MEMORANDUM			
TO	i3 Consulting Pty Ltd		
FROM	Eco Logical Australia		
DATE	10 August 2020	PURPOSE	For Information
SUBJECT	Lot 1003 on DP 47607, Kwinana Beach Road Black Cockatoo Habitat Assessment and Tuart Woodlands TEC Assessment		

1. Introduction

1.1 Project background

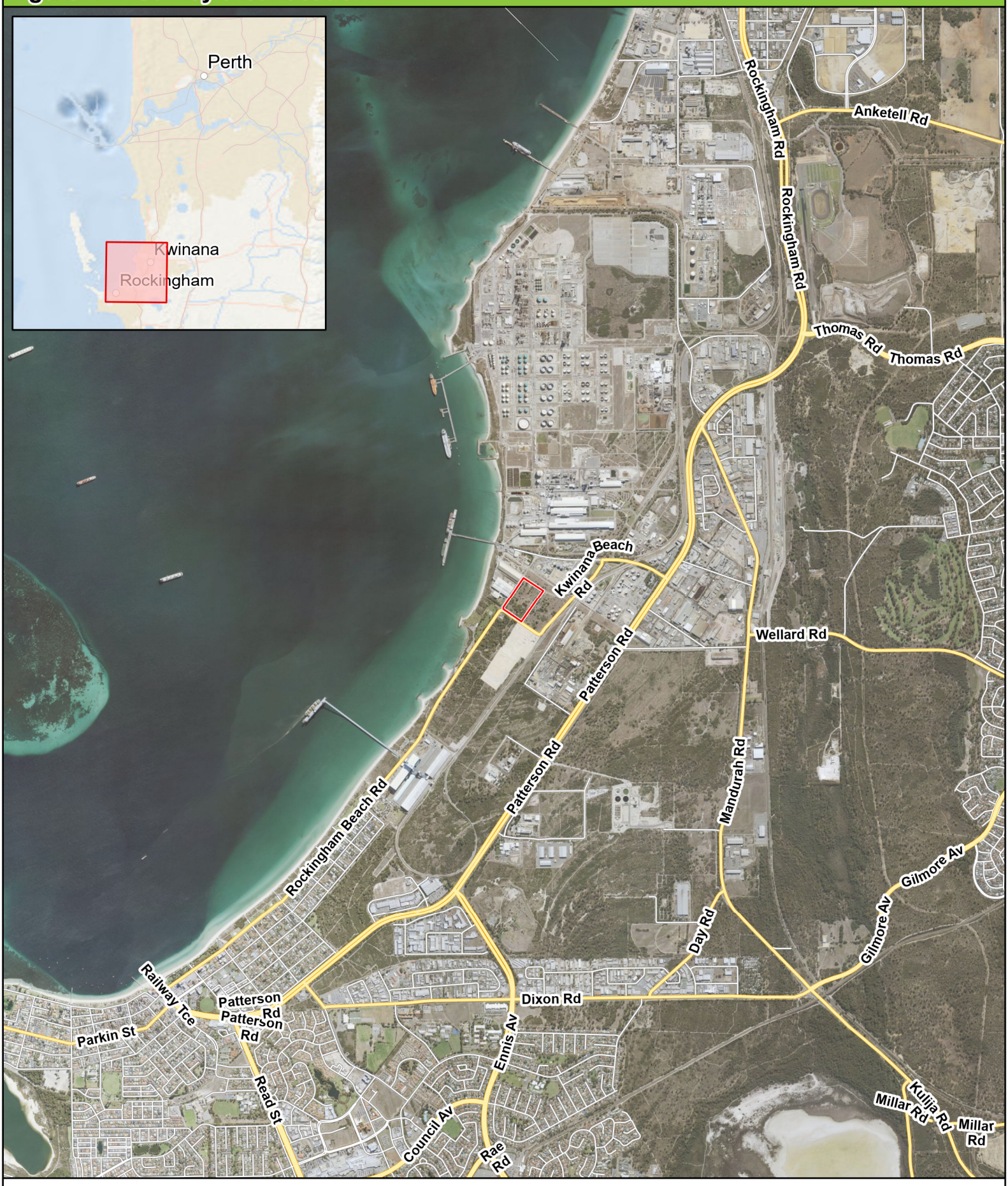
i3 Consulting Pty Ltd (i3 Consulting) is preparing a Development Application (DA) for Lot 1003 on DP 47607 Kwinana Beach Road, Kwinana, to support future development of the site.

Eco Logical Australia (ELA) was engaged by i3 Consulting to conduct a Reconnaissance and Targeted flora and vegetation survey and a black cockatoo habitat assessment of the survey area, which comprises a 6.42 hectare (ha) parcel of bushland located adjacent to Kwinana Beach Road, Kwinana Beach, approximately 40 kilometres (km) south of Perth, Western Australia (the survey area; Figure 1-1).

The scope of work for this survey included the following tasks:

- Undertake a desktop assessment to document the existing environment in which the survey area is located, identifying any previously recorded conservation significant flora and vegetation communities (including their likelihood of occurrence);
- Undertake a Targeted survey for conservation listed flora species identified from the desktop assessment as possibly occurring within the survey area;
- Undertake a Reconnaissance vegetation survey to describe dominant vegetation communities, with respect to dominant species, structure and overall condition. Results of the Reconnaissance level vegetation survey will inform an assessment to determine if the 'Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain Threatened Ecological Community (TEC)' occurs within the survey area;
- Undertake a targeted black cockatoo habitat assessment;
- Preparation of a standalone summary report detailing the findings of the desktop assessment and field survey; and
- Provision of data, including relevant mapping at an appropriate scale and associated data files.

Figure 1-1: Survey area location



Legend

- Survey Area

Road Network

- Distributor Road
- Access Road

0 0.25 0.5 1
Kilometers
Datum/Projection:
GDA 1994 MGA Zone 50

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2. Methodology

2.1 Desktop assessment

2.1.1 Database searches

The following Commonwealth and State databases were searched for information relating to conservation listed flora and ecological communities in order to compile and summarise existing data to inform the field survey. Database searches undertaken for the survey area are provided in Table 2-1 below. Applied buffers below are considered suitable based on flora and fauna assemblages expected to occur within the survey area.

Table 2-1: Database searches undertaken for the survey area

Database	Reference	Buffer (km)
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) Protected Matters Search Tool (PMST) for Threatened species and communities listed under the EPBC Act.	DAWE 2020a	10
Department of Biodiversity, Conservation and Attractions (DBCA) and Western Australian Museum (WAM) NatureMap online database for Threatened and Priority flora.	DBCA 2007-2020	10
Department of Water and Environmental Regulation (DWER) Environmentally Sensitive Areas (ESAs) database	DER 2020	N/A
Beard's (1979) Pre-European vegetation mapping	Beard 1979	N/A
Publicly available literature including, but not limited to, species guides and literature, and previous biological surveys undertaken in adjacent areas.	N/A	N/A

2.1.2 Likelihood of occurrence assessment

A likelihood of occurrence assessment was undertaken to identify conservation listed flora species that possibly occur within the survey area, identified from a review of key datasets and literature outlined in above. Conservation codes, categories and criteria for flora and fauna protected under the EPBC Act and the BC Act are provided in Appendix A. Criteria used for this assessment is presented in Appendix B.

