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Flora and Fauna Significance Assessment

Capel Tutunup Road, Tutunup

18 October 2019

Prepared for:
City of Busselton

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Document Control

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1 Introduction

Ecosystem Solutions were contracted by the City of Busselton to survey a portion of Capel Tutunup Road, Tutunup (hereafter called the "Site") within the City of Busselton, to document the presence and distribution of flora and fauna as part of the process to widen this portion of the road.

The fauna species specifically targeted were the Western Ringtail Possum (*Pseudocheirus occidentale)* and signs or suitable habitat for Black Cockatoo Species (*Calyptorhynchus baudinii, C. latirostis* and *C.banksii subsp. naso)* as well as any other significant fauna likely to occur within the proposed area of disturbance.

The flora elements specifically targeted includes Threatened and Priority species and Threatened or Priority Ecological Communities.

The flora and fauna assessment was limited to observing the species present during the time of the surveys.

2 Site Details

The Site is a portion of Capel-Tutunup Road, Tutunup, approximately 3.5 km in length, within the City of Busselton (Figure 1).

The Site includes areas of remnant vegetation as well as areas that have previously been cleared. The Site sits approximately 25 m AHD (Australian Height Datum) to the north and rises to the south to approximately 35 m AHD.

The surrounding area consists of rural lots with extensive areas that have been cleared for agricultural purposes, with patches of remnant and planted vegetation.

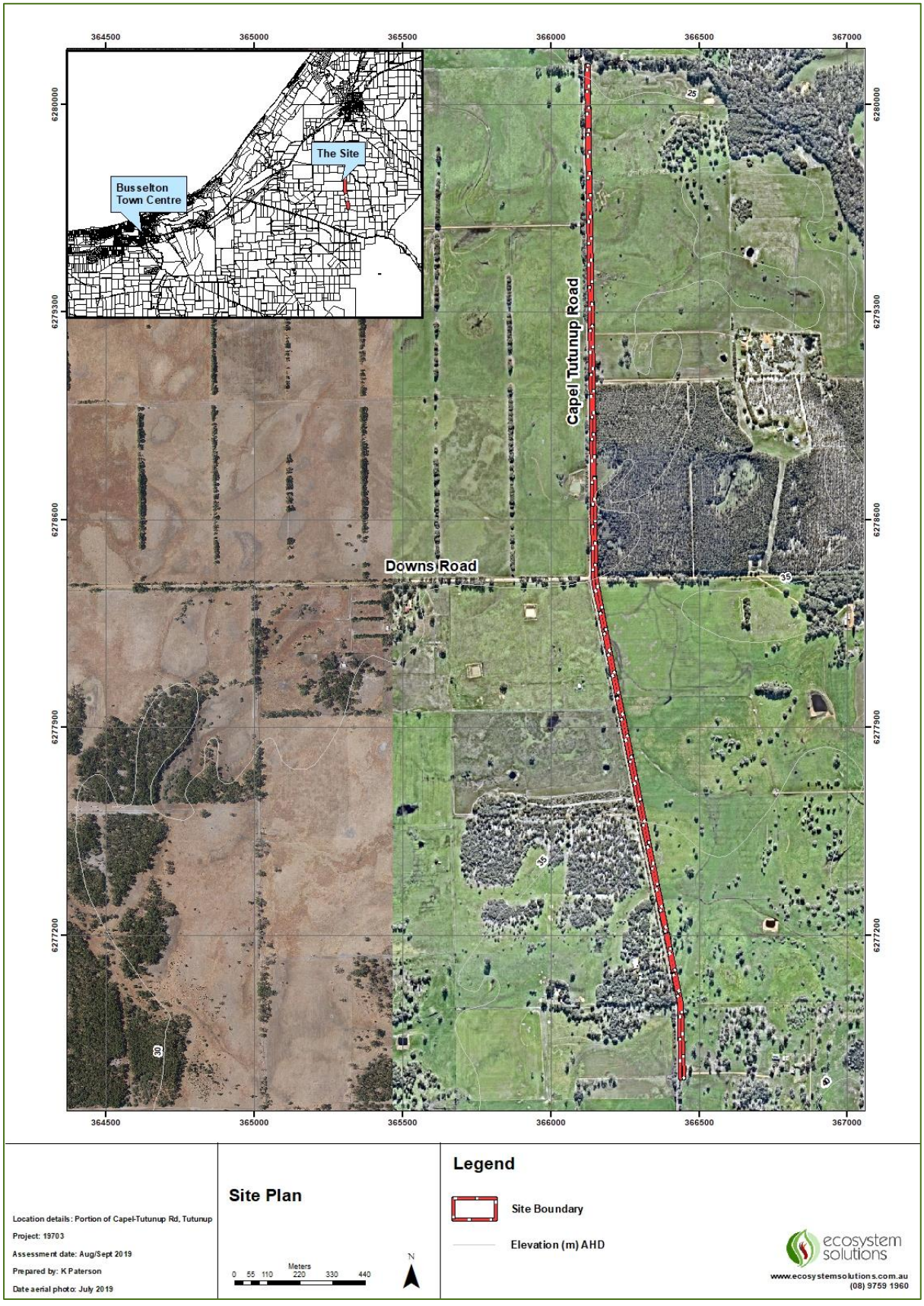

Figure 1 Site Plan for portion of Capel-Tutunup Road, surveyed by Ecosystem Solutions

3 Flora and Vegetation

3.1 Desktop Analysis

3.1.1 Landscape, Soils and Vegetation

Soil-Landscape systems are areas with recurring patterns of landforms, soils and vegetation and are used by the Department of Agriculture to maintain a consistent approach to land resource surveys.

The Site is located within the Pinjarra Soil-Landscape Zone which consists of alluvial deposits between the Bassendean Dunes Zone and the Darling Scarp and colluvial and shelf deposits adjacent to the Darling Scarp. Soils of this zone are typically clayey to sandy alluvial soils with wet areas (Figure 2 and 3). These soils are further classified as soil systems (DPIRD, 2019).

The Abba System represents the soils of the Site, these are located on the southern Swan Coastal Plain and consists of deep, grey, sandy duplex and wet soils on poorly drained flats (DPIRD, 2019). The Site represents five sub-soil systems;

- Abba Flats System (213AbAB1) - Flats and low rises with sandy grey brown duplex (Abba) and gradational (Busselton) soils.
- Abba Deep Sandy Rises (213AbABd) Gently sloping low dunes and rises (0-5% gradients) with deep bleached sands.
- Abba Wet Flats (213AbABw) Winter wet flats and slight depressions with sandy grey brown duplex (Abba) and gradational (Busselton) soils.
- Abba Wet Ironsone Flats (213AbABwi) Winter wet flats and slight depressions with shallow red brown sands and loams over ironstone (i.e. bog iron ore soils).
- Abba Wet Vales (213AbABvw) Small narrow swampy depressions along drainage lines. Alluvial soils.

The vegetation mapping of Havel and Matiske (2000) identifies the Site (Figure 4 and 5) as being located on the Abba Vegetation Complex (Heddle, Loneragan and Havel,1980).

Updated Heddle et.al (1980) vegetation complex descriptions by Webb, Kinloch, Keighery & Pitt (2016) define the Abba Complex vegetation

- Abba Complex - is dominated by an open-forest of marri, jarrah, banksia and a woodland of marri with the presence of the occasional mountain gum adjacent to the Whicher Scarp. Common plant species include *Nuytsia floribunda*, *Kingia australis*, *Persoonia longifolia* and *Banksia grandis*. The low-lying areas along the creeks and on the flood plains support a woodland of *E. rudis*, *Melaleuca* spp., with common species including *M. preissiana*, *M. rhaphiophylla*, *Regelia ciliata*, *Hypocalymma angustifolia*, *Pericalymma ellipticum*, *Hakea varia*, *Acacia saligna*, *Astartea scoparia*, *A. leptophylla*, *Viminaria juncea* and sedges of the *Chaetanthus, Schoenus, Hypolaena* and *Anarthria* genera.

Vegetation Complex statistics for the Swan Coastal Plain indicate the vegetation extent remaining of the Abba Complex to be 6.7%. (Webb, et al., 2016).

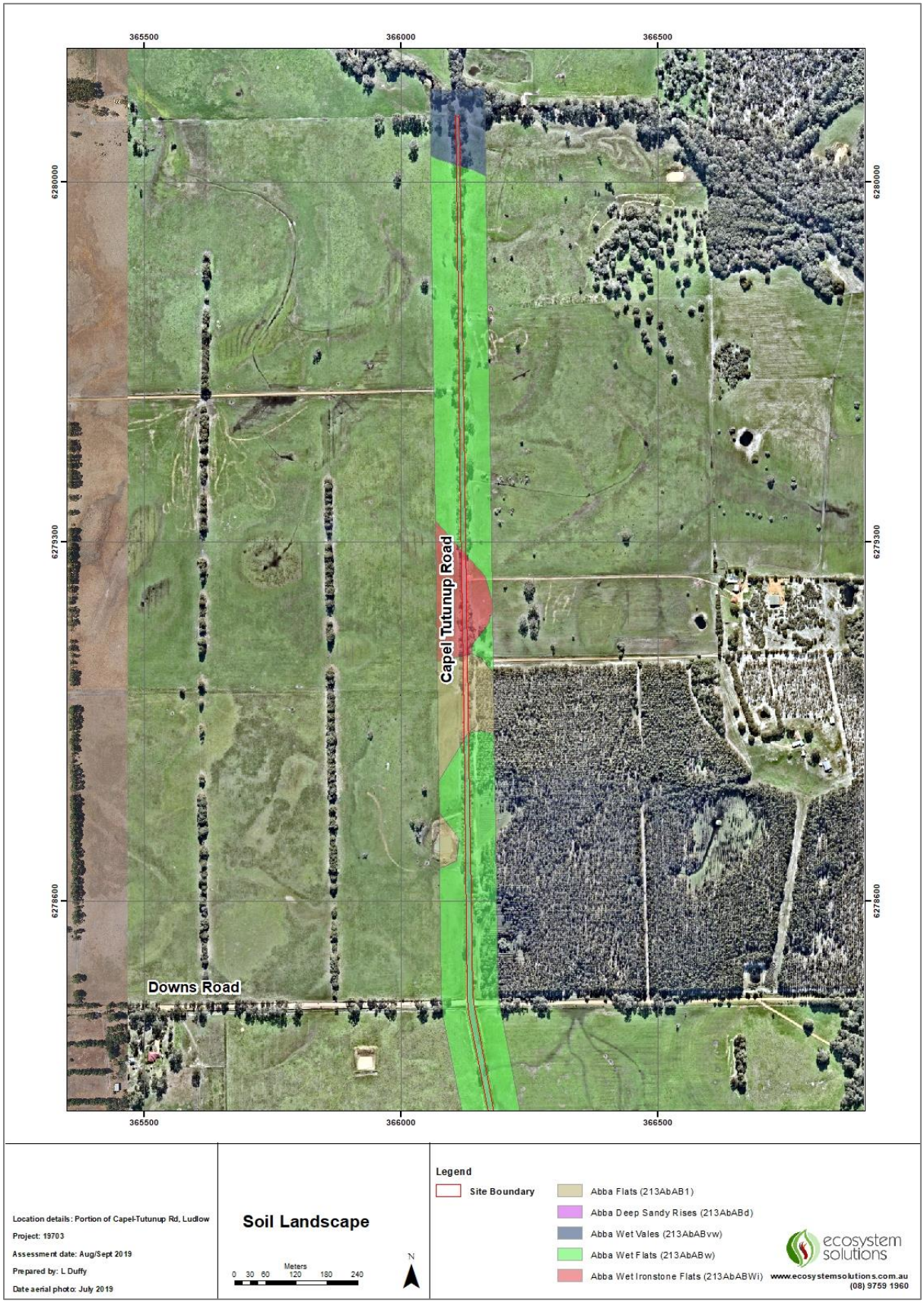

Figure 2 Soil Landscape Mapping, Capel-Tutunup Road, Tutunup (north of Site)

Figure 3 Soil Landscape mapping, Capel-Tutunup Road, Tutunup (continued, south of Site).

Figure 4 Vegetation Complex Mapping, Capel-Tutunup Road, Tutunup (north of Site).

Figure 5 Vegetation Complex Mapping, Capel-Tutunup Road, Tutunup (continued, south of Site)

3.1.2 Threatened and Priority Flora

Extracts from the Department of Parks and Wildlife (DPaW) Nature Base Database (Appendix A) and the Commonwealth Environmental Protection and Biodiversity Conservation (EPBC) Protected Matters Search Tool (Appendix B) were obtained to determine if records of any rare or threatened flora are known within the boundary or in vicinity of the Site. A preliminary reconnaissance survey of the results of the desktop study was conducted, consistent with a Reconnaissance Survey Flora and Vegetation Survey (EPA, 2016).

