



Ongerup Flora and Fauna Survey

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Prepared by	Jeni Morris, Daniel Panickar, Jeff Cargill, Rebecca Hide
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Abbreviations

Abbreviation	Description
BAM Act	State <i>Biosecurity and Agriculture Management Act 2007</i>
BC Act	State <i>Biodiversity Conservation Act 2016</i>
BoM	Bureau of Meteorology
CBH	CBH Group
cm	centimetre
DAFWA	Department of Agriculture and Food Western Australia
DAWE	Department of Agriculture, Water and the Environment
DBCA	Department of Biodiversity, Conservation and Attractions
DBH	Diameter at breast height
DPIRD	Department of Primary Industries and Regional Development
DRF	Declared Rare Flora
ELA	Eco Logical Australia
EP Act	State <i>Environmental Protection Act 1986</i>
EPA	Environmental Protection Authority
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
ESA	Environmentally Sensitive Areas
ha	hectares
IBRA	Interim Biogeographical Regionalisation for Australia
km	kilometre
m	metre
mm	millimetre
PEC	Priority Ecological Community

Abbreviation	Description
PMST	Protected Matters Search Tool
SEWPaC	Department of Sustainability, Environment, Water, Populations and Communities
TEC	Threatened Ecological Community
WAH	Western Australian Herbarium
WAM	Western Australian Museum
WC Act	State <i>Wildlife Conservation Act 1950</i>
WoNS	Weeds of National Significance

Executive summary

Eco Logical Australia was engaged by CBH Group to undertake a Detailed and Targeted flora and vegetation survey and a Level 1 fauna survey (including a Black Cockatoo assessment), of an area approximately 32 hectares in size, located adjacent to the current Ongerup Grain Receival Site in the Shire of Gnowangerup. The current survey and associated recommendations will form part of a feasibility study for the future expansion of the Ongerup Grain Receival Site. The field survey was conducted from the 3 to 7 September 2018 by Eco Logical Australia.

A total of 139 taxa from 85 genera and 30 families were recorded from 14 quadrats established across the study area and from opportunistic collections. This number included 136 native and three introduced (weed) species. The majority of taxa recorded were representative of the Myrtaceae (28 species) and Fabaceae (18 species) families.

No Threatened flora species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or *Biodiversity Conservation Act 2016* (BC Act) were recorded within the study area. Five Priority 3 Flora species were recorded within the study area, namely *Brachyloma mogin*, *Calectasia obtusa*, *Leucopogon florulentus*, *Leucopogon newbeyi* and *Melaleuca polycephala*. *Leucopogon newbeyi* (Priority 3) and *Melaleuca polycephala* (Priority 3) were relatively common throughout the study area, with the latter being a structurally dominant component of Vegetation Community 4.

Three introduced (exotic) taxa were recorded within the study area and of these, none were listed as Declared Pests listed under the State *Biosecurity and Agriculture Management Act 2007* or as Weeds of National Significance.

Five vegetation communities were delineated and mapped within the study area, these being:

- Vegetation Community 1: *Eucalyptus platypus* subsp. *platypus* and *Eucalyptus extensa* closed mallee forest;
- Vegetation Community 2: *Eucalyptus phaenophylla* subsp. *phaenophylla*, *Eucalyptus captiosa* and *Eucalyptus uncinata* sparse mallee shrubland over *Melaleuca carrii* and *Leptospermum erubescens* sparse shrubland over *Gahnia* sp. South West (K.L. Wilson & K. Frank K LW 9266) and *Lepidosperma* sp. Bandalup Scabrid (N. Eveleigh 10798) sparse sedgeland;
- Vegetation Community 3: *Eucalyptus thamnoides* subsp. *thamnoides* and *Eucalyptus phaenophylla* subsp. *phaenophylla* sparse mallee shrubland over *Melaleuca hamata*, *Melaleuca carrii* and *Gastrolobium crassifolium* open shrubland over *Lepidosperma* sp. Bandalup Scabrid (N. Eveleigh 10798) sparse sedgeland;
- Vegetation Community 4: *Eucalyptus phenax* subsp. *phenax* and *Eucalyptus thamnoides* subsp. *thamnoides* sparse mallee shrubland over *Melaleuca ?undulata* and *Melaleuca polycephala* sparse shrubland over *Gahnia ancistrophylla* and *Gahnia* sp. dull bases (K.R. Newbey 5111) sparse sedgeland; and
- Vegetation Community 5: *Eucalyptus thamnoides* subsp. *thamnoides* and *Eucalyptus phaenophylla* subsp. *phaenophylla* sparse mallee shrubland over *Melaleuca glaberrima*, *Melaleuca hamata* and *Melaleuca spathulata* open shrubland over *Gahnia ancistrophylla* and *Gahnia* sp. dull bases (K.R. Newbey 5111) isolated sedges.

No Threatened or Priority Ecological Communities occurred or were inferred to occur within the study area.

Vegetation condition within the study area ranged from Good to Excellent. Disturbances within the study area included the occurrence of cleared tracks, minor weed presence, dumped rubbish and effects from sheet flow of surface water from the adjacent golf course.

A total of two fauna habitats were delineated and mapped within the study area:

- Closed mallee forest on light grey/brown sandy clay plain; and
- Open mallee woodland over mixed *Melaleuca* shrubland on light grey/brown sandy clay plain.

A total of 24 fauna species were recorded from within the study area, comprising 19 birds, four mammals and one reptile, including two introduced fauna species, **Felis catus* (Feral Cat) and **Vulpes vulpes* (Red Fox). No Threatened or Priority fauna species were recorded within the study area. Based on the fore mentioned fauna habitats, one conservation significant fauna species was assessed as likely to occur, *Leipoa ocellata* (Malleefowl), listed as Vulnerable under the EPBC Act and BC Act. A further four conservation significant fauna species were identified as having the potential to occur within the study area:

- *Phascogale calura* (Red-tailed Phascogale; listed as Vulnerable under the EPBC Act and as Conservation Dependent under the BC Act);
- *Falco peregrinus* (Peregrine Falcon; listed as Other Specially Protected Fauna under the BC Act);
- *Notamacropus irma* (Western Brush Wallaby; listed as Priority 4 by the Department of Biodiversity, Conservation and Attractions [DBCA]); and
- *Pseudomys occidentalis* (Western Mouse; listed as Priority 4 by DBCA).

No suitable habitat for Black Cockatoo breeding, foraging or roosting was recorded within the study area.

1 Introduction

1.1 Project background

Eco Logical Australia (ELA) was engaged by CBH Group (CBH) to undertake a Detailed and Targeted flora survey and a Level 1 fauna survey (including a Black Cockatoo assessment) of an area approximately 32 hectares (ha) in size, located adjacent to the current Ongerup Grain Receival Site in the Shire of Gnowangerup, approximately 400 kilometres (km) southeast of Perth, Western Australia (**Figure 1**). This survey and associated reporting and recommendations will form part of a feasibility study for the future expansion of the Ongerup Grain Receival Site (the project).

The objectives of the flora and fauna survey were to undertake the following tasks:

- Undertake a desktop assessment to identify the potential occurrence of any Federal or State conservation listed flora, fauna or communities;
- Undertake a Detailed and Targeted flora survey, including:
 - Description and mapping of vegetation communities, including Threatened or Priority Ecological Communities (TECs or PECs);
 - Compiling a species inventory using 20 x 20 metre (m) quadrats for the overstory and 10 x 10 m quadrats for the understory, including opportunistic sampling;
 - Mapping of Declared pest plants listed under the State *Biosecurity and Agriculture Management Act 2007* (BAM Act) and Weeds of National Significance (WoNS);
 - Vegetation condition mapping; and
 - Targeted searches for conservation significant flora species and populations;
- Undertake a Level 1 fauna survey together with a Black Cockatoo assessment, including:
 - Habitat assessments for each fauna habitat observed, including associated mapping;
 - Searches for signs of Malleefowl and other potentially occurring conservation significant fauna species including associated mapping;
 - Comprehensive assessment and mapping of Black Cockatoo breeding, foraging and roosting habitat, in accordance with the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) referral guidelines for the three listed Black Cockatoo species (Department of Sustainability, Environment, Water, Populations and Communities [SEWPaC] 2012); and
 - Opportunistic fauna records;
- Preparation of a report, including associated mapping, and recommendations relevant to facilitation any necessary future environmental approvals for the project.



Figure 1: Study area location

2 Methodology

2.1 Desktop review

2.1.1 Database searches

The following Commonwealth and State databases were searched for information relating to conservation listed flora, fauna and ecological communities in order to compile and summarise existing data to inform the field survey. **Table 1** below presents the database searches undertaken around the central coordinate m 637441E, m 6239427N. Applied buffers below are considered suitable based on flora and fauna assemblages expected to occur within the study area.

Table 1: Database searches undertaken for the study area

Database	Reference	Buffer (km)
EPBC Act Protected Matters Search Tool (PMST) for Threatened species and communities listed under the EPBC Act.	Department of the Environment and Energy (DAWE) 2021	10
Department of Biodiversity, Conservation and Attractions (DBCA) and Western Australian Museum (WAM) NatureMap online database.	DBCA 2007-2021	10
DBCA Threatened and Priority flora database searches for Declared Rare Flora (DRF) listed under the latest WA Wildlife Conservation (Rare Flora) Notice and Priority Flora.	DBCA 2018a	20
DBCA Threatened and Priority fauna database searches for Scheduled fauna listed under the EPBC Act or latest WA Wildlife Conservation (Specially Protected Fauna) Notice and Priority Fauna.	DBCA 2018b	40
DBCA Threatened and Priority Ecological Communities' database search	DBCA 2018c	50

2.1.2 Likelihood of occurrence assessment

A likelihood of occurrence assessment was undertaken to identify conservation listed flora and fauna species that possibly occur within the study area, identified from a review of key datasets and literature, as specified above.

The following criteria was used:

- Likelihood: Recorded.
 - The species has previously been recorded within study area from DBCA database search results and/or from previous surveys of the study area, and/or the species has been confirmed through a current vouchered specimen at WA Herbarium.

- Likelihood: Likely.

- The species has not previously been recorded from within the study area. However, (to qualify requires one or more criteria to be met):
 - the species has been recorded in close proximity to the study area, and occurs in similar habitat to that which occurs within the study area
 - core habitat and suitable landforms for the species occurs within the study area either year-round or seasonally. In relation to fauna species, this could be that a host plant is seasonally present on site, or habitat features such as caves are present that may be used during particular times during its life cycle e.g. for breeding. In relation to both flora and fauna species, it may be there are seasonal wetlands present
 - there is a medium to high probability that a species uses the study area

- Likelihood: Potential.

- The species has not previously been recorded from within the study area. However, (one or more criteria requires to be met):
 - targeted surveys may locate the species based on records occurring in proximity to the study area and suitable habitat occurring in the study area
 - the study area has been assessed as having potentially suitable habitat through habitat modelling
 - the species is known to be cryptic and may not have been detected despite extensive surveys
 - the species is highly mobile and has an extensive foraging range so may not have been detected during previous surveys
- The species has been recorded in the study area by a previous consultant survey or there is historic evidence of species occurrence within the study area. However, (one or more criteria requires to be met)
 - doubt remains over taxonomic identification, or the majority of habitat does not appear suitable (although presence cannot be ruled out due to factors such as species ecology or distribution)
 - coordinates are doubtful

- Likelihood: Unlikely (one or more criteria requires to be met).

- The species has been recorded locally through DBCA database searches. However, it has not been recorded within the study area and
 - it is unlikely to occur due to the site lacking critical habitat, having at best marginally suitable habitat, and/or being severely degraded
 - it is unlikely to occur due to few historic record/s and no other current collections in the local area.
- The species has been recorded within the bioregion based on literature review but has not been recorded locally or within the study area through DBCA database searches.
- The species has not been recorded in the study area despite adequate survey efforts, such as a standardised methodology or targeted searching within potentially suitable habitat.

- Likelihood: Does not occur (one or more criteria requires to be met).
 - The species is not known to occur within the IBRA bioregion based on current literature and distribution.
 - The conspicuous species has not been recorded in the study area despite adequate survey efforts at an appropriate time of year to detect the species within potentially suitable habitat.
 - The study area lacks important habitat for a species that has highly selective habitat requirements.
 - The species has been historically recorded within study area or locally; however, it is considered locally extinct due to significant habitat changes such as land clearing and/or introduced predators.

2.2 Field survey

2.2.1 Survey team and timing

A Detailed and Targeted flora survey and a Level 1 fauna survey including a Black Cockatoo assessment was conducted by Sarah Dalglish (Botanist) and Jeni Morris (Ecologist) from 3 – 7 September 2018. The survey team's relevant qualifications, experience and licences are provided in **Table 2** below.

Table 2: Survey team

Name	Qualification	Relevant experience	Licences
Sarah Dalglish	BSc. Environmental Management (Hons.)	Sarah has over seven years' experience undertaking flora and fauna surveys across several bioregions of Western Australia, including targeted species surveys, vegetation and habitat assessment and baseline surveys.	Flora scientific collection licence: SL012349 DRF collection licence: 11-1718
Jeni Morris	BSc. Conservation and Wildlife Biology	Jeni has over four years' experience undertaking flora and fauna surveys in the southwest of Western Australia, including Black Cockatoo habitat assessment.	Flora scientific collection licence: SL012347 DRF collection licence: 9-1718

2.2.2 Flora and vegetation survey

The Detailed and Targeted flora and vegetation survey was conducted in accordance with the Environmental Protection Authority (EPA) *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016a). The number of quadrats established to describe vegetation communities were informed using aerial imagery as well as being assessed in the field. Dominant vegetation communities were described, with respect to dominant species, structure and overall condition. The survey involved the use of 20 x 20 m quadrats for the overstory and 10 x 10 m quadrats for the understory, as recommended for the Mallee bioregion (EPA 2016a). Opportunistic sampling of species not recorded within the quadrats was undertaken to develop a list of species occurring within the study area.

A total of 14 quadrats were established across the study area (**Figure 2**). Photos were taken from the north western corner of each quadrat. The following data was recorded within each quadrat:

- Site details (site name, site number, observers, date and location);
- Environmental information including slope, aspect, bare ground, rock outcropping, soil colour and type, litter layer, topographical position and time since last fire event; and
- Biological information including vegetation structure and condition, degree of disturbance, species present and species percentage cover.

A targeted survey was completed within the study area to identify any conservation significant flora or communities potentially occurring, including:

- Threatened flora or TECs listed under the EPBC Act or *Biodiversity Conservation Act 2016* (BC Act);
- PECs endorsed by the Western Australian Minister for the Environment; or
- Priority flora recognised by DBCA.