2.2 Field survey

2.2.1 Survey team and timing

A Reconnaissance and Targeted flora and vegetation survey and a targeted black cockatoo habitat assessment were undertaken over one day on 29th June 2020 by ELA Senior Ecologist Dr. Jeff Cargill. The survey team's relevant qualifications, experience and licences are provided in Table 2-2 below.

Table 2-2: Survey team

Name	Qualification	Relevant experience	Licences
Dr. Jeffry Cargill	BSc. Hons. PhD Environmental Sciences	Jeff has extensive experience in botanical and ecological studies throughout Western Australia including baseline vegetation studies (Reconnaissance and Detailed surveys), Targeted threatened and priority flora surveys, fauna and black cockatoo surveys, MNES surveys and rehabilitation and vegetation monitoring programs.	Flora scientific collection licence: FB62000138 Declared Rare Flora permit: TFL 48-1920

2.2.2 Flora and vegetation survey

A Reconnaissance and Targeted flora and vegetation survey was conducted in accordance with the Environmental Protection Authority (EPA) *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016).

A total of six relevés were established across the survey area (Figure 2-1). Dominant vegetation communities were described with respect to dominant species, structure and overall condition. The following data was recorded within each relevé:

- Site details (site name, number, observer/s, date and location);
- Vegetation structure classes, cover of all species observed in each relevé and dominant species lists for each vegetation type, in accordance with the National Vegetation Information System (NVIS) Level V structure and floristics; and
- Vegetation condition in accordance with the vegetation condition scale adapted from Keighery (1994) and Trudgen (1988), as provided in the EPA Technical Guidance (EPA 2016).

A Targeted flora survey was undertaken within the survey area to identify any conservation significant flora or communities potentially occurring, including:

- Threatened flora or Threatened Ecological Communities (TECs) listed under the EPBC Act;
- Threatened (Declared Rare) flora listed under the latest WA Wildlife Conservation (Rare Flora) Notice under the BC Act;
- Priority Ecological Communities (PECs) endorsed by the WA Minister for the Environment; and
- Priority (P) flora listed by DBCA.

Survey methodology involved personnel walking transects across the survey area, with spacing dependent on factors including suitable habitat, disturbance (e.g. cleared areas) and landform. Locations of survey transects are presented in Figure 2-1 below. Flora species able to be identified in the field were recorded, and voucher specimens of unfamiliar species were collected for later

identification. All collections were assigned a unique collecting number. For conservation significant flora species identified in the field, the following was recorded:

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

Flora specimen identification was undertaken by ELA Senior Ecologist Jeff Cargill, with the Western Australian Herbarium (WAH)also utilised to confirm additional specimens. Species identification utilised taxonomic literature and keys and where required specimens were confirmed using the WAH collection. Where considered appropriate, specimens that meet WAH specimen lodgement requirements (e.g. Threatened and Priority Flora, range extensions), will be submitted along with Threatened and Priority Report forms to DBCA. Nomenclature used for the flora species within this report follows the WA Plant Census as available on FloraBase (DBCA and WAH 2020).

2.2.2.1 Assessment of diagnostics to assess presence of Threatened Ecological Communities

The 'Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain' ecological community is listed as Critically Endangered under the EPBC Act (DotEE 2019). For information to assist in referral, environmental assessment and compliance issues, it has been recommended to refer to the Listing Advice and/or Conservation Advice on the DotEE Species Profile and Threats Database (DotEE 2019). The Listing Advice and/or Conservation Advice defines the national ecological community and includes key diagnostic characteristics, condition thresholds and additional considerations (DotEE 2019).

In order to determine whether the 'Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain' TEC is present in the survey area key diagnostic characteristics must be met under Section 3.2 of the Conservation Advice (DotEE 2019). The assessment identified by DotEE to ascertain the presence of the Tuart (*Eucalyptus gomphocephala*) woodlands endangered ecological community within the site was undertaken by ELA following the field survey.

2.2.3 Black cockatoo habitat assessment

An assessment of black cockatoo habitat was undertaken in accordance with the Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) *EPBC Act referral guidelines for three threatened black cockatoo species* (SEWPaC 2012). This involved assessing all significant tree species known to support potential suitable breeding, roosting and foraging habitat. Significant breeding trees are defined as trees of suitable species with a Diameter at Breast Height (DBH) greater than 500 millimetres (mm; >300 mm for Salmon Gum and Wandoo; SEWPaC 2012). Trees with a DBH greater than 500 mm (or >300 mm for Salmon Gum and Wandoo) are large enough to potentially contain hollows suitable for nesting black cockatoos or have the potential to develop suitable hollows over the next 50 years. Trees of this size may also be large enough to provide roosting habitat (i.e. trees

which provide a roost or rest area for the birds). All potential breeding trees with a DBH of 500 mm or greater encountered within the survey area were recorded with a GPS.

Hollows were considered 'suitable' if the entrance was >100 mm in diameter, >300 mm deep and aligned near vertical. If it was not possible to determine if a hollow was suitable or not, it was categorised as 'potentially suitable'. Hollows that did not meet any of the requirements were categorised as 'unsuitable'. Trees that met the required measurements were inspected from the ground for suitability of hollows for nesting and/or roosting and evidences of current or previous occupancy, including wear and chew marks around the entrance.

Vegetation present within the survey area was assessed for its potential to provide foraging and roosting habitat for black cockatoos as per the SEWPaC guidelines (SEWPaC 2012), and the extent of potential suitable habitat within the survey area was mapped. Observations were also made of any black cockatoo foraging activity or feeding residue such as chewed Banksia, Jarrah and Marri nuts, and any black cockatoo individuals observed within the survey area.

2.3 Limitations

The EPA *Technical Guide – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016) recommends including discussion of the constraints and limitations of the survey methods used. Constraints and limitations for the Reconnaissance and Targeted flora and vegetation and survey and the Level 1 fauna survey and black cockatoo habitat assessment for the survey area summarised in Table 2-3 below. No constraints were identified.

Table 2-3: Survey limitations

Potential survey limitation	Impact on survey
Sources of information and availability of contextual information (i.e. pre-existing background versus new material).	**Not a constraint**. Previous reports for the region were provided where applicable. Broad-scale vegetation mapping at a scale of 1:1,000,000 was available. Land system mapping at a scale of 1:2,000,000 and soil and landform mapping was also available. Available information was sufficient to provide context at varying scales and therefore were not considered a limitation.
Scope (i.e. what life forms, etc., were sampled).	**Not a constraint**. The survey requirement of a Reconnaissance and Targeted flora and vegetation survey and a black cockatoo habitat assessment in accordance with relevant State and Federal legislation and EPA guidance documents was adequately met.
Proportion of flora collected and identified (based on sampling, timing and intensity).	**Not a constraint**. A Reconnaissance level survey records the dominant and abundant species, with little requirement for a comprehensive account of species richness. Data recorded was sufficient for this level of survey.
Completeness and further work which might be needed (i.e. was the relevant survey area fully surveyed).	**Not a constraint**. The survey area was fully covered to meet requirements of a Reconnaissance and Targeted level flora and vegetation survey and a black cockatoo habitat assessment as outlined in the scope of work.
Mapping reliability.	**Not a constraint**. Coverage of the survey area was considered to be good. High quality aerial maps were used for both the survey and subsequent vegetation mapping. Due to the nature of vegetation in the survey area, mapping boundaries of individual communities were discrete, and thus are considered accurate.