Species of flora and fauna are protected as defined in Table 1, have been determined that their populations are restricted geographically or threatened by local processes. DBCA recognizes these threats of extinction and consequently applies regulations towards population and species protection. Protected species are gazetted under the *Biodiversity Conservation Act (2016)* and therefore it is an offence to "take" or damage rare flora without Ministerial approval. The act defines "to take" as "… to gather, pick, cut, pull up, destroy, dig up, remove or injure the flora or to cause or permit the same to be done by any means" (Government of Western Australia, 2010).

Appendix C presents the definitions for conservation codes under the *Biodiversity Conservation Act (2016)* which was previously the *Wildlife Conservation Act 1950*.

3.1.3 Threatened and Priority Ecological Communities

An ecological community is a naturally occurring biological assemblage that occurs in a particular habitat. A Threatened Ecological Community (TEC) is one which is found to fit into one of the following categories: Presumed Totally Destroyed; Critically Endangered; Endangered, or Vulnerable.

Possible TECs that do not meet survey criteria are added to the Department of Parks and Wildlife's Priority Ecological Community Lists, under Priority 1, 2 and 3. These are ranked in order of priority for survey and/or the definition of the community and evaluation of its conservation status.

3.2 Targeted Survey

A preliminary survey was undertaken at the Site on 19th July 2019 by Gary McMahon(B.Sc. M. Env Mgmt, PG Dip Bushfire Protection) to look for the distinctive leaves of Drakea elastica. Another preliminary survey was conducted on 12th August 2019 by Kelly Paterson (B.Sc Hons. Nat Rs Mgmt., SL012472) and Dani Cuthbert (Dip Bus & Dip TM). Subsequent site survey was undertaken on 20th August by Kelly Paterson, Dani Cuthbert and Lorraine Duffy (B.Sc Env Biology, B.Arts Geo) to record conservation significant species. A final floristic survey was undertaken on 12 September 2019 by Kelly Paterson, Dani Cuthbert, Gary Mc Mahon and Nathan Mc Quoid (DRF Permit: 55-1819, SOPP: SL12476).

The Site was walked in a systematic manner, focusing on the proposed areas of disturbance. Zones with consistent vegetation structure and composition were noted and the main species in each of the strata were identified and recorded through relevés (Appendix D). All potentially suitable habitats within the Site were systematically searched for significant flora or vegetation, with specific targets being based on the Department of Biodiversity Conservation and Attractions database records.

3.3 Results

The NatureMap Database (DBCA – Appendix A) and Protected Matters Search Tool (PMST, DoEE – Appendix B) identified 15 Threatened (T) species and 34 Priority species which are likely to occur within the area or the critical habitat for a species is likely to occur within the area (Table 2).

Table 1 Protected Flora Likely to Occur Within 5 km of the Site (Protected Matters Search Tool & NatureMap)

SPECIES	LIFEFORM	HABITAT	DCBA CONSERVATION CODE	EPBC ACT STATUS
Acacia flagelliformis	Shrub	Sandy soils and winter-wet areas	P4	
Acacia semitrullata	Shrub	White/grey sands, sandplains and swampy areas	P4	
Adelphacme minima	Herb	Grey sand. Peaty swampy areas.	P3	
Andersonia ferricola	Shrub	White sand or red-brown loam over ironstone, seasonally wet flats	P1	
Angianthus drummondii	Herb	Grey or brown clay soils, ironstone. Seasonally wet flats	P3	
Aponogeton hexatepalus	Aquatic Herb	Freshwater: ponds, rivers, claypans and drainage lines	P4	
Banksia meisneri subsp. ascendens	Shrub	White or grey sand. Swampy flats.	P4	
Banksia nivea subsp. uliginosa	Shrub	Sandy clay, gravel	Threatened	Endangered
Banksia squarrosa subsp. argillacea	Shrub	White/grey sand, gravelly clay or loam. Winter-wet flats, clay flats	Threatened	Vulnerable
Blennospora doliiformis	Herb	Grey or red clay soils over ironstone. Seasonally wet flats	P3	
Boronia anceps	Herb	White sand, gravelly laterite. Seasonally swampy heaths.	P3	
Boronia humifusa	Herb	Gravelly clay loam over laterite. Jarrah-marri open forest.	P1	
Boronia tetragona	Shrub	White/Grey or black sand. Winter-wet swamps, hillslopes	P3	

SPECIES	LIFEFORM	HABITAT	DCBA CONSERVATION CODE	EPBC ACT STATUS
Brachyscias verecundus	Herb	Winter-wet clays over ironstone	Threatened	Critically Endangered
Caladenia huegelii	Herb	Grey or brown sand, clay loam	Threatened	Endangered
Caladenia procera	Herb	Alluvial loamy flats	Threatened	Critically Endangered
Caladenia speciosa	Herb	White, grey or black sand	P4	
Calothamnus quadrifidus subsp. teretifolius	Shrub	Winter-wet areas	P4	
Calytrix retrorsifolia		Shallow red clays and/or yellow sands over massive ironstones at the base of the Whicher Range	P2	
Chamelaucium sp.S coastal plain		Winter-wet sandy clay sites in low woodlands and heathland	Threatened	Vulnerable
Chordifex gracilior	Herb	Wet heathlands and sedgelands	P3	
Darwinia whicherensis		Winter-wet area of shrubland over shallow red clay over ironstone at the base of the Whicher Range	Threatened	
Drakaea elastica	Herb	White or grey sand, low lying situations adjoining winter-wet swamps	Threatened	Endangered
Franklandia triaristata	Shrub	White or grey sand	P4	
Gastrolobium papilio	Shrub	Sandy clay over ironstone and laterite. Flat plains	Threatened	Endangered
Grevillea elongata	Shrub	Gravelly clay, sandy clay, sand	Threatened	Vulnerable

SPECIES	LIFEFORM	HABITAT	DCBA CONSERVATION CODE	EPBC ACT STATUS
Grevillea maccutcheonii	Shrub	Shallow soils over laterite, clay. Seasonally inundated areas	Threatened	Critically Endangered
Hakea oldfieldii	Shrub	Red clay or sand over laterite seasonally wet flats	P3	
Isopogon formosus subsp. dasylepis	Shrub	Sand, sand clay, gravelly sandy soils over laterite. Swampy areas	P3	
Lambertia echinata subsp. occidentalis	Shrub	White sandy soils over laterite, orange/brown-red clay over ironstone. Flat to foothills, winter wet sites	Threatened	Endangered
Leptomeria furtiva	Shrub	Grey or peaty sand, winter-wet flats.	P2	
Lepyrodia extensa	Herb	Sand and sandy peat. Seasonally inundated swamps	P2	
Leucopogon sp. Busselton	Shrub	Variety of habitats	P2	
Loxocarya magna	Herb	Sand, loam, clay, ironstone, seasonally inundated or damp habitats	P3	
Meionectes tenuifolia	Shrub	Claypans.	P3	
Myriophyllum echinatum	Herb	Clay. Winter-wet flats.	P3	
Ornduffia submersa	Aquatic Herb	Heavy clay soils that are generally inundated from winter to mid-summer	P4	
Petrophile latericola	Shrub	Winter-wet flats on red sandy clay over ironstone	Threatened	Endangered
Schoenus benthamii	Herb	White grey sand, winter-wet flats, swamps	P3	
Schoenus loliaceus	Herb	Sandy soils. Winter-wet depressions	P2	

SPECIES	LIFEFORM	HABITAT	DCBA CONSERVATION CODE	EPBC ACT STATUS
Schoenus natans	Herb	Winter-wet depressions	P4	
Stylidium paludicola	Herb	Peaty sand over clay. Winter wet habitats	P3	
Stylidium squamellosum	Herb	Brown to red-brown clay loam. Winter-wet habitats	P2	
Synaphea hians	Shrub	Sandy soils	P3	
Tetraria australiensis	Herb	Creeklines	Threatened	Vulnerable
Tripterococcus sp. Brachylobus	Herb	Winter wet areas	P4	
Verticordia attenuata	Shrub	White or grey sand	P3	
Verticordia densiflora var. pedunculata	Shrub	Light yellow or grey sands in low lying winter-wet areas	Threatened	Endangered
Verticordia lindleyi subsp. lindleyi	Shrub	Sand, sandy clay. Winter wet depressions	P4	
Verticordia plumosa var. vassensis		Variety of sands and swampy clay soils in mostly winter-wet flats and depressions	Threatened	Endangered

There were no Declared Rare Flora observed on Site. Three Priority 4 species were identified during the flora surveys.

*Aponogeton hexatepalus (*Stalked Water Ribbons - Figure 6) an aquatic herb was observed along both roadside gullies, to the north of Downs Road (Figure 11). The population was observed to contain a higher number of individuals on the eastern side of the road. This species relies on seasonally wet areas and it is possible the area this species covers could be more extensive in wetter years. All areas with potential to be seasonally wet within proximity to this population should be regarded as having the potential to support this species.

Acacia semitrullata (see Figure 7) was located on the southern end of the Site area, south of Downs Road, on the western side of the road (Figure 12).

Figure 6 Aponogeton hexatepalus (Priority 4)

Figure 7 Acacia semitrullata (Priority 4)

Eucalyptus rudis subsp. cratyantha (Figure 8) while not listed by Nature Map or the Protected Matters Search was recorded on both sides of the road, at the most northern and southern points of the Site (Figure 10 and 12).

Figure 8 Eucalyptus rudis subsp. cratyantha (Priority 4)

Relevés where these species where recorded are shown in Figure 9. The locations of the Priority Species observed were record and are shown in Figures 10, 11 and 12.

Figure 9 Relevé Points at Capel Tutunup Road, with Priority flora species recorded

Figure 10 Priority Flora, Capel-Tutunup Road, Tutunup

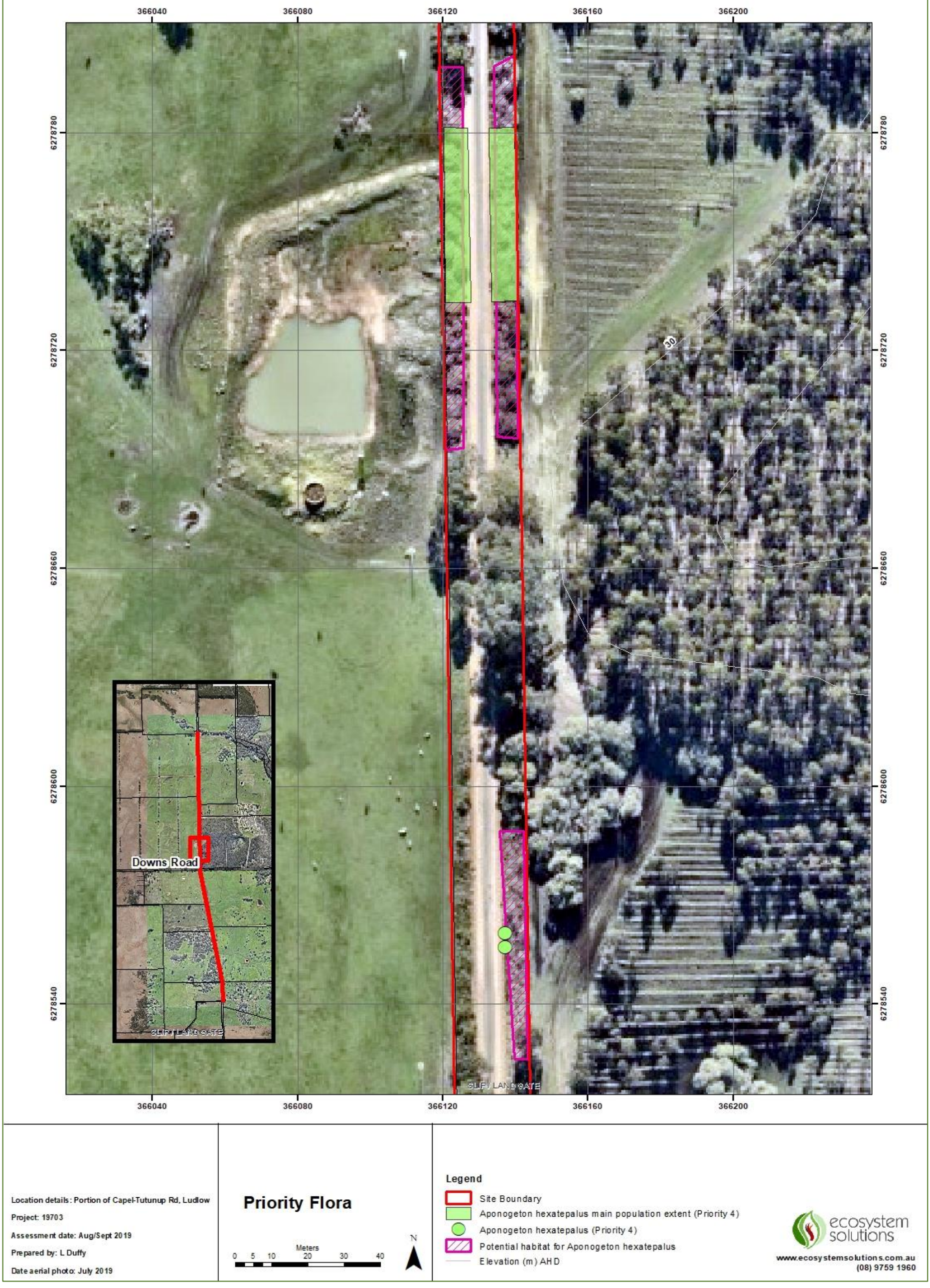

Figure 11 Priority Flora continued, Capel-Tutunup Road, Tutunup

Figure 12 Priority Flora continued, Capel-Tutunup Road, Tutunup

4 Fauna

4.1 Desktop Analysis

The conservation status of fauna within Western Australia is determined by criteria outlined within two acts of legislation: Commonwealth EPBC Act 1999 and the State-based Western Australian *Biodiversity Conservation Act 2016* (WA). The conservation codes for fauna under the *Biodiversity Conservation Act (2016)* which was previously the *Wildlife Conservation Act 1950* are presented in Appendix C. These categories are consistent with the International Union for Conservation of Nature (IUCN) classifications and therefore link into a global ranking system for taxa at risk of extinction.