The survey methodology involved personnel walking transects across the study area, with transects spaced (on average) 5-15 m apart. Locations of survey transects is shown in **Figure 2** below. Flora

species able to be identified in the field were recorded, and voucher specimens of unfamiliar species were collected for later identification. All collections were assigned a unique collecting number. For conservation significant identified in the field, the following was recorded:

- A colour photograph;
- GPS location;
- Population size estimate;
- Location of population boundaries;
- Associated habitat/landscape element;
- Time and date observed;
- Observer details; and
- A voucher specimen suitable for use as a reference specimen (if appropriate to do so for conservation significant flora).

Flora specimen identification was undertaken by Senior Botanist Brian Morgan. Species identification utilised taxonomic literature and keys and where required specimens were confirmed using the Western Australian Herbarium (WAH) reference collection. Suitable material that meets WAH specimen lodgement requirements, such as flowering material and range extensions, will submitted along with Threatened and Priority Report forms to DBCA, as required by conditions of collection licences issued under the *Wildlife Conservation Act 1950* (since superseded by the BC Act).

Nomenclature used for the flora species within this report follows the WA Plant Census as available on FloraBase (DBCA and WAH 2018).

2.2.3 Fauna survey and Black Cockatoo habitat assessment

The Level 1 fauna survey was conducted in accordance with the EPA Technical Guidance: Terrestrial Fauna Surveys (EPA 2016b). An assessment of fauna habitat in terms of its ability to support and sustain populations of fauna, along with an assessment of the likelihood of occurrence of conservation significant fauna species was undertaken during the survey. The habitat characteristics and fauna database records used in assessing likelihood of occurrence for fauna included:

- Vegetation community, structure and condition;
- Soil and landform type;
- Extent and connectivity of bushland;
- Fauna species habitat preferences;
- Proximity of conservation significant fauna records; and
- Signs of species presence.

An assessment of Black Cockatoo habitat was undertaken in accordance with the EPBC Act referral guidelines (SEWPaC 2012). This involved assessing all tree species known to support breeding for their diameter at breast height (DBH) and their potential to support hollows. Jarrah (*Eucalyptus marginata*) and Marri (*Corymbia calophylla*) trees with DBH over 50 centimetres (cm) and Salmon Gum (*Eucalyptus salmonophloia*) trees over 30 cm DBH have the potential to form hollows suitable for breeding and are considered as potential breeding habitat for Black Cockatoos as defined in the referral guidelines (SEWPaC 2012). For all trees with a DBH greater than 50 cm, the tree was inspected for presence of potential breeding hollows, and the following data was recorded:

- Tree DBH;
- Tree species;
- GPS location;
- Presence of potentially suitable nesting hollows;
- Hollow type (branch, spout, trunk); and
- Presence of hollow competitors (feral bees, corellas, galahs, owls).

In addition to potential breeding habitat, the study area was surveyed for suitable foraging and roosting habitat for Black Cockatoos (i.e. proteaceous shrubland or woodland; tall Eucalypt trees or introduced pines). Prior to the survey, aerial imagery was studied to determine the vegetation communities present within the study area and their potential for providing foraging habitat for Black Cockatoos. The values were then ground-truthed during the survey to determine the quality and extent of potential foraging or roosting habitat within the study area. This was undertaken in conjunction with the vegetation community mapping methodology. Observations were also made of any Black Cockatoo foraging activity based on feeding residue such as chewed *Banksia*, Jarrah and Marri nuts or cones, and any Black Cockatoo individuals observed foraging within the study area.

Opportunistic recordings of fauna species were made at all times during the field survey. These included visual sightings of active fauna such as reptiles and birds; records of bird calls; and signs of species presence such as tracks, diggings, burrows, scats and any other signs of fauna activity.

Nomenclature used for the vertebrate fauna species within this report follows the WAM Checklist of the Vertebrates of Western Australia (WAM 2018). Where common names were not stated for certain species, the following references were consulted:

- Amphibians and reptiles: Bush et al. (2010);
- Reptiles: Wilson and Swan (2013);
- Birds: Morcombe (2007); and
- Mammals: Menkhorst and Knight (2011).

2.3 Data analysis

2.3.1 Flora species accumulation curve

A flora species accumulation curve was undertaken to indicate adequacy of the survey effort (Clarke and Gorley 2006). As the number of survey sites increases, and correspondingly the size of the area surveyed increases, there should be a diminishing number of new species recorded. At some point, the number of new species recorded becomes essentially asymptotic. The asymptotic value was determined using Michaelis-Menten modelling and provided an incidence-based coverage estimator of species richness. When the number of new species being recorded for survey effort expended approaches this asymptotic value, the survey effort can be considered adequate.

2.3.2 Vegetation Communities

Plymouth Routines in Multivariate Ecological Research v6 (PRIMER) statistical analysis software was used to analyse species-by-site data and discriminate survey sites based on their species composition (Clarke and Gorley 2006). To down weight the relative contributions of quantitatively dominant species a 4th root transformation was applied to the dataset. Introduced species (weeds), specimens not identified to species level and singletons (species recorded at a single quadrat and not forming a dominant structural component) were excluded from the data set prior to analysis. In addition, annuals were also removed from the dataset prior to analysis due to the likelihood of substantial differences between years based on seasonality of local rainfall events. Computation of similarity matrices was based on the Bray-Curtis similarity measure. Data were analysed using a series of multivariate analysis routines including Similarity Profile (SIMPROF), Hierarchical Clustering (CLUSTER) and Similarity Percentages (SIMPER). Results were used to inform and support interpretation of aerial photography and delineation of individual plant communities.

2.4 Limitations

The EPA *Technical Guide – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016a) recommends including discussion of the constraints and limitations of the survey methods used. Constraints and limitations for the Detailed and Targeted flora and vegetation survey and the Level 1 fauna survey and Black Cockatoo habitat assessment for the study area summarised in **Table 3**.

Table 3: Survey limitations

Limitation	Comment
Sources of information	No flora or fauna surveys have been previously undertaken in the study area. Broad-scale vegetation mapping at a scale of 1:1,000,000 was available. Land system mapping at a scale of 1:2,000,000 and soil and landform mapping was also available. The information which was available was sufficient and as such sources of information were not considered a major limitation.
Scope of works	The survey requirement of a Detailed and Targeted flora and vegetation survey and a Level 1 fauna survey and Black Cockatoo assessment in accordance with relevant State and Federal legislation and EPA guidance documents was adequately met.
Completeness of survey	The study area was surveyed to the satisfaction of the scope and a Detailed and Targeted flora and vegetation survey and a Level 1 fauna survey and Black Cockatoo assessment as per the relevant guidelines.
Intensity of survey	The survey effort was adequately met. The area was searched for conservation significant species by field staff undertaking transects across the study area spaced 5-15 m apart on average. This method provides an accurate assessment of habitat characteristics and likelihood of conservation significant species. The number of quadrats established was sufficient to determine the vegetation community and to identify any vegetation of conservation significance. Adequacy of sampling effort was tested via a species accumulation curve; approximately 71% of the flora potentially present within the study area were recorded.

Limitation	Comment
Timing, weather, season, cycle	The study area is located in the Mallee bioregion of Western Australia. Recommended survey timing for this region is Spring (September-November; EPA 2016a). Many flora species were flowering at the time of the survey or had sufficient material (fruit) available to identify dominant and targeted species. The timing was appropriate for conducting this level of survey.
Disturbances	Disturbances within the study area were minimal and included signs grazing (macropod), low presence of weeds edge effects of clearing and some sheet flow from surrounding areas.
Resources	The personnel conducting this field survey were both suitably qualified to identify specimens, having previously undertaken numerous flora and fauna surveys in the South West botanical region of Western Australia.
Accessibility/Remoteness	All relevant areas in the study area were easily accessed and able to be surveyed.



Figure 2: Survey effort

3 Results

3.1 Desktop review

3.1.1 Climate

The Western Mallee bioregion experiences a warm Mediterranean climate with an annual rainfall of 250-500 millimetres (mm; Beecham and Danks 2001). Based on climate data from the nearby Bureau of Meteorology (BoM) Borden weather station (station number 10519, rainfall data 1923 – current; located approximately 30 km to the southwest of the study area) the study area receives on average a total of 380.9 mm of rainfall each year, with majority falling between June and August (BoM 2018; **Table 4**). In the 12 months preceding the field survey, the study area received a total of 294.6 mm of rainfall, which is below the long-term average (**Table 4**). A total of 121.8 mm of rainfall was recorded in the three months prior to the field survey in September, which is comparable to the long-term average of 143 mm for the same time period (BoM 2018). A total of 2.5 mm of rainfall was recorded at the Ongerup weather station (station number 10622; located approximately 1 km north of the study area) during the field survey.

Mean monthly maximum temperatures experienced in the area range from 28.7°C in January to 15.0°C in July. Mean monthly minimum temperatures range from 14.3°C in February to 5.8°C in July (BoM 2018). Temperatures experienced during the field survey ranged from 3.0°C to 20.0°C (BoM 2018).

Table 4: Rainfall data recorded at the Borden weather station (10519) 12 months prior to the field survey compared to the long-term average (BoM 2018)

Month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Total monthly rainfall 2017-2018 (mm)	14.6	10.8	19.0	13.8	4.4	15.4	17.8	9.6	35.4	40.6	45.8	67.4	294.6
Average monthly rainfall 1923-current	33.0	25.3	17.7	18.7	16.3	20.2	24.7	42.7	49.0	50.5	43.5	39.3	381.8

3.1.2 Regional context

Environmental values for the region relevant to the study area are presented in **Table 5**.

Table 5: Environmental values of the region

Existing environmental attribute	Study area
Interim Biogeographical Regionalisation for Australia (IBRA) Bioregion*	Mallee (MAL)
IBRA Subregion*	Western Mallee (MAL2)
Geological units^	<p>Felsic Intrusives 74292 – Undifferentiated felsic intrusive rocks, including monzogranite, granodiorite, granite, tonalite, quartz monzonite, syenogranite, diorite, monzodiorite, pegmatite. Locally metamorphosed, foliated, gneissic. Local abundant mafic and ultramafic inclusions</p> <p>Colluvium 38491 - Colluvium, sheetwash, talus; gravel piedmonts and aprons over and around bedrock; clay-silt-sand with sheet and nodular</p>

Existing environmental attribute	Study area
	kankar; alluvial and aeolian sand-silt-gravel in depressions and broad valleys in Canning Basin; local calcrete, reworked laterite

*Department of the Environment and Energy 2018

^Geological Survey of WA and Geoscience Australia 2008

3.1.3 Broad-scale vegetation mapping

Vegetation type and extent have been mapped at a regional scale by Beard (1979) who categorised vegetation into broad vegetation associations. Based on this mapping at a scale of 1:1,000,000, the Department of Primary Industries and Regional Development (DPIRD; previously Department of Agriculture and Food Western Australia [DAFWA]) has compiled a list of vegetation extent and types across WA (Shepherd et al. 2002).

One vegetation association occurs within the study area (**Table 6; Figure 3**). This vegetation association has less than 15% of its total pre-European extent remaining within the Mallee bioregion (Government of Western Australia 2019).

Table 6: Beard (1979) / Shepherd et al. (2002) vegetation associations of the study area

Vegetation association	Description	Pre-European extent (ha) within the Mallee bioregion	Current extent (ha) within the Mallee bioregion	Remaining %
Mallee 1075	Shrublands; mallee scrub, <i>Eucalyptus eremophila</i> & black marlock (<i>Eucalyptus redunca</i>)	517,041.34	73,513.35	14.22

3.1.4 Areas of conservation significance

Environmentally Sensitive Areas (ESAs) are defined in the Environmental Protection (Environmentally Sensitive Areas) Notice 2005 under section 51B of the State *Environmental Protection Act 1986* (EP Act). ESAs include areas declared as World Heritage, included on the Register of the National Estate¹, defined wetlands, and vegetation containing Threatened flora and TECs.

PECs are biological flora or fauna communities that are recognised to be of significance, but do not meet the criteria for a TEC. There are five categories of PECs, none of which are currently protected under legislation.

A DBCA Threatened and Priority Communities database search (DBCA 2018c) identified seven known occurrences of conservation significant ecological communities within a 50 km of the study area (**Figure 4 and Table 7**).

¹Note the Register of National Estate was closed in 2007 and is no longer a statutory list. The Register of National Estate has been replaced by the National Heritage List under the EPBC Act.

Table 7: Conservation significant ecological communities located within a 50 km radius of the study area (DBCA 2018c)

Community ID	Community description	Conservation code		Closest occurrence
		EPBC Act	Endorsed by the WA Minister/ listed by DBCA	
Coyanarup Wetland	Coyanarup Wetland Suite: microscale paluslopes associated with seepage and creeks in the area between Coyanarup Peak and Bluff Knoll in the Stirling Ranges	-	P1	50 km to the southwest
Wheatbelt Woodlands	Eucalypt woodlands of the Western Australian Wheatbelt. Composed of eucalypt woodlands that formerly were the most common type of vegetation across the wheatbelt landscape of south-western Western Australia (WA), i.e. inland between the Darling Range and western edge of the goldfields. The woodlands are dominated by a complex mosaic of eucalypt species with a tree or mallet form over an understorey that is highly variable in structure and composition. Woodlands dominated by mallee forms or vegetation with a very sparse eucalypt tree canopy are not part of the ecological community.	CR	P3	0.4 km to the east
Chinocup	Gypsum dunes (Lake Chinocup). <i>Eucalyptus</i> aff. <i>incrassata</i> mallee over low scrub on gypsum dunes.	-	P2	47 km to the north
Montane Mallee	Montane mallee thicket community of the Stirling Range. Thicket, mallee-thicket and heath community on mid to upper slopes of Stirling Range mountains and hills east of Red Gum Pass.	-	P1	45 km to the southwest
Montane	Montane Thicket of the eastern Stirling Range (all/or portion in EPBC listed Kwongkan community). A montane community of heath, thicket and, on skeletal soils, scrub vegetation. Key species that characterise the ecological community include <i>Andersonia axilliflora</i> (giant andersonia), <i>Andersonia echinocephala</i> , <i>Kunzea montana</i> (mountain kunzea), <i>Beaufortia anisandra</i> , <i>Sphenotoma</i> sp. Stirling Range and <i>Darwinia</i> spp.	EN	EN	43 km to the southwest
Proteaceae Dominated Kwongkan Shrubland	Proteaceae dominated kwongkan shrublands of the southeast coastal floristic province of Western Australia. Consists of predominantly obligate seeding proteaceous shrubland and heath (kwongkan) and mallee heath on sandplain, duplex sand/clay and gravels overlying Eocene sediments, quartzite, schist, Yilgarn and Albany Fraser granite and greenstone ranges. Its flora is characterised by high species diversity and a high degree of endemism, particularly in the Stirling Range, Fitzgerald River National Park, Ravensthorpe Range and Russell	EN	P3	20 km to the southeast

Community ID	Community description	Conservation code		Closest occurrence
		EPBC Act	Endorsed by the WA Minister/ listed by DBCA	
	Ranges. Due to the high levels of endemism, there are few species that exist across the entire range of the dense, obligate seeding Proteaceae dominated shrublands and kwongan of the Esperance Sandplains, however particular species have been identified as common dominant species in each of its ecodistricts.			
Swamp Yate woodland (South Coast)	Swamp Yate (<i>Eucalyptus occidentalis</i>) woodland in seasonally-inundated basins (South Coast). Yate woodlands with intact understorey and fringing vegetation are poorly conserved in the region.	-	P3	39 km to the south

There are no known occurrences of ESAs, TECs or PECs located within the study area (DBCA 2018c).