Potential survey limitation	Impact on survey
Timing, weather, season, cycle.	**Not a constraint**. The field survey was undertaken out of season, as specified by the EPA *Technical Guidance*: *Flora and Vegetation Surveys for Environmental Impact Assessment* (2016a). Rainfall in the three months prior to the survey above the long-term average. Dominant species were able to be described. to the level of survey required (Reconnaissance level survey). The targeted survey was primarily conducted to assess the suitability of habitat present onsite to support conservation significant flora species.
Disturbances (fire, flood, accidental human intervention, etc.).	**Not a constraint**: Disturbances within the survey area included presence of weeds, tracks, clearing and minor rubbish dumping. Disturbances did not impact the ability to undertake the level of survey required.
Intensity (in retrospect, was the intensity adequate).	**Not a constraint**. The survey effort was adequately met for a Reconnaissance and Targeted level flora and vegetation survey and a black cockatoo habitat assessment.
Resources (i.e. were there adequate resources to complete the survey to the required standard).	**Not a constraint**. The number of personnel conducting this field survey in the given time was adequate to undertake the required level of survey. Additional resources, including equipment available, additional support and personnel were adequate.
Access problems (i.e. ability to access survey area).	**Not a constraint**. All relevant areas within the survey area were able to be accessed and surveyed.
Experience levels (e.g. degree of expertise in plant identification to taxon level).	**Not a constraint**. The personnel conducting this field survey were both suitably qualified to identify specimens, having multiple years of field experience and previously undertaken flora and fauna surveys across Western Australia, particularly on the Swan Coastal Plain.

Figure 2-1: Survey effort

Legend

- Survey Area
- Relevé
- GPS Track

0 15 30 60
Metres
Datum/Projection:
GDA 1994 MGA Zone 50

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3. Results

3.1 Desktop assessment

3.1.1 Climate

The Swan Coastal Plain experiences a warm, Mediterranean climate with hot dry summers and mild wet winters (Mitchell et al. 2002). Based on climate data from the nearby Bureau of Meteorology (BoM) Anketell weather station (station number 9258; climate data 2002 – current; located approximately 11.7 km to the east-northeast of the survey area) the area receives an annual average rainfall of 789.3 millimetres (mm), with most rainfall occurring during the winter months of June, July and August (137.3 mm, 153.1 mm and 129.1 mm, respectively; BoM 2020; Table 3-1; Figure 3-1). In the 12 months preceding the field survey, the area received a total of 772.8 mm, which is comparable to long-term average. A total of 183.8 mm of rainfall was recorded in the three months prior to the field survey in June, which is above than the long-term average for the same time period (160.8 mm). Conditions were considered suitable for a Reconnaissance level survey.

Table 3-1: Rainfall data recorded at the Anketell weather station (9258) 12 months prior to the field survey compared to the long-term average (BoM 2020)

Rainfall (mm)	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Total
Average rainfall (mm) 2002-present	137.3	153.1	129.1	86.6	43.6	28.1	15.5	18.8	16.4	20.2	45.1	95.5	**789.3**
Rainfall (mm) 2019-2020	208.4	128.8	129.4	43.2	37.1	22.8	4.5	5.2	9.6	46.4	12.8	124.6	**772.8**

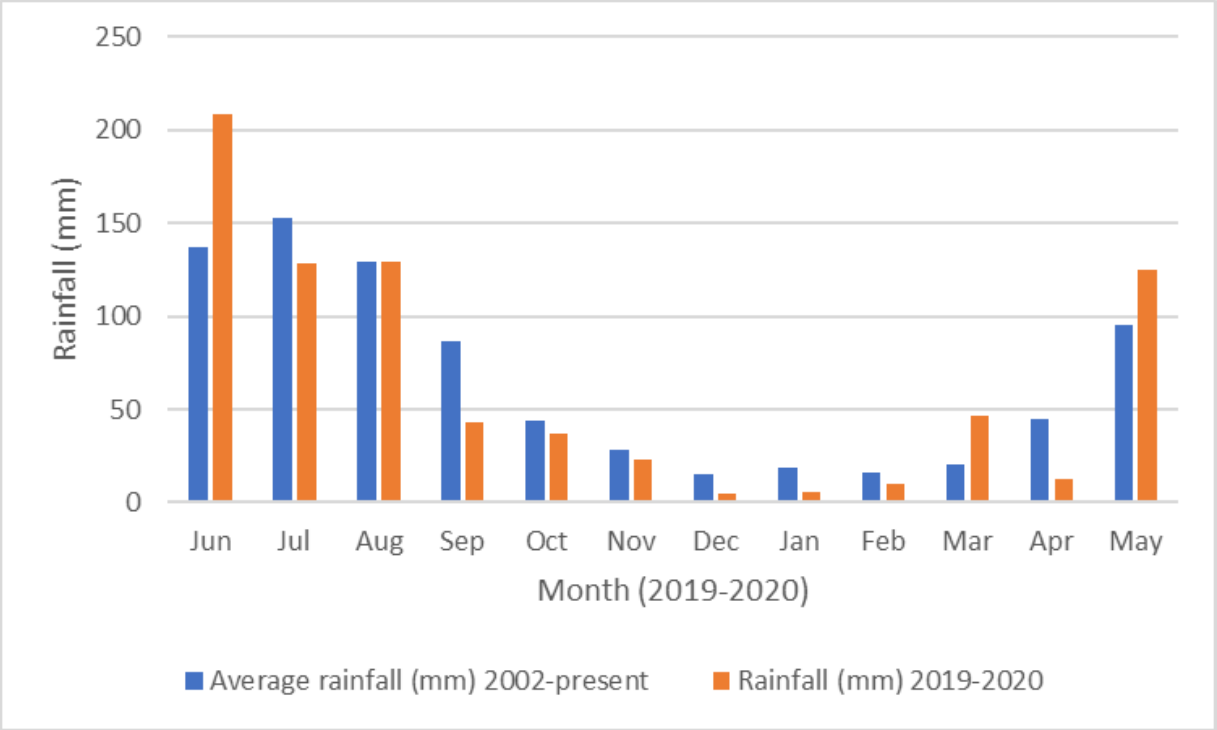

Figure 3-1: Rainfall data recorded at the Anketell weather station (9258) 12 months prior to the field survey compared to the long-term average (BoM 2020)

3.2 Regional context

Environmental values for the region relevant to the survey area are presented in Table 3-2 below.

Table 3-2: Environmental values of the region

Environmental value	Survey area
Interim Biogeographical Regionalisation for Australia (IBRA) Bioregion (DAWE 2019b)	Swan Coastal Plain (SWA)
IBRA sub-region	Perth (SWA02) – commonly characterised by Tuart and heath on limestone soils and *Banksia*-Jarrah-Marri woodland on sandy soils. The subregional area is 1,333,901 ha (Mitchell et al. 2002).
Geology, landform and soils	Situated on the Quindalup Dune System composed of unconsolidated sand (quartz grains) and shell fragments. Shell fragments are mostly calcium carbonate with alkaline sands (Geological Survey of WA and Geoscience Australia 2008). Forms dunes or ridges that are generally oriented parallel to the present coast (McPherson and Jones 2005). Safety Bay Sands: Unlithified sand of mollusc and foram fragments, and quartz and heavy mineral grains (Geological Survey of WA and Geoscience Australia 2008).

