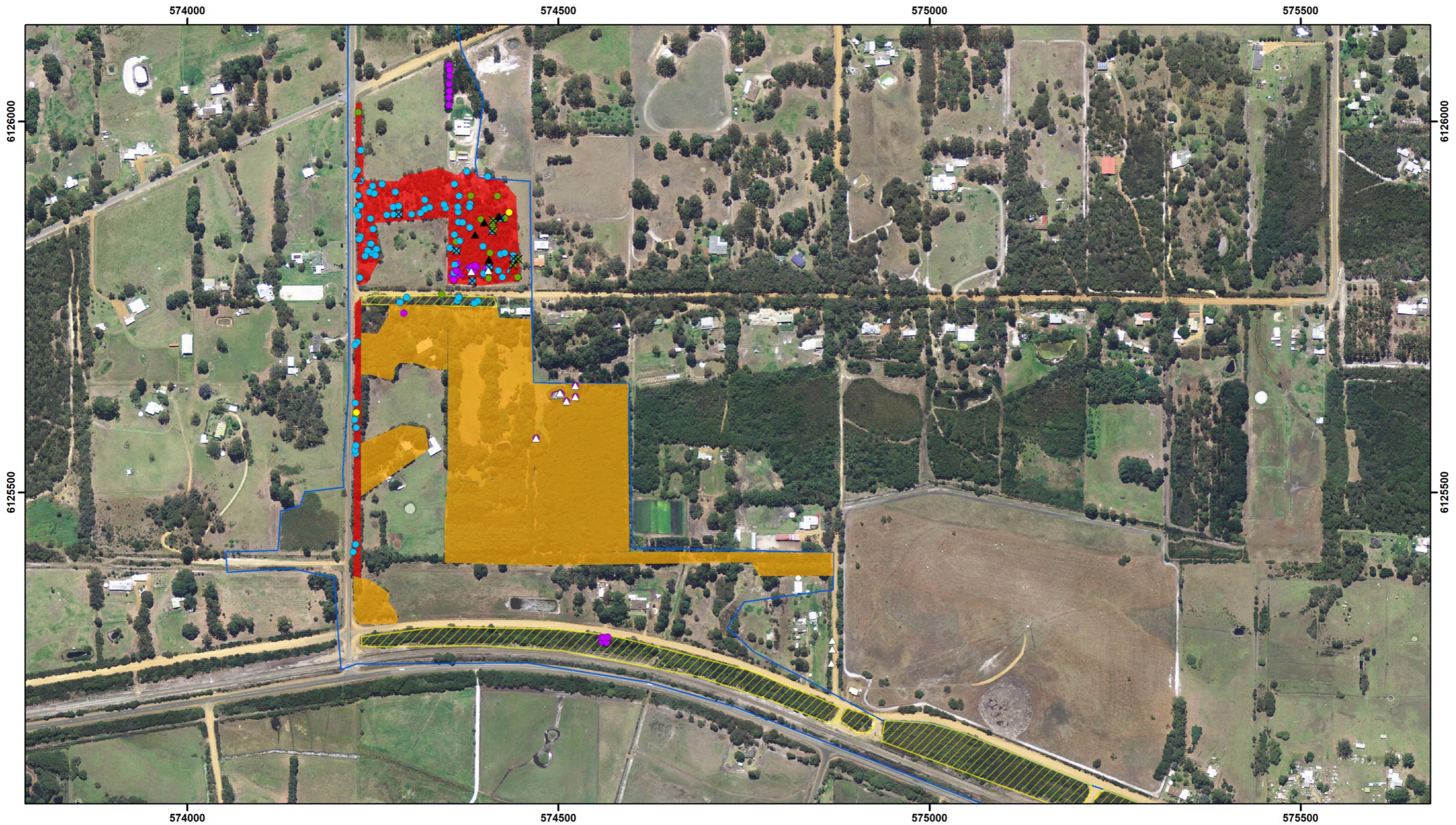
(suitable for three Cockatoo species, unless stated)

- High quality feeding, roosting and potential breeding
- High quality roosting
- Low quality feeding, roosting or potential breeding
- Low quality feeding (Camaby/FRTB)
- Low quality feeding (Carnaby)
- Baudin's Cockatoo (T) feeding evidence
- Carnaby's Cockatoo (T) feeding evidence
- Red-tailed Black Cockatoo (T) feeding evidence
- Hollows present (>200mm)

Significant Fauna Habitat Trees

- Eucalyptus marginata*
- Eucalyptus staeri*
- Eucalyptus gomphocephala*
- Corymbia calophylla*
- Dead *Eucalyptus/Corymbia* sp.
- Pinus radiata*





Map 3D: Cockatoo Habitat and Significant Fauna Habitat Trees

Map produced by Damien Rathbone on 22/02/2018.
 Report Reference: Biological Survey, Albany Ring Road 2018
 Map Projection: Transverse Mercator Horizontal Datum GDA 1994
 Grid: MGA Zone 50 Map Size: A3 Scale 1:5000

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Cockatoo Habitat and Observations

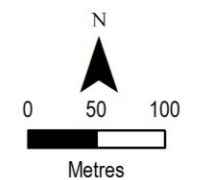
(suitable for three Cockatoo species, unless stated)

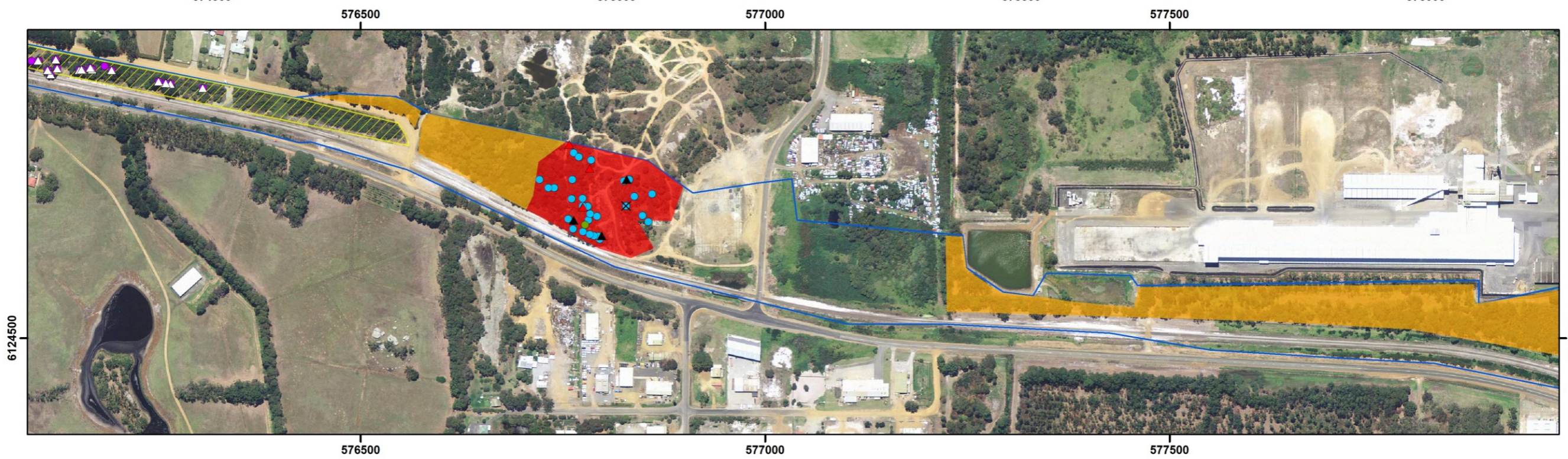
- High quality feeding, roosting and potential breeding
- High quality roosting
- Low quality feeding, roosting or potential breeding
- Low quality feeding (Carnaby/FRTB)
- Low quality feeding (Carnaby)

- Baudin's Cockatoo (T) feeding evidence
- Carnaby's Cockatoo (T) feeding evidence
- Red-tailed Black Cockatoo (T) feeding evidence

Significant Fauna Habitat Trees

- Eucalyptus marginata*
- Eucalyptus staeri*
- Eucalyptus gomphocephala*
- Corymbia calophylla*
- Dead Eucalyptus/Corymbia sp.*
- Pinus radiata*
- x Hollows present (>200mm)





Map 3E&F: Cockatoo Habitat and Significant Fauna Habitat Trees

Map produced by Damien Rathbone on 22/02/2018.
 Report Reference: Biological Survey, Albany Ring Road 2018
 Map Projection: Transverse Mercator Horizontal Datum GDA 1994
 Grid: MGA Zone 50 Map Size: A3 Scale 1:5000



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Cockatoo Habitat and Observations

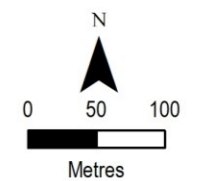
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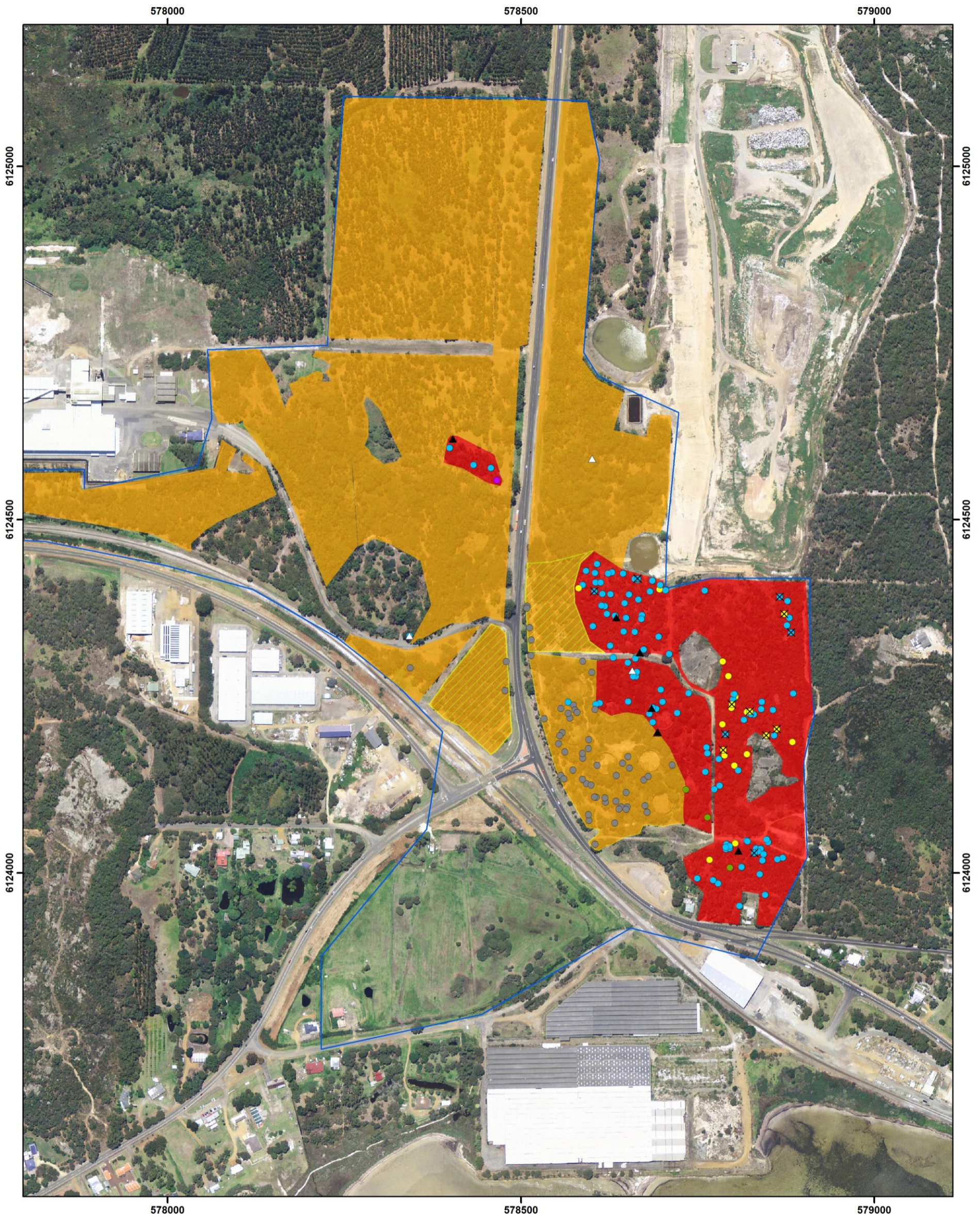
- High quality feeding, roosting and potential breeding
- High quality roosting
- Low quality feeding, roosting or potential breeding
- Low quality feeding (Carnaby/FRTB)
- Low quality feeding (Carnaby)