3.1.5 Flora and fauna species of conservation significance

An initial 49 conservation listed flora species and 28 conservation significant fauna species were identified as possibly occurring within the study area, based on the database searches undertaken in Section 2.1.1 and using criteria outlined in Section 2.1.2.

Marine species were not considered in the likelihood of occurrence assessment as the study area does not contain core habitat that these species solely rely on for survival. Likelihood of occurrence assessment tables are presented in **Appendix A** and **Appendix B**.



Figure 3: Beard's (1979) vegetation associations

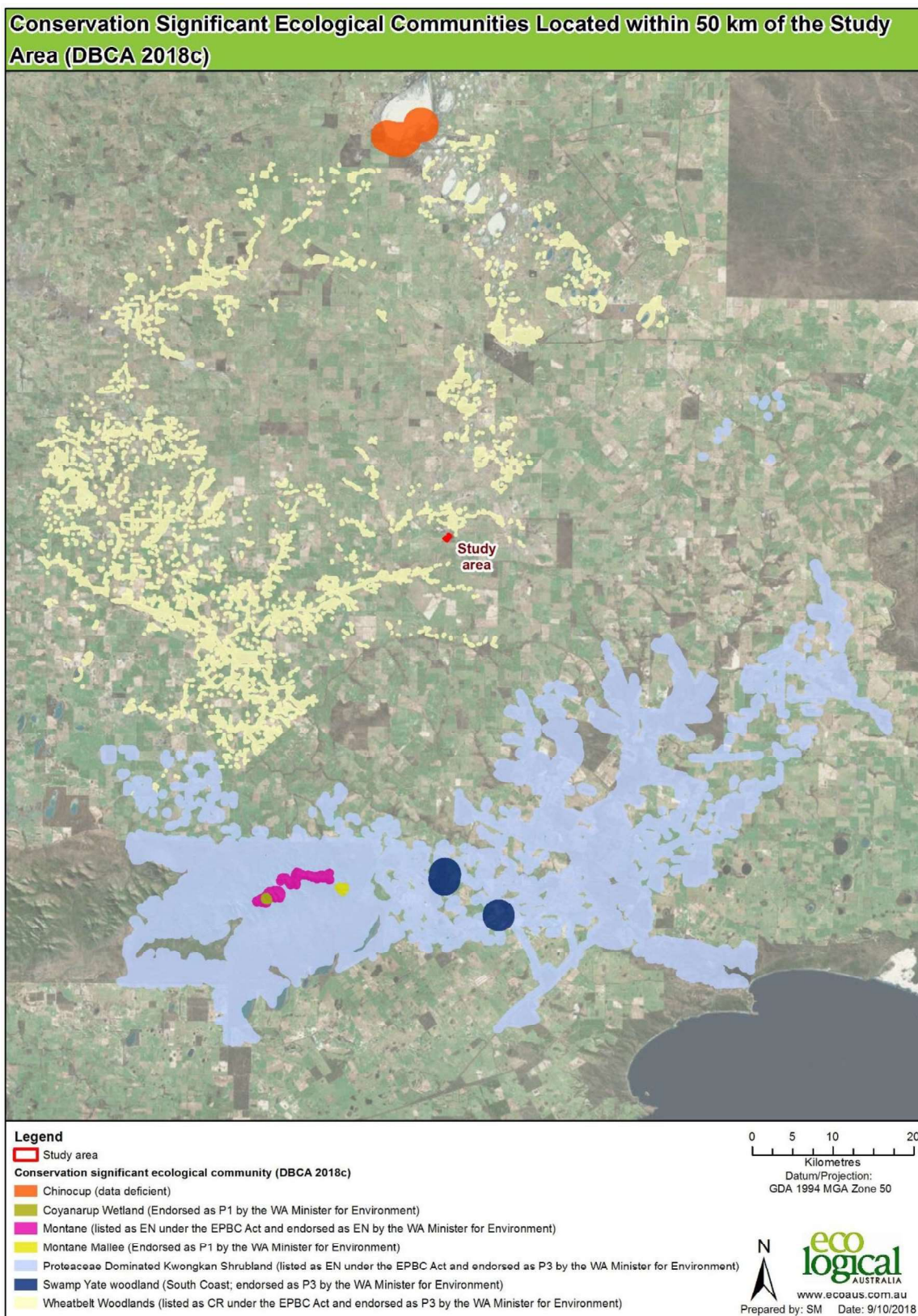


Figure 4: Conservation significant ecological communities within 50 km of the study area (DBCA 2018c)

3.2 Flora and vegetation survey

3.2.1 Flora overview

A total of 139 taxa from 85 genera and 30 families were recorded across 14 quadrats established across the study area and from opportunistic collections. A complete flora species list has been provided in **Appendix C**. Average native perennial species richness per quadrat was 21, ranging from a low of four at ELA4 to a high of 35 at ELA13. Families with the highest number of species included Myrtaceae (28 species) and Fabaceae (18 species). *Melaleuca* and *Eucalyptus* were the best represented genera throughout the study area with 12 and 9 taxa recorded, respectively. Quadrat site data is presented in **Appendix E**.

3.2.2 Accumulated Species – Sites Surveyed (Species-Area Curve)

A species accumulation curve (**Figure 5**) was used to evaluate the adequacy of sampling (Clarke and Gorley 2006). Only species data recorded from defined survey sites (quadrats) were used; no opportunistic flora collections were included. The asymptotic value was determined using Michaelis Menten modelling. Using this analysis, the incidence-based coverage estimator of species richness was calculated to be 136.08. Based on this value, and the total of 97 species recorded within survey sites, approximately 71.3% of the flora species potentially present within the study area were recorded.

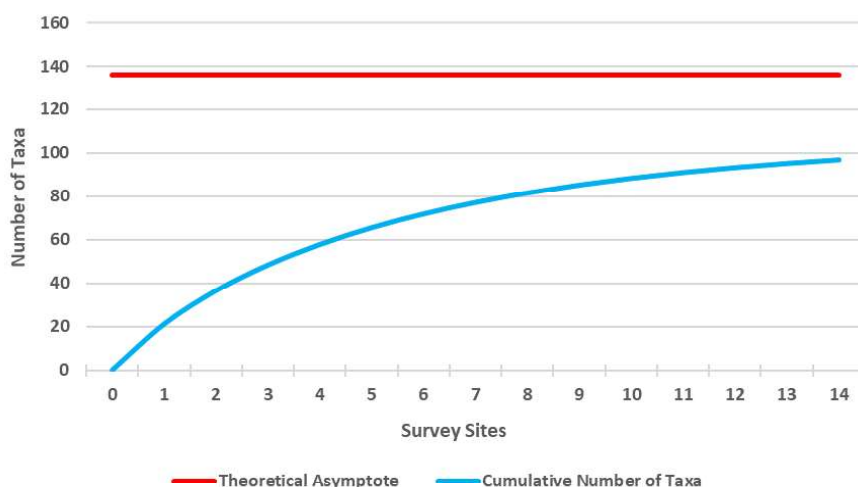


Figure 5: Averaged randomised species accumulation curve

Note: Only species recorded from survey sites were used to calculate the species accumulation curve and theoretical maximum number of species (asymptotic value).

3.2.3 Conservation significant flora

No Threatened flora listed under the EPBC Act or the BC Act were recorded as occurring within the study area. A total of five Priority (P) flora species listed by DBCA were recorded as occurring within the study area:

- *Brachyloma mogin* (listed as P3 by DBCA; one individual recorded within the study area);
- *Calectasia obtusa* (listed as P3 by DBCA; one individual recorded within the study area);
- *Leucopogon florulentus* (listed as P3 by DBCA; two individuals recorded within the study area);
- *Leucopogon newbeyi* (listed as P3 by DBCA; recorded from 37 locations within the study area with a total of 459 individuals recorded); and
- *Melaleuca polycephala* (listed as P3 by DBCA; recorded at a 0.5% cover throughout Vegetation Community 4).

Conservation significant flora species recorded within the study area are presented in **Table 8**. Locations of conservation significant flora recorded within the study area are presented in **Figure 6**.

Table 8: Conservation significant flora recorded within the study area



Brachyloma mogin (P3)



Calectasia obtusa (P3)



Leucopogon florulentus (P3)

*Leucopogon newbeyi* (P3)*Melaleuca polycephala* (P3)

Of the 49 conservation listed flora species identified in the desktop assessment as possibly occurring within the study area, four species were found to occur within the study area (as above, excluding *Calectasia obtusa* as this species did not appear in the database searches). One species, *Thelymitra* sp. Ongerup (S. Osborne 142; P3), was found to have the potential to occur, while the remaining 42 species were found to be unlikely to occur. This assessment was based on availability of suitable habitat, proximity of previous records and adequate survey effort. The flora likelihood of assessment is presented in **Appendix A**.



3.2.4 Introduced flora




A total of three introduced flora (weed) species were recorded from within the study area namely **Sonchus oleraceus* (Common Sowthistle), **Ursinia anthemoides subsp. anthemoides* (Ursinia); and *Vulpia myuros* (Rat's Tail Fescue). None of these species are listed as a Declared Pest under the BAM Act or are a WoNS.

3.2.5 Vegetation communities

Similarity Profile Analysis (SIMPROF) separated the fourteen survey sites into five statistically dissimilar groupings (Global R = 13.65; Significance level of sample statistic, $p = 0.001$; **Appendix D**). Based on this result, five vegetation communities were delineated and mapped within the study area. Details of the five communities, including associated species, and mapping boundaries are presented in **Table 9** and **Figure 7**, respectively.

Table 9: Vegetation communities recorded within the study area

Image	Vegetation Description	Quadrats	Extent within the study area (ha)	Portion of the study area (%)
	<p>Vegetation Community 1: <i>Eucalyptus platypus</i> subsp. <i>platypus</i> and <i>Eucalyptus extensa</i> closed mallee forest.</p> <p>Associated Species: <i>Austrostipa exilis</i>, <i>Caladenia horistes</i>, <i>Millotia tenuifolia</i> and <i>Oxalis perennans</i>.</p> <p>Average similarity: 45%</p>	ELA7 ELA8 ELA9	7.84	24.16
	<p>Vegetation Community 2: <i>Eucalyptus phaenophylla</i> subsp. <i>phaenophylla</i>, <i>Eucalyptus capiosa</i> and <i>Eucalyptus uncinata</i> sparse mallee shrubland over <i>Melaleuca carii</i> and <i>Leptospermum erubescens</i> sparse shrubland over <i>Gahnia</i> sp. South West (K.L. Wilson & K. Frank K LW 9266) and <i>Lepidosperma</i> sp. Bandalup Scabrid (N. Eveleigh 10798) sparse sedgeland.</p> <p>Associated Species: <i>Calytrix leschenautii</i>, <i>Dampiera lavandulacea</i>, <i>Desmodcladus asper</i>, <i>Melaleuca hamata</i> and <i>Santalum murrayanum</i>.</p> <p>Average similarity: 92%</p>	ELA13 ELA14	3.05	9.41

	<p>Vegetation Community 3: <i>Eucalyptus thamnoides</i> subsp. <i>thamnoides</i> and <i>Eucalyptus phaenophylla</i> subsp. <i>phaenophylla</i> sparse mallee shrubland over <i>Melaleuca hamata</i>, <i>Melaleuca carriei</i> and <i>Gastrolobium crassifolium</i> open shrubland over <i>Lepidosperma</i> sp. Bandalup Scabrid (N. Eveleigh 10798) sparse sedgeland.</p> <p>Associated Species: <i>Desmodium asper</i>, <i>Lepidosperma fimbriatum</i>, <i>Lepidospermum erubescens</i>, <i>Lomandra effusa</i> and <i>Rinzia communis</i>.</p> <p>Average similarity: 70%</p>	ELA5 ELA6	2.62	8.08
	<p>Vegetation Community 4: <i>Eucalyptus phenax</i> subsp. <i>phenax</i> and <i>Eucalyptus thamnoides</i> subsp. <i>thamnoides</i> sparse mallee shrubland over <i>Melaleuca ?undulata</i> and <i>Melaleuca polycephala</i> sparse shrubland over <i>Gahnia ancistrophylla</i> and <i>Gahnia</i> sp. dull bases (K.R. Newbey 5111) sparse sedgeland.</p> <p>Associated Species: <i>Billardiera laxiflora</i>, <i>Dillwynia acerosa</i>, <i>Eucalyptus annulate</i>, <i>Exocarpus aphyllus</i> and <i>Hibbertia lineata</i>.</p> <p>Average similarity: 76%</p>	ELA3 ELA10 ELA12	5.95	18.34
	<p>Vegetation Community 5: <i>Eucalyptus thamnoides</i> subsp. <i>thamnoides</i> and <i>Eucalyptus phaenophylla</i> subsp. <i>phaenophylla</i> sparse mallee shrubland over <i>Melaleuca glaberrima</i>, <i>Melaleuca hamata</i> and <i>Melaleuca spathulata</i> open shrubland over <i>Gahnia ancistrophylla</i> and <i>Gahnia</i> sp. dull bases (K.R. Newbey 5111) isolated sedges</p> <p>Associated Species: <i>Acacia bidentata</i>, <i>Dianella revoluta</i>, <i>Eucalyptus capflosa</i>, <i>Hakea laurina</i>, <i>Hibbertia lineata</i> and <i>Neurachne alopecuroides</i>.</p> <p>Average similarity: 59%</p>	ELA1 ELA2 ELA4 ELA11	12.98	40.01

3.2.6 Vegetation condition

The vegetation condition within the study area ranged from Good to Excellent condition based on the vegetation condition scale adapted from Keighery (1994) and Trudgen (1988) provided in the Environmental Protection Authority *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016a). The majority of the study area was in Excellent condition (29.17 ha; 89.92%), with some areas of Very Good (1.41 ha; 4.33%) and Good (1.86ha; 5.75%) condition (**Figure 8**).