A desktop study and analysis of the records of NatureMap and the Protected Matters Search Tool (Appendix A & B) were made to determine the presence or likely presence of fauna or faunal assemblages within the Site. The analysis primarily targeted terrestrial threatened vertebrate species listed under the *Biodiversity Conservation Act 2016* (WA) and *Environmental Protection Biodiversity Conservation Act 1999* (Commonwealth). A list of fauna expected to occur within a 5-kilometre radius of the Site was compiled from searches conducted on the DBCA database (NatureMap) and the Commonwealth EPBC Protected Matters Search Tool (Table 3).

The results of the native fauna database search for species likely to be within or utilising the Site are listed below (Table 2). Note marine species have been due to the location and lack of permanent water within the Site.

Table 2 Protected Fauna Likely to Occur Within 5 km of the Site (Protected Matters Search Tool & NatureMap)

SPECIES	COMMON NAME	STATUS	HABITAT
Pseudocheirus occidentalis	Western Ringtail Possum, Ngwayir	Critically Endangered	Coastal Areas of Peppermint woodland and peppermint /tuart associations
Calyptorhynchus baudinii	Baudin's cockatoo	Endangered	Dense Jarrah, Karri and Marri Forests. Species nests in large hollows in these species
Calyptorhynchus latirostris	Carnaby's cockatoo	Endangered	Dense Jarrah, Karri and Marri Forests. Species nests in large hollows in these species
Calyptorhynchus banksii subsp. *naso*	Forest red-tailed black cockatoo	Vulnerable	Dense Jarrah, Karri and Marri Forests. Species nests in large hollows in these species
Dasyurus geoffroii	Chuditch, Western quoll	Vulnerable	Variety, most dense in riparian jarrah forests. Require large unfragmented habitats
Westralunio carteri	Carter's Freshwater Mussel	Vulnerable	Freshwater lakes, rivers and streams.
Tyto novaehollandiae subsp. *novaehollandiae*	Masked Owl (southwest)	P3	Tall open eucalypt forest and woodlands. Preferred roosts large hollows in standing trees.
Hydromys chrysogaster	Water-rat, Rakali	P4	Areas of permanent fresh or brackish water, drainage swamps
Isoodon obesulus fusciventer	Quenda, Southern Brown Bandicoot	P4	Forest, woodland, shrub and heath, usually in sandy soils with dense healthy vegetation in lower stratum
Macropus irma	Western Brush Wallaby	P4	Favours open, seasonally damp areas with low grasses and open scrubby brush.
Oxyura australis	Blue Billed Duck	P4	Deep freshwater areas with dense vegetation.
Falsistrellus mackenziei	Western False Pipistrelle	P4	Wet sclerophyll forests.
Falco peregrinus	Peregrine Falcon	OS (Specially Protected)	Wide variety
Phascogale tapoatafa	Brush-tailed Phascogale	OS (Specially Protected)	Highly arboreal, prefers open forest with sparse groundcover.
Phascogale tapoatafa wambenger	South-western Brush-tailed Phascogale, Wambenger	OS (Specially Protected)	Highly arboreal, prefers open forest with sparse groundcover.

4.2 Field Survey

A field study of the Site was conducted, with a focus on the species identified in the desktop analysis. The approach adopted for this survey was:

- A Satellite Image of the Site was acquired.
- A day time visual inspection of the property and adjoining vegetation for any signs of fauna (e.g. scats, diggings, dreys, nests, burrows, feeding signs) was conducted.
- Hollow bearing trees or trees suitable for Black Cockatoos were recorded.
- Direct observations of fauna and signs of fauna were recorded using a Trimble Global Positioning System (GPS) and ArcPad© (Version 8- ESRI).
- Two, non-consecutive, night time spotlight surveys were conducted to determine fauna activity. A 40 w LightForce hand-held spotlight was used with white light. Observations were recorded using GPS and ArcPad©.
- Two pre-dawn and two dusk surveys were conducted to determine Black Cockatoo activity. A spotting scope was used in these surveys to identify any other birds within the Site.
- Field observations were analysed and mapped with ArcGis (ArcMap V10.3©).

The Site was traversed, and trees inspected via a physical inspection for hollows or signs of fauna usage.

All trees with large hollows were inspected for any signs of use by cockatoos. These include wear around the hollow, chewing, scarring and scratch marks on the trunks or branches. Old or recent evidence of cockatoo's feeding, nesting or roosting sites (feathers, droppings etc.) were also searched for.

This type of survey has minimal impact on the fauna within the Site and provides sufficient data on the presence and relative abundance and distribution of taxa. During the field surveys, the habitat at the Site was assessed to determine its potential suitability to host any of the anticipated threatened or priority species. This approach is consistent with a Level 1 survey under the EPA's Technical Guide: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (2010) which specifies a minimum requirement of a background research or desktop study to gather information on the subject site and a reconnaissance survey to verify the accuracy of the background study and delineate fauna and faunal assemblages.

The survey's protocol is also consistent with the requirements outlined in the Development Planning Guidelines for Western Ringtail Possums (CALM 2003, now DBCA).

Guidelines for the three Black Cockatoo species (Department of Sustainability, Environment, Water, Populations and Communities, 2011) outline requirements for appropriate level of surveys for these

species. This survey's intensity and design comply with these guidelines.

4.3 Results

The Site was surveyed on the 9, 19, 23 and 24 September 2019 by Gary McMahon (B.Sc. M. Env Mgmt). The Site was traversed in a systematic manner to cover the whole area.

Trees on site recorded a diameter at breast height (DBH) over 500 mm and having capacity to support nesting of any Black Cockatoo species.

The canopy of the vegetation within the Site was thoroughly inspected and there were no dreys observed.

The first nocturnal survey was conducted on 9 September 2019 pre sunset and following last light from 5:00 pm to 8:00 pm. The Site was traversed systematically to cover the entire area. Official sunset time was 6:06 pm with dusk (last light) at 6.30 pm. No fauna species, including Black Cockatoos were observed. The second nocturnal survey was conducted 23 September 2019 from 5:15 pm to 8:15 pm. This included the second dusk survey for black cockatoo species. The official sunset time was 6:15 pm with dusk at 6:40 pm.

A pre-dawn and dawn survey for any sign of Black Cockatoos was conducted on 19 September 2019 from 5:15 am to 7:15 am. Official sunrise time was 6:12 am with first light at 5:47 am. No Black Cockatoo or Western Ringtail Possum species were seen or heard during these surveys.

The second pre-dawn survey took place on 24 September 2019, between 5:00 am and 7:00 am. Dawn was at 6:05 am and first light was at 5:40 am. No Black Cockatoos were seen or heard during this survey.

The Site was traversed in a systematic fashion to ensure all habitat areas were inspected during these surveys. No fauna species were observed, and no Black Cockatoo species were observed or heard during the fauna survey. White Tailed Black Cockatoos' (*Calyptorhynchus sp.*) were however, observed foraging and socialising during the flora survey on 12 September between 10:00am and 11:30am (Figure 13). A positive identification on whether they were Carnaby's or Baudin's Cockatoos was not possible.

Figure 13 White Tailed Black-Cockatoo Foraging Site

A total of 125 Trees with a DBH over 500 mm were observed within the Site with, two trees observed with hollows or with the potential for hollows suitable for nesting of Black Cockatoo species (Tree details in Appendix E & Figure 15). White Tailed Black Cockatoos were seen foraging within the Site during the flora survey.

All local species of Black cockatoos can forage over extensive areas (up to 15-20 kms from their nesting sites (Saunders, 1980)) and given that there are larger areas of preferred habitat within their range, it could be assumed that Black Cockatoo species are not relying on the Site for habitat or food source.

The nocturnal survey did not identify a population of WRP or any other fauna of significance within the Site.

While no other animals of significance were observed, either directly or through signs, the lack of this data should not be taken directly as an indication that those species are absent from the Site. No trapping or seasonal sampling was conducted.

Table 3 summarises the likely presence of the species based on habitat availability for mammals. Table 4 and Table 5 discuss the likely presence and impact on Black Cockatoos.

The bird species protected under international agreements were not seen during the surveys.

The Carter's Freshwater Mussel, Blue Billed Duck, Western False Pipistrelle or Rakali were not identified nor was the species habitat. The Site has good drainage with no wetlands or permanent water body within the Site. It is unlikely these species are within the Site.

Table 3 Significant Fauna Likelihood and Impact

Species	Potential impact in the Site
Black Cockatoo Species	White Tailed Black Cockatoos were observed foraging in one area within the Site during the flora survey. These species can forage over large areas, with larger areas of preferred habitat within their range. It is unlikely the species is relying on the Site for habitat or food source.
Chuditch	This species is listed as being found within 5 km of the Site, however these are historical records and/or the habitat within the Site is not considered suitable. It is listed here for completeness and were not found within the Site.
Masked Owl (southwest)	No animals were observed during the surveys. No impact is anticipated, however a fauna spotter should be used to monitor any tree removal to ensure no animals are present at the time of any clearing.
Phascogale	Given their large home range required (20-70 ha) and minimal vegetation to be cleared on Site with no evidence of the species found, there is no impact anticipated. A fauna spotter should be used to monitor any tree removal to ensure no animals are present at the time of any clearing.
Quenda	Quenda will thrive in more open habitat subject to introduced predator control. The vegetation within the Site contained an open understory with limited protection from predators. Quenda's may be located within the Site however none were identified during the survey.
Western Brush Wallaby	This specie is listed as being found within 5 km of the Site, however these are historical records and/or the habitat within the Site is not considered suitable. It is listed here for completeness and were not found within the Site.
Western Ringtail Possum	No dreys or animals were observed during the surveys. No impact is anticipated, however a fauna spotter should be used to monitor any tree removal to ensure no animals are present at the time of any clearing.