- Baudin's Cockatoo (T) feeding evidence
- Carnaby's Cockatoo (T) feeding evidence
- Red-tailed Black Cockatoo (T) feeding evidence

Significant Fauna Habitat Trees

- Eucalyptus marginata*
- Eucalyptus staeri*
- Eucalyptus gomphocephala*
- Corymbia calophylla*
- Dead *Eucalyptus/Corymbia* sp.
- Pinus radiata*
- Hollows present (>200mm)





Map 3G: Cockatoo Habitat and Significant Fauna Habitat Trees

Map produced by Damien Rathbone on 22/02/2018.
 Report Reference: Biological Survey, Albany Ring Road 2018
 Map Projection: Transverse Mercator Horizontal Datum GDA 1994
 Grid: MGA Zone 50 Map Size: A3 Scale 1:5000



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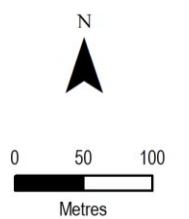
Cockatoo Habitat and Observations

(suitable for three Cockatoo species, unless stated)

- High quality feeding, roosting and potential breeding
- High quality roosting
- Low quality feeding, roosting or potential breeding
- Low quality feeding (Carnaby/FRTB)
- Low quality feeding (Carnaby)
- Baudin's Cockatoo (T) feeding evidence
- Carnaby's Cockatoo (T) feeding evidence
- Red-tailed Black Cockatoo (T) feeding evidence

Significant Fauna Habitat Trees

- Eucalyptus marginata*
- Eucalyptus staeri*
- Eucalyptus gomphocephala*
- Corymbia calophylla*
- Dead *Eucalyptus/Corymbia* sp.
- Pinus radiata*
- × Hollows present (>200mm)



10 APPENDIX C - Plant Taxa Inventory

Table C1: Vascular plant taxa recorded opportunistically in the Survey Areas. Nomenclature and status according WAH (1998-), DotEE (2017b) and DPIRD (2018). *denotes weed taxon.

Family	Taxon (Status)	Family	Taxon (Status)	
Anarthriaceae	<i>Anarthria gracilis</i>	Lepidosperma	<i>angustatum</i>	
	<i>Anarthria laevis</i>		<i>drummondii</i>	
	<i>Anarthria prolifera</i>		<i>gladiatum</i>	
	<i>Anarthria scabra</i>		<i>hopperi</i>	
	<i>Lyginia barbata</i>		<i>striatum</i>	
Apiaceae	* <i>Foeniculum vulgare</i>		<i>tenuie</i>	
	<i>Actinotus omnifertilis</i>		<i>Mesomelaena graciliceps</i>	
	<i>Centella asiatica</i>		<i>Mesomelaena tetragona</i>	
	<i>Daucus glochidiatus</i>		<i>Schoenus acuminatus</i>	
	<i>Xanthosia huegelii</i>		<i>Schoenus caespitius</i>	
	<i>Xanthosia rotundifolia</i>		<i>Schoenus cruentus</i>	
	<i>Xanthosia singuliflora</i>		<i>Schoenus multiglumis</i>	
Araceae	* <i>Zantedeschia aethiopica</i> (Declared Pest)		<i>Schoenus obtusifolius</i>	
Asparagaceae	* <i>Asparagus asparagoides</i> (WONS)		<i>Schoenus sp. infertile</i>	
	* <i>Asparagus declinatus</i>		<i>Schoenus sp. striate</i>	
	<i>Chamaescilla corymbosa</i>		<i>Tetralix octandra</i>	
	<i>Lomandra micrantha</i> subsp. <i>teretifolia</i>		<i>Tetralix sp. Jarrah Forest</i> (R. Davis 7391)	
	<i>Lomandra pauciflora</i>		<i>Tricostularia neesii</i>	
	<i>Lomandra purpurea</i>		Dasypogonaceae	<i>Dasypogon bromeliifolius</i>
	<i>Lomandra sericea</i>			<i>Kingia australis</i>
	<i>Thysanotus gracilis</i>	Dennstaedtiaceae	<i>Histiopteris incisa</i>	
	<i>Thysanotus isantherus</i> (P4)		<i>Pteridium esculentum</i>	
	<i>Thysanotus multiflorus</i>	Dilleniaceae	<i>Hibbertia cuneiformis</i>	
	<i>Thysanotus sparteus</i>		<i>Hibbertia cunninghamii</i>	
	<i>Thysanotus thyrsoideus</i>		<i>Hibbertia diamesogenos</i>	
	Asteraceae		* <i>Conyza bonariensis</i>	<i>Hibbertia furfuracea</i>
* <i>Sonchus oleraceus</i>			<i>Hibbertia microphylla</i>	
* <i>Taraxacum khatoonae</i>		Droseraceae	<i>Drosera erythrorhiza</i>	
<i>Lagenophora huegelii</i>			<i>Drosera glanduligera</i>	
<i>Millotia tenuifolia</i>			<i>Drosera menziesii</i>	
<i>Senecio minimus</i>	<i>Drosera pallida</i>			
<i>Borya sphaerocephala</i>	<i>Drosera pulchella</i>			
Boryaceae		<i>Drosera stolonifera</i>		
		Elaeocarpaceae	<i>Tetralix affinis</i>	
Campanulaceae	<i>Lobelia anceps</i>		<i>Tremandra diffusa</i>	
	<i>Lobelia heterophylla</i>		<i>Tremandra stelligera</i>	
Caryophyllaceae	* <i>Petrorhagia dubia</i>	Ericaceae	<i>Andersonia sp. Jamesii</i> (J. Liddelow 84) (P4)	
	* <i>Sagina maritima</i>		<i>Andersonia sprengelioides</i>	
Casuarinaceae	<i>Allocasuarina fraseriana</i>		<i>Astroloma pallidum</i>	
	<i>Allocasuarina humilis</i>		<i>Brachyloma baxteri</i>	
Centrolepidaceae	<i>Aphelia brizula</i>		<i>Cosmelia rubra</i>	
Cephalotaceae	<i>Cephalotus follicularis</i>	<i>Leucopogon assimilis</i>		
Chenopodiaceae	<i>Rhagodia preissii</i>	<i>Leucopogon australis</i>		
Cyatheaaceae	* <i>Cyathea cooperi</i>	<i>Leucopogon glabellus</i>		
Cyperaceae	<i>Baumea acuta</i>	<i>Leucopogon obovatus</i> subsp. <i>obovatus</i>		
	<i>Baumea arthrophylla</i>	<i>Leucopogon obovatus</i> subsp. <i>revolutus</i>		
	<i>Baumea juncea</i>	<i>Leucopogon pendulus</i>		
	<i>Baumea rubiginosa</i>	<i>Leucopogon verticillatus</i>		
	<i>Cyathochaeta avenacea</i>	<i>Sphenotoma capitata</i>		
	<i>Cyathochaeta equitans</i>	<i>Sphenotoma squarrosa</i>		
	<i>Evandra aristata</i>	Euphorbiaceae	* <i>Ricinus communis</i>	
	<i>Gymnoschoenus anceps</i>			
	<i>Isolepis cernua</i>			

Family	Taxon (Status)	
Fabaceae	* <i>Acacia baileyana</i>	
	* <i>Acacia longifolia</i>	
	* <i>Acacia melanoxylon</i>	
	* <i>Chamaecytisus palmensis</i>	
	* <i>Dipogon lignosus</i>	
	* <i>Ornithopus compressus</i>	
	* <i>Psoralea pinnata</i>	
	* <i>Trifolium angustifolium</i>	
	* <i>Trifolium arvense</i>	
	* <i>Ulex europaeus</i> (WONS)	
	<i>Acacia alata</i>	
	<i>Acacia browniana</i> var. <i>browniana</i>	
	<i>Acacia crassiuscula</i>	
	<i>Acacia divergens</i>	
	<i>Acacia drummondii</i>	
	<i>Acacia myrtifolia</i>	
	<i>Acacia pentadenia</i>	
	<i>Bossiaea dentata</i>	
	<i>Bossiaea linophylla</i>	
	<i>Callistachys lanceolata</i>	
	<i>Callistachys</i> sp. south-coast variant (M. Carter 180)	
	<i>Chorizema reticulatum</i>	
	<i>Gastrolobium bilobum</i>	
	<i>Gastrolobium sericeum</i>	
	<i>Gompholobium knightianum</i>	
	<i>Gompholobium polymorphum</i>	
	<i>Hardenbergia comptoniana</i>	
	<i>Hovea elliptica</i>	
	<i>Hovea trisperma</i>	
	<i>Isotropis cuneifolia</i>	
	<i>Jacksonia horrida</i>	
	<i>Paraserianthes lophantha</i>	
	<i>Pultenaea verruculosa</i>	
	<i>Sphaerolobium grandiflorum</i>	
	<i>Sphaerolobium hygrophilum</i>	
	<i>Sphaerolobium medium</i>	
	<i>Sphaerolobium vimineum</i>	
	Gentianaceae	* <i>Centaurium erythraea</i>
	Geraniaceae	* <i>Pelargonium capitatum</i>
	Goodeniaceae	<i>Dampiera leptoclada</i>
		<i>Dampiera linearis</i>
<i>Dampiera loranthifolia</i>		
<i>Dampiera pedunculata</i>		
<i>Diaspasis filifolia</i>		
<i>Goodenia coerulea</i>		
<i>Scaevola striata</i>		
Haemodoraceae		<i>Anigozanthos flavidus</i>
		<i>Conostylis setigera</i>
		<i>Haemodorum laxum</i>
	<i>Haemodorum spicatum</i>	
Haloragaceae	<i>Gonocarpus diffusus</i>	
Hemerocallidaceae	<i>Agrostocrinum hirsutum</i>	
	<i>Caesia micrantha</i>	

Family	Taxon (Status)
Iridaceae	<i>Dianella revoluta</i>
	<i>Johnsonia lupulina</i>
	<i>Stypandra glauca</i>
	<i>Tricoryne elatior</i>
	<i>Tricoryne humilis</i>
	* <i>Freesia alba</i> x <i>leichtlinii</i>
	* <i>Gladiolus undulatus</i>
	* <i>Moraea setifolia</i>
	* <i>Romulea rosea</i>
	* <i>Watsonia meriana</i> var. <i>bulbillifera</i>
Juncaceae	<i>Patersonia limbata</i>
	<i>Patersonia occidentalis</i>
	<i>Patersonia umbrosa</i> var. <i>umbrosa</i>
	* <i>Juncus articulatus</i>
	* <i>Juncus capitatus</i>
	<i>Juncus caespiticus</i>
	<i>Juncus pallidus</i>
	<i>Juncus planifolius</i>
	<i>Luzula meridionalis</i>
	<i>Cassylia racemosa</i>
Lauraceae	<i>Utricularia multifida</i>
Lentibulariaceae	<i>Lindsaea linearis</i>
Lindsaeaceae	<i>Orianthera serpyllifolia</i> subsp. <i>serpyllifolia</i>
Loganiaceae	<i>Nuytsia floribunda</i>
Loranthaceae	* <i>Lythrum hyssopifolia</i>
Lythraceae	<i>Thomasia angustifolia</i>
Malvaceae	* <i>Eucalyptus botryoides</i>
Myrtaceae	* <i>Eucalyptus cladocalyx</i>
	* <i>Eucalyptus globulus</i>
	* <i>Eucalyptus robusta</i>
	* <i>Leptospermum laevigatum</i>
	<i>Agonis flexuosa</i>
	<i>Agonis theiformis</i>
	<i>Astartea corniculata</i>
	<i>Astartea glomerulosa</i>
	<i>Astartea scoparia</i>
	<i>Astartea</i> sp.
	<i>Beaufortia decussata</i>
	<i>Beaufortia sparsa</i>
	<i>Callistemon glaucus</i>
	<i>Corymbia calophylla</i>
	<i>Corymbia ficifolia</i>
	<i>Darwinia oederoides</i>
	<i>Eucalyptus conferruminata</i> (planted)
	<i>Eucalyptus cornuta</i>
	<i>Eucalyptus gomphocephala</i> (planted)
	<i>Eucalyptus marginata</i>
<i>Eucalyptus megacarpa</i>	
<i>Eucalyptus patens</i>	
<i>Eucalyptus salubris</i> (planted)	
<i>Eucalyptus staeri</i>	
<i>Eucalyptus marginata</i> x <i>staeri</i>	
<i>Homalospermum firmum</i>	
<i>Hypocalymma cordifolium</i>	