3.2.1 Broad-scale vegetation mapping

Vegetation type and extent have been mapped at a regional scale by Beard (1979) who categorised vegetation into broad vegetation associations. Based on this mapping at a scale of 1:1,000,000, the Department of Primary Industries and Regional Development (DPIRD; previously Department of

Agriculture and Food Western Australia [DAFWA]) has compiled a list of vegetation extent and types across WA (Shepherd et al. 2002).

One vegetation association occurs within the survey area, namely Rockingham 3048 (Table 3-3). This vegetation association has less than 30% of its total pre-European extent remaining within the Swan Coastal Plain bioregion (Government of Western Australia 2019). The survey area accounts for 0.21% of the total current extent of vegetation association Rockingham 3048.

Table 3-3: Beard (1979) / Shepherd *et al*. (2002) vegetation associations of the survey area

Vegetation association	Description	Pre-European extent (ha) within the Perth (SWA02) sub-region	Current extent (ha) within the Perth (SWA02) sub-region	Remaining (%)
Rockingham 3048	Shrublands; scrub-heath on the Swan Coastal Plain	10,418.06	3,043.13	29.21

3.2.2 Flora of conservation significance

An initial 25 conservation significant flora species were identified as possibly occurring within the survey area based on database searches undertaken in Section 2.1.1 and using criteria outlined in Appendix B. Conservation significant flora species identified from database searches undertaken include 11 species listed as Threatened under the EPBC Act and 14 species listed as Priority species by DBCA. The flora likelihood of occurrence assessment is presented in Appendix C.

3.2.3 Areas of significance

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

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

A PMST search identified four TECs within a 10 km search buffer of the survey area:

- Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain ecological community (listed as Critically Endangered under the EPBC Act);
- Banksia Woodlands of the Swan Coastal Plain ecological community (listed as Endangered under the EPBC Act);
- Sedgelands in Holocene dune swales of the southern Swan Coastal Plain (listed as Endangered under the EPBC Act); and
- Thrombolite (microbial) community of coastal freshwater lakes of the Swan Coastal Plain (Lake Richmond; listed as Endangered under the EPBC Act.

A further three Wetlands of International Importance (Ramsar) wetlands were identified occurring within 10 km of the survey area:

- Becher Point Wetlands;
- Forrestdale and Thomsons Lakes; and
- Peel-Yalgorup System.

3.3 Flora and vegetation

3.3.1 Flora

A total of 36 flora species representing 20 families and 32 genera were recorded from the six relevés established within the survey area and from opportunistic collections. Families with the highest number of species included Fabaceae (7 taxa), Poaceae (six species) and Euphorbiaceae and Myrtaceae (three species in each). A full species list is provided in Appendix D.

No conservation significant flora species listed under the EPBC Act, the BC Act or by DBCA were recorded within the survey area. Of the 25 conservation significant flora species identified from the desktop assessment as possibly occurring within the survey area, all are considered as being unlikely to occur. This assessment is based on the absence of suitable habitat present within the survey area and Degraded nature of the survey area; with weeds occurring at high densities to the exclusion of native species. The flora likelihood of occurrence assessment is presented in Appendix C.

A total of 27 introduced (weed) species were recorded within the survey area, none of which are listed as Declared Pest under the BAM Act or as WoNS. All introduced (weed) species recorded from within the survey area are listed on the Western Australian Organism List (WAOL) Database as S-11 (permitted) species, indicating that no specific management of these species is required (DPIRD 2020). No weed species recorded from the survey area are listed as WoNS.

3.3.2 Vegetation communities

Two vegetation communities were delineated within the survey area (Figure 3-2). The most widespread vegetation community was AfEs, which covered 77.1% of the survey area (4.95 ha; Table 3-4). Cleared areas (tracks) accounted for 0.2% (0.01 ha) of the survey area (Table 3-4).

Table 3-4: Vegetation communities recorded within the survey area

Description	Relevés	Total area (ha)	Proportion of the survey area (%)
AfEs: *Agonis flexuosa*, **Erythrina* x *sykesii* low isolated trees over **Schinus terebinthifolius*, **Ricinus communis*, **Acacia longifolia* tall sparse shrubland over **Ehrharta* spp., **Lagurus obovatus* low open tussock grassland and **Oxalis pes-capre* low forbland	ELA01, ELA03, ELA06	4.95	77.1
Eg: *Eucalyptus gomphocephala* tall open forest over *Agonis flexuosa*, **Ficus* sp. low isolated trees over **Schinus terebinthifolius* tall open shrubland over *Ehrharta spp. low open tussock grassland and **Oxalis pes-capre*, **Fumaria capreolata* low forbland.	ELA02, ELA04, ELA05	1.46	22.7

Description	Relevés	Total area (ha)	Proportion of the survey area (%)
Cleared areas (tracks)		0.01	0.2
Total		**6.42**	**100**

3.3.2.1 Conservation significant ecological communities

Vegetation community Eg was assessed against key diagnostic characteristics outlined in the 'Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain TEC' approved conservation advice (DotEE 2019) in order to determine the presence of the TEC within the survey area.

Diagnostic characteristics met by Vegetation Community Eg, include:

- **Location/landform** – the survey area is located on the Swan Coastal Plain and occurs on the Quindalup Dune System.
- **Structure and composition** – Tuart (*Eucalyptus gomphocephala*) is present in the upper canopy layer (scattered large trees), with *Agonis flexuosa* present in the canopy/sub-canopy and native species present in the understory. Vegetation within the Eg community occurs as a tall open forest.
- **Patch Size** – On applying a 30 m patch boundary beyond the outer canopy of established Tuart trees, the area constitutes a known patch >5 ha.

Basic vegetation structure and function within the survey area has been severely impacted by disturbance and the area is in degraded condition. However, the approved conservation advice states that 'all patches ≥5 ha are part of the nationally protected ecological community, regardless of their understorey condition (DotEE 2019).' Based on this wording, the Eg vegetation community is considered to represent the Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain TEC (DotEE 2019). The Eg community itself has been mapped across an area of 1.46 ha, with the addition of the 30 m patch boundary increasing this known area to 5.7 ha. It is also noted that Tuart trees occur adjacent to the survey area, which would potentially extend the size of the patch further. A figure showing the Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain TEC patch boundary has been provided in Figure 3-3.

The full assessment against the key diagnostic characteristics for this TEC are presented in Appendix E.

3.3.3 Vegetation condition

Vegetation condition within the survey area ranged from Degraded to Completely Degraded based on the vegetation condition scale adapted from Keighery (1994) and Trudgen (1988) as provided in the EPA *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessmen*t (EPA 2016). Remnant vegetation (6.41 was classed as Degraded, with cleared areas (tracks) classed as Completely Degraded (0.01 ha). Disturbances within the survey area include high densities of weeds, informal tracks, previous clearing and minor dumping of rubbish (Figure 3-4).

3.4 Black cockatoo habitat assessment

3.4.1 Foraging habitat

Foraging habitat for black cockatoos is generally defined as the availability of plant food sources within an area (Finn 2012). Food availability for black cockatoos is a function of the diversity, abundance, distribution, energetic and nutritional qualities, and seasonality (phenology) of the food sources within a particular area. Black cockatoo foraging habitat within the survey area has been determined using vegetation associations defined in the vegetation assessment and from ground-truthing in the field. The quality of foraging habitat for black cockatoo species within the survey area (as defined Table 3-5 below) has been assessed based on the availability and density of plant food sources as observed on site.

