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CITY OF GOSNELLS
STATION STREET BRIDGE
FLORA AND FAUNA ASSESSMENT

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EXECUTIVE SUMMARY

In 2017, the City of Gosnells obtained a native vegetation clearing permit (NVCP) as part of Station Street Bridge construction works based on the results of a previous flora and fauna survey undertaken by Golder Associates on the 3rd of September and 5th of October 2016. Although the initial application was approved and a permit granted, the project did not proceed within the required timeframe and the original clearing permit lapsed. Ecologia Environment (*ecologia*) was engaged by WSP Golder on behalf of the City of Gosnells to undertake a re-survey of the proposed vegetation clearing area (0.41 ha), comprising a flora and vegetation assessment, targeted flora survey and basic fauna and fauna habitat assessment (including black cockatoo habitat assessment) to support the new NVCP application. The current flora and fauna surveys were undertaken on the 7th of September 2022.

Flora and Vegetation Assessment

A total of 11 vascular plant taxa representing seven families and 11 genera were recorded within the survey area. There were no EPBC Act (1999) or DBCA listed Priority taxa recorded within the survey area. Eight of the 11 species recorded were introduced, none of which are listed as Declared Pests or Weeds of National Significance (WONS).

Vegetation within the survey area consists mainly of *Eucalyptus rudis* subsp. *rudis* tall closed forest over *Fumaria capreolata* and *Oxalis pes-caprae* low closed herbland on plains associated with the alluvial deposits of the Guildford Formation, and *Eucalyptus rudis* subsp. *rudis, Melaleuca rhaphiophylla* tall closed forest over *Fumaria capreolata* and *Holcus lanatus* low closed herbland or grassland along a creek line associated with the Guildford Formation. Vegetation within the survey area was in a 'Completely Degraded' condition.

There were no plant communities observed within the survey area that corresponded to any state (DBCA) or Commonwealth (EPBC Act) listed Threatened Ecological Community (TEC), nor any state listed Priority Ecological Community (PEC).

Fauna and Fauna Habitat Assessment

Fauna habitat assessments were undertaken at five sites to describe representative habitat types present within the proposed vegetation clearing area. Two habitat types were identified: Open Woodland (41.14%) and Creekline (5.06%). Neither habitat type is restricted to the proposed vegetation clearing area. The remainder of the proposed vegetation clearing area (53.80%) was mapped as Cleared (road/verge) and Cleared (parkland), which provide minimal habitat for terrestrial fauna species. Habitat condition ranged from 'Degraded' to 'Poor' with clearing and significant weed infestations contributing to lower condition ratings for several habitat assessment sites.

Twenty-four vertebrate fauna species were recorded during the survey including one introduced mammal and 23 birds. Fauna recorded during the survey were generally common and are not restricted to the proposed vegetation clearing area. Six introduced species were recorded during the survey, including the dog, chicken, mallard, rainbow lorikeet, laughing turtle dove and laughing kookaburra. A small flock of Carnaby's cockatoos were recorded foraging in a marri tree in the northeast corner of the survey area. Although the Baudin's cockatoo was not recorded during the current survey, this species was previously recorded overflying the survey area.

The post-survey likelihood of occurrence assessment identified two birds (forest red-tailed black cockatoo [*Calyptorhynchus banksii naso*] and blue-billed duck [*Oxyura australis*]) considered 'Likely' to occur within the proposed vegetation clearing area. An additional four species (peregrine falcon [*Falco peregrinus*], water rat [*Hydromys chrysogaster*], quenda [*Isoodon fusciventer*]) and the brush-tailed phascogale [*Phascogale tapoatafa wambenger*]) are considered 'Possible' to occur within the proposed vegetation clearing area. Twenty-four significant birds, five mammals and three reptiles were assessed as 'Unlikely' to occur within the proposed vegetation clearing area due to absence of suitable habitat, age of records, distance of records from the survey area or a combination of these factors.

Black Cockatoo Assessment

An assessment was undertaken to investigate potential breeding habitat, night roosting habitat, and foraging habitat for the three black cockatoo species within the proposed vegetation clearing area. Nine Carnaby's cockatoos were recorded foraging in a marri tree located within cleared (parkland) habitat in the northeast corner of the proposed vegetation clearing area. A total of 27 potentially suitable habitat trees (> 500 mm DBH) were recorded within the proposed vegetation clearing area. None of these trees had known or probable nesting hollows and only seven trees contained potentially suitable hollows (Category 5). The remaining 20 trees identified as habitat trees did not support hollows of a suitable size, height or angle to support black cockatoos (Category 7).

Black cockatoo foraging habitat within the proposed vegetation clearing area was assessed as low quality. Given the appropriate timing of the survey, the lack of confirmed breeding records, low quality foraging habitat recorded within the survey area, and that no trees had 'known' or 'probable' breeding hollows, it is unlikely that black cockatoos are currently utilising any of the trees identified as breeding habitat or roost trees within the survey area.

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ABBREVIATIONS

BAM Act	*Biosecurity and Agriculture Management Act 2007*
BC Act	Biodiversity Conservation Act 2016
BOM	Bureau of Meteorology
CALM	Department of Conservation and Land Management (now DBCA and DWER)
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAWE	Department of Agriculture, Water and the Environment (previously DoEE)
DBCA	Department of Biodiversity, Conservation and Attractions (previously DPaW)
DEC	Department of Environment and Conservation (now DBCA)
DER	Department of Environment Regulation
DWER	Department of Water and Environmental Regulation
DoEE	Department of Environment and Energy (previously DSEWPaC, now DAWE)
DPaW	Department of Parks and Wildlife (now DBCA)
DPIRD	Department of Primary Industry and Regional Development
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities (now DAWE)
EPA	Environment Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act* 1999
ESCAVI	Executive Steering Committee for Australian Vegetation Information
IBRA	Interim Biogeographic Regionalisation for Australia
IUCN	International Union for Conservation of Nature
NVIS	National Vegetation Information System
PEC	Priority Ecological Community
SAC	Species Accumulation Curve
TEC	Threatened Ecological Community
TPFL	Threatened and Priority Flora List database
TPFR	Threatened and Priority Flora Report form
WA	Western Australia
WAH	Western Australian Herbarium
WAHERB	Western Australian Herbarium Specimen Database
WAOL	Western Australian Organism List
WC Act	*Wildlife Conservation Act* 1950
WAOL	Western Australian Organism List
WONS	Weeds of National Significance

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1 INTRODUCTION

1.1 PROJECT BACKGROUND

In 2017, the City of Gosnells obtained a native vegetation clearing permit (NVCP) as part of Station Street Bridge construction works. Although the initial application and associated flora and fauna survey was approved and a permit granted, the project did not proceed within the required timeframe and the original clearing permit lapsed. Ecologia Environment (*ecologia*) was engaged by WSP Golder on behalf of the City of Gosnells to undertake a re-survey of the proposed vegetation clearing area (0.41 ha) (subsequently referred to as "the survey area"), comprising a flora and vegetation assessment, targeted flora survey and basic fauna and fauna habitat assessment (including black cockatoo habitat assessment) to support a new clearing permit application.

1.2 SURVEY OBJECTIVES

The following were provided as part of the fauna, flora and vegetation assessment:

- A desktop assessment to evaluate biological values of the survey area and surrounds, including a review of existing physical and biological values, significant species and communities, and other relevant available data.
- A single-phase detailed flora and vegetation survey in accordance with the *Technical Guidance* (EPA 2016b).
- Targeted searches for significant plant species and communities (see Appendix A for definitions).
- A plant species inventory, including all native and introduced species.
- An inventory of significant plant species, and an assessment of their local and regional distribution (if present).
- An inventory and a map of Weeds of National Significance (WONS) and Declared Pests (if present).
- Classification, characterisation, and mapping of vegetation types.
- Assessment and mapping of vegetation condition.
- An assessment of vegetation significance at a national, state, regional, and local level.
- A basic fauna and fauna habitat assessment, including black cockatoo habitat assessment in accordance with the *Technical Guidance* (EPA 2020).

1.3 LEGISLATIVE AND REGULATORY FRAMEWORK

The Environmental Protection Authority's (EPA) environmental objectives for the factors *Flora and Vegetation* (EPA 2016a) and *Terrestrial Fauna* (EPA 2020) are to protect fauna, flora and vegetation so that biological diversity and ecological integrity are maintained. In this context, 'ecological integrity' is the composition, structure, function and processes of ecosystems, and the natural range of variation of these elements. The primary objective of this flora and fauna assessment was to provide sufficient information to assess the impact of any proposed development on the fauna, flora, and vegetation of the survey area, thereby ensuring that the EPA's objectives can be met.

The survey was designed and undertaken to comply with the following guidance documents:

- Environmental Factor Guideline: Flora and Vegetation (EPA 2016a).
- Technical Guidance – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA 2020).
- Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016b).
- Environment Protection and Biodiversity Conservation (EPBC) *Act* 1999 (EPBC Act) Referral Guidelines for Three Threatened Black Cockatoo Species (DSEWPC 2012).

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Project: 1939
Date: 26 October 2022
Author: CB
Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Absolute Scale: 1:1,100 @A3

Figure 1.1: Location of the survey area.

Service Layer Credits: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

2 DESKTOP ASSESSMENT

2.1 DESKTOP METHODOLOGY

The methodology adopted for the desktop assessment was in accordance with the *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016b) and *Technical Guidance – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA 2020). A review of background environmental information for the survey area was undertaken, including, but not limited to, climate (BoM 2021) (BoM), biogeography (IBRA 7) (DSEWPaC 2012a), soil-landscape systems (land systems) (DPIRD 2016), the Surface Geology of Australia 1:1M spatial dataset (Geoscience Australia 2012), and pre-European native vegetation of Western Australia (Shepherd *et al.* 2002).

Searches of the databases listed in Table 2.1 were undertaken to determine the significant species and ecological communities previously recorded within 10 km of the survey area. The criteria listed in Table 2.2 were then applied to determine the likelihood of occurrence of these species and communities within the survey area. To assist in the assessment, habitat preferences were sourced, where available, from relevant taxonomic literature, FloraBase records (Western Australian Herbarium 1998–), Threatened Species Profiles (SPRATs), or specimen data from the Australasian Virtual Herbarium (AVH) database (CHAH 2017). Herbarium catalogue numbers are provided if habitat information was derived from specimen data.

Table 2.1: Databases queried for the desktop assessment.

Database	Search details
EPBC Act Protected Matters database	Records of matters of national significance under the EPBC Act within 10 km of the survey area
DBCA Threatened and Priority Ecological Communities Database	TECs and PECs within 10 km of the survey area
DBCA Threatened and Priority Flora Database	Significant plant records within the Swan Coastal Plain IBRA region within 5 km of the survey area.
DBCA Threatened and Priority Fauna Database	Significant fauna records within 10 km of the survey area.
DBCA NatureMap Database	All flora and fauna records within 10 km of the survey area.
BirdLife Australia's Birdata Database	All avifauna records within 10 km of the survey area.
Atlas of Living Australia Database	All fauna records within 10 km of the survey area.
IBSA Project Database	All IBSA projects located within 10 km of the survey area.

Table 2.2: Criteria used to assess the likelihood of occurrence of significant species and communities.

Rating	Criterion
Recorded	The species/community has been recorded within the survey area previously or during the current survey.
Likely	The species/community is likely to occur within the survey area as suitable habitat is known to be present and there are existing records very close to the survey area (within ca. 10 km).
Possible	The species/community may occur within the survey area as there are existing records in the vicinity of the survey area (ca. 10 – 40 km), and suitable habitat is likely to be present; or The species/community may occur within the survey area as there is insufficient information available to exclude the possibility of occurrence.
Unlikely	The species/community is unlikely to occur within the survey area as suitable habitat is not present or is not likely to be present; or Suitable habitat is present within the survey area, but the taxon/community has not been recorded despite reasonable survey effort.
Does not occur	The community is an existing regionally mapped vegetation association (e.g. Shepherd et al. 2002) or land system (e.g. DPIRD 2016) which does not occur within the survey area; or The species is recognised as being locally extinct or extinct in the wild and does not occur within the survey area.

2.2 CLIMATE

The survey area is located within the Swan Coastal Plains region of Western Australia, which experiences a Mediterranean climate with mild to cool, wet winters and warm to hot, dry summers (Mitchell *et al.* 2002). Average annual rainfall ranges from 600 mm to 1000 mm (Mitchell *et al.* 2002).

Rainfall data from the nearest long-term Bureau of Meteorology (BOM) weather station (since 1961) were obtained from Gosnells City (Station No. 009106), located 3.2 km to the northwest of the survey area. Rainfall at Gosnells City over the 12 months prior to the survey was approximately 28% of mean annual rainfall (219.7 mm) (Figure 2.1). Temperature data were also obtained from Gosnells City (Station No. 009106)(BoM 2022) (Figure 2.1). Maximum daytime temperatures are recorded to exceed 40°C in the summer months and rarely fall below 30°C during the winter months. Minimum temperatures often fall below 15°C.

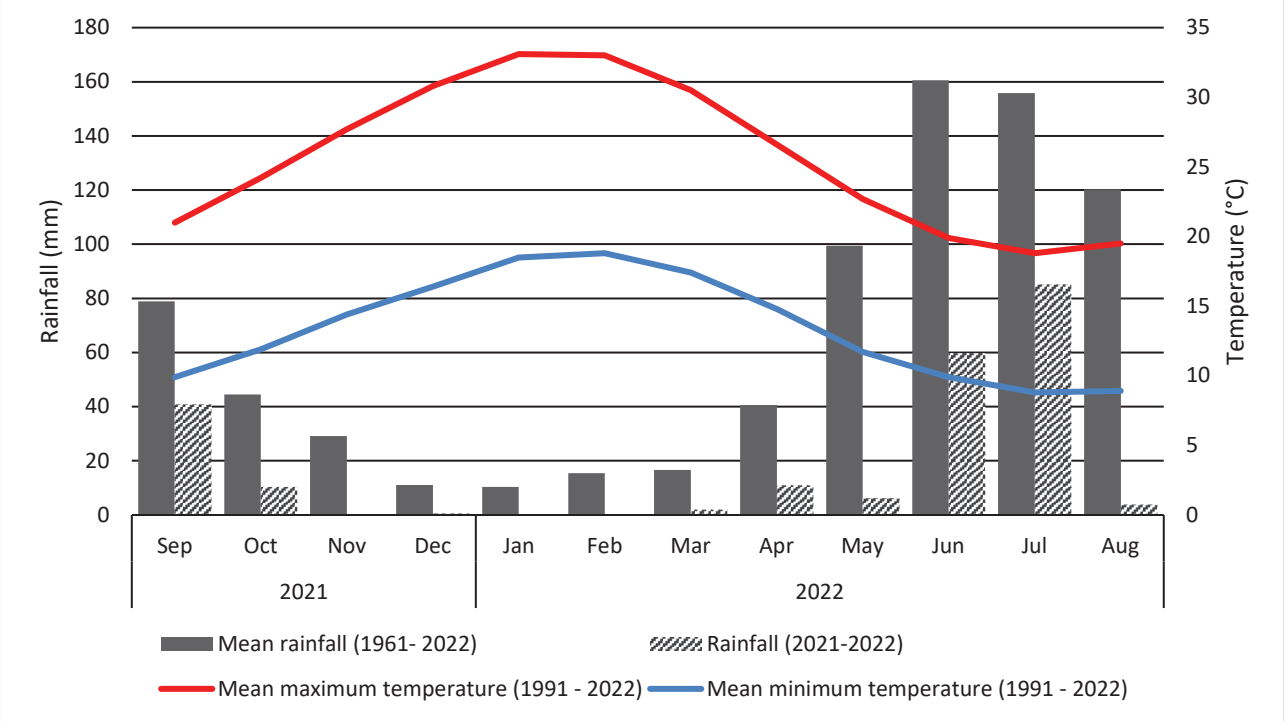

Figure 2.1: Climate data from Gosnells City (rainfall and temperature).

2.3 INTERIM BIOGEOGRAPHIC REGIONALISATION FOR AUSTRALIA

The Interim Biogeographic Regionalisation for Australia (IBRA) classifies the Australian continent into bioregions on the basis of similar geology, landform, vegetation, fauna and climate characteristics (DSEWPaC 2012a).

The survey area is situated within the Swan Coastal Plain bioregion according to IBRA 7. The Pilbara region is further divided into two subregions: Swan Coastal Plain and Dandaragan Plateau. The survey area is situated within the Swan Coastal Plain. The climate is classified as Mediterranean with warm dry summers and temperate wet winters (Mitchell *et al.* 2002).

2.4 SOIL-LANDSCAPE SYSTEMS

In 2016 the Department of Primary Industries and Regional Development consolidated soil-landscape mapping of Western Australia from two technical reports created by the Department of Agriculture and Food (Department of Agriculture Resource Management Technical Reports RMTR No. 280 (Purdie *et al.* 2016) and RMTR No. 313 (Tille 2006)). The resulting spatial dataset, *Soil-landscape mapping covering Western Australia at the best available scale (Version 05.01)* (DPIRD 2016), is a compilation of various surveys at different scales varying between 1:20,000 and 1:3,000,000. Mapping conforms to a nested hierarchy established to deal with the varying levels of information resulting from the variety of scales in mapping to provide soil-landscape data for all Western Australia. A single soil-landscape system is associated with the survey area (Table 2.3).

Table 2.3: Atlas of Australian Soil units associated with the survey area (Tille 2006).

Map code	Description	Extent within survey area (ha)
34	Alluvial deposits (early Pleistocene to Recent) between the Bassendean Dunes Zone and the Darling Scarp, colluvial and shelf deposits adjacent to the Darling Scarp. Clayey to sandy alluvial soils with wet areas.	0.41 (100%)

2.5 SURFACE GEOLOGY

The Surface Geology of Australia 1:1,000,000 scale spatial dataset is a seamless national coverage of outcrop and surficial geology (Geoscience Australia 2012). A single surface geological unit is associated with the survey area (Table 2.4).

Table 2.4: Surface geology associated with the survey area (Geoscience Australia 2012).

Map symbol	Surface geological unit	Description	Extent within survey area (ha)
Qag	Guilford Formation	Alluvial sand and clay with shallow-marine and estuarine lenses and local basal conglomerate.	0.41 (100%)

2.6 PREVIOUS SURVEYS

Golder Associates undertook flora and fauna surveys for the City of Gosnells within the survey area as part of the previous native vegetation clearing permit (NVCP) application to facilitate proposed Station Street Bridge construction works (Golder Associates 2016).

A total of 34 flora taxa (species, subspecies and varieties) were previously recorded by Golder Associates within the survey area, with 29 of these taxa representing weed species (85.3%) (Golder Associates 2016). A single vegetation association was detected within the survey area, with the entirety of the area assessed as 'Completely Degraded' (Golder Associates 2016).