Disturbances within the study area included the presence of cleared tracks, minor weed presence, dumped rubbish and effects from surface water sheet flow from the adjacent golf course.

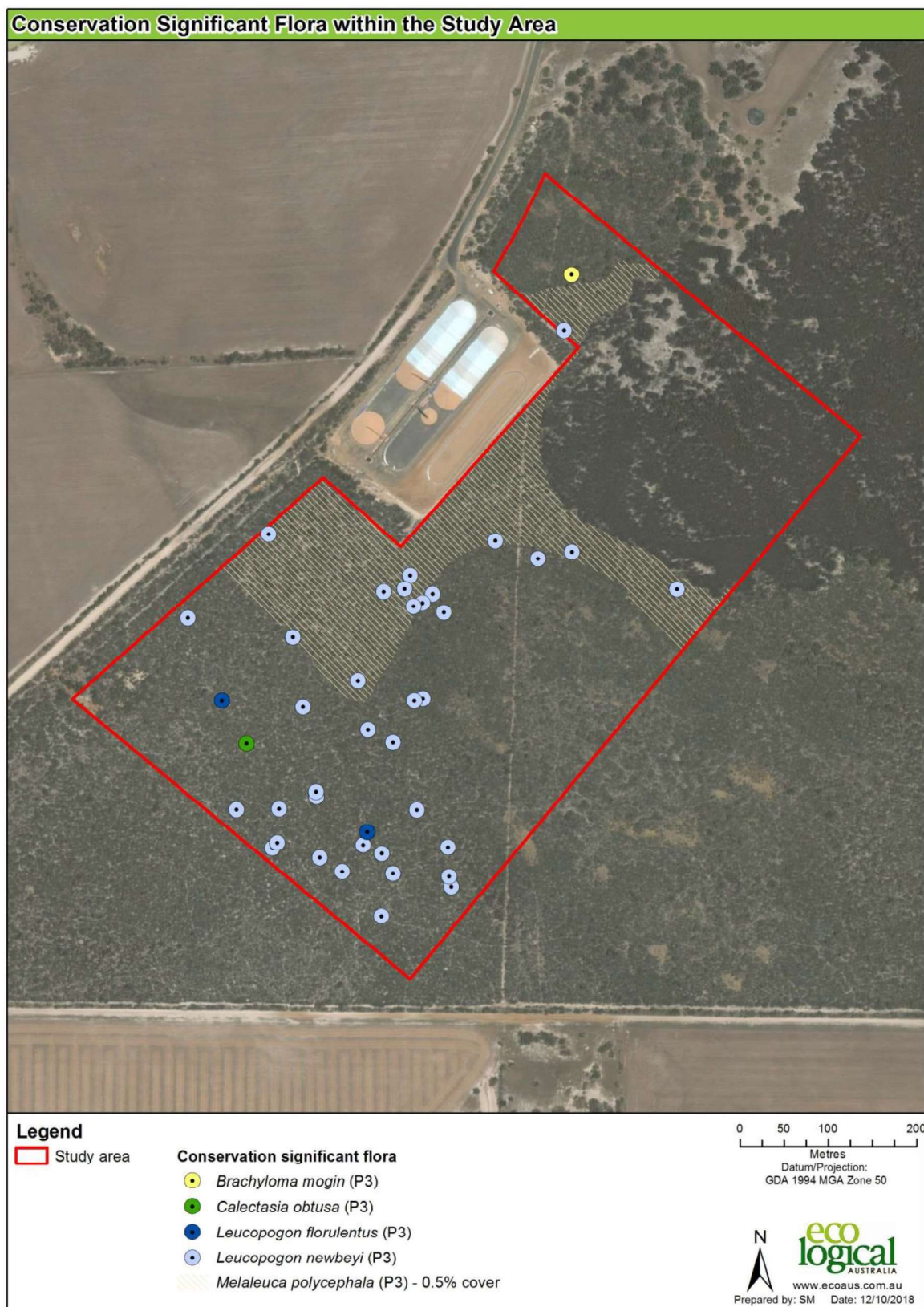


Figure 6: Conservation significant flora recorded within the study area



Figure 7: Vegetation communities recorded within the study area



Figure 8: Vegetation condition recorded within the study area

3.3 Fauna survey

3.3.1 Fauna habitat

A total of two fauna habitats were recorded within the study area (**Figure 9**):

- Closed mallee forest on light grey/brown sandy clay plain (7.84 ha and 24.16% of the study area); and
- Open mallee woodland over mixed *Melaleuca* shrubland on light grey/brown sandy clay plain (24.61 ha and 75.84% of the study area).

3.3.2 Fauna overview

A total of 22 native fauna species were recorded during the field survey. This number comprised 19 birds, two mammals and one reptile. Two introduced fauna species were also recorded within the study area, *Felis catus* (Feral Cat) and *Vulpes vulpes* (Red Fox).

A fauna species list is provided in **Appendix F**.

3.3.3 Conservation significant fauna

No Federal or State listed Threatened or Priority fauna species listed by DBCA were recorded within the study area.

Of the 28 conservation listed fauna species identified in the desktop assessment as possibly occurring within the study area, one species was assessed as likely to occur, four species were found to have the potential to occur, while the remaining 21 species were determined to be unlikely to occur. This assessment was based on availability of suitable habitat, proximity of previous records and adequate survey effort. *Leipoa ocellata* (Malleefowl), listed as Vulnerable (VU) under the EPBC Act and BC Act, was considered likely to occur. The four additional species considered to have the potential to occur included:

- *Phascogale calura* (Red-tailed Phascogale; listed as VU under the EPBC Act and as Conservation Dependent under the BC Act);
- *Falco peregrinus* (Peregrine Falcon; listed as Other Specially Protected Fauna under the BC Act);
- *Notamacropus irma* (Western Brush Wallaby; listed as P4 by DBCA); and
- *Pseudomys occidentalis* (Western Mouse; listed as P4 by DBCA).

The fauna likelihood of occurrence assessment is presented in **Appendix B**.

3.3.4 Black Cockatoo assessment

The study area comprised a mixture of mixed mallee woodland over a myrtaceous mid-storey. As such, no preferred or suitable habitat for Black Cockatoo breeding, foraging or roosting was recorded as occurring within the study area.



Figure 9: Fauna habitats recorded within the study area

4 Discussion

4.1 Flora and vegetation

A total of 139 taxa from 85 genera and 30 families were recorded within the study area. Weed species comprised of only 2% of the total flora taxa recorded; no Declared Pests listed under the BAM Act or WoNS were recorded within the study area. Average native perennial species richness per quadrat was 21 (range 5 to 35 taxa). Myrtaceae and Fabaceae were the most highly represented families occurring in the study area, with *Melaleuca* and *Eucalyptus* were the best represented genera.

A species accumulation curve determined that approximately 71.3% of the flora species potentially present within the study area were recorded. Many flora species were flowering at the time of the survey or had sufficient material (fruit) available to identify dominant and targeted species. The number of quadrats established was considered sufficient to determine the vegetation community and to identify any vegetation of conservation significance, and the sampling effort and survey timing was considered adequate.

No Threatened flora listed under the EPBC Act or the BC Act were recorded within the study area; however, five Priority 3 Flora species were observed during the field survey. *Brachyloma mogin* (P3) and *Calectasia obtusa* (P3) were each recorded once, whilst two individuals of *Leucopogon florulentus* (P3) were recorded. *Leucopogon newbeyi* (P3) was commonly recorded throughout the study area, particularly in central and southern sections, with 459 individuals recorded. Likewise, *Melaleuca polycephala* (P3) was a commonly occurring species within the study area, being a structurally dominant component (0.5% cover) of Vegetation Community 4. With the exception of *Calectasia obtusa* (P3), database searches verified that Priority Flora identified within the study area have also been recorded in the broader locality. A likelihood of occurrence assessment conducted post-field identified an additional Priority 3 flora species had the potential to occur within the study area; *Thelymitra* sp. Ongerup (S. Osborne 142).

The study area comprised a mixture of mallee woodland/shrubland over a Myrtaceous mid-storey. Differentiation of individual vegetation communities within this broader mallee complex was predominately based on subtle variations in the abundance and structure of dominant and co-dominant upper and mid storey species. A total of five vegetation communities were delineated and mapped within the study area. None of these vegetation communities were considered to represent Commonwealth or State listed TECs or PECs, based on the results of the field survey and database searches. However, an occurrence of the Eucalypt Woodlands of the Western Australian Wheatbelt TEC is located within 0.4 km of the study area.

The vegetation of the study area was primarily in Excellent condition. Disturbances within the study area were due to the presence of cleared tracks, minor weed presence, dumped rubbish and effects from surface water sheet flow from the adjacent golf course.

One Pre-European vegetation association occurs within the study area, Mallee 1075 (Beard 1979, Shepard *et al.* 2002); the study area represents 0.04% of the current extent of this vegetation association. This vegetation association has less than 15% of its total pre-European extent remaining within the Mallee bioregion (Government of Western Australia 2019). The study area therefore occurs within a highly cleared landscape.

4.2 Fauna

The study area broadly comprised a mixture of mallee woodland/shrubland over a dominant myrtaceous mid-storey. Two fauna habitats were described within the study area; closed mallee forest on light

grey/brown sandy clay plain and open mallee woodland over mixed *Melaleuca* shrubland on light grey/brown sandy clay plain.

Of the 22 native fauna species were recorded during the field survey (primarily common bird species), none were considered to be of conservation significance. Post field-survey, the likelihood of occurrence assessment identified that four conservation listed species had the potential to occur, and the Malleefowl was likely to occur. While the targeted search for Malleefowl did not identify any evidence (birds, tracks or mounds) within the study area, the closest known record is within 1 km (in close proximity to the Yongergnow Australian Malleefowl Centre; DBCA 2007-2021), and the mallee vegetation within the study area is contiguous with the habitat the nearby Malleefowl were recorded in. Therefore, despite the current absence of the species, the study area is still considered to contain habitat suitable for Malleefowl future forging activities. Due to a lack of evidence of usage of the study area for current or past breeding activities and the low levels of leaf litter across the study area, the study area is considered to represent only marginal potential breeding habitat.

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Appendix A Flora likelihood of occurrence assessment

Species	Conservation status		Habitat	Source ⁴	Likelihood of occurrence
	EPBC Act ¹	BC Act ² / DBCA ³			
<i>Duma horrida</i> subsp. <i>abdit</i>	CR	EN	The species is found on clay and silt depressions in seasonally inundated freshwater wetlands.	PMST	Unlikely
<i>Hibbertia priceana</i>	CR	EN	Occurs on sandy clay with laterite gravel and occurs primarily on ridges. The species occurs with <i>Banksia pseudoplumosa</i> and <i>Leucopogon</i> sp.	DBCA 2018a, PMST, NatureMap	Unlikely
<i>Adenanthos pungens</i> subsp. <i>effusus</i>	EN	CR	A low undershrub in undisturbed <i>Banksia</i> , <i>Melaleuca</i> and <i>Regelia</i> scrub, it grows in deep white sand.	PMST	Unlikely
<i>Eremophila verticillata</i>	EN	CR	Habitat is powdery brown loam over dolomite in open low Eucalypt woodland of <i>E. longicornis</i> (red morrel), <i>E. annulata</i> (open fruited mallee) and <i>E. flocktoniae</i> (Merrit) over <i>Maireana erioclada</i> (rosy bluebush) and <i>Threlkeldia diffusa</i> (coast bonefruit).	PMST	Unlikely
<i>Banksia pseudoplumosa</i>	EN	EN	<i>Banksia pseudoplumosa</i> is a non-lignotuberous shrub, growing to 1.8 m high in gravelly soils.	DBCA 2018a, PMST, NatureMap	Unlikely
<i>Caladenia bryceana</i> subsp. <i>bryceana</i>	EN	EN	Grows in open woodland of wandoo, yate, flooded gum or sheoak with a sparse understorey of low shrubs, sedges and herbs. Soils are sandy clays to red loam over granite.	DBCA 2018a, PMST, NatureMap	Unlikely
<i>Acacia leptalea</i>	EN	VU	This wattle grows in undulating plains and drainage lines. Found on white-grey or red sand or sandy loam slopes, in open mallee with a dense understorey of <i>Melaleuca</i> .	DBCA 2018a	Unlikely
<i>Conostylis misera</i>	EN	VU	The species favours seasonally waterlogged (but not inundated) flats of brown or grey sandy loam over clay duplex soils with underlying laterite, where it inhabits low woodland over heath or sedge, mallee heath and heath.	PMST	Unlikely
<i>Grevillea infundibularis</i>	EN	VU	Fan-leaf Grevillea grows in shallow sandy or loamy soil amongst quartzite boulders, with low-medium trees or heathland and	DBCA 2018a	Unlikely

Species	Conservation status		Habitat	Source ⁴	Likelihood of occurrence
	EPBC Act ¹	BC Act ² / DBCA ³			
			also on dunes and sand-drifts behind beaches.		
<i>Ricnocarpus trichophorus</i>	EN	VU	It is found in rocky, sandy clay along watercourses or in areas that collect run-off. It is associated with Bushy Yate (<i>Eucalyptus lehmannii</i>), Tallerack (<i>E. tetragona</i>), Broom Bush (<i>Melaleuca uncinata</i>), and sheoaks (<i>Allocasuarina</i> spp.).	PMST	Unlikely
<i>Roycea pycnophylloides</i>	EN	VU	Plants grow along shorelines or on slight rises above open saline flats and major drainage channels in white to pale brown sand over sandy clay, either on their own or within nearby fringing vegetation.	PMST	Unlikely
<i>Adenanthos pungens</i> subsp. <i>pungens</i>	VU	EN	Within Stirling Range National Park, this species grows in shallow, rocky pink soil over pink sandstone, in dense scrub of <i>Kunzea montana</i> and <i>Banksia oreophila</i> . West of Pingrup (at Chinocup), it has been collected on gypsum dunes.	DBCA 2018a, PMST, NatureMap	Unlikely
<i>Leucopogon</i> sp. Ongerup (A.S. George 16682)	VU	EN	Pale-brown sand clay loam and sandy loam soils with laterite gravel and quartz fragments on a laterite ridge, overlying granite. Dry, pale yellow to white sand and sandy loam soil overlying laterite, some gravel on soil surface. Simple slope gentle.	DBCA 2018a, PMST	Unlikely
<i>Myoporum cordifolium</i>	VU	EN	This species occurs on disturbed loamy-clays which prior to disturbance supported open eucalypt woodland over tall shrubs. At Corackerup NR it occurs scattered through mallee woodland which is occasionally disturbed by sheet flooding over sandy clay.	DBCA 2018a, PMST, NatureMap	Unlikely
<i>Thelymitra psammophila</i>	VU	VU	This species grows in seasonally wet sandy-clay soil in very open heath and sedges with a considerable amount of wiry ground cover and some low shrubs.	DBCA 2018a, PMST, NatureMap	Unlikely
<i>Tetratheca pilata</i>	-	P1	Granite loam. Rocky outcrops.	DBCA 2018a	Unlikely