Family	Taxon (Status)	Family	Taxon (Status)
	<i>Hypocalymma strictum</i>		<i>Neurachne alopecuroidea</i>
	<i>Kunzea baxteri</i> (planted)		<i>Poa porphyroclados</i>
	<i>Melaleuca diosmifolia</i> (planted)		<i>Rytidosperma setaceum</i>
	<i>Melaleuca preissiana</i>		<i>Tetrarrhena laevis</i>
	<i>Melaleuca raphiophylla</i>	Polygalaceae	<i>Comesperma confertum</i>
	<i>Melaleuca thymoides</i>		<i>Comesperma virgatum</i>
	<i>Pericalymma spongiocaula</i>	Potamogetonaceae	<i>Potamogeton tricarinatus</i>
	<i>Taxandria juniperina</i>	Proteaceae	<i>Adenanthos obovatus</i>
	<i>Taxandria linearifolia</i>		<i>Banksia grandis</i>
	<i>Taxandria marginata</i>		<i>Conospermum caeruleum</i>
	<i>Taxandria parviceps</i>		<i>Grevillea occidentalis</i>
	<i>Verticordia plumosa</i>		<i>Grevillea pilulifera</i>
Olacaceae	<i>Olax benthamiana</i>		<i>Grevillea pulchella</i>
Orchidaceae	* <i>Disa bracteata</i>		<i>Hakea amplexicaulis</i>
	<i>Caladenia flava</i>		<i>Hakea ceratophylla</i>
	<i>Cryptostylis ovata</i>		<i>Hakea drupacea</i>
	<i>Diuris</i> sp.		<i>Hakea elliptica</i>
	<i>Elythranthera brunonis</i>		<i>Hakea ferruginea</i>
	<i>Lyperanthus serratus</i>		<i>Hakea florida</i>
	<i>Microtis media</i>		<i>Hakea lasiantha</i>
	<i>Prasophyllum brownii</i>		<i>Hakea linearis</i>
	<i>Prasophyllum macrostachyum</i>		<i>Hakea oleifolia</i>
	<i>Pterostylis vittata</i>		<i>Hakea ruscifolia</i>
	<i>Thelymitra canaliculata</i>		<i>Hakea trifurcata</i>
	<i>Thelymitra crinita</i>		<i>Persoonia elliptica</i>
	<i>Thelymitra granitora</i>		<i>Persoonia longifolia</i>
	<i>Thelymitra macrophylla</i>		<i>Petrophile divaricata</i>
	<i>Thelymitra</i> sp.		<i>Petrophile diversifolia</i>
Orobanchaceae	* <i>Parentucellia latifolia</i>		<i>Petrophile squamata</i>
Oxalidaceae	* <i>Oxalis incarnata</i>		<i>Stirlingia tenuifolia</i>
	* <i>Oxalis purpurea</i>		<i>Synaphea gracillima</i>
	* <i>Oxalis violacea</i>		<i>Synaphea incurva</i> (P1)
Phytolaccaceae	* <i>Phytolacca octandra</i>	Ranunculaceae	<i>Clematis pubescens</i>
Pinaceae	* <i>Pinus pinaster</i>	Restionaceae	<i>Chordifex isomorphus</i>
	* <i>Pinus radiata</i>		<i>Chordifex laxus</i>
Pittosporaceae	* <i>Pittosporum undulatum</i>		<i>Desmocladius fasciculatus</i>
	<i>Billardiera fusiformis</i>		<i>Desmocladius flexuosus</i>
	<i>Billardiera heterophylla</i>		<i>Empodisma gracillimum</i>
	<i>Billardiera variifolia</i>		<i>Hypolaena fastigiata</i>
Plantaginaceae	* <i>Plantago lanceolata</i>		<i>Leptocarpus scariosus</i>
	<i>Veronica plebeia</i>		<i>Leptocarpus tenax</i>
Poaceae	* <i>Aira caryophyllea</i>		<i>Lepyrodia hermaphrodita</i>
	* <i>Anthoxanthum odoratum</i>		<i>Loxocarya cinerea</i>
	* <i>Avena barbata</i>		<i>Meeboldina scariosa</i>
	* <i>Briza maxima</i>		<i>Meeboldina tephрина ms</i>
	* <i>Briza minor</i>		<i>Tremulina tremula</i>
	* <i>Cenchrus clandestinus</i>	Rhamnaceae	<i>Spyridium globulosum</i>
	* <i>Cortaderia selloana</i>		<i>Trymalium odoratissimum</i>
	* <i>Holcus lanatus</i>	Rosaceae	* <i>Cotoneaster glaucophyllus</i>
	* <i>Lolium perenne</i>		* <i>Rubus species complex</i> (WONS)
	<i>Amphipogon amphipogonoides</i>	Rubiaceae	* <i>Coprosma repens</i>
	<i>Amphipogon laguroides</i>		<i>Opercularia hispidula</i>
	<i>Austrostipa mollis</i>	Rutaceae	<i>Boronia crassipes</i> (P3)
	<i>Microlaena stipoides</i>		<i>Boronia crenulata</i>

Family	Taxon (Status)
	<i>Boronia spathulata</i>
	<i>Rhadinothamnus anceps</i>
Sapindaceae	<i>Dodonaea ceratocarpa</i>
	<i>Dodonaea viscosa</i>
Schizaeaceae	<i>Schizaea fistulosa</i>
Solanaceae	* <i>Solanum laciniatum</i>
	<i>Anthocercis viscosa</i>
Stylidiaceae	<i>Levenhookia dubia</i>
	<i>Stylidium despectum</i>
	<i>Stylidium imbricatum</i>
	<i>Stylidium luteum</i>
	<i>Stylidium plantagineum</i>
	<i>Stylidium pygmaeum</i>
	<i>Stylidium spathulatum</i>
Thymelaeaceae	<i>Pimelea rosea</i> subsp. <i>rosea</i>
Typhaceae	<i>Typha orientalis</i>
Verbenaceae	* <i>Lantana camara</i> (WONS)
Xanthorrhoeaceae	<i>Xanthorrhoea platyphylla</i>
Xyridaceae	<i>Xyris lacera</i>
	<i>Xyris lanata</i>

11 APPENDIX D - Floristic Quadrat Data



Quadrat 1: Hill crest with laterite gravel and white sand. *Hakea* spp Shrubland/Woodland Complex, Very Good 22/11/2017 574224mE 6126834mN
Species: *Acacia browniana* var. *browniana*, *Acacia myrtifolia*, *Agonis theiformis*, *Agrostocrinum hirsutum*, *Amphipogon amphipogonoides*, *Anarthria gracilis*, *Anarthria prolifera*, *Anarthria scabra*, *Billardiera heterophylla*, *Billardiera variifolia*, *Chordifex laxus*, *Conostylis setigera*, *Cyathochaeta avenacea*, *Dampiera pedunculata*, *Dasyopogon bromeliifolius*, *Desmocladius fasciculatus*, *Drosera menziesii*, *Eucalyptus staeri*, *Grevillea pilulifera*, *Hakea ferruginea*, *Hakea lasiantha*, *Hibbertia microphylla*, *Hovea trisperma*, *Lepyrodia hermaphrodita*, *Leucopogon obovatus* subsp. *obovatus*, *Leucopogon verticillatus*, *Levenhookia dubia*, *Lomandra micrantha* subsp. *teretifolia*, *Lomandra sericea*, *Mesomelaena tetragona*, *Petrophile squamata*, *Schoenus acuminatus*, *Sphenotoma capitata*, *Synaphea gracillima*, *Taxandria parviceps*, *Tetraria octandra*, *Tricoryne humilis*, *Xanthorrhoea platyphylla*, *Xanthosia huegelii*, **Acacia longifolia*, **Anthoxanthum odoratum*, **Gladiolus undulatus*, **Leptospermum laevigatum*, **Psoralea pinnata*.



Quadrat 2: Hill crest with white sand with laterite gravel. *Hakea* spp Shrubland/Woodland Complex, Excellent 22/11/2017 574145mE, 6126849mN
Species: *Acacia browniana* var. *browniana*, *Acacia drummondii*, *Acacia myrtifolia*, *Agonis theiformis*, *Allocasuarina humilis*, *Amphipogon amphipogonoides*, *Anarthria gracilis*, *Anarthria prolifera*, *Andersonia* sp. *Jamesii* (J. Liddelow 84), *Beaufortia decussata*, *Billardiera variifolia*, *Boronia spathulata*, *Cassytha racemosa*, *Chordifex laxus*, *Chorizema reticulatum*, *Conostylis setigera*, *Cyathochaeta avenacea*, *Dampiera loranthifolia*, *Dasyopogon bromeliifolius*, *Desmocladius fasciculatus*, *Eucalyptus marginata* x *staeri*, *Goodenia coerulea*, *Grevillea pilulifera*, *Haemodorum laxum*, *Hakea ceratophylla*, *Hakea ferruginea*, *Hibbertia microphylla*, *Hovea trisperma*, *Lepidosperma angustatum*, *Lepidosperma drummondii*, *Lepyrodia hermaphrodita*, *Leucopogon obovatus* subsp. *obovatus*, *Lindsaea linearis*, *Lomandra sericea*, *Mesomelaena tetragona*, *Pericalymma spongiocaulum*, *Petrophile diversifolia*, *Pultenaea verruculosa*, *Schoenus acuminatus*, *Schoenus* sp. *striate*, *Sphaerolobium grandiflorum*, *Sphenotoma capitata*, *Stirlingia tenuifolia*, *Taxandria parviceps*, *Tetraria octandra*, *Thelymitra crinita*, *Tremulina tremula*, *Xanthorrhoea platyphylla*, *Xanthosia huegelii*, *Xanthosia singuliflora*, **Leptospermum laevigatum*.



Quadrat 3: Small perched wetland (potentially artificial due to gravel extraction) peat over sand Very Good. Mapped within *Hakea* spp Shrubland/Woodland Complex 22/11/2017 574095mE, 6126841mN
Species: *Acacia myrtifolia*, *Allocasuarina fraseriana*, *Billardiera heterophylla*, *Callistemon glaucus*, *Dampiera leptoclada*, *Drosera pulchella*, *Gymnoschoenus anceps*, *Hakea ferruginea*, *Homalospermum firmum*, *Lepidosperma angustatum*, *Lepidosperma striatum*, *Leucopogon obovatus* subsp. *revolutus*, *Lomandra sericea*, *Mesomelaena tetragona*, *Taxandria linearifolia*, *Taxandria parviceps*, *Thysanotus sparteus*, *Xanthosia huegelii*, **Acacia longifolia*, **Gladiolus undulatus*.



Quadrat 4: Hill crest with grey sand, Excellent. Jarrah/Marri/Sheoak Laterite Forest, 22/11/2017 574185mE 6126657mN

Species: *Acacia browniana* var. *browniana*, *Agonis theiformis*, *Allocasuarina fraseriana*, *Anarthria scabra*, *Beaufortia decussata*, *Cyathochaeta avenacea*, *Dampiera leptoclada*, *Dasyopogon bromeliifolius*, *Desmocladius fasciculatus*, *Drosera pallida*, *Eucalyptus marginata*, *Hibbertia cunninghamii*, *Leucopogon obovatus* subsp. *obovatus*, *Leucopogon verticillatus*, *Lindsaea linearis*, *Logania serpyllifolia* subsp. *serpyllifolia*, *Lomandra pauciflora*, *Lomandra sericea*, *Patersonia umbrosa* var. *umbrosa*, *Synaphea gracillima*, *Tetraria octandra*, *Thelymitra macrophylla*, *Xanthorrhoea platyphylla*, **Acacia longifolia*.