Foraging species recorded within the survey area included several *Eucalyptus gomphocephala* (Tuart) trees, two individuals of *Pinus* sp. and eight individuals of *Callitris* sp. Remnant vegetation within the survey area, comprising 1.46 ha, is considered as providing 'Poor' quality foraging habitat for all three black cockatoo species (SEWPaC 2012) due to a lack of density of suitable or preferred foraging species. Cleared areas, comprising 4.96 ha, provide 'Nil' foraging habitat for black cockatoo species (Table 3-5). Habitat foraging quality is presented in Figure 3-5 below. No evidence of black cockatoo foraging was observed within the survey area.

Table 3-5: Definition and extent of black cockatoo foraging habitat quality within the survey area

Foraging quality	Justification	Extent (ha) within survey area	% of survey area
Poor	Low density of species suitable for foraging by black cockatoos (i.e. foliage cover of suitable species 10-20%) and presence of food sources at only one stratum (i.e. canopy)	1.46	22.7
Nil	Cleared areas or no suitable vegetation present.	4.96	71.3
Total		**6.42**	**100**

3.4.2 Breeding and roosting habitat

The black cockatoo breeding habitat assessment identified 49 potentially suitable *Eucalyptus gomphocephala* (Tuart) breeding trees within the survey area, of which none contained potentially suitable breeding hollows over 100 mm in diameter. Potentially suitable breeding trees are presented in Figure 3-5 and in Appendix E below.

All potential breeding trees recorded from the survey area also provide potential suitable roosting habitat for black cockatoos as defined by the referral guidelines (SEWPaC 2012). There were no black cockatoo individuals observed within the survey area during the field survey. The survey area lies outside of the current known distribution of Baudin's Black Cockatoo (*Calyptorhynchus baudinii*) and outside of the known breeding range of Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*). The survey area falls within the known range of the Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*). Due to the lack of preferred foraging species within the survey area for these species, together with the highly-degraded nature of the survey area and the presence of powerlines, rail and heavy industrial area, these three black cockatoo species are considered as being unlikely to occur within the survey area.

Figure 3-2: Vegetation communities recorded within the survey area

Legend

Survey Area

Vegetation Communities

AfEs

Eg

Cleared

0 15 30 60

Metres

Datum/Projection:
GDA 1994 MGA Zone 50

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Figure 3-3: Tuart TEC Assessment

Legend

- Survey Area
- Tuart (*Eucalyptus gomphocephala*) canopy
- 30m Buffer from canopy

0 15 30 60
Metres
Datum/Projection:
GDA 1994 MGA Zone 50

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Figure 3-4: Vegetation condition recorded within the survey area

Legend

Survey Area

Vegetation Condition

Degraded

Completely Degraded

0 15 30 60

Metres

Datum/Projection:
GDA 1994 MGA Zone 50

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Prepared by: GM Date: 10/08/2020

Figure 3-5: Potential suitable black cockatoo habitat within the survey area

Legend

- Survey Area
- *Eucalyptus gomphocephala* (Tuart), DBH > 500mm

Foraging Quality

- Poor
- Nil

0 15 30 60
Metres
Datum/Projection:
GDA 1994 MGA Zone 50

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Prepared by: GM Date: 10/08/2020

4. Discussion

4.1 Flora and vegetation

A total of 36 flora species, representing 20 families and 32 genera, were recorded within six relevés established across the survey area. Families with the highest number of species included Fabaceae (7 taxa), Poaceae (six species) and Euphorbiaceae and Myrtaceae (three species in each).

No conservation significant flora species listed under the EPBC Act, the BC Act or by DBCA were recorded within the survey area. Suitable habitat to potentially support the occurrence of conservation significant flora was absent, with weeds dominating the survey area to the exclusion of native species.

A total of 27 introduced (weed) species were recorded within the survey area, none of which are listed as Declared Pest under the BAM Act or as WoNS. All introduced (weed) species recorded from within the survey area are listed on the Western Australian Organism List (WAOL) Database as S-11 (permitted) species, indicating that no specific management of these species is required. No weed species recorded from the survey area are listed as WoNS.

A total of two vegetation communities were delineated within the survey area: AfEs: *Agonis flexuosa*, **Erythrina* x *sykesii* low isolated trees, and Eg: *Eucalyptus gomphocephala* tall open forest. Vegetation community AfEs was the most widespread community, occurring across 77.1% of the survey area (4.95 ha). Cleared areas (tracks) accounted for 0.2% (0.01 ha) of the survey area.

One Beard's (1979) vegetation association occurs within the survey area, namely 'Rockingham 3048', which is described as Shrublands; scrub-heath on the Swan Coastal Plain (Government of Western Australia 2018). This association has less than 30% remaining within the Swan Coastal Plain bioregion. The survey area accounts for 0.21% of the total current extent of this vegetation association.

Vegetation community Eg was assessed against key diagnostic characteristics outlined in the Approved Conservation Advice for the Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain TEC (DotEE 2019). Following steps provided in this document, vegetation community Eg was assessed as representing the TEC. This conclusion was based on the known patch size being ≥5 ha and consequently, understorey condition thresholds did not apply (DotEE 2019).

Vegetation condition within the survey area ranged from Degraded to Completely Degraded based on the Keighery (1994) vegetation condition scale provided in the EPA *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessmen*t (EPA 2016). Remnant vegetation (6.41 ha was classed as Degraded, with cleared areas (tracks) classed as Completely Degraded (0.01 ha). Disturbances within the survey area include high densities of weeds, informal tracks, previous clearing and minor dumping of rubbish.

4.2 Black cockatoo habitat assessment

The black cockatoo breeding habitat assessment identified 49 potentially suitable *Eucalyptus gomphocephala* (Tuart) breeding trees within the survey area, of which none contained potentially suitable breeding hollows over 100 mm in diameter. All potential breeding trees recorded from the

survey area also provide potential suitable roosting habitat for black cockatoos as defined by the referral guidelines (SEWPaC 2012).

Foraging species recorded within the survey area included *Eucalyptus gomphocephala* (Tuart), two individuals of *Pinus* sp. and eight individuals of *Callitris* sp. Due to the low density of preferred foraging species within the survey area, together with the degraded nature of the survey area and the presence of powerlines, rail and heavy industrial area, these three black cockatoo species are considered as being unlikely to occur within the survey area.

There were no black cockatoo individuals observed within the survey area during the field survey. The survey area lies outside of the current known distribution of Baudin's Black Cockatoo (*Calyptorhynchus baudinii*) and outside of the known breeding range of Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*). The survey area falls within the known range of the Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*).

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Appendix A Framework for conservation significant flora and fauna ranking

CATEGORIES OF THREATENED SPECIES UNDER THE ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999 (EPBC ACT)

Threatened fauna and flora may be listed in any one of the following categories as defined in Section 179 of the EPBC Act. Species listed as 'conservation dependent' and 'extinct' are not Matters of National Environmental Significance and therefore do not trigger the EPBC Act.