Species	Conservation status		Habitat	Source ⁴	Likelihood of occurrence
	EPBC Act ¹	BC Act ² / DBCA ³			
<i>Acacia mutabilis</i> subsp. <i>incurva</i>	-	P2	Sandy loam, clayey loam. Undulating plains.	DBCA 2018a, NatureMap	Unlikely
<i>Gonocarpus rudis</i>	-	P2	Peaty sand. Seepages, roadsides.	DBCA 2018a, NatureMap	Unlikely
<i>Melaleuca viminea</i> subsp. <i>appressa</i>	-	P2	Shallow sand over clay. Near creeks or wet depressions.	DBCA 2018a	Unlikely
<i>Spyridium villosum</i>	-	P2	Sand over sandstone.	DBCA 2018a, NatureMap	Unlikely
<i>Thelymitra</i> sp. Ongerup (S. Osborne 142)	-	P2	Low heath of <i>Banksia</i> , <i>Melaleuca</i> and <i>Verticordia</i> with emergent mallee (<i>Eucalyptus</i> spp.). Rocky clay soil.	DBCA 2018a, NatureMap	Potential
<i>Acacia keigheryi</i>	-	P3	Grows on gentle slopes in often stony, gritty sand, sandy loam, sandy clay or clay over granite or gneiss, in very open Mallee woodland over heath scrub.	DBCA 2018a	Unlikely
<i>Bossiaea atrata</i>	-	P3	White sand or sandy loam over laterite or clay, quartzite sand, clay.	NatureMap	Unlikely
<i>Brachyloma mogin</i>	-	P3	Grey clayey sand. Swamp flat.	DBCA 2018a	Recorded
<i>Calytrix pulchella</i>	-	P3	Grey or white sand over laterite. Ridges, flats.	DBCA 2018a	Unlikely
<i>Chorizema carinatum</i>	-	P3	Sand, sandy clay.	DBCA 2018a	Unlikely
<i>Commersonia rotundifolia</i>	-	P3	Sand, clay, loam, skeletal soils over sandstone. Flats, slopes.	DBCA 2018a, NatureMap	Unlikely
<i>Frankenia drummondii</i>	-	P3	Sand. Lake edges.	DBCA 2018a, NatureMap	Unlikely
<i>Grevillea newbeyi</i>	-	P3	Clay loam, sandy gravelly soils.	DBCA 2018a, NatureMap	Unlikely
<i>Isolepis australiensis</i>	-	P3	Silty sand, sandy clay. Lake margins, pools.	NatureMap	Unlikely

Species	Conservation status		Habitat	Source ⁴	Likelihood of occurrence
	EPBC Act ¹	BC Act ² / DBCA ³			
<i>Leucopogon florulentus</i>	-	P3	White/grey or yellow sand, sandy clay, gravelly lateritic soils. Sandplains, gentle slopes.	DBCA 2018a, NatureMap	Recorded
<i>Leucopogon newbeyi</i>	-	P3	Occurs low in the landscape as a component of the understorey of mallee woodland, commonly in association with various <i>Melaleuca</i> species, and in sandy loam soils, probably with clay at depth.	DBCA 2018a, NatureMap	Recorded
<i>Melaleuca polycephala</i>	-	P3	Sandy clay, clay.	DBCA 2018a, NatureMap	Recorded
<i>Melaleuca pritzelii</i>	-	P3	Sandy or clayey soils. Swampy areas.	DBCA 2018a	Unlikely
<i>Persoonia brevirhachis</i>	-	P3	White or yellow sand, gravelly sandy soils.	DBCA 2018a	Unlikely
<i>Rinzia longifolia</i>	-	P3	Sand, clay. Low rises.	DBCA 2018a, NatureMap	Unlikely
<i>Spyridium oligocephalum</i>	-	P3	Sandy soils. Sandplains.	DBCA 2018a	Unlikely
<i>Stylidium lepidum</i>	-	P3	Gravelly sand or loam, clay. Winter-wet depressions.	DBCA 2018a, NatureMap	Unlikely
<i>Thysanotus gageoides</i>	-	P3	Sand, clay, granite, sandstone, laterite.	DBCA 2018a	Unlikely
<i>Verticordia coronata</i>	-	P3	Clay loam, clay & sandy loam, sometimes gravelly.	DBCA 2018a	Unlikely
<i>Acacia trulliformis</i>	-	P4	Sandy loam	DBCA 2018a	Unlikely
<i>Banksia parva</i>	-	P4	Gravelly clay loam, sandy loam, white sand.	DBCA 2018a	Unlikely
<i>Banksia laevigata</i> subsp. <i>laevigata</i>	-	P4	Rocky soils (spongolite, laterite). Hills, top of breakaways.	DBCA 2018a	Unlikely
<i>Banksia porrecta</i>	-	P4	White/grey sand, sandy loam.	DBCA 2018a	Unlikely

Species	Conservation status		Habitat	Source ⁴	Likelihood of occurrence
	EPBC Act ¹	BC Act ² / DBCA ³			
<i>Bossiaea divaricata</i>	-	P4	Sandy lateritic soils.	DBCA 2018a, NatureMap	Unlikely
<i>Chorizema ulotropis</i>	-	P4	Moist to dry soils, white sand with gravel, laterite, granite. Outcrops, winter damp to dry areas, flats.	DBCA 2018a	Unlikely
<i>Eremophila veneta</i>	-	P4	Clay to loam, white/grey sand. Plains & flats, slopes.	DBCA 2018a, NatureMap	Unlikely
<i>Eucalyptus vesiculosa</i>	-	P4	Flat sites, slight rises.	DBCA 2018a	Unlikely
<i>Orthrosanthus muelleri</i>	-	P4	Grows on shallow brown, sandy loam soil in association with spongelite sandstone and granite geology.	DBCA 2018a	Unlikely

¹EPBC Act = Flora listed under the *Environment Protection and Biodiversity Conservation Act 1999*.

²BC Act = Flora listed under the *Biodiversity Conservation Act 2016*.

CR = listed as Critically Endangered under the EPBC Act or BC Act

EN = listed as Endangered under the EPBC Act or BC Act

VU = listed as Vulnerable under the EPBC Act or BC Act

³DBCA = Flora listed as Priority species under the Department of Biodiversity, Conservation and Attractions

P1 = Priority 1: Species that are known from one or a few locations (generally five or less) which are potentially at risk. Listed by DBCA

P2 = Priority 2: Poorly known species that are known from one or a few locations. Listed by DBCA.

P3 = Priority 3: Poorly known species that are known from several locations and the species does not appear to be under imminent threat. Listed by DBCA.

P4 = Priority 4: Rare, Near Threatened and other species in need of monitoring. Listed by DBCA.

⁴DBCA = Department of Biodiversity, Conservation and Attractions *Threatened and Priority Flora database search* (DBCA 2018a).

NatureMap = NatureMap database search (DBCA 2007-2021)

PMST = EPBC Act Protected Matters Search Tool report (DAWE 2021).

Appendix B Fauna likelihood of occurrence assessment

Species name	Conservation code		Source ⁴	Likelihood of occurrence	Justification
	EPBC Act ¹	BC Act ² / DBCA ³			
<i>Calidris ferruginea</i> (Curlew Sandpiper)	CR, MI	VU, MI	DBCA 2018b, PMST	Unlikely	Not suitable habitat
<i>Numenius madagascariensis</i> (Eastern Curlew)	CR, MI	VU, MI	PMST	Unlikely	Not suitable habitat
<i>Pezoporus occidentalis</i> (Night Parrot)	EN	CR	PMST	Unlikely	Not suitable habitat
<i>Calyptorhynchus latirostris</i> (Carnaby's Black Cockatoo)	EN	EN	DBCA 2018b, PMST, NatureMap	Unlikely	No preferred habitat (breeding, foraging or roosting) within the study area
<i>Botaurus poiciloptilus</i> (Australasian Bittern)	EN	EN	PMST	Unlikely	No preferred habitat (breeding, foraging or roosting) within the study area
<i>Myrmecobius fasciatus</i> (Numbat)	EN	EN	DBCA 2018b, NatureMap	Unlikely	Habitat not suitable (nesting and foraging)
<i>Parantechinus apicalis</i> (Dibbler)	EN	EN	PMST	Unlikely	Few records, large distance from study area, no current collections in the local area
<i>Psophodes nigrogularis</i> subsp. <i>nigrogularis</i> (Western Whipbird (western heath))	EN	EN	DBCA 2018b, NatureMap	Unlikely	Very old historic record nearby, outside current habitat range
<i>Leipoa ocellata</i> (Malleefowl)	VU	VU	DBCA 2018b, PMST, NatureMap	Likely	Closest record 1 km north of the study area and habitat is suitable. No signs of nests within the study area
<i>Dasyurus geoffroyi</i> (Chuditch, Western Quoll)	VU	VU	DBCA 2018b, PMST	Unlikely	Not suitable habitat (e.g. hollow logs)
<i>Falco hypoleucos</i> (Grey Falcon)	VU	VU	PMST	Unlikely	Species is rare with a very wide distribution. Closest record is over 300 km away
<i>Phascogale calura</i> (Red-tailed Phascogale)	VU	CD	DBCA 2018b	Potential	Record <15 years old, 15 km to the north east, potentially suitable habitat present
<i>Actitis hypoleucos</i> (Common Sandpiper)	MI	MI	PMST	Unlikely	Not suitable habitat

Species name	Conservation code		Source ⁴	Likelihood of occurrence	Justification
	EPBC Act ¹	BC Act ² / DBCA ³			
<i>Calidris acuminata</i> (Sharp-tailed Sandpiper)	MI	MI	DBCA 2018b, PMST	Unlikely	Not suitable habitat
<i>Calidris melanotos</i> (Pectoral Sandpiper)	MI	MI	PMST	Unlikely	Not suitable habitat
<i>Calidris ruficollis</i> (Red-necked Stint)	MI	MI	DBCA 2018b	Unlikely	Not suitable habitat
<i>Calidris subminuta</i> (Long-toed Stint)	MI	MI	DBCA 2018b	Unlikely	Not suitable habitat
<i>Motacilla cinerea</i> (Grey Wagtail)	MI	MI	PMST	Unlikely	Not suitable habitat
<i>Pandion haliaetus</i> (Osprey)	MI	MI	PMST	Unlikely	Not suitable habitat
<i>Falco peregrinus</i> (Peregrine Falcon)	-	OS	DBCA 2018b	Potential	Very wide distribution and varying habitat requirements
<i>Isoodon fusciventer</i> (Quenda)	-	P4	DBCA 2018b	Unlikely	Historic records, marginal habitat
<i>Notamacropus eugenii</i> subsp. <i>derbianus</i> (Tammar Wallaby)	-	P4	DBCA 2018b, NatureMap	Unlikely	The site lacks critical habitat and nearby records are historical
<i>Notamacropus irma</i> (Western Brush Wallaby)	-	P4	DBCA 2018b	Potential	Presence of potentially suitable habitat within the study area - this species occurs in a wide range of habitats (woodland, Mallee, heathland)
<i>Oxyura australis</i> (Blue-billed Duck)	-	P4	DBCA 2018b	Unlikely	Not suitable habitat
<i>Platycercus icterotis</i> subsp. <i>xanthogenys</i> (Western Rosella; inland subsp.)	-	P4	DBCA 2018b	Unlikely	Historic records, marginal habitat
<i>Pseudomys occidentalis</i> (Western Mouse)	-	P4	DBCA 2018b	Potential	Historic record nearby, potentially suitable habitat present
<i>Psophodes nigrogularis</i> subsp. <i>oberon</i> (Western Whipbird (western mallee))	-	P4	DBCA 2018b, NatureMap	Unlikely	Nearby records are very historic, marginal habitat (not dense enough understory)
<i>Thinornis rubricollis</i> (Hooded Plover)	-	P4	DBCA 2018b	Unlikely	Not suitable habitat

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²BC Act = Fauna listed under the *Biodiversity Conservation Act 2016*.

CR = listed as Critically Endangered under the EPBC Act or BC Act

EN = listed as Endangered under the EPBC Act or BC Act

VU = listed as Vulnerable under the EPBC Act or BC Act

MI = listed as Migratory under the EPBC Act or as Specially Protected under the BC Act, in the category 'migratory species'

CD = listed as Specially Protected under the BC Act, in the category 'species of special conservation interest (conservation dependent fauna)'

OS = listed as Specially Protected under the BC Act, in the category 'other specially protected fauna'

³DBCA = Fauna listed as Priority species under the Department of Biodiversity, Conservation and Attractions

P4 = Priority 4: Rare, Near Threatened and other species in need of monitoring. Listed by DBCA.

⁴DBCA = Department of Biodiversity, Conservation and Attractions *Threatened and Priority Fauna database search* (DBCA 2018b).

NatureMap = NatureMap database search (DBCA 2007-2021)

PMST = EPBC Act Protected Matters Search Tool report (DAWE 2021).