Quadrat 5: Upper hill slope with grey sand. Very Good. Jarrah/Marri/Sheoak Laterite Forest, 22/11/2017 573739mE 6126842mN

Species: *Acacia browniana* var. *browniana*, *Agonis theiformis*, *Agrostocrinum hirsutum*, *Allocasuarina fraseriana*, *Anarthria scabra*, *Beaufortia decussata*, *Billardiera variifolia*, *Bossiaea linophylla*, *Conostylis setigera*, *Corymbia calophylla*, *Cyathochaeta avenacea*, *Dasyopogon bromeliifolius*, *Desmocladius fasciculatus*, *Eucalyptus marginata*, *Gompholobium knightianum*, *Hakea amplexicaulis*, *Leucopogon obovatus*, *Leucopogon verticillatus*, *Logania serpyllifolia*, *Lomandra sericea*, *Patersonia umbrosa* var. *umbrosa*, *Petrophile diversifolia*, *Stylidium plantagineum*, *Tetraria octandra*, *Tetraria* sp. Jarrah Forest (R. Davis 7391), *Xanthorrhoea platyphylla*.



Quadrat 6: Middle hill-slope with grey sand. Jarrah/Marri/Sheoak Laterite Forest Very Good/Excellent 22/11/2017 573757mE 6126236mN

Species: *Acacia myrtifolia*, *Agonis theiformis*, *Allocasuarina fraseriana*, *Anarthria prolifera*, *Anarthria scabra*, *Banksia grandis*, *Billardiera heterophylla*, *Bossiaea linophylla*, *Conospermum caeruleum*, *Cyathochaeta equitans*, *Dasyopogon bromeliifolius*, *Eucalyptus marginata*, *Johnsonia lupulina*, *Kingia australis*, *Lepidosperma angustatum*, *Leucopogon obovatus*, *Leucopogon verticillatus*, *Melaleuca thymoides*, *Opercularia hispidula*, *Patersonia umbrosa* var. *umbrosa*, *Persoonia longifolia*, *Schoenus multiglumis*, *Taxandria parviceps*, *Xanthosia rotundifolia*, **Holcus lanatus*.



Quadrat 7: Middle hill-slope with grey sand. Jarrah/Marri/Sheoak Laterite Forest Very Good/Excellent 22/11/2017 573942mE 6126424mN

Species: *Agonis flexuosa*, *Allocasuarina fraseriana*, *Amphipogon amphipogonoides*, *Anarthria prolifera*, *Anigozanthos flavidus*, *Beaufortia decussata*, *Billardiera variifolia*, *Bossiaea linophylla*, *Caesia micrantha*, *Cyathochaeta avenacea*, *Dasyopogon bromeliifolius*, *Eucalyptus marginata*, *Hibbertia cunninghamii*, *Lepidosperma angustatum*, *Lepidosperma angustatum*, *Leucopogon obovatus*, *Lindsaea linearis*, *Lomandra pauciflora*, *Lomandra sericea*, *Opercularia hispidula*, *Patersonia umbrosa* var. *umbrosa*, *Scaevola striata*, *Schoenus multiglumis*, *Xanthosia rotundifolia*.



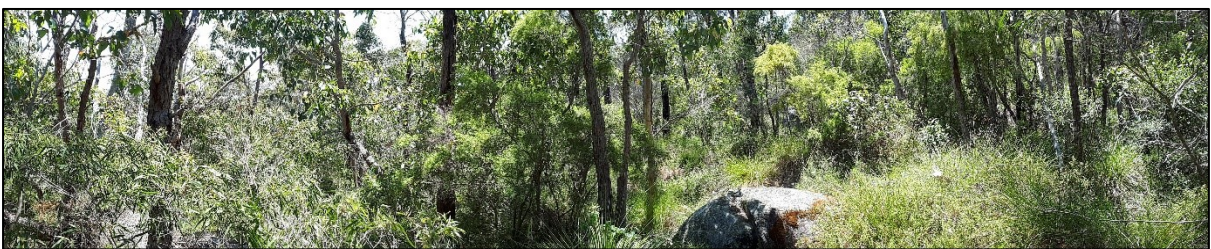
Quadrat 8: Middle hill-slope with grey sand. Jarrah/Sheoak/*E. staeri* Sandy Woodland 22/11/2017 Very Good/Excellent 574188mE 6126436mN
 Species: *Acacia browniana* var. *browniana*, *Agonis theiformis*, *Allocasuarina fraseriana*, *Anarthria scabra*, *Beaufortia decussata*, *Cyathochaeta avenacea*, *Dasypogon bromeliifolius*, *Drosera menziesii*, *Eucalyptus marginata*, *Lepidosperma angustatum*, *Leucopogon obovatus*, *Opercularia hispidula*, *Patersonia umbrosa* var. *umbrosa*, *Persoonia longifolia*, *Tetraria octandra*, *Thelymitra crinita*, *Xanthorrhoea platyphylla*, *Xanthosia rotundifolia*.



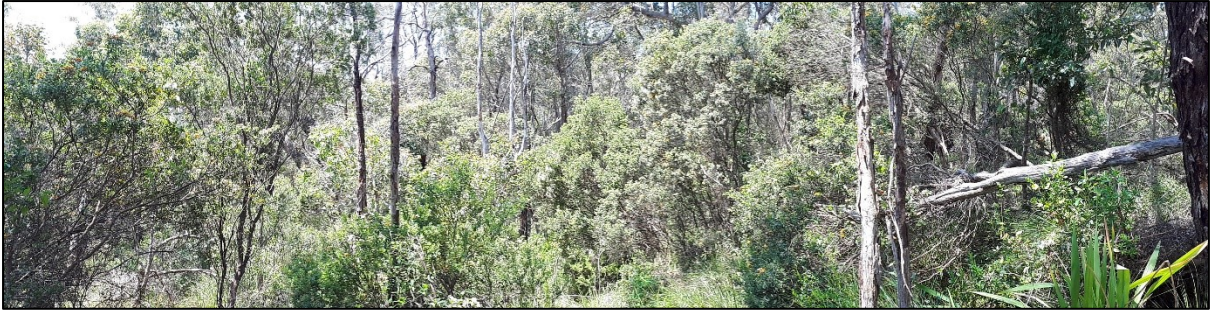
Quadrat 9: Middle hill-slope. Outcropping granite boulders. Very Good. Marri/Jarrah Forest/Peppermint Woodland 23/11/2017 578825mE 6124018mN
 Species: *Acacia alata*, *Agonis flexuosa*, *Agonis theiformis*, *Billardiera variifolia*, *Billardiera variifolia*, *Billardiera variifolia*, *Bossiaea linophylla*, *Corymbia calophylla*, *Eucalyptus marginata*, *Hovea elliptica*, *Lepidosperma tenue*, *Leucopogon obovatus*, *Loxocarya cinerea*, *Opercularia hispidula*, *Tetrarrhena laevis*, *Tremandra stelligera*, *Xanthorrhoea platyphylla*, *Xanthosia rotundifolia*, **Anthoxanthum odoratum*, **Asparagus asparagoides*, **Briza maxima*, **Holcus lanatus*, **Lythrum hyssopifolia*, **Pittosporum undulatum*, **Sonchus oleraceus*, **Taraxacum khatoonae*.



Quadrat 10: Granite outcrop. *Taxandria marginata* Granite Shrubland Very Good 23/11/2017 578848mE 6124117mN
 Species: *Acacia crassiuscula*, *Anthocercis viscosa*, *Diuris* sp., *Drosera stolonifera*, *Juncus pallidus*, *Lepidosperma hopperi*, *Lepidosperma tenue*, *Patersonia limbata*, *Stypantra glauca*, *Taxandria marginata*, **Aira caryophylla*, **Anthoxanthum odoratum*, **Briza maxima*, **Briza minor*, **Omithopus compressus*, **Psoralea pinnata*, **Watsonia meriana* var. *bulbillifera*.



Quadrat 11: Granite boulders, brown loamy sand. Marri/Jarrah Coastal Hills Forest Very Good/Excellent 23/11/2017 578868mE 6124198mN
 Species: *Agonis flexuosa*, *Bossiaea linophylla*, *Clematis pubescens*, *Corymbia calophylla*, *Eucalyptus cornuta*, *Gastrolobium bilobum*, *Hibbertia cunninghamii*, *Hovea elliptica*, *Lepidosperma tenue*, *Leucopogon obovatus* subsp. *obovatus*, *Loxocarya cinerea*, *Loxocarya cinerea*, *Microlaena stipoides*, *Opercularia hispidula*, *Poa porphyroclados*, *Stypantra glauca*, *Tetrarrhena laevis*, *Thomasia angustifolia*, *Tremandra stelligera*, *Xanthorrhoea platyphylla*, **Anthoxanthum odoratum*, **Asparagus asparagoides*, **Avena barbata*, **Briza maxima*, **Lythrum hyssopifolia*.



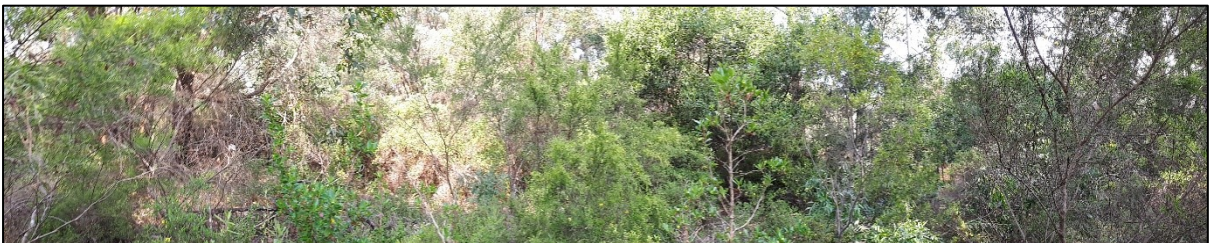
Quadrat 12: Granite boulders, dark brown loamy sand. Marri/Jarrah Coastal Hills Forest Very Good 23/11/2017 578863mE 6124350mN
 Species: *Acacia myrtifolia*, *Billardiera heterophylla*, *Clematis pubescens*, *Corymbia calophylla*, *Daucus glochidiatus*, *Eucalyptus cornuta*, *Gastrolobium bilobum*, *Hibbertia cuneiformis*, *Hibbertia furfuracea*, *Hovea elliptica*, *Lepidosperma tenue*, *Leucopogon obovatus* subsp. *obovatus*, *Loxocarya cinerea*, *Microlaena stipoides*, *Opercularia hispidula*, *Poa porphyroclados*, *Rhagodia preissii*, *Tetraria octandra*, *Tremandra stelligera*, **Anthoxanthum odoratum*, **Asparagus asparagoides*, **Watsonia meriana* var. *bulbillifera*.



Quadrat 13: Granite outcrop, brown loamy sand. *Leucopogon assimilis* Granite Shrubland Very Good/Excellent 23/11/2017 578796mE 6124359mN
 Species: *Andersonia sprengeioides*, *Austrostipa mollis*, *Billardiera heterophylla*, *Borya sphaerocephala*, *Dodonaea ceratocarpa*, *Eucalyptus cornuta*, *Gastrolobium bilobum*, *Hibbertia diamesogenos*, *Lepidosperma tenue*, *Leucopogon assimilis*, *Leucopogon obovatus* subsp. *obovatus*, *Leucopogon pendulus*, *Luzula meridionalis*, *Microlaena stipoides*, *Neurachne alopecuroidea*, *Schoenus* sp. *infertile*, *Stypandra glauca*, *Verticordia plumosa*, **Acacia longifolia*, **Anthoxanthum odoratum*, **Briza maxima*, **Briza minor*, **Centaurium erythraea*, **Ornithopus compressus*, **Parentucellia latifolia*, **Romulea rosea*, **Trifolium arvense*.



Quadrat 14: Granite outcrop margin, brown loamy sand. *Taxandria marginata*/*Gastrolobium bilobum* Granite Shrubland Very Good/Excellent 23/11/2017 578781mE 6124287mN
 Species: *Billardiera heterophylla*, *Dodonaea ceratocarpa*, *Eucalyptus cornuta*, *Gastrolobium bilobum*, *Hibbertia furfuracea*, *Lepidosperma tenue*, *Leucopogon obovatus* subsp. *obovatus*, *Loxocarya cinerea*, *Pimelea rosea* subsp. *rosea*, *Rhagodia preissii*, *Stypandra glauca*, **Acacia longifolia*, **Anthoxanthum odoratum*, **Briza maxima*, **Briza minor*, **Parentucellia latifolia*, **Plantago lanceolata*, **Trifolium angustifolium*, **Trifolium arvense*, **Watsonia meriana* var. *bulbillifera*.