Category	Definition
Extinct (EX)	There is no reasonable doubt that the last member of the species has died.
Extinct in the Wild (EW)	Taxa known to survive only in captivity or as a naturalised population well outside its past range; or taxa has not been recorded in its known and/or expected habitat at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered (CE)	Taxa considered to be facing an extremely high risk of extinction in the wild.
Endangered (EN)	Taxa considered to be facing a very high risk of extinction in the wild.
Vulnerable (VU)	Taxa considered to be facing a high risk of extinction in the wild.
Near Threatened (NT)	Taxa has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.
Least Concern (LC)	Taxa has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.
Data Deficient (DD)	There is inadequate information to make a direct, or indirect, assessment of taxa's risk extinction based on its distribution and/or population status.
Not Evaluated (NE)	Taxa has not yet been evaluated against the criteria.
Migratory (M)	Not an IUCN category. Species are defined as migratory if they are listed in an international agreement approved by the Commonwealth Environment Minister, including: • the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animal) for which Australia is a range state; • the agreement between the Government of Australian and the Government of the People's Republic of China for the Protection of Migratory Birds and their environment (CAMBA); • the agreement between the Government of Japan and the Government of Australia for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (JAMBA); or • the agreement between Australia and the Republic of Korea to develop a bilateral migratory bird agreement similar to the JAMBA and CAMBA in respect to migratory bird conservation and provides a basis for collaboration on the protection of migratory shorebirds and their habitat (ROKAMBA).

CONSERVATION CODES FOR WESTERN AUSTRALIA FLORA AND FAUNA

The Wildlife Conservation (Specially Protected Fauna) Notice 2018 and the Wildlife Conservation (Rare Flora) Notice 2018 have been transitioned under regulations 170, 171 and 172 of the Biodiversity Conservation Regulations 2018 to be the lists of Threatened, Extinct and Specially Protected species under Part 2 of the *Biodiversity Conservation Act 2016*.

Specially protected fauna or flora are species which have been adequately searched for and are deemed to be, in the wild, threatened, extinct or in need of special protection, and have been gazetted as such.

Threatened species (T)
Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act).

Threatened fauna is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for Threatened Fauna.

Threatened flora is that subset of 'Rare Flora' listed under schedules 1 to 3 of the Wildlife Conservation (Rare Flora) Notice 2018 for Threatened Flora.

The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.

Category	Code	Description
Critically Endangered species	CR	Threatened species considered to be "facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for critically endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for critically endangered flora.
Endangered species	EN	Threatened species considered to be "facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for endangered flora.
Vulnerable species	VU	Threatened species considered to be "facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for vulnerable fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for vulnerable flora.

Extinct species

Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild, as follows:

Category	Code	Description
Extinct species	EX	Species which have been adequately searched for and there is no reasonable doubt that the last individual has died. Published as Specially Protected under the Wildlife Conservation Act 1950, in Schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Presumed Extinct Fauna and Wildlife Conservation (Rare Flora) Notice for Presumed Extinct Flora.
Extinct in the wild species	EW	Species that "is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act). Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.

Specially protected species

Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.

Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.

Categories are detailed below.

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

Priority species (P)

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora.

Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.

Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.

Category	Code	Definition
Priority 1	P1	*Poorly-known species* Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
Priority 2	P2	*Poorly-known species* Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
Priority 3	P3	*Poorly-known species* Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
Priority 4	P4	*Rare, Near Threatened and other species in need of monitoring* (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Appendix B Likelihood of occurrence assessment criteria

Likelihood rating	Criteria
Recorded	The species has previously been recorded within survey area from DBCA database search results and/or from previous surveys of the survey area, and/or the species has been confirmed through a current vouchered specimen at WA Herbarium.
Likely	The species has not previously been recorded from within the survey area. However, (to qualify requires one or more criteria to be met): • the species has been recorded in close proximity to the survey area, and occurs in similar habitat to that which occurs within the survey area • core habitat and suitable landforms for the species occurs within the survey area either year-round or seasonally. In relation to fauna species, this could be that a host plant is seasonally present on site, or habitat features such as caves are present that may be used during particular times during its life cycle e.g. for breeding. In relation to both flora and fauna species, it may be there are seasonal wetlands present • there is a medium to high probability that a species uses the survey area.
Potential	The species has not previously been recorded from within the survey area. However, (one or more criteria requires to be met): • targeted surveys may locate the species based on records occurring in proximity to the survey area and suitable habitat occurring in the survey area • the survey area has been assessed as having potentially suitable habitat through habitat modelling • the species is known to be cryptic and may not have been detected despite extensive surveys • the species is highly mobile and has an extensive foraging range so may not have been detected during previous surveys The species has been recorded in the survey area by a previous consultant survey or there is historic evidence of species occurrence within the survey area. However, (one or more criteria requires to be met): • doubt remains over taxonomic identification, or the majority of habitat does not appear suitable (although presence cannot be ruled out due to factors such as species ecology or distribution) • coordinates are doubtful.
Unlikely	The species has been recorded locally through DBCA database searches. However, it has not been recorded within the survey area and • it is unlikely to occur due to the site lacking critical habitat, having at best marginally suitable habitat, and/or being severely degraded • it is unlikely to occur due to few historic record/s and no other current collections in the local area. The species has been recorded within the bioregion based on literature review but has not been recorded locally or within the survey area through DBCA database searches. The species has not been recorded in the survey area despite adequate survey efforts, such as a standardised methodology or targeted searching within potentially suitable habitat.

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

Appendix C Flora likelihood of occurrence assessment

Species	Conservation status		Source	Habitat	Likelihood	Justification
	EPBC Act	BC Act / DBCA				
Synaphea sp. Fairbridge Farm (D. Papenfus 696)	CR	CR	PMST	Selena's Synaphea occurs on grey, clayey sand with lateritic pebbles in low woodland areasnear winter flats.	Unlikely	No suitable habitat within the survey area. Species would have been visible during the field survey.
Synaphea sp. Serpentine (G.R. Brand 103)	CR	CR	PMST	*Synaphea* sp. Serpentine occurs predominantly on flat terrain on grey-brown sandy loams to clay in seasonally wet areas. Warm Mediterranean climate.	Unlikely	No suitable habitat within the survey area. Species would have been visible during the field survey.
Caladenia huegelii	EN	CR	PMST, Naturemap	The King Spider-orchid grows in well-drained, deep sandy soils in low mixed woodlands of Coast Banksia (*Banksia attenuata*), Firewood Banksia (*B. menziesii*), Holly-leaved Banksia (*Banksia ilicifolia*), Western Sheoak (*Allocasuarina fraseriana*) and Jarrah (*Eucalyptus marginata*). It tends to favour areas of lush undergrowth.	Unlikely	No suitable habitat within the survey area.
Drakaea elastica	EN	CR	PMST, Naturemap	The species grows on bare patches of sand within otherwise dense vegetation in low-lying areas alongside winter-wet swamps, typically in banksia (*Banksia menziesii*, *B. attenuata* and *B. ilicifolia*) woodland or spearwood (*Kunzea glabrescens*) thicket vegetation.	Unlikely	No suitable habitat within the survey area.
Eucalyptus x balanites	EN	CR	PMST	*Eucalyptus balanites* is found on light coloured sandy soils over laterite. Habitat consists of gently sloping heathlands; open mallee woodland over shrubland (Population 2) or heathland with emergent mallees (Population 1).	Unlikely	No suitable habitat within the survey area. Species would have been visible during the field survey.
Diuris purdiei	EN	EN	PMST	It grows on sand to sandy clay soils, in areas subject to winter inundation, and amongst native sedges and dense heath with scattered emergent *Melaleuca preissiana*,	Unlikely	No suitable habitat within the survey area.