Appendix C Flora species list

Family	Known Name
Aizoaceae	<i>Carpobrotus modestus</i>
Asparagaceae	<i>Chamaexeros serra</i>
	<i>Lomandra effusa</i>
	<i>Thysanotus patersonii</i>
	<i>Lomandra mucronata</i>
Asteraceae	* <i>Sonchus oleraceus</i>
	* <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i>
	<i>Argentipallium niveum</i>
	<i>Brachyscome ciliaris</i>
	<i>Millotia tenuifolia</i>
	<i>Olearia imbricata</i>
	<i>Actinobole uliginosum</i>
	<i>Calotis hispidula</i>
	<i>Podolepis tepperi</i>
	<i>Senecio glossanthus</i>
Casuarinaceae	<i>Allocasuarina huegeliana</i>
	<i>Allocasuarina thuyoides</i>
Celastraceae	<i>Stackhousia pubescens</i>
Chenopodiaceae	<i>Chenopodium desertorum</i> subsp. <i>microphyllum</i>
	<i>Rhagodia preissii</i> subsp. <i>preissii</i>
	<i>Sclerolaena diacantha</i>
	<i>Threlkeldia diffusa</i>
Cupressaceae	<i>Callitris roei</i>
Cyperaceae	<i>Gahnia ancistrophylla</i>
	<i>Gahnia</i> sp. dull bases (K.R. Newbey 5111)
	<i>Gahnia</i> sp. South West (K.L. Wilson & K. Frank K LW 9266)
	<i>Lepidosperma fimbriatum</i>
	<i>Lepidosperma</i> sp. Bandalup Scabrid (N. Eveleigh 10798)
	<i>Lepidosperma squamatum</i>
	<i>Lepidosperma tuberculatum</i>
	<i>Schoenus sesquispiculus</i>

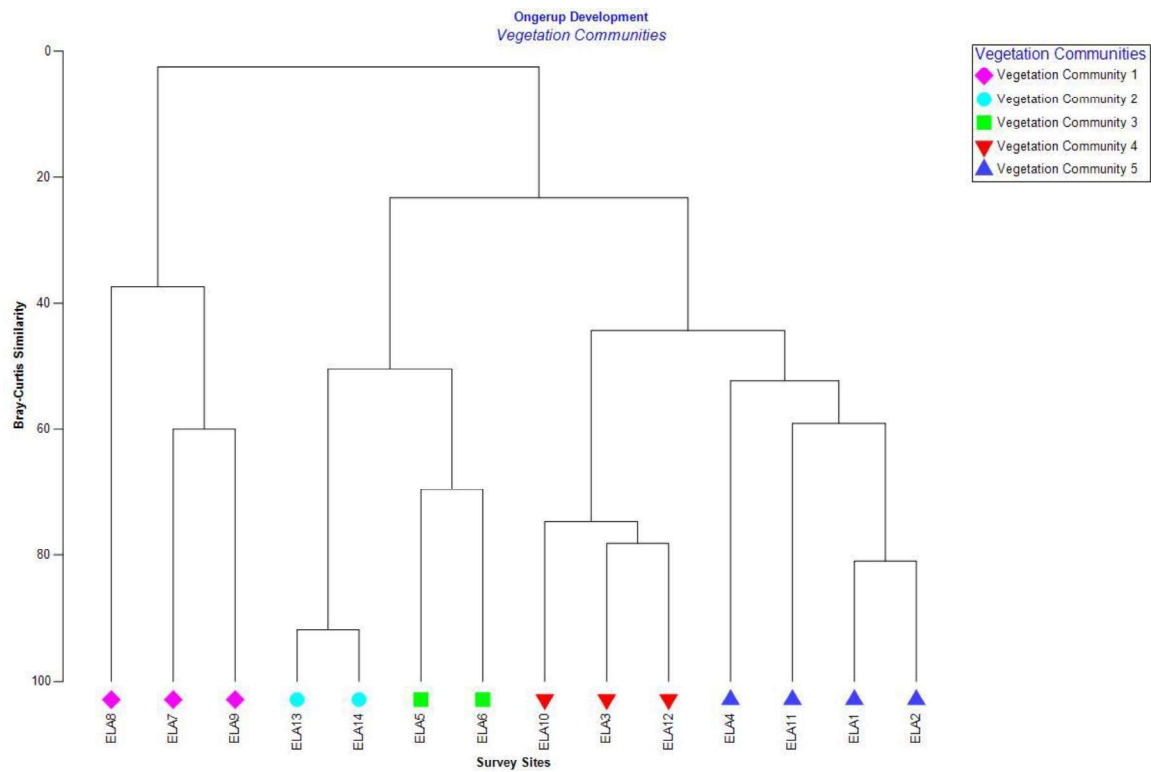
Family	Known Name
	<i>Schoenus subflavus</i> subsp. long leaves (K.L. Wilson 2865)
	<i>Tetraria</i> sp. Mt Madden (C.D. Turley 40 BP/897)
Dasypogonaceae	<i>Calectasia obtusa</i> (P3)
Dilleniaceae	<i>Hibbertia hemignosta</i>
	<i>Hibbertia lineata</i>
Droseraceae	<i>Drosera subhirtella</i>
	<i>Drosera zonaria</i>
Ericaceae	<i>Brachyloma mogin</i> (P3)
	<i>Coleanthera myrtoidea</i>
	<i>Leucopogon florulentus</i> (P3)
	<i>Leucopogon newbeyi</i> (P3)
	<i>Leucopogon</i> sp. Bremer Bay (K.R. Newbey 4667)
	<i>Styphelia intertexta</i>
Fabaceae	<i>Aotus</i> sp. Southern Wheatbelt (C.A. Gardner & W.E. Blackall 1412)
	<i>Chorizema aciculare</i> subsp. <i>aciculare</i>
	<i>Daviesia aphylla</i>
	<i>Daviesia articulata</i>
	<i>Daviesia incrassata</i> subsp. <i>incrassata</i>
	<i>Dillwynia acerosa</i>
	<i>Eutaxia empetrifolia</i>
	<i>Gastrolobium crassifolium</i>
	<i>Isotropis cuneifolia</i> subsp. <i>cuneifolia</i>
	<i>Acacia amputata</i>
	<i>Acacia bidentata</i>
	<i>Acacia chrysocephala</i>
	<i>Acacia erinacea</i>
	<i>Acacia pulviniformis</i>
	<i>Acacia sphacelata</i> subsp. <i>recurva</i>
	<i>Acacia sulcata</i> var. <i>planoconvexa</i>
	<i>Daviesia lancifolia</i>
	<i>Pultenaea empetrifolia</i>

Family	Known Name
	<i>Templetonia rossii</i>
Goodeniaceae	<i>Dampiera lavandulacea</i>
	<i>Anthotium humile</i>
Hemerocallidaceae	<i>Dianella revoluta</i> var. <i>divaricata</i>
Lauraceae	<i>Cassytha aurea</i> var. <i>hirta</i>
Malvaceae	<i>Lasiopetalum rosmarinifolium</i>
	<i>Lysiosepalum involucratum</i>
Myrtaceae	<i>Beaufortia micrantha</i>
	<i>Calothamnus quadrifidus</i> subsp. <i>quadrifidus</i>
	<i>Darwinia vestita</i>
	<i>Eucalyptus uncinata</i>
	<i>Melaleuca glaberrima</i>
	<i>Melaleuca polycephala</i> (P3)
	<i>Rinzia communis</i>
	<i>Calytrix ?flavescens</i>
	<i>Calytrix leschenaultii</i>
	<i>Eucalyptus annulata</i>
	<i>Eucalyptus captiosa</i>
	<i>Eucalyptus extensa</i>
	<i>Eucalyptus flocktoniae</i> subsp. <i>flocktoniae</i>
	<i>Eucalyptus phaenophylla</i> subsp. <i>phaenophylla</i>
	<i>Eucalyptus phenax</i> subsp. <i>phenax</i>
	<i>Eucalyptus platypus</i> subsp. <i>platypus</i>
	<i>Eucalyptus thamnoides</i> subsp. <i>thamnoides</i>
	<i>Leptospermum erubescens</i>
	<i>Melaleuca ?undulata</i>
	<i>Melaleuca acuminata</i> subsp. <i>acuminata</i>
	<i>Melaleuca carrii</i>
	<i>Melaleuca cucullata</i>
	<i>Melaleuca depauperata</i>
	<i>Melaleuca hamata</i>

Family	Known Name
	<i>Melaleuca lateralis</i>
	<i>Melaleuca spathulata</i>
	<i>Melaleuca subtrigona</i>
	<i>Melaleuca violacea</i>
	<i>Taxandria spathulata</i>
Orchidaceae	<i>Caladenia horistes</i>
	<i>Leporella fimbriata</i>
	<i>Pterostylis mutica</i>
	<i>Pyrorchis nigricans</i>
	<i>Caladenia falcata</i>
	<i>Caladenia flava</i> subsp. <i>flava</i>
	<i>Caladenia longicauda</i> x <i>falcata</i>
	<i>Caladenia radialis</i>
	<i>Cyanicula aperta</i>
	<i>Diuris</i> ? <i>brachyscapa</i>
	<i>Ericksonella saccharata</i>
	<i>Pterostylis recurva</i>
Oxalidaceae	<i>Oxalis perennans</i>
Pittosporaceae	<i>Billardiera laxiflora</i>
Poaceae	<i>Austrostipa elegantissima</i>
	* <i>Vulpia myuros</i>
	<i>Amphipogon</i> ? <i>turbinatus</i>
	<i>Austrostipa exilis</i>
	<i>Neurachne alopecuroidea</i>
	<i>Rytidosperma setaceum</i>
Proteaceae	<i>Banksia tenuis</i> var. <i>reptans</i>
	<i>Grevillea dolichopoda</i>
	<i>Grevillea huegelii</i>
	<i>Grevillea oligantha</i>
	<i>Hakea corymbosa</i>
	<i>Hakea florida</i>

Family	Known Name
	<i>Hakea laurina</i>
	<i>Hakea lissocarpha</i>
	<i>Isopogon</i> sp. Fitzgerald River (D.B. Foreman 813)
	<i>Petrophile squamata</i> subsp. northern (J. Monks 40)
Restionaceae	<i>Desmocladius asper</i>
Rhamnaceae	<i>Cryptandra minutifolia</i> subsp. <i>brevistyla</i>
Rutaceae	<i>Boronia crenulata</i> subsp. <i>crenulata</i>
	<i>Boronia octandra</i>
Santalaceae	<i>Exocarpos aphyllus</i>
	<i>Santalum murrayanum</i>
Sapindaceae	<i>Dodonaea viscosa</i> subsp. <i>angustissima</i>
Stylidiaceae	<i>Stylidium piliferum</i>
	<i>Stylidium pingrupense</i>
Thymelaeaceae	<i>Pimelea angustifolia</i>
Xanthorrhoeaceae	<i>Chamaescilla corymbosa</i> var. <i>corymbosa</i>

Appendix D Hierarchical clustering dendrogram



Appendix E Quadrat data

Site name and number	Date	Site type	Observer
ELA1	03/09/2018	10 x 10 m understory 20 x 20 m overstory	SD & JM
Condition	Disturbance	Fire history - years	Landscape type
Excellent	Tracks, altered water regime	Old (>20 years)	Flat plain
Soil type	Soil colour	Leaf litter cover (%)	Bare ground cover (%)
Sandy clay	Light grey	1	15
Easting		Northing	
637280		6239042	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
<i>Acacia bidentata</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Anthotium humile</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Cryptandra minutifolia</i> subsp. <i>brevistyla</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Daviesia lancifolia</i>	0.25	M	Shrub, cycad, grass-tree, tree-fern
<i>Dianella revoluta</i> var. <i>divaricata</i>	0.1	G	Forb
<i>Eucalyptus captiosa</i>	10	M	Mallee shrub
<i>Eucalyptus phaenophylla</i> subsp. <i>phaenophylla</i>	0.1	M	Mallee shrub
<i>Eucalyptus thamnoides</i> subsp. <i>thamnoides</i>	2	M	Mallee shrub
<i>Eucalyptus uncinata</i>	5	M	Mallee shrub

<i>Gahnia ancistrophylla</i>	0.25	G	Sedge
<i>Gahnia</i> sp. dull bases (K.R. Newbey 5111)	0.25	G	Sedge
<i>Hibbertia lineata</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Leucopogon florulentus</i> (P3)	0.1	M	Shrub, cycad, grass-tree, tree-fern
<i>Leucopogon newbeyi</i> (P3)	0.75	M	Shrub, cycad, grass-tree, tree-fern
<i>Melaleuca glaberrima</i>	10	M	Shrub, cycad, grass-tree, tree-fern
<i>Melaleuca hamata</i>	5	M	Shrub, cycad, grass-tree, tree-fern
<i>Melaleuca spathulata</i>	30	M	Shrub, cycad, grass-tree, tree-fern
<i>Melaleuca violacea</i>	1	M	Shrub, cycad, grass-tree, tree-fern
<i>Neurachne alopecuroidea</i>		G	Other grass
<i>Pultenaea empetrifolia</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Rytidosperma setaceum</i>		G	Other grass
<i>Stylidium pingrupense</i>		G	Forb
<i>Templetonia rossii</i>		M	Shrub, cycad, grass-tree, tree-fern

Site name and number	Date	Site type	Observer
ELA2	03/09/2018	10 x 10 m understory 20 x 20 m overstory	SD & JM
Condition	Disturbance	Fire history - years	Landscape type
Excellent	None	Old (>20 years)	Flat plain
Soil type	Soil colour	Leaf litter cover (%)	Bare ground cover (%)
Sandy clay	Light brown	2	30
Easting		Northing	
637132		6239184	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
<i>Acacia amputata</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Acacia bidentata</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Banksia tenuis</i> var. <i>reptans</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Cryptandra minutifolia</i> subsp. <i>brevistyla</i>	0.5	M	Shrub, cycad, grass-tree, tree-fern
<i>Daviesia lancifolia</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Dianella revoluta</i> var. <i>divaricata</i>		G	Forb
<i>Drosera subhirtella</i>		G	Forb
<i>Eucalyptus captiosa</i>		M	Mallee shrub
<i>Eucalyptus phaenophylla</i> subsp. <i>phaenophylla</i>		M	Mallee shrub
<i>Eucalyptus thamnoides</i> subsp. <i>thamnoides</i>		M	Mallee shrub
<i>Eucalyptus uncinata</i>	5	M	Mallee shrub

<i>Gahnia ancistrophylla</i>	10	G	Sedge
<i>Gahnia</i> sp. dull bases (K.R. Newbey 5111)	0.25	G	Sedge
<i>Hakea laurina</i>	0.25	M	Shrub, cycad, grass-tree, tree-fern
<i>Hibbertia lineata</i>	1	M	Shrub, cycad, grass-tree, tree-fern
<i>Lepidosperma squamatum</i>		G	Sedge
<i>Leucopogon florulentus</i> (P3)		M	Shrub, cycad, grass-tree, tree-fern
<i>Melaleuca glaberrima</i>	0.5	M	Shrub, cycad, grass-tree, tree-fern
<i>Melaleuca hamata</i>	2	M	Shrub, cycad, grass-tree, tree-fern
<i>Melaleuca spathulata</i>	10	M	Shrub, cycad, grass-tree, tree-fern
<i>Melaleuca violacea</i>	15	M	Shrub, cycad, grass-tree, tree-fern
<i>Neurachne alopecuroides</i>	2	G	Other grass
<i>Pterostylis recurva</i>		G	Forb
<i>Tetraria</i> sp. Mt Madden (C.D. Turley 40 BP/897)		G	Sedge
* <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i>		G	Forb