No conservation significant flora species were recorded during the previous survey (Golder Associates 2016). A single fauna species of conservation significance (Baudin's cockatoo [*Calyptorhynchus baudinii*]) was previously recorded calling while overflying the survey area, but was never sighted (Golder Associates 2016).

2.7 FLORA

2.7.1 Floristic Diversity

According to NatureMap (DBCA 2007 –), a total of 2918 native vascular plant taxa and 26 naturalised vascular plant taxa (including species, infraspecific taxa, and phrase name taxa), from 151 families and 760 genera, have been recorded within 10 km of the survey area (Appendix B). The most diverse families are Fabaceae (296 taxa), Poaceae (226 taxa), Myrtaceae (204 taxa), Asteraceae (187 taxa), Orchidaceae (184 taxa), and Cyperaceae (164 taxa). The most diverse genera are *Acacia* (82 taxa), *Stylidium* (68 taxa), *Drosera* (54 taxa), *Schoenus* (48 taxa), *Caladenia* (47 taxa), and *Lepidosperma* (44 taxa).

2.7.2 Significant Species

DBCA database searches identified 27 significant plant taxa within the Swan Coastal Plain IBRA region within 5 km of the survey area, including one Priority 1 taxon, two Priority 2 taxa, 10 Priority 3 taxa, and five Priority 4 taxa (Table 2.5, Figure 2.2). There were nine records of EPBC Act listed (Threatened) plant species within the Swan Coastal Plain IBRA region within 5 km of the survey area (PMST, Appendix B). The likelihood for each taxon to occur within the survey area was assessed (Table 2.5) using the criteria outlined in section 2.1.

Based on the proximity of previous records and the potential presence of suitable habitat, six taxa were considered to potentially occur within the survey area (rated as 'possible') (Table 2.5). Twenty-one taxa were considered unlikely to occur based on the results of the desktop assessment and those of a previous survey conducted within the survey area (Golder Associates 2016) (Table 2.5). A taxon assessed as 'unlikely' does not preclude its presence within the survey area.

2.7.3 Introduced Species

A search of the NatureMap database and review of previous reports (Golder Associates 2016) identified 54 introduced (weed) species within 10 km of the survey area (Table 2.6). None of the species are listed as a Weed of National Significance (WONS) (DSEWPaC 2012b). Two species are classified as a Declared Pest according to the Western Australian Organism List (WAOL) (DPIRD 2007–): *Crassocephalum crepidioides* and *Limnobium laevigatum*, with one species (*Catha edulis)* requiring specific permits (r73). One species has a high ecological impact rating and rapid invasiveness rating (*Northoscordum gracile*).

Table 2.5: Significant plant species recorded within the Swan Coastal Plain IBRA region within 5 km of the survey area.

Taxon	Status (WA)	Habitat	Flowering period	Desktop assessment	Desktop likelihood of occurrence	Post-survey likelihood of occurrence
Acacia horridula	P3	Gravelly soils over granite, sand. Rocky hillsides in *Eucalyptus* woodland. Darling Range.	May to August	DBCA records within 2 km. Not detected in Golder 2016 survey.	Unlikely	Unlikely
Acacia lasiocarpa var. bracteolata long peduncle variant (G.J. Keighery 5026)	P1	Grey or black sand over clay. Swampy area, winter wet lowlands.	May to August	DBCA records within 2 km. Not detected in Golder 2016 survey.	Unlikely	Unlikely
Acacia oncinophylla subsp. *patulifolia*	P4	Granitic soils, occasionally on laterite.	August to November	DBCA records within 2 km. Not detected in Golder 2016 survey.	Unlikely	Unlikely
Andersonia sp. Blepharifolia (F. & J. Hort 1919)	P2	Unknown.	Unknown	DBCA records within 2 km. Not detected in Golder 2016 survey.	Unlikely	Unlikely
Aponogeton hexatepalus	P4	Mud. Freshwater ponds, rivers, claypans.	July to October	DBCA records within 2 km. Not detected in Golder 2016 survey.	Unlikely	Unlikely
Asteridea gracilis	P3	Sand, clay, gravelly soils.	September to December	DBCA records within 2 km. Not detected in Golder 2016 survey.	Unlikely	Unlikely
Banksia mimica	T	White or grey sand over laterite, sandy loam. Disjunct populations.	December or January to February	DBCA records within 2 km. Not detected in Golder 2016 survey.	Unlikely	Unlikely
Beaufortia purpurea	P3	Lateritic or granitic soils. Rocky slopes on the Darling Scarp.	October to December or January to February	DBCA records within 2 km. Not detected in Golder 2016 survey.	Unlikely	Unlikely
Byblis gigantea	P3	Sandy peat swamps. Seasonally wet areas.	September to December or January	DBCA records within 5 km. Not detected in Golder 2016 survey.	Unlikely	Unlikely
Caladenia huegelii	T	Grey, white or brown sand, clay loam soils. Margins of swamps, low depressions and flats. Mixed jarrah and Banksia woodlands.	September to October	DBCA records within 5 km. Not detected in Golder 2016 survey.	Unlikely	Unlikely
Calytrix breviseta subsp. *breviseta*	T	Sandy clay. Swampy flats.	October to November	DBCA records within 2 km. Not detected in Golder 2016 survey.	Unlikely	Unlikely
Conospermum undulatum	T	Grey or yellow orange clayey sand, often over laterite, on flat gently sloping sites.	May to October	DBCA records within 2 km. Not detected in Golder 2016 survey.	Unlikely	Unlikely
Cyanothamnus tenuis	P4	Laterite and granite in stony soils. Darling Scarp.	August to December	DBCA records within 2 km. Suitable habitat potentially present.	Possible	Unlikely
Darwinia apiculata	T	Lateritic soils.	October	DBCA records within 2 km. Not detected in Golder 2016 survey.	Unlikely	Unlikely
Drosera occidentalis	P4	White-yellow sand, clayey soils. Swamps, seasonally wet depressions and slopes.	October to December	DBCA records within 5 km. Suitable habitat potentially present.	Possible	Unlikely
Eleocharis keigheryi	T	Clay, sandy loam. Emergent in freshwater, creeks, claypans.	August to November	DBCA records within 2 km. Not detected in Golder 2016 survey.	Unlikely	Unlikely
Grevillea thelemanniana	T	Sand, sandy clay. Winter-wet low-lying flats.	May to November	DBCA records within 5 km. Suitable habitat potentially present.	Possible	Unlikely
Halgania corymbosa	P3	Gravelly soils, soils over granite.	August to November	DBCA records within 2 km. Not detected in Golder 2016 survey.	Unlikely	Unlikely
Isopogon autumnalis	P3	Sandy soils, often in *Banksia* woodlands.	February to May	DBCA records within 5 km. Suitable habitat potentially present.	Possible	Unlikely
Lasiopetalum glutinosum subsp. *glutinosum*	P3	Unknown.	Unknown	DBCA records within 2 km. Not detected in Golder 2016 survey.	Unlikely	Unlikely
Meionectes tenuifolia	P3	Clay, loam soils. Swamps, seasonally wet areas and valleys.	September to December	DBCA records within 5 km. Not detected in Golder 2016 survey.	Unlikely	Unlikely
Morelotia australiensis	T	Unknown.	Unknown	DBCA records within 5 km. Relevant habitat information absent.	Possible	Unlikely
Schoenus benthamii	P3	White, grey sand, sandy clay. Winter-wet flats, swamps.	October to November	DBCA records within 2 km. Not detected in Golder 2016 survey.	Unlikely	Unlikely

Taxon	Status (WA)	Habitat	Flowering period	Desktop assessment	Desktop likelihood of occurrence	Post-survey likelihood of occurrence
Schoenus pennisetis	P3	Grey or peaty sand, sandy clay. Swamps, winter-wet depressions.	August to September	DBCA records within 5 km. Not detected in Golder 2016 survey.	Unlikely	Unlikely
Stenanthemum sublineare	P2	Littered white sand. Coastal plain.	October to December	DBCA records within 5 km. Suitable habitat potentially present.	Possible	Unlikely
Thelymitra stellata	T	Sand, gravel, lateritic loam.	October to November	DBCA records within 2 km. Not detected in Golder 2016 survey.	Unlikely	Unlikely
Verticordia lindleyi subsp. *lindleyi*	P4	Sand, sandy clay soils. Winter-wet depressions.	November to January, May	DBCA records within 5 km. Not detected in Golder 2016 survey.	Unlikely	Unlikely

Table 2.6: Introduced plant species recorded within 10 km of the survey area (NatureMap and (Golder Associates 2016).

Taxon	Common name	WAOL rating	Ecological impact	Invasiveness
Araucaria heterophylla	Norfolk island pine	Permitted - s11	NA	NA
Arbutus unedo	Strawberry tree	Permitted - s11	NA	NA
Arctotheca calendula	Cape weed	Permitted - s11	Unknown	Unknown
Auranticarpa rhombifolia	Diamond-leaf pittosporum	Permitted - s11	NA	NA
Avena barbata	Slender wild oat	Permitted - s11	NA	NA
Bidens pilosa	Cobbler's pegs	Permitted - s11	NA	NA
Brassica fruticulosa	Mediterranean cabbage	Permitted - s11	NA	NA
Calceolaria tripartita	-	NA	NA	NA
Catha edulis	Khat	Permitted, Requires Permit - r73	NA	NA
Centratherum punctatum	Lark daisy	NA	NA	NA
Cotula bipinnata	Ferny cotula	Permitted - s11	Unknown	Unknown
Crassocephalum crepidioides	Ragleaf	Declared Pest, Prohibited - s12	NA	NA
Crassula alata	Elegant crassula	Permitted - s11	Unknown	Rapid
Cuphea hyssopifolia	Mexican heather	Permitted - s11	NA	NA
Dombeya sp.	Pinkball	NA	NA	NA
Echinodorus sp.	Amazon sword	NA	NA	NA
Ehrharta calycina	Perennial veldt grass	Permitted - s11	High	Moderate
Ehrharta longiflora	Annual veldt grass	Permitted - s11	NA	NA
Eleusine indica	Indian goosegrass	Permitted - s11	NA	NA
Eriobotrya japonica	Loquat	Permitted - s11	NA	NA
Erodium botrys	Broadleaf filaree	Permitted - s11	NA	NA
Euphorbia peplus	Milkweed	Permitted - s11	Unknown	Rapid
Fraxinus angustifolia	Narrow-leaved ash	Permitted - s11	NA	NA
Freesia sp.	Fressia	NA	NA	NA
Fumaria capreolata	White ramping fumitory	Permitted - s11	NA	NA
Holcus lanatus	Yorkshire fog	Permitted - s11	Unknown	Unknown
Hypochaeris glabra	Smooth cat's ear	Permitted - s11	Unknown	Rapid

Taxon	Common name	WAOL rating	Ecological impact	Invasiveness
Iochroma sp.	-	NA	NA	NA
Jacaranda mimosifolia	Blue jacaranda	Permitted - s11	NA	NA
Juncus capitatus	Dwarf rush	Permitted - s11	Unknown	Rapid
Ligustrum ovalifolium	Korean privet	Permitted - s11	NA	NA
Limnobium laevigatum	West Indian spongeplant	Declared Pest - s22(2)	NA	NA
Lolium rigidum	Annual ryegrass	Permitted - s11	NA	NA
Malus domestica	Domestic apple	NA	NA	NA
Malvaviscus arboreus	Wax mallows	Permitted - s11	NA	NA
Megathyrsus maximus var. *maximus*	Guinea grass	NA	NA	NA
Noltea africana	Soap dogwood	NA	NA	NA
Northoscordum gracile	Slender false garlic	NA	High	Rapid
Oxalis pes-caprae	Bermuda buttercup	Permitted - s11	NA	NA
Poa annua	Annual meadow grass	Permitted - s11	Low	Rapid
Protea repens	Common sugarbush	Permitted - s11	NA	NA
Raphanus raphanistrum	Wild radish	Permitted - s11	Unknown	Unknown
Roldana petasitis	Velvet groundsel	NA	NA	NA
Romulea rosea	Guildford grass	Permitted - s11	Unknown	Unknown
Rothmannia globosa	Bell flowered gardenia	Permitted - s11	NA	NA
Schoencus asper	Prickly sowthistle	NA	NA	NA
Schoencus oleraceous	Common sowthistle	NA	NA	NA
Senegalia rugata	Soap pod wattle	NA	NA	NA
Spiraea sp.	Meadowsweets	NA	NA	NA
Stachys arvensis	Field woundwort	Permitted - s11	Unknown	Unknown
Tradescantia fluminensis	Wandering trad	Permitted - s11	NA	NA
Trifolium campestre	Hop trefoil	Permitted - s11	NA	NA
Trihaloragis hexandra subsp. *integrifolia*	-	NA	NA	NA
Youngia japonica	Oriental false hawksbeard	NA	NA	NA

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Project: 1939
Date: 26 October 2022
Author: LE
Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Absolute Scale: 1:50,000 @A3

Figure 2.2: DBCA significant fauna records of the Swan Coastal Plain within 5 km of the survey area.

Service Layer Credits: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

2.8 VEGETATION

2.8.1 Pre-European Vegetation

The Western Australian Land Use and Vegetation Data Project produced a 1:250,000 scale digital spatial dataset of the pre-European native vegetation of Western Australia, compiled from previous vegetation mapping exercises, primarily by J.S. Beard from 1964 to 1981, with updates reflecting the National Vegetation Information System (NVIS) standards (Shepherd et al. 2002). One vegetation association (968) is mapped within the survey area (Table 2.7).

The pre-European and current extent of each vegetation association is available from the Statewide Vegetation Statistics dataset (Government of Western Australia 2018). The National Objectives and Targets for Biodiversity Conservation 2001-2005 (DEH 2001) recognise that the retention of 30% or more of the pre-clearing extent of an ecological community is necessary if Australia's biological diversity is to be protected, as this is the threshold below which species loss appears to accelerate exponentially (EPA 2000). Vegetation associations at less than 30% of their pre-European extent are classified as either 'Vulnerable' (10-30%) or 'Endangered' (< 10 %) (DER 2014). The current extent of vegetation association 968 in the Swan Coastal Plain bioregion is below 10% of pre-European (Table 2.7), and is classified as 'Endangered'(DER 2014).

2.8.2 Threatened and Priority Ecological Communities

DBCA database searches and EPBC Act Protected Matters Report (Appendix B) indicate that four EPBC Act listed Threatened Ecological Communities (TECs) potentially occur within 10 km of the survey area. Two are categorised as Endangered: '*Banksia* Woodlands of the Swan Coastal Plain ecological community' and '*Corymbia calophylla – Kingia australis* woodlands on heavy soils of the Swan Coastal Plain' and two are categorised as Critically Endangered: 'Clay pans of the Swan Coastal Plain' and 'Tuart (*Eucalyptus gomphocephala)* Woodlands and Forests of the Swan Coastal Plain ecological community'. DBCA database searches identified three Priority Ecological Communities (PECs) within 10km: the 'Claypans with mid dense shrublands of *Melaleuca lateritia* over herbs' a Priority 1 PEC (synonymous with the 'Clay pans of the Swan Coastal Plain' TEC), the '*Banksia* Woodlands of the Swan Coastal Plain ecological community' a Priority 3 PEC and 'Tuart (*Eucalyptus gomphocephala)* Woodlands and Forests of the Swan Coastal Plain ecological community' a Priority 3 PEC (both of which are synonymous with the TEC of the same name, respectively) (Table 2.8).

The '*Banksia* Woodlands of the Swan Coastal Plain ecological community' is unlikely to occur within the survey area. The vegetation condition of the survey area has been identified as 'Completely degraded' and the dominant species required to meet the condition thresholds described for this community are absent.

The '*Corymbia calophylla – Kingia australis* woodlands on heavy soils of the Swan Coastal Plain' is unlikely to occur as the although the dominant species of this community (*Corymbia calophylla)* was recorded, associated species do not occur within the survey area. The vegetation condition and weed species present in the understory compound this statement.

The 'Clay pans of the Swan Coastal Plain' community is unlikely to occur in the survey area. The characteristic species of this community have not been recorded within the previous and current field survey of the area.

The 'Tuart (*Eucalyptus gomphocephala)* Woodlands and Forests of the Swan Coastal Plain ecological community' is unlikely to occur within the survey area as the characteristic species of this community (*Eucalytpus gomphocephala*) and associated species (such as *Agonis flexuosa*) have not been recorded within the survey area, and a native understory of herbs and grasses is absent, replaced by introduced weed species.

Table 2.7: Pre-European vegetation associations mapped within the survey area (Shepherd *et al.* 2002).