Figure 14 Significant Trees surveyed at Capel-Tutunup Road

Figure 15 Significant Trees surveyed continued at Capel-Tutunup Road

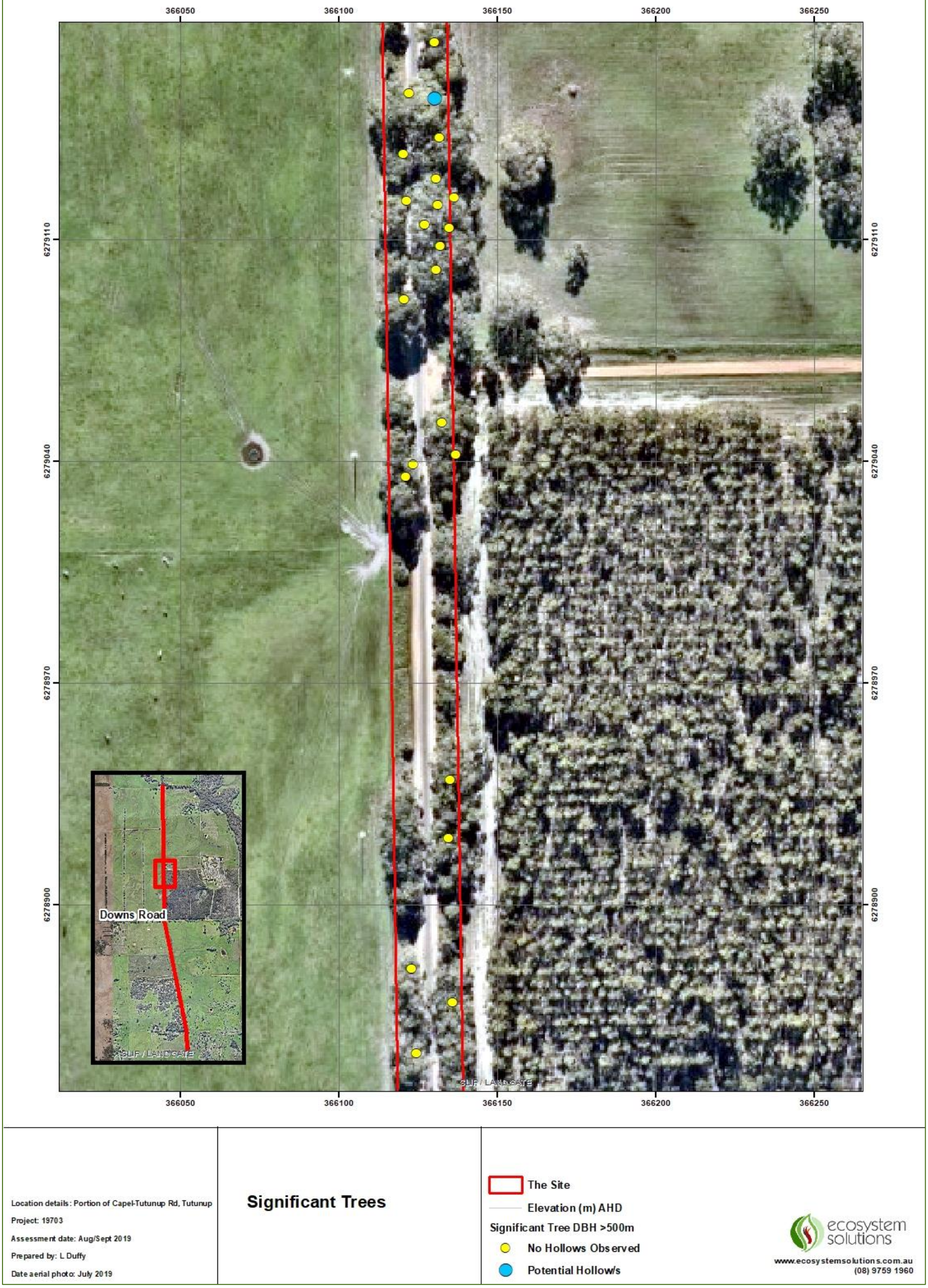

Figure 16 Significant Trees surveyed continued at Capel-Tutunup Road

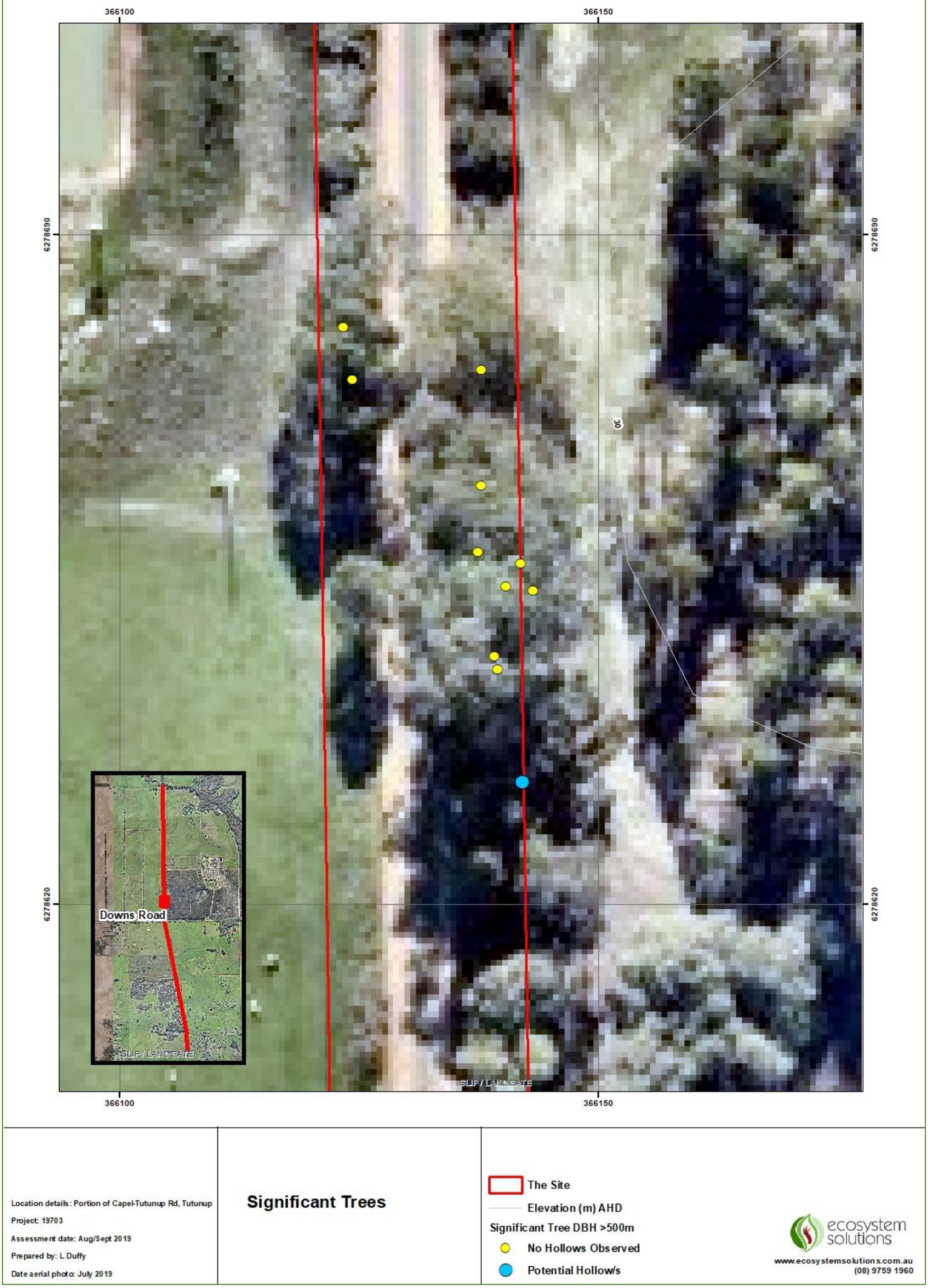

Figure 17 Significant Trees surveyed continued at Capel-Tutunup Road

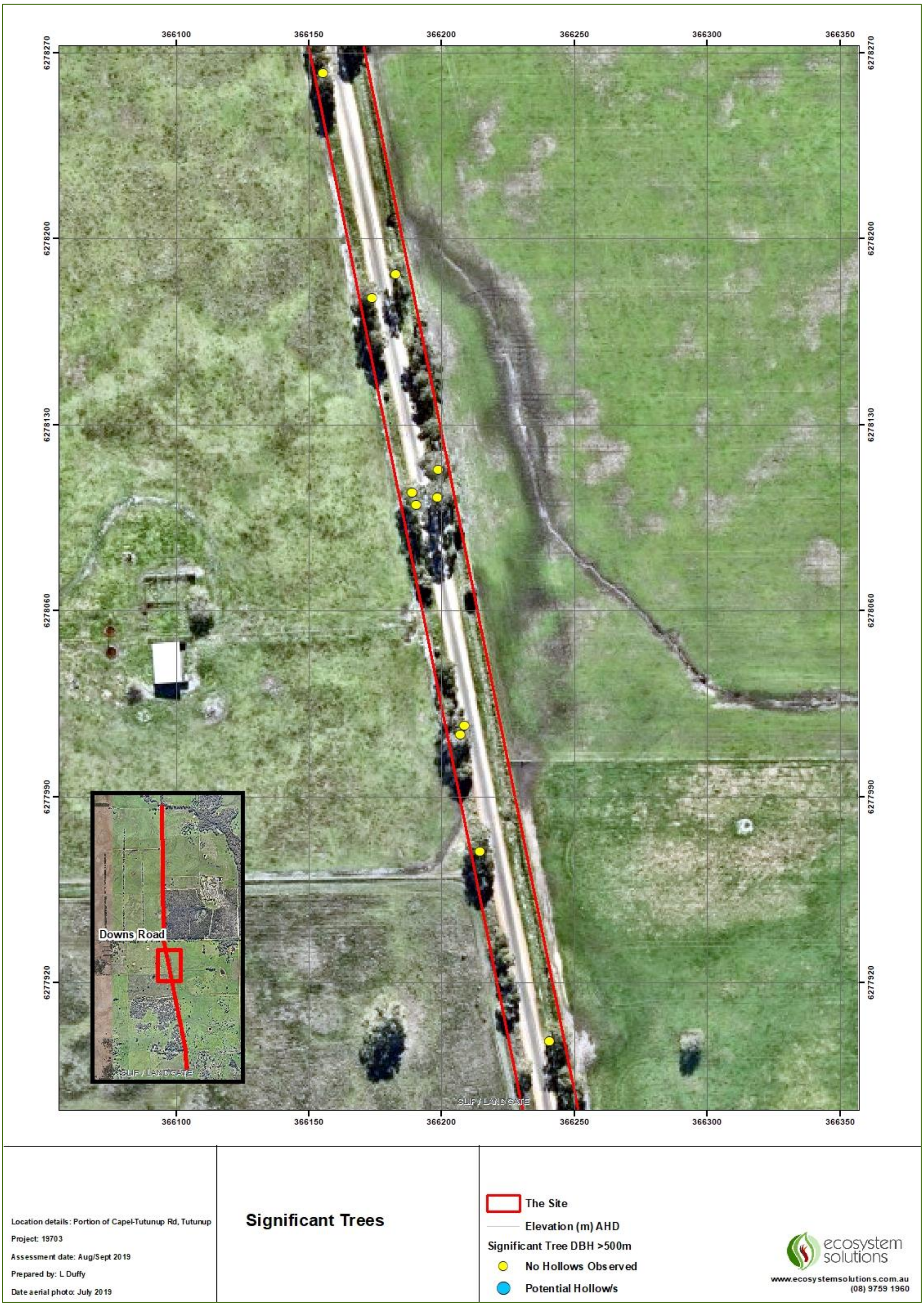

Figure 18 Significant Trees surveyed continued at Capel-Tutunup Road

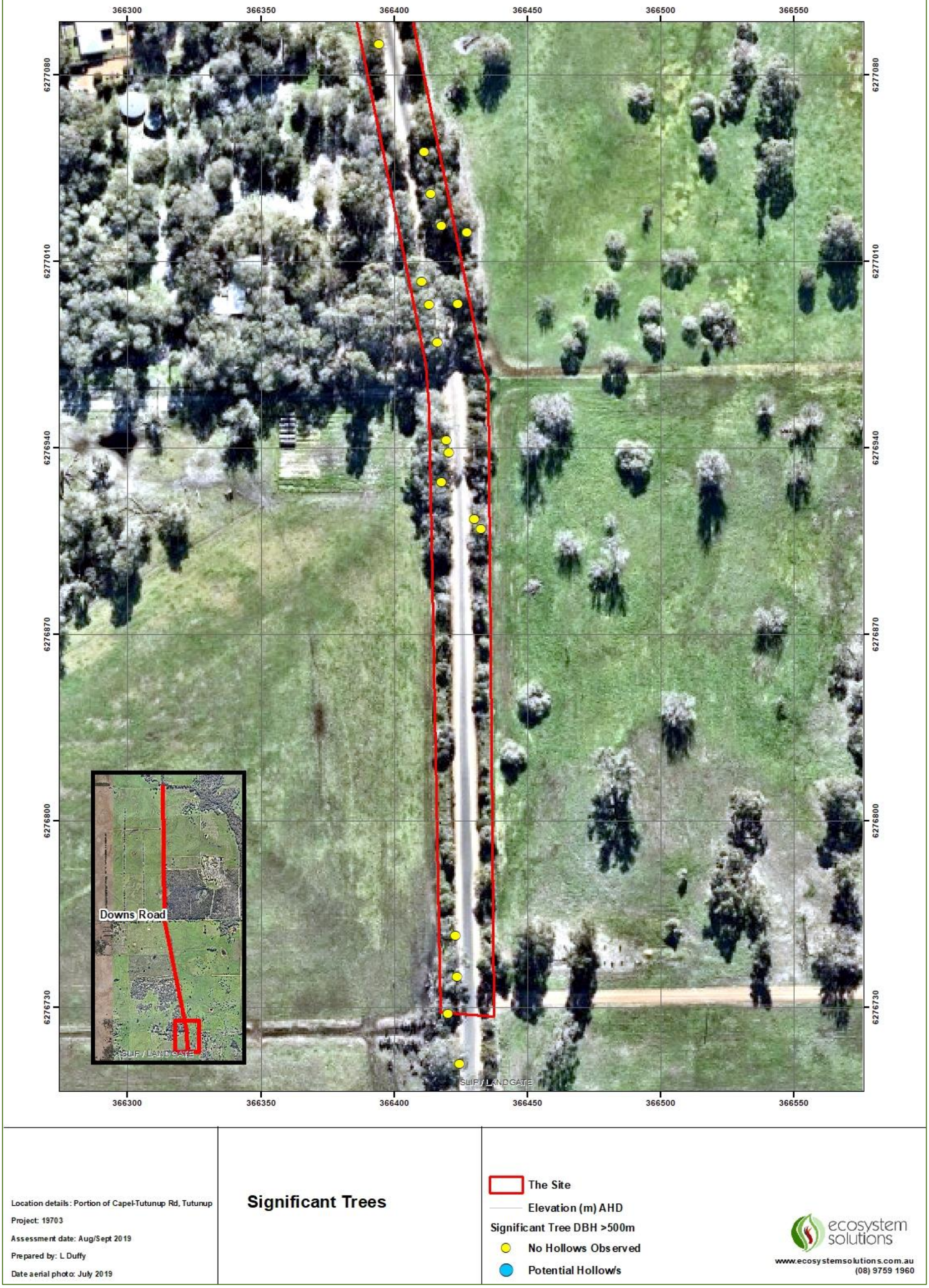

Figure 19 Significant Trees surveyed continued at Capel-Tutunup Road

5 Survey Constraints

Field surveys were confined to three-day flora surveys, two dawn fauna surveys and two dusk / nocturnal fauna spotlight surveys conducted over non-consecutive night. These were conducted to assess for Black Cockatoo and Western Ringtail Possum activity, along with any other conservation significant fauna and flora. All surveys were conducted using an experienced ecologist, with a head torch and a single hand-held spotlight used for the dusk and dawn / nocturnal fauna surveys.

The Site was traversed by foot in a systematic way.

All large trees of suitable size were examined from the ground for the presence of hollows. Guidelines for the survey techniques for Black Cockatoo species (Dept. of Sustainability, Environment, Water Populations and Communities, 2011) state that all trees with a DBH of over 500 m should be inspected. It should be noted however, that all of the prerequisites that determine the suitability of a hollow for use by cockatoos is difficult to assess. In addition to entrance size, the depth, floor and orientation of the hollow are important factors. The presence of suitable hollows, even in breeding areas, does not make them available for breeding as hollows must be spatially, structurally and temporally correct (Johnstone and Johnston, 2004). The listing of potential nesting hollows is therefore likely to be an over estimation of those actually suitable.

Western Ringtail Possums are arboreal nocturnal species (Dept of BCA, 2017). They use up to 2-7 rest sites and up to 20 throughout the year. Rest sites can be within a tree hollow or drey, built in various tree canopies. In suburban areas, they may also rest in roof spaces and other dark cavities. Their home range is less than 5 ha. There are constraints in surveying Western Ringtail Possums due to the time they may arise from their rest site or their home range may overlap the survey area, with a rest site being used outside the Site during the survey times.

There are constraints in monitoring flora which include some annual species do not appear every season and fauna can have large home ranges, with the survey limited to identifying only those flora and fauna that are present during the survey times.

6 Significance

Under the EPBC Act, an action that has, will have, or is likely to have, a significant impact on a matter of national environmental significance, requires approval from the Minister. A significant impact is defined as an impact which is important or of consequence, having regard for its context or intensity (Commonwealth of Australia, 2009).

Matters of environmental significance are:

- Listed threatened species and ecological communities
- Migratory species protected under international agreements
- Ramsar wetlands of international importance
- The Commonwealth marine environment
- World Heritage properties
- National Heritage places
- Great Barrier Reef Marine Park, and
- Nuclear actions.

For this development, there is a limited potential for impact on threatened species. Significant Impact Guidelines 1.1 (Commonwealth of Australia, 2009) lists significant impact criteria for the assessment for activities which may impact on threatened species. Table 4 below describes these criteria as they relate to the Site and the vulnerable species that may potentially be impacted within the Site.

Table 4 Significant Impact Criteria for Key Protected Species

Significant Impact Criterion	Discussion		Meets Criterion
	Black Cockatoo Species	**Western Ringtail Possum**	
Lead to a long term decrease in the size of an important population[1] of a species	There were White Tailed Black Cockatoos observed foraging within a single tree within the Site during the flora survey, however none were seen nesting or roosting within the Site and it is unlikely that this species is relying upon the Site as a food or habitat source.	No signs of the species are present in the Site.	No
Reduce the area of occupancy of an important population	No Black Cockatoos were observed nesting or roosting within the Site. A slight reduction in area will occur, however trees with DBH >500mm will be retained wherever possible within the road verge, with a focus on the trees with observed or potential hollows.	No population was observed within the Site. A slight reduction in area will occur, however trees will be retained wherever possible within the road verge, with a focus on the trees with observed or potential hollows.	No
Fragment an existing important population into two or more populations	No population was observed nesting or roosting within the site. Trees will be retained wherever possible within the road verge, with a focus on the trees with observed or potential hollows.	No population was observed within the Site. Trees will be retained wherever possible within the road verge, with a focus on the trees with observed or potential hollows.	No

[1] *An 'important population' is a population that is necessary for a species' long-term survival and recovery.*

Adversely affect habitat critical to the survival of a species	No population was observed nesting or roosting within the Site. Trees will be retained wherever possible within the road verge, with a focus on the trees with observed or potential hollows.	No Western Ringtail Possums were observed within the Site. Will not affect critical habitat. Trees will be retained wherever possible within the road verge, with a focus on the trees with observed or potential hollows.	No
Disrupt the breeding cycle of an important population	No Black Cockatoos were observed nesting or roosting within the Site. Will not affect critical habitat as trees with observed or potential hollows will not be impacted.	No Western Ringtail Possums were observed within the Site. No impact is anticipated.	No
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	No Black Cockatoos were observed nesting or roosting within the Site. A slight decrease in trees above 500 mm DBH will occur however trees will be retained wherever possible within the road verge, with a focus on the trees with observed or potential hollows.	No Western Ringtail Possums were observed within the Site. No impact is anticipated.	No
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Introductions are unlikely to occur. Any introductions highly unlikely to have any impact on species.	Introductions are unlikely to occur. Any introductions highly unlikely to have any impact on species.	No
Introduce disease that may cause the species to decline	Highly unlikely to occur.	Highly unlikely to occur.	No