Site name and number	Date	Site type	Observer
ELA3	04/09/2018	10 x 10 m understory 20 x 20 m overstory	SD & JM
Condition	Disturbance	Fire history - years	Landscape type
Excellent	None	Old (>20 years)	Flat plain
Soil type	Soil colour	Leaf litter cover (%)	Bare ground cover (%)
Sandy clay	Light grey/brown	3	30
Easting		Northing	
637234		6239333	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
<i>Aotus</i> sp. Southern Wheatbelt (C.A. Gardner & W.E. Blackall 1412)		M	Shrub, cycad, grass-tree, tree-fern
<i>Billardiera laxiflora</i>		G	Vine
<i>Cassytha aurea</i> var. <i>hirta</i>		G	Vine
<i>Cryptandra minutifolia</i> subsp. <i>brevistyla</i>	0.5	M	Shrub, cycad, grass-tree, tree-fern
<i>Dillwynia acerosa</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Eucalyptus annulata</i>		M	Mallee shrub
<i>Eucalyptus phenax</i> subsp. <i>phenax</i>	5	M	Mallee shrub
<i>Eucalyptus thamnoides</i> subsp. <i>thamnoides</i>	10	M	Mallee shrub
<i>Exocarpos aphyllus</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Gahnia ancistrophylla</i>	0.5	G	Sedge
<i>Gahnia</i> sp. dull bases (K.R. Newbey 5111)	0.5	G	Sedge

<i>Hibbertia lineata</i>	0.1	M	Shrub, cycad, grass-tree, tree-fern
<i>Lepidosperma squamatum</i>		G	Sedge
<i>Leucopogon</i> sp. Bremer Bay (K.R. Newbey 4667)		M	Shrub, cycad, grass-tree, tree-fern
<i>Melaleuca ?undulata</i>	40	M	Shrub, cycad, grass-tree, tree-fern
<i>Melaleuca glaberrima</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Melaleuca polycephala</i> (P3)	0.1	M	Shrub, cycad, grass-tree, tree-fern
<i>Neurachne alopecuroidea</i>		G	Other grass
<i>Rytidosperma setaceum</i>		G	Other grass
<i>Styphelia intertexta</i>		M	Shrub, cycad, grass-tree, tree-fern

Site name and number	Date	Site type	Observer
ELA4	04/09/2018	10 x 10 m understory 20 x 20 m overstory	SD & JM
Condition	Disturbance	Fire history - years	Landscape type
Excellent	None	Old (>20 years)	Flat plain
Soil type	Soil colour	Leaf litter cover (%)	Bare ground cover (%)
Sandy loam	Light grey/brown	30	5
Easting		Northing	
637352		6239236	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
<i>Acacia amputata</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Acacia bidentata</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Acacia pulviniformis</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Acacia sphacelata</i> subsp. <i>recurva</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Austrostipa elegantissima</i>	0.1	G	Other grass
<i>Billardiera laxiflora</i>		G	Vine
<i>Caladenia flava</i> subsp. <i>flava</i>	0.1	G	Forb
<i>Chenopodium desertorum</i> subsp. <i>microphyllum</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Daviesia articulata</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Desmocladius asper</i>	0.5	G	Forb
<i>Dianella revoluta</i> var. <i>divaricata</i>	0.1	G	Forb
<i>Ericksonella saccharata</i>		G	Forb

<i>Eucalyptus flocktoniae</i> subsp. <i>flocktoniae</i>		M	Mallee shrub
<i>Eucalyptus phaenophylla</i> subsp. <i>phaenophylla</i>	10	M	Mallee shrub
<i>Eucalyptus thamnoides</i> subsp. <i>thamnoides</i>		M	Mallee shrub
<i>Gahnia ancistrophylla</i>	5	G	Sedge
<i>Gahnia</i> sp. dull bases (K.R. Newbey 5111)	0.25	G	Sedge
<i>Gastrolobium crassifolium</i>	0.25	M	Shrub, cycad, grass-tree, tree-fern
<i>Hakea laurina</i>	1	U	Tree, palm
<i>Hibbertia lineata</i>	1	M	Shrub, cycad, grass-tree, tree-fern
<i>Lasiopetalum rosmarinifolium</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Lepidosperma squamatum</i>		G	Sedge
<i>Melaleuca acuminata</i> subsp. <i>acuminata</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Melaleuca hamata</i>	1	M	Shrub, cycad, grass-tree, tree-fern
<i>Neurachne alopecuroides</i>	40	G	Other grass
<i>Pterostylis recurva</i>		G	Forb
<i>Styphelia intertexta</i>		M	Shrub, cycad, grass-tree, tree-fern
* <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i>	0.5	G	Forb

Site name and number	Date	Site type	Observer
ELA5	04/09/2018	10 x 10 m understory 20 x 20 m overstory	SD & JM
Condition	Disturbance	Fire history - years	Landscape type
Excellent	None	Old (>20 years)	Flat plain
Soil type	Soil colour	Leaf litter cover (%)	Bare ground cover (%)
Sandy loam	Light brown	2	15
Easting		Northing	
637558		6239279	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
<i>Acacia sphacelata</i> subsp. <i>recurva</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Boronia crenulata</i> subsp. <i>crenulata</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Cassytha aurea</i> var. <i>hirta</i>		G	Vine
<i>Dampiera lavandulacea</i>	0.1	G	Forb
<i>Desmocladus asper</i>	0.1	G	Forb
<i>Drosera zonaria</i>	0.1	G	Forb
<i>Ericksonella saccharata</i>		G	Forb
<i>Eucalyptus phaenophylla</i> subsp. <i>phaenophylla</i>		M	Mallee shrub
<i>Eucalyptus thamnoides</i> subsp. <i>thamnoides</i>	5	M	Mallee shrub
<i>Gastrolobium crassifolium</i>	0.5	M	Shrub, cycad, grass-tree, tree-fern
<i>Lepidosperma fimbriatum</i>		G	Sedge
<i>Lepidosperma</i> sp. Bandalup Scabrid (N. Eveleigh 10798)	0.1	G	Sedge

<i>Lepidosperma</i> sp. Bandalup Scabrid (N. Eveleigh 10798)		G	Sedge
<i>Leptospermum erubescens</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Lomandra effusa</i>		G	Forb
<i>Lomandra mucronata</i>	0.1	G	Forb
<i>Melaleuca carrii</i>	2	M	Shrub, cycad, grass-tree, tree-fern
<i>Melaleuca depauperata</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Melaleuca hamata</i>	30	M	Shrub, cycad, grass-tree, tree-fern
<i>Neurachne alopecuroidea</i>		G	Other grass
<i>Rinzia communis</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Stylidium piliferum</i>		G	Forb
<i>Stylidium pingrupense</i>	0.1	G	Forb
<i>Styphelia intertexta</i>		M	Shrub, cycad, grass-tree, tree-fern
* <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i>		G	Forb

Site name and number	Date	Site type	Observer
ELA6	04/09/2018	10 x 10 m understory 20 x 20 m overstory	SD & JM
Condition	Disturbance	Fire history - years	Landscape type
Excellent	Track nearby	Old (>20 years)	Flat plain
Soil type	Soil colour	Leaf litter cover (%)	Bare ground cover (%)
Sandy loam	Light brown	15	1
Easting		Northing	
637513		6239695	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
<i>Billardiera laxiflora</i>		G	Vine (G)
<i>Caladenia flava</i> subsp. <i>flava</i>		G	Forb (G)
<i>Desmocladus asper</i>		G	Forb (G)
<i>Dianella revoluta</i> var. <i>divaricata</i>		G	Forb (G)
<i>Diuris ?brachyscapa</i>		G	Forb (G)
<i>Drosera subhirtella</i>		G	Forb (G)
<i>Drosera zonaria</i>		G	Forb (G)
<i>Ericksonella saccharata</i>		G	Forb (G)
<i>Eucalyptus phaenophylla</i> subsp. <i>phaenophylla</i>	5	M	Mallee shrub (M)
<i>Eucalyptus thamnoides</i> subsp. <i>thamnoides</i>	3	M	Mallee shrub (M)
<i>Gahnia ancistrophylla</i>		G	Sedge (G)
<i>Gastrolobium crassifolium</i>	1	M	Shrub, cycad, grass-tree, tree-fern (M)
<i>Lasiopetalum rosmarinifolium</i>		M	Shrub, cycad, grass-tree, tree-fern (M)

<i>Lepidosperma fimbriatum</i>		G	Sedge (G)
<i>Lepidosperma</i> sp. Bandalup Scabrid (N. Eveleigh 10798)	1	G	Sedge (G)
<i>Lepidosperma</i> sp. Bandalup Scabrid (N. Eveleigh 10798)		G	Sedge (G)
<i>Leptospermum erubescens</i>	1	M	Shrub, cycad, grass-tree, tree-fern (M)
<i>Lomandra effusa</i>	0.5	G	Forb (G)
<i>Lysiosepalum involucratum</i>		M	Shrub, cycad, grass-tree, tree-fern (M)
<i>Melaleuca carrii</i>	1	M	Shrub, cycad, grass-tree, tree-fern (M)
<i>Melaleuca depauperata</i>	3	M	Shrub, cycad, grass-tree, tree-fern (M)
<i>Melaleuca hamata</i>	30	M	Shrub, cycad, grass-tree, tree-fern (M)
<i>Neurachne alopecuroidea</i>		G	Other grass (G)
<i>Rinzia communis</i>	0.1	M	Shrub, cycad, grass-tree, tree-fern (M)
<i>Senecio glossanthus</i>		G	Forb (G)
<i>Stylidium piliferum</i>		G	Forb (G)
* <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i>		G	Forb (G)

Site name and number	Date	Site type	Observer
ELA7	04/09/2018	10 x 10 m understory 20 x 20 m overstory	SD & JM
Condition	Disturbance	Fire history - years	Landscape type
Excellent	Tracks, altered water regime	Old (>20 years)	Flat plain
Soil type	Soil colour	Leaf litter cover (%)	Bare ground cover (%)
Sandy clay	Light grey	95	3
Easting		Northing	
637592		6239476	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
<i>Austrostipa exilis</i>		G	Other grass
<i>Ericksonella saccharata</i>		G	Forb
<i>Eucalyptus extensa</i>	1	U	Tree mallee
<i>Eucalyptus platypus</i> subsp. <i>platypus</i>	80	U	Tree mallee
<i>Melaleuca ?undulata</i>	0.1	M	Shrub, cycad, grass-tree, tree-fern
<i>Oxalis perennans</i>		G	Forb

Site name and number	Date	Site type	Observer
ELA8	04/09/2018	10 x 10 m understory 20 x 20 m overstory	SD & JM
Condition	Disturbance	Fire history - years	Landscape type
Excellent	None	Old (>20 years)	Flat plain
Soil type	Soil colour	Leaf litter cover (%)	Bare ground cover (%)
Sandy clay (more clay)	Light grey	80	2
Easting		Northing	
637707		6239410	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
<i>Caladenia horistes</i>		G	Forb
<i>Eucalyptus platypus</i> subsp. <i>platypus</i>	85	U	Tree mallee
<i>Millotia tenuifolia</i>	0.1	G	Forb
<i>Senecio glossanthus</i>		G	Forb
* <i>Sonchus oleraceus</i>		G	Forb

Site name and number	Date	Site type	Observer
ELA9	04/09/2018	10 x 10 m understory 20 x 20 m overstory	SD & JM
Condition	Disturbance	Fire history - years	Landscape type
Excellent	None	Old (>20 years)	Flat plain
Soil type	Soil colour	Leaf litter cover (%)	Bare ground cover (%)
Sandy loam	Light brown	90	1
Easting		Northing	
637754		6239509	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
<i>Caladenia horistes</i>		G	Forb
<i>Eucalyptus extensa</i>	30	U	Tree mallee
<i>Eucalyptus platypus</i> subsp. <i>platypus</i>	30	U	Tree mallee
<i>Melaleuca cucullata</i>	0.25	M	Shrub, cycad, grass-tree, tree-fern
<i>Oxalis perennans</i>		G	Forb
<i>Pterostylis mutica</i>		G	Forb

Site name and number	Date	Site type	Observer
ELA10	04/09/2018	10 x 10 m understory 20 x 20 m overstory	SD & JM
Condition	Disturbance	Fire history - years	Landscape type
Excellent	Minor rubbish dumping	Old (>20 years)	Flat plain
Soil type	Soil colour	Leaf litter cover (%)	Bare ground cover (%)
Sandy clay	Light grey	5	15
Easting		Northing	
637424		6239425	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
<i>Billardiera laxiflora</i>		G	Vine
<i>Boronia crenulata</i> subsp. <i>crenulata</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Calotis hispidula</i>		G	Forb
<i>Cassytha aurea</i> var. <i>hirta</i>		G	Vine
<i>Dillwynia acerosa</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Eucalyptus annulata</i>		M	Mallee shrub
<i>Eucalyptus flocktoniae</i> subsp. <i>flocktoniae</i>		M	Mallee shrub
<i>Eucalyptus phenax</i> subsp. <i>phenax</i>	10	M	Mallee shrub
<i>Eucalyptus thamnoides</i> subsp. <i>thamnoides</i>	5	M	Mallee shrub
<i>Exocarpos aphyllus</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Gahnia ancistrophylla</i>	0.5	G	Sedge

<i>Gahnia</i> sp. dull bases (K.R. Newbey 5111)	0.5	G	Sedge
<i>Hakea laurina</i>		U	Tree, palm
<i>Hibbertia lineata</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Lepidosperma squamatum</i>		G	Sedge
<i>Melaleuca ?undulata</i>	5	M	Shrub, cycad, grass-tree, tree-fern
<i>Melaleuca hamata</i>	2	M	Shrub, cycad, grass-tree, tree-fern
<i>Melaleuca polycephala</i> (P3)		M	Shrub, cycad, grass-tree, tree-fern
<i>Melaleuca violacea</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Neurachne alopecuroidea</i>		G	Other grass
<i>Pterostylis recurva</i>		G	Forb
<i>Rytidosperma setaceum</i>		G	Other grass
* <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i>		G	Forb