Shepherd et al. (2002) vegetation association	Description	Pre-European extent within Swan Coastal Plain IBRA region (ha)	Percentage remaining within Swan Coastal Plain IBRA region	Current percentage protected for conservation within Swan Coastal Plain IBRA region	Extent within survey area (ha)
968	Medium woodland; jarrah, marri & wandoo.	136, 188.2	6.62	1.18	0.41 (100%)

Table 2.8: Threatened and Priority Ecological Communities within 10 km of the survey area

Community	Source	Category (WA)	Category EPBC Act	Description	Likelihood of occurrence
Corymbia calophylla – Kingia australis woodlands on heavy soils, Swan Coastal Plain.	EPBC Protected Matters search (2022)	Critically Endangered	Endangered	The community occurs on heavy soils of the eastern side of the southern Swan Coastal Plain largely between Capel and Chittering. Typical native taxa in the community are: *Corymbia calophylla* (marri), *Banksia dallanneyi* (couch honeypot), *Philotheca spicata* (pepper and salt), *Kingia australis*(kingia) and *Xanthorrhoea preissii* (balga), *Cyathochaeta avenacea, Dampiera linearis* (common dampiera), *Haemodorum laxum, Desmocladus fasciculatus, Mesomelaena tetragona* (semaphore sedge) and *Tetraria octandra.*	Unlikely
Claypans of the Swan Coastal Plain.	EPBC Protected Matters search (2022)	Priority 1	Critically Endangered	Claypans (predominantly basins) usually dominated by a shrubland of *Melaleuca lateritia* occurring both on the coastal plain and the adjacent plateau. These claypans are characterised by aquatic (*Hydrocotyle lemnoides* – Priority 4) and amphibious taxa (e.g. *Glossostigma diandrum*, *Villarsia capitata* and *Eleocharis keigheryi* - DRF).	Unlikely
Banksia woodlands of the Swan Coastal Plain.	EPBC Protected Matters search (2022)	Priority 3	Endangered	Canopy is most commonly dominated or co-dominated by *Banksia attenuata* and/or *B. menziesii*. Other Banksia species that can dominate in the community are *B. prionotes* or *B.ilicifolia*. It typically occurs on well drained, low nutrient soils on sandplain landforms, particularly deep Bassendean and Spearwood sands and occasionally on Quindalup sands; it is also common on sandy colluvium and aeolian sands of the Ridge Hill Shelf, Whicher Scarp and Dandaragan Plateau and, in other less common scenarios.	Unlikely
Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain.	EPBC Protected Matters search (2022)	Priority 3	Critically Endangered	Mostly confined to Quindalup Dunes and Spearwood Dunes but can also occur on the Bassendean dunes and Pinjarra Plain. It can occur on the banks of rivers and wetlands. Tuart is the key upper canopy species although it may co-occur with trees of other species. Trees commonly co-occurring with Tuart include *Agonis flexuosa* (peppermint), *Banksia grandis*, *Banksia attenuata*, *Eucalyptus marginata*; and less commonly, *Corymbia calophylla*, *Banksia menziesii* and *Banksia prionotes*. An understorey of native plants is typically present, which may include grasses, herbs and shrubs.	Unlikely
Banksia attenuata and/or *Eucalyptus marginata* woodlands	(Golder Associates 2016)	Endangered		The community occurs on sands at the base of the scarp predominantly on the Pinjarra Plain and Ridge Hill Shelf. Most of the occurrences of this community comprise *Banksia attenuata* (slender banksia) - *Eucalyptus marginata* (jarrah) woodlands but the community also occurs as Banksia	Unlikely

Community	Source	Category (WA)	Category EPBC Act	Description	Likelihood of occurrence
of the eastern side of the Swan Coastal Plain				woodlands and heaths. The sedge *Mesomelaena pseudostygia* is a common component of the community, which is very species rich and has a diverse shrub layer and low weed frequency. *Hakea stenocarpa*, *Conostylis setosa* (white cottonhead), and *Johnsonia pubescens* subsp. *cygnorum* (priority 2) generally differentiate the community from similar Banksia communities.	
Central Northern Darling Scarp Granite Shrubland Community	(Golder Associates 2016)	Priority 4		Shrublands and heath on deeper loams and red earths on fragmented granite/quartzite. Heath species typically consist of the taller shrubs *Xanthorrhoea acanthostachya* and *Allocasuarina humilis* over smaller proteaceous and myrtaceous shrubs, namely *Melaleuca* aff. *scabra*, *Baeckea camphorosmae* and to a lesser extent, the proteaceous shrubs *Dryandra armata*, *Hakea incrassata* and *Hakea undulata*. Located in central region of the Northern Darling Scarp,Perth.	Unlikely
Corymbia calophylla – Xanthorrhoea preissii woodlands and shrublands, Swan Coastal Plain	(Golder Associates 2016)	Endangered	Endangered	The community occurs on heavy soils of the eastern side of the southern Swan Coastal Plain, generally between Bullsbrook and Stratham. The community is dominated by *Corymbia calophylla*(marri) and *Xanthorrhoea preissii* (balga). It also occasionally includes *Eucalyptus wandoo* (wandoo). The more common shrubs include *Gompholobium marginatum*, *Hypocalymma angustifolium* (white myrtle) and *Banksia dallanneyi* (couch honeypot). The herbs, grasses and sedges including *Burchardia congesta, Cyathochaeta avenacea, Neurachne alopecuroidea* (foxtail mulga grass), *Caesia micrantha* (pale grass-lily), *Mesomelaena tetragona* (semaphore sedge), *Tetraria octandra, Desmocladus flexuosus, Opercularia vaginata* (dog weed), *Sowerbaea laxiflora*, *Lepidosperma* spp. and *Drosera menziesii* are also common.	Likely
Herb rich saline shrublands in clay pans	(Golder Associates 2016)	Types 7,8 and 9 listed as Vulnerable, 10a listed as Endangered	Endangered	The seasonal clay-based wetlands are the most floristically diverse of the Swan Coastal Plain wetlands. The deeper pools and wet flats are characterised by temporally overlapping suites of annual herbs and geophytes (plants that die down to bulbs corms or tubers over summer) that flower and set seed as the pools dry through spring. Over summer the clay substrates dry to impervious pans. At least 50% of the flora comprise annual or perennial herbs, many endemic to the claypans. These clay pan communities are otherwise known as 'floristic community type 7, 8, 9, and 10a' as defined in the 1994 report by Gibson et al. entitled 'A floristic survey of the southern Swan Coastal Plain'.	Unlikely
Low lying *Banksia attenuata* woodlands or shrublands	(Golder Associates 2016)	Priority 3	Endangered	A component of the Endangered Banksia Woodlands of the Swan Coastal Plain EPBC listed TEC. This type occurs sporadically between Gingin and Bunbury and is largely restricted to the Bassendean system. The type tends to occupy lower lying wetter sites and is variously dominated by *Melaleuca preissiana*, *Banksia attenuata*, *B. menziesii*, *Regelia ciliata*, *Eucalyptus marginata* or *Corymbia calophylla*. Structurally, this community type may be either a woodland or occasionally shrubland.	Unlikely
Shrublands and woodlands of the eastern side of the Swan Coastal Plain	(Golder Associates 2016)	Critically endangered	Endangered	The community generally comprises a shrubland or woodland of *Banksia attenuata* (candlestick banksia) and *Banksia menziesii* (firewood banksia), sometimes with *Allocasuarina fraseriana* (western sheoak), over a shrub layer that can include *Adenanthos cygnorum* (woolybush), *Hibbertia huegelii*, *Scaevola repens* var. *repens* (fan flower), *Allocasuarina humilis* (dwarf sheoak), *Bossiaea eriocarpa* (common brown pea), *Hibbertia hypericoides* (yellow buttercups) and *Stirlingia latifolia* (blueboy). A suite of herbs including *Conostylis aurea*, *Trachymene pilosa,*	Unlikely

Community	Source	Category (WA)	Category EPBC Act	Description	Likelihood of occurrence
				Lomandra hermaphrodita, Burchardia congesta and *Patersonia occidentalis*, and the sedges *Mesomelaena pseudostygia* and *Lyginia barbata* usually occur in the community.	

2.9 FAUNA

2.9.1 Fauna Assemblage

According to database search results, 252 fauna species have been recorded within 10 km of the survey area comprising 10 mammals (five introduced), 200 birds (two introduced), 29 reptiles, 12 amphibians and one introduced fish (Table 2.9, Appendix B).

Table 2.9: Summary of fauna database search results within the study area.

Databases	Mammals	Birds	Reptiles	Amphibians	Fish
DBCA Threatened and Priority Fauna Search	8	30	3	0	0
Birdlife Australia Birdata	0	200	0	0	0
DAWE Protected Matters Search	4	45	0	0	0
Atlas of Living Australia (ALA)	10	142	29	12	1

2.9.2 Significant Fauna

An assessment of likelihood of occurrence for significant fauna recorded during the desktop assessment was undertaken based on the categories described in Table 2.2 and was subsequently revised to incorporate observations from the field survey and habitat types identified within the survey area (Table 4.5). As the current survey only includes terrestrial vertebrate fauna, four Threatened invertebrates (three short-tongued bee species and the Carter's freshwater mussel) and four Priority invertebrates (grey vernal katydid, McMillan's biting midge, a short-tongued bee and the Swan Coastal Plain shield-backed trapdoor spider) identified in DBCA Threatened and Priority database search results (shown in Figure 2.3) have been excluded from further discussion.

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Project: 1939
Date: 26 October 2022
Author: CB
Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Absolute Scale: 1:85,000 @A3

Figure 2.3: DBCA significant fauna records within 10 km of the survey area.

Service Layer Credits: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

2.10 DBCA LANDS AND NATIONALLY IMPORTANT WETLANDS

The Department Agriculture, Water and the Environment's (DAWE) Protected Matters Search Tool (PMST) (DAWE 2020) and the DBCA's legislated lands and waters database were queried for Ramsar Wetlands, Nationally Important Wetlands, and DBCA managed lands and waters occurring in the vicinity of the survey area. One DBCA managed land occurs within the survey area: R48327. PMST identified the Forestdale and Thomson's lakes as Wetlands of International Importance (Ramsar Wetlands) occurring within the survey area.

3 METHODOLOGY

3.1 FLORA AND VEGETATION ASSESSMENT

3.1.1 Field Survey

The detailed flora and vegetation assessment of the survey area was conducted by an *ecologia* botanist on the 7th September 2022, concurrently with the basic fauna and fauna habitat assessment. The survey was completed in accordance with the Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016b), primarily by sampling vascular plant species within bounded quadrats. To provide a more comprehensive species inventory for the survey area, quadrat sampling was supplemented by additional opportunistic sampling along traverses.

3.1.2 Quadrat Sampling

Sampling site locations were selected using a combination of aerial photography, topographic features, land system mapping, pre-European vegetation mapping, and field observations, to represent the geomorphological and floristic variation found within the survey area. Where possible, at least three sites were selected to represent each potentially distinct plant community in accordance with EPA (2016b).

Three sampling sites (two quadrats and relevé) were assessed within the survey area (Figure 3.1). All quadrats were 10 m x 10 m in dimension or of an equivalent area, and in most cases had a north-south orientation. Quadrats were measured prior to assessment and the location of each corner was recorded. The following parameters were recorded from each quadrat and relevé:

- Site code.
- GPS coordinate of all corners (central location for relevé).
- Photograph from the north-west corner (central location for relevé).
- A comprehensive species list (including introduced species) and the dominant stratum and estimated percentage foliage cover (using a variant of the Domin scale) of each species.
- Vegetation condition (Table 3.1) and description of disturbance.
- Additional information to assist vegetation characterisation, including landform, slope, soil type, surface geology, and fire history.

3.1.3 Significant Species

Targeted searches for significant plant species identified from the desktop assessment were made along traverses in areas of potential suitable habitat, and within representative areas of each of the major landforms and plant communities present within the survey area. Where significant species were observed the following parameters were recorded: location (for individual or localised plants) or population boundary (for more extensive populations, time permitting); number of plants (count, for individual or localised plants) or estimated number of plants for more extensive populations; reproductive state; plant community; and landform.

The initial likelihood of occurrence assessment for each species was reviewed following the field survey based on the level of survey effort, seasonal conditions, vegetation condition, and the presence of suitable habitat. This reassessment is presented in the desktop results.

3.1.4 Specimen Identification

Specimen identification was undertaken with reference to current taxonomic literature and herbarium reference specimens. Scientific names used in this report follow the species concepts currently adopted by the Western Australian Herbarium. Specimens that could not be adequately identified to genus or species level due to the absence of reproductive material required for positive identification were indicated with a query but were not considered to be otherwise anomalous.

3.1.5 Vegetation Classification and Characterisation

Vegetation classification using multivariate clustering methods is preferred for detailed surveys. However, due to the small size of the survey area and the highly degraded nature and homogeneity of the vegetation, structural descriptions were applied to the vegetation types identified in the field instead of undertaking any detailed statistical cluster analysis.

The groups identified as vegetation types were characterised by the constancy of shared taxa, shared dominant species, and other abiotic attributes (e.g., soil, landform). Vegetation types were given descriptive names consistent with NVIS Level V – Association (ESCAVI 2017), which include structural features and dominant or diagnostic species. Plant communities are naturally variable across wide geographic areas, and vegetation types here are delineated based on the overall floristic similarity of sites. Species included in descriptive names are therefore those that are most characteristic of the vegetation type as a whole but were not necessarily present at all sites. Species that are dominant in some examples of a community but present in ≤ 50% of sites representing that community are indicated with '±' in the description.

3.1.6 Vegetation Mapping

Vegetation mapping of survey area was undertaken in the field using aerial imagery and data from ground-truthed sites. Vegetation type boundaries were refined using aerial imagery in ESRI ArcMap v.10.8. Condition mapping was undertaken in a similar manner, with reference to the vegetation condition recorded at sampled sites using the EPA scale (EPA 2016b) (Table 3.1), opportunistic observations, and aerial imagery.

Table 3.1: EPA vegetation condition scale (EPA 2016).

Vegetation condition	Criterion (South West and Interzone Botanical Provinces)
Pristine	Pristine or nearly so, no obvious signs of disturbance or damage caused by human activities since European settlement.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. Damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle tracks.
Very Good	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds at high density, partial clearing, dieback and grazing.
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees and shrubs.

3.1.7 Assessment of Vegetation Significance

Vegetation types described for the survey area were assessed at National, State, regional, and local levels to assist the environmental impact assessment (EIA) process. Each vegetation type was assessed against the following 11 criteria:

Nationally Significant Vegetation

1. Vegetation supporting populations of Threatened (EPBC listed) plant species.
2. Vegetation which corresponds to a nationally (EPBC) listed Threatened Ecological Community.
3. Vegetation which includes Ramsar wetlands and Nationally Important (DIWA) wetlands.

State Significant Vegetation

4. Vegetation supporting populations of Threatened (DBCA listed) plant species.
5. Vegetation which corresponds to a State listed (DBCA) listed Threatened Ecological Community.
6. Vegetation occurring within a State-managed conservation estate (areas protected under the *Conservation and Land Management Act 1984*) or areas that have been formally recommended by DBCA for inclusion in the State conservation estate.

Regionally Significant Vegetation

7. Vegetation corresponding to a State (DBCA) listed Priority Ecological Community.
8. Vegetation associated with significant watercourses or permanent or ephemeral wetlands.
9. Vegetation supporting potentially new plant species.
10. Vegetation that is represented by less than 30% of its pre-European extent. This criterion was assessed using the vegetation association mapping of Shepherd *et al.* (2002).

Locally Significant Vegetation

11. Vegetation represented by small, isolated communities or vegetation with a limited local extent.

Figure 3.1: : Locations of sampling sites and traverses within the survey area.

3.2 FAUNA

A basic vertebrate fauna and fauna habitat assessment was undertaken by an *ecologia* zoologist concurrently with the flora and vegetation survey. The survey methods adopted accorded with the *Technical Guidance – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA 2020). Low-intensity fauna sampling was also undertaken to identify any significant vertebrate fauna within the survey area.

3.2.1 Habitat Descriptions and Mapping

A fauna habitat type broadly describes an area of habitat that is distinguished by its vegetation, soil characteristics and land features, and is likely to support a different fauna assemblage to that found in other fauna habitats. Habitat delineation and mapping was based upon interpretation of aerial photography and landforms, habitat site assessments, soil descriptions, and the complementary vegetation descriptions and vegetation mapping undertaken for this report. Particular attention was given to the likelihood that significant fauna may be present only in particular habitat types.

Habitat assessments were undertaken within the survey area at sites considered representative of each habitat type. For each fauna survey site, the following parameters were recorded:

- Broad habitat type.
- Digital photographs.
- Landform type.
- Soil colour, type and characteristics.
- Type and extent of non-vegetative surface cover.
- Type of vegetation in lower, middle and upper strata.
- Observable fire history and evidence of any disturbance.
- Presence and extent of leaf litter and coarse woody debris.
- Presence of, or distance to, water sources.
- Presence of significant microhabitats such as tree hollows and rocky outcrops.
- Notes on suitability for hosting significant fauna.

A habitat condition rating was assigned to each habitat assessment site, delineated according to the habitat condition criteria described in Table 3.2.

Table 3.2: Habitat Condition Assessment

Habitat Condition	Criteria
Excellent	Pristine or nearly so, no obvious sign of damage caused by human activity since European settlement or introduced fauna and/or flora. No signs of recent, extensive fires.
Very Good	Some relatively slight signs of damage caused by human activity since European settlement e.g. damage to tree trunks by repeated fires, no significant signs of introduced fauna and/or flora or occasional vehicle tracks.
Good	More obvious signs of damage caused by human activity since European settlement, including some obvious impact to vegetation structure such as that caused by low levels of grazing, weed introduction or by selective logging. Some tracks or secondary evidence of introduced fauna. Some signs of recent fires.
Poor	Still retains basic vegetation structure or ability to regenerate it after very obvious impacts of human activity since European settlement such as partial clearing or very frequent fires. Presence of introduced fauna and/or flora.
Very Poor	Severely impacted by grazing, introduced fauna and/or flora, fire, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management.
Completely Degraded	Areas that are completely or almost completely without vegetation communities and are heavily impacted by extensive fires and/or introduced species e.g. cow paddock.

3.2.2 Fauna Survey

At each of the fauna survey sites established for the habitat assessments, all vertebrate fauna observed were recorded with the following actions undertaken:

- Fixed-time bird surveys of 10 minutes.
- Targeted searches involving direct observation of animals focussing on significant fauna species, as well as detection of secondary evidence including tracks, scats, remains and other traces.
- Hand searching for cryptic species including raking leaf litter, searching beneath the bark of dead trees, breaking open old logs, stumps and dead free-standing trees, investigating burrows and over-turning logs and stones.

Opportunistic fauna observations were made throughout the survey to supplement the site survey results. Tracks, diggings, scats, burrows and nests were recorded wherever secondary evidence was observed.

3.2.3 Targeted Significant Fauna Survey

Prior to conducting the field survey, a desktop assessment of the preferred habitats of significant fauna species potentially occurring in the survey area was undertaken to assess the likelihood of each species occurring within the survey area (Section 2.9.2). These results were verified during the field survey and, based on the actual habitats present, searches were undertaken to determine the presence of significant fauna species occurring. Marine and migratory species identified in database searches which exclusively occupy marine habitats including tidal mudflats, mangroves and sandflats have been excluded from this report as these habitats are not present within the survey area. For relevant species, the likelihood of occurrence was determined by investigating the following:

- Fauna habitats likely to exist within the survey area based on the desktop study.
- Distance of previously recorded significant species based on publicly available records.
- Frequency of occurrence of significant species records.
- Time passed since significant species were recorded.

Each significant fauna species assessed as potentially occurring within the study area was assigned a likelihood of occurrence rating based on the categories described in Table 2.2.

3.3 BLACK COCKATOO HABITAT ASSESSMENT

Three Threatened species of black cockatoo listed under both the EPBC Act and the BC Act occur within the south-west of Western Australia (Table 3.3). The EPBC Act referral guidelines for three Threatened black cockatoo species (DSEWPC 2012) provide modelled distributions for the three species of black cockatoo, including breeding areas. The study area falls within the Swan Coastal Plain IBRA region and overlaps the modelled distribution of the Carnaby's cockatoo ('non-breeding range'), Baudin's cockatoo ('known foraging range') and forest red-tailed black cockatoo ('likely to occur').

The EPBC Act referral guidelines for three Threatened black cockatoo species (DSEWPC 2012) recommend 'habitat assessments' as the primary method to inform decisions on the potential for significant impact for black cockatoos as short-term surveys for bird presence are unlikely to give a true representation of habitat use. Targeted black cockatoo habitat assessments should be undertaken in areas within the range focusing on key criteria such as foraging, roosting and breeding. Known breeding and night roosting trees for black cockatoos are generally large with a diameter at breast height (DBH) of at least 500 mm, or 300 mm for salmon gum and wandoo (Commonwealth of Australia 2017).