Interfere substantially with the recovery of the species.	Development will not impact on the recovery of the species.	Development will not impact on the recovery of the species.	No

Using these criteria, the proposed development will not significantly impact on any significant species to a point where a referral is required under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Referral guidelines for three threatened Black Cockatoo species (Commonwealth of Australia. 2011) uses a decision tree and a set of criteria to determine whether actions significantly impact on Black Cockatoos. These are set out in Table 5, based on the details of the development and the data obtained from the surveys.

Table 5 Assessment of Significant Impact to Black Cockatoo

Question	Answer	High Risk of Significance - Referral Recommended
1. Could the impacts of your action occur within the modelled distribution of the Black Cockatoos?	Yes – Action occurs within the distribution area of all three species. Trees within the road verge will be retained wherever possible, with a focus on retaining trees with a DBH >500mm with observed or potential hollows.	Low risk of significant impacts – referral may not be required.
2. Could the impacts of your action affect any Black Cockatoo habitat or individuals?	No signs of animals nesting or roosting within the Site. Trees with a DBH greater than 500 mm with identified or potential hollows will be retained within the road verge wherever possible.	Low risk of significant impacts – referral may not be required.
3. Have you surveyed for Black Cockatoos using the recommended methods?	Yes	
4. Could your actions have an impact on Black Cockatoos or their habitats?	Unlikely impact. No signs of animals roosting or nesting was found within the Site.	Low risk of significant impacts – referral may not be required.

Question	Answer	High Risk of Significance - Referral Recommended
5. Is your impact mitigation best practice so that it may reduce the significance of your impacts on Black Cockatoos?	Yes, there is no significant impact anticipated due to lack of evidence of roosting or nesting activity on Site.	Low risk of significant impacts – referral may not be required.
6. Could your action require a referral to the federal environmental Minister for significant impact on Black Cockatoos?	No, as there are no direct signs of any of the three species roosting or nesting within the Site. It is unlikely that the species is dependent on the Site.	

The summary of these responses are:

- The development is within the area of modelled distribution of Black Cockatoo species.
- The Site has been surveyed using the recommended methods from the guideline.
- There was evidence of foraging by Black Cockatoos species within the Site, but no signs of nesting or roosting. There was no evidence of use or visitation of Western Ringtail Possums.
- Trees with a DBH greater than 500 mm and with identified or potential hollows will be selected to stay wherever possible.
- Using the flow chart and criteria it is determined that there is a low risk of actions resulting in an impact upon Black Cockatoos within the Site.

It is recommended that a referral pursuant to the EPBC Act is not required for the components of the development within the Site, as actions involved do not constitute a significant impact on any of the threatened species present.

7 Summary and Recommendations

Based on the results of the analysis of Site, the following conclusions and recommendations are made.

- There were no threatened flora observed in the Site.
- Three Priority 4 flora species were observed within the Site, being *Aponogeton hexatepalus, Acacia semitrullata* and *Eucalyptus rudis* subsp. *cratyantha*.
- White Tailed Black Cockatoos were observed feeding within the Site during the flora survey. There were no signs of nesting or roosting by Black Cockatoos species within the Site. Black cockatoo species are highly mobile and it is highly unlikely they would be relying on the vegetation within the Site.
- There were no signs of the Western Ringtail Possum within the Site or any other listed fauna (Table 2).
- A fauna spotter should be used to monitor any tree removal to ensure no animals are present at the time of any clearing.

Given there were no signs of threatened flora or any signs of roosting or nesting of any significant fauna, a referral under the EPBC Act is not considered as required as any proposed actions are unlikely to significantly impact on the species or the local populations.

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Appendix A NatureMap Extract

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 20/08/2019

Kingdom Plantae
Conservation Status Conservation Taxon (T, X, IA, S, P1-P5)
Current Names Only Yes
Core Datasets Only Yes
Method 'By Circle'
Centre 115° 33' 44" E,33° 37' 26" S
Buffer 5km

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
1.	3339	*Acacia flagelliformis*		P4	
2.	3537	*Acacia semitrullata*		P4	
3.	43201	*Adelphacme minima*		P3	
4.	18102	*Andersonia ferricola*		P1	
5.	7829	*Angianthus drummondii*		P3	
6.	141	*Aponogeton hexatepalus (Stalked Water Ribbons)*		P4	
7.	17107	*Banksia meisneri subsp. ascendens (Scott River Banksia)*		P4	
8.	32204	*Banksia nivea subsp. uliginosa*		T	
9.	32046	*Banksia squarrosa subsp. argillacea*		T	
10.	20026	*Blennospora doliiformis*		P3	
11.	16313	*Boronia anceps*		P3	
12.	16618	*Boronia humifusa*		P1	
13.	17804	*Boronia tetragona*		P3	
14.	18492	*Brachyscias verecundus*		T	
15.	1596	*Caladenia huegelii (Grand Spider Orchid)*		T	
16.	13862	*Caladenia speciosa*		P4	
17.	35796	*Calothamnus quadrifidus subsp. teretifolius*		P4	
18.	48449	*Calytrix retrorsifolia*		P2	
19.	43980	*Chamelaucium sp. S coastal plain (R.D.Royce 4872)*		T	
20.	17686	*Chordifex gracilior*		P3	
21.	34765	*Darwinia whicherensis*		T	
22.	1639	*Drakaea elastica (Glossy-leaved Hammer Orchid)*		T	
23.	1945	*Franklandia triaristata (Lanoline Bush)*		P4	
24.	20509	*Gastrolobium papilio*		T	
25.	14526	*Grevillea elongata*		T	
26.	17112	*Grevillea maccutcheonii*		T	
27.	2190	*Hakea oldfieldii*		P3	
28.	16522	*Isopogon formosus subsp. dasylepis*		P3	
29.	17734	*Lambertia echinata subsp. occidentalis*		T	
30.	29492	*Leucopogon sp. Busselton (D. Cooper 243)*		P2	
31.	13779	*Loxocarya magna*		P3	
32.	33638	*Meionectes tenuifolia*		P3	
33.	6193	*Myriophyllum echinatum*		P3	
34.	36200	*Ornduffia submersa*		P4	
35.	14085	*Petrophile latericola*		T	
36.	974	*Schoenus benthamii*		P3	
37.	999	*Schoenus loliaceus*		P2	
38.	1003	*Schoenus natans (Floating Bog-rush)*		P4	
39.	25800	*Stylidium paludicola*		P3	
40.	7801	*Stylidium squamellosum (Maize Trigger Plant)*		P2	
41.	16769	*Synaphea hians*		P3	
42.	1033	*Tetraria australiensis*		T	
43.	44444	*Tripterococcus sp. Brachylobus (A.S. George 14234)*		P4	
44.	12392	*Verticordia attenuata*		P3	
45.	12412	*Verticordia densiflora var. pedunculata*		T	
46.	14714	*Verticordia lindleyi subsp. lindleyi*		P4	
47.	12453	*Verticordia plumosa var. vassensis*		T	

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement

NatureMap is a collaborative project of the Department of Biodiversity, Conservation and Attractions and the Western Australian Museum.