Quadrat 15: Hill slope with light grey sand. Marri/Jarrah Forest/Peppermint Woodland Very Good/Excellent 23/11/2017 578746mE 6124229mN
 Species: *Agonis theiformis*, *Anigozanthos flavidus*, *Bossiaea linophylla*, *Corymbia calophylla*, *Eucalyptus cornuta*, *Hibbertia cuneiformis*, *Hibbertia furfuracea*, *Lepidosperma gladiatum*, *Leucopogon obovatus* subsp. *obovatus*, *Loxocarya cinerea*, *Opercularia hispidula*, *Pteridium esculentum*, *Tetraria octandra*, **Acacia longifolia*, **Anthoxanthum odoratum*, **Asparagus asparagoides*, **Cenchrus clandestinus*, **Cenchrus clandestinus*, **Gladiolus undulatus*, **Holcus lanatus*, **Pelargonium capitatum*, **Psoralea pinnata*, **Taraxacum khatoonae*.



Quadrat 16: Wetland, peat over sand. *Homalospermum firmum*/*Callistemon glaucus* Peat Thicket Very Good 23/11/2017 575182mE 6125118mN
 Species: *Adenanthos obovatus*, *Anarthria prolifera*, *Anarthria scabra*, *Anigozanthos flavidus*, *Astartea* sp., *Austrostipa mollis*, *Beaufortia sparsa*, *Billardiera heterophylla*, *Bossiaea linophylla*, *Cyathochaeta avenacea*, *Eucalyptus marginata*, *Gastrolobium sericeum*, *Homalospermum firmum*, *Hypolaena fastigiata*, *Johnsonia lupulina*, *Leucopogon australis*, *Lomandra pauciflora*, *Meeboldina scariosa*, *Tricoryne elatior*, *Tricoryne elatior*, *Xyris lanata*, **Acacia longifolia*, **Watsonia meriana* var. *bulbillifera*.



Quadrat 17: Wetland, peat over sand. *Homalospermum firmum*/*Callistemon glaucus* Peat Thicket Very Good 23/11/2017 574417mE 6125317mN
 Species: *Acacia divergens*, *Anarthria prolifera*, *Astartea* sp., *Beaufortia sparsa*, *Callistachys lanceolata*, *Empodisma gracillimum*, *Homalospermum firmum*, *Hypocalymma cordifolium*, *Lepidosperma striatum*, *Lobelia heterophylla*, *Meeboldina scariosa*, *Opercularia hispidula*, *Patersonia occidentalis*, *Patersonia umbrosa* var. *umbrosa*, *Pteridium esculentum*, *Taxandria juniperina*, *Taxandria linearifolia*, **Eucalyptus globulus*, **Watsonia meriana* var. *bulbillifera*.



Quadrat 18: Wetland, grey sand. *Evandra aristata* Sedgeland Very Good 23/11/2017 574971mE 6125166mN
 Species: *Acacia myrtifolia*, *Adenanthos obovatus*, *Agonis flexuosa*, *Amphipogon laguroides*, *Anarthria laevis*, *Anarthria prolifera*, *Anarthria scabra*, *Beaufortia sparsa*, *Billardiera heterophylla*, *Boronia crenulata*, *Boronia spathulata*, *Dampiera linearis*, *Dasyopogon bromeliifolius*, *Evandra aristata*, *Gymnoschoenus anceps*, *Homalospermum firmum*, *Hypocalymma strictum*, *Hypolaena fastigiata*, *Jacksonia horrida*, *Lyginia barbata*, *Melaleuca thymoides*, *Nuytsia floribunda*, *Opercularia hispidula*, *Patersonia limbata*, *Schoenus cruentus*, *Sphenotoma capitata*, *Taxandria parviceps*, *Xyris lanata*, **Leptospermum laevigatum*.



Quadrat 19: Granite outcrop, brown loamy sand. *Taxandria marginata* Granite Shrubland Degraded/Good 23/11/2017 576814mE 6124669mN
 Species: **Anthoxanthum odoratum*, **Asparagus asparagoides*, **Avena barbata*, **Briza maxima*, **Freesia alba x leichtlinii*, **Gladiolus undulatus*, **Lythrum hyssopifolia*, **Watsonia meriana* var. *bulbillifera*, *Agonis flexuosa*, *Agonis theiformis*, *Astroloma pallidum*, *Austrostipa mollis*, *Billardiera variifolia*, *Bossiaea linophylla*, *Corymbia calophylla*, *Cyathochaeta avenacea*, *Desmodcladus fasciculatus*, *Dianella revoluta*, *Dodonaea ceratocarpa*, *Hibbertia furfuracea*, *Lepidosperma tenue*, *Leucopogon obovatus* subsp. *obovatus*, *Lomandra pauciflora*, *Loxocarya cinerea*, *Microlaena stipoides*, *Stypantra glauca*, *Tetaria octandra*, *Tremandra stelligera*, *Xanthorrhoea platyphylla*.



Quadrat 20: Swale adjacent to granite outcrop, brown loam. Marri/Jarrah Forest/Peppermint Woodland Very Good 23/11/2017 576759mE 6124635mN
 Species: *Agonis flexuosa*, *Agonis theiformis*, *Anarthria scabra*, *Billardiera heterophylla*, *Bossiaea linophylla*, *Corymbia calophylla*, *Dasyopogon bromeliifolius*, *Eucalyptus marginata*, *Hardenbergia comptoniana*, *Hibbertia cuneiformis*, *Hypolaena fastigiata*, *Leucopogon obovatus* subsp. *obovatus*, *Leucopogon verticillatus*, *Lomandra purpurea*, *Loxocarya cinerea*, *Patersonia umbrosa* var. *umbrosa*, *Pteridium esculentum*, *Schoenus multiglumis*, *Tremandra diffusa*, **Anthoxanthum odoratum*, **Asparagus asparagoides*, **Oxalis purpurea*, **Oxalis violacea*, **Pelargonium capitatum*, **Taraxacum khatoonae*, **Watsonia meriana* var. *bulbillifera*.



Quadrat 21: Middle hill-slope, grey sand. Jarrah/Sheoak/E.staeri Sandy Woodland Excellent 24/11/2017 574326mE 6127589mN
 Species: *Acacia browniana* var. *browniana*, *Agonis theiformis*, *Anarthria prolifera*, *Banksia grandis*, *Beaufortia decussata*, *Billardiera variifolia*, *Bossiaea linophylla*, *Corymbia calophylla*, *Desmocladius fasciculatus*, *Eucalyptus marginata*, *Gompholobium polymorphum*, *Hakea florida*, *Hibbertia cunninghamii*, *Johnsonia lupulina*, *Kingia australis*, *Lepidosperma angustatum*, *Leucopogon obovatus* subsp. *obovatus*, *Leucopogon verticillatus*, *Lomandra pauciflora*, *Lomandra sericea*, *Opercularia hispidula*, *Patersonia umbrosa* var. *umbrosa*, *Persoonia elliptica*, *Tetraria octandra*, *Tetraria* sp. Jarrah Forest (R. Davis 7391), *Xanthorrhoea platyphylla*, *Xanthosia rotundifolia*.



Quadrat 22: Wetland, peat over sand. *Homalospermum firmum*/*Callistemon glaucus* Peat Thicket Excellent 24/11/2017 574397mE 6127513mN
 Species: *Anarthria scabra*, *Baumea rubiginosa*, *Beaufortia sparsa*, *Callistemon glaucus*, *Cephalotus follicularis*, *Drosera pulchella*, *Empodisma gracillimum*, *Eucalyptus marginata*, *Gymnoschoenus anceps*, *Histiopteris incisa*, *Homalospermum firmum*, *Leptocarpus tenax*, *Schizaea fistulosa*, *Schoenus multiglumis*, *Sphaerolobium vimineum*, *Taxandria parviceps*, *Xanthosia rotundifolia*, *Xyris lanata*, **Rubus anglocandicans*.



Quadrat 23: Wetland. *Homalospermum firmum*/*Callistemon glaucus* Peat Thicket Excellent 24/11/2017 574400mE 6127491mN, 5 x 20 m dimensions.
 Species: *Baumea rubiginosa*, *Callistemon glaucus*, *Cassytha racemosa*, *Diaspasis filifolia*, *Drosera pallida*, *Drosera pulchella*, *Empodisma gracillimum*, *Gymnoschoenus anceps*, *Hakea florida*, *Lepidosperma striatum*, *Leptocarpus tenax*, *Meeboldina scariosa*, *Sphaerolobium vimineum*, *Stylidium pygmaeum*, *Taxandria linearifolia*, *Thelymitra canaliculata*, *Xyris lanata*, **Anthoxanthum odoratum*, **Cortaderia selleana*.



Quadrat 24: Wetland. ex. peat over sand. *Homalospermum firmum*/*Callistemon glaucus* Peat Thicket Excellent 24/11/2017 574452mE 6127424mN
 Species: *Acacia divergens*, *Boronia crassipes*, *Callistemon glaucus*, *Dampiera leptoclada*, *Diaspasis filifolia*, *Drosera menziesii*, *Empodisma gracillimum*, *Homalospermum firmum*, *Lepidosperma striatum*, *Leptocarpus tenax*, *Meeboldina tephрина ms*, *Schoenus multiglumis*, *Sphaerolobium vimineum*, *Taxandria linearifolia*, **Holcus lanatus*.



Quadrat 25: Lower hill-slope, grey sand. Jarrah/Sheoak/*E. staeri* Sandy Woodland Very Good/Excellent 24/11/2017 574300mE 6127524mN
 Species: *Agonis theiformis*, *Amphipogon amphipogonoides*, *Anarthria prolifera*, *Anarthria prolifera*, *Banksia grandis*, *Beaufortia decussata*, *Bossiaea linophylla*, *Corymbia calophylla*, *Desmocladius fasciculatus*, *Drosera pallida*, *Eucalyptus marginata*, *Haemodorum spicatum*, *Hakea ruscifolia*, *Hibbertia cuneiformis*, *Lepidosperma angustatum*, *Leucopogon obovatus* subsp. *obovatus*, *Leucopogon verticillatus*, *Mesomelaena graciliceps*, *Opercularia hispidula*, *Patersonia umbrosa* var. *umbrosa*, *Persoonia longifolia*, *Scaevola striata*, *Tetraria octandra*, *Tricostularia neesii*, *Xanthorrhoea platyphylla*, *Xanthosia rotundifolia*.



Quadrat 26: Wetland, peat over sand. *Homalospermum firmum*/*Callistemon glaucus* Peat Thicket Excellent 27/11/2017 574270mE 6127433mN
 Species: *Baumea acuta*, *Baumea rubiginosa*, *Callistemon glaucus*, *Diaspasis filifolia*, *Drosera menziesii*, *Empodisma gracillimum*, *Gymnoschoenus anceps*, *Hakea linearis*, *Leptocarpus tenax*, *Schoenus multiglumis*, *Sphaerolobium vimineum*, *Taxandria juniperina*, *Taxandria linearifolia*, *Thysanotus sparteus*, *Xyris lanata*, **Holcus lanatus*, **Psoralea pinnata*, **Rubus anglocandicans*.



Quadrat 27: Wetland, peat over sand. *Homalospermum firmum*/*Callistemon glaucus* Peat Thicket Excellent 27/11/2017 574254mE 6127408mN
 Species: *Acacia divergens*, *Baumea rubiginosa*, *Boronia crassipes*, *Callistemon glaucus*, *Dampiera leptoclada*, *Empodisma gracillimum*, *Gymnoschoenus anceps*, *Homalospermum firmum*, *Leptocarpus tenax*, *Schoenus multiglumis*, *Xyris lanata*.



Quadrat 28: wetland peat over sand. ex. *Homalospermum firmum*/*Callistemon glaucus* Peat Thicket Excellent 27/11/2017 574566mE 6127504mN
 Species: *Acacia divergens*, *Astartea corniculata*, *Baumea acuta*, *Baumea rubiginosa*, *Callistemon glaucus*, *Cosmelia rubra*, *Dampiera leptoclada*, *Drosera menziesii*, *Empodisma gracillimum*, *Gymnoschoenus anceps*, *Homalospermum firmum*, *Leptocarpus tenax*, *Schoenus multiglumis*, *Taxandria linearifolia*, *Xyris lanata*, **Rubus anglocandicans*.



Quadrat 29: Wetland, peat over sand. *Homalospermum firmum*/*Callistemon glaucus* Peat Thicket Excellent 27/11/2017 574307mE 6127407mN
 Species: *Acacia divergens*, *Baumea rubiginosa*, *Boronia crassipes*, *Callistemon glaucus*, *Empodisma gracillimum*, *Gymnoschoenus anceps*, *Homalospermum firmum*, *Leptocarpus tenax*, *Schoenus multiglumis*, *Sphaerolobium vimineum*, *Taxandria linearifolia*.