Potential breeding and roosting habitat were assessed by identifying every tree occurring over the survey area with a DBH greater than 500 mm, and for wandoo and salmon gum a DBH greater than 300 mm. DBH was measured and determined using the methodology outlined in Appendix G (Herries *et al.* 2010).

Table 3.3: Status of black cockatoos occurring within the south-west.

Common name	Taxon	EPBC Act	BC Act
Forest red-tailed black cockatoo	*Calyptorhynchus banksii naso*	Vulnerable	Vulnerable
Baudin's cockatoo	*Calyptorhynchus baudinii*	Endangered	Endangered
Carnaby's cockatoo	*Calyptorhynchus latirostris*	Endangered	Endangered

3.3.1 Breeding Habitat

EPBC Act referral guidelines for three Threatened black cockatoo species (DSEWPC 2012) define black cockatoo breeding habitat as any species of tree known to support breeding within the range of the species which will either have a suitable nest hollow or are of suitable DBH to develop a nest hollow. Trees which contain deep, near vertical hollows with an entrance diameter of >100 mm and are >10 m high are classified as suitable for use by black cockatoos (Whitford 2002; Whitford and Williams 2002).

Commonwealth of Australia (2017) draft guidelines further define 'potential' breeding habitat as being trees of flora species known to support black cockatoo breeding which are of a suitable diameter to develop a nest hollow at some stage in the future (i.e. potential future habitat). Any tree species with a DBH of >500 mm is considered a potential breeding tree for black cockatoos although the DBH is lower at >300 mm for *Eucalyptus salmonophloia* (salmon gum) and *E. wandoo* (wandoo).

Breeding potential for each of the individual trees identified was assessed from the ground level and potential nest hollows were categorised using the definitions within Table 3.4**.** For trees with a suitable DBH which are functionally capable of supporting a nest hollow, the following information was recorded:

- Fauna habitat.
- Fauna species.
- Flora species.
- DBH.
- Hollow suitability category (as per Table 3.4).
- Location (using a Global Positioning System [GPS]).
- Photographs of any trees classified as category 1, 2 or 3.

Trees with DBH > 500 mm (>300 mm for wandoo and salmon gum) which were deemed functionally unable to support a nest hollow (e.g. trees that branch into multiple thin trunks with DBH <500 mm within a metre of breast height or trees with completely hollowed out trunks), were excluded at the discretion of the recorder.

Table 3.4: Breeding habitat tree categories.

Cat No.	Tree Category	Description
1	Suitable DBH Tree with Known Nesting Hollows – hollows where breeding has been recorded or there is evidence of previous use.	**Hollow where breeding has been recorded (i.e. bird/s observed in hollow) or there is evidence of previous use (i.e. hollow contains Black Cockatoo feathers or eggs).**
2	Suitable DBH Tree with a potential suitably hollow with signs of use (not confirmed).	**Hollows that appear to have a suitably sized entry and display signs of use, however internal dimensions have not been assessed.** Although signs of use may be present, the signs, such as chew marks, could be from prospecting Black Cockatoos or other birds such as Galahs, which leave very distinctive marks on hollow and trees (impacted potentially suitably sized hollows should be confirmed by competent observer). Where hollows cannot be avoided, the status of Category 2 hollows must be reassessed during the assessment process to determine whether it is a Category 1, 3, 4 or 6 hollow.
3	Suitable DBH Tree with a suitable hollow with no signs of use (confirmed).	**Hollows that appear to have a suitably sized entry, with internal dimensions assessed.** Category usually based on follow up hollow assessment with pole camera or drone. Although hollow appears to be suitable, there is no evidence of Black Cockatoo use. Where hollows cannot be avoided, status of Category 3 hollows should be reassessed immediately prior to clearing.
4	Suitable DBH Tree with a marginally unsuitable hollow with no signs of use (confirmed)	**Hollows that are not currently suitable but have the potential to become suitable within five years.** Where hollows cannot be avoided and have not been checked within 5 years, the hollow status must be reassessed to determine whether it has become suitable (Category 3 hollows) or a Known Nesting Hollow (Category 1 hollows).
5	Suitable DBH Tree with a potential suitable hollow with no signs of use (not confirmed).	**Hollows that appear to have a suitably sized entry, however internal dimensions have not been assessed.** Category usually based on ground observation only. Where hollows cannot be avoided, status of Category 5 hollows must be reassessed during the assessment process to determine whether it is a Category 1, 3, 4 or 6 hollow.
6	Suitable DBH Tree with unsuitable hollows.	**Hollows that have a hollow entry greater than 50 mm that is not suitable due to the size of its entry, internal dimensions, angle and/or height off ground**.
7	Suitable DBH Tree without hollows.	**Trees with a 500 mm DBH (or 300 mm for Wandoo or Salmon Gum) that do not have visible hollows (hollows with an entry opening below 50 mm not considered a hollow).** Note – multiple stemmed trees that branch above DBH may not be suitable.

3.3.2 Roosting Habitat

Black cockatoo flocks show strong fidelity to night roosts. Generally, these roost trees are close to, and provide access to nearby high-quality foraging sites and an important water source. According to DSEWPC (2012) roosting habitat is classified as:

- A tree or group of trees where there are records or recent evidence of night roosting.
- Located in the tallest trees (native or introduced) within an area (generally with a DBH of at least 500 mm.
- Usually close to an important water source and within an area of quality foraging habitat.

3.3.3 Foraging Habitat

Black cockatoos rely on foraging resources to provide sufficient energy for their movements across their range and the availability of foraging habitat plays a critical role in the post-breeding period when individuals need to build condition after breeding, and teach juveniles where foraging resources are located (Commonwealth of Australia 2017).

The Department of Environment and Conservation (2011) compiled information from a variety of sources to provide advice on over 130 prioritised food species used by Carnaby's black cockatoo; Valentine and Stock (2008) also provide a list of food plants utilised by the species. Bamford (2013) employed a consolidated species list derived from multiple sources. The most common native plant genera preferred by the species are *Banksia, Hakea, Grevillea, Allocasuarina*, *Corymbia*, and *Eucalyptus*.

Foraging habitat surveys for black cockatoo species are recommended to be undertaken in any remaining vegetation containing proteaceous heath, eucalypt woodlands or forest (Commonwealth of Australia 2017). The survey area was traversed by foot and food sources known to be utilised by black cockatoos were identified and quantified in both the over-storey and under-storey using the consolidated species list employed by Bamford (2013). A concurrent flora and vegetation assessment of the survey area facilitated this assessment.

Additionally, specific effort was made to document actual presence of black cockatoos by direct observation, chew marks around hollows, or feeding evidence such as characteristically chewed eucalypt fruit.

3.4 STUDY TEAM AND LICENCES

The flora, vegetation and fauna assessments were undertaken by those summarised in Table 3.5.

Table 3.5: Project staff and licences.

Project staff			
Name	**Qualification**	**Role**	Project role
Shaun Grein	B.App. Sc (Biol.); Grad. Dip. Nat. Resources; MBA	Managing Director/Senior Principal Scientist	Project management, QA
Andrew Craigie	B.Sc (Hons.) (Botany); PhD (Botany)	Principal Botanist and Taxonomist	Specimen identification, data analysis, QA
Sam Hall	B.Sc. (Hons.) (Botany and Cons. Biol.)	Level 1 Botanist	Field survey, desktop assessment
Claudia Buters	B.Sc Cons. Biol. & Zool.; MWildlifeHth.	Level 2 Zoologist	Field survey, reporting, GIS
Lydia Ellwood	B.Sc Cons. Wildlife. Biol. & Env. Mgmt. & Sust.	Graduate Ecologist	Reporting, GIS
Licences - "Flora Taking (Biological Assessment) Licence"			
Sam Hall	Flora Taking (Biological Assessment) Licence: FB62000450 (exp. 03/07/2025)		

3.5 LIMITATIONS AND CONSTRAINTS

An assessment of survey-specific issues and limitations is detailed in

Table 3.6 and Table 3.7.

Table 3.6: Flora and vegetation survey limitations.

Aspect	Assessment	Constraint
Availability of contextual information at a regional and local scale	Broad vegetation, land system, soil, and geology mapping data were available for the survey area, in addition to DBCA database spatial data. This information was adequate to provide appropriate contextual information for the survey.	Nil
Competency/experience of the team carrying out the survey, including experience in the bioregion surveyed	The personnel undertaking field work and specimen identification were suitably qualified and have conducted numerous botanical surveys within the South-West botanical province. Key personnel leading the field survey and undertaking specimen identification, data analysis, vegetation mapping, and reporting have over 10 years' combined experience with flora and vegetation surveys in the Swan Coastal Plain region.	Nil
Proportion of flora recorded and/or collected, any identification issues	All species encountered during the survey were recorded within sampling sites or opportunistically. Representative specimens of all taxa recorded in the field were collected for confirmation. Some specimens could not be identified to species level due to a lack of required reproductive material, but a small number of unidentified samples is unlikely to have any impact on the classification of plant communities at this site. None of these specimens were believed to correspond to any significant species nor were any considered to be anomalous.	Nil
Was the appropriate area fully surveyed (effort and extent)	Three sampling sites (two quadrats and one relevé) were assessed within the survey area as well as additional targeted searches and opportunistic collections. The appropriate area was sufficiently surveyed.	Nil
Access restrictions within the survey area	There were no access restrictions. A car was utilised to access the survey area and it was easily traversed on foot.	Nil
Survey timing, rainfall, season of survey	The single-phase survey encompassed the entire survey area and was conducted in September 2022 during the primary season for flora and vegetation surveys in the South-West botanical province. Lower than average rainfall was recorded for the area in the months preceding the survey, however the overall seasonal conditions were adequate for the flora and vegetation survey to be conducted and for the vegetation present to be characterised.	Nil
Disturbance that may have affected the results of survey such as fire, flood or clearing	No significant limitations identified. The survey area was not affected by any recent fire that might have affected the results of the survey.	Nil

Table 3.7: Fauna survey limitations.

Aspect	Comment
Competency/experience of the consultant carrying out the survey.	The zoologist undertaking the fauna survey has more than five years of experience conducting terrestrial vertebrate fauna surveys in Western Australia and has completed numerous black cockatoo habitat assessments within the Swan Coastal Plain and Wheatbelt regions.
Scope (what faunal groups were sampled and were some sampling methods not able to be employed because of constraints such as weather conditions).	The fauna survey focussed on significant fauna species that may have the potential to occur in the study area. The scope was well defined. Fauna and their habitats were surveyed using standardised and well-established techniques. Relevant databases were reviewed.
Proportion of fauna identified, recorded and/or collected.	A comprehensive desktop study adequately gathered background information on the study area. The fauna survey focussed on significant fauna species that may have the potential to occur in the study area. All fauna taxa observed were identified.
Sources of information (previously available information as distinct from new data).	Database records, including significant fauna species, were available for the area and considered adequate to provide appropriate contextual information for the study.
The proportion of the task achieved and further work which might be needed.	Planned survey works were conducted and completed. No further work is required to complete the survey scope.
Timing/weather/season/cycle.	The survey was conducted during an appropriate time/season.
Disturbances which affected results of the survey (e.g. fire, flood, accidental human intervention).	There were no natural or human interventions that constrained the survey of the study area.
Intensity (in retrospect was the intensity adequate).	Given the access to available information from the area, the survey intensity was considered adequate and is appropriate for a basic fauna and fauna habitat assessment.
Completeness (e.g. was relevant area fully surveyed).	The basic fauna and fauna habitat assessment was considered complete. The majority of the study area was able to be accessed and representative sites were sampled across the entirety of the survey area.
Resources (e.g. degree of expertise available in animal identification to taxon level).	Resources were adequate to carry out the survey and survey participants were competent in the identification of species and likelihood of occurrence. Database searches and literature reviews were used to prepare for the survey and used for the confirmation of any species.
Remoteness and/or access problems.	Most of the survey area was accessible at the time of the survey. Remoteness and/or access were not a constraint.
Availability of contextual (e.g. biogeographic) information on the region.	The data available was adequate for the level of survey work undertaken during this assessment.
Efficacy of sampling methods (i.e. any groups not sampled by survey methods).	A comprehensive desktop study adequately gathered background information on the study area. A basic survey verified the desktop results and characterised habitats.

4 RESULTS

4.1 FLORA

4.1.1 Floristic Diversity and Estimated Species Richness

A total of 11 vascular plant taxa (species, infraspecific, and phrase names) representing seven families and 11 genera were recorded during the survey within three sampling sites (quadrats and relevés) and opportunistically through traverses (Appendix C). Of these species three were annuals or short-lived perennials, and eight (ca. 73%) were introduced. The most dominant families in terms of species richness were the Myrtaceae (three taxa) and Poaceae (three taxa). All genera (11) were represented by only one taxon.

4.1.2 Significant Species

Threatened and Priority listed species

Representative areas of each of the major landforms and plant communities within the survey area were traversed on foot to record significant plant species. No EPBC Act or BC Act listed Threatened species were recorded. No DBCA listed Priority species were recorded within the survey area.

Atypical specimens

Several specimens collected within the survey area were unable to be identified to species level due to a lack of reproductive material required for positive identification. None of these were believed to represent Threatened or Priority species, nor were any considered to be anomalous.

Range extensions

Based on current WA Herbarium collections there were no new bioregional range extensions recorded (i.e., new records for the Swan Coastal Plain IBRA region) and no records representing range extensions of greater than 100 km.

4.1.3 Introduced Species

Eight introduced plant species were recorded within the survey area (Table 4.1). Five are listed as Permitted - s11 (DPIRD 2021) and three are not listed. There were no Declared Pests (Declared Pests - s22(2)) or Weeds of National Significance (WONS) recorded. Three taxa had a high ecological impact and rapid invasiveness rating, which are listed in Table 4.1.

Table 4.1: Summary of introduced species recorded within the survey area.

Species	Common name	Family	WAOL rating	Ecological impact	Invasiveness
*?*Allium* sp.		Alliaceae	Not listed	Not rated	Not rated
**Citrus reticulata*	Mandarin orange	Rutaceae	Not listed	Not rated	Not rated
**Ehrharta calycina*	Perennial veldt grass	Poaceae	Permitted - s11	High	Rapid
**Fumaria capreolata*	White ramping-fumitory	Papaveraceae	Permitted - s11	High	Rapid
**Holcus lanatus*	Yorkshire fog	Poaceae	Permitted - s11	High	Unknown
**Olea europaea* subsp. *europaea*	European olive	Oleaceae	Permitted - s11	High	Rapid
**Oxalis pes-caprae*	Bermuda buttercup	Oxalidaceae	Permitted - s11	High	Slow
*Poaceae sp. (indet.)		Poaceae	NA	NA	NA

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4.2 VEGETATION

4.2.1 Vegetation Type Classification and Characterisation

Floristic features and other relevant attributes were used from the three sampling sites to characterise the vegetation types, which are mapped in Figure 4.1. One vegetation type was described based on landform characteristics (plain or major creek) and the dominant species (Table 4.2). Other relevant attributes (landform, soils, vegetation condition, and species richness) are also summarised in Table 4.2. Representative site photograph is shown in Plates 1. The vegetation type was mapped within the survey area through extrapolation from aerial imagery and ground-truthed sites (Figure 4.1).

4.2.2 Vegetation Condition

Vegetation condition according to the EPA (2016) scale was recorded at each sampling site and was assessed periodically along traverses. As the survey area follows the linear corridor of a cleared and bituminised road and associated verge, the vegetation condition across the entirety of the survey area was 'Completely Degraded' (0.41 ha, 100%), with the presence of introduced species comprising the understory throughout the entirety of remaining parkland (Figure 4.2). Significant infestations of introduced species were recorded in the survey area, particularly along the creek line and associated embankments, in which dense *Oxalis pes-caprae* (Bermuda buttercup), *Fumaria capreolata* (white ramping-fumitory) and introduced grasses were present (Figure 4.2).

4.2.3 Threatened and Priority Ecological Communities

There were no plant communities observed within the survey area that corresponded to any state (DBCA) or Commonwealth (EPBC Act) listed Threatened Ecological Community (TEC), nor to any state listed Priority Ecological Community (PEC).

Table 4.2: Summary of vegetation types within the survey area – landforms, condition, species richness, and extent.

Map code	Broad floristic formation (NVIS III)	Vegetation type name (NVIS V)	Landform	Vegetation condition (EPA 2016)	Mean site species richness (range)	Extent within survey area (ha) (%)	Representative sites
Er	*Eucalyptus* closed forest	*Eucalyptus rudis subsp. rudis open forest; *Fumaria capreolata, *Oxalis pes-caprae herbland, *Holcus lanatus forbland/grassland*	Plain	Completely Degraded	7 (2 native)	0.17 (41.1%)	S01, S02, S03

ecologia ENVIRONMENT

Project: 1939
Date: 27 October 2022
Author: SH
Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Absolute Scale: 1:1,100 @A3

Figure 4.1: Vegetation types and significant plant species recorded within the survey area.

0 0.0225 0.045
Kilometers

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

ecologia ENVIRONMENT

Project: 1939
Date: 27 October 2022
Author: SH
Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Absolute Scale: 1:1,100 @A3

Figure 4.2: Vegetation condition within the survey area.

0 0.0225 0.045
Kilometers

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Er: *Eucalyptus rudis subsp. rudis open forest; *Fumaria capreolata, *Oxalis pes-caprae herbland, *Holcus lanatus forbland/grassland*.

Plate 1: Representative photographs of vegetation type (Er).

4.3 FAUNA

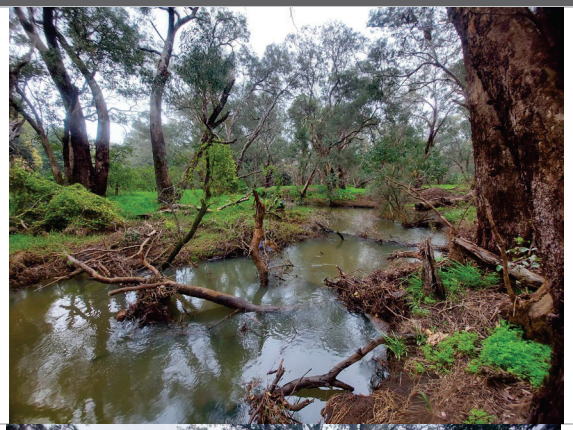
4.3.1 Fauna Habitat

Fauna habitat assessments were undertaken to describe and map fauna habitat types with the potential to support significant fauna species within the survey area. After assessing the various vegetation types, soil units, and landforms, two fauna habitat types were identified within the survey area: Open Woodland (41.14%) and Creekline (5.06%) (Table 4.3). The majority of the survey area (53.80%) was mapped as Cleared (road/verge) (17.61%) and Cleared (parkland) (36.20%) which provide limited habitat for terrestrial fauna species.