Species	Conservation status		Source	Habitat	Likelihood	Justification
	EPBC Act	BC Act / DBCA				
				Eucalyptus calophylla, *E. marginata* and *Nuytsia floribunda*.		
Lepidosperma rostratum	EN	EN	PMST	Beaked Lepidosperma is associated with Marsh Banksia (*Banksia telmatiaea*) and Hairy Clawflower (*Calothamnus hirsutus*) and grows in sandy soil among low heath in a winterwet swamp.	Unlikely	No suitable habitat within the survey area. Species would have been visible during the field survey.
Andersonia gracilis	EN	VU	PMST	*Andersonia gracilis* is found on seasonally damp, black sandy clay flats near or on the margins of swamps, often on duplex soils supporting low open heath vegetation with species such as *Calothamnus hirsutus*, *Verticordia densiflora* and *Kunzea recurva* over sedges.	Unlikely	No suitable habitat within the survey area. Species would have been visible during the field survey.
Drakaea micrantha	VU	EN	PMST	The Dwarf Hammer-orchid occurs in infertile grey sands, in Banksia, Jarrah (*Eucalyptus marginata*) and Common Sheoak (*Allocasuarina* fraseriana) woodland or forest. It is often found under thickets of Spearwood (*Kunzea ericifolia*) with Flying Duck orchid (*Paracaleana nigrita*) and other *Drakaea* species.	Unlikely	No suitable habitat within the survey area.
Diuris micrantha	VU	VU	PMST, Naturemap	It is found in small populations, on dark, grey to blackish, sandy clay-loam substrates in winter wet depressions or swamps.	Unlikely	No suitable habitat within the survey area.
Eleocharis keigheryi	VU	VU	PMST	Keighery's Eleocharis grows in small clumps in a substrate of clay or sandy loam. This species is emergent in freshwater creeks and claypans.	Unlikely	No suitable habitat within the survey area.
Acacia sp. Binningup (G. Cockerton et al. WB 37784)	-	P1	Naturemap	Known from sand in Tuart woodland.	Unlikely	No suitable habitat within the survey area. Species would have been visible during the field survey.
Lachnagrostis nesomytica subsp. *paralia*	-	P1	Naturemap	Calcareous sands. Coastal dunes and swales.	Unlikely	No suitable habitat within the survey area.

Species	Conservation status		Source	Habitat	Likelihood	Justification
	EPBC Act	BC Act / DBCA				
Tetraria sp. Chandala (G.J. Keighery 17055)	-	P2	Naturemap	Grey brown peaty soil in a swamp, damplands. Low open forest of *Eucalyptus rudis* and *Melaleuca preissiana*.	Unlikely	No suitable habitat within the survey area. Species would have been visible during the field survey.
Austrostipa mundula	-	P3	Naturemap	Shallow grey sand over limestone on moderate slope.	Unlikely	No suitable habitat within the survey area.
Cyathochaeta teretifolia	-	P3	Naturemap	Grey sand, sandy clay. Swamps, creek edges.	Unlikely	No suitable habitat within the survey area.
Jacksonia gracillima	-	P3	Naturemap	Grey sand in low open forest.	Unlikely	No suitable habitat within the survey area. Species would have been visible during the field survey.
Pimelea calcicola	-	P3	Naturemap	Sand. Coastal limestone ridges.	Unlikely	No suitable habitat within the survey area. Species would have been visible during the field survey.
Sphaerolobium calcicola	-	P3	Naturemap	White-grey-brown sand, sandy clay over limestone, black peaty sandy clay. Tall dunes, winter-wet flats, interdunal swamps, low-lying areas.	Unlikely	No suitable habitat within the survey area. Species would have been visible during the field survey.
Aponogeton hexatepalus	-	P4	Naturemap	Mud. Freshwater: ponds, rivers, claypans.	Unlikely	No suitable habitat within the survey area.
Dodonaea hackettiana	-	P4	Naturemap	Sand. Outcropping limestone.	Unlikely	No suitable habitat within the survey area. Species would have been visible during the field survey.
Jacksonia sericea	-	P4	Naturemap	Calcareous & sandy soils.	Unlikely	No suitable habitat within the survey area. Species would have been visible during the field survey.
Lepidium puberulum	-	P4	Naturemap	Sandy soils.	Unlikely	No suitable habitat within the

Species	Conservation status		Source	Habitat	Likelihood	Justification
	EPBC Act	BC Act / DBCA				
						survey area. Species would have been visible during the field survey.
Stylidium ireneae	-	P4	Naturemap	Sandy loam. Valleys near creek lines, woodland, often with Agonis.	Unlikely	No suitable habitat within the survey area.
Stylidium striatum	-	P4	Naturemap	Brown clay loam over laterite. Hillslopes. Jarrah/Marri forest, Wandoo woodland.	Unlikely	No suitable habitat within the survey area.

Appendix D Flora species list

Family	Species	Introduced (weed) species
Amaryllidaceae	*Narcissus tazetta*	*
Anacardiaceae	*Schinus molle*	*
Anacardiaceae	*Schinus terebinthifolia*	*
Asparagaceae	*Agave americana*	*
Asteraceae	*Hypochaeris glabra*	*
Asteraceae	*Sonchus oleraceus*	*
Brassicaceae	*Brassica* sp.	*
Brassicaceae	*Diplotaxis tenuifolia*	*
Chenopodiaceae	*Rhagodia baccata*	
Cupressaceae	*Callitris* sp.	
Euphorbiaceae	*Euphorbia peplus*	*
Euphorbiaceae	*Euphorbia terracina*	*
Euphorbiaceae	*Ricinus communis*	*
Fabaceae	*Acacia ?longifolia*	*
Fabaceae	*Acacia saligna*	
Fabaceae	*Erythrina x sykesii*	*
Fabaceae	*Kennedia prostrata*	
Fabaceae	*Medicago ?polymorpha*	*
Fabaceae	*Templetonia retusa*	
Fabaceae	*Trifolium* sp.	*
Geraniaceae	*Pelargonium capitatum*	*
Malvaceae	*Hibiscus ?rosa-sinensis*	*
Moraceae	*Ficus* sp.	*
Myrtaceae	*Agonis flexuosa*	
Myrtaceae	*Melaleuca huegelii*	
Myrtaceae	*Eucalyptus gomphocephala*	
Oxalidaceae	*Oxalis pes-caprae*	*
Papaveraceae	*Fumaria capreolata*	*
Pinaceae	*Pinus* sp.	*
Poaceae	*Arundo donax*	*
Poaceae	*Cynodon dactylon*	*
Poaceae	*Ehrharta calycina*	*
Poaceae	*Ehrharta longiflora*	*
Poaceae	*Hyparrhenia hirta*	*
Poaceae	*Lagurus ovatus*	*
Rhamnaceae	*Spyridium globulosum*	