Quadrat 30: Wetland, peat over sand. *Taxandria juniperina* Closed Forest Very Good 28/11/2017 574485mE 6125533mN
 Species: *Acacia divergens*, *Baumea acuta*, *Homalospermum firmum*, *Lepidosperma striatum*, *Leptocarpus scariosus*, *Taxandria juniperina*, *Tetrarrhena laevis*, **Acacia melanoxydon*, **Anthoxanthum odoratum*.



Quadrat 31: Wetland, peat over sand. Firebreak. *Taxandria juniperina* Closed Forest Very Good 28/11/2017 574591mE 6125459mN
 Species: *Aphelia brizula*, *Baumea acuta*, *Chamaescilla corymbosa*, *Drosera pulchella*, *Isolepis cernua*, *Lobelia heterophylla*, *Microtis media*, *Prasophyllum macrostachyum*, *Rhadinothamnus anceps*, *Taxandria juniperina*, *Thelymitra* sp., *Utricularia bifida*, **Acacia longifolia*, **Anthoxanthum odoratum*, **Briza maxima*, **Briza minor*, **Gladiolus undulatus*.



Quadrat 32: Middle hill-slope, grey sand with laterite gravel. *Hakea* spp Shrubland/Woodland Complex Very Good/Excellent 28/11/2017 573977mE 6126876mN

Species: *Acacia browniana* var. *browniana*, *Acacia myrtifolia*, *Agonis theiformis*, *Allocasuarina fraseriana*, *Anarthria gracilis*, *Anarthria prolifera*, *Anarthria scabra*, *Billardiera heterophylla*, *Boronia spathulata*, *Cyathochaeta avenacea*, *Dampiera loranthifolia*, *Dasyogon bromeliifolius*, *Desmocladius fasciculatus*, *Eucalyptus marginata*, *Grevillea pilulifera*, *Haemodorum laxum*, *Hakea ferruginea*, *Hibbertia microphylla*, *Hovea trisperma*, *Lepidosperma drummondii*, *Lomandra sericea*, *Mesomelaena tetragona*, *Patersonia umbrosa* var. *umbrosa*, *Sphaerolobium medium*, *Taxandria parviceps*, *Tetragonia octandra*, *Tetragonia* sp. Jarrah Forest (R. Davis 7391), *Thysanotus sparteus*, *Xanthorrhoea platyphylla*, *Xanthosia rotundifolia*.

12 APPENDIX E - Likelihood of Occurrence Analysis

A likelihood of occurrence of all conservation significant species (flora and fauna) was assessed based on the presence of suitable habitat and other factors as outlined in Table E1. Suitable habitat was determined from information in herbarium voucher labels, published descriptions, distribution records and knowledge from the authors.

Table E1: Criteria for assessing the likelihood of occurrence of conservation significant flora and fauna that could potentially occur within the Survey Area.

Present	Species is recorded within the Survey Area.
Likely	Species is relatively wide spread, has been previously recorded a number of times recently within 10 km of the Survey Area and suitable habitat occurs within the Survey Area.
Possible	Species previously recorded within 10 km and suitable habitat occurs in the Survey Area.
Unlikely	Suitable habitat may occur but the species has a highly restricted distribution, is very rare and only known from a limited number of populations.
Highly Unlikely	Suitable habitat for the species does not occur at the Survey Area OR Suitable habitat does occur but the species has a highly restricted distribution, is very rare and only known from a limited number of populations OR The Survey Area is outside the species' natural distribution.

Table E2. Likelihood of occurrence of conservation significant flora recorded in the vicinity of the Survey Area (<10 km). An additional five Threatened taxa are not recorded within the vicinity, but have the potential to occur according to the Protected Matters Search Tool (PMST) (Department of the Environment and Energy [DotEE] 2017a):- *Caladenia winfieldii*, *Darwinia collina*, *Diuris drummondii*, *Kennedia glabrata* and *Sphenotoma drummondii* (all are highly unlikely to occur).

Status, Taxon [FAMILY]	Records in vicinity <10km	Description, Habitat & Distribution	Likelihood of Occurrence
EX <i>Acacia prismifolia</i> [Fabaceae]	1	Shrub, 0.15-0.5 m high. Rocky slopes.	Unlikely
T <i>Banksia brownii</i> [Proteaceae]	22	Bushy, non-lignotuberous shrub or tree (small), 1-6 m high. Flowers cream & brown/orange-red, Mar to Jul. Sand over laterite, gravel, loam over granite. In gullies.	Unlikely
T <i>Banksia goodii</i> [Proteaceae]	15	Lignotuberous, prostrate shrub, ca 0.2 m high. Flowers orange-brown-red, May or Nov. White or grey sand over laterite.	Possible
T <i>Banksia verticillata</i> [Proteaceae]	13	Non-lignotuberous shrub or tree (rarely), 1.3-6 m high. Flowers yellow-orange, Jan to Apr. Sandy loam. On or beside granite outcrops.	Unlikely
T <i>Caladenia harringtoniae</i> [Orchidaceae]	2	Tuberous, perennial, herb, 0.2-0.4 m high. Flowers pink, Oct to Nov. Sandy loam. Winter-wet flats, margins of lakes, creeklines, granite outcrops.	Possible. Season and fire absence may have affected detection.
T <i>Calectasia cyanea</i> [Dasyopogonaceae]	11	Rhizomatous, clump forming, woody perennial, herb, 0.1-0.6 m high, to 0.3 m wide. Flowers blue/purple, Jun to Oct. White, grey or yellow sand, gravel.	Unlikely
T <i>Chordifex abortivus</i> [Restionaceae]	1	Rhizomatous, erect perennial, herb, to 0.5 m high. Flowers brown, Sep to Oct. Sand. Low rises & undulating areas.	Possible
T <i>Conostylis drummondii</i> [Haemodoraceae]	1	Rhizomatous, tufted perennial, grass-like or herb, 0.1-0.3 m high. Fl. yellow, Oct to Nov. White, grey or yellow sand, gravel.	Unlikely
T <i>Conostylis misera</i> [Haemodoraceae]	1	Rhizomatous, tufted perennial, grass-like or herb, 0.05-0.18 m high. Flowers yellow, Oct to Nov. White or grey sand, sandy loam. Winter-wet flats.	Unlikely
T <i>Drakaea micrantha</i> [Orchidaceae]	3	Tuberous, perennial, herb, 0.15-0.3 m high. Flowers red & yellow, Sep to Oct. White-grey sand.	Possible. Season and fire absence may have affected detection.
T <i>Isopogon uncinatus</i> [Proteaceae]	10	Tufted spreading or prostrate, non-lignotuberous shrub, 0.05-0.4 m high. Flowers yellow/cream, Oct to Nov. Loam or sand on granite, peaty sand. Swampy depressions, hillslopes.	Possible
T <i>Verticordia fimbriolepis</i> subsp. <i>australis</i> [Malvaceae]	1	Slender shrub, 0.2-0.4 m high. Flowers pink, Oct to Dec. Shallow sand, clay loam. Granite outcrops.	Possible
P1 <i>Caladenia evanescens</i> [Orchidaceae]	1	Tuberous, perennial, herb, 0.15-0.2 m high. Flowers green-cream-yellow, Nov. Sand. Consolidated sand dunes.	Unlikely

Status, Taxon [FAMILY]	Records in vicinity <10km	Description, Habitat & Distribution	Likelihood of Occurrence
P1 <i>Coleanthera coelophylla</i> [Ericaceae]	1	Erect shrub, 0.3-0.6 m high. Flowers pink/white, Sep to Nov. Gravelly sandy soils.	Unlikely
P1 <i>Prasophyllum paulinae</i> [Orchidaceae]	2	Tuberous, perennial, herb, 0.15-0.4 m high. Fl. green-purple-red, Sep to Nov. Black, peaty soils. Swamps.	?Present
P1 <i>Stylidium falcatum</i> [Stylidiaceae]	10	Perennial, herb, 0.15-0.35(-0.6) m high. Flowers white, Oct to Nov. Sand, gravelly clay loam. Plains, lateritic ridges.	Possible
P1 <i>Synaphea incurva</i> [Proteaceae]	9	Clumped, spreading shrub. Flowers yellow, Sep to Nov. Gravelly loam, sandy soils. Slopes.	Present
P1 <i>Thomasia multiflora</i> [Malvaceae]	2	Spreading shrub, 0.3-1 m high, to 2 m wide. Flowers pink-purple, Sep to Oct. Black sand. Seasonally wet areas, granite outcrops.	Possible
P1 <i>Thomasia purpurea x solanacea</i> [Malvaceae]	6	Shrub, 0.5-0.8 m high. Flowers pink-purple, Nov to Dec or Jan. Grey sand over limestone. Creek sides.	Possible
P2 <i>Agrostocrinum scabrum</i> subsp. <i>littorale</i> [Heremocallidaceae]	1	Rhizomatous, perennial, herb, to 0.15 m high. Flowers blue, Oct to Nov. Shallow granite loams. Coastal slopes.	Unlikely
P2 <i>Conospermum quadripetalum</i> [Proteaceae]	11	Diffuse, straggly shrub, 0.3-1 m high. Fl. blue/white, Sep to Nov. Sandy clay, grey sand. Flats behind coastal hills.	Possible
P2 <i>Conospermum spectabile</i> [Proteaceae]	1	Erect, compact shrub, 0.5-0.8 m high. Flowers white & blue, Oct to Nov. Sandy soils.	Unlikely
P2 <i>Gyrostemon thesioides</i> [Gyrostemonaceae]	5	Straggling, decumbent shrub, to 0.7 m high. Flowers red-orange-yellow/yellow-green, Nov. Sand over limestone. Consolidated coastal dunes.	Unlikely
P2 <i>Isopogon buxifolius</i> var. <i>buxifolius</i> [Proteaceae]	2	Upright shrub, 0.45-1 m high. Flowers pink-cream, Jul to Dec. Grey sand. Swampy areas.	Possible
P2 <i>Leucopogon bracteolaris</i> [Ericaceae]	2	Shrub, 0.25-1 m high. Flowers white, Feb or May or Jul or Oct. Stony sand, gravelly loam.	Possible
P2 <i>Leucopogon cymbiformis</i> [Ericaceae]	1	Dense, erect or spreading shrub, 0.1-0.6(-0.8) m high. Flowers white, Jul to Nov or Feb to Mar. White/grey or yellow sand, lateritic gravelly soils. Sandplains, wet flats, foothills.	Possible
P2 <i>Schoenus</i> sp. Grassy (E. Gude & J. Harvey 250) [Cyperaceae]	1	Rhizomatous, perennial, grass-like or herb (sedge), to 0.7 m high. Fl. yellow. Black silt. Swamps.	Possible
P2 <i>Stylidium articulatum</i> [Stylidiaceae]	2	Rosetted perennial, herb, 0.15-0.25 m high, Leaves erect to spreading, oblanceolate, 3-8 cm long, 5-14 mm wide, apex subacute to acute, glabrous. Scape glandular in upper half. Inflorescence paniculate. Flowers pink, Nov to Dec. Sandy loam, granite. Hills, coastal heath.	Unlikely
P2 <i>Thelymitra variegata</i> [Orchidaceae]	5	Tuberous, perennial, herb, 0.1-0.35 m high. Flowers orange & red & purple & pink, Jun to Sep. Sandy clay, sand, laterite.	Possible. Season may have affected detection.
P3 <i>Acacia ataxiphylla</i> subsp. <i>ataxiphylla</i> [Fabaceae]	2	Prostrate, sprawling shrub, 0.15-0.5 m high, to 1 m wide. Flowers yellow, Nov to Dec or Jan. Gravelly clay loam, white/grey sand. Flats, roadsides.	Possible
P3 <i>Andersonia auriculata</i> [Ericaceae]	2	Erect or spreading shrub, 0.1-0.3(-0.5) m high. Flowers white & blue, Apr to Oct. Grey or peaty sand, often over laterite. Swampy areas, granite outcrops.	Possible
P3 <i>Andersonia setifolia</i> [Ericaceae]	1	Decumbent to erect, cushion-forming shrub, 0.05-0.15 m high. Flowers red/white, Jun to Oct. Sandy & gravelly soils. Hillslopes & breakaways.	Possible
P3 <i>Austrostipa mundula</i> [Poaceae]	1	Perennial caespitose grass to 0.5m. Grey sand.	Unlikely
P3 <i>Boronia crassipes</i> [Rutaceae]	10	Erect, spindly shrub, 0.5-2 m high. Flowers red-pink, Aug to Sep. Sand, peaty sand. Winter-wet swamps, creeklines.	Present
P3 <i>Chorizema carinatum</i> [Fabaceae]	1	Erect or spreading shrub, 0.1-0.6 m high. Flowers yellow, Oct to Dec. Sand, sandy clay.	Possible
P3 <i>Corybas abditus</i> [Orchidaceae]	1	Tuberous, perennial, dwarf herb, 0.01-0.02 m high. Fl. red-purple, Oct to Nov. Black peaty soils. Winter-wet swamps.	Possible
P3 <i>Juncus meianthus</i> [Juncaceae]	1	Tufted perennial, herb, 0.05-0.2 m high, to 0.4 m wide. Flowers brown, Nov to Dec or Jan. Black sand, sandy clay. Creeks, seepage areas.	Possible
P3 <i>Leucopogon alternifolius</i> [Ericaceae]	4	Erect or semi-erect, scrambling shrub, 0.1-1(-2) m high. Flowers white/white-pink, Aug to Dec. Grey/white sand. Swampy areas, seasonally wet areas.	Likely
P3 <i>Leucopogon altissimus</i> [Ericaceae]	1	Erect shrub to 2 m high. Inflorescence pendulous, flowers creamy - white. Grey or brown sandy loam over granite.	Unlikely
P3 <i>Leucopogon interruptus</i> [Ericaceae]	1	Spreading shrub, to 2 m high. Grey sand over granite.	Possible
P3 <i>Melaleuca ringens</i> [Myrtaceae]	6	Bushy shrub, 0.4-2.5 m high. Fl. cream-yellow, Sep to Oct. Sand. Limestone ridges & cliff tops.	Unlikely
P3 <i>Poa billardierei</i> [Poaceae]	3	Tussock grass to 0.5 m. Foredunes, drift sands.	Unlikely