Habitat assessments were undertaken at five sites (SSBHA01 to SSBHA05) to describe habitats within the survey area and identify areas most likely to support significant fauna species. Habitat mapping is provided in Figure 4.3 and an overview of fauna habitats is provided in Table 4.3. Data from individual site assessments are presented in Appendix E.

From a local perspective, habitat features that are disjunct and provide sources of shelter, food and mesic qualities required for restricted species may be considered important. Clearing and weeds were the primary factors contributing to condition ratings of ‘Poor’ to ‘Degraded’, with native understorey and associated refugia generally absent from the survey area.

Table 4.3: Fauna habitats in survey area.

Broad habitat type	Extent within proposed vegetation clearing area (ha)	Habitat description	Representative photos
Creekline	0.02 (5.06%)	This habitat encompasses a tributary of the Canning River with scattered *Eucalyptus rudis* over introduced weed species. During the survey, large volumes of woody debris and rubbish were present within this habitat type. Based on the poor condition of this habitat type, it is considered unlikely to support permanent populations of significant fauna and represents dispersal or temporary habitat only. This habitat type provides habitat for waterbirds and fish (including the blue-billed duck) and may be intermittently utilised by the water rat when transiting up/down stream.	
Open Woodland	0.17 (41.14%)	*Eucalyptus rudis* woodland over a cleared understory of grassy weeds. Few microhabitats are present within this habitat type. Small numbers of eucalypts which may provide hollows and foraging opportunities for arboreal mammals and birds. The degraded nature of this habitat type makes it unlikely to support permanent populations of significant fauna and is likely to represent dispersal habitat or intermittent foraging habitat only.	
Cleared (parkland)	0.15 (36.20%)	Parkland areas containing predominantly introduced flora species that are highly disturbed and do not provide critical habitat for fauna species. Small numbers of native trees (including marri and *E. rudis*) present within this habitat type.	N/A
Cleared (road/verge)	0.07 (17.61%)	Road and verge.	N/A

4.3.2 Fauna Assemblage

Twenty-four vertebrate fauna species were recorded during the survey including 23 birds (five introduced), and one introduced mammal (Table 4.4). Nine Carnaby's cockatoos (EN EPBC Act & BC Act) were recorded foraging in a marri tree in the northeast corner of the survey area during the survey.

Five introduced birds and one introduced mammal were recorded during the survey. Primary and secondary evidence of the domestic dog was recorded within the survey area and the chicken and mallard were present in the yard of a residential property at the periphery of the survey area. Rainbow lorikeets were observed overflying and foraging within the survey area on numerous occasions and the laughing turtle dove and laughing kookaburra were both recorded calling during the survey.

Table 4.4: Vertebrate species recorded.

Taxon	Common name
Birds	
Eolophus roseicapilla	Galah
Corvus coronoides	Australian raven
Trichoglossus moluccanus	Rainbow lorikeet
Calyptorhynchus latirostris	Carnaby's cockatoo
Gymnorhina tibicen	Australian magpie
Rhipidura leucophrys	Willie wagtail
Barnardius zonarius	Australian ringneck
Threskiornis molucca	Australian white ibis
Dacelo novaeguineae	Laughing kookaburra
Anthochaera carunculata	Red wattlebird
Anas superciliosa	Pacific black duck
Gallus gallus domesticus	Chicken
Spilopelia senegalensis	Laughing turtle dove
Purpureicephalus spurius	Red capped parrot
Smicrornis brevirostris	Weebill
Pardalotus striatus	Striated pardalote
Cracticus torquatus	Grey butcherbird
Grallina cyanoleuca	Magpie lark
Spilopelia chinensis	Spotted dove
Anthochaera lunulata	Western wattlebird
Chenonetta jubata	Australian wood duck
Gavicalis virescens	Singing honeyeater
Anas platyrhynchos	Mallard
Mammals	
Canis familiaris familiaris	Dog

4.3.3 Significant Fauna

Significant vertebrate fauna includes species that have been adequately surveyed and are deemed to be, in the wild, either rare, at risk of extinction, or otherwise in need of special protection, and have been gazetted as such.

The Carnaby's cockatoo (Endangered EPBC Act & BC Act) was recorded foraging within the survey area during the current survey. This species has not previously been recorded within the survey area. Nine individuals were observed foraging in a roadside marri tree, with characteristic chew marks evident on chewed nuts. Although the Baudin's cockatoo was recorded calling within the survey area during a previous basic fauna and fauna habitat assessment (Golder Associates 2016), no evidence of this species was observed during the current survey.

The desktop likelihood of occurrence assessment (Section 2.9.2) was reviewed and revised post-survey to incorporate current field survey results and can be seen in Table 4.5.

The likelihood of occurrence assessment identified two significant birds (forest red-tailed black cockatoo and blue-billed duck) which are considered 'Likely' to occur within the survey area due to proximity of recent records and presence of suitable habitat within the survey area. An additional four species, comprising the peregrine falcon (*Falco peregrinus* [OS BC Act]), water rat (*Hydromys chrysogaster* [Priority 4]), quenda (*Isoodon fusciventer* [Priority 4]) and the brush-tailed phascogale (*Phascogale tapoatafa wambenger* [CD BC Act]) are considered 'Possible' to occur based on the presence of potentially suitable habitat and/or recency of records in the vicinity of the survey area.

The likelihood of occurrence assessment identified 24 significant birds, five mammals and three reptiles considered 'Unlikely' to occur within the survey area due to absence of suitable habitat, age of records, distance of records from the survey area or a combination of these factors. These species will not be discussed further.

Table 4.5: Likelihood of significant fauna occurring within the survey area.

Taxon	Common name	BC Status	EPBC Status	Number of records	Latest record	Preferred habitat type	Comments	Likelihood of occurrence
BIRD								
Actitis hypoleucos	Common Sandpiper	MI	MI	1	1976	Shallow waters and bare, soft mud at edges of saline, sheltered wetlands, often with protruding rock and mangrove roots. Venture into grassy areas adjoining wetlands.	No suitable habitat within survey area.	Unlikely
Apus pacificus	Pacific Swift (Fork-tailed Swift)	MI	MI	2	1978	Arrive late September and are common in the airspace over the Kimberley coastline.	No suitable habitat within survey area.	Unlikely
Botaurus poiciloptilus	Australasian Bittern	EN	EN	7	1981	Coastal and sub coastal areas. Tall grasses and sedges in near-coastal freshwater swamps. Nests in bulrushes and sticks constructed into untidy platforms above water's edge.	No suitable habitat within survey area.	Unlikely
Calidris acuminata	Sharp-tailed Sandpiper	MI	MI	7	1981	Variety of freshwater and saline habitats, more often found on the coasts than in the interior. Muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation.	No suitable habitat within survey area.	Unlikely
Calidris canutus	Red Knot	EN	EN & MI	2	1980	Intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, sometimes on sandy beaches or shallow pools. Terrestrial saline wetlands along the coast.	No suitable habitat within survey area.	Unlikely
Calidris ferruginea	Curlew Sandpiper	CR	CR & MI	10	1981	Intertidal mudflats in sheltered coastal areas.	No suitable habitat within survey area.	Unlikely
Calidris melanotos	Pectoral Sandpiper	MI	MI	3	1979	Intertidal mudflats in sheltered coastal areas.	No suitable habitat within survey area.	Unlikely
Calidris ruficollis	Red-necked Stint	MI	MI	12	1981	Coastal, occurring on the edge of sheltered estuaries, beaches and salt lakes both on the mainland and offshore islands. Occasionally on inland salt lakes and freshwater swamps.	No suitable habitat within survey area.	Unlikely
Calidris subminuta	Long-toed Stint	MI	MI	7	1981	Primarily coastal with scattered inland records. They occur in a variety of terrestrial wetlands, preferring shallow freshwater or brackish waters including lakes, swamps, river floodplains, streams lagoons and sewage works	No suitable habitat within survey area.	Unlikely
Calidris tenuirostris	Great Knot	CR	CR & MI	1	1980	Sheltered coastal habitats, with large intertidal mudflats or sandflats, inlets, bays, harbours, estuaries and lagoons.	No suitable habitat within survey area.	Unlikely
Calyptorhynchus banksii naso	Forest Red-tailed Black Cockatoo	VU	VU	89	2020	Breeds and roosts in dense jarrah, karri and marri forests mainly in the hilly interior. Foraging habitat includes jarrah and marri woodlands and forest and the edges of karri forests.	May overfly all habitat types and utilise habitat while foraging. Suitable foraging habitat restricted to a small number of marri trees. Roosting and foraging habitat unlikely to be present.	Likely
Calyptorhynchus baudinii	Baudin's Cockatoo	EN	EN	191	2018	Breeds and roosts in dense jarrah, karri and marri forests mainly in the hilly interior. Foraging habitat includes jarrah and marri woodlands and forest and the edges of karri forests.	May overfly all habitat types and utilise habitat while foraging. Suitable foraging habitat restricted to a small number of marri trees. Roosting and foraging habitat unlikely to be present.	Recorded (previous survey)
Calyptorhynchus latirostris	Carnaby's Cockatoo	EN	EN	126	2018	Breeds and roosts in dense jarrah, karri and marri forests mainly in the hilly interior. Foraging habitat includes jarrah and marri woodlands and forest and the edges of karri forests.	Species recorded foraging in small patch of marri trees during current survey. Roosting habitat unlikely to occur and breeding habitat unlikely to be present.	Recorded (current survey)
Charadrius dubius	Little Ringed Plover	MI	MI	1	1981	Intertidal mudflats in sheltered coastal areas.	No suitable habitat within survey area.	Unlikely
Charadrius leschenaultii	Greater Sand Plover	VU	VU & MI	2	1979	Intertidal mudflats in sheltered coastal areas.	No suitable habitat within survey area.	Unlikely
Elanus scriptus	Letter-winged Kite	P4	-	1	1977	Occupy grasslands and wetlands with large trees	Single, old record with critical habitat absent from survey area. If present, species may overfly all habitat types and may occasionally utilise habitat while foraging.	Unlikely

Taxon	Common name	BC Status	EPBC Status	Number of records	Latest record	Preferred habitat type	Comments	Likelihood of occurrence
Falco peregrinus	Peregrine Falcon	OS	-	23	2016	Cliffs and gorges, inland drainage systems, lowland plains, acacia shrublands intersected by water courses.	Survey area does not contain critical breeding habitat for this species; however, may overfly all habitat types and utilise habitat while foraging.	**Possible**
Glareola maldivarum	Oriental Pratincole	MI	MI	6	1981	Open plains, bare ground around swamps and claypans.	No suitable habitat within survey area.	**Unlikely**
Limosa lapponica	Bar-tailed Godwit	MI (& VU or CR at subsp. level)	MI (& VU or CR at subsp. level)	2	1980	Coastal habitat, large intertidal mudflats, estuaries, inlets and coastal lagoons. Around beds of seagrass and nearby saltmarsh.	No suitable habitat within survey area.	**Unlikely**
Limosa limosa	Black-tailed Godwit	MI	MI	3	1979	Sheltered bays, estuaries and lagoons with large intertidal mudflats or sandflats, banks of mud, sand or shell-grit. Occasionally recorded on rocky coasts or coral islets.	No suitable habitat within survey area.	**Unlikely**
Oxyura australis	Blue-billed Duck	P4	-	63	2010	Freshwater swamps, large damns, lakes and some open waters	Occasional/intermittent visitation only. Critical habitat not present within survey area.	**Likely**
Calidris pugnax	Ruff	MI	MI	2	1980	Intertidal mudflats in sheltered coastal areas.	No suitable habitat within survey area.	**Unlikely**
Plegadis falcinellus	Glossy Ibis	MI	MI	8	1991	Shallows and adjacent flats of freshwater lakes and swamps, river pools, flooded samphire and sewage ponds in south-west Kimberley.	No suitable habitat within survey area.	**Unlikely**
Pluvialis fulva	Pacific Golden Plover	MI	MI	2	1981	Coastal habitats, on beaches, mudflats and in sheltered areas such as estuaries.	No suitable habitat within survey area.	**Unlikely**
Pluvialis squatarola	Grey Plover	MI	MI	3	1980	Along coastal areas, rocky coasts, including some west-coast islands and near-coastal salt lakes. Marine shores, inlets, estuaries and lagoons with large tidal mudflats or sandflats for feeding and sandy beaches for roosting.	No suitable habitat within survey area.	**Unlikely**
Thalasseus bergii	Greater Crested Tern (Crested Tern)	MI	MI	29	1981	Coastal bays and inlets, lakes and large rivers.	No suitable habitat within survey area.	**Unlikely**
Tringa glareola	Wood Sandpiper	MI	MI	5	1981	Coastal, better-watered regions, occurs around the muddy or grassy margins of freshwater wetlands, including swamps, lagoons, river pools, dams, bore overflows and sewage ponds.	No suitable habitat within survey area.	**Unlikely**
Tringa nebularia	Common Greenshank	MI	MI	39	2003	Uncommon to moderately common on coasts and coastal plains, in shallow freshwaters and salt waters, such as estuaries, samphire flats and reef flats.	No suitable habitat within survey area.	**Unlikely**
Tringa stagnatilis	Marsh Sandpiper	MI	MI	2	1981	Permanent or ephemeral wetlands of varying salinity, intertidal mudflats, prefer freshwater to marine environments.	No suitable habitat within survey area.	**Unlikely**
MAMMAL								
Bettongia penicillata ogilbyi	Brush-tailed Bettong, Woylie	CR	EN	2	2006	Tall eucalypt forest and woodland, dense myrtaceous shrubland and kwongan (proteaceous) or mallee heath.	No suitable habitat recorded within survey area.	**Unlikely**
Dasyurus geoffroii	Western Quoll, Chuditch	VU	VU	14	2016	Wet and dry sclerophyll and mallee forest.	No suitable habitat recorded within survey area.	**Unlikely**
Hydromys chrysogaster	Water Rat	P4	-	7	2019	Lives in burrows on low banks of rivers, lakes, wetlands, estuaries and even along the coast. Intact riparian vegetation and associated bank stability is critical to their survival.	No suitable habitat recorded within survey area. Creek lacks riparian vegetation and presence of introduced predators makes permanent occupancy unlikely. Watercourse may be used while transitioning through survey area.	**Possible**
Isoodon fusciventer	Quenda	P4	-	545	2020	Dense understorey around swamps and banksia or jarrah woodlands.	Species may intermittently utilise habitat within the area; however, survey area is unlikely to support permanent occupancy due to absence of understorey and evidence of introduced predators.	**Possible**
Myrmecobius fasciatus	Numbat, Walpurti	EN	EN	4	1983	Wandoo and jarrah forest in south-west WA. (e.g. Dryandra and Perup).	No suitable habitat recorded within survey area.	**Unlikely**
Notamacropus irma	Western Brush Wallaby	P4	-	11	2017	Open forest or woodland, particularly open, seasonally wet flats with low grasses and open scrubby thickets. May also be found in mallee and heathland.	No suitable habitat recorded within survey area.	**Unlikely**

Taxon	Common name	BC Status	EPBC Status	Number of records	Latest record	Preferred habitat type	Comments	Likelihood of occurrence
Phascogale tapoatafa wambenger	Wambenger Brush-tailed Phascogale	CD	-	7	2016	Dry sclerophyll forests and open woodlands that contain hollow-bearing trees but a sparse ground cover.	Species may intermittently utilise habitat while transiting through vegetation along the waterway; however, survey area is unlikely to support permanent occupancy due to absence of understorey and evidence of introduced predators.	**Possible**
Setonix brachyurus	Quokka	VU	VU	9	2011	Dense understorey with less than 10 years since fire surrounded by vegetation >25 years	No suitable habitat recorded within survey area.	**Unlikely**
REPTILE								
Acanthophis antarcticus	Southern Death Adder	P3	-	7	1977	Shrublands, heaths and rainforest	No suitable habitat recorded within survey area.	**Unlikely**
Lerista lineata	Perth Lined Slider	P3	-	2	1975	Sandy coastal heath and shrubland	No suitable habitat recorded within survey area.	**Unlikely**
Neelaps calonotos	Black-striped Snake	P3	-	4	1975	Dunes and sandplains vegetated with heaths and eucalypt/banksia woodlands	No suitable habitat recorded within survey area.	**Unlikely**

4.3.4 Black Cockatoo Habitat Assessment

4.3.4.1 Breeding Habitat

Two species of medium to large eucalypts were identified within the survey area that have the potential to provide breeding habitat for black cockatoo: *Eucalyptus rudis* subsp. *rudis* (flooded gum) and *Corymbia calophylla* (marri). Locations of habitat trees recorded during the survey with a suitable DBH are provided in Figure 4.3 and associated data is provided for each tree in Appendix G.

Twenty-seven potential breeding habitat trees were identified and recorded during the survey (Table 4.6). No trees with known or confirmed breeding hollows were recorded. Seven trees containing potential breeding hollows were identified within the survey area; however, as these hollows were only examined from ground level internal characteristics were unable to be assessed. The remainder of trees within the survey area lacked visible hollows suitable for black cockatoo occupancy.

Table 4.6: DBH trees recorded within the survey area.

Hollow category	Number of trees		Total
	Eucalyptus rudis subsp. *rudis*	*Corymbia calophylla*	
Suitable DBH Tree with Known Nesting Hollows -Category 1	0	0	**0**
Suitable DBH Tree with a potential suitably hollow with signs of use (not confirmed) -Category 2	0	0	**0**
Suitable DBH Tree with a suitable hollow with no signs of use (confirmed) – Category 3	0	0	**0**
Suitable DBH Tree with a marginally unsuitable hollow with no signs of use (confirmed) – Category 4	0	0	**0**
Suitable DBH Tree with a potential suitable hollow with no signs of use (not confirmed) – Category 5	7	0	**7**
Suitable DBH Tree with unsuitable hollows – Category 6	0	0	**0**
Suitable DBH Tree without hollows – Category 7	17	3	**20**
Total	**24**	**3**	**27**

4.3.4.2 Roosting Habitat

Flocks of black cockatoos demonstrate a strong site fidelity to night roosts that are near high-quality foraging habitat (Saunders 1986). Roosting habitat is classified as a tree (or group of trees) where there are records or recent evidence of night roosting. Night roosts are usually located in the tallest trees within an area and in proximity (usually within 6 km) to both quality foraging habitat and an important water supply. Flocks will use different night roosts, often for weeks, or until the local food supply is exhausted. However, due to changing patterns of resource availability not all night-roosts are used every year.

Trees with a DBH greater than 500 mm may be tall enough to provide roosting habitat for Carnaby's black cockatoos (Department of Sustainability Environment Water Population and Communities 2012). Black-cockatoos tend to have traditional roosting sites and these have been documented in the Great Cocky Count (Byrne *et al.* 2015).

No evidence of roosting was recorded during the current or previous survey.