Department of Biodiversity, Conservation and Attractions
WESTERN AUSTRALIAN MUSEUM

NatureMap
Mapping Western Australia's biodiversity

Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area

S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 14/10/2019

Kingdom Animalia
Conservation Status Conservation Taxon (T, X, IA, S, P1-P5)
Current Names Only Yes
Core Datasets Only Yes
Method 'By Circle'
Centre 115° 33' 44" E,33° 37' 26" S
Buffer 10km
Group By Conservation Status

Conservation Status	Species	Records
Other specially protected fauna	3	16
Priority 3	2	3
Priority 4	5	52
Protected under international agreement	4	8
Rare or likely to become extinct	7	364
TOTAL	**21**	**443**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Rare or likely to become extinct					
1.	24731	*Calyptorhynchus banksii subsp. naso (Forest Red-tailed Black Cockatoo)*		T	
2.	24733	*Calyptorhynchus baudinii (Baudin's Cockatoo, White-tailed Long-billed Black Cockatoo)*		T	
3.	24734	*Calyptorhynchus latirostris (Carnaby's Cockatoo, White-tailed Short-billed Black Cockatoo)*		T	
4.	48400	*Calyptorhynchus sp. (white-tailed black cockatoo)*		T	
5.	24092	*Dasyurus geoffroii (Chuditch, Western Quoll)*		T	
6.	24166	*Pseudocheirus occidentalis (Western Ringtail Possum, ngwayir)*		T	
7.	34113	*Westralunio carteri (Carter's Freshwater Mussel)*		T	
Protected under international agreement					
8.	48587	*Hydroprogne caspia (Caspian Tern)*		IA	
9.	24690	*Macronectes giganteus (Southern Giant Petrel)*		IA	
10.	24843	*Plegadis falcinellus (Glossy Ibis)*		IA	
11.	24808	*Tringa nebularia (Common Greenshank, greenshank)*		IA	
Other specially protected fauna					
12.	25624	*Falco peregrinus (Peregrine Falcon)*		S	
13.	25508	*Phascogale tapoatafa (Brush-tailed Phascogale)*		S	
14.	48070	*Phascogale tapoatafa subsp. wambenger (South-western Brush-tailed Phascogale, Wambenger)*		S	
Priority 3					
15.	34030	*Geotria australis (Pouched Lamprey)*		P3	
16.	24855	*Tyto novaehollandiae subsp. novaehollandiae (Masked Owl (southwest))*		P3	
Priority 4					
17.	24189	*Falsistrellus mackenziei (Western False Pipistrelle, Western Falsistrelle)*		P4	
18.	24215	*Hydromys chrysogaster (Water-rat, Rakali)*		P4	
19.	48588	*Isoodon fusciventer (Quenda, southwestern brown bandicoot)*		P4	
20.	48022	*Notamacropus irma (Western Brush Wallaby)*		P4	
21.	24328	*Oxyura australis (Blue-billed Duck)*		P4	

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

NatureMap is a collaborative project of the Department of Biodiversity, Conservation and Attractions and the Western Australian Museum.

Department of Biodiversity, Conservation and Attractions

WESTERN AUSTRALIAN MUSEUM

Appendix B EPBC Act Protected Matters Report

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

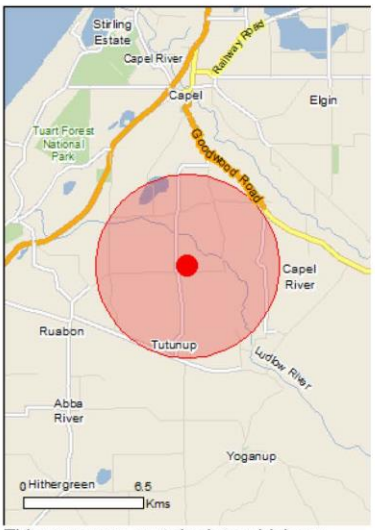
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 17/09/19 15:31:29

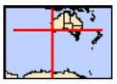
Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates
Buffer: 5.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	34
Listed Migratory Species:	10

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	15
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	2
Regional Forest Agreements:	None
Invasive Species:	21
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar)	[Resource Information]
Name	Proximity
Vasse-wonnerup system	Within 10km of Ramsar

Listed Threatened Ecological Communities		[Resource Information]
For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.		
Name	Status	Type of Presence
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community likely to occur within area
Clay Pans of the Swan Coastal Plain	Critically Endangered	Community likely to occur within area
Shrublands on southern Swan Coastal Plain ironstones	Endangered	Community likely to occur within area
Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community	Critically Endangered	Community likely to occur within area

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area
Calyptorhynchus baudinii Baudin's Cockatoo, Long-billed Black-Cockatoo [769]	Endangered	Breeding known to occur within area
Calyptorhynchus latirostris Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat may occur within area
Fish		

Name	Status	Type of Presence
Nannatherina balstoni Balston's Pygmy Perch [66698]	Vulnerable	Species or species habitat may occur within area
Mammals		
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Pseudocheirus occidentalis Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Species or species habitat known to occur within area
Other		
Westralunio carteri Carter's Freshwater Mussel, Freshwater Mussel [86266]	Vulnerable	Species or species habitat known to occur within area
Plants		
Andersonia gracilis Slender Andersonia [14470]	Endangered	Species or species habitat may occur within area
Banksia nivea subsp. uliginosa Swamp Honeypot [82766]	Endangered	Species or species habitat known to occur within area
Banksia squarrosa subsp. argillacea Whicher Range Dryandra [82769]	Vulnerable	Species or species habitat known to occur within area
Brachyscias verecundus Ironstone Brachyscias [81321]	Critically Endangered	Species or species habitat known to occur within area
Caladenia busselliana Bussell's Spider-orchid [24369]	Endangered	Species or species habitat likely to occur within area
Caladenia huegelii King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat likely to occur within area
Chamelaucium sp. S coastal plain (R.D.Royce 4872) Royce's Waxflower [87814]	Vulnerable	Species or species habitat known to occur within area
Darwinia whicherensis Abba Bell [83193]	Endangered	Translocated population known to occur within area
Daviesia elongata subsp. elongata Long-leaved Daviesia [64883]	Vulnerable	Species or species habitat may occur within area
Diuris micrantha Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat may occur within area
Drakaea elastica Glossy-leafed Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat known to occur within area
Drakaea micrantha Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat may occur within area
Gastrolobium papilio Butterfly-leaved Gastrolobium [78415]	Endangered	Species or species habitat likely to occur within area
Grevillea elongata Ironstone Grevillea [64578]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat known to occur within area
Grevillea maccutcheonii McCutcheon's Grevillea [64522]	Endangered	Species or species habitat known to occur within area
Lambertia echinata subsp. occidentalis Western Prickly Honeysuckle [64528]	Endangered	Species or species habitat known to occur within area
Petrophile latericola Laterite Petrophile [64532]	Endangered	Species or species habitat known to occur within area
Synaphea sp. Fairbridge Farm (D. Papenfus 696) Selena's Synaphea [82881]	Critically Endangered	Species or species habitat may occur within area
Synaphea stenoloba Dwellingup Synaphea [66311]	Endangered	Species or species habitat likely to occur within area
Tetraria australiensis Southern Tetraria [10137]	Vulnerable	Species or species habitat likely to occur within area
Verticordia densiflora var. pedunculata Long-stalked Featherflower [55689]	Endangered	Species or species habitat known to occur within area
Verticordia plumosa var. vassensis Vasse Featherflower [55804]	Endangered	Species or species habitat known to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat likely to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat likely to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Pandion haliaetus		
Osprey [952]		Species or species habitat may occur within area
Tringa nebularia		
Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat likely to occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat likely to occur within area
Calidris canutus		
Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea		
Grey Wagtail [642]		Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Capel	WA
Unnamed WA46006	WA

Invasive Species	[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur

Name	Status	Type of Presence within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Brachiaria mutica Para Grass [5879]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-33.62389 115.56222

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Appendix C Conservation Codes for Western Australian Flora and Fauna (DBCA, Jan 2018)

CONSERVATION CODE	CATEGORY
Threatened species (T)	Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under Section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act). ***Threated fauna*** is that subset of 'Specially Protected Fauna' listed under Schedules 1 to 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for Threatened Fauna. ***Threatened flora*** is that subset of 'Rare Flora' listed under schedules 1 to 3 of the *Wildlife Conservation (Rare Flora) Notice 2018* for Threated Flora. The Assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below
Critically endangered species (CR)	Threatened species considered to be *"facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the criteria set out in the ministerial guidelines"*. Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for critically endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for critically endangered flora.
Endangered species (EN)	Threatened species considered to be *"facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines"*. Listed as endangered under Section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for endangered flora.

CONSERVATION CODE	CATEGORY
Vulnerable species (VU)	Threatened species considered to *be "facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines"*. Listed as endangered under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for vulnerable fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for vulnerable flora.
Extinct species (EX)	Species where *"there is no reasonable doubt that the last member of the species has died"*, and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act). Published as presumed extinct under schedule 4 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for extinct fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for extinct flora.
Extinct in the wild species (EW)	Species that *"is known only to survive in cultivation, captivity or as a naturalised population well outside its part range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form"*, and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act). Currently there are no threated fauna or flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.
Specially protected species	Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection. Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.

CONSERVATION CODE	CATEGORY
Migratory species (MI)	Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (Section 15 of the BC Act). Includes 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 fauna subject to the *Convention on the Conservation of Migratory Species of Wild Animals* (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements of treaties, excluding species that are listed as Threated species. Published as migratory birds protected under an international agreement under schedule 5 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018.*
Species of special conservation interest (conservation dependent fauna) (CD)	Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act). Published as conservation dependent fauna under schedule 6 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018.*
Other specially protected species (OS)	Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act). Published as other specially protected fauna under schedule 7 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018.*

CONSERVATION CODE	CATEGORY
Priority species (P)	Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora. Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring. Assessment of Priority codes in based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.
Priority 1 - Poorly-known species	Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases, or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
Priority 2 - Poorly-known species	Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from know threatening processes. Such species are in urgent need of further survey.

CONSERVATION CODE	CATEGORY
Priority 3 - Poorly-known species	Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
Priority 4 - Rare, Near Threatened and other species in need of monitoring	(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.