Status, Taxon [FAMILY]	Records in vicinity <10km	Description, Habitat & Distribution	Likelihood of Occurrence
P3 <i>Synaphea preissii</i> [Proteaceae]	7	Erect, low shrub, 0.15-0.4 m high. Flowers yellow, Jul to Nov. Sand, gravelly loam.	Possible
P3 <i>Verticordia endlicheriana</i> var. <i>angustifolia</i> [Myrtaceae]	1	Erect shrub, 0.3-0.5 m high. Flowers yellow, Oct to Nov. Sandy clay. Granite outcrops.	Possible
P4 <i>Adenanthos x cunninghamii</i> [Proteaceae]	35	Erect open shrub, 1-3 m high. Flowers red/pink-red, Mar or Sep to Oct. Grey sand. Coastal dunes & sandplains.	Unlikely
P4 <i>Andersonia</i> sp. <i>Jamesii</i> (J. Liddelw 84) [Ericaceae]	4	Shrub, 0.5 m high x 0.1 m wide. Perennial, erect, open. Flowers pink / blue. Sandy clay, laterite.	Present
P4 <i>Banksia seneciifolia</i> [Proteaceae]	2	Columnar, non-lignotuberous shrub, 0.6-1 m high. Fl. cream-yellow-brown, Jun or Aug. Sandy loam, sand. Rocky hillslopes.	Possible
P4 <i>Banksia serra</i> [Proteaceae]	10	Erect, slender, non-lignotuberous shrub, 1-4(-7) m high. Flowers yellow/cream-green, Jul to Sep. Gravel, sand or clay loam over laterite. Hillslopes.	Possible
P4 <i>Centrolepis caespitosa</i> [Centrolepidaceae]	3	Tufted annual, herb (forming a rounded cushion up to 25 mm across). Flowers Oct to Dec. White sand, clay. Salt flats, wet areas.	Possible
P4 <i>Corybas limpidus</i> [Orchidaceae]	1	Tuberous, perennial, dwarf herb, 0.01 m high. Flowers red & green, Aug to Sep. Sand. Coastal dunes.	Unlikely
P4 <i>Drosera fimbriata</i> [Droseraceae]	6	Erect tuberous, perennial, herb, 0.05-0.15 m high. Flowers white, Sep to Oct. White sand, granite.	Possible
P4 <i>Gahnia scleroides</i> [Cyperaceae]	2	Lax, slender rhizomatous, perennial, grass-like or herb (sedge), 0.3-0.9 m high. Loam, sandy soils. Moist shaded situations.	Possible
P4 <i>Gonocarpus pusillus</i> [Haloragaceae]	2	Prostrate annual, herb, 0.05-1.2 m high. Flowers green/yellow-red, Nov to Dec. Grey sandy clay. Winter-wet swamps.	Possible
P4 <i>Gonocarpus simplex</i> [Haloragaceae]	3	Tufted perennial, herb, 0.2-0.6 m high. Fl. green/red-brown, Nov to Dec. Peaty sand. Swamps, seasonally inundated areas.	Possible
P4 <i>Laxmannia jamesii</i> [Asparagaceae]	12	Tufted, stilt-rooted perennial, herb, 0.05-0.2 m high. Flowers red & white, May to Jul. Grey sand. Winter-wet locations.	Possible
P4 <i>Lepidium pseudotasmanicum</i> [Brassicaceae]	1	Erect annual or biennial, herb, 0.2-0.4(-1) m high. Flowers white-green, Feb or Dec. Loam, sand.	Unlikely
P4 <i>Lysinema lasianthum</i> [Ericaceae]	10	Spindly shrub, 0.25-0.7 m high. Flowers white-cream, Jul to Nov. Swamps, seasonally wet areas.	Possible
P4 <i>Microtis pulchella</i> [Orchidaceae]	2	Tuberous, perennial, herb, 0.12-0.25 m high. Flowers white, Nov to Dec or Jan. Peaty sand. Winter-wet swamps.	Possible. Season and fire absence may have affected detection.
P4 <i>Microtis quadrata</i> [Orchidaceae]	1	Erect herb with tuber, 0.4 m high. Greenish flowers. Grey sandy clay. Wet areas.	Possible. Season and fire absence may have affected detection.
P4 <i>Spyridium spadiceum</i> [Rhamnaceae]	4	Erect slender or weak semi-prostrate shrub, 0.15-3 m high. Flowers white, Aug to Dec or Jan to Feb or Apr. Sand or gravelly loam. Granitic hills.	Possible
P4 <i>Thomasia quercifolia</i> [Malvaceae]	19	Shrub to 1 m high. Pink purple flowers borne in Apr, Aug, Oct, Nov or Dec. Karri loam or grey coastal sand.	Unlikely
P4 <i>Thomasia solanacea</i> [Malvaceae]	17	Erect shrub, 0.5-3 m high. Flowers blue-purple-pink, Sep to Dec. Alluvium, sand over limestone, rocky loam. Coastal areas.	Unlikely
P4 <i>Thomasia</i> sp. Toolbrunup (G.J. Keighery 9895) [Malvaceae]	1	Erect shrub, 0.7-3 m high. Flowers pink, Sep to Nov. Peaty acid sand over quartzite, shallow loam over schist or siltstones. Steep slopes, gullies near summits, creeklines.	Unlikely
P4 <i>Thysanotus isantherus</i> [Asparagaceae]	9	Caespitose perennial, herb (with tuberous roots), to 0.15 m high. Flowers purple, Nov to Dec. Granite.	Present

Table E2. Likelihood of occurrence of conservation significant fauna recorded in the vicinity of the Survey Area (<10 km). Records obtained from NatureMap (DPaW 2017a) and Protected Matters Search Tool (DotEE 2017a)

Taxon	EPBC Act Listing	State Listing	Habitat	Likelihood of Occurrence
Mammals				
Bilby, Dalgyle (<i>Macrotis lagotis</i>)	T	T	Bilbies are now mostly restricted to the drier and least fertile parts of their former range with the exception of populations in the north of the NT and WA. Remaining populations occupy three major vegetation types, namely: open tussock grassland on uplands and hills, mulga woodland/shrubland growing on ridges and rises, and hummock grassland in plains and alluvial areas (Pavey 2006)	Highly Unlikely. Not within current known range. One uncertain record from 1969.
Chuditch, Western Quoll (<i>Dasyurus geoffroii</i>)	T	T	Eucalypt forest (especially Jarrah, <i>Eucalyptus marginata</i>), dry woodland and mallee shrublands (Van Dyke & Strahan, 2008). In Jarrah forest, Chuditch populations occur in both moist, densely vegetated, steeply sloping forest and drier, open, gently sloping forest. The Chuditch occurs at low densities, even in quality habitats of coastal areas. In Jarrah forest they shelter during the day in horizontal, hollow logs or earth burrows (DotEE 2016).	Unlikely. Suitable habitat is present, however the lack of secure, baited reserves Chuditch range widely and occur in very low densities.
Dibbler (<i>Parantechinus apicalis</i>)	T	T	Dibblers have been recorded over an extensive area and it is likely that they can occupy a diverse range of habitats (Friend, 2004). However, the species seem to prefer vegetation with a dense canopy greater than 1 m high which has been unburnt for at least 10 years or more (Baczocha & Start 1996). Mainland habitat is characterised by the presence of long-unburnt heathland, typified by sandy substrates and occasionally lateritic soils (Baczocha & Start 1996; Barrett 1998). This generalisation applies to records from Cheyne Beach, Torndirrup National Park and most records from Fitzgerald River National Park (Friend 2004)	Highly unlikely. No suitable habitat exists within the Survey Area.
Quokka (<i>Setonix brachyurus</i>)	T	T	A range of vegetation types including dense forests and thickets, streamside vegetation, heaths and shrublands, <i>Taxandria linearifolia</i> dominated swamps in the Jarrah (<i>Eucalyptus marginata</i>) forest. On the south coast - swamps, riparian areas, incised gullies and dense coastal heath (de Tores et al. 2007). Specifically, in the Two Peoples Bay area habitat critical to survival is known to comprise of coastal heath and thickets (<i>Eucalyptus staeri</i> , <i>Allocasuarina fraseriana</i> , <i>Hakea elliptica</i> with <i>Melaleuca striatum</i> , <i>Anarthria scabrum</i>); swamps (<i>Taxandria juniperina</i> , <i>T. linearifolia</i> , <i>Melaleuca lanceolata</i> with <i>Hakea nitida</i> , <i>Beaufortia sparsa</i> and <i>Gahnia trifida</i>); and riparian systems (<i>Eucalyptus megacarpa</i> , <i>Banksia littoralis</i> , <i>Lepidosperma</i> spp.) (DEC 2013)	Highly unlikely. Suitable habitat does not exist within the Survey Area.
South-western brush-tailed phascogale, wambenger (<i>Phascogale tapoatafa wambenger</i>)	NL	CD	See main text	Possible. See discussion in main text
Western Ringtail Possum, ngwayir (<i>Pseudocheirus occidentalis</i>)	T	T	See main text	Present. See discussion in main text
Woylie, Brush-tailed Bettong (<i>Bettongia penicillata</i> subsp. <i>ogilbyi</i>)	T	T	Current habitat includes tall eucalypt forest and woodland, dense myrtaceous shrubland, kwongan (proteaceous) or mallee heath (Yeatman and Groom 2012 and references therein). Thickets and other suitable habitat types such as heath, provide refuges for woylies against predators.	Highly Unlikely. Suitable habitat exists, however the lack of secure, baited reserves in the Survey Area reduces the likelihood of this species being present.
Quenda, Southern Brown Bandicoot (<i>Isodon obesulus</i> subsp. <i>fusciventer</i>)		P4	See main text	Present. See discussion in main text
Western Brush Wallaby (<i>Macropus irma</i>)		P4	Habitat includes open forest or woodland, particularly favouring open, seasonally wet flats with low grasses and open scrubby thickets. It is also found in some areas of mallee and heathland, and is uncommon in karri forest.	Unlikely. Potentially suitable habitat occurs, but no scats were observed during the survey.
Birds				
Australasian Bittern (<i>Botaurus poiciloptilus</i>)	T	T	Densely vegetated freshwater wetlands and, rarely, in estuaries or tidal wetlands. In the southwest of Western Australia, the Bittern is found in beds of tall rush mixed with or near short fine sedge or open pools. It also occurs around swamps, lakes, pools, rivers and channels fringed with lignum <i>Muehlenbeckia</i> , canegrass <i>Eragrostis</i> or other dense vegetation (Marchant & Higgins 1990). It occasionally ventures into areas of open water or onto banks. Brackish water is tolerated in estuaries and tidal wetlands; sea coasts are avoided (Pickering 2013)	Highly Unlikely. No suitable habitat exists within the Survey Area.