Appendix E Tuart woodlands TEC assessment

Step	Key diagnostic characteristics	Outcome
1	Occurs in the Swan Coastal Plain Bioregion within the state of Western Australia.	The survey area is located on the Swan Coastal Plain in Western Australia.
	Primarily occurs on the Spearwood and Quindalup dune systems but can also occur on the Bassendean dunes and Pinjarra Plain. It can occur on the banks of rivers and wetlands.	The survey area is located on the Quindalup Dune system.
	The primary defining feature is the presence of at least two living established *Eucalyptus gomphocephala* (Tuart) trees in the uppermost canopy layer, although they may co-occur with trees of other species. There is a gap of no more than 60 m between the outer edges of the canopies of adjacent Tuart trees. These trees may occur either as single stemmed trees or as a mallee growth form.	Scattered emergent Tuart (*Eucalyptus gomphocephala*) trees occur throughout Vegetation Community Eg.
	Most often occurs as a woodland but can occur in other structural forms, For example, forest, open forest, woodland, open woodland, and various mallee forms.	Vegetation community Eg occurs as a tall open forest.
	Other tree species may be present in the canopy or sub-canopy. They commonly include: *Agonis flexuosa* (Peppermint) and *Banksia grandis* (Bull Banksia) (both in the southern part of the range), *Banksia attenuata* (Candlestick Banksia), *Eucalyptus marginata* (Jarrah); and less commonly, *Corymbia calophylla* (Marri), *Banksia menziesii* (Firewood Banksia) and *Banksia prionotes* (Acorn Banksia).	One dominant tree species is present in the canopy or sub-canopy: *Agonis flexuosa*
	An understorey of native plants is typically present, which may include grasses, herbs and shrubs, although this is often modified by disturbance. Some understorey plant species that are most commonly present are listed in Section 2.3.3.	Native understory species occurring within this vegetation community include *Agonis flexuosa*, *Rhagodia baccata* and *Spyridium globulosum*
2	**Further information to assist in defining a patch of the ecological community** • Patches of Tuart woodlands and forests may contain areas that vary in structural or biological complexity. One part of a patch may have a larger number of mature trees and more ecological diversity, whereas another part of the same patch may demonstrate fewer mature trees and less groundcover. Areas with soil exposed and/or plant litter can also be expected within this ecological community. • Variation in quality or condition of vegetation across a patch should not necessarily be considered to be evidence of multiple patches. Patches of the ecological community can be spatially variable and are often characterised by one or more areas within a patch that meet higher condition thresholds amongst areas of lower condition. • If an area meets the key diagnostic characteristics but the average condition across that area falls below the minimum condition thresholds, the largest area or areas of at least 0.5 ha that meet minimum condition	Vegetation community Eg within the survey area does not vary in structural or biological complexity. Vegetation community Eg covers an area of 1.46 ha. However, when applying the patch boundary of 30 m from beyond the outer canopy of established Tuart trees, the known patch size is 5.7 ha. In addition, Tuart trees occur adjacent to the survey area have the potential to increase the known patch size. Known patch, being defined as trees physically recorded within the survey area. All patches ≥5 ha are considered to be part of Threatened Ecological Community, regardless of their understorey condition.

Step	Key diagnostic characteristics	Outcome
	thresholds on average, should be specified as the patch or patches of the nationally listed ecological community. This may result in multiple patches of the ecological community being identified within the overall area first identified as meeting the key diagnostics.	
3	**Relationship with other ecological communities** The range of the ecological community overlaps and interacts with other ecological communities of the Swan Coastal Plain, including some listed under the EPBC Act. At some locations more than one ecological community may be present. The following considerations apply to the identification of the ecological community where it is likely to overlap with some other listed ecological communities: • Banksia woodlands of the Swan Coastal Plain. • Sedgelands in Holocene Dune Swales. • Aquatic root mat community of caves of the Swan Coastal Plain.	The vegetation community does not co-occur with any other known vegetation community.
4	**Condition thresholds and categories** For confirmed patches of the ecological community, following the key diagnostic characteristics and patch definition above (Step 1), determine the following requirements for information on condition to indicate if they are part of the nationally protected ecological community: • If the patch is smaller than 0.5 ha it is not part of the nationally protected ecological community; • If the patch is at least 0.5 ha and up to 5 ha in size, conduct on ground surveys to see which condition category applies. Condition categories are outlined in the Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain ecological community approved conservation advice (DotEE 2019). • All patches of 5 ha or greater that meet the key diagnostic characteristics are part of the nationally protected ecological community.	The known patch size is ≥5 ha, as a result condition thresholds and categories do not apply.

Appendix F Black cockatoo potentially suitable breeding trees recorded within the survey area

Species	Easting	Northing
Tuart (*Eucalyptus gomphocephala*)	383400	6431748
Tuart (*Eucalyptus gomphocephala*)	383283	6431647
Tuart (*Eucalyptus gomphocephala*)	383269	6431637
Tuart (*Eucalyptus gomphocephala*)	383254	6431615
Tuart (*Eucalyptus gomphocephala*)	383251	6431614
Tuart (*Eucalyptus gomphocephala*)	383369	6431759
Tuart (*Eucalyptus gomphocephala*)	383259	6431605
Tuart (*Eucalyptus gomphocephala*)	383261	6431603
Tuart (*Eucalyptus gomphocephala*)	383237	6431573
Tuart (*Eucalyptus gomphocephala*)	383228	6431572
Tuart (*Eucalyptus gomphocephala*)	383218	6431562
Tuart (*Eucalyptus gomphocephala*)	383224	6431557
Tuart (*Eucalyptus gomphocephala*)	383229	6431552
Tuart (*Eucalyptus gomphocephala*)	383225	6431532
Tuart (*Eucalyptus gomphocephala*)	383202	6431522
Tuart (*Eucalyptus gomphocephala*)	383219	6431514
Tuart (*Eucalyptus gomphocephala*)	383226	6431507
Tuart (*Eucalyptus gomphocephala*)	383280	6431591
Tuart (*Eucalyptus gomphocephala*)	383285	6431586
Tuart (*Eucalyptus gomphocephala*)	383285	6431605
Tuart (*Eucalyptus gomphocephala*)	383319	6431613
Tuart (*Eucalyptus gomphocephala*)	383317	6431614
Tuart (*Eucalyptus gomphocephala*)	383288	6431485
Tuart (*Eucalyptus gomphocephala*)	383301	6431527
Tuart (*Eucalyptus gomphocephala*)	383300	6431528
Tuart (*Eucalyptus gomphocephala*)	383305	6431526
Tuart (*Eucalyptus gomphocephala*)	383317	6431529
Tuart (*Eucalyptus gomphocephala*)	383315	6431536
Tuart (*Eucalyptus gomphocephala*)	383330	6431547
Tuart (*Eucalyptus gomphocephala*)	383323	6431693
Tuart (*Eucalyptus gomphocephala*)	383337	6431558
Tuart (*Eucalyptus gomphocephala*)	383416	6431670
Tuart (*Eucalyptus gomphocephala*)	383418	6431674
Tuart (*Eucalyptus gomphocephala*)	383439	6431706
Tuart (*Eucalyptus gomphocephala*)	383449	6431719
Tuart (*Eucalyptus gomphocephala*)	383458	6431731
Tuart (*Eucalyptus gomphocephala*)	383392	6431563
Tuart (*Eucalyptus gomphocephala*)	383382	6431566
Tuart (*Eucalyptus gomphocephala*)	383369	6431579
Tuart (*Eucalyptus gomphocephala*)	383351	6431558

Species	Easting	Northing
Tuart (*Eucalyptus gomphocephala*)	383348	6431545
Tuart (*Eucalyptus gomphocephala*)	383342	6431540
Tuart (*Eucalyptus gomphocephala*)	383344	6431526
Tuart (*Eucalyptus gomphocephala*)	383338	6431527
Tuart (*Eucalyptus gomphocephala*)	383322	6431516
Tuart (*Eucalyptus gomphocephala*)	383317	6431508
Tuart (*Eucalyptus gomphocephala*)	383355	6431500
Tuart (*Eucalyptus gomphocephala*)	383414	6431522
Tuart (*Eucalyptus gomphocephala*)	383297	6431662