4.3.4.3 Foraging Habitat

Black cockatoos rely on foraging resources to provide sufficient energy for their movements across their range and availability of foraging habitat plays a critical role in the post-breeding period when individuals need to build condition after breeding and teach juveniles where these foraging resources are located (Commonwealth of Australia 2017).

The results of the flora and vegetation assessment indicate that the survey area contain very few plant species that black cockatoos are known to utilise as a food source. Small numbers of marri (*Corymbyia calophylla*) and patches of *Eucalyptus rudis* trees were recorded within the survey area which provide foraging habitat for black cockatoos. The remainder of the survey area lacks proteaceous species (e.g. *Banksia*, *Hakea* or *Grevillea*) and the foraging habitat was assessed a low quality within the survey area.

4.3.4.4 Direct Observations

Primary evidence of the Carnaby's cockatoo was recorded during the current survey. A total of nine individuals were recorded foraging in a mature marri tree located in the northeast corner of the survey area. The birds were recorded foraging for a period of approximately 15 minutes, before they departed the survey area.

Figure 4.3: Fauna habitat types, habitat assessment sites, significant fauna and black cockatoo habitat trees recorded (DBH > 500 mm).

5 DISCUSSION

5.1 FLORA

5.1.1 Floristic Diversity

A total of 11 vascular plant taxa were recorded within the survey area. The most dominant families within the survey area were the Myrtaceae and Poaceae, with all genera represented by only one taxon. These dominant families are consistent with those identified during the desktop assessment, and the overall species diversity and floristic composition of the survey area is typical of highly degraded roadside vegetation within the Swan Coastal Plain IBRA region.

5.1.2 Significant Species

No DBCA listed Priority taxa were recorded within the survey area.

In the desktop assessment, six Priority taxa were assessed as potentially occurring within the survey area based on proximity and the potential presence of suitable habitat. The likelihood of occurrence of these species was reassessed following the field survey based on survey effort, the presence of suitable habitat, and vegetation condition. Seasonal conditions were suitable for detecting the presence of most annual species; however, the vegetation within the survey area was mostly in a 'Completely Degraded' condition. None of the significant species identified during the desktop study were recorded within the survey area, and all species were downgraded to 'unlikely' as either suitable habitat is not considered to occur within the survey area, or suitable habitat is present but is in 'Completely Degraded' condition and the species was not recorded despite reasonable survey effort.

5.1.3 Range Extensions

Based on current WA Herbarium collections there were no new bioregional range extensions recorded (i.e., new records for the Swan Coastal Plain IBRA region) and no records representing range extensions of greater than 100 km.

5.1.4 Introduced Species

Eight introduced species were recorded within the survey area, none of which are listed as Declared Pests or Weeds of National Significance. The introduced species recorded are generally widely naturalised across the Swan Coastal Plain region, and their presence within the survey area is not considered unusual.

5.2 VEGETATION

5.2.1 Vegetation Types and Condition

Remnant vegetation within the survey area consists of one vegetation types dominated by *Eucalyptus rudis* subsp. *rudis* and occur on the alluvial deposits associated with soil landscape unit 34. The vegetation type of *Eucalyptus rudis* subsp. *rudis* open forest over *Fumaria capreolata, Holcus lanatus* and Oxalis *pes-caprae* forbland/grassland on plains associated with the alluvial deposits of the Guildford Formation accounted for 41.1 % (0.17 ha) of the survey area. The remaining 58.9% (0.24 ha) of the survey area was classified as Cleared, including cleared road, verge, parkland and creek line (other).

Remnant vegetation condition within the survey area was classified as 'Completely Degraded' according to the EPA (2016) vegetation condition scale. The survey area mostly consisted of cleared road, verge, creek line (other) and parkland (58.9%) and the remaining 41.1% of vegetation was exclusively in a 'Completely Degraded' condition with significant infestations of introduced species (primarily *Oxalis pes-caprae*, *Fumaria capreolata* and introduced grasses) comprising the understory of these areas.

5.2.2 Significant Vegetation

Vegetation may be considered significant for a range of reasons including, but not limited to: being listed as a Threatened Ecological Community under the BC Act 2016 or the EPBC Act; being classified as a Priority Ecological Community by DBCA; having a restricted distribution; the degree of historical impact from threatening processes; playing a role as a refuge for Threatened species; or providing an important function required to maintain ecological integrity of a significant ecosystem (EPA 2016b). Other environmental features, such as significant watercourses or wetlands may also be considered significant under some circumstances (DER 2014).

Spatial data from the EPBC Act Protected Matters Report were compared to the vegetation types described here to assess the potential presence of TECs and PECs within the survey area. TECs listed under the EPBC Act are regarded as nationally significant. No EPBC Act listed TECs were recorded within the survey area. State listed TECs and PECs are regarded as being of state significance. No state listed TECs or PECs were recorded within the survey area. The vegetation type within the survey area were not considered refugia for any Threatened species nor were they known to provide any function required to maintain the ecological integrity of a significant ecosystem.

The pre-European extent of vegetation occurring within the survey area was assessed using the spatial dataset Pre-European Vegetation (DPRID-006) (Shepherd *et al.* 2002). The current extent of vegetation association 968 mapped by Shepherd *et al.* (2002) is below 10% of its pre-European extent and is therefore classified as 'Endangered' (DER 2014) according to this criterion; however, the specific vegetation types identified within the survey area do not have any conservation significance according to DBCA or the EPBC Act.

5.3 FAUNA

5.3.1 Fauna and Fauna Habitat

Two distinct habitat types were identified within the survey area: Open Woodland and Creekline. The condition of Open Woodland habitat within the survey area ranged from 'Poor' to 'Degraded', with significant weed infestations and evidence of introduced predators recorded. The majority (53.80%) of the survey area has been cleared or significantly altered by human activity, with remaining habitat (Open Woodland and Creekline) assessed as being in 'Poor' to 'Degraded' condition. Although Open Woodland habitat within the survey area contains eucalypts which provide potential breeding, foraging and roosting habitat for black cockatoos, this habitat type generally lacks native understorey and associated refugia for terrestrial vertebrate fauna species and does not represent critical habitat for any significant fauna species.

Of the 252 vertebrate fauna species identified by database searches as potentially occurring within the survey area, 24 species (9.5%) were recorded during the basic fauna and fauna habitat assessment, including 23 birds and one introduced mammal. The fauna assemblage recorded is considered typical for the habitat types observed within the survey area.

Six introduced fauna species were recorded during the survey, comprising: domestic dogs, chicken, mallard, laughing turtle dove, rainbow lorikeet and laughing kookaburra.

5.3.2 Significant Fauna

Significant vertebrate fauna includes species that have been adequately surveyed and are deemed to be, in the wild, either rare, at risk of extinction, or otherwise in need of special protection, and have been gazetted as such. Nine Carnaby's cockatoo (EN EPBC Act & BC Act) were recorded during the field survey.

The Baudin's cockatoo was recorded overflying the survey area during the previous flora and fauna survey (Golder Associates 2016). No other species of conservation significance have previously been recorded within the survey area according to DBCA Threatened and Priority database searches. Based on the results of the desktop assessment and field survey, two bird species (forest red-tailed black cockatoo and blue-billed duck) are considered 'Likely' to occur and a further four species (water rat, quenda, brush-tailed phascogale and peregrine falcon) are considered 'Possible' to occur within the survey area.

5.3.2.1 Significant species recorded:

Carnaby's black cockatoo (*Calyptorhynchus latirostris*) (Endangered under BC Act and EPBC Act)

This species was recorded foraging within the survey area during the basic fauna and fauna habitat assessment. DBCA search results identified more than 126 records of the Carnaby's cockatoo within 10 km of the survey area (most recent 2018). Carnaby's cockatoos may intermittently visit the survey area and may utilise Open Woodland and Cleared (parkland) habitat within the survey area and surrounds while foraging; however, the survey area does not occur within the breeding range for this species.

More information surrounding roosting and foraging habitat can be seen in Section 5.3.3.

Baudin's cockatoo (*Calyptorhynchus baudinii*) (Endangered under BC Act and EPBC Act)

Although this species was not recorded during the current survey, it was previously recorded by (Golder Associates 2016) within the survey area. DBCA search results identified 191 records of the Baudin's cockatoo within 10 km of the survey area (most recent in 2018). The survey area is situated within the 'known foraging' area for the Baudin's cockatoo and the species may intermittently utilise a small patch of marri trees located within Cleared (parkland) habitat within the northeast portion of the survey area while foraging.

More information surrounding breeding, roosting and foraging habitat can be seen in Section 5.3.3.

5.3.2.2 Significant species considered 'Likely' to occur

Blue-billed duck (*Oxyura australis*) (Priority 4 BC Act)

The blue-billed duck occupies freshwater swamps, lakes, salt lakes and estuaries within the south-east and south-west parts of Australia (Johnstone and Storr 1998). The species is almost completely aquatic and is rarely seen on land. Blue-billed ducks are typically observed in pairs or small flocks, although up to several hundred birds may congregate on large, deep freshwater bodies in autumn (Johnstone and Storr 1998). The species forages on the surface of the water and intermittently dives below the surface in search of aquatic invertebrates.

DBCA search results identified 63 records of the blue-billed duck within 10 km of the survey area (most recent 2010) and this species is considered 'Likely' to occur. The blue-billed duck may intermittently utilise Creekline habitat within the survey area; however, critical breeding habitat is not present within the survey area and the species is unlikely to be significantly impacted by proposed maintenance activities.

Forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*) (Vulnerable under BC Act and EPBC Act)

DBCA search results identified 89 records of the forest red-tailed black cockatoo within 10 km of the survey area (most recent 2020). This species was not recorded during the current survey. A post-survey likelihood of occurrence was completed, and this species is considered 'Likely' to occur within the survey area. Although the survey area coincides with the known distribution of the forest red-tailed black cockatoo, suitable habitat for this species is restricted to a small stand of foraging habitat within the northeast portion of the survey area. As the survey area generally lacks jarrah and hollow-bearing marri trees, breeding habitat for this species is unlikely to occur within the survey area.

More information surrounding roosting and foraging habitat can be seen in Section 5.3.3

5.3.2.3 Significant species considered 'Possible' to occur

Peregrine falcon (*Falco peregrinus*) (Other Specially Protected Fauna BC Act)

The species is widespread in Australia but requires specific nesting sites. It does not build a nest but requires cliffs, rocky outcrops, or large tree hollows (Johnstone and Storr 1998). Peregrine falcons feed almost entirely on birds, especially ducks, parrots and pigeons. Due to its widespread movements, the species may overfly all habitat types.

This species was not recorded during the current survey. DBCA search results identified 23 records of the peregrine falcon within 10 km of the survey area (most recent 2016) and this species is considered 'Possible' to occasionally overfly and utilise habitat within the survey area while foraging. Suitable breeding habitat is not present within the survey area and usage of habitat within the survey area by the peregrine falcon is likely to represent intermittent visitation only.

Quenda (*Isoodon fusciventer*) (Priority 4 BC Act)

The quenda (southern brown bandicoot) has a scattered distribution along the southern coastline of Western Australia and inhabits heathlands, shrublands, dry sclerophyll forests and woodlands along the southern west coast (DEC 2007).

The quenda is omnivorous, eating both plants and small animals. It forages for food mainly by digging in the leaf litter and soil to find insects, fungi, plant root nodules and bulbs (Threatened Species Network 2007). This species has been observed exhibiting both diurnal and nocturnal behaviour whilst foraging for food. When food availability is high, territories may overlap; however, this species is considered to be solitary and fighting between individuals is common.

This species was not recorded during the current survey. DBCA database searches indicate that the quenda has been recorded on 545 occasions within 10 km of the survey area and this species is considered 'Possible' to occur. Although Open Woodland habitat provides low-quality habitat which may be used as a dispersal

corridor between patches of remnant habitat, permanent occupancy of the survey area is unlikely due to the general absence of understorey vegetation and presence of introduced predators.

South-western brush-tailed phascogale (*Phascogale tapoatafa wambenger*) (Conservation Dependent under BC Act)

This species is typically nocturnal, feeds predominently on large insects and spiders, occasionally preys on small vertebrates and has even been known to take chickens (Soderquist and Rhind 2008). It also relishes nectar when available and can spend most of the night foraging for nectar on heavily flowering eucalypts (Soderquist and Rhind 2008). The south-western brush-tailed phascogale is one the most arboreal dasyurids and seldom feeds on the ground due to its capacity to leap up to 2 m between trees (Soderquist and Rhind 2008). Preferred foraging is amongst mature trees, large logs and dead standing trees (Soderquist and Rhind 2008).

The south-western brush-tailed phascogale formerly occurred throughout the dry sclerophyll forests and woodlands of temperate and tropical Australia (Soderquist and Rhind 2008). Following European settlement, the distribution of this species has greatly reduced and it is now restricted to isolated patches of remnant habitat (Soderquist and Rhind 2008). A subspecies occurs in the south-west of Western Australia where it occupies dry sclerophyll forest (Soderquist and Rhind 2008).

Male brush-tailed phascogales die following their first breeding season and although females can live up to three years in the wild most only survive to raise one litter (Soderquist and Rhind 2008). Home ranges of females typically span 20 to 40 ha and can be as small as 5 ha in high quality habitat while male home ranges are often greater than 100 ha and can expand ten-fold during the breeding season (Soderquist and Rhind 2008).

This species was not recorded during the current survey. The south-western brush-tailed phascogale has been recorded on seven occasions (most recent 2016) within the study area. The proximity of the survey area to residential properties and the presence of domestic cats and dogs within the local area combined with the general absence of suitable hollows and highly degraded habitat condition makes it unlikely that the survey area supports a permanent population of brush-tailed phascogales. Habitat within the survey area may act as a corridor between suitable habitat fragments which the species may intermittently utilise during foraging or dispersal activities.

Water rat (*hydromys chrysogaster*) (Priority 4 under BC Act)

Water rats (rakali) are restricted to Australia, New Guinea and adjacent islands. This species is distributed around much of the periphery of Australia and can occur anywhere in the vicinity of permanent waterbodies with fresh or brackish water (Olsen 2008). The only areas in which they do not occur are the arid central and western zones. Water-rat dens are created along the banks of waterways and occasionally in logs (Olsen 2008).

Water rats hunt on land, amongst the vegetation along the shoreline, and dive around submerged roots and logs in the water. They are opportunistic hunters which feed on large aquatic insects, fish, crustaceans, frogs, lizards, water birds, small mammals, fresh carrion and plant material (Olsen 2008). This species is not considered to be entirely nocturnal and is most active around sunset, but may undertake diurnal foraging (Olsen 2008). This species is highly territorial, particularly when populations reach high densities and it is not uncommon to see evidence of fighting in males (Olsen 2008). Breeding occurs throughout the year, with the majority of litters born in spring and late summer (Olsen 2008).

This species is preyed on by introduced predators (cats and foxes) as well as birds of prey, snakes and large fish (Olsen 2008). Swap reduction and flood mitigation activites have caused a significant reduction in numbers across the south-west population as a consequence of habitat degradation, increased salinity and waterway degradation (Olsen 2008).

This species was not recorded during the current survey. The water rat has been recorded on seven occasions within 10 km of the survey area (most recent 2019). This species has been deemed 'Possible' to occur within

the survey area due to the proximity of records and limited availability of suitable habitat within Creekline habitat. The proximity of the survey area to residential properties and the presence of domestic cats and dogs within the local area combined with the degraded condition of suitable habitat makes it unlikely that the survey area supports a permanent population of water rats; however, habitat within the survey area provides a corridor between suitable habitat fragments for the species to utilise and usage by this species may occur intermittently during foraging or dispersal activities.

5.3.3 Black Cockatoo Habitat Assessment

The study area falls within the modelled distributions of the three black cockatoo species and DBCA database searches identified records of each species within the study area. An assessment was undertaken to investigate potential breeding habitat, night roosting habitat, and foraging habitat for the three species of black cockatoo within the survey area. A small flock of nine Carnaby's cockatoos were observed foraging in a single marri tree within the survey area during the current survey.

A total of 27 potentially suitable habitat trees (DBH >500 mm) were recorded within the survey area, none of which had known or probable nesting hollows:

- Seven trees supporting potentially suitable hollows (Category 5) were recorded; however, the internal characteristics of these hollows were unable to be verified.
- Twenty potential habitat trees with no hollows (Category 7) were recorded within the survey area.

As the survey area does not intersect the current breeding distribution of the Carnaby's cockatoo or Baudin's cockatoo, potential breeding habitat trees within the survey area are unlikely to be utilised by these species. No evidence of breeding (forest red-tailed black cockatoo only) or roosting activity (all black cockatoo species) was recorded during the current survey. Although the 27 suitably sized trees recorded within the survey area represent potential roosting habitat for all three black cockatoo species, the survey area does not encompass the largest trees in the surrounding area and evidence of roosting was not recorded during the current survey.

Black cockatoo foraging habitat within the survey area was assessed as 'low quality' (individual foraging plants or small stand of foraging plants). Foraging habitat is generally restricted to a small patch of marri in the northeast corner of the survey area and *Eucalyptus rudis* which may be utilised by black cockatoo species while foraging. Native proteaceous plant species (known Carnaby's and Baudin's cockatoo foraging items) were not recorded during the vegetation survey. A small number of mature marri trees (*Corymbia calophylla*) were recorded in the northeast corner of the survey area, represent low-quality foraging habitat for all three species of black cockatoo. Although a small flock of nine Carnaby's cockatoos were recorded foraging in a single marri tree during the basic fauna survey, these birds spent a short period of time (<15 minutes) within the survey area before moving into adjacent vegetation. Due to the small number of primary foraging species present, low-quality and limited diversity of foraging species available, habitat within the survey area represents low-quality secondary foraging habitat rather than a primary foraging resource for black cockatoos.

Given the appropriate timing of the survey, general absence of suitable breeding hollows and low-quality of foraging habitat, the results of the black cockatoo habitat assessment indicate that the survey area is unlikely to encompass critical breeding, roosting or foraging habitat for black cockatoos.

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7 APPENDICES

Appendix A Definitions of significant species, communities, and weeds.

SIGNIFICANT FLORA

According to the *EPA Factor Guideline: Flora and Vegetation* (EPA 2016a), plant taxa (or records) may be considered significant for a number of reasons including, but not restricted to, the following:

- A taxon listed as 'Threatened' under the *Biodiversity Conservation Act 2016* (WA) or the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth);
- A taxon on the Department of Biodiversity, Conservation and Attractions (DBCA) Priority Flora List;
- Locally endemic species or those associated with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems);
- New species or those having anomalous features that indicate a potential new species;
- Being representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range);
- Unusual species, including restricted subspecies, varieties or naturally occurring hybrids; and
- Being representative of taxonomic groups that no longer occur widely in the broader landscape (relictual species/populations).