Appendix D Relevé Field Sheets

STRUCTURAL VEGETATION, FLORA – Relevé										SITE_ID:
Date: 12/09/2019	**GPS:**		**3**	**6**	**6**	**1**	**0**	**6**	**E**	**Structural comm. type**
		6	**2**	**8**	**0**	**1**	**2**	**6**	**N**	
Recorder: KP	**Photo no. + direction:**									*Eucalyptus rudis* subsp. *cratyantha* and *Corymbia*
Location: S of bridge										

Condition: Pristine Excellent Very Good Good **Degraded** Completely Degraded	
Aspect: N NE E SE S SW W NW **NA**	**Slope: Flat** Gentle Mod Steep
Geology: Gran **Lat** Lime Other	**Rock: 0** <2 2-10 10-20 20-50 >50
Soil Colour: Grey Dark Brown Light Brown **Orange/Brown** Red/Brown White Yellow	**Soil Type:** C CL CLS CS L **LS** S SCL SL SP ZCL ZL ZS
Litter (% cover & depth): 50%, 5cm	**Bare Ground (% cover): 0%**
Hydrology: Good drain Poor drain Wet all year Seas wet winter/spring	**Topographic position:** Upland Wetland Rock Outcrop **Drainage Depression** Creekline Riparian Bank Gully Plain Slope Lower Slope Middle Slope Upper Valley Flat

Layer	**Height (m)**	**Cover**	**Plant Species (Dominant 3 first)**
Tree (T2)	10-30	10 – 30	*Eucalyptus rudis* subsp. *cratyantha, Corymbia calophylla, Melaleuca rhaphiophylla*
Tree (T3)	< 10	<2	*Eucalyptus rudis* subsp. *cratyantha, Corymbia calophylla*
Shrub (S1)	> 2	NA	
Shrub (S2)	1-2	NA	
Shrub (S3)	0-1	NA	
Sedge/Rush (VR)		NA	
Herb (H)		<2	**Raphanus raphanistrum, *Sonchus asper*
Grass (G)		>70%	**Avena fatua, *Ehrharta longiflora*
Other (climbers) (C)			

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

Surrounding plants:

STRUCTURAL VEGETATION, FLORA – Relevé										SITE_ID: R02
Date: 12/09/2019	**GPS:**		**3**	**6**	**6**	**1**	**8**	**8**	**E**	**Structural comm. type**
		6	**2**	**7**	**9**	**9**	**6**	**1**	**N**	
Recorder: KP	**Photo no. + direction:**									*Corymbia calophylla* woodland
Location: 400m south of bridge										

Condition: Pristine Excellent Very Good Good **Degraded** Completely Degraded	
Aspect: N NE E SE S SW W NW **NA**	**Slope: Flat** Gentle Mod Steep
Geology: Gran **Lat** Lime Other	**Rock: 0** <2 2-10 10-20 20-50 >50
Soil Colour: Grey Dark Brown Light Brown Orange/Brown Red/Brown White Yellow	**Soil Type:** C CL CLS CS L LS **S** SCL SL SP ZCL ZL ZS
Litter (% cover & depth): Grass thatch, 100%	**Bare Ground (% cover): 0%**
Hydrology: Good drain Poor drain Wet all year Seas wet winter/spring	**Topographic position:** Upland Wetland Rock Outcrop Drainage Depression Creekline Riparian Bank Gully Plain Slope Lower Slope Middle Slope Upper Valley **Flat**

Layer	Height (m)	Cover	Plant Species (Dominant 3 first)
Tree (T2)	10-30	10 - 30	*Corymbia calophylla*
Tree (T3)	< 10	2 – 10	*Corymbia calophylla, Nuytsia floribunda*
Shrub (S1)	> 2	<2	*Nuytsia floribunda*
Shrub (S2)	1-2	<2	*Acacia extensa*
Shrub (S3)	0-1	<2	*Adenanthos meisneri, Adenanthos sericeus, Xanthorrhoea preissii, Hibbertia hypericoides*
Sedge/Rush (VR)		NA	
Herb (H)		<2	**Raphanus raphanistrum, *Sonchus asper, *Freesia laxa*
Grass (G)		>70%	**Ehrharta longiflora, *Ehrharta calycina, *Cynodon dactylon*
Other (climbers) (C)		NA	

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

Surrounding plants:

STRUCTURAL VEGETATION, FLORA – Relevé											SITE_ID: R03
Date: 12/09/2019	**GPS:**									**E**	**Structural comm. type**
										N	
Recorder: KP	**Photo no. + direction:**										*Astartea scoparia* shrubland
Location: Opposite 571 Capel Tutunup Road											

Condition: Pristine Excellent Very Good Good **Degraded** Completely Degraded	
Aspect: N NE E SE S SW W NW **NA**	**Slope: Flat** Gentle Mod Steep
Geology: Gran **Lat** Lime Other	**Rock: 0** <2 2-10 10-20 20-50 >50
Soil Colour: Grey Dark Brown Light Brown Orange/Brown Red/Brown White Yellow	**Soil Type:** C **CL** CLS CS L LS S SCL SL SP ZCL ZL ZS
Litter (% cover & depth): Grass thatch	**Bare Ground (% cover): only from rabbits**
Hydrology: Good drain **Poor drain** Wet all year Seas wet winter/spring	**Topographic position:** Upland Wetland Rock Outcrop Drainage Depression Creekline Riparian Bank Gully Plain Slope Lower Slope Middle Slope Upper Valley **Flat**

Layer	Height (m)	Cover	Plant Species (Dominant 3 first)
Tree (T2)	10-30	NA	
Tree (T3)	< 10	NA	
Shrub (S1)	> 2	NA	
Shrub (S2)	1-2	10 – 30	*Astartea scoparia, Kingia australis*
Shrub (S3)	0-1	2 – 10	*Xanthorrhoea preissii, Xanthorrhoea gracilis, Patersonia* sp., *Banksia lindleyana*
Sedge/Rush (VR)		NA	
Herb (H)		<2	**Rumex* sp., **Arctotheca calendula, *Hypochaeris radicata*
Grass (G)		>70%	**Ehrharta longiflora, *Cynodon dactylon*
Other (climbers) (C)		NA	

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

Surrounding plants:

STRUCTURAL VEGETATION, FLORA – Relevé											SITE_ID: R04
Date: 12/09/2019	**GPS:**									**E**	**Structural comm. type**
										N	
Recorder: KP	**Photo no. + direction:**										*Corymbia calophylla* and *Eucalyptus marginata* open
Location: 50m south of 571 Capel Tutunup Road											

Condition: Pristine Excellent Very Good Good **Degraded** Completely Degraded	
Aspect: N NE E SE S SW W NW **NA**	**Slope: Flat** Gentle Mod Steep
Geology: Gran **Lat** Lime Other	**Rock: 0** <2 2-10 10-20 20-50 >50
Soil Colour: Grey Dark Brown Light Brown Orange/Brown Red/Brown White Yellow	**Soil Type:** C CL CLS CS L LS S SCL **SL** SP ZCL ZL ZS
Litter (% cover & depth): Patchy, 1cm, 10%	**Bare Ground (% cover): 10% - rabbits**
Hydrology: Good drain Poor drain Wet all year Seas wet winter/spring	**Topographic position:** Upland Wetland Rock Outcrop Drainage Depression Creekline Riparian Bank Gully Plain Slope Lower Slope Middle Slope Upper Valley **Flat**

Layer	Height (m)	Cover	Plant Species (Dominant 3 first)
Tree (T2)	10-30	2 – 10	*Corymbia calophylla, Eucalyptus marginata* subsp*. marginata*
Tree (T3)	< 10	2 - 10	*Eucalyptus marginata* subsp*. marginata*
Shrub (S1)	> 2	2 – 10	*Kingia australis, Eucalyptus marginata* subsp*. marginata*
Shrub (S2)	1-2	2 – 10	*Kingia australis, Hakea linearis, Acacia extensa*
Shrub (S3)	0-1	2 – 10	*Eucalyptus marginata* subsp*. marginata, Hypocalymma angustifolium, Acacia stenoptera, Synaphea* sp., *Xanthorrhoea preissii*
Sedge/Rush (VR)		2 – 10	*Mesomelaena tetragona, Meeboldina* sp.
Herb (H)		<2	**Rumex* sp.
Grass (G)		10 – 30	**Ehrharta longiflora, *Eragrostis curvula, *Briza minima, *Cynodon dactylon*
Other (climbers) (C)		NA	

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

Surrounding plants:

Relevé Location R01

Relevé Location R02

Relevé Location R03

Relevé Location R04

STRUCTURAL VEGETATION, FLORA – Relevé											SITE_ID: R05
Date: 12/09/2019	**GPS:**									**E**	**Structural comm. type**
										N	
Recorder: KP	**Photo no. + direction:**										*Melaleuca viminea* tall open scrub
Location: 400m N Downs Road											

Condition: Pristine Excellent Very Good **Good** Degraded Completely Degraded	
Aspect: N NE E SE S SW W NW **NA**	**Slope: Flat** Gentle Mod Steep
Geology: Gran **Lat** Lime Other	**Rock: 0** <2 2-10 10-20 20-50 >50
Soil Colour: Grey Dark Brown **Light Brown** Orange/Brown Red/Brown White Yellow	**Soil Type:** C CL CLS CS L LS **LC** S SCL SL SP ZCL ZL ZS
Litter (% cover & depth): NA	**Bare Ground (% cover): 0%**
Hydrology: Good drain **Poor drain** **Wet all year** Seas wet winter/spring	**Topographic position:** Upland **Wetland** Rock Outcrop Drainage Depression Creekline Riparian Bank Gully Plain Slope Lower Slope Middle Slope Upper Valley Flat

Layer	Height (m)	Cover	Plant Species (Dominant 3 first)
Tree (T2)	10-30	NA	
Tree (T3)	< 10	NA	
Shrub (S1)	> 2	30 – 70	*Melaleuca viminea*
Shrub (S2)	1-2	2 – 10	*Melaleuca viminea*
Shrub (S3)	0-1	<2	*Melaleuca viminea*
Sedge/Rush (VR)		2 – 10	*Leptocarpus scariosa, Baumea* sp.,
Herb (H)		2 – 10	*Rumex* sp., *Aponogeton hexatepalus, Triglochin* sp., **Lotus angustifolium, Isoetes drummondii, *Romulea rosea, *Freesia laxa, *Arctotheca calendula*
Grass (G)		30 – 70	**Ehrharta longiflora, *Briza minima, *Briza maxima*
Other (climbers) (C)		NA	

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

Surrounding plants:

STRUCTURAL VEGETATION, FLORA – Relevé											SITE_ID: R06
Date: 12/09/2019	**GPS:**									**E**	**Structural comm. type**
										N	
Recorder: KP	**Photo no. + direction:**										*Melaleuca rhaphiophylla* low open woodland
Location: 200m N of Downs Road											

Condition: Pristine Excellent Very Good **Good** Degraded Completely Degraded		
Aspect: N NE E SE S SW W NW **NA**	**Slope: Flat** Gentle Mod Steep	
Geology: Gran **Lat** Lime Other	**Rock: 0** <2 2-10 10-20 20-50 >50	
Soil Colour: Grey **Dark Brown** Light Brown Orange/Brown Red/Brown White Yellow	**Soil Type:** C **CL** CLS CS L LS S SCL SL SP ZCL ZL ZS	
Litter (% cover & depth): Grass thatch	**Bare Ground (% cover): 0%**	
Hydrology: Good drain **Poor drain** Wet all year Seas wet winter/spring	**Topographic position:** Upland **Wetland** Rock Outcrop Drainage Depression Creekline Riparian Bank Gully Plain Slope Lower Slope Middle Slope Upper Valley Flat	

Layer	Height (m)	Cover	Plant Species (Dominant 3 first)
Tree (T2)	10-30	NA	
Tree (T3)	< 10	30 – 70	*Melaleuca rhaphiophylla*
Shrub (S1)	> 2	10 – 30	*Hakea varia, Melaleuca viminea, Xanthorrhoea preissii*
Shrub (S2)	1-2	2 – 10	*Hakea varia, Hakea linearis, Melaleuca viminea, Melaleuca raphiophylla, Acacia extensa*
Shrub (S3)	0-1	2 – 10	*Hakea linearis*
Sedge/Rush (VR)		2 – 10	*Lepidosperma squamatum, Leptocarpus scariosa, Juncus pallidus, Patersonia* sp.
Herb (H)		2 – 10	**Rumex* sp., **Hypochaeris radicata, *Freesia laxa, *Zantedeschia aethiopica, *Fumaria* sp., **Romulea rosea*
Grass (G)		>70	**Ehrharta longiflora, *Eragrostis curvula, *Briza minima, *Cynodon dactylon*
Other (climbers) (C)		NA	

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

Surrounding plants: *Synaphea* sp.