Taxon	EPBC Act Listing	State Listing	Habitat	Likelihood of Occurrence
Baudin's Cockatoo, Long-billed black-cockatoo (<i>Calyptorhynchus baudinii</i>)	T	T	See main text	Present. See main text
Carnaby's Cockatoo, Short-billed black-cockatoo (<i>Calyptorhynchus latirostris</i>)	T	T	See main text	Present. See main text
Eastern Curlew (<i>Numenius madagascariensis</i>)	T & IA	T & IA	Open mossy or transitional bogs, moss-lichen bogs and wet meadows, and on the swampy shores of small lakes; in the non-breeding season it is essentially coastal, occurring at estuaries, mangrove swamps, saltmarshes and intertidal flats, particularly those with extensive seagrass (<i>Zosteraceae</i>) meadows. BirdLife Australia http://www.birdlife.org.au/bird-profile/eastern-curlew	Highly Unlikely. No suitable habitat exists within the Survey Area.
Forest Red-tailed Black-Cockatoo (<i>Calyptorhynchus banksii subsp. naso</i>)	T	T	See main text	Present. See main text
Noisy Scrub-bird, Tjmiluk (<i>Atrichornis clamosus</i>)	T	T	The Noisy Scrub-bird inhabits ecological communities that support a dense understorey or lower stratum of sedges and shrubs, a dense accumulation of leaf litter and an abundant population of litter-dwelling invertebrates. In the area between Oyster Harbour and Cheyne Beach, the core areas of male Noisy Scrub-bird territories are found in dense, long-unburnt vegetation characterised as low forest (5-15 m high), scrub/thicket and (rarely) heath. These vegetation formations occur in the gullies and drainage lines of hills and granite mountains and, in lowland areas, in overgrown swamps, lake margins and beside streams (Danks <i>et al.</i> 1996).	Highly Unlikely. No suitable habitat exists within the Survey Area.
Western Bristlebird (<i>Dasyornis longirostris</i>)	T	T	The Western Bristlebird is restricted to floristically diverse low dense coastal heathland. The distribution of the Western Bristlebird is fragmented, with populations in Fitzgerald National Park separated from those in the Hassell Beach/Waychincup National Park/Two Peoples Bay Nature Reserve area. Within this distribution, the species occurs in heathland that is 0.5–1.5 m tall, comprising a diverse variety of shrubs such as banksias, paperbarks, <i>Hakeas</i> , sheoaks and <i>Leptospermum</i> sp. The Western Bristlebird occurs in similar areas to the Western Whipbird (<i>Psophodes nigrogularis nigrogularis</i>), Noisy Scrub-bird (<i>Atrichornis clamosus</i>) and the western subspecies of the Ground Parrot (<i>Pezoporus wallicci flaviventris</i>).	Highly Unlikely. No suitable habitat exists within the Survey Area.
Western Ground Parrot (<i>Pezoporus flaviventris</i>)	T	T	The vegetation types used by Ground Parrots can be broadly characterised as sedgelands, temperate shrub heaths, temperate graminoid heaths or sub-tropical graminoid heaths (Burbidge <i>et al.</i> 1997). There is only one population remaining of the western sub-species of the Ground Parrot, in coastal heath east of Albany in southwest Western Australia. There are only two remaining areas of refuge, Arid and Fitzgerald River National Parks, with about 110 individuals still thought to live in the wild.	Highly Unlikely. No suitable habitat exists within the Survey Area.
Western Whipbird (western heath) [<i>Psophodes nigrogularis</i> subsp. <i>nigrogularis</i>]	T	T	The western heath subspecies of the Western Whipbird is known only to occur in one small population in south Western Australia, in the Two-Peoples Bay- Mt Manypeaks region. The population at Two Peoples Bay-Mt Manypeaks region is estimated as less than 100 pairs and occurs in dense coastal heath (Simpson <i>et al.</i> 2004, Smith, 1991). The preferred habitat is thicket, a 2-3m high formation of varied floristic composition. Other vegetation associations are used infrequently, although all nests are usually found in dense heath adjacent to areas of thicket (Smith, 1991). Restricted to a small coastal strip east of Albany from Two Peoples Bay and Mount Gardner in the south west to about Cape Riche Road in the north east, with the South Coast Highway as an approximate inland boundary. In this area it occurs in heath-like thicket associations on coastal dunes and in low, dense mallee woodland or shrubland with understorey of dense, stunted shrubs	Unlikely. The western heath subspecies of the Western Whipbird is restricted to the dense coastal heath in the Two-Peoples Bay- Mt Manypeaks region, east of the Survey Area. Given this species very specific habitat it is unlikely to occur in the Survey Area.
Malleefowl (<i>Leipoa ocellata</i>)	T	T	Malleefowl are large and distinctive ground-dwelling birds. They occur in shrublands and low woodlands that are dominated by mallee vegetation throughout the wheatbelt and Jarrah forests, and coastal areas east of Waychincup.	Highly unlikely. No suitable habitat present. Out of current known range.
Fork-tailed Swift, Pacific Swift (<i>Apus pacificus</i>)	IA	IA	See main text	Possible. See discussion in main text.
Glossy ibis (<i>Plegadis falcinellus</i>)	NL	IA	Non-breeding visitor to the south-west of Western Australia. Requires shallow water and mudflats, so is found in well-vegetated wetlands, floodplains (http://www.birdlife.org.au/bird-profile/glossy-ibis)	Highly unlikely. No suitable habitat present.
Masked Owl (southern subsp) (<i>Tyto novaehollandiae</i> subsp. <i>Novaeahollandiae</i>)	NL	P3	See main text.	Possible. See discussion in main text.

Taxon	EPBC Act Listing	State Listing	Habitat	Likelihood of Occurrence
Migratory Shorebirds				
Lesser Sand Plover (<i>Charadrius mongolus</i>)	T & IA	T & IA	Shorebirds are a group of wading birds that can be found feeding on swamps, tidal mudflats, beaches and open country. All those listed are migratory and do not breed in Australia, except for the Hooded Plover which breeds on sandy beaches, and also occurs on inland salt lakes in the South West of WA.	Highly Unlikely. No suitable habitat exists within the Survey Area.
Great Knot (<i>Calidris tenuirostris</i>)	T & IA	T & IA		
Curlew Sandpiper (<i>Calidris ferruginea</i>)	T & IA	T & IA		
Ruddy Turnstone (<i>Arenaria interpres</i>)	IA			
Sharp-tailed Sandpiper (<i>Calidris acuminata</i>)	IA	IA		
Sanderling (<i>Calidris alba</i>)	IA	IA		
Red-necked Stint (<i>Calidris ruficollis</i>)	IA	IA		
Greater Sand Plover (<i>Charadrius leschenaultii</i>)	T & IA	T & IA		
Bar-tailed Godwit (<i>Limosa lapponica</i>)	T & IA	T & IA		
Black-tailed Godwit (<i>Limosa limosa</i>)	IA	IA		
Whimbrel (<i>Numenius phaeopus</i>)	IA	IA		
Pacific Golden Plover (<i>Pluvialis fulva</i>)	IA	NL		
Grey Plover (<i>Pluvialis squatarola</i>)	IA	NL		
Grey-tailed Tattler (<i>Tringa brevipes</i>)	IA	IA & P4		
Wood Sandpiper (<i>Tringa glareola</i>)	IA	IA		
Ruff Reeve (<i>Philomachus pugnax</i>)	IA	IA		
Hooded Plover (<i>Charadrius rubricollis</i>)	T	P4		
Reptiles				
Short-nosed Snake (<i>Elapognathus minor</i>)	NL	P2	See main text	Possible. See discussion in main text.
Fish				
Balston's Pygmy Perch (<i>Nannatherina balstoni</i>)	NL	T	Balston's Pygmy Perch inhabits acidic, tannin-stained freshwater pools, streams and lakes in peat flats within 30 km of the coast Margaret River and Two People's Bay. Typically found in freshwater with a pH range of 3.0–6.5 and seasonally fluctuating temperatures of 11–30 °C. It is typically found amongst inundated riparian vegetation where it is thought to feed and spawn, though adults are also found in open water. Larvae tend to be confined to shallow water < 10 cm deep amongst the flooded riparian vegetation, and as the larvae increase in size they gradually move to deeper waters (Morgan <i>et al.</i> 1995).	Highly Unlikely. No suitable habitat exists within the Survey Area.
Western Mud Minnow (<i>Galaxiella munda</i>)	NL	T	Occurs in swift flowing streams within karri forests and is typically found near submerged vegetation, occasionally in the still water of ponds, swamps and roadside drains, and often inhabiting darkly tannin-stained and acidic water	Highly Unlikely. No suitable habitat exists within the Survey Area.
Pouched Lamprey (<i>Geotria australis</i>)	NL	P1	Adults spawn in the headwaters of freshwater rivers and streams, and when the larvae or ammocoetes hatch, they drift downstream and burrow into soft muddy sediments. They spend the next few years filter-feeding on micro-organisms from the water above. After metamorphosis, young adults migrate downstream to estuaries and coastal waters, where they feed parasitically by rasping flesh from other fishes with their toothy tongues. They eventually cease feeding and migrate back to freshwater to breed (Bray and Gomon 2011)	Highly Unlikely. No suitable habitat exists within the Survey Area.
Black-stripe Minnow (<i>Galaxiella nigrostriata</i>)	NL	T	Found only in coastal wetlands of south-west Western Australia. During summer when ephemeral pools dry out they burrow into the moist soil below and aestivate until the rains return in autumn (Bray and Gomon 2011)	Highly Unlikely. No suitable habitat exists within the Survey Area.

Taxon	EPBC Act Listing	State Listing	Habitat	Likelihood of Occurrence
Invertebrates				
Carter's Freshwater Mussel (<i>Westralunio carteri</i>)	NL	T	The current distribution is restricted to freshwater streams, rivers, reservoirs and lakes within 50-100 km of the coast with mean salinity <1.6 ppt. Patchy distribution in sandy/muddy sediments with greatest densities associated with exposed submerged tree roots (<i>Eucalyptus rudis</i> , <i>Melaleuca</i> spp. and others), woody debris and overhanging riparian vegetation near stream banks and edges of lakes/dams; Precise habitat requirements and quantification of density within habitat types are in the early stages of study for this species; juveniles may require specific micro-habitats and are difficult to locate in the wild. Semi-parasitic, therefore requires presence of host fish species.	Highly Unlikely. No suitable habitat exists within the Survey Area.
Banksia brownii plant-louse (<i>Trioza barrettae</i>)	NL	T	Current records from the Stirling Range NP and the Vancouver Peninsula (Taylor and Moir 2014). It is closely associated with its only known host plant <i>Banksia brownii</i> .	Highly Unlikely. No <i>Banksia brownii</i> populations are present within Survey Area.
Western Archaeid Spider (<i>Zephyrarchaea mainae</i>)	NL	T	Associated with Gondwanan refugial habitats. Requires long unburnt low coastal peppermint (<i>Agonis flexuosa</i>) woodland with a coastal heath understorey and leaf litter accumulating on top of the understorey sedges (<i>Lepidosperma</i> and <i>Restionaceae</i>) which remain most throughout the year (Rix and Harvey 2009). Specimens have been collected by beating and sifting sedges (<i>Lepidosperma</i> sp.), curly grass (<i>Empodisma gracillimum</i>) and low shrubs in dense coastal or near-coastal groves of Peppermint (<i>Agonis</i> sp.), with several outlying populations also known from wet Karri (<i>Eucalyptus diversicolor</i>) forest (Rix and Harvey 2012).	Highly unlikely, no suitable habitat exists within the Survey Area
Woollybush Bee (<i>Hylaeus globuliferus</i>)	NL	P3	See main text	Possible. See discussion in main text.
Albany Land Snail (<i>Helicarion castanea</i>)	NL	EX	Unknown.	Highly Unlikely. Habitat unknown. Presumed Extinct

13 APPENDIX F - Protected Matters Search (see attachment)