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) (Cwlth)

At a Commonwealth level, Threatened species are protected under the EPBC Act, which lists species in accordance with the criteria of the International Union for Conservation of Nature (International Union for Conservation of Nature 2014), that is, 'Critically Endangered', 'Endangered', 'Vulnerable', 'Conservation Dependant', 'Extinct', or 'Extinct in the Wild' (see http://www.environment.gov.au/cgi-bin/sprat/public/publicthreatenedlist.pl?wanted=flora).

Biodiversity Conservation Act 2016 (Western Australia)

At a State level, Threatened species are protected under the BC Act. These are taxa which have been adequately surveyed and are deemed to be either rare, in danger of extinction, or otherwise in need of special protection in the wild and are gazetted as Threatened (Declared Rare) Flora. Threatened species are further categorised by the Department of Biodiversity, Conservation and Attractions (DBCA) according to their level of threat using the International Union for Conservation of Nature (IUCN) red list criteria ((International Union for Conservation of Nature 2014) (see https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities for definitions).

Priority Flora (DBCA)

The DBCA maintains a list of Priority species, which are considered poorly known, uncommon or under threat but for which there is insufficient justification to be listed as Threatened, based on known distribution and population sizes. Priority species are assigned to one of four categories, described below. DBCA listed Priority species do not have any statutory protection (see https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-plants for definitions.)

SIGNIFICANT VEGETATION

According to *EPA Factor Guideline: Flora and Vegetation* (EPA 2016a), vegetation may be considered significant for a number of reasons including, but not restricted to, the following:

- Being identified as a 'Threatened Ecological Community' under the *Biodiversity Conservation* (BC) *Act* 2016 (WA) or the *Environment Protection and Biodiversity Conservation* (EPBC) *Act* 1999 (Cwlth);
- Being classified as a 'Priority Ecological Communities' by DBCA;
- Having a restricted distribution;
- The degree of historical impact from threatening processes;
- Playing a role as a refuge;
- Providing an important function required to maintain ecological integrity of a significant ecosystem.

See https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/wa-s-threatened-ecological-communities for definitions, categories, and criteria of Threatened and Priority Ecological Communities.

INTRODUCED PLANT SPECIES

Weeds of National Significance (WONS)

At a national level, there are 32 weed species listed as Weeds of National Significance (WONS). The Commonwealth National Weeds Strategy: *A Strategic Approach to Weed Problems of National Significance* (DSEWPaC 2012b) describes broad goals and objectives to manage these species.–

Declared Pests

The purpose of the *Biosecurity and Agriculture Management Act 2007* (BAM Act) is to prevent serious animal and plant pests and diseases from entering WA and becoming established, and to minimise the spread and impact of those that are already present. The BAM Act (and associated regulations) replaces the *Agriculture and Related Resources Protection Act 1976* (and associated regulations).

The BAM regulations were enacted on 1 May 2013, placing organisms into one of five legal status categories: Declared Pest - Prohibited, Declared Pest, Permitted, Permitted – Requires Permit, and Unlisted (Appendix A). The Western Australian Organism List (WAOL) (DPIRD 2007–) lists organisms in each of these categories. Unlisted organisms must not be imported (unless in accordance with an import permit and regulations). The BAM Act further categorises Declared Pests in one of three control categories: C1 Exclusion, C2 Eradication, and C3 Management (see https://www.agric.wa.gov.au/bam/western-australian-organism-list-waol for control category definitions).

Environmental Weeds

At a regional level, DBCA rates weed species against four criteria based on the Weed Prioritisation Process (DPaW 2013): invasiveness, ecological impact, potential and current distribution, and feasibility of control. Currently, only species with a rating for both the ecological impact and invasiveness criteria are listed (see https://www.dpaw.wa.gov.au/plants-and-animals/plants/weeds/156-how-do-we-manage-weeds for definitions).

SIGNIFICANT FAUNA

According to the *EPA Factor Guideline: Terrestrial Fauna* (EPA 2016c), animal taxa (or records) may be considered significant for a number of reasons including, but not restricted to, the following:

- A taxon listed as 'Threatened' under the *Biodiversity Conservation Act 2016* (WA) or the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth);
- A taxon on the Department of Biodiversity, Conservation and Attractions (DBCA) Priority Fauna List;
- Species with restricted distributions;
- Degree of historical impact from threatening processes;
- Providing an important function required to maintain the ecological integrity of a significant ecosystem.

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) (Cwlth)

At a Commonwealth level, Threatened species are protected under the EPBC Act, which lists species in accordance with the criteria of the International Union for Conservation of Nature (International Union for Conservation of Nature 2014), that is, 'Critically Endangered', 'Endangered', 'Vulnerable', 'Conservation Dependant', 'Extinct', or 'Extinct in the Wild' (see http://www.environment.gov.au/cgi-bin/sprat/public/publicthreatenedlist.pl?wanted=fauna).

Biodiversity Conservation Act 2016 (Western Australia)

At a State level, Threatened species are protected under the BC Act. These are taxa which have been adequately surveyed and are deemed to be either rare, in danger of extinction, or otherwise in need of special protection in the wild and are gazetted as Threatened (Declared Rare) Flora. Threatened species are further categorised by the Department of Biodiversity, Conservation and Attractions (DBCA) according to their level of threat using the International Union for Conservation of Nature (IUCN) red list criteria ((International Union for Conservation of Nature 2014) (see https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities for definitions).

Priority Fauna (DBCA)

The DBCA maintains a list of Priority species, which are considered poorly known, uncommon or under threat but for which there is insufficient justification to be listed as Threatened, based on known distribution and population sizes. Priority species are assigned to one of four categories, described below. DBCA listed Priority species do not have any statutory protection (see https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-animals for definitions).

Appendix B Desktop assessment database search results.

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 14-Sep-2022

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	67
Listed Migratory Species:	35

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Lands:	79
Commonwealth Heritage Places:	None
Listed Marine Species:	43
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	17
Regional Forest Agreements:	1
Nationally Important Wetlands:	3
EPBC Act Referrals:	50
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar Wetlands) [Resource Information]

Ramsar Site Name	Proximity	Buffer Status
Forrestdale and thomsons lakes	Within Ramsar site	In feature area

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community likely to occur within area	In feature area
Clay Pans of the Swan Coastal Plain	Critically Endangered	Community likely to occur within area	In buffer area only
Corymbia calophylla - Kingia australis woodlands on heavy soils of the Swan Coastal Plain	Endangered	Community known to occur within area	In buffer area only
Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community	Critically Endangered	Community likely to occur within area	In feature area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area	In buffer area only
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In buffer area only
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In buffer area only
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Zanda baudinii listed as Calyptorhynchus baudinii Baudin's Black-Cockatoo, Long-billed Black-cockatoo [87736]	Endangered	Roosting known to occur within area	In feature area
Zanda latirostris listed as Calyptorhynchus latirostris Carnaby's Black Cockatoo, Short-billed Black-cockatoo [87737]	Endangered	Breeding known to occur within area	In feature area
FISH			
Thunnus maccoyii Southern Bluefin Tuna [69402]	Conservation Dependent	Species or species habitat likely to occur within area	In buffer area only
INSECT			
Leioproctus douglasiellus a short-tongued bee [66756]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only
Neopasiphae simplicior A native bee [66821]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only
MAMMAL			
Bettongia penicillata ogilbyi Woylie [66844]	Endangered	Species or species habitat known to occur within area	In feature area
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat known to occur within area	In buffer area only
Pseudocheirus occidentalis Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Species or species habitat may occur within area	In feature area
Setonix brachyurus Quokka [229]	Vulnerable	Species or species habitat known to occur within area	In feature area
OTHER			
Westralunio carteri Carter's Freshwater Mussel, Freshwater Mussel [86266]	Vulnerable	Species or species habitat known to occur within area	In feature area
PLANT			
Acacia anomala Grass Wattle, Chittering Grass Wattle [8153]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Acacia aphylla Leafless Rock Wattle [13553]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Andersonia gracilis Slender Andersonia [14470]	Endangered	Species or species habitat known to occur within area	In feature area
Anthocercis gracilis Slender Tailflower [11103]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Austrostipa bronwenae [87808]	Endangered	Species or species habitat known to occur within area	In buffer area only
Austrostipa jacobsiana [87809]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only
Banksia mimica Summer Honeypot [82765]	Endangered	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Caladenia huegelii King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat known to occur within area	In buffer area only
Calytrix breviseta subsp. breviseta Swamp Starflower [23879]	Endangered	Species or species habitat known to occur within area	In feature area
Chamelaucium sp. Gingin (N.G.Marchant 6) Gingin Wax [88881]	Endangered	Species or species habitat may occur within area	In buffer area only
Conospermum undulatum Wavy-leaved Smokebush [24435]	Vulnerable	Species or species habitat known to occur within area	In feature area
Darwinia apiculata Scarp Darwinia [8763]	Endangered	Species or species habitat known to occur within area	In feature area
Diplolaena andrewsii [6601]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Diuris drummondii Tall Donkey Orchid [4365]	Vulnerable	Species or species habitat known to occur within area	In feature area
Diuris micrantha Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Diuris purdiei Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat known to occur within area	In feature area
Drakaea elastica Glossy-leafed Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat known to occur within area	In feature area
Drakaea micrantha Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Eleocharis keigheryi Keighery's Eleocharis [64893]	Vulnerable	Species or species habitat known to occur within area	In feature area
Eremophila glabra subsp. chlorella [84927]	Endangered	Species or species habitat known to occur within area	In feature area
Eucalyptus x balanites Cadda Road Mallee, Cadda Mallee [87816]	Endangered	Species or species habitat known to occur within area	In feature area
Goodenia arthrotricha [12448]	Endangered	Species or species habitat known to occur within area	In feature area
Grevillea curviloba subsp. incurva Narrow curved-leaf Grevillea [64909]	Endangered	Species or species habitat likely to occur within area	In feature area
Grevillea flexuosa Zig Zag Grevillea [2957]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Grevillea thelemanniana Spider Net Grevillea [32835]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only
Lepidosperma rostratum Beaked Lepidosperma [14152]	Endangered	Species or species habitat known to occur within area	In feature area
Macarthuria keigheryi Keighery's Macarthuria [64930]	Endangered	Species or species habitat known to occur within area	In feature area
Ptilotus pyramidatus Pyramid Mulla-mulla [18216]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only
Synaphea sp. Fairbridge Farm (D. Papenfus 696) Selena's Synaphea [82881]	Critically Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Synaphea sp. Pinjarra Plain (A.S. George 17182) [86878]	Endangered	Species or species habitat may occur within area	In feature area
Synaphea sp. Serpentine (G.R. Brand 103) [86879]	Critically Endangered	Species or species habitat may occur within area	In buffer area only
Thelymitra dedmaniarum Cinnamon Sun Orchid [65105]	Endangered	Species or species habitat may occur within area	In buffer area only
Thelymitra stellata Star Sun-orchid [7060]	Endangered	Species or species habitat known to occur within area	In feature area
REPTILE			
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area	In buffer area only
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area	In buffer area only
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
SHARK			
Sphyrna lewini Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat likely to occur within area	In buffer area only

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area	In buffer area only
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In buffer area only
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In buffer area only
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Migratory Marine Species			
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area	In buffer area only
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area	In buffer area only
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat may occur within area	In buffer area only
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat may occur within area	In buffer area only
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Migratory Terrestrial Species			
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area	In feature area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area	In buffer area only
Calidris subminuta Long-toed Stint [861]		Roosting known to occur within area	In buffer area only
Charadrius dubius Little Ringed Plover [896]		Roosting known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area	In buffer area only
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area	In buffer area only
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area	In buffer area only
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area	In buffer area only
Pandion haliaetus Osprey [952]		Breeding known to occur within area	In buffer area only
Philomachus pugnax Ruff (Reeve) [850]		Roosting known to occur within area	In buffer area only
Tringa glareola Wood Sandpiper [829]		Roosting known to occur within area	In buffer area only
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area	In feature area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area	In buffer area only

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State	Buffer Status
Defence		
Defence - AIRTC CANNINGTON [50229]	WA	In buffer area only
Defence - AIRTC CANNINGTON [50232]	WA	In buffer area only
Defence - AIRTC CANNINGTON [50233]	WA	In buffer area only
Defence - AIRTC CANNINGTON [50230]	WA	In buffer area only
Defence - AIRTC CANNINGTON [50231]	WA	In buffer area only
Unknown		
Commonwealth Land - [51241]	WA	In buffer area only
Commonwealth Land - [51986]	WA	In buffer area only
Commonwealth Land - [50837]	WA	In buffer area only
Commonwealth Land - [51514]	WA	In buffer area only
Commonwealth Land - [51518]	WA	In buffer area only
Commonwealth Land - [50953]	WA	In buffer area only
Commonwealth Land - [50874]	WA	In buffer area only
Commonwealth Land - [50850]	WA	In buffer area only
Commonwealth Land - [51268]	WA	In buffer area only
Commonwealth Land - [51197]	WA	In buffer area only
Commonwealth Land - [51196]	WA	In buffer area only
Commonwealth Land - [51907]	WA	In buffer area only
Commonwealth Land - [51198]	WA	In buffer area only
Commonwealth Land - [51192]	WA	In buffer area only
Commonwealth Land - [51193]	WA	In buffer area only
Commonwealth Land - [51266]	WA	In buffer area only
Commonwealth Land - [51267]	WA	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [51190]	WA	In buffer area only
Commonwealth Land - [51349]	WA	In buffer area only
Commonwealth Land - [51348]	WA	In buffer area only
Commonwealth Land - [51242]	WA	In buffer area only
Commonwealth Land - [51243]	WA	In buffer area only
Commonwealth Land - [50883]	WA	In buffer area only
Commonwealth Land - [51287]	WA	In buffer area only
Commonwealth Land - [50949]	WA	In buffer area only
Commonwealth Land - [50881]	WA	In buffer area only
Commonwealth Land - [51917]	WA	In buffer area only
Commonwealth Land - [51918]	WA	In buffer area only
Commonwealth Land - [50866]	WA	In feature area
Commonwealth Land - [50865]	WA	In buffer area only
Commonwealth Land - [51525]	WA	In buffer area only
Commonwealth Land - [51347]	WA	In buffer area only
Commonwealth Land - [51350]	WA	In buffer area only
Commonwealth Land - [51180]	WA	In buffer area only
Commonwealth Land - [50272]	WA	In buffer area only
Commonwealth Land - [51526]	WA	In buffer area only
Commonwealth Land - [51220]	WA	In buffer area only
Commonwealth Land - [51387]	WA	In buffer area only
Commonwealth Land - [51207]	WA	In buffer area only
Commonwealth Land - [51357]	WA	In buffer area only
Commonwealth Land - [50882]	WA	In buffer area only
Commonwealth Land - [50836]	WA	In buffer area only
Commonwealth Land - [51356]	WA	In buffer area only
Commonwealth Land - [51376]	WA	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [51211]	WA	In buffer area only
Commonwealth Land - [51210]	WA	In buffer area only
Commonwealth Land - [51163]	WA	In buffer area only
Commonwealth Land - [51928]	WA	In buffer area only
Commonwealth Land - [51427]	WA	In buffer area only
Commonwealth Land - [51354]	WA	In buffer area only
Commonwealth Land - [51218]	WA	In buffer area only
Commonwealth Land - [51160]	WA	In buffer area only
Commonwealth Land - [51927]	WA	In buffer area only
Commonwealth Land - [50833]	WA	In buffer area only
Commonwealth Land - [50870]	WA	In feature area
Commonwealth Land - [50872]	WA	In feature area
Commonwealth Land - [50873]	WA	In buffer area only
Commonwealth Land - [50838]	WA	In buffer area only
Commonwealth Land - [51219]	WA	In buffer area only
Commonwealth Land - [50835]	WA	In buffer area only
Commonwealth Land - [50867]	WA	In feature area
Commonwealth Land - [51382]	WA	In buffer area only
Commonwealth Land - [51910]	WA	In buffer area only
Commonwealth Land - [51179]	WA	In buffer area only
Commonwealth Land - [50844]	WA	In buffer area only
Commonwealth Land - [50864]	WA	In buffer area only
Commonwealth Land - [51206]	WA	In buffer area only
Commonwealth Land - [50843]	WA	In buffer area only
Commonwealth Land - [51209]	WA	In buffer area only
Commonwealth Land - [51975]	WA	In buffer area only
Commonwealth Land - [51205]	WA	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [51204]	WA	In buffer area only
Commonwealth Land - [50848]	WA	In buffer area only
Commonwealth Land - [50849]	WA	In buffer area only

Listed Marine Species

[Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area overfly marine area	In feature area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area overfly marine area	In buffer area only
Calidris subminuta Long-toed Stint [861]		Roosting known to occur within area overfly marine area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Charadrius dubius Little Ringed Plover [896]		Roosting known to occur within area overfly marine area	In buffer area only
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area overfly marine area	In buffer area only
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area	In buffer area only
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In buffer area only
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area overfly marine area	In buffer area only
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area overfly marine area	In buffer area only
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Roosting known to occur within area overfly marine area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area overfly marine area	In buffer area only
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In buffer area only
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area overfly marine area	In buffer area only
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area	In buffer area only
Pandion haliaetus Osprey [952]		Breeding known to occur within area	In buffer area only
Philomachus pugnax Ruff (Reeve) [850]		Roosting known to occur within area overfly marine area	In buffer area only
Recurvirostra novaehollandiae Red-necked Avocet [871]		Roosting known to occur within area overfly marine area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Rostratula australis as Rostratula benghalensis (sensu lato)			
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Thalassarche impavida			
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche melanophris			
Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Thalassarche steadi			
White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thinornis cucullatus as Thinornis rubricollis			
Hooded Plover, Hooded Dotterel [87735]		Species or species habitat likely to occur within area overfly marine area	In buffer area only
Tringa glareola			
Wood Sandpiper [829]		Roosting known to occur within area overfly marine area	In buffer area only
Tringa nebularia			
Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area overfly marine area	In feature area
Tringa stagnatilis			
Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area overfly marine area	In buffer area only
Mammal			
Neophoca cinerea			
Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat known to occur within area	In buffer area only
Reptile			
Caretta caretta			
Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area	In buffer area only
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area	In buffer area only