STRUCTURAL VEGETATION, FLORA – Relevé											SITE_ID: R07
Date: 12/09/2019	GPS:									E	Structural comm. type
										N	
Recorder: KP	Photo no. + direction:										*Kunzea glabrescens* tall shrubland
Location: 200m S of 730 Capel Tutunup Road											

Condition: Pristine Excellent Very Good Good **Degraded** Completely Degraded	
Aspect: **N** NE E SE S SW W NW	**Slope:** Flat **Gentle** Mod Steep
Geology: Gran **Lat** Lime Other	**Rock:** **0** <2 2-10 10-20 20-50 >50
Soil Colour: **Grey** Dark Brown Light Brown Orange/Brown Red/Brown **White** Yellow	**Soil Type:** C CL CLS CS L LS **S** SCL SL SP ZCL ZL ZS
Litter (% cover & depth): **Scattered, up to 1cm**	**Bare Ground (% cover): <2%**
Hydrology: **Good drain** Poor drain Wet all year Seas wet winter/spring	**Topographic position:** Upland Wetland Rock Outcrop Drainage Depression Creekline Riparian Bank Gully Plain Slope Lower Slope Middle **Slope Upper (slight)** Valley Flat

Layer	Height (m)	Cover	Plant Species (Dominant 3 first)
Tree (T2)	10-30	NA	
Tree (T3)	< 10	<2	*Banksia attenuata* (dead)
Shrub (S1)	> 2	10 – 30	*Kunzea glabresecens*
Shrub (S2)	1-2	2 – 10	*Kunzea glabrescens, Acacia pulchella*
Shrub (S3)	0-1	2 – 10	*Adenanthos meisneri, Acacia pulchella, Gompholobium tomentosum, Jacksonia furcellata, Leucopogon* sp., Kunzea glabrescens
Sedge/Rush (VR)		<2	*Hypolaena exsulca, Patersonia* sp., *Leptocarpus scariosa, Dasypogon bromeliifolius*
Herb (H)		2 – 10	**Ursinia anthemoides, *Arctotheca calendula, *Hypochaeris radicata, *Romulea rosea, Chamaescilla corymbosa, *Cotula turbinata, *Oxalis* sp., *Burchardia congesta*
Grass (G)		>70%	**Ehrharta longiflora, *Ehrharta calycina, *Eragrostis curvula, *Briza minima,*
Other (climbers) (C)		<2	*Drosera* sp.

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

Surrounding plants:

STRUCTURAL VEGETATION, FLORA – Relevé											SITE_ID: R08
Date: 12/09/2019	GPS:									E	Structural comm. type
										N	
Recorder: KP	Photo no. + direction:										*Corymbia calophylla* woodland
Location: 200m S of 800 Capel Tutunup Road											

Condition: Pristine Excellent Very Good **Good** Degraded Completely Degraded	
Aspect: N NE E SE **S (slight)** SW W NW	**Slope:** Flat **Gentle** Mod Steep
Geology: Gran **Lat** Lime Other	**Rock: 0** <2 2-10 10-20 20-50 >50
Soil Colour: Grey Dark Brown Light Brown Orange/Brown Red/Brown White Yellow	**Soil Type:** C CL CLS CS L LS **S** SCL SL SP ZCL ZL ZS
Litter (% cover & depth): Patchy, up to 6 cm	**Bare Ground (% cover): <2%**
Hydrology: Good drain Poor drain Wet all year Seas wet winter/spring	**Topographic position:** Upland Wetland Rock Outcrop Drainage Depression Creekline Riparian Bank Gully Plain Slope Lower Slope Middle **Slope Upper (slight)** Valley

Layer	Height (m)	Cover	Plant Species (Dominant 3 first)
Tree (T2)	10-30	10 – 30	*Corymbia calophylla*
Tree (T3)	< 10	10 – 30	*Agonis flexuosa, Corymbia calophylla*
Shrub (S1)	> 2	2 - 10	*Banksia grandis, Agonis flexuosa, Kingia australis*
Shrub (S2)	1-2	2 – 10	*Acacia extensa, Persoonia longifolia, Kingia australis, Xylomelum occidentalis, Agonis flexuosa, Xanthorrhoea preissii*
Shrub (S3)	0-1	2 – 10	*Banksia grandis, Agonis flexuosa, Acacia extensa, Xanthorrhoea preissii, Acacia semitrullata, Stirlingia latifolia, Acacia stenoptera, Acacia alata, Adenanthos meisneri, Hibbertia hypericoides, Banksia lindleyana*
Sedge/Rush (VR)		2 – 10	*Desmocladus fasciculatus, Lepidosperma* sp., *Conostylis aculeata, Lepidosperma squamatum, Phlebocarya ciliata, Lomandra* sp., *Hypolaena exsulca*
Herb (H)		<2	*Pterostylis* sp., **Hypochaeris radicata, *Cotula turbinata, Chamaescilla corymbosa, *Freesia laxa*
Grass (G)		10 - 30	**Ehrharta longiflora, *Briza minima*
Other (climbers) (C)			

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

Surrounding plants:

Relevé Location R05

Relevé Location R06

Relevé Location R07

Relevé Location R08

Appendix E Significant Trees

DBH (cm)	Species	Height (m)	Easting	Northing	Notes
NATM	Rudis	20m	366118	6280131	No Hollows Observed
67	Marri	16m	366114	6280085	No Hollows Observed
85	Marri	16m	366112	6280079	No Hollows Observed
65	Marri	16m	366114	6280064	No Hollows Observed
NATM	Marri	19m	366116	6280049	No Hollows Observed
58	Marri	17m	366116	6280038	No Hollows Observed
91	Marri	15m	366118	6280030	No Hollows Observed
64	Marri	12m	366115	6280007	No Hollows Observed
65	Marri	16m	366116	6280007	No Hollows Observed
64	Marri	17m	366119	6279995	No Hollows Observed
62	Marri	17m	366117	6279988	No Hollows Observed
65	Marri	14m	366113	6279961	No Hollows Observed
71	Marri	12m	366117	6279958	Dead
60	Marri	14m	366119	6279867	No Hollows Observed
85	Marri	14m	366116	6279858	No Hollows Observed
70	Marri	15m	366116	6279851	No Hollows Observed
77	Marri	12m	366105	6279948	No Hollows Observed
57	Marri	14m	366107	6279955	No Hollows Observed
60	Marri	12m	366109	6279971	No Hollows Observed
72	Marri	19m	366103	6280037	No Hollows Observed
62	Marri	18m	366105	6280045	No Hollows Observed
69	Rudis	16m	366106	6280099	No Hollows Observed

DBH (cm)	Species	Height (m)	Easting	Northing	Notes
62	Marri	20m	366105	6280109	No Hollows Observed
74	Rudis	17m	366103	6280123	No Hollows Observed
78	Rudis	19m	366101	6280134	No Hollows Observed
100	Rudis	15m	366105	6280140	No Hollows Observed
87	Marri	13m	366115	6279618	No Hollows Observed
85	Marri	13m	366116	6279667	No Hollows Observed
57	Marri	10m	366112	6279690	No Hollows Observed
65	Marri	15m	366112	6279699	No Hollows Observed
72	Marri	11m	366108	6279738	No Hollows Observed
63	Marri	14m	366110	6279774	No Hollows Observed
69	Jarrah	16m	366118	6279726	No Hollows Observed
72	Marri	15m	366120	6279673	No Hollows Observed
NATM	Marri	16m	366121	6279667	No Hollows Observed
69	Marri	16m	366122	6279665	No Hollows Observed
NATM	Marri	17m	366120	6279660	No Hollows Observed
59	Marri	11m	366123	6279653	No Hollows Observed
97	Marri	16m	366123	6279545	No Hollows Observed
75	Marri	16m	366123	6279536	No Hollows Observed
75	Marri	14m	366123	6279468	No Hollows Observed
60	Marri	12m	366123	6279437	No Hollows Observed
56	Jarrah	10m	366125	6279427	No Hollows Observed
61	Marri	12m	366125	6279398	No Hollows Observed

DBH (cm)	Species	Height (m)	Easting	Northing	Notes
85	Marri	18m	366123	6279385	No Hollows Observed
59	Marri	13m	366129	6279318	No Hollows Observed
65	Marri	16m	366125	6279308	No Hollows Observed
102	Marri	14m	366126	6279296	No Hollows Observed
74	Marri	17m	366116	6279368	No Hollows Observed
91	Marri	15m	366114	6279392	No Hollows Observed
71	Marri	13m	366113	6279430	No Hollows Observed
58	Marri	14m	366116	6279484	No Hollows Observed
63	Marri	17m	366111	6279486	No Hollows Observed
67	Marri	17m	366114	6279497	No Hollows Observed
102	Marri	17m	366114	6279506	No Hollows Observed
60	Marri	17m	366112	6279535	No Hollows Observed
57	Marri	15m	366114	6279545	No Hollows Observed
58	Marri	11m	366113	6279571	No Hollows Observed
69	Marri	16m	366111	6279578	No Hollows Observed
56	Marri	15m	366110	6279578	No Hollows Observed
65	Marri	15m	366109	6279581	No Hollows Observed
89	Marri	15m	366130	6279101	No Hollows Observed
76	Marri	14m	366132	6279108	No Hollows Observed
59	Marri	14m	366127	6279115	No Hollows Observed
74	Marri	17m	366131	6279121	No Hollows Observed
73	Marri	17m	366136	6279123	No Hollows Observed

DBH (cm)	Species	Height (m)	Easting	Northing	Notes
59	Marri	17m	366135	6279114	No Hollows Observed
66	Marri	17m	366130	6279129	No Hollows Observed
72	Marri	21m	366131	6279142	No Hollows Observed
131	Marri	17m	366130	6279155	Potential Hollows
68	Marri	6m	366130	6279172	Dead
74	Marri	15m	366122	6279156	No Hollows Observed
69	Marri	12m	366120	6279137	No Hollows Observed
62	Marri	14m	366121	6279122	No Hollows Observed
86	Marri	14m	366120	6279091	No Hollows Observed
76	Marri	10m	366124	6278675	No Hollows Observed
50	Marri	11m	366123	6278680	No Hollows Observed
59	Marri	12m	366124	6278853	No Hollows Observed
54	Marri	11m	366123	6278880	No Hollows Observed
85	Marri	15m	366121	6279035	No Hollows Observed
58	Marri	14m	366123	6279039	No Hollows Observed
53	Marri	14m	366132	6279052	No Hollows Observed
60	Marri	14m	366137	6279042	No Hollows Observed
54	Jarrah	13m	366135	6278939	No Hollows Observed
53	Marri	11m	366134	6278921	No Hollows Observed
58	Marri	12m	366136	6278869	No Hollows Observed
51	Marri	12m	366138	6278676	No Hollows Observed
63	Marri	14m	366138	6278664	No Hollows Observed

DBH (cm)	Species	Height (m)	Easting	Northing	Notes
56	Marri	12m	366137	6278657	No Hollows Observed
67	Marri	18m	366140	6278653	No Hollows Observed
63	Marri	15m	366142	6278656	No Hollows Observed
89	Marri	13m	366143	6278653	No Hollows Observed
101	Marri	17m	366139	6278646	No Hollows Observed
94	Marri	16m	366139	6278645	No Hollows Observed
78	Marri	10m	366142	6278633	Potential Hollow
81	Marri	12m	366127	6278507	No Hollows Observed
60	Marri	11m	366155	6278262	No Hollows Observed
95	Marri	18m	366183	6278187	No Hollows Observed
82	Marri	13m	366199	6278113	No Hollows Observed
100	Marri	14m	366198	6278102	No Hollows Observed
63	Marri	13m	366241	6277898	No Hollows Observed
69	Marri	13m	366214	6277969	No Hollows Observed
64	Marri	14m	366207	6278013	No Hollows Observed
52	Marri	10m	366208	6278017	No Hollows Observed
60	Marri	14m	366190	6278100	No Hollows Observed
54	Marri	14m	366189	6278104	No Hollows Observed
68	Marri	13m	366173	6278178	No Hollows Observed
55	Jarrah	12m	366394	6277091	No Hollows Observed
86	Marri	15m	366410	6277002	No Hollows Observed
54	Marri	16m	366413	6276994	No Hollows Observed

DBH (cm)	Species	Height (m)	Easting	Northing	Notes
76	Marri	16m	366416	6276980	No Hollows Observed
75	Marri	14m	366419	6276943	No Hollows Observed
117	Marri	14m	366420	6276938	No Hollows Observed
65	Marri	12m	366418	6276927	No Hollows Observed
67	Marri	12m	366423	6276757	Dead
78	Marri	15m	366423	6276741	No Hollows Observed
83	Marri	16m	366420	6276728	No Hollows Observed
106	Marri	15m	366424	6276709	No Hollows Observed
51	Rudis	13m	366432	6276910	No Hollows Observed
54	Rudis	13m	366430	6276913	No Hollows Observed
73	Marri	15m	366424	6276994	No Hollows Observed
74	Marri	15m	366427	6277021	No Hollows Observed
53	Marri	17m	366418	6277023	No Hollows Observed
82	Marri	14m	366414	6277035	No Hollows Observed
95	Marri	16m	366411	6277051	No Hollows Observed Potential Drey