Site name and number	Date	Site type	Observer
ELA11	05/09/2018	10 x 10 m understory 20 x 20 m overstory	SD & JM
Condition	Disturbance	Fire history - years	Landscape type
Very Good	Run off from golf course	Old (>20 years)	Flat plain
Soil type	Soil colour	Leaf litter cover (%)	Bare ground cover (%)
Sandy clay	Light brown	5	35
Easting		Northing	
637549		6239665	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
<i>Billardiera laxiflora</i>		G	Vine
<i>Ericksonella saccharata</i>		G	Forb
<i>Eucalyptus captiosa</i>	1	M	Mallee shrub
<i>Eucalyptus flocktoniae</i> subsp. <i>flocktoniae</i>	0.1	M	Mallee shrub
<i>Eucalyptus phaenophylla</i> subsp. <i>phaenophylla</i>	5	M	Mallee shrub
<i>Eucalyptus thamnoides</i> subsp. <i>thamnoides</i>	2	M	Mallee shrub
<i>Gahnia ancistrophylla</i>		G	Sedge
<i>Gahnia</i> sp. dull bases (K.R. Newbey 5111)		G	Sedge
<i>Hakea laurina</i>		U	Tree, palm
<i>Hibbertia lineata</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Leucopogon newbeyi</i> (P3)	1	M	Shrub, cycad, grass-tree, tree-fern

<i>Melaleuca glaberrima</i>	1	M	Shrub, cycad, grass-tree, tree-fern
<i>Melaleuca hamata</i>	0.5	M	Shrub, cycad, grass-tree, tree-fern
<i>Melaleuca lateralis</i>	15	M	Shrub, cycad, grass-tree, tree-fern
<i>Melaleuca polycephala</i> (P3)	1	M	Shrub, cycad, grass-tree, tree-fern
<i>Melaleuca spathulata</i>	5	M	Shrub, cycad, grass-tree, tree-fern
<i>Neurachne alopecuroidea</i>		G	Other grass
<i>Rytidosperma setaceum</i>		G	Other grass

Site name and number	Date	Site type	Observer
ELA12	05/09/2018	10 x 10 m understory 20 x 20 m overstory	SD & JM
Condition	Disturbance	Fire history - years	Landscape type
Excellent	None	Old (>20 years)	Flat plain
Soil type	Soil colour	Leaf litter cover (%)	Bare ground cover (%)
Sandy clay	Light brown	50	30
Easting		Northing	
637600		6239310	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
<i>Acacia sulcata</i> var. <i>planoconvexa</i>		M	Shrub, cycad, grass-tree, tree-fern (M)
<i>Aotus</i> sp. Southern Wheatbelt (C.A. Gardner & W.E. Blackall 1412)		M	Shrub, cycad, grass-tree, tree-fern (M)
<i>Billardiera laxiflora</i>		G	Vine (G)
<i>Cassytha aurea</i> var. <i>hirta</i>		G	Vine (G)
<i>Cryptandra minutifolia</i> subsp. <i>brevistyla</i>		M	Shrub, cycad, grass-tree, tree-fern (M)
<i>Dillwynia acerosa</i>		M	Shrub, cycad, grass-tree, tree-fern (M)
<i>Eucalyptus annulata</i>	10	M	Mallee shrub (M)
<i>Eucalyptus flocktoniae</i> subsp. <i>flocktoniae</i>		M	Mallee shrub (M)
<i>Eucalyptus phenax</i> subsp. <i>phenax</i>	1	M	Mallee shrub (M)
<i>Eucalyptus thamnoides</i> subsp. <i>thamnoides</i>	2	M	Mallee shrub (M)

<i>Exocarpos aphyllus</i>		M	Shrub, cycad, grass-tree, tree-fern (M)
<i>Gahnia ancistrophylla</i>	0.5	G	Sedge (G)
<i>Gahnia</i> sp. dull bases (K.R. Newbey 5111)	0.5	G	Sedge (G)
<i>Hibbertia lineata</i>		M	Shrub, cycad, grass-tree, tree-fern (M)
<i>Leucopogon newbeyi</i> (P3)	0.1	M	Shrub, cycad, grass-tree, tree-fern (M)
<i>Melaleuca ?undulata</i>	3	M	Shrub, cycad, grass-tree, tree-fern (M)
<i>Melaleuca depauperata</i>		M	Shrub, cycad, grass-tree, tree-fern (M)
<i>Melaleuca hamata</i>	0.1	M	Shrub, cycad, grass-tree, tree-fern (M)
<i>Melaleuca lateralis</i>		M	Shrub, cycad, grass-tree, tree-fern (M)
<i>Melaleuca polycephala</i> (P3)	0.5	M	Shrub, cycad, grass-tree, tree-fern (M)
<i>Neurachne alopecuroidea</i>		G	Other grass (G)
<i>Pterostylis mutica</i>		G	Forb (G)
<i>Rytidosperma setaceum</i>		G	Other grass (G)
* <i>Sonchus oleraceus</i>		G	Forb (G)

Site name and number	Date	Site type	Observer
ELA13	05/09/2018	10 x 10 m understory 20 x 20 m overstory	SD & JM
Condition	Disturbance	Fire history - years	Landscape type
Excellent	None	Old (>20 years)	Flat plain
Soil type	Soil colour	Leaf litter cover (%)	Bare ground cover (%)
Sandy clay	Light brown	2	15
Easting		Northing	
637499		6239158	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
<i>Amphipogon ?turbيناتus</i>		G	Other grass
<i>Calothamnus quadrifidus</i> subsp. <i>quadrifidus</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Calytrix leschenaultii</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Cassutha aurea</i> var. <i>hirta</i>		G	Vine
<i>Chamaexeros serra</i>		G	Forb
<i>Chorizema aciculare</i> subsp. <i>aciculare</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Dampiera lavandulacea</i>		G	Forb
<i>Desmocladus asper</i>		G	Forb
<i>Drosera subhirtella</i>		G	Forb
<i>Drosera zonaria</i>		G	Forb
<i>Ericksonella saccharata</i>		G	Forb
<i>Eucalyptus captiosa</i>	1	M	Mallee shrub
<i>Eucalyptus phaenophylla</i> subsp. <i>phaenophylla</i>	2	M	Mallee shrub

<i>Eucalyptus uncinata</i>	5	M	Mallee shrub
<i>Eucalyptus uncinata</i>	0.25	M	Mallee shrub
<i>Gahnia</i> sp. South West (K.L. Wilson & K. Frank K LW 9266)	0.1	G	Sedge
<i>Hakea lissocarpa</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Isopogon</i> sp. Fitzgerald River (D.B. Foreman 813)	0.1	M	Shrub, cycad, grass-tree, tree-fern
<i>Lasiopetalum rosmarinifolium</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Lepidosperma</i> sp. Bandalup Scabrid (N. Eveleigh 10798)	0.5	G	Sedge
<i>Leporella fimbriata</i>		G	Forb
<i>Leptospermum erubescens</i>	10	M	Shrub, cycad, grass-tree, tree-fern
<i>Lomandra mucronata</i>		G	Forb
<i>Melaleuca carrii</i>	10	M	Shrub, cycad, grass-tree, tree-fern
<i>Melaleuca hamata</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>Melaleuca subtrigona</i>	2	M	Shrub, cycad, grass-tree, tree-fern
<i>Neurachne alopecuroidea</i>		G	Other grass
<i>Petrophile squamata</i> subsp. northern (J. Monks 40)		M	Shrub, cycad, grass-tree, tree-fern
<i>Pterostylis recurva</i>		G	Forb
<i>Pyrorchis nigricans</i>		G	Forb
<i>Santalum murrayanum</i>	0.5	M	Shrub, cycad, grass-tree, tree-fern
<i>Schoenus sesquispiculus</i>		G	Sedge
<i>Schoenus subflavus</i> subsp. long leaves (K.L. Wilson 2865)		G	Sedge
<i>Stylidium piliferum</i>		G	Forb
<i>Stylidium pingrupense</i>		G	Forb

<i>Taxandria spathulata</i>		M	Shrub, cycad, grass-tree, tree-fern
<i>*Ursinia anthemoides</i> subsp. <i>anthemoides</i>		G	Forb

Site name and number	Date	Site type	Observer
ELA14	05/09/2018	10 x 10 m understory 20 x 20 m overstory	SD & JM
Condition	Disturbance	Fire history - years	Landscape type
Excellent	None	Old (>20 years)	Flat plain
Soil type	Soil colour	Leaf litter cover (%)	Bare ground cover (%)
Sandy clay	Light brown/white	2	20
Easting		Northing	
637432		6239316	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
<i>Acacia sphacelata</i> subsp. <i>recurva</i>		M	Shrub, cycad, grass-tree, tree-fern (M)
<i>Amphipogon ?turbinatus</i>		G	Other grass (G)
<i>Calytrix leschenaultii</i>	0.1	M	Shrub, cycad, grass-tree, tree-fern (M)
<i>Cassutha aurea</i> var. <i>hirta</i>		G	Vine (G)
<i>Chamaexeros serra</i>		G	Forb (G)
<i>Dampiera lavandulacea</i>		G	Forb (G)
<i>Desmocladius asper</i>		G	Forb (G)
<i>Drosera subhirtella</i>		G	Forb (G)
<i>Drosera zonaria</i>		G	Forb (G)
<i>Ericksonella saccharata</i>		G	Forb (G)
<i>Eucalyptus captiosa</i>	1	M	Mallee shrub (M)
<i>Eucalyptus phaenophylla</i> subsp. <i>phaenophylla</i>	5	M	Mallee shrub (M)
<i>Eucalyptus uncinata</i>		M	Mallee shrub (M)

<i>Gahnia</i> sp. South West (K.L. Wilson & K. Frank K LW 9266)	2	G	Sedge (G)
<i>Hakea laurina</i>		U	Tree, palm (U)
<i>Isopogon</i> sp. Fitzgerald River (D.B. Foreman 813)		M	Shrub, cycad, grass-tree, tree-fern (M)
<i>Lepidosperma</i> sp. Bandalup Scabrid (N. Eveleigh 10798)	1	G	Sedge (G)
<i>Leporella fimbriata</i>		G	Forb (G)
<i>Leptospermum erubescens</i>		M	Shrub, cycad, grass-tree, tree-fern (M)
<i>Lomandra mucronata</i>		G	Forb (G)
<i>Melaleuca carrii</i>	0.5	M	Shrub, cycad, grass-tree, tree-fern (M)
<i>Melaleuca hamata</i>	1	M	Shrub, cycad, grass-tree, tree-fern (M)
<i>Melaleuca subtrigona</i>		M	Shrub, cycad, grass-tree, tree-fern (M)
<i>Neurachne alopecuroidea</i>	0.1	G	Other grass (G)
<i>Petrophile squamata</i> subsp. northern (J. Monks 40)		M	Shrub, cycad, grass-tree, tree-fern (M)
<i>Pyrorchis nigricans</i>		G	Forb (G)
<i>Rinzia communis</i>		M	Shrub, cycad, grass-tree, tree-fern (M)
<i>Santalum murrayanum</i>		M	Shrub, cycad, grass-tree, tree-fern (M)
<i>Schoenus subflavus</i> subsp. long leaves (K.L. Wilson 2865)		G	Sedge (G)
<i>Stylidium piliferum</i>		G	Forb (G)
<i>Stylidium pingrupense</i>		G	Forb (G)
* <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i>		G	Forb (G)

Appendix F Fauna species list

Species name	Common name	Evidence type
Birds		
<i>Anthochaera carunculata</i>	Red Wattlebird	Observed
<i>Anthochaera lunulata</i>	Western Wattlebird	Observed
<i>Artamus cyanopterus</i>	Dusky Woodswallow	Heard
<i>Barnardius zonarius</i>	Australian Ringneck	Observed
<i>Corvus coronoides</i>	Australian Raven	Observed
<i>Cracticus tibicen</i>	Australian Magpie	Observed
<i>Egretta novaehollandiae</i>	White-faced Heron	Observed
<i>Eolophus roseicapilla</i>	Galah	Observed
<i>Grallina cyanoleuca</i>	Magpie-lark	Observed
<i>Lichmera indistincta</i>	Brown Honeyeater	Observed
<i>Pachycephala rufiventris</i>	Rufous Whistler	Heard
<i>Phaps chalcoptera</i>	Common Bronzewing	Observed
<i>Phylidonyris niger</i>	White-cheeked Honeyeater	Observed
<i>Phylidonyris novaehollandiae</i>	New Holland Honeyeater	Observed
<i>Polytelis anthopeplus</i>	Regent Parrot	Observed
<i>Pomatostomus superciliosus</i>	White-browed Babbler	Heard
<i>Rhipidura leucophrys</i>	Willy Wagtail	Observed
<i>Smicromnis brevirostris</i>	Weebill	Heard
<i>Strepera versicolor</i>	Grey Currawong	Observed
Mammals		
<i>Felis catus</i>	Feral Cat	Signs (tracks)
<i>Macropus fuliginosus</i>	Western Grey Kangaroo	Signs (scats, tracks)
<i>Tachyglossus aculeatus</i>	Short-beaked Echidna	Signs (diggings, scats)
<i>Vulpes vulpes</i>	Red Fox	Signs (tracks, scats)
Reptiles		
<i>Tiliqua rugosa</i>	Bobtail Lizard	Signs (dead specimens)



HEAD OFFICE

Suite 2, Level 3
668-672 Old Princes Highway
Sutherland NSW 2232
T 02 8536 8600
F 02 9542 5622

CANBERRA

Level 2
11 London Circuit
Canberra ACT 2601
T 02 6103 2314
F 02 9542 5622

COFFS HARBOUR

22 Ray McCarthy Drive
Coffs Harbour NSW 2450
T 02 6651 5484
F 02 6651 6890

PERTH

Level 1, Bishop's See,
235 St Georges Terrace
Perth WA 6000
T 08 6218 2200
F 02 9542 5622

MELBOURNE

Level 1, 436 Johnston St
Abbotsford, VIC 3076
T 03 9290 7173
F 02 9542 5622

SYDNEY

Suite 1, Level 1
101 Sussex Street
Sydney NSW 2000
T 02 8536 8650
F 02 9542 5622

NEWCASTLE

Suites 28 & 29, Level 7
19 Bolton Street
Newcastle NSW 2300
T 02 4910 3412
F 02 9542 5622

ARMIDALE

92 Taylor Street
Armidale NSW 2350
T 02 8081 2685
F 02 9542 5622

WOLLONGONG

Suite 204, Level 2
62 Moore Street
Austinmer NSW 2515
T 02 4201 2203
F 02 4268 4361

BRISBANE

Level 5, 12 Creek Street
Brisbane QLD 4000
T 07 3239 9600
F 02 9542 5622

HUSKISSON

Unit 1, 51 Owen Street
Huskisson NSW 2540
T 02 4201 2264
F 02 9542 5622

NAROOMA

5/20 Cauty Street
Narooma NSW 2546
T 02 4302 1266
F 02 9542 5622

MUDGEES

Unit 1, Level 1
79 Market Street
Mudgee NSW 2850
T 02 4302 1234
F 02 6372 9230

ADELAIDE

Level 2, 70 Pirie Street
Adelaide SA 5000
T 08 8470 6650
F 02 9542 5622

1300 646 131

www.ecoaus.com.au