Extra Information

State and Territory Reserves			[Resource Information]
Protected Area Name	Reserve Type	State	Buffer Status
Balannup Lake	Nature Reserve	WA	In buffer area only
Canning River	Management Area	WA	In feature area
Dundas Road	Nature Reserve	WA	In buffer area only
Forrestdale Lake	Nature Reserve	WA	In buffer area only
Kenwick Wetlands	Nature Reserve	WA	In buffer area only
Korung	National Park	WA	In buffer area only
Lesmurdie Falls	National Park	WA	In buffer area only
Piara	Nature Reserve	WA	In buffer area only
Stinton Cascades	Nature Reserve	WA	In buffer area only
Unnamed WA21569	5(1)(g) Reserve	WA	In buffer area only
Unnamed WA23076	Nature Reserve	WA	In buffer area only
Unnamed WA24657	Conservation Park	WA	In buffer area only
Unnamed WA29815	5(1)(h) Reserve	WA	In buffer area only
Unnamed WA37997	Nature Reserve	WA	In buffer area only
Unnamed WA49299	Nature Reserve	WA	In buffer area only
Unnamed WA49362	Nature Reserve	WA	In buffer area only
Unnamed WA49363	Conservation Park	WA	In buffer area only

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

RFA Name	State	Buffer Status
South West WA RFA	Western Australia	In buffer area only

Nationally Important Wetlands [Resource Information]

Wetland Name	State	Buffer Status
Brixton Street Swamps	WA	In buffer area only
Gibbs Road Swamp System	WA	In buffer area only
Swan-Canning Estuary	WA	In buffer area only

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Residential subdivision of Lot 126 Lawnbrook Road, Walliston	2021/9105		Completed	In buffer area only
Controlled action				
Airport & Freight Access Gateway	2010/5384	Controlled Action	Post-Approval	In buffer area only
Byford Rail Extension, Byford, WA	2020/8764	Controlled Action	Post-Approval	In buffer area only
Clearing for orchard expansion, Lot 400 Canning Road, Carmel, WA	2016/7647	Controlled Action	Completed	In buffer area only
Construction of Residential Dwelling, Ozone Terrace, Kalamunda	2006/3147	Controlled Action	Post-Approval	In buffer area only
Development of an Integrated Aged Care Facility, Kalumunda, WA	2013/6990	Controlled Action	Completed	In buffer area only
Garden Street road extension, Huntingdale, city of Gosnells, WA	2016/7735	Controlled Action	Post-Approval	In buffer area only
Keane Road Strategic Link, proposed construction central portion of Keane Road	2009/5035	Controlled Action	Completed	In buffer area only
Native vegetation clearing of Lot 21 Webster Road for Industrial Development	2011/6186	Controlled Action	Post-Approval	In buffer area only
Natural Gas Pipeline Expansion	2006/2813	Controlled Action	Post-Approval	In buffer area only
Nava-1 Cable System	2001/510	Controlled Action	Completed	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Ranford Road Residential Development	2002/549	Controlled Action	Post-Approval	In buffer area only
Residential development and bushfire protection within part Lot 9006 Reilly Road, Harrisdale, WA	2016/7846	Controlled Action	Post-Approval	In buffer area only
Residential Estate at Lot 1580 Warton Road, Southern River	2004/1471	Controlled Action	Post-Approval	In buffer area only
Southern Link Road Stage 3 City of Canning	2020/8809	Controlled Action	Referral Decision	In buffer area only
Thornlie-Cockburn Link Project, WA	2018/8188	Controlled Action	Post-Approval	In buffer area only
Tonkin Highway Grade Separated Interchanges	2019/8529	Controlled Action	Post-Approval	In buffer area only
Not controlled action				
Armadale Road Duplication - Tapper to Anstey Road	2017/7972	Not Controlled Action	Completed	In buffer area only
Berkshire Road and Roe Highway Interchange, Forrestfield, East Perth, WA	2014/7243	Not Controlled Action	Completed	In buffer area only
Burslem Drive Bridge Duplication Over Canning River, Maddington, WA	2014/7115	Not Controlled Action	Completed	In buffer area only
Canning Mills Road Improvement Project, Martin, WA	2015/7426	Not Controlled Action	Completed	In buffer area only
Clearing of Lot 400 Canning Road, Carmel, WA	2017/7979	Not Controlled Action	Completed	In buffer area only
Commercial development of Lot 106 Wright Road, Forrestdale WA	2003/1255	Not Controlled Action	Completed	In buffer area only
Construction of international rowing course and commercial/residential areas	2003/1034	Not Controlled Action	Completed	In feature area
Denny Avenue Level Crossing Removal, Kelmscott WA	2018/8377	Not Controlled Action	Completed	In buffer area only
Eighth Road and Forrest Road Upgrade, Armadale, WA	2019/8538	Not Controlled Action	Completed	In buffer area only
Eradication of the European House Borer, Perth metropolitan area, WA	2009/5027	Not Controlled Action	Completed	In feature area
Grazing of stock and associated works on Lot 1790 Passmore Street, Southern River Western Australia	2018/8176	Not Controlled Action	Completed	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Hartfield Park Sporting Field Extension	2013/7008	Not Controlled Action	Completed	In buffer area only
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed	In feature area
Industrial Development (multiple lots) Edward Street, Kenwick, WA	2018/8231	Not Controlled Action	Completed	In buffer area only
Perth Seawater Desalination Project: Thomsons Lake to Kogolup Pipeline	2005/1971	Not Controlled Action	Completed	In buffer area only
Residential Development, Hilbert	2020/8675	Not Controlled Action	Completed	In buffer area only
Residential development of Lots 302, 308, 320 and part of Lot 9502, Hawtin Rd, Forrestfield, WA	2016/7770	Not Controlled Action	Completed	In buffer area only
Road widening - Eighth Road Armadale between Gribble Avenue and Armadale Road	2021/8964	Not Controlled Action	Completed	In buffer area only
Roe Highway - Karel Avenue to Hope Road Bridge Project	2005/2061	Not Controlled Action	Completed	In buffer area only
Southern River Mixed Business Precinct F, City of Gosnells, WA	2013/6813	Not Controlled Action	Completed	In buffer area only
Southern River Precinct 3E	2017/7900	Not Controlled Action	Completed	In buffer area only
To develop a residential development at Glyde Road, Lesmurdie, WA	2013/7096	Not Controlled Action	Completed	In buffer area only
Tonkin Highway Extension	2001/470	Not Controlled Action	Completed	In buffer area only
Translocation of orchids (Caladenia huegelii) from Roe Hway Reserve	2002/781	Not Controlled Action	Completed	In buffer area only
Wungong Transfer Mains Project	2007/3532	Not Controlled Action	Completed	In buffer area only
Yule Brook Main Drain Flood Mitigation Works	2019/8572	Not Controlled Action	Completed	In buffer area only
Not controlled action (particular manner)				
City of Cockburn Sporting Facilties	2005/2139	Not Controlled Action (Particular	Post-Approval	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action (particular manner)				
		Manner)		
Commercial Estate and Aeronautical Infrastructure Development, Precincts 2A & 2B	2006/3021	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
South West Metropolitan Railway Project	2003/1175	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
State Football Centre	2020/8824	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Referral decision				
Commercial development of Lot 414 Grove Road, Kenwick	2021/9022	Referral Decision	Referral Publication	In buffer area only

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

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

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

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

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

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Appendix C Plant species recorded within the survey area.

Family	Taxon
Alliaceae	*?*Allium* sp.
Myrtaceae	*Corymbia calophylla*
	Eucalyptus rudis subsp. *rudis*
	Melaleuca rhaphiophylla
Oleaceae	**Olea europaea* subsp. *europaea*
Oxalidaceae	**Oxalis pes-caprae*
Papaveraceae	**Fumaria capreolata*
Poaceae	**Ehrharta calycina*
	**Holcus lanatus*
	*Poaceae sp. (indet.)
Rutaceae	**Citrus reticulata*

Appendix D Sampling site data.

S01

Date	9/7/2022	**Site type**	Quadrat	**Botanist**	SH
Northwest corner	52K 406187.84 mE 6451331.16 mN				
Landform	Plain	**Slope**	NA		
Soil colour	Dark brown	**Soil texture**	Sandy clay		
Rock type	NA	**Rock size**	NA	**Rock cover**	NA
Vegetation condition	Completely Degraded	**Disturbance**	Clearing, weeds.		
Time since fire	Long (> 3 yrs)				

Name	Stratum	Percentage cover (%)
Eucalyptus rudis subsp. *rudis*	Tree (>30 m)	95 – 100
Citrus reticulata	Tree (<10 m)	10 – 24
Olea europaea subsp. *europaea*	Tree (<10 m)	< 1
Ehrharta calycina	Grass	5 – 9
Holcus lanatus	Grass	< 1
?Allium sp.	Herb	1 – 4
Fumaria capreolata	Herb	33 – 49
Oxalis pes-caprae	Herb	33 – 49

S02

Date	9/7/2022	**Site type**	Quadrat	**Botanist**	SH
Northwest corner	52K 406230.8 mE 6451391.43 mN				
Landform	Plain	**Slope**	NA		
Soil colour	Dark brown	**Soil texture**	Sandy clay		
Rock type	NA	**Rock size**	NA	**Rock cover**	NA
Vegetation condition	Completely Degraded	**Disturbance**	Clearing, weeds.		
Time since fire	Long (> 3 yrs)				

Name	Stratum	Percentage cover (%)
Eucalyptus rudis subsp. *rudis*	Tree (>30 m)	95 – 100
Olea europaea subsp. *europaea*	Tree (<10 m)	< 1
Holcus lanatus	Grass	10 – 24
?Allium sp.	Herb	5 – 9
Fumaria capreolata	Herb	33 – 49
Oxalis pes-caprae	Herb	33 – 49

S03

Date	9/7/2022	**Site type**	Relevé	**Botanist**	SH
Northwest corner	52K 406218.03 mE 6451373.24 mN				
Landform	Creek	**Slope**	NA		
Soil colour	Dark brown	**Soil texture**	Sandy clay		
Rock type	Gravel	**Rock size**	Gravel	**Rock cover**	10 – 30
Vegetation condition	Completely Degraded	**Disturbance**	Clearing, weeds.		
Time since fire	Long (> 3 yrs)				

Name	Stratum	Percentage cover (%)
Eucalyptus rudis subsp. *rudis*	Tree (>30 m)	75 – 94
Melaleuca rhaphiophylla	Tree (10-30 m)	5 – 9
Holcus lanatus	Grass	10 – 24
Poaceae sp. (indet.)	Grass	5 – 9
?Allium sp.	Herb	25 – 32
Fumaria capreolata	Herb	25 – 32

Appendix E Fauna habitat assessment data.

SSBHA01

Date	7/09/2022		
Site type	Fauna habitat assessment		
Coordinate	50K 406194.79 mE 6451333.56 mN		
Habitat type (other)	Open Woodland		
Habitat description	Scattered E. rudis over planted fruit trees over weeds.		
Habitat condition	Poor		
Suitability for significant species	black cockatoo foraging habitat		
Evidence of significant species	N		
Disturbance	Weeds, clearing		
Time since fire	No evidence		
Leaf litter cover	10 – 40		
Woody debris	< 10		
Rocky crevices/caves	NA		
Large trees	Y		
Tree hollows	N		
Landform	Depression		
Slope	Negligible	**Aspect**	NA
Soil colour	Dark brown	**Soil texture**	Sandy clay
Bare soil	< 10	**Drainage**	Depression
Rock type	NA	**Rock size**	NA
Rock abundance	NA		
Upper stratum	Open woodland		
Middle stratum			
Lower stratum	Closed tussock grassland / sedgeland / herbland		

SSBHA02

Date	7/09/2022		
Site type	Fauna habitat assessment		
Coordinate	50K 406274.08 mE 6451407.01 mN		
Habitat type (other)	Cleared (parkland)		
Habitat description	Scattered marri over weeds along roadside.		
Habitat condition	Poor		
Suitability for significant species	black cockatoo foraging habitat		
Evidence of significant species	Carnaby's foraging		
Disturbance	Weeds, clearing		
Time since fire	No evidence		
Leaf litter cover	< 10		
Woody debris	< 10		
Rocky crevices/caves	NA		
Large trees	y		
Tree hollows	N		
Landform	Crest		
Slope	Negligible	**Aspect**	NA
Soil colour	Brown	**Soil texture**	Sand
Bare soil	< 10	**Drainage**	NA
Rock type	NA	**Rock size**	NA
Rock abundance	NA		
Upper stratum	Scattered trees		
Middle stratum			
Lower stratum	Closed tussock grassland / sedgeland / herbland		

SSBHA03

Date	7/09/2022		
Site type	Fauna habitat assessment		
Coordinate	50K 406208.44 mE 6451350.43 mN		
Habitat type (other)	Creekline		
Habitat description	Creekline with E. rudis along banks. Lots of debris in creek, banks unstable.		
Habitat condition	Poor		
Suitability for significant species	black cockatoo foraging habitat, waterbirds (intermittent usage only)		
Evidence of significant species	N		
Disturbance	Rubbish, weeds		
Time since fire	No evidence		
Leaf litter cover	10 – 40		
Woody debris	10 – 40		
Rocky crevices/caves	NA		
Large trees	y		
Tree hollows	N		
Landform	Creek		
Slope	Negligible	**Aspect**	NA
Soil colour	Dark brown	**Soil texture**	Sandy clay
Bare soil	< 10	**Drainage**	Minor creek (< 5 m)
Rock type	NA	**Rock size**	NA
Rock abundance	NA		
Upper stratum	Open woodland		
Middle stratum			
Lower stratum	Closed tussock grassland / sedgeland / herbland		

SSBHA04

Date	7/09/2022		
Site type	Fauna habitat assessment		
Coordinate	50K 406213.86 mE 6451373.32 mN		
Habitat type (other)	Open Woodland		
Habitat description	E.rudis over cleared land with negligible understorey.		
Habitat condition	Degraded		
Suitability for significant species	black cockatoo foraging habitat		
Evidence of significant species	N		
Disturbance	Weeds, clearing		
Time since fire	No evidence		
Leaf litter cover	10 – 40		
Woody debris	< 10		
Rocky crevices/caves	NA		
Large trees	y		
Tree hollows	N		
Landform	Depression		
Slope	Negligible	**Aspect**	NA
Soil colour	Dark brown	**Soil texture**	Sandy clay
Bare soil	< 10	**Drainage**	Depression
Rock type	NA	**Rock size**	NA
Rock abundance	NA		
Upper stratum	Open woodland		
Middle stratum			
Lower stratum			

SSBHA05

Date	7/09/2022		
Site type	Fauna habitat assessment		
Coordinate	50K 406156.52 mE 6451279.41 mN		
Habitat type (other)	Cleared (parkland)		
Habitat description	Scattered E. rudis over weeds along roadside with planted vegetation.		
Habitat condition	Degraded		
Suitability for significant species	black cockatoo foraging habitat		
Evidence of significant species	N		
Disturbance	Cleared, planted fruit trees, weeds		
Time since fire	No evidence		
Leaf litter cover	< 10		
Woody debris	< 10		
Rocky crevices/caves	NA		
Large trees	y		
Tree hollows	N		
Landform	Plain		
Slope	Negligible	**Aspect**	NA
Soil colour	Light brown	**Soil texture**	Sandy clay loam
Bare soil	< 10	**Drainage**	NA
Rock type	NA	**Rock size**	NA
Rock abundance	NA		
Upper stratum	Scattered trees		
Middle stratum			
Lower stratum	Closed tussock grassland / sedgeland / herbland		

Appendix F Survey track log

406100 406200 406300 406400

6451400

6451300

ecologia ENVIRONMENT

Project: 1939
Date: 26 September 2022
Author: CB
Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Absolute Scale: 1:1,000 @A3

Appendix F: Survey track log.

0 0.025 0.05
Kilometers

Service Layer Credits: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Appendix G Black cockatoo trees

Unique ID	Easting	Northing	Flora species	DBH	Hollow orientation	Hollow type	Number of hollows	Hollow size	Hollow category	Activity (e.g. chew marks, primary observation)	Comments
1002	406117.7	6451219	*E. rudis*	1170	west	pipe	1	150	5	No external evidence	Suitably sized hollow, internal characteristics not assessed
1003	406130	6451247	*E. rudis*	820			0		7	No external evidence	Cut stumps, does not appear to have hollows from ground
1006	406158.4	6451273	*E. rudis*	1680	east	hollow	2	150, <100	5	No external evidence	Suitably sized hollow, internal characteristics not assessed
1007	406183.9	6451306	*E. rudis*	1290			0		7	No external evidence	No hollows visible
1008	406188	6451308	*E. rudis*	670			0		7	No external evidence	No hollows visible
1009	406186.1	6451309	*E. rudis*	660			0		7	No external evidence	Broken branch, not yet a hollow
1010	406189.8	6451314	*E. rudis*	960			0		7	No external evidence	Broken branches, not yet a hollow
1011	406196.8	6451316	*E. rudis*	720			0		7	No external evidence	Broken branches, not yet a hollow
1012	406192.8	6451319	*E. rudis*	1000	up	crack	1	<50	7	No external evidence	Crack in broken branch, not yet a hollow
1013	406200.5	6451326	*E. rudis*	680			0		7	No external evidence	No hollows visible
1014	406198	6451325	*E. rudis*	540	up	chimney	1	400	5	No external evidence	Hollow appears suitable but may not be deep enough, internal characteristics not assessed.
1015	406200.5	6451325	*E. rudis*	650			0		7	No external evidence	No hollows visible
1016	406208.3	6451331	*E. rudis*	>500			0		7	No external evidence	Unable to accurately measure tree as over river. No visible hollows.
1017	406304.1	6451446	Marri	610			0		7	No external evidence	No hollows visible. Magpie nest in canopy
1018	406286.2	6451424	Marri	640			0		7	No external evidence	No hollows visible
1019	406258.5	6451392	*E. rudis*	930			0		7	No external evidence	Tree appears to be two trees from a distance, but is connected at base. Broken branches but no visible hollows present.
1020	406247.9	6451375	*E. rudis*	940	up	pipe	3	150, 100, <100	5	No external evidence	Two potentially suitable hollows, internal characteristics not assessed.
1021	406237.1	6451379	*E. rudis*	510			0		7	No external evidence	No hollows visible
1022	406234.9	6451381	*E. rudis*	590			0		7	No external evidence	No hollows visible
1023	406235.3	6451379	*E. rudis*	710			0		7	No external evidence	No hollows visible
1024	406239.4	6451362	*E. rudis*	590			0		7	No external evidence	No hollows visible
1025	406235.2	6451361	*E. rudis*	660			0		7	No external evidence	No hollows visible
1026	406232.8	6451363	*E. rudis*	1030	up	spout	1	150	5	No external evidence	Potentially suitable hollow, internal characteristics not assessed.
1027	406220.4	6451372	Marri	610			0		7	No external evidence	No hollows visible
1028	406209.7	6451371	*E. rudis*	810	north	spout	1	150	5	No external evidence	Potentially suitable hollow, internal characteristics not assessed.
1029	406209.8	6451366	*E. rudis*	1160	various	spout	2	100, 150	5	No external evidence	Potentially suitable hollow, internal characteristics not assessed.
1030	406213.1	6451354	*E. rudis*	>500			0		7	No external evidence	Unable to accurately measure tree as over river. No visible hollows.